



U.S. Fish & Wildlife Service

Chincoteague and Wallops Island National Wildlife Refuges

*Draft Comprehensive Conservation
Plan and Draft Environmental Impact
Statement*

May 2014

Front cover:

Sunrise at Chincoteague National Wildlife Refuge

Steve Hillebrand/USFWS



*This blue goose, designed by
J.N. "Ding" Darling, has become
the symbol of the National Wildlife
Refuge System.*

The U.S. Fish and Wildlife Service (Service) is the principal Federal agency responsible for conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The Service manages the National Wildlife Refuge System comprised of over 150 million acres including over 555 national wildlife refuges and thousands of waterfowl production areas. The Service also operates 70 national fish hatcheries and 81 ecological services field stations. The agency enforces Federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Wildlife and Sportfish Restoration Program which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

Comprehensive Conservation Plans (CCPs) provide long-term guidance for management decisions on a refuge and set forth goals, objectives, and strategies needed to accomplish refuge purposes. CCPs also identify the Service's best estimate of future needs. These plans detail program levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. CCPs do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Chincoteague and Wallops Island National Wildlife Refuges

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Refuge Vision Statement

Our vision statement for the refuges is a synthesis of the refuges' purposes, the National Wildlife Refuge System mission and goals, and other biological, legal, and social concerns in which the refuge has a role. It is intended to be an expression of what the refuge will be like in the future in terms of natural resources and visitor experience. Our vision for the refuge, as developed for this CCP/EIS to help provide the core component of management strategies hereafter, is as follows:

Chincoteague and Wallops Island National Wildlife Refuges encompass extraordinary and ever-changing lands at the edge of the sea, a place where unique habitats and wildlife flourish. In partnership with others, the refuges are a vital part of a larger system of protected lands and waters on the Delmarva Peninsula critical to migratory birds. People from around the world can visit the refuges to learn, recreate, refresh themselves, be inspired by wildlife and wild lands, and renew their connection with nature.

Chincoteague and Wallops Island National Wildlife Refuges

Draft Comprehensive Conservation Plan and Environmental Impact Statement

May 2014

Type of Action: Administrative – Development of a Comprehensive Conservation Plan

Lead Agency: U.S. Department of the Interior, Fish and Wildlife Service

Location: Chincoteague National Wildlife Refuge
Wallops Island National Wildlife Refuge
Chincoteague, Virginia

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This Draft Comprehensive Conservation Plan (CCP) and Environmental Impact Statement (EIS) analyzes three alternatives to managing the 14,032-acre Chincoteague National Wildlife Refuge (NWR) and 373-acre Wallops Island NWR over the next 15 years. This document also contains 17 appendices that provide additional information supporting our analysis. Following is a brief overview of each alternative:

Alternative A is the status quo and current management alternative as required by the National Environmental Policy Act. This alternative continues current management strategies as established by the Master Plan approved in 1992, and is referred to as our “No Action” alternative.

Alternative B would continue established habitat and wildlife management strategies but focus them in light of the new goals and vision established by the CCP. This alternative balances habitat management, public use and access, and administration of the refuge. Alternative B is our preferred alternative.

Alternative C would direct staffing and funding towards maximizing habitat and wildlife management strategies. As a result of prioritizing habitat and wildlife management, public use activities and access may be reduced.

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**Not included in print copy. Available online or on CD-ROM.*

Chapter 1



American Oystercatcher

Introduction, Purpose and Need, and Planning Background

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- 1.2 Regional Context and Project Area
- 1.3 Purpose and Need for Action
- 1.4 Refuge Purposes
- 1.5 National Wildlife Refuge System Mission
- 1.6 Ecological Integrity
- 1.7 National Wilderness Preservation System
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- 1.11 Description of the Refuge
- 1.12 Refuge Operational Plans (“Step-down” Management Plans)
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- 1.14 Issues and Opportunities
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Chapter 1: Introduction, Purpose and Need, and Planning Background**1.1 Introduction**

The U.S. Fish and Wildlife Service (USFWS, we, our) developed this draft Comprehensive Conservation Plan (CCP) and draft Environmental Impact Statement (EIS) for Chincoteague National Wildlife Refuge (NWR) and Wallops Island NWR, collectively referred to as “the refuge.” The refuge is part of the National Wildlife Refuge System (Refuge System) — a national network of lands managed for the conservation of fish, wildlife, and plants. This document meets the requirements of a CCP, as required by the Refuge System Administration Act of 1966 as amended by the Refuge System Improvement Act of 1997 (Improvement Act), while simultaneously following the accepted format and incorporating supplemental documentation for an EIS required by the National Environmental Policy Act (NEPA) of 1969. As a result of integrating the document to meet the requirements for both a CCP and an EIS, certain areas of the suggested EIS format have been expanded to include the core of the CCP, such as the inclusion of goals, objectives, and strategies in the description of alternatives in chapter 2 and the expansion of certain sections of chapter 1.

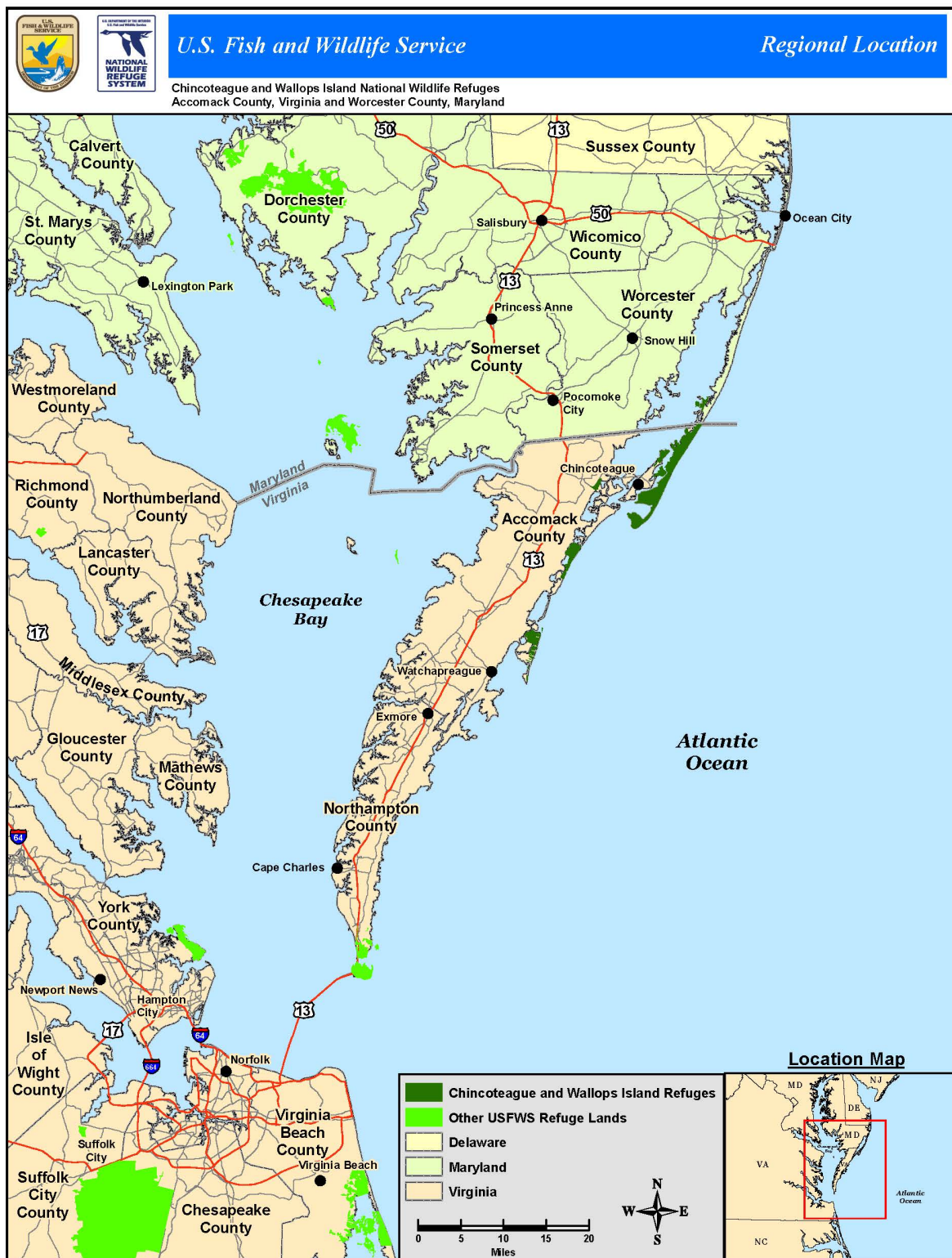
This chapter achieves the following:

- defines our planning analysis area;
- explains the purpose and need for preparing this CCP/EIS;
- documents the mission, policies, mandates, and relevant plans that affect the development of the CCP;
- describes the refuge, including its purposes and habitats;
- identifies refuge operational plans that complement the CCP;
- presents the vision and goals that will direct refuge management; and
- identifies issues and opportunities for consideration in the alternatives.

1.2 Regional Context and Project Area

The refuge is located on a system of barrier islands off the eastern shore of the Delmarva Peninsula, a large peninsula on the East Coast comprised of most of Delaware and portions of Virginia and Maryland (see Figure 1-1). The refuge primarily lies in Accomack County, Virginia. However, the planning area for the CCP/EIS also includes portions of Wicomico, Worcester, and Somerset Counties, Maryland, and Northampton County, Virginia (the Southern Delmarva Peninsula).

Figure 1-1. Overview Map of Chincoteague and Wallops Island NWRs Planning Area



1.3 Purpose and Need for Action

1.3.1 Need

Since we released the previous refuge management document, the Master Plan: Chincoteague National Wildlife Refuge (1993) and its corresponding EIS (1992), both natural processes and human uses have contributed to drastic changes to the refuge's environment. Climate change, sea level rise, and natural processes have altered and will continue to alter the coastal environment. Over the past 20 years, national directives from Congress and USFWS for managing uses and planning for units of the Refuge System have become more comprehensive and attuned to the essential features of natural systems. We designed this CCP/EIS to address management and protection of valuable natural resources into the future, a future where continued change is even more likely to occur.

Public visitation, which has stayed consistent over the past decade with approximately 1.25 million visits annually, is important to raising awareness and appreciation of the refuge and to generating revenue that supports public and wildlife services. Such high visitation provides a need to implement management strategies and direction to minimize human disruption to the natural environment.

Our development of this draft CCP/EIS addresses three major needs. First, the Improvement Act (1997) requires that all national wildlife refuges have a CCP to help fulfill the mission of the Refuge System.

Second, the refuge currently has an outdated master plan. Since 1993, environmental factors have morphed the coastal landscape of the refuge, resulting in a need to revisit our vision statement, goals, objectives, and management strategies to successfully manage the refuge now and into the future. Developing this CCP/EIS provides us with an opportunity to solicit public and partner involvement throughout the planning process that will inform the framework and direction with which to manage the refuge.

Third, our management practices should be consistent with current mandates. This new CCP will ensure the refuge conforms to all relevant current law and policies.

1.3.2 Purpose

We must evaluate and plan for the changing environmental conditions that the refuge currently faces; the natural environment, human uses, and management direction have all changed over the past 20 years. We designed the CCP to address management and protection of valuable natural resources into the future, anticipating to the extent possible how climate change and other factors will affect our ability to achieve refuge purposes. We will plan for approaches that are ecologically sound and sustainable in light of physical and biological change; practical, viable, or economically realistic; and responsive to issues, concerns, and policies.

Thus, in accordance with the Refuge System Planning Policy (Service Manual 602 FW 3), *the purpose of this CCP is to provide the refuge manager with a 15-year management plan for the conservation of fish, wildlife, and plant resources and their related habitats, while providing opportunities for compatible wildlife-dependent recreational uses.* Specifically this CCP is designed to provide a management plan that:

- (1) achieves the refuge's purposes;

- (2) fulfills the mission of the Refuge System;
- (3) maintains and, where appropriate, restores the ecological integrity of the refuge and the Refuge System;
- (4) helps achieve the goals of the National Wilderness Preservation System;
- (5) meets other mandates and the management goals set by the USFWS for the refuge; and
- (6) addresses other significant issues and concerns.

Each of these six elements of the purpose of the CCP is discussed in the sections below. The refuge purposes are discussed in section 1.4; the Refuge System Mission is presented in section 1.5; ecological integrity is defined in section 1.6, the goals of the National Wilderness Preservation System are discussed in section 1.7; and descriptions of other mandates relevant to the refuge are provided in section 1.8. In addition, all of these elements are succinctly addressed in the vision and goals that we established for the refuge as part of this CCP process and that are reported in section 1.13.

NEPA requires a thorough analysis of a *range of alternatives*, which are different ways to achieve the purpose of the CCP, and our vision and goals for the refuge. As illustrated in chapter 2, the purpose and need statement, along with our goals and vision for the refuge (discussed in section 1.13), are the key criteria in establishing this range of alternatives.

By addressing the CCP purposes stated above, this process will result in a management plan that:

- states clearly the desired future conditions of refuge habitat, wildlife, and visitor services;
- provides state agencies, refuge neighbors, visitors, and partners with a clear understanding of the reasons for refuge management actions;
- ensures that refuge management reflects the policies, legal mandates and the mission of the USFWS and the Refuge System and the refuge purposes;
- ensures the compatibility of current and future public use;
- provides long-term continuity in refuge management; and
- provides justification for refuge staffing, facilities, operations and maintenance, and projected budget requests.

1.4 Refuge Purposes

This CCP addresses both Chincoteague and Wallops Island NWRs and, therefore, the statutory purpose of each refuge is described below. Section 1.13 describes the vision statement and goals for the CCP that we developed with our partners to achieve both the purposes of the refuge and of the CCP.

1.4.1 Chincoteague National Wildlife Refuge

The Secretary of the Department of the Interior (DOI) established Chincoteague NWR in 1943 under authority of the Migratory Bird Conservation Act “...for use as an *inviolable sanctuary or for any other management purpose, for migratory birds*” (16 U.S.C. § 715d), especially migrating and wintering waterfowl. Since that time, the objectives have been expanded to include the protection and management of threatened and endangered species and other wildlife, and to

provide for wildlife-oriented public use. Other refuge purposes, and their associated acquisition authorities, now also include:

- “... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...” 16 U.S.C. § 460k- “... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ...” 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-4), as amended);
- “... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ...” 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986);
- “... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...” 16 U.S.C. § 742f(a)(4) “... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ...” 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956); and,
- “... for conservation purposes ...” 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act).

1.4.2 Wallops Island National Wildlife Refuge

Wallops Island NWR was created on March 11, 1971, when 373 acres of land were transferred to the USFWS from the National Aeronautics and Space Administration (NASA) Wallops Flight Center. Formally, Wallops Island NWR was established “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. § 715d) and for “... particular value in carrying out the national migratory bird management program.” (16 U.S.C. § 667b)].

1.5 National Wildlife Refuge System Mission

The Refuge System is the world’s largest collection of lands set aside specifically for the conservation of wildlife and the protection of ecosystems. President Theodore Roosevelt established the first national wildlife refuge in 1903, and as of September 30, 2012, the Refuge System consisted of 560 national wildlife refuges, 209 Waterfowl Production Areas, and 50 Coordination Areas encompassing more than 150 million acres of lands and waters in all 50 states and several island territories. The Refuge System is home to more than 700 species of birds, 220 species of mammals, 250 reptile and amphibian species, and more than 1,000 species of fish, and it also provides critical habitat for more than 280 threatened and/or endangered plants and animals. Each year, more than 45 million visitors hunt, fish, observe and photograph wildlife, or participate in environmental education and interpretive activities on refuges.

In 1997, President Clinton signed into law the National Wildlife Refuge System Improvement Act (PL 105-57, hereafter referred to as the Improvement Act), which established a unifying mission for the Refuge System:

“to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

The Improvement Act, which is discussed further in section 1.8.3, also established a new process for determining the compatibility of public uses on refuges, and requires us to prepare a CCP for each refuge and to focus on wildlife conservation.

1.6 Ecological Integrity

In order to fulfill the Refuge System mission, described above, the refuge staff is charged to maintain and, where appropriate, restore the ecological integrity of the refuge. Ecological integrity is the integration of biological integrity, natural biological diversity, and environmental health; and the replication of natural conditions.

Biological integrity is defined as biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities.

Biological diversity is the variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur.

Environmental health is an abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment.

The refuge visions and goals, which we developed partly to help fulfill the Refuge System mission for ecological integrity, are described in section 1.13.

1.7 National Wilderness Preservation System

The Wilderness Act of 1964 established the National Wilderness Preservation System (NWPS) and a process for Federal agencies to recommend wilderness areas to Congress. Its purpose is:

“to secure for the American people of present and future generations the benefits of an enduring resource of wilderness...for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness” and “to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness” (16 U.S.C §1131. 2011).

Wilderness, as defined by the Wilderness Act, is untrammeled (free from man's control), undeveloped, and natural land, offering outstanding opportunities for solitude and primitive recreation. Essentially, the goals of the Act are to ensure that, despite increasing population and expanding settlement and mechanization, there are still areas of the United States where these factors are not present or felt.

The Refuge System contains 20 percent of America's NWPS, with 20 million acres of designated wilderness on 63 refuges. The Refuge System also protects 1.9 million acres of proposed

wilderness on 21 refuges. By law and policy, we are responsible for preserving the wilderness character of these designated and proposed wilderness areas.

In response to the Wilderness Act, the entirety of Assateague Island was reviewed to see which areas still possessed primeval characteristics. As a result, the central 6,500 acres of Assateague Island was proposed as wilderness in 1974, but has yet to receive designation. Until such a congressional decision is made, Chincoteague NWR currently manages the proposed area within its jurisdiction to preserve its wilderness character. An evaluation of the current land status, Appendix A, provides a 2012 baseline assessment and describes the wilderness character monitoring program for the proposed Assateague Island wilderness.

As part of the 50th Anniversary of the Wilderness Act in 2014, USFWS has proposed to charter a Refuge System Wilderness Council to evaluate the 21 Proposed Wilderness Areas and Wilderness Study Areas within the Refuge System and to prepare a National Strategy to advance priority wilderness proposals to Congress for designation.

1.8 Other Mandates

In addition to the requirements discussed above in sections 1.4 through 1.7, there are other mandates that we must abide by in managing the refuge, including laws, policies for implementing those laws, and executive orders. Some of these are specific to USFWS and others are broader and apply to all Federal agencies. Some of these are summarized in this section.

For each of the USFWS mandates and policies, the Service Manual (found at: <http://www.fws.gov/policy/manuals/>) contains the standing and continuing directives implementing our authorities, responsibilities, and activities, and we amend it as necessary. We publish special directives that affect the rights of citizens or the authorities of other agencies separately in the Code of Federal Regulations (CFR), and the Service Manual does not duplicate them.

1.8.1 U.S. Fish and Wildlife Service and its Mission

The USFWS, as part of DOI, administers the Refuge System to safeguard the nation's fish, wildlife, plants and their habitats.

The USFWS vision is to “...*continue to be a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals, and commitment to public service.*”

The USFWS mission is: “*Working with others, to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.*”

The USFWS is the primary Federal agency responsible for conserving, protecting, and enhancing America's fish and wildlife populations and their habitats. These include migratory birds, federally listed endangered or threatened species, inter-jurisdictional fish, wetlands, certain marine mammals, and national wildlife refuges. We also enforce Federal wildlife laws and international treaties on importing and exporting wildlife, manage and protect migratory bird populations, restore national fisheries, administer the Endangered Species Act, and restore native plant habitats. The USFWS also assists states with their fish and wildlife programs and helps other countries develop conservation programs.

1.8.2 *Refuge System Goals*

Through the planning process, the USFWS has proposed specific management goals for the refuge, further defined in section 1.13. The Refuge System has developed a number of goals to help guide the development of CCPs and to improve its administration, management, and growth in a unified and consistent manner. These goals, as captured in the USFWS Service Manual (601 FW 1), are:

- Conserve a diversity of fish, wildlife, plants, and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, fish, and marine mammal populations that are strategically distributed and carefully managed to meet important life history needs of these species across their habitat ranges.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation, photography, environmental education, and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, plants, and their habitats.

1.8.3 *The Improvement Act (1997)*

The Improvement Act amended the Refuge System Administrative Act of 1966 by codifying various USFWS policies and establishing a unifying mission, policy direction, and management standards. This law established several new mandates to make management of the Refuge System more cohesive and standardized and to ensure that the USFWS considers wildlife first when managing refuges. These mandates include a new process for determining the compatibility of public uses on refuges, a requirement to prepare a CCP for each refuge, and a requirement to focus on wildlife conservation.

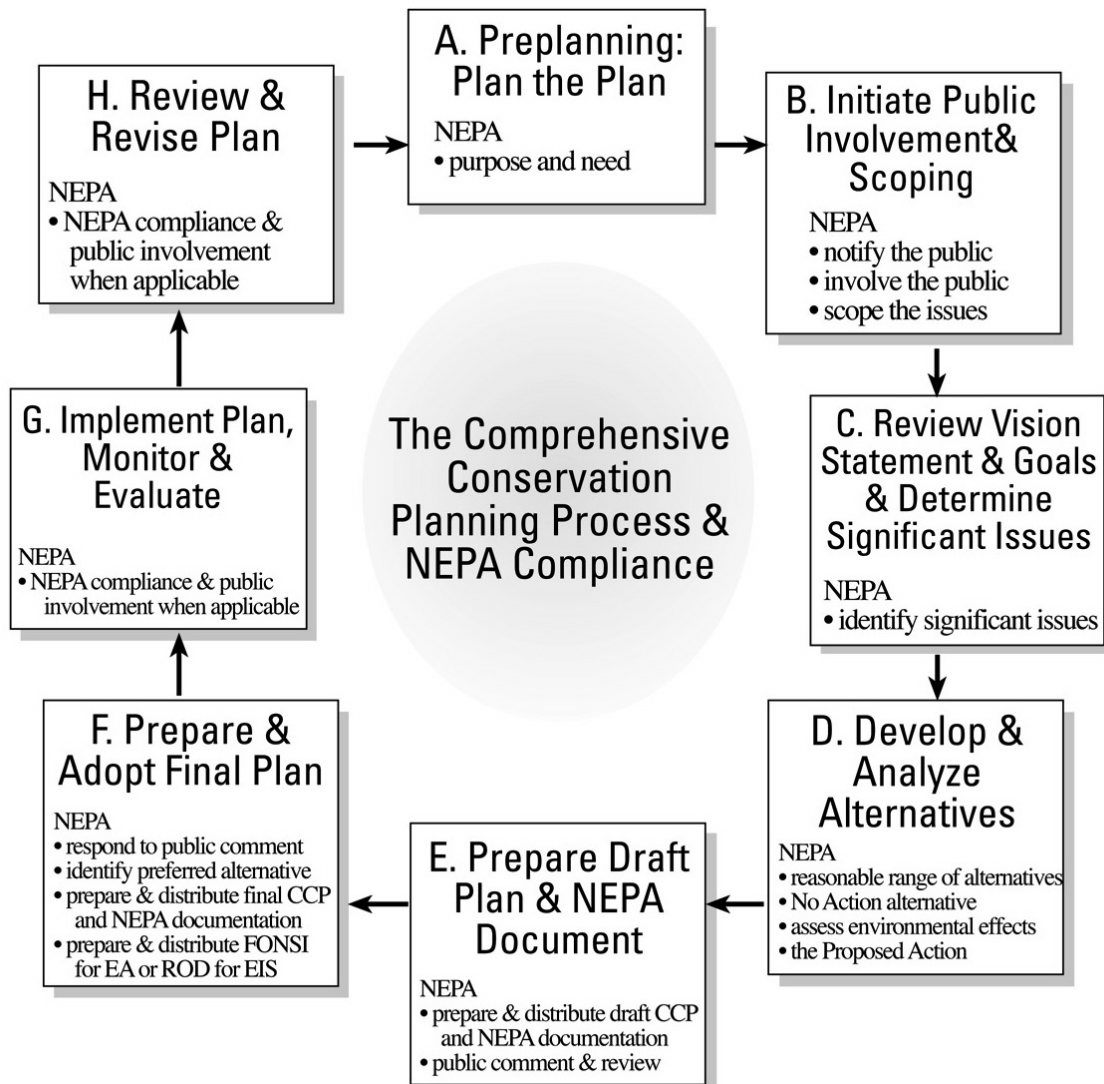
The Improvement Act directs the Secretary of the DOI to ensure that the mission of the Refuge System and purposes of the individual refuges are carried out. It states that the national mission, coupled with the purpose(s) for which each refuge was established, will provide the principal management direction for each refuge, as noted in the purpose statement of this CCP/EIS. It also requires the Secretary to maintain the biological integrity, diversity, and environmental health of the Refuge System, which is also included in the purpose of this CCP/EIS.

The Refuge System Planning Policy

The Refuge System Planning Policy (Service Manual 602 FW 1,2,3) establishes guidance, systematic direction, and minimum requirements for Refuge System planning, including CCPs, and stipulates a systematic decision-making process that fulfills those requirements. The purposes of this CCP that are listed in section 1.3.2 mirror those listed in the Service Manual, which states that we will manage all refuges in accordance with an approved CCP which, when implemented, will achieve refuge purposes; help fulfill the Refuge System mission; maintain and, where appropriate, restore the ecological integrity of each refuge and the Refuge System; help achieve the goals of the NWPS; and meet other mandates.

The policy establishes an eight-step planning process that facilitates compliance with NEPA (Figure 1-2). Each of the individual steps is described in detail in the Service Manual and CCP training materials (Service Manual 602 FW 3). By preparing this CCP, we are implementing the Planning Policy as directed by the Service Manual.

Figure 1-2. Steps in the Comprehensive Conservation Planning Process and its relationship to the National Environmental Policy Act of 1969 (Service Manual 602 FW 1,2,3)



Maintaining Biological Integrity, Diversity, and Environmental Health (BIDEH) Policy

The BIDEH policy (Service Manual 601 FW 1) provides guidance on maintaining or restoring the BIDEH of the Refuge System, including the protection of a broad spectrum of fish, wildlife, and habitat resources in refuge ecosystems, as reflected in the purpose of this CCP. It provides refuge managers with a process for evaluating the best management direction to prevent the additional degradation of environmental conditions and restore lost or severely degraded environmental components. The policy also provides guidance for dealing with external threats to the biological integrity, diversity, and environmental health of a refuge and its ecosystem.

Appropriate Refuge Uses Policy

Federal law and USFWS policy provide the direction and planning framework for protecting the Refuge System from inappropriate, incompatible, or harmful human activities and ensuring that visitors can enjoy its lands and waters, as noted in the purpose statement of this CCP. This policy provides a national framework for determining appropriate refuge uses in an effort to prevent or eliminate those uses that should not occur in the Refuge System. It describes the initial decision process the refuge manager follows when first considering whether or not to allow a proposed use on a refuge.

Compatibility Policy

The Improvement Act identifies six wildlife-dependent public uses as appropriate on national wildlife refuges. These uses—hunting, fishing, wildlife observation, photography, environmental education, and interpretation—will receive priority consideration on refuges and in CCPs. The Act also declares that all existing or proposed refuge uses must be found “compatible” with the refuge’s purpose and consistent with public safety, as affirmatively determined by the refuge manager. Each use is evaluated for its potential impact on refuge resources and its ability to not materially interfere with or detract from the fulfillment of the Refuge System’s mission or the refuge’s purpose.

Findings of appropriateness and compatibility determinations (CDs) are required for all refuge uses, excluding management actions, per the Improvement Act (1997). These statements evaluate an activity’s appropriateness and compatibility with refuge purposes and, in the case of the CDs, outline measures to ensure compatibility that must be followed if the use is to be allowed. The refuge manager may allow or deny any use, even one that is compatible, based on other considerations such as public safety, conflicts with other laws or policy, or available funding. This policy and its regulations, including a description of the process and requirements for conducting compatibility reviews, can be viewed online at: <http://www.fws.gov/policy/603fw2.html>.

1.8.4 The Endangered Species Act

Mandated under section 4(f) of the Endangered Species Act (ESA) of 1973, four Recovery Plans are in effect to protect and enhance threatened and endangered species that are residents of Chincoteague and/or Wallops Island NWRs:

- *Delmarva Fox Squirrel (Sciurus niger cinereus) Recovery Plan* (USFWS 1993b).
http://ecos.fws.gov/docs/recovery_plans/1993/930608.pdf
 - *Delmarva Peninsula Fox Squirrel 5-Year Review: Summary and Evaluation* (USFWS 2011d)

- *Recovery Plan for U.S. Populations of Loggerhead Turtle (Caretta caretta)* (NMFS and USFWS 1993). http://www.nmfs.noaa.gov/pr/pdfs/recovery/turtle_loggerhead_atlantic.pdf
- *Recovery Plan for Seabeach Amaranth (Amarantus pumilus)* (USFWS 1996b). http://www.cals.ncsu.edu/plantbiology/ncsc/rare/Recovery_Amaranthus.pdf
- *Atlantic Coast Piping Plover (Chadradius melodus) Recovery Plan* (USFWS 1996c). http://www.fws.gov/northeast/pipingplover/pdf/entire_plan.pdf

Current refuge management with respect to these federally listed species has been guided by these Recovery Plans and numerous ESA Section 7/Biological Opinions for refuge projects. For more detailed descriptions of these recovery plans and documents, see Appendix B, Appendix F, and Appendix O.

1.8.5 Other Federal Mandates

Although USFWS and Refuge System laws and policies, along with the purpose of each refuge, provide the foundation for managing the refuge, other Federal laws and executive orders affect how we manage refuges. These are addressed in chapter 4, Environmental Consequences, which evaluates the compliance of the alternatives with these mandates. These include, but are not limited to the following laws (as amended): the National Historic Preservation Act of 1966, the Clean Air Act of 1970, the Clean Water Act of 1977, the Coastal Zone Management Act (CZMA) of 1972, and the Migratory Bird Treaty of 1918.

The following Executive Orders (EOs) are also applicable and addressed in chapter 4: EO 1988, Floodplain Management; EO 11990, Protection of Wetlands; and EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Finally, we designed this CCP/EIS to comply with NEPA and the Council on Environmental Quality regulations for implementing NEPA (40 CFR, 1500-1508). Other laws and executive orders can be found on the USFWS Laws Digest Web site at: <http://www.fws.gov/laws/Lawsdigest.cfm>; the laws listed here and others are also listed in Appendix C.

1.9 Significant Concerns

Interest in the future management of the refuge is widespread. The concerns and interests of citizens, local and state officials, and non-governmental organizations are diverse. We have heard from businesses and full-time and part-time residents from the town of Chincoteague and neighboring communities; hunters and harvesters of waterfowl, fish, and shellfish, and upland game species; visitors who come to observe birds, the Chincoteague ponies, monarch butterflies, and other wildlife, or who seek solitude and respite in the natural world; beachgoers, horseback riders, and other non-wildlife-dependent recreation users; and State agencies and other programs and organizations concerned about the role and contributions the refuge can play in a larger network of natural areas across the Delmarva Peninsula, the Mid-Atlantic region, and the migratory bird flyway of the Atlantic coast.

Based on input we received and our professional judgment in incorporating the best available scientific and technical information, we have identified several key concerns which this CCP will address. They are:

- Climate change/sea level rise
- Regional conservation

- Balance between public use and habitat and wildlife conservation
- Public access to the refuge, in particular to the recreational beach, and impact on visitor experience and the local economy

We identified the first two concerns based on the policies and initiatives of the USFWS and the DOI, as well as feedback from other resource management agencies. The latter two concerns were the most consistently and strongly voiced themes from public comments received during scoping.

Each of these concerns is summarized below, and is also addressed in the alternatives we developed that are described in chapter 2 and as part of the existing conditions discussed in chapter 3.

1.9.1 *Climate Change/Sea Level Rise*

Climate change and sea level rise are a growing concern for the refuge and the nation. Rising air and water temperatures, intense precipitation events, drought, sea level rise, strong coastal storms, and intense wind events are all concerns identified by the scientific community for the Mid-Atlantic region. Since the current Master Plan was signed, our awareness and understanding of the impacts of climate change and sea level rise on barrier islands has increased.

Recent repeated coastal flooding and over wash caused by nor'easters and tropical hurricanes have resulted in damage to beach access and parking. Impacts on habitat and wildlife have been either beneficial or negative depending upon the timing and severity of the weather event. We are committed to working with partners to continue research and assessment of future climate change impacts on the Delmarva Peninsula. The effects of climate change and sea level rise at the refuge are discussed in more detail in section 1.14.7 and with regard to its effect on the existing conditions, in section 3.2.5.

1.9.2 *Regional Conservation*

We are committed to a landscape-level approach to conserve, manage, and restore refuge lands and waters, as well as to facilitate such conservation actions beyond our boundaries. We recognize the conservation importance of the southern Delmarva Peninsula and the regional challenges it faces, including those related to climate change and land use. We are committed to working with partners to examine opportunities to address these challenges, such as improving connectivity between protected lands and providing lands for multiple recreational activities to support the tourism economy, while also providing ecological, educational, and other benefits. Regional conservation is a significant concern and is discussed further in section 1.14.5 and with regard to the existing environment, in section 3.9.5.

1.9.3 *Balance Between Public Use and Habitat and Wildlife Conservation*

We received many comments requesting that the refuge maintain a balance between people and nature, or recreation and wildlife management. Federal land management agencies often allow multiple uses to occur on their lands, and some agencies, like national forests and the Bureau of Land Management (BLM) have a multiple use mandate and structure. However, statutory and policy framework of the Refuge System clearly defines that wildlife and wildlife conservation must come first on refuge lands and waters. Many of our policies and goals aim to achieve this balance, through allowing for public uses that are deemed appropriate and compatible for each refuge. A balanced approach that upholds that wildlife comes first is reflected throughout the discussion of visitor service issues and concerns in section 1.14.6.

1.9.4 Public Access to the Refuge, in Particular to the Recreational Beach, and Impact on Visitor Experience and the Local Economy

Access to the refuge, in particular to the recreational beach, was the most commonly cited issue by the public. We are committed to preserving access to the refuge, including by personal vehicle, and to continuing to provide a recreational beach. We considered impacts on visitor experience and the local economy throughout this CCP/EIS. Access issues are discussed in section 1.14.6 and in the affected environment chapter in section 3.5.2 and 3.6.2.

1.10 Other Relevant Plans and Initiatives

USFWS manages and administers the Chincoteague NWR and Wallops Island NWR as part of the Refuge System. In addition to the purposes, mandates, and policies that are discussed relative to the purpose of this CCP, as discussed in sections 1.3 through 1.9 above, a variety of international, national, state, regional, and local plans and initiatives affect the context and setting of refuge and therefore, the CCP. These plans and initiatives are related to conservation, public use, climate change, and land use. They are listed below and described in more detail in Appendix B.

1.10.1 International and National Conservation Plans and Initiatives

The plans and initiatives listed below, in chronological order, provide guidance for the CCP/EIS development and for development of refuge management policies, goals, and objectives with regard to the significance of the refuge's natural environment and considerations for its protection and management.

- *North American Breeding Bird Survey* (BBS; 1966-present).
<https://www.pwrc.usgs.gov/BBS/index.cfm?CFID=9765136&CFTOKEN=20581228>
- *North American Waterfowl Management Plan* (NAWMP; 1986, 2004, and 2012).
<http://nawmprevision.org/sites/default/files/NAWMP-Plan-EN-may23.pdf>
- *Partners in Flight: Mid-Atlantic Coastal Plain Bird Conservation Plan* (PIF; Watts, 1999). http://www.partnersinflight.org/bcps/plan/pl_44_10.pdf
- *Regional Wetland Concept Plan, Northeast Region* (USFWS; 1990).
<http://digitalmedia.fws.gov/utills/getfile/collection/document/id/1378/filename/1379.pdf>
- *North American Bird Conservation Initiative* (NABCI, 1998). <http://www.nabci-us.org/>
- *U.S. Shorebird Conservation and North Atlantic Regional Shorebird Plans*
 - The USSCP is available online at: <http://www.shorebirdplan.org/wp-content/uploads/2013/01/USShorebirdPlan2Ed.pdf> (Brown et al. 2001).
 - The North Atlantic Regional Shorebird Plan can be viewed online at: <http://www.fws.gov/shorebirdplan/RegionalShorebird/downloads/NATLAN4.pdf> (Clark & Niles 2000).
- *North American Waterbird Conservation Plan* (NAWCP; Version 1, 2002).
<http://www.nawcp.org/pubs/ContinentalPlan.cfm> (Kushlan et al. 2002).
- *Birds of Conservation Concern* (BCC).
<http://digitalmedia.fws.gov/cdm/ref/collection/document/id/1404>

- *New England/Mid-Atlantic Coast Bird Conservation Region (BCR 30) Implementation Plan*. http://www.acjv.org/BCR_30/BCR30_June_23_2008_final.pdf (Steinkamp 2008).
- *A Blueprint for the Future of Migratory Birds: A Strategic Plan 2004-2014*. http://library.fws.gov/Bird_Publications/blueprint04-14.pdf
- *Conserving the Future: Wildlife Refuges and the Next Generation* (USFWS 2011). <http://americaswildlife.org/wp-content/uploads/2012/01/Final-Documents-Conserving-the-Future.pdf>
- *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (2012)*. http://www.fws.gov/windenergy/docs/WEG_final.pdf

1.10.2 National Public Use Plans and Initiatives

- *America's Great Outdoors: A Promise to Future Generations* (AGO; 2011). <http://americasgreatoutdoors.gov/files/2011/02/AGO-Report-With-All-Appendices-3-1-11.pdf>
- Let's Move! And Let's Move Outside. <http://www.letsmove.gov/>
- Youth in the Great Outdoors. <https://youthgo.gov/>
- Connecting People with Nature. <http://www.fws.gov/northeast/cpwn/index.html>

1.10.3 Climate Change and Sea Level Rise Studies

USFWS is concerned with the potential effects of climate change on Assateague Island and the Virginia Eastern Shore, and the potential impact on refuge facilities, infrastructure, and access. We, therefore, consider climate change to be a key consideration for this CCP/EIS. These concerns are further described in section 1.14, Issues and Opportunities.

The two most relevant climate change plans are the following:

- *Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change* (USFWS 2009). <http://www.fws.gov/home/climatechange/pdf/CCStrategicPlan.pdf>.
- *The National Fish, Wildlife and Plants Climate Adaptation Strategy* (2012). <http://www.wildlifeadaptationstrategy.gov/pdf/NFWPCAS-Final.pdf>.

The relevant work on climate change for the refuge includes the following studies and plans, presented in chronological order:

- *A Case Study on Chesapeake Bay and Assateague Island* (EPA, NPS, USFWS 2009). http://www.nwf.org/~media/PDFs/Global-Warming/Reports/SeaLevelRiseandCoastalHabitats_ChesapeakeRegion.pdf?dmc=1&ts=20130325T1459161406
- *Refuges at Risk: the Threat of Global Warming* (Schlyer 2006). http://www.defenders.org/publications/refuges_at_risk_2006.pdf.
- *The Virginia Climate Change Action Plan* (Governor's Commission on Climate Change 2008). http://www.sealevelrisevirginia.net/docs/homepage/CCC_Final_Report-Final_12152008.pdf.

- *Sea Level Rise and Coastal Habitats in the Chesapeake Bay Region, Sea Level Affecting Marshes Model (SLAMM)*¹ (Glick 2008). http://www.nwf.org/~media/PDFs/Global-Warming/Reports/SeaLevelRiseandCoastalHabitats_ChesapeakeRegion.ashx.
- *Application of the SLAMM 5.0.2 in the Lower Delmarva Peninsula* (Nieves 2009). http://www.slamview.org/slamview2/reports/LDP_ChincoteagueFinal.pdf.
- *National Parks in Peril: The Threats of Climate Change Disruption* (Saunders 2009). <http://rockymountainclimate.org/website%20pictures/National-Parks-In-Peril-final.pdf>.

1.10.4 State, Regional, and Local Plans

- *Virginia's Comprehensive Wildlife Conservation Strategy and Wildlife Action Plan* (Virginia Department of Game and Inland Fisheries 2005). <http://www.bewildvirginia.org/wildlifeplan/>.
- *State Comprehensive Outdoor Recreation Plan* (Virginia Department of Conservation & Recreation 2007). http://www.dcr.virginia.gov/recreational_planning/vop.shtml.
- *Accomack County Comprehensive Plan* (County of Accomack 2008). http://www.co.accomack.va.us/Planning/2008_comprehensive_plan_update.html.
- *Town of Chincoteague Comprehensive Plan* (Town of Chincoteague 2010). <http://www.chincoteague-va.gov/pdf/ComprehensivePlan201001.04.10.pdf>.

¹ SLAMM is one of the models used to study the impact of coastal processes, such as sea level rise, on an area and simulate the dominant processes and forecast long-term effects. SLAMM takes into account five processes that determine the impact of sea level rise impact on wetlands: inundation (the rise of water levels and the salt boundary); erosion; overwash (beach migration and transport of sediments); saturation (migration of coastal swamps and fresh marshes onto adjacent uplands due to the water table responding to rising sea level); and accretion (vertical rise due to buildup of organic and inorganic matter).

1.11 Description of the Refuge

This section provides the history and description of the two refuges that are the subject of this CCP/EIS.

1.11.1 *Chincoteague National Wildlife Refuge*

Chincoteague NWR includes approximately 14,000 acres of beach, dune, marsh, and forest habitats. Federal title to refuge land extends to the mean low water line. Actual acreage is difficult to measure due to land erosion and accretion. Under common law, title to accreted lands inures to the uplands owner.

Originally, Chincoteague NWR encompassed 8,808 acres acquired under the Migratory Bird Conservation Act (1929). This land was located primarily on the southern end of Assateague Island, which lies in Accomack County, Virginia, but also included Jerico and Hebron Islands, two small marshes adjacent to the island but located in Worcester County, Maryland. These islands are now managed by the National Park Service (NPS). The northern end of Assateague Island lies in Maryland and is managed by the NPS (Assateague Island National Seashore) and the Maryland Department of Natural Resources (Maryland Assateague State Park). Assateague Island National Seashore was designated in 1965 with provisions for the southern end of Assateague Island to remain a refuge under the management of the USFWS. Since the refuge's creation, the USFWS has acquired additional lands using the Migratory Bird Conservation Fund or the Land and Water Conservation Fund. Today, Chincoteague NWR encompasses approximately 14,032 acres, of which all but 418 acres (as previously mentioned) are located in Accomack County, Virginia. In addition to the Virginia part of Assateague Island, Chincoteague NWR includes all 427 acres of Morris Island (located between Chincoteague and Assateague Islands), 546 acres of the northern end of Chincoteague Island (known as Wildcat Marsh), all 1,434 acres of Assawoman Island, 174 acres of the northern end of Metompkin Island, and 1,412 acres in fee title and 600 acres in easements on Cedar Island. Portions of Assawoman and Metompkin islands were acquired most recently, in 1990. Acreage given is based on realty transaction accounts; the actual acreage changes with land accretion, erosion, and other factors.

We have created and manage approximately 2,600 acres of fresh and brackish-water impoundments on Chincoteague NWR for migrating and wintering waterfowl and other migratory birds. Chincoteague NWR also provides and manages habitat for American black ducks, as part of a long-term effort, in compliance with the North American Waterfowl Management Plan, to reverse significant drops in this species' populations. These efforts also benefit other wildlife, especially shore and wading birds.

Wildlife management strategies at Chincoteague NWR continue to provide quality habitat for migrating and wintering waterfowl which also benefits a greater variety of wildlife, such as wading birds, shorebirds, and neotropical migrants. The refuge supports breeding populations of the endangered Delmarva Peninsula fox squirrel and the threatened piping plover. The American bald eagle (de-listed or removed from the Federal List of Endangered and Threatened Wildlife and Plants in 2007) regularly nests on the refuge, and the American peregrine falcon (de-listed in 1999) is seen quite frequently during its annual autumn migration. The refuge's southern barrier islands are particularly important as spring stopover sites for migrating red knots between late April to early June, with numbers peaking in late May (Niles et al. 2010). Virginia hosts approximately 30 percent of the hemisphere's red knot rufa subspecies population, and Cedar and Metompkin Islands fall in the upper third of islands in terms of numbers of red knots counted

during migration (TNC 1996). The red knot was proposed for listing as a Federal threatened species in September 2013. Additionally, the Atlantic loggerhead sea turtle is a threatened species that nests occasionally on Chincoteague NWR. Refuge management programs are targeted to provide feeding and resting areas for birds in migration, and nesting and brood-rearing habitat for those birds that find Chincoteague NWR suitable for reproduction. To this end, Chincoteague NWR continues efforts toward acquiring land and water for increased conservation of migratory bird resources and to protect important wildlife habitat from the impacts of development.

Chincoteague NWR has been designated as part of a Globally Important Bird Area (IBA) by the American Bird Conservancy and the Audubon Society; one of the top 10 birding Hotspots by the National Audubon Society; and a Site of International Importance within the Western Hemisphere Shorebird Reserve Network (WHSRN), a conservation partnership of stewards and landowners led by the Manomet Center for Conservation Sciences. This coastal barrier island/lagoon system has been designated a World Biosphere Reserve by the United Nations Educational, Scientific, and Cultural Organization in recognition of its great ecological value. Moreover, the DOI designated the area a National Natural Landmark in recognition of its outstanding natural values.

Chincoteague NWR is also an important recreational destination, particularly for people living in the Washington, DC, Baltimore, Philadelphia, and New York City areas. With approximately 1.2 to 1.4 million visits annually, Chincoteague NWR is one of the most visited refuges in the United States, providing visitors with the six wildlife-dependent recreation opportunities (hunting, fishing, wildlife observation and photography, environmental education and interpretation) designated as priority general public uses of the Refuge System by Congress, as well as other public uses that have been deemed appropriate and compatible. The majority of visits are to the recreational beach, which is managed by the NPS under an agreement with USFWS, and subject to a congressional mandate from 1965 when the Assateague Island National Seashore was designated. Visitation to Chincoteague NWR supports the tourism economy of the town of Chincoteague, which is the refuge's gateway community and is located on Chincoteague Island, and through which visitors must travel to access Chincoteague NWR.

Chincoteague NWR Management Units

The management units for Chincoteague NWR are organized by island, with habitats as sub units. Table 1-1 summarizes the management units by name, and then breaks down individual acreage for each sub unit by habitat. Habitats for each management unit, or group of units, are then described in more detail. The differences in habitat among the management units illustrate the need for different management. Figure 1-3 identifies the refuge management units.

Table 1-1. Management Units

Unit	Sub Unit by Habitat (acres)					Total Acreage
	Beach /Dune	Shrub/early successional	Forested Uplands	Impoundments	Salt Marsh	
Assateague Island	970	2,872	1,600	2,650	1,985	10,077
Wildcat Marsh	-	-	71	-	475	546
Morris Island	-	-	21	-	406	427
Assawoman Island	359	-	-	-	1,075	1,434
Metompkin Island	96	-	-	-	78	174
Cedar Island	402				1,610	2,012
Wallops Island NWR	-	57	121	-	195	373
Refuge Total	1,827	2,929	1,813	2,650	5,824	15,043

The areas assigned to each habitat type are approximate, based on a 1994 land cover map, and provide a rough idea of the proportion of each habitat type on the refuge. A dynamic environment and shoreline constantly modified by storm and extreme high tide means that the amount of beach/dune and salt marsh habitat varies from year-to-year and across seasons. Encroachment of shrubs and trees into impoundments further hinders the accurate estimation of cover types at any given point in time.

1.11.2 Wallops Island National Wildlife Refuge

Wallops Island NWR is located on the mainland, east of Wattsville in Accomack County, Virginia, immediately adjacent to Highway 175, which provides access to the Town of Chincoteague and Chincoteague NWR. Wallops Island NWR is comprised mainly of salt marsh and woodlands and contains habitat for a variety of species, including upland and wetland dependent migratory birds. Wallops Island NWR is managed as a satellite refuge of Chincoteague NWR.

Wallops Island NWR is adjacent to the NASA Wallops Flight Facility. In 1971, the Bureau of Sport Fisheries and Wildlife, the precursor to the USFWS, entered into a noninterference - nonexclusive use agreement with the NASA Wallops Flight Facility to manage property (approximately 3,000 acres, "...of any and all lands and marsh...") of Wallops Island, Virginia. These lands were entered into the national data base of land under control (but not ownership) of the USFWS. For the next 35 years this agreement was to be renewed every 5 years and administration and management of these lands were the responsibility of the Chincoteague NWR. These new lands under the nonexclusive use agreement assimilated the purpose(s) of Chincoteague NWR.

In 1975, NASA transferred 373 acres of upland and marsh that now comprise Wallops Island NWR to the USFWS for ownership. In 2006, the agreement between NASA and USFWS expired and NASA requested that the agreement not be renewed. Additionally, NASA asked the USFWS to remove the 3,000 acres it was managing from its national data base. This was done; however, the dialogue that took place between the NASA Wallops Flight Facility and the USFWS concerning the renewal of the use agreement produced a greater understanding of our individual agency missions and responsibilities. This led to extensive discussions concerning current and future challenges jointly faced by both our agencies in light of climate change and its corresponding sea level rise. It became readily apparent that the opportunities presented by working together as part of a larger collaborative effort would provide for a greater scientific

Figure 1-3. Refuge Management Units



understanding of our shared coastal environment, and that the advancements in the use of technologies for the study of these environments could be shared with others. On August 11, 2011, the NASA Wallops Flight Facility, The Marine Science Consortium, and the USFWS entered into a “Nonreimbursable Space Act Agreement” for the purpose of: Technical Collaboration for Data Collection and Studies related to Climate Change, Habitat Shifts, Algorithm Development, Instrument Development, and Small Satellite Development. This new agreement will form the backbone of many future collaborative efforts.

Since its creation in 1971, Wallops Island NWR has been unstaffed, with little monitoring or management, except by A&N Electric Cooperative (and previously by Delmarva Power), utility companies with a power line right-of-way that removes tall growing trees, primarily the non-native autumn olive, and some brush species. Both the NPS and U.S. Department of Agriculture (USDA) Wildlife Services have storage facilities and maintenance areas on the refuge.

Wallops Island NWR is closed to the public except for white-tailed deer hunting. It was opened to public hunting in 2002 to reduce effects of overbrowsing by white-tailed deer, and to reduce the potential of deer collision with vehicles on the adjacent Highway 175 and aircraft at the neighboring NASA flight facility.

1.12 Refuge Operational Plans (“Step-down” Management Plans)

The Service Manual lists more than 25 step-down management plans that may be required on refuges to complement the CCP. Those plans contain specific strategies and implementation schedules for achieving refuge goals and objectives. Some plans require annual revisions; others require revision every 5 to 10 years. Some plans require additional NEPA analysis, public involvement, and CDs before they can be implemented (Service Manual 602 FW 4).

This document incorporates by reference those step-down plans that were previously highlighted by the refuge as necessary for enhanced management. These plans are necessary to continue proper management of the refuge, and should be carried forth in the future.

The following step-down plans are complete or updated annually, and consequently are consistent with current management. We will revise them if necessary per the selected alternative after the CCP is complete.

1.12.1 Fire Management Plan

We completed the most recent Fire Management Plan for Chincoteague NWR in 2009; the plan is updated every 5 years and is currently being updated. The Fire Management Plan addresses wildland fire events with guidelines on the level of protection needed to ensure personal and public safety, and to protect facilities and resources. We have incorporated fire programs needed to mimic natural processes and manage habitats, and other pertinent portions of the fire management, into this CCP.

1.12.2 Prescribed Fire Plan

We require a Prescribed Fire Plan for each prescribed fire on the refuge, and such plans are to be updated every 2 to 5 years. Each plan lays out the management objectives for the prescribed fire, specific prescriptions to achieve the objectives, and contingency planning for managing the fire. We prepared the most recent prescribed fire plans for the refuge in 2009 for the Wash Flats and Fire Management Unit 2 (refuge impoundments), and the plan is currently being updated.

1.12.3 *Annual Habitat Work Plans*

For each NWR, we develop Annual Habitat Work Plans (AHWP) that review habitat management activities from the previous year, evaluate monitoring programs, and make recommendations for habitat management strategies and prescriptions for the upcoming year. The AHWP incorporates adaptive management practices by evaluating success of management programs on an annual basis. We prepared the most recent comprehensive AHWP for Chincoteague NWR in January 2006, followed by a streamlined version annually. Shorebird and Delmarva Peninsula fox squirrel reports are prepared annually and semi-annually, respectively. We incorporated the results summarized in the 2010 Shorebird and 2008 Delmarva Peninsula fox squirrel reports into this CCP. Likewise, we reviewed and incorporated information from the 2007-09 Impoundment (Water) Management Plan as appropriate.

1.12.4 *Predator Management Plan*

We manage mammalian and certain avian predators to minimize losses to federally listed species and other ground-nesting birds using an Annual Predator Management Program that we develop each year prior to the nesting season. The Program evaluates the prior year's results and outlines methods for the upcoming year—protective enclosures, trapping, and shooting—to protect nesting species (USFWS 2012g). This annual plan is tied to the Final Environmental Assessment for the Management of Predation Losses to Native Bird Populations on the Barrier and Chesapeake Bay Islands and Coastal Areas of the Commonwealth of Virginia, prepared by the USDA Wildlife Service (USDA 2005).

1.12.5 *Hunt Management Plans*

We prepared the current Chincoteague and Wallops Island NWR Hunt Management Plans in September 2007 and April 2007, respectively. These plans outline population objectives, identify areas to be open for hunting, and describe how the hunts will be administered for big game (i.e., deer and sika) and migratory birds.

1.12.6 *Annual Hunt Program*

Each year, we develop the Annual Hunt Program, which is a written document detailing specifics of each year's hunt.

1.12.7 *Inventory and Monitoring Plan*

The 1993 Chincoteague NWR Wildlife Inventory Plan describes surveys and protocols to monitor population numbers and trends. The information obtained from these surveys and programs is used to guide management decisions. We are currently reviewing the plan for consistency with national and regional guidance; once the Habitat Management Plan (HMP) and CCP are finalized, the inventory and monitoring plan will be revised and finalized.

1.12.8 *Pony Management Plan*

Chincoteague NWR has resident horses known as Chincoteague ponies on Assateague Island that are owned and managed by the Chincoteague Volunteer Fire Company and that graze in 2 large designated areas on the refuge under a special use permit. In partnership with the Fire Company, we have drafted an Interim Chincoteague Pony Management Plan (2013; Appendix D), which replaces the 1990 Plan. It outlines refuge and Fire Company responsibilities in managing the ponies (USFWS 2013c).

1.12.9 Plans to be Developed

We will develop the following plans after the CCP is finalized:

Habitat Management Plan (HMP)

We intend the HMP to be a dynamic working document that provides long-term vision, specific guidance, continuity, and consistency for managing habitat on the refuge. The document sets a direction for the next 15 years, with reviews every 5 years and the use of adaptive management to assess and modify management activities as research, monitoring and priorities may require. HMPs are often step-down plans from the CCP, but can also be prepared prior to or in conjunction with the CCP/EIS. We developed a draft HMP during the pre-planning phase of this CCP/EIS and incorporated its content, including wildlife habitat goals, objectives, and strategies, into this CCP/EIS. We will revise it as necessary to be consistent with the selected alternative and finalize it after the CCP is complete.

In 1992, we completed the Upland Habitat Management Plan for Chincoteague NWR, outlining goals, objectives, and management actions for 3,440 acres of forest and shrub habitats on Assateague Island (USFWS 1992b). Unfortunately, reductions in staff and changing priorities curtailed our implementation of the plan. We reviewed the Upland Management Plan during preparation of the draft HMP, and incorporated applicable portions into it.

The Virginia Ecological Services Field Office in Gloucester, Virginia, prepared several Biological Opinions which spell out terms, conditions, and conservation recommendations for various management activities on Chincoteague NWR. The most comprehensive and detailed one is the 2008 Biological Opinion (USFWS 2008b; Appendix F). It addresses the timing, location, and types of beach use permitted in areas that harbor piping plover, sea turtles, and seabeach amaranth. It also requires specific monitoring and protective measures (USFWS 2008b). Elements of the Biological Opinion were incorporated into the draft HMP. Biological Evaluations prepared by staff under Section 7 of the Endangered Species Act (and concurred by USFWS Endangered Species Offices in Virginia and Maryland) also set management guidance for other activities in Delmarva Peninsula fox squirrel habitat.

Visitor Services Plan

This plan will be a step-down plan to the CCP and will build upon other management plans, namely the Hunt Management Plan (2007), to document approved recreational activities and identify the structure of the visitor services program. The plan will include visitor services data and research to evaluate and plan for visitor services programs, and will assist in the implementation of the CCP.

1.13 Refuge Vision and Goals

Our vision statement for the refuge is a synthesis of the refuge's purposes, the Refuge System mission and goals, and other biological, legal, and social concerns in which the refuge has a role. It is intended to be an expression of what the refuge will be like in the future in terms of natural resources and visitor experience. Our vision for the refuge, as developed for this CCP/EIS to help provide the core component of management strategies hereafter, is as follows:

Chincoteague and Wallops Island National Wildlife Refuges encompass extraordinary and ever-changing lands at the edge of the sea, a place where unique habitats and wildlife flourish. In partnership with others, the refuges are a

vital part of a larger system of protected lands and waters on the Delmarva Peninsula critical to migratory birds. People from around the world can visit the refuges to learn, recreate, refresh themselves, be inspired by wildlife and wild lands, and renew their connection with nature.

We developed the following goals for the CCP in conjunction with feedback and collaboration with local partners, comprising the refuge's CCP/EIS planning team.² The goals are descriptive and provide broad statements of desired future conditions that work toward achieving the refuge's purposes and vision. We will use the goals presented below to form management objectives and actions, including forming and evaluating alternatives described in this CCP/EIS. The first four goals incorporate the goals from the draft HMP. Chapter 2 provides objectives for each goal by alternative.

Goal 1: Coastal Habitats. Manage quality coastal habitats for biological integrity, diversity, and environmental health of refuge barrier beach and dunes in concert with natural processes as part of the Delmarva Peninsula coastal barrier island system to provide habitat for species of conservation concern.

Goal 2: Managed Wetlands (Impoundments). Manage refuge impoundments to support native wildlife and plant communities, including a diversity of waterbirds, aquatic species, and other species of conservation concern.

*Goal 3: Upland Habitats. Manage upland habitats for biological integrity, diversity, and environmental health of coastal forests and shrublands to sustain native wildlife and plant communities, including species of conservation concern.*³

Goal 4: Southern Barrier Islands Unit (Assawoman, Metompkin, Cedar). Perpetuate the biological integrity, diversity, and long term viability of natural habitats that support native avian communities and turtles on Assawoman, Metompkin, and Cedar Islands through a partnership approach.

Goal 5: Partnerships. Working with partners, protect and restore vigorous, viable populations of migratory and resident wildlife, fish, and native plants and their habitats found on the Delmarva Peninsula and identified in state, national, and international treaties, plans, and initiatives. Take a leadership role in collaborative regional efforts to achieve broader conservation goals and serve as a catalyst for achieving a multi-state eco-regional partnership. The refuge will continue to work with partners to explore how best to sustain the resiliency of this unique barrier island system, its communities, and its economy, consistent with

² The CCP/EIS Planning Team met consistently throughout the planning process for this CCP/EIS. Attendance varied over time but included representatives from: U.S. Fish and Wildlife Service, National Park Service Assateague Island National Seashore, town of Chincoteague, Accomack County, Accomack County Board of Supervisors, Accomack-Norhampton Planning District Commission, Virginia Marine Resources Commission, Virginia Division of Game and Inland Fisheries, and NASA. The Volpe National Transportation Systems Center served as facilitator.

³ Focal species are those that received special management considerations due to their status (threatened or endangered), economic importance, declining population status, high degree of public interest, or similar attributes.

the refuge's mission and in the face of dynamic coastal processes, climate change, and storm events.

Goal 6: Visitor Services. People of all ages and abilities develop a stewardship ethic while enjoying their refuge experience and increasing their knowledge of the USFWS, Refuge System, and refuge.

Goal 7: Refuge Administration. Maintain and enhance refuge infrastructure and operations responsibly and sustainably for the safety and well-being of the wildlife, cultural resources, public, and employees.

1.14 Issues and Opportunities

As part of the CCP/EIS process, we developed a list of issues and opportunities based on input from public meetings, stakeholder feedback, refuge staff, and planning team meetings. Along with the goals stated above, these issues and opportunities are critical in framing the objectives and strategies for the various alternatives described in chapter 2. While the list of issues and opportunities below is a comprehensive list of those raised during the process to date, it should be recognized that it does not represent every issue which faces the refuge. Furthermore, although all of these issues are recognized here equally, the public commented on beach access, beach parking, and Chincoteague pony management the most during the public review of the alternatives. The issues and opportunities below are not listed in any priority order, but rather are organized by goal area, with those in the first four goal areas again corresponding to and drawing from the draft HMP, and those in the last three goals drawing from various other plans and initiatives. These issues and opportunities are not all relevant to Wallops Island NWR.

1.14.1 Coastal Habitat

Coastal habitats include beach/dune habitat within Chincoteague NWR for nesting, migrating, and wintering shorebirds as well as turtles and seabeach amaranth, and salt marsh and other habitats within the entire refuge that serve a variety of functions.

Beach/Dune Habitat for Coastal Nesting Birds

Currently, our management goal for the piping plover, as outlined in the Biological Opinion (2008), is a fledge rate goal of 1.2 chicks per pair. The fledge rate needed to keep the population stable is 0.83. The least tern is another high priority BCR 30 species and Tier II species in the Virginia Wildlife Action Plan. American oystercatcher, Wilson's plover, gull-billed tern, and black skimmer are other species of concern with high rankings that nest on refuge beaches that would benefit from management actions for piping plover and least tern.

Beach/Dune Habitat for Migrating and Wintering Shorebirds and Migrating Monarch Butterflies

In 1990, the Virginia and Maryland barrier islands were designated as a Western Hemisphere Shorebird Network Site due to the number of shorebirds using the area during migration, with tens of thousands of shorebirds stopping at Assateague Island between the months of April and September. Since Chincoteague NWR is a high public use refuge, we must continually manage activities with consideration of migrating shorebirds. Shorebirds are susceptible to human disturbances during their breeding season, and management policies that limit this disturbance are of a high priority for the refuge. Assateague Island is a critical stopover point for southbound migrating monarchs that use the refuge's resources to rest, refuel, and roost for the night. Nectar

source plants are located in various refuge habitats including Beach Road adjacent to Toms Cove, the Overwash, and tip of the Hook, blooming in succession during the migration period.

Beach/Dune Habitat for Turtles

The loggerhead sea turtle is a Federal and State-listed threatened species with habitat found on the refuge; the northern diamondback terrapin (Virginia Wildlife Action Plan Tier II species) also nests in the sandy beach habitats. There are three main threats to nesting loggerheads on Assateague Island. They are: (1) weather and tides, (2) predation, and (3) human activities. According to refuge files, weather is most likely to cause nest loss or mortality. Currently, no turtle nests have been knowingly lost to predators. Management actions, such as mammalian and avian predator removal and placing protective screening over nests, may have prevented predation.

Federally Endangered Plants and Rare Plant Communities

Seabeach amaranth is native to Atlantic coast barrier island beaches from Massachusetts to South Carolina (USFWS 2008b). Although seabeach amaranth generally grows in sparse to very sparse distribution, the existing population on the refuge is greatly dissipated. Beach stabilization efforts and intensive recreational use, as well as natural species predation, have plagued the species on the refuge. We must evaluate management steps, such as the transplanting and reseedling that was successful in Maryland, in order to implement the most effective recovery method on the refuge. The number of rare species documented in Lucky Boy Fen in Wallops Island NWR is high in proportion to its size. It contains 2 plant species (brown-fruited rush and few-flowered beakrush) considered “critically imperiled” and four plant species (southern bladderwort, ten-angle pipewort, white beakrush, and white-topped fleabane) considered “imperiled” in the state by the Virginia Department of Conservation and Recreation’s Natural Heritage Division. For some of these plant species, Virginia represents the southernmost extent of their range and this is the only habitat that supports these species in the state. Groundwater pollution, encroachment of invasive species and sea level rise are among the greatest threats to Lucky Boy Fen on the refuge.

Salt Marsh Habitats for Nesting, Migrating, and Wintering Birds

Known threats to salt marsh abiding species (like American black duck), besides sea level rise, include the following: (1) grazing by herbivores (i.e. Chincoteague ponies), which alters vegetation structure and species composition resulting in habitat loss for marsh-dependent focal species; (2) direct forage competition, which reduces food resources for wildlife; and (3) mammalian trampling during the nesting season, which can disturb or destroy nests.

1.14.2 *Managed Wetlands (Impoundments)*

Managed wetland includes impoundments and artificial nesting structures that we maintain on Assateague Island. They provide habitat for migrating, wintering, and breeding wildlife.

Impoundments for Waterfowl, Shorebirds, Waders and associated species

Impoundments supply numerous habitat benefits, including wintering/migratory habitat for waterfowl; fresh/brackish vegetation roots and seed as food for wintering waterfowl; food sources for waterbirds of conservation concern such as snowy egret, glossy ibis, Forster’s and gull-billed terns; and shorebird migratory stopover habitat for many species of conservation concern including short-billed dowitcher, dunlin, and semipalmated sandpiper. Furthermore, the impoundments concentrate large flocks of birds, providing wildlife viewing, and opportunities for photography, education, and interpretation. In order to provide adequate food, in the form of vegetation (seed or roots) and/or aquatic invertebrates, fresh water, and loafing areas requires the

precise management of water levels. All refuge impoundment management strategies depend entirely on precipitation as their sole source of freshwater for the generation of fresh/brackish water plants, and gravity or evaporation for drawdown. Both mechanisms limit management capabilities. Tidal cycles and strong coastal storm events, especially nor'easters and hurricanes, further challenge the attainment of management goals for impoundments. As sea level continues to rise and more frequent overwash events occur, we expect damage to dikes and other impoundment infrastructure. Maintaining water depths at desirable levels may also become more difficult.

1.14.3 Upland Habitats

Upland habitat includes shrub and forested uplands throughout the refuge, with specific conditions for maritime forest on Assateague Island and upland habitat on Wallops Island NWR.

Coastal Shrub Habitat for Breeding and Migrating Landbirds

Bird species that depend on shrubs and other early-successional habitats are declining in the Eastern U.S. due to loss of habitat. Shrubs provide abundance of insect food and berries for birds during the fall migration and/or throughout the winter. The refuge's wax myrtle/bayberry/groundsel shrub community provides migrating birds with an important stopover habitat that supplies the various species with food, water, and protection.

Loblolly Pine Forest for Delmarva Peninsula fox squirrel, Brown-headed Nuthatch and Eastern Towhee

Forest habitat on Assateague Island consists largely of monotypic stands of even-aged, mature loblolly pine trees, aged 65 years or older; some are older than 100 years (Merten, pers. comm., 2010). Without management, such as prescribed burning or selective cutting, these mature age classes are vulnerable to catastrophic loss from insect damage or extreme weather/wind events. The southern pine beetle, a native species, is the only major known insect threat to this forest.

Upland Habitats on Wallops Island NWR

Since its establishment in 1971, Wallops Island NWR has been understaffed with little monitoring and management. We have made some manipulations to the land, with the goal of creating early successional habitat favored by bobwhite and other species that prefer edge and early succession habitats, in the old-field habitat. However, these changes have been poorly documented. Likewise, some mechanical and chemical treatment of invasive plants such as non-native autumn olive, Phragmites, Nepalese browntop, Japanese siltgrass, Japanese honeysuckle, and several thistles also may have taken place (CNWR 2004).

1.14.4 Southern Barrier Islands Unit (Assawoman, Metompkin, Cedar)

The Southern Barrier Islands Unit consists of Assawoman, Metompkin, and Cedar Islands and share similar mixes of habitats and management conditions.

Beach/Dune Habitat for Breeding Shorebirds and Turtles

The Mid-Atlantic barrier islands provide preferred nesting habitat for terns, skimmers, gulls, American oystercatchers, willets, herons, egrets, other waterbirds, shorebirds, and turtles. During the shorebird breeding season, (March 15 – August 31), the southern islands are managed in partnership with the Commonwealth of Virginia and The Nature Conservancy to reduce disturbance, thereby increasing productivity. Despite this and other protective measures, many wildlife species are in decline throughout the flyway, including common terns, least terns, gull-billed

terns, black skimmers, American black duck, and several herons. The decline of these species is thought to be linked to severe weather events, sea level rise, competition and displacement from nesting habitat by aggressive avian species, mammalian and avian predators, and unmanaged human disturbance.

Beach/Dune and Tidal Marsh Habitat for Migrating/Wintering Shorebirds/Threatened Plants

The ecological significance of Assawoman, Metompkin, and Cedar Islands is recognized through their inclusion in the WHSRN as a site of international importance, and by their designation as part of a Biosphere Reserve. The refuge does not currently conduct or organize systematic winter/migratory shorebird surveys on the southern islands like those conducted by volunteers on Assateague Island.

Virginia's string of barrier islands, which extend from Assateague Island south to Fisherman Island at the mouth of the Chesapeake Bay, is the largest collection of near pristine barrier islands left in the country (USFWS 1988). Aside from small private in-holdings, all of Virginia's barrier islands are protected by either Federal or State agencies, or The Nature Conservancy. Although preferred habitat for seabeach amaranth is found on refuge barrier islands, it is only currently found on Assateague Island. Potential habitat on Cedar and Metompkin islands has not been surveyed.

1.14.5 Partnerships

A crucial component of our refuge management strategy is considering both the impacts of refuge actions on the region and our relevant partners as well as the opportunities for collaboration with partners at the regional level for the purposes of conservation, economic development, and safety.

Regional Conservation

The refuge is located in the southern Delmarva Peninsula, an area of recognized global ecological significance for its remarkable estuarine, coastal, and marine habitats and substantial populations of migratory and breeding shorebirds, colonial waterbirds, landbirds, and raptors. The coastal lagoons and barrier islands represent what is arguably the most significant remaining undeveloped, natural land on the Atlantic coast. In partnership with Federal, State, local, and non-profit organizations we have long recognized the area's conservation importance, and together we have protected over a quarter of the land on the southern Delmarva Peninsula.

Several real and growing challenges threaten the area's rich and diverse natural heritage and the many benefits humans derive from the region's intact habitats and natural systems. These include vulnerability of natural systems to global climate change, especially sea level rise and incompatible land uses and land management activities such as plasticulture, commercial pine plantations, conversion of natural habitats to residential development, shoreline armoring, and increased pumping of ground water for agricultural irrigation, commercial, and residential uses.

We are currently involved in a number of conservation partnerships, including but not limited to the Pocomoke River Conservation Partnership and the Southern Tip Ecological Partnership, and are working with a number of conservation entities, such as The Nature Conservancy, the Virginia Eastern Shore Land Trust, the Assateague Coastal Trust, and the Conservation Fund. We are committed to working with partners to address the regional issues identified above through examining opportunities to improve connectivity between protected lands, protecting and restoring the ecological integrity, functionality and value of diverse habitats, buffering harmful

effects of coastal flooding and storm surges to local communities and infrastructure, and providing lands for multiple recreational activities to support the tourism economy while also providing ecological, educational, and other benefits.

Economic Development

Access to the refuge is through the town of Chincoteague, the economy of which has become increasingly dependent on the tourism dollars brought into the community by refuge visitors. The Town of Chincoteague's Comprehensive Plan clearly states that proximity to the refuge continues to be its largest economic development opportunity, although the NASA facility and adjacent business activity is also considered important and growing, and finfish and shellfish harvest also contributes to local economic activity.

Based on 2010 data, lodging and food businesses comprise about two-thirds of the tourist-related business in Chincoteague (USFWS 2012a). Tourism not only generates revenue for these sectors, but also generates revenue for the town in the form of food and lodging excise taxes. Spending associated with recreational use of the refuge can generate a substantial amount of economic activity in both local and regional economies. The Accomack County Comprehensive Plan (2008), relying on data from the Accomack County and Northampton County Commissioners of Revenue and the Chincoteague Chamber of Commerce, reports that in 2000 about 83 percent of Accomack County's tourist-related tax revenue was generated by the activities and amenities that the town of Chincoteague and the refuge provide to visitors.

Horseshoe crabs live in and around shallow ocean waters of the refuge. They come onto shore in the springtime at the new and full moon tides to mate and lay eggs. Horseshoe crab eggs serve as a significant source of food for migrating birds. Conservation of migratory birds is the primary purpose of the refuge. During a 2011 coordination meeting with NPS, it came to light that commercial harvest of horseshoe crabs is occurring within Toms Cove on lands administered as part of the refuge and in waters administered as part of Assateague Island National Seashore. USFWS policy and law require that a Special Use Permit (SUP) be issued for any commercial activity that takes place on Refuge System lands and waters. No SUP has been issued for the commercial harvest of horseshoe crabs; it is, therefore, an unauthorized activity. In order for any commercial use to be permitted on Refuge System lands or waters, it must be shown to contribute to the purposes of the refuge. We address this commercial use as part of this CCP by finding the commercial harvesting of horseshoe crabs does not contribute to the refuge's migratory bird purpose, does not contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, and is not beneficial to refuge resources; consequently, the use cannot be permitted.

For this CCP/EIS, a regional economic assessment has been completed. This assessment provides a means of estimating how current management and the proposed activities could affect the local economy. This type of analysis provides two critical pieces of information. First it illustrates a refuge's contribution to the local community. Second, it can help in determining whether local economic effects are, or are not, a real concern in choosing among management alternatives. The public has expressed concern about impacts on visitation levels, with subsequent impacts to the tourism industry and related jobs. Additionally, there are concerns about property values, the capital/infrastructure improvements, maintenance, and operating costs of the different alternatives.

Hazard Mitigation

The town of Chincoteague, adjacent coastal communities, and NASA are concerned about future impacts of sea level rise and storm surge on infrastructure and access. We share this concern and will work in coordination with those entities and others to explore potential impacts and identify protective methods to address hazard mitigation. We will also work with our partners to explore how best to advance the study, information exchange, and project resources for adaptive management practices that sustain the resiliency of this unique barrier island system including but not limited to Assateague, Wallops, Assawoman, and Metompkin Islands in the face of dynamic coastal processes and climate change.

Interagency Federal Facility Management

The refuge is adjacent to several other Federal entities. NASA operates the Goddard Space Flight Center's Wallops Flight Facility, a center for aeronautic research. The Virginia Commercial Space Flight Authority leases space for the Mid-Atlantic Regional Spaceport, which is expected to see an increase in commercial space flight activity. In addition, the United States Navy's Surface Combat Systems Center is co-located with NASA and the National Oceanic and Atmospheric Administration Command and Data Acquisition Station has leased land for its adjacent facility from NASA since 1965 (Town of Chincoteague 2006). NASA has a visitor center that is adjacent to the Wallops Island NWR. NPS and USDA both have a use agreement with USFWS for shared facilities, mainly for storage, on Wallops Island NWR. Finally, as mentioned previously, Assateague Island National Seashore maintains staff and services within Chincoteague NWR.

We have coordinated with these Federal partners on many issues and are interested in identifying potential opportunities for future collaboration on wildlife management, scientific research, public education, and shared facilities.

Local Conservation of Tidal Creeks, Estuaries, Mudflats, and Nearshore Marine Waters

Most species found on the refuge depend on off-refuge habitats to fulfill one or more of their life cycle needs. Pollutants, human disturbance, or other activities off-refuge can influence the success of management activities that the refuge undertakes. For example, off-shore oil drilling and development of wind turbines on- or off-coast are potential activities that could impact migratory birds and bats.

1.14.6 Visitor Services

As mentioned previously, Chincoteague NWR provides a range of recreational opportunities, including the six priority wildlife-dependent activities, while Wallops Island NWR is limited to public access for hunting only. The six priority uses predetermined by the Improvement Act as appropriate but are still subject to a positive finding of compatibility with refuge purposes. Other uses must be determined to be both appropriate and compatible. Figure 1-4 identifies the primary public use areas on Assateague Island.

Concerns were expressed by the community that the USFWS would eliminate personal motor vehicle access to the refuge and beach parking. The USFWS has no goal or objective to do so. All public uses are dependent on access to the refuge. Personal motor vehicle access to Assateague Island, including parking at the beach, is very important to visitors and local residents. However, the USFWS does have concerns that climate change, with corresponding sea level rise and storms, will have a significant impact on the sustainability of the road and parking areas that

serve the recreational beach. The location and maintenance of the beach parking and the role of transit – whether to provide another option for visitors or to supplement available beach parking if reduced – need to be carefully considered and evaluated. Many visitors and residents also enjoy bicycling and walking to and within the refuge. Accessibility for all users, including those with mobility impairment, is also important.

Hunting

Hunting is a priority public use of the Refuge System and remains a popular form of wildlife-dependent recreation on the refuge and a vital part of the cultural, social, and economic fabric of the communities near the refuge. Chincoteague NWR provides big game hunting (sika and white-tailed deer) and migratory game bird hunting. On Wallops Island NWR, we only allow hunting of white-tailed deer.

Fishing

Surf fishing, crabbing, clamming, and oyster harvest are among the most popular wildlife-dependent recreational activities conducted on the refuge. The surf fishing areas south of the current parking lots are accessible via over-sand vehicle (OSV) use, which is administered jointly by NPS and the refuge, and is limited to certain times and areas to provide maximum protection to prime nesting habitat for coastal nesting birds. Fishing is allowed on Assawoman Island but requires a refuge permit to land a boat to fish the area. However, parts of the island may be closed based on nesting behavior.

Environmental Education and Interpretation

Refuge staff work with local schools, communities, and educational organizations to provide classroom and hands-on programs, both on and off the refuge, for youth. Activities are conducted throughout the region but on the refuge are concentrated on several trails as well as the Herbert H. Bateman Educational and Administrative Center. NPS offers its own set of programs. The refuge currently provides interpretive opportunities through self-guided interpretation but also through some guided programs.

We are facing a few major challenges, including how to meet the demand for these staff-intensive services, how to expand outreach off of the refuge, and how to provide virtual access to the resources of the refuge through broad band and fiber optic improvements.

Wildlife Observation and Photography

In general, wildlife observation and photography are becoming increasingly popular activities for visitors, and a source of economic growth for many communities where NWRs exist. Chincoteague NWR provides outstanding wildlife viewing opportunities throughout the year along trails, roads, and on the natural beach itself. These sites provide wildlife viewing and opportunities for amateur and professional photographers alike. The public and community desire continued access and additional opportunities for these uses; however, managers must balance opportunities with the need to limit disturbance.

Recreational Beach Use

The beaches of Assateague Island offer a unique experience in the Mid-Atlantic area. These beaches exist primarily in an undeveloped setting unlike other beaches (such as Virginia Beach,

Virginia, or Ocean City, Maryland) that are heavily developed with motels/hotels, boardwalks, eating establishments, and amusement parks. The natural setting draws many families seeking out a more traditional beach-going experience. Beach activities include sunbathing, swimming, shell collection, and campfires (on NPS lands), among other activities. If one wishes, it is possible to obtain an almost wilderness-like beach experience by hiking to areas where few visitors venture.

At the southern end of Assateague Island within the Chincoteague NWR, the NPS manages an “assigned area” consisting of the 1-mile recreational beach and corresponding adjacent 961 parking spaces, provided via a crushed shell surface. The NPS maintains a visitor contact station, restrooms, and pedestrian trails, as well as seasonal bathhouses, showers, and lifeguard-protected swimming beach. The current recreational beach and facilities on Assateague Island are located in one of the most dynamic areas of the island, which places them under constant threat of damage from flooding and erosion. Over the years, storms and accompanying extreme high tides have repeatedly washed out parts or all of the recreational beach parking lots. NPS has rebuilt and relocated the beach parking lots further to the west as they have been washed out. The 1993 Master Plan addressed these conditions by identifying a long-term strategy to pursue alternative means of transportation such as a shuttle system and off-site parking as necessary to maintain beach use in the future. Section 1.14.7 further addresses climate change impacts to facilities.

We have a cooperative relationship with the NPS for management of the recreational beach, defined in a series of agreements dating back to 1966; all of which have assigned certain management responsibilities to each of the two agencies. The agreements have evolved over time, reflecting changes in management goals as well as legislative changes to agency authority and administrative requirements. This management arrangement is defined in a 1990 interagency agreement between the NPS and USFWS and was revised in 2012 Memorandum of Understanding (MOU) (NPS/FWS 2012; Appendix E). USFWS has primary responsibility for managing the wildlife resources within the entire refuge, including the “assigned area.”

This agreement is necessary for the two agencies to comply with various public laws. Public Law 85-57 (1959) authorized the USFWS to grant to the Chincoteague-Assateague Bridge and Beach Authority (Authority) “easements and rights as may be necessary for the construction and maintenance of a bridge across the Assateague Channel and terminating on the Chincoteague National Wildlife Refuge. And also for the construction and maintenance of an access road from the terminus of such bridge to a public beach and recreation area to be developed along the southeastern shore of Assateague Island as designated by the Secretary.”

In 1965, Public Law 89-195 created the Assateague Island National Seashore and authorized the NPS to acquire all the interests of the Authority, including the right and obligation to develop of a recreational beach on the refuge. P.L. 89-195 also states: “Notwithstanding any other provision of this Act, land and waters in the Chincoteague National Wildlife Refuge, which are a part of the seashore, shall be administered for refuge purposes under laws and regulations applicable to national wildlife refuges, including administration for public recreation uses in accordance with provisions of the Act of September 28, 1962 (Public Law 87-714; 76 Stat. 653).”

Figure 1-4. Primary Public Uses of Chincoteague NWR on Assateague Island



Public Law 87-714, also known as the Refuge Recreation Act, authorizes the USFWS to administer areas within the National Wildlife Refuge System for public recreation, regardless of whether the recreation is wildlife-dependent. A recreational use that is not wildlife-dependent is an incidental or secondary use. The Refuge Recreation Act permits public recreation within a national wildlife refuge “only to the extent that is practicable and not inconsistent with other previously authorized Federal operations or with the primary objectives for which each particular area is established.” This compatibility standard was reinforced by the National Wildlife Administration Act of 1966 and the National Wildlife Refuge System Improvement Act of 1997.

These laws create a situation of competing interests. Language from P.L. 85-57 makes it clear that Congress intended for a recreational beach to be constructed and maintained on the refuge. It is also apparent that Congress believed or anticipated that “traditional” beach recreation (swimming, sunbathing, volleyball, etc.) could be compatible with refuge purposes, which today would be a difficult, if not impossible, standard to achieve. It may have been possible to meet these dueling mandates in the 1960s, before the ESA was passed, when beach users were fewer in number, and when more wildlife habitat existed in the area than today. It was also a time before the town of Chincoteague’s economy became so dependent on tourism from beach goers.

The USFWS Compatibility Policy contains exceptions for when the compatibility standard will not be applied to a refuge use. The policy reads:

“Exceptions may apply when there are rights or interests imparted by a treaty or other legally binding agreement, where primary jurisdiction of refuge lands falls to an agency other than us, or where legal mandates supersede those requiring compatibility. Where reserved rights or legal mandates provide that we must allow certain activities, we should not prepare a compatibility determination. In the case of reserved rights, the refuge manager should work with the owner of the property interest to develop stipulations in a special use permit or other agreement to alleviate or minimize adverse impacts to the refuge.”

The policy also states: *“Compatibility provisions of the Refuge Administration Act do not apply to activities authorized, funded, or conducted by another Federal agency that has primary jurisdiction over the area where a refuge or a portion of a refuge has been established, if those activities are conducted in accordance with a memorandum of understanding between the Secretary or the Director and the head of the Federal agency with primary jurisdiction over the area.”*

In order to comply with what we believe was the intent of Congress in passing P.L. 85-57, the USFWS has conveyed primary jurisdiction for beach use and recreation within the “assigned area” to the NPS. We have worked with them to minimize adverse impacts to the refuge, and developed a MOU to document operating procedures and respective responsibilities. Therefore, we will not prepare a CD for those activities administered by the NPS within the “assigned area.”

Other Recreational Uses

Other uses on Chincoteague NWR include walking, bicycling, horseback riding, boating, and commercial uses. Non-wildlife dependent recreation beach uses such as swimming, sunbathing, kite flying, campfires, and beachcombing are confined to the 1 mile assigned area of the NPS. All of these uses are limited to specific areas of land and/or times based on wildlife management objectives and might include permits and fees associated with use. There are no campsites on Chincoteague NWR. Visitors are not allowed to feed wildlife and are not allowed to bring alcohol

or pets onto the refuge, including in vehicles. Other restricted activities include use of skateboards, roller or in-line skates, and segways, and the collection of plants, animals, or artifacts. However, we allow the collection of one gallon per person per day of unoccupied seashells. Motorized vehicles are not allowed on trails and mopeds are not allowed on Wildlife Loop.

1.14.7 *Refuge Administration*

Refuge administration covers communication, staffing, and management of specific areas, such as wilderness and cultural and historic resources.

Outreach, Communication, and Emergency Communication

USFWS considers communication systems important for stakeholder consultation, public outreach, and emergency management. We have identified, received funding for, and implemented a variety of communication improvements over the past 5 years, including a variable message sign, partnership with the local radio station, reactivation of the 1610 AM radio station, and traffic counters for beach parking. In addition to these improvements focused on traveler information, traffic, and emergency response, we have identified the potential for further improvements, especially in terms of broad band and fiber optic capacity, which will allow for improved use of the refuge Web site and social media to provide environmental education and to better engage the public, in particular those unable to visit or who live far away.

Staffing & Volunteer Program/Friends Group

Chincoteague NWR has staff in the areas of visitor services, law enforcement, biology, administration, fee collection, management, and maintenance. In addition to refuge staff, NPS provides 6 permanent and 15 seasonal employees to provide lifeguard, law enforcement, maintenance, and interpretive services at Toms Cove and the recreational beach. Since its creation in 1971, Wallops Island NWR has been unstaffed, with limited monitoring or management, except in the past by Delmarva Power and now A&N Electric Cooperative, a utility company with a power line right-of-way that removes tall growing trees, primarily the non-native autumn olive, and some brush species.

Staff is supplemented by year-round volunteers as well as local and national youth and adult groups such as Road Scholar, Youth Conservation Corps (YCC), and the Student Conservation Association (SCA). These individuals and groups provide assistance with wildlife and habitat management programs, wildlife and habitat surveys, invasive species removal, trash pick-up, interpretive education, and other projects. Chincoteague NWR also receives significant support from its non-profit friends group, the Chincoteague Natural History Association (CNHA), which produces and provides interpretive and educational material for refuge visitors and for local teachers. Additionally CNHA provides funds for student interns, operates a bus tour, operates 2 retail stores, provides lighthouse keepers that welcome and guide visitors at the Assateague Lighthouse, and provides a conduit for matching grants for workshops and programs.

Wilderness

In 1974, the USFWS recommended that 1,740 acres on Assateague Island be established as part of the National Wilderness Preservation System, as defined by the Wilderness Act of 1964. Of this, 1,300 acres are located in Chincoteague NWR (882 acres in Virginia and 418 acres in Maryland) and 440 acres are within the boundaries of Assateague Island National Seashore in Maryland. A Wilderness Area proposal was submitted to Congress on January 13, 1977,

recommending 4,760 acres, mostly located in Maryland, as potential wilderness and to become part of the wilderness when nonconforming uses and structures were eliminated. No action has been taken in regard to this recommendation and there exists no “Congressionally designated wilderness lands” within Chincoteague NWR and Wallops Island NWR (USDOI 1974).

Cultural and Historic Resources

Assateague Island has several cultural and historic resources. Several cemeteries and the ruins of the former Assateague Village from when the island was inhabited remain. The current Assateague Lighthouse was completed in 1867, and the U.S. Coast Guard (the Coast Guard) considered it to be an aid to navigation. In 2004, the Coast Guard transferred ownership of the Assateague Island Lighthouse to the USFWS. The Coast Guard still operates the light, while the USFWS and CNHA share the maintenance of the historic structure. Tours of the lighthouse are provided by CNHA. In August 2008, the lighthouse began a restoration effort, which was completed in 2013.

In addition, following storms, remains of sailing vessels and their cargos are often uncovered and visible on the beach for short periods of time. We manage these resources by balancing preservation and protection with interpretation and public access.

Concerns were expressed by the community that the USFWS would reduce or eliminate the number of Chincoteague ponies grazing on the refuge. The USFWS has no goal or objective that would eliminate ponies from Assateague Island. The ponies are a main source of enjoyment for visitors throughout the year, and the Annual Pony Swim and Auction each July attracts an estimated 40,000 visitors and provides funding for the Chincoteague Volunteer Fire Company. The USFWS does have a concern that climate change, with corresponding sea level rise, and pony grazing will significantly impact the salt marsh. In both northern and southern grazing units the salt hay/grasses that come from these marshes are the basic forage upon which the ponies feed both summer and winter and are critical for the life cycle of many native species of animals. Over the life of this CCP, the refuge will work with the Chincoteague Volunteer Fire Company to ensure the health and well-being of Chincoteague ponies and refuge habitats.

Climate Change and Sea Level Rise

The increasing trend in sea level rise currently affecting the Delmarva Peninsula and surrounding areas is primarily driven by water influx from melting polar and glacial ice sheets. The synergistic actions of thermal expansion of the ocean waters (driven by increases in average global temperature), coastal subsidence, and coastal erosion are also greatly influencing the rate and intensity of sea level rise effects upon the refuge .

The rise in relative sea level for the Delmarva Peninsula will have a significant negative impact on the barrier island system where the refuge is located. Such changes from sea level will result in the submergence of the lowest tidal wetlands, erosion of coastal beaches, increased flooding of lowlands, and the alterations in salinity regimes in coastal waters. Low salt marshes could be converted to tidal flats, and existing tidal flats could become permanently inundated shallow water habitats. In places of more pronounced erosion, marshes could change directly to shallow waters. Currently, salt water is penetrating further and further inland, which is changing the local ecology. While this process has occurred in the past, the pace at which these changes are happening has accelerated and their magnitude has increased in recent times.

Climate change may also increase storm frequency and intensity which will further transform shorelines and coastal resources (IPCC 2013). The shoreline of Assateague Island, already impacted by erosion from the current sea level rise rate, is even more vulnerable with predicted increases of 2mm/year (Figure 1 5). If the rate increases by a little as 2mm/year, the island may break up into smaller sections (segmentation). This same rate will likely pose increased risk to back barrier marshes (Figure 1 6). The impacts of a 7mm/year rise would be a concern to coastal communities. (See Appendices E and F for more information).

With current climate change and sea level rise rates, the continued management of the refuge lands will become increasingly difficult based on the projected one meter rise in sea level by 2100 adopted by the Commonwealth of Virginia. Based on this prediction, the refuge has several facilities and resources that may be vulnerable to sea level rise and storm surge, including the recreational beach parking as described in section 1.14.6.

Figure 1-5. Map showing that Assateague Island may already be near its threshold condition and that just a 2mm/year rise in the rate of sea level rise will push it over the threshold which may initiate barrier beach migration and segmentation. (Source: Titus et al. 2009)

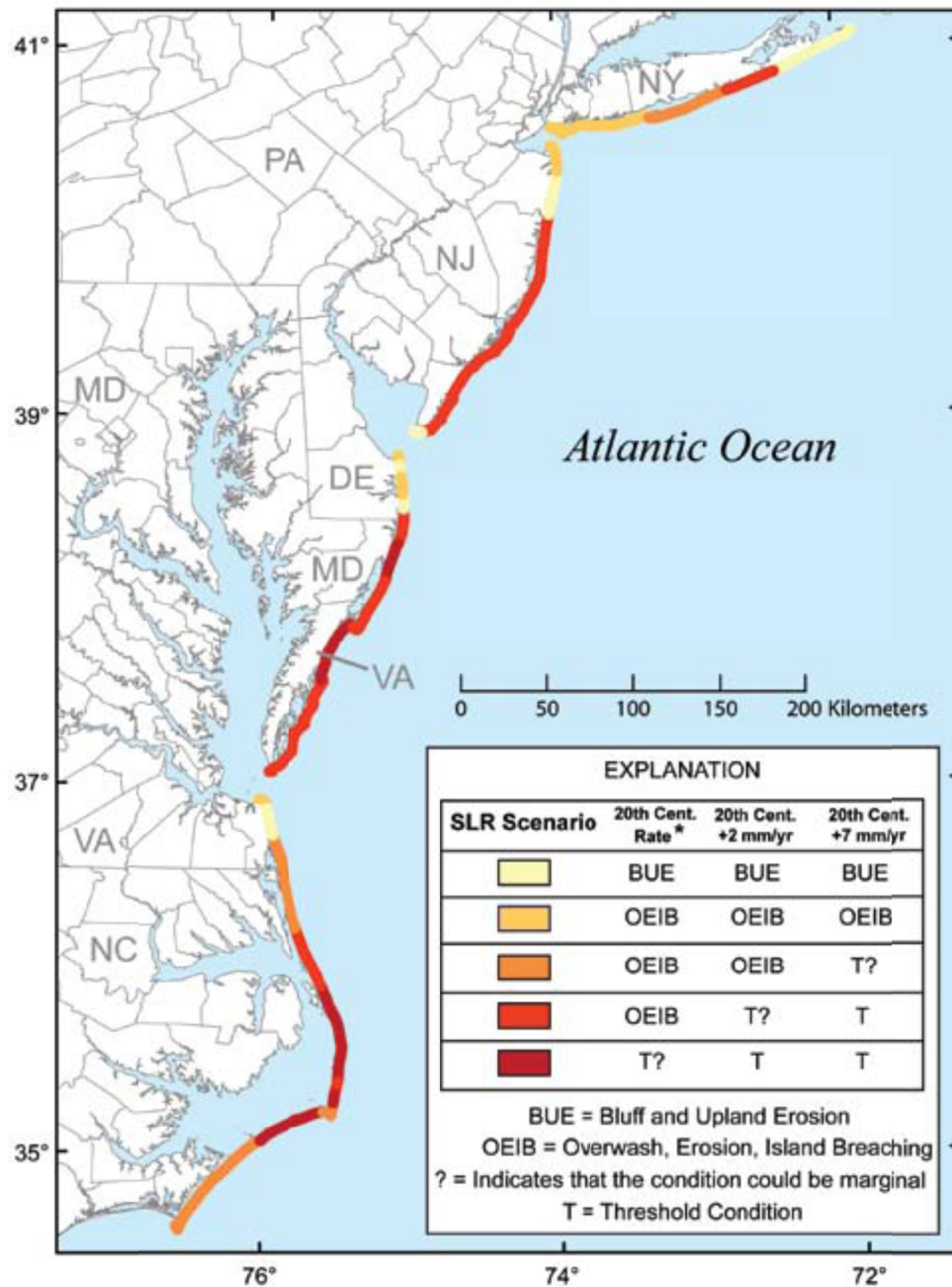
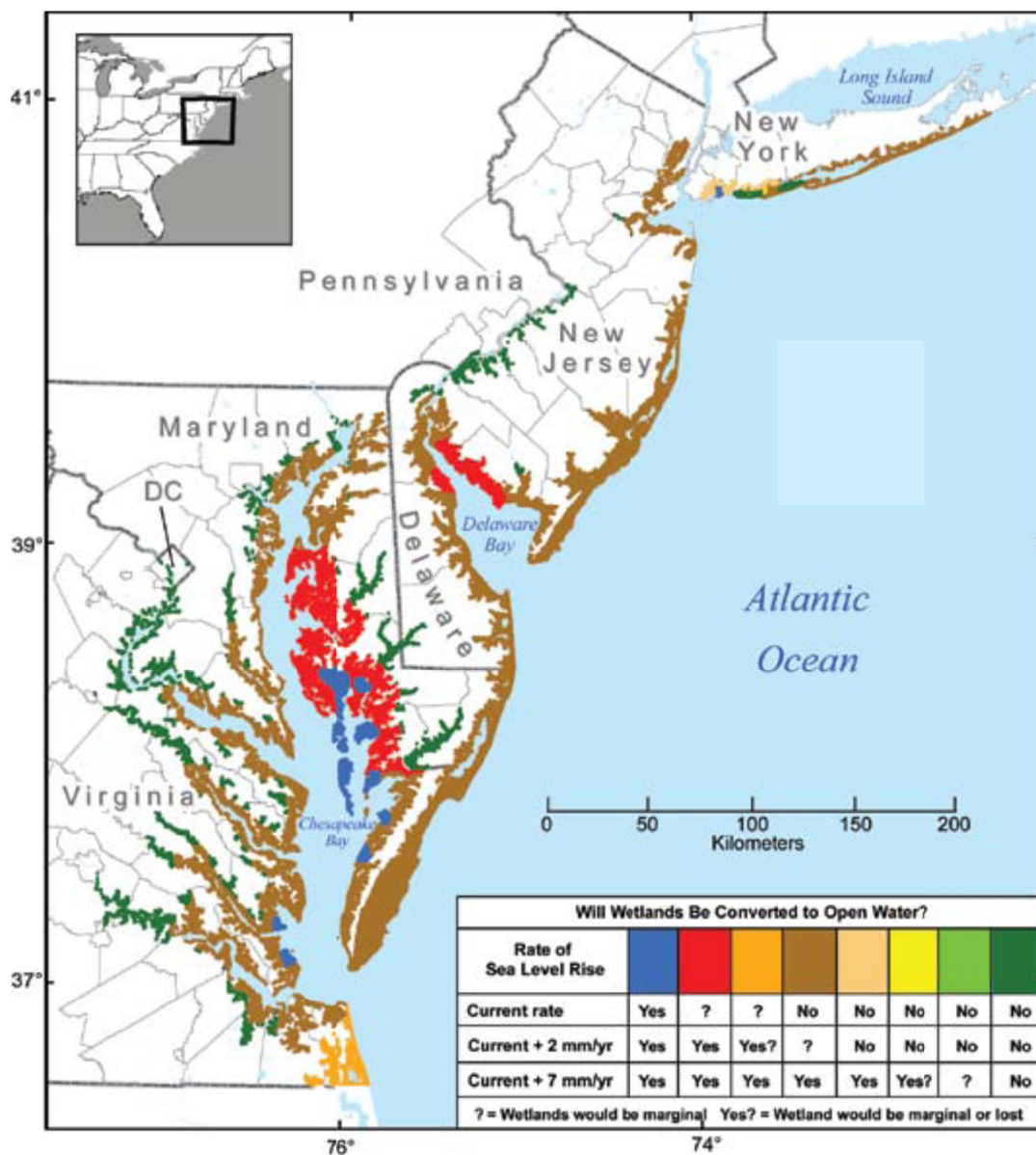


Figure 1-6 Map showing where tidal wetlands may be converted to open water at three rates of sea level rise. A 2mm/year rise in the rate should continue the conversion of low marsh to tidal flat and may even transform these marshes to open water. (Source: Titus et al. 2009)



1.15 Decision to be Made

The USFWS Regional Director will select a preferred alternative based on the USFWS and the Refuge System missions, the purposes for which the refuge was established, other legal mandates, and public and partner responses to this CCP/EIS. The alternative selected could be one of the proposed actions, the no action alternative, or a combination of actions or alternatives presented. The final decision will identify the desired combination of species protection, habitat management, public use and access, and administration for the refuge. A Record of Decision (ROD) will present and explain the decision, and certify that USFWS has met agency compliance requirements and that the CCP, when implemented, would achieve the purposes of the refuge and help fulfill the Refuge System mission. Once the Regional Director has signed the ROD and the CCP is complete, the public will be notified in the *Federal Register*, and implementation would begin.

After its completion, the CCP will be reviewed, evaluated, and subsequently updated approximately every 15 years. However, if and when significant new information becomes available, ecological conditions change, major refuge expansion occurs or the need to do so is identified, the plan can be reviewed sooner. All plan revisions would require NEPA compliance.

Chapter 2

USFWS



Pelican

Alternatives Considered

2.1 Introduction

2.2 Development of Alternatives

2.3 Evaluation of Alternatives

2.4 Alternatives and Components Considered but Eliminated from Detailed Analysis

2.5 Alternatives Carried Forward for Detailed Analysis

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Chapter 2: Alternatives Considered

2.1 Introduction

In this chapter we present and compare a range of reasonable alternatives for the Comprehensive Conservation Plan (CCP) and its associated Environmental Impact Statement (EIS), as well as component actions identified by others. We also include information on the process by which we developed and evaluated alternatives, a description of the alternatives or components considered but dropped from further analysis, and the reasons such alternatives or components were dropped. Finally, we describe in detail the alternatives that were retained for detailed analysis in this CCP/EIS, including elements or actions common to all retained alternatives and those that are unique to each retained alternative. At the end of this chapter, we provide a table that enables the reader to compare each retained alternative.

The Council on Environmental Quality (CEQ) regulations that implement the National Environmental Policy Act (NEPA) of 1969 (40 CFR Parts 1500-1508) state that the alternatives section is the heart of an EIS. Those regulations and accompanying CEQ guidance, titled *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations* (CEQ 1981) require a Federal decision maker, in this case the USFWS, to:

- Develop and describe a range of alternatives capable of achieving the purpose and need (40 CFR 1505.1), including alternatives not within the jurisdiction of the lead agency (Question 2b of CEQ's Forty Questions) and the No Action Alternative [40 CFR 1502.14(d)]; and
- Rigorously explore and objectively evaluate all reasonable alternatives¹ and provide reasons why we eliminated certain alternatives from detailed study [40 CFR 1502.14 (a)].

2.2 Development of Alternatives

We developed alternatives to achieve the purpose of the CCP and to be reasonable, as required by the NEPA. Alternatives are different approaches or combinations of management objectives and strategies designed to achieve the purposes of the CCP, which are articulated in Section 1.4 of this CCP/EIS and described in subsequent sections of chapter 1. The alternatives were also designed to achieve the vision and goals of refuge, which are articulated in Section 1.13, as required by USFWS planning requirements.

¹ NEPA requires alternatives to be reasonable and in Question 2a of CEQ's Forty Questions, CEQ defines reasonable as feasible or practical from a technical and economic standpoint and using common sense.

The three alternatives carried forward in this CCP for detailed analysis (Section 2.5) have evolved through the planning process to date, and will likely be revised again after the public comment period and before finalization. In summer 2011, after 10 months of initial scoping and public involvement, the USFWS published a newsletter with descriptions of four preliminary draft alternatives. Although there were many common components among them, each of the preliminary draft alternatives had a different focus, which is described below.²

- **Preliminary Draft Alternative A** would continue current management strategies, and satisfies the NEPA requirement for a “no action” alternative. Consistent with the 1993 Master Plan, the refuge would allow NPS to maintain 8.5 acres (961 spaces) at the recreational beach. As sea level rise and natural forces reduce the land base capable of supporting current parking, the refuge would pursue alternative parking opportunities and institute a shuttle service to the current recreational beach.
- **Preliminary Draft Alternative B** would mostly continue established habitat and wildlife management strategies, and the refuge would also work with NPS to develop a new recreational beach, beach access, and nearby parking 1.5 miles north of the existing beach. The refuge would allow NPS to maintain 961 parking spaces near the new beach, but would also pursue alternative parking opportunities and institute a shuttle service to supplement the beach parking.
- **Preliminary Draft Alternative C** would allow for natural successional and coastal processes to take place on the refuge with little intervention. Refuge administration of programs would be minimized primarily through reduction of activities, partnerships, and use of volunteer staff. Consistent with the 1993 Master Plan, the refuge would allow NPS to maintain 8.5 acres for parking at the recreational beach, only as long as the land base exists. As sea level rise and natural forces reduce the land base capable of supporting parking, feasible repairs would be made but the number of spaces would be reduced accordingly. While beach users would be able to use all parking available on the refuge, new parking, and a shuttle system would not be pursued by the refuge.³
- **Preliminary Draft Alternative D** would direct staffing and funding towards maximizing habitat and wildlife management strategies. Thus, some public use activities would be eliminated, such as horseback riding and over-sand vehicle access, and the pony herd would be reduced. The refuge would work with NPS to relocate the recreational beach as

² More detailed descriptions of the preliminary draft alternatives can be found in a newsletter published in August 2011 and found at: http://www.fws.gov/northeast/planning/Chincoteague/PDF/Chincoteague_CCP_Newsletter_August2011_web.pdf.

³ Preliminary Draft Alternative C was eliminated as a result of this alternatives evaluation process described in this chapter, and Preliminary Draft Alternative D was refined and renamed alternative C. Thus, references to alternative C in this CCP/EIS outside of this section refer to a refined version of the alternative referred to as Preliminary Draft Alternative D in this chapter.

in alternative B; however, the capacity of the parking would be less than in alternative B and the refuge would pursue alternative parking opportunities and a shuttle service.

In addition, the newsletter described other components that were raised during the scoping process: elimination of hunting, elimination of the beach parking shuttle from all alternatives, and maintenance of the existing beach and parking through a program of beach nourishment activities and engineering solutions like jetties and groins. These components were considered for inclusion in the draft CCP/EIS, along with the four preliminary draft alternatives, as part of the initial scoping process.

2.3 Evaluation of Alternatives

NEPA requires that alternatives evaluated in an EIS be capable of achieving the purpose and need (40 CFR 1505.1). Table 2-1 provides a summary-level evaluation of how each of the preliminary draft alternatives, and components identified during scoping, contributes to each element of the CCP purpose (as described in detail in chapter 1). Each alternative or component was evaluated as follows: if it would make a positive contribution towards achieving each element of the purpose, would make no contribution (i.e., neutral), or would make a negative contribution (i.e., it would detract from achieving the purpose). The assessment is based on the descriptions of the purposes of this CCP provided in sections 1.5 through 1.9, and the vision and goals described in section 1.13.

As illustrated in Table 2-1, Preliminary Draft Alternative C, as well as various components (elimination of hunting and the shuttle, and beach nourishment/coastal engineering), would primarily detract from achieving the purpose of the CCP. Section 2.4 discusses in more detail the reasons why one preliminary draft alternative, and different components, were eliminated from further consideration.

Table 2-1. Summary Screening of Preliminary Draft Alternatives - Meeting the Purpose of the CCP

CCP Purpose		CCP/EIS Section	Preliminary Draft Alternatives				Components from Scoping		
			A	B	C*	D*	Eliminate hunting	Beach Nourishment & Coastal Engineering	Elimination of Transit
1	Achieve refuge purposes	1.4	○	●	○	●	○	○	○
2	Fulfill the Refuge System mission	1.5	●	●	○	●	○	●	○
3	Maintain and, where appropriate, restore the ecological integrity of the refuge and Refuge System	1.6	●	●	●	●	○	○	N/A
4	Help achieve goals of the National Wilderness Preservation System	1.7	●	●	●	●	N/A	N/A	N/A
5	Meet other mandates	1.8	●	●	○	●	○	○	○
6	Address significant local concerns: climate change and sea level rise; regional conservation; balance between public use and wildlife conservation; public access to the refuge, in particular to the recreational beach; impact to visitor experience; and impact to local economy.**	1.9	○	●	○	○	○	○	○

● = positive contribution toward achieving purpose;

○ = negative contribution (detract from achieving the purpose); and

● = no contribution (neutral).

* Preliminary Draft Alternative C was eliminated as a result of the alternatives evaluation process described in this section, and a refined version of Preliminary Draft Alternative D was renamed alternative C. Thus, all other references to alternative C in this CCP/EIS outside of this section refer to a refined version of the alternative originally referred to in this chapter as Preliminary Draft Alternative D.

** Preliminary Draft Alternative D would make a positive contribution to this factor except with regard to the local economy.

As a result of comments received as well as other deliberations among the refuge and the CCP/EIS Planning Team⁴, we refined the remaining three preliminary draft alternatives, including but not limited to the following changes:

- We expanded elements common to all to include provision of a recreational beach, access by personal vehicle, and coordination on hazard mitigation, among others;
- We removed a voluntary shuttle from Draft Alternative B; and
- We removed development of a marine sanctuary and restriction of shellfish bed leasing.

These refined alternatives are described in detail in Section 2.5.

2.4 Alternatives and Components Considered but Eliminated from Detailed Analysis

The process of developing alternatives under NEPA and the Improvement Act is designed to allow for consideration of the widest possible range of issues and potential management approaches that achieve the purpose of the CCP. During this process, many different solutions were considered. The following components were considered but not selected for detailed study in this CCP/EIS for the reason(s) described.

2.4.1 Beach Nourishment

Several public comments indicated a desire to maintain the current recreational beach and parking locations through beach nourishment activities and other engineering strategies, such as jetties and groins. As shown in Table 2-1, these components would not contribute to achieving the purpose of the CCP and would in fact, detract from achieving nearly all of the elements of the purpose. It is the position of USFWS that natural shoreline processes (including migration) are beneficial to maintain the biological integrity, diversity, and environmental health of barrier beach islands and salt marsh habitats in the face of rising rates of sea level and climate change. Infrequently, USFWS has utilized site-specific beach nourishment to accomplish other habitat goals, such as at Prime Hook NWR in Delaware to fill breaches as part of a broader marsh restoration project.

A beach nourishment “only” project is unlikely to persist over time. Assateague Island is strongly influenced by a net movement of sand from north to south. As evidenced by the formation of Toms

⁴ The CCP/EIS Planning Team met consistently throughout the planning process for this CCP/EIS and included: USFWS, National Park Service (NPS) Assateague Island National Seashore, town of Chincoteague, Accomack County, Accomack County Board of Supervisors, Accomack-Norhampton Planning District Commission, Virginia Marine Resources Commission, Virginia Division of Game and Inland Fisheries, and NASA. The Volpe National Transportation Systems Center served as facilitator.

Cove Hook over the past 150 years, any sand artificially placed along the ocean beach can be expected to rapidly mobilize and move south away from the placement site. There is also large scale movement of sand on and offshore, reflected by a network of shoals adjacent to the southern end of the island. Because of these processes, beach nourishment would need to be repeated on a regular, recurring basis to be effective in creating a wider and more stable beach, or to prevent the island from breaching during some future storm event.

Beyond the concerns about significantly adverse habitat and aesthetic impacts, it should be noted that beach nourishment is very costly. The U.S. Army Corps of Engineers (USACE) policy requires that 35 to 50 percent of planning, implementation, and maintenance costs be borne by a state or local government partner (USACE, “Continuing Authorities Program”). The USFWS investigated beach nourishment during the early stages of developing potential alternatives for the CCP, and contacted the USACE to obtain an estimate of the scope and cost of beach nourishment for a project this size. Using research and analysis undertaken for the Wallops Flight Facility (WFF) Shoreline Restoration and Infrastructure Protection Program as a model, the USACE provided an analysis and cost estimate for stabilizing the current recreational beach and parking lots. The resulting analysis estimated that a beach nourishment project of similar scope could require an initial estimated investment of \$24 million, with recurring maintenance costs of \$8.3 million necessary every 3 to 7 years, for a total cost of nearly \$49 million over the 15 year life of the CCP, not including wetland mitigation (USACE 2012; Appendix J). This is more than twice the cost of any of the other alternatives, which range in cost over 15 years from \$11.7 to 22.2 million. Adding this component to alternative A or substituting it for the development of a new beach and parking lot proposed in alternative B would result in costs of approximately \$54 million dollars, which is 240 percent more than alternative B, the most costly alternative. NEPA requires alternatives to be reasonable from a technical, economic, and common sense perspective⁵ and compared to other alternatives evaluated, an alternative that includes the beach nourishment and coastal engineering element is not reasonable from an economic or common sense perspective.

In light of these considerations, the NPS and USFWS do not believe that beach nourishment and engineering strategies would be a responsible and sustainable management tool for use on southern Assateague Island. As described in chapter 1, the purpose and need associated with this CCP requires alternatives to include strategies in accordance with the refuge goals and mission, which would uphold our long-term agreement with the NPS to provide recreational beach access, while also considering its long term sustainability. Because of the predicted short term viability, and environmental factors, in addition to significant estimated cost, the USFWS considers beach

⁵ Council on Environmental Quality, *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*, Response to Question 2a, (46 Federal Register 18026, March 23, 1981, as amended).

nourishment to be outside the scope of the CCP, and will not be evaluating nourishment as part of the alternatives under consideration.

2.4.2 Elimination of Hunting

Refuges provide habitat for the conservation and protection of all native species of wildlife. Harvesting surplus animals through hunting is one tool used to manage wildlife populations at a level compatible with the environment, provide wildlife-dependent recreational opportunities, and permit the use of a valuable renewable resource. Closing the refuge to hunting would conflict with the Improvement Act, which lists hunting as an appropriate and priority use of the Refuge System; directs that hunting shall receive priority consideration in refuge planning and management; mandates that hunting opportunities should be facilitated when feasible; and directs USFWS to administer the Refuge System so as to “provide increased opportunities for families to experience compatible wildlife-dependent recreation, particularly opportunities for parents and their children to safely engage in traditional outdoor activities, such as fishing and hunting.” Furthermore, “no hunting” would conflict with Executive Order #13443: “Facilitation of Hunting Heritage and Wildlife Conservation.” The order directs the DOI and its component agencies, bureaus, and offices, “to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.” For all these reasons, the elimination of hunting would detract from achieving the purpose rather than contribute to meeting the purpose, and is not reasonable from a common sense perspective. Therefore, hunting will not be eliminated.

2.4.3 Preliminary Draft Alternative “C”

Preliminary Draft Alternative “C,” as described and illustrated in the August 2011 newsletter, would have utilized a habitat management strategy in which management actions and strategies would allow for natural succession and coastal processes to take place on the refuge with little intervention. Refuge administration of programs would have been minimized primarily through reduction of activities, increases in partnerships, and use of volunteer staff. Specifically, this alternative would only maintain the beach parking, Chincoteague pony units, and Toms Cove Visitor Center as long as the land base allows, would not develop a shuttle service or off-site parking, and would shift towards teacher and partner-led interpretive tours. This alternative does not contribute to achieving the purpose of the CCP; rather, it detracts from achieving the purpose. The public, in addition to key stakeholders, voiced strong opposition to this management alternative. Some comments stated that this alternative was a stop-gap management strategy that would not address longer-term needs, and we agree with this assessment. It was also voiced by the public that this alternative was seen as a solution that assumed limited funding, and therefore could not sustain long-term management. Furthermore, key stakeholders did not support allowing natural forces to reduce the land base for the recreational beach and parking, when there was no plan to replenish the area or to provide alternative off-site parking and access. Ultimately, it was determined that this alternative would not meet the purpose of the CCP and therefore, it was removed from further consideration.

2.4.4 Elimination of Transit

Transit was proposed to provide supplementary beach parking on Chincoteague Island and a shuttle when the parking is at capacity, and would provide access after catastrophic storm events that may temporarily eliminate or restrict beach parking. Some comments received during our planning process requested that transit not be considered in any of the alternatives.

It is the position of USFWS that transit is an important component of responsible management to provide visitors with an alternative option to driving along with bicycling and walking, to address high levels of demand on peak beach visitor use days, and to address impacts on current recreational beach parking resulting from rising rates of sea level and climate change effects. As such, transit is necessary for alternative A, not only to be consistent with the 1993 Master Plan, but also to ensure the same level of access in the future, given the uncertainty in being able to maintain the current level of parking. Transit is also necessary in alternative C due to the reduction in beach parking and the need to provide access during peak visitation. However, as a compromise to address public concerns, and in recognition that relocation of the beach and associated parking will greatly reduce risks to both, a voluntary shuttle was removed from the preferred alternative.

2.5 Alternatives Carried Forward for Detailed Analysis

The alternatives carried forward for detailed analysis are:

- Alternative A – (Current Management)
- Alternative B – (Balanced Approach)
- Alternative C – (Reduced Disturbance)

As an integrated CCP and EIS, details of the alternatives are described in terms of the main components of a CCP, namely measurable objectives and associated strategies to achieve each associated goal. The refuge goals, as listed in chapter 1, are common to all of the alternatives, but objectives and strategies may vary between alternatives. For each alternative, a rationale accompanies each objective to explain its context and why it is considered important. Strategies are also identified for each objective. The strategies are specific actions, tools, techniques, or a combination of these that may be used to achieve the objective. Respective lists of strategies under each objective represent a potential suite of actions to be implemented in step-down plans that will achieve the desired outcomes of the alternative selected.

These alternatives represent different management approaches for managing the refuge over a 15 year time frame. Features common to all three alternatives are summarized below, followed by descriptions, objectives, and strategies for each of the three alternatives. At the end of the chapter, Table 2-2 compares major elements of each alternative. Summary cost information for each alternative is provided in Appendix I.

2.5.1 Existing Management Actions that Continue Under All Alternatives

Although the alternatives differ in many ways, there are similarities among them as well. Throughout this chapter, appropriate references are made to other alternatives when there are similarities, but this section highlights those elements that all alternatives share and captures broader commonalities not captured in the detailed descriptions of each alternative. These are management actions that would not change under any of the alternatives. These commonalities are presented in the order of the CCP goals, not in order of importance.

Resource Protection

The refuge would continue current enforcement of all Federal and State laws applicable to the refuge to protect all known archaeological and historical sites, including any efforts to increase resource protection through education. Certain mandated responsibilities, such as protection of

Federal trust species and wetlands and prevention and control of invasive species, would be accomplished under all alternatives.

Habitat Management

The refuge would manage the following habitats and management structures the same, regardless of alternative: sea-level fen on Wallops Island NWR, maritime forest on Assateague Island, upland habitats on Wallops Island NWR, and natural coastal processes and habitats on Assawoman, Metompkin, and Cedar islands.

Marine Resource Management

In light of climate change and sea level rise, the refuge would recommend that the Commonwealth of Virginia protect and enhance newly submerged lands for the purpose of preserving wildlife habitat and recreational access. The refuge would encourage and support the Assateague Island National Seashore's Marine Research Reserve in Central Chincoteague Bay.

Threatened and Endangered Species

The refuge would continue to provide protective conservation measures for federally listed species and their habitats on the refuge as indicated in recovery plans and relevant regulations.

Exotic, Invasive, and Nuisance Species Management

The refuge would continue to conduct a number of strategies to address invasive species and their impacts. The refuge would continue to scout and remove invasive species such as Phragmites and Asiatic sand sedge by chemical, mechanical, or other means, using all current and future surveys to refine this strategy. The refuge would continue to map and track the changing acreage of invasive species, specifically Phragmites, on at least a bi-annual basis and use the results to prioritize treatments. The refuge would remove Asiatic sand sedge whenever it is found; patches of this highly invasive species are still small enough and occur infrequently to employ a zero tolerance policy. Finally, the refuge would continue to use refuge education programs and outreach efforts to educate visitors, hunters, and other groups about how they can help decrease the spread of invasive plants.

Regional Conservation

As indicated in Goal 5: Partnerships, the refuge would work with partners to conduct research, continue joint management of the southern barrier islands, and explore how best to establish a regional conservation network for the lower Delmarva Peninsula. This area is recognized globally for its remarkable estuarine, coastal, and marine habitats and substantial populations of migratory and breeding shorebirds, colonial waterbirds, landbirds, and raptors. Unfortunately, several real and growing challenges threaten the area's rich and diverse natural heritage and the many benefits humans derive from the region's intact habitats and natural systems. This partnership would seek to expand a resilient, productive, and connected network of protected lands to facilitate adaptation of native species, natural communities, and ecological systems and processes across a full range of representative habitats from tidal salt marshes to upland forests.

Economic Development

The refuge would work with its gateway coastal community, the town of Chincoteague, and regional organizations to support economic development. Continued partnerships with the surrounding community and local businesses, and consideration of economic impacts and

opportunities for the town of Chincoteague in future management practices, would be maintained to support and improve the surrounding economy.

Community Resiliency

The refuge would work with the town of Chincoteague to explore potential impacts and identify protective methods to address hazard mitigation, in coordination with others, such as Accomack County, Commonwealth of Virginia, NPS, National Aeronautics and Space Administration (NASA), Federal Emergency Management Agency (FEMA), and USACE. The refuge would also work with partners to explore how best to advance the study, information exchange, and project resources for adaptive management practices that sustain the resiliency of this unique barrier island system including but not limited to Assateague, Wallops, Assawoman, and Metompkin islands in the face of dynamic coastal processes and climate change.

Visitor Survey

The refuge would seek approval from the Office of Management and Budget to develop and conduct a visitor survey every 5 years to assess visitor experience and measure level of satisfaction with visitor service programs.

Parking and Access to the Beach

A 1-mile recreational beach with some level of parking nearby would be maintained on the refuge by NPS as long as funding allows. Personal motor vehicle access to Assateague Island would continue to be permitted. The refuge would coordinate with the town of Chincoteague to allow alternative vehicles, such as golf carts, on town and refuge roads and, thereby, increase parking capacity at the recreational beach parking lots.

The refuge considers a well-planned transportation system, in multiple forms (walking, biking, shuttle system, and automobiles) between the town of Chincoteague and Assateague Island essential to meet the expectations of current and future generations of refuge visitors.

Pony Management and Viewing

Chincoteague ponies would continue to inhabit Assateague Island, and management would be specified in the agreement with the Chincoteague Volunteer Fire Company. In light of sea level rise, the refuge would work with the Chincoteague Volunteer Fire Company to manage the ponies, including providing public viewing opportunities.

Access for Space Tourism Viewing

The refuge would work with the tourism industry, NASA, and the Virginia Commercial Space Flight Authority and Mid-Atlantic Regional Spaceport to provide access to the refuge for public viewing of rocket launches from the NASA-Wallops Island launch complex. The carrying capacity of parking areas for this purpose would need to be defined once the alternative decision is made.

Bilingual/Multilingual Material

The refuge would include the development of bilingual/multilingual information for regulations and environmental education.

Commercial Uses

In consultation and cooperation with the NPS and the Virginia Marine Resources Commission, the commercial harvest of horseshoe crabs that takes place on refuge lands does not contribute to

the refuge's migratory bird purpose, does not contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, and is not beneficial to refuge resources; consequently, the use cannot be permitted.

Facilities and Infrastructure

Universal access, including standards of the Americans with Disabilities Act, would be incorporated into the design of any new or significantly renovated facilities. Safety considerations, such as shelters, would also be included. In addition, impacts on natural resources and visitor satisfaction would be considered in design and construction to minimize any adverse effects.

Climate Change and Sea Level Rise

Each alternative anticipates future conditions as they pertain to climate change and anticipated sea level rise over the next 100 years and proposes a range of adaptation measures. A guiding principle is that sea level rise is a continuous, ongoing process, which along with coastal storms and other natural processes and man-made infrastructure (e.g., jetties and groins), reshapes coastal landscapes. The refuge has several facilities and resources that may be vulnerable to sea level rise and storm surge, including the NPS recreational beach parking area. To minimize facility damage, maintenance costs, and access disruptions in the future, in all alternatives the refuge would consider potential risks and strategies when making decisions about infrastructure that would last beyond the 15 year period covered by the CCP. Also, each alternative would provide for data gathering to measure and monitor the effects of accelerated climate change and sea level rise.

Wilderness

As part of implementation of *Conserving the Future* and in recognition for the 50th Anniversary of the National Wilderness Preservation System in 2014, USFWS is recommending the chartering of a Refuge System Wilderness Council to evaluate the 21 proposed wilderness areas and wilderness study areas and prepare a national strategy to advance priority wilderness proposals to Congress for designation. One of the 21 proposed wilderness areas to be evaluated is located within Chincoteague NWR. USFWS will complete a nationwide identification of potential wilderness areas throughout the Refuge System by 2025.

Implementation of the Selected Alternative

Refuge management would continue as established by the Final EIS for the Chincoteague NWR Master Plan approved in 1992, with a phased implementation of the approved alternative from the Final EIS/CCP, which will be dependent upon future budget approvals and available funding.

2.5.2 Alternative A (Current Management)

Alternative A is the status quo (current management) alternative and satisfies the requirements of NEPA for a no action alternative. This alternative describes the refuge's existing management priorities and activities established by 1992/1993 Master Plan and EIS, and serves as a baseline for comparing alternatives B and C. Figure 2-1 and Figure 2-2 provides an illustration of major spatial elements of the alternative.

Natural Resource Management. Under this alternative, the refuge would continue to protect and maintain all lands it administers, primarily focusing on the needs of threatened and endangered species, with additional emphasis on the needs of migratory birds and resident wildlife. The refuge would continue to preserve approximately 2,650 acres of wetland impoundments based on priority species needs. Natural coastal processes would continue to be the primary force that shapes habitat on the southern barrier islands. There would be no change in the size or location of the 1,300-acre proposed wilderness area within the refuge, and the refuge would continue to protect and enhance its enhanced wilderness character through actions to eliminate incompatible features and activities.

Beach Access and Parking. Consistent with the 1992/1993 Master Plan and EIS, the refuge would continue to allow NPS to maintain 961 automobile parking spaces (8.5 acres) at the recreational beach as long as suitable land base directly behind the recreational beach remains (USFWS 1992a, USFWS 1993a), and as long as funding is available. As sea level rise and natural forces reduce the land base capable of supporting current parking, the refuge would reduce the number of parking spaces accordingly, and would work with the town of Chincoteague and the NPS to identify suitable off-site parking and to implement an alternate means of transportation such as a shuttle system. The refuge would continue pursuit of bicycle trail development via Beach Road to the recreational beach to replace the temporary Swan Cove Trail.

Partnerships. Refuge staff would continue to work with the USDA to reduce the non-migrant Canada goose population. The refuge would continue existing partnerships, including those with the NASA and the U.S. Navy for monitoring and recovery of native species.

Visitor Use and Experience. Existing public uses, including wildlife observation, environmental education, interpretation, walking and bicycling access, fishing, wildlife photography, and hunting of sika, resident white-tailed deer, and off-island migratory birds, would continue with the current facilities, programs, and policies. The OSV closure schedule and vehicle limits would continue as in current management practices. The refuge would continue to manage opportunities for recreational shellfish and crab harvest.

Cultural Resource Management. The refuge would continue its responsibilities for the archaeological, cultural and historical sites on the refuge in compliance with all applicable Federal and State laws. Refuge staff would continue to allow the Chincoteague Natural History Association (CNHA) and refuge volunteers to conduct tours of the Assateague Lighthouse and would continue restoration of the Lighthouse. The refuge would allow grazing of the current Chincoteague pony population, with a maximum herd size of 150 ponies, consistent with the pony management agreement with the Chincoteague Volunteer Fire Company.

Figure 2-1. Alternative A – Chincoteague NWR

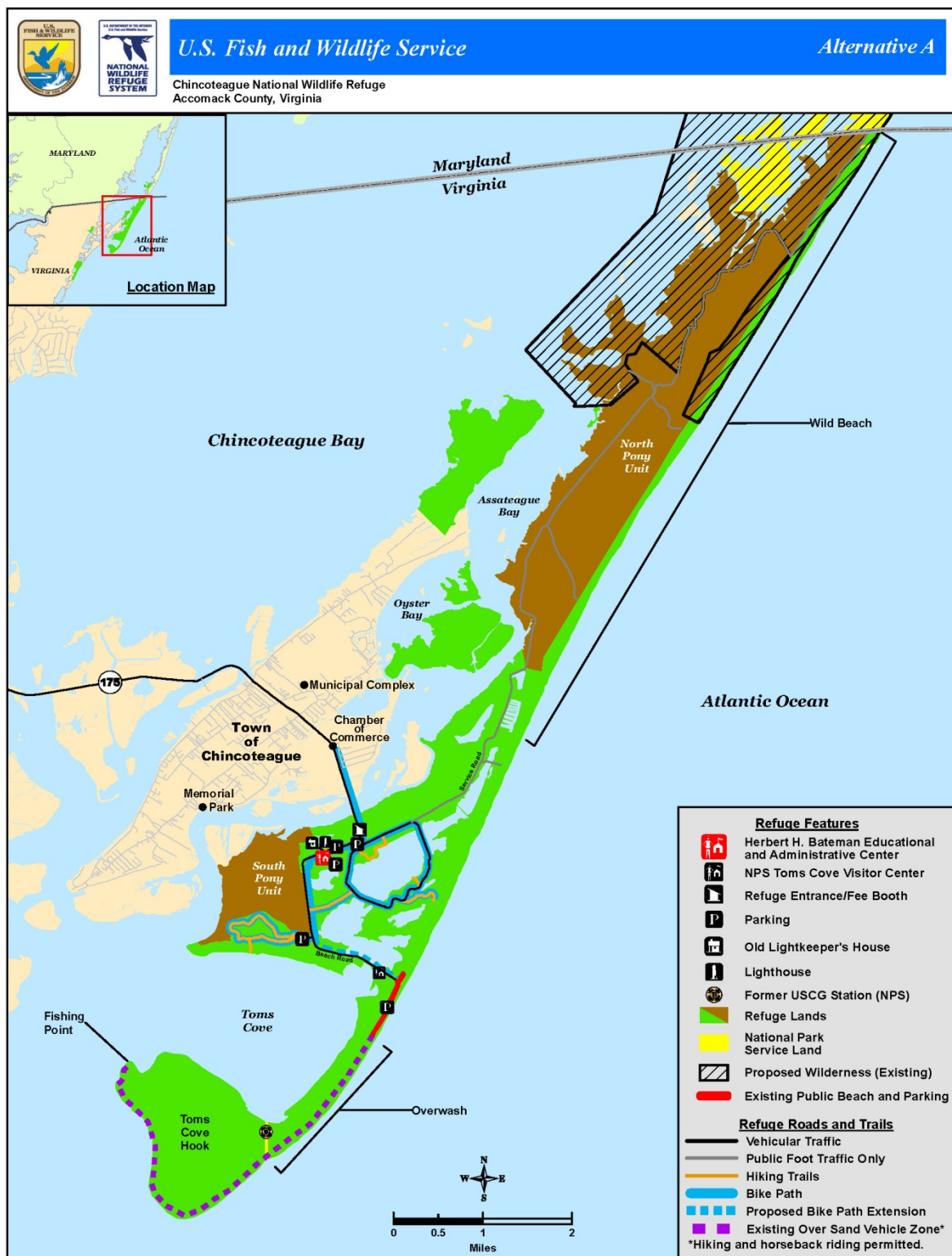
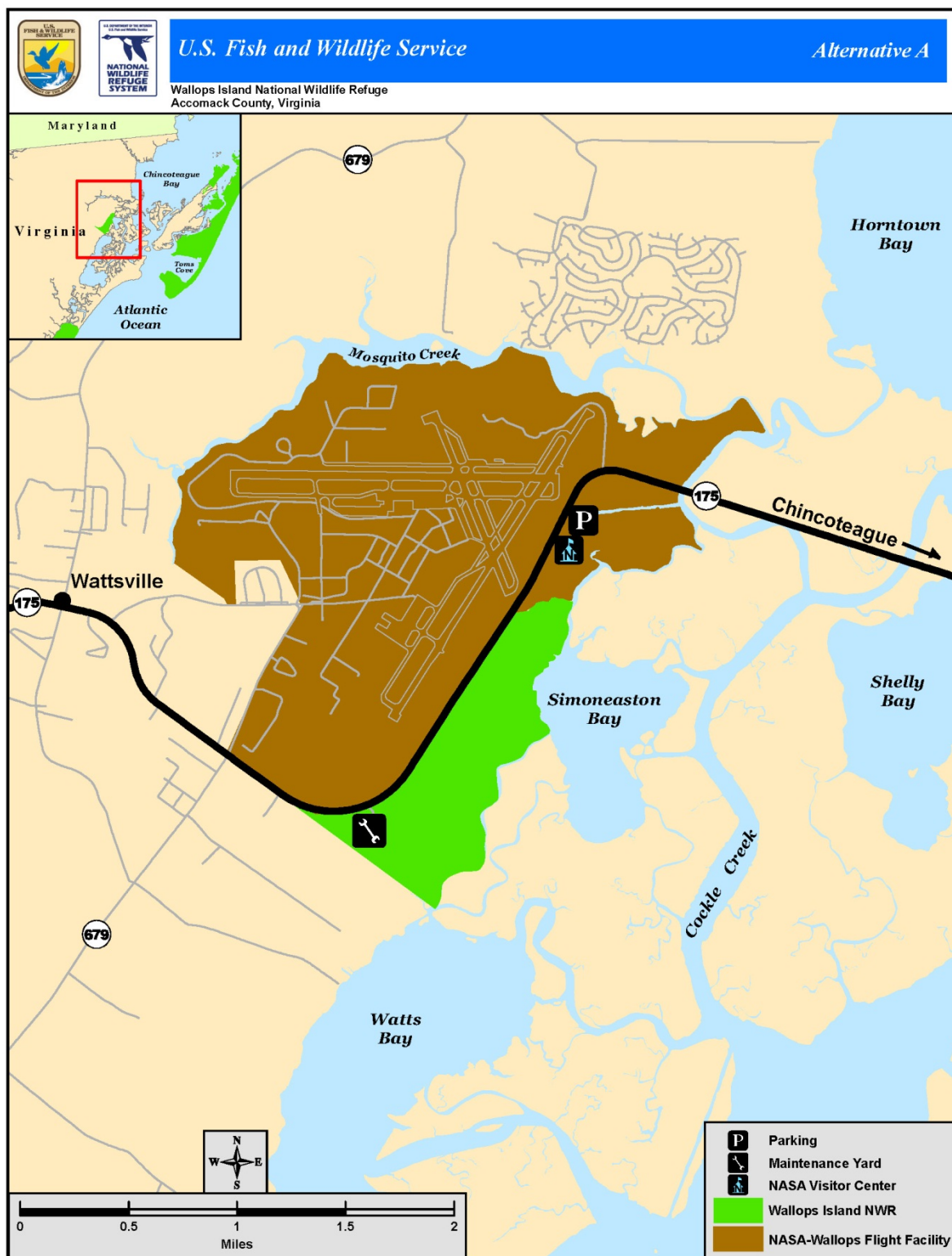


Figure 2-2. Alternative A – Wallops Island NWR



Goal 1: Coastal Habitats

Manage quality coastal habitats for biological integrity, diversity and environmental health of refuge barrier beach and dunes in concert with natural processes as part of the Delmarva Peninsula coastal barrier island system to provide habitat for species of conservation concern.

Objective 1.1 Barrier Beach and Dune Habitat – Coastal Nesting Birds

Manage sandy beach, dune edge, overwash, and intertidal areas on Assateague, Assawoman, Metompkin, and Cedar Islands, and reduce mortality factors, to maintain a refugewide piping plover fledge rate between 1.2 and 1.5 chicks per pair as averaged over a 10-year period. If fledging rate drops below 1.0 chick per pair over a 10-year period, management strategies and prescriptions would be re-evaluated using a formal process and outside expertise.

Rationale:

Management of the Federal and State-listed threatened piping plover is a high priority for the refuge, with management actions to be outlined by the HMP to maintain an acceptable fledge rate. The CCP fledge rate goal of 1.2 to 1.5 chicks per pair is based on Hecht and Melvin's (2009) recent analysis of 1989 to 2006 regionwide productivity data and the Piping Plover Recovery Plan (USFWS 1995). This management target allows for population growth necessary to meet recovery goals. Using 1.0 rather than a previous 0.93 chicks per pair as the trigger to re-evaluate management allows more time to find solutions and implement them. These management actions, though directed specifically at the piping plover, would also benefit other high ranking species such as the least tern, American oystercatcher, black skimmer, Wilson's plover, and gull-billed tern due to their similar habitat needs.

Management Strategies

- Restrict public access to reduce mortality and disturbance on Assateague, Assawoman, Metompkin, and Cedar beach, dune, and overwash areas during the breeding season: March 15 through August 31 or thereafter, until the last chick fledges.
- Continue to implement OSV and pedestrian closures as outlined in the 2008 Biological Opinion (USFWS 2008b; Appendix F): the OSV zone on Toms Cove Hook will be closed from March 15 to August 31 or thereafter, until the last shorebird fledges. The overwash portion of the OSV zone will close 256 feet (200 meters) north of any shorebird brood, and remain closed till the last shorebird fledges. Public use above the high tide zone on Wild Beach will be closed March 15 till August 31 or thereafter, until the last shorebird fledges.
- Erect "Area Closed" signs and symbolic fencing (rope strung between signs) in a buffer zone (minimum 25-foot radius) around nests within Public Beach, and maintain these protective measures until the nest hatches or is determined to be unviable.
- Erect exclosures around individual plover nests where necessary and logistically feasible. (Costs in terms of staff effort outweigh benefits on nesting islands accessible only by boat, where predation levels are low or nil such as on Cedar and Metompkin).
- Remove mammalian nest predators (primarily foxes and raccoons) from nesting habitat and nearby areas and travel corridors prior to and during the breeding season.
- Remove avian predators, such as gulls and corvids, from nesting areas when chicks are present, at other times of the breeding cycle, when needed.
- Conduct an analysis of the refuge's predator control efforts and results to develop recommendations to improve its effectiveness. The analysis would be done in conjunction

with other partners' analyses of predator management results on other islands to better understand system-wide responses to reductions in island predator populations.

- Continue interagency agreement between the USFWS and USDA which authorizes USDA to assist the refuge with threatened and endangered species recovery and migratory bird management.
- Continue working with coastal geologists to model the impacts of storm flooding events and other dune breaching scenarios on Assateague Island to evaluate potential effects that erosion of the artificial dunes may have on natural and manmade habitats, refuge infrastructure, and flood control for the town of Chincoteague.
- Allow natural geologic processes to restore overwash to a northern portion of Wild Beach (e.g., the North Wash Flats (NWF) Impoundment) on Assateague Island in order to increase nesting habitat for plover, least terns, sea turtles, and other nesting shorebirds that were lost when the artificial dune system was created. This would also allow natural island movement. The refuge would allow natural and artificial dune breaches in locations that would provide overwash as determined by working with coastal geologists as stated above.
- Continue to work with NPS to replace existing trash bins in parking lots around public beach areas on Assateague Island with a design that excludes bird and mammal predators and scavengers.
- Continue to develop interpretation programs that foster a public appreciation of nesting shorebirds (Shoreline Steward Program) and inspire refuge visitors to reduce their impacts on these species.
- Continue an active role in the Virginia Coastal Avian Partnership (VCAP) to conduct scientific research and education and outreach programs. As an example, the partners developed and distributed an informational brochure targeted for visitors to the barrier islands on how to minimize their disturbance to colonial and other ground-nesting birds.

Biological Monitoring

- Continue to annually monitor reproductive success of piping plover pairs on all islands, which includes determining the number of breeding pairs, nests, and chicks fledged.
- Determine the number of American oystercatcher pairs and fledge rate for all islands. Conduct more intensive monitoring of oystercatchers (e.g. number of nests, hatch success, cause of failure) on one island per year on a rotating basis.
- Annually monitor the number of nesting pairs/nests of least terns, common terns, Forster's terns, and black skimmers on all islands using methods outlined by the Atlantic Coast Least Tern Adult Window Count and Virginia Colonial Waterbird Coastal Plain Survey.
- Annually conduct scouting for invasive plant species on all islands in conjunction with bird monitoring; train interns and bio techs on how to identify invasive plant species of concern. Evaluate the success of refuge treatment programs using periodic aerial Phragmites mapping by the Virginia Department of Conservation and Recreation (DCR).
- Continue to conduct annual predator scent station monitoring in November to determine predator trends and guide predator pre-breeding season control activities.

Objective 1.2 Barrier Beach and Dune Habitat - Migrating and Wintering Shorebirds and Migrating Monarch Butterflies

Manage sandy beach, overwash, and dune grassland habitat along the approximately 17 miles of Assateague Island (Hook, Overwash, Wild Beach) and tidal flats along Toms Cove to benefit red knot, species of conservation concern, and other migrating/wintering shorebirds.

Rationale:

In 1990, the Virginia and Maryland barrier islands were designated as a Western Hemisphere Shorebird Network Site due to the number of shorebirds using the area during migration, with tens of thousands of shorebirds stopping at Assateague Island between the months of April and September. Protecting and enhancing this habitat would benefit these shorebirds such as red knots, sanderlings, and other migrating/ wintering shorebirds of conservation concern, by regulating and directing public use to less sensitive areas, away from roosting and feeding areas during peak migration.

Shorebirds using the Overwash and Hook are subject to human disturbance during a portion of peak fall migration (September, and sometimes parts of August in the Overwash). Forgues (2010) found that abundance of sanderlings, ruddy turnstones, willets, black-bellied plovers, and whimbrels on Assateague Island during spring and fall migration significantly declined with higher OSV frequency, and concluded that OSVs can interfere with the ability of shorebirds to accumulate fuel stores for migration. OSV use caused shorebirds on Assateague Island to spend less time foraging, and to avoid areas where OSVs were present (Forgues 2010). Five miles of the refuge's 16.8 miles of beach on Assateague Island are open to OSV use during the fall and winter (September 1 – March 14). Morton's (1996) studies of Assateague's wintering shorebirds found that human activity, both pedestrian and vehicular, negatively impacted sanderling use of beach areas, foraging activity, and energetics. Human disturbance caused sanderlings to avoid areas which were otherwise suitable (i.e., had good food resources), flush more, and feed less. This could result in the birds being less fit to make their migration (Morton 1996).

Assateague Island is a critical stopover point for southbound migrating monarchs that use the refuge's resources to rest, refuel, and roost for the night. The migration and wintering biology of the eastern population of the monarch butterfly has been labeled an "endangered biological phenomenon" (Gibbs 2008). The insect makes a journey of up to 2,200 miles, from summer breeding areas in New England and Canada to wintering grounds in Mexico's central mountains, in the State of Michoacán. Nectar source plants are located in various refuge habitats including Beach Road adjacent to Toms Cove, the Overwash, and tip of the Hook, blooming in succession during the migration period. Stands of seaside goldenrod, the most important nectar source on the refuge, can be lost or thinned from natural causes (salt-spray, overwash, storms), or management activities (roadside mowing, parking lot maintenance, facilities maintenance). Recent experiments with seed collection and planting seedlings have been successful in re-establishing/enhancing goldenrod stands.

Management Strategies

- Conduct education and outreach programs to educate visitors, particularly pedestrians on the beach, on how to reduce their disturbance impact on birds. For example, increase understanding of the impacts of people's behavior on wildlife, such as proximity.
- Continue an active role in the VCAP to conduct scientific research and education and outreach programs. As an example, the partners developed and distributed an

informational brochure targeted for visitors to the barrier islands on how to minimize their disturbance to colonial and other ground-nesting birds.

- Continue the partnership with monarch researchers/volunteers whereby refuge volunteers collect seaside goldenrod seeds in November for propagation, and seedlings are planted the following spring or fall.
- As opportunities arise, use volunteers to plant seaside goldenrod seedlings in spring or fall on Toms Cove Hook, small dunes that dot the Overwash area, the north end of Toms Cove (including the causeway west of the NPS Toms Cove Visitor Center), and the backsides of dunes along Wild Beach. Planting should occur on no greater than 5 percent of the Overwash area so as not to conflict with beach nesting birds, which prefer open un-vegetated beaches and shell flats.
- Establish annual temporary fencing (August-October) at dunes adjacent to overwash and public beach locations to aid in monarch nectaring and roosting locations.

Biological Monitoring

- Continue weekly shorebird surveys April through May and July through September, and every-other-week surveys October through March and in June. Since patterns of shorebird use of impoundments are related to the tidal cycle and beachfront is only accessible at low tide, adjust protocol to obtain the most complete count of all surveyed units on Assateague. This can best be accomplished by starting the shorebird survey one hour before low tide on Toms Cove/Hook, then proceeding north on Wild Beach to the beach access road north of Old Fields, and continuing south after surveying Old Fields to complete the remainder of the impoundments. Surveys on the impoundments would thus occur during mid and high tide, when shorebird activity was found to be the highest (Haines 1999).
- Continue re-sight surveys for tagged red knots in fall and spring in conjunction with weekly shorebird surveys and plover/oystercatcher breeding surveys, and using protocols consistent with partners involved with red knot monitoring and research.
- Continue bi-weekly re-sight Chincoteague Bay boat surveys for color-banded American oystercatchers in fall and winter in partnership with Virginia Department of Game and Inland Fisheries (VDGIF) and The Nature Conservancy (TNC). Prior to 2015, re-evaluate the resources available for this survey, which takes place off-refuge, and the information gained to determine if surveys would continue.
- Encourage partners and volunteers to monitor monarch migration on the refuge through monarchwatch.org or other cooperative efforts outlined in the North American Monarch Conservation Plan.

Objective 1.3 Barrier Beach and Dune Habitat - Turtles

Manage approximately 17 linear miles of sandy beach habitat on Assateague Island for nesting loggerhead sea turtles. Continue *in situ* nest protection such that no more than three nests over any 5 year period, and no more than one in any given year, are lost to human or predator-related causes.

Rationale:

The loggerhead sea turtle is a Federal and State-listed threatened animal with habitat found on the refuge, the management actions of which would benefit other species such as the diamondback terrapin. The three major threats towards these species on the refuge are predation, human

activities, and weather. Currently, no sea turtle nests have known to be lost to predators. Management actions, such as mammalian and avian predator removal directed primarily for piping plover production, and placing protective screening over sea turtle nests, may have prevented predation. Human use of nesting beaches, particularly at night or early morning when females come ashore to nest, can disturb nesting females, prevent egg-laying, and indirectly harm hatchlings. Flashlights, headlights, campfires, or lighting on buildings can cause females to abort nesting attempts and interfere with sea-finding behavior by hatchlings. Beach driving, pedestrian traffic, and beach cleaning poses a risk of injury to nesting females and live stranded turtles and can leave ruts that trap hatchlings attempting to reach the ocean (NOAA and USFWS 1991). Driving directly above incubating egg clutches can cause sand compaction, which may decrease hatching and emergence success and directly kill pre-emergent hatchlings (National Marine Fisheries Service and USFWS 2007). The most recent Biological Opinion (USFWS 2008b; Appendix F) determined that an incidental take of up to three sea turtle nests over a 5-year period, and no more than one per year, would not jeopardize the loggerhead sea turtle population. Management activities have kept mortality far below this so far. However, if turtle nesting increases on the refuge, there may be more overlap between human disturbance factors and turtle nesting.

Management Strategies

- Control human disturbance along 17 miles of Assateague Island during the turtle nesting season.
- Continue implementing OSV and pedestrian closures on the Hook, Overwash, and Wild Beach from March 15 through August 31 or thereafter, until the last shorebird fledges, as outlined in the 2008 Biological Opinion (USFWS 2008b; Appendix F).
- Erect “Area Closed” signs and symbolic fencing (rope strung between signs) in a buffer zone (minimum 5-foot radius) around all nests, and maintain these protective measures until the nest hatches or is determined to be unviable.
- Protect sea turtle nests from predators by placing predator screens over all nests and conducting mammalian and avian predator control for piping plovers which would indirectly help sea turtle production.
- Restore dynamic beach and overwash system on Assateague Island by allowing natural geologic processes to restore overwash to a northern portion of Wild Beach in order to increase nesting habitat for sea turtles lost when the artificial dune system was created.

Biological Monitoring

- Conduct sea turtle crawl and nest searches of Assateague beaches at least three times per week June through August, in conjunction with shorebird monitoring activities whenever possible.
- Deploy properly trained staff to determine whether sea turtle crawls resulted in a nest, and monitor all confirmed nests for hatching and emergence as described in the Biological Opinion (USFWS 2008b; Appendix F).

Objective 1.4 Federally Endangered Plants and Rare Plant Communities

Protect the integrity of rare plant communities and maintain or expand 970 acres of sandy beach and washover habitat for the federally endangered seabeach amaranth along Assateague Island

shoreline by allowing natural processes to occur with a goal of increasing the current population of 1 to 5 plants, as averages over a 5 year period.

Rationale:

Seabeach amaranth is a Federal endangered plant native to barrier islands beaches and inlets from Massachusetts to South Carolina; the population has been greatly reduced on the refuge due to beach stabilization efforts, increased recreational use, and herbivory. “Soft” stabilization methods such as placement of sand fences and planting vegetation like beachgrass can be detrimental; seabeach amaranth rarely persists where vegetative stabilization efforts have taken place (Weakley et al. 1996). Sika, resident white-tailed deer, cottontail, and Chincoteague ponies are documented herbivores of amaranth found on the refuge.

Seabeach amaranth generally occurs in a sparse to very sparse distribution. A typical density is 62 plants per linear mile of beach (100 plants per linear km) (Weakley et al. 1996). Current density of the one existing population at the north end of Wild Beach is much lower than this - less than 6 plants per mile (10 plants per km). Investigations regarding active management such as propagation/ transplanting, re-seeding, or removing artificial dunes that prevent suitable habitat from forming at the north end of Assateague Island are needed to re-populate the species. Suitable habitat is defined as overwash flats at accreting spits or ends of barrier islands and the lower foredunes and upper strands of non-eroding beaches. This native plant acts as an important habitat for nesting birds such as plovers, terns, and skimmers.

Lucky Boy Fen is a type of rare habitat that is only found in five different areas of the east coast. A fen is a unique and extremely rare type of freshwater wetland located at the upland edge of a wide, ocean-side tidal marsh. A fen is distinguished from a marsh or a bog by unique hydrological regimes and vegetation that is an unusual combination of northern bog plants and southern tidal freshwater wetlands plants. The number of rare species documented in Lucky Boy Fen is high in proportion to its size. It contains two plant species (brown-fruited rush and few-flowered beakrush) considered “critically imperiled” and four plant species (southern bladderwort, ten-angle pipewort, white beakrush, and white-topped fleabane) considered “imperiled” by the Virginia DCR Natural Heritage Division.

The greatest threat to sea-level fens in general is groundwater pollution. Possible movement of fertilizers and wastes into the groundwater from nearby developments or agricultural fields can lead to increased nutrient levels in the fen. Increased nutrient levels can disrupt soil characteristics and affect the plant species that naturally exist in fen conditions. Nearby developed areas include Highway 175 and the NASA WFF, both within one-half mile of Lucky Boy Fen. Other potential threats to the Lucky Boy Fen include encroachment of invasive species and trampling by grazing animals or visitors (Buffa 2009).

Contained within Assateague Island’s 1,600 acres of forested uplands are roughly 400 acres of maritime forest (Berman and Berquist 2007), located primarily in White Hills, Lighthouse, and Woodland Trail areas. This community type is considered globally rare because of restricted range and narrow habitat requirement (Fleming and Patterson 2010). Only 4,093 acres of maritime forest are found in Virginia, 855 acres of this in Accomack County (Berman and Berquist 2007). More recently, the Virginia DCR developed a list of the Commonwealth’s natural communities ranked according to their conservation priority. Maritime Mixed Deciduous Forest is ranked as “critically imperiled”, both globally (G1) and in Virginia (S1). Maritime Loblolly Pine Forest and Loblolly/Beach Heather Dune Woodland are ranked “Imperiled” globally (G2) and in

Virginia (S2) (Fleming and Patterson 2010). Three hundred acres of loblolly pine/mixed hardwood habitat in the White Hills, Woodland Trail, and Lighthouse compartments are possibly the globally significant Maritime Mixed Deciduous Forest community type. Other forested uplands may be part of the Maritime Loblolly Pine Forest or Loblolly/Beach Heather Dune Woodland communities (Buffa 2009). Additional field studies are needed to delineate the boundaries and amount of these important vegetation communities. Silvicultural practices to maintain or enhance the hardwood overstory, sub-canopy, and shrub/herbaceous understory can then be developed to maintain the integrity of maritime forest.

Seabeach Amaranth Management Strategies

- Continue to erect protective cages around amaranth plants each year.

Seabeach Amaranth Biological Monitoring

- Continue the annual August inventory of Assateague Island beaches for amaranth, in cooperation with NPS personnel whenever possible. Conduct inventories on Assawoman Island every 3 to 5 years.

Lucky Boy Fen Management Strategies

- Annually in early November, prior to the deer hunt, check closed area signs around fen and re-post with closed area signs and symbolic fencing (rope strung between posts) if necessary.
- Collaborate with stakeholders and adjacent landowners such as the Virginia Department of Transportation (DOT) and NASA WFF to monitor and preserve the integrity of the Lucky Boy Fen. For example, WFF has an Integrated Contingency Plan which details storm water pollution prevention and spill control measures; contact DOT to see if they have measures to prevent run-off from Highway 175 from degrading the fen.
- Maintain wooded habitat on Wallops Island NWR that serves as a recharge area for Lucky Boy Fen.

Lucky Boy Fen Biological Monitoring

- Monitor for invasive plants during rare plant assessments.

Maritime Forest Management Strategies

- Using the community type descriptions in Fleming and Patterson (2010) and coastal maritime forest map for Accomack County in Berman and Berquist (2007) as starting points, map the maritime forest on Assateague Island, and other areas on Chincoteague NWR.
- If any portions of the maritime forest type are found to be degraded, develop silvicultural or other forest management practices to restore its integrity.

Objective 1.5 Salt Marsh Habitats for Nesting, Migrating, and Wintering Birds

Manage 3,070 acres of salt marsh in Wildcat Marsh, Morris Island, Assateague Island, and on Wallops Island NWR to include a mix of high and low salt marsh vegetation, pool, mudflat, and

panne habitat containing less than 5 percent overall cover of non-native invasive plants, ensuring the quality and natural function of the marsh, as measured by a regionally developed salt marsh integrity index, are sustained and provide habitat for breeding clapper rail, saltmarsh sparrow and American oystercatcher, as well as, migrating and wintering American black duck and shorebirds.

Rationale:

Sea level rise is a constant threat to the natural salt marsh habitats of the refuge, with marsh submergence having a major negative impact on marsh-nesting species such as clapper rails, black rails, saltmarsh sparrows, seaside sparrows, American oystercatchers, and the American black duck. Whimbrel, a species of highest conservation priority in the New England/Mid-Atlantic Bird Conservation Region (BCR) 30, was selected as a surrogate or representative species by the Mid-Atlantic Landscape Conservation Cooperative to represent the guild of shorebirds that feed in mudflats at low tide and roost in salt marsh vegetation at high tide. It is a wintering and migrant bird in this area, as are many of the shorebirds that use salt marsh habitats, which include mudflats and salt pannes. The saltmarsh sparrow, a species of highest conservation priority in BCR 30, was selected as a representative species because it is an indicator of healthy salt marsh habitat. Saltmarsh sparrows breed in large patches, greater than or equal to 125 acres (50 hectares) in size, of high marsh dominated by saltmeadow cordgrass; they forage in low marsh dominated by smooth cordgrass and saltgrass (Smith, pers. comm., 2010). Chincoteague NWR is unique in being one of the few places that have good numbers of breeding and wintering saltmarsh sparrows; estimated at 2.47 birds per 2.5 acres (1 hectare) and 2.3 birds per 2.5 acres, respectively (Center for Conservation Biology 2010 and Paxton 2007). American oystercatcher were selected as a representative species because they are a species of conservation concern in Virginia and use a range of salt marsh habitats for their life history needs. They nest on low salt marsh islands (Rounds et al. 2004), and during the non-breeding season they gather in communal high-tide roosting flocks on sand or mud flats, oyster shell rakes, and topographic high spots in the marsh (Wilke et al. 2007). The American black duck is a globally vulnerable watch list species, considered one of the highest priority species of concern by the Atlantic Coast and Eastern Habitat joint ventures (Steinkamp 2008); its continental population is half of its historic size (Longcore et al. 2000). Since 2001, the Mid-Atlantic region (including New Jersey, Delaware, and Virginia) has accounted for approximately 68 percent of its U.S. wintering population; within the Mid-Atlantic region, Virginia comprises about 12 percent of that wintering population (VDGIF 2005).

With the exception of Chincoteague pony grazing on certain areas of Assateague Island, the salt marshes on Chincoteague NWR are relatively unaltered. Grazing effects on wildlife are mixed. Grazing can help attain wildlife objectives. For example, allowing the Chincoteague ponies in the North Wash Flat (NWF) impoundment prior to the breeding season removes vegetation, creating preferred habitat for plovers and other “beach nesting” birds. Pony fecal matter may stimulate the growth of invertebrate food matter for waterfowl. In salt marshes, the impacts of pony grazing on wildlife habitat may outweigh the benefits because: (1) Trampling during the nesting season can disturb or destroy nests; (2) Direct forage competition reduces food resources for wildlife; and (3) Grazing alters vegetation structure and species composition resulting in habitat loss for marsh-dependent representative species. Comparing grazed to un-grazed low salt marsh, study sites on the Maryland side of Assateague Island (Sturm 2008) found that areas grazed by Assateague horses had significantly lower overall plant cover, decreased reproductive success of smooth cordgrass, and resulted in a shift in species composition from smooth cordgrass to saltgrass. Horses alter the species composition of low salt marsh communities by preferentially grazing on smooth cordgrass, thus providing a competitive advantage to other plant species. The latter is

significant for wildlife because saltgrass provides very poor nesting cover and food resources for representative species compared to smooth cordgrass (Sturm 2007 and 2008). Grazing is therefore a concern in salt marshes because it can reduce the abundance and distributions of salt marsh obligate breeding birds such as clapper rail, seaside, and saltmarsh sparrows (NPS 2006). Management strategies would protect the salt marsh to allow for native species to nest and survive on the refuge, helping to meet other species objectives.

Management Strategies

- Work with the Chincoteague Volunteer Fire Company and others with technical expertise in grazing systems. Adjust grazing compartments and/or Chincoteague pony numbers in order to reduce the adverse effect of ponies on the habitat of representative species, and determine if pony grazing can be integrated into impoundment management strategies.

Biological Monitoring

- Use the USFWS Region 5 Salt Marsh Integrity Index for the installation of surface elevation tables in coordination with efforts by NPS in Maryland to assess the rate of sea level rise, assess grazed and un-grazed salt marsh, determine areas of the marsh that are impacted and need to be restored and design a monitoring program to improve salt marsh quality, diversity, and integrity.
- Encourage and work with partners (e.g., NASA, MSC, TNC, NPS, USGS) to conduct studies to better understand saltmarsh health and migration on the refuge, and coastal barrier islands.
- Continue collecting American oystercatcher data on the Chincoteague Bay Boat Route, and coordinate with partner agencies to determine the frequency of future productivity monitoring on this route.
- Encourage partners (e.g., Center for Conservation Biology (CCB) at the College of William and Mary and Virginia Commonwealth University, USGS, VDGIF, and Saltmarsh Habitat and Avian Research Program collaborators) to conduct studies to better understand the distribution and abundance of saltmarsh sparrows on the refuge, and help identify their limiting factors and other threats.

Goal 2: Managed Wetlands (Impoundments)

Manage refuge impoundments to support native wildlife and plant communities, including a diversity of waterbirds, aquatic species, and other species of conservation concern.

Objective 2.1 Impoundments for Waterfowl, Shorebirds, Waders, and associated species

Manage to provide approximately 2,650 acres of wetland habitat with a mosaic of native emergent marsh vegetation (i.e. American three-square, smartweed, Bidens) and mudflat to support migrating and wintering waterfowl and shorebirds, and breeding shorebirds and waterbirds until an impoundment is no longer functioning. Taxa specific objectives may be rotated among impoundments from year to year depending on environmental conditions and impoundment capabilities, and would be directed to provide the following:

- (1) Wintering Waterfowl - Manage 55 to 75 percent of the impoundments' surface area each winter (December through mid-March) to provide shallow flooded (less than 12 inch water depth) and seed-producing moist-soil vegetation for wintering waterfowl including black duck, pintail, gadwall, shoveler, teal, and Atlantic population of Canada geese.
- (2) Migrating Shorebirds - Manage 35 to 50 percent of the impoundments' surface area each spring (April and May), and 25 to 40 percent each early fall (July through October) to provide a mix of 40 percent mudflat and shallow water (less than four inch water depth) with sparse vegetation (less than 15 percent cover) for migrating shorebirds (e.g., short-billed dowitcher, dunlin, semipalmated sandpiper, yellowlegs).
- (3) Migrating Waterfowl - Manage 40 to 50 percent of the impoundments' surface area each fall (late October through November) for migrating waterfowl (e.g., black duck, green-winged teal, blue-winged teal) to provide shallow flooded (less than 12 inch water depth) annual vegetation composed primarily of American three-square, grasses of the genus *Echinochloa*, smartweed, Bidens, and other seed producing moist soil vegetation at time of peak migration and by controlling invasives.
- (4) Breeding Shorebirds - Manage NWF impoundment (mowing, pumping and pony exclusion fencing) to provide 90 percent dry habitat conditions for breeding piping plover, Wilson's plover and least terns between March 15 and August 31 or thereafter, until all chicks are fledged.
- (5) Foraging Waterbirds - Provide concentrated food resources in at least two impoundments during June, July, and August each year for breeding waterbirds such as snowy egrets, glossy ibis, and herons.

Rationale:

All of the refuge impoundments, with one exception, were constructed in the 1950s and 1960s with the primary purpose of providing waterfowl migration and wintering habitat. The impoundments supply numerous habitat benefits, including wintering/migratory habitat for waterfowl; food sources for water birds of conservation concern; and shorebird migratory stopover habitat for many species. The water levels of each impoundment are difficult to manage since they depend entirely on precipitation for their source of freshwater, and continued natural occurrences such as sea level rise and storms introduce more salt water, which diminishes the quality of the habitat. The HMP water control prescriptions will allow the refuge to meet their objectives.

The American black duck is a species that has declined by as much as 60 percent, due in part to the loss of their wintering habitat. Invertebrates comprise the majority of black duck diet, and in Virginia wintering areas, mudflat and salt marsh provide the greatest invertebrate biomass (Eichholz and Yerkes 2009). The refuge impoundments, typical black duck wintering habitat, have

seen less and less of these species due to decreased quality of the habitat, either by an increase in invasive plants, or increase in salinity due to sea level rise. We seek to improve the quality of black duck habitat as part of a regionwide effort to increase this species' population.

Coastal refuges in USFWS Region 5 are currently developing a tool, or model, that can be used to weigh the costs and benefits of maintaining an impoundment, and reach a decision about whether to restore or maintain it. Since this model would be science-based, would have technical expert review, would evaluate refuge impoundment habitat in a regional context, and be consistent with other coastal refuges, refuge staff plan to use the Coastal Impoundment SDM model to direct future management for each of the refuge impoundments. Until refined by the outcome of the SDM model, this objective would be met by manipulating impoundment water depths and vegetation. Refuge staff would continue to monitor and assess each impoundment using the Coastal Impoundment SDM model to evaluate whether to continue managing it for current capabilities, or to restore it to its natural hydrology.

An Annual Habitat Management Plan, detailing management prescriptions to achieve impoundment objectives, would be prepared annually. Impoundments are managed to encourage growth of desirable waterfowl food plants in impoundment bottoms, while balancing the need to maintain a certain amount of woody vegetation along pond edges for black duck thermal cover and songbird habitat. Annual water management plans would prescribe where and how frequently to remove encroaching woody vegetation through mowing, disking, and/or prescribed burning. Vegetation treatments would occur on a rotational basis, with two to four impoundments being manipulated each year. Taxa-specific objectives may be rotated among impoundments from year to year depending on environmental conditions and impoundment capabilities.

Assateague Island is a critical stopover point for southbound migrating monarchs that use the refuge's resources to rest, refuel, and roost for the night. *Bidens* is a prime peak migration nectar source for monarchs, as well as an excellent seed source for waterfowl. This species grows in the borrow ditches of impoundments, especially those along the Wildlife Loop, and can cover large portions of some impoundments, including Shoveler (B-North Pool), Mallard (C Pool), Pintail (D Pool), and Gadwall (E Pool). Blooming times vary from mid-September to mid-October, depending on rainfall from late summer storms and fall hurricanes; plants often hold buds closed for weeks until there is sufficient rainfall (Gibbs 2008). *Bidens* is particularly attractive to migrating monarchs because it often covers large areas and provides a quality nectar source.

Periodic mowing and disking seems to enhance the germination and growth of *Bidens* in refuge impoundments (Savage, pers. comm., 2010). Late summer and early fall are sometimes the only periods that mowing can be accomplished due to breeding birds or wet conditions during other times of the year. Therefore, mowing would be strategically planned so that at least half of the identified nectar sources would be left un-mowed for butterflies.

Management Strategies

- Manage at least 10 impoundments each winter (December through mid-March) for wintering waterfowl. Manage at least 4 impoundments each spring (April and May) and 3 each fall (July through October) for migrating shorebirds. Manage at least 6 impoundments each fall (late October to early November) for migrating waterfowl. Manage at least 2 impoundments during June, July, and August to provide suitable

feeding areas (ponded areas or borrow ditches that concentrate fish) for nesting waterbirds.

- Draw-down NWF impoundment beginning February 15 each year by a combination of pumping and constructing/maintaining shallow ditches. Continue to evaluate the contribution of NWF impoundment to plover reproductive success in the annual shorebird report; if it is determined that these efforts are not contributing to plover recovery or benefitting other species, develop alternate management prescriptions for the NWF impoundment and an alternative plan with USFWS Ecological Services to mitigate for the loss of piping plover habitat due to the current location of the recreational beach.
- On alternate years, enhance piping plover nesting habitat in the NWF impoundment by various methods which may include placing clam shells, constructing low-profile nesting islands, flooding and/or disking/mowing/burning to remove vegetation.
- Prescribe burn, on a rotational basis, 150 to 300 acres in impoundments. This is based on the acres of impoundments covered by burnable vegetation (1500 acres) divided by the fire return interval in this habitat type (T. Craig, USFWS Fire Mgmt, pers. comm., January 27, 2010).
- In cooperation with USDA, continue to reduce, eliminating if possible, populations of non-migrant Canada geese. Control measures would be timed to take place before migrants begin arriving (September). Support the town of Chincoteague's efforts to reduce Canada goose populations, since geese nesting and loafing in town areas move to the refuge.
- Record all management actions implemented in each impoundment in the refuge impoundment database.
- Encourage the growth of Bidens on 40 acres of impoundment bottoms and borrow ditches. Conduct mechanical treatments (disking, mowing) and prescribed burning in impoundments Snow Goose (B-South Pool), Shoveler (B-North Pool), Mallard (C Pool), Pintail (D Pool), and Gadwall (E Pool) on a rotational basis so that at least 50 percent of the Bidens stands are in flower September-October in a minimum of two of these impoundments.
- Avoid mowing or disking any areas with Phragmites because it spreads this invasive.
- Avoid prescribed burning of Bidens stands where natural germination and growth is desirable.
- Adjust the timing of Phragmites aerial spraying so that it is completed prior to September 10th to avoid herbicide contact with butterflies. In addition, avoid overspray and wind-drift onto non-target plants such as, goldenrod, Bidens, and other nectar plants by spraying in calm conditions.
- Delay fall mowing of other monarch nectaring plants on dike tops and slopes until after November 1.
- Collaborate with potential partners doing greenhouse germination experiments of Bidens, and other nectar plants if appropriate, by collecting seeds for propagation.
- Impoundment dikes such as for Mallard (C Dike), Pintail (D Dike), etc.: Mow as needed to prevent woody encroachment. During the growing season mow a 10-foot wide strip on the top of dike, providing un-mowed habitat on slopes and toes of dike for ground nesting birds and monarch nectar plants. Slopes and toes of dike would be mowed early in November to reduce woody encroachment but prevent waterfowl disturbance.

Biological Monitoring

- Continue monitoring for waterfowl, shorebirds, and waders on refuge impoundments and adjacent tidal areas as per the Chincoteague NWR Inventory and Monitoring Plan.
- Continue to collect bi-weekly water level and salinity readings for each impoundment throughout the year. Water gauge readings would be used to adjust impoundments to proper depth for target species use, and to conduct/evaluate water level manipulations as identified in annual work plans.
- Conduct vegetative transects at fixed sampling points in each impoundment in order to monitor the effectiveness of water level management/vegetation management for achieving bird and monarch objectives. Use the results to evaluate vegetation response to management actions, adjust prescriptions in the Annual Water Management Plan.
- Continue to map Phragmites patches in and adjacent to impoundments bi-annually, at a minimum, and annually the year following any major treatment such as aerial spraying or prescribed burning. Use results to prioritize treatment areas.
- Conduct observational walks within the impoundments following mechanical/chemical treatments or water level manipulations to qualitatively assess whether desired results are being achieved. Also scout for invasive species and estimate overall vegetative composition of the impoundments.

Goal 3: Upland Habitats

Manage upland habitats for biological integrity, diversity and environmental health of coastal forests and shrublands to sustain native wildlife and plant communities, including species of conservation concern.

Objective 3.1 Coastal Shrub Habitat for Breeding and Migrating Landbirds

Manage 2,500 acres of coastal shrubland with a continuous band of >500 feet between impoundment and the dunes, comprised of 100 percent native species (wax myrtle, bayberry, and groundsel) with at least 50 percent fruit bearing shrubs averaging about 10 feet in height and containing few or no pine trees, to provide forage and cover for breeding, migrating and wintering landbirds.

Rationale:

Early successional habitats are an important part of the forest landscape for supporting avian communities. As the frequency and extent of anthropogenic disturbances have declined, suitable habitat for scrub-shrub bird species also has decreased, resulting in significant declines for many species (Greenberg et al. 2011). Shrubs provide abundance of insect food and berries for breeding birds during the fall migration and/or throughout the winter. Migrating birds depend on stopover habitat along migration routes where they can find food, water, and protection to regain energy lost in flight and re-fuel for the next leg of the journey (Duncan et al. 2002). Robert's (2009) 10-year banding study found that the refuge's wax myrtle/bayberry/groundsel shrub community provides important stopover habitat. Dense, tall (10 to 12 feet high) wax myrtle/bayberry habitat between impoundments and the dune line is also preferred nesting habitat for passerines, including several "highest" and "high" priority species of conservation concern in BCR 30, such as prairie warbler, field sparrow, and brown thrasher.

A recent 3-year study at Assateague Island National Seashore in Maryland used a series of exclosure treatments to assess the influence of pony herbivory on Assateague Island's shrub and

forest habitats. The results indicate that pony grazing is reducing species diversity in forest habitats and altering vegetative community composition in both shrub and forest habitats (Sturm 2007). The study found that pony grazing also influences the abundance and average height of several native plant species in these habitats. Grazing by sika and resident white-tailed deer is a potential threat to achieving objectives if numbers are not managed by hunting.

Assateague Island is a critical stopover point for southbound migrating monarchs that use the refuge's resources to rest, refuel, and roost for the night. Monarch roosting site locations vary somewhat from year to year, but they are generally found on the east-facing and/or leeward side of trees and shrub clumps. Roosting habitat is defined as thickets of bayberry, groundsel-tree, black cherry, marsh elder, or red cedar with an eastern exposure of a patch size sufficient to buffer winds adjacent to large open areas such as north side of Toms Cove and western side of impoundments. Monarch seek protection from the wind behind low growing plants, manmade objects such as fences, and even tire tracks in the sand. On very windy days they wait for the wind to dissipate before crossing Chincoteague Inlet. Management activities to return the beach to more natural processes (no longer maintaining the artificial dune around the public beach and removing the split rail fences around the parking areas), removed some monarch wind breaks. Without daytime roosting areas that are protected from the wind on large open areas such as the Hook and Overwash, monarchs may deplete energy reserves to the point they are unable to continue southward migration, or are blown out to sea.

Management Strategies

Manage a 500-foot wide continuous strip of 10 to 12-foot tall myrtle/bayberry shrub, free of trees, parallel to (and behind the) dunes on eastern side of the South Wash Flats impoundment.

- Use a hydroaxe or chainsaw to selectively remove loblolly pine trees greater than or equal to 6.5 feet tall where they are encroaching in otherwise suitable myrtle/bayberry habitat on impoundment edges.
- Carefully manage the encroachment of woody shrubs around the edges of the impoundments around Wildlife Loop to achieve multiple objectives of providing waterbird habitat and wildlife viewing, while maintaining habitat for wintering sparrows. Mow on a rotational basis, leaving at least 50 percent of the brushy vegetation around the perimeter of these impoundments un-mowed in any given winter.
- Wildlife Loop: Mow a strip no wider than 5 feet on either side of the road around the perimeter, with minimal mowing around benches and viewing spots. Primarily for public health and safety reasons, keeping roadside grass low allows pedestrians and bicyclers to step off the road with less concern for ticks and chiggers. Dikes may be mowed between November 1 and April 1 to prevent woody encroachment and maintain wildlife viewing opportunities.
- Pony Fences: Mow only as wide as needed to facilitate inspection and repair of fences and prevent woody plants and vines from strangling the fence. Generally, this would be a swath no more than 6 to 7 feet wide on either side of the fence. In areas where brush or tree limbs need to be trimmed back to a distance greater than 7 feet from the fence to ensure the safety of equipment operators, maintenance and biology staffs would coordinate to flag or otherwise mark the areas prior to mowing. Mowing during the nesting season would be avoided, except where this is not possible (e.g., wet/muddy conditions). Combine with herbicide spraying to increase effectiveness.

- Through hunting, maintain the sika and resident white-tailed deer populations at levels low enough so as not to degrade the shrub vegetation by over-browsing. The present season: a sika/deer archery season in October, a sika/deer firearms season in early December, and a firearms sika only season in January is currently fulfilling this objective. Depending on the sika/deer population and/or hunter participation, this season may be expanded or contracted in the future.
- Delay mowing, on rotational basis, of monarch nectaring and roosting locations until after November 1 or seed-set (whichever is later) on at least 80 percent of the roost sites and 50 percent of the nectar sources.
- Encourage interested partner(s) to periodically (every 3 to 5 years) reassess important monarch roosting and nectar locations. The dynamic nature of barrier island systems is expected to alter some of the monarch habitat, so monarch habitat protection and management actions would need to be dynamic as well.
- Minimize mowing on Beach Road from Pony Coral to Toms Cove Visitor Center to protect goldenrod and other butterfly nectar plants. Mowing would occur only if needed for safety reasons and only then would grass on the road side of the wooden posts be trimmed so wooden posts are visible to motorists. Care would be taken by maintenance crew so that vegetation behind posts is left uncut for the entire growing season, allowing goldenrod plants to seed and spread. Mowing to control woody vegetation would not take place until after November 1.

Biological Monitoring

- Plot BBS route survey points on the cover map. Use this spatial analysis, together with results from previous strategy, to determine how frequently the refuge's BBS routes should be repeated, and whether additional routes should be added.
- Continue to partner with volunteers and other individuals or organizations as opportunities arise, to increase our understanding of how breeding and migrating landbirds use refuge habitats through banding and other monitoring projects.
- Continue to collaborate with VDGIF and NPS to annually estimate sika and resident white-tailed deer population size and structure on Assateague from deer hunt check station data and other information as appropriate.

Objective 3.2 Loblolly Pine Forest for Delmarva Peninsula fox squirrel, Brown-headed Nuthatch & Eastern Towhee

Manage the biological integrity and diversity of 1,600 acres of mature loblolly pine forest on Assateague Island by diversifying the structure and age class using small openings (2 to 10 acres) that favor hardwood regeneration, to support a minimum population of 200 Delmarva Peninsula fox squirrels as well as, breeding habitat for brown-headed nuthatch and eastern towhee.

Rationale:

Forest habitat on Assateague Island consists largely of monotypic stands of even-aged and mature loblolly pine trees, which are vulnerable to catastrophic loss from insect damage or extreme weather/wind events, without management. The southern pine beetle, a native species, is the only major known insect threat to this forest. Some younger forest stands date back to the southern pine beetle infestations in 1983 and 1994 when blocks of forest were clear-cut in Black Duck Drain (1983) and Woodland Trail/Wildlife Loop/White Hills (1994) to control the outbreak. Many of these younger stands are dense and stunted, with understory habitat conditions unfavorable for focal

species. Creating a mosaic of pine and hardwood trees of varying age classes and structural diversity would make the forest more resistant to damaging insect outbreaks, and create habitat characteristics more favorable to the Delmarva Peninsula fox squirrel, bobwhite, brown-headed nuthatch, and eastern towhee. The southern pine beetle does not attack hardwood trees and younger age-class trees provide a barrier to bark beetle spread (Merten, pers. comm., 2010).

The natural fire frequency for southern pine forests of the Mid-Atlantic is estimated at 5 to 15 years (Kulynycz 2004 and Tim Craig, USFWS Fire Mgmt Officer, pers. comm., January 27, 2010). Reintroducing fire into the “pure pine” habitat type described above through prescribed burning could create open understory habitat conditions preferred by Delmarva Peninsula fox squirrel (USFWS 2011), diversify the age-class and structure of the forest, and mimic natural disturbance factors. On the other hand, hardwoods are not resistant to fire, so prescribed burning may be detrimental in increasing the hardwood component. Other silvicultural techniques, such as creating small openings by clear-cutting pine around naturally regenerating hardwood saplings and/or replanting hardwoods in these clearings or natural openings, may better meet the objective (Kellum and Lewis, pers. comm., February 25, 2010).

Management Strategies

- If a southern pine beetle outbreak spreads to cover a single block of 5 contiguous acres in one growing season, assess whether management actions are needed to control the infestation so that it can be contained within a 10-acre or less block (Keller, pers. comm., February 25, 2010). Each situation would need to be evaluated on a case-by-case basis to determine rate of spread and whether natural barriers would contain the outbreak to a size that does not impact Delmarva Peninsula fox squirrels, public safety, or other important resources. If suppression action is determined necessary, the preferred method would be to cut all currently infested pine trees in addition to a green tree buffer of at least the average stand tree height in front of the leading edge or head of the outbreak during the April-October growing season (Merten, pers. comm., 2010). Green and infested trees within the buffer would be felled so they fall in the direction of the infected zone and can be left on the ground. Vacated trees (those with numerous beetle exit holes or with sloughing bark) should be left standing as they provide habitat for the checkered beetle, and other native biological control insects of southern pine beetle (Merten, pers. comm. 2010). Standing dead trees no longer harbor southern pine beetles and provide snag habitat for birds and squirrels. Leaving dead trees also minimizes disturbance to wildlife habitat, and may also promote the growth of hardwood trees in the understory. Hardwoods are not affected by southern pine beetle, but are often damaged by clear-cutting methods to remove infested pine trees.
- Thin overstocked, young, monotypic loblolly pine stands (“pure pine” habitat type) in the Woodland Trail compartment and along Wildlife Loop by mechanical means and/or the use of prescribed fire. Thin to the area’s Site Index. Time thinning so that it occurs when cones are green, to avoid spreading mature seeds.
- If supported by the Forest Management Plan and Continuous Forest Inventory (CFI), conduct another prescribed burn in “pure pine” forest habitat. The prescribed burn unit should be planned to avoid the “loblolly pine/mixed hardwood” habitat and maritime forest. The burn would be conducted in late spring/early summer, with the goal of creating a more open understory and increasing structural diversity. If the prescribed burn has the desired effect of creating habitat conditions favored by forest focal species, additional burns could be considered for other areas.

- Through hunting, manage sika and resident white tailed deer, at low enough levels so as not to degrade the shrub vegetation by over-browsing. If population decreases, maintain practices. Develop a managed threshold to identify desired population size (conduct research to identify vegetation thresholds)

Biological Monitoring

- Continue to regularly scout for natural southern pine beetle outbreaks, focusing the most effort during conditions when the southern pine beetle is most active: spring and fall when daily temperatures are between 60 and 80 degrees Fahrenheit. Scout weekly during these conditions. During periods of successive drought, or other physiological stress, conduct aerial surveys, especially in mid-summer. When southern pine beetle infested tree(s) are discovered, mark individual tree(s) and/or GPS the perimeter of the infestation and monitor for spread of the disease at least monthly. Identify and map natural barriers to the southern pine beetle such as non-pine vegetation, young pine stands, roads, water, etc.
- Continue to perform early detection and rapid response to control invasive, undesirable plants and animal species.
- Refer to previous strategies concerning BBS data analysis and resumption of refuge BBS routes as these would also serve to monitor the response of brown-headed nuthatch and eastern towhee to forest objectives and management actions.
- Conduct woodcock surveys on three of the four refuge routes every 3 to 5 years. Due to the complete lack of detections and marginal habitat, drop the northern Service Road route from the survey. In years that surveys are conducted, conduct a minimum of two surveys: one prior to March 14 and one during the national survey period (April 10 to April 30). Encourage a graduate student or other partner to investigate Assateague Island's importance for migrating and breeding woodcock. Woodcock was considered but eliminated as a focal species because it is thought that Chincoteague NWR does not make a significant contribution to the population; however, this assumption has not been thoroughly investigated.

Delmarva Fox Squirrel Management Strategies

- Protect Delmarva Peninsula fox squirrels from hunting, competition and predation by continuing to prohibit pets on Assateague Island, remove all feral cats, and reduce numbers of red fox. Trap and remove gray squirrels.
- In coordination with USFWS Ecological Services and recommendations from the most recent status review, evaluate the need to maintain Delmarva Peninsula fox squirrel nest boxes (the current number is 127). Decrease or eliminate boxes in favor of natural nesting cavities.
- Conduct Delmarva Peninsula fox squirrel population surveys in loblolly pine forest north of White Hills using Reconyx remote cameras, or other methods.
- Mow a 10 to 12-foot wide swath along each side of Beach Road between Assateague Channel Bridge and the Pony Corral as needed during the growing season to maintain vegetation height at less than or equal to 6 inches, in order to minimize Delmarva Peninsula fox squirrel fatalities due to vehicle strikes.
- Service Road: Mow a strip no wider than 5 feet along the road edge during the growing season to minimize Delmarva Peninsula fox squirrel fatalities due to vehicle strikes and for

maintenance of road bed. A wider swath may be mowed between November 1 and April 1 to prevent woody encroachment.

- Do not mow Woodland Trail, except to facilitate public enjoyment of kiosks, benches, and trails.

Delmarva Fox Squirrel Biological Monitoring

- Conduct bi-annual population estimate of Delmarva Peninsula fox squirrel population in White Hills, Lighthouse Ridge, and Woodland Trail areas using mark/re-capture methods.
- Continue to record (including sex and age) all Delmarva Peninsula fox squirrels killed by vehicle strikes and inspect them for Passive Integrated Transponder (PIT) tags to determine whether road-killed Delmarva Peninsula fox squirrels remain below 5 per year.

Objective 3.3 Upland Habitats on Wallops Island NWR

On Wallops Island NWR, manage and restore the biological integrity and diversity of 121 acres of mixed hardwood forest and 57 acres of early successional habitat maintained in the power line ROW and NASA runway approach to benefit migrating and nesting landbirds, bobwhite and woodcock with less than 40 acres infested with invasive plant species.

Rationale:

Since its creation in 1971, Wallops Island NWR has been unstaffed, with little to no monitoring or management, except by ANEC, a utility company with a power line ROW. ANEC removes tall growing trees, primarily the non-native autumn olive, and some brush species. Manipulations, with the goal of creating early successional habitat favored by bobwhite and other species that prefer edge and early succession habitats, have occurred in the old-field habitat, but these have been poorly documented.

Forested habitats have shown the greatest loss of any cover type on the Delmarva Peninsula, and forest cover on the Peninsula is fragmented (Chincoteague NWR 2004). Given that most forests in the area are small private woodlots, maintaining an approximately 175-acre block of mature forest with a significant hardwood component would provide an important habitat type for migrant and resident landbirds.

The spread of invasive plant species is the greatest management concern to upland habitat. Invasive plant mapping conducted in 2004 and 2009 identified autumn olive, Phragmites, Nepalese browntop, Japanese siltgrass, Japanese honeysuckle, and several thistles as non-native species of concern. Approximately 75 acres of autumn olive were mapped in 2009; one-third of the autumn olive mapped was located in monotypic stands along the forest edge, and two-thirds of the acreage consists of autumn olive invading the understory of the pine/hardwood forest. Japanese siltgrass also covers large areas of the forest understory (Buffa 2009). Twenty acres of Phragmites were mapped in wetlands adjacent to the forest.

Management Strategies

- Continue to support and build upon ANEC management of the ROW on Wallops Island NWR which favors maintenance of an early-successional plant community composed primarily of low-growing native shrubs such as dogwoods and warm- season grasses.

ANEC plans to conduct the following actions (Belknap, pers. comm., 2010) to manage their ROW:

- Mechanically (hydro-axe) remove tall-growing trees and shrubs, emphasizing the removal of autumn olive. Most mechanical work was completed in 2008; however, from time to time tall dead, dying, leaning, or brittle trees along the ROW border may need to be removed or topped.
- Selectively remove target growing trees/shrubs (red maple, pine, oak, sweet gum, dense raspberry) and all invasive species with herbicides and backpack sprayers within 3 years, and thereafter, conduct chemical treatments at intervals of 3 years. Manage vegetation selectively for dogwoods, low-growing shrubs like bayberry that don't interfere with ROW maintenance, and grasses.
- Minimize use of heavy equipment in wetlands or other areas where vehicles would tear up the ground or create deep ruts. Use hand tools and backpack sprayers in these areas, or conduct activities in winter when the ground is frozen.
- Time chemical-based vegetation control activities for August or later to avoid impacts to breeding birds.
- Work with ANEC staff to select danger trees that could be topped to create brush piles that would be left in place for wildlife habitat.
- Coordinate with ANEC representative annually (target is March) to review vegetation management plans for the coming year, collect information to prepare Pesticide Use Proposals, and/or conduct a site visit to evaluate vegetation management.
- Through hunting, maintain a sustainable white-tailed deer population that does not degrade the native understory vegetation by over-browsing or pose safety concerns to NASA, WFF, or the Virginia DOT.

Biological Monitoring

- Repeat GPS ground mapping of invasive species' perimeter every 3 years. Scout for invasive species in conjunction with other management or survey activities.
- ANEC would monitor vegetation objectives in the ROW by visual field observations every 1 to 2 years.

Goal 4: Southern Barrier Islands Unit (Assawoman, Metompkin, Cedar)

Perpetuate the biological integrity, diversity and long term viability of natural habitats that support native avian communities and turtles on Assawoman, Metompkin and Cedar Islands through a partnership approach.

Objective 4.1 Barrier Beach and Dunes - Breeding Shorebirds and Turtles

Work with partners to prevent disturbance and mortality to nesting representative species (piping plover, least tern, and loggerhead sea turtle) on Assawoman, Metompkin, and Cedar Islands during the breeding season.

Rationale:

Virginia's string of barrier islands, which extend from Assateague Island south to Fisherman Island at the mouth of the Chesapeake Bay, is the largest collection of near pristine barrier islands left in the country (USFWS 1998). Aside from small private in-holdings, all of Virginia's barrier islands are protected by either Federal or State agencies, or TNC. These partners developed a Conservation Action Plan in 1996 with a goal, "To ensure the long-term viability of the avian

communities, species, and habitats in the Virginia barrier islands system through a partnership approach” (TNC 1996). This objective works towards the preservation of these islands in their natural state, allowing coastal processes to continue to shape them.

The Mid-Atlantic barrier islands provide preferred nesting habitat for terns, skimmers, gulls, American oystercatchers, willets, herons, egrets, other waterbirds, shorebirds, and turtles. Erwin (1980) found that 81 percent of seabirds, which include terns and skimmers, in Virginia nest on barrier island beaches. Many of the avian species that nest, migrate, and winter in the Virginia barrier islands system were nearly extirpated at the turn of the 20th century by a combination of hunting and other human activities. Although nearly all of the Virginia barrier islands are in a protected status in one form or another, many wildlife species are still in decline or below objective levels, including common terns, least terns, gull-billed terns, black skimmers, American black duck, piping plover, and several herons. Documented and potential threats include severe weather events, sea level rise, competition and displacement from nesting habitat by aggressive avian species, mammalian and avian predators, and disturbance from recreational use of barrier islands and salt marsh habitats. Public recreational activities are restricted to varying degrees on Assawoman, Metompkin, and Cedar Islands during the shorebird breeding season (March 15–August 31) (USFWS 2008d), but because the islands are remote and unstaffed, human disturbance has not been measured or monitored.

The intermixed public and private ownership and lack of a complete boundary survey on Cedar Island limits staff’s ability to enforce restrictions on this island. Most wildlife-dependent public uses are allowed; however, because it is more remote than either Assawoman or Metompkin Islands and accessible only by boat, it is less visited by the public. The differences in permitted activities, dates of restrictions, and differing policies of the various agencies and organizations that manage the barrier islands also may make it hard for the public to understand and abide by regulations. Working with partners to develop consistent rules and signage, and directing public use to less sensitive areas would help meet this goal.

Where possible, the refuge will take management steps to replant natural vegetation and protect native species, such as conducting a feasibility study to determine if a transplant program to establish seabeach amaranth on southern barrier island(s) sites is desirable, to further enhance the habitat of the barrier islands.

Management Strategies

- Continue to work with VCAP and other partners (TNC, VDCR, VDGIF, etc.) to standardize public use regulations that reduce disturbance to nesting species on all Virginia barrier islands. This would include implementing standard operating procedures and consistent signing; directing recreation to less sensitive areas; and developing outreach materials and educational programs for the public.
- Continue to post the south end of Assawoman Island and the north end of Metompkin Island. Conduct law enforcement patrols during the breeding season, focusing on the period when nests and chicks are present and visitor use is highest: Memorial Day through Labor Day.
- Continue to minimize direct predation of piping plover, least tern, American oystercatcher, and other beach nesting birds through removal of mammalian and avian predators, and erecting nest exclosures. Discourage nesting of gulls by egg-addling, where feasible.

- Protect any sea turtle nests on Assawoman, Metompkin, and Cedar Islands from human disturbance and predators by erecting “closed area” signs, placing predator screens over all nests, and conducting mammalian and avian predator control.
- Maintain a refuge staff presence on Assawoman, Metompkin, and Cedar Islands of at least 3 days per week during the nesting season in order to enforce beach closures and educate the public about the need to minimize wildlife disturbance. At least one day should be on the weekend.
- Continue to work with Virginia DCR to periodically obtain up-to-date aerial mapping of Phragmites on the southern barrier islands.
- Continue early detection and removal of Japanese sedge and beach vitex on all three southern islands.
- Work with partners to obtain improved bathymetry data and vegetation cover mapping of the southern island units and seaside lagoons to better assess and plan for the impacts of sea level rise.

Biological Monitoring

- Continue breeding shorebird and invasive species monitoring on all of the refuge’s barrier islands (see Objective 1.1).
- Conduct sea turtle crawl and nest searches of Assawoman and Cedar Island beaches at least 3 times per week June through August, in conjunction with shorebird monitoring activities.
- Train all personnel conducting regular shorebird surveys on the identification of common native and potential non-native plants they may encounter, so that they can perform early detection and removal of invasive plants.

Objective 4.2 Barrier Beach, Dune, and Tidal Marsh – Migrating and Wintering Shorebirds

Manage natural functioning sandy beach and overwash habitat along Assawoman Island, Metompkin Island, and Cedar Island, and the tidal marshes on the backside of the islands to benefit migrating and wintering shorebirds of conservation concern (red knot, sanderling, American oystercatcher, whimbrel).

Rationale:

The ecological significance of Assawoman, Metompkin, and Cedar Islands is recognized through their inclusion in the Western Hemisphere Shorebird Reserve Network; in excess of 100,000 shorebirds migrate along the refuge’s barrier islands during their migration season, using the sandy beach, overwash, and tidal marsh areas as habitat for resting and feeding. This objective works to preserve those areas, and allow for migrating shorebirds to continue use of the refuge.

The refuge’s southern barrier islands are particularly important as spring stopover sites for migrating red knots between late April to early June, with numbers peaking in late May (Niles et al. 2010). Virginia hosts approximately 30 percent of the hemisphere’s red knot rufa subspecies population, and Cedar and Metompkin Islands fall in the upper third of islands in terms of numbers of red knots counted during migration (TNC 1996). The red knot was proposed for listing as a Federal threatened species in September 2013.

The refuge does not currently conduct or organize systematic winter/migratory shorebird surveys on the southern islands like those conducted by volunteers on Assateague Island. Aside from the

winter American oystercatcher roost-site surveys conducted over the past several winters by VDGIF and TNC, the level of non-breeding season surveys conducted by partners is unknown. The Wachapreague Christmas Bird Count includes Cedar Island; this 1-day survey in mid-December consists of a volunteer party walking the entire island and counting all birds seen and heard.

Biological Monitoring

- Evaluate existing shorebird and waterfowl data pertaining to islands in the Southern Barrier Islands Unit to identify key habitat use areas on Assawoman, Metompkin, and Cedar Islands for migrating/wintering red knots, American oystercatcher, sanderling, dunlin, whimbrel, American black duck, and other representative species.
- Support research by partners aimed at fostering a better understanding of migrant and winter bird use of Assawoman, Metompkin, and Cedar Islands. An example is the Center for Conservation Biology's study of the red knot use of barrier islands (Smith et al. 2008).
- Annually conduct resight surveys for tagged red knots in fall and spring, as part of cooperative study, using protocols consistent with partners involved with red knot monitoring and research.
- Continue to collaborate with partners on winter resight surveys for color-banded American oystercatchers in fall and winter. Currently, TNC and VDGIF survey roost sites around Metompkin, Assawoman, and Cedar Islands, while the refuge conducts winter roost resight surveys in Chincoteague Bay.

Goal 5: Partnerships

Working with partners, protect and restore vigorous, viable populations of migratory and resident wildlife, fish, and native plants and their habitats found on the Delmarva Peninsula and identified in state, national, and international treaties, plans, and initiatives. Take a leadership role in collaborative regional efforts to achieve broader conservation goals and serve as a catalyst for achieving a multi-state eco-regional partnership. The refuge will continue to work with partners to explore how best to sustain the resiliency of this unique barrier island system, its communities, and its economy, consistent with the refuge's mission and in the face of dynamic coastal processes, climate change, and storm events.

Objective 5.1 Regional Conservation

Enhance partnerships with conservation organizations to support mutual natural resource conservation efforts in the Delmarva Peninsula by establishing the Lower Delmarva Peninsula Conservation Area and developing other regional management strategies with partners.

Rationale:

With the establishment of the Refuge System over a century ago, USFWS created a vision to embrace a scientific, landscape-level approach to conserve, manage, and restore refuge lands and waters, and to facilitate conservation benefits beyond its boundaries. This vision has been revisited recently with the USFWS strategic plan for climate change and the NWRS's vision document, *Conserving the Future*, which employs a science-based adaptive resource management framework for conserving species on a landscape scale to bring to bear the best available planning, research, monitoring, and management tools to deliver conservation in the right places at the right time to address the challenges posed by climate change and predicted land use changes (USFWS 2010b and USFWS 2011).

The USFWS recognizes the conservation importance of the southern Delmarva Peninsula; over a quarter of the land in the area has been protected by the USFWS and its Federal, State, local, and non-profit partners. New challenges, such as climate change and increasing fragmentation of wildlife habitats, require an adaptive, broad, landscape level approach to conservation actions. To continue the conservation of the Delmarva area, the refuge currently is involved in a number of conservation partnerships, including but not limited to the Pocomoke River Conservation Partnership and the Southern Tip Ecological Partnership, and is working with a number of conservation entities, such as states of Virginia and Maryland and affected counties, TNC, the Conservation Fund, the Virginia Eastern Shore Land Trust, the Assateague Coastal Trust, and Ducks Unlimited. The refuge also works with Federal partners, including NPS, National Oceanic and Atmospheric Administration (NOAA), NASA, U.S. Navy, and USDA.

Strategies:

- Participate in events with local partners to advocate resource conservation and promote the mission of the Refuge System.

Objective 5.2 Economic Development

Continue partnerships and seek additional collaborative relationships with the gateway community and regional organizations to support economic development by participating in meetings and events and utilize information from a visitor survey to inform refuge management decisions.

Rationale:

Access to the refuge is primarily through the town of Chincoteague, the economy of which has become increasingly dependent on the tourism dollars brought into its community by refuge visitors. Tourism generates revenue for the town and for surrounding counties not only from the purchasing of products from local businesses, but also in the form of food and lodging excise taxes. Tourism also provides jobs and supports property values. Continued partnerships with the surrounding community and local businesses, and consideration of economic impacts and opportunities for the town of Chincoteague in future management practices would be maintained to support and improve the surrounding economy.

Strategies:

- Participate in economic development efforts and meetings of tourism groups (State tourism, Chamber of Commerce, NASA, Mid-Atlantic Regional Spaceport, etc.).
- Collaborate on communication to public about activities/events.
- Increase participation in events with local partners to enhance refuge visibility.
- Continue to work with NPS, the town of Chincoteague, and other partners to provide a high-quality recreational experience.

Objective 5.3 Community Resiliency

Collaborate with Federal, State, and local partners to explore potential impacts and identify protective methods to address hazard mitigation and improve community resiliency, in coordination with others.

Rationale:

The town of Chincoteague, Accomack and Northampton counties, adjacent coastal communities, and NASA are concerned about future impacts of sea level rise and storm surge on infrastructure

and access to the region. The refuge shares this concern and would work in coordination with other state and Federal agencies and other appropriate partners to investigate the vulnerabilities and anticipated impacts of climate change and sea level rise on the Eastern Shore. The refuge would also work with partners to explore how best to advance the study, information exchange, and project resources for adaptive management practices that sustain the resiliency of this unique barrier island system including but not limited to Assateague, Wallops, Assawoman, and Metompkin Islands in the face of dynamic coastal processes and climate change.

Strategies:

- Continue working with coastal geologists to model the impacts of coastal storm events and other dune breaching scenarios on Assateague Island to evaluate potential effects that breaches and modifications to infrastructure may have on natural and manmade habitats, refuge infrastructure, and flood control for the town of Chincoteague.

Objective 5.4 Federal Interagency Collaboration and Facility Management

Maintain existing partnerships focused on science research, interpretation, and shared facilities with adjacent Federal entities.

Rationale:

The USFWS recognizes the value of collaborating with other Federal agencies to accommodate their needs, goals, and mandates, when appropriate and when possible within the scope of the refuge purposes and USFWS mission. Currently, NASA and the U.S. Navy own and use land adjacent to the refuge, and NPS has an interagency agreement with the refuge to maintain a specific area and certain activities on Assateague Island. Also, USFWS, NPS, and USDA have a 2007 use agreement for shared facilities, in which the USDA uses area on the refuge to store various types of equipment. The refuge has coordinated with these Federal partners on many issues and is interested in identifying potential opportunities for future collaboration on wildlife management, scientific research, and public education. Furthermore, the refuge recognizes the need to formalize and expand upon arrangements of shared facilities to continue and enhance facility efficiencies in future developments.

Strategies:

- Continue existing partnerships (including monitoring of development impacts and access to Assawoman Island) and assist with trust species management and recovery.
- Continue to monitor and address wildlife/USFWS concerns and opportunities as NASA and the Mid-Atlantic Regional Spaceport explores expansion of its launch facilities and increases activities.
- On an annual basis, execute the objectives and operational activities of the NPS and USFWS MOU and the strategies in the annual work plan developed by staff.
- Continue the use agreements between NPS and USFWS and between USDA and USFWS for maintenance and storage facilities on Wallops Island NWR.

Objective 5.5 Local Conservation of Tidal Creeks, Estuaries, Mudflats, and Nearshore Marine Waters

Over the 15 year lifespan of the CCP, protect the ecological integrity of tidal creeks, estuaries, mudflats and nearshore marine waters through an active role in local, state, and Federal partnerships to ensure the needs of USFWS trust species are addressed in decisions and actions

within the focus areas of Chincoteague and Wallops Island NWRs. Increase protection of these habitats by 5 percent through agreements established through these partnerships.

Rationale:

Most species that are found on the refuge depend on off-refuge habitats to fulfill one or more of their life cycle needs. These habitats are highly susceptible to damage through pollution, human disturbance, and off-refuge projects, all which could influence the success of management activities that the refuge undertakes. Protection of these habitats through partnerships and pooling of resources and funding is needed.

Strategies:

- Continue an active role in the VCAP to share monitoring data with adjacent and sister agencies and organizations such as VDGIF, TNC, NASA WFF, and NPS.
- Continue to collect breeding American oystercatcher data on the Chincoteague Bay Boat Route, and coordinate with partner agencies to determine the frequency of future productivity monitoring on this route.
- Through the refuge's monthly Community Leaders Meeting, continue to inform local political leaders, tourism councils, and sister agencies about trust resources that use the refuge and actions they can take to protect and enhance the ecological integrity of Chincoteague Bay and adjacent habitats.
- Conduct outreach or form a collaborative partnership with the aquaculture industry in surrounding refuge waters aimed at eliminating or cleaning up netting that washes up on refuge habitats.
- Work with other members of VCAP to conduct education and outreach programs targeted at eco-tour operators and other boaters on how to minimize their disturbance to nesting birds.
- Participate in watershed, water quality, and other planning meetings hosted by the county, city, and other similar agencies/organizations.

Goal 6: Visitor Services

People of all ages and abilities develop a stewardship ethic while enjoying their refuge experience and increasing their knowledge of the USFWS, Refuge System, and the refuge.

Objective 6.1 Hunting

Maintain current level of opportunities (e.g., number of hunt days) and current level of visitor satisfaction in hunting program that offers high quality hunting opportunities, including migratory bird and big game.

Rationale:

Hunting is one of the priority public uses of the Refuge System and is to be facilitated when compatible. Hunting on the Delmarva Peninsula is a traditional outdoor pastime and remains a popular form of wildlife-dependent recreation on the refuge and a vital part of the cultural, social, and economic fabric of the communities near the refuge. Furthermore, harvesting surplus animals through hunting is one tool used to manage wildlife populations on the refuge at a level compatible with the environment, provide wildlife-dependent recreational opportunities, and permit the use of a valuable renewable resource. Responsible hunting practices can instill a unique understanding and appreciation of wildlife, their behavior, and habitat needs, as well as their role in the surrounding environment.

Strategies:

- Continue current hunting policy on Chincoteague NWR:
 - Big game hunting (white-tailed deer and sika) on Assateague Island with firearms and archery by lottery. (*Note: Although some hunters require OSV to access hunting areas in the Toms Cove Hook area, we address OSV uses primarily in sections where we discuss fishing*).
 - Migratory game bird hunting by water access outside of Assateague Island.
- Continue current hunting policy on Wallops Island NWR:
 - Big game hunting (white-tailed deer).
- Continue to utilize depopulation permits for sika from VDGIF to assess and monitor sika population.
- Continue monitoring techniques in partnership with NPS (e.g., camera detection survey, aerial flight, and remote sensing) to obtain more accurate population counts for sika and resident white-tailed deer.
- Continue to ensure that the white-tailed deer and waterfowl harvest are consistent with VA regulations.
- Complete development of opportunity for hunters with disabilities, such as those participating in the Wounded Warriors Project, outside of Woodland Trail area.

Objective 6.2 Fishing and OSV Use

Maintain current level of access to fishing areas (this includes surf fishing, crabbing, oyster harvest, and clamming) and current level of visitor satisfaction in these fishing opportunities for people of all ages and backgrounds, including access by OSV to high-quality surf fishing areas.

Rationale:

Fishing is one of the priority uses of the Refuge System and is to be facilitated when compatible. Surf fishing, crabbing, oyster harvest, and clamming are among the most popular wildlife-dependent recreational activities conducted on the refuge. Surf fishing is allowed anywhere along the Atlantic Ocean outside of the life-guarded area. Those surf fishing areas south of the current parking lots (Overwash and Toms Cove Hook) are accessible via OSV use, which is limited to times of the year to provide maximum protection to prime nesting habitat for coastal nesting birds and sea turtles. Crabbing is allowed in designated areas in Swan Cove Pool (F Pool) and along Beach Road. Clamming and oyster harvest are also allowed as a recreational activity in the bayside areas for Toms Cove, also accessible via the Bi-Valve Trail.

Strategies:

- Maintain existing fishing and crabbing programs and areas.

- Continue to allow surf fishing on Assateague Island without a refuge permit (except to stay after-hours) anywhere along the Atlantic Ocean outside of the life-guarded area, with areas north of the recreational beach accessible by foot only and areas south accessible by foot or OSV, with OSV permit.
- Continue to maintain designated crabbing areas (Toms Cove and Swan Cove Pool (F Pool)) (Areas within Assateague Channel provided by NPS).
- Continue joint programs with NPS on surf fishing demonstrations.
- Continue incorporating crabbing and other fishing activities into youth programs.
- Maintain existing OSV closure schedule, vehicle limits, and permits for fishing access south of recreational beach in coordination with NPS, per the NPS-FWS MOU.
- Continue yearly OSV permit sales (cost set by NPS). Continue to limit the number of vehicles to 48 at any one time or 18 when the Hook is closed.
- Continue to require OSV operators in designated zone to carry the following equipment:
 - A shovel with a blade at least 6 inch square and at least 18 inches long.
 - A vehicle jack sufficient to lift one wheel clear of the sand.
 - A jack support that is at least 12 inch by 12 inch of non-bending steel, 5/8 inch plywood or 1.5 inch hardwood.
 - A tire gauge with a minimum reading of 15 pounds or less.
 - A tow rope or tow strap, chain or cable with a minimum pulling strength of 6,000 pounds and at least 10 feet long. Minimum diameter is one-half inch for nylon or Dacron ropes; three-quarter inch for all other ropes; one-quarter inch for carbon steel cable; 5/8 inches for chain links.
- Close Overwash portion of the OSV zone March 15 through August 31 intermittently based on nesting behavior; close 256 feet (200 meters) north of nesting sites from 2 days prior to any nests hatching to fledging.
- Close Hook portion of the OSV zone from March 15 to August 31 or thereafter, until the last shorebird fledges.

Objective 6.3 Environmental Education and Interpretation

Continue to achieve current level of participation (number of students/programs, number of Web site hits) and current level of visitor satisfaction with environmental education and interpretation opportunities.

Rationale:

Interpretation and environmental education are priority public uses. Interpreting the resources and challenges of the refuge to the general public and incorporating these topics into school curricula is a service welcomed by the general public, communities, and schools. The refuge works with local K to 12 schools, communities, and educational organizations to provide classroom and hands-on programs both on and off the refuge for youth. On the refuge, interpretative hubs are located on several trails, with one trail and pavilion designated for environmental education, as well as the Herbert H. Bateman Educational and Administrative Center, built in 2003. Through the use of interpretation and education, the Refuge System can create a personal, emotional connection with visitors while providing them with a deeper understanding of their ecological place in the natural world, offering a clear understanding of the benefits of the Refuge System, and providing an avenue to promote an ecological conscience in future conservationists.

Strategies:

- Maintain current environmental education opportunities (at least 7,500 education participants annually) as administered by USFWS, including:
 - Serve students by working with NPS, MSC, Accomack and Northampton County school districts, Girl Scouts, Boy Scouts, and Home School students, among others.
 - Offer teacher workshops and teacher-led learning opportunities when staff guided programs are not available.
 - Offer environmental education programs in the classroom of the Herbert H. Bateman Educational and Administrative Center and in the environmental education pavilion (e.g. Habitat Hunting, Forest Ecology, Nature and ME, Critters and Gadgets).
 - Continue to allow the NPS to offer programs from the Toms Cove Visitor Center (e.g. Aquarium Talk, Beach Walk, Marine Explorers, and Salt Marsh Adventure).
 - Continue to participate in Science on the Shore program in collaboration with NASA, MSC, TNC, and the Eastern Shore Community College (ESCC) to “provide the Eastern Shore community with an understanding of how local science-based research and preservation techniques are used to solve challenges that impact the nation” (Marine Science Consortium).
- Maintain current interpretive opportunities (at least 68,000 interpretation participants annually) primarily through self-guided interpretation:
 - Continue to maintain exhibits and videos at the Herbert H. Bateman Educational and Administrative Center.
 - Continue to offer the Children of the Woods Day Camp (a week long day-camp offered to kids ages 8 to 11 which offers activities such as crabbing, clamming, archery, surf fishing, bicycling, and kayaking), sponsored by the CNHA.
 - Pursue interpretation opportunities on proposed shuttle, through an automated audio recording or staff narration.
 - Continue to maintain the kiosk at the Virginia New Church Welcome Center on Route 13.
 - Continue to partner with the CNHA on tours, lectures, and other programs.
 - Continue to allow the NPS to offer hands-on immersive programs from the Toms Cove Visitor Center (e.g., seining, kayaking).
 - Continue training of volunteers to assist in activities.
 - Continue pursuit of proposal for mobile trailer for outreach/education and acquire by 2015.
 - Continue to hold eight major special events (Junior Duck Stamp Contest, International Migratory Bird Day Celebration, National Wildlife Refuge Week, National Public Lands Day, Waterfowl Weekend, Sunrise Pony Walk during Pony Penning, Annual Beach Clean-up, Great Backyard Bird Count).

Objective 6.4 Wildlife Observation and Photography

Maintain current level of visitor satisfaction with opportunities for wildlife observation and photography.

Rationale:

Wildlife observation and photography are two of the 6 priority public uses of the Refuge System and are to be facilitated when compatible. Both public uses promote visitor understanding of, and increase visitor appreciation for, the value of and need for fish and wildlife habitat conservation.

Refuges facilitate these uses by providing enhanced opportunities to view wildlife in their natural habitat by providing platforms, brochures, interpreters, viewing areas, and tour routes. Developing specific areas for visitors to view wildlife enhances wildlife observation and limits the disturbance to wildlife and habitat.

The refuge provides outstanding wildlife viewing opportunities throughout the year, including migrating birds, sika, and resident white-tailed deer, and others. Birding in particular is a popular wildlife observation activity, with well-used sites at Swan Cove Pool (F Pool), Toms Cove, Woodland Trail, and Snow Goose Pool (B-South Pool) in the Wildlife Loop, all of which provide wildlife viewing and opportunities for amateur and professional photographers. This objective represents the current direction of the wildlife observation and photography program on the refuge and assumes continued funding and staffing for operations and maintenance.

Strategies:

- Maintain current walking, biking, and driving access and allow boating access for wildlife observation and photography:
 - Existing trails;
 - Hand-carried, human-powered, non-motorized boat access;
 - Photography workshops;
 - CNHA Bus Tours; and

Objective 6.5 Recreational Beach Use

In cooperation with the NPS, continue to provide a 1-mile recreational beach for enjoyment of an undeveloped, natural setting that is accessible by several means including private vehicles, and parking near the beach, to maintain the current level of visitor use.

Rationale:

The beaches of Assateague Island offer a unique experience in the Mid-Atlantic area as they exist primarily in an undeveloped setting, drawing many families seeking out a natural experience. Under a 2012 NPS-FWS MOU, the NPS manages an assigned area consisting of the 1-mile recreational beach and corresponding adjacent 961 parking spaces. The current recreational beach and facilities on Assateague Island are located in one of the most dynamic areas of the island, and over the years, coastal storms and accompanying extreme high tides have repeatedly washed out the recreational beach parking lots. The 1993 Master Plan addressed these conditions by identifying a long-term strategy to pursue alternative means of transportation such as a shuttle system and off-site parking as necessary to maintain beach use in the future. The 1993 Master Plan acknowledged that although the loss of the existing parking will not likely occur for many years, potential parking sites on Chincoteague Island, that are close to the refuge and beneficial from an economic standpoint to the town (in that visitors to the beach would be parking in town), are being lost to other forms of development, and as a result, potential off-site parking locations should be pursued (Master Plan 1992).

Strategies:

- Continue to allow NPS to maintain 8.5 acres of land for parking, which would preserve the existing capacity of 961 spaces, in the current location at the terminus of Beach Road near Toms Cove, as long as suitable land base directly behind the recreational beach remains. As sea level rise and natural forces reduce the land base capable of supporting the current parking, the number of spaces would be reduced accordingly.

- Continue to coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area for future use once the existing beach parking is reduced or lost due to lack of suitable land base behind the recreational beach.
 - Continue to identify potential Chincoteague Island parking site(s) and pursue funding to acquire land or rights to use. Any decision to pursue purchase of additional property will have a separate public process.
- In being consistent with the 1993 Master Plan, as storms and other natural forces eliminate parking spaces adjacent to the beach, implement an alternate means of transportation such as a shuttle system.
 - The shuttle would have an express route from off-site parking to the recreational beach.
 - Shuttle schedule would be dependent on the number of parking spaces lost, but would initially operate on weekends in May and September and Columbus Day weekend and daily June through August and move to year-round as necessary.
 - Ownership and operation of the shuttle would need to be determined; it may involve USFWS, the town of Chincoteague, or other partner (private or public).
 - Protection from hazardous weather conditions would be provided to shuttle riders in coordination with NPS by providing shelters.
- Continue to confine recreational beach use on Assateague Island to the assigned area identified in the NPS-FWS MOU.
- Continue to allow only wildlife-oriented recreational activities north of the recreational beach.
- Continue pursuit of bicycle trail development via Beach Road to recreational beach to replace the temporary Swan Cove Trail.
- Areas important to nesting piping plovers and other shorebirds would continue to be closed to recreational use from March 15 to August 31, or thereafter until the last shorebird fledges, annually. These closures are subject to extension if the refuge makes the determination that unfledged chicks or other beach nesting birds are still present beyond August 31. Refuge staff would post the nesting areas for protection of nesting birds as well as informing the public of the restricted area.
 - Public use activities would be monitored and if visits increase to a point where disturbance to nesting birds becomes a problem, additional access restrictions would be implemented.

Objective 6.6 Other Recreational Uses

Continue to provide opportunities for public to use the refuge for non-wildlife dependent recreation that is compatible with the refuge purpose and maintain current level of visitor satisfaction.

Rationale:

The refuge does allow uses beyond the 6 wildlife-dependent public uses but only after determining they are appropriate, compatible with the refuge's purpose, and consistent with public safety. All such uses are required to have a Finding of Appropriateness and a CD, which evaluates an activity's compatibility with refuge purposes and outlines measures to ensure compatibility which must be followed if the use is to be allowed.

Strategies:

- Maintain walking and bicycling on the following trails: Woodland Trail (1.6 miles), Black Duck Trail (1.0 miles), Wildlife Loop Trail (3.2 miles; closed to cars until 3 p.m. each day) and along Beach Road and connecting to Chincoteague. Continue to restrict bicycling on the Service Road from the Wildlife Loop to the MD line.
- Continue to restrict boat access:
 - Allow boats to land on designated areas on Toms Cove Hook from September 1 through March 14 or as otherwise posted.
 - Close refuge impoundments to all boats and flotation devices.
 - Only allow non-motorized, human-powered, hand-carried boats to access water from recreational beach and Toms Cove.
 - No boat ramps or docks available for public use.
- Continue to only allow horseback riding in OSV zone with closures March 15 through August 31 or thereafter, until the last shorebird fledges.
- Maintain current mobility-impaired access: designated mobility-impaired parking spaces, ramp access to boardwalk at NPS Visitor Center, two beach wheelchairs, and one designated accessible hunting zone.
- Continue current commercial use permits and restrictions:
 - Commercial photography allowed by special use permit only.
 - Commercial or education films or photography workshops allowed by special use permit only.
- Ceremonies/weddings allowed at recreational beach with permit and some restrictions.
- Continue current prohibition policies:
 - No littering;
 - No pets, including in vehicles;
 - No skateboards;
 - No roller or in-line skates;
 - No camping;
 - No alcohol;
 - No collecting plants, animals, or artifacts (exception: one gallon per person per day of unoccupied shells);
 - No feeding wildlife;
 - No segways;
 - No use of motorized vehicles on trails; and
 - No mopeds allowed on Wildlife Loop.

Goal 7: Refuge Administration

Maintain and enhance refuge infrastructure and operations responsibly and sustainably for the safety and well-being of the wildlife, cultural resources, public, and employees.

Objective 7.1 Outreach, Communication, and Emergency Communication

Continue to provide information about the refuge to maintain current levels of public awareness of the refuge purpose, programs, and challenges.

Rationale:

Though the fundamental purpose of the refuge is wildlife conservation, it is recognized that keeping the public aware of the refuge and its purpose, programs, and challenges is essential to the overall mission. An informed public can not only take advantage of the recreation afforded by

the refuge, but can play a role in influencing and shaping management direction and the challenges which face the refuge. It is no longer acceptable for the refuge to rely solely on posted signs, printed brochures, or interpretive kiosks to orient and educate the public; we must also utilize electronic communications tools—such as Web sites, social media, and mobile applications—to invite and prepare people to visit refuges, give them up-to-date information on what is happening there, and develop a greater appreciation for natural values.

Strategies:

- Continue to communicate refuge events and information through a variety of media outlets (Junior Duck Stamp Contest, International Migratory Bird Day Celebration, National Wildlife Refuge Week, National Public Lands Day, Waterfowl Weekend, Sunrise Pony Walk during Pony Penning, Annual Beach Clean-up, Great Backyard Bird Count).
- Continue to hold monthly Community Leaders Meetings.
- Continue to host on-site visits of public officials.
- Continue to implement the memorandum of agreement with the town of Chincoteague on emergency management.
- Participate in and support regional and national initiatives (e.g. Connecting People with Nature, America's Great Outdoors).
- Continue Web site updates, seasonal "Eagle Cam" broadcast, and upgrade/changeover of Web site to content management.
- Continue relationship and programs with local radio stations, WCTG 96.5 FM and Delmarva Public Radio's WSDL National Public Radio (NPR) News 90.7.
- Continue to maintain the 1610 AM Radio station (providing information on refuge hours, emergency information, and refuge special events) and continue development of messages in Spanish.
- Continue implementation of fiber optics capacity.
- Continue agreements on radio communications with NASA.
- Continue pursuit of proposal for mobile trailer for outreach/education and acquire by 2015.
- Continue current outreach activities and implementation of Intelligent Traffic System (Federal Transit Administration implementation grant):
 - Install off-site kiosks for entrance fee pass purchase and information at hotels and public places;
 - Install electronic information signage (variable message sign purchased);
 - Install traffic counters to monitor parking occupancy;
 - Inform the public of peak visitation times and alternative modes by of transportation; and
 - Provide the public with real-time information regarding parking availability, traffic congestion, and expected delays.

Objective 7.2 Staffing and Volunteer Program/Friends Group

Continue to fill any vacancies and otherwise sustain current levels of staffing and volunteer programs to achieve refuge purposes.

Rationale:

In 2007, our Regional Directorate completed a workforce plan to support a new base budget approach. Its goal is a maximum of 75 percent of a refuge station budget to cover salaries and fixed costs, while the remaining 25 percent or more would be operating and maintenance funds. Our strategy is to improve the capability of each refuge manager to do the highest priority work,

and not to have most of a refuge budget tied up in inflexible fixed costs. This strategy was successful for a few fiscal years; however, we now anticipate a level or declining budget environment, which will impact flexibility in managing financial resources and may have implications for the level of permanent staffing. A new round of workforce planning began in 2013 in response to the sequester and anticipated future budget reductions. Our budgets are determined annually by Congress and distributed through our Washington and Regional offices before arriving at field stations.

The Refuge System must continue to be adequately staffed to protect wildlife and habitat, make refuges safe places for staff and visitors, and meet its purposes while continuing opportunities for public use. The current staffing is supplemented by volunteers from the community as well as local and national youth and adult groups, who provide help with invasive plant removal, trash pick-up, interpretive education, and other projects. Chincoteague NWR also receives significant support from its non-profit friends group, the CNHA, which produces and provides interpretive and educational material for refuge visitors and for local teachers, funds student interns, and enables the refuge to receive matching grants for workshops and programs.

Strategies

- Maintain relationship with CNHA Friends group.
- Maintain 23 full-time positions and 10 to 20 part-time, student, or contractor positions in the areas of Visitor Services, Law Enforcement, Biology, administration, fee collection, management, and maintenance (see Appendix K for current staff plan).
- Continue to pursue opportunities for interns with the Student Conservation Association.
- Continue to cooperate with NPS staff, including lifeguard, law enforcement, maintenance, and seasonal interpretive staff, regarding their activities at Toms Cove and the recreational beach.
- Continue work with volunteer groups (e.g., Road Scholars, Master Gardeners, Master Naturalists).

Objective 7.3 Wilderness

Continue to protect and enhance the wilderness character of the proposed wilderness area.

Rationale:

The purpose of designated wilderness under the 1964 Wilderness Act (Public Law 88-577) is to “preserve the wilderness character” and preserve and protect natural conditions. Although there exists no “congressionally designated wilderness lands” within the refuge, there are 1,300 acres of land that have been proposed as wilderness. These areas can also protect watersheds and habitats and provide opportunities for unique scientific research and recreation.

Strategies:

- Continue to protect and enhance the wilderness character of the proposed area through actions to eliminate incompatible features and activities. There would be no change in the size or location of the proposed wilderness.
- Complete wilderness assessment every 5 years to follow monitoring protocol.

Objective 7.4 Cultural and Historic Resources

Continue to maintain and protect all archaeological, cultural and historical sites on the refuge in compliance with all applicable Federal and State laws.

Rationale:

Cultural resources include archaeological resources, historic and architectural properties, and areas or sites of traditional or religious significance to Native Americans. It is the policy of the USFWS to identify, protect, and manage cultural resources located on USFWS lands and affected by USFWS undertakings, in a spirit of stewardship, for future generations. Specifically, USFWS will manage these resources in such a manner that sites, buildings, structures, objects, and values of importance are sufficiently protected for present or future scientific study, public appreciation, and socio-cultural use. Consequently, USFWS will encourage and enhance educational, interpretive, and research opportunities for USFWS managed cultural resources consistent with the overall management objectives of USFWS. The refuge will also protect such resources from illegal take or damage in compliance with all applicable Federal and State laws.

Strategies:

- Continue to maintain cemeteries.
- Continue to allow CNHA and refuge volunteers to give tours of the Assateague Lighthouse.
- Complete restoration of Assateague Lighthouse.
- Working with CNHA, set up endowment account for maintenance funding for Assateague Lighthouse.
- Maintain a Chincoteague pony population consistent with current numbers (125 to 150 ponies), under the pony management agreement in partnership with the Chincoteague Volunteer Fire Company (the current CD allows 150 ponies to graze on 4,000 acres).

Objective 7.5 Climate Change and Sea Level Rise

Incorporate climate change considerations into decisions about facilities and development of new interpretive exhibits and pursue opportunities to contribute to climate change research.

Rationale:

The earth's climate is changing at an accelerating rate that has the potential to cause abrupt changes in ecosystems and increase the risk of species extinction. Climate change transcends USFWS and the Refuge System and poses one of the largest conservation threats of the 21st century. One climate change effect, sea level rise, has specific implications for coastal refuges in terms of habitat, public access, and facility management. The USFWS *Climate Change Strategic Plan* states that it is imperative that the USFWS rise to the challenges at hand, lay the foundation for wise decisions in the future, and begin taking steps right now to begin a continuous and dynamic process of actions that will be crucial to conserving the nation's fish and wildlife resources in the years to come. These steps focus on adaptation, or response to the anticipated impacts; mitigation, or reducing levels of greenhouse gases; and engagement, or soliciting partnerships and raising awareness of the issues. Similarly, *Conserving the Future* recognizes that climate change is a crosscutting theme that interacts with other stressors and requires an assessment of the challenges that climate change poses to refuges as well as of the quantification and reduction of the Refuge System's overall carbon footprint. Refuge system operations and facilities generate heat-trapping gases and have other impacts on the environment and wildlife. *Conserving the Future* states that USFWS stewardship of the Refuge System should provide

cutting-edge leadership in reducing carbon emissions and implementing sustainable, green business practice, including prioritizing land restoration activities that effectively sequester carbon.

Strategies:

- Incorporate climate change into interpretation:
 - Provide interpretive exhibits on climate change at the global and local levels by replacing the migration exhibit with a climate change/severe weather exhibit.
 - Update roadside exhibits with climate-range related content and Quick Response (QR) codes.
 - Add climate change link to refuge Web site.
 - Explore geocaching with climate change theme.
 - Develop questions to be asked as part of an exhibit and incorporated into the broad visitor survey to measure and track visitors' understanding of climate change issues.

2.5.3 Alternative B (Balanced Approach)

Alternative B would continue established habitat and wildlife management strategies but would pursue additional management activities for resources and public use. As introduced in section 1.9.3, a “balanced approach” here still upholds the statutory and policy framework of the Refuge System that states that wildlife and wildlife conservation must come first on refuge lands and waters. Figure 2-3 and Figure 2-4 provides an illustration of major spatial elements of the alternative.

Natural Resource Management. Under this alternative, the refuge would protect and maintain all lands it administers, primarily focusing on the needs of threatened and endangered species, with additional emphasis on the needs of migratory birds and resident wildlife. The refuge would continue to preserve approximately 2,650 acres of wetland impoundments, but make adjustments in accordance with a new impoundment management plan that takes into account various factors, such as the habitat needs of black ducks and monarch butterflies, climate change and natural coastal processes, and relocated beach access and parking. Natural coastal processes would continue to shape habitat on the barrier islands. The refuge would continue to protect and enhance the wilderness character of the 1,300-acre proposed wilderness area and there would be no change in its size or location.

Beach Access and Parking. The refuge would continue to allow NPS to maintain 961 automobile parking spaces (8.5 acres) at the recreational beach. In recognition of the vulnerability of the current parking, the refuge would develop and implement a site design plan for parking and access to a new beach location, approximately 1.5 miles north of the existing beach. The new recreational beach would offer accessible parking in close proximity to the beach.

The refuge in consultation with NPS would provide management strategies for maintaining the current beach in the interim until the newly located recreational beach is ready for visitor use. The refuge would provide a transition plan for moving from the current beach location to the new beach location, including proposed processes and management strategies to ensure access to a recreational beach is available for visitors.

Visitor Use and Experience. Existing public uses would continue with some exceptions. All public access on the Service Road north of the new recreational beach parking would be restricted unless authorized under special use permit or special day use privileges/openings. A joint NPS and USFWS Visitor Contact Station would be developed near the new recreational beach. The Beach Road causeway across Toms Cove would be closed to all public access once other equivalent public access to the new recreational beach is provided. The refuge would continue to allow vehicular access along Beach Road to its new terminus to provide multi-habitat viewshed, access to trails, and viewing of Chincoteague ponies and wildlife. A vehicle turn-around area, crabbing dock, and launch point for non-motorized boats would be constructed at the new terminus of Beach Road. Assawoman Island would be completely closed to all forms of public use, including fishing, from March 15 through September 15 or thereafter, until the last shorebird fledges. Swan Cove Bicycle Trail would be replaced by an alternative bicycle trail from Wildlife Loop north to the south end of the relocated recreational beach, near the OSV zone entrance.

The refuge would maintain and where possible expand current hunting opportunities by including additional species, extending hours, and providing special events and opportunities for youth and

women. The refuge would add mourning doves, light geese, and non-migratory Canada goose hunting opportunities to the refuge's migratory bird hunting program. Additionally, the refuge would allow migratory bird hunting on Federal holidays within the Commonwealth of Virginia hunting seasons. The refuge would also add turkeys to the big game hunting program and pursue development of a trapping program for furbearers. The refuge would continue sika hunting and would conduct research to identify a desired population size. The refuge would continue to manage opportunities for recreational shellfish and crab harvest.

OSV use would be permitted for priority public uses, including wildlife observation, fishing and to access hunting zones. The OSV zone would be expanded from the new recreational beach to Toms Cove and would be open from approximately September 16 to March 14. The OSV zone would be closed to public access March 15 through September 15 or thereafter, until the last shorebird fledges. There would be a designated, year-round area for fishing from south of the recreational beach to the point of closure that would include OSV parking. The refuge would allow recreational horseback riding in the OSV zone from approximately September 16 to March 14 and develop new horse trailer parking area near Mallard (C Dike)/entrance to OSV zone. The refuge would allow visitor access by foot to the OSV zone from approximately September 16 to March 14.

Partnerships. The refuge would pursue partnerships to enhance land conservation, environmental education and interpretation on the Delmarva Peninsula.

Cultural Resource Management. With partners, the refuge would restore the light keeper's house and historic landscaping at Assateague Lighthouse and develop new cultural resource and interpretation amenities, including a virtual tour of the lighthouse. The refuge would allow access to the cemetery near Beach Road and develop tours and controlled access opportunities for Assateague Village. The refuge would work with NASA to develop a boardwalk and kiosk from the NASA Visitor Center in or adjacent to Wallops Island NWR.

The refuge would implement a Chincoteague pony management plan that meets multiple objectives: visitor viewing, habitat management, and pony health. The refuge would allow grazing of the current pony population, with a maximum pony herd size of 150, per the management agreement with the Chincoteague Volunteer Fire Company.

Figure 2-3. Alternative B – Chincoteague NWR

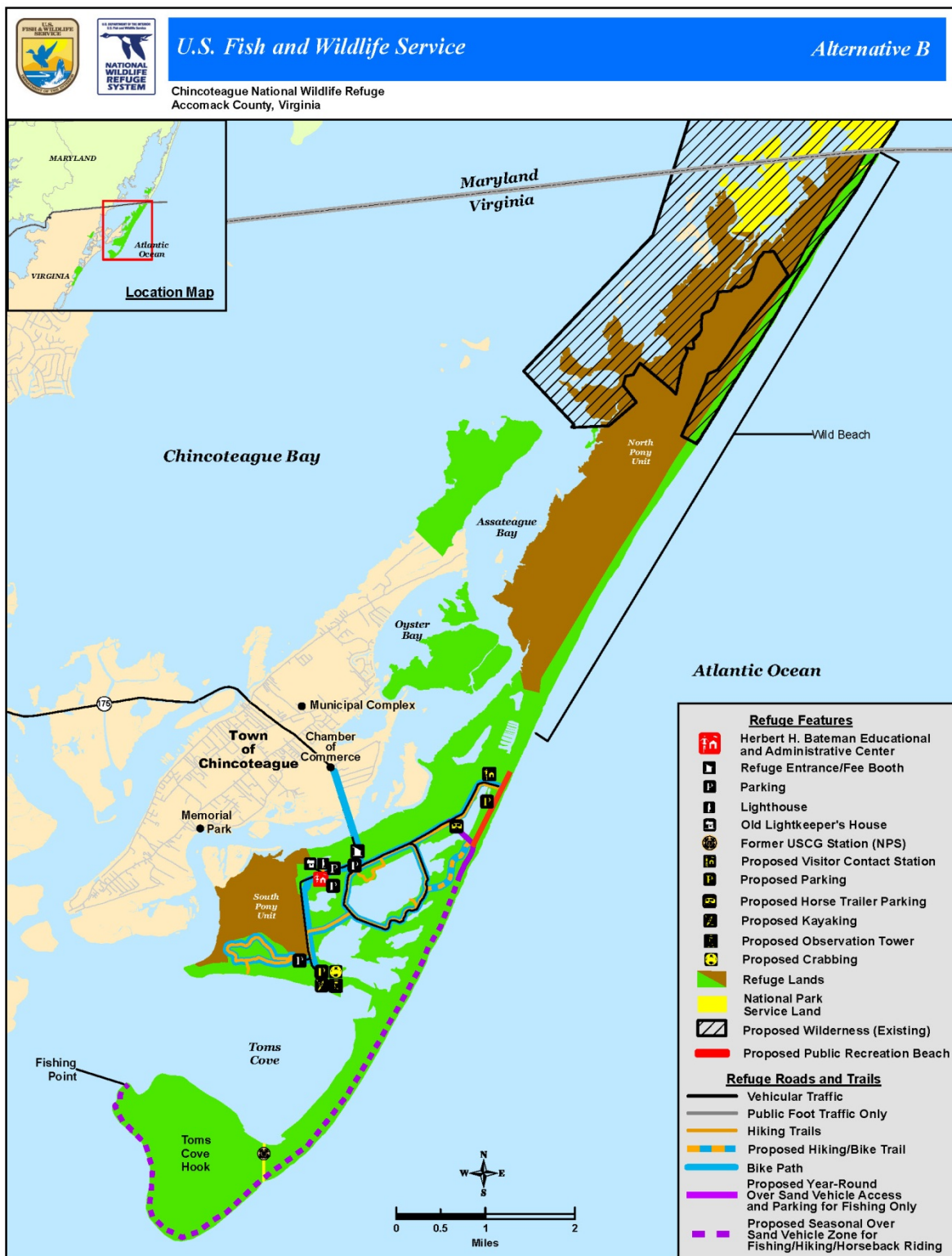
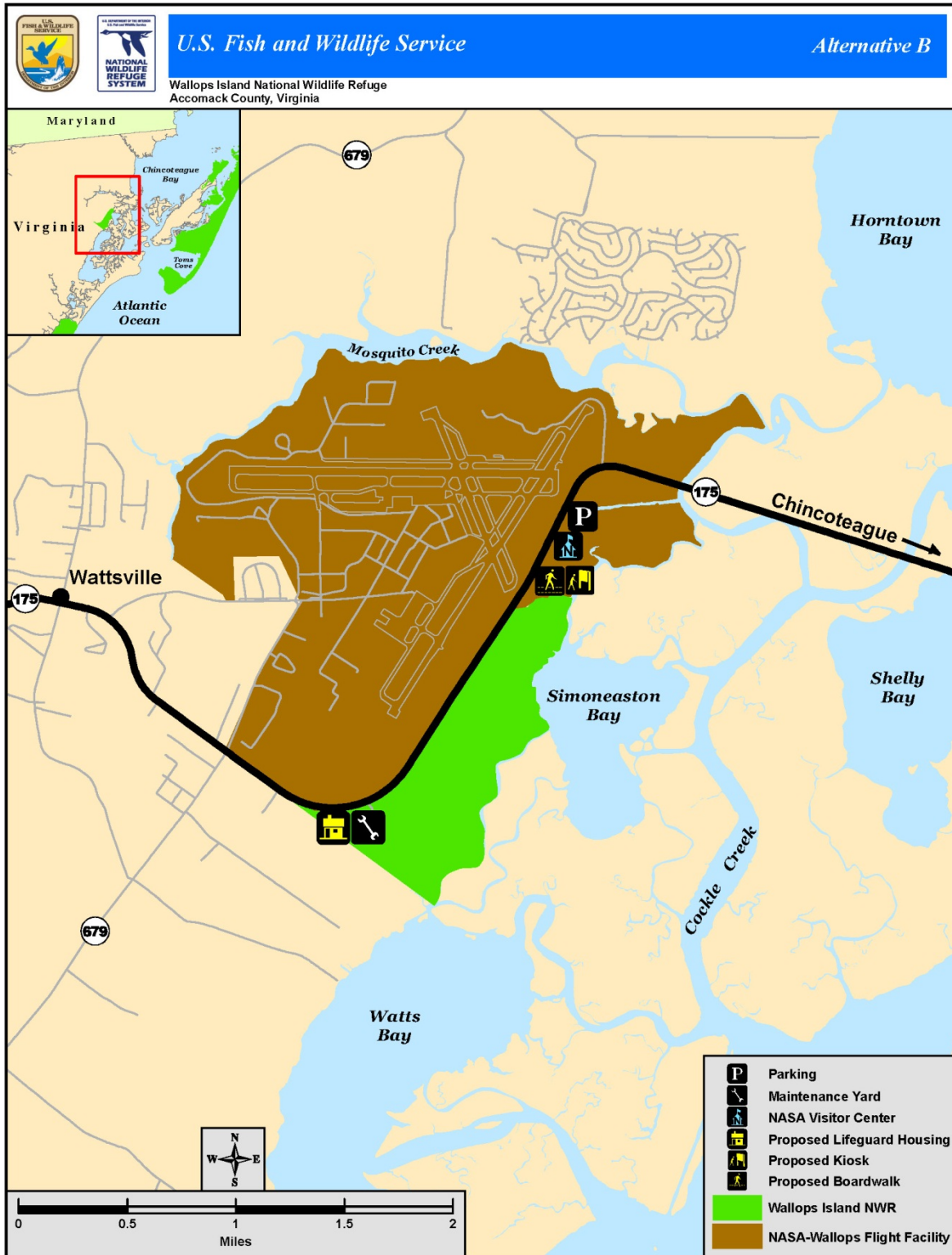


Figure 2-4. Alternative B – Wallops Island NWR



Goal 1: Coastal Habitats

Manage quality coastal habitats for biological integrity, diversity, and environmental health of refuge barrier beach and dunes in concert with natural processes as part of the Delmarva Peninsula coastal barrier island system to provide habitat for species of conservation concern.

Objective 1.1 Barrier Beach and Dune Habitat – Coastal Nesting Birds

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A, plus:

- Allow natural geologic processes to restore overwash to the former recreational beach and parking areas on Assateague Island in order to increase nesting habitat for plover, least terns, sea turtles, and other nesting shorebirds. This would also allow natural island movement, which would buffer the effects of sea level rise and future storms on other wildlife habitats.
- Require all OSV users to be actively engaged in wildlife-dependent priority public uses, such as wildlife observation, photography, surf fishing, or to access hunting zones at Toms Cove Hook during the hunting season, with a valid hunting permit.
- Improve the beach nesting habitat at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.

Objective 1.2 Barrier Beach and Dune Habitat - Migrating and Wintering Shorebirds and Migrating Monarch Butterflies

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A, plus:

- Improve the migratory and wintering habitat at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.

Objective 1.3 Barrier Beach and Dune Habitat - Turtles

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A, plus:

- Improve beach/dune habitat for turtle nesting areas at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.

- Restrict nighttime permitted beach driving in September and October, when the OSV zone is open but the sea turtle nesting season (June through October) is still ongoing. The refuge will continue to monitor the nesting area for artificial light sources caused by nighttime driving, which impairs the natural sea-finding capabilities of nesting female turtles and emerging hatchlings. Future management actions may need to be altered due to a change in current turtle nesting activity.
- Limit night use of the beach by official NPS or USFWS vehicles during the plover and sea turtle breeding season to the greatest extent possible.

Objective 1.4 Federally Endangered Plants and Rare Plant Communities

Same as alternative A

Rationale:

Same as alternative A

Seabeach Amaranth Management Strategies:

Same as alternative A, plus:

- Within 3 years of the CCP implementation, evaluate NPS amaranth propagation/transplant methods and success elsewhere (e.g., Assateague Island National Seashore in MD), and seek guidance from USFWS Seabeach Amaranth Coordinator to determine whether such methods could be used to establish another population on the Hook. Seek partners for implementing a transplant program if determined feasible.
- Within 3 years of the CCP implementation, study restoration for dynamic beach and overwash system, particularly in the Wild Beach area, in order to increase seabeach amaranth habitat that was lost when the artificial dune system was created. Improve beach/dune habitat for seabeach amaranth at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.
- Evaluate amaranth propagation/ transplant methods and success elsewhere and seek guidance to determine whether such methods should be used to establish another population on the Hook.

Lucky Boy Fen Management Strategies:

- Within 2 years, and/or in conjunction with Virginia DCR's next survey, accurately map the boundaries of the Lucky Boy Fen and a buffer area of sufficient width around the perimeter to protect it from human disturbance and other perturbations.
- Within 5 years, consult the literature and experts in fen management to determine whether the myrtle shrubs and other woody plants in and near the fen pose a threat to the rare plants in this unique habitat type, and determine best management practices to address any problems.

Lucky Boy Fen Biological Monitoring

- Starting in 2014, and at least every third year thereafter, coordinate with Virginia DCR personnel to survey rare plants present during the growing season. Monitoring surveys were previously conducted in 2003 and 1992.
- Within 5 years, initiate simple ground or surface water monitoring at Lucky Boy Fen to determine if pollutants are present, and identify potential limiting factors such as nitrogen or alkalinity. A recommended protocol involves first taking a grab sample to establish a

baseline and test for nutrients. Depending on the results, a simple perforated PVC tube ground water monitor or small surface collector (resembles a dustpan) could be installed.

Objective 1.5 Salt Marsh Habitats for Nesting, Migrating, and Wintering Birds

Same as alternative A

Rationale:

Same as alternative A

Management Strategies:

Same as alternative A, plus:

- In cooperation with USACE and other partners develop strategies that will improve tidal flow to Swan Cove Pool (F Pool). This may be accomplished by engineering new water control structures.
- Use adaptive approach to balance visitor use experience with the need to manage non-migrant Canada goose populations (selecting time and location to avoid negative visitor experience) and work with USDA to reduce non-migrant Canada goose population through addling, firearms, and round-ups.
- Within 5 years, evaluate existing studies conducted by the NPS, refuge, and others on the effects of pony grazing on wildlife and habitat, including the effects of compaction, to identify information gaps.
- Within 5 years, work with partners (Ducks Unlimited, Black Duck Joint Venture, VDGIF) to identify additional habitat restoration projects that can be done to enhance/restore habitat for black ducks.

Biological Monitoring:

Same as alternative A, plus:

- Within 5 years, implement a survey protocol (building on CCB study or the USFWS Region 5 Salt Marsh Integrity Study) to monitor population trends and densities of saltmarsh, Nelson's and seaside sparrows, and clapper rails in high priority salt marshes.

Goal 2: Managed Wetlands (Impoundments)

Manage refuge impoundments to support native wildlife and plant communities, including a diversity of waterbirds, aquatic species, and other species of conservation concern.

Objective 2.1 Impoundments for Waterfowl, Shorebirds, Waders, and associated species

Same as alternative A

Rationale:

Same as alternative A

Management Strategies:

Same as alternative A, plus:

- Within 4 years, complete the habitat analysis of existing impoundments to identify impoundments with the most potential for enhancement to meet black duck feeding, loafing, and thermal requirements; plan and implement habitat restoration/enhancement on one to two impoundments using an Adaptive Management approach.

- Within 4 years, contract a tidal wetland expert or a hydrologist to design several alternative hydrologic models to restore Sow Pond, Ragged Point, or Swan Cove Pool (F Pool) impoundment to salt marsh.
- Within 6 years, develop and implement an adaptive management experiment to flood encroaching myrtle and other encroaching woody vegetation in the impoundments to focus on black duck habitat enhancement and restoration.
- Within 10 years, investigate the feasibility of allowing Lighthouse Meadow impoundment to revert to a tidal salt marsh.
- Due to potential parking lot configuration, Pintail (D Pool) will be removed from impoundment management capabilities.
- Since NWF is no longer needed as a piping plover mitigation area due to the relocation of the recreational beach, pumping operation will no longer be required to create additional piping plover nesting habitat. In addition, the pony enclosure fencing will be removed, and artificial shell nesting islands will no longer be maintained.
- Management of NWF will be improved for spring and fall migratory shorebirds and waterfowl.
- In cooperation with USACE and other partners develop strategies that will improve tidal flow to Swan Cove Pool (F Pool). This may be accomplished by engineering new water control structures.
- Improve or replace all water control structures to maximize flow capabilities.
- As opportunities arise, use volunteers to plant seaside goldenrod seedlings in spring or fall on Toms Cove Hook, small dunes that dot the Overwash area, the north end of Toms Cove (including the causeway west of the NPS Toms Cove Visitor Center), and the backsides of dunes along Wild Beach. Planting should occur on no greater than 5 percent of the Overwash area so as not to conflict with beach nesting birds, which prefer open un-vegetated beaches and shell flats.
- Within 3 years, fine-tune water level management capability by completing a bathymetric survey of all impoundments so that water depths can be better related to water gauge readings.
- Within 3 years, evaluate whether Chincoteague pony grazing can be used more effectively to meet habitat needs of shorebird and waterfowl species and if so, work with the Chincoteague Volunteer Fire Company to adjust grazing compartments and/or pony numbers in order to accomplish this.
- Within 3 years, use outcomes from three USFWS efforts (the Integrated Waterbird Project, Region 3/Region 5 Impoundment Study, and the Coastal Impoundment SDM Model) to refine management strategies for impoundments.

Biological Monitoring:

- Within 3 years, analyze 20-year data set of bird use in comparison to water levels and precipitation. Use this data to identify which impoundments have the most potential to manage for different groups of birds.

Goal 3: Upland Habitats

Manage upland habitats for biological integrity, diversity and environmental health of coastal forests and shrublands to sustain native wildlife and plant communities, including species of conservation concern.

Objective 3.1 Coastal Shrub Habitat for Breeding and Migrating Landbirds

Same as alternative A

Rationale:

Scrub shrub habitat provides an abundance of insect food and berries for breeding birds during the fall migration and/or throughout the winter. Migrating birds depend on stopover habitat along migration routes where they can find food, water, and protection to regain energy lost in flight and re-fuel for the next leg of the journey (Duncan et al. 2002). Roberts' (2009) 10-year banding study found that the refuge's wax myrtle/bayberry/groundsel shrub community provides important stopover habitat. Dense, tall (10 to 12 feet high) wax myrtle/bayberry habitat between impoundments and the dune line is also preferred nesting habitat for passerines, including several of highest and high conservation concern BCR 30 species such as prairie warbler, field sparrow, and brown thrasher.

The refuge realizes the benefits of scrub shrub habitat for migrating and neotropical birds, and will therefore allow this habitat to form along the dune system east of the NWF, since mowing these areas would no longer be required to mitigate for the loss of piping plover habitat at the current recreational beach. Within the NWF there is a 704-acre mitigation area that would be allowed to succeed to scrub shrub habitat on approximately 300 acres. This will significantly offset the loss of scrub shrub habitat contained within the 27 acres of habitat lost due to development at the proposed new recreational beach.

Additionally, though the refuge will allow for the natural scrub shrub habitat to grow, we also recognize that natural coastal processes could reshape or change the type of habitat at any point. If overwash or other coastal processes were to occur, the refuge would not mitigate these natural effects. The possible habitat shift, from scrub shrub to coastal, would result in a tradeoff of benefits for species, eliminating migrating bird habitat but providing good nesting habitat for coastal bird species such as the threatened piping plover.

Strategies:

Same as alternative A, plus:

- Manage a minimum 500-foot wide continuous strip of 10 to 12-foot tall myrtle/bayberry shrub, free of trees, parallel to (and behind the) dunes on eastern side of the NWF impoundment.
- Mow a 10 to 12-foot wide swath along each side of the new access road between Assateague Channel Bridge and the newly established parking at Pintail (D Dike) as needed during the growing season to maintain vegetation height at less than or equal to 6 inches, in order to minimize Delmarva Peninsula fox squirrel fatalities due to vehicle strikes.
- Do not mow Woodland Trail, except to facilitate public enjoyment of kiosks, benches, and trails.
- Continue to record (including sex and age) all Delmarva Peninsula fox squirrels killed by vehicle strikes and inspect them for PIT tags to determine whether road-killed Delmarva Peninsula fox squirrels remain below 5 per year.
- Within 5 years, refine first strategy using a combination of ground reconnaissance, aerial photos, and GIS to identify and map additional areas on the eastern side of other impoundments (i.e., behind the dune line), where a 10 to 12-foot tall myrtle/bayberry shrub community would be maintained by various vegetation management techniques.

Biological Monitoring

- Within 5 years, analyze the 10-year data set (1996 to 2006) from the Breeding Bird Survey (BBS) routes conducted in refuge shrub and forest habitats and determine trends of prairie warbler, brown thrasher, northern bobwhite, field sparrow, and other breeding landbirds of Highest, High, or Medium conservation concern on the BCR 30 list, analyzing results in the context of other BBS routes in the Region. Use this analysis to develop additional habitat management actions to benefit these representative species.
- Within 5 years, assess whether elements of the USFWS Region 5 Migrating Landbird Study can be incorporated into refuge monitoring strategies.

Objective 3.2 Loblolly Pine Forest for Delmarva Peninsula fox squirrel, Brown-headed Nuthatch & Eastern Towhee

Same as alternative A

Rationale:

Same as alternative A

Management Strategies:

Same as alternative A, plus:

- Within 5 years, develop silvicultural prescriptions to create small openings (2 to 10 acres) in the forest that would increase the hardwood component.
- Within 5 years, update the vegetation cover map for Assateague Island.
- Within 5 years, develop Forest Management prescriptions for the HMP that integrate the results of the CFI; include silvicultural prescriptions to enhance the hardwood component, enhance habitat for focal species, and incorporate relevant management actions outlined in the 1992 Upland Management Plan.
- Within 7 years, implement a silvicultural prescription on a 100 to 150-acre block of mature forest that creates small openings, totaling no more than 25 acres of the block, and aims to increase the hardwood component and diversify the structure and age-class of loblolly forest.
- Within 3 years, create an updated forest stand/compartments map using CFI Procedures developed by Chesapeake Marshlands NWR Complex, or comparable inventory method that takes into account wildlife variables.

Biological Monitoring:

Same as alternative A, plus:

- Within 5 years, develop a simple monitoring protocol to estimate wild turkey population size and trends. The survey should be designed so volunteers and staff can conduct them easily. Wild turkeys are a popular game species and increasing populations may bring increased interest for opening a hunting season.

Objective 3.3 Upland Habitats on Wallops Island NWR

Same as alternative A

Rationale:

Same as alternative A

Management Strategies:

Same as alternative A, plus:

- Within 5 years, annually remove 5 to 10 acres of dense autumn olive stands by mechanical or chemical means, with the goal of eliminating the 25 acres of autumn olive-dominated stands.
- Within 3 years, develop a plan and funding source to remove autumn olive intermixed in the understory of the 52-acre pine/hardwood forest. “Basal bark treatment” with an oil-based herbicide applied to the bottom foot of individual trees during the winter is one possible technique. Consult with ANEC, Patuxent Research Refuge, TNC, and others experienced in removing this invasive tree to refine methods, schedules, funding sources, etc.
- Within 7 years, conduct a habitat assessment of the 57 acres of former agricultural fields to determine whether a portion of this area should be maintained in an early successional stage to provide bobwhite breeding habitat, in a patch size large enough to attract shrubland breeding birds.

Biological Monitoring:

- Within 5 years, survey suitable habitat for northern bobwhite and American woodcock to determine their breeding and population status on Wallops Island NWR.
- Within 10 years, recruit a graduate student(s), volunteer, or other partner to investigate Wallops Island NWR’s importance to migrating and breeding landbirds and make management recommendations.
- Within 3 years, develop a simple monitoring protocol to estimate wild turkey population size and trends. The survey should be designed so volunteers and staff can conduct them easily. Wild turkeys are a popular game species and turkey hunting may be proposed in the future for Wallops Island NWR.

Goal 4: Southern Barrier Islands Unit (Assawoman, Metompkin, Cedar)

Perpetuate the biological integrity, diversity, and long term viability of natural habitats that support native avian communities and turtles on Assawoman, Metompkin and Cedar Islands through a partnership approach.

Objective 4.1 Barrier Beach and Dunes - Breeding Shorebirds and Turtles

Same as alternative A

Rationale:

Same as alternative A

Management Strategies: Same as alternative A, plus:

- Meet with the Virginia Marine Resources Division and DCR staffs to review OSV laws, regulations, and enforcement options for beach driving on Cedar Island.
- Within 3 years of CCP, work with TNC to complete land transfer (fee title or easement) of TNC landholdings on Cedar Island to USFWS so that complete land survey and marking of refuge boundaries can be conducted.

- By 2020, collaborate with other barrier island managers and stakeholders to develop a “Virginia Barrier Island Public Use Management Plan.”
- Within 10 years, conduct a feasibility study to see if a population of seabeach amaranth should be established on one or more of the southern island units through a transplant program. According to Weakley et al. (1996), islands longer than 3 miles have the potential for supporting two to three sites, and islands shorter than 3 miles can support one site. Using these guidelines, Assawoman Island appears to have conditions suitable for the establishment of one to two seabeach amaranth sites, and Cedar Island, two to three sites.
- Reduce mortality and disturbance factors on Assawoman Island during the breeding season, by implementing a complete closure, including fishing, from March 15 through September 15 or thereafter, until the last shorebird fledges.

Biological Monitoring

- Within 7 years, conduct systematic search for seabeach amaranth on southern islands in suitable habitat defined as sandy beach zone from 0.7 to 5 feet above the mean high tide in overwash flats, blowouts, lower foredunes, and upper strands of non-eroding beaches. Focus survey on accreting portions of barrier islands that are sparsely vegetated with American sea rocket and seabeach spurge, with which the species always co-occurs (Weakley and Bucher 1992).

Objective 4.2 Barrier Beach, Dune and Tidal Marsh – Migrating and Wintering Shorebirds

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A

Goal 5: Partnerships

Working with partners, protect and restore vigorous, viable populations of migratory and resident wildlife, fish, and native plants and their habitats found on the Delmarva Peninsula and identified in state, national, and international treaties, plans, and initiatives. Take a leadership role in collaborative regional efforts to achieve broader conservation goals and serve as a catalyst for achieving a multi-state eco-regional partnership. The refuge will continue to work with partners to explore how best to sustain the resiliency of this unique barrier island system, its communities, and its economy, consistent with the refuge’s mission and in the face of dynamic coastal processes, climate change, and storm events.

Objective 5.1 Regional Conservation

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A, plus:

- Pursue adoption of a Preliminary Plan Proposal (PPP) or Landscape Conservation Design (LCD) for the Lower Delmarva Peninsula Conservation Area; PPP or LCD allows Washington Office to review any acquisition proposal and provide internal approval by the USFWS Director before proceeding with the Land Protection Plan (LPP).
 - In consultation with local and regional stakeholders, pursue completion of LPP for the Lower Delmarva Peninsula Conservation Area by 2015.
- Consider land acquisition, easements, and other land conservation strategies with partners and landowners, such as a rolling wetlands easement.
- Engage and work with USDA to conserve family farms, open space, and wildlife habitat in the Lower Delmarva Peninsula.

Objective 5.2 Economic Development

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A, plus:

- Within 5 years, develop a visitor survey to better assess visitation levels and patterns and capture visitor feedback to inform management decisions; the survey will be conducted every 5 years.

Objective 5.3 Community Resilience

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A, plus:

- Within 3 years:
 - Identify partners, which may include the town of Chincoteague, Accomack and Northampton counties, Commonwealth of Virginia, NPS, NASA, FEMA, USACE, etc. who may wish to work together to develop plans and strategies toward community resilience in the face of climate change impacts.
 - Participate in a study, which would be led by others, to determine potential impacts/vulnerabilities of the coastal communities and identify protective methods for hazard mitigation.
 - Work with NASA to conduct workshops and identify strategies on how best to advance the study, information exchange, and project resources for adaptive management practices that sustain the resiliency of this unique barrier island system including but not limited to Assateague, Wallops, Assawoman, and Metompkin Islands in the face of dynamic coastal processes and climate change.

Objective 5.4 Federal Interagency Collaboration and Facility Management

Within 5 years, enhance existing partnerships and develop new relationships focused on science research, interpretation, and shared facilities with adjacent Federal entities.

Rationale:

Same as alternative A

Strategies:

Same as alternative A plus:

- Re-establish an interagency non-exclusive use agreement/MOU with NASA to support wildlife and habitat management for marshlands and uplands not impacted by facilities (3,000 acres).
- Within 3 years, work with NPS to construct additional office space at the existing Herbert H. Bateman Administrative Office Complex.
- Within 4 years, develop boardwalk and kiosk for Wallops Island NWR with access from the NASA Visitor Center.
- Within 1 year, revise the use agreement between NPS and USFWS to include construction of lifeguard housing on Wallops Island NWR. This would require additional environmental compliance.
- Within 3 years, pursue funding in support of the 2011 non-reimbursable umbrella agreement signed between USFWS, NASA, and the MSC for establishing a leading research and teaching environment where students and staff tackle new and evolving challenges such as those posed by climate change and corresponding sea level rise to coastal environments, and work on inexpensive aerial data gathering platforms supporting the NASA mission theme of conducting earth science measurements, understanding global climate change and conducting coastal research.

Objective 5.5 Local Conservation of Tidal Creeks, Estuaries, Mudflats, and Nearshore Marine Waters

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A, plus:

- Within 5 years of plan implementation, collaborate with the USFWS Maryland Fisheries Office, Virginia Institute of Marine Science, Marine Science Consortium (MSC), and/or other technical experts to develop a fish monitoring program (that includes frequency, location, and protocols) aimed at monitoring refuge fisheries population and water quality implications. Within 5 years, meet with NPS staff monitoring water quality around Assateague Island and Chincoteague Bay to determine how their monitoring results can be used to help meet this objective, and how the refuge can better support NPS water quality monitoring efforts.
- Within 5 years, work with partners to assess and monitor water flow, water quality, and accretion rates within Swan Cove Pool (F Pool).

Goal 6: Visitor Services

People of all ages and abilities develop a stewardship ethic while enjoying their refuge experience and increasing their knowledge of the Service, System, and refuge.

Objective 6.1 Hunting and Trapping

Within 5 years of CCP approval, increase level of opportunity (e.g., expansion of hunted species) in the hunt program, such as the fall/winter light goose hunt, through expansion of hunted species, trapping, and new hunting programs.

Rationale:

Hunting is one of the priority uses of the Refuge System and is to be facilitated when compatible. Hunting on the Delmarva Peninsula is a traditional outdoor pastime and remains a popular form of wildlife-dependent recreation on the refuge and a vital part of the cultural, social, and economic fabric of the communities near the refuge. Expansion of current hunting practices to incorporate different species, such as fox and raccoon, and trapping opportunities would further reduce the stress of predators for threatened and endangered species. Furthermore, institution of increased hunting opportunities for youth and women would promote traditional wildlife-dependent recreation and provide increased opportunities for learning about wildlife, their habits, life histories and the need to protect their habitats.

Developing and using a visitor survey, whether for hunting or for any public use, is one tool the refuge could utilize to measure visitor satisfaction, experience, and knowledge. Such a survey can be activity-specific, refuge-specific, or completed as part of a larger national effort. Visitor satisfaction surveys are integral to establishing a baseline, and monitoring visitor experiences and responses over time at various levels, well as for assessing meeting of measurable objectives.

Strategies:

Same as alternative A, plus:

- Within 5 years, develop questions on visitor experience of hunting through measuring tools, which could include a refuge-specific visitor survey.
- Within 5 years, develop two partnerships for implementation of hunt programs for non-traditional audiences.
- Within 5 years, maintain, and where possible expand, current hunting opportunities by including additional species, extending hours, and creating events. Any expansions of current hunting programs would require additional environmental analysis and compliance with NEPA beyond that contained in this document. Additional details will be included in the hunt management plan and annual hunt program, but generally these proposed additions would include:
 - Introduce/add non-migratory Canada goose and light goose hunting opportunities in refuge impoundments on Assateague Island.
 - Add mourning doves for migratory bird hunting in areas of the refuge outside of Assateague Island.
 - Add turkey for big game for youth hunting on Assateague Island.
 - Increase outreach to youth, new hunters, and women about hunting opportunities; create an apprentice hunter program.
 - Increase hunter education opportunities (partnership with VDGIF or others).
 - Open refuge for migratory bird hunting on Federal holidays, in accordance with State regulations, in designated areas of the refuge within Wildcat Marsh, Morris

Island, Assawoman Island and Metompkin Island divisions, that occur outside of the current hunting days of Thursday, Friday, and Saturday (Labor Day, Columbus Day, Veteran's Day, Christmas, New Year's, Martin Luther King Jr. Day, President's Day).

- Reduce/minimize administration of hunt program through streamlining process (kiosks, electronic lottery, etc.).
- Within 10 years, assess opening of fox and raccoon hunting for both Chincoteague and Wallops Island NWRs.
- Within 10 years, assess a trapping program for fur-bearers (including fox, raccoon, opossum, nutria) for Chincoteague and Wallops Island NWRs.

Objective 6.2 Fishing and OSV Use

Within 8 years of CCP approval, achieve a 10 percent increase in visitor satisfaction with fishing (surf fishing, crabbing, oyster harvest, and clamming) through permit improvements, expansion of the OSV zone, and other improvements.

Rationale:

Fishing is one of the priority uses of the Refuge System and is to be facilitated when compatible. Surf fishing, crabbing, oyster harvest, and clamming are among the most popular wildlife-dependent recreational activities conducted on the refuge. The expansion of the OSV zone due to the relocated recreational beach maintains restrictions and closures to protect nesting habitat, while ensuring access for fishing from the new, relocated OSV entrance. Streamlined fishing permit access and enhanced fishing opportunities on the refuge are aimed to increase recreational opportunities and improve visitor experience.

Strategies:

- Reduce mortality and disturbance factors on Assawoman Island during the breeding season, by implementing a complete closure, including fishing, from March 15 through September 15, or until the last shorebird fledges. Within 5 years, develop questions on visitor experience of fishing for a visitor survey.
- Maintain and assess expansion of current fishing opportunities including shellfishing and crabbing.
- Develop bilingual or multilingual fishing brochure (similar to hunting brochure).
- Collaborate with partners to organize youth fishing event.
- Increase beach access for disabled (beach mats).
- Install self-service electronic kiosk for fishing information, license purchase, and/or registration in the Commonwealth of Virginia's Fisherman Identification Program.
- Streamline fishing permit process for Assawoman and Metompkin Islands:
 - Work with partners (e.g., TNC, Commonwealth of Virginia) to provide QR codes (matrix barcodes readable by smartphones) on signage to link to Web site with permit form specific to each location.
- Within 5 years, work with partners to have consistent messaging across Virginia Eastern Shore islands.
- Improve signing on Woodland Trail for access/info on shellfishing.
- Create fishing access (e.g., crabbing dock) at new Beach Road terminus.
- Increase law enforcement compliance checks on lower Islands and work with state and non-governmental organizations (NGOs) for consistency along islands.
- Make the following changes to OSV use and zone:

- Expand the OSV zone from the new recreational beach to Fishing Point on Toms Cove Hook and continue to keep the zone open from approximately September 16 to March 14.
- Close the OSV zone to public access March 15 through September 15 or thereafter, until the last shorebird fledges.
- Develop a designated, year-round area for fishing at the southern terminus of the National Park Service assigned area/recreational beach then south along the Atlantic Ocean beachfront approximately .5 mile.

Objective 6.3 Environmental Education and Interpretation

Within 5 years, develop three teacher-led curriculum materials online and increase online traffic to the Web site and social media by 25 percent to increase the understanding of the refuge throughout the Delmarva Peninsula and online by utilizing technologies that achieve outreach to a wide, diverse audience.

Rationale:

Environmental education and interpretation are essential parts of the Refuge System that promote knowledge and respect for the refuges purpose and mission. Expanding these opportunities, especially for youth, would make for a more educated visitor and an overall enhanced experience. Finding ways of accomplishing this goal, by reaching out to the community more vigorously, and recognizing the growing online generation and finding ways to communicate more readily, are all appropriate steps for the refuge.

Strategies:

- Within the next 2 years, research technology/social media (e.g., Twitter, Facebook) that can enhance environmental education and interpretation.
- Within 5 years, develop questions on visitor experience of environmental education and interpretation through an appropriate tool, such as a visitor survey.
- Within 5 years, share administration of environmental education and interpretation programs with NPS and the MSC, including scheduling and reservations, and develop an MOU to define roles and responsibilities.
- Within 10 years, increase current environmental education opportunities to more than 7,500 education participants annually:
 - Add additional programming (e.g., climate change toolkit, pollinator garden).
 - Increase opportunities for citizen science (e.g., e-Bird, Great Backyard Bird Count).
 - Conduct web-based environmental education programs (e.g., distance learning opportunities, especially for schools).
 - Develop web-based/emerging technology lessons for pre/post visit (e.g., incorporation of QR codes on brochures and exhibits).
 - Partner to increase environmental education on the Delmarva Peninsula (e.g., Chincoteague Museum, MSC, NPS, NASA, Delmarva Discovery Center in Pocomoke, CNHA, Shore People Advancing Readiness for Knowledge (SPARK), and others) through individual outreach efforts.
 - Target local schools/students to conduct offsite visits/outreach in addition to onsite workshops.

- Develop partnerships (e.g. concessionaire/school district teacher on loan/detailed) to do programs (NPS Teacher-Ranger-Teacher program, grants under Artists in Residence Program).
- Encourage local schools (K to 12) to utilize refuge as outdoor classroom through marketing and working on outreach to achieve buy-in from administration.
- Utilize other areas/facilities (e.g., boardwalk, etc.) for educational purposes (contingent upon new facilities with relocated beach, including overlook at terminus of Beach Road).
- Increase provision of teacher workshops in coordination with partners.
- Continue pursuit of proposal for mobile trailer for outreach/education and acquire by 2015.
- Within 15 years, increase current interpretive opportunities to more than 68,000 interpretation participants annually:
 - Build boardwalk/observation tower in partnership with NASA at or near Wallops Island NWR and provide opportunity for Blue Goose passport signing.
 - Maintain and where possible expand interpretive opportunities by installing new wayside exhibits, offering volunteer-led tours, and develop a portable exhibit.
 - Create a virtual exhibit for Assateague Lighthouse.
 - Restore lightkeeper's house and develop cultural resource/interpretation materials.
 - Develop data for exhibit at NASA visitor center.
 - Develop new Visitor Center exhibits and introductory videos.
 - Replace self service fee station with 24-hour access to kiosk for passes, refuge information, e-Bird/Merlin, etc.
 - Maintain oversight of training or certification of third-party providers; continue training of volunteers to assist in activities.

Objective 6.4 Wildlife Observation and Photography

Within 5 years, increase visitor satisfaction with wildlife observation by 10 percent and provide an opportunity for visitors to share photography reflecting wildlife observation on the refuge online.

Rationale:

Wildlife observation and photography are two of the 6 priority public uses of the Refuge System and are to be facilitated when compatible. Continued expansion of opportunities for visitors to photograph and observe the wildlife and habitat of the refuge is important to promote visitor understanding of, and increase visitor appreciation for, the value of and need for fish and wildlife habitat conservation. Providing opportunities to view the refuge for those unable to visit is a way for the USFWS to reach more people, particularly children. Change in access or infrastructure should be evaluated for impacts to these two uses and actions should be taken to continue or improve opportunities. New management strategies and enhanced infrastructure as a result of this alternative would provide new photography and observation opportunities.

Strategies:

- Within 5 years, develop questions on visitor experience of wildlife observation and photography for a visitor survey.
- Within 5 years, facilitate real-time, online photography sharing specific to the refuge.
- Within 8 years, at new Beach Road terminus, build a wildlife viewing tower.

- Within 10 years, maintain and enhance where possible improved walking, driving and kayak access for wildlife observation and photography by exploring options for permanent photo blinds, and extending existing trail system.
 - Work with partners (e.g., North American Nature Photography Association) to determine when and where to install universally accessible photo blinds.
 - Develop new launch point at end of new terminus of Beach Road for small watercraft (non-motorized, hand-carried, manually propelled boats).
 - Work with the land owners of the current Maddox Campground to explore options for kayak/canoe access from site to connect to proposed backcountry canoe/kayak trail.
 - Work with the Commonwealth of Virginia to acknowledge the current dock/platform within Wildcat Marsh.
 - Develop a refuge-run kayak/canoe environmental education program from Wildcat Marsh.

Objective 6.5 Recreational Beach Use

Within 8 years, or sooner if funding is available, complete transition of recreational beach and associated parking from current location to new location and, working with the NPS and town of Chincoteague, maintain current level of visitor satisfaction.

Rationale:

The proposed relocation of the 1-mile recreational beach and associated parking would be in response to historic and anticipated impairment to the current recreational beach and parking from natural hazards, such as heavy storm damage to parking lots, overwash events, sea level rise, and the natural movement of barrier beach land forms. The relocation is intended to provide a sustainable situation so that the habitat and recreation portion of the beach can be sustained for as long as possible for both the wildlife of the refuge, and the visitors to the seashore. The relocation is intended to provide a more protected location for the recreational beach and parking, but prior to the relocation, the refuge, NPS, and town of Chincoteague may consider short-term strategies to address access after damage caused by coastal storms at the existing beach.

Strategies:

- Within 2 years, provide management strategies for NPS to maintain the current beach until the newly located recreational beach is ready for visitor use.
- Within 3 years, develop communication plan in conjunction with NPS for timeline for construction and opening of relocated recreational beach, including proposed processes and management strategies for the transition between locations to ensure access to a recreational beach is available for visitors.
- Within 2 years, develop site design plan for parking and access to new beach location.
- Within 5 years, develop questions on visitor experience of recreational beach for a visitor survey.
- Within 8 years, relocate the recreational beach, or “NPS assigned area” (beach and 8.5 acres of parking), to a more stable area(s) that meets visitor service and resource management criteria (as determined through the structured decision-making process -- see Appendix N). All public access on the Service Road north of the new recreational beach would be restricted unless authorized under special use permit or special day use privileges/openings. Continue to allow vehicular access along Beach Road to its new

terminus but close Beach Road causeway to all public access once new recreational beach is open.

- Within 8 years, revise NPS-FWS MOU to account for relocated beach/ assigned area.
- In conjunction with building a new parking area for the recreational beach, manage biting insect population at the recreational beach. The refuge is open to using commercially available targeted devices that capture mosquitoes which would improve visitor experiences; however, we will not use adulticide.

Objective 6.6 Other Recreational Uses

Within 8 years, expand non-wildlife dependent recreation opportunities by adding facilities and improving accessibility, among other strategies, to achieve a 10 percent increase in visitor satisfaction.

Rationale:

The refuge has identified the opportunity for increased non-wildlife dependent recreation that is still appropriate and compatible for the refuge, especially as it supports wildlife-dependent recreation, while also improving visitor experience. In addition, the various actions under this alternative, such as the relocation of the beach, provide opportunities to expand and enhance non-wildlife dependent recreation opportunities with minimal disruption and in some cases, mitigation of impacts by improvements in previous sites of disturbance, such as relocating bicycle trails.

Strategies:

- Within 5 years, develop questions on visitor experience of non-wildlife dependent recreation for a visitor survey.
- Improve bicycle access on the refuge and in the region:
 - Partner with the town of Chincoteague and the Accomack-Northampton Planning District Commission (A-NPDC) as they implement the Town of Chincoteague Bicycle Plan (2008), the Chincoteague Streetscape Enhancement Project (Rizzio & Spivey 2009), and the Eastern Shore of Virginia Bicycle Plan (2004).
 - Increase and formalize bike parking at the relocated public beach with removable bike racks.
 - Eliminate Swan Cove Bicycle Trail access and pursue alternative route north to relocated public beach (e.g., from Wildlife Loop to Mallard (C Dike)).
 - Include bicycle lanes on new access road to relocated public beach.
- Revise public access policy:
 - All public access on the Service Road north of the new recreational beach would be restricted unless authorized under permit.
 - End existing Beach Road access to beach.
- Improve non-motorized boat access with the following:
 - Allow non-motorized, hand-carried, manually propelled boats to launch from beach outside of lifeguarded area.
 - Construct a new non-motorized launch site at terminus of Beach Road.
 - Work with the land owners of the current Maddox Campground to explore options for kayak/canoe access from site to connect to proposed backcountry canoe/kayak trail.
 - Work with the Commonwealth of Virginia to acknowledge the current dock/platform within Wildcat Marsh.

- Develop a refuge-run kayak/canoe environmental education program from Wildcat Marsh.
- Within 8 years, allow recreational horseback riding in the new OSV zone from approximately September 16 to March 14 and develop new horse trailer parking area near Mallard (C Dike)/entrance to OSV zone.
- Work with NPS to improve accessibility:
 - Increase accessible spaces at beach and improve signage and markings. (To be compliant with ADA, 2 percent (20) of the approximately 1,000 parking spaces would need to be handicap accessible).
 - Consider wheelchair matting for designated spaces and beach wheelchairs.
 - Add removable wheelchair beach ramps.
 - Add seasonal mobility-impaired parking areas and access ramps (dependent on final configuration of parking).
- Continue enforcement of fees and restrictions on commercial uses and allow increase in uses only if deemed appropriate and compatible.
- Same as alternative A on prohibitions, and promote voluntary antilittering and no smoking campaign on public beach.
- Continuously monitor evolving technologies and modes of recreational transportation to determine if appropriate and compatible.
- Allow use of certain alternative-powered vehicles determined by the refuge manager to be safe, environmentally friendly, appropriate, and compatible, on Wildlife Loop after 3pm.

Goal 7: Refuge Administration

Maintain and enhance refuge infrastructure and operations responsibly and sustainably for the safety and well-being of the wildlife, cultural resources, public, and employees.

Objective 7.1 Outreach, Communication, and Emergency Communication

Within 2 years, develop new outreach strategies, including technology-based communication, to communicate refuge purposes and programs and within 5 years, incorporate these strategies into an outreach communication plan and emergency communication infrastructure for the existing and relocated recreational beach.

Rationale:

Continued and improved means of promoting the refuge and communicating any changes occurring on the refuge is necessary to keep the refuge relevant to the public and to maintain transparency and trust. The refuge must find current and relevant ways to communicate with the public beyond traditional media techniques such as newsletters and pamphlets. With social media and web-based technology always advancing, it is important to utilize these opportunities to the benefit of the refuge, and continue to keep the public aware of the refuge and its purpose, programs, and challenges. This communication is especially important when significant changes are being made, such as those changes in infrastructure that this alternative would propose, including the relocated recreational beach.

Strategies:

- Within 2 years, develop new outreach strategies, including technology-based outreach, such as:
 - Improve Web site and identify and pursue social media strategy/new technologies (e.g., Twitter, Facebook) to improve outreach and communication.

- Consider bilingual/multi-lingual opportunities for materials (e.g., 1610 radio messages in other languages).
- Develop new fishing brochure and install self-service electronic kiosk for fishing information, license purchase, and/or registration in the Commonwealth of Virginia's Fisherman Identification Program.
- Within 5 years, develop a communication plan and emergency infrastructure for the relocated recreational beach, including:
 - Institute protocols for use of intelligent transportation systems to communicate weather events, status of summer beach parking, and special events (e.g., International Migratory Bird Day).
 - Ensure adequate phone access or service at new relocated beach, where new bicycle trail ends at beach, and at terminus of Beach Road.

Objective 7.2 Staffing and Volunteer Program/Friends Group

Within 5 years, fill vacancies, establish nine additional permanent full-time positions, and increase the number of volunteers by 25 percent.

Rationale:

The Refuge System must continue to be adequately staffed to protect wildlife and habitat, make refuges safe places for staff and visitors, and meet its purposes while continuing opportunities for public use. Wallops Island NWR currently has no designated staff; having designated staff would better enable the refuge to meet its mission and goals. For Chincoteague NWR, in order to implement the changes proposed within alternative B, additional staffing would be necessary in the areas of biology, maintenance, law enforcement, and visitor services.

In 2007, our Regional Directorate completed the "Strategic Workforce Plan for the National Wildlife Refuge System in Region 5" (Phase 2; January 16, 2007) to support a new base budget approach. Its goal is a maximum of 75 percent of a refuge station budget to cover salaries and fixed costs, while the remaining 25 percent or more would be operating and maintenance funds.

Our strategy is to improve the capability of each refuge manager to do the highest priority work, and not to have most of a refuge budget tied up in inflexible fixed costs. This strategy was successful for a few fiscal years; however, we now anticipate a level or declining budget environment, which will affect our flexibility in managing financial resources and may have implications for the level of permanent staffing. A new round of workforce planning began in 2013 in response to the Federal Government's sequestration directive and anticipated future budget reductions.

Within the constraints or opportunities of our budget and in conformance with future workforce plans, we would seek to fill any currently approved but vacant positions, which we believe are necessary to accomplish our highest priority projects.

The current refuge staffing is supplemented by local volunteers as well as local and national youth and adult groups, who provide help with invasive plant species removal, trash pick-up, interpretive education, and other projects. Chincoteague NWR also receives significant support from its non-profit friends group, the CNHA, which facilitates and supports the refuge's interpretive and educational programs for refuge visitors and for local teachers, funds student interns, and enables both refuges to receive matching grants for workshops and programs. Although permanent staff is important, making partnerships with volunteer groups, and recruiting new volunteers for the

refuge is a high priority. To advance the volunteer and educational programs, a permanent full-time refuge volunteer coordinator position and education program specialist position are necessary.

Strategies:

- Maintain refuge complex budget and fill vacancies to better meet the obligations of wildlife stewardship, habitat management, and public use.
- Strengthen existing volunteer program and recruit new volunteers.
- Expand volunteer program to enhance aspects of all refuge management activities.
- Establish the following permanent full-time positions (see Appendix K for diagram)
 - Wildlife Refuge Specialist for Wallops Island NWR
 - Park ranger Volunteer Coordinator
 - Education Program Specialist
 - Wildlife Refuge Specialist
 - Forest Technician
 - Wildlife Biologist (additional)
 - Biological Science Technician (additional)
 - Maintenance Worker (additional)
 - Land Management Law Enforcement Officer (additional)
- Increase training opportunities for staff and volunteers to maximize volunteer efforts and self-sufficiency.
- Include residential volunteers, interns, community volunteers, and CNHA in most management efforts.
- Coordinate with NPS to expand and enhance volunteer opportunities.
- Develop relationship with space tourism group (e.g., Star Gazers) to provide programming around launches.

Objective 7.3 Wilderness

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A

Objective 7.4 Cultural and Historic Resources

Within 10 years, establish partnerships to increase protection and visitor experience of archaeological, cultural and historical sites on the refuge in compliance with all applicable Federal and State laws.

Rationale:

Protection of the refuge's cultural and historic resources is a constant struggle in this harsh barrier island environment. Increased protection of these areas through new and enhanced partnerships with the surrounding community would benefit the resources and help preserve them for more visitors to experience. This alternative would also provide high-quality opportunities for Chincoteague pony viewing opportunities.

Strategies:

- Within 5 years, facilitate access to cemetery located near Beach Road
- Within 5 years, develop tours and allow controlled access to Assateague Village for general public (CNHA or volunteer led).
- Within 10 years, work with Partners to:
 - Restore the historic landscaping around the Assateague Lighthouse.
 - Restore Lightkeeper's house and develop cultural resource/interpretation.
 - Develop a virtual tour and exhibit for lighthouse.
- Within 10 years, take more active role on museum property preservation/restoration and making specimens available to public (stored at Wallops Island NWR, Herbert H. Bateman Educational and Administrative Center, and on loan).
- Within 10 years, assess feasibility of development of a virtual tour of museum property, using a digital photography database.
- Within 8 years, work with the Chincoteague Volunteer Fire Company to implement a Chincoteague pony management plan that designates a new grazing area for a viewable herd for the public along access to the new recreational beach.

Objective 7.5 Climate Change and Sea Level Rise

Same as alternative A

Rationale:

Adaptation to climate change impacts, such as sea level rise, consists of the following options for transportation and other facilities: maintain, manage, and operate; protect and strengthen; relocate and avoid; abandon and disinvest; promote redundancy. The refuge is committed to maintaining access to the recreational beach so we are not considering abandonment. We have historically, in partnership with NPS, been maintaining the recreational beach in place. However, scientific projections indicate that the current segment of land may not be able to continue to sustain the same amount of parking without substantial protection and strengthening actions. As documented previously (USACE 2012), this is not considered an option within the scope of this CCP by either NPS or USFWS. Instead, the refuge is interested in continuing to pursue relocation of facilities to a less vulnerable location.

Strategies:

Same as alternative A plus:

- Relocate beach parking and related facilities in part in response to climate change considerations and design new facilities to reduce energy use, such as an energy-efficient new visitor facility.
- Within 5 years, develop a process by which climate change is considered in planning and design for any infrastructure changes.
- Within 5 years, pursue designation from DOI to be a pilot site for mitigation research, such as testing the impacts of renewable energy on wildlife in partnership with other agencies, such as NASA, which is currently exploring solar panels.

2.5.4 Alternative C (Reduced Disturbance)

Alternative C would direct staffing and funding towards maximizing habitat and wildlife management strategies. As a result of prioritizing habitat and wildlife management, public use activities and access would be reduced. Figure 2-5 provides an illustration of major spatial elements of the alternative for Chincoteague NWR; Figure 2-2 provides an illustration for Wallops Island NWR (same as alternative A).

Natural Resource Management. Under this alternative, the refuge would protect and maintain all lands it administers, primarily focusing on the needs of threatened and endangered species, with additional emphasis on the needs of migratory birds and resident wildlife. The refuge would continue to preserve approximately 2,650 acres of wetland impoundments, but make adjustments in accordance with a new impoundment management plan that takes into account various factors including the habitat needs of black ducks and monarch butterflies, climate change and natural coastal processes, and new beach access and parking. The refuge would work with partners to protect comparable freshwater habitat on the Delmarva Peninsula. Natural coastal processes would continue to be the primary force that shapes habitat on the southern barrier islands.

Beach Access and Parking. The refuge would work with NPS to relocate the recreational beach, as indicated in alternative B. The refuge and NPS would allow and maintain 480 automobile parking spaces (approximately 4.25 acres) at the new recreational beach. The new recreational beach would offer accessible parking, pedestrian and bicycle connections, and safe storm shelters for visitors. We would coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area, as close to the beach as possible, and institute a shuttle service from off-site parking to recreational beach for use during specific times of the year when parking capacity is exceeded. The shuttle would have stowing capacity for beach cargo and shelters would be provided for shuttle riders at the beach in case of storms.

The refuge in consultation with NPS would provide management strategies for maintaining the current beach in the interim until the newly located recreational beach is ready for visitor use. The refuge would provide a transition plan for moving from the current beach location to the new beach location, including proposed processes and management strategies to ensure access to a recreational beach is available for visitors.

Visitor Use and Experience. Existing public uses would continue but with several exceptions. All public access on the Service Road north of the new recreational beach parking would be restricted unless authorized under permit, and public access to the beach south of the new recreational beach would be allowed from approximately September 16 to March 14. A joint NPS and USFWS Visitor Contact Station would be developed near the new recreational beach. The Beach Road causeway across Toms Cove would be closed to all public access as soon as the relocated recreational beach was accessible. Assawoman Island would be completely closed to all forms of public use, including fishing, from March 15 through September 15 or thereafter, until the last shorebird fledges.

The refuge would discontinue recreational horseback riding and OSV use. The refuge would prohibit smoking on the recreational beach. These actions are intended to reduce adverse impacts on humans and wildlife.

The refuge would maintain recreational hunting opportunities with a focus on local, regional, and state wildlife priorities like sika, light goose, and non-migrant Canada goose. The refuge would

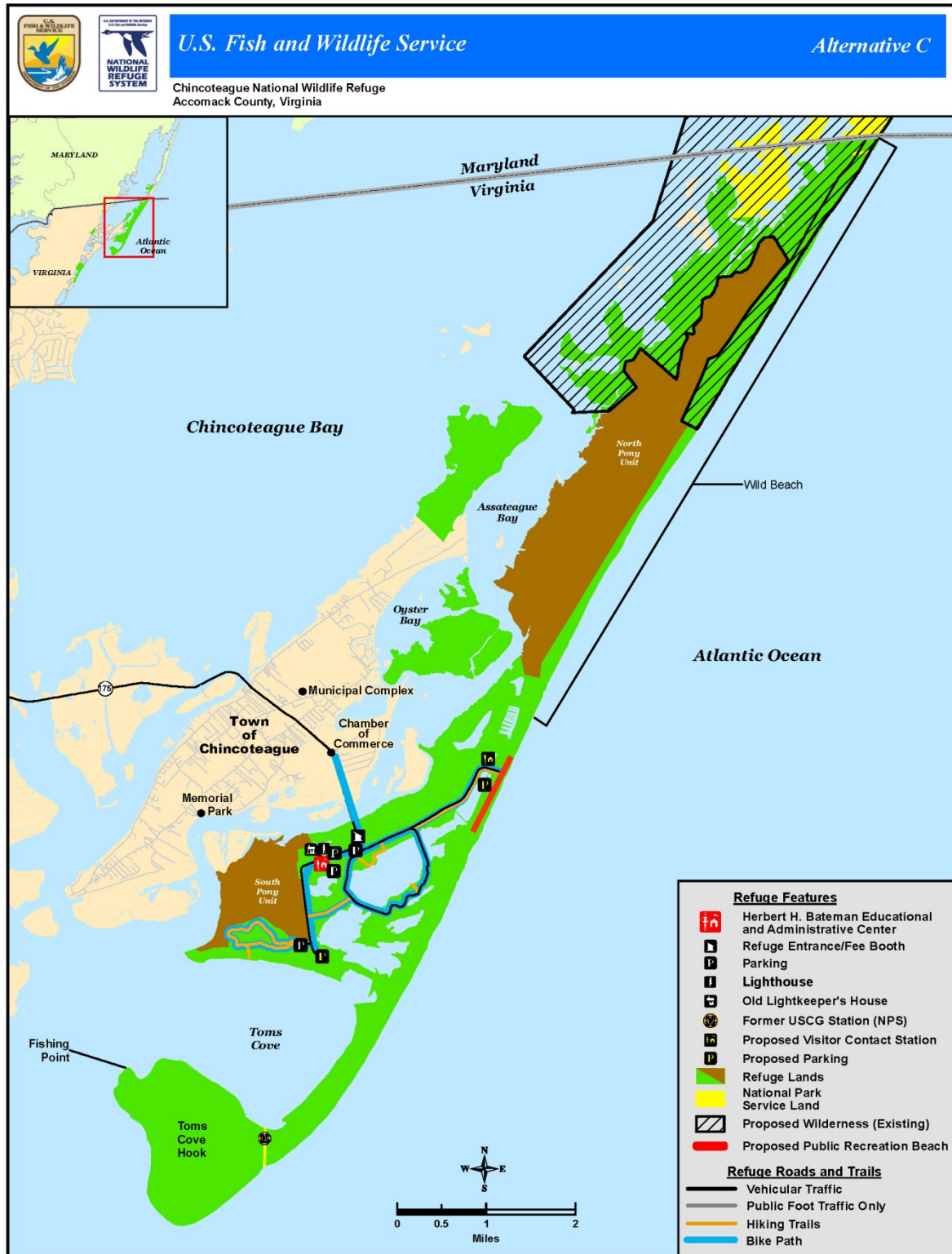
work to phase out the sika population through continued recreational hunt and professional contracts within 5 years. The refuge would expand non-migrant Canada goose and light goose hunting opportunities to other refuge properties where feasible and work to reduce those populations. The refuge would continue to manage opportunities for recreational shellfish and crab harvest.

Partnerships. The refuge would pursue and enhance off-refuge environmental education and interpretation partnerships with an emphasis on wildlife and habitat issues. The refuge would also work with partners to manage exotic, invasive, and nuisance species outside of refuge lands.

Cultural Resource Management. The refuge would complete restoration of Assateague Lighthouse and maintain current access to cultural resources. The refuge would limit the number of Chincoteague ponies allowed to graze on the refuge within 15 years to no more than 125 ponies.

Wilderness. The refuge would continue to protect and enhance the wilderness character of the proposed area through actions to eliminate incompatible features and activities.

Figure 2-5. Alternative C



Goal 1: Coastal Habitats

Manage quality coastal habitats for biological integrity, diversity, and environmental health of refuge barrier beach and dunes in concert with natural processes as part of the Delmarva Peninsula coastal barrier island system to provide habitat for species of conservation concern.

Objective 1.1 Barrier Beach and Dune Habitat – Coastal Nesting Birds

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative B, plus:

- Return footprint of current public beach parking area to wildlife habitat and reduce parking impact on habitat by reducing the size of public beach parking and relocating it to areas less sensitive for wildlife habitat and more stable to the forces of the tides and storms.
- Discontinue OSV use and horseback riding.

Objective 1.2 Barrier Beach and Dune Habitat - Migrating and Wintering Shorebirds and Migrating Monarch Butterflies

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A; except discontinue OSV use and horseback riding.

Objective 1.3 Barrier Beach and Dune Habitat - Turtles

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative B; except discontinue OSV use and horseback riding.

Objective 1.4 Federally Endangered Plants and Rare Plant Communities

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative B

Objective 1.5 Salt Marsh Habitats for Nesting, Migrating, and Wintering Birds

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative B except:

- Reduce allowed population of Chincoteague ponies from 150 to 125 and remove ponies from the proposed wilderness area.

Goal 2: Managed Wetlands (Impoundments)

Manage refuge impoundments to support native wildlife and plant communities, including a diversity of waterbirds, aquatic species, and other species of conservation concern.

Objective 2.1 Impoundments for Waterfowl, Shorebirds, Waders, and associated species

Same as alternative A

Rationale:

Same as alternative A

Management Strategies/Biological Monitoring:

Same as alternative B

Goal 3: Upland Habitats

Manage upland habitats for biological integrity, diversity, and environmental health of coastal forests and shrublands to sustain native wildlife and plant communities, including species of conservation concern.

Objective 3.1 Coastal Shrub Habitat for Breeding and Migrating Landbirds

Same as alternative A

Rationale:

Same as alternative A

Management Strategies/Biological Monitoring:

Same as alternative B

Objective 3.2 Loblolly Pine Forest for Delmarva Peninsula fox squirrel, Brown-headed Nuthatch and Eastern Towhee

Same as alternative B

Rationale:

Same as alternative B

Management Strategies/Biological Monitoring:

Same as B, plus:

- Within 5 years, reduce sika population through continued recreational hunt and professional means of elimination.
- Within 15 years, eliminate the sika population, using an aggressive recreational hunt and year-round removal contract for sika, and monitor population and make adjustments to program as necessary to eliminate this exotic species.

Objective 3.3 Upland Habitats on Wallops Island NWR

Same as alternative A

Rationale:

Same as alternative A

Management Strategies/Biological Monitoring:

Same as alternative B

Goal 4: Southern Barrier Islands Unit (Assawoman, Metompkin, Cedar)

Perpetuate the biological integrity, diversity, and long term viability of natural habitats that support native avian communities and turtles on Assawoman, Metompkin and Cedar Islands through a partnership approach.

Objective 4.1 Barrier Beach and Dunes - Breeding Shorebirds and Turtles

Same as alternative A

Rationale:

Same as alternative A

Management Strategies/Biological Monitoring:

Same as alternative B

Objective 4.2 Barrier Beach, Dune, and Tidal Marsh – Migrating and Wintering Shorebirds

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative B

Goal 5: Partnerships

Working with partners, protect and restore vigorous, viable populations of migratory and resident wildlife, fish, and native plants and their habitats found on the Delmarva Peninsula and identified in state, national, and international treaties, plans, and initiatives. Take a leadership role in collaborative regional efforts to achieve broader conservation goals and serve as a catalyst for achieving a multi-state eco-regional partnership. The refuge will continue to work with partners to explore how best to sustain the resiliency of this unique barrier island system, its communities,

and its economy, consistent with the refuge's mission and in the face of dynamic coastal processes, climate change, and storm events.

Objective 5.1 Regional Conservation

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative B

Objective 5.2 Economic Development

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative B

Objective 5.3 Community Resiliency

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative B

Objective 5.4 Federal Interagency Collaboration and Facility Management

Same as alternative B

Rationale:

Same as alternative B

Strategies:

Same as alternative B

Objective 5.5 Local Conservation of Tidal Creeks, Estuaries, Mudflats, and Nearshore Marine Waters

Same as alternative B

Rationale:

Same as alternative B

Strategies:

Same as alternative B

Goal 6: Visitor Services

People of all ages and abilities develop a stewardship ethic while enjoying their refuge experience and increasing their knowledge of the USFWS, Refuge System, and the refuge.

Objective 6.1 Hunting and Trapping

Within 15 years, work to phase out sika and non-migrant Canada goose populations.

Rationale:

Hunting is one of the priority uses of the Refuge System and is to be facilitated when compatible. Hunting can be used as a management tool to harvest surplus wildlife populations and achieve populations levels appropriate for the available habitat and to support other wildlife populations. Current hunting practices could be expanded to incorporate different species, such as fox and raccoon, and trapping opportunities to further reduce the stress of predators for threatened and endangered species. Efforts to reduce sika and non-migrant Canada goose could aid in the refuge's initiative to decrease the non-native, nuisance, or overabundant species that currently impact native species habitat.

Strategies:

Same as alternative A except:

- Expand hunting opportunities for sika, non-migrant Canada goose, and light goose (designated as non-native, nuisance, and/or overabundant species) to reduce populations. Specifically:
 - Within 5 years, reduce sika population through continued recreational hunt and professional means of elimination.
 - Within 15 years, eliminate the sika population, using an aggressive recreational hunt and year-round contract for sika removal, and monitor population and make adjustments to program as necessary to eliminate this exotic species.
- Within 5 years, introduce/add resident Canada goose and light goose hunting opportunities in refuge impoundments on Assateague Island.
- Within 10 years, use all available tools to minimize or eliminate non-migrant Canada goose (e.g. Provide non-migrant Canada goose hunting on all refuge properties).
- Within 10 years, refuge would assess opening of fox and raccoon hunting by assembling a new opportunity package.
- Within 10 years, assess a trapping program for furbearers (including fox, raccoon, opossum, and nutria) for the public.

Objective 6.2 Fishing and OSV Use

Discontinue OSV access in order to further protect refuge habitats, including a 10 percent increase in piping plover fledgling success rate as an annual average over a 5 year period.

Rationale:

Although current OSV management protects nesting habitat, concerns about OSV use still exist for habitat and species management, visitor experience, and administrative resources. Continuous compaction of the coastal zone habitat and deep tire ruts by repeated OSV trips could have adverse effect on unfledged young, invertebrates, and plant species that are part of the refuge ecosystem. Furthermore, visitor experience can be affected by the disruption of the natural landscape by repeated OSV trips.

Strategies:

Same as alternative B except:

- Continue fishing access by foot along the Atlantic Ocean except in the lifeguarded beach.
- Do not develop new crabbing docks at new Beach Road terminus.

Objective 6.3 Environmental Education and Interpretation

Same as alternative B

Rationale:

Same as alternative B

Strategies:

Same as alternative B except:

- No Wallops Island NWR boardwalk.
- No public canoe/kayak launch to Toms Cove.
- Develop audio message and/or training for shuttle.

Objective 6.4 Wildlife Observation and Photography

Same as alternative B

Rationale:

Same as alternative B

Strategies:

Same as alternative A except:

- Explore opportunities to restrict public use to specific sites during specific times of year (e.g., restrict access to Beach Road to bicycles and pedestrians before 3 p.m. during certain times of year).
- Restrict access on Service Road north of the recreational beach except under permit.

Objective 6.5 Recreational Beach Use

Within 8 years, complete transition of recreational beach and associated parking from current location to new location and, working with the NPS and town of Chincoteague, maintain current level of visitor satisfaction.

Rationale:

The proposed relocation of the 1-mile recreational beach and associated parking would be in response to historic and anticipated impairment to the current recreational beach and parking from natural hazards, such as heavy storm damage to parking lots, overwash events, sea level rise, and the natural movement of barrier beach land forms. The relocation is intended to provide a sustainable situation so that the habitat and recreation portion of the beach can be sustained for as long as possible for both the wildlife of the refuge, and the visitors of the shoreline. A reduction in parking would preserve more undeveloped, natural habitat and would meet the parking needs for most of the year. Based on hourly manual parking counts for shoulder and off-season weekends (approximately 9 a.m. to 4 p.m. in April 2010, May 2010, and September 2010 through February 2011), the demand for parking did not surpass 480 except for Memorial Day and September weekends. A shuttle system and off-site parking would provide access to visitors at times when 480 spaces are insufficient and provide opportunities for interpretation.

Strategies:

Same as alternative B except:

- Reduce beach parking to 480 spaces (approximately 4.25 acres).
- Coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area, as close to the beach as possible, and institute a shuttle service from off-site parking to recreational beach for use during specific times of the year when parking capacity is exceeded (anticipated to be every weekend in May and September and every day from Memorial Day weekend through Labor Day weekend).
 - The shuttle would operate an express route from identified off-site parking to the recreational beach.
 - For purposes of analysis, route length is assumed to be between 5 to 10 miles and one-way route time 12 to 25 minutes; however, the refuge would work with NPS and the Town to identify a site as close to the beach as possible.
 - The estimated frequency would be 10 minutes, assuming three shuttles each with a capacity of 40 people, as well as accommodation of beach gear and bicycles (actual vehicle type dependent on availability, cost, and other factors, but an open-air tram (power and trailer cars) may be considered).
 - Ownership and operation of the shuttle would need to be determined; it may involve USFWS, the town of Chincoteague, or other partner (private or public).
 - Protection from hazardous weather conditions would be provided to shuttle riders in coordination with NPS by providing shelters

Objective 6.6 Other Recreational Uses

Same as alternative B

Rationale:

Although current management of horseback riding protects nesting habitat, concerns about horseback riding still exist for habitat and species management, visitor experience, and administrative resources, especially when combined with the action to discontinue OSV use. Disturbance of the coastal zone habitat by repeated horse passage could have adverse effects on invertebrates and plant species that are part of the refuge ecosystem.

Strategies:

Same as alternative B except:

- No new off-road bicycle or pedestrian trails.
- No public non-motorized launch site at terminus of Beach Road.
- At Beach Road terminus, build a vehicle turn around.
- Continue to allow canoe/kayak access for environmental education and interpretation programs by NPS and the MSC.
- No horse trailer parking.
- Ensure shuttles are wheelchair accessible and equipped with external bike racks.

Goal 7: Refuge Administration

Maintain and enhance refuge infrastructure and operations responsibly and sustainably for the safety and well-being of the wildlife, cultural resources, public, and employees.

Objective 7.1 Outreach, Communication, and Emergency Communication

Same as alternative B

Rationale:

Same as alternative B

Strategies:

Same as alternative B except:

- Establish outreach activities primarily related to protection of wildlife and habitat.

Objective 7.2 Staffing and Volunteer Program/Friends Group

Within 5 years, fill vacancies, establish eight additional permanent, full-time positions, and otherwise sustain current levels of staffing and volunteer programs to achieve refuge purposes to increase citizen science efforts.

Rationale:

Same as alternative B

Strategies:

Same as alternative B except:

- No Education Program Specialist (see Appendix K).
- Utilize the services of volunteers and Friends group primarily in ways that benefit wildlife and promote a stewardship ethic in visitors.

Objective 7.3 Wilderness

Continue to protect and enhance the wilderness character of the proposed wilderness area.

Rationale:

Congressionally designated wilderness lands are that which are “untrammeled (free from man's control), undeveloped, and natural, offering outstanding opportunities for solitude and primitive recreation” (Wilderness Act of 1964). Actions to reevaluate wilderness potential after a change in public use and restriction of activities within the proposed wilderness area would support the Wilderness Act and the refuge's purpose and mission. These areas can also protect watersheds and habitats and provide opportunities for unique scientific research and recreation.

Strategies:

- Continue to protect and enhance the wilderness character for the proposed 1,300-acre wilderness area.
- Conduct a new wilderness review and evaluation after beach relocation.
- Restrict Chincoteague pony access to proposed wilderness area.

Objective 7.4 Cultural and Historic Resources

Same as alternative A

Rationale:

Same as alternative A

Strategies:

Same as alternative A, except:

- Where possible, increase law enforcement patrols on all known sites to inspect for disturbances and illegal digging and or looting.
- Do not invest resources in seeking shipwreck or any new historic structures.
- Limit the number of Chincoteague ponies allowed to graze on the refuge within 15 years to no more than 125 ponies.
- Maintain viewable herd along access to recreational beach and explore options to increase Chincoteague pony viewing opportunities with new relocated beach.

Objective 7.5 Climate Change and Sea Level Rise

Same as alternative A

Rationale:

Same as alternative B

Strategies:

Same as alternative B plus:

- Consider alternative fuel options for shuttle.

Table 2-2: Summary of Project Features by Alternative

Issue	Alternative A	Alternative B	Alternative C
Recreational Beach	- Continue to allow NPS to manage a 1-mile recreational beach. - Continue to allow NPS to maintain 8.5 acres of land (and preserve the capacity of 961 spaces) for parking at the existing recreational beach as long as suitable land base directly behind the recreational beach remains. - Continue to coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area for future use once existing beach parking is lost due to lack of suitable land base behind the recreational beach. - In being consistent with the 1993 Master Plan, as storms and other natural forces eliminate parking spaces adjacent to the beach, implement an alternate means of transportation such as a shuttle system. - Continue pursuit of bicycle trail development via Beach Road to recreational beach to replace the temporary Swan Cove Trail. - Allow hiking/intertidal zone access north of recreational beach.	- Continue to allow NPS to manage a 1-mile recreational beach. - Relocate recreational beach and 8.5 acres of land and parking for 961 vehicles approximately 1.5 miles north of current area. - Allow hiking/intertidal zone access north of recreational beach. - Allow pedestrian access south of recreational beach outside of breeding season, between approximately September 16 and March 14.	Same as alternative B, except: - Reduce beach parking to 480 spaces (approximately 4.25 acres) - Coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area, as close to the beach as possible, and institute a shuttle service from off-site parking to recreational beach for use during specific times of the year when parking capacity exceeded (anticipated to be every weekend in May and September and every day from Memorial Day weekend through Labor Day weekend).
Service Road	Maintain current access of the Service Road.	Close Service Road to all public access north of relocated parking except by special use permit or special day use privileges/openings.	Same as alternative B.

Issue	Alternative A	Alternative B	Alternative C
Beach Road causeway	- Continue current policy to allow access to the recreational beach, Toms Cove, and Toms Cove Hook via Beach Road. - Continue to allow canoe/kayak access for environmental education and interpretation programs by NPS and the MSC.	- Close Beach Road causeway to all public access. - At new road terminus, build a vehicle turn-around, crabbing dock, wildlife viewing tower, and new launching area for small non-motorized vessels. - Continue to allow canoe/kayak access for environmental education and interpretation programs by NPS and the MSC.	- Close Beach Road causeway to all public access. - At new road terminus, build a vehicle turn-around. - Continue to allow canoe/kayak access for environmental education and interpretation programs by NPS and the MSC.
Fishing and OSV Use	Maintain current access and closures.	- Improve signage, promotion, and coordination of the permit process for fishing throughout the refuge. - Create fishing access (e.g., crabbing dock) at new Beach Road terminus. - Close Assawoman Island to fishing during breeding season from March 15 until September 15 or thereafter until the last shorebird fledges. - Expand the OSV zone from the new recreational beach to Fishing Point on Toms Cove Hook and continue to keep the zone open from approximately September 16 to March 14. - Close the OSV zone to public access March 15 through September 15 or thereafter, until the last shorebird fledges. - Develop a designated, year-round area for fishing from south of the recreational beach to approximately .5 mile to the point of closure that would include OSV parking.	Discontinue OSV use.
Horseback riding	Maintain current access.	- Allow horseback riding within new OSV zone. - Develop horse-trailer parking area.	Discontinue horseback riding.

Issue	Alternative A	Alternative B	Alternative C
Hunting and Trapping	• Maintain current hunting policy of big game and migratory bird on Chincoteague NWR. • Maintain current hunting policy of big game on Wallops Island NWR.	Same as alternative A plus: • Introduce non-migratory Canada goose and light goose hunting within Assateague Island impoundments. • Add mourning dove hunting in areas outside of Assateague Island. • Add turkey to big game for youth hunting. • Open refuge for migratory bird hunting on Federal holidays in designated areas of the refuge within Wildcat Marsh, Morris Island, Assawoman Island and Metompkin Island divisions, that occur outside of the current hunting days of Thursday, Friday, and Saturday. • Pursue opening for fox and raccoon hunting on Assateague Island. • Pursue opportunity for fur-bearer trapping on Assateague Island.	Same as alternative A except: Work to eliminate sika and reduce non-migratory Canada goose populations. Same as alternative A plus: • Introduce non-migratory Canada goose and light goose hunting within Assateague Island impoundments. • Pursue opening for fox and raccoon hunting on Assateague Island. • Pursue opportunity for fur-bearer trapping on Assateague Island.
Pony Management	• Continue to allow current population of up to 150.	• Implement revised Chincoteague pony management plan. • Continue to allow for current pony population of up to 150.	• Within 15 years, phase in requirement for Chincoteague pony population to consist of no more than 125.
Cultural and Historic Resources	• Complete restoration of Assateague Lighthouse.	Same as alternative A plus: • Restore Lightkeeper's house, and historic landscaping and facilitate limited public access to cemetery and Assateague Village.	Same as alternative A
Wilderness	• Continue to protect the wilderness character of the proposed wilderness area.	Same as alternative A	• Same as alternative A plus remove Chincoteague ponies from proposed wilderness area and conduct wilderness review after relocation of recreational beach.

Chapter 3

USFWS



Beach Vegetation

Affected Environment

3.1 Introduction

3.2 Physical Environment

3.3 Vegetation

3.4 Wildlife

3.5 Socioeconomic Setting

3.6 Land Use Setting and Transportation

3.7 Visitor Services

3.8 Refuge Administration

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Chapter 3: Affected Environment**3.1 Introduction**

This chapter describes the physical, biological, and socioeconomic environment of the refuge. The physical environment section includes the refuge's geographic setting, its hydrogeomorphic features, soil information, and air and water quality. Biological resources are covered in sections on vegetation and wildlife that discuss how those resources have been influenced by human activity and management. For the refuge's current sociological environment, we explain refuge socioeconomics, land use and transportation, and visitor services. Finally, at the end of the chapter we explain the cultural and historic resources on the refuge, as well as important aspects of refuge administration. The information in this chapter acts as a reference for chapter 4, which documents the Environmental Consequences of each alternative on these resources.

3.2 Physical Environment**3.2.1 Geology and Erosion***Geology*

Regionally, the Delmarva Peninsula lies in the Atlantic Coastal Plain physiographic province, a seaward sloping province bounded on the west by a fall line and the Chesapeake Bay, and on the east by the Atlantic Ocean. The peninsula extends about 200 miles in a north-south direction and includes the State of Delaware and the eastern shores of Maryland and Virginia. The surficial sediments of Assateague Island are discontinuous Holocene Series deposits (tidal marsh and barrier sands). The subsurface sediments of the Delmarva Peninsula form a wedge of unconsolidated sands, silts, and clays that is over 7,000 feet thick and ranges in age from Cretaceous to Tertiary. The subsurface sediments rest on a seaward sloping basement of Paleozoic crystalline rocks. The basement is folded and faulted into a series of northwest-southeast trending ridges and depressions.

The Delmarva Peninsula was formed about 14,000 to 18,000 years ago during the last glacial retreat, when rising sea levels filled the large valley of the lower Susquehanna River, which became the Chesapeake Bay, thus isolating the area from the mainland. Consequently, the Delmarva Peninsula coastline with its barrier islands has changed dramatically since the retreat of the last glacial ice sheets and the melting of the polar icecaps. Sea level has risen more than 300 feet and the shoreline has shifted approximately 50 miles to the west. In general, the continued sea level rise will result in the submerging of the continental shelf and shifting barrier islands landward and upward.

However, the processes of barrier island and marsh-lagoonal system formation, and the migration of barrier islands along the eastern side of the Delmarva Peninsula (formed over several thousand years by broad sea level fluctuations) are not completely understood. One hypothesis is that as the sea level rose along the coastline, beaches retreated. Ridges of beach dunes originally formed by wind-blown sands were breached by storm waves from the rising water. The lowlands between the ridges and the coast were flooded and the ridges became barrier islands.

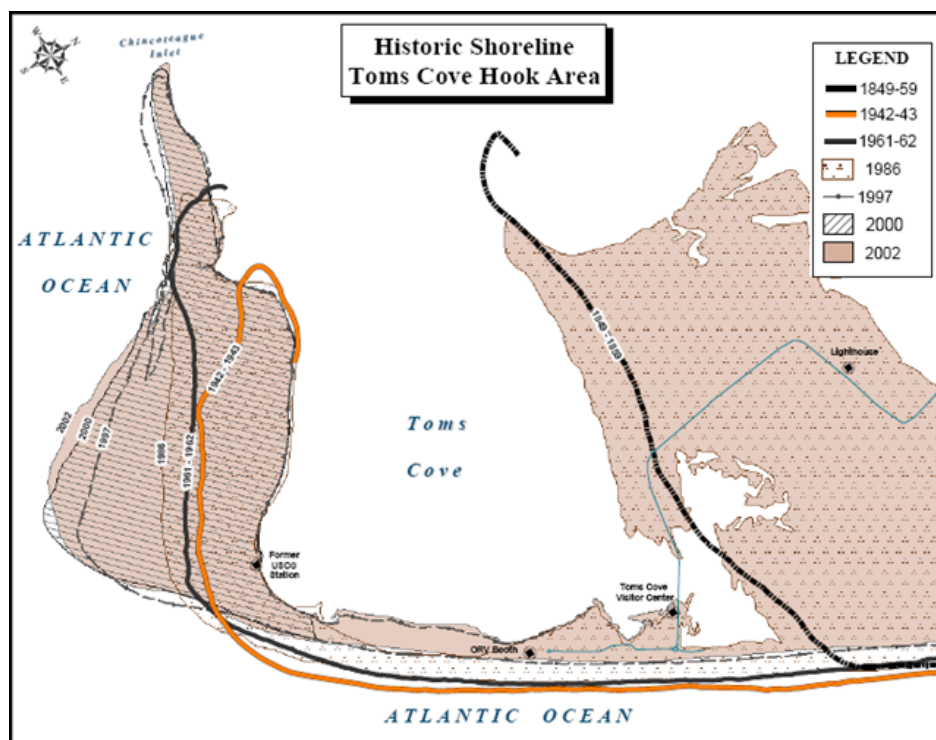
Assateague Island is a sand barrier resting on soft lagoonal mud that contains oyster, clam, and snail shells. The lagoonal mud overlies organic coastal salt marsh mud, and peat, which, in turn, overlies organic debris-rich sandy mud (USACE 1994). The sand and mud surface of Assateague

Island is underlain by 4,500 to 7,500 feet of discontinuous layers of sand, gravel, and clay that have accumulated during 135 million years of continental erosion and coastal action. Cretaceous Cenozoic and Mesozoic sands, silts, and clays account for more than half of the thickness of subsurface sediments (USDA 1994).

Today, Assateague Island (the longest barrier island on the Delmarva coast) is more than 37 miles long, but it is changing daily. Sea level rise, ocean currents, hurricanes and storms, and the very nature of barrier islands have created inlets and divided the island several times over the past few centuries. Geological research suggests that the southern portion of Assateague Island has developed as a series of recurved spits deposited by currents that erode the sands from northern beaches. Historical maps of the island indicate Toms Cove Hook is a sand spit that accreted since the 1850s (Figure 3-1).

Assawoman Island is approximately 2.5 miles long and in recent years joined to Wallops Island when Assawoman Inlet closed. Metompkin Island is 6.6 miles long and is also cut by an inlet. Cedar Island is 6.5 miles in length. Since Cedar Island does not have a large offshore sand supply similar to the other islands, it is moving westward at a greater rate than the other islands in the refuge (USFWS 1993a).

Figure 3-1. Changing Shoreline of Southern Assateague Island (USFWS 2004c)



Topography

Topographically, the Delmarva Peninsula region is nearly flat, indicating the past influence of the ocean and the more recent leveling effects of winds. The topography of Assateague Island, like other Mid-Atlantic barrier islands, rises from the sea to merge into flat and gently rolling sand dunes. These dunes may exhibit a transition from beachgrass to myrtle brush to loblolly pine on higher ground, or fall gently into low-lying potholes and salt meadows in the interior of the island.

Island elevations range from sea level to approximately 14 meters mean sea level (MSL) (about 46 feet) with the bay side of the island mostly timbered with pines and bordered by salt marsh and salt meadows.

Accretion and Erosion—Wind and Wave Effects on Barrier Islands

Due to the natural phenomenon of barrier island systems, Assateague Island is changing. The Maryland Geological Survey estimates that the eastern shore of Assateague Island is eroding at a rate of about 1.5 feet each year. Barrier islands are coastal features composed of sand and other loose sediments transported by waves, currents, storm surges, and winds. They are formed by sediments eroded from glacial deposits, or from ocean bottom sediments and/or coastal plain materials. For every 1-foot rise in sea level, it has been estimated that coastal barrier islands move 100 to 1,000 feet inland. When more sand is deposited than removed, the beach is said to be accreting. When longshore transport results in a net loss of sand, it is eroding. Erosion and accretion rates differ from island to island, as a result of differing sand supplies, prevailing winds, and wave energies; this, coupled with sea level rise, leads to an ever-changing landscape throughout the Virginia Barrier Islands (USFWS 1988).

The near shore zone is an area of wave turbulence and littoral drift where constant ocean currents and wave action create sand bars and shallow troughs that are exposed at low tide. Long shore currents move from north to south, transporting sands to Toms Cove Hook, where they accrete on bars and flats. Accreting spits, like Toms Cove Hook, are often sites for beach ridge development. Long shore currents and waves build new platforms of sand (i.e., beach), and organic debris accumulates on the beach crests. As sands continue to build, plants grow from buried drift lines, accumulating more sand in curved ridges corresponding to the original drift line position. Continued shoreline accretion builds more curvilinear ridges. The resulting spit displays a system of ridges with upland vegetation; between them, low interdunal areas support wetland species.

The beach is the transition area between marine and upland environments. By definition, barrier islands protect other features, such as lagoons and salt marshes, from direct ocean wave attack. Assateague Island protects Chincoteague Bay from the forces of the open sea, providing quiet waters where sands and silts settle out and accumulate. Inlet currents and wave action along the shore push these sediments into calmer areas where they eventually build up into the intertidal zone as sand and mudflats. The intertidal foreshore is flooded and exposed by daily tides; the backshore, separated from the foreshore by a berm, or terrace, is subject to storm waves. Broken rhizomes and beach plant seeds, along with other organic debris, accumulate in drift lines along the backshore. Windblown sands are caught in this debris and build up around sprouting plants. Capable of surviving sand burial, beach grasses grow with the accumulating sand, providing a relatively stable substrate and facilitating dune development. Erosion by storm action or other interference often precludes this process.

3.2.2 Soils

Soils directly influence habitat by shaping the kind and amount of vegetation and the amount of water available. In this way, they indirectly influence the kind of wildlife that can live in an area. Soils are organized into a taxonomic classification system by the USDA, Natural Resources Conservation Service, in which each soil is categorized by order, suborder, great group, subgroup, family, and soil series. Nationwide, there are 12 soil orders. Entisols are the dominant soil order on the refuge. Entisols are soils defined by the absence or near absence of horizons (layers) that clearly reflect soil-forming processes. The soils of the refuge consist of sand, silty loams, and shell

fragments, with sands found primarily on upland areas and silty loams found on tidal marshes and other wetlands. The soils of the refuge are a mixture of several Entisol soil series, all of which have a thermic soil temperature regime and mixed mineralogy as shown in Table 3-1, Figure 3-2, Figure 3-3, Figure 3-4, and Figure 3-5. Chincoteague NWR Soil Cover Map – Cedar Island (USFWS refuge staff). Chincoteague silt loam (0-1 percent slope), Assateague fine sand (2-35 percent slope), Camocca fine sand (0-2 percent slope), Fisherman fine sand (0-6 percent slope), Beach sand (1-5 percent slope), and other Entisol soils that occur within Udorthents and Udipsamments great group soils (see below) are the dominant soils found on the refuge. All of these soils are mixed and intermingled in many locations on the islands. Other associated soil complexes recognized by the soil scientists include Fisherman-Camocca (0-6 percent slope) and Fisherman-Assateague (0-35 percent slope) (USFWS 1992a).

Details for the dominant soil series are:

- Soils of the Chincoteague silt loam series are nonacid Typic Sulfaquents (great group) that are very deep and very poorly drained. They are formed in loamy sediments and are found throughout the refuge impoundments and in salt marshes primarily between the barrier islands and the seaside mainland as well as some barrier tidal flats. Soil permeability is moderately slow and they are very poorly drained with slow runoff, and saturated with salt water. These soils provide habitat for wetland wildlife and spawning grounds for shellfish and fin-fish species. Common plant life consists of cordgrasses, glasswort, and saltgrass. Cultivated crops, nursery stock, pasture grasses and legumes, and loblolly pines are all unsuitable on this soil because of flooding by salt water, wetness, excess salt, and ponding. Construction is similarly unsuitable with additional limitations of low strength and potential groundwater pollution.
- Soils of the Assateague fine sand series are primarily quartz (and other heavy minerals) within Typic Udipsamments (great group). They are very deep and excessively drained with very rapid permeability and are formed in sandy sediments. Assateague soils are found on undulating to steep sand dunes associated with beaches and salt marshes throughout Assateague Island. Assateague fine sand areas are rarely flooded. These soils provide habitat for wildlife and recreation. Common plant life consists of wax myrtle, bayberry, loblolly pine, and beach grasses. Potential for loblolly pine productivity on this soil is moderately high, although some areas support only salt-tolerant shrubs because of salt spray. Seedling survival is limited by moisture stress (very low water storage capacity). Cultivated crops, pasture grasses, and legumes are all unsuited to this soil. Flooding by salt water, low availability of fresh water, and erosion by water (slight) and wind (severe) are limitations.
- Soils of the Camocca fine sand series are Typic Psammaquents (great group) with a mixed mineralogy. Camocca soils are very deep, poorly drained and rapidly permeable. They are formed in sandy sediments and are found in shallow depressions (concave surface) between coastal dunes and on nearly level flats between dunes and marshes. Salt water flooding is common and the soil is periodically inundated by storm tides. The soil provides habitat for wildlife and a foundation for recreation. Common plant life consists of waxmyrtle, cordgrass, and greenbrier shrub community. Some areas support sparse stands of native pines and hardwoods where salt water flooding is less frequent.

- Soils of the Fisherman fine sand series are Aquic Udipsamments with a mixed mineralogy. Fisherman soils are very deep, moderately well drained, have very rapid permeability, and are formed in sandy sediments. They are found on nearly level and gently sloping areas and in depressions of undulating areas (back dunes) associated with dunes and salt marshes on Assateague and Chincoteague Islands. Depth to the water table is usually only 18-36 inches. The soil provides habitat for wildlife and a foundation for recreation. The natural plants are commonly cordgrasses, saltgrasses, and wax myrtle.
- Beach soils are found along a thin strip on the seaward side of the island. These are regularly flooded and generally characterized by poor drainage and are subject to wave, wind, and tidal action. This nearly level to moderately sloping soil unit consists of sandy sediments deposited by wave action. It is used primarily for recreation and for wildlife habitat. Most other uses are limited by flooding with salt water, severe erosion, and accretion of sediments.

Other sulfaquent soils are found in association with tidal marshes located behind the beaches on all three southern islands (Cedar, Metompkin and Assawoman). They have high sulfur content, drain poorly, and subject to tidal flooding, excessive settlement, and salinity (USFWS 1988).

Table 3-1: Soil Map Legend

Soil Abbreviation	Soil Taxonomic Name
As	Askecksy loamy sand
AtD	Assateague fine sand, 2 to 35 percent slopes, rarely flooded
Be	Beaches
BeB	Beaches, 1 to 5 percent slopes
BoA	Bojac fine sandy loam, 0 to 2 percent slopes
BX	Boxiron and Broadkill Soils
CaA	Camocca fine sand, 0 to 2 percent slopes, frequently flooded
ChA	Chincoteague silt loam, 0 to 1 percent slopes, frequently flooded
FhB	Fisherman fine sand, 0 to 6 percent slopes, occasionally flooded
FmD	Fisherman-Assateague complex, 0 to 35 percent slopes, rarely flooded
FrB	Fisherman-Camocca complex, 0 to 6 percent slopes, frequently flooded
MaA	Magotha fine sandy loam, 0 to 2 percent slopes, frequently flooded
MoB	Molena loamy sand, 0 to 6 percent slopes
MoD	Molena loamy sand, 6 to 35 percent slopes
MuA	Munden sandy loam, 0 to 2 percent slopes
PoA	Polawana mucky sandy loam, 0 to 2 percent slopes, frequently flooded
Pu	Purnell Peat
TP	Transquaking and Mispillion Soils
UnK	Unknown
UpD	Udorthent and Udipsamment soils, 0 to 30 percent slopes
W	Water

Figure 3-2. Chincoteague NWR Soil Cover Map – Northern Assateague Island (USFWS refuge staff)



Figure 3-3. Chincoteague NWR Soil Cover Map – Southern Assateague Island (USFWS refuge staff)

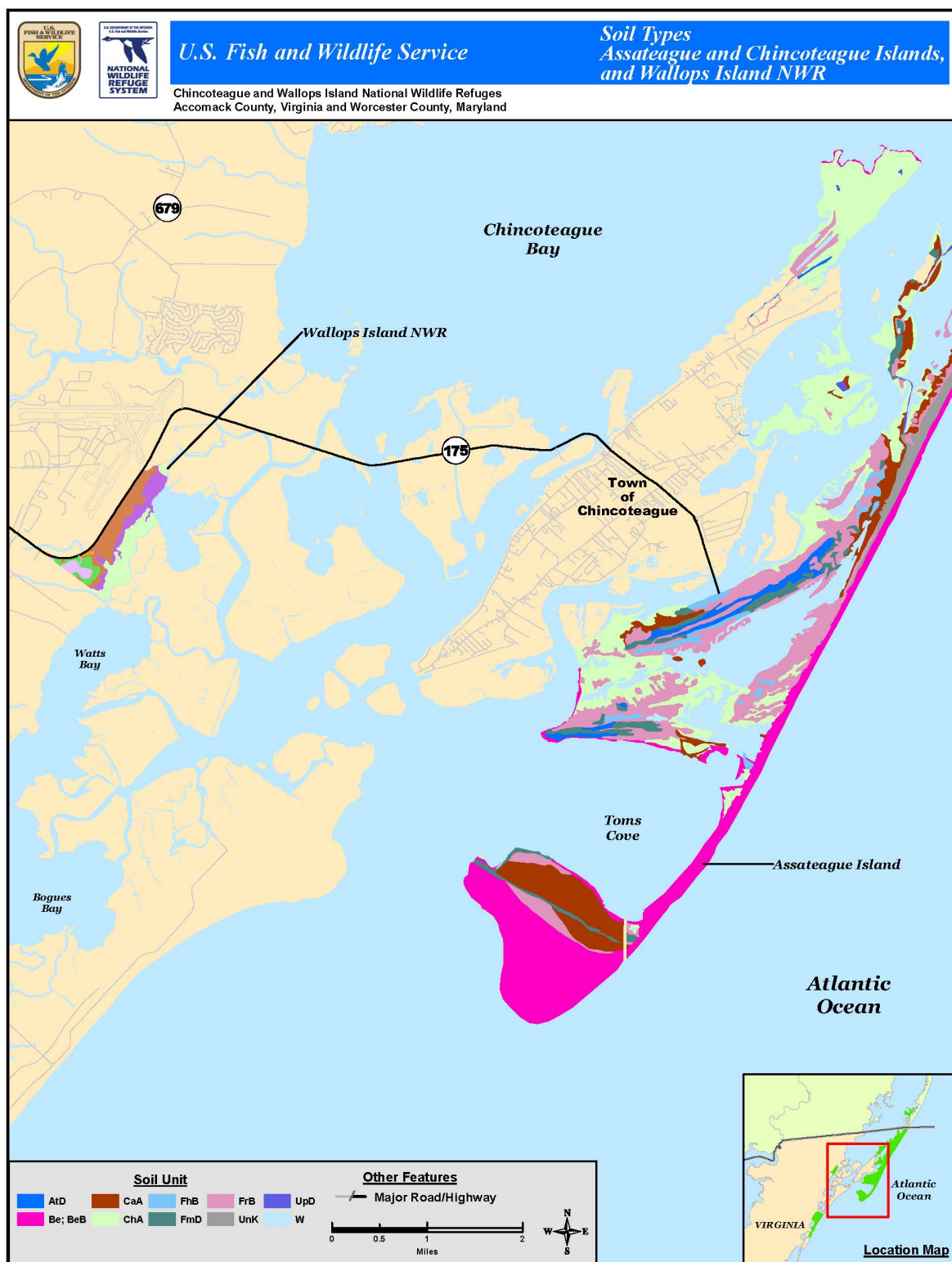


Figure 3-4. Chincoteague NWR Soil Cover Map – Assawoman and Metompkin Island Islands (USFWS refuge staff)



Figure 3-5. Chincoteague NWR Soil Cover Map – Cedar Island (USFWS refuge staff)



3.2.3 Air Quality

Air quality in the area of the refuge is influenced both by local sources of pollutants, such as ammonia from agricultural operations, and by industrial and automobile emissions occurring hundreds of miles away.

Since 2000, a National Atmospheric Deposition Program monitoring station (NADP-MD18) that is located on Assateague Island, adjacent to Assateague State Park in Worcester County, Maryland, has been monitoring atmospheric (wet) deposition of nitrogen, a major source of the nutrient load affecting the coastal bays adjacent to Assateague Island. The NADP station collects rainwater samples weekly and measures them for nitrogen compounds. Atmospheric deposition makes up more than 30 percent of the overall nitrogen load to the bays. Other air pollutants such as mercury seem to be less problematic as recurring surveys of aquatic sediments have failed to detect heavy metals at levels of concern. Recent ozone monitoring data from 2004 to present indicate that the area does experience periodic high levels during the summer months, but that local meteorological conditions serve to moderate the potential threat (National Parks Conservation Association 2007).

The Clean Air Act (CAA) of 1970 (as amended in 1990 and 1997) requires the U.S. Environmental Protection Agency (EPA) to implement air quality standards to protect the nation's health and welfare. National Ambient Air Quality Standards (NAAQS) were set for six pollutants commonly found throughout the United States: lead, ozone, nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter less than 1.0 and 2.5 microns in diameter (PM_{10} and $\text{PM}_{2.5}$).

Regionally, the states of Virginia, Maryland, and Delaware all maintain and operate air quality programs that satisfy the CAA monitoring requirements to assess compliance with the NAAQS. The Office of Air Quality Monitoring in Virginia's Department of Environmental Quality measures ambient air quality at approximately 45 locations throughout the Commonwealth (Virginia Department of Environmental Quality 2007). Maryland's Air Quality Monitoring Program in the Air and Radiation Management Administration, Department of the Environment, conducts ambient air monitoring at 26 sites (Maryland Department of the Environment 2006). The Air Quality Management Section of Delaware's Division of Air and Waste Management, Department of Natural Resources and Environmental Control, maintains an ambient air monitoring network consisting of 11 sites (Delaware Department of Natural Resources 2006 and 2008). Although these monitoring sites are located throughout the region, most of the sites are concentrated in the urban/industrial areas, which have the highest population and largest number of pollutant sources. Areas that meet the NAAQS are designated "attainment areas," while areas not meeting the standards are termed "non-attainment" areas.

On a regional basis (including the refuge), NAAQS for ambient concentrations of lead, carbon monoxide, nitrogen dioxide, and sulfur dioxide are in attainment; and long-term trends indicate that concentrations of the criteria pollutants have either been level or declining.

EPA's Air Quality Index (AQI) is a summary index for reporting daily air quality. It tells how clean or polluted the air is, and what associated health effects might be of concern. The AQI focuses on health effects that humans may have experienced within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the CAA: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. Because all areas of the United States are currently attaining the

NAAQS for lead, the AQI does not specifically address lead. For each of these pollutants, EPA has established national air quality standards to protect public health. The higher the AQI value is, the greater the level of air pollution, and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy at first for certain sensitive groups of people, then for everyone as AQI values get higher (EPA 2011).

More than 80 air quality monitoring sites are located within 100 miles of the refuge. However, the two closest sites, and thereby those two sites assumed to be most representative of the air quality of Assateague Island, are located in Sussex County on the Delaware Eastern Shore, about 70 air miles north of the refuges. They are Lewes (site # 10-005-1003), a coastal site, and Seaford (site #10-005-1002), a suburban site. Calculated AQI values, based on data collected in 2006 and 2007 at these two sites, showed that the air quality in Sussex County (representative of the air quality on the refuge) had good air quality 67 to 70 percent of the time; moderate air quality 26 to 27 percent of the time, and unhealthy/sensitive air quality 4 to 6 percent of the time. The single pollutant responsible for the highest index value is referred to as the “Main Pollutant.” The Main Pollutant was ozone (74 to 75 percent of the time) and particulate matter less than 2.5 microns (25 to 26 percent of the time). High AQI values due to ozone and small particulate matter are often associated with bright summer days and periods of hot, stagnant, summertime air, favoring the formation of ozone and condensation nuclei (EPA 2009).

3.2.4 Hydrology and Water Quality

Hydrology

No natural freshwater streams or lakes exist on the refuge. Rainfall and tidal overwash are the only sources of surface water on Assateague Island. Overwash is the process that causes the transportation and deposition of water and sediment over the beach crest. The man-made moist-soil units (impoundments) are slightly brackish to highly saline because of tidal overwash, salt spray, and the accumulation of salt residue as water evaporates. These same environmental factors also render the shallow groundwater beneath the islands brackish. Evaporation and transpiration account for major surface water depletion during the summer months. The drinking water supply for Chincoteague Island and the refuge comes via pipeline from three deep wells and a shallow well field near the NASA base on the mainland. On Cedar Island, there are approximately a dozen wells, and none currently exist on either Metompkin or Assawoman Islands (USFWS 1988). Large bodies of water bordering the island are the Atlantic Ocean (to the east) and Chincoteague Bay and Assateague Channel (to the west) (USFWS 2007b).

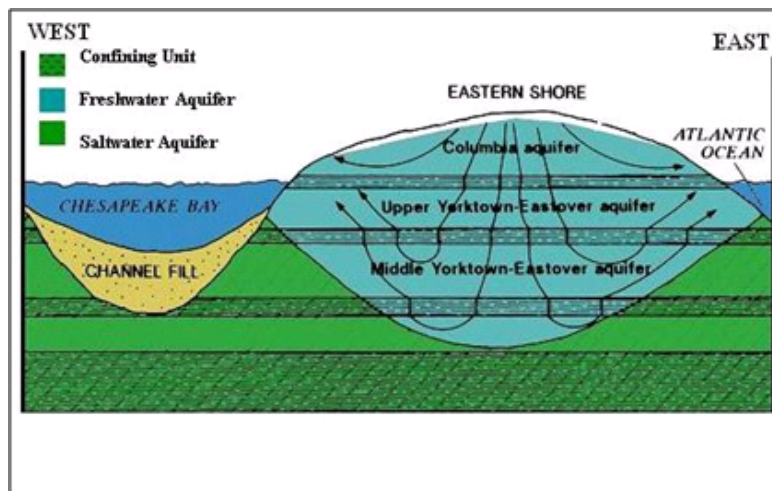
Assateague Island protects Chincoteague Bay from the strong wave activity of the open ocean, which allows for the accumulation of sands and silts that can eventually build up into mud flats. Algal mats, salt marsh cord grass, and mollusk colonies help stabilize the flats. This low salt marsh zone is flooded by tides twice daily. Tides and tidal currents in the inshore waters of Chincoteague Bay are controlled by the inlets at either end of Assateague Island. Ocean City inlet to the north and Chincoteague inlet to the south have mean tidal ranges of 3.4 to 3.8 feet, but near the midpoint between the two inlets in Chincoteague Bay, the tidal range is only about 0.4 feet. Through the

tides, approximately 7 percent of the water in the bays is renewed each day (USACE 1994, USFWS 1992a).

Groundwater

On the Eastern Shore, there are four major aquifers that make up the near surface system (see Figure 3-6). The system is comprised of the near-surface, unconfined Columbia (or Quaternary) aquifer (commonly referred to as the water table aquifer) and a series of deeper, confined aquifers and intervening semi-confining units. The Columbia aquifer is composed of sediments that are primarily sands with inter-fingering clay and silt beds. It ranges from near surface to a depth of about 100 feet, resulting in more susceptibility to surface sources of contamination. Consequently, the Columbia aquifer is not used as a major source of drinking water. The three deeper, confined aquifers deposited during the Miocene era (with depths up to 800 feet) consist of coarse shelly sands and are found in three layers separated by clay confining units. They are known as the Upper Yorktown-Eastover (or Pocomoke) aquifer; the Middle Yorktown-Eastover aquifer, and the Lower Yorktown-Eastover aquifer. The clay confining units help to protect the Yorktown-Eastover aquifer from surface water contamination, and generally the deeper aquifers have better water quality. The clay confining units separating the aquifers are somewhat porous and allow some groundwater exchange between the two deeper Yorktown-Eastover aquifers. Recharge of the aquifers comes from surface water—rain, snow, and leakage from ponds. The total available ground water supply is limited to the amount of fresh water recharging the aquifers from precipitation directly falling on the land surface. The salt water that completely surrounds Assateague Island (Atlantic Ocean and Chincoteague Bay) causes the groundwater to become brackish at relatively shallow depths (Horsley Witten Hegemann, Inc. 1992).

Figure 3-6. Schematic of Ground Water Aquifers—East-West Cross Section of the Eastern Shore of Virginia (Horsley Witten Hegemann, Inc. 1992)



Surface Water

Because there are no perennial freshwater streams on Assateague Island, surface water systems are vitally important for fish and other wildlife on the island and are managed accordingly. Many of the freshwater ponds are surface expressions of shallow groundwater, often ephemeral,

forming during the wet winter months and drying during the summer. Surface waters consist of bays, lagoons, and ponds. The numerous bays and inlets formed by the barrier island serve as a mixing zone for sea water that flows from the east and for the less saline waters from mainland creeks and streams. Due to the lack of a significant freshwater inflow, these back bays are not considered to be estuaries in the classical sense. Nonetheless, they are extremely important as finfish and shellfish areas, providing important nursery habitat for a rich variety of fish (USFWS 1988).

Freshwater wetlands on Chincoteague NWR occur at natural low points in the dunes or flats, or, impounded areas. On Toms Cove Hook, low areas between the beach ridges and dunes collect rainwater and support wetland vegetation. A few other small natural freshwater marshes occur behind the dunes of the northern beach. The refuge's impoundments are located between mean high and spring high tide and abut upland areas as well as fresh or brackish marshes not affected by tides (USFWS 1992a).

Thirteen impoundments covering over 2,650 acres were constructed on Chincoteague NWR to provide submergent and emergent wetland vegetation as forage for waterfowl and habitat for a variety of waterbirds (see Figure 3-7). Management of these impoundments is directed at providing fall and winter habitat for waterfowl and spring/fall stopover habitat for migrating shorebirds. A system of dikes confines these wetlands. Most dikes are also maintained as roads for public and/or staff access. Beach Road from the bend beyond the refuge headquarters to the rotary at the beach is a dike separating Black Duck Pool (A Pool) from the Black Duck Marsh and Swan Cove Pool (F Pool) from Little Toms Cove. Approximately half of the Wildlife Loop is a dike surrounding Snow Goose (B-South Pool), separating it from Black Duck Pool (A Pool), Swan Cove Pool (F Pool), and Shoveler Pool (B-North Pool). The dike between Black Duck and Swan Cove Pool (A and F Pools) is a bike trail. The Swan Cove bike trail, with access to the recreational beach, is built on a dike separating Swan Cove Pool (F Pool) from natural wetlands to the east.

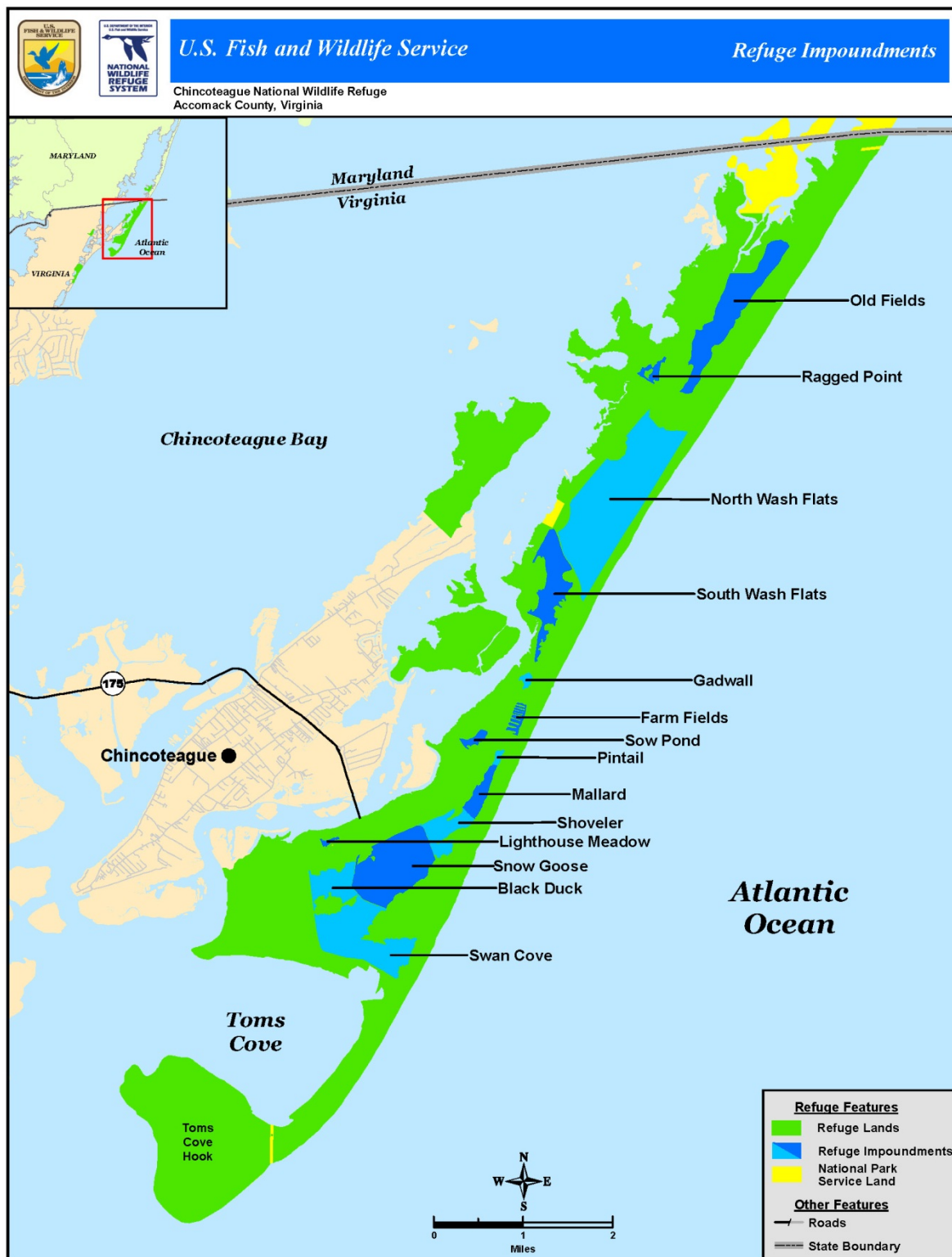
Most dikes have adjacent borrow ditches along their pool side. These ditches serve to:

- provide wading bird resting and feeding habitat;
- provide wading bird and waterfowl brood rearing habitat, an especially important function when drought or impoundment drawdown removes open water from other pool areas;
- facilitate drainage as flow channels to water control structures; and
- restrict visitors to use of dikes only, minimizing intrusion into protected wetland habitats.

Water control structures are used to manipulate impoundment water levels according to which species of plant or animal is being managed. These structures release water either into adjacent pools or through bayside channels into the tidal marshes. Impoundment water level control enables production of good quality wildlife food and assures a variety of wetland habitats for diverse species of wildlife.

In general, impoundments are located above high tide level so estuarine water cannot enter them; however, tidal influx can occur through the Virginia Creek water control structure (WCS) into Old Fields Impoundment. During severe weather and extreme high tides, overwash reaches impoundments from the sea and bay side; Black Duck (A) Pool, Snow Goose (B-South) Pool, Shoveler (B-North) Pool, Mallard (C) Pool, Pintail (D) Pool, Swan Cove (F) Pool, Wash Flats, and Old Fields impoundments are most susceptible. Other than these cases, impoundment water supply comes from direct precipitation. Impoundments receive very little surface run-off because surrounding soils are highly permeable (USFWS 1992a).

Figure 3-7. Refuge Impoundments – Chincoteague NWR (USFWS refuge staff)



Water Quality Concerns

Dissolved ammonia and nitrates are the dominant nutrients in ground water in the area. Submarine discharges from the shallow groundwater aquifer into the estuarine system have been found to carry nutrient and contaminant loads. Chincoteague Bay (and Sinepuxent Bay) suffers from an influx of excess nutrients, primarily nitrogen and phosphorus. As much as one-half of the excess nutrients are believed to come from agricultural sources such as chemical fertilizers and manure generated by intensive chicken production facilities on the mainland. Atmospheric nitrogen, primarily from coal-fired power plants and motor vehicles, is also a significant source (~30 percent) of nutrient deposition into Chincoteague Bay surface waters. These nutrients promote the growth of algae blooms that deplete dissolved oxygen levels in the water when the algae die and decompose, resulting in fish die-offs. Since 1972, the Maryland DNR has documented a decrease in the abundance of forage species such as bay anchovy, menhaden, spot, and Atlantic silverside in Assateague Island's bayside waters. Small forage fish are most susceptible to fish kills when summer algal blooms create anaerobic conditions in shallow bays and canals. Brown tide, a harmful alga that can kill sedentary species such as shellfish, has been documented every year since 1999 in Assateague's bayside waters. Sea grasses have been increasingly stressed by deteriorating water quality and the associated proliferation of algae, which reduce light availability. Bays such as Chincoteague are particularly prone to algal blooms because their waters are exchanged with open ocean waters relatively slowly. At Chincoteague, flushing may take as long as 63 days (National Parks Conservation Association 2007 and Dillow 2002).

Floodplains

The majority of the Chincoteague NWR landmass falls within the one percent flood zone, commonly called the 100 year flood line. The only portions of the island not in the 100 year flood zone are the White Hills, located north of the Wildlife Loop. These hills, with the highest elevation of the refuge, are located within the 0.2 percent or 500 year flood zone (FEMA 2009). The average base flood elevation for the flood zones on the island are approximately eight to nine feet, meaning that this elevation, relative to the mean sea level, has a one percent chance or greater of flooding in a given year as determined by the Federal Emergency Management Agency (FEMA).

3.2.5 Climate Change and Sea Level Rise

Current Climate and Overwash Conditions

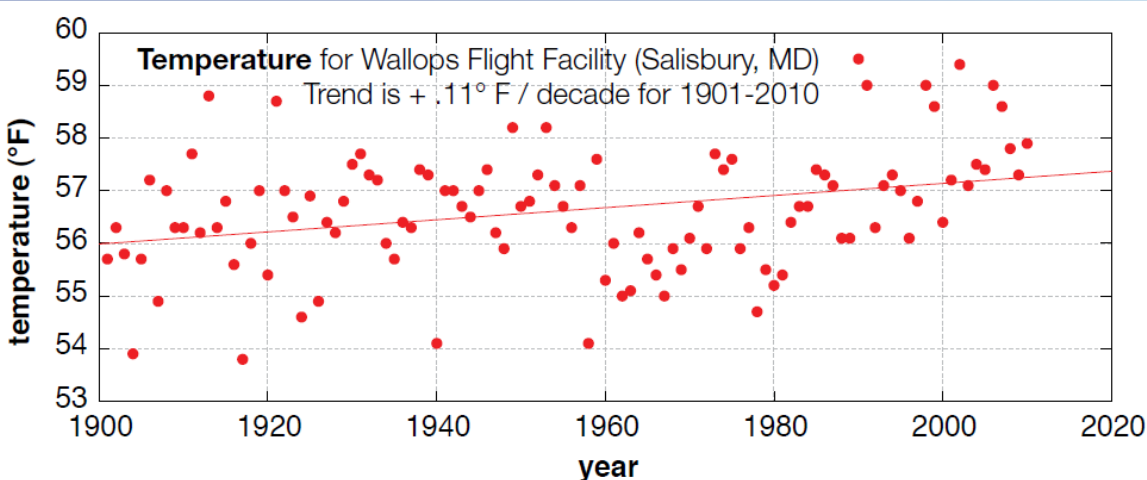
The climate of the refuge is generally temperate and humid. Seasonal temperature ranges are influenced by the moderating effects of the Delmarva Peninsula's proximity to Chesapeake Bay and the Atlantic Ocean. The area lies in the zone of prevailing westerlies, where most weather systems track west to east. The low relief and Atlantic exposure of the refuge make it extremely vulnerable to storms.

The climatic conditions of the refuge are moderated by the Atlantic Ocean. Summer days are typically hot and humid, with prevailing winds from the northeast and southeast. Occasional thunderstorms hit with little notice, presenting danger of lightning strikes and exposure to beach goers and other visitors. Although autumn days are typically cool and clear, the season also marks the onset of nor'easters. These low pressure systems move up the coast, generating storms caused by counterclockwise cycling of moist air. Nor'easters are characterized by heavy rain, strong northeast winds, high tides, and rough seas. Conditions may last for 2 to 5 days. Winter temperatures tend to be mild, though nor'easters are usually more intense, and carry the greatest

potential for overwash of the primary dunes along the ocean side of Assateague Island (USFWS 1992a).

Figure 3-8 and Table 3-2 present historic temperature and precipitation data for Assateague Island. The lowest mean monthly temperature is about 36°F, in January; and, the highest monthly mean temperature is about 76°F, in August. Rainfall is rather uniformly distributed throughout the year averaging about 3.5 inches a month and totaling about 43 inches a year. Annual precipitation totals have ranged from between 30 to 60 inches. Snowfall is light, with February historically having accumulations of about two inches. Total annual snowfall is only about 5 inches (Southeast Regional Climate Center 2007 and USFWS 2007d).

Figure 3-8. Daily Average Temperature for Assateague Island National Seashore area, and Predicated Future Climate Change (NASA 2012)



		2020's	2050's	2080's
	Average Annual Precipitation	0 to +10%	0 to +10%	0 to +15%
	Sea Level (inches)	+2 to +5	+7 to +11	+12 to +21
	Sea Level–Rapid Ice Melt Scenario (inches)	+5 to +9	+19 to +28	+42 to +56
	Average Annual Temperature (F°)	+1.5° to +2.5°	+2.5° to +4.5°	+3.5° to +6.5°

Table 3-2. Temperature and Precipitation Data Assateague Island Area (12/1/1955 to 4/29/2012) (Southeast Regional Climate Center 2012. <http://www.sercc.com/>)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	46.7	49.1	56.8	66.8	75.1	82.8	86.7	85.3	79.7	69.7	60.4	50.7	67.5
Average Min. Temperature (F)	29.5	30.8	37.4	45.9	55.0	64.0	68.8	67.4	61.3	50.4	41.8	33.3	48.8
Average Total Precipitation (in.)	3.48	3.22	4.16	3.12	3.38	3.82	4.61	4.17	3.60	3.66	2.99	3.62	43.82
Average Total SnowFall (in.)	3.9	2.7	1.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	9.4

The tropical storm and hurricane season runs from June through November. Summer season hurricanes, occurring June through August, originate over the Atlantic in the vicinity of the Bahamas, Leeward, or Windward Islands. Storm centers usually remain offshore, bringing heavy rains, high winds, high tides, and rough seas. Hurricanes and storms occurring later in the season, September through late October, tend to originate in the Caribbean. Though hurricane storms lose much of their force as they travel across the southeastern states, they still carry a potential for devastating effects when they reach the Delmarva Peninsula.

Past documentation and observations show that normal daily tide cycles and coastal storm processes actively change the configuration of the coastline. Normal low-energy processes move small volumes of sand and are both erosional and depositional in nature. High-energy coastal storm processes involve large volumes of sediment movement (Kraft and John 1976).

One of these high-energy storms, nor'easter Ida, occurred in November 2009, and struck Chincoteague NWR and Assateague Island National Seashore. This storm damaged public beach parking lots, which were washed away or buried under three feet of sand; brought about a tidal overwash of part of Assateague Island such that Toms Cove Hook was not accessible during high tide; and resulted in the flooding of Swan Cove Pool (F Pool), which put significant hydraulic pressure on Beach Road and undermined the road's structural stability. This storm also closed the refuge and seashore for several days and limited access for some time thereafter (Volpe National Transportation Systems Center 2009). Though storms of this magnitude have historically been sporadic, the refuge has been experiencing more frequent nor'easter activity with multiple big coastal storms making landfall during a single season, creating more rapid landscape and coastal changes. Table 3-3, below, is taken from the Chincoteague NWR: Recreational Beach Structural Decision Making Study (2011) and lists all the notable storm events since the 1800s. There have been a number of significant storms recorded over the last 200 years, some which have caused great damage to the refuge, such as the March 1962 nor'easter that destroyed most of Assateague

Island's natural foredune, and the storm in January 1992, which destroyed much of the dune line on the lower portion of the island and greatly reduced the primary dune line to the north.

More recently, in October 2012, the refuge was significantly impacted by damaging winds and water as a result of Hurricane Sandy. Trees knocked down by strong winds fell across many refuge roads and trails. One remote restroom was destroyed, some shingles were lost, and the bunkhouse roof was damaged, but other refuge buildings were spared major damage. Earthen dikes surrounding refuge impoundments suffered some erosion but there were no major breaches in these dikes. There was one ocean breach, just north of parking lot 1. All beach parking lots were washed over by the storm surge, which compromised the clay base and shell surface. The asphalt surface and shoulders of Beach Road were significantly damaged.

Table 3-3. Notable Chincoteague NWR Storm Events Since the 1800s

1800s	1900 – 1999 (100 years)	2000 – 2012 (13 years)
1878 - September Gale	1933 – August Hurricane	2000 – December Snowstorm
1888 - Great Blizzard	1936 – September Hurricane	2003 – North American Blizzard
	1962 – Ash Wednesday Storm	2005 – North American Blizzard
	1976 – NE U.S. Blizzard	2006 – Late November Nor'easter
	1984 – November Nor'easter	2007 – April Nor'easter
	1991 – 'Perfect Storm'	2009 – November Nor'easter (Nor'Ida)
	1993 – 'Storm of the Century'	2009 – December Nor'easter
	1994 – Christmas Nor'easter	2010 – March Winter Storm
	1996 – North American Blizzard	2010 – November Nor'easter
	1997 – April Fools' Day Blizzard	2010 – December Blizzard
		2011 – January Blizzard
		2011 – Hurricane Irene
		2011 – October Nor'easter
		2012 – Hurricane Sandy

Coastal storms with sustained winds can lead to prolonged flooding of refuge impoundments and roads and increase the erosion of refuge dunes. The surge of storm water landward results in heavy saltwater intrusion of freshwater wetlands and adjacent upland habitats. Long-term geologic changes from these coastal storms include beach erosion, dune erosion, and possible inlet formation from stronger flood and ebb tide surges (USFWS 2011b).

Wind and saltwater intrusion, nearshore channeling, and sedimentation also cause landscape changes. The advent of overwash along barrier coastlines is determined by the height and wave parameters. In general on the east coast, overwash threshold conditions have been steadily increasing since the 1990s. The refuge has been experiencing more frequent nor'easter activity with multiple big coastal storms making landfall during a single season, creating more rapid landscape and coastal changes. For example, the coastal storms of December 10 to 14, 1991, and January 4, 1992, had associated storm surges of up to 8.5 feet above mean high water. After these two storms, overwash and breaching of dunes occurred at scattered locations along the Delmarva Peninsula. This increased occurrence and severity of shoreline regression and overwash are continuously transforming the profile of Assateague Island, as shown in Figure 3-9.

Figure 3-9. Changes in shoreline of Assateague Island, 2006 through 2013, with consistent marking of the same features over time (Patrick J. Hendrickson)



Global Climate Change and Warming

According to NOAA and NASA data, the Earth's average surface temperature has increased by about 1.2 to 1.4°F since 1900 (IPCC 2007). In January of 2008, NOAA reported that seven of the eight warmest years on record have occurred since 2001, part of a rise in temperatures of more than 1°F since 1900. Within the past three decades, the rate of warming in global temperatures has been approximately three times greater than the century scale trend (NOAA 2008). If greenhouse gases, primarily carbon dioxide, methane, and nitrous oxide, continue to increase, climate models predict that the average temperature at the Earth's surface could increase from 3.2 degrees Fahrenheit (°F) to 7.2°F above 1990 levels by the end of this century (IPCC 2007).

The effect of climate change and global warming are anticipated to result in changes in weather/rainfall patterns (fewer but more intense storms), decreases in snow and ice cover, rising sea levels, and stressed ecosystems. For the Mid-Atlantic region, this can mean extreme precipitation events, greater likelihood of warmer/dryer summers, and wetter/reduced winter cold. During the past 100 years, the average temperature in the Mid-Atlantic region has risen by nearly 1°F, and precipitation has increased by up to 10 percent. Compared with today's temperatures, climate models project that the region's climate may become approximately 2°F warmer by 2030, with an additional 3°F to 8°F average temperature increase by the end of the 21st century — all leading to alterations of ecosystems, habitats, and species distributions due to these changes in weather patterns (EPA, NPS, and USFWS 2009).

Global warming, resulting in both melting of glaciers and ice sheets and ocean water thermal expansion, will cause sea levels to rise. Worldwide measurements of sea level show a rise of about 0.17 meters (0.56 feet) during the 20th century (NASA, August 12, 2009). New satellite measurements reveal that the Greenland and West Antarctic ice sheets are shedding about 125 billion tons of ice per year (Solomon 2007). Considering that land less than 10 meters above sea level contains 2 percent of the world's land surface, but 10 percent of its population, major impacts in the United States will be felt by large numbers of people living on the low lying coastlands. We commissioned a study using the sea level rise model simulation Sea Level Affecting Marshes Model (SLAMM) to predict refuge impacts from future sea level rise, based on an estimate of a one meter rise in sea level along the Virginia coast line by the year 2100. This assumption is

consistent with Virginia's Climate Change Action Plan (Governor's Commission on Climate Change 2008). Rising sea levels will result in tidal marsh submergence and habitat migration as salt marshes transgress landward and replace tidal freshwater wetlands and brackish marsh, in addition to increased beach and shoreline erosion due to wave activity. The SLAMM analysis further projects that climate change could cause a variety of coastal habitat changes, including increased loss of barrier islands and wetlands; increased risk of shoreline flooding due to sea level rise, storm surge, and extreme overwash events; and alterations of ecosystems and habitats due to changes in weather patterns.

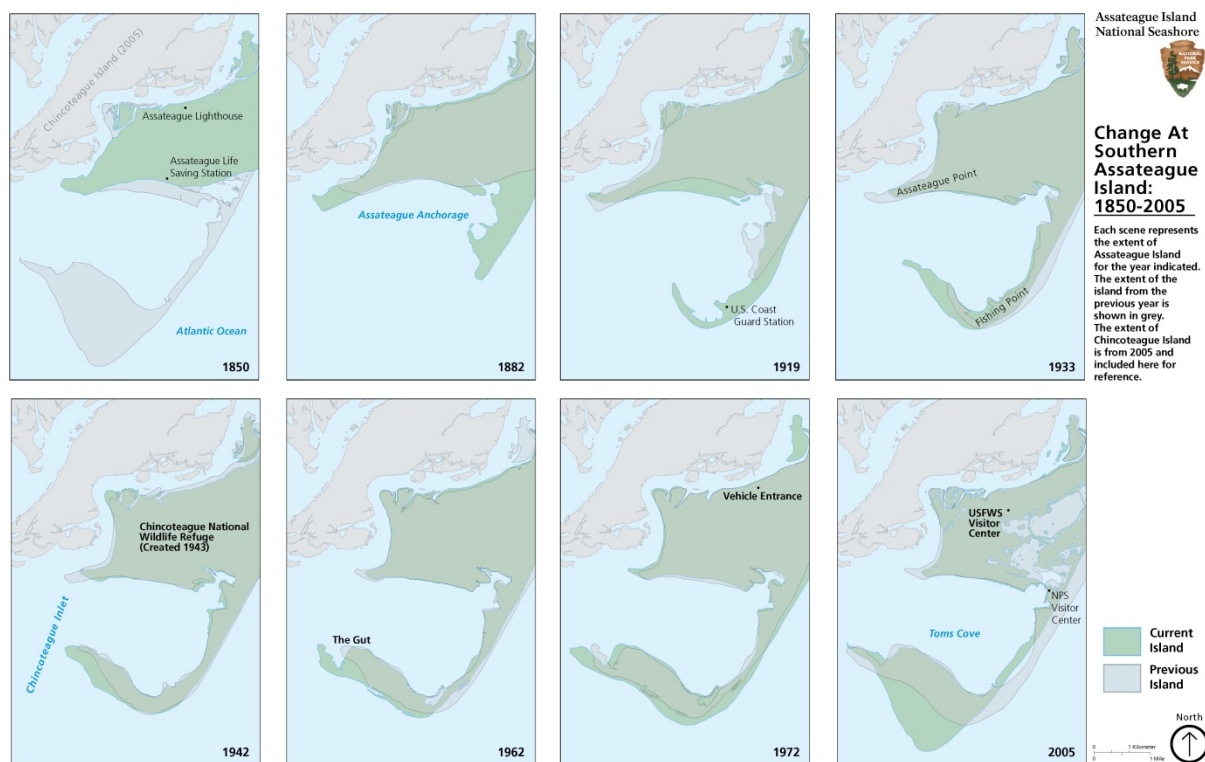
The Intergovernmental Panel on Climate Change (IPCC) estimates that 20 to 30 percent of plant and animal species will be at risk of extinction if temperatures climb more than 1.5° to 2.5°C (Solomon 2007). Warmer air or water temperatures can also impact animal species. For example, evidence suggests that the gender of sea turtles is determined by the surrounding temperature at critical stages in development, with warmer temperatures producing more females. Warmer temperatures could thus create reproductive problems for an already declining species (Mrosovsky and Provancha 1992). A recent study of the effects of climate change on eastern U.S. bird species concluded that as many as 78 bird species could decrease by at least 25 percent, while as many as 33 species could increase in abundance by at least 25 percent (Matthews et al. 2004).

Potential Effects and Shoreline Vulnerability due to Climate Change and Sea Level Rise

DOI Secretarial Order 3226 states that there is a consensus in the international community that global climate change is occurring and that it should be addressed in Federal governmental decision-making. This Order requires Departmental planning and decision-making to take climate change impacts into account. Additionally, it calls for the incorporation of climate change considerations into long-term planning documents, such as a CCP. It is difficult to predict the specific effects climate change and potential sea level rise will have on the refuge in the future, but past and current events have been documented and analyzed to allow for more informed management. As a barrier island with an elevation of no more than 46 feet (14 meters) at its highest points, Assateague Island will be greatly affected by the predicted changes in sea level associated with global climate change. Furthermore, the refuge is located in a "hotspot" of accelerated sea level rise. For this "hotspot," which spans 1,000-kilometers along the highly populated North American Atlantic coast north of Cape Hatteras, scientists estimate that sea level rise increased at a much higher rate than the global average between 1950 to 1979 and 1980 to 2009 (Salinger 2012).

Meteorological and climatological events, such as hurricanes and sea level rise, pose challenges for refuge management, and continuously morph the landscape of the refuge. To highlight the change in shoreline, Figure 3-10 shows the historic shoreline change of southern Assateague Island. This figure represents how significantly a barrier island can change in a mere 150 years, and specifically shows the variability in the refuge's shoreline due to increased storm activity, continued shoreline erosion, and sedimentary transportation events such as overwash.

Figure 3-10. Shoreline Change for Toms Cove, Assateague Island, from 1850 to 2005 (Assateague Island National Seashore/NPS staff)



Further climate change related stressors will likely enhance impacts on shoreline morphology even more in years to come. Using past climate and weather data, we commissioned a study to project the effects of sea level rise on the barrier islands extending from Ocean City Inlet, Maryland to Fisherman Island, Virginia in the Delmarva Peninsula with a main focus on Chincoteague NWR, incorporating the SLAMM model (Nieves 2009). The study itself used three different model scenarios for sea level rise: the IPCC prediction of 0.7 m by 2100, and a 1 m, and 1.5 m global sea level rise by 2100. Simulations were executed in 25 year increments from the date of available existing conditions (1988-2003) until 2100. The study found that the most significant changes would occur on the eastern shore beaches and marshes. A significant conversion of salt marsh to open estuarine water is anticipated for Assateague Island and other barrier islands within the refuge by 2075 or 2100 in the 1.0 and 1.5 meter rise scenarios, respectively. Ocean beach habitat would decline by 80 percent by the year 2100 in the 1.0 meter sea level rise scenario, while estuarine beaches, on the other hand, are projected to gain habitat. Table 3-4 shows the total habitat change percentages for the refuge assuming the 1.0 m sea level rise by 2100 scenario, which the refuge currently uses for management purposes.

Table 3-4. One meter sea level rise scenario by 2100 (Nieves 2009)

	Area of habitat change					Percentage of habitat change				
	Initial Condition	2025	2050	2075	2100	Initial Condition	2025	2050	2075	2100
Dev. Dry Land	3021	3021	3021	3018	3003	0.5%	0%	0%	0%	1%
Undev. Dry Land	164043	153740	148629	142518	133655	28.6%	-6%	-9%	-13%	19%
Swamp	56721	65889	67200	67609	64828	9.9%	16%	18%	19%	14%
Inland Fresh Marsh	8120	8484	8541	8564	8527	1.4%	4%	5%	5%	5%
Tidal Fresh Marsh	635	583	567	521	452	0.1%	-8%	-11%	-18%	-29%
Trans. Salt Marsh	3016	3102	3966	4953	9205	0.5%	3%	32%	64%	205%
Saltmarsh	30374	29728	28798	22076	13055	5.3%	-2%	-5%	-27%	-57%
Estuarine Beach	1304	1275	1721	2405	3940	0.2%	-2%	32%	84%	202%
Tidal Flat	41220	39610	32746	34430	31477	7.2%	-4%	-21%	-16%	-24%
Ocean Beach	1618	1558	1443	1025	329	0.3%	-4%	-11%	-37%	-80%
Rocky Intertidal	1	1	1	0	0	0.0%	-7%	-44%	-78%	-95%
Inland Open Water	1395	1372	1349	1304	1231	0.2%	-2%	-3%	-7%	-12%
Riverine Tidal	489	284	222	75	53	0.1%	-42%	-55%	-85%	-89%
Estuarine Open Water	124230	127702	144259	163248	185390	21.6%	3%	16%	31%	49%
Open Ocean	109667	110426	111124	112206	113765	19.1%	1%	1%	2%	4%
Brackish Marsh	19164	18761	14020	6403	3362	3.3%	-2%	-27%	-67%	-82%
Inland Shore	33	30	30	30	29	0.0%	-10%	-10%	-10%	-10%
Tidal Swamp	9108	8593	6524	3774	1860	1.6%	-6%	-28%	-59%	-80%
Grand Total	574159	574159	574159	574159	574159	100.0%	(-) pct. habitat loss			

As can be derived from the data, most of the habitat diversity on the refuge will be lost or reduced due to shifts in habitat types. The rise in sea level will cause the shoreline and the near shore habitats to recede back and diminish, decreasing near shore habitats such as the ocean beaches and tidal flats. This increased sea level will quickly envelop the coastline, turning most of the current coastal habitats into transitional zones, where the inland fresh water meets with the rising salt water. As can be seen in the table, by 2100 most of the habitat will be open water, estuarine beach, or transitional salt marsh. Most of the smaller diverse habitats will be lost, and these main broader habitats will envelop most of the refuge.

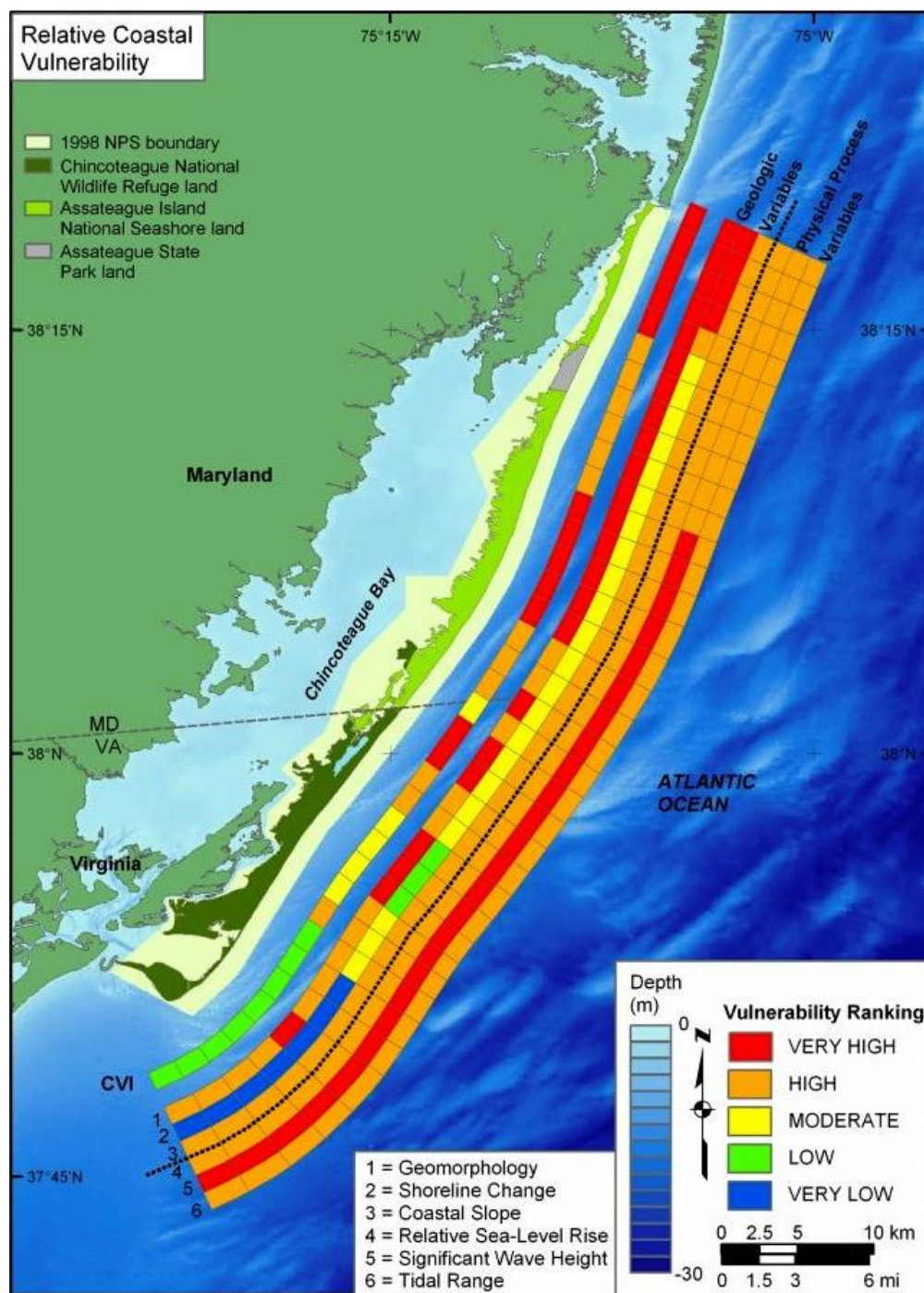
These changes in shoreline and refuge habitat have already been observed in the refuge. Severe overwash events, as documented in the Chincoteague NWR: Recreational Beach Structured Decision Making (SDM) Process Study (2011), have already begun to deposit more sand on the shores of the refuge, and move the shoreline westward. The first photo (Figure 3-11) from 1991 shows the parking area and visitor center that was located behind the artificial dunes. The second photo (2003) shows the deposition of sand after a storm that is building the island to the west.

Figure 3-11. Chincoteague NWR parking area (1991) and Overwash Event (2003) (USFWS 2011b)

Furthermore, a 2004 study by the USGS assessed the coastal vulnerability of Assateague Island to sea level rise based on six variables (geomorphology, shoreline erosion/accretion rate, coastal slope, relative sea level rise rate, mean wave height, and mean tide range). It reports that over 60 percent of the 37 miles of shoreline of Assateague Island are classified as being very highly vulnerable or highly vulnerable to future sea level rise and future storm washover events, as was outlined in the SDM study. The areas within Assateague Island that are the most vulnerable to sea level rise are those with the highest occurrence of overwash and the highest rates of shoreline change. These areas are found predominantly on the north end of the island. Details are given in Figure 3-12. (Pendleton 2004).

Low-lying islands will always face impacts from global climate change, particularly rising sea level and coastal storms. Such occurrences have already been experienced; however, these events may become more frequent and severe within the 15-year time period covered by this CCP, based on recent projections by the IPCC (Solomon 2007). Saline intrusion into the subsurface freshwater lens from sea level rise and saltwater inundation of surface freshwaters from storm surges can alter coastal ecosystems and freshwater marshes resulting in more salt-tolerant aquatic plant communities.

Figure 3-12. Coastal Vulnerability Rankings for Assateague Island (Pendleton 2004)



3.3 Vegetation

From sandy beaches along the island's seaward side to salt marshes on the western bay side, Assateague Island hosts a wide variety of habitats and vegetative communities. A diverse array of environmental conditions—elevation, the availability of water, ranging from fresh to salt, distance from the impacts of the ocean, the movement of sand, storm-driven winds and seas—all work to shape these habitats and vegetative communities, providing unique environs within which a plethora of different species live.

Chincoteague NWR is a dynamic area with constant fluctuations in its shoreline boundaries and habitat acreage. Current vegetation cover is strongly associated with a certain habitat, and is so described in this section. There are five major habitat types found on the refuge (which include three smaller divisions: Assawoman Island, Metompkin Island and Cedar Island). They are: Beach-Dune habitat (approximately 1,800 acres); Shrub-Early Successional habitat (approximately 2,900 acres); Forested Uplands habitat (approximately 1,800 acres); Impoundments and Freshwater Wetlands habitat (approximately 2,000 acres); and over 5,800 acres of salt marshes.

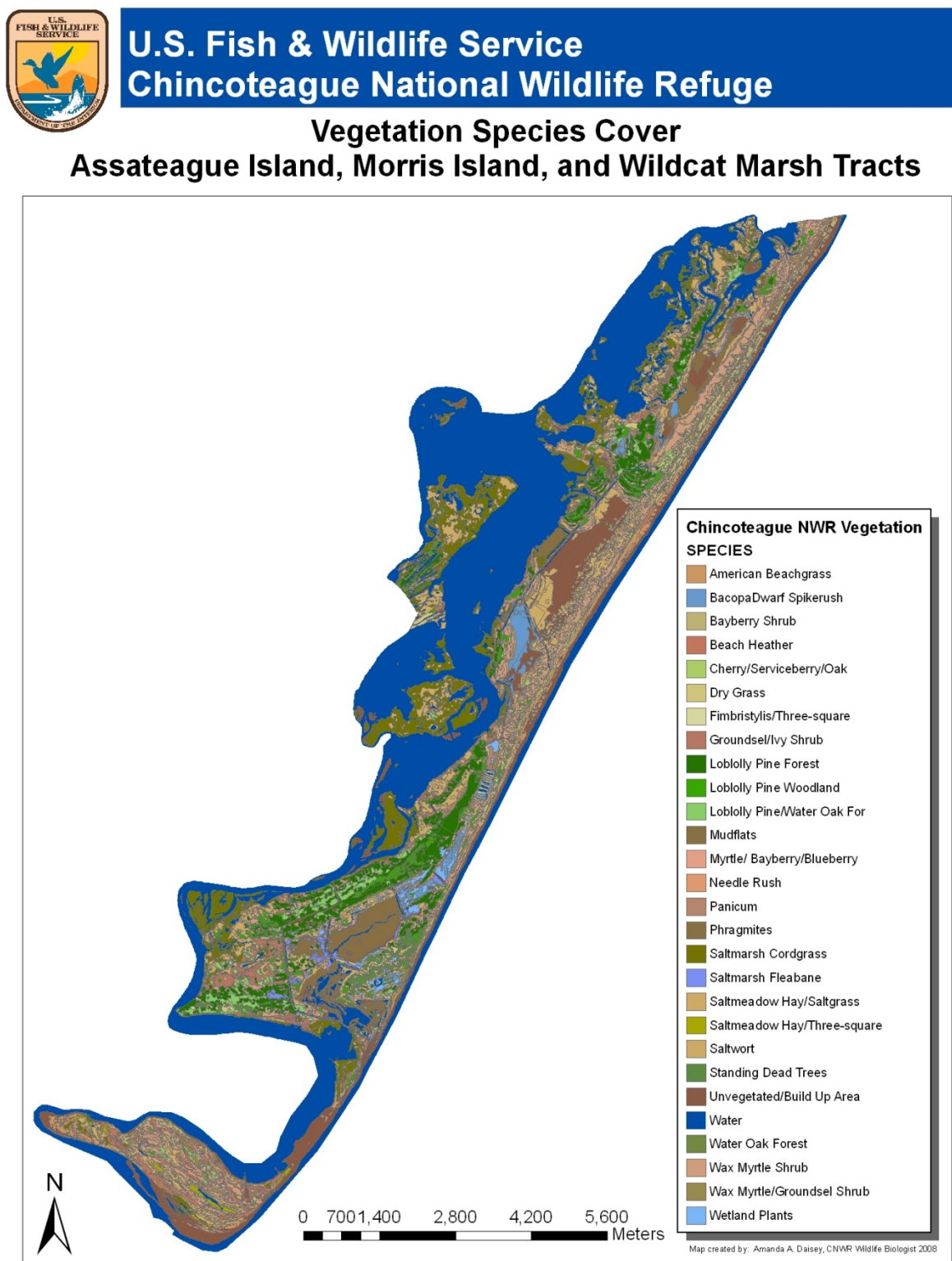
This section describes habitat types and vegetation for the refuge. Habitat type descriptions are separated into the Assateague Island Unit (Figure 3-13), the Southern Barrier Islands Unit of Chincoteague NWR, and Wallops Island NWR. Latin names for vegetation can be found in Appendix L.

3.3.1 *Assateague Island Unit*

The most dominant vegetation on Assateague Island is the loblolly pine and loblolly pine/hardwoods maritime forest, encompassing much of the upland habitat, with salt marsh grasses encompassing much of the lowland habitats. Associated upland plant species include southern red oak, sweetgum, and sassafras. Understory associates include wild grape, Japanese honeysuckle, greenbriar, and American holly. The predominant vegetation in the open areas includes a variety of grasses, wax myrtle, and groundsel tree. Common fresh marsh vegetation consists of dwarf spike rush, smartweed, fleabane, swamp rose mallow, American three-square, umbrella-grass, saltgrass, beggartick, cattail, and eastern baccharis. Salt marsh vegetation consists mainly of salt marsh cord grass and salt meadow hay.

Seabeach amaranth was federally listed as threatened in 1993 by the USFWS. Seabeach amaranth is an annual plant species that occurs on the upper beach and sparsely vegetated overwash fans and inter-dune areas. This species appears to require extensive areas of barrier island beaches and inlets functioning in a relatively natural and dynamic manner. In the absence of overwash and storms, other plants less tolerant of disturbance colonize the sparsely vegetated areas and ultimately outcompete amaranth. Threats include beach stabilization efforts (particularly the use of beach armoring, such as sea walls and riprap), intensive recreational use, and herbivory (grass eating) by white-tailed deer, sika, and Chincoteague ponies.

Figure 3-13. Chincoteague NWR Vegetation Map (Source USFWS Refuge Staff)



Seabeach amaranth was first documented on the refuge in 1966 by Dr. Elizabeth Higgins as a graduate student, and the species was also present in 1967 and 1972. It was not recorded on the refuge between 1972 and 2001, nor were any surveys documented. In 2001, nine plants were found just south of the Maryland/Virginia border, a year after the NPS began a program to restore the species in Maryland. Since 2001, refuge staff has conducted surveys for seabeach amaranth on the beaches of Assateague Island each August, often in conjunction with NPS personnel. The number of plants identified varies but a peak of 69 plants was documented in 2005.

In addition to seabeach amaranth, Assateague Island supports several other rare plants, in particular: seabeach knotweed, sea purslane, seabeach orach, and seabeach sandwort, which all occupy beach habitats similar to amaranth.

Fragile communities of submerged aquatic vegetation along Assateague's bay side are an important component of the estuarine ecosystem. Beds of sea grasses such as eelgrass and less abundant widgeon grass provide shelter for mollusks such as the Atlantic bay scallop, critical nursery habitat for fish and crustaceans, and foraging grounds for waterfowl, river otters, and other animals. Sea grasses are extremely sensitive to water quality. Excess suspended sediments and algal blooms caused by nutrient enrichment can kill sea grass by blocking sunlight. Boats can also destroy sea grasses in shallow waters when they become grounded or when propellers churn through and tear up the grasses. Boating restrictions help protect against this damage. A southern corridor provides access to the north side of Toms Cove for personal watercraft from nearby Chincoteague Island. Another corridor provides access to the north end of the island close to Ocean City where boat traffic has traditionally been heaviest. All other personal watercraft use within Assateague Island National Seashore is prohibited.

Beach – Dune

This habitat type covers approximately 970 acres, or 10 percent, of the Assateague Island Unit. Its width varies along its 27 km (17 mile) interface with the ocean. Considered pioneer species, beach plants are exposed and adapted to constantly shifting sands, limited fresh water, temperature and wind extremes, and frequent salt water spray and overwash. The entire community can be covered by tidal surges. The beach extends from the intertidal zone into the dunes along the entire east and south sides of Assateague Island. Smaller areas are along Toms Cove and Assateague Point and Channel. The most common beach species are American sea rocket and sea lavender.

The dune habitat serves as a line of defense against storm surges, protecting other habitats from alteration due to salt water intrusion. A gradual transition to the dune grass community occurs beyond the high tide line. Dune grass establishes readily on the stabilized dunes as well as in natural areas. Characteristic species are American beach grass, sea oats, saltmeadow cordgrass, seaside goldenrod, dune sandbur, rough buttonweed, carpetweed, and seabeach evening primrose. Seabeach amaranth occurs in very low numbers.

Shrub-Early Successional

Between the dunes and the upland forest community lies a lower, flat expanse (swales) with a successional shrub community that covers about 2,872 acres (roughly 25- 30 percent) of the Assateague Island Unit. Deciduous trees, shrubs, and vines are the predominant plant forms. This shrub community is important for migrating and nesting songbirds, as well as to migrating monarch butterflies. The shrub habitat adjacent to the freshwater impoundments and the transition zone between the forest and salt and fresh water marshes provide important foraging

for a variety of neotropical migrant birds. The shrub community composition varies with groundwater supply, elevation, proximity to salt spray, and frequency of tidal inundation. In general, the shrub community vegetation zone extends north and south on barrier flats and backdunes, gradually merging on the east with dunegrasses and on the west with forests or marshes. The majority of shrub habitat is scattered throughout the refuge with most adjacent to the forests, saltmarshes, and impoundments. In the sheltered zone beyond the dunes where fresh water is more plentiful, vegetative cover can reach 80 percent and is predominantly characterized by less salt-tolerant shrubs and thickets. Here, taller plants undergo a natural pruning process, as salt-laden winds blowing over the dunes stunt their growth.

Common species in these areas include wax myrtle and northern bayberry, which provide food and cover for songbirds, small rodents, and rabbits. Other common shrub species include black cherry, serviceberry, blackberry, poison ivy, and greenbrier. Evergreens are less frequent, but include red cedar and American holly. False heather or beach-heath along with jointweed and broom-sedge can be the dominant species in localized areas within the shrub community. These species form large mound-shaped colonies on low interior dunes that are generally very dry and free of salt spray. This plant community is an important dune stabilizer, capturing windblown sands. Most of the shrub species occur to a lesser degree in the forest community.

Forested Uplands

Where Assateague Island is wide enough to allow sufficient protection from the ocean's salt spray and overwash, trees are able to establish a foothold. The forest stands occur on large stable dunes (such as White Hills), generally west of shrub areas and impoundments, indicative of parts of the island that have been stable for several decades. Approximately 1,600 acres (17 percent) of the Assateague Island Unit are classified as upland forest and are comprised almost entirely of loblolly pine, a hardy salt-tolerant and fire-resistant tree. Loblolly pine requires full sunlight to establish new stands, and can produce cone crops in as little as ten years, although seed production is greater in older trees. Thinning of stands has been shown to increase production of cones and seeds by dominant and co-dominant trees. These forests are important to the survival of the endangered Delmarva fox squirrel and other forest dwelling wildlife, particularly the white-tailed deer, turkey, eastern hognose snake, and many species of woodland migratory birds.

Mixed stands of loblolly pine and hardwood usually contain southern red oak, white oak, and water oak as the most abundant hardwoods. The mixed hardwood forest provides premium Delmarva Peninsula fox squirrel and woodcock habitat. The hardwood stands have developed only in areas where topography and distance from salt water provide maximum protection from aerosol salt spray. Other mixed hardwood species may include red maple, sweet gum, sassafras, black gum, black cherry, American holly, and wax myrtle. Forested wetlands occur on the west side of Snow Goose (B-South) Pool, in the vicinity of the Woodland Trail, and in lowlands near the White Hills. Dominant vegetative species in these areas include red maple, black willow, wax myrtle, and marsh elder.

Forested understory vegetation is usually composed of dogwood, high-bush blueberry, blackberry, greenbrier, poison ivy, common chokecherry, and fox grape. Many of the rarest plants on Assateague Island are found in the forests, including Indian pipe, crested yellow orchid, spotted wintergreen, and partridgeberry.

Approximately 400 acres of the forested uplands on Assateague Island in Virginia were mapped as maritime upland forest community as defined by the Virginia Department of Conservation and

Recreation (VDCR) and 50CFR 84.11 (Berman and Berquist 2007). According to VDCR, maritime upland forests are considered globally rare because of restricted ranges, narrow habitat requirements, and threats from coastal development. Maritime upland forests contain species-poor evergreen and mixed coastal forests, often pine-dominated with an understory of deciduous trees; they grow in well to rapidly drained nutrient poor sandy soils (Berman and Berquist 2007). They occur on old coastal dunes that have been stable long enough to sustain forests, have well-drained sandy soils, and a water table close to the surface (50 CFR 84.11).

Wetlands

The 13 impoundments (roughly 22-28 percent of the Assateague Island Unit) are managed to provide submergent and emergent wetland vegetation and mudflats as foraging areas and cover for waterfowl, shorebirds, and other waterbirds. Approximately 2,650 acres of this “habitat type” is contained within the dikes. The discrepancy between this and the 2,012 acreage figure obtained from the cover map is due to shrub encroachment on the edges, which was mapped as shrub/early successional. Since many impoundments tend to be brackish due to storm overwash and salty soils, they are inhabited by plants with some salt tolerance. Characteristic plants include dwarf spike rush, salt marsh fleabane, *Bacopa*, sago pondweed, American three-square, saltgrass, *Bidens*, smartweed, umbrella-grass, and salt meadow grass. Non-native *Phragmites* grows in many of the impoundments and other wetland areas. This invasive plant has been the target of mechanical and chemical control efforts.

Wax myrtle and loblolly pine encroach into some of the impoundments where these woody species are not regularly controlled. Currently, Sow Pond, Ragged Point, Pintail Pool (D Pool), South Wash Flats, and North Wash Flats (NWF) have expanding areas of woody vegetation that will require management to maintain open shallow water habitat favored by shorebirds and some waterfowl. On the other hand, flooded myrtle habitat is used by wintering black ducks, and landbirds use shrub habitat on impoundment edges for breeding, winter, and migration habitat.

Forested wetlands occur on the west side of Snow Goose (B-South) Pool, in the vicinity of the Woodland Trail, and in lowlands near the White Hills. Dominant species include red maple, black willow, wax myrtle, ferns, and blueberries.

A more open transitional freshwater marsh that borders uplands and salt marshes on the bayside of Assateague Island includes groundsel tree, cattails, wax myrtle, swamp rose, and marsh elder. Approximately 108 acres of wetlands also occur on Toms Cove Hook on the flats and in low areas between the beach ridges and dunes that pond collect rainwater. A few other small natural freshwater marshes occur behind the dunes of the northern beach.

Salt Marsh

Approximately 2,875 acres of salt marshes are located along the western boundaries of the Assateague Island Unit. Tidal flooding influences the distribution of salt marsh plants. Salt marsh cordgrass is the dominant species in the low marsh, the zone between mean high tide and mean low tide. Salt meadow cordgrass (also called salt meadow hay), saltgrass, and saltwort grow in the less frequently flooded high marsh. Northern sea lavender and marsh elder occur at upper levels, along the marsh/upland edge.

3.3.2 Southern Island Units

Salt marsh habitat covers approximately 95 percent (406 acres) of the Morris Island Unit and approximately 87 percent (485 acres) of the Wildcat Marsh Unit. Salt marsh cord grass, salt meadow cordgrass, and saltwort are the major vegetation species. Upland vegetation on Morris Island is limited to a few scattered sites (21 acres) of loblolly pine, wax myrtle, black cherry, and sassafras. Approximately 13 percent (73 acres) of the southern part of Wildcat Marsh is an upland forest consisting of loblolly pine, oak, and typical understory associates. Wax myrtle is scattered throughout the area.

Assawoman and Metompkin islands are barrier islands with habitat types consisting of beach, dunes, and extensive salt marshes to the west of the islands. The predominant species in the marsh include salt marsh cordgrass and salt meadow hay. On Metompkin, the marsh extends to the mainland, although it is intersected by numerous creeks and channels. The remainder of the island is predominantly sparse grasslands with little woody growth. Assawoman Island also contains extensive salt marshes, particularly in the northern half of the island. A cobble-laden washover area, located at the northern tip and formed by the sealing of Assawoman Inlet, provides good habitat for nesting birds. Pockets of woody shrubs occur in depressions between the beach front and the westward marshes. Plants found here include wax myrtle, bayberry and groundsel bush.

Cedar Island is dominated by beach and dune habitats on the ocean side and a brackish marsh dominated by salt meadow cordgrass on the bay side. A small thicket dominated by eastern red cedar and poison ivy occurs on the north end of the island. It is adjacent to the beach and is eroding rapidly. The north end also supports most of the island's other plant diversity. Dead shrubs and some low-growing vegetation are present in overwash areas. Other habitat types found on Cedar Island include a salt flat to the south and mudflats that are exposed at low tide.

3.3.3 Wallops Island NWR

Wallops Island NWR is composed of 195 acres of salt marsh, 121 acres of forest, and 57 acres of old-field/early successional forests. Loblolly pine is the dominant species in the forest habitat and secondary components include: tulip poplar, red maple, southern red oak, wild cherry, dogwood, sassafras, and sweet gum. Understory includes: American holly, spicebush, Devil's walkingstick, and greenbrier. Transition zones between the marsh and woodland are dominated by groundsel tree and wax myrtle. The salt marsh is dominated by cordgrasses.

A Simoneaston Bay sea-level fen, named the Lucky Boy Fen, is found on Wallops Island NWR. Sea-level fens are nutrient-poor, maritime seepage wetlands, confined to a few sites within the Mid-Atlantic region that have an unusual combination of environmental conditions (VDCR 2001). The sea-level fen is a globally significant (ranked as "G1" or critically imperiled) community type (Fleming and Patterson 2010); only four occur in Virginia, all of them in Accomack County (VDCR 2001). Lucky Boy Fen is located just above highest tide levels, at the base of a slope where abundant groundwater discharges. It is less than one-half acre in size, but supports six rare plant species.

3.4 Wildlife

Despite the often harsh conditions that occur in a coastal environment, a wide variety of wildlife species thrive on the refuge. Each of the islands' different habitats supports a multitude of birds, mammals, reptiles, amphibians, and invertebrates. In addition, the coastal waters that surround

the refuge teem with life. The sheltered, nutrient-rich waters of the estuary formed by the islands provide breeding and spawning habitat for many aquatic species, and important feeding areas for birds. Wildlife species in the refuge are described below. Latin names for wildlife can be found in Appendix L.

3.4.1 Federal and State Threatened and Endangered Species

Although the refuge habitat is used by several protected species, the only resident Federal endangered species is the Delmarva Peninsula fox squirrel. Other known Federal endangered or threatened species that can be found on the refuge but that are not resident include the piping plover, roseate tern, and the leatherback and loggerhead sea turtles. Red knot, a species proposed to be listed as threatened under the ESA, uses Chincoteague NWR beaches during spring and fall migration.

Wilson's plover is on Virginia's State endangered bird list. State-threatened birds that are present or breed on the refuge include the gullied tern, upland sandpiper, and the peregrine falcon. In 2012, the Board of the Virginia Department of Game and Inland Fisheries (VDGIF) decided to remove the bald eagle from the Virginia State list of threatened and endangered species effective January 1, 2013.

Several Federal listed threatened and/or endangered species are found in the study area, although not all of them are resident to the refuge. A full list of threatened and endangered flora and fauna that are found in the vicinity of the refuge is provided in Appendix L. The species that are most pertinent to the refuge are described in detail below.

Delmarva Peninsula fox squirrel

The Delmarva Peninsula fox squirrel is both a Federal and state listed endangered species inhabiting the Chincoteague NWR's loblolly pine forests. Fox squirrels can be commonly seen in the headquarters area and around the Woodland Trail. Their coloring is similar to the gray squirrel, but the fox squirrel is larger with a bushier tail and is more terrestrial than the gray squirrel.

The Delmarva Peninsula fox squirrel's original range stretched from central New Jersey south through eastern Pennsylvania and down the length of the Delmarva Peninsula. As woodland has been cleared for farming and altered by forestry, available fox squirrel habitat has dwindled, and the known population has been reduced to several sites in Maryland, Delaware, and Chincoteague NWR in Virginia. The refuge population was translocated here in the early 1970s. Over the past few years their numbers on the refuge have stabilized.

On Chincoteague NWR, Delmarva Peninsula fox squirrels live in forest stands predominated by mature loblolly pines. In other parts of its range, the fox squirrel is usually found in mixed stands of mature hardwoods where a variety of mast-producing trees ensure a reliable food source. With its terrestrial habits, the fox squirrel is adapted to a park-like, open understory and is rarely found in dense underbrush, although production in areas with a developed understory has been observed on Chincoteague NWR. Because they spend so much time on the ground, road accidents are a mortality factor of the Delmarva Peninsula fox squirrel. Major natural predators are red fox, raccoon, and great horned owl.

Refuge forest management and predator control objectives are designed to provide optimum fox squirrel habitat. Specific practices include:

- Maintain open understory in specified areas;
- Provide nesting boxes to supplement natural tree cavities;
- Reduce competition from gray squirrels;
- Protect from hunting and natural predation;
- Supply reliable food source through management of vegetation.

Marine Mammals

Federal endangered marine mammals with ranges that encompass the waters of Assateague Island include: 5 species of baleen whales (humpback, gin, sei, blue, and northern right); one toothed whale (sperm); and, one sirenian (West Indian manatee). Anecdotal observations suggest that these species visit the Island's waters; however, most do so only as occasional transients or seasonal migrants. The species most at risk is the northern right whale, with a North Atlantic population of approximately 200. A number of right whales winter along the Assateague Island coastline and can occasionally be seen from the beach.

Sea Turtles

Five species of Federal listed sea turtles use Assateague Island's ocean and bay waters. The leatherback sea turtle (which is also State-listed), Kemp's Ridley sea turtle, and the hawksbill sea turtle are Federal endangered species. The loggerhead sea turtle and green sea turtle are Federal-threatened, with the loggerhead also being State-threatened.

Piping Plover

The piping plover, a Federal and State-threatened species since January 1986, nests on sandy or cobble beaches and overwash areas. The eastern coast of Virginia is a significant area for nesting piping plovers, supporting approximately 20 percent of the breeding population on the U.S. Atlantic Coast. Chincoteague NWR is one of the most important plover nesting areas of any of the Virginia barrier islands and supports one of the largest concentrations of piping plovers along the Atlantic coast. In order to protect this species, the Chincoteague NWR closes certain critical nesting areas to public entry.

In Virginia, piping plovers begin displaying territorial behavior and their elaborate courtship rituals in mid-March. This is followed by egg-laying in mid-April. Each pair forms a shallow depression in the sand to serve as a nest in which usually four eggs are laid. The eggs hatch in about 25 days, and the downy young are soon able to follow their parents in foraging for marine worms, crustaceans, and insects, which they pluck from sand and mudflats in the intertidal zone. Both eggs and young are so well-camouflaged that they are apt to go undetected. When predators and other intruders come close, the young squat motionless on the sand while the parents attempt to attract the attention of the intruders to themselves, often by feigning a broken wing. Surviving young fly within about 30 days of hatching. Storm tides, predators, or human activity often disrupt nesting before the eggs hatch. When this happens, fledglings from late nesting efforts may not fly until mid-August. Plovers commonly gather in groups on undisturbed beaches prior to their southward migration. Feeding occurs along the intertidal zone and on sand flats and mudflats. The plover's diet consists mainly of worms, crustaceans, mollusks, and other invertebrates.

Beaches on Assateague (including the Hook, Overwash, and Wild Beach), Assawoman, Metompkin, and Cedar islands are managed and intensively monitored for nesting shorebirds including the American oystercatcher, terns, and piping plover. The NWF impoundment is also intensively managed for piping plover nesting habitat as mitigation for the loss of habitat at the recreational beach. The number of piping plover nesting pairs on Chincoteague NWR has

increased from 50 pairs in 1987 to 100 or more pairs in recent years (2005 to 2010). The number of piping plover chicks fledged increased steadily between 1987 (when monitoring began) and 2004 (with a peak of 224 fledged chicks), declined from 2005 to 2008, and increased slightly (132 chicks fledged) in 2009 and 2010. Weather events and predation affect fledgling success. Productivity has reached or exceeded the Recovery Plan goal of 1.5 chicks/pair in 5 of the last 10 years (USFWS 1995). Prior to 2007, Assateague Island consistently had the highest number of nesting plover pairs, but in recent years (2007-2009), Cedar and Assawoman islands have had more breeding pairs and higher fledgling success. Increased flooding events due to high tides on the Hook and Overwash during the breeding season, and erosion of Wild Beach are factors.

The following factors have contributed to the decline of the piping plover along the Atlantic Coast and depress plover production at Chincoteague NWR:

- Human disturbance can curtail breeding success. Pedestrians and off-road vehicles may cause plover parents to desert the nest, exposing eggs or chicks to the summer sun and predators, not to mention the possibility of the vehicles crushing the well-camouflaged nests or young. Interruption of feeding may stress juvenile birds during critical periods in their development.
- Predation from ghost crabs and foxes is a significant factor in survival. Six total nests on Assateague Island were disturbed by predators in 2011 (Refuge biology data), resulting in significant loss of eggs. However, in 2011, the most significant loss of eggs ($n=42$) was due to weather and tide, with the nests being over washed during full or new moon tide cycles (USFWS 2011a)).

Monitoring and management efforts for the 2011 nesting season (USFWS 2011a) included:

- Pre-season surveys were conducted opportunistically beginning in March; staff surveyed all shorebird breeding areas for plover and other nesting shorebird species arrival, establishment of territories, courtship display, and preliminary nest scrapes. Initial surveys allowed observers to estimate the number of potential nesting plover and shorebird pairs for the season. More intense monitoring began in mid-April when territorial pairs were firmly documented.
- Using binoculars and spotting scopes, staff observed individual nesting shorebirds or pairs from a vehicle or dune. As mating pairs were identified, staff walked through nesting areas at a slow pace looking for scrapes and bird tracks. Once the nest was located, the observer placed a paint stick 10 meters from the nest and recorded the location. Paint sticks allowed observers to identify and observe a nest from a distance without disturbing the incubating adults. Weather conditions, time, and potential stress on the birds was considered while nest searching. Nests were located from late April through early July 2011.
- Brood monitoring (determining the location and number of chicks in each brood) was attempted 7 days a week on Assateague and Assawoman Islands and 4 days on Cedar Island. Metompkin Island was monitored weekly by Chincoteague NWR staff. NASA staff attempted brood monitoring on Wallops Island three mornings a week. Brood monitoring was accomplished by observations of chicks from a vehicle using spotting scopes or by foot. Metompkin and Cedar islands are not accessible by vehicle. Staff traveled to and from the islands by boat. Shorebird surveys, nest searches, and brood monitoring were conducted by foot. To reduce brood disturbance, chick observations lasted only long enough to count the chick numbers. Brood monitoring was not conducted in extreme weather conditions such as mid-day heat, rain, or high wind.

- Staff used invasive plant management, crushed shells, pony grazing, ditching, and water pumps as tools to improve shorebird nesting habitat on Chincoteague NWR. A portable diesel water pump was used to reduce the level of water held on the NWF shorebird breeding area into the South Wash Flats impoundment during breeding season. This season, maintenance staff placed crushed shells on the flats as a continuation of the nesting island creation on the area. Due to dry weather conditions and previous management, the maintenance staff operated the pump in February for 16 hours, a considerable lower amount compared to last year (335 hours).
- As part of the invasive plant management to improve shorebird nesting habitat, USFWS along with cooperating agencies sprayed patches of *Phragmites* along the Virginia barrier island system, in September 2009 and 2010. Due to the success of this effort, no treatment occurred in 2011.
- Predator management activities began on Assateague Island from February through June and on Assawoman Island from January to May confined to areas known to be piping plover habitat. Chincoteague NWR possesses a VDGIF Scientific Collections permit to conduct mammalian predator management on refuge lands targeting red fox, raccoon, mink, and opossum.
- Predator exclosures were also used on the refuge to help protect nesting birds and eggs. Exclosures used on the Hook, Overwash, Public Beach, and Wild Beach formed a 3.7 m diameter around nests. Six 1.5 m pieces of 12.7 mm diameter rebar were evenly spaced around the perimeter and driven into the ground to secure the welded wire in place.

Loggerhead sea turtle

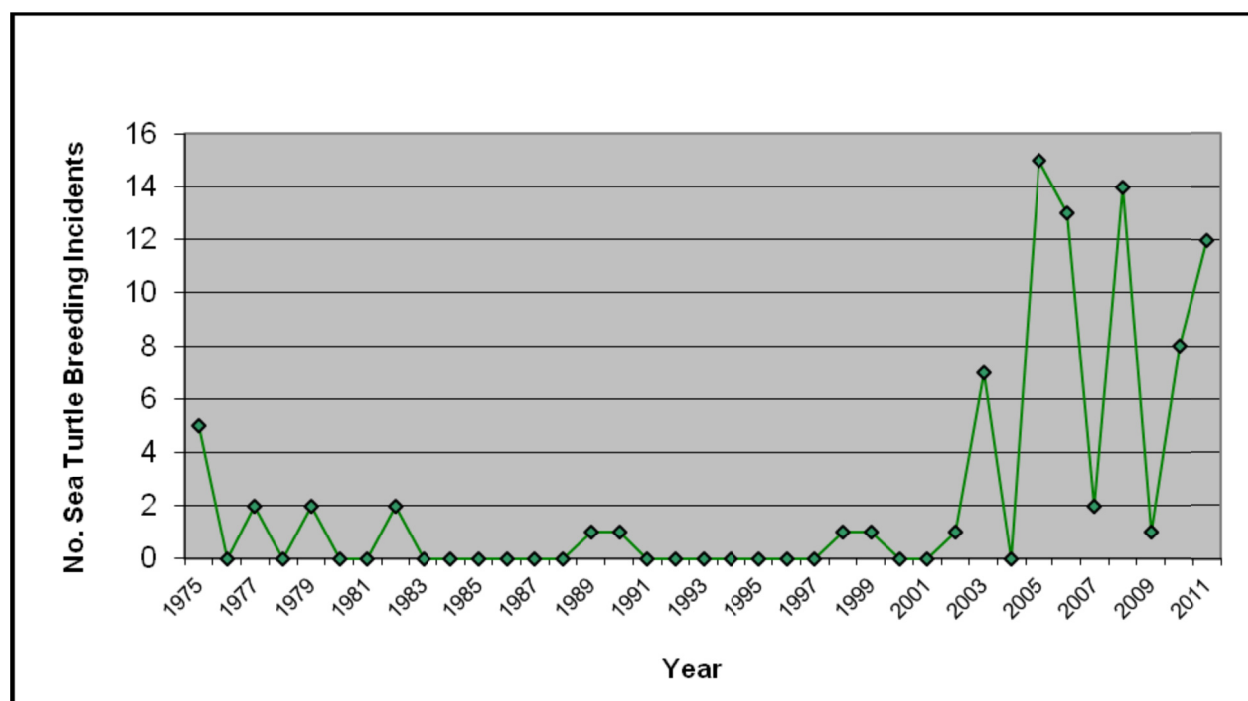
The Federal and State-threatened loggerhead sea turtle nests on Assateague Island, which is the northern extent of its breeding range. Crawl and nesting activity occurs June through August, but activity tends to occur every other year according to refuge data. Because incubation takes longer (90 or more days) at this latitude, the hatch window is August through October. Nesting activity on Assateague Island and Wallops Island has risen noticeably in recent years, perhaps the result of a loggerhead translocation project. From 1969 to 1979, sea turtle eggs from nests laid on Cape Island of Cape Romain NWR, Charleston County, SC, were translocated to Chincoteague NWR. During this time, and the two decades following (1970 – 1999), staff recorded 16 crawls on Assateague Island and Wallops Island; 10 resulted in nests and 6 were false crawls, meaning no nest was made. Loggerhead nesting activity from 2000 to 2010 had a total of 62 crawls; 22 resulted in nests and 40 were false crawls. Loggerhead sea turtles take 30 years to reach maturity, so females that were part of the transplant project may now be returning to their hatch and release sites.

Chincoteague NWR staff monitors for and manages sea turtle crawls and nests on the Virginia portion of Assateague Island and assists when needed on NASA's Wallops Island and the Maryland portion of Assateague Island, in accordance with the Chincoteague NWR Intra-Service Section 7 and Biological Opinion (USFWS 2008b). Chincoteague NWR maintained records of all crawl, nesting, and hatching activity (Figure 3-14).

During the 2011 nesting season, 12 loggerhead sea turtle crawls were identified on Assateague Island's Maryland and Virginia sides combined; 2 crawls with no confirmed nesting in Maryland and 10 crawls with 5 confirmed nests on Chincoteague NWR in Virginia. All nests received predator screening and barriers to deter walking and driving near or on the nests (USFWS 2008b). Ropes and poles were placed around Wild Beach 01 and Wild Beach 02 nests as they were in areas not already closed to public access. During routine monitoring, Chincoteague NWR

biological staff identified and took precautions for potential nest disturbances. Only one of Chincoteague NWR's five nests exhibited signs of hatching. Wild Beach 01 began a trickle style hatch on August 8th, 13 days into its hatch window. Twenty-three hatchlings were confirmed to have emerged from the nest, but a success rate is indeterminable due to impacts from Hurricane Irene. The Overwash reopened to public access on August 12th, prior to which, symbolic ropes and poles were erected around the Overwash 01 nest. Over Sand Vehicles users were instructed to drive west of the nest. Similar precautions were taken for Hook 02 nest following the opening of the Hook to OSVs on September 1st.

Figure 3-14. Sea Turtle Breeding Activity (Crawls and Nests), Assateague Island and NASA Wallops Island, 1974-2011 (Source USFWS 2011a)



*2010 – Includes one Assateague Island National Seashore nest.

3.4.2 Birds

The refuge is renowned for its abundant, diverse bird life. Situated on the Atlantic migratory flyway, the refuge provides crucial migratory stopover habitat for many species of shorebirds and waterfowl in the spring and fall. Shorebirds by the tens of thousands use Assateague Island's ocean beaches, impoundments, and other intertidal habitats to forage and rest. Shrub habitats behind the dunes provide important resting and feeding habitat for southbound neotropical migratory songbirds including warblers, flycatchers, and thrushes. Assateague Island also offers important winter habitat for numerous waterfowl and breeding habitat during spring and summer for colonial waterbirds and ground-nesting shorebirds such as the threatened piping plover. More than 320 species are known to use the refuge regularly for nesting and brood rearing, feeding, resting and staging during migration, or wintering. Most conspicuous to visitors are the waterfowl, shorebirds, wading birds, and raptors. A full listing of bird species frequenting the refuge is given in Appendix L.

Waterfowl

Because the refuge lies strategically within the Atlantic flyway, dozens of waterfowl species stop to feed and rest on the refuge during the spring and fall migration seasons. The maximum number of waterfowl using refuge impoundments usually occurs in November, but occasionally peak numbers occur in December due to drought or other factors. The refuge supports wintering greater snow geese, Canada geese, American black ducks, mallards, green-winged teal, northern pintail, northern shoveler, gadwall, American widgeon, bufflehead, red-breasted merganser, ruddy duck, tundra swan, and others. Assateague Channel and Toms Cove provide critical winter feeding habitat for Atlantic brant, which also use refuge impoundments for fresh water and resting.

Recorded numbers of waterfowl on the refuge can be seen in Table 3-5, but no negative or positive trend in overall waterfowl numbers is apparent in the past two decades.

Table 3-5 Chincoteague NWR Waterfowl Maximum Population Estimates from 1989-2009

Year (Winter of)	November	December	Month Peak Occurred
1989/90	8,710	4,739	Nov
1990/91	8,917	14,879	Dec
1991/92	13,414	17,452	Dec
1992/93	18,282	19,680	Dec
1993/94	22,824	14,504	Nov
1994/95	33,025	23,549	Nov
1995/96	28,973	35,437	Dec
1996/97	51,790	24,432	Nov
1997/98	40,559	51,349	Dec
1998/99	11,494	19,438	Dec
1999/2000	25,711	22,465	Nov
2000/01	16,345	11,766	Nov
2001/02	8,062	8,274	Dec
2002/03	49,818	16,937	Nov
2003/04	44,395	10,932	Nov
2004/05	Unavailable	23,077	Dec
2005/06	47,776	27,711	Nov
2006/07	23,444	32,734	Dec
2007/08	3,616	3,904	Dec
2008/09	56,326	36,222	Nov
20-yr Average	25,674	20,974	

Impoundments are managed for waterfowl to provide invertebrate and plant food sources, loafing cover, and winter thermo-regulatory cover. Vegetation is kept at an early successional stage by a combination of mowing, disking, prescribed fire, and chemical treatments (for invasive plants such as *Phragmites*). Water levels are manipulated in spring to provide moist soil conditions conducive to production of preferred waterfowl food plants. Dewatering of impoundments occurs mid-March through mid-June depending on the desired plant response and rainfall. Earlier draw-downs favor

sedges, smartweeds, and bulrushes, while later drawdowns favor grasses. Late summer re-flooding provides desirable feeding sites for early fall migrants, particularly shorebirds. However, this is only possible with adequate rainfall. Fall re-flooding produces feeding conditions conducive to later migrants and to wintering waterfowl. Maintaining certain impoundments with high water levels year round, and flooding very large impoundments during the fall migration, creates roosting and loafing sites. Thermo-regulatory areas for waterfowl are maintained by allowing woody plants to remain within certain impoundments, or by raising the water level to flood wooded areas.

Black duck management is a high priority throughout this species' range because of declining populations and hybridization with mallards. Wintering habitat quality on the refuge is enhanced by controlling Phragmites and wax myrtle in favor of vegetation with higher waterfowl food value, such as three square, spikerush, and red root flat-sedge. Refuge black duck populations peak during fall migration when 1,100 to 1,400 are typically counted during November impoundment surveys. Black ducks in winter use tidal salt marsh and impoundments to a lesser extent.

Snow goose populations have recovered significantly since the 1930s and 1940s, when they were considered an imperiled species. The refuge's current mid-winter snow goose population averages around 6,000 to 12,000 geese but can range as high as 50,000 for a few weeks. These birds rest in the protected refuge impoundments, and regularly feed in adjacent salt marshes and in agricultural fields on the mainland. Occasionally geese feeding activity is concentrated in particular salt marsh locations, undesirably uprooting salt marsh cordgrass and creating muddy devegetated "eat-out" areas.

Chincoteague is not considered a significant waterfowl production refuge, and production data is not collected. However, during the 1980s, duck and goose production was emphasized on this refuge and many others throughout the Refuge System due to extended prairie drought and declining duck numbers. Intensive management activities to enhance waterfowl nesting no longer occur. Usually, a few broods of gadwall, mallards, black ducks, and wood ducks are present each year. Resident geese and non-native mute swans are selectively removed from Chincoteague NWR because they damage habitat on which migrant and wintering species depend.

Wading Marsh and Waterbirds

A variety of wading birds inhabit the tidal creeks and moist soil management units of the refuge to include the glossy ibis, great egrets, snowy egrets, green herons, little blue herons, tri-colored herons, black-crowned night herons, and cattle egrets, as well as several rail species. Being fairly large, beautiful, and plentiful along refuge trails, these birds offer visitors with excellent viewing and photography moments, particularly during the spring and summer when species of egret, heron, and ibis frequent the impoundment borrow ditches, eating small finfish and eels. Colonial nesting birds such as heron, egret, and ibis commonly nest on salt marsh islands in Chincoteague Bay. Other rookeries are located in the outer marsh fringe between Chincoteague Island and the mainland. Grebes and loons winter at the refuge, resting and feeding on adjacent waters. The eastern brown pelican (whose populations have recovered from population declines due to the use of the pesticide DDT and are now no longer endangered) frequent the refuge's intertidal zones, the ocean, and Assateague Channel. Pelicans nest in coastal areas south of the refuge; however, over the past few years they have nested progressively northward.

Shorebirds, Gulls, and Terns

Chincoteague NWR is one of the country's top five shorebird migration staging areas east of the Rocky Mountains (USFWS 1993a). It is designated a site of international importance by the Western Hemisphere Shorebird Reserve Network (WHSRN). Peak shorebird numbers during spring migration occur in May. The fall migration usually peaks in August and spans the period of July to October.

Spring migration begins with the arrival of piping plovers in March, but there are few other signs of migration before mid-April. During early spring migration, defined as the period of April 7 to May 6, 1,000 to 4,000 shorebirds may be present on Assateague Island habitats. The great majority are dunlins (50 percent) and sanderlings (22 percent), but short-billed dowitchers, black-bellied plovers, willets, and whimbrel are also present (Wilds 2007 and Refuge unpubl. data). During late spring migration, defined as the period of May 7 to June 6, between 6,000 and 26,000 (typically 12,000 – 13,000) birds are present on Assateague Island. The majority (46 percent) are semipalmated sandpipers, but good numbers of dowitchers, sanderlings, least sandpipers, dunlin, and ruddy turnstones are also present (Wilds 2007 and Refuge unpubl. data).

Fall migration begins around July 1 with the arrival of short-billed dowitchers. Soon thereafter greater and lesser yellowlegs and least and semipalmated sandpipers arrive, the latter species making up the vast majority (around 40 percent) of shorebird numbers present July through September (Wilds 2007). Virtually all migrants present in July are adults. Hatching year migrants are not common until the last third of August, and by the last third of September, juveniles usually comprise the only shorebirds around, except for adults of shorebird species that overwinter.

Red knot, a species proposed to be listed as threatened under the ESA, uses Chincoteague NWR beaches during spring and fall migration, with peak spring numbers occurring in the last half of May and peak fall numbers occurring in August (Smith et al. 2008a), as confirmed by refuge data. Since the 1980s, the population of red knots has declined 68 to 80 percent; the severe decrease in a major food item during migration—horseshoe crab eggs in Delaware Bay—is a suspected cause (Cohen et al. 2009). A significant proportion (25 to 30 percent) of the population of red knots (estimate 10,000 to 13,000) use Virginia's barrier islands during spring migration (Cohen et al. 2009). These recent findings that Virginia barrier islands support a significant migratory red knot population add importance to Chincoteague NWR's role in red knot conservation.

Shorebirds were historically reported to occur in "huge numbers," but hunting for sport and food during the late 1800s and early 1900s resulted in decreases in populations of many species of shorebirds. Although hunting has been illegal for all but two species of shorebirds since 1916, many populations of shorebirds are still declining today. Many of the negative shorebird population trends suggest habitat degradation (50 percent of U.S. wetlands have been lost or degraded), depletion of critical food supplies (over-harvest of Delaware horseshoe crabs may be the most recent example), or other factors at work" (Harrington 1999). The United States Shorebird Conservation Plan identifies a number of shorebird characteristics that pose "conservation challenges" including: (1) long distance migration; (2) low productivity and resulting slow population recovery; (3) concentration of populations and increased vulnerability to environmental occurrences; (4) dispersed and ephemeral habitat; (5) loss of habitat; (6) population changes and (7) the need to conserve across international borders (Brown et al 2001).

Avian migration is largely governed by endogenous rhythms, but annual variations in schedules may occur due to sex and age composition of flocks (Holmgren et al. 1993, Nebel et al. 2000), and

weather, tides, and prey availability at stopover sites (Akeson and Hedenstrom 2000, Alerstam 2003). Virginia stopover site has been of historic importance in supporting red knots during spring migration and is not simply an ephemerally used satellite site to Delaware Bay (Cohen et al. 2009). The diet of red knots in Virginia includes coquina clams (*Donax variabilis*) and blue mussels (*Mytilus edulis*; Truitt et al. 2001), as was also the case historically (MacKay 1893), and lacks the horseshoe crab (*Limulus polyphemus*) eggs that are a staple in the Delaware Bay. Furthermore, unlike Delaware Bay, the Virginia habitat consists of high-wave-energy ocean shoreline, similar to much of the rest of the historic stopover range (Cohen et al. 2009). As many as 10,000 knots also stage on the outer barrier islands along the Virginia coast (Watts and Truitt 2000). Red knots tagged in Argentina, Brazil, and Chile stopped in Virginia in 2007 (Smith et al. 2008) as well as in Delaware and New Jersey, providing evidence that both stopover sites hosted birds from the southern wintering sites (Cohen et al. 2009).

Stopover duration for knots in Virginia from 2006 to 2010 was shorter, on average, than for Delaware Bay. The duration in Virginia was 7 to 8 days through May 25th, and increased to 9 to 12 days from May 26th to June 6th. Red knots exhibited two peaks in the duration of stopover. The first occurred during the first through third week of May, and the second occurred from the last week in May to the first week in June. The pattern of stopover duration in Virginia may be driven by abundance of benthic prey. In 2007, prey peaked at the end of May through early June (Cohen et al. 2009). Arrival to Virginia appears to be constant throughout stopover, while changes in fidelity rates (0.76 – 0.84) mirror peaks in total stopover duration (Duerr et al. 2011). Analysis of mark-resight data on an annual basis (Cohen et al. 2009) provided evidence that red knots from Virginia move between Virginia and one or more other spring locations. Movement from Virginia to an unobserved location (60 percent) was greater than fidelity to Virginia (40 percent). However, this movement was not permanent, as many (48 percent) returned in subsequent years (Duerr et al. 2011).

Virginia supports the second largest number of red knots in the Eastern U.S. during their final stopover during the northward migration in spring (Duerr et al. 2011). Although numbers of animals that use an area is not an indication of habitat quality (Van Horne 1983), survival of those animals is a valid indicator of quality. The Virginia annual survival (0.87) is higher than the estimates for knots from Tierra del Fuego and Delaware Bay prior to (0.84) and after (0.54) a population decline in 2000 (Baker et al. 2004, Duerr et al. 2011).

The barrier islands along the Delmarva Peninsula in Virginia provide high quality habitat for migrating red knots. This area contributes to high survival, and supports tens of thousands of birds. Early preservation of the barrier islands and lagoon systems in Virginia contribute to the long-term survival of the rufa subspecies, potentially helping to avert steep short-term declines that were predicted (Baker et al. 2004) for Delaware Bay. Knots using Virginia and Delaware Bay constitute a single population that includes red knots from throughout their winter range (Duerr et al. 2011).

Migrant shorebirds use Assateague Island beaches, tidal flats, and impoundments. Shoveler Pool (B-North Pool), Snow Goose Pool (B-South Pool), Swan Cove Pool (F Pool), Black Duck Pool (A Pool), Old Fields, South Wash Flats, and NWF are the most important for shorebirds (Wilds 2007), as confirmed by refuge data. Pintail and Gadwall (D and E Pools), Sow Pond, and Ragged Point typically have little or no shorebird use. The Hook is the most important beach area on Assateague Island for migrant and nesting shorebirds (Refuge unpublished data).

Refuge staff have cooperated with the VDGIF and TNC to monitor American oystercatcher population size and breeding success since 2001. In 2008, the refuge supported 25 percent (100) of the total number (395) of nesting pairs on Virginia's barrier islands. This amounts to 14 percent of the State's total number of breeding pairs (731). Cedar Island has the most breeding pairs on the refuge, followed by Assawoman and Assateague Islands. Metompkin Island had the largest population (95 breeding pairs) of oystercatchers on any of Virginia's barrier islands, however only 14 pairs nested on the refuge portion. Refuge staff also conduct boat-based breeding and fall/winter roost surveys of oystercatchers in Chincoteague Bay, when staffing allows.

The refuge also provides excellent nesting habitat for colonial and other beach nesting birds. Colonial species include common terns, least terns, gull-billed terns, and black skimmers. Wilson's and piping plovers nest on beach ridges and overwash areas (Assateague Island is the northern limit of Wilson's plover breeding range). Intertidal sand and mud flats on the cove side of Toms Cove Hook contain horseshoe crab eggs and other high quality food during the entire shorebird season. Willets and oystercatchers nest on the cove side beach and around the natural freshwater marsh in the Hook interior. Oystercatchers also nest in the dunes and recently-vegetated areas near Fishing Point.

Herring, ring-billed, and laughing gulls are the three gull species commonly seen during summer months. Great black-backed gulls have recently expanded their range southward, and can be found on the refuge yearlong. Gulls nest along the causeway connecting Chincoteague Island to the mainland. They feed and rest along refuge beaches and in impoundments.

In regards to numbers of shorebirds using an area during the southward migration, Chincoteague NWR ranks fourth among 454 sites east of the Rockies where a census was taken in the United States, and is important for many species on an international scale. The refuge ranked second in diversity of shorebird species from among all 450 sites in the International Shorebird Survey network (Schulte and Chan 1985, Manomet 2008), and the barrier islands of Virginia and Maryland were dedicated as part of the International Shorebird Reserve.

Raptors

Many raptors are known to be present on or adjacent to the refuge, with the American kestrel, osprey, black vulture, red-tailed hawk, bald eagle, and great horned owl among the most common species.

Bald eagles were de-listed from the Federal ESA in 2007 and de-listed from the Virginia list as of January 1, 2013. The three known bald eagle nests on Chincoteague NWR are checked for activity in March and May each year by VDGIF; they are currently located in a loblolly pine tree at Black Duck Pool (A Pool), Great Neck (directly west of Old Fields), and Wallops Island.

Assateague Island is a major resting and feeding area for peregrine falcons during fall migration. They hunt shorebirds and other prey and use the beach as a resting area. In 1980, a peregrine hacking tower was erected on the NWF. Hacking is a falconry technique in which chicks are placed in artificial nests and fed until they are ready to fly. Eight falcon chicks were hacked from the tower in 1980 and 1981. The first successful nesting of peregrine falcons in Virginia after the DDT era occurred on the NWF tower in 1982, and pairs nesting on this tower produced a total of 54 fledglings between 1982 and 2003. Between 2004 and 2008, pairs occupied the tower, but nesting was assumed to be unsuccessful based on behavior and aerial surveys. In 2008, the tower was climbed for the first time in several years, and evidence of mammalian predation (probably

raccoon) on the eggs was found, and the predator guards were in disrepair. The tower was removed prior to the 2009 breeding season because of conflicts with piping plover management objectives on the NWF and a statewide decision to not repair or maintain existing peregrine towers located in important shorebird areas within the seaside lagoon system. The peregrine hacking tower on Metompkin Island was removed in 2010 for this reason (Watts et al. 2008).

Ospreys fish in refuge marshes and Swan Cove Pool (F Pool), northern harriers hunt in marshes and impoundments, and red-tailed hawks nest in forests. Three species of owls are year-round residents. Eastern screech owls nest in Delmarva Peninsula fox squirrel and wood duck nest boxes, as well as in natural cavities. Barn owls often nest in hunting blinds on adjacent marshes. Great horned owls prey on rabbits, Delmarva Peninsula fox squirrels, and shorebirds. Southbound migrating hawks stop to rest and feed on the refuge during fall migration as they fly over the Delmarva Peninsula. Large numbers of hawks stop to rest and feed during their fall migration, including kestrels, merlins, sharp-shinned hawks, and Cooper's hawks. Turkey vultures are occasionally seen roosting in trees or flying over the refuge in search of carrion. The known raptor migration through the area occurs in September and October.

Landbirds

From 1999 to 2009, refuge volunteer Dr. Richard (Dick) Roberts monitored landbird habitat use through mist netting and banding. During these 10 years, Dr. Roberts sampled 14 different areas on Chincoteague NWR, comprising shrub/early successional, forested uplands, and shrub/pine edge habitats. Some areas have been sampled for 5 consecutive years or more, others for 3 years or fewer (Roberts 2009). Nets were operated year-round, weather permitting. Overall goals of this monitoring were to:

- Collect baseline data on species using refuge habitats as a basis for management decisions;
- Identify habitats being used by species of special concern;
- Document/confirm nesting and migrating species;
- Document the occurrence of rare or unusual species; and
- Conduct environmental education.

In shrub habitat dominated by wax myrtle/bayberry vegetation adjacent to the South Wash Flats impoundment, 72 species were captured during the 5-year sample period. Evidence of breeding of common yellowthroats, gray catbirds, and prairie warblers was found. The latter is a highest priority Bird of Conservation Concern for the New England/Mid-Atlantic Coast (BCR 30) and gray catbird is a medium priority BCR 30 species (USFWS 2008c). Yellow-rumped (myrtle) warblers depend upon this habitat extensively during migration and winter. BCR Highest or High Priority Species that have been banded in this habitat during breeding or migration include (in order of relative abundance): field sparrow, prairie warbler, brown thrasher, eastern towhee, great crested flycatcher, Baltimore oriole, eastern kingbird, worm-eating warbler, and northern flicker. Medium priority BCR 30 species captured in this habitat in order of relative abundance are gray catbird, Canada warbler, and Blackburnian warbler.

Dr. Roberts considers shrub habitats behind beach dunes, such as that typified by his study site adjacent to Toms Cove Visitor Center, essential stopover habitat for southbound fall migrants. This habitat is particularly important to juvenile birds (and hence recruitment into the population), since 85 to 90 percent of birds migrating southbound through the mid-Atlantic coast are hatch-year birds (2009). This vegetation on the lee side of the dunes appears to provide

important refuge to birds inexperienced in navigation that may otherwise be blown out to sea without somewhere to shelter and re-fuel (Roberts 2009). BCR Highest or High Priority Species that have been captured in migration during 5 years of mist-netting in this site include (in order of relative abundance): field sparrow, black-and-white warbler, eastern towhee, eastern kingbird, prairie warbler, Louisiana waterthrush, Baltimore oriole. Gray catbird, a medium priority BCR 30 species, was captured in this study site, but at relatively low numbers compared to other sites.

Mist-netting/banding sites in forest habitat have been operated for 1 to 3-year periods in approximately six locations along the Woodland Trail and Wildlife Loop to measure response to habitat modifications such as pine bark beetle outbreaks and prescribed burns. The following BCR Highest or High Priority Species have been among the 75 species captured in this habitat in order of relative abundance: brown thrasher, field sparrow, northern flicker, eastern towhee, black-and-white warbler, Baltimore oriole, great-crested flycatcher, prairie warbler, eastern kingbird, and worm-eating warbler. Medium priority BCR 30 species captured in this habitat in order of relative abundance are gray catbird, brown-headed nuthatch, and red-headed woodpecker.

The longest consecutive mist netting/banding site operated by Dr. Roberts (2001-2009) is adjacent to the Woodland Trail parking lot. It is located on the edge between forested uplands and salt marsh habitat and contains more understory shrubs (myrtle, bayberry, greenbrier, and other berry-producing shrubs) than typical mature loblolly pine forest on Assateague Island. Bird species diversity was high: 87 species captured in a 9-year period. Gray catbird, a medium priority BCR 30 species, has the highest number of captures here compared to any other site. The following BCR Highest or High Priority Species have been captured at this site (in order of relative abundance): black and white warbler, eastern towhee, Baltimore oriole, prairie warbler, eastern kingbird, northern flicker, field sparrow, and worm-eating warbler (Roberts 2009).

The mist-netting study has provided valuable data, particularly for skulking species, non-singing migrants, and wintering birds. However, canopy birds and larger species such as crows and bobwhite are under-represented. A breeding bird survey (BBS), conducted for 10 years between 1996 and 2006, provides additional data on the refuge's landbird population. Two BBS routes of 30 points each, spaced 0.5 miles apart, in myrtle shrub and loblolly pine forest (total = 60 points) were run during the second week of June using slightly modified BBS protocols (Chincoteague NWR 1996).

Appendix L lists the 20 most abundant birds (in order of relative abundance) observed in each of the two habitats (myrtle shrub and loblolly pine forest) during the 10 year BBS period. Ten BCR 30 Priority Species breed on the refuge: gray catbird, northern bobwhite, and brown thrasher—found in both habitats; field sparrow, eastern kingbird, and prairie warbler—found in myrtle shrub; and eastern towhee, great-crested flycatcher, northern flicker, and brown-headed nuthatch—found in loblolly pine forest.

Appendix L also compares the BBS results with Dr. Robert's 20 most abundant mist-net captures (1999-2007). Only nine species were on the top 20 in both the BBS and the mist net study: gray catbird, common yellowthroat, song sparrow, house wren, northern cardinal, common grackle, Carolina wren, field sparrow, and yellow-breasted chat. Birds that appear on Dr. Robert's "Top 20" and not on the BBS are generally wintering or migrant birds. For example, the most numerous wintering and migrant bird on the refuge—yellow-rumped warbler—was not encountered at all on the BBS. Birds that appear on the BBS "Top 20" and not on Dr. Robert's

study are canopy birds such as eastern wood peewee, brown-headed nuthatch, and great-crested flycatcher, or species too large to be captured in passerine mist nets such as crows and bobwhite.

Upland Game Birds

Based on the 10-year BBS noted above, northern bobwhite quail are widespread with a stable to increasing population trend on the refuge. They were detected on 29 of 30 possible points in myrtle shrub vegetation over the 10-year period, and on average detected on 40 percent of the points each year. Quail were detected on all 30 points in loblolly pine vegetation at one time or another during the 10-year survey and on average detected on 36 percent of the points each year. According to refuge data records, the number of quail counted in both the myrtle shrub and loblolly forest BBS routes has increased between 1996 and 2006 (unpubl. data, Refuge files).

Four American woodcock singing-ground survey routes (totaling 40 survey points) encompass all suitable woodcock habitat on the refuge accessible by road. Routes have been run intermittently in 8 of the past 20 years, beginning in 1990. A maximum of 15 woodcock were detected during the 2000 survey, and the most recent survey in 2009 counted five woodcock. Birds have been counted on each route with the exception of the North Service Road. Beach Road/Woodland Trail has had the highest number of detections and been the most consistent in having woodcock over the years. The Swan Cove Trail/Wildlife Loop did not have any woodcock during the first 10 years of the survey but has had more woodcock than any other route during the most recent decade. It was the only area with woodcock in 2009. No long-term trend can be determined from the data except that higher numbers of woodcock were counted during the first half of March, irrespective of the year. Counts after March 21 generally detect fewer birds, perhaps indicating that Chincoteague NWR is more important to migrating or wintering woodcock than breeding birds. Wallops Island NWR appears to have suitable habitat but lacks survey data.

The first turkeys on Assateague Island were sighted in March 2005 by an employed law enforcement officer. Coincidentally, the NPS staff reported turkeys on the north end of Assateague Island around the same time. Turkeys are regularly encountered on the bi-weekly waterfowl survey. The population size of turkeys is unknown, but a flock no greater than 20 birds (adults and juveniles) was observed in December 2009 (Buffa 2009). Turkeys are thought to be at least stable and probably increasing, according to refuge data. Turkeys are also frequently sighted on Wallops Island NWR.

3.4.3 Fish and Other Aquatic Species

A full list of fish species collected on the refuge during the refuge's Fish Survey is listed in Appendix L.

Finfish

The refuge and surrounding area has a diverse assemblage of fish species that inhabit the impoundments and is somewhat tolerant of fluctuating water salinity. During droughts and periods of water level drawdown, fish are confined to borrow ditches, where they are an easy food source for wading birds, skimmers, terns, and osprey. Species include the sheepshead minnow, rainwater killifish, striped killifish, mummichog, banded killifish, tidewater silverside, threespine and fourspine stickle-back, white and yellowperch, and American eel.

Myriads of fish spawn and feed in the nutrient rich, protected waters on Assateague Island's bay side. Marine finfish of primary recreational or commercial importance in the refuge vicinity

include the black drum, red drum or channel bass, bluefish, winter and summer flounder, menhaden, spot, Atlantic croaker, weakfish, mullet, and spotted sea trout. Other common species are puffer, rockfish, spotfin killifish, king fish, and sand tiger shark.

Since 1972, the Maryland DNR Critical Area Commission for the Chesapeake and Atlantic Coastal Bays has documented a decrease in the abundance of forage species such as bay anchovy, menhaden, spot, and Atlantic silverside in Assateague Island's bayside waters. Small forage fish are most susceptible to fish kills when summer algal blooms create anaerobic conditions in shallow bays and canals. Other finfish populations in Chincoteague and Sinepuxent Bays appear relatively stable. Summer flounder, however, are still recovering from a 1989 population crash. Declining populations of forage fish commonly eaten by the flounder may be slowing recovery rates. Disease also presents a threat of unknown magnitude as different species of fish in the bays periodically show symptoms such as lesions. Scientists are currently attempting to better understand these afflictions and how they may be related to observed changes in water quality.

Other Marine Resources

Historically, the mollusks and crustaceans of Assateague's bayside waters were an important food source for American Indians and a commercial resource for local communities dating back to the earliest settlers. Oysters were abundant in Assateague Island's bays until the mid-1930s, when construction of the Ocean City inlet and jetty system dramatically altered the salinity regime and the abundance of native predators. Coupled with chronic overharvesting and the introduction of two aggressive single-celled oyster parasites during the 1950s (multinucleated sphere X (MSX) and dermo), the oyster population plummeted and is now in danger of disappearing altogether. Presently, Virginia oysters are grown commercially on leased beds below the low tide mark in Toms Cove and along Assateague Channel. A few "wild oysters" may be found along the low marsh edge and the banks of Toms Cove (as well as some ribbed mussels that cling to banks of low tidal marsh creeks.)

The mollusk community was further disrupted during the mid-20th century by the virtual disappearance of eelgrass resulting from a viral disease that affected sea grasses worldwide. Atlantic bay scallops, once regionally abundant, were nearly extirpated by the outbreak. With the resurgence of eelgrass during the 1980s and 1990s, scallops have begun to repopulate the bays, though numbers remain very low. Quahogs, or hard shell clams, which live in bayside sand and mudflats, showed greater resistance to the forces driving population decline in other mollusk species and remain an important component of the estuarine ecosystem. Introduction of the hydraulic clam dredge during the 1960s increased harvest efficiencies and fueled the development of commercial clam industries in Maryland and Virginia. Unfortunately, hydraulic clam dredging damages sea grass beds and other bottom habitats, reducing habitat value and altering community structure.

Blue crabs are also abundant in cove and bay waters adjacent to the refuge. Crabs can also be found in Swan Cove Pool (F Pool) on the refuge, where crabbing is a popular activity of summer visitors. Blue crabs are food for wading birds, otters, and raccoon; and harvest of hard- and soft-shelled blue crabs is important both recreationally and commercially, which takes place in the National Seashore waterway. After declines in the 1950s and increases through the 1970s and 1980s, crab populations currently seem stable

Ghost crabs are small omnivores that burrow in the less-traveled sections of the refuge beach, eating detritus and dead organisms that wash up in tidal drift. They also prey on eggs and young chicks of beach nesting birds. Their predators include raccoon, fox, gulls, and various shorebirds.

The horseshoe crab is an endemic species found on the east coast of the United States, with the center of abundance between New Jersey and Virginia. This species spawns in the spring during new and full moon periods starting the end of April and lasting into June. This period of time coincides with the spring migration of shorebirds. Migration is an extremely energetic undertaking for these birds and their success or failure is dependent upon finding sufficient energy (food) to complete migration and then to breed. Studies have shown that horseshoe crab eggs that wash up on beaches after a spawning cycle are known to supply some or the entire energy requirement to complete migration. The Chincoteague NWR location along the Atlantic flyway makes it a vital resting and feeding spot for a large number of migrating shorebirds.

American horseshoe crab is one of four extant species of horseshoe crabs; it is the only North American representative (Shuster 1982). Horseshoe crabs are slow to reach sexual maturity (USFWS 2006; Shuster 1982). Although female horseshoe crabs lay thousands of eggs each spawning attempt, it is unknown how many of these eggs result in mature, reproducing crabs.

3.4.4 Mammals

The refuge supports relatively few native, terrestrial mammalian species. Among the more common terrestrial species are white-tailed deer and cottontail rabbit. Less common mammals include muskrat, river otter, opossum, gray squirrel, and three species of bat. Mammal diversity ranges from a variety of rodents and shrews to large marine mammals—the latter including the bottlenose dolphin and several species of whale that feed in the island's offshore waters.

Assateague Island and Chincoteague NWR are perhaps more noted for their exotic mammals (sika and Chincoteague ponies—see below) than for their native mammals. The endangered Delmarva Peninsula fox squirrel was introduced to Chincoteague NWR as part of a regional recovery effort (see “Federal Endangered Species” section above). Red fox, which is not native to barrier islands, impacts piping plovers and other ground-nesting birds on Assateague and Assawoman Islands. Red fox and raccoon are selectively controlled through a trapping program to minimize their predation on nesting piping plovers, American oystercatchers, terns, and skimmers (USDA 2005).

Deer

White-tailed deer are the largest native land mammals on the refuge. They are abundant in wooded areas and upland meadows, but they are also attracted to sites where dead trees have been cleared and tender regenerating forest vegetation is plentiful. They are managed through a regulated hunt program on Assateague Island, Wildcat Marsh, and Wallops Island NWR to maintain populations at levels that are commensurate with refuge habitat objectives, and to provide recreational hunting opportunities (USFWS 2007d and 2007e). The refuge partners with NPS on monitoring population size. Some white-tailed deer also use Cedar and Assawoman islands, as evidenced by tracks and scat.

Sika

Sika, a species native to east Asia and Japan, were released on the northern end of Assateague (MD) in the 1920s when the island was privately owned (Flyger 1960). They increased in number

and expanded their range to occupy the entire island, and sika were well established on the Virginia end of the island when Chincoteague NWR was established in 1943. By 1963, refuge records estimated the sika population at 1,300 and reported that a browse line was becoming evident on refuge vegetation, indicating an over-population. Public hunting, started in 1964, has continued to the present in order to reduce the abundance of an exotic animal, preventing habitat degradation, and providing a public recreational opportunity. The refuge also uses depopulation permits from the VDGIF to control the population.

The population of sika on the Chincoteague NWR portion of Assateague Island was estimated at 1,000 animals in the mid-1990s using a model combined with spotlight surveys (Bicksler et al. 1995). The minimum population estimate for sika in the fall of 2007 and 2008 was 600 animals based on Chincoteague NWR harvest data and the Downing population reconstruction model (Davis et al. 2007). Each year harvest data and staff observations of habitat conditions are evaluated to determine season lengths, hunt areas, and bag limits needed to control the herd and keep deer and elk from causing resource damage. The refuge also partners with NPS on monitoring population size.

Chincoteague Ponies

The "Chincoteague Ponies" are descendants of colonial horses brought to Assateague Island in the 17th century by Eastern Shore planters when crop damage caused by free roaming animals led colonial legislatures to enact laws requiring fencing and taxes on livestock. The modern-day descendants of those domestic horses are wild and have adapted to their environment. The year 1925 marked the first year that Chincoteague Volunteer Fire Company members, later dubbed "saltwater cowboys," herded the ponies to the Assateague Channel and swam them to nearby Chincoteague Island for auction. This event is now known as the annual pony swim and auction. The land used for the ponies' herding became part of the Chincoteague NWR with its creation in 1943, so the USFWS issued the Fire Company a Special Use Permit to allow no more than 150 head of horses to graze in designated areas of the refuge, a permit that is still in effect today.

The ponies' status as managed grazing livestock and a historical resource, and their effects on the island's habitats such as salt marshes and forests, is at odds with the fact that they are a popular feature of the island. Consequently, managing their populations is needed to maintain a balance with the island's ecosystem and remain compatible with refuge purposes. A fence along the Virginia/Maryland State line (the northern refuge boundary) separates the island's ponies into two herds. There are approximately 130 adult ponies on the southern Virginia end of the island. The Virginia herd is managed by the Chincoteague Volunteer Fire Company and is grazed in two designated compartments on the refuge, known as the North and South Pony Units.

Marine Mammals

Marine mammals are often sighted in waters around the refuge, and occasionally wash onto shore. With the exception of several common dolphins and seals, most marine mammals occur as occasional transients or seasonal migrants. Documented marine mammals in the ocean and bayside waters surrounding Assateague Island include six species of baleen whales, of which five are endangered; 16 species of toothed whales (including dolphins), one of which is endangered; and the West Indian manatee, which is also endangered. Other recorded species include: harbor seals; Risso's dolphins, long-finned pilot whales, humpback whales, fin-backed whales, sperm whales, pygmy sperm whales, spotted and Atlantic bottle-nosed porpoises, and common dolphins.

Most at risk is the northern right whale, with a North Atlantic population of perhaps only 200 individuals.

3.4.5 Reptiles and Amphibians

Reptile and amphibian diversity on the refuge is relatively limited owing to the island's isolation and harsh environmental conditions. (A full list of reptiles and amphibians occurring on Chincoteague NWR is included in Appendix L). Several species of reptiles possess morphological adaptations necessary to survive the varying and sometimes harsh conditions of barrier island life. Many reptiles, for instance, have tough skins that exclude salt and retain moisture. Still others exhibit behavioral adaptations that limit their exposure to severe temperature or salinity. Due to their highly permeable skins, most amphibians cannot tolerate the infusion of salt that occurs when submersed in seawater. Another major limiting factor is the relative scarcity of fresh water habitats available on the island. Assateague Island's amphibian species require fresh water to reproduce, but vary in the amount of moisture they require for day-to-day survival. Fowler's toads can actually tolerate low levels of salinity and are able to absorb moisture from their environment directly through their skin. This decreased dependence on fresh water explains their larger range and ability to survive in most of island's habitats.

Documented reptile and amphibian species on Assateague Island include 11 turtles, 7 frogs and toads, 7 nonvenomous snakes, and one lizard; of which approximately 20 of these reptile and amphibian species are assumed to be present on the Chincoteague NWR. Reptiles most likely to be observed on the refuge are: eastern box turtle, Northern diamond back terrapin, eastern mud turtle, eastern hognose snake, black rat snake, and northern water snake. Chincoteague's commonly observed amphibians include Fowler's toad, southern leopard frog, bull frog, and green tree frog.

Reptiles

Eastern box turtles, painted turtles, and mud turtles are seen occasionally in the fresh water impoundments, as are snapping turtles, which can grow quite large and prey on fish, frogs, and young waterfowl. Northern diamondback terrapin inhabit the salt marsh and more brackish impoundments. One freshwater species, the spotted turtle, is known to live only in a small group of ponds located in the oldest part of the island.

The northern diamondback terrapin dwells in refuge salt marshes. Female terrapins lay eggs on beach habitats (i.e., berms, dunes, and washover sand flats) of Assateague, Assawoman, Cedar, and Metompkin Islands from early June through early August (Feinberg and Burke 2003). A 3-year study (2006-2008) of terrapins nesting on south Cedar Island found that egg-laying peaks in June and tapers off in late July; predation followed by wash-out are the leading causes of mortality (Boettcher, unpubl. data). Predators (ghost crabs and red fox) destroyed 94 percent of nests in 2006 and only 38 percent in 2007, following the implementation of a predator control program (Boettcher, unpubl. data). Raccoons were not present on Cedar Island during this study, but are considered major predators where they occur on barrier islands (Feinburg and Burke 2003). Therefore, predator control programs to protect beach nesting birds also benefit terrapins.

No venomous snakes are known to inhabit Assateague Island. The most commonly seen snakes are the eastern hognose snakes, which prefer sandy woods, fields, and dune areas; and black rat snakes, which grow to 5 feet long, are excellent climbers, and live in high tree cavities. The less common northern water snake is also an excellent tree climber and is seen in the impoundments.

Northern fence lizards are very rare on the island and have not been observed in recent years.

As mentioned in section 3.4.1, four species of Federal listed sea turtles use Assateague Island's ocean and bay waters, and presumably the coastal waters of the refuge: leatherback sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, and green sea turtle.

Amphibians

Of the six frog and toad species, four were commonly encountered by Toadvine (2000) and during aural call count surveys conducted by refuge staff in 2003, 2004, and 2005: Fowler's toad, southern leopard frog, green tree frog, and bullfrog. The New Jersey chorus frog (last observed in 1970s at one location near the lighthouse), and green frog (not reported since Conant 1990) may no longer be present on the island. Green frogs occupy permanent bodies of freshwater, and several periods of drought in the 1990s may have eliminated habitat on Assateague Island (Toadvine 2000). Re-colonization is still a possibility (Mitchell et al. 1993 and Conant et al. 1990).

The red-back salamander may be becoming more common on the refuge. Few individuals were found by Toadvine (2000) and Mitchell et al. (1993). A quick survey using the White Hills Delmarva Peninsula fox squirrel trap line as a sampling transect line in December 2008 found these salamanders to be common under mixed hardwood/loblolly pines with adequate leaf litter, and absent under pure loblolly pine stands with relatively dry sandy substrate and no litter.

3.4.6 Invertebrates

Invertebrates are the most diverse and abundant animals in natural ecosystems, but their importance in sustaining those systems is not commonly understood or appreciated. Chincoteague NWR is home to several types of invertebrates, as well as used as a resting area for other migrating species. Invertebrate conservation and management depends on sound knowledge of the distribution, biology, and food web dynamics of individual species and ecosystem interrelations which all have far-reaching implications for migratory bird management. Both terrestrial and aquatic invertebrate communities are very important components within the Chincoteague NWR ecosystem and more than outweigh all the taxa combined in species richness, abundance, and biomass. Invertebrates serve vital functions as pollinators and detritivores (facilitating decomposition of matter and returning nutrients to the soil), and are critical food resources for birds, insectivorous mammals, fish, reptiles, and amphibians. They play predominant roles in all ecosystem processes and are necessary links in all food webs in refuge biological communities. Invertebrates represent critical elements of biological integrity, diversity, and environmental health, and are essential to the maintenance of ecosystem services. Few formal surveys on invertebrates have been conducted on the refuge, but casual observations show a rich diversity of terrestrial insects such as spiders, beetles, ants, dragonflies, butterflies, moths, flies, wasps, and bees, and certainly a healthy population of ticks, chiggers, and mosquitoes. Although not prudent to highlight all invertebrate types individually, there are some that require specific discussion due to their importance to the refuge and visitor experiences.

Bees are among the most common flower visitors of the refuge, acting as important pollinators through their nectar feeding. According to a 2006 bee collection survey, Chincoteague NWR is home to at least 41 species of bees. The majority of the species were recorded in areas of deep sandy soil, and wherever flowers could be found (USGS 2006).

The northeastern beach tiger beetle, a state and federally threatened species, inhabits beaches on the Chesapeake Bay and parts of the Atlantic coast, and is one of four subspecies of the eastern beach tiger beetle. Broad sandy beaches provide the best habitat for these beetles. Adults live in the zone between the high-tide line and the dunes; larvae inhabit burrows in the upper intertidal zone. These beetles have learned to adapt to this active habitat that is constantly disturbed by erosion and weather, and their presence is an indicator of a healthy beach. Adult beetles roam and fly over the sand foraging for other insects and small crustaceans, and also scavenge dead fish and crabs. Surveys for northeastern beach tiger beetle have been conducted on the refuge, but none have been found.

Eastern beach tiger beetles (with the exception of the northeastern subspecies) are greatest on the refuge during the months of June through August, which is their breeding season and during which the females lay eggs in shallow burrows on the beach. As a species, the eastern beach tiger beetle is rated by Nature Serve as common and globally secure, but the northeastern subspecies is ranked imperiled both globally and at the state level. The USFWS has developed a conservation and recovery plan for sites inhabited by the beetle. Key components of that plan include monitoring populations, protecting beach habitat from foot and vehicular traffic, and educating landowners and the public about the endangered beetle (VNHP 2008).

Assateague Island is a critical stopover area for fall-migrating monarch butterflies migrating south from Canada and New England to Mexico, with sometimes as many as 100,000 monarchs counted migrating over the beach dunes. Refuge habitats provide an abundance of nectar sources such as seaside goldenrod, climbing hempweed, *Biden*, groundsel-tree, and horsemint, which fuel the monarch's journey to wintering sites in Mexico. Important night-roosting sites are located in thickets of bayberry, wax myrtle, groundsel-tree, loblolly pine, and eastern red-cedar in the vicinity of Toms Cove and along the Service Road. The largest night roost recorded at Chincoteague NWR has over 30,000 monarchs clustering in the branches of a wild blackberry tree (Gibbs 2008).

Peak migration usually occurs during the last week of September and the first week in October, with a second wave occurring during mid-October in some years. In most years there are three peaks or "waves" of monarchs. Monarchs at Chincoteague NWR typically stay a maximum of 5 days, nectaring on the flowers to build up enough fat to sustain them on the rest of their journey to Mexico. The waves most often occur after the passing of a cold front, and large waves also occur after hurricanes (Gibbs 2008).

Several insect pests are common on the refuge, most notably the mosquito and the southern pine beetle. Although no formal surveys for mosquitos have been done on a refuge specific level, their existence has been noted and is incorporated within the refuge management practices for mitigating in areas of high public visitation when needed.

The southern pine beetle is a native species that has likely been present on the Delmarva Peninsula since the last ice age. Adult beetles are 0.08 to 0.16 inches (2 to 4 mm) in length with short legs and cylindrical bodies and are brown to black in color. The southern pine beetle is one of the most destructive insect enemies in the southern United States, Mexico, and Central America for pine trees. Adult beetles locate a host tree during their breeding cycle and bore into it. The beetles then release pheromones used to attract a mate; as the species breed and more beetles bore into the tree, eggs are deposited and egg galleries form inside the tree, which then hatch into young beetles. When they have developed into adult beetles, they leave the host tree in search of

other trees to colonize and infect, repeating the cycle in a different tree. This continued boring and feeding on the tree by adults and broods will ultimately kill a tree, and the area of destruction can quickly increase if the population is not controlled. Certain management methods, such as “fell in” method of management in which the infested trees are cut down and pushed to the center of the infested area, or burning certain areas, are practiced on the refuge to help control the beetle population.

3.4.7 *Invasive/Exotic Species of Concern*

Harsh environmental conditions such as exposure to saltwater spray and periodic storm overwash help prevent the introduction and spread of invasive/exotic plant species. By far the invasive plant causing the most resource impacts on Assateague Island is the common reed, *Phragmites*. It accounts for the majority of the acreage estimated to be affected by invasive plants, and occurs on all of the barrier islands on Chincoteague NWR as well as Wallops Island NWR. *Phragmites* outcompetes native wetland vegetation and provides little or no food or shelter for most wildlife. *Phragmites* can also eliminate small intertidal channels and obliterate pool habitat that offers natural refuge and feeding grounds for wildlife. The USFWS has been cooperating with other state and private landowners on the Delmarva Peninsula’s eastern shore to eradicate *Phragmites* using herbicide and other control techniques. Other invasive species on Chincoteague NWR include Asiatic sand sedge, climbing fern, Japanese stilt-grass, Japanese wisteria, and Japanese Honeysuckle.

Autumn olive, a non-native tree, was widely planted for wildlife habitat “improvement” in the 1960s and 1970s. It was planted along the edges of Wallops Island NWR as one of the refuge’s early management actions, but has spread to additional areas and is now considered an invasive exotic.

An invasive marine species potentially threatening the refuge’s aquatic habitat is dead man’s fingers, a macro algae or seaweed that arrived in New York in 1957 and has been making its way south along the coast. In parts of the northeast, dead man’s fingers has outcompeted native algae species and overrun shellfish beds by monopolizing limited space on suitable substrate in intertidal areas.

Non-native faunal species in refuge estuaries and intertidal zones may prove to be a formidable threat. Several invasive species have recently established themselves in portions of the bays, particularly along shorelines armored with rock such as bridge abutments and jetties. Three species of crabs—green crabs, Asian shore crabs, and possibly Chinese mitten crabs—may threaten native species and ecosystem health. Asian shore crabs were transported to the Atlantic via ship ballast water in the 1950s, while green crabs were probably introduced as bait for tautog, a fish popular with anglers.

Other non-native species of concern include nutria, a large South American aquatic rodent capable of devastating tidal marshes and other wetland habitats. Fortunately, the spread of nutria up the Atlantic seaboard has not yet reached Assateague Island, although occasional sightings have been made on the adjacent mainland. Although native to North America, nonmigratory Canada geese present a continuing challenge as regional populations are rapidly expanding and causing a variety of conflicts with both humans and native wildlife.

3.5 Socioeconomic Setting

This section provides a summary of information from the baseline report, *Chincoteague National Wildlife Refuge Economic Analysis in support of Comprehensive Conservation Plan* (USFWS 2012e), a full version of which is in Appendix M, as well as an analysis of environmental justice characteristics.

3.5.1 Socio-Demographic Characteristics

According to the U.S. Census Bureau, the population of Chincoteague grew 21 percent (from 3,572 to 4,317 individuals) between 1990 and 2000, but declined 32 percent (to 2,941 residents) between 2000 and 2010 (U.S. Census Bureau 2010). In comparison, Accomack County's population declined by 13.4 percent over the same time period, while the total population for the Commonwealth of Virginia increased by 13 percent, an amount greater than U.S. population growth. Table 3-6 shows the comparison between these geographical entities.

Table 3-6 Change in Population, 2010 and 2000

Year	Chincoteague Town	Accomack County	Virginia	U.S.
2010	2,941	33,164	8,001,024	308,745,538
2000	4,317	38,305	7,078,515	281,421,906
Percent (%) Change	-31.9%	-13.4%	13.0%	9.7%
U.S. Census Bureau, 2010 and 2000 Demographic Profile Data, DP-1. Accessed at www.factfinder2.census.gov on March 20, 2012				

Chincoteague has nearly three times the number of housing units as total households, reflecting the town's linkages to the tourism-based industry. The Census reports that nearly 60 percent of all vacant housing units were built for seasonal, recreational, or occasional use, compared to a state average of 2.4 percent.

Demographically, the town of Chincoteague is older and less racially and ethnically diverse than the surrounding county, state, and nation. Chincoteague has 1,417 households. Over 40 percent of these households are made of up individuals 65 years and older, reflecting Chincoteague's popularity as a retirement destination, and over 95 percent of residents are white. Both of these figures are higher than county, state, and national characteristics. Chincoteague's average household size of 2.06 is slightly smaller than that of the county, state, or nation. Over 83 percent of Chincoteague residents have a high school degree or higher, which is close to the national average of 85 percent. Compared to the county, Chincoteague has a higher percentage of residents with a bachelor's, graduate, or professional degree (13.7 percent vs. 10.3 percent). Only 16.6 percent of Chincoteague residents have not achieved a high school diploma, which is less than the county but more than the state (13.9 percent) and national (14.9 percent) averages.

The average earnings for people 25 years and over is less in Chincoteague than in other areas. Specifically, the average earnings for a Town resident is \$23,000 compared to \$27,406 for a county resident, \$39,409 for a State resident, and \$34,665 for an average national resident. However, these estimates are heavily influenced by the lower earnings power of Town residents with only a high school diploma or less. Town residents with a bachelor's degree or higher earn more on average than a resident of the county or nation (but not the state). Regardless of educational attainment, however, a higher percentage of Chincoteague residents experience poverty

compared to state or national residents. Table 3-7 presents an overview of poverty status and earnings.

Table 3-7. Poverty Status and Earnings

Category	Chincoteague, Virginia	Accomack County, Virginia	Virginia	United States
	Total Estimate	Total Estimate	Total Estimate	Total Estimate
Poverty Rate For The Population 25 Years And Over For Whom Poverty Status Is Determined By Educational Attainment Level				
Less than high school graduate	30.7%	28.0%	21.3%	24.7%
High school graduate (includes equivalency)	22.8%	13.2%	9.6%	12.0%
Some college or associate's degree	9.4%	12.2%	6.2%	8.4%
Bachelor's degree or higher	5.4%	3.6%	2.5%	3.8%
Median Earnings In The Past 12 Months (In 2010 Inflation-Adjusted Dollars)				
Population 25 years and over with earnings	23,000	27,406	39,409	34,665
Less than high school graduate	12,852	16,634	21,001	19,492
High school graduate (includes equivalency)	15,729	25,979	29,064	27,281
Some college or associate's degree	28,495	27,535	36,137	33,593
Bachelor's degree	52,417	40,809	53,522	48,485
Graduate or professional degree	66,563	50,898	75,613	63,612
Source: U.S. Census, American Community Survey 5 year estimates, 2006 - 2010.				

3.5.2 Economic Characteristics of Chincoteague and Accomack County

The town of Chincoteague has several sources of economic activity, including tourism (both refuge-related and other outdoor-based recreation opportunities), commercial fishing and seafood manufacturing, and impacts from the nearby NASA Wallops Island Flight Facility. This section will summarize some general economic characteristics for Chincoteague and discuss tourist-related characteristics of the economy, the commercial and seafood manufacturing sectors and the impacts of the NASA Wallops Island Flight Facility.

Employment

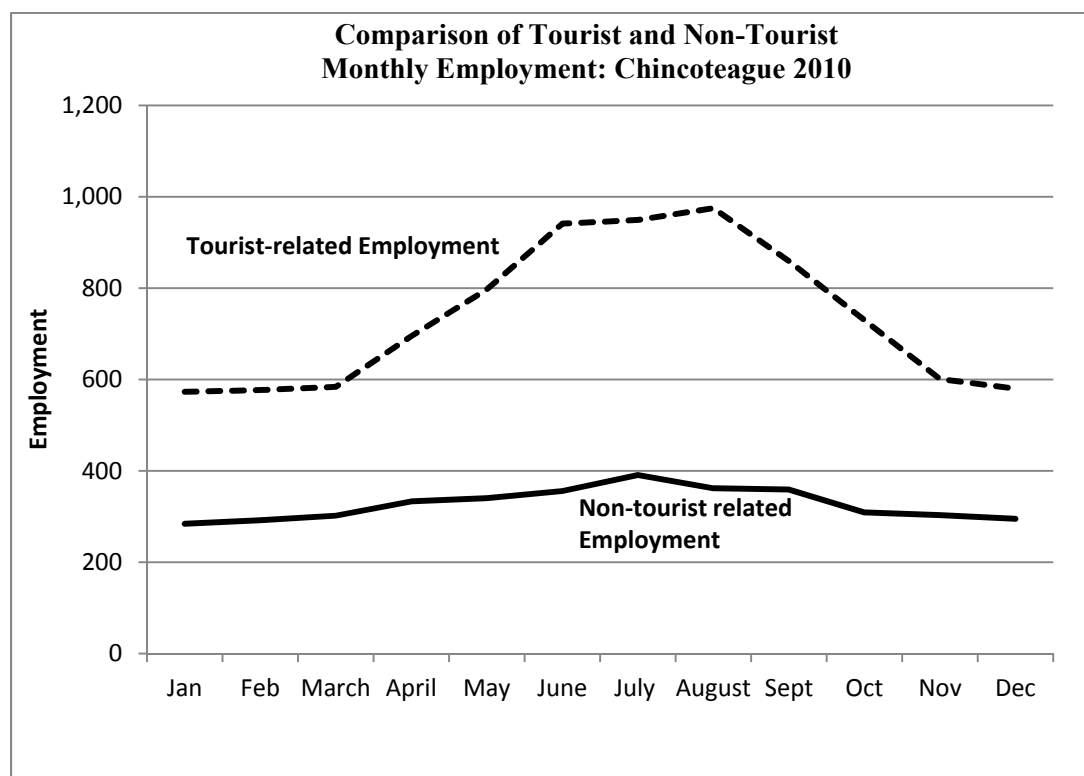
The Census estimates that during the year 2010, there were a total of 1,363 people employed in the town of Chincoteague. Roughly two-thirds were employed year-round while a third was seasonally employed. The three largest employment sectors, accommodation and food services, retail trade, and health care and social assistance, accounted for almost 75 percent of total wage and salary employment. The accommodation and food services sector accounted for 47 businesses, the retail trade sector accounted for 31, the construction sector for 15, and the real estate, rental

and leasing sector for 11. These four sectors accounted for 70 percent of all businesses which hired workers in 2010.

Chincoteague also has a substantial number of self-employed, as evidenced by the number of business licenses issued in 2011 compared with the number of businesses which employed at least one person during the year. In 2011, Chincoteague issued 1,269 business licenses, of which 149 employed at least one person, 700+ were for tourist rental homes, and approximately 416 were for other types of self-employment aside from tourist rental homes.

Chincoteague relies to a significant degree on tourism for town income. Tourism is not constant throughout the year, the summer months have the highest concentration of visitors and the winter months, the lowest. Consequently, much of the employment in Chincoteague follows a similar pattern. Total employment is lowest in January and highest in July, ranging from 857 to 1,340. Tourist-related employment ranges from 573 in January to 975 in August, representing an increase of 70 percent. In contrast, non-tourist related employment ranges from 284 in January to 391 in July, an increase of 38 percent. Figure 3-15 shows a monthly graph of tourist and non-tourist employment in 2010.

Figure 3-15. Comparison of Tourist and Non-Tourist Monthly Employment. Source: Virginia Employment Commission 2011



Real Estate

In terms of the real estate, rental and leasing sector, in the year 2010 there were a total of 2,775 combined rooms, spaces, and sites provided by 707 establishments. Ninety percent of these establishments were vacation rental homes. There were also 21 hotels/motels offering 849 rooms,

6 bed and breakfasts offering 33 rooms, and 6 cottages offering 80 rooms. Four campsites offered 1,143 spaces. The rental of these places to tourists not only generates revenue for the owners but also generates revenue for the town in the form of food and lodging excise taxes.

Tax Revenues

The town levies taxes on many of the tourist-related business to help pay for the provision of many public goods. In particular, taxes are levied on real estate, business licenses, occupancy, and meals.

Real estate is assessed by the Accomack County Assessor. Real estate within the town of Chincoteague is taxed by both the Town and Accomack County, with each having different rates. Real estate taxes for the Town are billed in early November of each year and are due on or before December 5th of the same year. The current Town real estate tax rate is \$0.06 per \$100 of assessed value.¹

Personal property taxes are assessed by the Accomack County Commissioner of Revenue on such items as automobiles, motorcycles, travel trailers, boats, and mobile homes. Personal property is also taxed by the Town and Accomack County with different rates. Personal property bills are mailed the same time as real estate and have the same due date. The current Town personal property tax rate is \$0.85 per \$100 of assessed value. However, mobile homes are billed at the real estate rate.

The town of Chincoteague levies an annual business license tax on all persons conducting business within the town. The tax is due on April 30th of each year. For most business categories, the current rate for this tax is \$0.13 per \$100 of gross receipts of the previous year, with a minimum tax of \$50.00 and a maximum tax of \$500.00 per year.

Transient occupancy tax is charged by providers of lodging for less than 30 days. The current town transient occupancy tax rate is 3 percent. Meals tax is charged on all prepared meals including beverages within the town. The current meals tax rate is 5 percent. Over the 10 year period from 2000 to 2010, hotels and motels accounted for 60.5 percent of the average annual gross receipts from the transient occupancy lodging tax, tourist homes 31.3 percent, campgrounds 4.7 percent, and bed and breakfasts 3.5 percent. Annual receipts averaged \$17.6 million over the 10-year period. Chincoteague also contributed roughly 55 percent of Accomack County's lodging tax receipts between 2005 and 2010.

Both food and lodging excise tax receipts increased from 2004 to 2010. Food tax receipts for the town have increased 12.5 percent, while lodging tax receipts increased 84 percent, leading to an overall 43.1 percent in revenue increase from excise taxes.

¹ The Town offers tax relief on real estate for certain elderly or handicapped individuals. The relief may be 50 percent or 100 percent. There are eligibility criteria, such as: income and amount of real estate owned. The contact is the Accomack County Commissioner of Revenue. The Commissioner of Revenue will notify the Town of those eligible for this relief.

Non-Tourism Sectors

In addition to tourist revenue, Chincoteague also harvests finfish and shellfish from the waters surrounding the refuge and benefits from its adjacency to NASA and associated facilities.

In 2010, the value of the harvest was over \$3.3 million, more than half of which came from private shellfish farms that began forming recently. Blue crab and quahog represent the most valuable harvest. Data from the Virginia Marine Resources Commission show that the annual total amount of the finfish harvest is declining over the years, while the amount of the shellfish harvest has been increasing. In 1993, Accomack County waters produced nearly 400,000 pounds of finfish and 400,000 pounds of shellfish. By 2010, shellfish harvests increased to nearly 1.8 million pounds, while finfish harvests declined to less than 100,000 pounds.

The NASA Wallops Flight Facility and Mid-Atlantic Regional Spaceport also provide economic activity for the town and county. It has been estimated that of the \$188.3 million it brings to the region from its operations and the spending of the employees and tourists it attracts, \$77.8 million ends up in Accomack County while \$110.5 million go to the Lower Eastern Shore. The facility and spaceport are also responsible for 2,347 jobs, of which 1,206 are in Accomack County.

3.5.3 *Refuge Recreation Visits and Economics*

The refuge attracts visitors to the region for a number of reasons. Visitors come for the beach, the wildlife and Chincoteague ponies, surf fishing, off-road vehicle use, and waterfowl and big game hunting. In 2010, the refuge had almost 1.4 million visits, with over half of those visits occurring in the peak summer months.² The beach parking lot closed five times that year due to over capacity.

Visitors stimulate the economy through direct payments for food, lodging, transportation, equipment, and supplies. In turn, local merchants use a portion of the money spent to buy other local goods, resulting in a multiplier effect. While refuge specific expenditures are not available, estimates can be derived from averages taken from the 2007 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. The percentages of expenditures estimated are then apportioned among Accomack County, Worcester County, and outside the area. The expenditure percentages are assumed to be 45 percent for Accomack County, 45 percent for Worcester County, and 10 percent for outside the area, based on a study of expenditures resulting from the Wallops Flight Facility.

Total visitor recreation expenditures and associated economic output for Accomack and Worcester Counties in 2010 are summarized in Table 3-8 below. Based on the percentages noted above and the assumption, supported by the Springsted report, *Review of Revenues Received by the Accomack County from the Town* (2010), that Chincoteague brings in 85 percent of tourism revenue for Accomack County, total refuge-related expenditures by visitors was \$42.4 million, supporting roughly 593 jobs in the lodging, food (including groceries), and retail sectors.

In addition to the revenue coming from visitors, the refuge itself spends \$3.4 million in operations and maintenance each year, three-quarters of which goes to employees who live in the area,

² A “visitor” is one person visiting the refuge for all or part of one day.

supporting roughly 44 jobs.³ In addition, refuge revenue sharing agreements resulted in \$99,300 to Accomack County, \$2,900 to Chincoteague, and \$587 to Worcester County, MD in Fiscal Year 2008.

Table 3-8. 2010 Visitor Recreation Expenditures and Associated Economic Output for Accomack and Worcester Counties (in millions)

Economic Category	Residents	Non-Residents	Total
Retail Expenditures	\$2.9	\$110.9	\$113.8
Economic Output	\$3.8	\$146.5	\$150.3
Job Income	\$1.2	\$47.4	\$48.6
Tax Revenue	\$0.6	\$10.0	\$10.6
Total	\$8.50	\$314.80	\$323.30
Jobs	45	1,749	1,794
Source: Estimates compiled by the Division of Economics, USFWS.			

3.5.4 Environmental Justice

Executive Order 12898, General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994), requires all Federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. As defined by the EPA on their Web site, environmental justice is the “fair treatment and meaningful involvement of all people, regardless of race, color, national origin or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

This section identifies the location of environmental justice populations in the study area, including minorities and those with incomes at or below the federal poverty level. For the purposes of this assessment, the study area is defined as Accomack County, consistent with the definition used in the socioeconomic analysis. The presence of environmental justice populations in the study area is determined based on U.S. Census tract information. Figure 3-16 shows the U.S. Census tracts located in Accomack County.

³ The jobs number includes both refuge jobs and jobs supported by its spending.

One difficulty in identifying the location of these populations within the study area is the highly seasonal nature of the town of Chincoteague's population, which fluctuates based on peak season tourist activities and services during the summer months. The U.S. Census Bureau recording date of April 1 is not during the peak season for the town, leading to a petition by the town and county for an adjustment to the Census population count. Specific details about the town economics and employment are provided in Section 3.5.2.

Minority Population

As shown in Table 3-9, the town of Chincoteague (Census Tract 901) contains a much smaller proportion of minorities (5 percent) than the surrounding county (35 percent) or the Commonwealth of Virginia (33 percent). Four of the eight census tracts in Accomack County have a higher proportion of minority population than the county as a whole, as shown in Table 3-9.

Low-Income Populations

Two Federal agencies, the Economic Development Administration (EDA) and the Housing and Urban Development Administration (HUD), have developed thresholds to identify concentrations of low-income populations that are commonly used in environmental justice analysis. EDA defines its eligibility for assistance as 80 percent of national per-capita income. HUD defines poverty level for a family of four at 60 percent of the median national household income. Neither the total population for Accomack County nor for the town of Chincoteague is below either threshold. However, half (four) of the individual census tracts within Accomack Country fall below the EDA threshold, as shown in Table 3-9 (see Figure 3-16 for the U.S. Census tracts located in Accomack County).

Figure 3-16. Map of Census Tracts for Accomack County

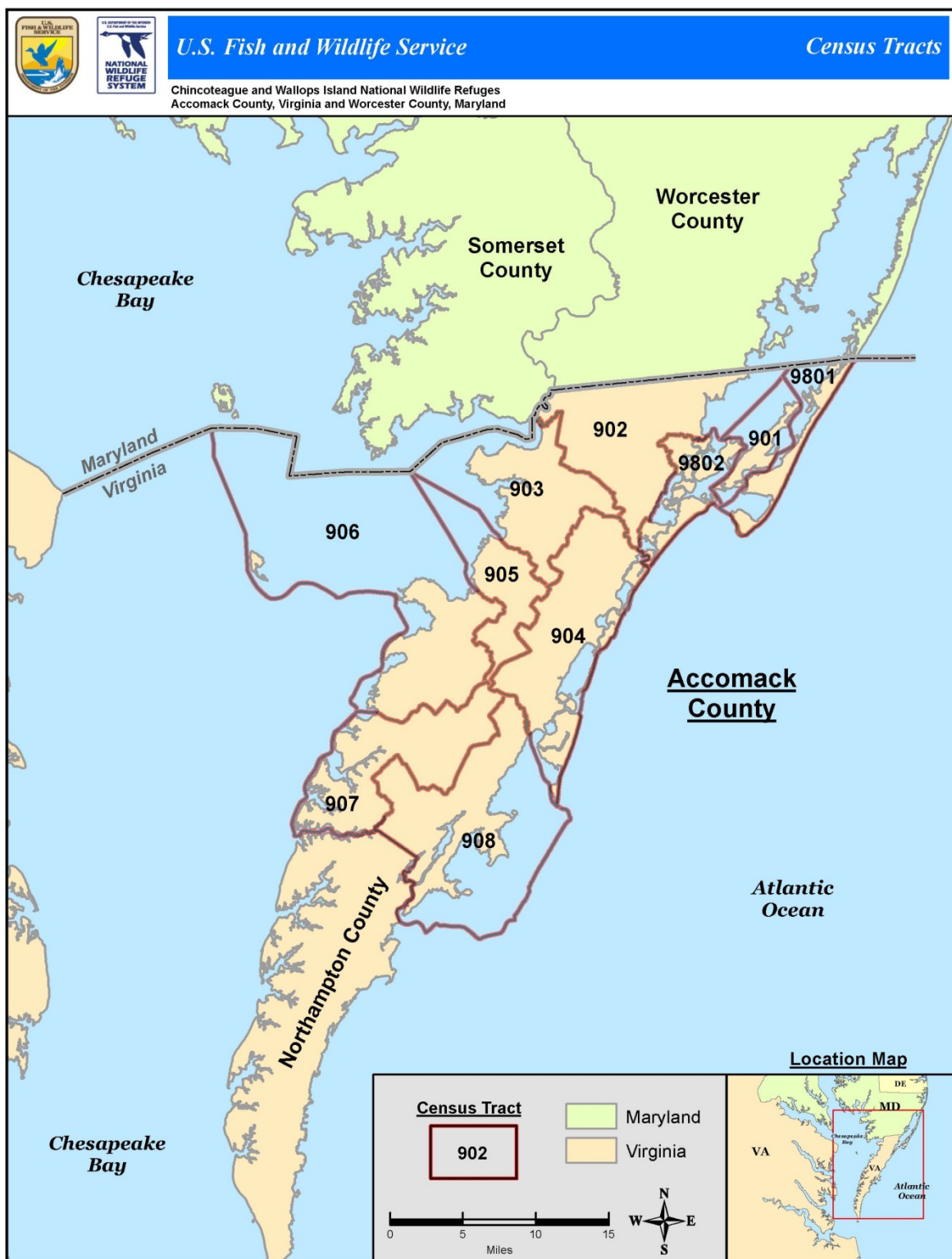


Table 3-9. Low-Income Thresholds and Minority Population by Census Tract (see Figure 3-16 for location of census tracts)

Area	Per Capita Income	Median Household Income	Minority Population
United States	\$27,334	\$51,914	28%
80% / 60% of National	\$21,867	\$31,148	N/A
Virginia	\$32,145	\$61,406	33%
Accomack County	\$22,766	\$41,372	35%
Tract 901 (Chincoteague)	\$29,752	\$33,109	5%
Tract 902	\$23,343	\$43,212	35%
Tract 903	<u>\$17,595</u>	\$35,368	26%
Tract 904	<u>\$17,542</u>	\$40,412	<u>50%</u>
Tract 905	<u>\$20,496</u>	\$41,042	<u>38%</u>
Tract 906	\$31,658	\$50,278	21%
Tract 907	\$22,548	\$43,629	<u>39%</u>
Tract 908	<u>\$20,033</u>	\$35,329	<u>47%</u>

Underlined figures signal that a census tract has a lower income level than the national poverty level or is above the percent minority of Accomack County.

3.6 Land Use Setting and Transportation

The refuge has a history of prior land use, as well as several adjacent land uses. Access to the refuge relies primarily on the personal motor vehicle, but there are a range of adjacent transportation systems, some of which connect to the refuge.

3.6.1 Land Use

This section describes use of land adjacent to the refuge, which includes other federally owned lands, the town of Chincoteague, and Accomack County.

Other Federal Lands

Adjacent Federal lands consist of the NPS Assateague Island National Seashore and the NASA Goddard Space Flight Center's Wallops Flight Facility, which has U.S. Navy and Commonwealth of Virginia tenants. The Flight Facility is a center for aeronautic research, and it has a visitor center that is adjacent to the Wallops Island NWR. It has launched approximately 16,000 rockets and expects an increase in commercial launch activity in the near future (Orbital 2008). The Virginia Commercial Space Flight Authority leases space for the Mid-Atlantic Regional Spaceport, which offers launch facilities for government, commercial, and academic/scientific uses and is expected to see an increase in commercial space flight activity (Orbital 2008). In addition, the United States Navy's Surface Combat Systems Center is co-located with NASA and the NOAA Command and Data Acquisition Station has leased land for its adjacent facility from NASA since 1965 (Town of Chincoteague 2010a).

Chincoteague Island

Figure 3-17 shows land use as of 2005 within the town of Chincoteague as presented in the *Comprehensive Plan* (2010). The two primary commercial areas are located on South Main Street, in the historic downtown area, and along Maddox Boulevard. The remaining land uses are predominantly residential or vacant, with businesses, tourist facilities, and public facilities scattered throughout the Town. Public facilities include schools, the Chincoteague Center, public service and safety facilities, and municipal offices.

According to the *Comprehensive Plan* (2010), Chincoteague's growth is constrained by land, capacity of the drinking water system, and the lack of a centralized sewage treatment system. Although there is vacant land, only a limited amount is available or feasible for commercial or residential development. For drinking water, Chincoteague is entirely dependent upon 5 miles of pipeline that carry water from underground wells on the mainland to the island; withdrawal of water from these wells is regulated by the Virginia Department of Health. There is currently no central sewage collection and treatment system serving the Island. Instead, wastewater is primarily disposed of by discharge directly into seepage pits, cesspools, or by the use of holding tanks or septic tanks and drain fields. Some residents have recently installed "package" sewage treatment systems.

Accomack County

The Accomack County Comprehensive Plan (2008) includes a thorough description of existing land use. The county's landscape consists mostly of farms, forests, and marshlands, interspersed with towns, villages and hamlets. The distribution of these land uses are shown in the County's zoning map (see Figure 3-18). The plan reports that 1996 satellite land use imagery shows that less than 2 percent of the county is developed, 35 percent is crop and field, 39 percent is wooded, and 24 percent wetlands. The plan also notes the extensive conservation ownership within the county,

including lands owned and managed by the by the NPS, USFWS, VDGIF, the VDCR, TNC, and The Chesapeake Bay Foundation (see Figure 3 19).

Figure 3-17. Town of Chincoteague: Existing Land Use (2005) (Town of Chincoteague 2010a)

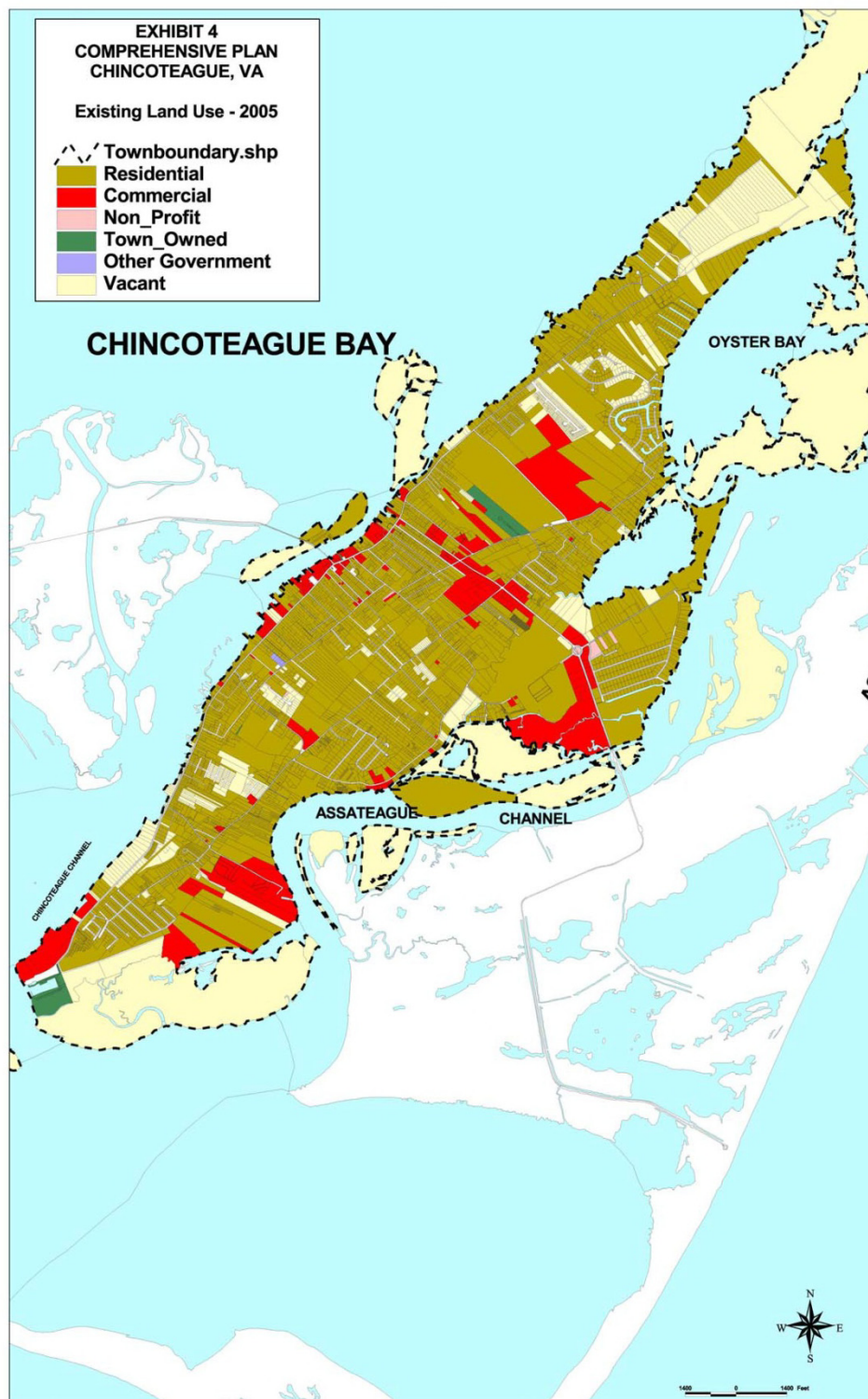


Figure 3-18. Accomack County Zoning Districts (Refuge Lands Excluded) (Accomack County 2008)

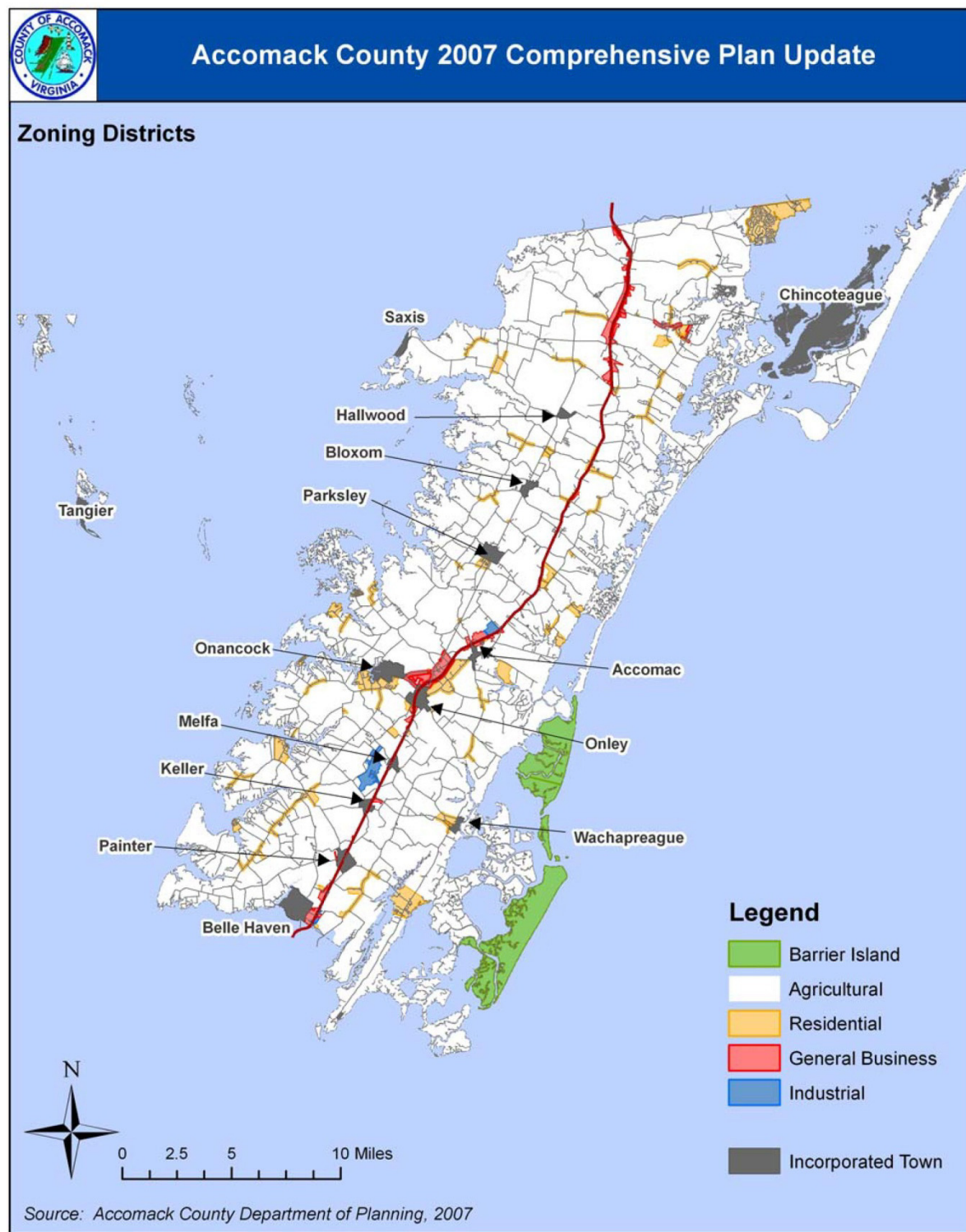
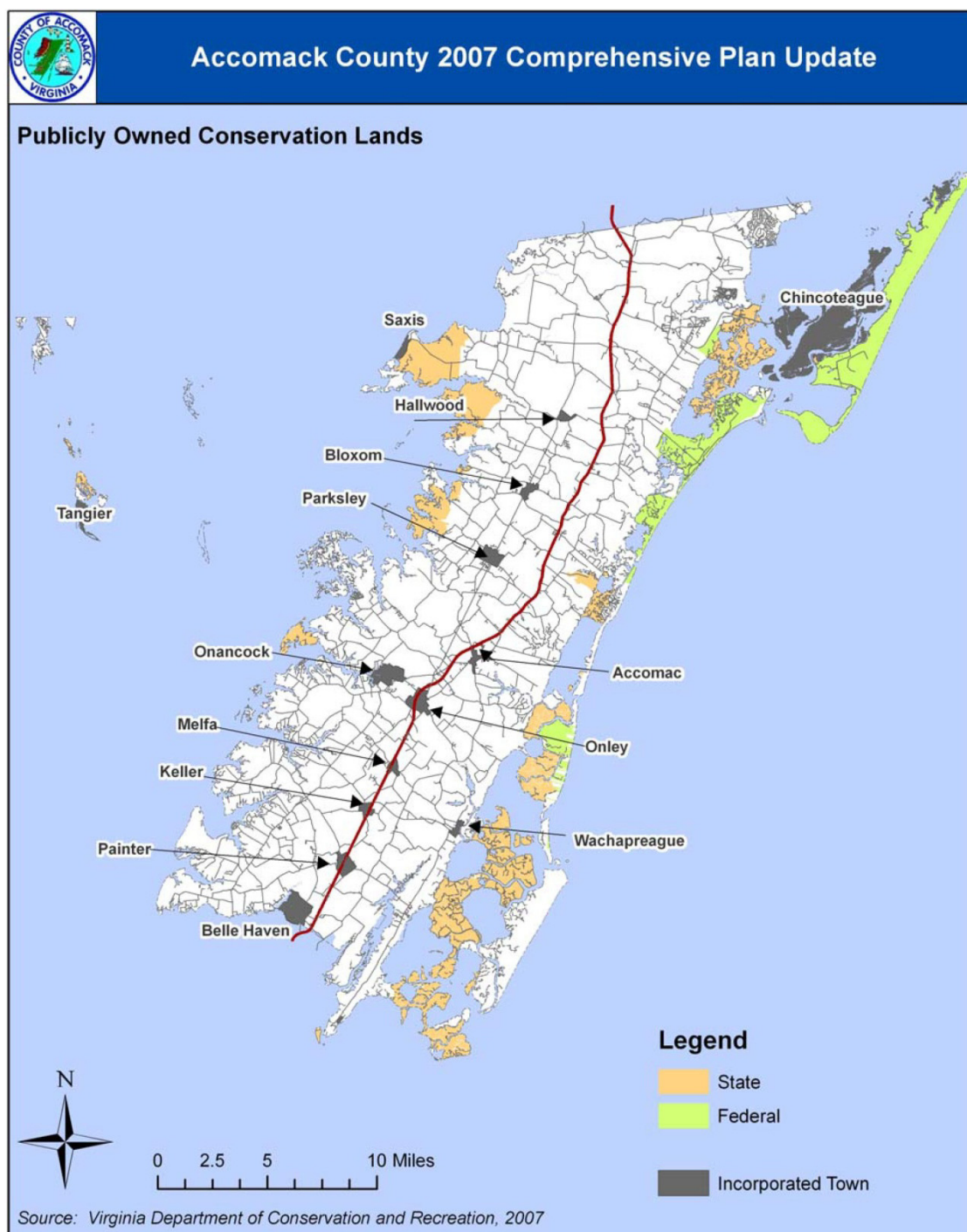


Figure 3-19. Accomack County Conservation Areas (Accomack County 2008)



Special Designations

In addition to NWR status, the lands within individual refuges may be recognized by additional designations, either legislatively or administratively. Special designation may also occur through the actions of other agencies or organizations. The influence that special designations may have on the management of refuge lands and waters may vary considerably.

Authority for designation of some special management area types (e.g., Research Natural Areas) on refuges lies solely with the USFWS. Wilderness Areas, on the other hand, must be legislatively designated by the U.S. Congress. For most special management area types, responsibility is held by or shared with others.

Refuges may also be included within much larger special management areas designated by other agencies or organizations, such as Western Hemisphere Shorebird Reserves, National Marine Sanctuaries, Estuarine Sanctuaries and Biosphere Reserves. Such designation may result in changes in management strategies, pursuant to this additional designation.

The following specially designated areas exist within the refuge:

Research Natural Areas

Chincoteague NWR contains approximately 150 acres of loblolly pine-shortleaf pine designated as a research natural area. We administratively designate research natural areas on refuges; currently there are 210 such areas on refuges totaling almost 2 million acres. Research natural areas are part of a national network of reserved areas under various ownerships and are intended to represent the full array of North American ecosystems with their biological communities, habitats, natural phenomena, and geological and hydrological formations. In research natural areas, as in designated wilderness, natural processes are allowed to predominate without human intervention. Under certain circumstances, deliberate manipulation may be used to maintain the unique features for which the research natural area was established.

Activities such as hiking, bird watching, hunting, fishing, wildlife observation, and photography are permissible, but not mandated, in research natural areas. Research natural areas may be closed to all public use if such use is determined to be incompatible with primary refuge purposes.

Western Hemisphere Shorebird Reserves

The Maryland/Virginia Barrier Islands International Reserve, extending along the Atlantic coast of Maryland and Virginia, includes the Chincoteague NWR, Eastern Shore of Virginia NWR, and the Assateague National Seashore. These Barrier Islands are extremely important to migratory shorebirds during both spring and fall migrations. Results obtained from the International Shorebird Surveys (Schulte and Chan 1985 with recent 2008 update) show that of all 600 sites surveyed to the east of the Rocky Mountains, Chincoteague NWR ranks second in species diversity during both spring and fall migrations, and is among the top 10 for sites with greatest maximum counts. Further investigation may likely reveal that the Barrier Islands host numbers of shorebirds well exceeding 500,000 annually. Additional information regarding the Maryland/Virginia Barrier Islands International Reserve can be found at <http://www.whsrn.org/index.html>.

Assateague Island National Seashore

Assateague Island National Seashore was authorized by Congress in PL 89-195, on September 21, 1965, for the purpose of protecting Assateague Island and “. . . for public outdoor recreation and enjoyment . . .” The National Seashore includes approximately 48,000 acres of land, marsh wetlands and water, featuring the 37 miles of Assateague Island's beautiful sandy coastline. Chincoteague NWR (~14,000 acres) and Assateague State Park (~800 acres) are located within the boundaries of the National Seashore. The Seashore exists to preserve the unique Mid-Atlantic coastal resources and natural ecosystem conditions and processes upon which they depend while providing high quality resource-compatible recreational opportunities.

Globally Important Bird Area (IBA) – Audubon

The Virginia Barrier Island Lagoon System, which extends from the Maryland-Virginia border south along the eastern coast of the lower Delmarva Peninsula, meets the criteria for, and has been designated as, an IBA by the Audubon Society. The area provides breeding habitat for 100 percent of Virginia's piping plover population, as well as a majority percentage of many other bird populations, and also provides wintering and migration locations for species at risk, such as the red knot.

Coastal Bays Program – National Estuary Program

Established in 1987 under the Clean Water Act, the National Estuary Program was developed to protect economically and environmentally sensitive estuaries across the United States by engaging all user groups. As part of the National Estuary Program, the Coastal Bays Program is a partnership among the towns of Ocean City and Berlin, NPS, Worcester County, U.S. EPA, and the Maryland DNR, Agriculture, Environment, and Planning, to manage and protect the land and waters of Assawoman, Isle of Wight, Sinepuxent, Newport, and Chincoteague bays.

UNESCO and DOI

The coastal barrier island/lagoon system of Chincoteague NWR has also been designated a World Biosphere Reserve by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in recognition of its great ecological value. Moreover, the DOI designated the area a National Natural Landmark in recognition of its outstanding natural values.

Wilderness Areas

Chincoteague and Wallops Island NWRs have been reviewed for their suitability in meeting the criteria for Wilderness Areas, as defined by the Wilderness Act of 1964. In 1974, the USFWS recommended that 1,740 acres on Assateague Island be established as part of the National Wilderness Preservation System. Of this, 1,300 are located in Chincoteague NWR (882 acres in Virginia and 418 acres in Maryland) and 440 acres are within the boundaries of Assateague Island National Seashore in Maryland. In addition, 4,760 acres, mostly located in Maryland, were recommended as potential wilderness, to become part of the wilderness when nonconforming uses and structures were eliminated (USDOI 1974). However at the present time, no action has been taken in regard to this recommendation and there exist no "congressionally designated wilderness lands" within the refuge.

Atlantic Coastal Bays Critical Area

The Chesapeake Bay Critical Area Protection Act was enacted in 1984 by the Maryland General Assembly to help reverse the deterioration of the Chesapeake Bay's (and later the Atlantic Coastal Bay's) environments. The Law and Criteria were designed to foster more sensitive land use and development activity along the shoreline of the Chesapeake Bay, Atlantic Coastal Bays, their tributaries, and tidal wetlands and to ensure the implementation of appropriate long-term conservation measures to protect important habitats. The Atlantic Coastal Bays, including Assawoman Bay, Isle of Wight Bay, and the St. Martin River, Sinepuxent Bay, Newport Bay, and Chincoteague Bay (totaling approximately 30,000 acres), were added to the Critical Area Program in 2002. The three goals of the Critical Area Program are: the protection of water quality; the conservation of fish, wildlife, and plant habitat; and, the accommodation of future growth and development without adverse environmental impacts. The law requires the establishment and maintenance of a minimum 100-foot naturally-vegetated buffer adjacent to all tidal waters, tidal wetlands, and tributary streams.

3.6.2 Transportation and Access

Automobile Traffic and Circulation

Private automobile travel is the primary mode of transportation to the refuge from the mainland (see Figure 3-20). U.S. Route 13 is the principal north-south corridor linking the Eastern Shore of Virginia (Accomack and Northampton Counties) with the mainland of Virginia to the south and the State of Maryland to the northeast. On the Eastern Shore, U.S. Route 13 is a four-lane arterial with a variable-width median separating northbound and southbound traffic throughout most of the corridor.

U.S. Route 13 provides a direct connection to Route 175, the only access road to Chincoteague Island and the Virginia section of Assateague Island. Route 175 runs east across the Delmarva Peninsula from Route 13 to the town of Chincoteague, crossing over the Wire Narrows and Black Narrows Salt Marshes. From Route 13, Route 175 is a two-lane road with no shoulders until its intersection with Route 679, where the road broadens to include paved shoulders until it reaches the shore. The John Whealton Memorial Causeway (“Route 175 Causeway”), built in 1922, is a 2.5-mile stretch of two-lane road with no shoulders and a limited number of pull-off zones. The Causeway connects to Chincoteague Island via the Chincoteague Channel Route 175 Bridge, which leads to Maddox Boulevard. There is one parking area off of the Causeway, at Queen Sound Landing, for fishing and boat launching.

The road network in the town of Chincoteague consists of two-lane commercial and residential streets with varying levels of traffic and service. Circulation on local roadways features local and non-local traffic accessing residential, commercial, and recreational destinations.

Once on the refuge, visitors can access the various refuge sites, including the recreational beach, via the two-lane Beach Road. Refuge roads and parking are discussed further in Section 3.9 Refuge Administration. The recreational beach parking consists of four unpaved parking areas at the terminus of Beach Road at the recreational beach (see Figure 3-21). The Chincoteague NWR Master Plan (1993a) references 961 existing spaces on the beach, but the spaces are not marked so the actual maximum capacity is reported as higher by refuge staff, dependent on people’s parking and the size of vehicles. Parking capacity at the beach lots is sufficient for most days of the year but occasionally the lots reach capacity resulting in temporary closures. In addition, storm events can temporarily close the lots due to overwash and subsequent restoration efforts.

Figure 3-20. Transportation Access to the Refuge

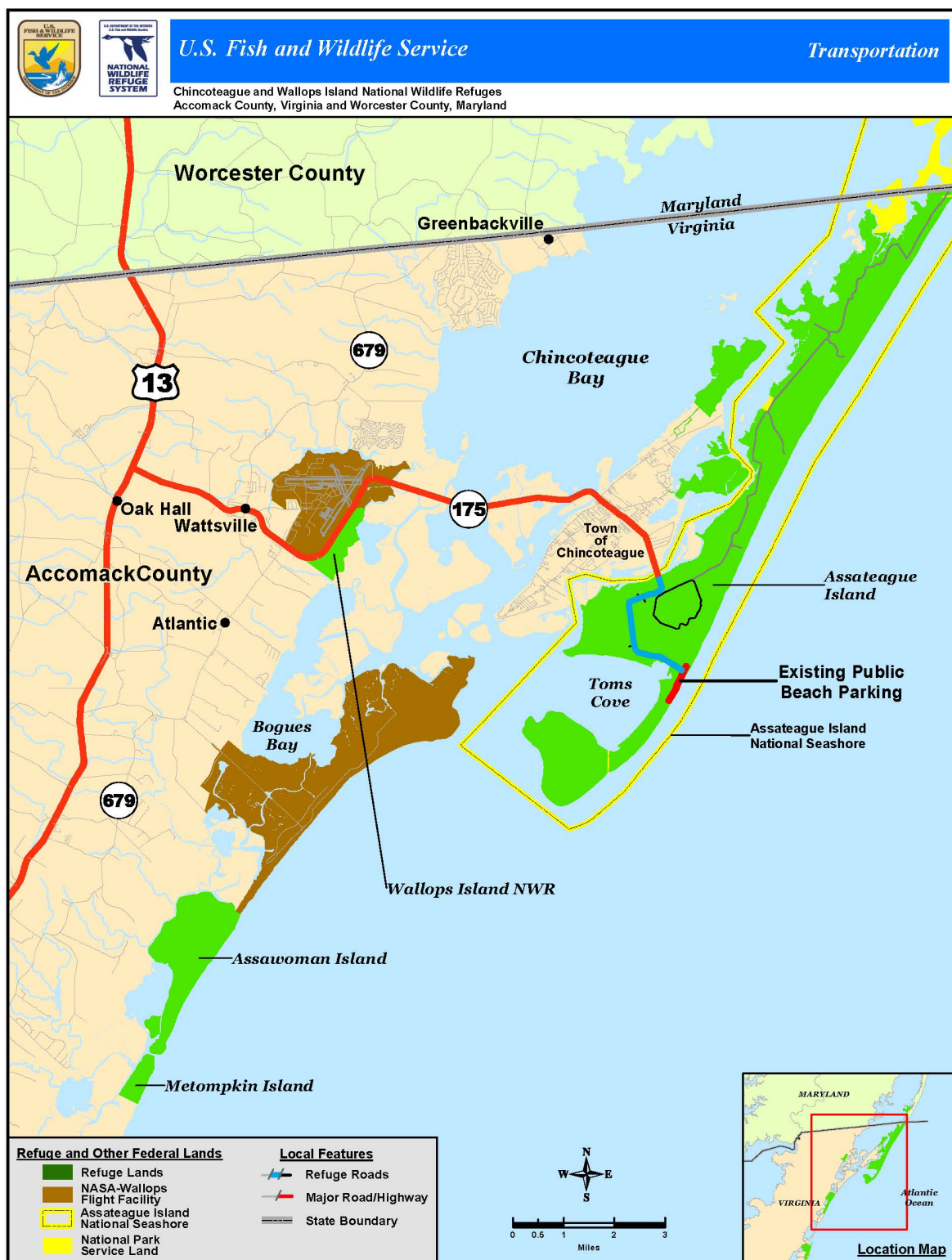
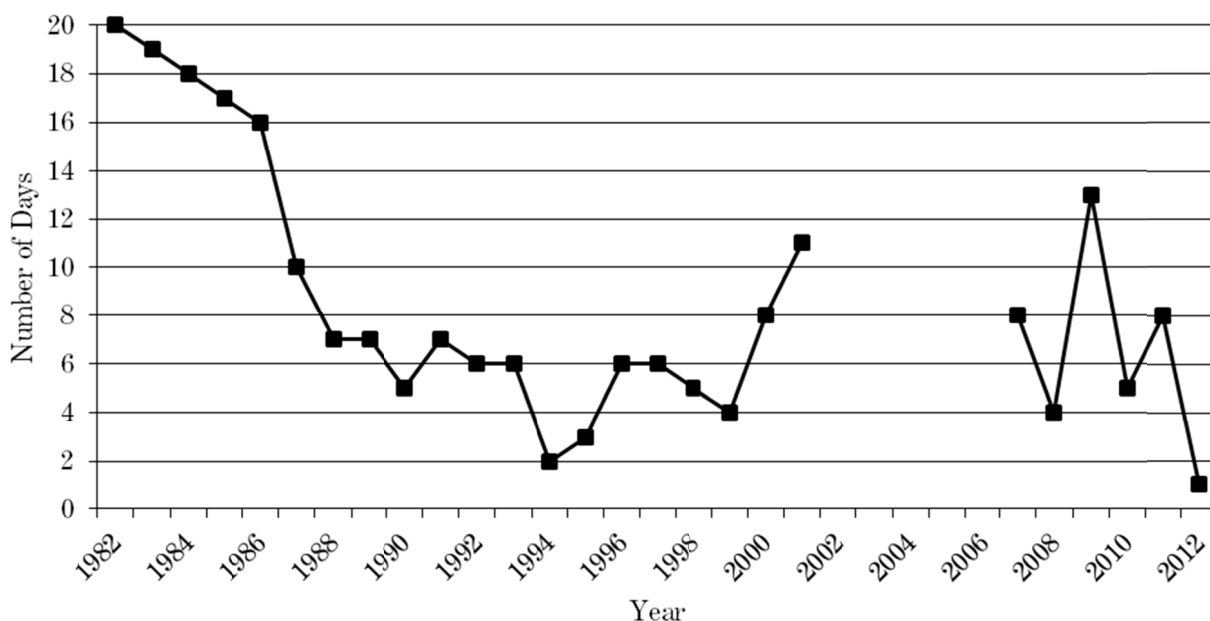


Figure 3-21. Chincoteague NWR Beach Parking Lot (Volpe Center July 2009)

From 1982 to 2001, the refuge and Seashore kept records of the frequency and dates for when the beach parking lots reached capacity; the refuge began recording frequency again in 2007 (see Figure 3-22). A review of data from 2000 and 2001 indicates that closures last from 30 minutes to 4 hours and were always initiated between 11:00 a.m. and 2:00 p.m. There are no similar records for a more recent year, but refuge staff anecdotally reported that there are typically 4 to 6 closures a year, also occurring between the peak hours noted above, and lasting approximately 30 minutes to 2 hours. These closures are highly weather-dependent but usually occur on the 4th of July if it is a 3-day weekend, and on the first two Saturdays and Sundays in August. The capacity closure data do not include closures due to damage to the parking from storm events.

In terms of parking occupancy for non-summer months, the refuge conducted hourly manual parking counts (approximately 9 a.m. through 4 p.m.) for the weekends of April and May 2010 and September 2010 through February 2011. The data indicates that total parked vehicles did not surpass 200 between November and April, and did not surpass 480 from October through May except for Memorial Day weekend.

Figure 3-22. Chincoteague NWR Entrance Closures Due to Full Beach Parking Lots (Seashore and refuge staff)



Intelligent Transportation and Traveler Information Systems

The refuge has been expanding its intelligent transportation and traveler information systems on the refuge using funding from a grant from the Paul S. Sarbanes Transit in Parks and technical assistance from Eastern Federal Lands, a division of the Federal Highway Administration's (FHWA) Office of Federal Lands Highway. The refuge purchased a solar-powered, portable variable message sign (VMS) in October 2009 to inform visitors of refuge and beach conditions, in particular during storm events and parking lot closures. In 2012, the refuge successfully re-activated an AM radio station, installed a traffic counter for the beach parking area, and explored options to sell passes and provide information via off-site kiosks. At the regional level, although VDOT manages a traffic and traveler information website to provide road condition information, it does not yet cover the Eastern Shore.

Public Transportation

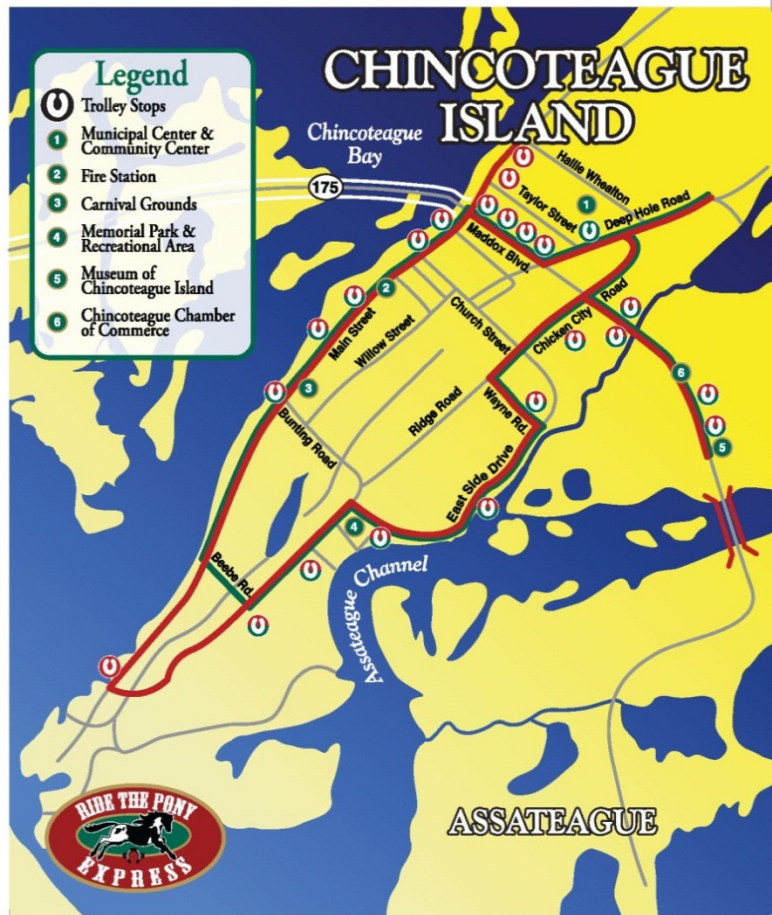
There are two public transportation systems that serve the town of Chincoteague. The town has a public transit system, the Pony Express, which is owned and operated by the Town of Chincoteague and that is also used for a historic tour of the town. Accomack and Northampton counties also have a public transit system, Shore Transit and Rideshare (STAR) Transit, which currently provides limited service to the town of Chincoteague. The refuge's friends group, the Chincoteague Natural History Association (CNHA), provides an interpretive tour and has partnered in the past with the refuge to offer transportation to the beach when the parking lots were temporarily destroyed by Hurricane Irene. The town of Chincoteague and CNHA also provide special event public transportation during the Annual Pony Penning in July. The town of Chincoteague is not served by intercity bus transportation.

Pony Express

The Pony Express was initiated in 2004. It is a seasonal trolley that serves primary community and tourist sites throughout the Town but does not currently serve the refuge. The service has two routes (see Figure 3-23) and only operates in the evening from approximately 5:00 p.m. to 10:30 p.m. every day from the first weekend in June through the end of August. Extended service is provided after 10:30 p.m. on specific dates in May, July, and October and daytime service is provided the week of the Pony Swim and Auction (see below). The service also operates on the weekends in May, September, and October. Frequency varies by route and stop but is either every 30 or 60 minutes. The Town owns three trolleys. Fares are \$0.25 per ride.

The Pony Express trolleys are also used by the History Tour Volunteers for an historical tour of the Town that is offered on Tuesday and Thursday afternoons from mid-June through Labor Day. Adult fares are \$3.00 and reduced fares (\$2.00) are available for riders aged 2 to 12. Children under 2 years of age ride free.

Figure 3-23. Pony Express Routes



STAR Transit

STAR Transit began in 1996 and currently runs four fixed-route bus services on weekdays, one of which served the town of Chincoteague from 1996 to 2010, and a demand-response service. STAR Transit offers a deviated route service (1.5 miles) on all its routes for those with an approved ADA

application and its buses are all equipped with external bicycle racks. For 2012, STAR Transit received Federal Transit Administration (FTA) Section 5317 (New Freedom) funds to begin deviated fixed-route service on weekdays to Chincoteague to provide service for the elderly, disabled, and unemployed community from Chincoteague to Route 13, where it will connect to one of STAR Transit's existing fixed route services (KFH Group 2011).

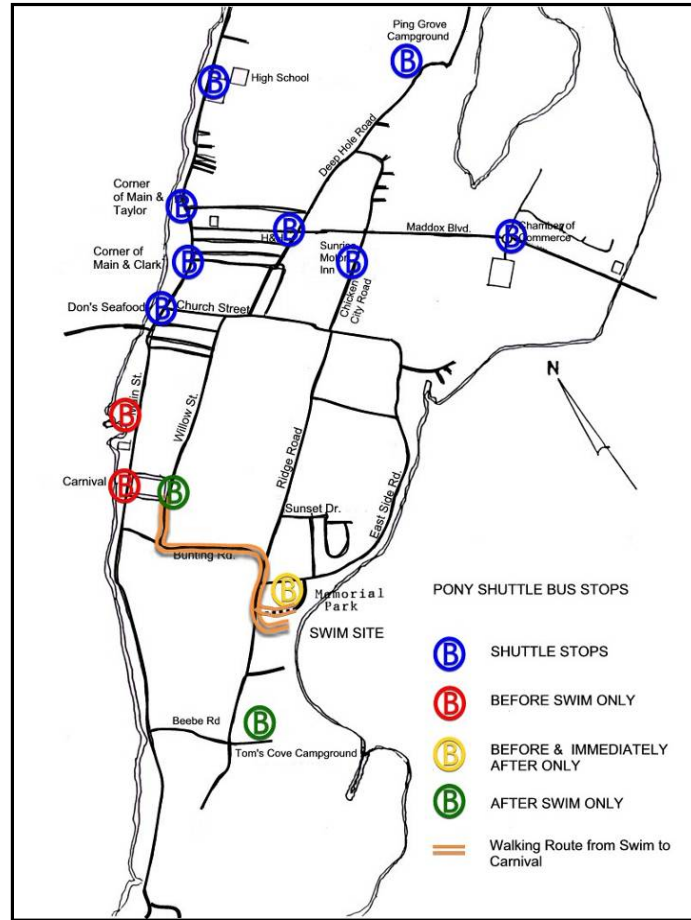
CNHA Services

The CNHA provides a seasonal, interpretive bus tour service within the Chincoteague NWR under a cooperative agreement. The service began in 2004 to provide opportunities for the public to develop an understanding and appreciation for wildlife. As a nonprofit enterprise, CNHA uses proceeds collected from the tour to support its interpretation services. The tour operates from April through November and takes visitors to a part of the island that is not publically accessible by vehicles, including one of the best locations to see the Chincoteague ponies. The tour departs from the Visitor Center parking lot and travels to the end of the Service Road and back, a distance of approximately 15 miles round trip. The tour lasts 1.5 hours and is accompanied by an interpreter/guide who provides information about wildlife and ecology. The cost in 2012 is \$12 for adults, \$8 for CNHA members (except July and August), and \$6 for children ages 2 to 12. The CNHA operates a used, 32-seat bus equipped with air conditioning and a wheelchair lift. CNHA contracts with a small company, Eastern Shore Action, to provide drivers.

In 2011, after Hurricane Irene damaged the parking lots and recreational beach (see section 3.8.1), the public beach was temporarily moved to an alternate site outfitted with lifeguard stands and portable toilets. This location was about 1.5 miles away from the closest refuge parking lots. CNHA partnered with the refuge to provide temporary bus transportation every 30 minutes from 10 a.m. to 5 p.m. from the parking for the Herbert H. Bateman Educational and Administrative Center and Wildlife Loop to Swan Cove Trail, from where visitors could walk one-half mile to the beach (USFWS "CNHA Offers Shuttle Service," 2011). The fare per person was \$1. The service ran for 5 days and served 3,286 beach visitors, according to refuge staff.

Pony Swim and Auction Special Event Transportation

During the Annual Pony Swim and Auction each July, several special event transportation services are offered. During the round-up of the northern pony herd, CNHA provides bus services from the Herbert H. Bateman Educational and Administrative Center to the beach on the morning of the Beach Walk, when the ponies from the northern herd are brought to the southern pony corral in preparation for the swim. On the day of the Pony Swim, the Town offers a free shuttle service from Chincoteague High School, which is used for parking, to Memorial Park, near the site of the Pony Swim, where the ponies come ashore from Assateague Island, and then back to the High School or site of the Carnival (see Figure 3-24). The shuttle consists of Accomack County school buses and a rented handicapped-accessible vehicle (note that the Pony Express trolleys maintain their scheduled service). Buses begin operation at 5 a.m. from the High School and operate until approximately 2 p.m., one hour after the ponies reach the Carnival. Volunteer guides are present on each bus.

Figure 3-24. Pony Swim Shuttle Route

Non-motorized Transportation

The refuge has several facilities and opportunities for walking, bicycling, and non-motorized boating. This section focuses on bicycling for transportation; other activities will be covered under section 3.8 Visitor Services and 3.9 Refuge Administration.

Cycling in the town of Chincoteague and within the refuge is a popular recreational activity as well as a mode of transportation for visitors and residents. The bicycle connection between the refuge and the Town is very important because many bicyclists travel from the Town, where they are staying or where they rent bicycles, into the refuge. Rental options within the Town include a variety of two-wheel bicycles (e.g., recumbent, tandem, side-by-side tandem) as well as four-wheel bicycle surreys. Many bicyclists also drive into the refuge with their bicycles to park at the Wildlife Loop or one of the other parking areas to bike recreationally. Limited data exists on the number of cyclists and bicycle trips to and within the refuge, but annual estimates range from 65,000 (Chincoteague Recreation and Community Enhancement Committee, May 19, 2009) to 75,000 (FHWA 2008) bicycle trips between the Town and refuge, with up to 300,000 bicycle trips within the refuge.

Within the refuge, bicycle use enables visitors to observe wildlife. Construction of bicycle trails began in the 1970s and 1980s and currently consists of several trails throughout the refuge (see

Figure 1-4 in chapter 1). An alternating paved and gravel bicycle trail runs from Chincoteague across the bridges between Assateague and Chincoteague (see Figure 3-25) to the Woodland Trail parking lot. It begins at the bridge between Chincoteague and Assateague islands as a paved trail that runs to the Wildlife Loop parking area and shortly beyond, where it then joins the road as a gravel path. The Wildlife Loop itself offers a 3-mile paved loop for exclusive use by bicyclists, runners, and walkers each day before 3:00 p.m., after which vehicular traffic is permitted. From the Wildlife Loop, bicyclists can access Beach Road via the paved Black Duck Trail or access the beach via the paved Swan Cove Trail. The Swan Cove Trail formerly ran south along the beach to the lifeguarded beach but the refuge stopped maintaining it after it was repeatedly washed away by wave and sand action. In response to the lost connection to the lifeguarded beach, the refuge provided bicycle parking and an emergency cellular phone booth where the Swan Cove Trail met the beach. However, such services were badly damaged by the 2009 nor'easter and have not been replaced. The current plan for the future is to develop a bicycle trail along Beach Road to replace the Swan Cove Trail connection.

Figure 3-25. Bicycle Trail over the Bridge (Volpe Center July 2009)



In 2008, the refuge received a FY08 implementation project grant for \$600,000 from the FTA's Paul S. Sarbanes Transit in Parks Program to extend the existing pedestrian/bicycle path a quarter-mile (0.25) from the Assateague Channel Bridge to the Maddox Boulevard traffic circle (see

Figure 3-26). After design and environmental compliance work, in 2012 a bicycle lane was added along Maddox Boulevard from the traffic circle to the end of private development, and an elevated boardwalk trail was constructed along the remaining road section before the bridge.

Figure 3-26. Section of Maddox Boulevard Bicycle/Pedestrian Trail Extension Before/After Trail Installation (USFWS refuge staff 2008 and Volpe Center March 2012)



Alternative Vehicles

There are a number of rental options for small motorized vehicles for visitors and some electric vehicle use, primarily modified golf carts, by residents. Visitors to Chincoteague have the opportunity to rent several small motorized vehicles including: mopeds, scooters, and the Scoot Coupe, a three-wheeled, two-passenger scooter. The Scoot Coupe meets all Federal safety standards for motorcycles and are “street legal” in all 50 states. Depending on the model, the Scoot Coup is classified as either a moped/scooter or motorcycle and operates at a top speed of 30 or 55 MPH, respectively.

3.7 Visitor Services

Chincoteague NWR provides a range of recreational opportunities, including the six wildlife-dependent activities as well as beach recreation and other uses, while Wallops Island NWR is limited to public access for hunting only. For all activities and facilities, the refuge maintains some mobility-impaired access, such as paved trails, designated mobility-impaired parking spaces, ramp access to boardwalk at the NPS Visitor Center, two beach wheelchairs, and one designated accessible hunting zone. The USFWS and NPS visitor centers are also accessible.

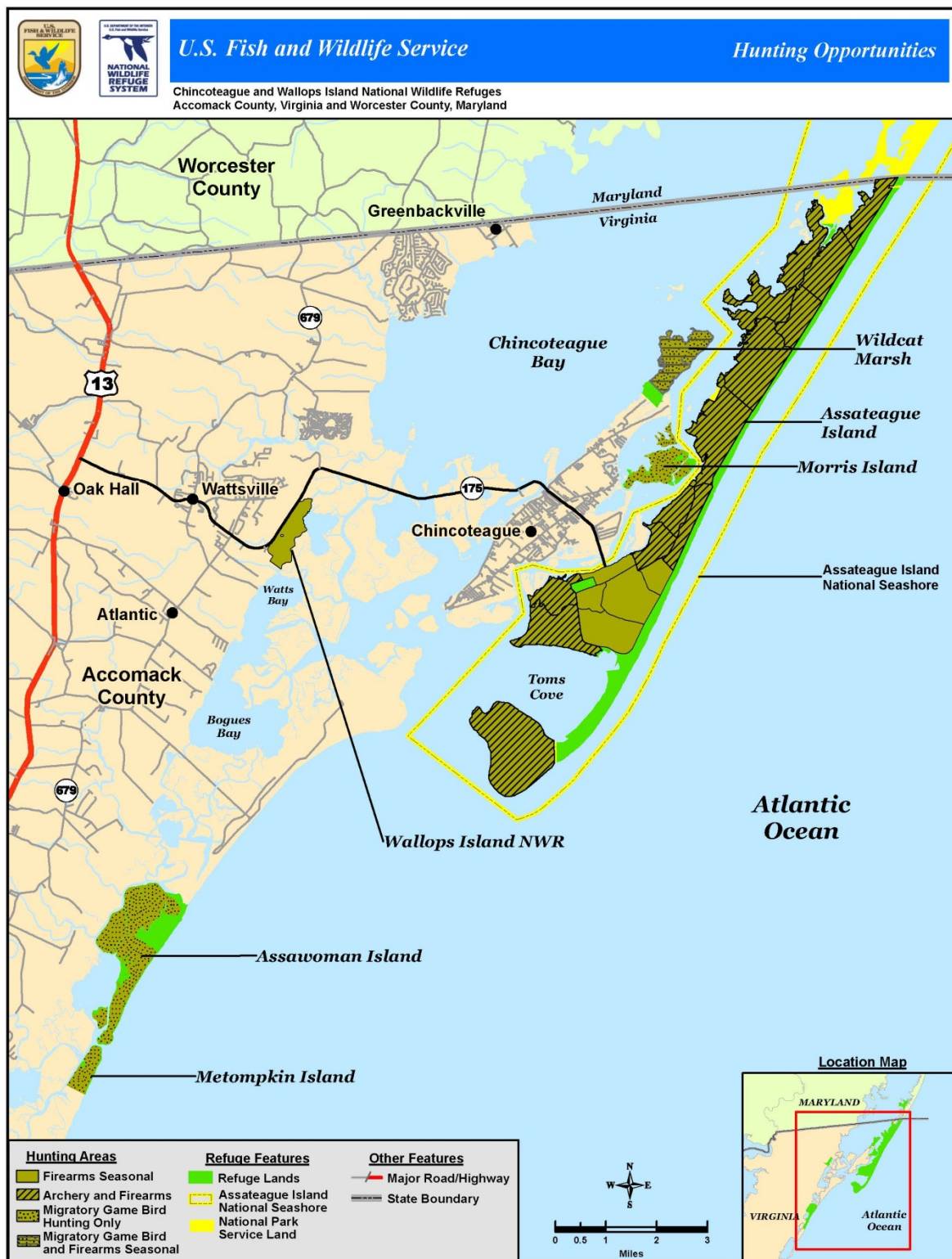
3.7.1 Hunting

Big game hunting and migratory game bird hunting opportunities are provided in designated areas throughout the refuge. Figure 3-27 provides an overview of where each opportunity is allowed. Brochures with specific regulations and maps are available on the refuge Web site: <http://www.fws.gov/northeast/chinco/hunting.html>. All hunting is conducted within the regulatory framework established annually by the Commonwealth of Virginia.

Big Game Hunting

The current big game hunting program for Chincoteague NWR consists of sika (Oriental Elk) and white-tailed deer with archery or firearms. The opportunity for big game hunting is controlled through a lottery process. Once selected by the lottery system, firearm hunters must attend a firearms orientation session prior to hunting on the refuge. The refuge is divided into 11 primary hunting zones, with a few of those zones that are located closer to developed portions of the refuge subdivided for smaller force firearms for safety considerations to the public. A user fee helps defray the annual administrative costs of the program. In 2011, big game hunting saw 1,230 visits.

Figure 3-27. Hunting Opportunities



Each year the deer herds are evaluated, after which species hunted, season lengths, and bag limits are determined for the Annual Hunt Program. Approximately 150 to 200 sika are taken each year, from an estimated population of 600 to 800.

Wallops Island NWR only allows hunting of white-tailed deer, per the same conditions as described above, including the lottery. Each fall, 25 hunters participate in the big game hunt, either with firearms or archery. A user fee helps defray the annual administrative costs of the program. In 2011, 60 visits were recorded for hunting. All big game lottery applications, which have a \$5 application fee, and permits for hunting (\$20) are administered online.

Migratory Game Bird Hunting

Hunters must obtain a Migratory Game Bird Hunting permit in order to hunt on the refuge. Hunters must also possess valid hunting license, stamp(s), and/or permits as required by the Commonwealth of Virginia and Federal statutes/regulations. Migratory game bird hunting occurs in the fall on Thursdays, Fridays, and Saturdays and is only provided via water access for four hunt units, Wildcat Marsh, Morris Island, Assawoman and Metompkin. Hunters may harvest ducks, geese, swans, coots, and rails. In 2011, only 99 visits occurred on the refuge for migratory bird hunting, possibly because the hunt areas are only accessible by boat.

Other Programs

The refuge is currently working with the Wounded Warriors Project, a non-profit dedicated to fostering successful, well-adjusted wounded service members through programs for the mind and body, to develop an opportunity for hunters with disabilities.

3.7.2 Fishing

Surf fishing, crabbing, and clamming are among the most popular wildlife-dependent recreational activities conducted on the refuge. For all activities, Virginia Marine Resources Commission regulations must be observed, including licenses and catch and size limits. Anglers age 16 and older must possess a valid Virginia Saltwater Fishing or Potomac River Fisheries Sport Fishing license. Anglers who are exempt from licensing and holders of out of state reciprocal licenses must register with the Virginia Fisherman Identification Program (FIP). Visitors may fish after refuge operating hours ("overnight") by procuring an overnight fishing permit from NPS. The refuge does not host any fishing tournaments.

Assateague Island

Crabbing and Clamming

Crabbing and clamming on Chincoteague NWR are allowed as recreational activities in accordance with Virginia Marine Resources Commission regulations.⁴ Crabbing is allowed in designated areas in Swan Cove Pool (F Pool) and along Beach Road. Clamming is also allowed in the bayside areas for Toms Cove, also accessible via the Bi-Valve Trail. The refuge incorporates crabbing and fishing into its various youth and visitor programs.

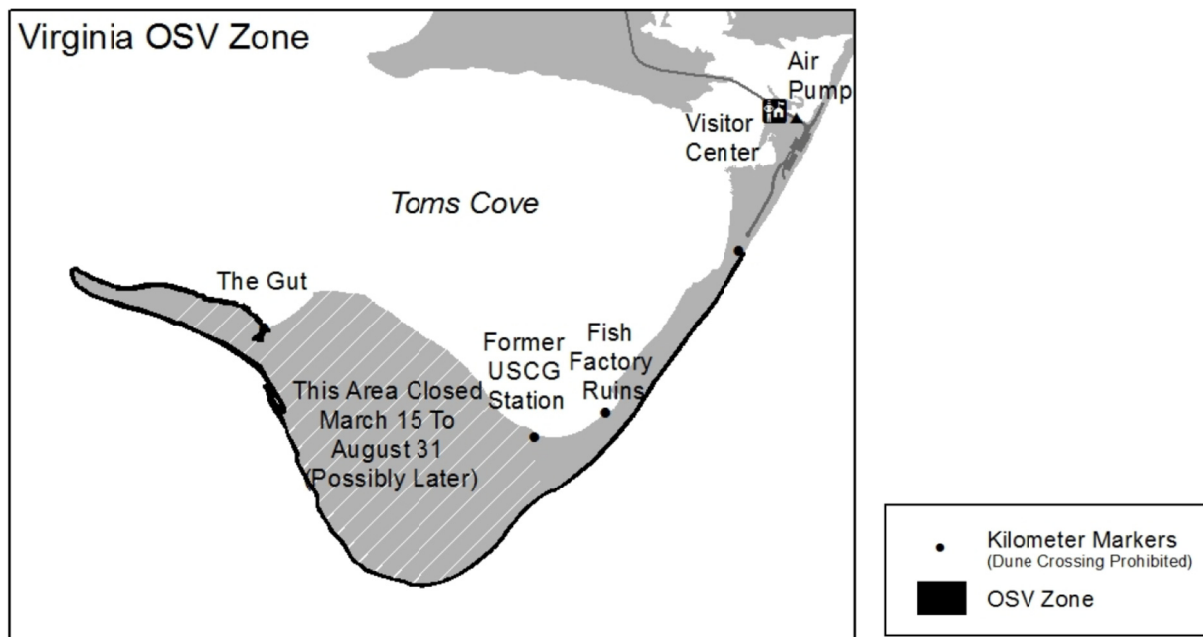
⁴ <http://www.mrc.virginia.gov/regulations/recfish&crabrules.shtml>

Surf Fishing

Some of the fish common to the waters around the refuge are bluefish, striped bass, summer flounder, Atlantic croaker, spot, and red drum. Clearnose skate, bullfish, and southern stingrays may be caught, as well as smooth or spiny dogfish sharks. Surf fishing is allowed anywhere along the Atlantic Ocean on Assateague Island outside of the life-guarded areas and areas closed for coastal nesting birds. NPS and USFWS provide joint programs that include surf fishing demonstrations.

The surf fishing areas south of the current parking lots (overwash and Toms Cove Hook) are also accessible via over-sand vehicle (OSV) use, which is administered by NPS and the refuge. Such access is limited to certain times and areas to provide maximum protection to prime nesting habitat for coastal nesting birds. OSV use is limited to the OSV zone, located between the recreational beach and the end of Toms Cove Hook (see Figure 3-28). The Hook portion of the zone is closed to OSV use from March 15 through August 31 or until the last shorebird fledges; the Overwash portion is closed intermittently during the same period based on nesting behavior. Access can be further restricted based on wildlife management practices. OSV use requires a permit and specific equipment, both of which are set by NPS, and is restricted to 48 vehicles at any one time when the entire zone is open and to 18 vehicles when the Hook portion is closed. More information on OSV use regulations can be found at the NPS webpage: <http://www.nps.gov/asis/planyourvisit/osv.htm>.

Figure 3-28: Virginia OSV Zone (Source: NPS)



Southern Barrier Islands

Fishing is allowed on Assawoman Island but requires a refuge permit to land a boat to fish the area. However, parts of the island may be closed based on nesting behavior.

3.7.3 Environmental Education and Interpretation

The refuge works with local K to 12 schools, communities, and educational organizations to provide classroom and hands-on programs both on and off the refuge for youth. Partner agencies include the NPS, local school districts, Eastern Shore Environmental Education Council (sponsored by the Eastern Shore Soil and Water Council), Shore People Advancing Readiness for Knowledge (SPARK), Marine Science Consortium (MSC), and CNHA. Activities are conducted throughout the region but on the refuge are concentrated on several trails as well as the Herbert H. Bateman Educational and Administrative Center, a green facility that opened in 2003, offering 5,000 square feet for interpretive natural history exhibits, educational programming, a 125 seat auditorium, and a classroom/wet lab.

The refuge currently provides environmental education opportunities for approximately 7,500 participants annually, primarily through classroom and onsite programs with students as well as programs in collaboration with other groups. The refuge serves students by working with NPS, MSC, Accomack and Northampton County school districts, Girl Scouts, Boy Scouts, and Home School students, among others. Student programs occur in the classroom of the Herbert H. Bateman Educational and Administrative Center and in the environmental education pavilion (e.g. Habitat Hunting, Forest Ecology, Nature and ME, Critters and Gadgets). The refuge also offers teacher workshops and Teacher Guided Learning Opportunities when staff guided programs are not available. NPS offers several programs from Toms Cove Visitor Center (e.g. Aquarium Talk, Beach Walk, Marine Explorers, and Salt Marsh Adventure). The refuge is also participating in collaboration with NASA, MSC, TNC, and the Eastern Shore Community College called “Science on the Shore” to “provide the Eastern Shore community with an understanding of how local science-based research and preservation techniques are used to solve challenges that impact the nation.”

The refuge currently provides interpretive opportunities to approximately 68,000 participants annually, primarily through self-guided interpretation but also through some guided programs. Refuge staff give presentations at the Herbert H. Bateman Educational and Administrative Center and also lead popular bird walks, crabbing and surf fishing demonstrations, marsh walks, and photography hikes, and assist with NPS beach campfires. Interpretative hubs are located on several trails, with one trail and pavilion designated for environmental education. The refuge maintains exhibits and videos at the Herbert H. Bateman Educational and Administrative Center. The refuge also maintains an outdoor information kiosk at the Virginia New Church Welcome Center on Route 13. The refuge offers multiple week-long day camps, the Children in the Woods Day Camp, for children ages 8 to 11 with activities such as crabbing, clamming, archery, surf fishing, bicycling, and kayaking. The Camp is sponsored by CNHA. NPS also offers interpretive exhibits at the visitor center and activities, such as kayaking programs from Toms Cove. Finally, the refuge holds eight major special events: Great Backyard Bird Count (February), Junior Duck Stamp Contest (April), International Migratory Bird Day Celebration (May), Sunrise Pony Walk during Pony Penning (July), Annual Beach Clean-up (September), National Public Lands Day (September), National Wildlife Refuge Week (October), and Waterfowl Weekend (November).

3.7.4 Wildlife Observation and Photography

Chincoteague NWR provides outstanding wildlife viewing opportunities throughout the year, including migrating birds, resident sika and white-tailed deer, Chincoteague ponies, and others. Birding in particular is a popular wildlife observation activity, with popular sites at Swan Cove Pool (F pool), Toms Cove, Woodland Trail, and Snow Goose Pool (B-South Pool) in the Wildlife

Loop. The Wildlife Loop, Marsh Trail, and Woodland Trail, as well as water access, various pull-offs along Beach Road, and the natural beach itself, provide wildlife viewing and opportunities for amateur and professional photographers. In partnership with the CNHA, the refuge hosts lectures on wildlife and conservation topics throughout the year.

3.7.5 Recreational Beach Use

The beaches of Assateague Island offer a unique experience in the Mid-Atlantic area as they exist primarily in an undeveloped setting unlike other nearby beaches, such as Virginia Beach, Virginia or Ocean City, Maryland that are heavily developed. This natural setting draws many families seeking activities such as sunbathing, swimming, shell collection, and campfires.

At the southern end of Assateague Island within the Chincoteague NWR, the NPS manages an “assigned area” consisting of the 1-mile recreational beach and corresponding adjacent 961 parking spaces, provided via a crushed shell surface. The NPS maintains a visitor contact station, restrooms, and pedestrian trails, as well as seasonal bathhouses, showers, and lifeguard-protected swimming beach. Beyond this recreational area, only wildlife-oriented recreational activities are allowed.

After the establishment of the refuge in 1943, the only public recreation that occurred on Chincoteague before the bridge was constructed in 1962 was beach use, primarily surf fishing. Visitors would drive down the beach from the Maryland end of Assateague Island. On June 17, 1957, Congress passed Public Law 85-57, Chincoteague National Wildlife Refuge, Virginia - Bridge and Road. This law authorized the Secretary of the Interior to permit the construction of a bridge and road across Chincoteague National Wildlife Refuge. The objective of this law was "to permit the controlled development of a portion of the seashore of the Chincoteague National Wildlife Refuge, Virginia for recreational purposes, ..." This law also authorized the Secretary to enter into agreements for the construction, maintenance, and operation "of a public beach, concession, parking areas, and other related public conveniences..."

On April 1, 1959, the Bureau of Sport Fisheries and Wildlife (precursor to USFWS) entered into an agreement with the Chincoteague-Assateague Bridge and Beach Authority whereby a public access easement to the Atlantic Ocean beach was established (Mackintosh 1982). The deed of easement provided for the construction of a bridge and access road to the Toms Cove Hook and assigned to the Authority the south 4 miles of the island for 40 years, renewable for two 15-year periods. These rights were subject to “such terms and conditions as the Secretary of the Interior deems appropriate for the adequate protection of the wildlife refuge.” The 1959 public access easement has not been in effect since 1966, when it was acquired by the Federal government as directed by the Assateague Island National Seashore enabling legislation (Public Law 89-195), which states: “Notwithstanding any other provision of this Act [16 USCS §§ 459f et seq.], land and waters in the Chincoteague National Wildlife Refuge, which are a part of the seashore, shall be administered for refuge purposes under laws and regulations applicable to national wildlife refuges, including administration for public recreation uses in accordance with the provisions of the Act of September 28, 1962 (Public Law 87-714; 76 Stat. 653) [16 USCS §§ 460k et seq.]”

In 1965, the Assateague Island National Seashore was established. Under a MOU completed in the summer of 1979 between the USFWS and NPS, NPS would provide and manage visitor contact and interpretive facilities and programs on a day-use basis for public recreation and interpretation including, but not limited to, swimming and associated beach uses. Also under that agreement, we would retain the primary responsibility for managing the wildlife resources within

the "Assigned Area," with the understanding by both agencies that recreational use programs will be planned and carried out to minimize impacts on wildlife resources. In 1990, an Interagency Agreement replaced the MOU, with the new agreement allowing for the same uses as the MOU. The Agreement was renewed and revised in 2012.

Since the opening of a public beach in the early 1960s, visitation steadily rose during the 1960s, 1970s, and most of 1980s. In 1987 visitation peaked at over 1.5 million visits, with over 800,000 occurring during the summer season, June through August. Since then, the number of annual visits to the refuge has leveled off to between 1.2 and 1.4 million visits. From 2007 to 2011, 58 percent of the visits occurred during the months of June, July, and August. Recreational beach use tapers off quickly after early September and returns at the end of May.

Although not all summer visitation is associated with beach use, the parking patterns and anecdotal reports indicate that beach use is the primary use. The town of Chincoteague developed and distributed a "Beach Access Questionnaire" online and throughout the community in summer of 2010 that resulted in almost 3,000 responses. In the survey, 82 percent of respondents indicated that they primarily came to Chincoteague to go to the beach (Town of Chincoteague 2010b).

3.7.6 Other Recreational Uses

Other recreational uses on Chincoteague NWR include walking, bicycling, horseback riding, OSV use, boating, and commercial uses. All of these uses are limited to specific areas of land and/or times based on wildlife management and some have permits and fees, as described below. There are no campsites on Chincoteague NWR. Visitors are not allowed to feed wildlife and are not allowed to bring alcohol or pets onto the refuge, including in vehicles. Other restricted activities include use of skateboards, roller or in-line skates, or segways and the collection of plants, animals, or artifacts, except for one gallon per person per day of unoccupied shells. Motorized vehicles are not allowed on trails and mopeds are not allowed on Wildlife Loop.

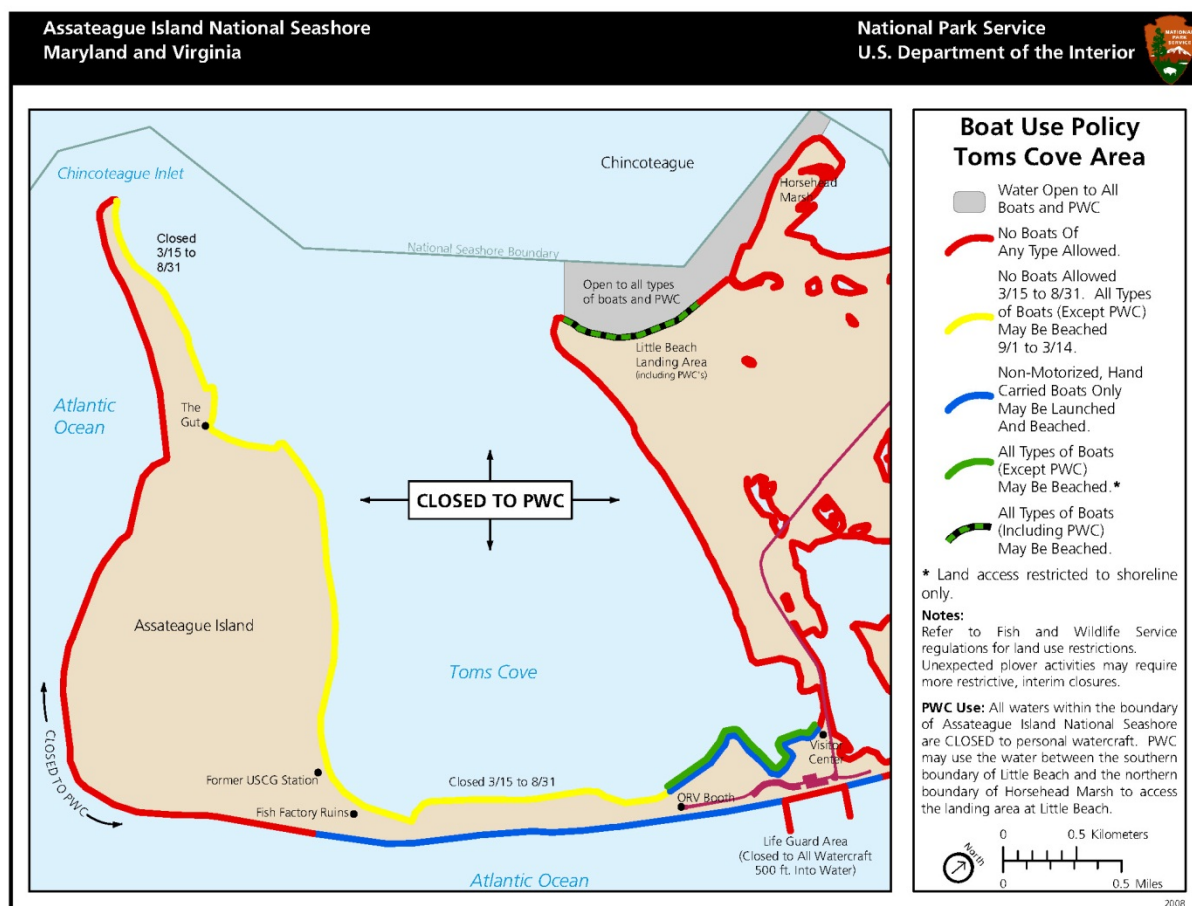
As described previously, bicycling is accommodated through a paved and gravel trail system beginning on Chincoteague Island and running along Beach Road and via the Wildlife Loop and Swan Cove Trail to the beach and to the Woodland Trail parking lot as well as the Woodland Trail itself. Bicycling is not allowed on the Service Road although walking is. Walking visitors make use of the bicycle trails as well as Lighthouse and Marsh Trails.

Horseback riding is limited to within the OSV zone from March 15 through August 31 or until the last shorebird fledges. Access can be further restricted based on wildlife management practices.

Motorized and non-motorized boats are allowed to beach at Toms Cove Hook between September 1 and March 14 but there are no boat ramps or docks available for public use at Chincoteague NWR. Boats and flotation devices are not permitted in the impoundments. Non-motorized, human-powered, hand-carried boats are allowed to access the water from the recreational beach in designated areas.

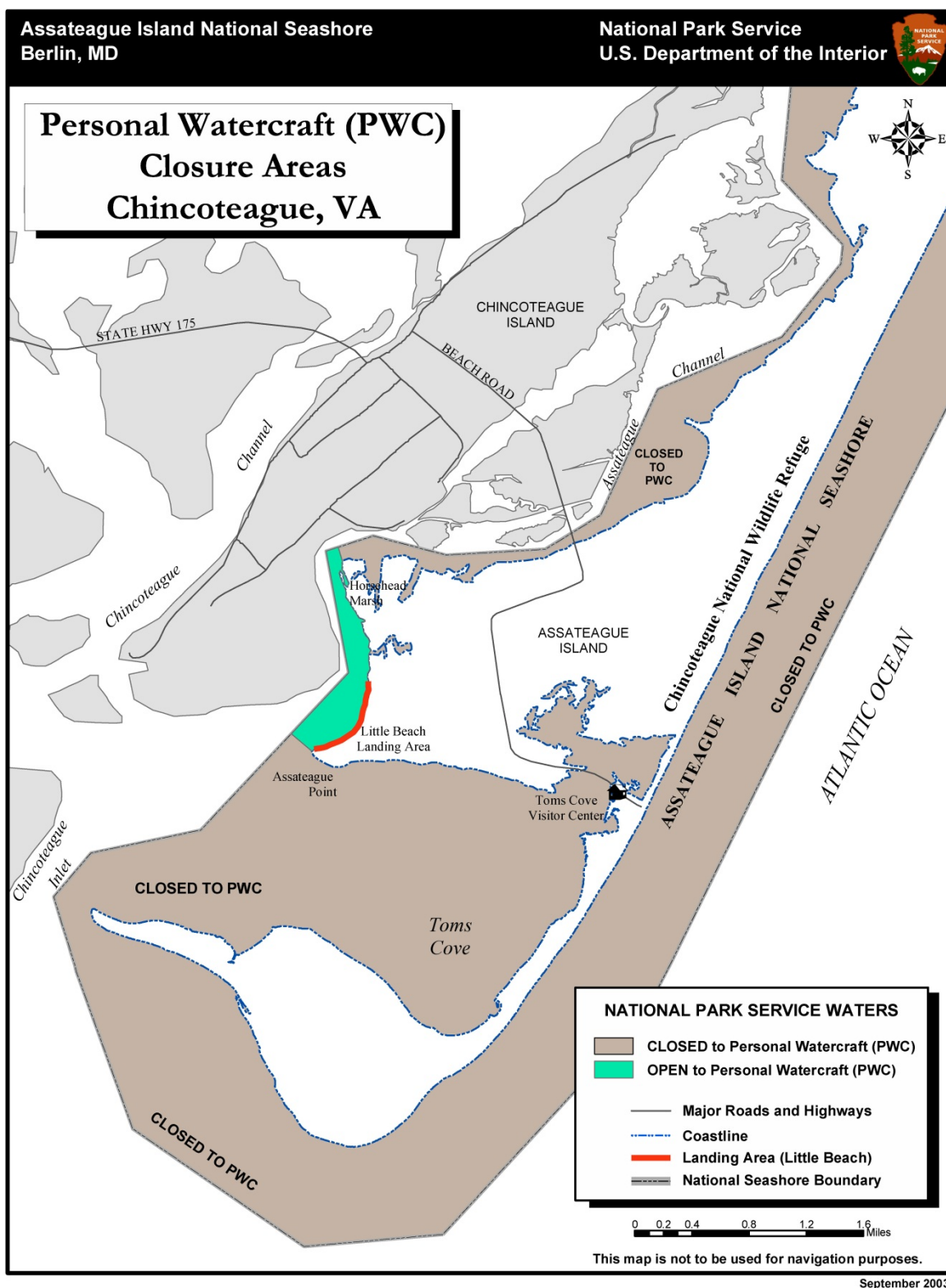
Figure 3-29 provides a summary of the boat policies, as developed by NPS. All waters within the boundary of Assateague National Seashore are closed to personal water crafts (PWCs)⁵ except the water between the southern boundary of Little Beach and the northern boundary of Horsehead Marsh, as indicated in Figure 3-30. Visitors with kayaks or canoes may follow part of the 70-mile long Seaside Water Trail, which was developed by the Accomack-Northampton Planning District Commission in cooperation with Accomack County, Northampton County, the Town of Chincoteague, the Town of Wachapreague, and the Virginia Coastal Zone Management Program.

Figure 3-29. Boat Use Policy (NPS Seashore)



⁵ PWCs are high performance vessels designed for speed and maneuverability and are often used to perform stunt-like maneuvers. PWC includes vessels commonly referred to as jet ski, waverunner, wavejammer, wetjet, sea-doo, wet bike and surf jet (NPS 2000).

Figure 3-30. Personal Watercraft Closure Areas (NPS Seashore)



3.8 Refuge Administration

3.8.1 Facilities and Maintenance

Refuge facilities consist of buildings and transportation infrastructure, including roads, marine facilities, trails, intelligent transportation and traveler information systems, and parking areas. In addition to the refuge facilities, NPS maintains a visitor center, lifeguard-protected swimming beach, restrooms, bathhouses, parking areas, and boardwalk trail, and coordinates the OSV area, as detailed in a memorandum of understanding. NPS and USDA both have a use agreement with USFWS for shared facilities, mainly for storage, on Wallops Island NWR.

Buildings

Within Chincoteague NWR, buildings consist of a visitor center, staff offices, staff housing, maintenance facilities, and an environmental education pavilion, as well as the Assateague Lighthouse and light keeper's house. The Herbert H. Bateman Educational and Administrative Center, a green facility that opened in 2003, consists of two buildings, one for the visitor center and one for administrative offices. The visitor center offers 5,000 square feet for interpretive natural history exhibits, educational programming, a 125-seat auditorium, and a classroom/wet lab.

Marine Facilities

The Assateague Lighthouse Landing is on the north side of refuge, on the Assateague Channel, and consists of a boat ramp, a fixed dock and a floating dock connected by a ramp. These facilities are not open to the public.

Roads

As mentioned previously in Section 3.6.2: Transportation and Access, Chincoteague NWR is accessed by a two-lane road, Beach Road, which extends from Maddox Boulevard across the bridge to the beach parking areas. The only other paved road open to the public is Wildlife Loop, which is approximately 3 miles in length and is open to vehicles after 3 p.m. each day. There are also two unpaved service roads that are not open to the public. One service road is approximately one-quarter mile long and leads from Beach Road to Assateague Lighthouse Landing, which has marine facilities on the Assateague Channel. The other service road extends north from the Wildlife Loop 7.5 miles, providing access to one of the areas where the Chincoteague ponies are kept. The entire length of that service road is open to private vehicles only during part of Waterfowl Week at the end of November, but the CNHA bus tour is allowed to use this same section throughout its season of operation.

Trails

Chincoteague NWR has the following paved trails, with round-trip distance:

- Main bicycle trail (0.5 miles from Maddox Boulevard traffic circle to bridge; 1.3 miles from bridge to end of trail; 1.9 miles along Beach Road to beach)
- Woodland Trail (1.6 miles)
- Black Duck Trail (1.0 miles)
- Swan Cove Trail (0.5 miles)

In addition, there is the Marsh Trail (0.6 miles boardwalk, 0.3 miles on Wildlife Loop road) and unpaved Lighthouse trail (0.3 miles) and Bivalve Trail (0.25 miles), which is only accessible from the Woodland Trail. All trails are shown in Figure 1-4 in chapter 1.

Parking

Chincoteague NWR has a number of parking facilities, as documented in Table 3-10. All of these, except for the parking at the recreational beach and NPS visitor center, are maintained by the refuge and require routine maintenance.

Table 3-10. Parking Facilities on Refuge

<i>Location</i>	<i>Paved, Marked Spaces</i>	<i>Handicapped Spaces (paved and marked)</i>	<i>Other spaces</i>	<i>Bus/Oversize Parking Spaces</i>
Recreational Beach	-	-	961 (unpaved, unmarked except for handicapped)	-
Herbert H. Bateman Educational and Administrative Center	52	4	23 regular; 6 for Govt. (unpaved, car stops)	Gravel area for oversized vehicles and bus parking
Wildlife Loop (Main lot)	38	1	5 (paved but unmarked)	3 paved
Woodland Trail	26	1	-	-
Lighthouse Trail	17	-	6 (paved, unmarked)	2 (paved, unmarked)
Wildlife Loop (Near boardwalk)	7	1	None	-
Boat ramp, west side	-	-	12 (paved, unmarked)	-
Light Keepers House	-	-	15 spaces (unpaved) – for handicapped	-
NPS Toms Cove Visitor Center	-	2 (unpaved but marked)	~50, both sides of road (unmarked, unpaved)	-
TOTAL	140	9	1,078	~5

NPS is the principal Federal agency charged with the restoration and rehabilitation of the recreational beach parking lots located at the Chincoteague NWR. NPS uses Assateague Island National Seashore base funding and supplemental Emergency Relief for Federally Owned Roads (ERFO) funds to perform emergency storm damage repairs and routine parking lot maintenance. Through an intra-governmental agreement between the NPS and USFWS, the refuge transfers \$200,000 from its entrance fees to the Seashore for maintenance of the recreational beach, parking lots, visitor safety services (lifeguards), and law enforcement support.

Routine maintenance consists of raking the lot's surface and filling in ruts from ocean over-wash, hard rains, and vehicular traffic with crushed-shell. Maintenance generally occurs twice weekly April through November and weekly December through March. The estimated annual cost for this work is \$7,200 in labor (assuming four hours per day at \$20/hour), but there are also

additional costs for the fuel and for the purchase and maintenance of a 3/4 ton pick-up with drag attachment.

Repair of the beach parking from storm events varies based on the level of damage. The length of time needed for storm repairs varies from two weeks to three months and can consist of additional routine maintenance tasks or more significant replacement of sand and crushed shell and moving the parking areas westward (see Figure 3-31). There have been five storm events in the past ten years that resulted in impacts to the beach parking that meet the definition of “totally destroyed.” “Totally destroyed” refers to major portions of the Toms Cove recreational beach parking and visitor use infrastructure that were damaged so as to be unusable or inaccessible by the public. These storms were the following: Hurricane Isabel in 2003, Hurricane Ernesto and Nor’easter in 2006, Nor’easter Ida in 2009 (see Figure 3-32), Hurricane Irene in 2011, and Hurricane Sandy in 2012.

Figure 3-31. Damage and Clean-up of Parking Areas 2-4 (Patrick J. Hendrickson, Highcamera.com (9-30-08), provided to USFWS refuge staff)



Figure 3-32. Turn Circle at Chincoteague NWR Beach and Beach Road during Nor’easter Ida. November 2009 (USFWS refuge staff; James Fair, November 2009)



Table 3-11 provides a summary of the expenses for the recreation beach parking for 2007 through 2011; at the time of publication of this document, USFWS was still working with NPS and the FHWA on final costs for repair of the beaching parking lots, Beach Road, and Service Road from

damage sustained during Hurricane Sandy. In 2008, NPS received funding from the FHWA to rehab the asphalt parking lot leading to the beach parking lot. The other funding sources reflect storm-specific funding requests. In addition to those four storm events listed, there may have been some high-tide or overwash events that destroyed the parking lots, but USFWS and NPS do not have verifiable data on the dates, cost to repair, or extent of damage from those events.

To provide one example, for the Hurricane Irene repairs, approximately \$151,300 (21 percent) of the total estimated repair cost of \$724,112 was accomplished with existing NPS staff and equipment during normal working hours. All of the personnel, material, supply, and equipment costs for repairing the roads and parking lots were funded through the Emergency Relief for Federally Owned (ERFO) Roads program. While the use of existing NPS staff to conduct storm damage repairs is cost effective, the additional workload detracts from the park's ability to conduct normal operational activities such as preventative maintenance and repairs to other visitor use facilities. Similarly, the use of NPS-owned equipment contributes to accelerated wear and tear that is not accounted for in normal replacement cycles.

Table 3-11. Record of Maintenance and Repair Costs for Recreational Beach Parking

Fiscal Year in which Funding Received	Storm (Year)	Routine Repairs and Storm Damage		Storm Damage		Total
		NPS Base Funding and FWS Reimbursable	Federal Highway Project - non emergency	Emergency Relief for Federally Owned Roads	NPS	
2007	Hurricane Ernesto (2006)			\$746,213		\$746,213
2008		\$218,521	\$39,226			\$257,747
2009	Hurricane Hanna (2008)	\$133,820			\$196,931	\$330,751
2010	Nor'easter Ida (2009)	\$160,826		\$343,771		\$504,597
2011	Hurricane Irene (2011)	\$275,036		\$724,112		\$999,148
2012	Hurricane Sandy					TBD
Total		\$788,203	\$39,226	\$1,814,096	\$196,931	\$2,838,456

When a storm occurs, the following steps are taken:

- Secure funding. One main funding source has been the ERFO, which provides assistance to Federal agencies when their Federal roads that have sustained damaged from natural disasters.
- Define the wetland boundary. Each time a strong coastal storm hits Assateague Island, the island literally rolls over on itself, moving the island in a westward direction. This is a normal barrier island response to coastal storms and sea level rise. When this happens, the bayside wetlands immediately adjacent to the island are covered with sand that has washed across the island; this provides a new upland site on which to rebuild the parking lots. However, a new wetland/upland boundary has to be determined so the new parking lot is aligned with the new upland.
- Recover materials. In order to recycle and reuse as much of the old parking lot material as possible to reduce costs, the NPS reclaims old shell and clay material from the old parking

lot, which requires heavy equipment such as bulldozers, graders, large high-flotation material hauling dump trucks, etc. The reclaimed materials are stockpiled on-site for reuse at a later time.

- Design the new parking areas. The new parking lots are laid out on the ground using a design best fitted to the new wetlands delineation provided by the regulatory agencies. To date, the NPS has always been able to fit 961 parking spaces for cars on the newly created uplands.
- Construct the parking areas. During the winter months, when visitation is low, the construction work can be accomplished in phases, which allows the NPS to complete one parking lot and open it to the public in a safe manner. If the lots are lost during the summer months, i.e., the peak visitation period, the demand for any parking spaces will quickly exceed the capacity the NPS can provide and will thus create an unsafe environment for the public and equipment operators. Therefore, the parking lots are totally closed to public access until they are fully restored. When at all possible, the NPS will provide parking at the beach. For example, the total time needed to completely repair storm damages similar that those caused by Hurricane Irene is approximately three months.
- Reinstall infrastructure – the last stage of recovery is the replacement of shower stalls, pump houses, restroom facilities, lifeguard stands, displays, and informational and traffic signs, etc.

Refuge Revenues

Under the authority of the Federal Lands Recreation Enhancement Act (FLREA), which expires in December 2014 unless re-authorized, Chincoteague NWR charges an entrance fee per vehicle; Table 3-12 lists the 2012 fee amounts. The refuge introduced a daily fee in 2008 along with an increase to the weekly entrance fee and the addition of an expanded amenity fee for beach parking for the refuge annual pass and the Federal Duck Stamp program. Entrance fees are collected year-round 7 days a week, but the hours of operation for the entrance fee booth (Figure 3-33) vary throughout the year. Credit card machines were added to the fee booths in 2007. When the fee booths are unstaffed, the honor system is used. Visitors who need to pay the daily fee are expected to use the iron ranger, a self-serve pay station located outside the Herbert H. Bateman Educational and Administrative Center, by taking an envelope, inserting \$8.00, and dropping the envelope into the vaulted iron ranger. The refuge is working on plans to install off-site pass purchase machines.

Total annual revenue from entrance fee dollars averages \$750,000 to \$850,000. Twenty percent of the total revenues collected are provided to the USFWS Region 5 (Northeast Region) Office to be used in a competitive grant program for field stations that provide visitor services, or maintenance projects that have a direct tie to the visitor. Additionally, each year we transfer approximately \$200,000 to the NPS for maintenance of the recreational beach parking lots, visitor safety services (lifeguards), and law enforcement support. The refuge retains approximately \$400,000 to \$450,000 annually. In compliance with FLREA, we allocate these funds for:

- Visitor services, visitor information, visitor needs assessments, interpretation and signs;
- Habitat restoration directly related to wildlife-dependent recreation limited to hunting, fishing, wildlife observation, or photography;
- Law enforcement related to public use and recreation;

- Repair, maintenance, and facility enhancement directly related to visitor enjoyment, visitor access, and health and safety. This includes annual or routine maintenance, deferred maintenance, and capital improvements. and
- Costs of collection – operating and capital.

Table 3-12. Chincoteague NWR Entrance Fees (as of 2012)

Type of Fee*	Description	New Fee Total
Daily Fee		\$8.00
Weekly Pass		\$15.00
Refuge Annual Pass		\$30.00
Federal Duck Stamp	Annual pass to NWRs valid from July 1 to June 30 of the following year. Hunters over the age of 16 must purchase a Federal Duck Stamp each year if they want to hunt migratory waterfowl. Revenue from the Federal Duck Stamps goes directly to the Migratory Bird Conservation Fund, which uses \$0.98 out of every dollar to purchase or lease wetland habitat for protection in the National Wildlife Refuge System.	\$15.00 or \$30.00**
America The Beautiful - The National Parks and Federal Recreational Lands Pass		\$80.00
Senior Pass	Lifetime pass for U.S. citizens or permanent residents age 62 and over. Admits the pass holder and passengers in a non-commercial vehicle at per vehicle fee areas and pass holder +3 adults at per person fee areas	\$10.00
Access Pass	Lifetime pass for U.S. citizens or permanent residents with permanent disabilities (documentation required). Admits the pass holder and passengers in a non-commercial vehicle at per vehicle fee areas and pass holder +3 adults at per person fee areas.	Free
Commercial Buses – 20 or fewer passengers		\$40.00
Commercial Buses – 21 or more passengers		\$100.00

* Entrance fees are per vehicle. Fee required for anyone over the age of 16.

** \$15 Expanded Amenity Fee added in 2008 for beach parking maintenance. Visitors with Federal Duck Stamp pass must pay if such visitors want to park in the beach parking lots.

Figure 3-33. Chincoteague NWR Entrance Booths (USFWS refuge Web site)

3.8.2 Staffing

Chincoteague NWR shares its refuge manager with both Wallops Island NWR and the Eastern Shore of Virginia and Fisherman Island NWRs, which have their own designated staffing and CCP process. Since its creation in 1971, Wallops Island NWR has been otherwise unstaffed, with little to no monitoring or management, except by A&N Electric Cooperative, a utility company with a power line ROW that removes tall growing trees, primarily the non-native autumn olive, and some brush species.

Chincoteague NWR has 23 full-time positions and 10 to 20 part-time, student, or contractor positions in the areas of visitor services, law enforcement, biology, administration, fee collection, management, and maintenance (see Appendix K for current staff plan). Fee collection employees primarily work from May to September, although some work from March to November. In addition to refuge staff, NPS provides 6 permanent and 21 seasonal employees to provide lifeguard, law enforcement, maintenance, and interpretive services at Toms Cove and the recreation beach. The staffing breakdown is as follows: 1 permanent and 2 seasonal law enforcement staff, 1 permanent and 6 seasonal interpretation staff, 1 permanent visitor use assistant, 2 permanent and 7 seasonal maintenance staff, and 1 permanent and 6 seasonal lifeguards.

3.8.3 Volunteer Programs

Refuge staff is supplemented by year-round volunteers as well as from local and national youth and adult groups such as Service Road Scholar and the Student Conservation Association (SCA). These individuals and groups provide assistance with wildlife and habitat management programs, wildlife and habitat surveys, invasive species removal, trash pick-up, interpretive education, and other projects.

Chincoteague NWR also receives significant support from the CNHA, a non-profit association established in partnership with the USFWS. The purpose of the CNHA is to promote a better understanding and appreciation of the refuge, the Eastern Shore of Virginia NWR, and the natural history and environment of Virginia's Eastern Shore in general. The CNHA produces and

provides interpretive and educational material for refuge visitors and for local teachers, funds student interns, and enables both refuges to receive matching grants for workshops and programs. Proceeds from memberships and items sold at the retail store at the Herbert H. Bateman Educational and Administrative Center are used to support and enhance the interpretive programs, projects, and activities at both of the refuges. Under a cooperative agreement with USFWS since 2004, the CHNA owns and operates a small seasonal interpretive bus tour service, which they use to provide interpretive tours of Chincoteague NWR from April through November. CHNA also manages the visitation of the Assateague Lighthouse, and seeks grants for its restoration.

3.8.4 Management Units

Chincoteague NWR is a wildlife refuge comprised of over 14,000 acres administered by the USFWS with land spanning over five islands in Accomack County, Virginia. Within the refuge is a vast array of natural habitats that make up a barrier island ecosystem: Beach–Dune, Shrub–Early Successional, Forested Uplands, Wetlands, and Salt Marsh. All of these are described in greater detail in section 3.3 Vegetation. For management purposes and to facilitate understanding of the descriptions of these habitats and biological resources, Chincoteague NWR is divided into two management units: the Assateague Island Unit and the Southern Islands Unit. The Assateague Island Unit consists primarily of the Virginia section of Assateague Island as well as adjacent Morris Island and Wildcat March and is comprised of beach, dune, salt marsh, freshwater impoundments, maritime forest, and shrub habitats. The Southern Islands Unit includes Assawoman, Metompinkin, and Cedar Islands, and is made up mostly of beach-dune and salt marsh habitats.

3.8.5 Landscape Conservation Cooperatives

The refuge is located in the North Atlantic Landscape Conservation Cooperative (LCC), of which USFWS is an active participant. LCCs are public-private partnerships composed of states, tribes, Federal agencies, non-governmental organizations, universities, and others that were established by DOI Secretarial Order Number 3289, signed on September 14, 2009. The cooperatives are intended to address landscape-scale stressors, including climate change, and to work interactively with DOI Climate Science Centers to help coordinate regional adaptation efforts. There are 22 LCCs, covering all states and territories of the United States and adjacent areas of Canada, Mexico and the Caribbean, and transcending political and jurisdictional boundaries to create a networked approach to conservation (see Figure 3-34). The geographic areas were developed by a team of USFWS and USGS scientists and experts by aggregating Bird Conservation Regions. Other frameworks, such as the Freshwater Ecoregions of the World, were also referenced. The LCC effort is coordinated with other partnerships, such as the National Fish Habitat Action Plan, Migratory Bird Joint Ventures and the State and Tribal Wildlife Grants Program.

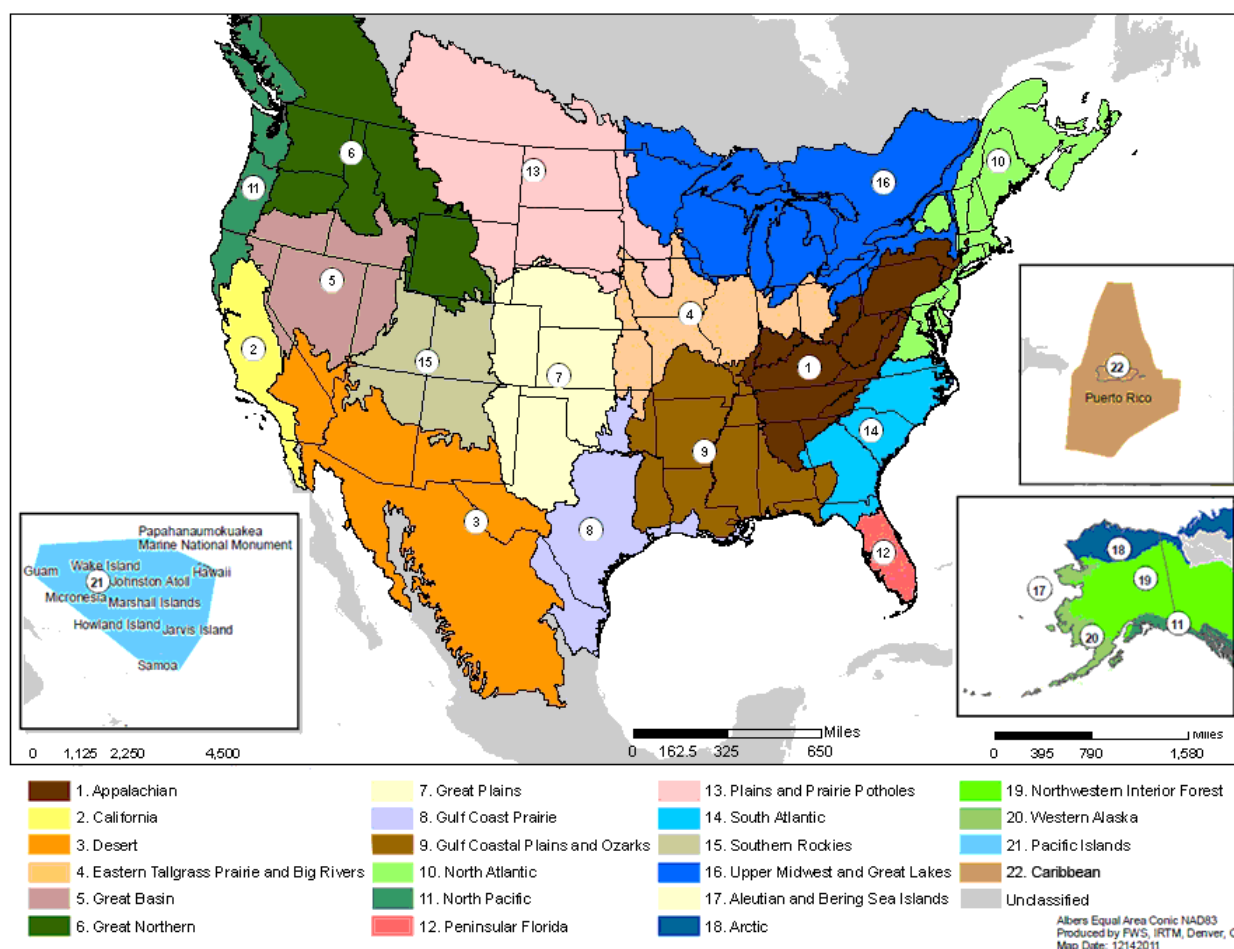
LCCs were developed with the recognition by the DOI and others that in order to ensure landscapes that are resilient and can sustain natural resources and cultural heritage into the future, conservation agencies and partners need to work together at landscape scales to address increasing land use pressures and widespread resource threats and uncertainties amplified by multiple effects of a rapidly changing climate including sea level rise and increased frequency and intensity of coastal storms.

There are three components to the LCC initiative: the LCC network, the individual LCCs, and LCC partners. The LCC network provides a national forum for conservation planning and is

intended to integrate the efforts of 22 LCCs organized, governed and operated in a consistent manner that promotes landscape conservation. LCCs are self-directed, regional, science-management partnerships directed by a steering committee, supported by several technical teams and facilitated by a small staff. The LCCs improve data sharing, communication and coordination across and within agencies; provide and leverage funding, staff and resources; develop common goals, tools, and strategies; link science to management; and facilitate information exchange (USFWS 2012f).

USFWS Region 5 is a member of the North Atlantic LCC steering committee and has the lead role for staffing and facilitating the partnership. The LCC has a science strategic plan, operations and development plan, and a number of collaborative active projects that are focused on providing science and information to guide conservation planning and actions in the face of change. These projects include regional habitat and species climate change vulnerability assessments, a project to forecast effects of accelerating sea level rise on the habitat of Atlantic Coast piping plovers (with an initial focus on Assateague); the Designing Sustainable Landscapes project that is assessing landscape changes including climate change and urban growth on species, habitats and systems in the LCC, and a research and decision support framework to evaluate sea level rise impacts in the northeastern United States.

Figure 3-34. Map of Landscape Conservation Cooperatives (USFWS 2012f)



Chapter 4



Refuge wetlands

Environmental Consequences

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- 4.3 Air Quality
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- 4.6 Federally Threatened and Endangered Species
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Chapter 4: Environmental Consequences

4.1 Introduction

This chapter describes the environmental consequences we predict from implementing management alternatives presented in chapter 2. Where detailed information is available, we provide a more analytic comparison between alternatives and their anticipated consequences. These consequences are described as impacts or effects. In absence of detailed information, we make comparisons based on professional judgment and strategies of the three alternatives: Current Management (alternative A); Balanced Approach (alternative B); and Reduced Disturbance (alternative C).

The chapter is organized by resource category, with the discussion focused on the direct, indirect, and cumulative impacts of both beneficial and adverse effects likely to occur over the 15-year life span of this CCP. Three tables are provided (Tables 4-1, 4-5, and 4-6) that show in which of the alternative(s) a management action is included, notes which of the resource categories would likely be affected by the action, and summarizes whether the impact is adverse or beneficial to that use. In the text, the actions that cause a particular impact are sometimes referenced by the number listed in the tables, as indicated by “(management action #)”, where it is more efficient or clear to do so rather than to include a lengthy and repetitive description of the impact-causing action. At the end of this chapter, a matrix summarizes the impacts identified for each action alternative by resource topic and allows for a side-by-side comparison.

Consistent with the CEQ and USFWS regulations on implementing NEPA, we assessed the impacts of the alternatives based on their significance, which takes into account context and intensity of the proposed actions for the alternatives. The geographic scale of their context ranges from site-specific to local or region. Although the area of the refuge is only a small percent of the context of its ecosystem or region, we developed all management alternatives to contribute to the many conservation goals in those larger contexts.

We based evaluations of the intensity of the effects of the alternatives on these factors:

- expected degree or percent of change in the resource from current conditions;
- frequency and duration of the effect;
- sensitivity of the resource to such an effect or its natural resiliency to recover from such an effect; and
- potential for implementing effective preventive or mitigating measures to lessen the effect.

The duration of identified effects varies within the 15-year period of this plan, from those occurring only once for a brief period (e.g., the effects of construction for when facilities are expanded) to those occurring more frequently during a given season or year (e.g., observing wildlife from refuge trails).

This chapter does not separately evaluate the consequences of certain types of management actions described in chapter 2 because these actions often have impacts too trivial to matter, and would be categorically excluded if independently proposed, which would exclude them from further analysis or review. Such categorically excluded actions include but are not limited to:

- Conducting environmental education and interpretation programs (unless major construction is involved, or significant increase in visitation is expected);

- Conducting research, inventorying resources, or otherwise collecting resource information;
- Operating and maintaining infrastructure and facilities (unless major renovation or improvements are involved);
- Recurring, routine habitat management actions and improvements;
- Constructing small projects (e.g., fences, berms, interpretive kiosks) or developing access for routine management;
- Planting and restoring native vegetation; and
- Enforcing Federal laws or policies.

The most recent refuge comprehensive plan, the Chincoteague NWR Master Plan (1993), was created after completion of its own EIS, which included analysis of the refuge's current management for impacts under the NEPA process. Alternative A, Current Management, principally uses the 1992 EIS as the baseline for analyses in this document. This document identifies where impacts would remain consistent for alternative A from the assessment conducted for the 1992 EIS, and identifies management actions that have evolved or changed based on refuge needs since 1992. Previous land and wetland acquisition to ensure protection of important habitats for various birds and aquatic species was a high priority in the 1993 Master Plan. Protection and management of these acquired lands would continue to be a high priority for the refuge, making as much suitable habitat as possible available for the varied refuge wildlife.

There are additional actions proposed under the alternatives that are not fully analyzed in this draft CCP/EIS because they would require additional information and a level of analysis that is beyond the scope of this EIS. These larger actions would require further planning by the refuge. Once detailed proposals for these actions have been developed, a separate environmental analysis and associated environmental assessment document would be prepared, which would include public involvement and comment at that time. Where possible, we analyzed these alternative actions based on current information.

4.2 Soils

Soils are an important natural resource of the refuge that serve as a fundamental basis of the physical environment of all habitats. Soil biotic communities consume the wastes and the remains of dead organisms and recycle their constituent materials that are incorporated into the soil for plant productivity. The primary component of the soils found on the refuge is sand and shell (base layer) with various amounts of organic materials forming the different soil types. The refuge must protect these soils to sustain the variety of wetland and upland habitats that would meet refuge goals for habitat and species management. Chapter 3, Affected Environment, provided a profile of soil types on the refuge. This section provides the results of the evaluation of the management actions each alternative proposes for impacts on soils generally.

We reviewed visitor use activities (hunting, fishing and OSV use, recreational beach use, walking, biking, horseback riding) currently occurring on the refuge for impacts to soil. These activities could disturb upper soil layers, thereby increasing the potential for erosion. However, the compaction of soil could result in minor effects to wildlife along heavily used access routes. For hunting, impacts to soil are not significant because the limited amount of hunters in a given season are not enough to cause any permanent impacts, especially since the routes used by hunters to stalk game are often sporadic. Hiking trails, wildlife observation areas, parking areas, and other high-use areas would continue to be well-maintained through distinct paths and areas where

visitors are permitted to traverse, resulting in negligible soil impacts to areas outside specified areas. Soil erosion would not be anticipated; no significant impacts would result on the refuge from these visitor services, although monitoring efforts would continue.

We evaluated the management actions for each alternative for their potential to benefit or adversely impact refuge soil, including one or more of the following:

- Prescribed burning, disking, and mowing;
- Removal of vegetation;
- Visitor service activities; and
- OSV and horseback riding use.

Table 4-1 assesses the impact of management actions on soils; management actions are referenced throughout the text by a number and by a (b), (s), or (v) depending on whether they are dealing with biological, socioeconomic, or visitor services resources, respectively.

4.2.1 Impacts on Soils in Alternative A

As stated earlier, current management practices that occur on the refuge were analyzed for impacts in the 1992 EIS and would remain consistent for this document. Impacts on soil under alternative A (“Current Management”) serve as a baseline for comparing and contrasting alternatives B and C to the refuge’s existing management activities. Under alternative A, continuing current management practices will not result in any new or significant impacts to soils. We will continue to use best management practices in all activities that might affect refuge soils to ensure that we maintain soil productivity and do not contribute to erosion or sedimentation.

4.2.2 Impacts on Soils in Alternative B

Proposed management actions in alternative B that would affect soils include three primary changes from alternative A: change in management for the NWF (management actions 22b and 23b), moving of the recreational beach and parking (management action 52b), and widening of the Service Road to permit access to the new recreational beach.

Alternative B proposes changes to visitor services (specifically hunting). These visitor service actions have been analyzed and found to have no significant adverse impacts to soils (management action 68b). The current refuge big game hunting program (deer and sika elk only) would see a slight change in services (but there would be no significant increase in visitation related to hunting). New hunting opportunities under alternative B, including mourning dove and light goose hunting as well as the addition of turkey hunting (big game) would likely result in a negligible increase in visitors related to hunting (management actions 69b, 70b, 71b, 72b). These hunt programs would also be regulated as the current hunt programs are, only allowing a limited amount of permits to be awarded.

Current management of the NWF removes natural scrub shrub vegetation to create more suitable habitat for coastal nesting shorebirds, such as piping plover and American oystercatcher.

Alternative B would cease the vegetation removal and allow for the natural vegetation to grow back in the 300-acre area (management actions 22b and 23b), improving the habitat for spring and fall neotropical migratory birds. This increased amount of natural vegetation would create a significant beneficial impact for the habitat and soil. Increased vegetation in an area would help to prevent soil erosion and disturbance, as well as improve the soils structure and microbial communities by returning nutrients into the ground.

Negative impacts to soil would result from the construction of the new recreational parking as well as the widening of the new beach access road (management actions 49b and 52b). Alternative B provides for 8.5 acres of parking in a new location, for which soil would be impacted. Approximately 18 acres of soil would be impacted from the expansion of the current Service Road to access the new beach parking. Although no soil in either case would be removed from the refuge, leveling and grading practices would be used, with the need to use fill in some areas. If this were to occur, the current soil may be moved or covered with fill. Furthermore, the increased area of hard compact surface (i.e., new road and increased parking) would increase the potential for erosion in those areas during heavy storm and rain events. Mitigation for these impacts would include allowing the natural growth of vegetation around these areas, which would aid for the capture of soil and decreased erosion. Best construction practices would be followed during the parking and road expansions, and mitigation measures such as erosion prevention screens would be employed to minimize impacts. Since the proposed actions associated with the relocated beach parking and road expansion are conceptual and not finalized, specific details for these actions are currently unknown. Further environmental assessments and analysis for impacts on soils would need to be completed prior to construction. Allowing the existing parking site (8+ acres) to revert to natural conditions would result in a positive impact to soils.

Negative impacts to soil would occur from the construction of the 1-acre horse trailer parking at the entrance of Mallard/C Dike (management action 64b). These impacts would not be significant because there would be no removal of soil. The effects of the parked vehicles would be soil compaction, which would result in limited increased runoff and could not be considered significant as the horse trailer parking area is extremely small compared to the overall refuge lands.

Negative impacts would result from the expansion of the OSV zone from the new recreational beach location to the current OSV zone (management action 59b). Adding approximate 2.7 miles that vehicles and horseback riders would be allowed to drive and ride on under alternative B could increase the possibility of destabilization and soil compaction in the coastal habitat. However, OSV users would only be permitted to travel in the intertidal zone, limiting soil disturbance to non-vegetated compact sand. Closures would continue to be instituted during the coastal bird nesting season.

4.2.3 Impacts on Soils in Alternative C

Beneficial impacts to soils would result from the elimination of OSV use and horseback riding (management actions 62b and 65b). This action would allow pioneer beach and dune vegetation growth, consequently encouraging beach ridge and dune development on a currently disturbed barrier island beach. This alternative would virtually eliminate motorized travel on the Overwash and Toms Cove Hook and its negative impacts to beach and dune sand stability. Management access to the Hook would occur via the intertidal zone, limiting soil disturbance to non-vegetated compact sand and not in the sensitive high beach zone.

Negative impacts to soils would occur from the creation of beach parking at the new recreational beach (management actions 49b and 52b). These impacts would be similar as those assessed for the relocated beach parking and widened beach access road in alternative B; however, the extent of the impacts to soils under alternative C would be decreased since the parking area would be approximately half the size. Since the proposed actions associated with the relocated beach parking and road expansion are conceptual and not finalized, specific details for these actions are currently unknown. Further environmental assessments and analysis for impacts on soils would

need to be completed prior to construction. All other soil impacts resulting from alternative C would be the same as alternative B.

4.3 Air Quality

Chapter 3, Affected Environment, discusses the status of air quality on and near the refuge. This section provides the results of the evaluation of the management actions each alternative proposes for impacts on air quality. Table 4-1 assesses the impact of management actions on air quality; management actions are referenced by number throughout the text.

4.3.1 Impacts on Air Quality in Alternative A

With the exception of continued high visitation by vehicles, current management activities neither substantially benefit nor adversely affect local and regional air quality. There are no changes as a result of the No Action Alternative and therefore, no impacts. Continuing current management practices as proposed under alternative A will not result in any new or significant impacts to air quality.

4.3.2 Impacts on Air Quality in Alternative B

Alternative B would relocate the beach parking north approximately 1.5 miles from its current location (management actions 49b and 52b). The final location of the relocated beach parking lots may result in an overall decreased VMT (vehicle miles travelled) of passenger vehicles, a positive outcome. However, new uses such as space tourism and separation of existing uses (recreational beach from crabbing and clamming areas) could cause additional vehicle use by visitors and create seasonal or temporal decreases in air quality from increased VMT.

The main source of emissions at Chincoteague NWR is from gasoline operated passenger cars and trucks, from which the main pollutant is carbon monoxide (management action 48b). Alternative B would not have a significant impact on air quality due to the minor changes in vehicle activity and because the area surrounding Chincoteague NWR meet the National Ambient Air Quality Standards set by EPA as required by the Clean Air Act. Localized increases in emissions from visitors' vehicles would be negligible compared to current off-refuge contributions to pollutant levels and likely increases in air emissions in the Accomack County airshed from land development over the next 15 years. Any adverse effects on air quality from refuge activities would be more than offset by the benefits of maintaining the refuge in natural vegetation.

4.3.3 Impacts on Air Quality in Alternative C

Alternative C would move the beach parking area approximately 1.5 miles north from its current location (management actions 49b and 52b) and would maintain 480 parking spaces, half the number under alternative B (management action 51b). Similar to alternative B, the final location of the relocated beach parking lots may result in an overall decreased VMT of passenger vehicles, a positive outcome. Additionally, institution of a shuttle service during peak visitation (management action 50b) would have a slight negative impact on air quality, but the increase in emissions associated with a shuttle vehicle would be partially if not completely offset with the reduction in passenger vehicles and their associated VMT, which would be greater than that under alternative B. OSVs would be discontinued (management action 62b), thus further reducing VMT and resulting in a positive impact on air quality.

4.4 Hydrology/Water Quality

We evaluated the alternatives for their potential to help maintain or improve the hydrology and water quality of the Delmarva coastal area watershed and identify any impacts to water quality. The area of primary focus would extend from Chincoteague Bay south through the coastal bays and waterways to the southern end of Cedar Island and to the Atlantic Ocean fronting the coastal barrier islands.

The refuge manages 13 impoundments totaling 2,650 acres that are designed to hold freshwater of which the sole water source is precipitation. Precipitation is relatively unpredictable, and each spring and summer managers must weigh the benefits and disadvantages of releasing this water to tidal waters, thereby lowering water levels in the impoundments. Low soil moisture due to insufficient precipitation negatively impacts the growth of moist soil plants with possible consequences to the production of wildlife food and cover. Inadequate late summer and fall precipitation limits the ability to capture fresh water within the impoundments for wintering waterfowl, the primary purpose for which the impoundments were built.

None of the proposed refuge management activities in any alternative should adversely affect local or regional hydrology and water quality. None would violate Federal or state standards for contributing pollutants to water sources, and all three alternatives would comply with the Clean Water Act.

The Sea Level Affecting Marshes Model (SLAMM) analysis suggests that within the next 100 years, significant marsh loss with subsequent gains in open water would be very likely to occur (Nieves 2009). For example, a modeled scenario of one meter sea level rise and a marsh accretion rate of 3.1 mm/year could result in a projected 20 percent loss of upland habitats, 14 percent loss in forested wetlands and scrub-shrub habitats, with an increase from current open water component of 15 percent to 88 percent of the entire refuge, over the next 100 years.

Table 4-1 assesses the impact of management actions on hydrology and water quality; management actions are referenced by number throughout the text.

4.4.1 Impacts on Hydrology/Water Quality in Alternative A

Existing management activities do not adversely affect local or regional hydrology and water quality. Continuing current management practices as proposed under alternative A will not result in any new or significant impacts to hydrology or water quality.

4.4.2 Impacts on Hydrology/Water Quality in Alternative B

Alternative B proposes changes to the hunting program (management actions 69b, 70b, 71b, 72b, and 73b). These visitor service actions have been analyzed and found to have no significant adverse impacts to hydrology or water quality. Current big game hunting programs on the refuge would see a slight change in services (increased hunting outreach events), but there would be no significant increase in visitation related to hunting. Since there would not be a significant increase in visitor use, then there would not be an increase in visitor pollution or vehicle run-off which could negatively impact water quality. Other new visitor services, such as light goose hunting, would be added to the refuge hunting opportunities and result in a slight potential increase in visitors related to hunting.

The management of the Beach Road causeway, which would be restricted from routine visitor use, and the eventual modification of that area, would have a positive impact on tidal flow and water

quality for Swan Cove Pool (F Pool) (management action 15b). The increased tidal rhythm through impoundment culverts would now be allowed to mimic the natural tidal rhythm of Toms Cove, which would lead to improved water quality, dissolved oxygen, pH, and salinity levels for the new flow area. Improvements to tidal flow will require additional consultation with partners (e.g. USACE, Town), an additional environmental analysis.

The disturbance of Mallard and Pintail Pools (C and D Pools) (management action 22b), as part of construction of new recreational beach parking, could have negative impact on water quality for all impoundments to the south (management action 52b). Since impoundment flow is connected from north to south by culverts, anything that occurs in upper watershed beginning at Pintail Pool (D Pool) would flow through the impoundments south of them. Pollutants from vehicle emissions, oils, and coolants that leak out and collect in the parking area could eventually be washed into the adjacent water systems, which would flow south to Toms Cove. This occurrence would be largely confined to the summer months when beach traffic would be at its highest, and would be mitigated through best engineering practices such as the creation of catch basins around the parking area, as well as new culvert containments that would trap pollutants.

General construction practices associated with parking lot building (management action 52b), road expansion, and the improvement of water control structures along the refuge (management action 15b) including site grading, top soiling, and fertilizing could cause erosion, nutrient runoff, and a potential decline in surface and shallow groundwater quality, until development is completed. These impacts would be temporary and best management practices would be followed to help mitigate.

4.4.3 Impacts on Hydrology/Water Quality in Alternative C

Impacts to hydrology and water quality under alternative C would be nearly the same as alternative B, but likely less due to the reduced parking lot size (management action 51b).

4.5 Vegetation

We evaluated the management actions for each alternative for their potential to benefit or adversely impact vegetation on the refuge, including one or more of the following:

- Water level and habitat management for impoundments;
- Construction impacts due to the building of new facilities;
- Management strategies that allow natural succession and dynamic coastal processes to proceed unimpeded along undeveloped barrier island areas of the refuge;
- Change in OSV and horseback riding management; and
- Invasive species management.

Table 4-1 assesses the impact of management actions on vegetation; management actions are referenced by number throughout the text.

Regardless of the alternative selected, impacts on vegetation would be influenced by climate change and sea level rise as increased weather extremes and more severe coastal storms would introduce greater frequency and duration of salt water intrusions in freshwater wetland and upland habitats. These impacts can be seen in detail in the SLAMM analysis (Nieves 2009).

4.5.1 Impacts on Vegetation in Alternative A

Current management practices, as proposed to continue under alternative A, will not result in any new or significant impacts to vegetation.

4.5.2 Impacts on Vegetation in Alternative B

Proposed management actions in alternative B that would affect vegetation include three primary changes from alternative A: change in management for the NWF (management actions 22b and 23b), relocation of the recreational beach and parking, and widening of the new beach access road to permit public access to the new recreational beach (management action 52b).

Alternative B also proposes changes to the hunting program (management actions 69b, 70b, 71b, 72b, and 73b). These visitor service actions have been analyzed and found to have no significant adverse impacts to vegetation. Current big game hunting programs on the refuge would see a slight change in services (increased hunting outreach events), but no anticipated increase in visitation related to hunting, and thus, no increase in visitor trampling potential or vegetation habitat disturbance. Other new visitor services, such as turkey and light goose hunting, would be added to the refuge hunting opportunities which would result in a potential increase in visitors related to hunting. However, the total number of hunters on the refuge at any time would be limited.

Impacts from new or expanded visitor uses would be minimal since visitors use pre-selected paths and hiking trails which the refuge created to traverse through habitat, and avoid future vegetation impacts. For hunters, impacts to wildlife habitat would be minimal as most species impacted would have already undergone senescence (aging or dying process) or become dormant during the hunting seasons. Further impacts are minimized by not permitting hunters to cut vegetation for shooting lanes or camouflage, and by not permitting the use of permanent hunting structures attached by nails, wire, and other materials that could adversely affect vegetation. No significant impacts would result on the refuge from these visitor services, but current monitoring efforts would continue (USFWS 2007b).

The relocation of the recreational beach boundaries and parking areas, along with the expansion of the beach access road, would result in negative impacts to approximately 27 acres of vegetation (management action 52b). The creation of new recreational beach parking would negatively impact approximately 8.5 acres of a mixture of scrub shrub, wetland, and forested habitats, with their associated vegetation (see chapter 3). Vegetation would be altered and/or removed from the vicinity of Mallard Pool (C Pool) and Pintail Pool (D Pool) resulting in a loss of that habitat, mostly myrtle/bayberry shrub (management action 22b). Mitigation for these adverse impacts would result from management of the NWF (management action 23b), as outlined in the section on Soils, that would cease vegetation removal and allow for the natural vegetation to grow back in an area of approximately 300 acres, improving the habitat for spring and fall migratory neotropical birds. In other words, while 8.5 acres of this habitat type would be negatively impacted by construction of the parking lot, 300 acres would be allowed to grow back naturally and improve the overall habitat on the refuge for the native species. The impacts to vegetation resulting from the expansion of the beach access road would result in removal of approximately 18 acres of scrub shrub and forest vegetation. The exact footprint and design of the expanded beach access road is unknown at this time, although the amount of impact is a conservative estimate; it accounts for the existing roadway at this location and acknowledges that road construction would be an expansion of a current footprint. Further environmental analysis would be required for the beach access

road expansion prior to construction. The removal of vegetation would be mitigated by expanding the road in currently impacted areas as much as possible (i.e., expansion into the current man-made borrow ditches that were created to build the road originally), and where not possible, only impacting minimal scrub shrub or forest vegetation where no threatened or endangered species are known to occur. Construction of a new bike path from the current Wildlife Loop to Mallard/C Dike would result in negative vegetation impacts to wetland or scrub shrub habitat, depending on specifically where the bike path is located (management action 56b). When construction occurs, best management practices would be used to limit impacts. Mitigation to this impact would come from the elimination of the current Swan Cove bike trail, and by allowing native species to grow back, resulting in net positive impacts to vegetation and hydrology of that area of about 0.5 linear miles.

OSV and horseback riding use would expand approximately 2.7 miles (management action 59b). Impacts would not be significant because access would continue to be limited throughout the season, and vehicles would still be required to stay within the intertidal zone.

The opening of the OSV zone from September 16 to March 14 creates negative impacts by exposing the area to potential vegetation trampling and habitat alteration. The closing of the zone to protect nesting shorebirds from March 15 to September 15 has beneficial impacts for vegetation; decreasing the amount of time that trampling would be possible (management action 57b). All of these impacts would not be significant due to the restricted area in which these activities are permitted, and the lack of vegetation that occurs on the beach.

Horseback riding would take place along the Atlantic Ocean beachfront below the high tide zone between September 16 and March 14 (management action 63b). This area is devoid of vegetation. It is anticipated however, that allowing this use would have minimal impact to vegetation near parking area assigned for horse trailer parking. Current plant communities that occur in these areas are not rare or highly sensitive to disturbance based on available information. Through the development of brochures, maps, and established travel corridors we would minimize the impacts to vegetation along the entire horseback riding/OSV zone.

New horseback riding parking would have a negative impact on approximately 1 acre of forested upland vegetation at the corner of Mallard/C Dike and the new beach access road (management action 64b). This adverse impact would be mitigated by using best management practices and construction where the least amount of vegetation would be removed. The parking lot would not be paved. This would allow for the minimal amount of disturbance, causing only the compaction of underbrush and small vegetation, with no large removal needed.

Closing all routine public access on the Service Road north of the relocated recreational beach would have a beneficial impact to vegetation by decreasing the potential for humans to trample or damage native vegetation adjacent to the road (management action 75b).

The improvement or replacement of all water control structures would have beneficial impact on all freshwater impoundments into Toms Cove and Chincoteague Bay (management action 15b). By updating flow capabilities, of Mallard Pool (C Pool), Shoveler Pool (B-North Pool), and Snow Goose Pool (B-South Pool), water could drain freely into Toms Cove through Swan Cove (F Pool) more efficiently. This would maintain low salinity levels and improve water quality for moist soil vegetation and associated wildlife.

Opening non-migratory (resident) Canada goose and light goose hunting on Assateague Island would have a slight beneficial impact to wetland vegetation in the impoundments (management action 69b). Any decreased amount of these species would result in less grazing effects that deteriorate native vegetation.

The construction of new lifeguard housing facilities and a boardwalk at or near Wallops Island NWR would result in an adverse impact for forested vegetation such as loblolly pine (management action 66b). This impact would be minimal due to the small size of the facilities and the boardwalk, but further investigations and environmental analysis to assess impacts would need to be conducted prior to construction. Efforts would be made to assure minimal vegetation would be impacted.

4.5.3 Impacts on Vegetation in Alternative C

The creation of new recreational beach parking would negatively impact approximately 4.25 acres of a mixture of scrub shrub, wetland, and forested habitats, with their associated vegetation (see Chapter 3) (management action 51b). Vegetation would be altered and/or removed from the vicinity of Mallard and Pintail (C and D Pools) impoundments resulting in a loss of that habitat, mostly myrtle/bayberry shrub (management action 22b). Impacts associated with the recreational beach relocation, and the expansion of the new beach access road would be consistent with alternative B (management action 52b).

The elimination of OSV use and horseback riding on the refuge would have a positive benefit to vegetation along approximately eight linear miles of the beach, by eliminating the risk of trampling, compaction, or other degrading possibilities to the native plants (management actions 62b and 65b) if visitors stray from the designated routes of travel.

Currently the population of the Chincoteague pony herd on Chincoteague Island is approximately 125 to 135, with slight fluctuations depending on the time of year and whether or not it is breeding season. The current management of allowing 150 potential ponies would be reduced to only allowing a population of 125 ponies, with no potential to increase the herd size. This change in management would reduce the pony population, which would likely decrease the effects of grazing and trampling that the ponies currently have on vegetation on the refuge (management action 17b).

Phasing out of the exotic sika population on the refuge over the next 15 years would have a beneficial impact for vegetation, especially for the endangered seabeach amaranth, of which sika is a documented herbivore (management action 37b). The grazing habitats of sika have led to an overgrazing of certain habitat types on the refuge, mainly in the impoundments and forested areas. These areas have been documented as overbrowsed areas of vegetation, which would see a positive increase in regeneration if sika were phased out.

There would be no new construction of a bicycle or pedestrian trail in alternative C. The impacts described for the building of a new bicycle trail in alternative B would therefore be avoided. All other impacts to vegetation would be the same as alternative B.

4.6 Federally Threatened and Endangered Species

Piping plover, loggerhead sea turtle, Delmarva Peninsula fox squirrel, and seabeach amaranth are the current federally threatened or endangered species managed on the refuge. We analyzed the

alternatives for impacts to these four endemic focal species, which would exemplify the impacts for all other listed species that may be found on the refuge. Red knot, a shorebird species proposed to be listed as threatened under the Endangered Species Act (ESA), also uses refuge beaches during spring and fall migration.

Table 4-1 assesses the impact of management actions on threatened and endangered species; management actions are referenced by number throughout the text.

4.6.1 Impacts on Federally Threatened and Endangered Species in Alternative A

Current management adheres to guidelines set forth in previous recovery plans and biological opinions. Under alternative A, continuing those current management practices will not result in any new or significant adverse impacts to threatened or endangered species.

4.6.2 Impacts on Federally Threatened and Endangered Species in Alternative B

Allowing natural vegetation to grow within the NWF to improve habitat for spring and fall migratory birds, waterfowl, and neotropical birds would result in an initial negative impact for piping plovers (management action 23b) at that location. Current management of the NWF area has vegetation adjacent to open mudflats being annually cut back to create a more suitable habitat for coastal nesting shorebird populations. Allowing natural scrub shrub vegetation to grow in adjacent to the open mudflats, would transform the area into habitat that is not commonly used by coastal nesting shorebirds, altering approximately 300 acres of habitat. However, this negative impact would be off-set and even surpassed as a beneficial effect from relocating the current recreational beach (management actions 2b and 3b).

The existing 1-mile beach area and 8.5 acres of beach parking on the southern end of the refuge is determined to be prime coastal shorebird and seabeach amaranth habitat. By moving the recreational beach and accompanying facilities north (management action 52b), this area would be allowed to revert back to coastal nesting shorebird and amaranth habitat by natural processes (management actions 2b and 3b). Piping plovers and amaranth favor areas with frequent overwash events, which occur currently where the recreational beach is located. Areas adjacent to the recreational beach exhibit high density of piping plovers nesting. This area has the potential to support a higher number of species than what is currently supported in the NWF. Sea turtles exist in the same types of habitats as piping plovers, and the increase in habitat quality coming from the allowance of natural processes to take over would see a beneficial impact for both (management action 8b), as well as the benefits from the general decrease in human disturbance.

Through the creation of the year-round OSV access area, all day and nighttime OSV use south of this area would be discontinued between March 15 and September 15 (management actions 9b, 10b, 60b, 61b). This would eliminate the potential for OSV users to run over nests, hatchlings or plants, or otherwise disturb the nesting process.

From September 16 to March 14, negative impacts could result from the expansion of the OSV zone from the new recreational beach location to the current zone (management action 59b). This expanded OSV area would increase the possibility of human disturbance in the coastal habitat. However, negative impacts would be minimized since OSV users would only be permitted to travel in the intertidal zone, and by management action conducted by refuge staff, usually in the form of exclosures and signs.

Mowing would occur on various roads within the refuge to benefit the Delmarva Peninsula fox squirrel. Alternative B's (and C's) actions for mowing would result from the change in the access to and relocation of the recreational beach. Although this management action (mowing) is similar to alternative A's, the location of the mowing would shift to the areas where refuge traffic would be the highest due to the new access routes for the new recreational beach.

4.6.3 Impacts on Federally Threatened and Endangered Species in Alternative C

The phasing out of OSV and horseback riding on the refuge would have a beneficial impact to threatened and endangered species on the refuge (management actions 62b and 65b). Currently, OSV and horseback riding is managed to minimize disturbance to threatened and endangered species, but a complete elimination of the activities would eliminate the threat of disturbance. Other impacts to federally threatened and endangered species under alternative C would be the same as under alternative B.

4.7 Birds

Habitat conservation and management is the highest priority of the refuge, consistent with the original establishment purposes for the protection of migratory birds. More than 320 species of birds are known to use the refuge regularly for nesting and brood rearing, feeding, resting and staging during migration, or wintering.

We evaluated the management actions for each alternative for their potential to benefit or adversely impact the various bird species on the refuge, including one or more of the following:

- management of the recreational beach and parking;
- change in impoundment management;
- OSV management;
- access to Assawoman Island; and
- hunting.

Visitor use activities (hunting, fishing, recreational beach use, walking, biking, horseback riding, OSV use) currently occurring on the refuge have been analyzed for impacts to birds. As analyzed for the 1992 EIS, such activities are expected to have a negative short term impact on birds. These activities are known to create disturbance to migratory and breeding birds and can cause alteration of habitats by trampling vegetation, compacting soils, and increasing the potential of erosion. For other visitor use activities, impacts would be minimal since visitors are required to use pre-selected paths and hiking trails which the refuge created to traverse through habitat, and avoid future vegetation impacts. No significant impacts would result on the refuge from these visitor services, but current monitoring efforts would continue.

Table 4-1 assesses the impact of management actions on birds; management actions are referenced by number throughout the text.

4.7.1 Impacts on Birds in Alternative A

Previous land and wetland acquisition to ensure protection of important habitats for various birds and aquatic species was a high priority in the previous master plan and EIS. Protection and management of these acquired lands have continued to be of the highest priority for the refuge, making as much suitable habitat as possible available for the varied refuge wildlife. Existing management activities do not adversely affect birds or bird populations. Under alternative A,

continuing current management practices will not result in any new or significant adverse impacts to birds.

4.7.2 Impacts on Birds in Alternative B

Alternative B proposes changes to the hunting program (management actions 69b, 70b, 71b, 72b, and 73b). These visitor service actions have been analyzed and found to have no significant, overall adverse impact to the bird population. Current big game hunting programs on the refuge would see a slight change in services (increased hunting outreach events), but there would be no significant increase in visitation related to big game hunting.

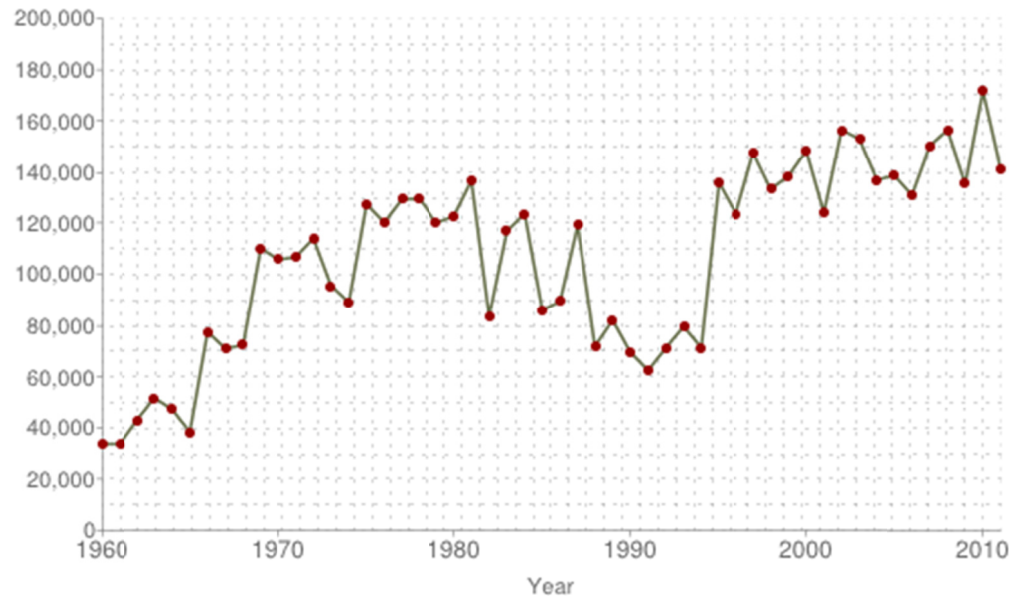
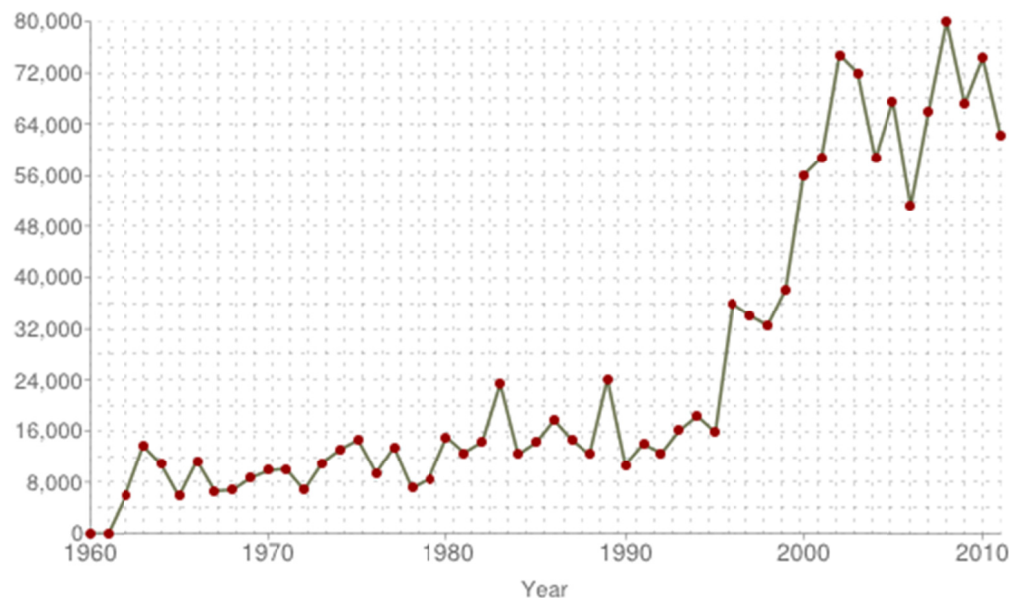
Light goose, resident Canada goose, and mourning dove hunting would be added to the refuge hunting opportunities which would result in a potential increase in visitors related to hunting (management action 69b). Additional impact analysis for any new hunts will be addressed in hunts plans that will include environmental compliance. These hunt programs would be regulated as the current hunt programs are, with a limited amount of permits awarded. Any increase in hunting will likely have adverse impacts on individual waterfowl, but at the population level no significant impact is expected.

Net positive impacts from the refuge hunt program are expected. We expect that the harvest of local resident Canada geese would have the following beneficial effects on other resources:

- Increase natural seed regeneration within refuge impoundments thereby increasing fall/winter food availability for migrating ducks, geese and swans.
- Reduce fecal contamination in the refuge impoundments. Excessive fecal matter also changes the nitrogen and oxygen levels in the refuge waters resulting in algal blooms and death of aquatic organisms. (Source: USDA-APHIS. 1999. Environmental Assessment for the management of conflicts associated with non-migratory Canada geese, migratory Canada geese, and urban/suburban ducks in the Commonwealth of Virginia. 77 pp.)
- Reduce the possibility of transmitting disease to susceptible populations of migrating birds as they over-winter at the refuge or pass through.
- Reduce negative interactions (aggressive behavior) with refuge visitors on roads and trails during spring breeding season.

Harvest and disturbance of light geese under the authority of the light goose conservation order would have the following beneficial effects:

- Reduce damage caused by light geese to sensitive arctic breeding habitats. This would have the additional benefit of reducing negative impacts to other bird species nesting within that same arctic habitat.
- Reduce damage to wintering habitats within the Atlantic Flyway.

Total number of ducks harvested in Virginia**Total number of geese harvested in Virginia**

<http://www.flyways.us/regulations-and-harvest/harvest-trends>

The resident Canada goose population increased significantly during the 1980s and early 1990s. The population peaked at over 260,000 geese in the mid-late 1990s in Virginia and has been steadily reduced by specific management programs since that time. The current population estimate is 158,267 (+/- 28%) in Virginia and over 1 million in the Atlantic Flyway. For migrant Canada geese, the breeding population estimate for 2012 (190,340) is similar to the past 3 year average (189,317).

http://www.dgif.virginia.gov/hunting/va_game_wildlife/waterfowlfactsheets.pdf

Liberal duck seasons (60 days, 6 bird bag limit) and resident goose seasons have resulted in higher waterfowl harvests in Virginia during the past 10 years. Harvest has averaged approximately 150,000 ducks and 60,000 geese from 2000-2011, compared to 114,770 ducks and 25,000 geese during the 1990s. The long season length and liberal bags offer greater opportunity and a greater cumulative harvest over the course of the season.

Waterfowl hunter numbers in Virginia have been generally stable since the late 1990s, and Federal Duck Stamp sales have averaged 23,390 in Virginia (for 5-year period, 2006-10). Since 1999, the Harvest Information Program (HIP) has been used to estimate hunter effort and harvest. The average number of duck and goose hunters over the past 3 years, as measured by HIP, was 13,618 and 12,360 respectively. In 2011, only 99 visits occurred on the refuge for migratory bird hunting, possibly because the hunt areas are only accessible by boat.

Chincoteague Waterfowl Harvest (self-reported, 2008-2013)

2008/2009 - 212

2009/2010 - 65

2010/2011 - 53

2011/2012 - 67

2012/2013 - 69

Given the exceptionally low numbers of waterfowl harvested from the refuge in respect to the total statewide harvest and waterfowl population, no cumulative impacts to local, regional, or statewide populations of ducks or geese are anticipated from hunting on the refuge.

Disturbance to wintering waterfowl can be significant particularly from human activity within feeding and loafing areas. Hunting occurs only on the Wildcat Marsh and on Morris, Assawoman, and the north end of Metompkin islands. Morton (1986) found that the increased presence of humans associated with the refuge big game hunting program can contribute to significant movements of ducks, particularly black ducks, off the refuge. These disturbances are at a time when these birds need the isolation of the refuge to feed and rest. Paulus (1984) and Belanger (1989) found that hunting activity (gun shots or hunter movements) caused waterfowl to move to less disturbed areas and avoided some areas until after the hunting season. Laskowski et al (1993) documented human disturbance to a representative species of waterfowl by the visiting public on Back Bay NWR, Virginia. Disturbance elicited behavioral changes ranging from increase alertness to flying to other parts of the refuge. McNeil et al. (1992) found that many waterfowl species avoid human disturbance by feeding at night instead of the day.

Waterfowl and other migratory bird hunting would continue to be limited to specific areas on the refuge in order to reduce potential disturbance. Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when “hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any bird, or any part, nest, or egg” of migratory game birds can take place, and to adopt regulations for this purpose.

Changes in hunt management would have net positive impacts for bird species on the refuge, mostly by the elimination of predation and competition. Adding new hunting opportunities and developing a trapping program would add to the beneficial impacts of the current predator management program (management actions 69b, 70b, 71b, 72b, and 73b). These new hunting and trapping programs would further reduce mammalian predators of coastal nesting birds. Further, adding resident Canada goose and light goose hunting on Assateague Island would reduce their negative impact to habitat on the refuge.

Impacts to shorebirds from human activity have been well documented. Pfister et al. (1992) investigated human disturbance as a factor that might limit the capacity of appropriate staging areas to support migrating shorebirds. Results indicate that adverse impacts from human disturbance would be greater on shorebird species using the front side of beach habitats, and because of these impacts the local abundance of species may be reduced by 50 percent. Such disturbance is implicated as a potential factor in long-term declines in shorebird abundance during migration periods at disturbed sites.

Based on past observations of impacts on shorebirds by refuge staff, disturbance by refuge hunters to shorebirds is expected to be negligible since most shorebird species have completely passed through Virginia by peak hunting season in November through January. Some hunting occurs when these species may be migrating before and after this peak hunting time. In addition, hunters are restricted from prime shorebird use areas.

The new recreational beach area was chosen through a Structured Decision Making (SDM) analysis (USFWS 2011b).¹ Through this SDM process, a 1-mile segment of beach was identified as having the least impacts to refuge habitat and wildlife. This 1-mile segment would be the location for the new recreational beach in alternatives B and C (management action 52b). Human disturbance to coastal nesting birds would be greatly diminished since the recreational beach would be relocated north, and OSV use would be limited to September 16 to March 14 (management action 60b). Natural processes would allow for overwash to occur in the location of the existing recreational beach, resulting in fresh sand and shell which is prime habitat for coastal nesting birds, turtles, and seabeach amaranth (management actions 2b, 3b, 6b, 8b, and 13b).

The moving of the recreational beach and parking areas, along with the expansion of the beach access road, would result in removal to approximately 27 acres of migratory bird habitat, but the initial negative impacts would be alleviated (management action 52b) with restoration of other areas. The creation of new recreational beach parking would negatively impact approximately 8.5 acres of a mixture of scrub shrub, wetland, and forested habitats, with their associated vegetation (see chapter 3). Vegetation would be altered and/or removed from the vicinity of Mallard Pool (C Pool) and Pintail Pool (D Pool) resulting in a loss of that feeding and nest habitat, mostly myrtle/bayberry shrub (management action 22b). Pintail Pool (D Pool) has received very low waterfowl and shorebird use over the past 20 years, so minimal impact is expected.

¹ The Chincoteague refuge staff conducted a workshop with the following attendees to arrive on a consensus on the problem statement and findings of the document: the town of Chincoteague (town planner), FWS Regional Biologist, FWS Assistant Regional Biologist, FWS Inventory and Monitoring Coordinator, NPS Assateague Island National Seashore, Virginia Division of Game and Inland Fisheries, FWS Coastal Delaware NWR Complex Manager, Chincoteague refuge staff, Eastern Shore of Virginia Refuge Manager. (Accomack County was invited but not in attendance).

The proposed new management of the NWF under alternative B would help to mitigate initial adverse impacts as outlined in the Soils and Vegetation sections (management action 23b). Proposed management at the NWF would cease vegetation removal and allow for the natural succession of vegetation to occur in this 300-acre area, improving the habitat for spring and fall migratory neotropical birds.

The new management of the extended OSV zone would have negative impacts to shorebird species that feed and loaf outside the breeding season (management action 59b). Although the zone would be increasing in size from alternative A, impacts would not be significant because the OSV use is now only allowed in support of priority public uses like surf fishing, and the driving limitations to the intertidal zone. The year-round fishing zone south of the relocated recreational beach would have a negligible impact on coastal nesting birds, primarily because of its location (management action 61b). The specific area highlighted for year-round fishing was chosen because of its current lack of use by coastal nesting birds, and its close proximity to the new recreational beach.

Assawoman Island would see beneficial impacts to birds as the area would be closed to all visitor use during the nesting season (management action 41b). Additionally, beneficial impact for migratory waterfowl is expected as this management strategy would: increase thermal cover for waterfowl in the winter; increase the food sources for water birds of conservation concern such as snowy egret, glossy ibis, Forster's and gull-billed terns; and improve shorebird migratory stopover habitat for many species of conservation concern, including short-billed dowitcher, dunlin, and semipalmated sandpiper.

4.7.3 Impacts on Birds in Alternative C

The phasing out of OSV and horseback riding on the refuge would have a positive benefit for coastal, migratory, and wintering shorebird species (management actions 62b and 65b). As analyzed under alternative A, current OSV and horseback riding use does not pose a significant impact for birds in that area, but the complete phase out of these activities would further diminish the possibility for trampling or general human disturbance. All other impacts to birds in this alternative would be the same as under alternative B.

4.8 Fish and Other Aquatic Species

The refuge has a minimal assemblage of fish species in the freshwater impoundments. The refuge currently manages the impoundment habitats for birds, and not necessarily for fish, but impacts that occur in this habitat for birds would potentially affect fish as well. Since the impoundments are managed annually and on a strict regime through water control structures, the habitat remains a beneficial area for all aspects of the fish lifecycle.

The horseshoe crab is an endemic species found on the east coast of the United States, with the center of abundance between New Jersey and Virginia. This species spawns in the spring during new and full moon periods starting the end of April and lasting into June. This period of time coincides with the spring migration of shorebirds. Migration is an extremely energetic undertaking for these birds and their success or failure is dependent upon finding sufficient energy (food) to complete migration and then to breed. Studies have shown that horseshoe crab eggs that wash up on beaches after a spawning cycle are known to supply some or the entire energy requirement to complete migration.

Table 4-1 assesses the impact of management actions on aquatic species; management actions are referenced by number throughout the text.

4.8.1 *Impacts on Fish and Other Aquatic Species in Alternative A*

Existing management activities do not adversely affect fish or fish populations. Under alternative A, continuing current management practices will not result in any new or significant adverse impacts to fish.

4.8.2 *Impacts on Fish and Other Aquatic Species in Alternative B*

Improvements to the tidal flow of Swan Cove (F Pool) resulting from modification and replacement of water control structures within Beach Road causeway would have a positive impact on fish and other aquatic species (management action 15b). Increased water flow and tidal rhythm would allow fish and aquatic invertebrates such as crabs and mollusks passage into this restored salt marsh.

4.8.3 *Impacts on Fish and Other Aquatic Species in Alternative C*

Impacts to fish and other aquatic species under alternative C would be the same as under alternative B.

4.9 *Mammals*

The refuges support populations of mammalian species common to habitats of the Delmarva Peninsula (plus the Delmarva fox squirrel, which is endemic to the area and rare). As a taxonomic group, mammals would benefit from the refuge land protection and management of riparian habitats, forests, grasslands, shrub, and wetlands proposed for listed species, waterfowl, and migratory birds. Likewise, refuge habitats would benefit from careful attention to the impacts on mammals resulting from any of its activities. We evaluated management actions and visitor uses for alternatives for their potential to beneficially or adversely affect large and small aerial, terrestrial, or wetland mammals. Table 4-1 assesses the impact of management actions on mammals; management actions are referenced by number throughout the text.

4.9.1 *Impacts on Mammals in Alternative A*

Current management practices that occur on the refuge were analyzed for impacts in the 1992 EIS, and largely remain consistent for this alternative. In general, the presence of humans disturbs most mammals, typically resulting in indirect short-term adverse impacts considered negligible since they would not cause any long-term effects on individuals or populations. Continuing existing management activities will not result in any new or significant adverse impacts to mammals.

4.9.2 *Impacts on Mammals in Alternative B*

Refuge strategies for conserving and maintaining biological integrity, diversity, and environmental health, restoring native plant communities, improving habitat conditions for the endangered Delmarva Peninsula fox squirrel, and controlling invasive or nuisance species would be management actions that have net beneficial impacts to mammals. The actions would directly or indirectly benefit mammalian populations over the long term by ensuring the continuation of quality natural habitats for resident mammalian wildlife.

Controlling invasive plant species, particularly those that quickly colonize an area and form dense, monotypic stands such as phragmites, would benefit mammals by maintaining the balance of food resources and native vegetative communities with which they evolved or adapted to for cover, nesting, and diverse food resources. For smaller, insectivorous mammals, maintenance of native plant diversity and structural integrity by controlling invasive species would have a positive impact as those species rely on biodiversity and availability of invertebrate food resources that are only associated with native floral assemblages.

UFWFS recognizes USDA-Animal and Plant Health Inspection Service (APHIS) as the expert in reducing mammalian predation on natural resources. Chincoteague NWR and APHIS agree to work together and with other interested parties to benefit threatened and endangered wildlife, bird species of management concern, and wildlife nesting habitat. The objective of the project is to: (1) conduct avian and mammalian predator management throughout the refuge complex to support the refuge's effort to enhance migratory bird populations of selected bird species, and to carry out wildlife management objectives of the complex; (2) assist the complex with the management and eradication of invasive species such as nutria; and (3) assist the complex with the monitoring and management of wildlife disease surveillance and outbreaks.

APHIS will conduct predatory mammalian and avian species management efforts on the refuge complex upon request by refuge staff and approved by the Refuge Manager. The strategy used will include preventative control and corrective control. Preventative control will include the removal of red fox, coyote, raccoons and mink as requested on Assateague Island, Assawoman Island, Eastern Shore of Virginia, Fisherman Island and other designated units (Cedar, Metompkin, Morris Islands and Wildcat Marsh) within the refuge complex from February through August and continue until predator management goals for red fox, gray fox, raccoons, coyote, mink and opossum are met for individual complex units.

Hunting is an important visitor use activity that results in a net positive impact for mammals by helping control the current sika elk and white-tailed deer populations. Overall it serves both a wildlife-dependent recreational use and a method of population control that would benefit other non-hunted mammals, conserve migratory bird habitats, reduce vehicle/deer collisions, and reduce overbrowsing of vegetation.

VDGIF has primary responsibility for managing white-tailed deer in Virginia. The Virginia Deer Management Plan, first completed in 1999 and revised in 2006, guides management of deer habitat, deer populations, damage caused by deer, and deer-related recreation in the Commonwealth. In 2012, 213,597 deer were reported killed by hunters in Virginia. This total included 96,712 antlered bucks, 18,061 button bucks, 98,781 does (46.3 percent), and 43 "unknown" deer. It is also 8 percent below the last 10-year average of 232,573. In Accomack County, an average of 3,056 deer per year are killed (see Table, 2008-2012 data).

Accomack County Deer Kills, 2008-2012

Year	Antlered Males	Male Fawns	Females	% Female	Unknown	Total Kill
2008	1412	371	1924	51.9%	0	3707
2009	1225	249	1614	52.3%	0	3088
2010	1246	307	1740	52.8%	0	3293
2011	1007	263	1535	54.7%	2	2807
2012	923	212	1249	52.4%	0	2384

<http://www.dgif.virginia.gov/wildlife/deer/harvest/index.asp>

Population reconstruction computer models indicate that Virginia's statewide deer population has been relatively stable over the past decade, fluctuating between 850,000 and 1,050,000 animals (mean = 945,000). <http://www.dgif.virginia.gov/wildlife/deer/management-plan/virginia-deer-management-plan.pdf>

Hunting resident game species, such as deer, on Chincoteague NWR and Wallops Island NWR will result in negligible impacts on their populations because of their restricted home ranges. The refuges also contribute negligibly to the state's total harvest for resident game species.

Chincoteague NWR white-tailed deer harvest

2008/2009 - 23

2009/2010 - 20

2010/2011 - 15

2011/2012 - 27

2012/2013 - 26

Wallops Island NWR white-tailed deer harvest

2008 - 13

2009 - 15

2010 - 15

2011 - 8

2012 - 11

The refuges harvested a total of 173 white-tailed deer over the past 5 years, with 37 in 2012. Given the exceptionally low numbers of animals harvested from the refuges in respect to the total statewide harvest and deer population, no cumulative impacts to local, regional, or statewide populations of white-tailed deer are anticipated from hunting of the species on the refuges.

Aggressive management of the non-native sika population would have a beneficial impact on native white-tailed deer. As white-tailed deer compete with sika for habitat and food sources, the decreased sika population would reduce this competition. Deer impacts to ecosystems (e.g., forest regeneration, ground-dwelling birds) are a concern in certain areas with poor habitat and high deer populations. VDGIIF has implemented innovative programs such as the Deer Population Reduction Program (DPOP). The refuge manages sika population with DPOP. Approximately 150 to 200 sika are taken each year, from an estimated population of 600 to 800.

At Wallops Island NWR, hunting would be used primarily as a management tool for reducing the impacts of white-tailed deer on forested habitats important to migratory birds and other wildlife. The public hunt would also reduce the threat of deer-aircraft strikes at the adjacent

NASA/Goddard Space Flight Center/Wallops Flight Facility, and deer-automobile strikes on the adjacent Virginia State Highway Route 175. Finally, the hunt would provide limited public hunting opportunities on Wallops Island NWR.

Negative impacts from hunting on non-hunted mammals, such as voles, moles, mice, shrews, and bats, are expected to be negligible. Except for some species of migratory bats, these species have very limited home ranges and hunting would not affect their populations regionally. Impacts of hunting to migratory bat species would be negligible. These species are in torpor or have completely passed through Virginia by peak hunting season in November through January. Vehicles are restricted to roads and harassment or taking of any wildlife other than legal game species is not permitted.

4.9.3 Impacts on Mammals in Alternative C

Impacts for alternative C would be similar to those of alternative B, except that, in addition, the refuge would work towards the eventual phasing out of the entire sika population (management action 37b). This phasing out of the exotic species would further diminish the competition with the white-tailed deer for food and habitat.

4.10 Reptiles and Amphibians

Other than the Federal listed species of turtles, 20 other amphibian and reptile species have been recorded on the refuge. Although no specific management policies are set in place for these species, the management of other species and habitats where these 20 species have been recorded would have direct impacts on these species. These species are commonly found in areas of the refuge with very limited visitor use, such as forest, vernal pools, refuge impoundments, and salt marsh areas. Impacts from visitor use actions such as hunting would not be significant due to the hibernation or torpor actions by cold-blooded reptiles and amphibians that limit their activity during the current hunting season when temperatures are low. Research is conducted on island dwarfisms in toads, a phenomenon common on Mid-Atlantic barrier islands, and what possible variables could cause this trait (Hranitz 2010).

Incidental mortality of reptiles and amphibians occurs on refuge roads between March and October. However, this mortality is negligible and the impact is not expected to affect the overall populations. Illegal harvest of reptiles and amphibians for the pet trade and/or consumptive use can and could have a negative impact on these populations.

The dewatering of the impoundments from May through August concentrates fish, amphibian and reptile species in deeper channels. Waterbirds such as snowy egrets, glossy ibis, terns, and herons take advantage of this abundant food supply. Table 4-1 assesses the impact of management actions on reptiles and amphibians; management actions are referenced by number throughout the text.

4.10.1 Impacts on Reptiles and Amphibians in Alternative A

Existing management activities do not adversely affect reptiles or amphibians. Continuing current management practices as proposed under alternative A will not result in any new or significant impacts to reptiles and amphibians.

4.10.2 Impacts on Reptiles and Amphibians in Alternative B

Increased incidental mortality of reptiles and amphibians may occur on newly created refuge roads between March and October (management action 52b). However, we expect negligible

impacts since best management practices would be implemented in the design and engineering of the roads and parking lots. For example, underground crossings, culverts, and timing of construction could be viable options to mitigate potential adverse impacts. Therefore, it would not affect their overall populations.

4.10.3 Impacts on Reptiles and Amphibians in Alternative C

Impacts to reptile and amphibian species under alternative C would be the same as under alternative B.

4.11 Invertebrates

Chapter 3, Affected Environment, discusses the valuable role that invertebrates play on the refuge. This section provides the results of the evaluation of the management actions each alternative proposes for impacts on invertebrates. Table 4-1 assesses the impact of management actions on invertebrates; management actions are referenced by number throughout the text.

4.11.1 Impacts on Invertebrates in Alternative A

Prescribed burning, disking, and mowing would continue on or around impoundments to manipulate vegetation for the benefit of wildlife. Consideration of invertebrate species would be included in these management practices under all alternatives. No significant impacts to invertebrates would be anticipated to occur on the refuge from visitor services, and current monitoring would be continued. Continuing existing refuge management activities will not result in any new or significant adverse impacts to invertebrates.

4.11.2 Impacts on Invertebrates in Alternative B

Invertebrate species (emergent grazers and algal-detrital feeders) commonly found in salt marshes within coastal Virginia include fiddler crabs, ghost crabs, mole crabs, saltmarsh snail, periwinkle, mud snail, mussels, and isopods (Mitsch and Gosselink 1986). Impacts to the above mentioned and other invertebrates such as butterflies, moths, other insects, and spiders would not be significant. While beach use, OSV use, surf fishing, and horseback riding can occur in areas where intertidal invertebrates (i.e. species such as coquina clams, ghost crabs and mole crabs) are located, impacts from these uses are thought to be minimal (Wolcott & Wolcott, 1984). Invertebrates are not active during the majority of the hunting season and would have few interactions with hunters (USFWS 2007b).

The alteration of Mallard and Pintail Pools (C and D Pools) from the refuge impoundment management in order to allow the building of approximately 8.5 acres of recreational beach parking would have a negative impact on invertebrates, mainly monarchs (management action 22b). This area is known habitat for Bidens, a type of vegetation that monarchs use for nectaring during their migration. Although this would be a permanent negative impact, it would not be a significant impact because of the small acreage that would be affected, and because there are several nearby habitats where monarchs could nectar, including Shoveler and Snow Goose Pools (B Pools). Monarch numbers are relatively low overall on the refuge, as compared to other regions (Gibbs 2008), and the removal of this vegetation would not be detrimental to their life cycle. The planting of seaside goldenrod seedlings along small dunes in the vicinity of the former recreational beach, as well as on the backsides of dunes along Wild Beach and Toms Cove Hook would have a beneficial impact towards monarchs, and could work to mitigate the negative effects of Bidens removal (management action 32b). Seaside goldenrod is the most important nectar source for monarchs on the refuge, and also acts a nesting location.

Improvements to the tidal flow of Swan Cove (F pool) resulting from modification and replacement of water control structures within Beach Road causeway would have a positive impact on aquatic invertebrates and fish species (management action 15b). Increased water flow and tidal rhythm would allow fish and aquatic invertebrates such as crabs and mollusks passage into this restored salt marsh.

Under alternative B, the new location of the recreational beach and parking lot would include management actions to control mosquitoes through water manipulation, insect traps, and best management practices. Control of mosquitoes would have the potential for an impact on other invertebrates in the area not being managed (management action 52b). The loss of mosquitoes may have adverse impacts on birds, fish, amphibians, bats, and other wildlife since they are known food source for these species. This impact would not be significant because it only occurs in a small area of the refuge focused around the recreational beach and parking, and would not expand out into habitats for the above mentioned wildlife.

4.11.3 Impacts on Invertebrates in Alternative C

Impacts under alternative C would be the same as under alternative B, except that the negative impacts from removal of Bidens at the new recreational beach parking would be reduced to only 4.25 acres (management action 51b).

Table 4-1 Beneficial and Adverse Impacts on Biological Resources by Management Action

● = benefits only; ○ = adverse impact only; ◐ = adverse impacts and benefits

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
1. Protect and enhance refugewide suitable coastal habitat for piping plovers which allows for the reduction of mortality factors; keep the fledge rate between 1.2 and 1.5 chicks per pair.	X	X	X				●	●	●			●	
2. Allow natural geologic processes to restore overwash to the former recreational beach and parking areas on Assateague Island in order to increase nesting habitat for plover, least terns, sea turtles, and other nesting shorebirds.		X	X				●	●	●			●	
3. Improve the beach nesting habitat at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.		X	X				●	●	●			●	
4. Return footprint of current public beach parking area to wildlife habitat and reduce parking impact on habitat by reducing the size of public beach parking and relocating it to areas less sensitive for wildlife habitat and more stable to the forces of the tides and storms.			X	◐			◐	◐	◐			◐	◐
5. Protect and enhance 16.8 linear miles of Assateague Island and Toms Cove to benefit migrating and wintering shorebirds.	X	X	X				●	●	●			●	●
6. Improve the migratory and wintering habitat at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.		X	X				●	●	●			●	●
7. Protect a minimum of 16.8 linear miles of sandy beach habitat on Assateague Island for nesting loggerhead sea turtles.	X	X	X				●	●	●			●	●

² The (b) represents management actions relating to biological resources.

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
8. Improve beach/dune habitat for turtle nesting areas at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.		X	X				•	•	•			•	•
9. Restrict nighttime permitted beach driving in September and October, when the OSV zone is open but the sea turtle nesting season (June through October) is still ongoing.		X	X		•		•	•	•			•	•
10. Limit night use of the beach by official vehicles during the plover and sea turtle breeding season to the greatest extent possible.		X	X		•		•	•	•			•	•
11. Continue in situ nest protection for loggerhead sea turtles.	X	X	X					•					
12. Increase the number of Federal endangered seabeach amaranth plants by maintaining and enhancing coastal habitat along Assateague Island shoreline by allowing natural processes to occur.	X	X	X				•	•	•			•	•
13. Improve beach/dune habitat for seabeach amaranth at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.		X	X				•	•	•			•	•
14. Refugewide, maintain 3,070 acres of salt marsh habitat for nesting, migrating and wintering birds.	X	X	X						•	•			
15. In cooperation with USACE and other partners develop strategies that will improve tidal flow to Swan Cove (F Pool).		X	X			•				•			•
16. Work with USDA to reduce non-migrant Canada goose population through addling, firearms, and round-ups.		X	X				•		•				
17. Within 15 years, phase in requirement for Chincoteague pony population to consist of no more than 125.			X	•			•						
18. Remove ponies from the proposed wilderness area.			X	•			•						
19. Protect the integrity of Lucky Boy Fen.	X	X	X			•	•					•	

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
20. Protect the ecological integrity of tidal creeks, estuaries, mudflats, and nearshore marine waters.	X	X	X			•			•	•			
21. Provide approximately 2,650 acres of quality wetland habitat to support wintering waterfowl, spring migrating shorebirds, breeding shorebirds and waterbirds, and fall migrating shorebirds and waterfowl.	X	X	X	•		•	•	•	•				•
22. Remove Pintail (D Pool) from impoundment management capabilities.		X	X			•	•		•				•
23. Since the NWF would no longer be needed as a piping plover mitigation area due to the relocation of the recreational beach, pumping operation would no longer be required to create additional piping plover nesting habitat. Management of the NWF would be improved for spring and fall migratory shorebirds and waterfowl.		X	X	•	•		•	•	•				•
24. Enhance or restore at least 100 acres to meet the habitat needs of black ducks.	X	X	X						•				
25. Manage at least 40 acres in the refuge impoundments each fall with the goal of providing 50 percent cover of Bidens to benefit monarch butterflies.	X	X	X	•			•		•				•
26. Annually maintain 35 nest boxes located in or adjacent to impoundments for tree swallows (as a citizen science project).	X	X	X						•				
27. Discontinue maintaining wood duck nest boxes.	X	X	X						•				
28. Maintain 2,500 acres of coastal shrubland to provide forage and cover habitat for fall landbird migrants, and breeding, and wintering landbirds.	X	X	X	•			•		•				
29. Manage a minimum 500-foot wide continuous strip of 10 to 12-foot tall myrtle/bayberry shrub, free of trees, parallel to (and behind the) dunes on eastern side of the NWF impoundment.		X	X	•			•		•				
30. Maintain, through rotational mowing, a minimum of 80 percent of the reliable monarch roosting locations and 50 percent of the preferred nectar source locations during mid-September through mid-October.	X	X	X	•	•		•						•

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
31. Restore and enhance preferred nectaring plants (seaside goldenrod, <i>Bidens laevis</i>) in areas where they already grow or other suitable areas.	X	X	X				•						•
32. Use volunteers to plant seaside goldenrod seedlings in spring or fall on Toms Cove Hook, small dunes that dot the Overwash area, the north end of Toms Cove (including the causeway west of the NPS Toms Cove Visitor Center), and the backsides of dunes along Wild Beach.		X	X				•						•
33. Manage mowing on refuge roadsides, cross-dikes and fence lines in order to minimize Delmarva Peninsula fox squirrel vehicle mortality.	X	X	X	○	○		○	•					
34. Manage mowing on refuge roadsides, cross-dikes, and fence lines in order to minimize Delmarva Peninsula fox squirrel vehicle mortality, making necessary changes to incorporate the relocation of the recreational beach and access.		X	X	○	○		○	•					
35. Manage mowing on refuge roadsides, cross-dikes, and fence lines in order to maximize nesting opportunities for northern bobwhite and brown thrasher.	X	X	X	○	○		○		•				
36. Manage 1,600 acres of predominantly mature loblolly pine habitat to support a population of 200 Delmarva Peninsula fox squirrel, brown-headed nuthatch, and eastern towhee.	X	X	X				•	•	•				
37. Reduce, and eventually phase out, sika and resident, non-migratory Canada goose population through continued recreational hunt and professional means of elimination.			X	•			•	•	•		•		
38. Delineate the boundaries of the maritime upland forest and maritime dune forest community types, and develop appropriate conservation measures.	X	X	X				•						
39. Maintain and restore 178 acres of pine/mixed hardwood forest for the benefit of migrating/nesting landbirds, bobwhite, and woodcock.	X	X	X				•		•				
40. Continue to work with partners that manage other Virginia barrier islands to prevent human disturbance to nesting focal species.	X	X	X				•	•	•			•	

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
41. Implement a complete closure on Assawoman Island, including fishing, from March 15 through September 15 or thereafter, until the last shorebird fledges.		X	X		•	•	•	•	•			•	
42. Conserve sandy beach and overwash habitat along Assawoman Island, and northern end of Metompkin Island, Cedar Island, and the tidal marshes on the backside of the islands to benefit migrating and wintering focal species and other shorebirds of conservation concern.	X	X	X				•	•	•			•	
43. Allow and advocate for natural coastal processes as the primary force that shapes the southern barrier islands habitats and species composition.	X	X	X				•	•	•			•	
44. Complete a habitat management plan and continue to manage habitats and management structures.	X	X	X	•	•	•	•	•	•	•	•	•	•
45. Provide protective conservation measures for federally listed species and their habitats.	X	X	X	•	•	•	•	•	•	•	•	•	•
46. Work with partners toward regional conservation to protect estuarine, coastal, and marine habitats and substantial populations of migratory and breeding shorebirds, colonial waterbirds, landbirds, and raptors.	X	X	X	•			•	•	•	•	•	•	•
47. Work with the town of Chincoteague and other local, state, and Federal agencies to address hazard mitigation and sustain the resiliency of this unique barrier island system in the face of dynamic coastal processes and climate change.	X	X	X			•	•	•	•	•	•	•	•
48. Maintain personal motor vehicle access to Assateague Island and work with the town of Chincoteague to allow golf carts and allow a variety of modes of transportation to and in the refuge.	X	X	X	○	○	○	○	○	○			○	○
49. Continue to allow NPS to manage a 1-mile recreational beach.	X	X	X	•	•	•	•	•	•			•	•

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
50. Continue to allow NPS to maintain 8.5 acres of land (and preserve the capacity of 961 spaces) for parking at the existing recreational beach as long as suitable land base directly behind the recreational beach remains.	X			●	●	●	●	●	●			●	●
51. Reduce beach parking to 480 spaces (approximately 4.25 acres).			X		●		●	●	●			●	●
52. Relocate recreational beach, beach parking, access, and associated facilities approximately 1.5 miles north of current area.		X	X	●	●	●	●	●	●			●	●
53. Pursue shuttle from off-site parking to supplement reduced beach parking.	X		X		●								
54. Remove Swan Cove Trail.	X	X	X			●	●						
55. Continue pursuit of bicycle trail development via Beach Road to recreational beach to replace Swan Cove Trail.	X					●	●						
56. Replace Swan Cove Trail with an alternative bicycle trail from Wildlife Loop north to the south end of the relocated recreational beach, near the OSV zone entrance.		X				●	●						
57. Maintain current access and closures for OSV and horseback riding.	X			●	●	●	●	●					●
58. <i>ACTION ELIMINATED.</i>													
59. Expand the OSV zone from the new recreational beach to Toms Cove.		X		○	○	○	○	○	○				○
60. Keep the OSV zone open from approximately September 16 to March 14 and close the OSV zone to public access March 15 through September 15 or thereafter, until the last shorebird fledges.		X		●	●	●	●	●					●
61. Develop a designated, year-round area for fishing from south of the recreational beach to the point of closure that would include OSV parking.		X		●	●	●	●	●					●

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
62. Discontinue OSV use.			X	●	●	●	●	●	●				●
63. Allow horseback riding in OSV zone.	X	X		○			○	○	○				○
64. Designate separate parking for horse trailer parking.		X		○			○						
65. Discontinue horseback riding.			X	●			●	●	●				●
66. Work with NASA to develop a boardwalk, observation tower, and kiosk from the NASA Visitor Center to an area at or near Wallops Island NWR.		X		○			○						
67. Re-establish an interagency non-exclusive use agreement/MOU with NASA to support wildlife and habitat management for marshlands and uplands not impacted by facilities (3,000 acres).		X		●			●	●	●		●		
68. Maintain current hunting policy on Chincoteague NWR and Wallops Island NWR.	X	X	X	●			●	●	●		●	●	●
69. Introduce non-migratory Canada goose and light goose hunting within Assateague Island impoundments.		X	X	○		○	●		●				
70. Add mourning dove hunting to areas outside of Assateague Island.		X		○		○	○		○				
71. Add turkey to big game for youth hunting.		X		○			○						
72. Open refuge for migratory bird hunting on Federal holidays in designated areas of the refuge within Wildcat Marsh, Morris Island, Assawoman Island and Metompkin Island divisions, that occur outside of the current hunting days of Thursday, Friday, and Saturday.		X		○		○	○		●				
73. Pursue opening for fox and raccoon hunting as well as fur-bearer trapping on Assateague Island.		X	X	○			○	●	●			●	
74. Maintain current public access by foot to the Service Road.	X						○						

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
75. Close Service Road to all public access north of relocated parking except by special use permit or special day use privileges/openings.		X	X				•						
76. Maintain 23 full-time positions and 10 to 20 part-time, student, or contractor positions.	X	X	X	•	•	•	•	•	•	•	•	•	•
77. Add 8 full-time staff positions.		X	X	•	•	•	•	•	•	•	•	•	•

4.12 Socioeconomics

Similar to Chapter 3, Affected Environment, this section provides a summary of information from the report, *Chincoteague National Wildlife Refuge Economic Analysis in support of Comprehensive Conservation Plan* (USFWS 2012e), a full version of which is in Appendix M.

Table 4-5 assesses the impact of three management actions for which information is available on socioeconomics; these management actions are referenced by number throughout the text.

All alternatives would maintain access to a 1-mile recreational beach, incorporate Americans with Disabilities Act standards and universal access into new buildings, and develop bilingual/multilingual materials. These commonalities serve to either maintain or increase the beneficial economic impacts of tourism for the region by improving the accessibility of the refuge.

4.12.1 Impacts on Socioeconomics in Alternative A

Alternative A, the no action alternative, assumes that the refuge would lose a significant number of beach parking spaces due to the projected intensity and frequency of coastal storms and sea level rise. The NPS surveyed the current recreational beach and determined that there will likely be sufficient area to provide for 400 parking spaces over the next 15 years, but the remaining 561 spaces currently available may lose their land base over time (management action 1s).

Due to an inability to predict when that land base may be lost and whether all 561 spaces would be taken away, a conservative estimate can be made comparing a situation in which all 561 are lost to the base year of 2009. The estimate does not include any mitigating effects of alternative parking solutions or shuttle service. It assumes, given survey data, that 10 percent of visitors come in the very early morning hours and 10 percent come in the evening hours, while the remaining visitors come during the prime beach hours of 10:00 a.m. to 5:00 p.m. The estimate shows that a maximum of 1,904 vehicles could be denied entrance to the recreational beach daily in the busiest month under the 400-car parking lot scenario of the no-action alternative. Table 4-2, taken from the economic alternatives analysis performed by the USFWS Economics Division, shows the number of vehicles denied access during the busy visit times.

Table 4-2 Vehicular Visits and Number of Vehicles Denied Access

Month	Average Daily Visits	Average Daily Visits During Peak Hours	Parking Available	Assumed Length of Stay (hours)	Vehicles Denied Access	Percent(%) of Day-long Beach Use Visits Affected
Memorial Day weekend	2,186	1,749	400	8	1,349	77
June	1,505	1,204	400	8	804	67
July	2,881	2,304	400	8	1,904	83
August	2,542	2,033	400	8	1,633	80
Labor Day weekend	2,843	2,275	400	8	1,875	82

Assuming that vehicles denied access to the beach choose not to visit the region at all and that each vehicle represents approximately \$268 dollars in lost regional expenditures per day, the loss of 561 parking spaces would result in a total economic impact per year of \$38.4 million, roughly 34 percent of annual total direct regional expenditures.

Table 4-3 breaks the impact down by the popular visit times.

Table 4-3 Economic Impact of Loss of Parking under Alternative A

Month	Daily Vehicles Denied Access	Associated Number of Daily Visitors Affected	Economic Impact Per Day	Economic Impact per Month/Holiday Weekend
Memorial Day weekend	1,349	4,317	\$ 361,073	\$ 1,083,219
June	804	2,573	\$ 215,185	\$ 6,455,560
July	1,904	6,094	\$ 509,720	\$ 15,801,328
August	1,633	5,227	\$ 437,155	\$ 13,551,794
Labor Day weekend	1,875	5,999	\$ 501,748	\$ 1,505,243
Total				\$ 38,397,143

4.12.2 Impacts on Socioeconomics in Alternative B

Alternative B would maintain the 8.5 acres of land for beach parking and relocates the beach approximately 1.5 miles north of the current area (management action 2s). USFWS assumes that visitation would not change as a result of the relocation, as the same number of spaces would be available, and the short-term transition between the locations would be carefully managed outside the peak visitation period. The alternative includes several expanded visitor services, such as hunting, but no significant increase in visitation would be expected, as hunting is limited by permits and other changes are aimed at benefiting current visitors. Therefore, USFWS assumes that there would not be any negative economic impact per year resulting from alternative B compared to the base year of 2009.

Enforcement of Federal laws that would effectively eliminate illegal horseshoe crab harvesting in the Toms Cove area would likely result in a negative impacts to some commercial watermen. According to VMRC, over 330,000 pounds of horseshoe crabs were harvested within the entire State of Virginia in 2012, at a value of \$276,305. In 2011, these numbers were almost 254,000 pounds and \$166,094 statewide. VMRC estimates that approximately 20 percent of the annual harvest is done by hand; thus, assuming that all hand harvesting is done in the Toms Cove area, the annual value of horseshoe crab harvesting on the refuge is, at most, approximately \$55,261. For the waters of Accomack County, 361,072 pounds of horseshoe crabs at a value of \$208,407 were reported from 1993 through 2010 (appendix M, section 3.3).

4.12.3 Impacts on Socioeconomics in Alternative C

Alternative C would reduce beach parking to 480 spaces, close the Beach Road causeway and the Service Road, and discontinue OSV use and horseback riding, all of which could have negative impacts on the number of visitors coming to the refuge. The negative impact could be mitigated somewhat by the implementation of a shuttle system to compensate for lost parking, and the implementation of hunting and trapping for certain species. Of these potential impacts, the only one for which an economic impact estimate is available is the loss of 481 parking spaces (management action 3s). Following the same methodology as alternative A, Table 4-4 estimates the economic impact of the lost visits. This analysis does not account for the institution of a shuttle from off-site parking.

The impact is less than that of alternative A. While the no action alternative would result in a loss of \$38.4 million in a year, alternative C would result in a loss of \$36.3 million, or 32 percent of the current annual baseline expenditures in Accomack and Worcester Counties. Impacts from elimination of horseshoe crab harvesting would be the same as described under alternative B.

Table 4-4 Economic Impact of Loss of Parking under Alternative C

Month	Daily Vehicles Denied Access	Associated Number of Daily Visitors Affected	Economic Impact Per Day	Economic Impact per Month/Holiday Weekend
Memorial Day weekend	1,269	4,061	\$ 339,661	\$ 1,018,983
June	724	2,317	\$ 193,774	\$ 5,813,208
July	1,824	5,838	\$ 488,309	\$ 15,137,565
August	1,553	4,971	\$ 415,743	\$ 12,888,031
Labor Day weekend	1,795	5,743	\$ 480,336	\$ 1,441,008
Total				\$ 36,298,795

Table 4-5 Beneficial and Adverse Impacts on Socioeconomics by Management Action

● = benefits only; ○ = adverse impact only; ◐ = adverse impacts and benefits

Management Action (s) ³	Element Included in Alternative			Socioeconomic
	A	B	C	
1. Continue to allow NPS to maintain 8.5 acres of land (and preserve the capacity of 961 spaces) for parking at the existing recreational beach as long as suitable land base directly behind the recreational beach remains, but maintain 400 spaces at a minimum over the 15 years.	X			○
2. Maintain 8.5 acres of land for parking (approximately 961 spaces).		X		●
3. Reduce beach parking to 480 spaces (approximately 4.25 acres).			X	○

³ The (s) represents management actions relating to socioeconomic resources.

4.13 Visitor Use and Access

The refuge is a major attraction for outdoor enthusiasts and a popular destination for visitors who participate in a range of activities, including the six wildlife-dependent priority activities (hunting, fishing, environmental education, interpretation, wildlife observation, photography), other recreational uses (e.g., bicycling, horseback riding, and OSV use in support of surf fishing and hunting) and use of the recreational beach. Each alternative evaluated in this document is comprised of a series of management actions. This section addresses the impacts on visitor use and access of the proposed management actions included in each alternative. These management actions broadly include:

- changes in visitor facilities or infrastructure;
- changes in approved public access, wildlife-dependent activities and other visitor uses;
- collaborations and partnerships with local, regional, and state recreation interests; and
- improvements in outreach and USFWS visibility.

This section considers the potential short- and long-term direct and indirect, and cumulative impacts on visitor use and access that could result from the actions above. The impacts include:

- conflicts among users—both actual (e.g., conflicts about safety and access) and perceived (e.g., outreach for one activity may deter the interest of other users);
- changes in visual landscape;
- a more informed public (e.g., about species, their habitats, and their conservation);
- a more supportive public (e.g., of the refuge, the refuge system, and the USFWS).

The discussion of impacts on visitor use and users is organized similar to other sections in this chapter, with some adjustment to reflect the fact that there are multiple uses and the impact of the same management action may be different on the various uses. First is a discussion of the impacts that do not vary by alternative and that generally affect all or most of the visitor uses. These impacts are the result of management actions that are included in all of the alternatives, and most of them are current management practices that that would remain the same for the next 15 years. Next, instead of dealing with all visitor uses by alternative, to make the comparison between alternatives more transparent, the impacts of each alternative are discussed by use and impacts to that use and subsequently to users (e.g. to hunting and hunters). Table 4-6 assesses the impact of management actions on visitor use and access; management actions are referenced by number throughout the text.

In general, there are both beneficial and adverse impacts to all visitor uses that would result from elements that are common to all of the alternatives. In all alternatives, the refuge would promote wildlife-oriented recreational opportunities that are compatible with the purpose for which the refuge was established, and would also maintain a recreational beach and many of the other recreation uses that are currently available at the refuge. The benefits of providing these activities would include helping to meet existing and future demands for outdoor recreation, interpretation, and education in the region. Visitors that are interested in these uses would benefit from high quality opportunities to engage in them. Another action that would likely benefit all users is the proposed implementation of a visitor survey every 5 years, which would allow visitors to share feedback on visitor use activities and to indirectly benefit from that information shaping refuge management over time. In addition, identifying and removing old abandoned structures on the refuge would enhance public safety and views.

Under all alternatives, visitor use and access, in terms of timing and location, would continue to be regulated to protect federally listed species and their habitats, such as the piping plover, tern, and shorebird habitat on Toms Cove Hook. As a result, potential users of this area would be adversely affected by the closures. The main visitor use constraints would occur from the continued closure of Toms Cove Hook and the Overwash area from March 15 through August 31 or thereafter, until the last shorebird fledges for alternative A, and through September 15 for alternative B.

Conversely, management actions to sustain and increase wildlife populations, in coordination with partners, could provide additional opportunities (benefits) for all six of the wildlife-dependent uses.

Coordination with the town of Chincoteague and other local, state, and Federal agencies to address hazard mitigation and resiliency in the face of dynamic coastal processes and climate change under all alternatives would benefit all uses on the refuge. In addition, as a result of these efforts, visitors would have the opportunity to learn about climate change at both local and global levels.

Under all alternatives, visitors would experience continued access to the refuge by bicycle, foot, and private vehicle. Access to several areas of the refuge, including the Woodland Trail, Lighthouse Trail, Herbert H. Bateman Educational and Administrative Center, and Wildlife Loop and associated trails, would be maintained under all alternatives. Access to other areas is addressed elsewhere in this section. Private motor vehicle access to Assateague Island would be maintained and the refuge would work with the town of Chincoteague to allow golf carts on the refuge and public roads, in order to provide a variety of modes of transportation to and in the refuge, thereby enhancing overall access to the refuge. Visitors would benefit directly from having multiple access options (walking, biking, shuttle system, and automobiles) from the pursuit of a well-planned transportation system by the refuge, in partnership with the town of Chincoteague. All visitors would benefit, because even those that still use automobiles would benefit from reduced roadway congestion and more available automobile parking.

Visitors would experience continued communication and outreach, which would have educational benefits and let them be aware of different visitor service restrictions or opportunities; continued access to the Assateague Lighthouse; and continued staffing of visitor programs as well as wildlife and maintenance programs that provide visual, safety, and other benefits to visitors.

4.13.1 Impacts on Hunting and Trapping Opportunities

All of the alternatives would maintain current hunting policies (management actions 41v and 42v) and as a consequence, would allow people to continue to enjoy hunting as a wildlife-related visitor use.

Under alternative A, opportunities for hunting are limited to big-game (white-tailed deer and sika elk) and migratory game bird hunting (waterfowl and rail).

Under alternative B, the expansion of hunting opportunities for new species (see management actions 43v, 44v, and 45v) and opening of additional hunting days (management action 46v) would benefit hunters. The relocation of the recreational beach, closure of the Beach Road causeway, and associated change in the OSV zone (management action 12v, 26v and 34v respectively) would change access to hunting zones. Those hunting zones currently closest to the OSV access point and recreational beach, such as Toms Cove Hook, would be 1.7 miles further away from the new OSV

access point, thus having the adverse impact of requiring hunters to travel longer distances. Conversely, those hunting zones currently further away would have the benefit of being more convenient for hunters to access from the improved Service Road and other facilities.

Under both alternatives B and C, the expansion of hunting areas and hunting for new species (management actions 44v and 45v) and introduction of fur-bearer trapping (management action 48v) would benefit hunters and trappers by providing new and expanded opportunities for these activities.

Under alternative C, the increase in sika hunting to achieve the species' removal (management action 49v) would be a short-term benefit to hunters as it could increase the number of hunters able to experience the hunt, but the eventual elimination of the sika population would mean over the long term, hunters would not be able to hunt sika and there would be fewer hunting permits available, an adverse impact. While OSV use would be discontinued (management action 37v), use of 4x4 vehicles would be permitted to access the Toms Cove Hook area for sika hunting.

If alternative B or C is selected for implementation, a new hunt management plan and other documentation would be developed to reflect changes. The plan would provide additional details, such as exact locations, time periods, and number of permits, and would be assessed through a separate NEPA process.

4.13.2 Impacts on Fishing Opportunities

Under all alternatives, users would continue to enjoy fishing, with the same areas available for surf fishing, crabbing, clamming and oyster harvest on Assateague Island, but with changes in access to those areas. Users would also continue to have restricted access to fishing near Assawoman Island from March 15 through August 31 or thereafter, until the last shorebird fledges for alternative A (management action 32v), and through September 15 for alternative B. For all alternatives, continued pedestrian access north and south of the recreational beach (management actions 21v and 23v) would allow for continued access to surf fishing areas and thus, reduced crowding along the beach.

Under alternative A, visitors would continue to have access to crabbing, clamming and oyster harvest areas; however, some of these areas could suddenly become inaccessible, an adverse impact, if parking/access to the recreational beach is lost due to natural causes (management action 10v).

Under alternative B, OSV use would be limited to those visitors who are engaged in wildlife-dependent recreational activities. This may result in an adverse impact to some users, but visitors that are fishing may benefit from reduced crowding within the OSV zone. With the expansion of the OSV zone (management action 34v), visitors would have access to approximately 2.65 more miles of beach for surf fishing by OSV, a benefit resulting in less crowding. A benefit of the designated year-round OSV parking area for fishing (management action 36v), is that visitors would have more convenient access to surf fishing when other portions of the OSV zone are closed and an extended time period for fishing using OSV access. Visitors would benefit from improved communication and coordination of the permit process throughout the region under this alternative (management action 31v) by saved time, reduced confusion, and raised awareness of rules and opportunities.

Under alternatives B and C, the relocated beach and change in Beach Road causeway access (management actions 12v and 26v, respectively) would result in improved experience for visitors interested in crabbing, clamming and oyster harvest in Swan Cove (F Pool) and Toms Cove. However, under alternative B, a new crabbing dock at the terminus of Beach Road (management action 28v) would create a new facility that would substitute for current inconvenient sites and be more accessible to visitors with disabilities and family groups, resulting in a net benefit from alternative B for this recreational activity. Under alternative C, visitors would not experience this improved amenity.

Under alternative C, OSV use would be discontinued (management action 37v) and there would be an adverse impact to visitors who come to the refuge to surf fish. Visitors who want to surf fish would experience greater inconvenience in taking their gear to surf fishing locations and surf fishing activities would be concentrated at points along the beach closer to the recreational beach so visitors would experience increased crowding. As a result, some visitors would continue to fish and carry gear by foot, some visitors would not choose to walk with gear down the beach, and others would choose not to visit the refuge.

4.13.3 Impacts on Environmental Education and Interpretation Opportunities

Under all alternatives, students able to travel to the refuge would continue to receive programming and experience the refuge. Visitors who stop by the exhibits and kiosks at the USFWS and NPS visitor centers and throughout the refuge would continue to learn about the agencies and the natural environment. The development of bilingual/multi-lingual information would enhance interpretation and environmental education opportunities for non-English speaking public and would also enhance compliance with hunting, fishing and other refuge laws and regulations. This is a benefit to non-English speakers and also to other uses because it would result in reduced violations and enhanced public safety. The replacement of existing exhibits with ones dedicated to climate change would benefit the public in raising awareness of the issue but could also lessen their awareness of other issues that could otherwise be covered in the same area.

Under alternative B, as communication in the “interconnected age” requires new approaches and changes in our communication culture, visitors would have new visual and interpretive experiences both online and on the refuge (management action 56v). Visitors would also benefit from improved organization and increased programming with the addition of an Education Program Specialist on staff (management action 61v). All of these would result in a more informed public and increased stewardship, and for Wallops Island NWR in particular, development of on-site interpretative opportunities with NASA would lead to increased visitation and awareness (management action 54v).

Under alternatives B and C, there are a number of common benefits to visitors involved in environmental education and interpretation. Students and others not able to travel to the refuge would be able to experience and learn about the refuge through the virtual exhibits. Enhanced opportunities would provide for a more informed public and increased stewardship. With the relocation of the recreational beach and change in access (management action 12v), beachgoing visitors would no longer pass by the Herbert H. Bateman Educational and Administrative Center en route to the beach and therefore, may be less inclined to visit, resulting in an adverse impact. However, the new visitor contact station at the recreational beach (management action 22v) would have information on both NPS and USFWS and would result in USFWS information being more directly accessible by beachgoing visitors, which would result in a net benefit to beachgoers.

Despite the relocation of the recreational beach and the closure of Beach Road causeway (management action 26v), visitors would continue to benefit from NPS and Marine Science Consortium canoe/kayak programs, which would have access to Toms Cove at the terminus of Beach Road.

Under alternative C, some beachgoing visitors who previously had not learned about the refuge would benefit from interpretation provided on the beach shuttle.

4.13.4 Impacts on Wildlife Observation and Photography Opportunities

For all alternatives, there are common adverse and beneficial impacts to visitors pursuing wildlife observation and photography due to resource management and continuation of other uses. Measures that are proposed to manage habitats could have short-term adverse impacts and long-term benefits to wildlife observation and photography. For example, visitors may be exposed to visual impacts of the removal of invasive species. These activities may be perceived as disturbing the natural character of the landscape and could temporarily decrease wildlife observation and photography opportunities. However, these vegetation management activities would be limited and temporary, and would result in long-term aesthetic and habitat benefits as native species replace the invasive species. The long-term result would be enhanced diversity and abundance of species that would be available for wildlife observation and photography, and could also result in enhanced opportunities for interpretation and education.

Under all alternatives, the continued allowance of hunting (management actions 41v) on the refuge would have adverse impacts on other users, including those pursuing wildlife observation and photography, by causing some noise and resulting in temporary access restrictions to certain areas, such as the Woodland Trail, on specific days while hunting is taking place. However, hunting also helps keep wildlife populations at healthy levels, which results in better opportunities for viewing of a variety of wildlife, a benefit to wildlife observers and photographers. For all alternatives, the continued parking access to the beach (management actions 8v, 9v, 11v) and continued pedestrian access north and south of the recreational beach (management action 21v and 23v) would be a benefit to wildlife observers and photographers by allowing continued access for wildlife observation and photography along the full length of the beach. The removal of Swan Cove Trail (management action 18v) would be an adverse impact, as it would reduce access to wildlife observation and photography opportunities along the trail and at the beach area that the trail accesses which currently provides a more remote, isolated experience.

Under alternative A, the limited level of hunting (management action 41v) would allow visitors to continue to enjoy wildlife observation and photography with minor noise and visual disturbance. Continued vehicular parking and access to the beach (management action 10v), while available, would facilitate visitors having convenient access to observe shorebirds and other coastal wildlife and for beach-related photography opportunities, including a vista with water on both sides. When the parking is reduced by natural processes, there would be a short-term disruption and then increased inconvenience in access to these opportunities (management action 10v and 13v). Under alternative A, visitors would continue to be able to access the Service Road by foot (management action 25v), thus providing for wildlife observation and photography opportunities to the north, including viewing of the northern pony herd.

Under alternative B, the replacement of Swan Cove Trail with an alternative trail to the relocated recreational beach (management action 20v) would provide visitors with a benefit in the form of

access to a new area for wildlife observation and photography and continue to facilitate such access to the beach. The expansion of hunting opportunities for new species (management action 43v, 44v, and 45v) and opening of additional hunting days (management action 46v) would mean that other visitors would be more likely to see or hear signs of hunting from adjacent areas, which could adversely affect their wildlife observation and photography. However, this impact would be minimized because hunting would occur during off-peak visitation times. Hunting of new species (management action 43v and 44v) would reduce the number of those species that visitors could see; however, these species are being identified because of their overabundance and impacts on other species. Thus, in the long term, increased hunting could enhance the opportunity for wildlife observation and photography. Under alternative B, a benefit of the new observation tower at or in the vicinity of Wallops Island NWR (management action 55v) is that it would provide new photography/wildlife observation opportunities in a new location, which would reduce crowding elsewhere and increase awareness of the refuge. Other improvements, such as the pursuit of photography blinds, could attract more visitors, which would increase crowding and disturbance, but would also provide new experiences for existing visitors and bring new visitors to the refuge.

Under alternative B and C, the relocation of the beach (management action 12v) and closure of beach causeway (management action 26v) would be an adverse impact because it would reduce opportunities for wildlife observation and photography in Swan Cove (F Pool), Toms Cove, and the southern end of the island, as parking and foot access to these sites would be more difficult and inconvenient. The relocated recreational beach would change the beach viewshed such that water would not be visible on both sides; however, the viewshed at the relocated recreational beach would also have reduced views of parking. A benefit is that the new wildlife viewing tower at the terminus of Beach Road (management action 27v) would provide a new opportunity for wildlife observation and photography and alternative access to viewing Toms Cove.

The relocated recreational beach would make it inconvenient to drive by the viewing area for the Chincoteague ponies; however, the planned relocation of some of the ponies would ensure continued convenient visual access, mitigating this impact. Relocation of the beach would change the use of part of the Wildlife Loop such that there may be increased disturbance to wildlife that would reduce wildlife observation and photography opportunities along the Loop; however, the stretch of road to be used is already well shielded and separate from most of the Loop habitat; lessening this impact. Closure of the Service Road north of the recreational beach to public access (management action 25v) would reduce opportunities to view the northern pony herd and access to that landscape for photography; however, alternative pony viewing opportunities would be pursued and some of the previous area would still be accessible as the recreational beach would be further north, thus minimizing this impact.

Under alternative C, there would be an increase in noise and visual disturbance from increased sika hunting (management action 49v), and as this species is removed, sika would no longer be available to observe and photograph. Expanded hunting and trapping opportunities (management actions 43v, 47v, 48v) under alternative C would result in increased noise and visible signs of hunting, disturbing users engaged in wildlife observation and photography and disturbing wildlife. In general, while the increase in hunting could adversely affect wildlife observers and photographers, because the hunts would take place mostly outside of the primary visitor use areas, the impact would be minimized. The limit on Chincoteague pony population to 125 (management action 52v) could reduce viewing opportunities; however, the current population is between 125 and 135 so no significant impact would be anticipated. Views of parking from the

recreational beach would be reduced due to the reduction in parking (management action 11v), which would be a benefit.

4.13.5 Impacts on Recreational Beach Use Experience

Under all of the alternatives, beachgoing visitors would continue to benefit from access to a 1-mile recreational beach with at least 480 adjacent parking spaces (there are currently 961 parking spaces).

Under alternative A, the recreational beach would remain in its current location and as a result, visitors would continue to enjoy beach activities, view of water on both sides of the beach, access to both ocean-side and bayside beaches, nearby clamming, crabbing and oyster harvest areas, and beach access within approximately 100 feet of parked vehicles. However, beach parking would only be maintained at the existing 961 spaces as long as the land base allows (management action 10v). Under alternative A, beachgoers would benefit from the new Beach Road bicycle connection to the recreational beach (management action 19v), which would provide a safer option than riding on the shoulder and could result in lower demand on beach parking.

As described elsewhere, NPS and USFWS expect that natural forces (wind, tidal flooding, strong coastal storms and sea level rise) will result in the partial or full loss of the existing beach parking lots over the next 15 years. These factors will combine to reduce the capacity of the land base to support 961 spaces of parking. This probability is supported by USGS in its vulnerability modeling. Additionally, the likelihood of the NPS continuing to obtain funding to rebuild the lots in the same location is uncertain.

The reduction in parking would have a significant adverse impact on beachgoers. It is possible that the land base would be able to continue to sustain the current parking areas; if not, the NPS has determined that they may be able to maintain a core parking area of 400 parking spaces between two significant overwash areas, over the next 15 years. NPS and USFWS realize that 400 parking spaces would not meet the current level of visitation to the recreational beach during peak season. Under this alternative, the parking reduction would mimic the loss of the land base, which is dependent on natural forces and other uncertainties as described above.

In addition to losing the parking areas under this approach there would not be infrastructure in place to start a shuttle system immediately, the shuttle implemented may not meet all visitor requirements, and the request for funds may be less competitive because other facilities are experiencing similar impacts. All of this could result in a significant adverse impact until such time that the shuttle system could meet all visitor requirements.

Based on visitation data, USFWS made a number of assumptions to calculate that if the number of parking spaces is reduced to 400, an estimated 67 to 83 percent of summer visitors (Memorial Day weekend through Labor Day weekend; 57 percent of total visitation) could eventually not have access to parking under alternative A (see Appendix M). In the short term, these visitors could be adversely affected in a significant manner by the insufficient transit services until adequate services are provided.

Under alternatives A and C, the introduction of a shuttle (management actions 14v and 16v) would have both adverse and beneficial impacts. NPS and USFWS realize that some visitors may be reluctant to use transit. Visitors dependent on transit would experience some adverse effects.

They would lose some beach time in using the shuttle and would be inconvenienced if bringing a lot of recreational beach gear. Visitors would not have the same level of flexibility in coming and going from the recreational beach. Visitors accessing the beach by shuttle would experience delays and risk exposure if everyone left at the same time due to a storm; however, the refuge and NPS would provide shelters and develop an evacuation plan. A benefit of the shuttle is that some visitors would gain time at the beach from not having to wait in traffic or wait for a parking space at the beach. The shuttle would also increase the number of visitors who could access the recreational beach, which would mean new beachgoing experiences but also potential overcrowding of the recreational beach.

Under alternative B, beachgoers would benefit from the ongoing provision of the same number of parking spots as there are currently at the existing beach without disruption. However, they would also experience the adverse impacts of traffic and waiting for parking as they currently do.

Beachgoers would benefit from the new bicycle connection to the recreational beach (management action 20v), which would provide a safer transportation option and could result in lower demand on beach parking.

Under alternatives B and C, the relocation of the beach (management action 12v) would have significant adverse impacts, as well as some beneficial impacts, on beachgoing visitors. Beachgoers would be able to continue the same type and level of beach activities on the ocean-side. Visitors would not have access to the bayside and thus would not be able to pursue bayside activities, such as clamming, crabbing, and swimming with young children. Due to the reduced points of access to the beach, visitors would experience the adverse impact of more crowding at access points, as some people would not want to carry recreational beach gear further up or down the beach. Visitors would experience increased exposure to mosquitoes in the relocated parking areas; however, the refuge would take measures to reduce the mosquito population, avoiding or minimizing this impact to the extent possible. Under both alternatives, the facilities would be constructed such that visitors would have continuous access to the refuge and recreational beach throughout the transition from the current to the new location of the recreational beach, and would receive communication on the timeline for relocation, reducing any significant disruption in visitor use.

Under alternatives B and C, the closure of Beach Road causeway (management action 26v) would eliminate access to the current recreation beach and its particular characteristics, such as water on both sides and easy access to clamming, crabbing, oyster harvest and other bayside activities.

Under alternative C, the reduction in beach parking (management action 11v) and introduction of a shuttle (management action 16v) would have significant adverse impacts on beach going visitors. Some beachgoers would choose not to visit and instead go elsewhere. Based on visitation data, USFWS made a number of assumptions to calculate that if the number of parking spaces is reduced to 480, an estimated 60 to 79 percent of summer visitors (Memorial Day weekend through Labor Day weekend; 57 percent of total visitation) would eventually not have access to parking under alternative C (see Appendix M). However, visitors would be able to access the beach by shuttle, which would accommodate some visitors but may discourage others.

4.13.6 Impacts on Other Uses

Under all alternatives, similar to impacts on wildlife observation and photography, the continued allowance of hunting (management actions 41v and 42v) on the refuge would have adverse impacts on other bicyclists, walkers and other users by causing some noise and resulting in temporary restrictions to access to certain areas during the hunting season, such as the Woodland Trail, on specific days while hunting is taking place. The removal of Swan Cove Trail (management action 18v) would be an adverse impact that reduces access to an area that provides a more remote, isolated experience away from the recreational beach.

Under alternative A, the replacement of Swan Cove Trail with a bicycle trail along Beach Road to the recreational beach (management action 19v) would provide a beneficial impact. It would provide safer access that would reduce safety incidents, and increase the likelihood that visitors, in particular those with families, would access the recreational beach by bicycle. This could result in fewer demands on beach parking, thus increasing the capacity for visitors. However, this trail would be dependent on the extent of erosion that Beach Road may experience. Additionally, visitors would continue to have non-motorized boat access at the current beach, horseback riding in the existing OSV zone, and bicycle access on the Wildlife Loop and existing trails.

Under alternative B, the expansion in the OSV zone (management action 34v) and consequently the horseback riding zone (management action 38v) would result in an expanded riding area for horseback riders but may also attract more use. The relocation of the recreational beach (management action 12v) and closure of the Beach Road causeway (management action 26v) would result in reduced access to Toms Cove for non-motorized boats; however, this would be offset because refuge would develop a launch point at terminus of Beach Road (management action 28v). In addition, relocation of the recreational beach would benefit bicyclists' access and beach access via bicycle, with introduction of new on-road bicycle lanes and trail that would provide improved, safer, and more direct access and could result in an increase in overall beach visitation, and reduced beach parking demand. However, this may be offset by more visitors choosing to bike to the beach, resulting in more crowded bicycle trails.

Under alternatives B (management actions 43-48v) and C (management actions 43v, 47v, 48v), the increase in hunters due to new hunting opportunities could result in increased violations and safety concerns for other visitors. However, the use by hunters occurs during the off-season for the majority of visitation and, the increase in hunter education and the introduction of bilingual hunting regulations would help mitigate such violations and concerns. Relocation of the beach (management action 12v) would change the use of part of the Wildlife Loop such that Loop non-motorized traffic would need an alternative or to share the right of way with beach traffic. This could result in adverse impacts in the form of increased crowding, discomfort, and safety incidents.

Under alternative C, there would be adverse impacts to users who horseback ride, which would be discontinued (management action 40v), or who smoke, which would be banned on the beach. The relocation of the beach and lack of access at the terminus at Beach Road would result in reduced access to Toms Cove.

Table 4-6 Beneficial and Adverse Impacts on Visitor Uses by Management Action

● = benefits only; ○ = adverse impact only; ◐ = adverse impacts and benefits

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
1. Complete a habitat management plan and continue to manage habitats and management structures.	X	X	X	◐	◐	◐	◐	◐	◐
2. Provide protective conservation measures for federally listed species and their habitats.	X	X	X	◐	◐	◐	◐	◐	◐
3. Work with partners toward regional conservation to protect estuarine, coastal, and marine habitats and substantial populations of migratory and breeding shorebirds, colonial waterbirds, landbirds, and raptors.	X	X	X	●	●	●	●		
4. Work with the town of Chincoteague and other local, state, and Federal agencies to address hazard mitigation and sustain the resiliency of this unique barrier island system in the face of dynamic coastal processes and climate change.	X	X	X	●	●	●	●	●	●
5. Maintain personal motor vehicle access to Assateague Island and work with the town of Chincoteague to allow golf carts and allow a variety of modes of transportation to and in the refuge.	X	X	X				●	●	●
6. Include the development of bilingual/ multilingual information for regulations and environmental education.	X	X	X	●	●	●	●		●
7. Incorporate universal access and Americans with Disabilities Act standards into all new facilities.	X	X	X	●	●	●	●	●	
8. Continue to allow NPS to manage a 1-mile recreational beach.	X	X	X				●	●	
9. Maintain 8.5 acres of land for parking.		X					●	●	
10. Continue to allow NPS to maintain 8.5 acres of land (and preserve the capacity of 961 spaces) for parking at the existing recreational beach as long as suitable land base directly behind the recreational beach remains.	X						●	◐	

⁴ The (v) represents management actions relating to visitor use resources.

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
11. Reduce beach parking to 480 spaces (approximately 4.25 acres).			X				●	○	
12. Relocate recreational beach, beach parking, and associated facilities approximately 1.5 miles north of current area.		X	X	●	●	●	●	●	●
13. Continue to coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area for future use once existing beach parking is lost due to lack of suitable land base behind the recreational beach.	X							●	
14. In being consistent with the 1993 Master Plan, as storms and other natural forces eliminate parking spaces adjacent to the beach, implement an alternate means of transportation such as a shuttle system.	X							●	
15. Work with the town of Chincoteague to develop a response plan for beach access during periods when existing beach parking is unavailable due to storm events, and during peak periods when existing beach parking is inadequate to meet demand. The response plan would include designated parking areas which may be on or off-refuge, and would include alternative means of transportation from the parking areas to the beach.	X	X	X					●	
16. Coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area, as close to the beach as possible, and facilitate a shuttle service from off-site parking to recreational beach for use during specific times of the year when parking capacity exceeded (anticipated to be every weekend in May and September and every day from Memorial Day weekend through Labor Day weekend).			X					●	
17. Work with NPS to install shelters for transit users, bicyclists, and walkers.	X	X	X					●	
18. Remove Swan Cove Trail.	X	X	X	●				○	○
19. Continue pursuit of bicycle trail development via Beach Road to recreational beach to replace Swan Cove Trail.	X							●	●
20. Replace Swan Cove Trail with an alternative bicycle trail from Wildlife Loop north to the south end of the relocated recreational beach, near the OSV zone entrance.		X		●			●	●	●
21. Allow pedestrian access in intertidal zone access north of recreational beach.	X	X	X		●		●		

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
22. Develop joint NPS and USFWS Visitor Contact Station near the new recreational beach.		X	X			•	•		
23. Allow pedestrian access south of recreational beach outside of breeding season, between approximately September 16 and March 14.	X	X	X		•		•		
24. Maintain current public access by foot to the Service Road.	X						•		
25. Close Service Road to all public access north of relocated parking except by special use permit or refuge event.		X	X				○		
26. Close Beach Road causeway to all public access.		X	X		○		○	○	○
27. At new road terminus, build a vehicle turn around.		X	X				•		
28. At new road terminus, build a wildlife viewing tower, crabbing dock, and new launching area for small non-motorized vessels.		X			•				•
29. Allow canoe/kayak access from road terminus for environmental education and interpretation programs by NPS and the Marine Science Consortium.		X	X			•			
30. Maintain current access and closures for OSV.	X				•				
31. Improve signage, promotion, and coordination concerned barrier islands access and permitted activities throughout the refuge and Virginia's Eastern Shore.		X			•		•		
32. Close Assawoman Island to fishing during breeding season from March 15 until September 15 or thereafter until the last shorebird fledges.	X	X	X		○				
33. Allow OSV for priority uses, like wildlife observation, fishing and to access hunting zones, and restrict nighttime OSV use during September and October, when OSV zone is open but sea turtle nesting season (June through October) is still ongoing.		X		•	•				
34. Expand the OSV zone from the new recreational beach to Toms Cove.		X		•	•		•		•
35. Keep the OSV zone open from approximately September 16 to March 14 and close the OSV zone to public access March 15 through September 15 or thereafter, until the last shorebird fledges.		X			•		•		
36. Develop a designated, year-round area for fishing from south of the recreational beach to the point of closure that would include OSV parking.		X			•				
37. Discontinue OSV use.			X		○		•		

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
38. Allow horseback riding in OSV zone.	X	X		○			●		●
39. Designate separate parking for horse-trailer parking.		X						●	●
40. Discontinue horseback riding.			X	●			●		○
41. Maintain current hunting policy of big game and migratory bird on Chincoteague NWR.	X	X	X	●			●		○
42. Maintain current hunting policy of big game on Wallops Island NWR.	X	X	X	●					
43. Introduce non-migratory Canada goose and light goose hunting within Assateague Island impoundments.		X	X	●			●		
44. Add mourning dove hunting in areas outside of Assateague Island.		X		●			●		
45. Add turkey to big game for youth hunting.		X		●			●		
46. Open refuge for migratory bird hunting on Federal holidays in designated areas of the refuge within Wildcat Marsh, Morris Island, Assawoman Island and Metompkin Island divisions, that occur outside of the current hunting days of Thursday, Friday, and Saturday.		X		●			●		
47. Pursue opening for fox and raccoon hunting on Assateague Island.		X	X	●			●		
48. Pursue opportunity for fur-bearer trapping on Assateague Island.		X	X	●			●		
49. Work to eliminate sika and non-migratory Canada goose populations.			X	●			●		
50. Continue to allow current Chincoteague pony population of up to 150.	X	X					●		
51. Implement revised Chincoteague pony management plan.	X	X	X				●		
52. Within 15 years, phase in requirement for Chincoteague pony population to consist of no more than 125.			X				●		
53. Continue to protect the wilderness character of the proposed wilderness area.	X	X	X						
54. Work with NASA to develop a boardwalk, observation tower, and kiosk from the NASA Visitor Center to an area at or near Wallops Island NWR.		X				●	●		

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
55. Maintain the restored Assateague Lighthouse and continue to allow the Chincoteague Natural History Association (CNHA) and refuge volunteers to conduct tours of the Assateague Lighthouse.	X	X	X			•	•		
56. Restore the light keeper's house and historic landscaping at Assateague Lighthouse. Develop new cultural resource and interpretation amenities, including a virtual tour of the lighthouse and museum property. The refuge would allow access to the cemetery near Beach Road and develop tours and controlled access opportunities for Assateague Village.		X				•			
57. Continue public outreach activities (Web site, press releases, radio outreach, Community Leaders meetings, etc.), including implementation of fiber optics capacity and Intelligent Traffic System and the pursuit of mobile trailer for outreach/education and acquire by 2015.	X	X	X	•	•	•	•	•	•
58. Develop new outreach strategies, including technology-based outreach, and develop a communication plan and emergency infrastructure for the relocated recreational beach.		X	X	•	•	•	•	•	•
59. Maintain 23 full-time positions and 10 to 20 part-time, student, or contractor positions.	X	X	X	•	•	•	•	•	•
60. Add 8 full-time staff positions.		X	X	•	•	•	•	•	•
61. Add Education Program Specialist.		X				•			

4.14 Cultural and Historic Resources

Chapter 3, Affected Environment, discusses the status and location of cultural and historic resources on the refuge. This section provides the results of the evaluation of the management actions each alternative proposes for impacts on these resources, although nearly all known impacts would not vary by alternative.

An impact to cultural resources would be considered significant if it adversely affects a resource listed in or eligible for listing in the National Register of Historic Places. In general, an adverse effect may occur if a cultural resource would be physically damaged or altered, isolated from the context considered significant, or affected by project elements that would be out of character with the significant property or its setting. Title 36 CFR Part 800.5(2) provides the following examples of adverse effects on historic properties:

- Physical destruction, damage, or alteration of all or part of the property;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;
- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contributes to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

Refuge lands are protected from development or destructive land uses that may result in substantial impacts on cultural and historic resources. Regardless of which alternative we select, we would protect known cultural and historic resources. USFWS has a regular process for ensuring protection of archaeological sites and historic structures from activities. The process includes review of projects by professional archaeologists in the USFWS Regional Office and consultation with the Virginia Department of Historic Resources (the Virginia State Historic Preservation Office, SHPO). Project leaders submit descriptions of their proposed projects, maps, and plans to the Regional Historic Preservation Officer (RHPO), who determines what is needed to identify archaeological sites in the project area and helps the refuge avoid sites when called for. Rarely, the USFWS will mitigate an unavoidable impact to a site, in consultation with the SHPO and interested parties. Any future ground disturbing activities would go through this process. Activities such as shoreline modification, development of infrastructure for roads or parking, and wetland restoration will require RHPO review and SHPO consultation under this process.

4.14.1 Impacts on Cultural and Historic Resources in Alternatives A, B, and C

We expect that our routine process for compliance with the NHPA (review of projects by the RHPO, identification of as yet unknown sites, consultation with SHPOs, Tribes, and other interested parties, archaeological site avoidance at the planning stage, and mitigation of any impacts that are unavoidable) will address any unanticipated potential impacts of implementation

of the CCP on cultural resources. We foresee no particular cumulative impacts to archaeological sites from the implementation of the plan. We will continue to protect the refuge's archaeological sites from our activities through our routine compliance process including RHPO review, site location surveys or evaluations, redesign of projects to avoid sites, consultation with SHPO, and mitigation of impacts when necessary. Current management adheres to guidelines set forth in previous coordination with SHPO. Under alternative A, continuing those current management practices will not result in any new or significant adverse impacts to cultural and historic resources.

In regard to the potential development in alternatives B and C, a refuge volunteer, under the guidance of refuge staff, compared findings in the report, "Archaeological Reconnaissance of the Chincoteague National Wildlife Refuge, Accomack County, Virginia and Worcester County, Maryland" (Goodwin & Associates, Inc. 1989) with the potential development in alternatives B and C. Intended as a "fatal flaw" test, the volunteer prepared a brief summary memo concluding that nothing in the Goodwin report indicated we would be impacting cultural resources based on the previous findings. Since the proposed actions associated with the relocated beach parking and road expansion are conceptual and not finalized, specific details for these actions are currently unknown. Further environmental assessments and analysis for impacts on cultural resources would need to be completed prior to construction.

4.15 Refuge Administration

Refuge administration consists of staffing, fee administration, communications, and facility management, among other functions. This section evaluates the following management actions for their potential beneficial or adverse impacts on refuge administration:

- changes in staffing;
- increased coordination or other administration requirements; and
- changes in visitor use activities that would require increased or decreased administration and law enforcement.

This section considered the following potential short- and long-term direct, indirect, and cumulative impacts on refuge administration that could result from the actions above:

- conflicts among resources (staff, time, funding);
- ability to meet requirements and administer the elements under each alternative; and
- ability to meet short-term and long-term agency goals and objectives, such as environmental education and fiscally responsible and environmental sustainability.

Having well-maintained visitor facilities is important for encouraging and welcoming visitors to Federal lands. It reflects on USFWS's responsibility to spend taxpayer dollars effectively and efficiently. It is also important to protect public safety and refuge resources, both of which can be directly impacted or compromised when facilities deteriorate. In addition, the refuge is committed to incorporating universal access and Americans with Disabilities Act standards into all new facilities.

Regional conservation, economic, and resiliency/hazard mitigation efforts would require refuge staff to coordinate with other Federal, State, regional, and local agencies but may also provide access to additional funding or in-kind support.

4.15.1 Impacts on Refuge Administration in Alternative A

Under alternative A, the existing level of staffing and volunteer support would likely be sufficient for the refuge to meet most of its major commitments. However, lack of designated staffing for Wallops Island NWR could result in competing demands on Chincoteague NWR staff time, in particular for biology, which may limit the ability of staff to fulfill future strategies.

4.15.2 Impacts on Refuge Administration in Alternative B

Under alternative B, new activities and programs would result in staffing needs and infrastructure investment. The focus on use of social media/technology would require new technical knowledge and some infrastructure investments (i.e., fiber optics). The expansion of hunting and trapping opportunities would require a follow-up hunt management plan, with a short-term impact on staff time. Subsequent increase in hunting permits and need for new materials and maps would require additional staff and funding to administer permits, patrol hunting zones, and provide orientation for new hunters. This would be a long-term impact, as such administration is year-round. The relocation of the recreational beach and related facilities would require staff to develop a transition and communication plan, as well as participate in design, further environmental assessment, and other planning efforts. New staffing would better address Wallops Island NWR needs and the needs created by strategies for resource management (biology), visitor services, maintenance, law enforcement, and coordination with NASA.

4.15.3 Impacts on Refuge Administration in Alternative C

Under alternative C, new activities would require staff time while the removal of some activities would lessen the administrative burden. Similar to alternative B, the expansion of hunting and trapping opportunities and the relocation of the recreational beach would have long and short term administrative impacts. The removal of the OSV and horseback riding zone would reduce the administrative and enforcement burden on NPS and refuge staff. Such staff would then be able to devote more time to other resource management needs. New staffing would better address Wallops Island NWR needs and the needs created by strategies for resource management (biology), visitor services, maintenance, law enforcement, and coordination with NASA.

4.16 Cumulative Impacts

CEQ defines cumulative effect as the “impact on the environment which results from the incremental impact of the action(s) when added to other past, present and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7). The purpose of cumulative effects analysis (CEA) is to determine if, when they are added together, the adverse impacts would be significant. Therefore, cumulative effects can result from individually minor but cumulatively significant adverse effects.

As noted elsewhere in this CCP/EIS, there are management actions proposed by the alternatives for which the details are not available at this time, and will therefore be addressed in a separate NEPA analysis, including relocation of the recreational beach (alternatives B and C) and relocation of parking at an offsite location (alternatives A and C). The potential cumulative impacts of these actions are addressed conceptually in this section.

4.16.1 Resources Evaluated

CEQ’s guidance on CEA says that “Determining thresholds beyond which cumulative effects significantly degrade a resource, ecosystem and human community is often problematic. Without a definitive threshold, the NEPA practitioner should compare the cumulative effect with

appropriate national, state or community goals to determine if the total effect is significant” (CEQ 1997). Following the guidance, the scope of the CEA should be related to the magnitude of the environmental effects of the proposed actions only for those resource areas upon which the proposed actions, when combined with other actions, may be significant. For this CEA, the following resources areas are evaluated:

- air quality;
- hydrology/water quality;
- vegetation, wildlife, and habitat;
- birds;
- threatened and endangered species;
- socioeconomics; and
- soils.

4.16.2 Actions Included

CEA is framed by geographic and temporal (time) boundaries based on the magnitude and the nature of the proposed action, with boundaries for actions that constitute major changes in management of the refuge or that result in many significant impacts compared to other actions.

The geographic boundary for CEA in this CCP/EIS includes the Southern Delmarva Peninsula (in particular Accomack County) and all coastal NWRs in the area of the Chesapeake Bay and Delmarva Peninsula. Although our analysis is done resource by resource, we have chosen a large geographic boundary to include all possible cumulative effects, including possible additive effects of strategies within this CCP on others’ actions. The other NWRs are included because past and future management actions and resources at these refuges could be similar to the actions proposed in this CCP. These include the Eastern Shore of Virginia/Fisherman Island NWRs, Eastern Neck NWR, Back Bay NWR, Prime Hook NWR, Bombay Hook NWR, and the Chesapeake Marshlands NWR Complex (NWRC), which includes Blackwater, Martin, and Susquehanna NWRs. The total land area of these refuges, including Chincoteague and Wallops Island NWRs, is approximately 87,500 acres. For these other refuges, this CEA includes only the adverse effects of each refuge CCP’s selected alternative. Bombay Hook is in the process of developing its CCP/EA and therefore, no information impact information is available to include in this analysis.

Temporal boundaries are often more challenging to define than geographic boundaries. The period from the last refuge master plan through the 15-year CCP planning period (1993 to 2028) is a logical study period for this CEA. However, the availability of data often determines how far back past effects are examined. Because data on past conditions are usually scarce, the analysis of past effects is usually qualitative. Identifying the effects of fairly recent past actions and actions presently underway is easier than identifying past or future actions, but is by no means simple (CEQ 1997). Identifying future actions requires determining what is reasonably foreseeable, rather than what is speculative and requires using the best available information, which generally results in an analysis that is both quantitative and qualitative.

The 1997 CEQ guidance states that identifying future actions requires investigating the planning documents of other agencies. Accordingly, the following sources were consulted in this CEA: the 1992 Chincoteague NWR Master Plan EIS; CCPs/EAs covering the NWRs in the CEA study area; the Town of Chincoteague (2010) and Accomack County (2008) comprehensive plans; the 2005 Wildlife Action Plan (2005), the Virginia Outdoors Plan (2007); Federal and state data on

economic activity and labor force data; other relevant documents on the Delmarva Peninsula; and 15 NEPA documents completed between 1997 and 2013 for actions on the Wallops Flight Facility (WFF) site and one on the Assateague Island National Seashore (Seashore), which are major Federal land facilities that abut the refuge.

4.16.3 Results of Cumulative Effects Analysis

Because information on past actions is limited, this section provides background on the CEA study area to frame the analysis. It contains a summary of data available from the sources listed above as an overview of the CEA study area to supplement information provided in chapter 3.

At some point in the past, much of the CEA study area was undeveloped. Due to its isolated location, the Delmarva Peninsula developed more slowly than the rest of the eastern seaboard, but human habitation changed the natural state of the CEA study area as it was subsequently settled. While Accomack County is the largest in total area in the Commonwealth of Virginia, nearly 65 percent of the area is water and the population is 0.4 percent of the Commonwealth's population (U.S. Census 2010). The WFF facility was initially developed by the U.S. Navy in the 1930s, followed by the establishment of the refuge in 1943 and the Seashore in 1965. Over 47,000 acres (about 5 percent) of Accomack County remain in conservation and some of the remaining land is undevelopable as wetlands or marsh (Accomack County 2008).

While the particular impacts of the area's early development and the early management actions at the refuge are not documented, the existing conditions documented in the various state and local plans consulted provide an overview of the cumulative effects of past actions, just as chapter 3 of the CCP/EIS represents the cumulative effects of past actions on the refuge. Population in the county grew at an average rate of approximately 10 percent each decade between 1930 and 1990, and then grew just one percent between 1990 and 2000 (Accomack County 2008). Consistent with the national economy and its position as a tourist economy, Accomack County lost 13 percent of its population between 2000 and 2010 (Virginia Employment Commission 2013), reflecting the tendency of tourist economies to experience greater swings when the national economy changes. There are few large employers in the County; only 5 percent of them employ more than 50 people and 58 percent of all employers have less than five employees (Virginia Employment Commission 2013). As a result, we were unable to identify proposed actions for inclusion the CEA other than those in the other refuge CCPs and Federal agency NEPA documents. The Town of Chincoteague's Comprehensive Plan (2010) identifies some economic development opportunities; however, these opportunities are not sufficiently developed or detailed to determine the adverse environmental impacts for this CEA.

Past and future actions by relevant Federal agencies are less speculative because they are described in detail in long-term planning documents. With regard to past actions on the refuge, according to the EIS on the 1993 Master Plan, construction of the Herbert H. Bateman Educational and Administrative Center, and the associated access road and parking lot, resulted in loss of habitat, especially pine forest. The Center and its related uses also introduced more signs of human presence in the refuge landscape, and along with the new bicycle trail, reduced pervious surface thereby increasing storm water runoff. However, stormwater runoff percolates through the sandy soil and is captured in the freshwater lens. Other impacts of the facilities were largely mitigated by the removal of the existing visitor contact station site and old administrative area, which were allowed to succeed to native habitat.

Each of the nearby NWRs developed a CCP in the past several years and the impacts of each of the management actions in those CCPs have been evaluated in detail in an EA, as shown in the sources notes to Table 4-7. Some of the actions have been implemented and others are programmed to occur in the next several years. In accordance with the mission of the Refuge System, most of the management actions undertaken and proposed at NWRs result in benefits, rather than adverse impacts, to natural resources and wildlife-dependent uses. However, some of the actions result in minor unintended adverse effects that can be mitigated. These are listed in Table 4-7 and considered in this CEA. Table 4-7 also includes the effects of past and proposed actions at the WFF and the Assateague Island National Seashore. Information on future actions is limited, however, because both NPS and NASA are in the process of updating their long-term plans: NPS is in the process of preparing a new General Management Plan (GMP) and EIS for the Seashore. A site-wide Programmatic EIS for expanding operations at Wallops Flight Facility is currently being developed.

Air Quality

Air quality is addressed here as it is an issue typically evaluated on a regional basis. All of the refuges would undertake prescribed burning on a periodic basis, and most of them expect to experience at least a minor increase in visitation as a result of improved facilities. Several planned construction projects at WFF would generate dust and emissions. In a 2003 Final EA for rocket operations at WFF (NASA 2003), air quality impacts were assessed cumulatively with other projects and operations in the surrounding area. Although increased rocket operations would increase the amount of hazardous constituents and emissions, the overall impact to air quality would be negligible and the cumulative impact would not be significant to the surrounding environment when combined with other projects and operations. More recently, a 2012 Draft EIS for WFF (NASA 2012) analyzed rocket operations and its cumulative impacts towards air quality and climate change. The impacts to the global atmosphere from emissions of greenhouse gases related to the project would be global, negligible, and long-term; and when combined with the existing air quality impacts in the surrounding area, little air pollution concentration change was expected, with levels expected to continue below ambient standards. However, all of these impacts are considered negligible and therefore, the cumulative impact is expected to be negligible.

Hydrology/Water Quality

At Chincoteague NWR, potentially significant effects to uplands and wetlands would result from the construction of a new recreational beach parking lot and expansion of the service road under alternatives B (approximately 27 acres) and C (approximately 22 acres), including clearing, site preparations, and earth moving. This action would also potentially disturb Mallard and Pintail Pools (C and D Pools). These activities could cause erosion, runoff, and a potential temporary decline in surface and shallow groundwater quality until development is completed. However, the proposed action (relocated beach parking and road expansion) is conceptual and further environmental evaluations would be completed prior to construction. All other activities are relatively minor with negligible impacts and therefore, the cumulative impact that we can evaluate at this time would not be significant.

Vegetation, Wildlife, and Habitat

The other refuges considered seem to experience different and fewer impacts to vegetation, habitat, and wildlife than Chincoteague NWR does, probably because Chincoteague NWR is one of the most intensely visited refuges in the nation. The other refuge EAs are concerned primarily with the impacts to wildlife from hunting and human interaction and with specific actions that

require vegetation clearing. Minor adverse effects to vegetation and wildlife as a result of human contact and trampling from various public activities are reported at the refuge under all alternatives, as well as at Eastern Shore of Virginia/Fisherman Island NWRs and the Chesapeake Marshlands NWRC. Although this is a cumulative effect, in all cases it is temporary and partially mitigated for by education and management activities. Both Chincoteague NWR and Prime Hook NWR experience impacts from overgrazing of certain overpopulated wildlife species (e.g. light geese); this will be mitigated through hunting. As shown in Table 4-7, actions on all of the refuges, at the Seashore, and on the WFF have identified vegetation clearing projects. At WFF most of the effect of a very large vegetation clearing project will be mitigated by replanting with lower-growing vegetation. The estimated total effect of these actions (excluding the mitigated areas at WFF), and the clearing associated with the beach parking and access for alternatives B and C at Chincoteague NWR, is approximately 27 acres. This is less than 0.01 percent of the total area of these sites and most of the impacts would be mitigated. Selective cutting of forest vegetation through silviculture practices at both Chincoteague NWR and Prime Hook NWR would have temporary adverse impacts, but beneficial long term impacts to vegetation and wildlife habitat. The spraying of herbicides and pest control chemicals could result in cumulative effects to invertebrates at Chincoteague NWR and Prime Hook NWR.

Birds

Minor adverse effects to shorebirds as a result of human contact from hunting, fishing, hiking, and walking are reported at the refuge under all alternatives, as well as at Eastern Shore of Virginia/Fisherman Island NWRs and the Chesapeake Marshlands NWRC. At Eastern Shore of Virginia NWR, additional human contact would increase over the existing condition by adding canoeing and kayaking opportunities and from the loss of beneficial foods when an impoundment complex is allowed to revert to scrub-shrub and natural emergent marshes. At Chesapeake Marshlands NWRC, an adverse effect would result from permitting hunting on an additional 200 acres. The greatest impact at Chincoteague Island NWR is reported from continued use of the recreation beach under alternative A. The beach would be relocated under alternatives B and C, eliminating these effects. While alternatives B and C would have minor impacts of their own, these would be greatly offset by the relocation of the beach and beach parking area and allowing natural processes to occur, which is beneficial to shorebirds, and also by allowing for natural succession of vegetation to occur in the 300-acre NWF. While a cumulative adverse effect would result from actions at these three refuges, the net effect, when considering the beneficial impact of management actions at the three refuges, is negligible.

Threatened and Endangered Species

None of the protected wildlife or plant species that would be adversely affected at the refuge would be adversely affected by actions that have been taken or are proposed at other NWRs in the CEA study area. Some past actions at the WFF have had an adverse effect on piping plover habitat; however, all of these actions have been subject to Section 7 consultation and the impacts have been mitigated. Therefore, there are no adverse cumulative impacts to threatened and endangered species.

Socioeconomic Effects

As reported in Section 4.12, alternatives A and C would result in adverse socioeconomic effects in the form of reduced expenditures in Accomack and Worcester counties by visitors. The economic impact to the region would be a loss of direct expenditures from tourists of \$38.4 million for alternative A and \$36.3 million for alternative C. Acquisition of several thousand acres

(cumulatively) is proposed at Back Bay NWR, Chesapeake Marshlands NWRC, and the Eastern Shore of Virginia/Fisherman Island NWRs. Some of this land is farmland and this property acquisition would result in reduced local tax revenue. Adverse economic effect to farmers is not expected, as all acquisitions would be voluntary, however there may be some adverse effects to agricultural support businesses. However, the tax revenue impact would be partially offset by payment in lieu of taxes and the acquisitions would be made only from willing sellers and would occur over a 15-year period. Although it would partially be mitigated by the fact that each of these effects would be located in different counties, there would be a cumulative adverse effect to socioeconomics as a result of these actions.

Soils

Increased public use at all refuges would result in temporary minor impacts due to soil compaction. This effect would not be considered cumulative because it only occurs locally at all refuges, and does not contribute to an additive effect of other actions.

4.16.4 Climate Change

The lower Delmarva Peninsula is an area of recognized global ecological significance for its remarkable estuarine, coastal, and marine habitats and substantial populations of migratory and breeding shorebirds, colonial waterbirds, landbirds, and raptors. The coastal lagoons and barrier islands represent what is arguably the most significant remaining wilderness on the Atlantic coast. Located across the peninsula from Chincoteague NWR, Pocomoke Sound, Beasley Bay, and smaller tidal creeks to the south along the western margin of the peninsula provide some of the most significant wetlands and largest beds of submerged aquatic vegetation in the Chesapeake Bay. Bisecting the peninsula, the Pocomoke River and its watershed are a recognized biodiversity hotspot and contain critical habitats for a number of rare, threatened, and endangered plants and animals. The Smithsonian Institution named the Pocomoke River and its bottomland forests as one of the most important sites for natural diversity on the east coast. Collectively, the focus area for the CCP provides globally significant habitat for a wide diversity of species, especially shorebirds, waterfowl, and migratory and breeding songbirds.

Fortunately, the conservation importance of area within the Atlantic Flyway has been long recognized by the USFWS and its Federal, state, local, and non-profit partners. All have worked together to protect over 27.6 percent of the land within the 987,000-acre focus area.

Unfortunately, several real and growing challenges threaten the area's rich and diverse natural heritage and the many benefits humans derive from the region's intact habitats and natural systems. The greatest of these is global climate change and its associated effects including sea level rise, changing frequency and intensity of storms, warming air and water temperatures, increasing variability in seasonal and annual precipitation, and increases in ocean acidity. Vulnerability of natural systems to global climate change, especially sea level rise, will be exacerbated by incompatible land uses and land management activities such as plasticulture, industrial pine plantations, conversion of natural habitats to residential development, shoreline armoring, increased pumping of ground water for agricultural irrigation, commercial, and residential uses, and the continued ditching of wetlands. Fifty-one (51) percent of protected lands within the proposed project area currently lie one meter or less above sea level, compared to only 30 percent of the project's overall area. While complex sediment dynamics and marsh migration processes mean that not all of these acres will actually be submerged by rising waters, it is clear that, unless steps are taken, sea level rise will have profound effects, often negative, on the

region's coastal habitats and that impact will be disproportionately severe on existing protected lands. While decades of investment and conservation work by the USFWS and its many partners in Maryland and Virginia have yielded real, tangible, and significant results, there is a conspicuous lack of connectivity among existing protected lands along the gradient from estuary to uplands. This lack of connectivity magnifies impact of existing threats and represents a real impediment to building resilience into the ecological systems so that they can adapt and migrate in response to sea level rise, increased frequency of droughts, and other climate change effects.

Table 4-7. Summary of Adverse Effects of Actions at Other Major Facilities in the CEA Study Area

Resource	Back Bay NWR	Chesapeake Marshlands NWRC ⁵	Eastern Neck NWR	Eastern Shore of Virginia & Fisherman Island NWRs	Prime Hook NWR	Assateague Island National Seashore	Wallops Flight Facility
Air Quality	Minor impacts from prescribed burning (every 1 to 3 years).						Negligible air quality impacts from increased rocket operations. Negligible impacts to climate change from WFF operations.
	Minor increase in vehicle emissions from increase in visitation.						
Hydrology/ Water Quality	Potential negligible impacts from select use of low-toxicity herbicides.				Increased erosion, bottom sediments stirred up, and/or pollutants introduced to waterways from recreational use.	Increase in runoff from minor increase in impervious surface surfaces (2.2 acres).	4.6 acres wetlands fill from several projects (mitigated). Increase in runoff from minor increase in impervious surfaces. Minor changes to drainage patterns and potential to alter drainage patterns to Little Mosquito Creek.
	Potential negligible increased leaking oils and antifreeze from vehicles associated with increased visitation.						
		Potential minor sedimentation associated with from shrub and tree clearing.					
		Increase in runoff from minor increase in impervious surfaces.		0.33 acres wetlands fill (mitigated).			

⁵ Includes Blackwater, Martin, and Susquehanna NWRs.

Vegetation /Habitat /Wildlife	Effects to wildlife and vegetation from human activity					2.5 acres of vegetation disturbance.	8 to 100 acres of vegetation clearing (60 to 92 acres mitigated by planting lower- growing vegetation). 2.3 acres rare maritime dunes altered.
	Slight risk of increase in distribution on non-native plant species from increased visitation and hunting.				Effect from routine maintenance (prescribed burn, moving, and forest management). Vegetation and habitat impacts from overgrazing by light geese, Canada geese, and white tailed deer.		
	Elimination of most impoundment populations of rare Carolina grasswort. Effect on habitat from clearing vegetation for trail, canoe/kayak parking areas boat launch, and eight acres for HQ/VC/ maintenance compound. Vegetation clearing for	Increased visitation results in additional disturbance to wildlife and vegetation. Prescribed burning could increase amount of sunlight and/destroy food sources in forest for fox squirrel.	Tree cutting of 17 acres.	Vegetation disturbance from for 3 to 6 new bike /walk trails on existing old roads and rail right of way on 6,000-acre additional parcel to be acquired(725- acre tidal marsh and 120 acres open water).	Minor impacts to piping plovers and horseshoe crabs could result from improper sand sources (i.e., incorrect sediment grain size). Disturbance of vegetation and wildlife from selective cutting on forest vegetation. Active salt marsh restoration		

	footpath, bridges, and boardwalk that could create some barriers for wildlife.				strategies could disturb habitat and temporarily disturb wildlife (mostly birds). Hypersaline soil conditions that persist during the summer will have moderate and potentially long-term impacts to wildlife and habitat. Spraying of pest control chemicals could affect wildlife, specifically invertebrate species.		
Birds	Effect on shorebirds from human contact, adding canoeing/kayaking opportunities. Loss of beneficial foods when impoundments revert to scrub-shrub and emergent marsh.			Effects on water fowl hunting on 200 additional acres.	Same as above.		

Socio-economics	Reduced local tax revenue as a result of proposed land acquisition partially offset by payment in lieu of taxes. Minor adverse economic effect on agricultural support businesses from taking farmland out of production.	Reduced local tax revenue as a result of proposed land acquisition, partially offset by payment in lieu of taxes. Minor adverse economic effect on agricultural support businesses from taking farmland out of production.					
Soil	Compaction from increased public use.						
					Siltation and erosion effects from salt marsh and upland forest restoration.		

Sources:

USFWS, Back Bay NWR Draft CCP and EA (March 2010)

USFWS, Chesapeake Marshlands NWR Complex CCP and EA (September 2006)

USFWS, Eastern Neck NWR CCP and EA (September 2010)

USFWS, Eastern Shore of Virginia and Fisherman Island NWRs CCP and EA (September 2004)

USFWS, Prime Hook NWR CCP and EIS (December 2012)

NPS, Assateague Island National Seashore. Improvements to Island Facilities Environmental Assessment (February 2006)

NASA and U.S. Navy, Wallops Flight Facility, various NEPA documents (1997-2013), <http://sites.wff.nasa.gov/code250/documents.html>

4.17 Relationship Between Short-term Uses of the Human Environment and the Enhancement of Long-term Productivity

This section considers the relationship between local, short-term uses of the human environment and maintaining the long-term productivity of the environment. Long-term is considered for impacts that would extend beyond the 15-year period of this draft CCP/EIS. Under all alternatives, the primary aim is to maintain or enhance the long-term productivity, resiliency, and sustainability of natural resources on the refuge, the southern Delmarva Peninsula, and the Commonwealth of Virginia, along with migratory birds and inter-jurisdictional fish and other far-ranging wildlife species, across their whole range.

Habitat protection and restoration actions across all alternatives may entail short-term negative impacts to ensure the long-term productivity of the refuge. Many of the cyclic management actions in the alternatives, namely, prescribed burning, controlling invasive plants and animals, proactively managing habitats, and restoring native plant communities can have dramatic short-term impacts. These include direct mortality of some plants and animals, displacement of species, and temporary displacement or cessation of certain types of visitor use. However, the long-term benefits of those actions generally offset their short-term impacts. Habitat management practices that mimic ecological and sustainable processes optimize the maintenance and enhancement of the biological diversity, integrity, resiliency, and environmental health of those habitats for the long term. Long-term productivity is especially enhanced when the ecological and sustainable management actions that are proposed in the alternatives would best support and improve links between nutrient cycling, ecological processes, and ecosystem function.

The nutrient cycling of the refuge's habitats is closely linked to other ecological processes discussed in this document. Vegetative structural diversity in the forms of dead wood, leaf litter, senesced wetland vegetation, and detritus contributes to terrestrial and aquatic invertebrate resources that maximize sustainable nutrient recycling which in turn enhances the long-term productivity of the refuge's natural resources to people and wildlife.

Diverse and wide-ranging wildlife recreational opportunities for visitor use should provide the best long-term positive economic impacts to local communities. That mirrors the widely accepted premise that maintaining biological diversity in natural ecosystems helps ensure their long-term resiliency. The visitor use programs under each alternative heavily rely on outreach and environmental education to explain management actions to visitors and the public that would encourage everyone to be better stewards of our natural environment.

Climate change is a growing concern for the refuge and the nation. Within the 15-year horizon envisioned by this document, we can expect repeated weather events that will cause coastal flooding and overwash of Assateague Island and the other barrier islands on Virginia's Eastern Shore. However, over the longer term (20 to 80 years) rising air and water temperatures, intense precipitation events, drought, sea level rise, strong coastal storms, and intense wind events will significantly alter the shape and character of these islands and the coastal marshes behind them. We fully recognize the conservation importance of the southern Delmarva Peninsula and the challenges it faces due to a changing climate. Adapting to a changing coastal environment will require a landscape-level approach to conservation, management, protection and where appropriate restoration of lands and waters, for the good of wildlife and people.

In summary, the alternatives would contribute positively to maintaining and enhancing the long-term productivity of the refuge's natural resources, with sustainable beneficial cumulative and long-term benefits to the environment surrounding the refuge with minimal inconvenience or loss of opportunity for the American public.

4.18 Unavoidable Adverse Effects

Unavoidable adverse effects are the effects of those actions that could cause harm to the human environment and cannot be completely avoided, even with mitigation measures. All alternatives would result in some minor, localized, unavoidable adverse effects. For example, any new construction, burning of prescribed fires, or control of invasive species would produce minor, short-term, localized adverse effects. However, none of those effects would rise to a significant level. Furthermore, all of those impacts would be mitigated with best management practices, so none of the alternatives would cause significant, unavoidable cumulative impacts.

As previously noted, many of the habitat and facility construction projects in the alternatives have a certain level of unavoidable adverse effects, especially during the actual construction. Those effects are mitigated to some degree by the use of practices and precautions that safeguard water quality, avoid sensitive or irreplaceable habitats, and by timing activities or including actions to avoid or minimize impacts on fish and wildlife. The adverse effects generally are short-term and more than offset by the long-term gains in habitat quality and fish, wildlife, and plant productivity.

All these unavoidable adverse effects on the physical and biological environment would be relatively local and more than offset by the long-term benefits of cleaner air, cleaner water, and making rare wildlife species more common across the landscape, while providing quality wildlife-dependent recreation.

All the alternatives, in varying degrees, would have adverse impacts to a certain segment of the public that does not desire any change to current habitat management or visitor use programs, or that may have differing views on the course of action to be taken. Some may be concerned about decreased visitation to the refuge or restraints for certain uses, such as horseback riding or OSV use. These impacts to individuals or groups are unavoidable given the need to follow current law and policy, the diversity and number of publics, conflicts between and within user groups due to preferences, continued increase in use numbers, and relatively finite nature of land available on the refuge for public recreation. It is the refuge's responsibility to provide equal opportunities to the American public and seek a fair balance in minimizing and mitigating adverse impacts while optimizing wildlife conservation and providing excellent recreational opportunities to the public.

4.19 Potential Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be reversed, except perhaps in the extreme long term or under unpredictable circumstances. One example is an action that contributes to a species' extinction. Once extinct, it can never be replaced.

By comparison, irretrievable commitments of resources are those that can be reversed, given sufficient time and resources, but represent a loss in production or use for a time. An example of an irretrievable commitment is relocating the recreational beach parking and related facilities in alternative B and C. Small visitor facilities, such as information kiosks, are not considered irretrievable commitments of resources. Those facilities could be dismantled and restored at a more suitable site if resource damage is occurring.

4.20 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations. The Order directed Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities’ access to public information and participation in matters relating to human health or the environment.

We evaluated alternatives in this CCP to determine if low-income and minority communities would bear a disproportionate burden from negative impacts resulting from the any of the alternatives in this CCP. Burdens that have a disproportionate effect on low-income and minority communities either target the geographic areas where the communities are based, or burdens are due from imposed fees to access resources. Agencies should also make every effort to include low-income and minority communities in the planning process. To address the latter, outreach for the CCP/EIS process hosted meetings in multiple locations, including in the lower income portions of Accomack County, and held meetings at various times throughout the day to accommodate different work schedules. For more information on public outreach, see chapter 5.

As described in chapter 3, within the study area, low-income and minority communities reside outside of the town of Chincoteague in the more rural areas of Accomack County. Given the distance between the refuge and environmental justice communities, they would not be affected as residents, for the most part, but these communities were evaluated for environmental justice impacts as visitors to the refuge and as employees of town businesses. According to the Springsted Report referred to in the Economic Analysis section, 85 percent of travel related expenditures in Accomack County occur in Chincoteague, and it has nearly 600 jobs supported by refuge-related visits. Given the importance of the town of Chincoteague to the county economy, the economic impacts to the town described in the economic impacts section can be considered to be felt more broadly within the county as a whole. Economic impacts resulting from any of the alternatives would not disproportionately affect low-income communities.

The refuge maintains a commitment to develop bilingual/multilingual materials for use in the refuge. Such materials increase the enjoyment and educational benefit of the refuge for non-English speaking populations and as such provide positive environmental justice benefits.

Each of the alternatives also maintains access to a 1-mile recreational beach. The variation among the alternatives in parking location and availability and the provision of shuttle service do not have differential environmental justice impacts as long as the vehicle entrance fee for the beach remains the same regardless of whether it is accessed via shuttle or private vehicle. As the bicycle entrance to the refuge is currently free, bicycle trail construction under all alternatives would have positive impacts for low-income communities.

Impacts to horseback riding, OSV use, and hunting and trapping among the various alternatives could benefit or burden those user groups irrespective of income or minority status, and there is no evidence that such groups are disproportionately low-income or minority.

4.20.1 Impacts on Environmental Justice in Alternative A

There are no specific impacts on environmental justice in alternative A.

4.20.2 Impacts on Environmental Justice in Alternative B

Alternative B would restrict Service Road access north of the new recreational beach to those with a special permit. The time and effort required to obtain a permit would have a small negative impact on all users, and any fee involved would have a small but disproportionate effect on low-income users.

4.20.3 Impacts on Environmental Justice in Alternative C

Alternative C would restrict Service Road access north of the new recreational beach to those with a special permit. The time and effort required to obtain a permit would have a small negative impact on all users, and any fee involved would have a small but disproportionate effect on low-income users.

4.21 Environmental Consequences Comparison Matrix by Alternative (Table 4-8)

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Soils	Beneficial impacts would result from the shift in management of the NWF. Negative impacts to approximately 27 acres of soil would result from the creation of new recreational beach parking, including new horse-trailer parking, and from the expansion of the new recreational beach access road. Negative impacts, compaction and increased erosion, would result from the expansion of the OSV zone.	Beneficial impacts would result from the elimination of OSV use and horseback riding, greatly reducing soil compaction and increasing beach and dune sand stability. All other impacts to soil would be the same as alternative B; however, the area negatively impacted would be approximately 22.5 acres.
Air Quality	Alternative B would relocate beach parking north approximately 1.5 miles from its current location. Final location of the relocated beach parking lots is expected to be closer than the current recreational beach, which may result in a decreased VMT of passenger vehicles, a positive outcome. However, new uses such as space tourism and separation of existing uses (recreational beach from crabbing and clamming areas) would cause additional vehicle use by visitors which would create seasonal or temporal decreases in air quality.	Positive impacts would result from the reduction of passenger vehicles on the refuge through the decreased amount of parking, as well as the discontinuation of OSV use.
Hydrology/Water Quality	Management of the Beach Road causeway, which would restrict it from routine visitor use, and eventual modification of that area would have a positive impact on tidal flow and water quality for Swan Cove Pool (F Pool). The increased tidal rhythm through impoundment culverts would now be allowed to mimic the natural tidal rhythm of Toms Cove, which would lead to improved water quality, dissolved oxygen, pH, and salinity levels for the new flow area. The disturbance of Mallard and Pintail (C and D Pools) to allow for the construction of new public beach parking could have negative impacts on water quality for all impoundments to the south. Since impoundment flow is connected from north to south by culverts, anything that occurs in upper watershed beginning at Pintail Pool (D Pool) would flow through the impoundments south of them.	Impacts to hydrology and water quality under alternative C would be the same as alternative B but perhaps less due to reduced parking lot size.

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Vegetation	Negative impacts to approximately 27 acres of vegetation would result from the moving of the recreational beach, associated parking, and the expansion of the new Beach Road. Closing all routine public access on the service road north of the relocated recreational beach would have a beneficial impact to vegetation by decreasing the potential for humans to trample or damage native vegetation adjacent to the road. Beneficial impacts through better water flow and salinity levels would result from the improvement of water control structures throughout refuge impoundments. The reduction of non-migratory (resident) Canada geese and light geese on the refuge through hunting would create benefits by decreasing the amount of grazing by these species that currently impact native plant species. Construction of a new bike path from the current Wildlife Loop to Mallard/C Dike would result in negative vegetation impacts, most likely from wetland or scrub shrub habitat, depending on where the bike path is located. The construction of new lifeguard housing facilities and a boardwalk at or near Wallops Island NWR would have a negative impact on forested vegetation such as loblolly pine.	Adverse impacts resulting from the movement of the recreational beach, associated parking, and the expansion of the new beach access road would be the same as alternative B, except impacts would be limited to approximately 22.5 acres. The discontinuation of OSV and horseback riding would have a beneficial impact by eliminating potential trampling and compaction of native plants. It would also reduce the possibility that vehicles or horses could bring invasive species to the refuge. The phasing out of the exotic sika population, resulting in the elimination of associated grazing, would have a beneficial impact on native vegetation including the endangered seabeach amaranth. All other vegetation impacts would be the same as alternative B, except there would be no new construction of a bicycle trail in alternative C. Impacts described for the building of a new bicycle trail in alternative B would therefore be avoided. All other impacts to vegetation would be the same as B.

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Federal Threatened and Endangered Species	Negative impacts would occur for piping plovers on the refuge resulting from the shift of habitat management by allowing natural vegetation to grow back in the NWF impoundments area. However, this impact would be off-set and even surpassed as a result from relocating the current recreational beach. The expansion of the OSV zone from the new recreational beach would create negative impacts for sea turtles and coastal birds by increased potential for disturbance. Through the creation of the year-round OSV access area, all day and nighttime OSV use south of this area would be discontinued between March 15 and September 15. This would eliminate the potential for OSV users to run over nests, hatchlings or plants, or otherwise disturb the nesting process - a beneficial outcome. From September 16 to March 14, negative impacts would result from the expansion of the OSV zone from the new recreational beach location to the current zone. This expanded OSV area would increase the possibility of human disturbance in the coastal habitat. Negative impacts would be minimized since OSV users would only be permitted to travel in the intertidal zone and by management actions usually in the form of exclosures and signs.	The elimination of OSV and horseback riding would have beneficial impacts on threatened or endangered species (piping plover, seabeach amaranth, and loggerhead sea turtle). All other impacts would be the same as alternative B.
Birds	Human disturbance to coastal nesting birds would be greatly diminished since the recreational beach would be relocated north, and OSV use would be limited to September 16 to March 14. New management of the extended OSV zone would have negative impacts to shorebird species that feed and loaf outside the breeding season. The moving of the recreational beach and parking areas, along with the expansion of the beach access road, would result in negative impacts to approximately 27 acres of migratory bird habitat, but the impacts would be mitigated. This management strategy would cease vegetation removal from the	The elimination of OSV and horseback riding on the refuge would have a positive benefit for coastal, migratory, and wintering shorebird species. As analyzed under alternative A, current OSV and horseback riding use does not pose a significant impact for birds in that area, but the complete phase out of these activities would further diminish the possibility for trampling or general human disturbance. All other impacts to birds in this alternative would be the same as under alternative B.

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
	NWF and allow for natural succession improving habitat for spring and fall migratory neotropical birds. Beneficial impacts for migratory waterfowl are also expected as this management strategy would increase thermal cover for waterfowl in the winter, increase the food sources for water birds and improve shorebird migratory stopover habitat. The change in hunt management would have positive impacts for bird species on the refuge, mostly by the elimination of predation and competition. Further, adding resident Canada goose and light goose hunting on Assateague Island would reduce their populations on the refuge and their negative impact to habitat.	
Fish and Other Aquatic Wildlife	Improvements to the tidal flow of Swan Cove Pool (F Pool) resulting from modification and replacement of water control structures within Beach Road causeway would have a positive impact on fish and other aquatic species. Increased water flow and tidal rhythm would allow fish and aquatic invertebrates such as crabs and mollusks passage into this restored salt marsh.	Impacts would be the same as alternative B.
Mammals	The refuge would implement new hunting and trapping programs for raccoon and red fox populations. These new programs would minimize predation on nesting piping plovers and other coastal birds – a beneficial outcome for birds, yet adverse for mammals.	Impacts for alternative C would be the same as alternative B, except that, in addition, the refuge would work towards the elimination of the entire sika population on the refuge. This elimination of the exotic species would further diminish the competition with the white-tailed deer for food and habitat.
Reptiles and Amphibians	Increased incidental mortality of reptiles and amphibians could occur on newly created refuge roads between March and October. However, we expect negligible impacts since best management practices would be implemented in the design and engineering of the roads and parking lots. Therefore, it would not affect their overall populations.	Impacts to reptile and amphibian species under alternative C would be the same as under alternative B.

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Invertebrates	The alteration of Mallard and Pintail (C and D Pools) in order to allow the building of approximately 8.5 acres of recreational beach parking would have a negative impact on invertebrates, mainly monarchs, due to the removal of Bidens. Although this would be a permanent negative impact, it would not be a significant impact because of the small acreage that would be affected, and because there are several nearby habitats where monarchs could nectar, including Shoveler and Snow Goose (B Pools). Improvements to the tidal flow of Swan Cove Pool (F Pool) resulting from modification and replacement of water control structures within Beach Road causeway would have a positive impact on aquatic invertebrates and fish species. Increased water flow and tidal rhythm would allow fish and aquatic invertebrates such as crabs and mollusks passage into this restored salt marsh. Control of mosquitoes may have adverse impacts on birds, fish, amphibians, bats, and other wildlife since they are a known food source for these species. This impact would not be significant because it only occurs in a small area.	Impacts under alternative C would be the same as under alternative B, except that the negative impacts from removal of Bidens at the new recreational beach parking would be reduced to only 4.5 acres.
Socioeconomics	Assuming that visitation would not change as a result of the beach relocation, as the same number of spaces would be preserved, and the short-term transition between the locations would be carefully managed outside the peak visitation period, there would not be any negative economic impact per year resulting from alternative B compared to the base year of 2009. The expansion of several visitor services, such as hunting, may result in increased visitation but is not expected to be significant.	The reduction in beach parking to 480 spaces, would result in a loss of \$36.3 million, or 32 percent of current annual baseline expenditures in Accomack and Worcester Counties. Parking loss is the only action for which an economic impact estimate is available, but other actions (e.g., closing the Beach Road causeway and the Service Road and discontinuing OSV use and horseback riding) could have negative impacts on the number of visitors coming to the refuge, although institution of a shuttle and expansion of hunting opportunities could mitigate these decreases.

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Hunting	The expansion of hunting opportunities due to increase in permits, additional hunting days and hunting of new species would benefit hunters. The relocation of the recreational beach, closure of the Beach Road causeway, and associated change in the OSV zone would change access to the Toms Cove Hook hunting zone which would be 1 to 2 miles further away, thus having the adverse impact of requiring hunters to travel longer distances. The expansion of hunting for new species and introduction of fur-bearer trapping would benefit hunters and trappers by providing new and expanded opportunities for these activities.	In addition to those listed below, impacts and benefits would be the same as for alternative B. The increase in sika hunting to achieve the removal of species would be a short-term benefit to hunters as it could increase the number of hunters able to experience the hunt, but the eventual elimination of the sika population would mean over the long term, hunters would not be able to hunt sika and there would be fewer hunting permits available, an adverse impact. While OSV use would be discontinued, use of 4x4 vehicles would be permitted to access the Toms Cove Hook area for sika hunting.
Fishing	OSV use would be allowed to access surf fishing areas but would be limited in the Overwash area from March 15 to September 15 or whenever the last shorebird chick fledges. This would be a slight decrease over present opportunities, creating an adverse impact to anglers. Anglers may benefit from reduced crowding within the OSV zone. With the expansion of the OSV zone, visitors would have access to approximately 2.7 more miles of beach for surf fishing by OSV, a benefit resulting in less crowding. A benefit of the designated year-round OSV parking area for fishing is that visitors would have more convenient access to surf fishing when other portions of the OSV zone are closed and an extended time period for fishing using OSV access. Visitors would benefit from improved communication and coordination of the permit process throughout the region under this alternative by saved time, reduced confusion, and raised awareness of rules and opportunities.	OSV use would be discontinued and there would an adverse impact to visitors who come to the refuge to surf fish. Visitors who want to surf fish would experience greater inconvenience in taking their gear to surf fishing locations and surf fishing activities would be concentrated at points along the beach closer to the recreational beach so visitors would experience increased crowding. As a result, some visitors would continue to fish and carry gear by foot, some visitors would not choose to walk with gear down the beach and others would choose not to visit the refuge.

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
	The relocated beach and change in Beach Road causeway access would result in improved experience for visitors interested in crabbing, clamming, and oyster harvest in Swan Cove (F Pool) and Toms Cove. A new crabbing dock at the terminus of Beach Road would create a new facility that would substitute for current inconvenient sites and be more accessible to visitors with disabilities and family groups, resulting in a net benefit.	
Environmental Education and Interpretation	Students and others not able to travel to the refuge would be able to experience and learn about the refuge through the virtual exhibits. Enhanced opportunities would provide for a more informed public and increase stewardship. With the relocation of the recreational beach and change in access, beachgoing visitors would no longer pass by the Herbert H. Bateman Educational and Administrative Center en route to the beach and therefore, may be less inclined to visit, resulting in an adverse impact. However, the new visitor contact station at the recreational beach would have information on both NPS and USFWS and would result in USFWS information being more directly accessible by beachgoing visitors, which would result in a net benefit to beachgoers. Despite the relocation of the recreational beach and the closure of Beach Road causeway, visitors would continue to benefit from NPS and Marine Science Consortium canoe/kayak programs, which would have access to Toms Cove at the terminus of Beach Road.	Some beachgoing visitors who previously had not learned about the refuge would benefit from interpretation provided on the beach shuttle.
Wildlife Observation and Photography	Relocation of the beach and closure of beach causeway would be an adverse impact because it would reduce opportunities for wildlife observation and photography in Swan Cove (F Pool), Toms Cove, and the southern end of the island, as parking and foot access to these sites would be more difficult and inconvenient. A relocated recreational beach would change the beach viewshed such that water would not be visible on both sides; however, the viewshed at the relocated beach would also have reduced views of parking.	Same adverse and beneficial impacts of removing invasive plant species and of increased hunting as alternative B, except that the elimination of sika would likely increase the abundance of other plant and animal species. Same adverse impacts as alternative B as a result of the relocation of the beach and

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
	Closure of the Service Road north of the new recreational beach to public access would reduce opportunities to view the northern Pony Herd and access to that landscape for photography. The replacement of Swan Cove Trail with an alternative trail to the relocated recreational beach would provide visitors with a benefit in the form of access to a new area for wildlife observation and photography and continue to facilitate such access to the beach. The expansion of hunting opportunities for new species and opening of additional hunting days would mean that other visitors would be more likely to see or hear signs of hunting from adjacent areas, which could adversely affect their wildlife observation and photography. However, this impact would be minimized because hunting would occur during off-peak visitation times. Hunting of new species would reduce the number of those species that visitors could see; however, these species are being identified because of their overabundance and impacts on other species. Thus, in the long term, increased hunting could enhance the opportunity for wildlife observation and photography. The relocated recreational beach would make it inconvenient to drive by the viewing area for the Chincoteague ponies; however, the planned relocation of some of the ponies would ensure continued convenient visual access, mitigating this impact. A benefit of the new observation tower at or in the vicinity of Wallops Island NWR is that it would provide new photography/wildlife observation opportunities in a new location, which would reduce crowding elsewhere and increase awareness of the refuge. Other improvements, such as the pursuit of photography blinds, could attract more visitors, which would increase crowding and disturbance, but would also provide new experiences for existing visitors and bring new visitors to the refuge.	closure of beach causeway. Same adverse impact and minimization of impact as alternative B from the closure of the Service Road north of the new recreational beach to public access with regard to viewing the northern Pony Herd and access to that landscape for photography. Sika would no longer be available to observe and photograph as a result of the planned elimination through hunting, an adverse impact. Views of parking from the recreational beach would be reduced due to the reduction in parking, which would be a benefit. The loss of Swan Cove Trail and no replacement from Wildlife Loop to the new beach would result in an overall loss of wildlife observation and photography opportunities along a trail. The limit on the Chincoteague pony population to 125 could reduce viewing opportunities; however, the current population is between 125 and 135 so no significant impact would be anticipated.

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Recreational Beach Use	Beachgoers would benefit from the ongoing provision of the same number of parking spots as there are currently at the existing beach without disruption. However, they would also experience the adverse impacts of traffic and waiting for parking as they currently do. Beachgoers would benefit from the new bicycle connection to the recreational beach which would provide a safer transportation option and could result in lower demand on beach parking. The relocation of the beach would have significant adverse impacts, as well as some beneficial impacts, on beachgoing visitors. Beachgoers would be able to continue the same type and level of beach activities on the ocean-side. Visitors would not have access to the bayside and thus would not be able to pursue bayside activities, such as clamming, crabbing, and swimming with young children. Due to the reduced points of access to the beach, visitors would experience the adverse impact of more crowding at access points, as some people would not want to carry recreational beach gear further up or down the beach. Visitors could experience increased exposure to mosquitoes in the relocated parking areas; however, the refuge would take measures to reduce the mosquito population, avoiding or minimizing this impact. Facilities would be constructed such that visitors would have continuous access to the refuge and recreational beach throughout the transition from the current to the new location of the recreational beach, and would receive communication on the timeline for relocation, reducing any significant disruption in visitor use. The closure of Beach Road causeway would eliminate access to the current recreation beach and its particular characteristics, such as water on both sides and easy access to clamming, crabbing, oyster harvest, and other bayside activities.	The reduction in beach parking and introduction of a shuttle would have significant adverse impacts on beach going visitors. Some beachgoers would choose not to visit and instead go elsewhere. The relocation of the beach would have significant adverse impacts, as well as some beneficial impacts, on beachgoing visitors. Beachgoers would be able to continue the same type and level of beach activities on the ocean-side. Visitors would not have access to the bayside and thus would not be able to pursue bayside activities, such as clamming, crabbing, and swimming with young children. Due to the reduced points of access to the beach, visitors would experience the adverse impact of more crowding at access points, as some people would not want to carry recreational beach gear further up or down the beach. Visitors could experience increased exposure to mosquitoes in the relocated parking areas; however, the refuge would take measures to reduce the mosquito population, avoiding or minimizing this impact. Facilities would be constructed such that visitors would have continuous access to the refuge and recreational beach throughout the transition from the current to the new location of the recreational beach, and would receive communication on the timeline for relocation, reducing any significant disruption in visitor use.

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
		The closure of Beach Road causeway would eliminate access to the current recreation beach and its particular characteristics, such as water on both sides and easy access to clamming, crabbing, oyster harvest, and other bayside activities.
Other Uses	Relocation of the beach would change the use of part of the Wildlife Loop such that non-motorized traffic would need to share the right of way with beach traffic, resulting in adverse impacts in the form of increased crowding, discomfort, and safety incidents. In addition, relocation of the recreational beach would benefit bicyclists' access and beach access via bicycle, with introduction of new on-road bicycle lanes and trail that would provide improved, safer, and more direct access and could result in an increase in overall beach visitation, and reduced beach parking demand. However, this may be offset by more visitors choosing to bike to the beach, resulting in more crowded bicycle trails.	Same impacts and benefits as alternative B with regard to impacts of rocket launches and impact to Wildlife Loop. There would be adverse impacts to users who horseback ride, which would be discontinued and to those who smoke, which would be banned on the beach. The relocation of the beach and lack of access at the terminus at Beach Road would result in reduced access to Toms Cove. Bicyclists would benefit from on-road bicycle lanes but bicyclists and visitors generally would be adversely impacted by the loss of Swan Cove Trail and no replacement from Wildlife Loop to the new beach.
Cultural and Historic Properties	A comparison of findings in the report, "Archaeological Reconnaissance of the Chincoteague National Wildlife Refuge, Accomack County, Virginia and Worcester County, Maryland" (Goodwin & Associates, Inc. 1989) with the potential development in alternatives B and C concluded that nothing in the Goodwin report indicated we would be impacting cultural resources based on the previous findings. Since the proposed actions associated with the relocated beach parking and road expansion are conceptual and not finalized, specific details for these actions are currently unknown. Further environmental assessments and analysis for impacts on cultural resources would need to be completed prior to construction.	
Refuge Administration	New activities and programs would require expanded staffing and infrastructure investment. A focus on use of social media/technology would require some infrastructure investments (i.e., fiber optics).	Impacts related to hunting, the relocation of the recreational beach and Wallops Island would be the same as for alternative B. The removal of the OSV and horseback riding

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
	The expansion of hunting and trapping opportunities would require a follow-up hunt management plan, with a short-term impact on staff time. Subsequent increase in hunting permits and need for new materials and maps would require additional staff and funding to administer permits, patrol hunting zones, and provide orientation for new hunters. This would be a long-term impact, as such administration is year-round. The relocation of the recreational beach and related facilities would require staff to develop a transition and communication plan, as well as participate in design, further environmental assessment, and other planning efforts. New staffing would better address Wallops Island NWR needs and the needs created by strategies for resource management (biology), visitor services, maintenance, law enforcement, and coordination with NASA.	zone would reduce the administrative and enforcement burden on NPS and Refuge staff which is a benefit because the time could be dedicated to other management needs.

Chapter 5

USFWS



Lighthouse

Consultation and Coordination with the Public and Others

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- 5.2 Federal Register Notice of Intent
- 5.3 Public Meetings and Comments
- 5.4 Planning Team Meetings
- 5.5 Other Meetings of Note
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Chapter 5: Consultation and Coordination with the Public and Others

Effective conservation planning begins with effective consultation with the public and conservation partners, including: other federal and state agencies, county and town officials, civic groups, non-government conservation and education organizations, and user groups. To ensure that future management of the refuge considers the issues, concerns, and opportunities expressed by the public, USFWS used a variety of public involvement techniques to inform this draft CCP/EIS.

Public interest in the future management of Chincoteague NWR is widespread. The concerns and situations of the interested members of the public are diverse. The refuge has heard from businesses and full-time and part-time residents from the town of Chincoteague and neighboring communities; hunters and harvesters of waterfowl, fish, and shellfish, and upland species; visitors who come to observe birds, the Chincoteague ponies, monarch butterflies, and other wildlife or who seek solitude and respite in the natural world; beach-goers, OSV drivers, horse-back riders, and other non-wildlife-dependent recreation users; and State agencies and other programs and organizations concerned about the role and contributions the refuge can play in a larger network of natural areas across the State, the mid-Atlantic, and the Atlantic coast migratory bird flyway.

What follows is the chronology of public outreach activities USFWS conducted while preparing this document. It does not detail activities associated with studies that informed the document, such as the Chincoteague National Wildlife Refuge Alternative Transportation Study (2010), or the hundreds of informal discussions the refuge manager and his staff had. Those involved a wide range of audiences, including congressional representatives or their staffs, local community leaders and other residents, refuge neighbors, refuge visitors, and other interested individuals. During those discussions, the refuge manager and his staff often would provide an update on the CCP/EIS progress and encourage comments and other participation. Since 2009, the Refuge Manager has held regularly monthly meetings with community leaders and held Town Hall Meetings for the public each May with NPS. The refuge also continued regular communication with NPS throughout the process.

5.1 Pre-Planning Meetings

Refuge pre-planning for the CCP began in 2007. In December, we held an initial joint planning meeting between refuge and NPS Assateague Island National Seashore staff regarding overlaps between the agencies' respective long range planning processes. The NPS document is known as the General Management Plan (GMP) and similar to the CCP, establishes a vision and provides broad guidance for park management over the next 15 to 20 years. Other pre-planning meetings included local outreach, participation in state events, and working meetings between the CCP consultant at the time, the Tennessee Valley Authority, and USFWS staff. Specific meetings of note were as follows:

- *May 15-16, 2007:* USFWS staff meeting to discuss the development of a draft Habitat Management Plan, to be incorporated into the CCP.
- *July 16, 2007:* Meeting with Town Council and Ron Wolff, Supervisor, Accomack County.
- *December 17-19, 2007:* Meeting with Seashore to identify common goals, issues of concern, and opportunities for coordination as each agency begins long range planning processes for their respective units.

- *September 2-5, 2008*: First core planning team meeting to develop work plan, discuss key issues, identify data needs, and meet with NPS for the Seashore's GMP kickoff meeting (September 3-4).
- *October 30, 2008*: Commonwealth of Virginia event, "Conserving Virginia's Fish and Wildlife for the Future: Preparing for a Changing Climate," with references to Chincoteague NWR.
- *February 26, 2009*: Technical experts meeting to discuss the overall CCP process, to discuss sea level rise, to review/rank top issues of concern, to define the study area, and to identify conservation areas and critical habitat in the study area.
- *March 10, 2009*: The Commonwealth of Virginia wildlife and climate change workshop.
- *May 11, 2009*: Town Hall Meeting in Chincoteague held by the Refuge Manager and Assateague Island NS Superintendent, with the ongoing GMP and upcoming CCP as major discussion topics.
- *February 25, 2010*: Technical experts meeting to continue discussion of the development of a draft Habitat Management Plan, to be incorporated into the CCP.

5.2 **Federal Register Notice of Intent**

USFWS published the original Notice of Intent (NOI) in the *Federal Register* on September 17, 2010 stating that USFWS intended to prepare "a Comprehensive Conservation Plan (CCP) and associated Environmental Impact Statement (EIS) document for Chincoteague National Wildlife Refuge (NWR) and Wallops Island NWR".

5.3 **Public Meetings and Comments**

USFWS received public comments from a wide range of user groups and interested parties during two formal periods: the initial scoping period and the presentation of the preliminary draft alternatives. Both of these are described further in this section.

5.3.1 **Scoping**

USFWS conducted a public scoping period from September 17, 2010, through January 18, 2011, to gather public input and identify key issues and concerns to consider during the CCP process. During this timeframe, USFWS invited the public to submit comments and communicated information through news releases, the refuge Web site, and flyers made available at the refuge.

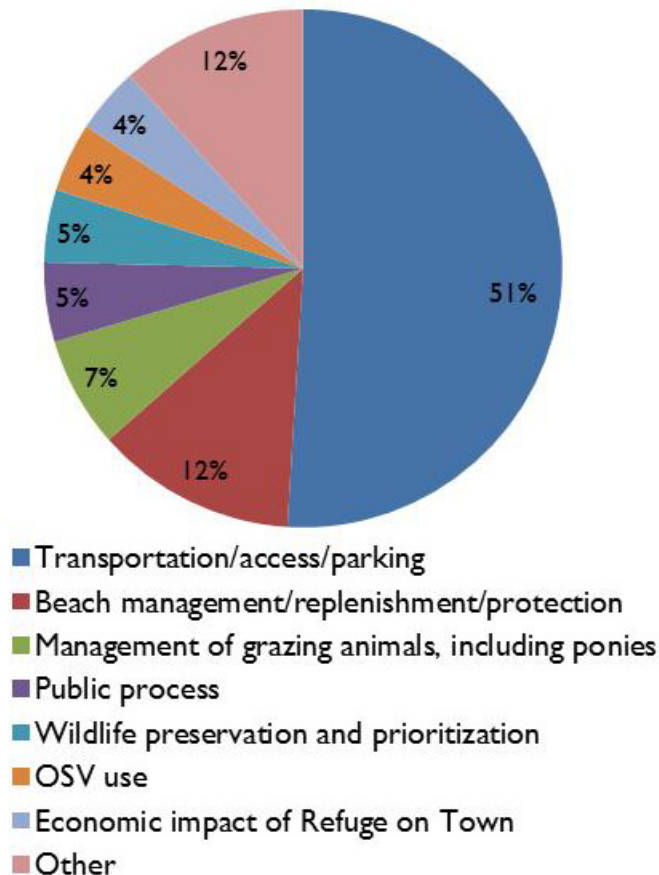
As part of this initial scoping process, USFWS held four events across three separate days:

- *August 25, 2010*: Open house event from 9:00 a.m. to 2:00 p.m. at the parking area by the public recreational beach.
- *September 21, 2010*: Two public meetings and open houses at the Chincoteague Community Center in the Town of Chincoteague; one from 3:00 p.m. to 5:00 p.m. and one from 6:00 p.m. to 8:00 p.m.
- *January 13, 2011*: Public meeting from 6:00pm to 8:00pm at the Old Train Station in Snow Hill, Maryland.

Over 150 participants attended these meetings and wrote down over 200 discrete comments. In addition, 134 written comments were received by mail, including official comments from the town

of Chincoteague's Chincoteague to Assateague Beach Access Committee, the Chincoteague Chamber of Commerce, the County of Accomack, the Citizens Beach Committee, TNC, Ducks Unlimited, and Defenders of Wildlife. Figure 5-1 provides a general categorization of scoping comments by topic.

Figure 5-1: General Categorization of Scoping Comments



5.3.2 Preliminary Alternatives

Preliminary draft alternatives were developed in summer 2011, after 10 months of initial scoping and public involvement. On August 15, 2011, the USFWS published a newsletter with descriptions of four preliminary draft alternatives, which initiated the public comment period on the draft alternatives for further alternative development in this CCP/EIS.

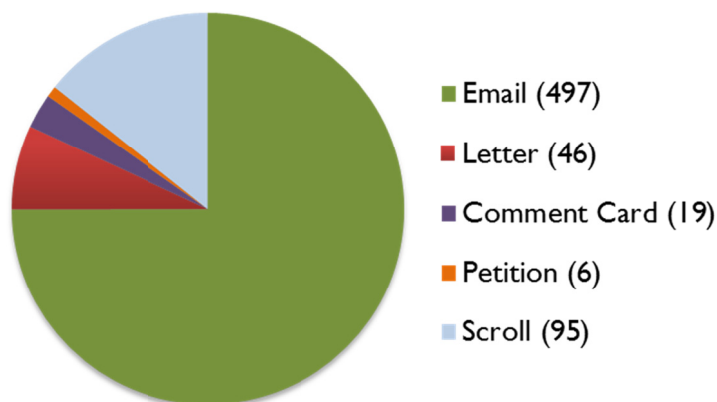
The comment period began on August 15, 2011, and was set to end on October 1, 2011, but was extended to October 31, 2011 at the request of the public. Four public meetings were held to present the draft CCP alternatives on three separate days in August:

- *August 22, 2011:* Two public meetings, one from 9:00 a.m. to 12:00 p.m. at the recreational beach on the refuge and one from 5:00 p.m. to 7:00 p.m. at the Chincoteague Center.
- *August 30, 2011:* One public meeting from 4:00 p.m. to 7:00 p.m. at the Eastern Shore Community College in Melfa, VA.

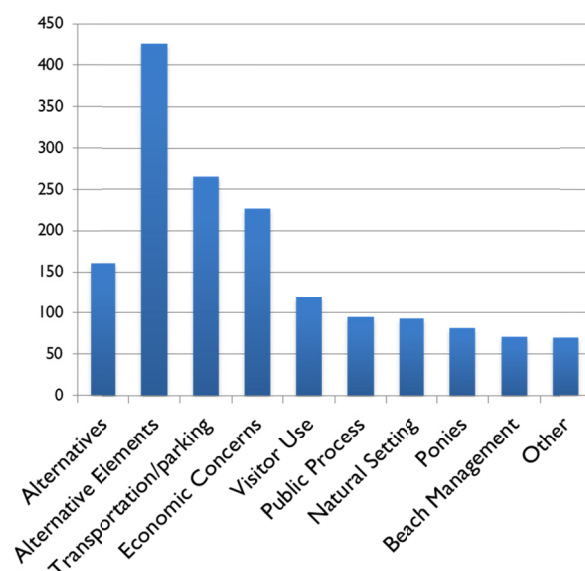
- *August 31, 2011*: One public meeting from 4:00 p.m. to 7:00 p.m. at the Delmarva Discovery Center in Pocomoke City, MD.

In all, 663 comments were received. Approximately 17 percent (113) of commenters self-identified as property owners and 29 percent (189) of commenters self-identified as visitors. The format of written comments included the use of the public meeting comment form, personalized emails or letters, and petitions (see Figure 5-2). Written comments on draft alternatives were submitted directly to the Refuge Manager, the USFWS regional office, or to the refuge staff. The email address northeastplanning@fws.gov was provided as the designated email address for the project. Comments were also made by participants at the four public meetings held in late August 2011 on comment forms and scrolls provided at exhibits showing the draft alternatives. Some participants submitted comments via more than one format but such comments were only counted once.

Figure 5-2: Format of Comments Received



Comments focused on the four draft alternatives presented in the newsletter as well as other suggested alternatives and alternative elements. Some of the responses were related to only one subject, while others addressed multiple subjects. Most stakeholders commented on transportation/parking, economic concerns, visitor use, the public process itself, the natural setting of the refuge, the Chincoteague ponies, beach management, and other general comments. Figure 5-3 provides the distribution of comments received by topic.

Figure 5-3: Topics Raised in Comments

5.4 Planning Team Meetings

USFWS assembled a CCP/EIS Planning Team of public stakeholders who met throughout the planning process for this CCP/EIS and included representatives from the following public agencies: USFWS, NPS Assateague Island National Seashore, town of Chincoteague, Accomack County, Accomack County Board of Supervisors, Accomack-Northampton Planning District Commission, VMRC, VDGIF, and NASA. Participants were added over time as they were identified, and although all agencies were invited to each meeting, not all were able to attend each meeting. The Volpe National Transportation Systems Center served as facilitator.

Three CCP Planning Team meetings were held:

- *April 6, 2011:* Participants discussed the qualities and attributes of the refuge, reviewed and revised management issues and goals, and drafted a preliminary refuge vision statement.
- *June 21-22, 2011:* Refuge solicited feedback on preliminary draft alternatives to be presented to the public in August for comment. Participants reviewed draft, preliminary management objectives and strategies for key issues across four alternatives and provided feedback on specific content, both in terms of what range of objectives should be considered for each issue but also how specific objectives can be accomplished. On one day, visitor service issues were discussed, and on the other day, resource management issues were discussed. Each day also covered cross-cutting issues.
- *December 21, 2011:* Participants discussed comments received and proposed changes to the CCP draft alternatives. The discussion and subsequent follow-up resulted in clarifications and additional changes to the alternatives.

5.5 Other Meetings of Note

Throughout the development of the draft CCP/EIS, from 2010 to 2012, the refuge conducted a series of meetings with local, Federal, and State agencies and representatives to inform them of the status of the CCP/EIS and solicit input on different considerations. These included meetings

specific to the economic analysis for the CCP and to the feasibility of relocating the recreational beach. Some of these meetings included the following:

- *August 10, 2010:* Meeting with Town Beach Access Committee.
- *September 9, 2010:* Coordination meeting with the VDGIF and the Wildlife Services (WS) Division of USDA Animal and Plant Health Inspection Service (APHIS) to discuss CCP issues.
- *February 4, 2011:* Coordination meeting with VDGIF and USDA APHIS WS to discuss CCP issues.
- *March 7, 2011:* Meeting with Marine Science Consortium and NASA to discuss coastal zone research.
- *March 8, 2011:* Meeting with NPS and the VMRC to discuss CCP/GMP issues.
- *March 10, 2011:* Meeting by conference call with NPS to discuss CCP and GMP.
- *March 22, 2011:* Kick-off for Structured Decision-Making (SDM) process for recreational beach.
- *April 28, 2011:* Webinar on sea level rise and coastal impoundment management to inform SDM process.
- *May 4, 2011:* Town Hall Meeting with NPS.
- *June 20, 2011:* Meeting with Congressman Scott Rigell (Virginia District 2) to discuss draft alternatives and tour proposed relocated recreational beach.
- *August 12, 2011:* Meeting with NPS to discuss CCP preliminary draft alternatives.
- *August 17, 2011:* Briefing by conference call of congressional staff on the CCP.
- *August 23, 2011:* Meeting with Town and USFWS Economics Division to discuss CCP economic analysis.
- *August 29, 2011:* Meeting with Mayor and Town staff to assess beach damage from Hurricane Irene.
- *September 19, 2011:* Tour of proposed beach relocation area by Town Beach Access Committee by hay wagon.
- *September 19, 2011:* Meeting with Ron Wolff, Supervisor, Accomack County and constituents in Atlantic, VA about CCP.
- *September 20, 2011:* Meeting with Beach Access Committee to discuss preliminary draft alternatives.
- *November 17, 2011:* Update by conference call of congressional staff on the CCP.
- *January 19, 2012:* Meeting with the Town to review the draft baseline economic analysis for the CCP.
- *February 17, 2012:* Oversight Hearing for the U.S. House of Representatives Natural Resources Committee's Subcommittee on Fisheries, Wildlife, Oceans, and Insular Affairs on "Fish and Wildlife Service's Proposed Comprehensive Conservation Plan and its Potential Devastating Impact on the Economy of the Town of Chincoteague, Virginia."
- *February 22, 2012:* Meeting with USACE in Norfolk, VA on CCP issues.
- *February 23-24, 2012:* Presentation on the CCP at the Virginia State and Federal Partners Meeting, attended by various State and Federal agencies.
- *March 22, 2012:* Meeting with Virginia U.S. Senator Mark Warner's staff to provide overview of refuge CCP issues.
- *April 11, 2012:* Visit by representatives from the Cooperative Alliance for Refuge Enhancement to tour the refuge and discuss CCP issues.
- *May 8, 2012:* Site visit by USACE to identify issues with relocated beach and parking sites.

- *May 15, 2012:* On-site visit and meeting with USGS and Virginia Tech to discuss sea level rise and the piping plover.
- *May 16, 2012:* Meeting between USFWS Region 5 staff and U.S. Congressman Scott Rigell (Virginia District 2).
- *June 4-5, 2012:* Site visit by consultant conducting external review of the CCP/EIS process, in particular the range of alternatives and their viability.
- *June 15-16, 2012:* Presentation and beach walk on climate change and sea level rise with Orrin Pilkey, Professor Emeritus of Earth and Ocean Sciences, Nicholas School of the Environment, at Duke University, and Founder and Director Emeritus of the Program for the Study of Developed Shorelines, which is currently based at Western Carolina University.
- *July 18, 2012:* Site visit and meeting with USACE, NPS, and local government officials to discuss impacts of beach and parking relocation.
- *July 31, 2012:* Kick-off for Wilderness Review (NPS and USFWS collaboration for Assateague Island).
- *August 8, 2012:* Informal consultation with USFWS staff on Delmarva fox squirrel status.
- *August 23, 2012:* Meeting between Joe McCauley, USFWS Region 5 Regional Chief, Division of Realty, and CCP regional lead, and the Town Council and the Beach Access Committee to discuss CCP.
- *September 13, 2012:* Presentation by USFWS Economics Division to Town Council and Beach Access Committee on results of baseline economic analysis for CCP.
- *October 17, 2012:* Presentation by USFWS Economics Division to Accomack County Board of Supervisors on results of baseline economic analysis for CCP.
- *October 17, 2012:* Meeting and site visit with U.S. Congressman Scott Rigell (Virginia District 2) and staff, as well as the Mayor of Chincoteague and representative from the Accomack County Board of Supervisors.
- *January 30, 2013:* Briefing on status of CCP by Joe McCauley for the Town of Chincoteague's Beach Access Committee via phone.
- *April 5, 2013:* Visit and meeting with Virginia U.S. Senator Tim Kaine, as well as the Mayor of Chincoteague and a representative of the Beach Access Committee, to discuss the CCP.

5.6 Public Outreach

USFWS employed a number of outreach strategies, including newsletters, a Web site, radio interviews, and traditional media coverage.

5.6.1 Newsletters

USFWS developed and distributed six “CCP Update” newsletters dated February 2011, May 2011, August 2011, August 2012, November 2012, and April 2013. The newsletters described the USFWS and the Refuge System, the planning process, proposed and updated Draft CCP/EIS schedule, summaries of public comments, potential issues to be addressed in the Draft EIS/CCP, draft Refuge vision and goals, and times and locations of upcoming public meetings. Additional details on each newsletter are provided below:

- *February 2011:* This newsletter described the Notice of Intent in the *Federal Register* to prepare the EIS/CCP and the initial public scoping process. In addition to background information on Chincoteague NWR, the newsletter provided a summary of comments from

the completed public scoping process, including a categorization of all comments by topic area.

- *May 2011:* This newsletter outlined the members of the CCP/EIS Planning Team and introduced the structured decision-making processes for determining potential alternative locations for the public recreational beach as well as other parallel efforts. In addition, the newsletter presented the draft vision statement and goals for the refuge.
- *August 2011:* This newsletter provided detail on the four preliminary draft alternatives under consideration to initiate a public comment period. In addition to providing the draft preliminary alternatives and requesting comments, the newsletter announced meeting purpose, dates, locations, and times; provided USFWS contact information; provided background summary information on the CCP; provided instructions on submitting comments; and listed locations where additional information on the process was available.
- *August 2012:* This newsletter provided information on the draft alternatives, refined from public feedback. Three alternatives are presented and, in light of public concerns expressed since the release of the preliminary draft alternatives, clarification as to how the different alternatives and the larger CCP effort will impact recreational beach access and parking.
- *November 2012:* This newspaper summarized the impact of Hurricane Sandy on the refuge and addressed how Hurricane Sandy would and would not impact the CCP/EIS. Overall, Hurricane Sandy resulted in a delay in schedule but no changes to alternatives.
- *April 2013:* This newsletter provided an update on the schedule for the CCP/EIS, a review of the alternatives, and information on post-Sandy restoration and the effects of the Federal budget sequestration on the refuge.

The first three newsletters were made available online and in hard copy at several locations and public meetings. The August 2011 newsletter, in which the preliminary draft alternatives were first made public, was made available at the following locations and events:

- Refuge's Herbert H. Bateman Educational and Administrative Center,
- NPS Toms Cove Visitor Center,
- the public library and Sundial Book Store in the town of Chincoteague,
- Public meetings for scoping and draft preliminary alternatives,
- Seashore's GMP meeting at the Marine Science Consortium on Wallops Island,
- Refuge's monthly Community Leaders Meetings, and
- A Kiwanis Club meeting featuring Refuge Manager Louis Hinds.

Hard copies of the August 2011 newsletter were also distributed by TNC and a refuge volunteer. Finally, hard copies were mailed to individuals upon request.

The three most recent newsletters (August 2012, November 2012, and April 2013) were made available online, including through several forms of social media such as Twitter and Facebook.

5.6.2 Web

In addition to the newsletters, all meeting dates, updates to alternatives, and background information were made available on the refuge's CCP planning Web site throughout the process: <http://www.fws.gov/northeast/planning/Chincoteague/ccphome.html>.

5.6.3 Radio

Throughout the CCP process, from August 2010 to March 2013, the refuge manager and others, including representatives from USFWS Region 5, have made periodic appearances on air on local radio stations WCTG 96.5 FM and Delmarva Public Radio's WSDL National Public Radio (NPR) News 90.7 to discuss the CCP. Such appearances have occurred to announce newsletters, public meetings, and address specific concerns around the CCP.

5.6.4 Media

There has been extensive media coverage of the CCP, from local newspapers such as the *Chincoteague Beacon* and *Eastern Shore News* to national newspapers such as the *Washington Post*, as well as on-line blogs and social media. USFWS has issued public releases to the media on newsletters and meetings. In addition, USFWS submitted a letter to the *Washington Post* in response to Timothy Saasta's opinion article, "A misguided approach to preserving Chincoteague's refuge," published in the *Post* on December 9, 2011. The USFWS letter was published December 23, 2011.

5.7 Draft CCP/EIS Public Comment Period

The input USFWS obtained from public meetings, comments, and workshops informed the preparation of this draft CCP/EIS, which will be released for 60 days of public review and comment. USFWS encourages the public to respond with ideas about the plan. During that period, USFWS will host public meetings and hearings at locations near the refuge to gather opinions and answer questions about the draft CCP/EIS.

Comments may also be submitted in written form by mail or e-mail to the address provided:

Thomas Bonetti, Planning Team Leader
U.S. Fish and Wildlife Service, Region 5
300 Westgate Center Drive
Hadley, MA 01035-9589
Email: northeastplanning@fws.gov; specify "Chincoteague" in subject line.

The USFWS considered all public comments submitted prior to preparing the Draft EIS/CIS and will take future comments on the Draft EIS/CCP into consideration before preparing the Final EIS/CCP.

Chapter 6

Gary Kramer/USFWS



Black Skimmer

List of Preparers

Chapter 6: List of Preparers**6.1 U.S. Fish & Wildlife Service****6.1.1 Region 5**

Thomas Bonetti, Senior Refuge Planner, B.S. Biology, M.S. Recreation Administration
 Scott Kahan, Regional Chief, National Wildlife Refuge System, B.S. Wildlife Biology
 Tylar Greene, Public Affairs Officer, B.A. Geography/Geographic Information Systems and Journalism
 Meredith Bixby, Outreach Assistant, B.S. Arts and Letters, M.S. Wildlife Conservation
 Margaret Engesser, Outreach Assistant, B.A. Environmental Studies, Anthropology, M.R.P. Regional Planning
 Kathryn Fox, Assistant Planner, B.A. Environmental Studies and Sociology
 Joseph McCauley, Wildlife Administrator, B.S. Wildlife Management
 Andrew Milliken, North Atlantic Landscape Conservation Cooperative Coordinator, B.A. Northern Studies/Biology, M.S. Biological Oceanography
 Janith Taylor, Division of Natural Resource Chief, B.S. Wildlife Biology
 Les Vilchek, Biologist (GIS), B.S. Conservation and Resource Development
 John S. Wilson, Regional Historic Preservation Officer/Archaeologist, B.A. & M.A. Anthropology

6.1.2 Chincoteague & Wallops Island National Wildlife Refuge

Amanda Daisey, Deputy Refuge Manager, B.S. Wildlife Science, M.S. Natural Resources
 Michael S. Dixon, Supervisory Park Ranger, B.S. Park Administration, M.A. Corporate and Organizational Communication
 Kim Halpin, Deputy Refuge Manager, B.S. Biology
 Louis Hinds, Refuge Manager, B.S. Wildlife Biology
 Kevin Holcomb, Supervisory Wildlife Biologist, B.S. Environmental Studies/Biology

6.1.3 Virginia Ecological Services Field Office

Cindy Schulz, Field Supervisor, B.S. Forestry, Fisheries, and Wildlife, M.S. Wildlife Ecology

6.1.4 USFWS Economics Division

James Caudill, Division Chief, B.A. Geography, M.A. Agricultural Economics, M.A. Architecture and Urban Planning, Ph.D. Agricultural Economics
 Edward Mailllett, Senior Economist, B.A. and M.A. Economics

6.2 Department of Interior**6.2.1 Office of the Regional Solicitor, Northeast Region****6.3 U.S. Department of Transportation Volpe National Transportation Systems Center**

Becky Blatnica, AICP, Environmental Protection Specialist, B.A. History and Geography, Master of Community and Regional Planning
 Jonathan Cybulski, Environmental Protection Specialist, B.S. Environmental Science
 David Daddio, B.S. Environmental Policy, Master of City and Regional Planning

Marla Engel, AICP, Environmental Protection Specialist, B.A. Urban Planning/Political Science, Master of Regional Planning
 Lindsey Morse, AICP, Community Planner, A.B. Social Studies with a Certificate in Health Policy, Master of Urban Planning
 George Noel, Civil Engineer, B.S. Civil Engineering
 Rosalie Ray, Economist, B.A. Economics
 Frank Smigelski, Environmental Protection Specialist / NEPA Team Leader (until August 2011), B.S. Biology, M.S. Engineering

6.4 Tennessee Valley Authority

Anne Aiken, Program Manager
 Winifred Nannette Brodie, Senior Environmental Scientist
 Patricia Ann Hamlett, Geographic Information and Engineering
 Shawn Markus, Geographic Information and Engineering
 Chevales Williams, Environmental Engineer

6.5 Planning Team

Jack Tarr, Mayor, Town of Chincoteague
 Rob Ritter, Town Manager, Town of Chincoteague
 Bill Neville, Town Planner, Town of Chincoteague
 John Jester, Town Councilman, Town of Chincoteague
 Trish Kicklighter, Superintendent, Assateague Island National Seashore
 Carl Zimmerman, Management Assistant, Assateague Island National Seashore (retired)
 Todd Engelmeyer, District Wildlife Biologist, Virginia Division of Game and Inland Fisheries
 Hank Badger, Chief Engineer – Eastern Area, Virginia Marine Resources Commission
 Caroline Massey, Assistant Director, National Aeronautics and Space Administration (NASA) / Wallops Island
 Elaine Meil, Executive Director, Accomack-Northampton Planning District Commission
 Curt Smith, Director of Planning, Accomack-Northampton Planning District Commission
 Rob Testerman, Accomack County Planning Department
 Steve Miner, Accomack County Administrator
 Robert Crockett, Supervisor, Accomack County Board of Supervisors
 Wanda Thornton, Supervisor, Accomack County Board of Supervisors

6.6 Technical Experts

Participants and invitees to the February 2009 Technical Experts Meeting; titles and affiliations listed are as of February 2009

6.6.1 U.S. Fish and Wildlife Service

Richard Roberts, Volunteer Biologist, Chincoteague NWR
 Hal Laskowski, Biologist, Region 5
 Delissa Padilla Nieves, Coastal Biologist, National Wildlife Refuge System
 Brian Czech, National Wildlife Refuge System, Conservation Biologist
 Tom Penn, Wildlife Refuge Biologist, Blackwater NWR /Chesapeake Marshlands National Wildlife Refuge Complex (NWRC)
 Suzanne Baird, Refuge Manager (Project Leader), Chesapeake Marshlands NWRC

6.6.2 Other Federal Agencies

David Allaben, Southeast District Supervisor, Wildlife Services, U.S. Department of Agriculture (USDA)

Steve Kendrot, Biologist, Animal and Plant Health Inspection Service, USDA

Brian Scharle, Biologist, Animal and Plant Health Inspection Service, USDA

Sam Droege, Biologist, Patuxent Wildlife Research Center, U.S. Geological Services

Adrianna Ortiz, Student Ecologist, U.S. Navy Surface Combat Systems Center (Wallops Island)

Marilyn Ailes, Ecologist, U.S. Navy Surface Combat Systems Center (Wallops Island)

Carolyn Turner, Group Lead/Environmental Program Manager, NASA

Joshua Bundick, Lead, NEPA and Water Programs, NASA

Joel Mitchell, Lead, Hazardous Waste & Natural Resources Program, NASA

6.6.3 Local Government

Katherine Munson, Planner (Land Preservation), Worcester County, Maryland

Ray Rosenberger, Member, Eastern Shore Resource Conservation and Development Council and Chincoteague Planning Commission

6.6.4 Commonwealth of Virginia

Ruth Boettcher, Biologist, Virginia Department of Game & Inland Fisheries

Dot Field, Eastern Shore Steward, Virginia Department of Conservation and Recreation

Robbie Lewis, Area Forester, Virginia Department of Forestry

Tony Watkinson, Deputy Chief Habitat Management Division, Virginia Marine Resources Commission

6.6.5 The Nature Conservancy

Joe Fehrer, Nassawango Land Manager, Maryland/DC Field Office

Alexandra Wilke, Bird Conservation Specialist, Virginia Field Office

Joe Scalf, Habitat Restoration Specialist, Virginia Field Office

Steve Parker, Director, Virginia Coast Reserve

Barry Truitt, Chief Conservation Scientist, Virginia Coast Reserve

6.6.6 Academic Institutions

Dr. Michael Fenster, Professor, Environmental Studies Program, Randolph-Macon College

Dr. George Oertel, Professor, Associate Director for the Program for Spatial Analysis of Coastal Environments Program and Director of the Barrier Island Program, Department of Ocean, Earth and Atmospheric Sciences, Old Dominion University

Acronyms and Glossary

Amanda Boyd/USFWS



Willet

Acronyms and Glossary

Acronyms

ACJV	Atlantic Coast Joint Venture
AGO	America's Great Outdoors
AHWP	Annual Habitat Work Plans
ANEC	A&N Electric Cooperative
AQI	Air Quality Index
BCC	Birds of Conservation Concern
BCR	Bird Conservation Regions
BIDEH	Biological integrity, diversity, and environmental health
BBS	North American Breeding Bird Survey
CAA	Clean Air Act
CCB	Center for Conservation Biology
CCP	Comprehensive Conservation Plan
CD	Compatibility Determinations
CEQ	Council on Environmental Quality
CFI	Continuous Forest Inventory
CFR	Code of Federal Regulations
CNHA	Chincoteague Natural History Association
DNR	Department of Natural Resources
DOI	Department of the Interior
DOT	Department of Transportation
DRPT	Virginia Department of Rail and Public Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
EDA	Economic Development Administration
EFL	Eastern Federal Lands
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERFO	Emergency Relief of Federally Owned Roads Program
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
HMP	Habitat Management Plan
HUD	Housing and Urban Development Administration
IBA	Important Bird Area
IPCC	Intergovernmental Panel on Climate Change
LPP	Land Protection Plan
USFWS	U.S. Fish and Wildlife Service
MOU	Memorandum of Understanding
MSC	Marine Science Consortium
NAAQS	National Ambient Air Quality Standards
NABCI	North American Bird Conservation Initiative
NACA	National Advisory Committee for Aeronautics
NADP	National Atmospheric Deposition Program
NASA	National Aeronautics and Space Administration
NAWCP	North American Waterbird Conservation Plan
NAWMP	North American Waterfowl Management Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWF	North Wash Flats

NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
OSV	Over-sand vehicle
PIF	Partners In Flight
PIT	Passive Integrated Transponder
PPP	Preliminary Plan Proposal
SDM	Structured Decision Making
SHPO	State Historic Preservation Office
SLAMM	Sea Level Affecting Marshes Model
SSWG	State Wildlife Grant Program
STAR	Shore Transit and Rideshare
SWF	South Wash Flats
T&E	Threatened and Endangered
TNC	The Nature Conservancy
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USC	United States Code
USACE	U.S. Army Corps of Engineers
USSCP	U.S. Shorebird Conservation Plan
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VDCR	Virginia Department of Conservation and Recreation
VCAP	Virginia Coastal Avian Partnership
VDF	Virginia Department of Forestry
VDGIF	Virginia Department of Game and Inland Fisheries
VMS	Variable Message Sign
VOP	Virginia Outdoors Plan
WCS	Water Control Structure
WWF	Wallops Flight Facility

Glossary

<i>Adaptive Management:</i>	Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in a management plan. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.
<i>Alternative:</i>	Alternatives are different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues (Service Manual 602 FW 1).
<i>Biological Diversity:</i>	The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1). The Refuge System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as biodiversity.
<i>Comprehensive Conservation Plan:</i>	A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (Service Manual 602 FW 1).
<i>Concern:</i>	See Issue
<i>Designated Wilderness Area:</i>	An area designated by the U.S. Congress to be managed as part of the National Wilderness Preservation System (Service Manual 610 FW 1).
<i>Disturbance:</i>	Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).
<i>Ecosystem:</i>	A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.
<i>Endangered Species (Federal):</i>	A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
<i>Endangered Species (State):</i>	A plant or animal species in danger of becoming extinct or extirpated in the state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.

<i>Environmental Assessment (EA):</i>	A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).
<i>Environmental Impact Statement (EIS):</i>	A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).
<i>Estuary:</i>	The wide lower course of a river into which the tides flow. The area where the tide meets a river current.
<i>Focal Species:</i>	Focal species are those that received special management considerations due to their status (threatened or endangered), economic importance, declining population status, high degree of public interest, or similar attributes.
<i>Goal:</i>	Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Service Manual 620 FW 1.6J).
<i>Habitat:</i>	Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.
<i>Habitat Type:</i>	A land classification system based upon the concept of distinct plant associations.
<i>Invasive species</i>	An alien species whose introduction causes or is likely to cause environmental harm or economic losses or harm human health. An invasive species is usually an aggressive plant or animal that colonizes a habitat and displaces native and beneficial species.
<i>Invertebrates</i>	Any animal lacking a backbone or bony segment that encloses the central nerve cord.
<i>Impoundment</i>	An area of tidal marsh that has been cut off from tidal inundation through the construction of dikes, dams, or water control structures.
<i>Issue:</i>	Any unsettled matter that requires a management decision [e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or other presence of an undesirable resource condition (Service Manual 602 FW 1.6K)].

<i>Management Alternative:</i>	See Alternative
<i>Migration:</i>	The seasonal movement from one area to another and back.
<i>Migratory Birds</i>	Birds that follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds
<i>Moist Soil Management:</i>	A technique that targets wetlands and their unique cycles of flooding and draining to support wildlife.
<i>Monitoring:</i>	The process of collecting information to track changes of selected parameters over time.
<i>National Environmental Policy Act of 1969 (NEPA):</i>	Requires all agencies, including the USFWS, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision-making (40 CFR 1500).
<i>National Wildlife Refuge System Improvement Act of 1997:</i>	Under the Refuge Improvement Act, the USFWS is required to develop 15-year comprehensive conservation plans for all national wildlife refuges outside Alaska. The Act also describes the six public uses given priority status within the Refuge System (i.e., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) (Public Law 105-57).
<i>National Wildlife Refuge System Mission:</i>	The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.
<i>National Wildlife Refuge System:</i>	Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management areas; or waterfowl production areas.
<i>National Wildlife Refuge:</i>	A designated area of land, water, or an interest in land or water within the Refuge System.

<i>Native Species:</i>	Species that normally live and thrive in a particular ecosystem.
<i>Objective:</i>	A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).
<i>Overwash</i>	The process that causes the transportation and deposition of water and sediment over the beach crest.
<i>Preferred Alternative:</i>	This is the alternative determined (by the decision-maker) to best achieve the refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.
<i>Priority Species:</i>	Fish and wildlife species that require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) State-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.
<i>Public:</i>	Individuals, organizations, and groups; officials of Federal, state, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in service issues and those who do or do not realize that Service decisions may affect them.
<i>Refuge Goal:</i>	See Goal
<i>Representative Species:</i>	A representative species is a species whose habitat needs, ecosystem function, or management responses are similar to a group of other species. It is assumed that conservation planning and actions for a representative species will also address the needs of other species.
<i>Songbirds:</i> (Also <i>Passerines</i>)	A category of birds that is medium to small, perching landbirds. Most are territorial singers and migratory.
<i>Strategy:</i>	A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).

<i>Study Area:</i>	The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP, the study area includes the lands within the currently approved refuge boundary and potential refuge expansion areas.
<i>Threatened Species (Federal):</i>	Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
<i>Threatened Species (State):</i>	A plant or animal species likely to become endangered in the state within the near future if factors contributing to population decline or habitat degradation or loss continue.
<i>U.S. Fish and Wildlife Service Mission:</i>	The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.
<i>Vegetation Type, Habitat Type, Forest Cover Type:</i>	A land classification system based upon the concept of distinct plant associations.
<i>Vision Statement:</i>	A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (Service Manual 602 FW 1.6 Z).
<i>Wetlands</i>	Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. These areas are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted to life in saturated soil conditions.
<i>Wilderness Study Areas:</i>	Lands and waters identified through inventory as meeting the definition of wilderness and undergoing evaluation for recommendation for inclusion in the Wilderness System. A study area must meet the following criteria: Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; Has outstanding opportunities for solitude or a primitive and unconfined type of recreation; and Has at least 5,000 contiguous roadless acres or is sufficient in size as to make practicable its preservation and use in an unimpaired condition (Service Manual 610 FW 1.5).
<i>Wilderness:</i>	See Designated Wilderness Area

Wildfire: A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

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Kirk Rodgers/USFWS



Common Tern

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Literature Cited

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Appendix A

Bill Thompson/USFWS



American Black Duck

The Proposed Assateague Wilderness: Building Blocks for the Wilderness Character Monitoring Report

2012

U.S. Fish & Wildlife
Service
U.S. National Park
Service

Taryn Sudol
Wilderness Fellow



[THE PROPOSED ASSATEAGUE ISLAND WILDERNESS]

Building Blocks for the Wilderness Character Monitoring Report

Executive Summary

The Assateague barrier island off the Maryland and Virginia mainland is managed, in part, by the U.S. Fish and Wildlife Service as the Chincoteague National Wildlife Refuge (CNWR), the U.S. National Park Service as the Assateague Island National Seashore (ASIS), and the Maryland Department of Natural Resources as Assateague State Park. Federal and state protection of this island provides a wildlife sanctuary, especially for shorebirds and migratory birds, and recreational opportunities for a high number of visitors.

In response to the Wilderness Act, 1964, the entire island was reviewed to see which areas still possessed primeval characteristics. As a result, the central 6,500 acres of Assateague Island was proposed as wilderness in 1974, but has yet to receive designation. Until such a Congressional decision is made, ASIS and CNWR manage the area to preserve its wilderness character. An evaluation of the current land status will set a 2012 baseline for wilderness character and support a plan for monitoring long-term trends.

An interagency team, representing the U.S. Fish & Wildlife Service (USFWS), National Park Service (NPS), U.S. Forest Service (USFS), and Bureau of Land Management (BLM), developed a guide for wilderness character monitoring. This national strategy is described in the 2008 “Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character across the national Wilderness Preservation System” publication, and will be followed herein.

The purpose of this document is to describe a wilderness character monitoring program for the proposed Assateague Island wilderness. The designed 33 measures are largely consistent for both ASIS and CNWR. They were developed with ASIS and CNWR staff as well as outside USFWS and NPS guidance. They are composed of readily available data such as field surveys, management policies, documented uses, and professional judgment.

First, the setting of the proposed wilderness is described, including current boundary descriptions, the island’s ecology, a legislative history and refuge and park purposes. Second, a wilderness narrative expresses what makes the proposed Island Wilderness special. Third, the process for developing these measures is explained. Fourth, the wilderness character hierarchy is expanded upon to provide context for the fifth section, the Measures. This section describes the suite of proposed measures, such as their relevance to wilderness character, how the data is collected, and 2012 data. This section also includes measures under development and those measures considered but ultimately dismissed as not functional. Lastly, concluding thoughts are given on the proposed monitoring program and continuing issues.

In effect, this document provides a 2012 baseline assessment and describes the wilderness character monitoring program for the proposed Assateague Island wilderness.

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Section 1. Setting of the Assateague Island Wilderness

1.1 Geographic setting: Current Land Status, Boundary Description and Map

The proposed Assateague Island Wilderness is located on the central portion of Assateague Island. This island resides to the east of the Delmarva Peninsula, situated between the Sinepuxent and Chincoteague Bays and Atlantic Ocean. Stretching longer than 37 miles, it crosses through Accomack County, Virginia and Worcester County, Maryland. While the island's shape is in a constant flux, it is approximately 15,616 land acres, and varies between 1.25 and 3 miles wide. The wilderness portion of the barrier island spans the state line. In Maryland it begins south of Fox Hills, stretches through Virginia and ends around the Old Fields Impoundment. The wilderness area is about 5,700 acres or 37% of the island.

The length of the island is divided by three managing agencies. The Maryland Department of Natural Resources owns the Assateague State Park, 688 acres, in the northern part of the island across from the Sinepuxent Bay. The National Park Service (NPS) manages the northern tip of the barrier island, skips over the state park then reaches down to the Virginia state line as the Assateague Island National Seashore (ASIS). The NPS also owns a few small islands bayside of the state line and manages one mile of Tom's Cove Recreational Beach on the Fish and Wildlife Service (FWS) portion of the island through an interagency agreement with the Chincoteague National Wildlife Refuge (CNWR). The FWS manage 9,021 acres on the southern end of the barrier island in Virginia (17 miles) as well as a few islands in southern Maryland as the CNWR

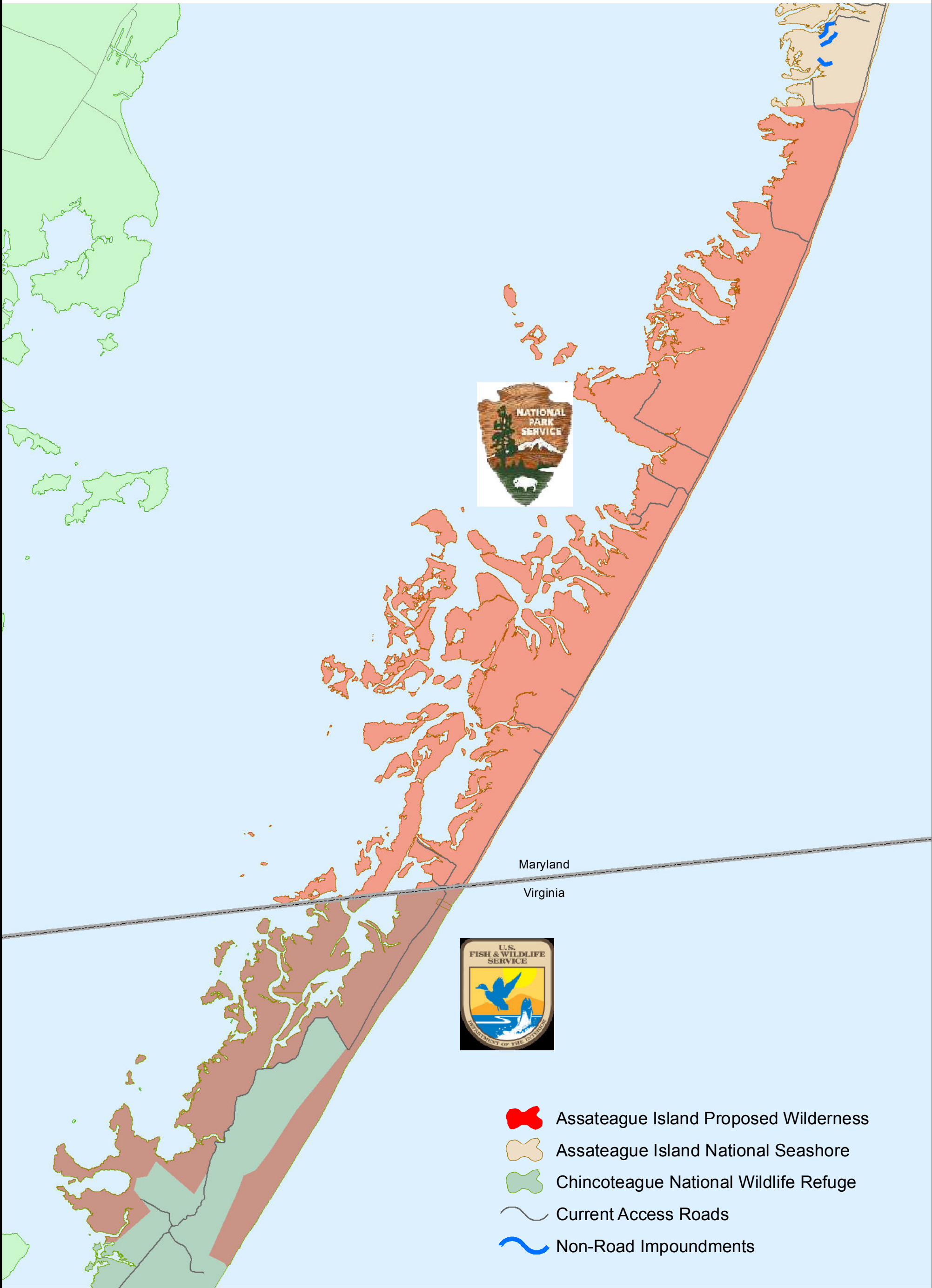
At the time of the wilderness proposal, the FWS was to manage 1,300 acres (882 in Virginia and 418 in Maryland) of recommended wilderness. The NPS was to manage 440 acres of recommended wilderness as well as 4,760 proposed additional wilderness or 5,200 acres total. A recent NPS analysis using 2008 aerial photography and GIS has determined that the NPS wilderness area is actually 4,034 acres rather than 5,200 acres. The most recent GIS maps show that FWS manages 1,721 acres in Virginia. This difference in acreage between 1974 and 2011 is attributed to Assateague Island's changing shape and inaccuracies in the original land estimations.

Beach recreation and wildlife viewing make the Park and Refuge attractive destinations for the nearby urban and suburban residents. The island is within moderate driving distance of several major urban centers. Norfolk, VA is about two and half hours away (85 air miles), Washington D.C. is three and half hours away (110 air miles), and Philadelphia is less than four hours away (105 air miles). As such, CNWR is regularly one of the top six visited National Wildlife Refuges. In the 2011 fiscal year, it received 1,353,354 visitors. The Assateague Island National Seashore received 301,007 visitors (ASIS is ranked 36th in NPS recreation visits). A limited number of these total visitors (about 1% in CNWR and less than 10% in ASIS), however, enter into the Island Wilderness.





ASIS Wilderness Character Map



0 3 Kilometers
0 2 Miles

Produced by Assateague Island National Seashore, Resource Management, GIS

N
August 2012

1.2 Ecological setting

As a barrier island, Assateague Island is constantly responding to wind, waves, and storm surges. Strong waves and storm surges can erode the sand on the beach away from the dune line and back into the ocean or they can push the sand past the dunes and overwash the interior and western portions of the island with sand. Natural sand dunes form based off the frequency and extent of storms and prevailing winds as well as the growth of stabilizing vegetation. Historically the island had low dunes and was frequently overwashed. The coastal edge progressively moves to the west due to erosion and overwash. When the sand is spread across the dunes and marshes, and deposited into the bays on the island's backside, the process is sometimes described as "barrier island rollover" or "island migration."

During the 1950s and early 1960s, tall artificial dunes were built along the Maryland and Virginia portions of the Assateague coast to protect features on the island's interior such as impoundments (moist soil management units for migratory birds) and public use facilities. These tall dunes are vulnerable to strong storms that may blow out or wash the dunes away. Global climate change may bring greater storm events and higher sea levels which will accelerate erosion and overwash. Up until the 1990s, many of these artificial dunes were maintained. The 1993 Master Plan for CNWR deemphasized dune maintenance in Virginia. Strong coastal storm events in Maryland during the 1990s eliminated the majority of these relict artificial dune lines resulting in wide expansive ocean beaches. Allowing for natural barrier island migration is now the favored management practice, as opposed to dune maintenance, on ASIS and the CNWR.

The climate for Assateague Island is primarily influenced by the Atlantic Ocean. The barrier island acts as a buffer for the mainland against hurricanes or tropical storms that travel through the Atlantic. Summer days are usually hot and humid while autumn days are cool and clear. Autumn and winter, however, are Nor'easter season. Nor'easters are low pressure storms with heavy rains, very strong northeast winds, high tides and rough seas. Nor'easters can exert great force on the island. Winter temperatures average at 49 degrees Fahrenheit. Snowfall is uncommon, and rarely accumulates. Rainfall has a uniform distribution throughout the year with an average of 3.5 inches per month or 42 inches a year.

Multiple habitats occur on the barrier island and within the wilderness. These habitats transition from ocean to bayside:

The beach habitat hosts pioneer species such as American sea rocket and sea lavender that can tolerate shifting sands, overwash, limited fresh water, salt water sprays, and extreme winds and temperatures. The beach grass community establishes itself on the stabilized dunes beyond the high tide line. Sea beach Amaranth, a federally threatened plant, is present in low numbers across the island, including the wilderness area. Nesting birds such as the Piping Plover, American Oystercatcher, Least Tern and Black Skimmer will utilize the beach for nesting habitat. Loggerhead sea turtles will also opportunistically nest predominantly within CNWR.

Beyond the dunes are pockets of shrub/early successional habitat. This is composed of shrubs, small trees, and vines, such as wax myrtle, northern bayberry and false Mayberry. Land birds such as the Yellow Warblers, Pine Warblers and Brown Thrashers may be present. Monarch butterflies, tree swallows and Peregrine falcons all migrate through Assateague Island each Fall.

Ancient, stable dunes and stable sand ridges support the forested uplands. The soil is sandy and suited for loblolly pine, the dominant species, and dogwood, high-bush blueberry, greenbrier and fox grape in the understory. Rare or uncommon plants such as the Indian pipe, crested yellow orchid, and pink lady slipper can also be found in the Virginia uplands. The Delmarva Fox Squirrel is present in woodlands in the southern portion of CNWR and may have extended into the wilderness. The uplands may transition to shrub lands again before shifting into the salt marsh habitat.

Salt marshes are rich and productive ecosystems. The vegetation is influenced by tidal flooding and the silty loam soil. Salt marsh cordgrass dominates the low marsh (the zone between low and high tide). Northern sea lavender

and marsh elder grow along the marsh/upland edge. The Clapper Rail and Salt Marsh Sparrow are species of interest in the salt marsh. The Diamondback terrapin also inhabits the salt marsh islands.

1.3 History of land status, legislation, and establishing the wilderness

While no direct evidence has yet been found, it is likely that Assateague Island was used by Native Americans for thousands of years as a place for seasonal plant gathering, hunting and fishing. Giovanni da Verrazano first explored the island in 1524 while sailing for the King of France. For the next one hundred years explorers investigated the island, but colonists preferred the better soils and protected environment offered on the mainland. During the late-1600s, livestock grazed on the island as a way to avoid fencing ordinances on the mainland. The first Assateague Lighthouse was constructed in 1833 and later two life-saving stations, one near Green Run Inlet, MD, were occupied to respond to shipwrecks. Over time livestock herding, hunting, salt extraction and shell fishing brought more inhabitants to the island and established a small village.

In the 1930s and 1940s numerous, large ditches were dug in the salt marshes within Maryland as an effort to control the mosquito population. This failed to limit the mosquitoes and instead disrupted the salt marsh hydrology. In 1943 the Virginia portion of the island became the Chincoteague National Wildlife Refuge to provide a sanctuary for migratory birds, particularly the snow goose. On the Maryland portion, during the 1950s and 1960s intensive development was planned. Ultimately few houses were built but associated infrastructure such as forest clearing, roads and artificial dune construction was underway. In 1962 the Ash Wednesday Nor'easter struck, destroying much of the developments so that only about 30 structures remained in Maryland. When the national seashore was designated in 1965, these structures were moved or destroyed in place. Eleven property owners retained their rights within the seashore, occupying their properties which included roads, docks, and duck blinds over the next 25 years.



Photo: Chincoteague National Wildlife Refuge

The passing of the Wilderness Act of 1964 required that the Secretary of the Interior review every roadless area of 5,000 contiguous acres or more in the units of the NPS as well as any roadless area regardless of size within the NWR, for the suitability of wilderness designation. The results of this review would lead to a wilderness study for potential areas. Based off the wilderness studies, the Secretary of the Interior would make his recommendation to the President of the United States. From there the President would pass his recommendation to Congress, which would formally sign the bill for designated wilderness.

The Chincoteague National Wildlife Refuge was studied jointly with the Assateague Island National Seashore for the inclusion of land in the National Wilderness Preservation System in 1973. The entire island was considered at the time. Due to the heavy recreational uses at the islands poles, lands which still represented primeval character were reduced to the central portion of the island. In 1973, this estimated acreage was 6,500 acres, with 1,740 acres being recommended wilderness and 4,760 acres as additional wilderness. These 4,760 acres would be eligible as wilderness when nonconforming uses, such as multiple retained rights hunting camps were removed or terminated. The public had some concerns with regard to the prohibition of motorized vehicles, but were largely in favor of the wilderness proposal.

United States President, Gerald Ford, recommended this Assateague area as wilderness and Congress drew up the bill in 1974, but has not signed it since. Even though Assateague's lands have not been formally designated as Federal wilderness, the recommended and potential wilderness lands are meant to be managed to preserve the wilderness character. The NPS and FWS manage the land in a way that is generally consistent with the Wilderness Act.

1.4 Refuge and Park purposes

The Chincoteague NWR was established on May 13, 1943 under the authority of the Migratory Bird Conservation Act. This FWS ownership of the land was necessary for the protection of migratory birds, such as the snow goose. The purposes of the refuge are:

“...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (Migratory Bird Conservation Act)

“... suitable for – (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species...” (Refuge Recreation Act)

“... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligation contained in various migratory bird treaties and conventions...” (Emergency Wetlands Resources Act of 1986)

The Assateague Island NS was established on September 21, 1965 by President Lyndon B. Johnson. The purposes of the seashore are to:

“Preserve the outstanding Mid-Atlantic coastal resources of Assateague Island and its adjacent waters and the natural processes upon which they depend;

“Provide high quality resource-compatible recreational opportunities.”

According to the General Management Plan Wilderness Update, the primary goals in managing the Assateague Island Wilderness are to:

“Protect, restore, and preserve the area’s natural resources and values, and the integrity of its wilderness character for present and future generations;

“Provide for freedom of public use and enjoyment of the wilderness area in a manner that is consistent with the Wilderness Act, NPS management policies, park purposes, and the protection of resources and values; and

“Provide for public understanding and support of wilderness resources and values”

1.5 Significant resources and values

Natural –As described in section 1.2, the proposed Island wilderness supports a continuum of habitats that include beach, dunes, shrub lands, maritime forest, and salt marsh. Specialized species have adapted to these habitats year round and this is an important stopover site for migratory birds. Aquatic habitats in the form of sea grasses, salt marshes, sand shallows and mudflats additionally support a high diversity of life. Additionally, the wilderness is intended to have high water quality. The island’s hydrology includes the ocean, estuary, groundwater, and standing surface water. The wilderness is also an area to observe natural coastal processes such as dune formation and migration.

Visitor Experiences –The proposed wilderness can provide visitors with panoramic views, natural sounds, inviting waters, and dark night skies. The diversity of ecosystem types in an accessible landscape is attractive to many locals in the surrounding area as well as long distance visitors. The refuge and seashore value recreation opportunities that include hunting, fishing, birding, hiking and swimming.



Photo: Taryn Sudol

Cultural –Given the history of the island, certain sites have heritage value. The Green Run Hunting Lodge qualifies for the national register. There is a small cemetery in the northern portion of the wilderness as well. Old shipwrecks are still buried beneath the island’s sands and should they emerge, they will be preserved on site or removed to protect their value.

Section 2. Wilderness Character Narrative

A wilderness character narrative is a positive and affirming description of what is unique and special about a given wilderness. The narrative describes the five tangible and measurable qualities of wilderness character. This is a description of values, issues, and threats for the subject wilderness; it is not a critique on the state of wilderness or recommendation for management.

In the beloved children's book, *Misty of Chincoteague*, Marguerite Henry describes the legendary arrival of the island's famous wild horses: "Then they rolled in the wiry grass, letting out great whinnies of happiness. They seemed unable to believe that the island was all their own. Not a human being anywhere. Only grass. And sea. And sky and the wind."

Assateague Island, the Virginia portion of which contains the Chincoteague National Wildlife Refuge, is a barrier island which has been set aside as a wild place of nature. An ocean breeze will push the sand up the beach, roll it over the dunes, rustle the leaves on the wax myrtle shrub and whistle through the tall loblolly pines in the upland forest, until it passes across the salt marshes to the Chincoteague Bay. There are no buildings for the breeze to collide against, no mail boxes to nudge it, and no drive-overs for it to whiz beneath. Although the entire island is preserved as a national park or wildlife refuge, the central 5,700 acres across the Maryland-Virginia state line, is a federally proposed wilderness, where the markings of man are minor and natural forces prevail.

Barrier islands are in constant flux, in response to climatologic impacts. Historically, man has applied his hand to these lands, but their dynamism, over time, erases the human imprint ---Mother Nature clears the scars. The island has existed for thousands of years but has only survived by constantly changing form. Therefore, when visitors stand atop an ancient dune on Assateague, a dune that is perhaps one hundred years old, they see a snapshot in time; they see how nature has meant a barrier island to evolve. The new shape of Assateague may be different, but it is still the barrier island that Giovanni da Verrazzano explored over four hundred years ago.

When the Island Wilderness was proposed in 1974, it was the only undeveloped barrier island between Massachusetts and North Carolina. It is a rarity, and yet within a moderate drive for millions of people from the Norfolk, Washington, DC, Baltimore and Philadelphia metropolises. President Johnson's philosophy was that the Assateague Wilderness would protect one of the few natural shorelines still left, and provide the greatest good for the greatest number of the public.

As of 2012, the United States Congress has yet to sign to bill for Island Wilderness designation but the Assateague Island National Seashore (ASIS) and the Chincoteague National Wildlife Refuge (CNWR) have managed to preserve the wilderness character of the proposed wilderness.

UNTRAMMELED

Wilderness is essentially unhindered and free from modern human actions that control or manipulate the community of life.



At the time of the wilderness recommendation, the Director of the CNWR and the Deputy Director of the ASIS decided that, “The really significant aspect of the proposal is to allow the natural processes of the barrier island to flourish.”

A barrier island, without man’s rigid grip, fluctuates, bends, and rolls over itself on a faster timescale than many other geological processes. The migration of the land has a natural push west to the mainland and to the south because of the tides and littoral drift. The sun, moon, and the Earth all exert their forces to shape this coastal sliver of sand. Storm events and sea level rise further mold the island: pulling sand away, pushing it into new dunes or creating entirely new inlets. These forces act on the island regardless of the presence of man.

One purpose of the proposed wilderness is to provide a natural laboratory, where geologists may observe and study how an island responds to the flow of wind and waves.

If current trends continue and future predications are actualized, it is likely that the island will subside, sea level will rise, and significant storm events will increase. The island, along with the rest of the region, is subsiding due to unknown reasons but scientists speculate the effects of deep aquifer removal. This subsidence adds to local trends in sea level rise. A rise in sea level may reduce the island’s size, erode the sand, alter the habitat composition, and hasten the western and southern migration.

Major storm events reshape island morphology by causing breaks in the dune systems or creating new inlets between the Atlantic Ocean and Chincoteague Bay. With increasing sea level, there is an increased probability of these changes. Yet, much uncertainty remains about the pace of sea level rise and the consequences of global climate change.

An untrammelled wilderness, such as Assateague, allows for substantial alteration due to natural forces. But, the effect of potential landscape alterations may contest with what the public feels is appropriate. In such an instance, the ASIS and CNWR managers are obligated to meet the objectives of the federal Wilderness designation, as well as their specific mandates for the protection of resources. Any engineering, such as dune maintenance or shoreline stabilization, would interfere with the true, natural processes of the barrier island and be considered incompatible with the wilderness designation.

Day-to-day activities of the agencies managing the island’s Wilderness is mostly passive: monitoring species of concern as well as implementation of necessary precautions for the successful proliferation of these species, such as predator exclosures; herbicide applications are made to invasive plants; and steps are taken for the management of the rare fire event. Mitigation efforts, such as removal of abandoned structures and salt marsh restoration activities are currently conducted to improve wilderness character. While these activities may temporarily trammel the environment, they are necessary to restore and enhance the untrammelled qualities of the barrier island.

It is evident that, given free reign, nature is a dynamic, changing force on the Island Wilderness.

NATURAL

Wilderness maintains ecological systems that are substantially free from the effects of modern civilization



Photo: Taryn Sudol

Assateague Island, in the ASIS Administrative History, was described as, “A barren place, swept by wind and sun, its solitude broken only by the shrill cry of wheeling gulls and the metronome boom of the surf.”

In the glare of the bright white sand, pioneer species, such as the American sea rocket and the sea lavender, grasp for a foothold in constantly shifting sands and sprays of salt water. It is a harsh environment where the indigenous species have victoriously adapted.

The sea rocket, for example, has a long taproot to anchor it in the sand and thick, fleshy leaves to retain moisture. The speckled shorebird eggs mimic the seashells which dapple the sand. The dune grass community has established a foothold beyond the high tide line; these flora include American beach grass, sea-oats, seaside goldenrod and sea beach amaranth (a federally threatened plant).

On the other hand, Phragmites and Asiatic sand sedge are invasive non-native plants that have rapidly begun to dominant parts of the wilderness. These two species, left unchecked, will likely spread their monotypic stands, out-competing the native plants which provide better habitat for the wildlife.

The habitat types range from shrubs on the wind-rippled dunes to needle-carpeted upland forests. In these forests, loblolly pines have taken root on only the most stable interior dunes and sand ridges. Years ago these dunes formed as the island rolled over on itself. The continuum of habitats may shift from the sweet pungency of pine woods back to the shrubs, and then to the sharp, tangy salt marsh.

The sun is strong and the wind is often forceful, yet wildlife found here and have nestled closely with available flora. The wild horses and Sika deer, both introduced animal species, have adapted to this harsh, salty scrub by feeding on salt grasses and other plant life. Although the wild horses have become a cultural attraction, and the Sika deer have supplemented the hunter’s catch, their grazing pressures and trampling effects have added strain to the fragile and challenged vegetation system.

In addition, climate change will expose vulnerabilities in current vegetation composition and wildlife populations. As mentioned above, the wilderness will likely face more frequent disturbances in the form of sea level rise as well as increased storms and droughts. The varieties of habitat may shift as the beach expands or contracts. Beach

nesting shorebirds and other wildlife can be significantly impacted from a single storm event. The amount and quality of forage, as well as freshwater may become further limited during droughts.

As the natural features change on the island, the new characteristics will not be any less natural, but they may cause a greater change in a shorter time period than would be expected without a change in climate.

UNDEVELOPED

Wilderness retains its primeval character and influence, and is essentially without permanent improvements or modern human occupation.



An outstanding feature at the time of the wilderness recommendation was Assateague's undeveloped quality. This barren island, with its shrill gulls, was an "onlyness" which had to be protected.

Just as the wire cages protect the federally threatened Piping Plover nests from the common predators, the ASIS and CNWR policies have generally protected this natural landform from the human encroachment.

Assateague Island is relatively flat and one's sight extends far out to distant horizons. On the bay side, the skyline is pine trees; the view is a scattered jigsaw of salt marshes. On the Atlantic side, the blue of the ocean meets the blue of the sky. Within the wilderness, cottontail rabbits cut one off instead of cars; gulls, terns, warblers, and sparrows produce a more complex and pleasing cacophony than the sound of lawnmowers, motor vehicles, and sirens. The corner of one's eye will barely glimpse a deer before it soundlessly disappears into the shrub. What is the wilderness for, if not Beauty?

Luckily, the harsh, infertile qualities of the land have kept Assateague from ever being much developed. The hunting clubs and the fishing camps that did develop have been limited and could be removed. Private property rights from inholdings of 1964 have since been transferred to the National Park Service. Infrastructure associated with intended development such as roads, berms, artificial dunes, and mosquito ditches have been abandoned and eventually will be reset by nature or restored through management. The remaining weatherworn and warped old homes stand in stark contrast to the wind-swept grass and are a reminder of how transient humankind is.

There are still some persistent structures throughout the proposed wilderness. There are unpaved roads for administrative uses, research, and limited recreation. Three back country campsites in ASIS have minimal features such as picnic tables, toilets, or fire rings. Fencing along the state line between Maryland and Virginia is necessary to separate the Assateague and Chincoteague wild horse herds, creates barriers and closures throughout multiple parts of the wilderness. Research structures, signing, and the weather stations also punctuate an otherwise undeveloped landscape.

To sustain resource and visitor protection, staff for research/wildlife monitoring, and law enforcement patrols access the wilderness with motor vehicles. Additionally, recreationists with an Over Sand Vehicle (OSV) permit on the ASIS in Maryland are allowed to drive their vehicle along the beach. This combination of vehicular presence currently impacts the island's wilderness character.

SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION

Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.



Photo: Taryn Sudol

The proposed Island Wilderness offers a vivid contrast to the recreational beaches of either of its sides. To the north or south, visitors can spy birds from the comfort of their own air-conditioned "SUV" seats or tote their cooler and beach blanket only a few yards between the parking lot and the beach.

But, to reach the wilderness on foot a seven mile hike from the Chincoteague side as well as a several mile hike from the Assateague side. It would seem that only the most intrepid would trek to the wilderness, having to brave the summer heat and the thick mosquitoes.

While the CNWR and ASIS are both highly visited, a small proportion of these visitors (approximately 1% on CNWR and less than 10% on ASIS) actually enter the wilderness.

In the wilderness, however, visitors will have escaped a thicket of beach umbrellas and reclining chairs. Here, they can find hoof prints of the wild horses instead of the footprints of flip-flops. When, a visitor reaches the wilderness, the only footprints he or she will see will be their own.

Hiking to the state line in the Island Wilderness makes the word "shipwrecked" feels much more real. It may generate a mixture of accomplishment and humbleness: an oneness with nature. A visitor may contemplate the steady roll of the waves or sympathize with the American sea rocket that has found a way to grow in the hot sun, sand, and salt. There is the chance to see more secretive wildlife that avoid the more populous areas in the park and refuge: a river otter may play on the banks of the Old Fields impoundment; a hunting eagle may soar overhead; a mare may even be giving birth to her colt.

In this scenario, it is easy to feel at peace with nature, but there are distractions which may intrude on any self-induced shipwreck: the persistent or abandoned structures may be more startling in this otherwise undeveloped environment; litter, from far away, may have drifted upon the shore; tire tracks from the last monitoring patrol may mar

the sand; an OSV permit owner may even drive up within a few minutes next to the exhausted hiker. The gas-powered OSV vehicle user, however, will not have the same experience as a human-powered encounter with nature.

This primitive, unconfined recreation on Assateague Island is the intention for its proposed wilderness designation.

OTHER FEATURES OF THE WILDERNESS

A wilderness' future existence and significance evolves with the current flow of natural forces.

The limited human development and the dynamic evolution of Assateague's landscape have left few cultural or archeological features on the island.

Nonetheless, Green Run, a former hunting lodge, has cultural significance and will be preserved. The small cemetery on site will also be protected. Also, an artifact of significance may arise at any time, such as after a major storm. For instance, beneath the feet of a wilderness visitor may await, ready to emerge at a given natural event, the ribs of a washed-up ship; under the drifting sand may be hundreds of ancient maritime relics or other archeological treasures --- for now, unknown and undiscovered.

In conclusion, Assateague Island is a living patch of land moving inexorably over the past and reacting only to the present.

Section 3. Resources and Process

3.1 Documents Consulted

The following is a list of documents consulted to inform the wilderness character monitoring report.

Assateague Island National Seashore. 2012. General Update-Wilderness.

Bureau of Land Management. Measuring Attributes of Wilderness Character: BLM Implementation Guide Version 1.4.

Chincoteague National Wildlife Refuge. 2011. Habitat Management Plan for Chincoteague & Wallops Island National Wildlife Refuges.

Landres, P., et al. 2008. Keeping It Wild: An Interagency Strategy to Monitor Trend in Wilderness Character across the National Wilderness Preservation System. Gen. Tech. Rep. RMRS-GTR-212. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Mackintosh, Barry. 1982. Assateague Island national Seashore: An Administrative History. History Division National Park Service, Department of the Interior, Washington D.C.

U.S. Bureau of Sport Fisheries and Wildlife and National Park Service. 1974. Assateague Island Wilderness Study Summary.

U.S. Bureau of Sport Fisheries and Wildlife and National Park Service. 1973. A Preliminary Feasibility Study of Wilderness Potential on Assateague Island.

U.S. Bureau of Sport Fisheries and Wildlife and National Park Service. 1973. Joint Wilderness Study Draft Assateague Island (VA/MD).

U.S. Bureau of Sport Fisheries and Wildlife and National Park Service. 1974. Draft Environmental Statement: Proposed Assateague Island Wilderness Area Maryland-Virginia.

U.S. Fish and Wildlife Service, Northeast Region Five. 1993. Master Plan Chincoteague National Wildlife Refuge Virginia and Maryland.

3.2 Assateague NS and Chincoteague NWR Staff Consulted

The following is a list of staff that was consulted in the process of identifying measures and researching Assateague Island's wilderness properties. Their time and effort is greatly appreciated.

Assateague NS

Trish Kicklighter, Superintendent
 Bill Hulslander, Chief, Resource Management
 Jack Kumer, Natural Resource Specialist
 Brian Sturgis, Aquatic Ecologist
 Neil Winn, GIS Specialist
 Walt West, Law Enforcement
 Ish Ennis, Chief of Maintenance

Chincoteague NWR

Lou Hinds, Refuge Manager
 Kim Halpin, Deputy Refuge Manager
 Kevin Holcomb, Supervisory Wildlife Biologist
 Emarie Ayala, Wildlife Biologist
 Eva Savage, Biological Technician
 Janelle Walters, Biological Technician
 Charlene Swartz, Maintenance Worker
 Grover "Drizz" Wilgus Jr., Engineering Equip. Operator
 Jenny Owen, Park Ranger
 Jim Fair, Law Enforcement Officer
 Lee Woltman, Refuge Volunteer

3.3 Process Used For Identifying Measures

This section describes the process used to identify the measures for the Assateague Island wilderness character baseline assessment. From the beginning, measures were designed to fit within the “Keeping It Wild” Monitoring Framework.

Research for potential measures first began with an overview of internal Chincoteague NWR documents. The legislative history for the proposed wilderness, including the environmental impact statement and wilderness study, were reviewed to gain insight into valuable features of the lands or development present at the time of designation. Planning documents, such as the Chincoteague NWR Master Plan and Habitat Management Plan were read to learn about activities throughout the Refuge or specifically the proposed wilderness. A tour of the wilderness displayed the ecological systems on site as well as any human impacts within or adjacent to the wilderness. Short interviews with the biological staff further informed the types of activities that take place and led to other literature sources. A search through the CNWR Public drive also attempted to identify wilderness features. This initial overview was used to produce a general inventory of wilderness features and activities in order to determine which measures would be relevant to the assessment.

Reference material through the four land management agencies (BLM, FS, FWS, and NPS) largely informed the compilation of draft measures. Potential measures provided through the Ft. Collins Wilderness Fellows training suggested broad enough measures to be applicable to many refuges. The BLM technical manual was influential in setting measure protocols. Details, such as activity indexes, were completely specific to the proposed Island Wilderness. These were created based off literature and interviews and were further revised in the review process.

The wilderness fellow, Taryn Sudol, reviewed the draft measures with CNWR Supervisory Biologist, Kevin Holcomb, during multiple meetings. These draft measures were then presented to ASIS staff which included Bill Hulslander, Neil Winn, Jack Kumer, and Brian Sturgis. This thorough discussion revised the draft measures so that some measures were added while a few were dismissed. Primary concerns at the meeting included defining what best represented the Natural quality for wilderness character and whether the wilderness character monitoring would require too much time, effort, or resources for the staff to implement. When these measures were decided upon, the wilderness fellow completed her interpretation of the priority score worksheet. This draft was circulated and edits incorporated.

Data collection for the finalized measures occurred over the next several weeks. This included interviews with biological, maintenance and law enforcement staff for knowledge of actions and developments. Data were also collected through external research for regional data, internal data on number of hunters and harvest, and calculations with GIS. As data were collected, measures would be updated to better fit what was available. During this time the wilderness fellow also composed the other parts of the report. When data collection was near completion, Taryn Sudol, Kevin Holcomb, and Bill Hulslander convened to discuss what qualified as a significant change in data. What qualified as a significant change was measure-dependent, but tended to be based on the frequency and variability of when the measurable events occurred. The final time period was spent filling in any gaps in the data and refining the report.

Section 4. Framework For Wilderness Character Monitoring

The Wilderness Act mandates the “preservation of wilderness character.” Based off the legal description of the wilderness definition, the “Keeping It Wild” publication derived five specific qualities to support wilderness character: Untrammeled, Natural, Undeveloped, Opportunities for Solitude or Primitive and Unconfined Recreation and Other Features. This monitoring framework further divides the five qualities of wilderness character into successively finer elements. This hierarchy, from the top down, is composed of qualities, monitoring questions, indicators, and measurements.



Qualities are the primary elements of the wilderness character that are directly related to the statutory language of the Wilderness Act.

Untrammeled –The Wilderness Act states that wilderness is “an area where the earth and its community of life are untrammeled by man,” and “generally appears to have been affected primarily by the forces of nature.” This quality is degraded by modern human activities or actions that control or manipulate the components or processes of ecological systems inside the wilderness. Any modern human action, authorized or unauthorized, that alters the wilderness is considered trammeling, meaning that restraint is a necessary tool in wilderness stewardship. An *action* for this monitoring report is an act or series of acts that purposefully manipulate the biophysical environment. Actions may degrade the untrammeled quality but have a desired impact on another quality.

Natural - The Wilderness Act states that wilderness should be free from the *effects* of “an increasing population, accompanied by expanding settlement and growing mechanization” and that the “earth and its community of life...is protected and managed so as to preserve its natural conditions.” This quality is degraded by intended or unintended effects of modern people on the ecological systems inside the wilderness since the area was designated.

Native species’ communities and the structure and function of ecological systems within wilderness are meant to be protected. All ecological systems change over time and vary from one place to another. This monitoring is not intended to maintain static or unchanging natural conditions in the wilderness nor is one habitat composition more natural than another (if natural forces shaped them). Trends in the indicators may suggest the need for research or more intensive monitoring to verify the change and understand its cause.

Undeveloped –The Wilderness Act states that wilderness is “an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation,” “where man himself is a visitor who does not remain,” and “with the imprint of man’s work substantially unnoticeable.” This quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport because these increase people’s ability to occupy or modify the environment.

Only non-recreational developments are measured under this quality, while recreational structures are measured under a different quality (to avoid double-counting). Some cultural developments may be an important part of wilderness character. These features are allowed to persist in the wilderness.

Solitude or Primitive and Unconfined Recreation –The Wilderness Act states that wilderness has “outstanding opportunities for solitude or primitive and unconfined type of recreation.” This quality is degraded by settings that reduce those opportunities, such as visitor encounters, signs of modern civilization, recreation facilities and management restrictions on visitor behavior. Solitude is meant to separate people from civilization. Primitive recreation relies on personal skills. Unconfined recreation is freedom from societal or managerial controls. Monitoring this quality assessment how the opportunity for people to experience is changing, not on how visitor experiences are changing.

Other Features – The Wilderness Act states that a wilderness “may also contain ecological, geological, or other features of scientific, education, scenic, or historical value.” This quality is degraded by the deterioration or loss of cultural resources integral to the wilderness character. Cultural resources may be damaged by natural disasters or humans.

Monitoring questions are major elements under each quality that are significantly different from one another, which are meant to frame particular management questions.

Indicators are distinct and important elements within each monitoring question. Each monitoring question typically has more than one indicator. There are a total of thirteen indicators. Every indicator must have a measure.

Measures are specific aspects of wilderness on which data are collected to assess the trend of an indicator. More than one measure can describe an indicator therefore providing management with a range of options to assess indicator trends. All measures for the proposed Island Wilderness will be summarized and described in detail in section five.

This hierarchy allows for national assessments of trends while still allowing flexibility for individual agencies and wildernesses to monitoring the specific elements of wilderness character most meaningful to them. The Wilderness Act (P.L. 88-577, Section 7) requires the Secretaries of Agriculture and Interior to jointly report on the status of the National Wilderness Preservation System including descriptions of the areas, regulations in effect, and other pertinent information, together with any recommendations. This mandate necessitates individual wildernesses to monitor and assess wilderness character and report to the national level.

Baseline conditions must be set as a reference point against which change over time is measured and evaluated. Ideally, all baseline data would have been collected at the time of designation. Since few existing wilderness actually have the data that extends back to designation for the measurements created at the time of the monitoring report, the initial condition assessment will be the substitute. For the proposed Island Wilderness, the baseline assessment year is 2012.

With the baseline in place, change can be monitored over time. The trend (improving, degrading, or stable) will be assessed based on what is determined as a significant change. If a significant change has occurred since the last monitoring point, a ↑ is assigned for an increase, a ↓ is assigned for a decrease and a ↔ for stable. These arrows trans into a numerical score: +1 for ↑, a -1 for ↓ and a 0 for ↔. These scores are summed together for the number of measures in each indicator to produce the trend for the indicator; the indicators’ trends are summed for the monitoring question trend, the monitoring trends summed for the qualities’ trend, and finally the qualities’ trends summed for the overall wilderness character trend. If a +1 is added to a -1 this is an “offsetting stable”. This process to compute the trend is automatically done in the wilderness character database when the measurement data is added at each monitoring period.

Section 5. Measurements

This section provides the suite of measures selected to actively monitor wilderness character in 2012 for the proposed Assateague Island Wilderness. Each of the five qualities and their associated measurements has a sub-section. Each sub-section has a table which summarizes the monitoring questions, indicators, measures, and frequency of reporting for each quality. Secondly, each quality will have the detailed attributes for each of its measurements. The following outlines the general format and definitions of the attributes that will discuss each measure.

Definitions of Attributes of Measures	
Measure	A <i>measure</i> is a specific aspect of wilderness on which data are collected to assess the trend of an indicator. The measure being discussed is listed in this section
Indicator	An <i>indicator</i> is defined as a distinct and important element within each monitoring question. The indicator corresponding with each measure is specified in this section to provide context.
Context	The <i>context</i> describes why the measure is appropriate for the site and any background for understanding or interpreting trend in the measure.
Data Source(s)	The <i>data source(s)</i> provides information on where or with whom the data is located for reference. If the data source changes over time, this field should be updated with appropriate information
Data Collection Process	The <i>data collection process</i> is the process used to compile or gather the data with as much detail as possible.
Significant change	A <i>significant change</i> provides information on what degree of change signifies a change in trend. This section also describes how a change in data would improve or degrade the quality or under what ranges the measurement is considered stable. A significant change can be defined as any change, a percent change, or other appropriate units.
Data adequacy (H/M/L)	The <i>data adequacy</i> discusses the degree of confidence in the quality of the data. Data adequacy is ranked high, medium, or low.
Confidence	The <i>confidence</i> describes how the staff feel toward the accuracy or comprehensiveness of the data provided. It is ranked high, medium, or low.
2012 Data	The <i>2012 data</i> refers to the data being reported for the baseline year. This row will provided the data for the subsequent monitoring years as well.
Condition	The <i>condition</i> comments on the staff's general impression of the state of the wilderness with regard to the particular measurement. It is ranked as good, caution, poor, or unknown.

5.1 Natural

Monitoring Question	Indicator	Measurement	Freq. of Reporting
What are the trends in terrestrial, aquatic, and atmospheric natural resources inside the wilderness?	Plant and animal species and communities	Population dynamics of selected non-native plant species	Every five years
		Population dynamics of non-native wild horses	Every five years
		Population dynamics of non-native Sika deer	Every five years
		Number of extirpated indigenous species	Every five years
	Physical	Visibility	Every five years

	Resources	Ozone air	Every five years
		Total Nitrogen and total Sulfur deposition	Every five years
	Biophysical Processes	Mean Sea Level Rise	Every five years
		Significance of storm events	Sum of past five years

Measure 1.1 Population dynamics of selected non-native plant species

Indicator	Plant and animal species and communities																						
Context	A wilderness area can provide protection for sensitive, native plant species. The presence of non-native plant species can shift the flora composition to a historically unnatural state. The proliferation of certain non-native plant species can outcompete native species, resulting in a loss of diversity that once made Assateague Island a distinct natural location. At the time of this baseline assessment, two non-native plants species are considered a threat, Phragmites and Asiatic Sand Sedge (CAKO). Phragmites is a large perennial grass that is capable of forming monotypic stands that out-compete native wetland vegetation and provide poorer habitat for the wetland fauna. Phragmites is able to proliferate in freshwater ponds and on the fringes of salt marshes, supposing the salinity is low enough. While Phragmites may provide cover and shoreline stabilization, the native plant composition would be preferable to supply stabilization, food (seed source), and cover. Asiatic sand sedge colonizes beach habitats and can out-compete American beach grass. Asiatic sand sedge is more vulnerable to wind blow outs or storm erosion. When it forms thick mats in the sand, it becomes poor Piping Plover habitat. While Asiatic sand sedge is a threat as of 2012, there is no known occupied acreage of it in the wilderness at this time.																						
Data source	Internal survey documents and professional judgment																						
Data collection process	A list is compiled for selected non-native plant species. Scouting and vegetative surveys provide the acreage occupied for the selected non-native plants. This is limited to monotypic stands rather than interspersed species. The total measure will be the sum of each specie's "Percent of acreage occupied" score. <table border="1"> <thead> <tr> <th>Species</th><th>estimated percent of the wilderness on which it is found</th><th>Score</th></tr> </thead> <tbody> <tr> <td></td><td>Very Low (or Spot) = <1%</td><td>1</td></tr> <tr> <td></td><td>Low = 1-5%</td><td>2</td></tr> <tr> <td></td><td>Moderate = 5-20%</td><td>3</td></tr> <tr> <td></td><td>High = 20-35%</td><td>4</td></tr> <tr> <td></td><td>Very High = 35-65%</td><td>5</td></tr> <tr> <td></td><td>Extreme = >65%</td><td>6</td></tr> </tbody> </table>		Species	estimated percent of the wilderness on which it is found	Score		Very Low (or Spot) = <1%	1		Low = 1-5%	2		Moderate = 5-20%	3		High = 20-35%	4		Very High = 35-65%	5		Extreme = >65%	6
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	Very High = 35-65%	5																					
	Extreme = >65%	6																					
Data Entry	Every five years																						
Significant Change	ANY change in the acreage occupied score is significant. If the acreage occupied score increases since the last data monitoring point, then it degrades the measurement. If the acreage occupied score decreases, then it improves the measurement.																						
Data Adequacy	Medium-This is limited to monotypic stands. The baseline data is not 2012 but still considered representative of the site.																						

Confidence	Low –Given the age of the data set (1993/1995), staff does not feel it represents the invasive coverage of 2012		
2012 Data	Species	Percent Occupied Score	
		ASIS	CNWR
	Phragmites	1	0
	Asiatic Sand Sedge	0	0
	Total	1	0
Condition	Good		

Measure 1.2 Population dynamics of non-native wild horses

Indicator	Plant and animal species and communities		
Context	While the wild horses on Assateague Island have become a cultural resource, the natural ecosystems on the island become stressed by grazing pressure and trampling effects when horse herds become too large. ASIS and CNWR both have management strategies to maintain a target wild horse population. The horses' island presence is an important feature to many visitors and the public, which requires careful management of the wild horse population.		
Data source	Internal records –Bill Hulslander, Kim Halpin		
Data collection process	The adult horse population (including foals bought back during the Chincoteague Volunteer Fire Company (CVFC auction) for the entire island (herds in both Assateague NS and Chincoteague NWR except the CNWR southern herd which does not have wilderness access) will serve as a surrogate measure for the horses' wilderness presence. These horses have access to large parts of the island including the wilderness area. ASIS monitors their horse population through routine surveys and manages their population through a fertility control program, while the CVFC keeps a number of the CNWR herds. Of the total horse population in CNWR, about two-thirds reside in the North herd which has access to the wilderness. This number may change as horses are transferred from one herd to the other.		
Data Entry	Every five years		
Significant Change	If the horse population increases by 50 since the last data monitoring point, then this degrades the measurement.		
Data Adequacy	Medium-Wild Horse populations are monitored by ASIS staff and the CVFC. This does not directly comment on the amount of impact horses have in the wilderness.		
Confidence	High		
2012 Data	Wild Horse herds		Population
	Chincoteague NWR		83
	Assateague ISLAND NS		113
	Total		196
Condition	Good		



Measure 1.3 Population dynamics of non-native Sika deer

Indicator			Plant and animal species and communities				
Context			The Sika deer were introduced in the early 1920s and have since grown into considerable population. While the island's carrying capacity for Sika deer is unknown, large populations impact the natural quality by overgrazing, competing white-tailed deer, and becoming a source for ticks. A hunting program, in place since the 1960s, have allowed for the harvest of Sika deer.				
Data source			Distance sampling data, Mark Sturm, professional judgment, Jack Kumer				
Data collection process			ASIS has four years of distance sampling data that is able to provide an estimated range for the Sika population as part of a study on ungulate grazing effects on vegetation by Mark Sturm. In the future, ASIS hopes to have new technology or population density methods so that the distance sampling technique does not have to be repeated but the new technique will provide comparable statistical results.				
Data Entry			Every five years				
Significant Change			If the Sika deer harvest increases by 25%, then this degrades the measurement. If the population decreases by 25%, then it improves the measurement.				
Data Adequacy			Medium -This data reflects the island as a whole and is not confined to the wilderness.				
Confidence			Medium –This is a best estimate from a recent but not current study.				
2012 Data			<table><tr><td>Sika Harvest</td><td>Population</td></tr><tr><td>Assateague NS</td><td>24 sika per square mile</td></tr></table>	Sika Harvest	Population	Assateague NS	24 sika per square mile
Sika Harvest	Population						
Assateague NS	24 sika per square mile						
Condition			Unknown –Do not yet know what the island's carrying capacity is for Sika.				

Measure 1.4 Number of extirpated indigenous species

Indicator	Plant and animal species and communities	
Context	The loss of indigenous species on the island reduces biodiversity. This affects the public understanding and experience on the island. Potentially the loss of a certain species can have cascading effects through the ecosystem and reduce ecological services.	
Data source	Internal survey documents and professional judgment, Kevin Holcomb, Jack Kumer	
Data collection process	Based off an inventory of flora and fauna and professional judgment, a count is maintained of any indigenous species no longer believed to be present on the island within the past five years.	
Data Entry	Every five years –any known extirpations since the last monitoring report	
Significant	ANY change in the number of extirpated indigenous species is significant. The more	

Change	species extirpated the more the measurement is degraded, unless it is believed that extirpation occurred through natural processes such as shifting habitats. If an extirpated species is recovered or reintroduced in the wilderness, then it would improve the measurement.	
Data Adequacy	Medium- It is difficult to monitor every specie on the island and know whether it has been completely extirpated or still have a viable population.	
Confidence	Medium	
2012 Data	Extirpated Species	Estimated Date of Extirpation
	Total	0 for ASIS/CNWR
Condition	Good	

Measure 1.5 Visibility

Indicator	Physical Resources	
Context	Deciview is a cumulative index to express light extinction. In other words, deciview indicates the amount of visibility in the landscape. Ideally, a wilderness area will have skies clear of anthropogenic pollutants. Deciview measures the fine nitrates and sulfates in the air, the accumulation of which reduces visibility. Deciview is not measured on site for the Assateague island, so the nearest Deciview reading location will be used.	
Data source	USFWS National Air Quality Office	
Data collection process	To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm . Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).	
Data Entry	Every five years	
Significant Change	For examining temporal changes, we cannot perform a rigorous statistical trend analysis on interpolated data (and for only 2 data points). Instead, we are simply assessing whether the estimated value is increasing or decreasing. Visibility (deciviews – dv): < 2 dv - Good 2-8 dv - Moderate > 8 dv - Significant Concern	
Data Adequacy	Medium --data for this measure came from a location farther than 100 km.	
Confidence	Medium	
2012 Data	Group 50 Visibility minus natural conditions= 11.7 for 2005-2009	
Condition	Significant Concern	

Measure 1.6 Ozone air pollution

Indicator	Physical Resources	
Context	Ozone can be a man-made air pollutant. It is capable of traveling long distances and so may be an unnatural presence in the Island wilderness.	
Data source	USFWS National Air Quality Office	
Data collection	To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations,	

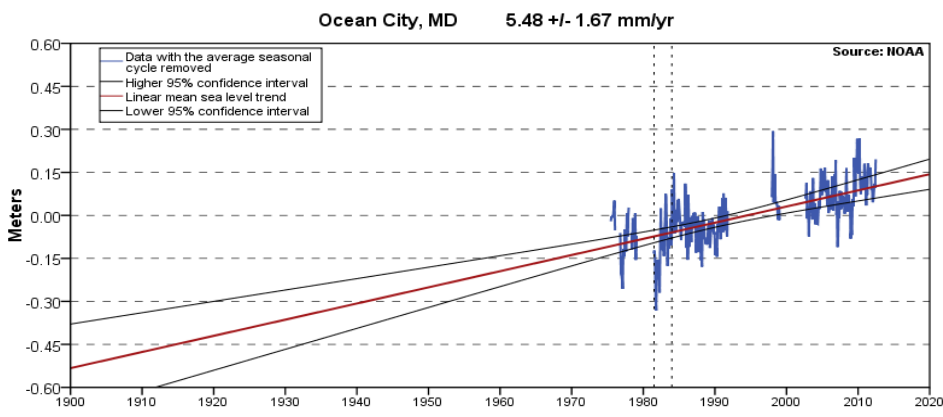
process	averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm . Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
Data Entry	Every five years
Significant Change	For examining temporal changes, we cannot perform a rigorous statistical trend analysis on interpolated data (and for only 2 data points). Instead, we are simply assessing whether the estimated value is increasing or decreasing. Ozone (parts per billion – ppb): < 60 ppb - Good 61-75 - Moderate > 76 - Significant Concern
Data Adequacy	Medium – data for this measure came from a location farther than 16 km.
Confidence	Medium
2012 Data	Ozone 4 th highest 8 hr= 79.1 ppb for 2005-2009
Condition	Significant Concern

Measure 1.7 Total Nitrogen and Total Sulfur deposition

Indicator	Physical Resources
Context	Acid deposition is the concentration of sulfur and nitrogen in the rain or snow. High concentrations can be detrimental for algae, aquatic invertebrates, amphibians, fish, soil microorganisms, plants and trees.
Data source	USFWS National Air Quality Office
Data collection process	To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm . Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
Data Entry	Every five years
Significant Change	For examining temporal changes, we cannot perform a rigorous statistical trend analysis on interpolated data (and for only 2 data points). Instead, we are simply assessing whether the estimated value is increasing or decreasing. Total-N and S (based on wet deposition in kilograms per hectare per year – kg/ha/yr): <1 - Good 1-3 - Moderate > 3 - Significant Concern
Data Adequacy	High – data for this measure came from a location within 16 km.
Confidence	High
2012 Data	Total N= 3.9, Total S= 5.0 for 2005-2009
Condition	Significant Concern

Measure 1.8 Mean Sea Level Rise

Indicator	Biophysical Processes
Context	Sea level rise exerts a major impact on barrier island dynamics. Assateague Island is

	subsiding and may continue to subside in the future. The island's subsidence also contributes to a relative rise in sea level. An increase in sea level causes increases in erosion and quickens the island's westward and southern migration. Sea level rise can disrupt and alter salt marshes. Also, sea level rise is connected to salt water intrusion and storm surge impacts. Should the sea level rise in the future, it may be responsible for changes in wilderness acreage and habitat composition. The altered landscape will not be considered more unnatural than the original. The change in sea level will be monitored, however, to potentially provide an explanation to ecological changes.
Data source	NOAA Mean Sea Level Trend, Ocean City Inlet, MD http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8570283
Data collection process	The mean sea level trend and a plot (from 1900 to 2010) shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. This data is taken from NOAA Tides and Currents at the Ocean City Inlet, MD, which is the nearest station to Assateague Island.
Data Entry	Every five years
Significant Change	At this time, the Refuge and NPS has not determined a sea level rise which is unnatural. The trend will remain stable unless staff's discretion agrees that the current sea level rise is degrading or improving the natural quality for the wilderness.
Data Adequacy	High- The data was collected with a high degree of confidence from the Ocean City station that is monitored by NOAA
Confidence	High
2012 Data	 As of July, 25 2012 the mean sea level trend shows a 5.48 mm/yr rise in sea level with a 95% confidence level of +/- 1.67 mm/yr based on monthly mean sea level data from 1975 to 2006. This is equal to 1.8 feet of sea level rise in 100 years.
Condition	Unknown –While the trend shows a rise in sea level it is difficult to directly comment on how the natural quality is being affected.

Measure 1.9 Frequency of Storm Events

Indicator	Biophysical process
Context	Storm events can influence the barrier island's shape in terms of shore line and dune formation. Strong wind and waves can cause blow outs or overwash as well as erosion. Some meteorological models suggest an increase in storm events due to climate change, thereby exposing the island possibly to more storm events. The resulting landscape from the storm events will not be considered unnatural, but the effects of these storm events may prompt other management actions or developments.
Data source	Hurricanes/Tropical Storms/Tropical Depressions are logged at NOAA Historical

Data collection process	Hurricane Tracks http://csc.noaa.gov/hurricanes/index.html and Nor'easters are logged at National Weather Service Forecast Office: Wakefield VA http://www.erh.noaa.gov/er/akq/EREVIEW.php														
Data Entry Significant Change	Hurricane/Tropical Storms/Tropical Depressions are recorded at NOAA's website above. Locations, Chincoteague and ASIS, are entered in and the storm events are recorded for the five year monitoring period or annually. To learn about Nor'easters go to the National Weather Service Forecast Office for Wakefield VA and see if any Historical Winter Storm Graphics/Events are labeled as Nor'easters in the drop down menu. If so, check the Nor'easter data to make sure it affected the ASIS/CNWR wilderness. As monitoring continues, other weather events that appear to have significantly affected the landscape can be included in this measure so long as it is confirmed and titled consistently with NOAA or the Wakefield Forecast Office.														
Data Adequacy Confidence	Sum of storms for the past five years														
2012 Data	Storm events are variable from year to year but a trend may be visible over time that shows an increase in storms or a decrease in storms. At this time there is no determination of how many storms would be considered unnatural. Depending on the trend over time, future staff may decide whether the number of storms has improved or degraded the natural quality.														
Condition	High –NOAA's tracking is reliable and CNWR/ASIS staff can determine if the reported storm occurred on the island. High Number of significant storms in the past five years: 3														
	<table border="1"> <thead> <tr> <th>Year</th><th>Storm</th></tr> </thead> <tbody> <tr> <td>2007</td><td></td></tr> <tr> <td>2008</td><td>Hanna H1</td></tr> <tr> <td>2009</td><td>Nor'easter 11/11-11/13</td></tr> <tr> <td>2010</td><td></td></tr> <tr> <td>2011</td><td>Irene H2 8/12-8/30</td></tr> <tr> <td>Total</td><td>3</td></tr> </tbody> </table>	Year	Storm	2007		2008	Hanna H1	2009	Nor'easter 11/11-11/13	2010		2011	Irene H2 8/12-8/30	Total	3
Year	Storm														
2007															
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2010															
2011	Irene H2 8/12-8/30														
Total	3														
	Unknown –Are three storms in five years normal?														

5.2 Untrammelled

Monitoring Question	Indicator	Measurement	Freq. of Reporting
What are the trends in actions that control or manipulate the "earth and its community of life" inside the wilderness?	Actions authorized by the Federal land manager that manipulates biophysical the environment	Number of actions to manage plants, animals, pathogens, soil, water, or fire	Annually
		Number of actions to manipulate fire	Annually
		Number of actions for dune maintenance	Annually
	Actions not authorized by the Federal land manager that manipulate	Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire	Annually

	the biophysical environment		
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Measure 2.1 Number of actions to manage plants, animals, pathogens, soil, water or fire

Indicator	Actions authorized by the Federal land manager that manipulates biophysical environment																																					
Context	An action is the implementation of an intentional decision to manipulate the biophysical environment. Large or significant actions taken within the proposed wilderness are trammeling the biophysical environment. Some actions in the wilderness are accounted for in the management plan. Unforeseen, intentional actions will be added to the record as they occur. The authorized actions by the ASIS and CNWR Federal land managers are recorded below. Actions that apply to fire or dune maintenance are not recorded here but in their own separate measures. The tools, equipment, structures or transportation used in association with these actions will be included under the Undeveloped measurements.																																					
Data source	Internal staff inventory of actions: Charlene Swartz/Drizz Wilgus, Eva Savage, Jim Fair and Ish Ennis, Jack Kumer, Walt West																																					
Data collection process	Actions are counted annually and entered into the database each year. The time spent on each activity (recorded as number of days that staff entered the wilderness and worked some period of time on the activity) is listed. It is assumed that the more time spent conducting the action, the more trammeling has occurred (this is not always the case but given the breath of activities, the generalization applies). This table is condensed, but a detailed list of specific activities for monitoring, maintenance, etc is located in Appendix D.																																					
Data Entry	Annually																																					
Significant Change	+/- 25%. An increase of 25% in time spent on actions in the wilderness since the last monitoring point degrades the measurement; A decrease of 25% in time spent in the wilderness improves the measurement.																																					
Data Adequacy	High- These are authorized activities which staff can reliably record. This first year may not be as accurate as future years because it was a recall of the past year, not day to day tracking.																																					
Confidence	Medium																																					
2012 Data	<table><tr><th rowspan="2">Activity</th><th colspan="2">Time Spent on Activity</th></tr><tr><th>ASIS</th><th>CNWR</th></tr><tr><td>Set up for monitoring</td><td>103</td><td>13</td></tr><tr><td>Installing informational signs</td><td>38</td><td>1</td></tr><tr><td>Maintaining existing structures</td><td>24</td><td>5</td></tr><tr><td>Mowing</td><td>14</td><td>8</td></tr><tr><td>Horse Management</td><td>25</td><td>4</td></tr><tr><td>Treating Phragmites</td><td>60</td><td></td></tr><tr><td>Marsh Restoration</td><td>100</td><td></td></tr><tr><td>Survey Benchmark installation and maintenance</td><td>15</td><td></td></tr><tr><td>Trapping</td><td></td><td>60</td></tr><tr><td>TOTAL</td><td>379</td><td>91</td></tr></table>			Activity	Time Spent on Activity		ASIS	CNWR	Set up for monitoring	103	13	Installing informational signs	38	1	Maintaining existing structures	24	5	Mowing	14	8	Horse Management	25	4	Treating Phragmites	60		Marsh Restoration	100		Survey Benchmark installation and maintenance	15		Trapping		60	TOTAL	379	91
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TOTAL	379	91																																				
Condition	Caution –There is a considerable amount of activities in the wilderness even though they all serve a purpose.																																					

Measure 2.2 Number of actions to manage fire

Indicator	Actions authorized by the Federal land manager that manipulates biophysical environment						
Context	Fire has not been a historical disturbance on the island. Wildfires, however, may occur through natural or human ignitions. Any actions associated with fire will be listed here. If a fire is allowed to burn without intervention then it will not be recorded. Wildfires may be suppressed or contained. This distinction between these actions will be made in the data table.						
Data source	Internal staff inventory of actions as well as outside fire crews						
Data collection process	Actions are counted annually and entered into the database each year. Refer to measure 2.1. For this measurement, two types of activities are expected: fire suppression or fire containment, in which fire is allowed within a designated area but prevented from spreading to undesirable areas. Fire suppression should be weighted more heavily than fire containment.						
Data Entry	Annually						
Significant Change	ANY action to manage fire is significant. A greater amount of actions in the wilderness degrades the measurement; fewer actions improve the measurement.						
Data Adequacy	High-While it is possible for small fires to go undetected, on the whole fire events and associated actions are noticeable and well recorded.						
Confidence	High						
2012 Data	<table><tr><td>Activity</td><td>Time Spent on Activity</td></tr><tr><td>0</td><td></td></tr></table>	Activity	Time Spent on Activity	0			
Activity	Time Spent on Activity						
0							
	While one call came to ASIS about a fire in the wilderness, no fire was found. No fire events have occurred in ASIS or CNWR in the past year.						
Condition	Good						

Measure 2.3 Number of actions for dune maintenance

Indicator	Actions authorized by the Federal land manager that manipulates biophysical environment		
Context	Dunes form, accumulate, or erode naturally, however, man can and has manipulated dunes to serve his purposes on Assateague Island. Artificial dunes in the past have been built as storm breaks to protect the interior lands. These artificial dunes may blow out or wash out during storms. Sometimes these dunes will then be repaired, however, they are costly to maintain and impede the natural migration of the islands, sand transport, and overwash habitat creation. Both ASIS and CWNR have planned to allow natural processes to dominate where possible. Any actions in dune maintenance will highlight a departure from the planning process.		
Data source	Internal staff inventory of actions		
Data collection process	Actions are counted annually and entered into the database each year. Refer to measure 2.1.		
Data Entry	Annual average of past five years		
Significant Change	ANY change in dune maintenance is significant. A greater amount of actions in the wilderness degrades the measurement; fewer actions improve the measurement.		
Data Adequacy	High- Alteration to dunes requires a deliberate management decision. Any alterations will be well recorded.		
Confidence	High		
2012 Data	Activity	Time Spent on Activity	

Condition	0	0
	No dune maintenance occurred in ASIS or CNWR this year.	
	Good	

Measure 2.4 Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire

Indicator	Actions not authorized by the Federal land manager that manipulate the biophysical environment								
Context	Actions may be taken on the island without the authorization of the federal land managers. An unauthorized action is any action undertaken by any individual, group, or agency without specific approval by the authorized officer. The individuals, citizen groups, or agencies may take actions which are not necessarily violations but still trammel the environment. At this time, staff at ASIS and CNWR is not aware of any regular, unauthorized actions or the frequency of possible unauthorized actions. This data is limited, therefore, to only specific actions that are known to have occurred rather than any estimation on what the staff suspects may be occurring.								
Data source	Internal staff observations and personal judgment of different actions and occurrences: Jim Fair, Walt West								
Data collection process	Actions are counted annually and entered into the database each year. Actions are organized by type of activity and number of times this activity was reported or estimated.								
Data Entry	Annual average of past five years								
Significant Change	+/- 15 cases. Fifteen more unauthorized actions since the last monitoring point in the wilderness degrades the measurement; fifteen fewer actions improve the measurement.								
Data Adequacy	Medium- Many potential unauthorized activities are difficult to catch in the act, so a precise count is likely impossible.								
Confidence	Medium								
2012 Data	<table><tr><td>Type of Activity</td><td>Agency/Group/Person responsible</td><td>No. of times reported/estimated</td></tr><tr><td>Littering</td><td>Public</td><td>14 (CNWR)</td></tr></table>			Type of Activity	Agency/Group/Person responsible	No. of times reported/estimated	Littering	Public	14 (CNWR)
Type of Activity	Agency/Group/Person responsible	No. of times reported/estimated							
Littering	Public	14 (CNWR)							
	It is also possible that pets are within the proposed wilderness, but it is difficult to know for sure and no reports have been made within the last year.								
Condition	Good								

5.3 Undeveloped

Monitoring Question	Indicator	Measurement	Freq. of Reporting
What are the trends in non-recreational development inside the wilderness?	Non-recreational structures, installations, and developments	Index of authorized physical structures, installations, or developments	Annually
		Length of active roads and fence	Every five years
		Index of unauthorized physical structures, installations, or developments	Every five years
		Index of abandoned structures	Every five years
		Length of abandoned roads and fence	Every five years
	Inholdings	Index of inholdings with wilderness	Every five years

What are the trends in mechanization inside the wilderness?	Use of motor vehicles, motorized equipment, and mechanical transport	Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport	Annually
		Authorized Recreational Motor Vehicle Use	Annually
		Type and amount of motor vehicles, motorized equipment, or mechanical transport use not authorized by the Federal land manager	Annually

Measure 3.1 Index of authorized physical structures, installations, or developments

Indicator	Non-recreational structures, installations, and developments																																																		
Context	The wilderness area is meant to be free of man's imprint on the landscape. Any man-made features therefore detract from the undeveloped quality. The Island Wilderness was designated with some man-made features already present; other features, such as research equipment have been added over time. This measure includes all active, authorized physical structures, installations and developments that are currently within the wilderness such as those present prior to designation and temporary structures. This measure does not include unauthorized structures, recreational structures, or abandoned structures. These developments are included in subsequent measures.																																																		
Data source	Internal documentation/GIS/knowledge of structures: Eva Savage, Jack Kumer																																																		
Data collection process	A list of structures, installations, and developments will be created based off of inventories already present in GIS as well as any unmapped features known to be on the ground. The list of structures, installations, and developments are multiplied by the weight defined in an index. This weight includes the magnitude of the structure and how long the structure was in place. The sum of the product of structure, installations, and developments and weight will be the measure for the five year monitoring period. A detailed list of known structures is in Appendix G, which is intended to help track added structures.																																																		
Data Entry	Annually																																																		
Significant Change	More than 25% of new developments in the wilderness since the last monitoring period degrade the measure; 10% fewer developments since the last monitoring period improve the measurement.																																																		
Data Adequacy	Medium-Some structures are mapped, but the temporary or minor structures such as posts and flags are best estimates.																																																		
Confidence	Medium																																																		
2012 Data	<table border="1"> <thead> <tr> <th rowspan="2">Structure, Installation, or Development</th><th colspan="2">Number present x fraction of the year present</th><th rowspan="2">Weight</th><th colspan="2">Total</th></tr> <tr> <th>ASIS</th><th>CNWR</th><th>ASIS</th><th>CNWR</th></tr> </thead> <tbody> <tr> <td>Bridges</td><td>1</td><td></td><td>5</td><td>5</td><td></td></tr> <tr> <td>Gates</td><td>6</td><td>5</td><td>3</td><td>18</td><td>15</td></tr> <tr> <td>Weather Station</td><td>1</td><td>1</td><td>3</td><td>3</td><td>3</td></tr> <tr> <td>Traps</td><td></td><td>50</td><td>1</td><td></td><td>50</td></tr> <tr> <td>Squirrel boxes</td><td></td><td>5</td><td>2</td><td></td><td>10</td></tr> <tr> <td>Biological exclosures</td><td>Am: (120 x .33) + PP: (6 x .19) =40.74</td><td>(4 x .25)</td><td>2</td><td>81.48</td><td>2</td></tr> </tbody> </table>					Structure, Installation, or Development	Number present x fraction of the year present		Weight	Total		ASIS	CNWR	ASIS	CNWR	Bridges	1		5	5		Gates	6	5	3	18	15	Weather Station	1	1	3	3	3	Traps		50	1		50	Squirrel boxes		5	2		10	Biological exclosures	Am: (120 x .33) + PP: (6 x .19) =40.74	(4 x .25)	2	81.48	2
Structure, Installation, or Development	Number present x fraction of the year present		Weight	Total																																															
	ASIS	CNWR		ASIS	CNWR																																														
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Squirrel boxes		5	2		10																																														
Biological exclosures	Am: (120 x .33) + PP: (6 x .19) =40.74	(4 x .25)	2	81.48	2																																														

Biological signs	PP: (100 x .19) + BE (25 X .33) + BB (140 X .49) =95.85	(22 x .46)	2	191.7	20
Cultural sites	2 (Green Run, Graveyard)		5	10	
Fence lines	PP: (30 posts + rope x .19) =5.7		2	11.4	
Deer cameras	(12 x .16) =1.92		2	3.84	
Fox cameras	(90 x .33)=29.6		2	59.2	
PVC Pipe	124		2	248	
Wells	8		2	16	
Flags	100		1	100	
Posts for pond marsh	10		2	20	
Survey benchmark	3	2	1	3	2
No Hunting signs	150		2	300	
Pond hydrology instruments	6		2	12	
OSV boundary posts	160		2	320	
SETs	3		1	3	
Deer/Horse grazing posts	336		2	672	
TOTAL				2,077.62	100

Condition

Caution –Increases in structures will reduce the undeveloped quality

Measure 3.2 Length of authorized physical structures, installations, or developments

Indicator	Non-recreational structures, installations, and developments
Context	This measure lists any authorized, active, physical structures, installations, or developments that are measured by length –primarily roads and fences. Refer to measure 3.1.
Data source	Internal documentation/GIS/knowledge of structures: Jack Kumer
Data collection process	Features that are measured by length, primarily roads and fences, are listed below. The sum of roads and fences will be compared every five years. Roads and fences are not weighted because while the roads may have a greater footprint, they are unpaved and access routes and fences cause barriers.
Data Entry	Every five years
Significant Change	+/- 1000 m. More than 1000 m of road or fence in the wilderness degrade the measure; a reduction of 1000 m of road or fence improves the measurement.
Data Adequacy	High –All known road and fence accounted for

Confidence 2012 Data	High		
	Structure, Installation, or Development	Length	
		ASIS	CNWR
	Roads	20380 m	8351 m
	Pony Fence		6437 m
	State line Fence	1145 m	
	Post and cable fence along roadways	FX: 989 + BL: 1943 + CB: 443 =3375	
	Horse fence	1200 m	
	Deer fence	240 m	
	Deer/horse grazing fence	1600 m	
Condition	Total	27940 m	14788 m
	Good –But could be improved		



Photo: Taryn Sudol

Measure 3.3 Index of unauthorized physical structures, installations, or developments

Indicator	Non-recreational structures, installations, and developments
Context	Unauthorized physical structures, installations, or developments still show man's impact or present on the natural landscape. Any features erected by individuals, citizen groups or Federal or state agencies that have not been authorized will be included in this measurement. Any unauthorized recreational structures will not be included here but in a subsequent measure under a Solitude or Primitive and Unconfined Recreation Quality measure.
Data source	Internal documentation/knowledge of structures, etc.
Data collection	A list of unauthorized features will be developed based off any maps and on the ground observations. The sum of these developments will be compared every five years.
Data Entry	Every five years
Significant Change	ANY change in the number of unauthorized developments is significant. More developments in the wilderness degrade the measurement; fewer developments

Data Adequacy	improve the measurement.				
Confidence	Medium-These are on the ground chance observations. While there is fairly high confidence in these judgments, no survey was conducted and it is possible that that unauthorized structures went unnoticed.				
2012 Data	Medium				
	Structure, Installation, or Development	Number present	Length	Weight	Total
	0				
Condition	There are no known unauthorized structures in the proposed wilderness at this time.				
	Good				

Measure 3.4 Index of abandoned structures

Indicator	Non-recreational structures, installations, and developments				
Context	Some structures, installations or developments are no longer active in the wilderness. They remain present, but are not being used. Over time the features may be removed or naturally decompose and be absorbed in the landscape. We will determine when these structures have decomposed enough or been absorbed back into the landscape. A significant number of features have been abandoned on Assateague and have therefore been separated as a single measure. In a sense, abandoned structures are “on their way out” and may be viewed differently from active, maintained structures.				
Data source	Internal documentation/GIS/knowledge of structures, etc.				
Data collection process	This list will be created based off maps and on the ground observations. The list of structures, installations, and developments is multiplied by the weight defined in an index. This list will be limited to abandoned structures that may be both authorized and unauthorized. Recreational structures that are now abandoned are also included in this measure because they no longer serve a recreational function. The sum of the product of structure, installations, and developments and weight will be the measure for the five year monitoring period.				
Data Entry	Every five years				
Significant Change	An increase of 25% of abandoned developments in the wilderness degrade the measurement; Any reduction in the abandoned developments improve the measurement.				
Data Adequacy	High-Staff is confident in their knowledge of abandoned structures				
Confidence	High				
2012 Data	Structure, Installation, or Development	Number present		Weight	Total
		ASIS	CNWR		ASIS CNWR
	Retention Structures	7		5	35
	Mosquito ditches	812 affected acres		2	1624
	Blinds	0		3	
	TOTAL				1659
	While there are known berms and dikes on ASIS at this time, they are not mapped and estimation on their footprint cannot be made. When berms/dikes are quantified they will be weighted a 3.				
Condition	Good				



Photo: Taryn Sudol

Measure 3.5 Length of abandoned physical structures, installations, and developments

Indicator	Non-recreational structures, installations, and developments																
Context	Refer to measure 3.4																
Data source	Internal documentation/GIS/knowledge of structures, etc.																
Data collection process	Refer to measure 3.3. The same protocol is followed except that applicable structures are measured by length in meters.																
Data Entry	Every five years																
Significant Change	An increase of 25% in abandoned developments in the wilderness degrade the measurement; any fewer abandoned developments improve the measurement.																
Data Adequacy	High-Staff is confident in their knowledge of abandoned structures																
Confidence	High																
2012 Data	<table><tr><td rowspan="2">Structure, Installation, or Development</td><td colspan="2">Length</td></tr><tr><td>ASIS</td><td>CNWR</td></tr><tr><td>Roads</td><td>14293 m</td><td></td></tr><tr><td>Fences</td><td>0</td><td></td></tr><tr><td>TOTAL</td><td>14293 m</td><td></td></tr></table>			Structure, Installation, or Development	Length		ASIS	CNWR	Roads	14293 m		Fences	0		TOTAL	14293 m	
Structure, Installation, or Development	Length																
	ASIS	CNWR															
Roads	14293 m																
Fences	0																
TOTAL	14293 m																
Condition	Good																

Measure 3.6 Inholdings

Indicator	Inholdings
Context	An inholding is any non-federal land within the wilderness boundary. It does not include cherry-stemmed parcels or external edge-holdings that may be acquired in the future. While inholdings existed at the time of the wilderness proposal, those rights have since expired and been transferred to NPS. Some of those old inholdings may still be on site but they are now included in the abandoned structure measure. At the time of this baseline assessment, there are no inholdings on site nor is there any foreseeable properties that may become inholdings.

Data source	Internal inventory				
Data collection process	A count of each inholding and its acreage				
Data Entry	Every five years				
Significant Change	ANY change in the number of inholdings is significant. More inholdings degrade the measurement while fewer inholdings improve the measurement.				
Data Adequacy	High –There is an accurate count of the number of inholdings.				
Confidence	High				
2012 Data	Number of Inholdings and Their Acreage in the Proposed Island Wilderness <table border="1"> <tr> <th>Inholding</th><th>Acreage</th></tr> <tr> <td>0</td><td>0</td></tr> </table> There are no inholdings for ASIS or CNWR in 2012. Any old inholdings are now included in the abandoned structures measure.	Inholding	Acreage	0	0
Inholding	Acreage				
0	0				
Condition	Good				

Measure 3.7 Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport

Indicator	Use of motor vehicles, motorized equipment, and mechanical transport
Context	“Motor vehicles” are any machines used to transport people or material across or over land, water, or air, and which are powered by the use of a motor, engine, or other nonliving power source. This includes, but is not limited to, ATVS, motor boats, trucks and aircraft that either land or drop off or pick up people or material (i.e., not aircraft that merely fly over the wilderness). “Motorized equipment” are any machines that are not used for transportation by are powered by a motor, engine, or other nonliving source. This includes, but is not limited to, machines such as chainsaws and generators. It does not include small hand-carried devices such as shavers, wristwatches, flashlights, cameras, etc. “Mechanical transport” refers to any contrivance for moving people or material in or over land, water, or air, having moving parts, that provides a mechanical advantage to the user, and that is powered by a living or non-motorized power source. This includes, but is not limited to, sailboats, bicycles, game carriers, carts, and wagons. It does not include wheelchairs when used as necessary medical appliances. It also does not include rafts, canoes, or similar primitive devices without moving parts. This measure applies to all sectors of the NPS and FWS staff or other authorized bodies. This includes law enforcement patrols or those agencies that respond to emergencies. Since emergencies are rare events, they are included in this measure instead of being a separate measure. At the time of this baseline assessment, recreational OSVs are permitted in the NPS portion of the Island Wilderness. At most, 145 OSVs are allowed per day in the wilderness zone during certain portions of the year.
Data source	Internal staff reporting of activities and associated transport/equipment. CNWR: Charlene Swartz and Drizz Wilgus, Eva Savage and Jim Fair. ASIS: Ish Ennis, Jack Kumer, and Walt West.
Data collection process	Use of motorized vehicles and equipment and mechanical transport is recorded based on activity, the number of times it was used (a “time” means it entered and exited the wilderness. A time does not exceed one whole day in length, but otherwise this does not indicate the length the vehicle or equipment was in use). Transportation and equipment used is assumed based on the activity done. Refer to Appendix G for a

	detailed list of activities.						
Significant Change	+/- 10%. An increase of 10% of motorized vehicles, motorized equipment, and mechanical transport in the wilderness degrades the measurement while 10% less motorized vehicles, motorized equipment, and mechanical transport improves the measurement.						
Data Entry	Annually						
Data Adequacy	Medium –Interviewers have confidence what they reported, but this tracking remains a retroactive estimation. Admittedly several activities may have been forgotten/unaccounted for. There is also the possibility that double counting has occurred because some activities may have been accomplished in one vehicle trip.						
Confidence 2012 Data	Medium						
	Activity	No. of times motorized vehicles used		No. of times mechanical transport used		No. of times motorized equipment used	
		ASIS	CNWR	ASIS	CNWR	ASIS	CNWR
	Monitoring	594	89				
	Research	142	64				
	Other Biological Actions	234				126	
	Patrolling	1220	800				
	Maintenance	135	69		15	48	1
	Mowing	14	16		8		
	TOTAL	2,339	1038	0	23	174	1
Condition	Caution/Poor –There is a high frequency of motor vehicles in the wilderness						

Measure 3.8 Authorized Recreational Motor Vehicle Use

Indicator	Use of motor vehicles, motorized equipment, and mechanical transport						
Context	As of 2012, ASIS policy allows for recreationalists to use motor vehicles in two ways within the wilderness. If OSV users have a permit, they can drive their vehicles on the beach. During hunt season, hunters can enter their areas with their vehicles as well.						
Data Source	Number of OSV users counted through gate entry automated counter. OSV use in the wilderness based on Katherina Forgue's thesis. Hunter vehicles for duck hunting logged by check-in and hunter vehicles for deer hunting is professional judgment by Walt West.						
Data collection process	To calculate the OSV usage, use the total traffic count per month from August of the previous year to July of the current year. The assumption is that 10% of OSVs that enter the zone will travel to the wilderness zone. This assumption was derived from Katherina Forgues' thesis observations. To calculate hunter vehicles in the wilderness, use a count of the sign in and sign out for duck hunting. For deer hunting use professional judgment of how many vehicles entered the wilderness.						
Significant Change	+/- 10%. An increase of 10% of motorized vehicles, motorized equipment, and mechanical transport in the wilderness degrades the measurement while 10% less motorized vehicles, motorized equipment, and mechanical transport improves the measurement.						
Data Entry	Annually						
Data Adequacy	Medium- While the traffic count for OSV should be accurate, how many OSV users enter the wilderness is an estimation. Duck hunting vehicle counts should be accurate but deer hunting vehicles is another estimation.						
Confidence 2012 Data	Medium						
	Use of Motor Vehicle			No. of motor vehicles			
	OSVs			2748			

Condition	Hunter Vehicles –Duck	73
	Hunter Vehicles –Deer	<20
	TOTAL	2841
	Poor /Unknown–Motor vehicles are prohibited in the wilderness. Do not know whether this is a high or low year of recreational use.	

Measure 3.9 Type and amount of motor vehicles, motorized equipment, or mechanical transport use unauthorized by the Federal land manager

Indicator	Use of motor vehicles, mechanical transport and motorized equipment																										
Context	Ref to measure 3.7 for motor vehicle, motorized equipment, and mechanical transport definitions. The use of these devices by any individuals, citizen groups or unauthorized Federal and state agencies will be listed here. The awareness of unauthorized use depends in part on the amount of monitoring and patrolling (which has its own wilderness impacts). At this time the amount of use of different types of transport and equipment will be given a score based on a range of frequency and extent. Recreational uses are also recorded here.																										
Data source	Observations and professional judgment from law enforcement: Walt West, Jim Fair.																										
Data collection process	The use of unauthorized motorized and mechanical transportation and equipment will fall within frequency ranges. Staff will decide the range for frequency (week, month, and year) and then use observations and informed personal judgments to assign a score to the different type of uses.																										
	<table><tr><th>Category</th><th>Frequency of unauthorized use</th><th>Score</th></tr><tr><td rowspan="3">Public</td><td>less than 5x per year</td><td>1</td></tr><tr><td>5x/year to 1x/month</td><td>2</td></tr><tr><td>more than 1x/month</td><td>3</td></tr><tr><td rowspan="3">Permittees</td><td>less than 5x per year</td><td>1</td></tr><tr><td>5x/year to 1x/month</td><td>2</td></tr><tr><td>more than 1x/month</td><td>3</td></tr><tr><td rowspan="3">Agencies</td><td>less than 5x per year</td><td>1</td></tr><tr><td>5x/year to 1x/month</td><td>2</td></tr><tr><td>more than 1x/month</td><td>3</td></tr></table>			Category	Frequency of unauthorized use	Score	Public	less than 5x per year	1	5x/year to 1x/month	2	more than 1x/month	3	Permittees	less than 5x per year	1	5x/year to 1x/month	2	more than 1x/month	3	Agencies	less than 5x per year	1	5x/year to 1x/month	2	more than 1x/month	3
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	5x/year to 1x/month	2																									
	more than 1x/month	3																									
Data Entry	Annual average of past five years																										
Significant Change	+/- 3 points. If more unauthorized use of motorized vehicles, motorized equipment, or mechanical transport occurs this degrades the measurement, while less use improved the measurement.																										
Data Adequacy	Medium –Unauthorized activities are not readily recorded and staff is only aware of it through chance observation.																										
Confidence	Medium																										
2012 Data	<table><tr><th>Type of Use</th><th>Category</th><th>Frequency Score</th></tr><tr><td>Bikes (CNWR)</td><td>Public</td><td>1</td></tr><tr><td>Vehicles (ASIS)</td><td>Public</td><td>1</td></tr></table>			Type of Use	Category	Frequency Score	Bikes (CNWR)	Public	1	Vehicles (ASIS)	Public	1															
Type of Use	Category	Frequency Score																									
Bikes (CNWR)	Public	1																									
Vehicles (ASIS)	Public	1																									

Condition	Good
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5.4 Solitude or Primitive and Unconfined Recreation

Monitoring Question	Indicator	Measurement	Freq. of Reporting
What are the trends for outstanding opportunities for solitude within the wilderness?	Remoteness from sights and sounds of people inside the wilderness	Percent of wilderness affected by access or travel routes inside the wilderness	Every five years
		Amount of litter on CNWR	Annually
	Remoteness from occupied and modified areas outside the wilderness	Permanent Viewshed	Every five years
		Temporary Viewshed	Every five years
		Percent of wilderness affected by access or travel routes outside the wilderness	Every five years
What are the trends for outstanding opportunities for primitive and unconfined recreation inside the wilderness?	Facilities that decrease self-reliant recreation	Agency-provided recreation facilities	Every five years
		User-created recreation facilities	Every five years
	Management restrictions on visitor behavior	Visitor restriction index	Every five years
		Extent of management restrictions	Every five years

Measure 4.1 Percent of wilderness affected by access or travel routes inside the wilderness

Indicator	Remoteness from sights and sounds of people inside the wilderness		
Context	The wilderness is intended as a place to feel isolated from the sites and sounds of people. It provides an opportunity for solitude with nature. Being within proximity to access or travel routes exposes visitors to people and motorized transport. For the purposes of this measurement, travel routes include active roads or routes used by vehicles, authorized or unauthorized. This includes routes in the sand typically used by OSVs. It does not include abandoned roads that are no longer used.		
Data source	Internal GIS records		
Data collection process	Staff will create a 35 ft buffer area around access or travel routes. The total of this buffer area calculated in GIS will be divided by the total wilderness area for the percent affected. Travel routes will include roads or routes that are actively being used by vehicles. It does not apply to foot traffic. Roads that are abandoned are no longer considered travel routes.		
Data Entry	Every five years		
Significant Change	+/-5% An increase of 5% from the last monitoring data point in the percent of wilderness affected degrades the measurement, while a decrease of 5% is an improvement.		
Data Adequacy	High-Travel routes are known and mapped. The most up-to-date total acreage should be used.		
Confidence	High		
2012 Data		ASIS	CNWR

Condition	Area Affected	443554 m ²	178191 m ²
	Percent Affected	3%	3%
	Good		

Measure 4.2 Amount of litter on CNWR

Indicator	Non-recreational structures, installations, and developments																																							
Context	Litter is any discarded man-made materials. While litter from visiting individuals may be low, a noticeable amount of litter washes up on the shore from the ocean. From Mylar balloons to old tires, this garbage interrupts the natural landscape and may pose a threat to wildlife.																																							
Data source	Ocean Conservancy International Coastal Clean Up Summary Card. The beach cleanup is conducted on Chincoteague NWR by volunteers who are led by Jenny Owen, Volunteer Coordinator, or Sally Bowen.																																							
Data collection	Annually on CNWR there is a beach cleanup as part of the Ocean Conservancy. Since the wash up of trash from the ocean is a random process and not wilderness specific, this measure will track the amount of litter collected on the whole CNWR. The clean up occurs in mid-September. Data collected includes number of volunteers, the distanced cleaned at the site, the pounds of debris collected, and what that debris is composed of. For the purposes of this measure, the average weight of debris collected will be compared over each five year monitoring period. The number of volunteers and the distance cleaned will be listed also as a possible explanation for the amount of debris collected, but will not be included in the final measurement (average pounds of debris collected).																																							
Data Entry	Annually																																							
Significant Change	+/- 1500 pounds. The litter collected can be highly variable from year to year. The measurement is improved if litter decreases by 1,500 pounds or is degraded if litter increases by 1,500 pounds.																																							
Data Adequacy	Medium –This data is not specific to the wilderness and the amount of debris collected may be influenced by number of volunteers to area of beach cleaned. This data therefore does not precisely reflect the exact amount of litter in the wilderness.																																							
Confidence	High																																							
2012 Data	<table><tr><td></td><td colspan="3">Annual Average for Pounds of Litter Collected on Chincoteague NWR</td></tr><tr><td>Year</td><td>Volunteers</td><td>Distance cleaned (Miles)</td><td>Pounds of litter collected</td></tr><tr><td>2006</td><td>153</td><td>16</td><td>6560</td></tr><tr><td>2007</td><td>139</td><td>18</td><td>15,660</td></tr><tr><td>2008</td><td colspan="3">Not collected due to a hurricane</td></tr><tr><td>2009</td><td>117</td><td>16</td><td>3280</td></tr><tr><td>2010</td><td>200</td><td>12</td><td>920</td></tr><tr><td>2011</td><td>137</td><td>15.5</td><td>4760</td></tr><tr><td>Annual Average</td><td>151</td><td>14.5</td><td>4627*</td></tr></table>					Annual Average for Pounds of Litter Collected on Chincoteague NWR			Year	Volunteers	Distance cleaned (Miles)	Pounds of litter collected	2006	153	16	6560	2007	139	18	15,660	2008	Not collected due to a hurricane			2009	117	16	3280	2010	200	12	920	2011	137	15.5	4760	Annual Average	151	14.5	4627*
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	*Year 2007 is not included in the average because it is an extreme outlier																																							
Condition	Unknown –The past five years is fairly scattered																																							

Measure 4.3 Permanent Viewshed

Indicator	Remoteness from occupied and modified areas outside the wilderness
Context	Visitors to the wilderness are not meant to feel surrounded by civilization. A visitor to

	the wilderness ideally should only see a natural landscape. Visible developments outside of the wilderness boundary detract from a feeling of solitude. This measure tracks permanent man-made structures within view of the wilderness. While some structures may come and go, if they are not seasonal or temporary at the time of data collection, they are considered permanent. Across the bay, some houses are present but they are distant and indistinguishable so were not included in the count. Crab floats are also present in the bay, but also because of their small size and distance from the wilderness boundary, they are not included in the count.																
Data source	Field count																
Data collection	Count number of man-made structures visible in wilderness that are permanent features through the on-the-ground surveys. A boat ride in the bay along the length of the wilderness will provide a count of visible structures. Effort is made to be as close to the shore as possible, but is limited by the water depth.																
Data Entry	Every five years																
Significant Change	+/-10% If the number of structures in the permanent viewshed increases by 10% since the last monitoring data point, then the measurement degrades. If the number of structures decreases by 10%, the measurement improves.																
Data Adequacy	Medium- While this was a physical survey, it was limited by how close the boat could get to the border and what could be seen.																
Confidence	Medium																
2012 Data	<table><tr><th rowspan="2">Type of Structure</th><th colspan="2">No. of structures</th></tr><tr><th>ASIS</th><th>CNWR</th></tr><tr><td>House/oyster shacks</td><td>2</td><td>10</td></tr><tr><td>Blinds</td><td>2</td><td>37</td></tr><tr><td>TOTAL</td><td>4</td><td>47</td></tr></table>			Type of Structure	No. of structures		ASIS	CNWR	House/oyster shacks	2	10	Blinds	2	37	TOTAL	4	47
Type of Structure	No. of structures																
	ASIS	CNWR															
House/oyster shacks	2	10															
Blinds	2	37															
TOTAL	4	47															
Condition	Good																

Measure 4.4 Temporary Viewshed

Indicator	Remoteness from occupied and modified areas outside the wilderness
Context	Some structures only pass by the wilderness, yet still interrupt a visitor's solitude experience. In this case, motor boats, OSVs, or aircraft may be within view of certain parts of the wilderness. For this measure, visible OSV will be included even though they are within the wilderness. This is because OSV is prohibited in wildernesses in general, and their presence is a detractor from the feeling of solitude and primitive recreation.
Data source	Field count
Data collection process	A sample will be taken (15 min) of the number of temporary man-made structures that pass through the viewshed during a designated time (10:00 am) at a specified location, the state line fence. During the sample the monitor will list mobile structures that pass within view (not sound), how long it takes to pass, and how close the structures are based on a distance score (4-Just outside the boundary to 1-Distant, on the horizon or high in the sky).
Data Entry	Every five years
Significant Change	+/-5 mobile structures. If the number of structures in the temporary viewshed increases by 5 since the last monitoring data point, then the measurement degrades. If the number of structures decreases by 5, the measurement improves.
Data Adequacy	Low –This is one fifteen window in five years. While it provides a snap shot, it does not capture the whole picture. Data adequacy can be improved if more points were measured with greater frequency, but this requires greater time and effort from the staff.
Confidence	Confidence is data collected from protocol is high.

2012 Data

Site	Type of structure	No. of structures	Time in viewshed	Distance from viewer	TOTAL
Stateline-Ocean	OSV	2	15 min	1	30
Stateline-Bayside	0				
Bay view	0				

Condition

Good



Measure 4.5 Percent of wilderness affected by access or travel routes outside the wilderness

Indicator	Remoteness from occupied and modified areas outside the wilderness
Context	Being within proximity of travel routes can detract from a solitude experience even if the routes are not within the wilderness boundary. These travel routes are still accounted for. For the purposes of this measurement, travel routes include active roads or routes used by vehicles, authorized or unauthorized. This includes routes in the sand typically used by OSVs. It does not include abandoned roads that are no longer used.
Data source	GIS data on travel routes determined to be adjacent to wilderness
Data collection	Staff will create a 35 ft buffer area around adjacent access or travel routes. The total of this buffer area calculated in GIS will be divided by the total wilderness area for the percent affected. Travel routes will include roads or routes that are actively being used by vehicles. It does not apply to foot traffic.
Data Entry	Every five years
Significant Change	+/- 5%. If there is an increase of 5% of the percent affected since the last monitoring point, then this is degradation to the measurement. If there is a decrease of 5% of the percent affected, then this is an improvement.
Data Adequacy	High-Traveled routes are known and mapped. The most accurate, up to date acreage should be used.
Confidence	High

2012 Data		ASIS	CNWR
	Area Affected	228 m ²	78945 m ²
	Percent Affected	>1%	1.13%
Condition	Good		

Measure 4.6 Agency-provided recreation facilities

Indicator	Facilities that decrease self-reliant recreation																													
Context	Recreation facilities reduce the feeling of primitive recreation, which is meant to be provided in a wilderness setting. Even though some visitors may enjoy or appreciate facilities, and in some cases the facilities are authorized by law, they are inconsistent with primitive recreation. As such, this measure tracks the number of ASIS and CNWR provided recreational facilities.																													
Data source	Internal staff inventory																													
Data collection	The recreational facilities will be counted and organized by type.																													
Significant Change	ANY change in the number of trails or campsites is significant. If the number of trails/campsites is reduced, then this improves the measurement. If the number of trails/campsites is increased, this degrades the measurement. If any combination of picnic tables, toilets or fire rings is greater than 3, this qualifies as a campsite. Two hunting blinds also qualifies as a campsite. The addition or removal of 15 white rods for hunting posts qualifies as a trail.																													
Data Adequacy	CNWR does not provide campsites or recreational facilities in the proposed wilderness. ASIS has three back country campsite areas within the wilderness.																													
2012 Data	<table><tr><th>Type of Recreation Facility</th><th colspan="2">No. of facilities</th></tr><tr><th></th><th>ASIS</th><th>CNWR</th></tr><tr><td>Hunting Trails</td><td>8</td><td></td></tr><tr><td>White Rods</td><td>175</td><td></td></tr><tr><td>Blinds</td><td>8</td><td></td></tr><tr><td>Campsites:</td><td>3</td><td></td></tr><tr><td>Picnic Tables</td><td>9 (3 per site)</td><td></td></tr><tr><td>Toilets</td><td>9 (3 per site)</td><td></td></tr><tr><td>Fire Rings</td><td>9 (3 per site)</td><td></td></tr></table>			Type of Recreation Facility	No. of facilities			ASIS	CNWR	Hunting Trails	8		White Rods	175		Blinds	8		Campsites:	3		Picnic Tables	9 (3 per site)		Toilets	9 (3 per site)		Fire Rings	9 (3 per site)	
Type of Recreation Facility	No. of facilities																													
	ASIS	CNWR																												
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Picnic Tables	9 (3 per site)																													
Toilets	9 (3 per site)																													
Fire Rings	9 (3 per site)																													
Condition	Unknown –This is a baseline. The state of recreational facilities has not changed much.																													



Measure 4.7 User-created recreation facilities

Indicator	Facilities that decrease self-reliant recreation			
Context	Some visitors may create their own recreation facilities, such as hunting blinds, but these detract from primitive recreation for them, other people who utilize them, and those who see them as man-made features. These user-created recreation facilities must also be tracked to the best available knowledge.			
Data source	Observations and professional judgment from law enforcement: Walt West, Jim Fair.			
Data collection process	Unauthorized recreational facilities will be counted and organized by type.			
Significant Change	+/- 3. If the users create 3 more new recreation facilities since the last monitoring data point, then this is a degradation of the measurement. A decrease of 3 since the last monitoring data point would be an improvement of the measurement.			
Data Adequacy	Medium –This count is gained only through chance observation rather than a complete survey. The general feeling is that user-created facilities are few. Hunting blinds/aids may be created each year.			
Confidence	Medium			
2012 Data	Type of recreation facility	No. of facilities	Weight	Total
	Temporary tree stands	~7		
	Law enforcement on ASIS believes that maybe 5-10 temporary tree stands for hunters are found each year.			
Condition	Unknown –This is a baseline. A 5-10 range might be good or it could be reduced?			

Measure 4.8 Visitor Restrictions Index

Indicator	Management restrictions on visitor behavior		
Context	Being in a wilderness an opportunity to experience freedom or be unconfined. Restrictions on activities will be tracked as degradation to unconfined recreation. While regulations in most cases serve to protect resources in the wilderness, a decrease in the level of restrictions indicates an improvement in unconfined creation.		
Data source	Internal records		
Data collection	A score will be given to ASIS and CNWR based on the type of restrictions. These restrictions will be organized by category and the score assigned based on if there is no regulation or total prohibition. The higher the sum of the scores the more restrictions exist in the wilderness.		
	Category	Type of Restriction	Score
	Camping	No Restriction	0
		Designated site or mandatory setback	1
		Total prohibition	2
	Campfires	No Restriction	0
		Any mandatory setback (e.g. designated site)	1
		Total prohibition	2
	Fees	No Fees	0
		Fees charged of selected user type	1
		Fees charged of all visitors	2
	Length of Stay	No restrictions on length of stay	0
		Length of stay limited	1
	Group size limits	No restriction	0
		Group size limits in place	1

Significant Change Data Entry Data Adequacy Confidence 2012 Data Condition	Leash requirement	No restriction	0
		Pets required to be on leash	1
		Total prohibition	2
	Hunting Restrictions	No restriction	0
		Designated Season	1
		Total prohibition	2
	ANY change in the visitor restriction score is significant. A higher score is degradation to the measure while a lower score is an improvement to the measurement.		
	Every five years		
	High-Management policies are definite		
	High		
	Type of Restriction	ASIS Score	CNWR Score
	Camping	1	2
	Campfire	1	2
	Fees	2	2

Length of Stay	1	1
Group Size Limits	1	0
Leash Requirement	2	2
Hunting Restrictions	1	1
TOTAL SCORE	9	10

Caution –The maximum score possible in this index is 12.

Measure 4.9 Percent of wilderness closed to public access year-round

Indicator	Management restrictions on visitor behavior		
Context	If areas of the wilderness are closed off there is a restriction in visitor behavior. This measure focuses on the percent of wilderness closed to public access over a certain number of days. In general, CNWR restricts visitors to the service road and wet beach except during the hunting season. Predator exclosures for nest are also blocked off in ASIS and CNWR but these are small enough to be considered insignificant.		
Data source	Internal records –GIS layer delineation of wilderness area and roadways.		
Data collection	This is a GIS calculation of the accessible travel routes area within the wilderness. All area outside these travel routes is restricted in the CNWR portion of the land. This number (area restricted/total area) is then compared to the number of days it is prohibited (year minus hunting season). Restricted areas in ASIS include retention structures and research plots.		
Data Entry	Every five years		
Significant Change	If a greater amount of the wilderness is prohibited, then this degrades the measurement. If less of the wilderness is prohibited, then this improves the measurement.		
Data Adequacy	High –Management policies are clear and the calculation is reliable in GIS.		
Confidence	High		
2012 Data		Percent area restricted	Days area is restricted
	ASIS	<1%	365
	CNWR	99%	315
Condition	Good for ASIS. Poor for CNWR.		

5.5 Other Features

Monitoring Question	Indicator	Measurement	Freq. of Reporting
Other Features	Deterioration or loss of cultural resources integral to wilderness character	Number of actions that result in disturbances to cultural resources (looting, trespass activities, non-compliance with NHPA)	Annual average of past five years

Measure 5.1 Number of actions that result in disturbances or improvements to cultural resources

Indicator	Deterioration or loss of cultural resources integral to wilderness character		
Context	Certain sites in the wilderness have cultural significance. Any damage or disturbance of these sites, including unauthorized activities such as looting, would result in a loss of Assateague's wilderness character. If actions are taken to preserve or restore these cultural sites, this will improve the measurement. These sites include the graveyard, Green Run Hunting Lodge, and shipwrecks. If any cultural feature emerges in the future, any damages or preservation actions to it must also be tracked.		
Data source	Internal staff consultation of associated activities.		
Data collection process	An inventory of the cultural sites will be created then any actions that occur on these sites will be listed. If the activity is damaging it will receive a negative score. If the activity preserves or restores the site it will receive a positive score. The sum of the activities will be tracked during the five year monitoring period.		
Significant Change	ANY change in the number of actions that disrupt or improve cultural resources is significant. If more actions have disrupted cultural sites since the last monitoring data point, then this degrades the measurement. If fewer actions have disrupted since the last monitoring data point or more actions have improved the cultural site, then this improves the measurement. If the score for a subsequent monitoring period is less because fewer improvements were made but no damaging activities occurred, this is not degradation but stable.		
Data Entry	Annual Average of past five years		
Data Adequacy	High- Cultural sites and activities associated with them are well tracked.		
Confidence	High		
2012 Data	Cultural Site	Activity	Score
		0	
Condition	Good		

5.6 Measures under Development

Indicator	Biophysical processes
Measure	Salt Marsh Integrity
Context	Salt marshes, or coastal wetlands, are unique ecosystems comprising of flora and fauna that have adapted and evolved to extreme conditions of hydrology, soils, and salinity. Numerous wildlife species are highly dependent on salt marshes as breeding, feeding, migratory, or wintering habitat. Unfortunately, the majority of salt marshes have experienced some form of anthropogenic alteration such as oil spills, chemical mosquito control, drainage for mosquito control, salt hay farming, introduction of invasive species, restricted tidal flow, road construction, or channelization. These

	alterations impact both the intrinsic value of salt marshes as well as the quality of salt marsh habitat for the unique wildlife they support. Among the most important anthropogenic changes operating at the landscape/regional scale are the threats posed by global climate change. Sea level rise is a specific consequence of global climate change, and as sea-level rise accelerates and inundates some salt marshes, migration/creation of new salt marshes will be severely hampered by human development of adjoining lands.
Data source	Internal Survey documents
Data collection process	A series of metrics have been identified for Salt Marsh Integrity (Tidal flushing, natural butter, nekton density, bird abundance, salinity, etc). For each metric a utility function has been devised based on values from the literature and fieldwork. Based off these utility functions (graphical relationships: linear, parabolic, logarithmic), the measure in the field is converted to a score between 0-1 (good, bad or ugly). The sum of these scores is the Salt Marsh Integrity. This rank can be compared over time or between salt marshes, and is meant to be measured on a 3-5 year rotation. Since this is the first year (2012) that data is being collected, utility functions and scores may still require adjustment.
Data Entry	Every five years
Significant Change	Cannot yet be determined
Data Adequacy	High-Protocol is functioning on a regional level and has been studied/tested for a balance between feasibility and accuracy.

Measure	Night Sky Visibility
Indicator Context	Remoteness from occupied and modified areas outside the wilderness Light pollution by artificial light sources reduces visibility of stars and nebulae. A visible night sky can be associated with feelings of humility and being part of something larger. Also, light pollution can disorient wildlife. ASIS and CNWR have limited control of light pollution from the surrounding areas but they may take action at administrative sites and work with local communities. As light pollution increases only the brightest stars remain visible. Based on how many stars are visible on a clear night, the park and refuge can estimate night sky visibility and compare over time.
Data source	Staff observation. Protocol derived from GLOBE at Night http://www.globeatnight.org/observe_magnitude_orion.html
Data collection process	An hour after sunset on a clear night, a staff/volunteer will travel to point within the wilderness and locate the Orion constellation. The amount of visible stars associated with this constellation will be compared to magnitude charts provided by GLOBE at Night. The visible constellation that is most similar to whichever magnitude chart (1-7) will receive that magnitude score. The higher the magnitude score, the better night sky visibility. Higher night sky visibility increases the remoteness of people within the wilderness.
Significant Change	ANY change in the magnitude score is significant. If the magnitude score increases since the last monitoring data point, this improves the measurement. If the magnitude score decreases, this degrades the measurement.
Data Adequacy	Medium –The protocol is simple and requires low resources but can be influenced by weather and subjective estimations.
2012 Data	

5.7 Measures Not Used

Measures Not Used			
Quality	Indicator	Measure	Comments
Natural	Plant and Animal Species Communities	Composition of habitat types	It was ultimately decided that under no circumstances would the loss of habitat types suggest that the wilderness is less natural than it was before
Natural	Biophysical	Change in Natural Fire Regime	Fire has not been historical disturbance on the island. It is a rare event caused by lighting or human ignitions
Natural	Biophysical	Subsidence Rate	At this time it is not possible to distinguish between the island subsiding and a rise in the surround ocean. It would be useless to separate the between sea level rise and subsidence because sea level rise is caused by more global processes while subsidence is caused by a reduction in the groundwater aquifers.
Natural	Biophysical	Volume of Sand	On further consideration, it would be impossible to attribute whether the island is changing due to natural processes or man-made events. As such, any shape of the island with whatever volume of sand is considered natural.
Natural	Plant and Animal Communities	Status of Species of Concern	Species of concern have populations that are too variable to allow for trends for improvements or decreases. They are dependent on available habitat. At the moment wilderness areas particularly do not offer prime habitat compared to other portions of the island
Solitude or Primitive and Unconfined Recreation	Remoteness from modified and occupied areas outside the wilderness	Seasonal Viewshed	At this point in time, there are two possible seasonal features in the bay: blinds and crab floats. It was determined that crab floats are not visible in the viewshed. There is no current knowledge of which blinds are seasonal. If this is determined these temporary blinds will be accounted of the permanent viewshed but will receive a lesser weight (the fraction of the year it occupies the viewshed).
Solitude or Primitive and Unconfined Recreation	Remoteness from sights and sounds of people inside the wilderness	Number of Hunters in Wilderness Zones	Hunters may choose to hunt in zones that are within the wilderness in order to have a solitude experience. This measure attempted to quantify the number of hunters per zone, however, data was not available on the number of hunters in each zone per day. Management does not intend to reduce the number of hunters in the wilderness nor discourage hunters from accessing the wilderness. The measure therefore would be sporadic and not experience administrative actions.

Section 6. Issues and Conclusion

The 2012 wilderness character baseline assessment designed 35 measures to be monitored into the future. Three measures are under development and should be incorporated by the next monitoring period. If new technologies make more sophisticated and precise measures possible, these measures may be revised.

The completed measures, and those soon to be implemented, comprehensively represent trends in the five wilderness character qualities. Tracking these measures over time will indicate whether the wilderness remains stable, improves, or degrades. Given that some measures may be more variable than others, management on ASIS and CNWR may target certain measures for improvement or address measures that continually face challenges.

One issue of environmental concern is that the barrier island may undergo significant alterations from future climate change. There may be pressures for dramatic intervention to preserve the island at a certain state. When deciding on how to treat the barrier island dynamics, consideration should also be given to wilderness character.

In Maryland, it is currently permissible for permit-holders to access the wilderness on OSVs, yet, a minimal number of motorized vehicles best represents primitive recreation. OSV usage can be a contentious issue. As mentioned in the ASIS General Management Plan update, “OSVs are the greatest obstacle to public acceptance of wilderness designation and the most serious impact to wilderness character.” When considering the alternatives to the present OSV access, the impact they have on wilderness character should hopefully be reflected in the designed wilderness measures.

A ranking of Good, Caution, Poor or Unknown described the condition for each measure in 2012. While many of the measures are in good condition, a few measures are in danger of becoming poor. For these measures, which include authorized actions, authorized developments and authorized motorize vehicles, Minimum Requirement Analysis may guide which management alternatives are most appropriate in the wilderness.

This baseline assessment may serve as a tool to develop awareness of the proposed wilderness and key features within it. Staff can communicate to the public the state of the wilderness and the opportunities they have to experience it. Additionally, because the proposed Assateague Island wilderness is managed by both USFWS and NPS, there is the opportunity to coordinate management approaches so that this area is treated as one wilderness. As it stands, actions taken on one side of the state line may affect the experiences visitors may have on the other side.

In sum, the developed wilderness measures encompass wilderness character for the proposed Assateague Island wilderness. Commitment to monitoring these measures will track wilderness status. This can then inform management plans and encourage public appreciation for the wilderness.

Appendix A. Wilderness Act

WILDERNESS ACT
Public Law 88-577 (16 U.S.C. 1131-1136)
88th Congress, Second Session
September 3, 1964
AN ACT

To establish a National Wilderness Preservation System for the permanent good of the whole people, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

Short Title

Section 1. This Act may be cited as the "Wilderness Act."

WILDERNESS SYSTEM ESTABLISHED STATEMENT OF POLICY

Section 2.(a) In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas", and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as "wilderness areas" except as provided for in this Act or by a subsequent Act.

(b) The inclusion of an area in the National Wilderness Preservation System notwithstanding, the area shall continue to be managed by the Department and agency having jurisdiction thereover immediately before its inclusion in the National Wilderness Preservation System unless otherwise provided by Act of Congress. No appropriation shall be available for the payment of expenses or salaries for the administration of the National Wilderness Preservation System as a separate unit nor shall any appropriations be available for additional personnel stated as being required solely for the purpose of managing or administering areas solely because they are included within the National Wilderness Preservation System.

DEFINITION OF WILDERNESS

(c) A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

NATIONAL WILDERNESS PRESERVATION SYSTEM - EXTENT OF SYSTEM

Section 3.(a) All areas within the national forests classified at least 30 days before September 3, 1964 by the Secretary of Agriculture or the Chief of the Forest Service as "wilderness", "wild", or "canoe" are hereby designated as wilderness areas. The Secretary of Agriculture shall - **(1)** Within one year after September 3, 1964, file a map and legal description of each wilderness area with the Interior and Insular Affairs Committees of the United States Senate and the House of Representatives, and such descriptions shall have the same force and effect as if included in this Act: Provided, however, That correction of clerical and typographical errors in such legal descriptions and maps may be made.

(2) Maintain, available to the public, records pertaining to said wilderness areas, including maps and legal descriptions, copies of regulations governing them, copies of public notices of, and reports submitted to Congress regarding pending additions, eliminations, or modifications. Maps, legal descriptions, and regulations pertaining to wilderness areas within their respective jurisdictions also shall be available to the public in the offices of regional foresters, national forest supervisors, and forest rangers.

Classification. (b) The Secretary of Agriculture shall, within ten years after September 3, 1964, review, as to its suitability or unsuitability for preservation as wilderness, each area in the national forests classified on September 3, 1964 by the Secretary of Agriculture or the Chief of the Forest Service as "primitive" and report his findings to the President.

Presidential recommendation to Congress. The President shall advise the United States Senate and House of Representatives of his recommendations with respect to the designation as "wilderness" or other reclassification of each area on which review has been completed, together with maps and a definition of boundaries. Such advice shall be given with respect to not less than one-third of all the areas now classified as "primitive" within three years after September 3, 1964, not less than two-thirds within seven years after September 3, 1964, and the remaining areas within ten years after September 3, 1964.

Congressional approval. Each recommendation of the President for designation as "wilderness" shall become effective only if so provided by an Act of Congress. Areas classified as "primitive" on September 3, 1964 shall continue to be administered under the rules and regulations affecting such areas on September 3, 1964 until Congress has determined otherwise. Any such area may be increased in size by the President at the time he submits his recommendations to the Congress by not more than five thousand acres with no more than one thousand two hundred and eighty acres of such increase in any one compact unit; if it is proposed to increase the size of any such area by more than five thousand acres or by more than one thousand two hundred and eighty acres in any one compact unit the increase in size shall not become effective until acted upon by Congress. Nothing herein contained shall limit the President in proposing, as part of his recommendations to Congress, the alteration of existing boundaries of primitive areas or recommending the addition of any contiguous area of national forest lands predominantly of wilderness value. Notwithstanding any other provisions of this Act, the Secretary of Agriculture may complete his review and delete such area as may be necessary, but not to exceed seven thousand acres, from the southern tip of the Gore Range-Eagles Nest Primitive Area, Colorado, if the Secretary determines that such action is in the public interest.

Report to President. (c) Within ten years after September 3, 1964 the Secretary of the Interior shall review every roadless area of five thousand contiguous acres or more in the national parks, monuments and other units of the national park system and every such area of, and every roadless island within the national wildlife refuges and game ranges, under his jurisdiction on September 3, 1964 and shall report to the President his recommendation as to the suitability or unsuitability of each such area or island for preservation as wilderness.

Presidential recommendation to Congress. The President shall advise the President of the Senate and the Speaker of the House of Representatives of his recommendation with respect to the designation as wilderness of each such area or island on which review has been completed, together with a map thereof and a definition of its boundaries. Such advice shall be given with respect to not less than one-third of the areas and islands to be reviewed under this subsection within three years after September 3, 1964, not less than two-thirds within seven years of September 3, 1964 and the remainder within ten years of September 3, 1964.

Congressional approval. A recommendation of the President for designation as wilderness shall become effective only if so provided by an Act of Congress. Nothing contained herein shall, by implication or otherwise, be construed to lessen the present statutory authority of the Secretary of the Interior with respect to the maintenance of roadless areas within units of the national park system.

Suitability. (d)(1) The Secretary of Agriculture and the Secretary of the Interior shall, prior to submitting any recommendations to the President with respect to the suitability of any area for preservation as wilderness –

Publication in Federal Register. (A) give such public notice of the proposed action as they deem appropriate, including publication in the Federal Register and in a newspaper having general circulation in the area or areas in the vicinity of the affected land;

Hearings. (B) hold a public hearing or hearings at a location or locations convenient to the area affected. The hearings shall be announced through such means as the respective Secretaries involved deem appropriate, including notices in the Federal Register and in newspapers of general circulation in the area: Provided, That if the lands involved are located in more than one State, at least one hearing shall be held in each State in which a portion of the land lies;

(C) at least thirty days before the date of a hearing advise the Governor of each State and the governing board of each county, or in Alaska the borough, in which the lands are located, and Federal departments and agencies concerned, and invite such officials and Federal agencies to submit their views on the proposed action at the hearing or by no later than thirty days following the date of the hearing.

Any views submitted to the appropriate Secretary under the provisions of (1) of this subsection with respect to any area shall be included with any recommendations to the President and to Congress with respect to such area.

Proposed modification. (e) Any modification or adjustment of boundaries of any wilderness area shall be recommended by the appropriate Secretary after public notice of such proposal and public hearing or hearings as provided in subsection (d) of this section. The proposed modification or adjustment shall then be recommended with map and description thereof to the President. The President shall advise the United States Senate and the House of Representatives of his recommendations with respect to such modification or adjustment and such recommendations shall become effective only in the same manner as provided for in subsections (b) and (c) of this section.

USE OF WILDERNESS AREAS

Section 4.(a) The purposes of this Act are hereby declared to be within and supplemental to the purposes for which national forests and units of the national park and national wildlife refuge systems are established and administered and -

(1) Nothing in this Act shall be deemed to be in interference with the purpose for which national forests are established as set forth in the Act of June 4, 1897 (30 Stat. 11), and the Multiple-Use Sustained-Yield Act of June 12, 1960 (74 Stat. 215) (16 U.S.C. 528-531).

(2) Nothing in this Act shall modify the restrictions and provisions of the Shipstead-Nolan Act (Public Law 539, Seventy-first Congress, July 10, 1930; 46 Stat. 1020), the Thyse-Blatnik Act (Public Law 733, Eightieth Congress, June 22, 1948; 62 Stat. 568), and the Humphrey-Thyde-Blatnik-Andresen Act (Public Law 607, Eighty-Fourth Congress, June 22, 1956; 70 Stat. 326), as applying to the Superior National Forest or the regulations of the Secretary of Agriculture.

(3) Nothing in this Act shall modify the statutory authority under which units of the national park system are created. Further, the designation of any area of any park, monument, or other unit of the national park system as a wilderness area pursuant to this Act shall in no manner lower the standards evolved for the use and preservation of such park, monument, or other unit of the national park system in accordance with sections 1, 2, 3, and 4 of this title, the statutory authority under which the area was created, or any other Act of Congress which might pertain to or affect such area, including, but not limited to, the Act of June 8, 1906 (34 Stat. 225; 16 U.S.C. 432 et seq.); section 3(2) of the Federal Power Act (16 U.S.C. 796(2)); and the Act of August 21, 1935 (49 Stat. 666; 16 U.S.C. 461 et seq.).

(b) Except as otherwise provided in this Act, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.

PROHIBITION OF CERTAIN USES

(c) Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

SPECIAL PROVISIONS

(d) The following special provisions are hereby made:

(1) Within wilderness areas designated by this Act the use of aircraft or motorboats, where these uses have already become established, may be permitted to continue subject to such restrictions as the Secretary of Agriculture deems desirable. In addition, such measures may be taken as may be necessary in the control of fire, insects, and diseases, subject to such conditions as the Secretary deems desirable.

(2) Nothing in this Act shall prevent within national forest wilderness areas any activity, including prospecting, for the purpose of gathering information about mineral or other resources, if such activity is carried on in a manner compatible with the preservation of the wilderness environment. Furthermore, in accordance with such program as the Secretary of the Interior shall develop and conduct in consultation with the Secretary of Agriculture, such areas shall be surveyed on a planned, recurring basis consistent with the concept of wilderness preservation by the United States Geological Survey and the United States Bureau of Mines to determine the mineral values, if any, that may be present; and the results of such surveys shall be made available to the public and submitted to the President and Congress.

Mineral leases, claims, etc. (3) Notwithstanding any other provisions of this Act, until midnight December 31, 1983, the United States mining laws and all laws pertaining to mineral leasing shall, to the extent as applicable prior to September 3, 1964, extend to those national forest lands designated by this Act as "wilderness areas"; subject, however, to such reasonable regulations governing ingress and egress as may be prescribed by the Secretary of Agriculture consistent with the use of the land for mineral location and development and exploration, drilling, and production, and use of land for transmission lines, waterlines, telephone lines, or facilities necessary in exploring, drilling, producing, mining, and processing operations, including where essential the use of mechanized ground or air equipment and restoration as near as practicable of the surface of the land disturbed in performing prospecting, location, and , in oil and gas leasing, discovery work, exploration, drilling, and production, as soon as they have served their purpose. Mining locations lying within the boundaries of said wilderness areas shall be held and used solely for mining or processing operations and uses reasonably incident thereto; and hereafter, subject to valid existing rights, all patents issued under the mining laws of the United States affecting national forest lands designated by this Act as wilderness areas shall convey title to the mineral deposits within the claim, together with the right to cut and use so much of the mature timber therefrom as may be needed in the extraction, removal, and beneficiation of the mineral deposits, if needed timber is not otherwise reasonably available, and if the timber is cut under sound principles of forest management as defined by the national forest rules and regulations, but each such patent shall reserve to the United States all title in or to the surface of the lands and products thereof, and no use of the surface of the claim or the resources therefrom not reasonably required for carrying on mining or prospecting shall be allowed except as otherwise expressly provided in this Act: Provided, That, unless hereafter specifically authorized, no patent

within wilderness areas designated by this Act shall issue after December 31, 1983, except for the valid claims existing on or before December 31, 1983. Mining claims located after September 3, 1964, within the boundaries of wilderness areas designated by this Act shall create no rights in excess of those rights which may be patented under the provisions of this subsection. Mineral leases, permits, and licenses covering lands within national forest wilderness areas designated by this Act shall contain such reasonable stipulations as may 32

Appendix B. Worksheet to Prioritize Measures

In each row, write the indicator and potential measure in the left column. Use the following criteria and ranking guide to create an overall score for each measure. Those measures with the highest overall scores should be the highest priority for assessing trends in wilderness character.

A. Level of importance (the measure is highly relevant to the quality and indicator of wilderness character, and is highly useful for managing the wilderness):

High = 3 points, Medium = 2 points, Low = 1 point

B. Level of vulnerability (measures an attribute of wilderness character that currently is at risk, or might likely be at risk over 10-15 years):

High = 3 points, Medium = 2 points, Low = 1 point

C. Degree of reliability (the measure can be monitored accurately with a high degree of confidence, and would yield the same result if measured by different people at different times):

High = 3 points, Medium = 2 points, Low = 1 point

D. Degree of reasonableness (the measure is related to an existing effort or could be monitored without significant additional effort):

High = 1 point, Low = 0 point

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
Indicator: Plant and animal species and communities Measure: Composition of habitat types	2 – Diversity does not influence wilderness character. Further discussion (possibly lower)	2- Habitat areas will likely change but may not be significant (uncertainty esp of storms)	3- If the protocol clearly specifies what habitat the land will fall under, this subjective determination can easily be duplicated in the GIS calculation	0- This measure may have a fairly easy determination system, but requires time to classify in GIS, which has not been done before	7
Indicator: Plant and animal species and communities Measure: Population dynamics of selected non-native plant species (phragmites and CAKO)	3- Invasive, non-native plant species have the potential to dominant ecosystems and reduce biodiversity of indigenous species	3- Unless invasives are managed for, their coverage may spread significantly	3-Protocols for invasive coverage are in place/ in development that involve ground surveying and GIS determination	1- Surveys already in place for monoculture stands only	10
Indicator: Plant and animal species and communities Measure: Population dynamics of wild horses	3- Current horse population is a severe detriment to natural barrier island ecosystems. Differentiate between Maryland (suite of wildlife) and	2- Horses have been under an effective population management strategy for years, and not likely to explode (may be politically harder to reduce herd, if suspected it is now too	3- Horse populations are closely monitored	1- Horse populations are currently being monitored islandwide (but not wilderness	9

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
	Virginia herd (exotic).	high). Would become low vulnerability if we reduce herd or remove from certain areas. (There is room for improvement).		specific)	
Indicator: Plant and animal species and communities Measure: Population dynamics of Sika Deer	3- Sika have high population numbers and stress certain habitats	3-Sika may be outcompeting white-tail deer and are already inhabiting the salt marsh. Hunting is a population control mechanism.	1- Sika harvest may provide some estimate of population trends, but catch can be influenced by factors besides size.	1- Use of data that is already being collected	8
Indicator: Plant and animal species and communities Measure: Number of extirpated indigenous species	3- An extirpation is a significant event and may indicate a disruption of a functional ecosystem (unless evolutionary decline or climate change)	2- No suspected imminent extirpations	2- Professional judgment would be informed by inventories, but always a hard call to make if a species is completely extirpated	1- Professional judgement does not require additional monitoring	8
Indicator: Physical Resources	Monitored at a national level				High

Criteria for Prioritizing Potential Measures					OVERALL SCORE
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
Measure: Visibility based on average deciview and sum of anthropogenic fine nitrate and sulfate					
Indicator: Physical Resources Measure: Ozone air pollution based on concentration of N100 episodic and W126 chronic ozone exposure affecting sensitive plants	Monitored at a national level				High
Indicator: Physical Resources Measure: Acid deposition based on concentration of sulfur and nitrogen in wet deposition	Monitored at a national level				High

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
Indicator: Biophysical Processes Measure: Salt Marsh Integrity	3- Salt Marshes are very productive ecosystems	3- Salt marshes face multiple threats	3- These are established protocols in the FWS Region 5. Led by Susan Adamowicz.	1- Protocols in development	10
Indicator: Biophysical Processes Measure: Mean Sea Level Rise	3- Sea level rise is a major influence on island dynamics	2-Sea level will likely rise although there is uncertainty about the amount or the effects	2- Taken from NOAA but data not collected on site	1-Data retrieved from outside source, not internal monitoring	8
Indicator: Biophysical Processes Measure: Subsidence Rate	3- Subsidence is a contributing factor when calculating sea level rise.	3-Subsidence is occurring faster than sea level rise.	3-Established protocol and measures	1-Already being monitored	10
Indicator: Biophysical Processes Measure: Frequency of storm events	3- Storm events are major influences on island habitats and system dynamics	3-Uncertainty as well as randomness of whether storm events will occur. High suspicion of more storms.	3-Taken from NOAA	1- Data retrieved from outside source, not internal monitoring	10
Indicator: Biophysical	3- Measure considers island as a whole and	1-Not sure if a major enough change will alter	3-Accurate	1-Simple GIS	8

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
Processes Measure: Volume of Sand on Island	whether it has been reduced or growing	island in next 10-15 years	measurements in GIS	calculation	
Indicator: Actions authorized by the Federal land manager that manipulates biophysical the environment Measure: Number of actions to manage plants, animals, pathogens, soil, water or fire	3-Directly relevant to the indicator	3-Actions likely to vary from year to year, and can potentially managed to reduce/minimize	2-Actions may be estimated rather than detailed recording. Some actions likely to be missed. (Can keep better track after baseline)	1-Time only necessary to record actions	9
Indicator: Actions authorized by the Federal land manager that manipulates the biophysical environment Measure: Actions used to maintain dunes	3-Directly relevant to the indicator	2-Dunes are not intended to be maintained so any actions would be a major event. Could be told to build them again by Congress.	3- Since dune maintenance is rare, it should be easy to keep track of	1 –Time only necessary to record actions	9

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
Indicator: Actions authorized by Federal land manager that manipulates the biophysical environment Measure: Action to Control Fire	3- Directly relevant to the indicator	1- Fire is an infrequent event	3-Since fire is infrequent, it should be easy to keep track of	1-Time only necessary to record actions	9
Indicator: Actions not authorized by the Federal land manager that manipulate the biophysical environment Measure: Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire	3-Directly relevant to the indicator	2-Not suspected that many unauthorized actions occur	2-Impossible to monitor or patrol all unauthorized actions. Must make estimations (although there could be high confidence in estimations)	1-Time only necessary to make estimations	8
Indicator: Non-recreational structures, installations, and developments Measure: Index of authorized physical	3-Directly relevant to indicator	2-Not anticipating addition of many physical features. May remove some.	3-Should be possible to track all physical features	1-Initial research may take time, if features not already mapped	9

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
structures, installations, or developments					
Indicator: Non-recreational structures, installations, and developments Measure: Length of active roads and fence	3-Directly relevant to indicator	2-Not anticipating addition of many physical features.	3-Should be possible to track all physical features	1-Roads mapped, fences accounted for	9
Indicator: Non-recreational structures, installations, and developments Measure: Index of unauthorized physical structures, installations, or developments	3-Directly relevant to indicator	2-Not anticipating major change in unauthorized habits	2-Unless visible on Google Earth, harder to survey on-the-ground.	0-Research required about any additional features that are likely unreported	7
Indicator: Non-recreational structures, installations, and developments Measure: Index of abandoned structures	3-Directly relevant to indicator	2-Abandoned structures should be stable unless removed, decomposed, or active structures become abandoned	3-Should be mostly aware of abandoned structures as they've been present for awhile	0-Initial inventory must be made for unmapped structures and determination of when to be	8

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
				decomposed. Future tracking should take less time.	
Indicator: Non-recreational structures, installations, and developments Measure: Length of abandoned roads and fences	3-Directly relevant to indicator	2-Abandoned structures should be stable unless removed, decomposed, or active structures become abandoned	3-Should be mostly aware of abandoned structures	1-Old roads are mapped	9
Indicator: Inholdings Measure: Index of inholdings with wilderness	1-Does not pertain to us	1-No inholdings now or in unforseeable future	3-Easily tracked	1-Easily tracked	6
Indicator: Inholdings Measure: Miles of road associated with inholdings	1-Does not pertain to us	1-No inholding roads now or in forseeable future	3-Easily tracked	1-Easily tracked	6
Indicator: Use of motor vehicles, motorized equipment, and	3-Directly relevant to indicator	3-Variable amount of motorized/mechanical uses. OSV use a management issue.	2-Try to estimate usage based on activity. Difficult to track all usage,	0-Should use existing data of planned activities, but requires time	8

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
mechanical transport Measure: Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport		Multiple pressures applied to usage or not	especially unplanned trips.	for organization, interviews, and brainstorming	
Indicator: Use of motor vehicles, motorized equipment, and mechanical transport Measure: Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport use not authorized by the Federal land manager	3-Directly relevant to indicator	2-Authorized use occurs more often than unauthorized.	2-Difficult to track all usage. Estimations not as accurate as detailed recordings, but may show high confidence	1-Time spent on estimations. Use best judgment and known occurrences.	8
Indicator: Remoteness from sights and sounds of people inside the	3- OSV route is having significant effect on the	3- OSV boundary may change which will produce a significant effect on the measure.	3-Simple GIS calculation	1-Simple GIS calculation	10

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
wilderness Measure: Percent of wilderness affected by access or travel routes inside the wilderness	wilderness.	to			
Indicator: Remoteness from sights and sounds of people inside the wilderness Measure: Hunter use in Virginia	2-Hunters make up just one type of visitor. Currently low hunter density in zones 8,9, & 10	1-No anticipated change in hunter density	3-Easy to track hunters in CNWR wilderness zones	1-Data available	7
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Permanent Viewshed	2-Viewshed should influence only the perimeter of wilderness	1-Not expecting rapid development in viewshed	3-Easy to track	1-Will require a reevaluation every five years, but additions shouldn't be too high.	7

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Seasonal Viewshed	2-Viewshed should influence only perimeter of wilderness	1-Not expecting significant change in seasonal structures	2-Requires more vigilant monitoring at different times of year	0-Requires tracking of whole year of probably unauthorized structures	5
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Temporary Viewshed	2-Viewshed will mostly influence perimeter (boats) and aircrafts fairly rare	2-Motorboats and aircrafts usage may change. More variable.	2-Protocol is consistent, but only a sample once every five years at limited locations and times	1-Will require limited monitoring every five years	7
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Percent of wilderness affected by access or travel routes outside the wilderness	3- OSV usage may significantly affect feeling of remoteness	3-Likely that OSV boundary may be considered outside of the wilderness	3-Simple GIS calculation	1-Simple GIS calculation	10

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
Indicator: Facilities that decrease self-reliant recreation Measure: Agency-provided recreation facilities	3-Directly relevant to measure	1-No anticipated additional facilities or removal of facilities, but new access points and distribution of trails/roads, safety/personal facilities, staff infrastructure	3-Easy to keep track of	1-Retrieved from already available data	9
Indicator: Facilities that decrease self-reliant recreation Measure: User-created recreation facilities	3-Directly relevant to measure	2-May change more so than provided facilities	2-Hard to be fully aware of any user created facilities (hunting blinds)	0-Will require review each five years	7
Indicator: Facilities that decrease self-reliant recreation Measure: Abandoned recreational structures	3-Directly relevant to measure	1-No anticipated additional facilities, may degrade over time.	3-Easy to keep track of because they're more persistent	1-Should have data of agency facilities abandoned. Harder to monitor user created abandoned.	8
Indicator: Management restrictions on visitor	3-Directly relevant to	1-Policies are mostly set	3-Staff determinations.	1- already available	9

Criteria for Prioritizing Potential Measures					
Potential Measure	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	OVERALL SCORE
behavior Measure: Type of management restrictions	measure	in place	Should be documented	data	
Indicator: Management restrictions on visitor behavior Measure: Percent of area restricted	3-Directly relevant to measure	1-Policies are mostly set in place	3-Staff determinations.	1-Already available data. Requires calculation.	9
Indicator: Deterioration or loss of cultural resources integral to wilderness character Measure: Number of actions that affect cultural resources	3-Directly relevant to measure	1-Minimal activities on cultural sights	2-Hard to track unauthorized activities, but smaller area to track	1-Will be based on of known occurrences	7

Names of team members filling out this worksheet:

Taryn Sudol
Kevin Holcomb
Jack Kumer

Appendix C. Summary of Measures

Measure	Priority (H, M, or L)	Detailed Description of the Data Source(s) and How the Data Were Gathered
Natural		
1.1 Population dynamics of selected non- native plant species	H	<i>Source:</i> Internal survey documents and professional judgment <i>Protocol:</i> A list is compiled for selected non-native plant species. Scouting and vegetative surveys provide the acreage occupied for the selected non-native plants. This is limited to monotypic stands rather than interspersed species. The total measure will be the sum of each specie's "Percent of acreage occupied" score. See measure 1.2 for acreage occupied score.
1.2 Population dynamics of non-native wild horses	H	<i>Source:</i> Internal records –Bill Hulslander, Kim Halpin <i>Protocol:</i> The adult horse population (including foals bought back during the Chincoteague Volunteer Fire Company (CVFC auction) for the entire island (herds in both Assateague NS and Chincoteague NWR except the CNWR southern herd which does not have wilderness access) will serve as a surrogate measure for the horses' wilderness presence. These horses have access to large parts of the island including the wilderness area. ASIS monitors their horse population through routine surveys and manages their population through a fertility control program, while the CVFC keeps a number of the CNWR herds. Of the total horse population in CNWR, about two-thirds reside in the North herd which has access to the wilderness. This number may change as horses are transferred from one herd to the other.
1.3 Population dynamics of non-native sika deer	M	<i>Source:</i> Distance sampling data, Mark Sturm, professional judgment, Jack Kumer <i>Protocol:</i> ASIS has four years of distance sampling data that is able to provide an estimated range for the Sika population as part of a study on ungulate grazing effects on vegetation by Mark Sturm. In the future, ASIS hopes to have new technology or population density methods so that the distance sampling technique does not have to be repeated but will provide comparable statistical results.
1.4 Number of extirpated indigenous species	M	<i>Source:</i> Internal survey documents and professional judgment, Kevin Holcomb, Jack Kumer <i>Protocol:</i> Based off an inventory of flora and fauna and professional judgment, a count is maintained of any indigenous species no longer believed to be present on the island within the past five years.
1.5 Visibility	H	<i>Source:</i> USFWS National Air Quality Office <i>Protocol:</i> To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm . Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
1.6 Ozone air	H	<i>Source:</i> USFWS National Air Quality Office

pollution		<i>Protocol:</i> To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm. Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
1.7 Total Nitrogen and Total Sulfur Deposition	H	<i>Source:</i> USFWS National Air Quality Office <i>Protocol:</i> To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm. Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
1.8 Mean Sea Level Rise	M	<i>Source:</i> NOAA Mean Sea Level Trend, Ocean City Inlet, MD http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8570283 <i>Protocol:</i> The mean sea level trend and a plot (from 1900 to 2010) shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. This data is taken from NOAA Tides and Currents at the Ocean City Inlet, MD, which is the nearest station to Assateague Island.
1.9 Significance of storm events	H	<i>Source:</i> Hurricanes/Tropical Storms/Tropical Depressions are logged at NOAA Historical Hurricane Tracks http://csc.noaa.gov/hurricanes/index.html and Nor'Easters are logged at National Weather Service Forecast Office: Wakefield VA http://www.erh.noaa.gov/er/akq/EREVIEW.php <i>Protocol:</i> Hurricane/Tropical Storms/Tropical Depressions are recorded at NOAA's website above. Locations, Chinoteague and ASIS, are entered in and the storm events are recorded for the five year monitoring period or annually. To learn about Nor'easters go to the National Weather Service Forecast Office for Wakefield VA and see if any Historical Winter Storm Graphics/Events are labeled as Nor'Easters in the drop down menu. If so, check the Nor'easter data to make sure it affected the ASIS/CNWR wilderness. As monitoring continues, other weather events that appear to have significantly affected the landscape can be included in this measure so long as it is confirmed and titled consistently with NOAA or the Wakefield Forecast Office.
Untrammelled		
2.1 Number of actions to manage plants, animals, pathogens, soil, water or	H	<i>Source:</i> Internal staff inventory of actions: Charlene/Drizz, Eva Savage, Jim Fair and Ish Ennis, Jack Kumer, Walt West <i>Protocol:</i> Actions are counted annually and entered into the database each year. The time spent on each activity (recorded as number of days that staff entered the wilderness and worked some period of time on the activity) is listed. It is assumed that the more time spent conducting the action, the more trammeling has occurred (this is not always the case but given the

fire		breath of activities, the generalization applies). This table is condensed, but a detailed list of specific activities for monitoring, maintenance, etc is located in Appendix D.
2.2 Number of actions to manipulate fire	H	<i>Source:</i> Internal staff inventory of actions as well as outside fire crews <i>Protocol:</i> Actions are counted annually and entered into the database each year. Refer to measure 2.1. For this measurement, two types of activities are expected: fire suppression or fire containment, in which fire is allowed within a designated area but prevented from spreading to undesirable areas.
2.3 Number of actions for dune maintenance	H	<i>Source:</i> Internal staff inventory of actions <i>Protocol:</i> Actions are counted annually and entered into the database each year. Refer to measure 2.1.
2.4 Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire	M	<i>Source:</i> Internal staff observations and personal judgment of different actions and occurrences. <i>Protocol:</i> Actions are counted annually and entered into the database each year. Actions are organized by type of activity and number of times this activity was reported or estimated.
Undeveloped		
3.1 Index of authorized physical structures, installations, or developments	H	<i>Source:</i> Internal documentation/GIS/knowledge of structures: Eva Savage, Jack Kumer <i>Protocol:</i> A list of structures, installations, and developments will be created based off of inventories already present in GIS as well as any unmapped features known to be on the ground. The list of structures, installations, and developments are multiplied by the weight defined in an index. This weight includes the magnitude of the structure and how long the structure was in place. The sum of the product of structure, installations, and developments and weight will be the measure each year. A detailed list of known structures is in Appendix F, which is intended to help track added structures.
3.2 Length of authorized physical structures, installations, and developments	H	<i>Source:</i> Internal documentation/GIS/knowledge of structures: Jack Kumer <i>Protocol:</i> Features that are measured by length, primarily roads and fences, are listed below. The sum of roads and fences will be compared every five years. Roads and fences are not weighted because while the roads may have a greater footprint, they are unpaved and access routes and fences cause barriers.
3.3 Index of unauthorized physical structures, installations,	M	<i>Source:</i> Internal documentation/knowledge of structures, etc. <i>Protocol:</i> A list of unauthorized features will be developed based off any maps and on the ground observations. The list of structures, installations, and developments multiplied by the weight defined in an index. The sum of the product of structure, installations, and developments and weight will be

or development s		the measure for the five year monitoring period.
3.4 Index of abandoned structures	M	<i>Source:</i> Internal documentation/GIS/knowledge of structures, etc. <i>Protocol:</i> This list will be created based off maps and on the ground observations. The list of structures, installations, and developments is multiplied by the weight defined in an index. This list will be limited to abandoned structures that may be both authorized and unauthorized. Recreational structures that are now abandoned are also included in this measure because they no longer serve a recreational function. The sum of the product of structure, installations, and developments and weight will be the measure for the five year monitoring period.
3.5 Length of abandoned physical structures,	M	<i>Source:</i> Internal documentation/GIS/knowledge of structures, etc. <i>Protocol:</i> Refer to measure 3.4. The same protocol is followed except that applicable structures are measured by length in meters.
3.6 Index of inholdings with wilderness	L	<i>Source:</i> Internal inventory <i>Protocol:</i> A count of each inholding and its acreage
3.7 Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport	M	<i>Source:</i> Internal staff reporting of activities and associated transport/equipment. CNWR: Charlene and Drizz, Eva Savage and Jim Fair. ASIS: Ish Ennis, Jack Kumer, and Walt West. <i>Protocol:</i> Use of motorized vehicles and equipment and mechanical transport is recorded based on activity, the number of times it was used (a "time" means if it entered and exited the wilderness. A time does not exceed one whole day in length, but otherwise this does not indicate the length the vehicle or equipment was in use). Transportation and equipment used is assumed based on the activity done. Refer to Appendix G for a detailed list of activities.
3.8 Authorized Recreational Motor Vehicle Use	M	<i>Source:</i> Number of OSV users counted through gate entry automated counter. OSV use in the wilderness based on Katherina Forgue's thesis. Hunter vehicles for duck hunting logged by check-in and hunter vehicles for deer hunting is professional judgment by Walt West. <i>Protocol:</i> To calculate the OSV usage, use the total traffic count per month from August of the previous year to July of the current year. The assumption is that 10% of OSVs that enter the zone will travel to the wilderness zone. This assumption was derived from Katherina Forgues' thesis observations. To calculate hunter vehicles in the wilderness, use a count of the sign in and sign out for duck hunting. For deer hunting use professional judgment of how many vehicles entered the wilderness.
3.11 Type and amount of motor vehicles, motorized	M	<i>Source:</i> Observations and professional judgment from law enforcement: Jim Fair, Walt West. <i>Protocol:</i> The use of unauthorized motorized and mechanical transportation and equipment will fall within frequency ranges. Staff will decide the range for frequency (week, month, year) and then use observations and informed

equipment, or mechanical transport use not authorized by the Federal land manager		personal judgments to assign a score to the different type of uses. Refer to measure for score table.
Solitude or Primitive and Unconfined Recreation		
4.1 Percent of wilderness affected by access or travel routes inside the wilderness	H	<i>Source:</i> Internal GIS records <i>Protocol:</i> Staff will create a 35 ft buffer area around access or travel routes. The total of this buffer area calculated in GIS will be divided by the total wilderness area for the percent affected. Travel routes will include roads or routes that are actively being used by vehicles. It does not apply to foot traffic. Roads that are abandoned are no longer considered travel routes.
4.2 Amount of litter on the Refuge's coast		<i>Source:</i> Ocean Conservancy International Coastal Clean Up Summary Card. The beach cleanup is conducted on Chincoteague NWR by volunteers who are led by Jenny Owen, Volunteer Coordinator, or Sally Bowen. <i>Protocol:</i> Annually on CNWR there is a beach clean up as part of the Ocean Conservancy. Since the wash up of trash from the ocean is a random process and not wilderness specific, this measure will track the amount of litter collected on the whole CNWR. The clean up occurs in mid-September. Data collected includes number of volunteers, the distanced cleaned at the site, the pounds of debris collected, and what that debris is composed of. For the purposes of this measure, the average weight of debris collected will be compared over each five year monitoring period. The number of volunteers and the distance cleaned will be listed also as a possible explanation for the amount of debris collected, but will not be included in the final measurement (average pounds of debris collected).
4.3 Permanent Viewshed	M	<i>Source:</i> Field count <i>Protocol:</i> Count number of man-made structures visible in wilderness that are permanent features through the on-the-ground surveys. A boat ride in the bay along the length of the wilderness will provide a count of visible structures. Effort is made to be as close to the shore as possible, but is limited by the water depth.
4.4 Temporary Viewshed	M	<i>Source:</i> Field count <i>Protocol:</i> A sample will be taken (15 min) of the number of temporary man-made structures that pass through the viewshed during a designated time (10:00 am) at a specified location (state line). During the sample the monitor will list mobile structures that pass within view (not sound), how long it takes to pass, and how close the structures are based on a distance score (4-Just outside the boundary to 1-Distant, on the horizon or high in the sky).
4.5 Percent of wilderness affected by access or	H	<i>Source:</i> GIS data on travel routes determined to be adjacent to wilderness <i>Protocol:</i> Staff will create a 35 ft buffer area around adjacent access or travel routes. The total of this buffer area calculated in GIS will be divided by the total wilderness area for the percent affected. Travel routes will include

travel routes outside the wilderness		roads or routes that are actively being used by vehicles. It does not apply to foot traffic.
4.6 Agency-provided recreation facilities	H	<i>Source:</i> Internal staff inventory <i>Protocol:</i> The recreational facilities will be counted and organized by type.
4.7 User-created recreation facilities	M	<i>Source:</i> Observations and professional judgment from law enforcement: Walt West, Jim Fair. <i>Protocol:</i> Unauthorized recreational facilities will be counted and organized by type.
4.8 Visitor Restriction Index	H	<i>Source:</i> Internal records <i>Protocol:</i> A score will be given to ASIS and CNWR based on the type of restrictions. These restrictions will be organized by category and the score assigned based on if there is no regulation or total prohibition. The higher the sum of the scores the more restrictions exist in the wilderness. Refer to measure for score table.
4.9 Extent of management restrictions	H	<i>Source:</i> Internal records –GIS layer delineation of wilderness area and roadways. <i>Protocol:</i> This is a GIS calculation of the accessible travel routes area within the wilderness. All area outside these travel routes is restricted in the CNWR portion of the land. This number (area restricted/total area) is then compared to the number of days it is prohibited (year minus hunting season).
Other Features		
5.1 Number of actions that result in disturbances to cultural resources (looting, trespass activities, non-compliance with NHPA)	M	<i>Source:</i> Internal staff consultation of associated activities <i>Protocol:</i> An inventory of the cultural sites will be created then any actions that occur on these sites will be listed. If the activity is damaging it will receive a negative score. If the activity preserves or restores the site it will receive a positive score. The sum of the activities will be tracked during the five year monitoring period.

Appendix D. Effort

Effort Required for Wilderness Character Monitoring					
FWS Wilderness Fellows, 2012					
Table completed by: TARYN SUDOL					
Refuge: CHINCOTEAGUE NATIONAL WILDLIFE REFUGE & ASSATEAGUE NATIONAL SEASHORE					
Quality	Indicator	Measure	Were data gathered from office paper files, computer files, or field work (professional judgment <u>is</u> an option)?	Time you spent gathering data for each measure (in whole hours)	Comments
Natural	Plant and Animal species and communities	Population dynamics of selected non-native plant species	paper, computer, GIS	3	Keep in mind that the time estimations include discussion and data collection among both ASIS and CNWR. This does not include time to identify or write the measures for the report.
		Population dynamics of non-native wild horses	professional judgment	1	
		Population dynamics of non-native sika deer	paper, office paper files on harvest	2	
		Number of extirpated indigenous species	professional judgment	1	
	Physical Resources	Visibility based on average deciview and sum of	National office		Not supplied by ASIS or CNWR by USFWS National Air Quality Office

		anthropogenic fine nitrate and sulfate				
		Ozone air pollution based on concentration of N100 episodic and W126 chronic ozone exposure affecting sensitive plants	National office			
		Acid deposition based on concentration of sulfur and nitrogen in wet deposition	National office			
	Biophysical Processes	Mean Sea Level Rise	Computer, NOAA	2		
		Significance of storm events	Computer, NOAA	4		
Untrammeled	Actions authorized by the Federal land manager that manipulates	Number of actions to manage plants, animals, pathogens, soil, water or fire	Computer file, professional judgment	7	This includes all the interviews plus organizing the data.	
		Number of actions to manipulate fire	Professional judgment	1		

	biophysical the environment	Number of actions for dune maintenance	professional judgment	1
	Actions not authorized by the Federal land manager that manipulate the biophysical environment	Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire	professional judgment	3
Undeveloped	Non-recreational structures, installations, and developments	Index of authorized physical structures, installations, or developments	Computer file, GIS, professional judgment	6
		Length of active roads and fences	Computer file, GIS	2
		Index of unauthorized physical structures, installations, or developments	professional judgment	3
		Index of abandoned structures	Computer file, GIS, professional judgment	5
		Length of abandoned roads and fence	Computer file, GIS	1
	Inholdings	Index of inholdings with wilderness	Computer file	1

	Use of motor vehicles, motorized equipment, and mechanical transport	Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport	professional judgment	6
		Authorized Recreational Motor Vehicle Use	Traffic counter, sign in –sign out sheets, professional judgement	3
		Type and amount of motor vehicles, motorized equipment, or mechanical transport use not authorized by the Federal land manager	professional judgment	2
Solitude or Primitive and Unconfined Recreation	Remoteness from sights and sounds of people inside the wilderness	Percent of wilderness affected by access or travel routes inside the wilderness	Computer file, GIS	3
		Amount of Litter on CNWR	Data sheet from cleanup	1
	Remoteness from occupied and modified areas outside	Permanent Viewshed	Field data collection	5
		Temporary Viewshed	Field data collection	4

	the wilderness	Percent of wilderness affected by access or travel routes outside the wilderness	Computer file, GIS	3
	Facilities that decrease self-reliant recreation	Agency-provided recreation facilities	Computer file, GIS, professional judgement	3
		User-created recreation facilities	professional judgement	2
	Management restrictions on visitor behavior	Visitor restriction index	professional judgement, known policies	2
		Extent of management restrictions	Known policies, GIS	2
	Other Features	Deterioration or loss of cultural resources integral to wilderness character	Number of actions that affect cultural resources (looting, trespass activities, non-compliance with NHPA)	Professional judgment 2

Effort Required for Wilderness Character Monitoring		
FWS Wilderness Fellows, 2012		
Table completed by: Taryn Sudol		
Refuge: Chincoteague National Wildlife Refuge and Assateague National Seashore		
Title of staff involved in identifying, prioritizing, and selecting measures	Staff time to identify, prioritize, and select measures (in whole hrs)	Comments
Lou Hinds	10	Conference call, initial meeting with ASIS, interviews

Kim Halpin	10	Conference call, initial meeting with ASIS, interviews
Kevin Holcomb	32	Conference call, initial meeting with ASIS, interviews, second ASIS visit, outside time??
Emarie Ayala	2	Interview
Eva Savage	1	Interview, harvest data
Janelle Walters	1	Interview
Charlene Swartz	1	Interview
Drizz Wilgus Jr.	1	Interview
Jim Fair	1	Interview
Aubrey Hall	1	Hunter questions
Trish Kicklighter	3	Initial meeting with CNWR
Bill Hulslander	15	Initial meeting with CNWR, second visit, interview, outside time??
Jack Kumer	29	Identify measures, interview, compose and organize activity table
Brian Sturgis	4	Identify measures
Neil Winn	5	Identify measures, compile data
Walt West	1	Interview
Ish Ennis	1	Interview

Effort Required for Wilderness Character Monitoring

FWS Wilderness Fellows, 2012

Table completed by: Taryn Sudol

Refuge: Chincoteague National Wildlife Refuge and Assateague National Seashore

Time you spent to identify, prioritize, and select all the measures (in whole hours)	Time you spent to learn how to enter data into the WCM database application (in whole hours)	Time you spent to enter all data into the WCM database application (in whole hours)	Time you spent on other tasks directly related to WCM (e.g., reading CCP, giving presentations, talking with staff) (in whole hours)	Time you spent doing <u>other</u> Refuge tasks not directly related to WCM (in whole hours)
156	3	5	18	77

Appendix E. Actions –Detailed

Action	Days Spent to Complete Action	
	ASIS	CNWR
Set up for monitoring:		
Piping plover management	15	
Bald Eagle management	5	
Breeding bird signage	4	
Deer monitoring set up/ fence repair	8	
Set up amaranth cages	12	
Post signs after marsh restoration	30	
Install instruments in pond marsh	10	
Marsh bird monitoring installations	2	
Set up for fox ecology study	12	
Soil analysis set up	1	
Groundwater monitoring set up	4	
Erect nest exclosures		3
Salt Marsh Monitoring set up		10
Installing informational signs:		
Put up signs	9	
OSV trail boundary signs	15	
White rods on hunting trails	14	
Post biological signs		1
Maintaining existing structures:		
Horse fence repair	4	
Horse/deer grazing fences	6	
Stateline fence	14	
Pony fence repair		5
Mowing:		
Cross island roads	14	
Service road		5
Weather station		2
Other:		
Jeep trail		1
Horse Management	25	4
Treating Phragmites	60	
Marsh Restoration	100	
Survey Benchmark installation and maintenance	15	
Trapping		60
TOTAL		

Appendix F. List of Authorized Developments

Feature	Name of Components
Bridge	Valentine's Road Bridge
Gates	Backtrail/ Cable
	Pope Bay Road/Cable
	Backtrail/ Cable
	Boat Launch Road/Road Q /Single Wooden Arm
	Green Run Road/ Cable
	Valentine's Road/ Single Wooden Arm
Duckblinds	A-17
	A-18
	A-19
	B-21
	A-23
	B-22
	B-24
	B-25
Old Roads	Dune Crossing 9
	Dune Crossing 11
	Dune Crossing 12
	Dune Crossing 14
	Dune Crossing 16
	Peoples/Lynch Road
	Backtrail
	Road P
	Jims Gut Campsite
	Blind 18 Access Road
	Valentines Road
	Road Scar
	Mussers Road
	Clements Road
Current Roads	OSV Zone
	Fox Hills Road
	Green Run Road
	Clements Boathouse Road
	Valentines Road
	Backtrail
	Big Levels Road
	Pope Bay Access Road
	State Line Road
	Back Country Road
	Peoples/Lynch
Hunting Trails	B-22
	B-24

	B-25
	B-21
	A-23
	A-20
	A-17
	A-18
Retention Structures	Valentines
	People's Lynch
	BobOdell
	Clements
	Clements Boathouse
	Musser
Cultural Site	Jackson's Green Run
	Graveyard

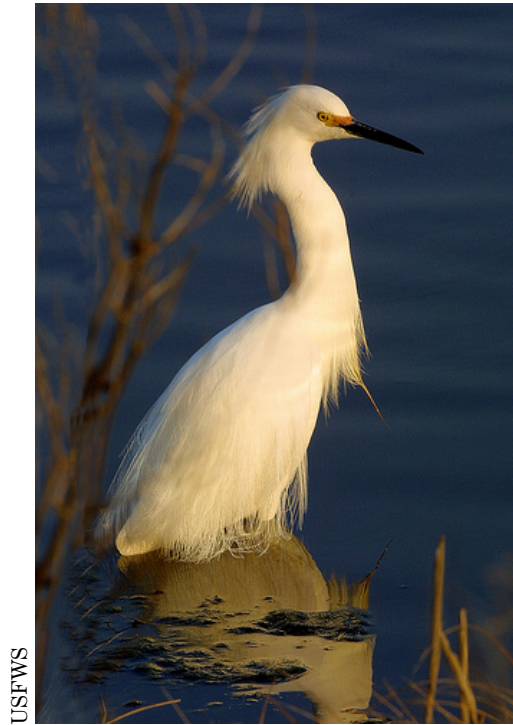
Appendix G. Authorized motorized vehicles, mechanical transport and motorized equipment –Detailed

Activity	No. of times motorized vehicles used*		No. of times mechanical transport used		No. of times motorized equipment used	
	ASIS	CNWR	ASIS	CNWR	ASIS	CNWR
Monitoring:						
Horses	40					
Plover	140	42				
Bald Eagle	25					
Other breeding birds	14	34				
Herpetology	10					
Deer	75	3				
Goose	5					
General survey: rare or invasive plants	12					
General survey: rare of invasive animals	12					
Amaranth	20	1				
Sea turtle	20					
Mosquito	30					
Shoreline	8					
Pond hydrology	10					
SETs	4	3				
Nekton	20	3				
Marsh vegetation	15	3				
Marsh birds	12					
Tiger Beetle	1					
Falcons	21					
Groundwater	15					
Cross Island Elevation	15					
Post marsh hydrology	60					
Post marsh restoration	10					
Research:						
Mapping invasive plants	20					
Assessment of cultural resources	12					
Assessment of storm/flood events	20					
Fox ecology	60					
Soil Analysis	30					
Other Biological Actions						
Horse Management	25					
Treating Phragmites	60				25	
					(generator	

			r)
Mammal strandings	10		
Marsh restoration	100 (dump trucks, loaders, pick up)		100 (generator, chainsaws)
Survey Benchmark	15		1 (jackhammer)
No hunting signs	9		
OSV trail boundaries	15		
Trapping		60	
Nest exclosures		3	
Post signs		1	
Patrolling			
Hunting: waterfowl	360		
Hunting: big game	360	350	
Daily	485	450	
Assistance response	14		
Fire report	1		
Maintenance			
Horse/marsh fencing	4		
Deer/horse forest fencing	6		
Stateline fencing	42 (wheel loader, tractor)		
Pony fence		5	
Pony penning		1	
Roadwork leveling		60 (dump truck, loader, bobcat, fuel truck)	15 (equipment trailer)
Post storm surveillance		1	
Remove trees	12	1	1 (chainsaw)
Check weather station		1	
RomTech Service	48		48 (pumper)
Maintain bridges	1 (fill-in loader)		
Maintain gates	6		
Beach route	12		
Cross island roads	14 (mower)		
Fill in potholes	4 (loader)		

Service road mowing		10 (pickup, mower)	5 (trailer)				
Mow weather station		4 (pick up, mower)	2(trailer)				
Mow Jeep Trail		2 (pick up, mower)	1(trailer)				
TOTAL	2338	1038	0	23	174	1	

Appendix B



USFWS

Snowy Egret

Other Federal Mandates and Relevant Plans and Initiatives

This appendix provides full summary descriptions of the ESA Recovery Plans listed in Section 1.8.4 and of those plans and initiatives discussed in Section 1.10.

1.8.4 Other Federal Mandates

Federal Endangered Species Act (ESA) Recovery Plans

Four Federal ESA Recovery Plans are in effect to protect and enhance threatened and endangered species which are residents of Chincoteague and/or Wallops Island NWRs: Atlantic Coast Piping Plover (*Chadradius melodus*) Recovery Plan (USFWS 1995), Delmarva fox squirrel (*Sciurus niger cinereus*) Recovery Plan (USFWS 1993b), Recovery Plan for Seabeach amaranth (*Amarantus pumilus*) Rafinesque (USFWS 1996b), and Recovery Plan for U.S. Populations of Loggerhead Turtle (*Caretta caretta*) (NMFS and USFWS 1993). Current refuge management with respect to these federally-listed species has been guided by these Recovery Plans and numerous ESA Section 7/Biological Opinions for refuge projects. Habitat Management Plans (HMPs) for Chincoteague and Wallops Island NWRs will incorporate and build upon these recovery plans but each plan is summarized below.

Atlantic Coast Piping Plover (*Chadradius melodus*) Recovery Plan (1996)

The primary objective of this recovery program is to remove the Atlantic Coast piping plover population from the List of Endangered and Threatened Wildlife and Plants by: (1) achieving well-distributed increases in numbers and productivity of breeding pairs, and (2) providing for long-term protection of breeding and wintering plovers and their habitat. Loss and degradation of habitat due to development and shoreline stabilization have been major contributors to the species' decline. Disturbance by humans and pets often reduces the functional suitability of habitat and causes direct and indirect mortality of eggs and chicks. Predation has also been identified as a major factor limiting piping plover reproductive success at many Atlantic Coast sites, and substantial evidence shows that human activities are affecting types, numbers, and activity patterns of predators, thereby exacerbating natural predation (USFWS 1995). This recovery plan follows the Atlantic Coast Recovery guidelines for managing and protecting piping plovers and describes specific policies concerning monitoring guidelines, protection efforts, disturbance issues, predator control, and reporting requirements. The refuge objectives are to maximize production of the piping plover (with mean productivity of 1.50 chicks fledged per nesting pair) and least tern on refuge lands. This will be accomplished through the reduction of predation and human disturbance, and through public educational efforts about the plight of the piping plover and least tern and the work conducted by the refuge to restore the bird populations.

Delmarva Fox Squirrel (*Sciurus niger cinereus*) Recovery Plan (1993)

The Delmarva Peninsula fox squirrel, generally called the Delmarva fox squirrel, was listed as federally endangered in 1967 because of concerns about a reduction in distribution to only 10 percent of its historical range. Three recovery plans have been written for this species, with the most recent completed in 1993 (USFWS 1993). This recovery plan focuses primarily on determining the current distribution and habitat requirements of the Delmarva fox squirrel and on implementing habitat protection within its remaining natural range. The plan also notes that successful establishment of translocated populations will be required for full recovery. The Delmarva fox squirrel's forested habitat is susceptible to continued loss and fragmentation through overcutting and land use changes, although this is balanced to some extent by regeneration of forest resources.

2011 Delmarva Peninsula Fox Squirrel 5-Year Review

This five-year status review (USFWS 2011) summarizes information obtained since the previous five-year review by the USFWS in 2007 and evaluates the status of the species' populations, habitat, and threats. It considers delisting criteria specified in the most current recovery plan and conducts an assessment of the five listing factors to determine the appropriate classification of this species under the ESA. USFWS will continue monitoring efforts on the refuge through the use of trapping and camera stations on the grounds.

Recovery Plan for Seabeach amaranth (*Amarantus pumilus*) (1996)

Seabeach amaranth is restricted to sandy ocean beaches, and its habitat consists of the sparsely vegetated zone between the high tide line and the toe of the primary dune. This plan seeks to establish the species in at least six of the coastal states within its historic range (Delaware, Massachusetts, Maryland, North Carolina, New Jersey, New York, Rhode Island, South Carolina, and Virginia). Recovery is defined as when a minimum of 75 percent of the sites with suitable habitat within each state are occupied by amaranth populations for 10 consecutive years. Habitat destruction and alteration, incompatible beach grooming practices, and recreational activities have all contributed to the decline of this species. Although some of the surviving populations are on public lands (national wildlife refuges, national seashores, and state parks), they are not completely protected from the threats that face almost all populations (Seabeach amaranth 1996b).

Recovery Plan for U.S. Populations of Loggerhead Turtle (*Caretta caretta*) (1993)

This plan reviews and discusses the species ecology, population status and trends, and identifies threats to the loggerhead turtle in the northwestern Atlantic. It lays out a recovery strategy to address the threats, based on the best available science, and includes recovery goals and criteria. In addition, the plan identifies actions needed to address the threats to the species and achieve recovery. This revised plan is significant in that it identifies five unique recovery units, which comprise the population of loggerhead turtles in the northwest Atlantic, and describes specific recovery criteria for each recovery unit (NMFS and USFWS 1993).

1.10 Other Relevant Plans and Initiatives**1.10.1 International and National Conservation Plans and Initiatives**

The plans and initiatives listed below, in chronological order, provide guidance for the CCP/EIS development and development of refuge management policies, goals, and objectives in regard to the significance of the refuge's natural environment and considerations for its protection and management.

North American Breeding Bird Survey (BBS; 1966 to present)

The BBS is an ongoing cooperative effort between the U.S. Geological Survey's Patuxent Wildlife Research Center and Environment Canada's Canadian Wildlife Service to monitor the status and trends of North American bird populations. BBS data are collected by thousands of participants along thousands of randomly established roadside routes throughout the continent. Professional BBS coordinators and data managers work closely with researchers and statisticians to compile and deliver these population data and population trend analyses on more than 400 bird species.

In the mid-twentieth century, the success of DDT (dichlorodiphenyltrichloroethane) as a pesticide ushered in a new era of synthetic chemical pest control. As pesticide use grew, concerns, as epitomized by Rachel Carson in *Silent Spring*, regarding their effects on wildlife began to surface (Carson, 2002). Local studies had attributed some bird kills to pesticides, but it was unclear how, or if, bird populations were being affected at regional or national levels. Responding to this concern, Chandler Robbins and colleagues at the Patuxent Wildlife Research Center developed the BBS to monitor bird populations over large geographic areas.

Although most concerns over pesticide use in North America have subsided in recent decades, bird populations continue to be subjected to numerous widespread threats including habitat loss, habitat fragmentation, land-use changes, and other chemical contaminants. Today, the BBS continues to monitor bird populations across North America and informs researchers and wildlife managers of significant changes in bird population levels. If significant declines are detected, their causes can then be identified and appropriate actions taken to reverse them before populations reach critically low levels.

North American Waterfowl Management Plan (NAWMP; 1986 and update 2004)

Originally written in 1986, the NAWMP describes a 15 year strategy for the United States, Canada, and Mexico to restore and sustain waterfowl populations by protecting, restoring, and enhancing habitat. The plan committee, including representatives from Canada, the United States, and Mexico, has modified the 1986 plan twice to account for biological, sociological, and economic changes that influenced the status of waterfowl and the conduct of cooperative habitat conservation. The most recent modification in 2004 updates the latest needs, priorities, and strategies for the next 15 years, and guides partners in strengthening the biological foundation of North American waterfowl conservation and stakeholder confidence in the direction of the plan (NAWMP Committee 2004).

To convey goals, priorities, and strategies more effectively, that 2004 modification comprises two separate documents: a Strategic Guidance document and an Implementation Framework document. The former is for agency administrators and policy makers who set the direction and priorities for conservation and the latter includes supporting technical information for use by biologists and land managers (NAWMP Committee 2004).

The plans are implemented at the regional level in 14 habitat Joint Ventures and 3 species Joint Ventures: Arctic Goose, Black Duck, and Sea Duck. Chincoteague and Wallops Island NWRs lie in the Atlantic Coast Joint Venture, which includes all the Atlantic Flyway states from Maine to Florida and Puerto Rico.

Partners in Flight Conservation Plans (PIF; 1990)

In 1990, PIF began as a voluntary, international coalition of government agencies, conservation organizations, academic institutions, private industries, and citizens dedicated to reversing the population declines of bird species and “keeping common birds common.” The foundation of its long-term strategy is a series of scientifically-based bird conservation plans using physiographic areas as planning units.

The goal of each PIF plan is to ensure the long-term maintenance of healthy populations of native birds, primarily non-game birds. The plan for each physiographic area ranks bird species according to their conservation priority, describes their desired habitat conditions, develops biological objectives, and recommends conservation measures. The priority ranking factors in habitat loss, population trends, and the vulnerability of a species and its habitats to regional and local threats.

Chincoteague and Wallops Island NWRs are included in the Mid-Atlantic Coastal Plain (physiographic area 44) and its plan (Version 1.0, April 1999). The plan includes objectives for the following habitat types and associated species of conservation concern.

- Barrier and Bay Islands: American oystercatcher, black skimmer, least tern, Forester’s tern, gull-billed tern;
- Salt Marsh: black duck, clapper rail, willet and seaside sparrow;
- Pine Plantation: brown-headed nuthatch, eastern wood pewee, and eastern towhee;
- Early successional: field sparrow, northern bobwhite, and yellow-breasted chat; and
- Fresh/Brackish Emergent Wetland: American black duck.

The Mid-Atlantic Coastal Plain plan is available on line at http://www.partnersinflight.org/bcps/pl_44sum.htm (Watts 1999).

Regional Wetland Concept Plan, Northeast Region (1990)

Congress enacted the Emergency Wetlands Resources Act in 1986 to promote the conservation of wetlands nationwide. Through this act, Congress directed the Department of the Interior to develop a national

wetlands priority conservation plan identifying the location and types of wetlands that should receive priority attention for acquisition by Federal and state agencies using Land and Water Conservation Fund appropriations. In 1990, the USFWS Region 5 completed a regional wetlands concept plan that complemented the national plan by providing more detailed information about the wetland resources of the northeastern states (USFWS 1990).

The regional wetlands concept plan identifies 850 wetland sites that warrant consideration for acquisition. It also describes wetland functions and values as well as identifies habitat loss and threats to wetlands remaining in the region. Of the 205 wetland sites identified in the Commonwealth of Virginia, 20 sites are located in Accomack County, including Cedar and Metompkin islands and Chincoteague Island. This information is important to consider for regional conservation efforts (USFWS 1990).

North American Bird Conservation Initiative (NABCI, 1998)

The NABCI is a coalition of government, private and academic organizations, and private industry leaders addressing bird conservation. The initiative's vision is to achieve regionally-based, biologically-driven, landscape-oriented partnerships that deliver the full spectrum of bird conservation across the North American continent and that support simultaneous, on-the-ground delivery of conservation for all birds. It evolved in 1998 out of recognition of the value of coordinating efforts of the NAWMP and PIF. Populations and habitats of North America's birds are protected, restored, and enhanced through coordinated efforts at international, national, regional, state, and local levels, guided by sound science and effective management. NABCI has designated 37 Bird Conservation Regions (BCR) that encompass landscapes having similar bird communities, habitats, and resource issues. NABCI defined BCRs as ecologically based units in a framework for planning, implementing, and evaluating bird conservation. Each BCR has its own implementation plan (NABCI n.d.a). Chincoteague and Wallops Island NWRs lie in the New England/Mid-Atlantic (NABCI n.d.b).

U.S. Shorebird Conservation (2001) and North Atlantic Regional Shorebird Plans

The U.S. Shorebird Plan Council is a partnership of state and federal agencies, non-governmental conservation organizations, academic institutions, and individuals that collaborated under a grant from USFWS in 2000 to develop the U.S. Shorebird Conservation Plan (USSCP), with a second addition published in May 2001. The plan develops conservation goals for each U.S. region, identifies important habitat conservation and research needs, and proposes education and outreach programs to increase public awareness of shorebirds and of threats to them. The USSCP is available online at <http://www.shorebirdplan.org/wp-content/uploads/2013/01/USShorebirdPlan2Ed.pdf> (Brown 2001).

In the Northeast, the North Atlantic Regional Shorebird Plan was drafted to step down the goals of the continental plan to smaller scales and identify priority species, habitats, and species goals, as well as prioritize implementation projects.

The North Atlantic Regional Shorebird Plan can be viewed online at <http://www.fws.gov/shorebirdplan/RegionalShorebird/downloads/NATLAN4.pdf> (Clark 2000).

North American Waterbird Conservation Plan (NAWCP; Version 1, 2002)

The NAWCP is the result of an independent partnership among individuals and institutions interested in or responsible for conserving water birds and their habitats. The plan is just one element of a multi-faceted conservation program. The primary goal of the plan is to ensure that the distribution, diversity, and abundance of populations and habitats of breeding, migratory, and non-breeding water birds are sustained or restored throughout the lands and waters of North America, Central America, and the Caribbean. It provides a framework for conserving and managing colonially-nesting water-dependent birds. In addition, it will facilitate continent-wide planning and monitoring; national, state, and provincial conservation; regional coordination; and local habitat protection and management.

A copy of the continental plan can be requested at <http://www.nawcp.org/pubs/ContinentalPlan.cfm> (Kushlan et al. 2002).

Birds of Conservation Concern (BCC; 2002 and update 2008)

USFWS developed the BCC report, Birds of Conservation Concern 2002, and its update, Birds of Conservation Concern 2008, in consultation with the leaders of ongoing bird conservation initiatives and partnerships such as PIF, NAWMP, NAWCP, and USSCP. The report fulfills the mandate of the 1988 amendment to the Fish and Wildlife Conservation Act requiring the Secretary of the Interior, through the USFWS, to “identify species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973.”

The BCC report identifies the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities. The underlying philosophy behind BCC 2008 is that proactive bird conservation actions are necessary at a time when human impacts are at an all-time high to ensure the future of healthy avian populations and communities. BCC 2008 data and information serve as a barometer of the condition of the nation’s avifauna from a national landscape scale funneled down to regional details.

The 2008 report identifies species at three geographic scales: NABCI BCRs, USFWS regions, and national. The national BCC 2008 priority bird list provides an early warning for those bird species that have the potential to decline to levels requiring ESA protection; it is to be consulted before actions are taken on Federal lands, and for research, monitoring, and management funding in accordance with Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (2002). The national list serves as an outreach tool for educating the public about the precarious status of selected bird species across the United States and as a general rule is not used to foster bird conservation at smaller geographic scales; that is the purpose of the BCR 30 and USFWS region lists (USFWS 2008c). The relevant BCR list for the refuge is discussed below.

New England/Mid-Atlantic Coast Bird Conservation Region (BCR 30) Implementation Plan (2008)

The Atlantic Coast Joint Venture partnership created this plan in response to the NABCI challenge of building on existing partnerships to plan, implement, and evaluate cooperative bird conservation across North America. The plan outlines actions to restore and maintain healthy populations of birds native to the New England/Mid-Atlantic BCR (BCR 30).

Of the 134 bird species identified in the plan as priorities for conservation, 107 species occur on the refuge. Priority species include American black ducks, Atlantic brant, scoters, and bufflehead for waterfowl; piping plovers, American woodcock, red knots and American oystercatchers for shorebirds; least terns, gull-billed tern, glossy ibis and clapper rails for waterbirds; and northern bobwhite, field sparrow, eastern towhee, and prairie warblers for landbirds. We considered these species and priority habitats in developing management actions for this CCP.

The habitats of BCR 30 are a complex transition between the southern New England and the southern Atlantic coastal plains. Major threats to birds and habitats are invasive exotic species, climate change and sea level rise, and human disturbance from recreational uses and land development.

The implementation plan may be viewed online at http://www.acjv.org/BCR_30/BCR30_June_23_2008_final.pdf (Steinkamp 2008).

A Blueprint for the Future of Migratory Birds: A Strategic Plan 2004-2014 (2004)

In tandem with the BCC 2008 effort, USFWS also developed a 10-year national strategic migratory management plan to collaborate with its partners to recommit and set a successful course for migratory bird conservation over the next decade. The finalized plan describes the challenges facing migratory bird

conservation, with associated management strategies to meet these future challenges. We formulated a strong recommitment to migratory bird conservation with the following vision statement “*Through careful management built on solid science and diverse partnerships, the Service and its partners will restore and sustain the epic sweep of bird migration and the natural systems on which it depends --- fostering a world in which bird populations continue to fulfill their ecological roles while lifting the human spirit and enriching human lives in infinite ways, for generations to come*” (USFWS 2004a).

The plan points out that “birds enrich people’s lives and have intrinsic value as threads in the earth’s ecological tapestry, as pollinators, predators, and prey. Birds serve as excellent indicators of the health and quality of the environment as clean air, clean water and abundant, diverse natural habitats are essential for birds to survive and flourish” (USFWS 2004a). The plan also recognizes that birds are enjoyed by a large proportion of Americans, as more than 82 million residents of the U.S. (39 percent of adult population) participate in wildlife-related activities, and 64 million pursue bird-related recreation, contributing substantially to local economies throughout the nation by spending more than \$40 billion dollars annually on these pursuits.

The plan also identifies the major future challenges to conserve migratory birds. Declines in abundance of many landbird, shorebird, and waterbird populations are indicative of ecosystems that have been highly stressed and altered. The plan acknowledges that reductions in natural habitat quantity and quality are the primary causes of negative population trends in many bird species and are exacerbated by the direct loss of bird life from an array of environmental contaminants. Pesticides continue to poison birds and their food supplies. Invasive species and disease outbreaks also contribute to migratory bird mortality. Global climate change and demand for fresh water supplies pose current and future threats.

The plan explains that meeting these challenges will require consistent adherence to the principles of sound science. We will address many of these threats in this CCP/EIS and use the best available scientific information to mitigate environmental dangers to migratory birds. The refuge and its partners will focus on these challenges in the most cost-effective manner to perpetuate avian populations (USFWS 2004a).

Conserving the Future: Wildlife Refuges and the Next Generation (USFWS 2011)

USFWS created this report, *Conserving the Future*, using the previous Refuge System strategic plan, the 1999 report *Fulfilling the Promise* (USFWS 2009), as a foundation. It provides an updated vision for the future of America’s national wildlife refuges. The report recognizes that since the 2009 report, much of America has changed from a conservation standpoint, with an increasing focus on such topics as invasive species and changing climate. USFWS worked with the National Wildlife Refuge Association, a non-profit focused on policy, landscape-scale conservation efforts, grassroots development and public education, to develop this report, as well as over 100 USFWS staff members and input from over 10,000 public comments.

This report outlines a vision that states:

“The Service will enhance its close relationship with the state fish and wildlife agencies. We will coordinate with them on management of fish and wildlife within the Refuge System and on establishing population objectives. We will strive to increase hunting and fishing opportunities to a diverse constituency. We will also be a catalyst to find common ground with other refuge supporters with the goal of expanding the conservation constituency for the benefit of healthy wildlife and habitats for future generations” (USFWS 2011c).

Specifically, this document is split into three chapters that highlight the main ideas for conservation:

- “Conserving the Future: Wildlife and Wildlands,” which outlines how the USFWS will embrace a scientific, landscape-level approach to conserving, managing and restoring refuge lands and waters, and work to facilitate conservation benefits beyond our boundaries;

- “A Connected Conservation Constituency,” which explains how the USFWS will engage the American people to better understand their expectations and increase their awareness of the Refuge System and its role in conservation; and
- “Leading Conservation into the Future,” which speaks to developing a diverse workforce that embodies the Guiding Principles of the USFWS and demonstrates those principles in our daily activities and interactions.

USFWS recognizes the challenges that refuges face in coming years, and the report focuses on gaining conservation strength through partnerships with other agencies and individuals (USFWS 2011c). We have incorporated the importance of partnerships in the changing world into this CCP/EIS throughout, and specifically in Goal 5.

U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (2012)

The USFWS developed these guidelines developed in conjunction with the Wind Turbine Guidelines Advisory Committee to acknowledge the growing concern of potential wildlife disturbance due to wind energy sources. We recognize that as the U.S. shifts to renewable energy production to supplant the need for carbon-based fuel, wind energy will be an important source of power. As wind energy production increases, both developers and wildlife agencies have also recognized the need for a system to evaluate and address the potential negative impacts of wind energy projects on species of concern. These voluntary guidelines provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development. They also promote effective communication among wind energy developers and federal, state, and local conservation agencies and tribes. When used in concert with appropriate regulatory tools, the guidelines form the best practical approach for conserving species of concern (USFWS 2012b).

1.10.2 National Public Use Plans and Initiatives

America's Great Outdoors: A Promise to Future Generations (AGO; 2011)

On April 16, 2010, President Obama launched the America's Great Outdoors (AGO) initiative and charged the Secretaries of the Departments of the Interior and Agriculture, the Administrator of the Environmental Protection Agency (EPA), and the Chair of the White House Council on Environmental Quality to develop a 21st-century conservation and recreation agenda. Multiagency teams conducted more than 50 listening sessions in communities throughout the U.S., engaging a full range of interested groups, including tribal leaders, farmers and ranchers, sports enthusiasts, foresters, motorized recreationists, youth groups, businesspeople, educators, historic preservationists, state and local governments, and land trusts. Many thousands of Americans provided feedback and comments through e-mail and the AGO website. In all, more than 105,000 comments contributed to the conversation. These comments and recommendations provide the basis for the AGO report to the President, and a starting point for a continuing conversation on conservation in the 21st-century. The report was created in consultation with the American people; it reflects their ideas on how to reconnect people with America's lands, waters, and natural and cultural treasures and builds on the conservation successes in communities across the nation (Department of the Interior, et. al. 2012.).

Let's Move! And Let's Move Outside

Let's Move is an initiative launched by First Lady Michelle Obama, with the goal of solving the problem of obesity within a generation. The program is focused on children, and helping them and their parents focus on healthy eating and physical activity. At the launch of the initiative, President Barack Obama signed a Presidential Memorandum creating the first-ever Task Force on Childhood Obesity to conduct a review of every single program and policy relating to child nutrition and physical activity and develop a national action plan to maximize federal resources and set concrete benchmarks toward the First Lady's national goal. The five pillars of the initiatives are: creating a healthy start for children, empowering their parents

and caregivers, providing healthy food in schools, improving access to healthy, affordable foods, and increasing physical activity.

Let's Move has an outgrowth initiative, Let's Move Outside, administered by the DOI in partnership with the U.S. Forest Service and U.S. Army Corps of Engineers with the goal of connecting children to nature through active, outdoor recreation. The initiative's website has several ways to search by type of activity or type of location for nearby recreational opportunities. Let's Move Outdoors is an initiative of the AGO.

Youth in the Great Outdoors

Youth in the Great Outdoors is a U.S. Department of Interior initiative to employ, educate, and engage young people from all backgrounds in exploring, connecting with and preserving America's natural and cultural heritage. This initiative aims to promote outdoor and educational programs as well as employment opportunities for youth throughout the Department and reach out to audiences who have never visited their public lands. The hope for this initiative is to help tackle some of the many challenges facing youth today, from high unemployment rates to declining health, by reconnecting youth with the outdoors and building pathways to careers in resource stewardship.

Connecting People with Nature

Connecting People with Nature is a USFWS initiative that recognizes the need to connect children, their families and communities to nature through innovative ideas, evidence-based resources and tools, broad-based collaboration, and the support of grassroots leadership. Through this initiative, we partner with companies and educators across the country as well as other initiatives to develop programs that inspire people to get outside and become more connected with nature.

1.10.3 Climate Change and Sea Level Rise Studies

USFWS is concerned with the potential effects of climate change on Assateague Island and the Virginia Eastern Shore, and the potential impact on refuge facilities, infrastructure, and access. We therefore consider climate change to be a key consideration for this CCP/EIS. These concerns are further described in section 1.14.

The two most relevant climate change plans are the following:

- *Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change.* Our climate change strategic plan identifies key goals and objectives for the agency centered around three areas: adaptation, mitigation, and engagement. Key adaptation goals and objectives include the creation of regional Climate Science Centers and Landscape Conservation Cooperatives, development of a National Fish and Wildlife Adaptation Strategy over a 5 year period (see below), conduct species and habitat vulnerability assessments, and incorporate climate change into agency activities and decisions (USFWS 2010b). A draft supplemental, "Appendix: 5-Year Action Plan for Implementing the Climate Change Strategic Plan," details the specific actions the USFWS will take through 2013 to achieve each of the goals and objectives (USFWS 2009).
- *The National Fish, Wildlife and Plants Climate Adaptation Strategy* (2012) was called for by Congress in 2010. USFWS, the National Oceanic and Atmospheric Administration, the Council on Environmental Quality, state wildlife agencies, and Tribes co-led the development of this Strategy using the best available science. Working with a broad range of conservation interests, including local governments, states, tribes, conservation organizations, federal agencies, industry and private landowners, the strategy provides "a unified approach—reflecting shared principles and science-based practices—for reducing the negative impacts of climate change on fish, wildlife, plants, and the natural systems upon which they depend." The strategy is a blueprint for action, and includes scientific support, policy and legal frameworks, best management practices, processes for integration and communication, and a framework for implementation.

The relevant work on climate change for the refuge includes the following studies and plans, presented in chronological order:

- *A Case Study on Chesapeake Bay and Assateague Island*, part of the 2001 Climate Change, Wildlife, and Wildlands Toolkit by the U.S. EPA in partnership with the National Park Service (NPS) and USFWS, recognizes the constant change in the shape and geographical position of Assateague Island and predicts that the island is likely to continue to move landward, as sand is pushed across the island to the bay side. It finds that similar habitats will probably not suffer serious net losses, but that infrastructure such as the Wildlife Loop Road may be destroyed (EPA, NPS, USFWS 2009)
- *Refuges at Risk: the Threat of Global Warming*, a 2006 report by the Defenders of Wildlife, warns of the threat of global warming to National Wildlife Refuges and details its potential effects on ten national wildlife refuges that it considers the most endangered. Chincoteague NWR is included in those ten. The report states that scientists predict that Assateague Island will narrow due to sea level rise leading to a loss in wildlife habitat and impacts to roads and visitor facilities (Schlyer 2006).
- *The Virginia Climate Change Action Plan*, published in 2008 by the Governor's Commission on Climate Change, identifies sea level rise as a major concern for coastal Virginia. The Plan projects that sea levels in the Chesapeake Bay region will be 0.7 to 1.6 meters (2.3 to 5.2 feet) higher by 2100, with great local variability as a result of subsidence. The Plan recommends that local governments in coastal Virginia and the Secretary of Transportation include projected climate change impacts, especially sea level rise and storm surge, in all planning efforts, including transportation planning, project design, and prioritization of projects for funding as well as transportation systems management, operations, and maintenance (Governor's Commission on Climate Change 2008).
- *Sea Level Rise and Coastal Habitats in the Chesapeake Bay Region*, published by the National Wildlife Federation, used the Sea Level Affecting Marshes Model (SLAMM)¹ to predict coastal changes, including impacts on coastal wildlife habitats, in the Chesapeake Bay region over the 21st century. The report notes that because of its expansive coastline, low-lying topography, and growing coastal population, the Chesapeake Bay region is one of the most vulnerable places in the nation to the impacts of sea level rise. Many places along the Chesapeake Bay have seen a one-foot increase in relative sea level rise over the 20th century, including six inches due to global warming and six inches due to naturally subsiding coastal lands. In looking at the Chesapeake Bay area, the report concluded that there would be significant inundation of dry-land and conversion to marshes by 2100 (Glick 2008).
- *Application of the SLAMM 5.0.2 in the Lower Delmarva Peninsula* was commissioned by Chincoteague NWR to project the effects of sea level rise on barrier islands extending from Ocean City Inlet, Maryland to Fisherman Island, Virginia in the Delmarva Peninsula with a main focus on Chincoteague NWR and Assateague Island National Seashore. The study used three scenarios, which reflect the projections adopted by the Virginia Climate Change Action Plan, including:

¹ SLAMM is one of the models used to study the impact of coastal processes, such as sea-level rise, on an area and simulate the dominant processes and forecast long-term effects. SLAMM takes into account five processes that determine the impact of sea level rise impact on wetlands: inundation: (the rise of water levels and the salt boundary); erosion; overwash (beach migration and transport of sediments); saturation (migration of coastal swamps and fresh marshes onto adjacent uplands due to the water table responding to rising sea level); and accretion (vertical rise due to buildup of organic and inorganic matter).

- o Intergovernmental Panel on Climate Change (IPCC) A1B scenario: 0.7 meter global sea level rise by 2100
- o 1.0 meter global sea level rise by 2100
- o 1.5 meter global sea level rise by 2100

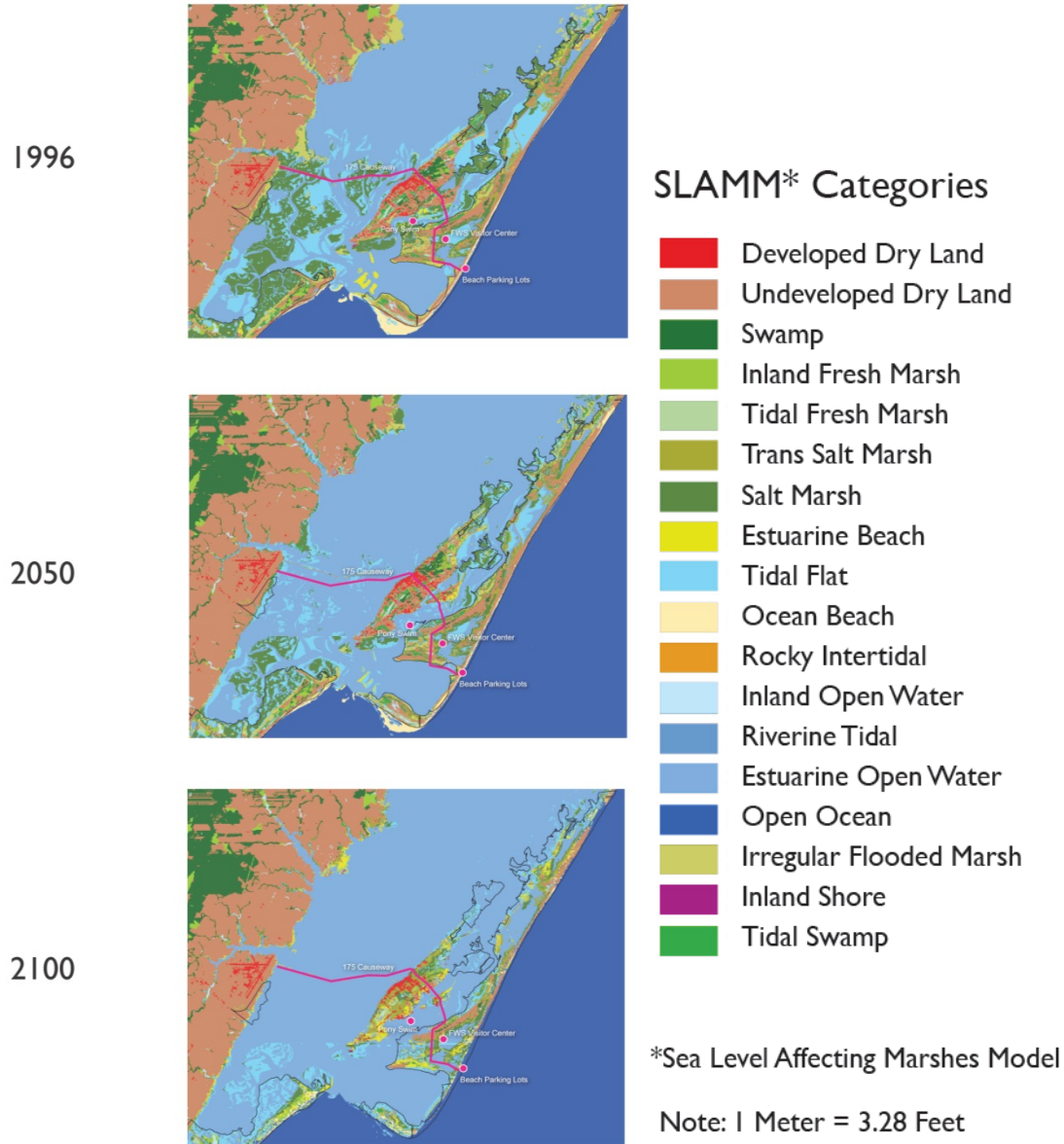
These three scenarios and the resulting habitat changes are shown in Figure 1-3. The study executed simulations in 25 year increments from the date of available existing conditions (1988-2003) until 2100 and found that the most significant changes would occur on the eastern shore beaches and marshes. Breaching is expected along areas near Toms Cove and significant loss of coastal habitats is anticipated for Assateague Island and other barrier islands within Chincoteague NWR by 2075 or 2100 in the 1.0 and 1.5 meter rise scenarios, respectively. Assuming a 0.69 m to 1.5 m sea-level rise, Brackish Water marshes would decline 68% to 91% and saltmarsh would decline 37% to 49% by 2100. Under the same sea-level rise scenarios, transitional salt marsh (scrub shrub) may gain 88% to 156% habitat. Furthermore, Ocean beach habitat would decline by 80 percent by the year 2100 in the 1.0 meter sea level rise scenario. Estuarine beaches, on the other hand, are projected to gain habitat. As with all ecological models, SLAMM does not currently account for all of the feedback and functions of coastal ecosystems.

The study indicates that critical transportation infrastructure is under threat of overwash and inundation in the future, including the Route 175 Causeway, the bridge and causeway between Chincoteague and Assateague Islands, and low-lying stretches of Beach Road. As noted in the Chincoteague NWR Master Plan (1993), the land now beneath current beach parking areas will eventually be reduced due to the natural movement of the barrier island, a movement that would most likely be exacerbated and added to by effects of climate change (Nieves 2009).

- *National Parks in Peril: The Threats of Climate Change Disruption*, published by The Rocky Mountain Climate Organization and the Natural Resources Defense Council, identifies 25 national parks, including Assateague Island National Seashore, as most at risk to climate change impacts. The report recommends that parks focus on reducing emissions of NPS operations and visitor activities, in particular due to transportation, through demonstrating model programs and becoming climate-neutral² (Saunders 2009).

² The term climate neutral, which is often used interchangeably with carbon-neutral, reflects the fact that it is not just carbon dioxide (CO₂), that is driving climate change, but also encompasses other greenhouse gases regulated by the Kyoto Protocol, such as: methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulphur hexafluoride (SF₆).

Figure 1-1. SLAMM Analysis Results for Chincoteague and Wallops Island NWRs (Nieves 2009).



1.10.4 State, Regional, and Local Plans

Virginia's Comprehensive Wildlife Conservation Strategy and Wildlife Action Plan

In 2002, Congress created the State Wildlife Grant Program (SWG), and appropriated \$80 million in state grants. The purpose of the program is to help state and tribal fish and wildlife agencies conserve fish and wildlife species of greatest conservation need. The funds appropriated under the program are allocated to states according to a formula that takes into account their size and population.

To be eligible for additional Federal grants and satisfy the requirements for participating in the SWG program, each state and U.S. territory developed a statewide “Comprehensive Wildlife Conservation Strategy” and submitted it to the National Advisory Acceptance Team by October 1, 2005. Each plan addressed eight required elements and identified and focused on “species of greatest conservation need,” while still addressing other wildlife and wildlife-related issues.

The Virginia Department of Game and Inland Fisheries developed the Virginia Wildlife Action Plan as to meet that charge. The goal of the plan is to create a vision for conserving wildlife and stimulate other states, Federal agencies, and conservation partners to think strategically about their individual and coordinated roles in prioritizing conservation. The eight elements addressed in the Virginia Wildlife Action Plan supplement and validate the information on species and habitat and their distribution on Chincoteague and Wallops Island NWRs – which helps identify conservation threats and management strategies for species and habitats of conservation concern on the refuge. The plan identifies 925 species in need of greatest conservation concern in Virginia and groups them into four tiers of relative risk of imperilment. The plan also identifies the “top 10” threats faced by terrestrial wildlife; seven are related to habitat destruction or fragmentation (Virginia Department of Game and Inland Fisheries 2005).

State Comprehensive Outdoor Recreation Plan (2007)

The 2007 *Virginia Outdoors Plan* (VOP) is the ninth VOP created since 1965, and provides guidance and direction in meeting the state’s needs for outdoor recreation and for the conservation of natural, cultural, and scenic resources important to Virginians’ quality of life. The document recognizes that with the growing population, decrease in undeveloped natural landscape, and increase in anthropogenic stimuli, the preservation of natural lands and the provision of outdoor recreation opportunities are high public demands. The 2007 VOP offers specific statewide recommendations for program areas, land management agencies responsible for outdoor recreation, and land conservation. It also includes numerous recommendations for each planning region throughout the Commonwealth; the refuge is located within the Accomack-Norhampton Planning District. Region-specific recommendations include working with USFWS on optimizing compatible recreation activities while still protecting sensitive beach habitats and working with partners on wildlife corridor protection and migratory bird habitat. It highlights several issues and trends that Virginia faces in the coming years, with the most critical being funding and economics, outdoor recreation, and land conservation and key infrastructure planning (Virginia Department of Conservation & Recreation 2007).

Accomack County Comprehensive Plan (2008)

The Accomack County Comprehensive Plan provides an inventory of existing conditions, list of issues and concerns, future land use plan, and goals, objectives, and recommendations. The plan identifies natural resource preservation as an important issue and goal for the future. The plan recognizes that the County’s natural resources base, including forests, fields, marsh, creeks, bays, and barrier islands, has economic, aesthetic, and recreational value, as well as being valuable habitat for a variety of wildlife. The plan states that the County will enact a variety of policy, regulatory, and program tools to preserve farmland, shorelines, water resources, and other natural resources (County of Accomack 2008).

Town of Chincoteague Comprehensive Plan (2010)

The Town of Chincoteague Comprehensive Plan provides a community profile, with information on the history, socioeconomic characteristics, natural features, and land use of the Town of Chincoteague, and goals, objectives, and implementation strategies for land use, economic development, community facilities, transportation, and housing. The plan focuses on balancing growth and economic development with economic and environmental sustainability. The plan identifies tourism and aquaculture as two primary areas of concern for economic development and establishes a resource conservation planning area to complement the purpose and objectives established by the NPS and the USFWS for Assateague Island National Seashore and Chincoteague NWR. This includes maintaining the protections afforded by barrier islands from storm events and protecting the diverse and unique ecology that serves as the basis for the Town's economy and visitation to the area (Town of Chincoteague 2010).

Appendix C



USFWS

Ruddy Turnstone

Laws and Executive Orders Applicable to Chincoteague NWR and Wallops Island CCP

Legal mandates and policies of the U.S. Fish and Wildlife Service (USFWS) govern our planning and management of the National Wildlife Refuge System (Refuge System). A list and brief description of these legal mandates can be found at the “Division of Congressional and Legislative Affairs, USFWS” Web site (<http://www.fws.gov/laws/Lawsdigest.html>). In addition, USFWS has developed policies to guide NWRs planning and management. These policies can be found at the “NWRs Policies Web site” (<http://www.fws.gov/refuges/policiesandbudget/refugepolicies.html>).

All projects and step-down plans described in a CCP will be required to comply with the National Wildlife Refuge System Improvement Act of 1997 and the National Environmental Policy Act (described in Chapter 1 of the CCP), as well as a variety of other Federal regulations, EOs, and legislative acts. A brief description of the laws and EOs applicable to Chincoteague and Wallops Island NWR CCP, as well as a statement indicating how each relates to the CCP, is provided in Table 1.

Table 1. Applicable Laws and Executive Orders

Law, Regulation, or Guideline	Description	Relation to the CCP
Enabling Legislation		
Public Law 89-195 (16 U.S.C. 459f) (1965)	Created the Assateague Island National Seashore and authorized the Secretary of the Department of Interior to acquire all of the right, title, or interest of the Chincoteague-Assateague Bridge and Beach Authority, in the bridge constructed by such Authority across the Assateague Channel, together with all lands or interests therein, roads, parking lots, buildings, or other real or personal property of such Authority, and such right, title, and interest have been acquired by the National Park Service.	The CCP references this law in determining ownership of the Chincoteague-Assateague Bridge and in continuing the recreational beach as referenced above.
16 U.S.C. § 667b, Public Law 80-537, An Act Authorizing the Transfer of Certain Real Property for Wildlife, or other Purposes; and,	Authority under which Wallops Island NWR was established.	The CCP relies on this authority for defining the purpose of the CCP.
16 U.S.C 715-715r, The Migratory Bird Conservation Act, as amended and Established under the authority of the Migratory Bird Conservation Act, as amended.	Authority under which Chincoteague and Wallops Island NWRs were established.	The CCP relies on this authority for defining the purpose of the CCP.

Law, Regulation, or Guideline	Description	Relation to the CCP
Climate Change		
Department of the Interior Secretarial Order 3226	States that there is a consensus in the international community that global climate change is occurring and that it should be addressed in governmental decision-making in the U.S. This Order requires Departmental planning and decision-making to take climate change impacts into account. Additionally, it calls for the incorporation of climate change considerations into long-term planning documents, such as Comprehensive Conservation Plans (CCP).	The CCP identifies addressing climate change as part of its purpose and establishes objectives and strategies that aim to meet this order.
Agency Coordination		
Executive Order 12372, Intergovernmental Review of Federal Programs	Requires that Federal agencies afford other agencies review of documents associated with Federal programs.	Availability of the EIS will be advertised in the Federal Register and copies of the draft CCP/EIS will be sent to Federal, State (including the State Clearinghouse), and local agencies and Tribal governments.
Human Rights		
Executive Order 12898, Environmental Justice	Mandates Federal agencies to achieve environmental justice by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.	Implementing the CCP will not have a disproportionately high and adverse human health or environmental effect on minority or low-income populations. The CCP promotes compatible uses of the land that protect the natural resources and provide opportunities for wildlife-dependent recreational uses.

Law, Regulation, or Guideline	Description	Relation to the CCP
Architectural Barriers Act of 1968, as amended (42 U.S.C. §§ 4151 et seq.)	Requires that all new federal buildings and facilities constructed or altered with federal funds since 1968 be accessible to and usable by individuals with disabilities. Also requires that modifications be made to existing buildings and facilities to ensure that individuals with disabilities have equal access to any program or opportunity provided to employees or visitors.	New buildings on the refuge will comply with these requirements. Where appropriate, new trails and outdoor facilities will be designed per the draft accessibility guidelines for outdoor developed areas.
Cultural Resources		
Antiquities Act of 1906	This act authorizes the scientific investigation of antiquities on Federal land. It prohibits and provides penalties for unauthorized search for or collection of artifacts or other objects of scientific interest. The Act also authorizes the President to establish national monuments and cultural areas on Federal lands.	USFWS will continue to comply with this Act under the CCP.
Native American Graves Protection and Repatriation Act of 1990 (PL 101-601; 25 USC 3001 et seq.)(NAGPRA)	Regulations for the treatment of Native American graves, human remains, funeral objects, sacred objects, and other objects of cultural patrimony. Requires consultation with Native American Tribes during Federal project planning.	
Executive Order 11593, Protection and Enhancement of the Cultural Environment	States that if the USFWS proposes any development activities that may affect archaeological or historical sites, the USFWS will consult with Federal and State Historic Preservation Officers to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.	Cultural resources that have been identified will be protected, and steps to avoid any inadvertent impacts to subsurface deposits that have yet to be identified will be taken as required by this Order. The USFWS will continue to comply with this Order under the CCP.
Archaeological Resources Protection Act of 1979 (PL 96-95; 93 STAT 722; 16 USC 470aa-47011), as amended (ARPA)	Protects materials of archeological interest from unauthorized removal or destruction and requires Federal managers to develop plans to locate archaeological resources.	Cultural resources that have been identified will be protected, and steps to avoid any inadvertent impacts to subsurface deposits that have yet to be identified will be taken. The USFWS will continue to comply with this Act under the CCP.

Law, Regulation, or Guideline	Description	Relation to the CCP
American Indian Religious Freedom Act 1978 (PL 95-341; 92 STAT 469; 42 USC 1996)	Provides for freedom of Native Americans to believe, express, and exercise their traditional religion, including access to important sites.	The Tribes will be contacted regarding the CCP and will be invited to provide information necessary to protect sacred sites and other resources.
National Historic Preservation Act of 1966 (PL 89-665; 50 STAT 915; 16 USC 470 et seq.; 36 CFR 800), as amended (NHPA)	Requires Federal agencies to consider the effects of any actions or programs on historical properties.	The EIS prepared to accompany the draft CCP addresses the potential effects of the actions proposed in the CCP and includes measure to ensure that no adverse effects to historical properties will occur.
Archaeological and Historic Preservation Act of 1974 (PL 93-291; 88 STAT 174; 16 USC 469)	Provides for the preservation of historical buildings, sites, and objects of national significance.	Potential historical resources have been identified in the CCP and those of national significance will be preserved. The USFWS will continue to comply with this Act under the CCP.
Tribal Coordination		
Executive Order 13175, Consultation and Coordination with Indian Tribal Governments	Requires Federal agencies to implement an accountable process to ensure meaningful and timely input by tribal officials as policies are developed that have tribal implications.	Tribal governments in Virginia were initially consulted prior to publication of the Notice of Intent and have continued to be updated on the progress of the CCP.
Paleontological Resources		
Paleontological Resources Preservation Act of 2009 (P.L. 111-11, Title VI, Subtitle D)	Requires the management and protection of paleontological resources on federal lands using scientific principals and expertise; requires the development of plans for the inventory, monitoring, and scientific and educational use of paleontological resources; addresses the collection and curation of resources; identifies prohibited acts, and establishes criminal and civil penalties.	The potential effects of refuge actions on paleontological resources have been evaluated and there is a low potential for these resources to be present on the refuge. The USFWS will however comply with the provision of this Act as applicable under the CCP.
Biological Resources		

Law, Regulation, or Guideline	Description	Relation to the CCP
Endangered Species Act of 1973 (16 USC 1531 et seq.), as amended (ESA)	Provides for protection of plants, fish, and wildlife that have a designation as threatened or endangered.	An Intra-Service Section 7 has been completed that evaluates the effects of the proposed actions on the refuge's endangered and threatened species.
National Environmental Policy Act of 1969 (42 USC 4321 et seq.) (NEPA)	Requires analysis, public comment, and reporting for environmental impacts of Federal actions.	The public will be notified of the availability of the draft EIS and will be provided with a 60-day period to provide comments.
Fish and Wildlife Act of 1956 (16 USC 742a-743j, not including 742d-742l)	Provides Secretary of Interior with authority to protect and manage fish and wildlife resources.	USFWS will continue to comply with this Act under the CCP.
Fish and Wildlife Conservation Act of 1980 (16 USC 661-667e), as amended	Requires the USFWS to monitor non-game bird species, identify species of management concern, and implement conservation measures to preclude the need for listing under ESA.	The CCP will continue to comply with this Act under the CCP.
Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	Instructs Federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation Plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.	The USFWS has incorporated the strategies and recommendations of the listed management plans into the CCP to conserve migratory birds. The USFWS will continue to comply with this Order under the CCP.
Executive Order 13112, Invasive Species	Federal agencies are required to use relevant programs and authorities to prevent, control, monitor, and research invasive species and coordinate complementary, cost-efficient, and effective activities concerning invasive species by relying on existing organizations already in place that address invasive species issues.	The CCP addresses the need to work with others to address invasive species issues on the refuge. In addition, an Integrated Pest Management Plan will be prepared for the refuge in association with the HMP.
Bald and Golden Eagle Protection Act of 1940 (16 USC 668 et seq.)	Provides protection for bald and golden eagles.	

Law, Regulation, or Guideline	Description	Relation to the CCP
Migratory Bird Treaty Act of 1918, as amended (MBTA)	Provides protection for bird species that migrate across state and international boundaries.	The USFWS will continue to comply with this Act under the CCP.
Fish and Wildlife Coordination Act of 1958	Requires equal consideration and coordination of wildlife conservation with other water resource development programs.	The CCP acknowledges the need to coordinate refuge actions with the agencies that maintain reservoirs downstream of the refuge.
Federal Noxious Weed Act of 1990	Requires the use of integrated management systems to control or contain undesirable plant species, and an interdisciplinary approach with the cooperation of other Federal and State agencies.	
Emergency Wetlands Resources Act of 1986	Promotes the conservation of migratory waterfowl and offsets or prevent the serious loss of wetlands by the acquisition of wetlands and other essential habitats.	The CCP includes strategies to protect, restore, and enhance the wetlands that occur on the refuge.
Hazardous Materials		
Oil Pollution Act of 1990 (PL 101-380; 33 USC 2701, et seq.)	Provides oil pollution policies and protections.	The USFWS will continue to comply with this Act under the CCP.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (PL 96-510; 42 USC 9601, et seq.) (CERCLA)	Provides mechanism for hazardous waste cleanup.	
Water Quality		
Clean Water Act of 1972, Section 404 (33 USC 1344 et seq.), as amended	Establishes a program to regulate the discharge of dredged or fill material into waters of the United States (U.S.), including wetlands and requires a permit from the U.S. Army Corps of Engineers before dredged or fill material may be discharged into waters of the U.S.	The CCP requires the implementation of best management practices during ground-disturbing activities to minimize siltation and run-off into adjacent wetlands, as well as during the application of pesticides, all to protect water quality.

Law, Regulation, or Guideline	Description	Relation to the CCP
Clean Water Act, Section 401	Requires that an applicant for a federal license or permit provide a certification that any discharges will comply with the Act, including water quality standard requirements.	
Land and Water Use		
National Wildlife Refuge System Administration Act of 1966 (16 USC 668dd-668ee), National Wildlife Refuge System Improvement Act of 1997 (PL 105-57)	Administration, management, and planning for National Wildlife Refuges, Amends the National Wildlife Refuge System Administration Act of 1966. Requires development of CCPs for all refuges outside of Alaska.	The USFWS determined that hunting, wildlife observation, photography, environmental education, interpretation, research, and recreational trails are compatible with the purposes for which the refuge was established. Implementation of the CCP will therefore satisfy the intent of this Act.
Executive Order 11990, Protection of Wetlands	Provides for the conservation of the natural and beneficial values of wetlands and their associated habitats.	The CCP includes strategies to protect, restore, and enhance the wetlands that occur on the refuge.
Executive Order 11988, Floodplain Management	Provides for the support, preservation, and enhancement of the natural and beneficial values of floodplains.	Structures, such as trail bridges, that have the potential to influence the movement of floodwater will be designed to take into consideration the hydrology of the site, thus the proposed action is consistent with this Order.
Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System	Directs the Secretary of the Interior to recognize compatible wildlife-dependent recreational activities involving hunting, fishing, wildlife observation and photography, and environmental education/interpretation as priority general public uses on refuges.	The CCP addresses the compatibility of these uses on the refuges.

Law, Regulation, or Guideline	Description	Relation to the CCP
Refuge Recreation Act of 1962, as amended	Provides for recreation use that is compatible with the primary purpose of a refuge.	The USFWS determined that hunting, wildlife observation, photography, environmental education, interpretation, and recreational trails are compatible with the purposes for which the refuge was established.
Fish and Wildlife Improvement Act of 1978	Improves administration of fish and wildlife programs and amends earlier laws including Refuge Recreation Act, NWRS Administration Act, and Fish and Wildlife Act of 1956. Authorizes the Secretary to accept gifts or real and personal property on behalf of the U.S. Also authorizes use of volunteers on Service projects and appropriations to carry out a volunteer program.	The CCP acknowledges the continued acquisition of lands within the approved refuge boundary and that some parcels may come into the refuge as a gift or donation. Volunteers will also an important aspect of refuge management.
Coastal Zone Management Act of 1972 (Pub.L. 92–583, 86 Stat. 1280, enacted October 27, 1972, 16 U.S.C. §§ 1451–1464, Chapter 33)	Designates certain undeveloped coastal barrier islands for inclusion in the Coastal Barrier Resources System (System). Areas so designated are ineligible for direct or indirect Federal financial assistance that might support development, including flood insurance, except for emergency life-saving activities. Exceptions for certain activities, such as fish and wildlife research, are provided, and National Wildlife Refuges and other, otherwise protected areas are excluded from the System. The law encourages the conservation of hurricane prone, biologically rich coastal barriers by restricting Federal expenditures that encourage development, such as Federal flood insurance.	The CCP acknowledges the Act and commits to considering climate change when planning or constructing infrastructure, but relevance of the Act's regulations are limited.
Wilderness Act of 1964 (Pub.L. 88–577)	Established the National Wilderness Preservation System and a process for Federal agencies to recommend wilderness areas to Congress.	The CCP commits to maintaining the wilderness character of the proposed wilderness within Chincoteague NWR.
Other		
Executive Order 13443, Facilitation of Hunting Heritage and Wildlife Conservation	Directs Federal agencies, including USFWS, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.	The CCP supports continued opportunities for hunting on the refuge.

Law, Regulation, or Guideline	Description	Relation to the CCP
Data Quality Act (DQA) passed through the United States Congress in Section 515 of the Consolidated Appropriations Act, 2001 (Pub.L. 106–554). (Also known as Information Quality Act).	Requires Federal agencies to adhere to guidance and regulation issued by the Office of Management and Budget (OMB) that "provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies".	The CCP commits the refuge to supporting efforts to improve and share data, consistent with USFWS guidance issued in response to this Act.

Appendix D

John White and Steve Hillebrand



Chincoteague Ponies

Interim Chincoteague Pony Management Plan

2013 INTERIM CHINCOTEAGUE PONY MANAGEMENT PLAN



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2013 INTERIM CHINCOTEAGUE PONY MANAGEMENT PLAN

PURPOSE

The purpose of the Interim Chincoteague Pony Management Plan (Plan) is to provide a written framework for the management of the semi-wild population of horses, known as Chincoteague ponies (ponies) on the Virginia portion of Assateague Island for a 5 – 10 year period. This plan builds upon the Chincoteague Pony Management Plan which was signed in 1990 and revised in 1995.

The National Wildlife Refuge System Improvement Act of 1997 requires all units of the National Wildlife Refuge System to be managed under a Comprehensive Conservation Plan (CCP). The CCP must describe the desired future conditions of a refuge and provide long-range guidance and management direction to achieve refuge purposes. This Plan will provide provisional guidance for the management of the ponies during the development of the CCP and until such time that a more robust management plan can be developed. This Plan will be incorporated into the CCP, and corresponding Environmental Impact Statement, as an attachment.

The Refuge Administration Act sets forth a mandate to ensure that all “uses” be managed in a manner compatible with the Refuge’s primary purposes. The Refuge is working to balance increasing demands for recreation and economic opportunities with the need to protect and enhance wildlife populations that depend on the Refuge.

Careful observation, research, and cooperation of the Chincoteague Volunteer Fire Company (CVFC), the National Park Service (NPS), the Fish and Wildlife Service and the community will continue to ensure that the hardy ponies remain healthy and do not detract from Assateague Island’s diverse natural resources.

BACKGROUND AND HISTORY

The Refuge:

Under the auspices of the Fish and Wildlife Service (Service), an agency within the Department of the Interior (DOI), the Chincoteague National Wildlife Refuge (Refuge) was established on May 13, 1943 through acquisition of 8,808 acres under authority of the Migratory Bird Conservation Act. The Assistant Secretary of the Interior determined that FWS ownership of this land was necessary for protection during nesting and migration seasons of all those species of wildlife determined as being of great value as a source of food, or in destroying of injurious insects, or nevertheless in danger of extermination through lack of adequate protection (U.S. District Court 1943). The Migratory Bird Conservation Commission (MBCC) initially approved

the Refuge at a meeting on March 25, 1941, acknowledging the importance of Assateague Island as wintering habitat for migrating greater snow geese, and nesting habitat for black ducks, shorebirds, and migratory birds (MBCC 1941). At that time they also approved acquisition of Jerico and Hebron Islands, two small marshes adjacent to Assateague Island, just north of the Virginia boundary in Maryland.

Since 1943, numerous tracts of land have been added to the Refuge. All lands have been purchased under the authority of either the Migratory Bird Conservation Act {16 U.S.C. 715d}, Refuge Recreation Act {16 U.S.C. 460 K-1}, and the Emergency Wetlands Resources Act of 1986. Federal title of these lands is acquired to the mean low water line. In 1990, Assawoman and portions of Metompkin Island (1,608.5 acres total) were purchased with Land and Water Conservation Funds.

Refuge purposes are taken from enabling legislation and acquisition authorities for a particular refuge and from Congressional legislation affecting the refuge system as a whole. CNWR “purposes” include:

- 1) “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- 2) "... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- 3) "... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)
- 4) "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)
- 5) "... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

In 1997, Congress passed the landmark National Wildlife Refuge System Improvement Act (NWRSA) establishing a unifying mission and a wildlife-first mandate for the Refuge System. The NWRSA affirmed that: refuges are anchors for biodiversity and ecosystem-level conservation; lands and waters of the System are biologically healthy; and refuge lands reflect national and international leadership in habitat management and wildlife conservation.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The NWRSA also declares that all existing and proposed public uses must be compatible with each refuge's purposes, and highlights six priority public uses that each Refuge should evaluate for compatibility. These are; wildlife observation, photography, interpretation, environmental education, hunting and fishing. Recreational activities allowed on CNWR are also influenced by the Assateague Island National Seashore (ASIS) within which the Assateague Island portion of the Refuge lies.

Now, almost 70 years later, the Refuge is managed to support a number of migratory bird species, federal threatened and endangered species, and a number of federal or state species of conservation concern. As one of the most visited refuges in the country, Chincoteague also provides a range of recreational opportunities and supports a critical part of the local economy.

The Ponies and the CVFC:

The legacy of the ponies is rich and enigmatic. Historical documents refer to domestic and wild livestock, including horses, on Assateague Island since the late 1600s. There is no recorded evidence on how the earliest horses arrived on Assateague Island, though legends romanticize the ways.

There are some that believe Native Americans released them on the islands. Others firmly believe the ponies are descendents from horses that swam ashore from the wreck of a Spanish galleon on the shoals of Assateague Island. However, the most realistic explanation is that the ponies originated from domestic stock of early Eastern Shore settlers. The pasturing of livestock on Assateague Island was done to evade taxes and fencing laws enacted to protect crops.

No matter what the origins of the ponies, early accounts describe grazing horses and cattle on Assateague and other barrier islands along the entire Atlantic Coast. These animals were semi-wild and roamed freely on the island(s). Existing on a barrier island subjected them to a wide variety of environmental extremes. Excessive heat and cold, strong northeasters, hurricanes,

tidal surges, snowstorms, droughts, biting insects, etc. made their existence difficult and their management problematic.

Archival research conducted by John Amrhein, Jr., author of *The Hidden Galleon*, suggests that a very powerful hurricane in 1749 eradicated all livestock on Assateague Island. Former governor of Virginia, Henry A. Wise, is credited as providing the earliest eyewitness testimony to the size of horses inhabiting Assateague Island. Attributed to him is the following statement reported in the 1840s:

“There has been, since long before the American Revolution, on the islands along the sea-board of Maryland-Virginia, a race of very small, compact, hardy horses, usually called beach horsesThey are very diminutive, but many of them are of perfect symmetry and extraordinary powers of action and endurance...and [one] was yet so small that a tall man might straddle one and his toes touch the ground on each side.”

Wise, an Accomack County resident, lived about 50 miles from Assateague. His knowledge of the ponies is believed to have come from his grandfather, John Cropper, whose grandfather Coventon Corbin lived across the bay from Assateague (See *The Hidden Galleon*, pp. 343-344).

Despite the hardships of managing livestock on barrier islands, periodic roundups and “pennings” were held regularly to determine ownership of animals and to account for and sell excess stock. The year 1925 marked the first pony roundup and swim conducted by the CVFC. Fire company members, later dubbed “Saltwater Cowboys,” herded the ponies to the Assateague Channel and swam them to nearby Chincoteague Island for auction.

With the creation of the Refuge in 1943, the Service granted a permit to livestock owner, Wyle Maddox, to graze cattle and horses on designated portions of the island (Narrative Report (NR) 1943). In 1946, the Service issued the CVFC a Special Use Permit (SUP) for grazing no more than 150 head of horses (NR 1946). Since the early 1950s, the CVFC remains the only permittee with livestock on the Refuge.

In 1947, the ponies reaped national and international attention with Marguerite Henry’s children’s classic, *Misty of Chincoteague*. The later movie version in 1961 further heightened the popularity of the authentic island pony and its lineage. To children and adults, “Misty of Chincoteague” is an iconic symbol of the spirited, pretty ponies frolicking on Assateague Island.

Ash Wednesday Storm:

A very powerful and long lived northeaster devastated Chincoteague and Assateague Islands from March 6-8, 1962. Because it fell during the first day of Lent, it is historically known as the Ash Wednesday Storm of 1962.

Unusually high tides during a new moon, winds up to 60 and 70 miles per hour, and crashing breakers caused flooding on 95 % of Chincoteague Island. Water rose six feet deep on Main Street as individuals sought safety at the second-story level. Electricity and telephone lines as well as the causeway to the mainland were cut off. On Assateague Island, the dunes and other habitats were flattened or otherwise damaged. Countless animals perished including a majority of the famous ponies. (Mariner, K., 1996, *Once Upon an Island*, pp. 140-142).

For over four months, outsiders and islanders helped the Town of Chincoteague and Assateague Island heal. Ponies penned that summer came from “Yankee” stock, imported to replenish the “storm-wasted” Assateague herd (See *Virginian-Pilot*, Feb. 1964, p.1).

Pony Roundup and Auction:

The ponies are a registered breed owned by the Chincoteague Volunteer Fire Company (CVFC) a 501c3 nonprofit organization. Annually three pony roundups take place; spring, summer and fall. The roundups are conducted by the fire company members and volunteers, riding horses. The presence of a veterinarian is required during all Pony Penning activities.

Both the spring and fall roundups take two days to complete. The spring pony roundup is done during the month of April to assess individual pony health after the winter season. Ponies are inoculated, blood is drawn for certain tests, and females are checked for pregnancy (See Appendix 1, “Veterinary Care and Procedures as explained by Dr. Charles Cameron DVM.”) The fall pony roundup is conducted in October to assess individual pony health before the onset of winter. Additionally, any foals that were sold during the auction but were too young to be weaned from the mare will be separated from the herd and given to their new owners.

The summer event takes place in the last week of July in which the Wednesday and Thursday fall within the month of July. This provides consistency in long range planning efforts for the CVFC, the Refuge, Town of Chincoteague, Chamber of Commerce, and tourism related agencies. The summer event is conducted in several specific phases:

1. Round-up and penning: On Saturday the south herd is rounded up and placed in the south corral. Following the round-up the veterinarian begins his/her health checks and identifies those individuals too old or young to make the swim to Chincoteague Island. The next day (Sunday) the process is repeated for the north herd. These animals are placed in the north corral and the veterinarian repeats the process of health checks and identification of those too old or young to make the swim.
2. Sunrise walk: On Monday morning at daybreak, the north herd is moved south down along the Atlantic Ocean beach to the south corral. This “Pony Walk” has become a major tourist attraction bringing approximately 1,500 to 3,000 people to the beach to witness this sunrise experience. This is currently a major public event requiring the

establishment of a small Incident Command System team and the entire Refuge staff to manage the crowds present that day.

Disturbance and/or harm to Federal threatened piping plovers, nests, and broods along the Pony Walk route is a concern. **The Pony Walk route is determined annually by the refuge manager.** If piping plover chicks are present within the Pony Walk route, CVFC will herd the ponies along an alternate route to avoid contact with plover broods (see Appendix 6 – Intra-Service Section 7 Biological Evaluation). On Tuesday, the ponies rest in the south corral.

3. Pony Swim: On Wednesday morning, the “Saltwater Cowboys” move the entire herd across the south pasture to Assateague Channel where at slack tide (high or low tide) the ponies are driven into the water for the swim over to Chincoteague Island. Thousands of exhilarated tourists watch the swim trying to get that once in a lifetime picture. After a brief rest at the shoreline the ponies are then paraded to the CVFC carnival grounds.
4. Pony Auction: On Thursday, the foals are auctioned by CVFC to the highest bidder. Money collected from the sale of the foals allows the CVFC to purchase new fire and rescue vehicles as well as maintaining the current fleet. This funding source is viewed by the community as critically important to safeguard the community, the Refuge and its visitors.
5. Return of Ponies to Refuge: On Friday, guided by the “Saltwater Cowboys,” the southern herd stallions and mares swim back to Assateague Island. The north herd is transported by truck to the north pasture. The few foals, too young to be separated from their mothers, are kept at the carnival grounds until they are old enough to be transferred to their new owners.

CLIMATE CHANGE AND ASSOCIATED SEA LEVEL RISE

For the last million years, the earth’s climate has changed from a cold ice age to a warm interglacial period back to an ice age roughly every 100,000 years. These changes have had enormous impacts on plant and animal life, human societies, and sea level with lowest levels during cold periods and highest levels during warm periods. Hence, changing sea level is not a recent phenomenon (Pew Center on Global Climate Change 2007).

Research now indicates that the Mid-Atlantic coastline is experiencing a rate of sea-level rise that is second only to that of the Louisiana and Texas wetlands/coastline along the Gulf of Mexico. Delissa Padilla Nieves, (2009), conducted a Sea Level Affecting Marsh Model (SLAMM) analysis for the lower Delmarva Peninsula. The results of that modeling revealed an

overall loss of approximately 57% of the salt marsh by the year 2100 under a 1 meter sea level rise scenario. This is alarming since most of the grazing area within the southern compartment (547 acres) consist primarily of salt marsh. In the northern compartment (3,399 acres) much of this unit is also salt marsh but it does have a more upland shrub/scrub and pine forest component.

Continued grazing by Chincoteague ponies in the salt marshes of the two grazing compartments is expected to reduce and/or eliminate the accumulation of detritus (decaying vegetation.) This build up of decaying vegetation is thought to be vital if salt marsh root systems are to keep pace with rising sea-levels. Reducing grazing pressure on the salt marsh is consistent with CVFC's goal of maintaining a viable healthy population of Chincoteague ponies on the Refuge.

Assateague Island is continually changing shape and geographic location. Refuge managers, park superintendents, wildlife biologists, and the CVFC will all need to work together to maintain pony grazing units that are robust so as to provide for a healthy pony herd that is self-sustaining, without human intervention, in light of a warming climate and corresponding sea-level rise. This issue will need to be revisited (at a minimum every 10 years) as new information becomes available from the scientific community. (See Appendix II - HISTORY of SEA LEVEL RISE and ASSATEAGUE ISLAND for more information on this topic.)

ECONOMIC IMPORTANCE OF PONIES

Regional and Local Economy:

The Assateague Island recreational beach, the ponies, and the Refuge are the Town of Chincoteague and Accomack County's major tourist attractions. Every year the Refuge experiences between 1.2 and 1.5 million visits. This makes the Refuge one of the top five most visited National Wildlife Refuges in America. Peak visitation to the area occurs Memorial Day weekend through Labor Day.

Eighty to 90 % of over 160,000 visitors stopping at the Eastern Shore Visitor Center located at the Chesapeake Bay Bridge-Tunnel plan to visit Chincoteague. This translates into over \$100 million dollars spent in the regional economy for lodging, meals, gasoline, souvenirs, recreation, and other items. The Town of Chincoteague accounts for approximately 60% of the county's total collected Lodging Excise Tax.

In 2010, the town completed a visitor survey. Eighty percent of Chincoteague visitors selected Assateague Beach as their top destination. Viewing the wild ponies consistently ranked among the top three activities most important to visitors.

Fireman's Carnival and Pony Swim:

By far, the Fireman's annual carnival, along with the annual Pony Swim and Auction, is the largest single event that draws tourists to the town. Beginning around the Fourth of July and continuing until the first weekend in August, the carnival is held every weekend and then every night of Pony Penning week except Sunday. Money collected from this much anticipated celebration allows the CVFC to purchase new fire and rescue vehicles and to maintain its current fleet which is vitally necessary to safeguard the community, the Refuge and its visitors.

In 2012, 67 foals were sold at auction for a total of \$96,625. The average price was \$1,442/foal. The veterinarian costs for the year were \$18,000, and hay and grain cost for supplemental feeding \$12,500 (Letter dated 9/25/2012, from Harry Thornton).

MANAGEMENT AND OPERATIONS

2012 Pony Population Estimates:

During the spring roundup of 2012, the CVFC estimated the adult pony population was approximately 125 animals. However as of 8/31/2012, that estimate was revised to 134 ponies on the refuge; 22 stallions and 112 mares. Twenty One (21) ponies roam within the southern compartment of the Refuge and 113 ponies graze within the northern compartment. (Letter dated 9/25/2012, from Harry Thornton).

The current SUP grants the CVFC, "...the grazing of not more than 150 head of wild ponies," on the Refuge. In managing for wildlife diversity, quality habitats, and overall environmental health, the Refuge supports a well managed pony herd.

With our current scientific understanding of Climate Change and its potential effects to local weather (i.e. intense rainfall events, stronger coastal storms, frequent coastal flooding, increase in the number of hot days, and sea level rise) the FWS recommends, **but does not demand**, that the current population of 134 adult ponies remain constant (or lower) until the year 2023 (year for the next CD review for this use.) At that time, additional scientific information (10 years of additional Climate Change data) will be available to the CVFC and the Refuge concerning Climate Change. This additional information will allow for better decisions concerning grazing management and population size.

Grazing Units

The grazing program allows up to 150 adult Chincoteague ponies, a registered breed and owned by the Chincoteague Volunteer Fire Company (CVFC), a 501c3 nonprofit organization, to graze within two separate compartments on the refuge. Foals of the year are annually sold at auction and are not included in count of adult horses.

The present grazing management units include the Southern Management Unit (Black Duck Marsh), totaling approximately 547 acres, and the Northern Management Unit (Pony Grate to MD/VA Line), with over 3,300 acres. These grazing units include four of the 14 waterfowl impoundment management areas. Combined, the two units comprise over 40 % of the Assateague Island portion of the Refuge. (See Appendix III, Map of Chincoteague National Wildlife Refuge Pony Management Areas)

Southern Grazing Unit (Black Duck Marsh)

This 547-acre unit encompasses the entire southern portion of the Refuge west of Beach Road, the road to the boat dock, and areas adjacent to Assateague Channel. This smallest unit used for grazing ponies includes Black Duck Creek and all of Black Duck Marsh. It is comprised of 70% saltmarsh cordgrass, saltmarsh meadow hay, salt grass, and upland grassland (bent grass and Panicum species) with the remaining 30 % in loblolly pine and oak/sweetgum hardwood forest. Tidal flooding occurs during spring and fall lunar tides and severe coastal storm events. Within the higher marsh and forested areas are several natural freshwater pools which usually provide adequate fresh drinking water. However, during times of severe drought conditions, water may be scarce, and animals may be forced to rely on brackish water or supplemental watering by CVFC to sustain them. The Fire Company usually keeps from 30 to 50 ponies in this unit throughout the year.

Northern Grazing Unit (Pony Grate to MD/VA Line)

This 3,399-acre expanse is the largest unit assigned for grazing ponies. Within this designated area are the freshwater impoundments of South Wash Flats, Old Fields, Ragged Point, and a portion of North Wash Flats. These impoundments occupy about 805 acres or 24 % of the total available grazing area. The remaining 2,594 acres consist mostly of saltmarsh cordgrass and saltmarsh meadow hay areas, adjacent to Assateague Channel. Also, on the interior of the island is a maritime forest of primarily loblolly pines and shrub communities with an understory of wax myrtle/greenbrier and upland grass species (Panicum species and bent grass). Most impoundment perimeters have significant areas of forage such as three-square bulrush, red-root nutsedge, and dwarf spikerush.

Located within Northern Grazing Unit is the North Wash Flats Impoundment. From March 15 – September 1, the ponies are excluded from this 704-acre area to provide for a safe haven for Piping Plovers and other migrant shorebirds and waterfowl (Refuge 2008 Intra-Service, Section 7 & Biological Opinion, pp. 5 & 6). This brackish water impoundment located between Chincoteague Bay and the ocean is intensively managed to create Piping Plover nesting and feeding habitat to mitigate impacts from public recreational beach use. It is also managed to mimic natural processes, which occurred before the artificial dunes were constructed (Habitat Management Plan, 2011, p. 55).

Wayward Ponies and Volunteer Call Out:

The Pony Committee will provide a list of people that will respond to roundup ponies that are found roaming outside of the assigned grazing units. These designated people will act on this matter no later than the first weekend after the horses are detected (see Appendix IV, List for Emergency Calling).

Fence Line Repairs and Replacement:

Repair and replacement of the approximately 13 miles of fences is an ongoing maintenance issue at the Refuge. Inclement weather, storm tides, sea level rise, fallen tree limbs or blow downs, ponies, people, and ordinary wear and tear continually damage the fence lines that delineate the pony enclosures. In the past the CVFC was responsible for all fence line maintenance. However, a federal court ruling concerning property rights called into question the advisability of continuing this course of action. Therefore, starting in 2008, the Refuge began purchasing materials such as post, wire, and gates and in consultation with CVFC to conduct repair and replacement of fence lines.

Key in fence line maintenance is the cooperation of all parties. Refuge staff working beside CVFC members creates a highly efficient team. The CVFC Pony Committee and the Refuge staff will meet minimally once annually to plan fence line maintenance for that year. It would be beneficial for planning and budgeting purposes for the CVFC and the Refuge to develop a long range fence line replacement schedule.

Mending fence lines in support of the Chincoteague pony management is an appealing volunteer project. Refuge staff and the CVFC should work together to provide opportunities for the public to volunteer and assist in fence line repair. It is imperative that all volunteers be provided with personnel protective equipment and given training on the standards and proper techniques of fence line repairs. In addition, it will be required that all volunteers working for the Refuge sign specified volunteer agreements before commencing work.

Current estimates for ¼ mile barbed wire fence installation including site preparation, materials and labor are shown below.

- Site Preparation:
 - Demolition of existing fence, brush clearing, and other operations. \$1,000 est.
- Materials:
 - Approximate material cost for ¼ mile = \$864
- Labor:
 - ¼ mile constructed by 4 “experienced” workers 96 hrs x \$21.36 = \$2,050

Total estimated cost for the replacement of ¼ mile of pony fence is:..... \$3,914

Total estimated cost for 1 mile of fence is:.....\$15,656

The 2013 - 2015 fence and gate replacement plan is:

2013.....2.2 miles x \$15,656/mile = \$34,443

2014-15.....4.2 miles x \$15,656/mile = \$65,755

Without considering inflation, the total estimated expenditure for fence replacement from 2013 through 2015 is \$100,198. Fences scheduled for replacement may require additional years to complete contingent on available funds and labor. Volunteers are important in this ongoing project because labor is the predominate cost.

Obtaining access to perform fence maintenance is necessary for the CVFC and the Refuge. To become more proficient at fence maintenance and/or installation, Refuge maintenance and biological staff have developed a GIS map, which shows a fence repair and replacement schedule. This map will be updated annually in consultation with the CVFC Pony Committee and will show what has been accomplished and what remains to be done in future years.

Entrance to Refuge by CVFC Pony Committee (Official Business):

Pony Committee members are required to apprise the Pony Committee Chairman and the Refuge Manager of their presence on the Refuge. All Pony Committee members must have a government or CVFC provided photo identification on their person when conducting official Pony Committee activities.

Fire Company members typically drive the official Pony Committee pick-up. Magnetic CVFC signs will be attached to their private transports.

Refuge LE will approach individuals they do not know, who appear to officially represent the CVFC, and ask to see proper identification. If the suspect or suspects are not authorized to be on the Refuge, they will be instructed to leave or be escorted off Assateague Island. This level of security is appropriate due to stolen watering troughs, vandalism, and other potential crimes against CVFC property and ponies.

Severe Weather Operations:

Pre-storm

The reoccurrence of severe weather events impacting Assateague Island are well documented in historical records. Northeasters, tropical storms, and hurricanes are a continuous threat to coastal communities and preparedness is everyone's responsibility. To do otherwise is irresponsible.

Annually, the Refuge staff prepares and/or updates the Hurricane Action Plan. This plan along with the Continuity of Operations Plan provides guidance for Refuge operations and staff actions during weather related or other emergencies. Contained within the documents are time frames for actions to be taken by Refuge staff. One of these actions is the closure of the Refuge when a direct impact from a severe coastal storm is predicted. Therefore, the integration of a CVFC action plan that addresses the care of the ponies before and after a major weather event is recommended.

Currently, if a severe weather event is predicted for Assateague Island, the CVFC has several options:

- 1) Do nothing and allow the ponies to weather the storm within the corrals.
- 2) The entrance/exit gates of the North and South grazing compartments will be open by a designated member of the CVFC or Refuge staff **at the request by CVFC**. This will be done so as to allow the ponies to seek the safety of higher ground. If the storm misses the area, the CVFC will promptly roundup the ponies and redistribute them to their respective grazing compartments.
- 3) Roundup the ponies in the South and/or the North compartments prior to the storm and relocate them to a safer location off the island.

At the request of the Refuge Manager, the CVFC developed a one-page emergency action plan in 2008 to describe the actions it would take in the event of a hurricane. However, the 2009 November northeaster identified deficiencies in this plan and in the execution of its strategies. It is recommended that CVFC develop a more detailed emergency action plan that addresses subjects such as, but not limited to:

- evacuation of the pony herd from the South and/or the North grazing compartments

- supplemental feeding and watering
- health and well-being evaluations following a severe storm
- updated emergency call list (See Appendix IV, List for Emergency Calling)

Post-storm Operations

Following a major weather event, the Refuge will be closed to all public entry until qualified staff (either the NPS or the Service) can conduct a Rapid Assessment (RA) of the impacts and/or damages to bridges, roads, buildings, habitat, and wildlife on CNWR. This RA is needed to ensure the safety of Refuge staff and visiting public to Assateague Island.

If possible, the RA will include a visual assessment of the overall well-being of the ponies and their foraging areas. The Refuge Manager or his/her designated representative will contact the CVFC Pony Committee Chairman and provide a verbal assessment of the pony herd.

If necessary, and when conditions are safe for CVFC members to enter the Refuge, the CVFC may move the ponies to suitable areas on the Refuge where they can be confined and provided supplemental food and fresh water.

If there is severe habitat damage, the CVFC should consider removing the horses off the island until the animals and natural environment recover. The CVFC will ask its veterinarian to come to the island and perform a visual assessment for injured ponies and treat them if necessary.

Supplemental Feeding and Watering

Supplemental feeding and watering of the ponies can be necessary when weather extremes (i.e. heat and drought, strong coastal storms and tidal flooding, snow and ice storms, etc.) dry up watering holes and/or make quality forage unavailable for ponies to feed upon. Williams C. A. and Ralston S. (2011), (See Rutgers - New Jersey Agriculture Experimental Station - 2011, Winter Feeding of Horses, Cooperative Extension - Fact Sheet FS1143) state that;

“Winter conditions vary dramatically between the various regions, as do the tolerances of individual horses to cold weather stressors, so it is impossible to give exact recommendations regarding nutritional needs that would be applicable to all horses and regions. However, there are general nutritional concerns that always need to be addressed as the weather gets colder. These are insuring adequate caloric (energy) and water intake, and recognizing situations where supplemental nutrients may be necessary to maintain a horse’s optimal health and well-being. ...” Additionally, “The major nutritional concerns during the winter months include adequate calories to maintain good body condition and adequate water intake to prevent impaction colic...”

Supplemental feeding and watering is fundamental to the continued health and well-being of the ponies. Since feeding and watering will be conducted at numerous locations within the grazing units the following conditions apply:

- 1) In order to reduce the importation of “weed seeds” into Refuge habitats, the use of certified **weed free hay/forage** is a requirement. Prior to beginning any supplemental feeding, CVFC will provide the Refuge Manager with documentation that the hay/forage to be dispersed is from a certified weed free hay/forage source.
- 2) Tanker trucks used to fill watering troughs must be filled at a location off the refuge water system/grid. All fire hydrants located east of Piney Island and the Assateague Channel Bridge fall within the refuge water system/grid system and therefore the Refuge is billed by the Town of Chincoteague for that water usage.

Stock Replacement:

As mentioned in earlier sections, it had been a past practice to supplement the Chincoteague pony herd with stock brought in from other sources. A wide variety of breeds such as Morgan, Welsh, Shetland, Arabian, and Mustangs were placed in the Chincoteague pony herd to increase genetic diversity and vigor among the present stock. Most Mustangs were brought to the island shortly after the 1978 EIA eradication program to help build-up the herd. Few survived the rigorous barrier island environmental conditions (Refuge Pony Management Plan, 1990).

On occasion, CVFC also replenished the herd with “problem” ponies from ASIS. These feral horses had been involved with visitor/pony conflicts in the campground areas. Only their offspring were sold. It has been the policy of CVFC to no longer supplement their herd with NPS northern herd animals. These animals proved to be problematic for the Fire Company and the Refuge. However, these animals may have a more direct genetic link to the current Chincoteague ponies than past genetic introductions.

To preserve the integrity of the registered Chincoteague pony breed, the CVFC will no longer introduce foreign stock into the Refuge population. If deemed necessary by CVFC in consultation with a geneticist and the Refuge Manager one “healthy” foreign mare may be introduced to mate with a stallion and give birth. Shortly thereafter, the foreign mare will be transported off the Refuge. The same mare’s progeny will remain behind to continue the lineage of this new genetic input.

The refuge encourages the active “Buy Back” program. This activity allows citizens within the community to buy foals and yearlings at auction and then to donate these animals back to the CFVC for release back into the pony population on the Refuge. This effort supports the sustainability of the herd on the Refuge without introducing foreign stock. CVFC will continue to pit tags ponies for identification of individual animals.

Following pony penning activities, the Pony Committee Chairman will provide the Refuge Manager with written records of all pit tags recorded during pony penning activities and the number placed in each grazing unit.

Disease and Injury:

The CVFC is responsible for the care and health of the ponies inhabiting the Refuge. Animals that become severely sick or injured are usually removed from the Refuge for treatment or, if conditions dictate, are euthanized and disposed of on the site where found. Pit tags should be recovered and that animals records closed.

Veterinarian services must be available for call out for injured or sick animals and for semiannual health checks when the entire herd is de-wormed, inoculated against EEE and rabies (confirmed on the Refuge in December 2012), and checked for equine infectious anemia (EIA) and other diseases the veterinarian deems necessary.

Animals testing positive for EIA are promptly removed from the Refuge for treatment or disposed of by the Fire Company or a qualified veterinarian. {See 1990 Pony Management Plan, pp. 2-3 & 10-11 for a thorough account of equine infectious anemia (EIA) and eastern equine encephalitis (EEE)}.

Injured ponies are routinely removed from the herd and transported to facilities on Chincoteague Island. When a pony is incapacitated by severe injuries, it is usually put down either by a refuge staff person at the request of the CVFC or its contracted veterinarian. It is the Refuge Manager's discretion to determine the fate of a clearly suffering animal when a member of the CVFC or a veterinarian cannot be reached, despite due diligence to reach these parties. (See Appendix I, "Veterinary Care and Procedures as explained by Dr. Charles Cameron DVM.")

Fees:

The current Federal grazing fee for 2012 is \$1.35/AUM for those public lands administered by the Bureau of Land Management (BLM). The acronym "AUM" stands for "animal unit month." It is "the amount of forage needed to sustain one cow and her calf, one horse, or five sheep or goats for a month."

The CVFC pays the Service \$1,500 per year for grazing rights on the Refuge. Currently the Service does not follow the BLM pricing guidelines.

The movement and placement of ponies within assigned grazing units is the responsibility of the CVFC's Pony Committee. During the summer months, about one-third of the present herd is placed within the South Unit (Black Duck Marsh), which affords viewing opportunities for the visiting public. The remainder is placed in the North Unit, accessible to the public by foot and

the Chincoteague Natural History Association tour bus. No requirement specifies that a given number of animals be assigned to any particular compartment.

Use of Ponies in Impoundment Vegetation Management:

Past studies by the USFWS (Service) confirm that controlled livestock grazing can be beneficial to some vegetative communities by increasing vigor of perennial grasses, speeding recycling of nutrients, increasing production of vegetation, preventing the decline and death of plants due to lodging and build-up of old plant material, and accomplishing the effect of burning without leaving soil severely exposed (Service 1987).

Annually the Refuge, on a rotational basis, undertakes mowing, disking and at times prescribed burning of impoundments to set back succession and maintain a healthy vigorous plant community. Refuge staff propose introducing a specified number of ponies (to be determined) into the impoundments (Pools A, B North, C, D, and E) for a specified period of time. This will provide rotational disturbance to the plant communities without the use of fossil fuels.

A recent *Rangelands* article entitled, “Livestock Grazing, Wildlife Habitat, and Rangeland Values,” supports rotational grazing as more likely to help managers achieve wildlife habitat objectives than continuous grazing. Through grazing treatments, key wildlife habitat components can be assured on the landscape each year. Carefully planned grazing rotations can ensure maintaining native habitats that are also functional for an abundance and diversity of wildlife. The authors propose that these grazing areas be appropriately stocked and managed to provide blocks of undisturbed cover at times that allow for plant reproduction and energy storage and wildlife reproduction and survival (Krausman, et. al., 2009, pp. 15-19).

Precautions should be implemented to thwart unnatural dissemination of exotic biota resulting from horse movement and feces. Direct effects include dispersal of undesirable alien seeds, fungi, arthropods, and other organisms, as well as the potential build up of pathogenic life forms. (ASIS, Berlin, MD – Wild Horse PHVA Workshop, March 28-31, 2006).

Overall, regulated grazing on impoundment and saltmarsh vegetation may stimulate growth, help control undesirable flora, and sustain the palatability of species which, upon maturing, become less desirable to wildlife (Pony Management Plan, 1995, p. 31).

Exclosures and Photo-documentation points:

In an effort to better understand the affect of grazing by herbivores on salt marsh and upland habitats of the Refuge we will establish exclosures and photo-documentation points within and outside the grazing compartments. This will be beneficial baseline information for future management planning.

COORDINATION WITH THE NATIONAL PARK SERVICE

Horse Management by ASIS in Maryland:

On the northern portion of Assateague Island in Maryland, the NPS owns the wild horses roaming within its boundary. In 2009, the NPS Northeast Regional Director approved the Finding of No Significant Impact for the Environmental Assessment of Alternatives for Managing the Feral Horses of ASIS (See FONSI – found at <http://parkplanning.nps.gov>).

The Selected Alternative (SA) (modified Alt D), will reduce the NPS-owned horse population to a more sustainable 80 - 100 head. This reduction will be accomplished over five to eight years through intensive use of contraceptives for mares as well as through natural mortality. No NPS-owned horses will be removed from the island.

The SA is a compromise between “reducing the adverse effects of the horses while protecting the long-term health of the population.” It includes long-term monitoring, public outreach and education, and mitigation to protect the horse population from potential inbreeding.

Service-owned land, located in Maryland and lying adjacent to ASIS, will be managed as part of ASIS. Any horses roaming within the Service’s land in Maryland will fall under the management guidelines of the NPS horse management plan.

Fence Line at the VA/MD State Line:

It is the responsibility of the NPS to maintain the .75 mile fence line at the Maryland and Virginia State line. This fence is necessary to keep the NPS horse herd separate from the ponies privately owned by the CVFC. However, it is in the best interest of all parties (the Service, the NPS, and the CVFC) to work cooperatively to maintain the boundary fence. The NPS received funding in 2011 to replace the entire dune to beach border fence. This project has been completed (pers. comm. Carl Zimmerman).

CONSIDERATIONS FOR THE CVFC

Hired Staff/Range-Hand:

The CNWR would like the CVFC to consider hiring a part time employee to work as a range hand. Duties could include checking the herd health, mending breaks in fence lines, coordinating Refuge and CVFC cooperative events, and when necessary rounding up wayward ponies. During winter months and/or strong storm events it would be crucial for this individual to carefully observe the ponies’ overall health, noting any aberrant behavior or poor habitat conditions.

Annual Special Use Permit

A Special Use Permit (SUP) for grazing is annually issued to the CVFC at the start of the new fiscal year. Prior to the signing of the new SUP the Refuge Manager will meet with the Pony Committee Chairman for the CVFC and discuss changes or updates to the proposed SUP. Once agreement has been reached as to the content of the SUP the Pony Committee Chairman will submit the proposed SUP to the CVFC Pony Committee and then the full CVFC membership. Once approved, the SUP will be signed by the Refuge Manager and the Pony Committee Chairman and/or the President of the CVFC. Additional meeting(s) with the CVFC Pony Committee are held to organize volunteer work details and/or round-up events.

As part of the SUP a section annually updated is “Special Terms and Conditions.” This section stipulates the terms and conditions under which the SUP will be administered for the year. However, it is an opportunity for the CVFC Pony Committee and the Refuge to jointly plan for that current year’s activities and agree to those activities in writing. Preplanning by the Pony Committee and the Refuge is essential for a health pony herd and a well run program. (See Appendix V – 2012 Special Use Permit - Special Terms and Conditions)

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APPENDICES:

Appendix I - Veterinary Care and Procedures as explained by Dr. Charles Cameron DVM:

In the spring of 1990, Eastern Shore Animal Hospital, located in Melfa, Accomack County, Virginia, became involved with the care of the Chincoteague pony herd.

“We are in charge of the preventative maintenance program, which includes vaccinating the herd annually for Eastern and Western Encephalitis, Tetanus and West Nile Virus (EWTWN) and Rabies,” explained Dr. Charles Cameron DVM. “We deworm the herd with a drench dewormer (Eqvalan) in the spring and fall.

Also in spring, we draw blood samples from all the Ponies and submit the samples to Ivor State Diagnostic Lab for Coggins Tests (the test for Equine Infectious Anemia (EIA)).

“During Pony Penning Week in July, we are available for any emergency that might occur with the herd or the riders’ horses,” he continued. “On Tuesday of that week (the day before the swim), we cull out the ponies that are too young or too old and otherwise not fit to make the swim. On the day of the sale (Thursday), we estimate the age of the foals before they go on the auction block and fill out and sign health certificates for the foals that have been sold.”

Dr. “Charlie” Cameron and his veterinary staff are also available to answer new owners’ questions regarding the care of their foals.

“Some foals will be going to states which require a negative Coggins Test on the foal regardless of its age,” Dr. Charlie explained. “We will advise the owners of this and draw the blood sample for the test.”

Over the course of the year, the veterinarians are occasionally called out for emergencies such as foaling issues and lacerations.

“A medical issue, which has occurred during Pony Penning Week, has been hypocalcaemia in some of the lactating mares,” said Dr. Charlie. “This is a medical emergency which can be reversed by administering calcium intravenously. So we are well prepared for this with stocks Cal-Dex Fluids, IV catheters and dri sets.”

Appendix II - HISTORY of SEA LEVEL RISE and ASSATEAGUE ISLAND

For the last million years, the earth's climate has changed from a cold ice age to a warm interglacial period back to an ice age roughly every 100,000 years. These changes have had enormous impacts on plant and animal life, human societies, and sea level with lowest levels during cold periods and highest levels during warm periods. Hence, changing sea level is not a recent phenomenon. During the warmest interglacial period about 130,000 years ago, the Earth's temperature was 2-3° F (35.6 - 37.4° C) warmer than today's temperatures and ocean levels were 13-20 feet (4.0 - 6.1 m) higher than today (Pew Center on Global Climate Change 2007).

The most recent cycle started over 100,000 years ago, when a 39-42°F (4-10° C) drop in global temperatures over thousands of years caused a major change in climate. Approximately 25,000 years ago, the Laurentide ice sheet moved out of Canada. About 18,000 years ago, it extended as far south as northern New Jersey and northeastern Pennsylvania on the East Coast, and nearly half of North America was covered by a continental glacier over one mile thick in places.

A significant amount of the Earth's fresh water was locked in glacial ice. Consequently, much fresh water was not returned to the oceans, leading to a significant drop in sea level. The Mid-Atlantic coast was roughly 40 to 50 miles (64 - 80 km) offshore from its present day location. This area was exposed for about 10,000 years and was occupied by tundra and boreal forest similar to what is found in Canada today. Elk, moose, and grizzly bears were dominant mammals. (Davis 2006). The waters were cold like Arctic waters and supported species like walrus, sea lions, and bearded seals (Harington 2008).

About 15,000 years ago, climate began to change again, and the warmer temperatures caused the Laurentide glacier to begin melting. The melt-water ran off the land and into the ocean causing sea levels to rise. The rise was not a steady one; it was marked by a rapid increase from 15,000 to 8,000 years ago at rates as high as 0.5m (1.6 ft.) per decade (Hansen 2007).

Around 6,000 years ago, the rate of sea level slowed to 0.5mm (.25 in.) per year due to a reduction in the rate of ice melting. This allowed shorelines to stabilize, and the Mid-Atlantic shoreline may have looked much like it does today (minus the human-induced alterations). These more stable conditions promoted the formation of barrier islands and spits, which facilitated the establishment of coastal marshes in sheltered lagoons behind the protective barriers and along the low-lying shores of tidally influenced rivers.

From 3000 years ago to the late 1800s (the beginning of the "Industrial Revolution"), the rate of sea level rise was very low: 0.1-0.2mm (.0625 in. - .125 in.) per year. (Titus et al. 2009). During the last century, the average global rise in sea level was 1.7mm (0.5 in.) per year (Church and White 2006).

From 1993-2003, the rate of sea level rise rose an average of 3.1mm (.75 in.) per year. (IPCC 2007). It is unclear whether this increase is simply a decadal response or an indicator of a longer-term trend. It is, however, likely that the losses of polar ice sheets during this decade significantly contributed to the increase (Titus et al. 2009).

The 2007 International Panel on Climate Change (IPCC) lowered predictions from their 1995 report. Most recently, they predicted a 0.6-1.9-foot (7-23-inch or 18-59 cm) increase in sea level over the next 100 years. Earlier, the Panel had predicted a 0.3-2.9-foot (nearly 9 cm – nearly 1 m) rise by 2100. This new estimate excludes any increase in melt-water from the Greenland and Antarctica ice sheets.

The IPCC admits that this is a very conservative estimate. Moreover, recent observations of accelerated ice flow and melting from Greenland and western Antarctica glaciers could contribute substantially to present increasing sea levels. (Titus et al. 2009). If the Greenland ice sheet disappeared, it would add 23 feet (7m) to sea level (IPCC 2007).

During the last interglacial period of 125,000 years ago, reductions of polar ice led to a 13-20-foot (4-6m) rise in sea level. It is interesting to note that the projected rise may not be a simple steady increase in sea levels. Instead, it may be rapid due to a quick collapse of large portions of the polar ice sheets (Pew Center on Global Climate Change 2007).

A 2007 study that accounted for continued increases in greenhouse gas emissions predicted that sea level could rise 1.6-4.5 feet (0.5-1.4m) by the end of the 21st century. (Rahmstorf 2007). This work and the view of other climatologists suggest that global sea level could rise by 3.3 feet or more (one meter or more) by 2100 and that it may rise additional meters over the next several centuries.

Impacts on the Mid-Atlantic Region

In the Mid-Atlantic region (New Jersey through Virginia), sea level is rising due to global changes and to land subsidence. During the past century, sea level rise rates were higher than global rates, ranging from 2.4-4.4 mm (about .75 in. – about 1 in.) per year. This translated to an approximate one-foot rise (0.3m) by 2000. These are the highest rates of sea level rise in the United States, excluding Louisiana and Texas where human-induced coastal subsidence is a significant contributing factor (Titus et al. 2009).

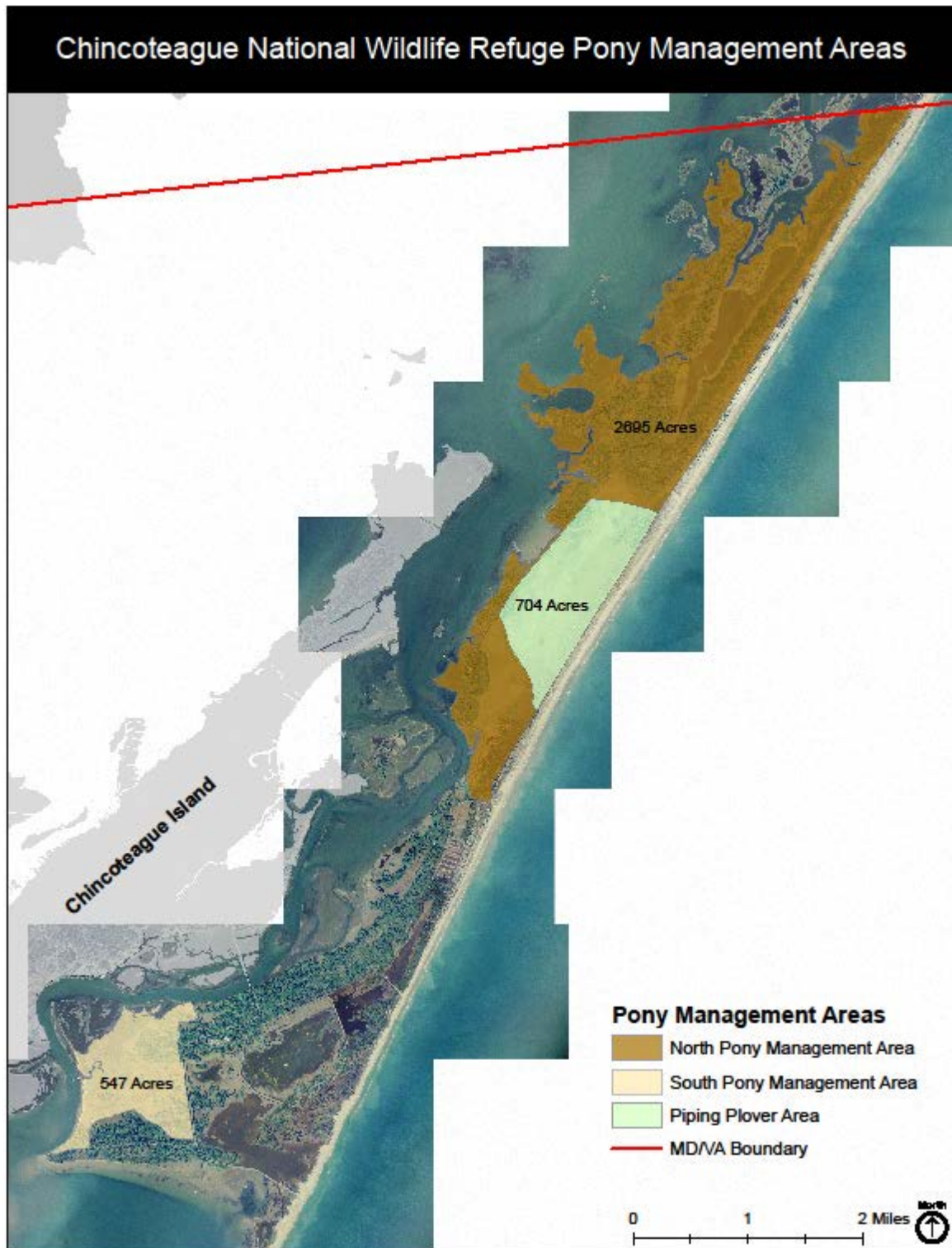
Rising seas are already changing the coast, submerging the lowest tidal wetlands, eroding coastal beaches, increasing flooding of lowlands, and altering salinity regimes in coastal waters. Low salt marshes are being converted to tidal flats, while existing tidal flats are becoming permanently inundated shallow water habitats.

The shoreline of Assateague Island, already threatened by erosion from the current sea-level rise rate, is even more vulnerable with predicted increases of 2mm (nearly 0.5 in.) per year. If the

rate increases by 2mm per year, the island may begin migrating landward and may break up into smaller sections (segmentation). The impacts of a 7mm (around 1.5 in.) per year rise would be devastating.

Assateague Island is continually changing shape and geographic location. Refuge managers, park superintendents, wildlife biologists, and the CVFC will all need to work together to maintain pony grazing units that are robust so as to provide for a healthy pony herd that is self-sustaining, without human intervention, in light of a warming climate and corresponding sea-level rise. This issue will need to be revisited (at a minimum every 5 years) as new information becomes available from the scientific community.

Appendix III – Pony Management Areas Map



Appendix IV - List for Emergency Calling

2010-2011 CVFC, Pony Committee members responsible for herd management.

SUP #51570-81233

LIST FOR EMERGENCY CALLING

Harry S. Thornton (Chairman)	336-5560	894-0440
Nathan (Skeebo) Clark	336-5996	894-8771
David Savage	336-5610	894-3574
Wesley Bloxom	336-3213	894-4751
Rick Raymond	336-2657	894-0618
Bobby Lapin	336-0619	894-3586
John Bloxom	336-1709	894-3381
Randy Thornton	336-6670	894-4136
Edwin Taylor		894-3384
Roe Terry	336-5758	894-0330
Denise Bowden		

EASTERN SHORE ANIMAL HOSPITAL

Dr. Charlie Cameron	757-442-3150 (24-hour service number)
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Appendix V - Special Use Permit: 81312 - FY 2013

See following page

Appendix VI - Intra-Service Section 7 Biological Evaluation for Chincoteague
Pony Penning and Piping Plover/Sea Turtle Management

See page 41

Appendix D

United States Department of the Interior
U.S. Fish and Wildlife ServiceMay 2014
OMB Control Number 1018-0102
Expiration Date: 06/30/2014**National Wildlife Refuge System
General Special Use
Application and Permit**Name of Refuge Chincoteague NWR
Address PO Box 62, Chincoteague, VA 23336
Attn: (Refuge Official) Louis S. Hinds III
Phone # 757-336-6122 E-mail louis_hinds@fws.gov**Application**(To be filled out by applicant. Note: Not all information is required for each use.
See instructions at the end of the notice.)1) ☐ New ☒ Renewal ☐ Modification ☐ Other _____**Applicant Information**2) Full Name: Chincoteague Volunteer Fire Company Pony Committee 6) Phone #: 757-894-0440
3) Organization: Chincoteague Volunteer Fire Company 7) Fax #: 757-336-1340
4) Address: PO Box 691 8) E-mail: _____
5) City/State/Zip: Chincoteague, VA 23336

9) Assistants/Subcontractors/Subpermittees: (List full names, addresses and phone #'s and specifically describe services provided if subcontractors are used.)

See Attached List

Activity Information10) Activity type: ☐ Event ☐ Wood Cutting ☐ Group Visit ☐ Cabin/Subsistence Cabin ☐ Educational Activity
☒ Other To permit the grazing of not more than 150 head of wild ponies.

11) Describe Activity: (Specifically identify timing, frequency, and how the event is expected to proceed.)

Grazing is permitted on those parts of Tract 4, 4a, 4b, 41, and 31 where ponies are not excluded by fences; the fenced enclosures where grazing will not be permitted are primarily the waterfowl development areas and sand dunes.

12) Activity/site occupancy timeline: (Specifically identify beginning and ending dates, site occupation timeline, hours, clean-up and other major events.)



Appendix D

May 2014
OMB Control Number 1018-0102
Expiration Date: 06/30/2014

(Depending on the activity for which you are requesting a permit, we may ask you for the following activity information. Please contact the specific refuge where the activity is being conducted to determine what activity information is required.)

13) Expected number of participants:

Children _____ Adults _____ Total _____

14) Grade level of educational group:

Grade _____ ☒ N/A

15) Will staff time/assistance be required?

☐ Yes ☐ No ☒ N/A

16a) Plan of Operation required? ☐ Yes ☐ No ☒ N/A

16b) Plan of Operation attached? ☐ Yes ☐ No

17) Location: (Specifically identify location; GPS location preferred.)

18a) Is map of location(s) required?

☒ Yes ☐ No ☐ N/A

18b) Is map of location(s) attached?

☒ Yes ☐ No

Insurance Coverage/Certifications/Permits

19a) Is insurance required?

☐ Yes ☐ No ☒ N/A

19b) Insurance: (Provided carrier, type and policy number)

20) Other licenses/certifications/permits required: (Specifically identify licenses, certifications, and permits.)

Logistics and Transportation

21) Does activity require personnel to stay overnight onsite? ☐ Yes ☐ No

22) Personnel involved:

See Attached Conditions

23) Specifically describe all equipment/gear and materials used:

24) Transportation description(s) and license number(s) to access refuge(s): [Provide description of and specific auto license/boat/plane registration number(s).]

See Attached List

25) Specifically describe onsite work and/or living accommodations:

N/A

26) Specifically describe onsite hazardous material storage or other onsite material storage space:

N/A

27) Signature of Applicant

James L. Russell

Date of Application:

2-4-2013

Sign, date, and print this form and return it to the refuge for processing.

Do not fill out information below this page.

PRINT NAME
James L. Russell

FWS Form 3-1383-G
03/11

For Official Use Only (This section to be filled out by refuge personnel only.)**Special Use Permit**

Permit #: 81312

1) Date: 1/11/2013

2) ☒ Permit Approved ☐ Permit Denied

3) Station #: 51570

4) Additional special conditions required: (Special conditions may include activity reports, before and after photographs, and other conditions.)

☒ Yes ☐ No ☐ N/A

Additional sheets attached:

☒ Yes ☐ No

5) Other licenses/permits required:

☐ Yes ☐ No ☒ N/A

Verification of other licenses/permits, type:

6) Insurance/certifications required:

☐ Yes ☐ No ☒ N/A

Verification of insurance/certification, type:

7) Record of Payments: ☐ Exempt ☐ Partial ☒ Full

Amount of payment: \$1500.00

PAID

Record of partial payment:

8) Bond posted:

☐ Yes ☐ No

This permit is issued by the U.S. Fish and Wildlife Service and accepted by the applicant signed below, subject to the terms, covenants, obligations, and reservations, expressed or implied herein, and to the notice, conditions, and requirements included or attached. A copy of this permit should be kept on hand so that it may be shown at any time to any refuge staff.

Permit approved and issued by (Signature and title):

James L. Birds

Date: 2/6/2013

Permit accepted by (Signature of applicant):

James F. Russell

Date: 2-4-2013

Notice

In accordance with the Privacy Act (5 U.S. C. 552a) and the Paperwork Reduction Act (44 U.S. C. 3501), please note the following information:

1. The issuance of a permit and collection of fees on lands of the National Wildlife Refuge System are authorized by the National Wildlife Refuge System Administration Act (16 U.S. C. 668dd-ee) as amended, and the Refuge Recreation Act (16 U.S. C. 460k-460k-4).
2. The information that you provide is voluntary; however submission of requested information is required to evaluate the qualifications, determine eligibility, and document permit applicants under the above Acts. It is our policy not to use your name for any other purpose. The information is maintained in accordance with the Privacy Act. All information you provide will be considered in reviewing this application. False, fictitious, or fraudulent statements or representations made in the application may be grounds for revocation of the Special Use Permit and may be punishable by fine or imprisonment (18 U.S.C. 1001). Failure to provide all required information is sufficient cause for the U.S. Fish and Wildlife Service to deny a permit.
3. No Members of Congress or Resident Commissioner shall participate in any part of this contract or to any benefit that may arise from it, but this provision shall not pertain to this contract if made with a corporation for its general benefit.
4. The Permittee agrees to be bound by the equal opportunity "nondiscrimination in employment" clause of Executive Order 11246.
5. Routine use disclosures may also be made: (a) to the U.S. Department of Justice when related to litigation or anticipated litigation; (b) of information indicating a violation or potential violation of a statute, rule, order, or license to appropriate Federal, State, local or foreign agencies responsible for investigating or prosecuting the violation or for enforcing or implementing the statute, rule, regulations, order, or license; (c) from the record of the individual in response to an inquiry from a Congressional office made at the request of the individual (42 FR 19083; April 11, 1977); and (d) to provide addresses obtained from the Internal Revenue Service to debt collection agencies for purposes of locating a debtor to collect or compromise a Federal Claim against the debtor, or to consumer reporting agencies to prepare a commercial credit report for use by the Department (48 FR 54716; December 6, 1983).
6. An agency may not conduct or sponsor and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. This information collection has been approved by OMB and assigned control number 1018-0102. The public reporting burden for this information collection varies based on the specific refuge use being requested. The relevant public reporting burden for the General Use Special Use Permit Application form is estimated to average 30 minutes per response, including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Comments on this form should be mailed to the Information Collection Clearance Officer, U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042-PDM, Arlington, Virginia, 22203.

General Conditions and Requirements

1. Responsibility of Permittee: The permittee, by operating on the premises, shall be considered to have accepted these premises with all facilities, fixtures, or improvements in their existing condition as of the date of this permit. At the end of the period specified or upon earlier termination, the permittee shall give up the premises in as good order and condition as when received except for reasonable wear, tear, or damage occurring without fault or negligence. The permittee will fully repay the Service for any and all damage directly or indirectly resulting from negligence or failure on his/her part, and/or the part of anyone of his/her associates, to use reasonable care.
2. Operating Rules and Laws: The permittee shall keep the premises in a neat and orderly condition at all times, and shall comply with all municipal, county, and State laws applicable to the operations under the permit as well as all Federal laws, rules, and regulations governing national wildlife refuges and the area described in this permit. The permittee shall comply with all instructions applicable to this permit issued by the refuge official in charge. The permittee shall take all reasonable precautions to prevent the escape of fires and to suppress fires and shall render all reasonable assistance in the suppression of refuge fires.
3. Use Limitations: The permittee's use of the described premises is limited to the purposes herein specified and does not, unless provided for in this permit, allow him/her to restrict other authorized entry onto his/her area; and permits the Service to carry on whatever activities are necessary for: (1) protection and maintenance of the premises and adjacent lands administered by the Service; and (2) the management of wildlife and fish using the premises and other Service lands.
4. Transfer of Privileges: This permit is not transferable, and no privileges herein mentioned may be sublet or made available to any person or interest not mentioned in this permit. No interest hereunder may accrue through lien or be transferred to a third party without the approval of the Regional Director of the Service and the permit shall not be used for speculative purposes.
5. Compliance: The Service's failure to require strict compliance with any of this permit's terms, conditions, and requirements shall not constitute a waiver or be considered as a giving up of the Service's right to thereafter enforce any of the permit's terms or conditions.
6. Conditions of Permit not Fulfilled: If the permittee fails to fulfill any of the conditions and requirements set forth herein, all money paid under this permit shall be retained by the Government to be used to satisfy as much of the permittee's obligation as possible.
7. Payments: All payment shall be made on or before the due date to the local representative of the Service by a postal money order or check made payable to the U.S. Fish and Wildlife Service.
8. Termination Policy: At the termination of this permit the permittee shall immediately give up possession to the Service representative, reserving, however, the rights specified in paragraph 11. If he/she fails to do so, he/she will pay the government, as liquidated damages, an amount double the rate specified in this permit for the entire time possession is withheld. Upon yielding possession, the permittee will still be allowed to reenter as needed to remove his/her property as stated in paragraph 11. The acceptance of any fee for the liquidated damages or any other act of administration relating to the continued tenancy is not to be considered as an affirmation of the permittee's action nor shall it operate as a waiver of the Government's right to terminate or cancel the permit for the breach of any specified condition or requirement.
9. Revocation Policy: This permit may be revoked by the Regional Director of the Service without notice for noncompliance with the terms hereof or for violation of general and/or specific laws or regulations governing national wildlife refuges or for nonuse. It is at all times subject to discretionary revocation by the Director of the Service. Upon such revocation the Service, by and through any authorized representative, may take possession of the said premises for its own and sole use, and/or may enter and possess the premises as the agent of the permittee and for his/her account.

10. Damages: The United States shall not be responsible for any loss or damage to property including, but not limited to, growing crops, animals, and machinery or injury to the permittee or his/her relatives, or to the officers, agents, employees, or any other who are on the premises from instructions or by the sufferance of wildlife or employees or representatives of the Government carrying out their official responsibilities. The permittee agrees to save the United States or any of its agencies harmless from any and all claims for damages or losses that may arise to be incident to the flooding of the premises resulting from any associated Government river and harbor, flood control, reclamation, or Tennessee Valley Authority activity.

11. Removal of Permittee's Property: Upon the expiration or termination of this permit, if all rental charges and/or damage claims due to the Government have been paid, the permittee may, within a reasonable period as stated in the permit or as determined by the refuge official in charge, but not to exceed 60 days, remove all structures, machinery, and/or equipment, etc. from the premises for which he/she is responsible. Within this period the permittee must also remove any other of his/her property including his/her acknowledged share of products or crops grown, cut, harvested, stored, or stacked on the premises. Upon failure to remove any of the above items within the aforesaid period, they shall become the property of the United States.

Instructions for Completing Application

You may complete the application portion verbally, in person or electronically and submit to the refuge for review. Note: Please read instructions carefully as not all information is required for each activity. Contact the specific refuge headquarters office where the activity is going to be conducted if you have questions regarding the applicability of a particular item.

1. Identify if permit application is for new, renewal or modification of an existing permit. Permit renewals may not need all information requested. Contact the specific refuge headquarters office where the activity is going to be conducted if you have questions regarding the applicability of a particular item.

2-8. Provide full name, organization (if applicable), address, phone, fax, and e-mail.

9. Provide names and addresses of assistants, subcontractors or subpermittees. Names and address are only required if the assistants, subcontractors or subpermittees will be operating on the refuge without the permittee being present. Volunteers, assistants, subcontractors or subpermittees that are accompanied by the permittee need not be identified.

10. Activity type: check one of the following categories:

- a. Event;
- b. Wood cutting;
- c. Group visit;
- d. Cabin/Subsistence cabin;
- e. Educational activity; or
- f. Other—any other activity(s) not mentioned above. Please describe "other" activity.

11. Describe Activity: provide detailed information on the activity, including times, frequency and how the activity is expected to proceed, etc. Permit renewals may not need activity description, if the activity is unchanged from previous permit. Most repetitive activities, such as group visits, do not require an activity description for each visit. Contact the specific refuge headquarters office where the activity is going to be conducted to determine if an activity description is required.

12. Activity/site occupancy timeline: Identify beginning and ending dates, site occupation timeline, hours, clean-up and other major events. Permit renewals may not need an activity/site occupancy timeline, if the activity is unchanged from previous permit. Most repetitive activities, such as group visits, do not require an activity/site occupancy timeline for each visit. Contact the specific refuge headquarters office where the activity is going to be conducted to determine if an activity/site occupancy timeline is required.

13-14 Expected number of participants: Provide an estimate of the number of adults, and children and grade level of group, if applicable.

15. Identify if onsite refuge staff will be required for group activities and anticipated time frame, if applicable.

16a-16b. Identify and attach Plan of Operation, if required. Most repetitive activities, such as group visits, do not require Plans of Operations for each visit. In addition, permit renewals may not require Plans of Operations if the activity is essentially unchanged from the previous permit. Contact the specific refuge headquarters office where the activity is going to be conducted to determine if a Plan of Operations is required.

17. Location: identify specific location (GPS coordinates preferred), if not a named facility. Most repetitive activities, such as group visits, do not require a location. In addition, permit renewals may not require a location if the activity is essentially unchanged from the previous permit. Contact the specific refuge headquarters office where the activity is going to be conducted to determine if a location is required.

18a-18b. Attach a map of location, if required and not conducted at a named facility. Most repetitive activities, such as group visits, do not require a map. In addition, permit renewals may not require a map if the activity is essentially unchanged from the previous permit. Contact the specific refuge headquarters office where the activity is going to be conducted to determine if a map is required.

19a-19b. Provide name, type and carrier of insurance, if required. Contact the specific refuge headquarters office where the activity is going to be conducted to determine if insurance and type of insurance are required.

20. Specifically identify types and numbers of other licenses, certifications or permits, if required. Contact the specific refuge headquarters office where the activity is going to be conducted to determine the types of licenses, certifications or permits required, and to coordinate the simultaneous application of several types of licenses, certifications or permits. This Special Use Permit (SUP) may be processed while other certifications are being obtained.

21-22. Provide name(s) of any personnel required to stay overnight, if applicable.

23. Identify all equipment and materials, which will be used, if required. Most repetitive events, such as group visits, do not require a list of equipment. In addition, permit renewals may not require a list of equipment if the event is essentially unchanged from the previous permit. Contact the specific refuge headquarters office where the activity is going to be conducted to determine if a list of equipment is required.
24. Describe and provide vehicle descriptions and license plate or identification numbers of all vehicles, including boats and airplanes, if required. Motor vehicle descriptions are only required for permittee vehicle, and/or if the vehicle will be operated on the refuge without the permittee being present. Motor vehicles that are accompanied by the permittee as part of a group (convoy) activity need not be identified if cleared in advance by refuge supervisor. Specifically describe ship-to-shore, intersite (between islands, camps, or other sites) and onsite transportation mechanisms, and license plate or identification numbers, if required.
25. Specifically describe onsite work and/or living accommodations, if applicable.
26. Specifically describe onsite hazardous material storage, or other onsite material storage space (including on and offsite fuel caches).
27. Sign, date, and print the application. Click on the Print button to print the application (if using the fillable version). The refuge official will review and, if approved, fill out the remaining information, sign, and return a copy to you for signature and acceptance.

The form is not valid as a permit unless it includes refuge approval, a station number, a refuge-assigned permit number, and is signed by a refuge official.

Special Use Permit: 81312
FY 2013

PERMITTEE: Chincoteague Volunteer Fire Company
South Main Street
Chincoteague Island, VA 23336

SPECIAL TERMS AND CONDITIONS

1. This permit authorizes the use of the Chincoteague National Wildlife Refuge (Refuge) for the grazing of Chincoteague Ponies (ponies) only. Ponies are authorized only within the permitted pasture/habitat units (i.e. North and South Pony Management Areas, see attached map.) The herd numbers will not exceed that allotted for such grazing, unless permission is granted by Refuge Manager for extenuating circumstances (i.e. weather, tidal flooding, etc.) Permittee is solely responsible for ensuring the ponies are not in violation of these conditions. Failure to comply may result in cancellation of grazing privileges, the imposition of administrative fees and/or legal charges.
 - a. Permittee has one week to return ponies to permitted compartments once notified by the Refuge Manager; an additional week may be granted based on adequate justification. Ponies that habitually get out of permitted compartments will be removed from the refuge until the fence is repaired or escape is blocked.
 - b. Ponies will be promptly returned to their assigned grazing units after the annual July round-up and auction.
2. The permittee is responsible for the maintenance of all assigned fences, including repair of damage caused by tidal flooding and other acts of nature. The U.S. Fish and Wildlife Service will purchase all post and fencing materials necessary for scheduled maintenance and repairs of fence lines. The permittee in concert with the Refuge Manager will develop a fence replacement and repair schedule/plan that stipulates the replacement of fence lines for a period of 15 years. The permittee will work in concert with the Refuge Manager for the scheduling of joint fence maintenance activities.
3. The permittee will designate individuals authorized to assist in management activities for the Chincoteague pony herd and will supply a list to the Refuge Manager within 30 days after issuance of the Special Use Permit. The top four names will be authorized to take action in the event of an emergency, if the Pony Committee Chairman is not available. Additionally, the permittee will provide the Refuge Manager a list of volunteers and helpers assigned to Pony Committee activities (round-ups, feeding and watering, etc.)
4. The permittee will provide the name and phone number of a contact veterinarian in case of emergency. CNWR will contact the permittee in case of an emergency, but should the permittee fail to respond within 12 hours, CNWR will initiate veterinarian services and the permittee will be responsible for all charges. Permittee will comply with all Commonwealth of Virginia and US Department of Agriculture livestock health laws.

5. During the July pony penning:

- a. Permittee will provide a minimum of three responsible CVFD staff from 0700 to 2200 hours to respond to public inquiries concerning the ponies and ensure safety. Those individuals will wear standardized, visible and clearly marked CVFD shirts that distinguish them to the public. All personnel inside the corral, with the exception of the veterinarian, will wear the CVFD shirt.
- b. Permittee will provide at least two individuals to monitor the ponies overnight from 2200 to 0700 hours. The permittee will erect a small tent, approximately ten feet square, clearly marked CVFD Pony Committee, to provide shelter from inclement weather and to distribute public information packets. No products may be sold. Tent location will be agreed upon by CNWR and the permittee.
- c. Permittee will provide water to ponies at least every five hours beginning at 0700 hrs and ending at 2200 (0700, 1200, 1700, and 2200 hours). The Permittee is encouraged to maintain the water supply line to the watering troughs, in the South corral that would automatically fill the troughs when they become low.
- d. Permittee will provide a licensed veterinarian for all pony penning activities who will remain within a one hour response time following the activity. The name and phone number of the veterinarian present will be provided to the Refuge Manager prior to any pony penning activities.
- e. Prior to all swims the veterinarian will inspect the pony herd to determine which animals shall swim and those needing to be transported.
- f. Permittee will erect a fence or barrier at least three feet from the corral fence to prevent physical contact between the public and the ponies. Fences will be clearly marked to keep the public off.
- g. No smoking is permitted within the corral.

6. The permittee is responsible for conduct of members of work parties while on the refuge. Consumption of alcoholic beverages is not allowed on the refuge.

7. When the refuge is closed to normal visitation (after hours, inclement weather, etc...), the CVFC Pony committee chairman must receive authorization from the Refuge Manager or his designee to gain access to the refuge. Access will be granted on a case by case basis to authorize individuals to ensure for the welfare of the ponies. All other activities are prohibited. When the refuge is closed due to emergency conditions, all third party requests for information regarding the status of the refuge shall be deferred to the refuge manager or his designee. No photographs may be taken.

8. The permittee after each round-up (spring, summer and fall) will provide the Refuge Manager a written report stating the number of ponies present on the refuge. The report at a minimum will

provide the number of adult females and males found in individual grazing units (north and south.) Stock present in excess of the maximum allowable as of November 1 will be removed from the refuge within 30 days. Animals in excess of the maximum allowable after 30 days will subject the permittee to appropriate administrative and legal action.

9. The Refuge Manager reserves the right to amend or modify this permit if conditions and management considerations dictate. The Chairman of the Pony Committee will be notified prior to any anticipated changes in this permit.

I hereby agree that I have read and understand the above terms and conditions and will comply with the Special Use Permit and its special terms and conditions. Failure to comply with the above terms and conditions may result in cancellation of all grazing privileges.

<u>Jama J. Russell</u>	<u>2-04-13</u>	<u>Louis J. Rendon</u>	<u>2/01/13</u>
President	Date	Refuge Manager	Date
<u>B. Thent PC. AWC</u>	<u>2-01-13</u>		
Chairman, Pony Committee	Date		

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Louis Hinds, Refuge Manager

Station Name: Chincoteague National Wildlife Refuge

Prepared By: Amanda A. Daisey, Wildlife Biologist

Telephone and Facsimile Numbers: (Phone) 757/336-6122; (Fax) 757/336-5273

Date: April 22, 2011

Project Title: Chincoteague Pony Penning and Piping Plover/Sea Turtle Management,

I. Service Program: National Wildlife Refuge System

II. Geographic Area Including Name of County/City and State and Specific Project Location:

Chincoteague National Wildlife Refuge
Assateague Island
Accomack County
Chincoteague, Virginia

III. Background Information:

Two herds of feral horses known as the "Chincoteague Ponies" reside on Chincoteague National Wildlife Refuge. Crop damage caused by free roaming animals in 17th century Eastern Shore led colonial legislatures to enact laws requiring fencing and taxes on livestock. The Chincoteague Ponies are believed descendants of colonial horses brought to Assateague Island by farmers to avoid fencing expenses and taxation. Prior to the refuge's establishment in 1943, the Chincoteague Volunteer Fire Company (CVFC) purchased the Virginia portion of Assateague Islands' ponies and retains ownership.

CNWR annually issues a Special Use Permit to CVFC allowing 150 adult ponies to graze on Assateague Island, Virginia. Ponies graze within two barbed wire sections referred to as the north (3,354 ac) and south (542 ac) compartments (Fig. 1). The North Wash Flats impoundment is closed to pony grazing during the piping plover breeding season. The grazing compartments were created in part to prevent ponies from grazing in important refuge habitats, including shorebird breeding areas, and to reduce visitor-pony contact for safety. The CNWR maintenance staff and CVFC maintain, replace, and repair sections of the fencing year round.

The Annual Chincoteague Pony Swim and Auction is held the last consecutive Wednesday and Thursday in July. The CVFC rounds up all ponies from both the north and south compartments and places them into holding corrals. Horseback riders swim the

ponies across Assateague Channel from Assateague Island to neighboring Chincoteague Island. Foals and yearlings are sold at auction to benefit the Town of Chincoteague's ambulance and fire services. Following the auction, the remaining ponies are returned to their respective compartments on CNWR.

Proposed Activity: CVFC Beach Pony Walk

The Monday prior to the Pony Penning Swim, approximately 110 ponies and their foals from the North compartment are herded to the south holding corral on Beach Road. The "Pony Walk" is a popular event with visitors and begins at 0600 hrs. The CVFC traditionally moves the ponies via horseback from the South Wash Flats along the beach intertidal zone through the beach parking lots and Beach Road to the south corral (Fig. 2). Over 1,700 visitors attended the Pony Walk in 2010. Spectators congregate on the beach berm between the beach parking lots and Swan Cove Trail to view the Chincoteague ponies. Because of the number of parking spaces available and the number of visitors anticipated to try to view the event, visitors are expected to park at the beach parking lot and walk north along the beach to where they would like to view the ponies. In 2010, two piping plover pairs nested and hatched chicks along a portion of the Pony Walk route. Disturbance and/or harm to piping plovers, nests, and broods is a concern. CNWR proposes continuing the Pony Walk using piping plover nest protection measures and alternative Pony Walk routes when necessary.

IV. Pertinent Species and Habitat Within Action Area

- A. Action area:** Assateague Island, Virginia beach habitat, from South Wash Flats (north pony corral) to the current public beach parking lots (Beach Road).
- B. List of listed species/critical habitat, proposed species/critical habitat, and candidate species known to occur or potentially occurring within the action area. Include species/habitat occurrence.**

Piping Plover (*Charadrius melodus*) - 2 breeding pairs with chicks in the area in 2010
 Loggerhead sea turtle (*Caretta caretta*) – 1 sea turtle nest in the area in 2010
 Green sea turtle (*Chelonia mydas*) – very low potential for a nest in the area
 Leatherback sea turtle (*Dermochelys coriacea*) – very low potential for a nest
 Seabeach amaranth (*Amaranthus pumilus*) – low potential for occurrence
 Red Knot (*Calidris canutus rufa*) – migrant, not present in late July

V. Determination of Effects

- A. Explanation of the adverse and beneficial effects of the action on species and/or critical habitat listed above.**

Herding ponies down the beach and the large number of spectators on the beach to view the ponies may result in trampling of plover nests or young and sea turtle nests that occur on the beach along the pony route. The ponies, the cowboys, spectators, and Refuge personnel all increase the chance of trampling. The pony penning event is also expected to result in human disturbance to piping plover nests and young that is greater than what would occur without the event. This includes the presence of large numbers of people for several hours; and mass movements of people up the beach in the early morning, and then down the beach after the ponies have passed. This may result in interference with normal breeding, feeding, and sheltering activities for plovers, and may result in plovers moving into areas they would not otherwise use as a result of either being precluded from normal use areas by people, and flushing. Any sea turtle hatchlings that emerge from nests at the time of the event may also be subject to trampling, disorientation, and disturbance as a result of the presence of large numbers of people and the ponies. Most of the activities are expected to occur within the intertidal zone, and consequently, the potential effects to seabeach amaranth are limited to those already addressed within the 2008 biological opinion.

B. Explanation of actions to be implemented to reduce adverse effects:

CNWR staff will meet annually with a CVFC representative prior to the Pony Walk to discuss event logistics and the pony route. If piping plover nests and/or chicks are present on the beach between South Wash Flats and the beach parking lot #1, staff and the CVFC will follow one or more of the following measures:

Piping Plover Nest Protection (Fig. 3).

Staff will construct a temporary fence north of the any piping plover nests located within the established pony penning route. The fence will direct the ponies, firemen, and spectators to the intertidal zone and around the plover nests. A staff member, intern or trained volunteer will be stationed near the plover nests during the Pony Walk to monitor incubating adults and eggs. Staff will remove the temporary fence after the ponies pass the nest. CNWR staff currently employs this method with sea turtles nests and found the method effective.

Sea Turtle Nest Protection

Staff will construct a temporary fence north of any sea turtle nest within the pony penning route to divert the ponies and people away from the nest. The nest site will also be marked with signs and flagging to aid in preventing trampling.

Alternate Pony Walk Routes

If piping plover chicks are present within the Pony Walk route, CVFC will herd the ponies along an alternate route to avoid contact with plover broods:

Alternate Route #1: Piping plover chicks between South Wash Flats and C-Dike (Fig. 4).

CVFC will herd ponies from the North Pony Corral along the Service Road to C-Dike. The ponies will cross the dike to the beach and continue along the traditional route to the South Pony Corral.

Alternate Route #2: Piping plover chicks between C-Dike and Swan Cove Trail (Fig. 5).

CVFC will herd ponies from the North Pony Corral along the Service Road to the Wildlife Loop. Ponies will follow the Wildlife Loop to Swan Cove Trail and cross to the beach. Once on the beach, the ponies will continue along the traditional route to the South Pony Corral.

Alternate Routes #3A & 3B: Piping plover chicks between Swan Cove Trail and Parking Lots.

Option A (Fig. 6): CVFC will herd ponies from the North Pony Corral and cross to the beach adjacent to South Wash Flats. Ponies will walk south along the beach intertidal zone and cross to the Wildlife Loop via Swan Cove Trail. The ponies will continue along the Wildlife Loop to Black Duck Trail. Ponies will continue on Beach Road to the South Pony Corral.

Option B (Fig. 7): CVFC will herd ponies from the North Pony Corral and cross to the beach adjacent to South Wash Flats. Ponies will walk south along the beach intertidal zone and into F-Pool. The ponies will continue through F-Pool, west of the beach parking lot #1 to Beach Road. Ponies will continue on Beach Road to the South Pony Corral. Staff will erect temporary buffer fencing on the beach around the plover brood. The fencing will keep visitors away from the plover brood during the event. Staff members, interns or trained volunteers will be stationed along the fencing during the Pony Walk. Staff will remove the temporary fence after the ponies pass the nest.

Alternate Route #4: Piping plover chicks in multiple locations between South Wash Flats and Parking Lots (Fig. 8).

CVFC will herd ponies from the North Pony Corral south along the Service Road. Ponies will cross to Beach Road through the Office Complex or Wildlife Loop parking lots. Ponies will continue on Beach Road to the South Pony Corral.

Visitor/Spectator Management

Refuge personnel will be briefed prior to the event to allow them to provide information to the public about avoiding plover and sea turtle nests that will reduce potential adverse effects. If alternate pony routes are used, Refuge staff will notify visitors of the selected route through outreach, signage, and visitor contacts. While most visitors are expected to closely follow the pony route, some visitors may travel up the beach to reach portions of the pony route that are along the beach, and in doing so, may walk past plover nests or unfledged young plovers that the pony re-routing was intended to protect. If spectators are expected to travel on the beach near plover nests or young, Refuge staff will provide direction, signage, and other appropriate aids to help direct people away from areas where young plovers or plover nests occur. If young plovers may be in the intertidal zone, a Refuge monitor will be stationed at the nest to determine the location of young and help Refuge staff direct spectators to avoid and minimize disturbance to plover nests and young.

With the implementation of these measures to avoid and minimize potential effects of the pony penning event on piping plovers and sea turtles, the risk to these species is significantly reduced. The likelihood of trampling of a plover nest or chick or sea turtle nest or hatchling is almost eliminated, and would only be expected to occur if the CVFC loses control of one or more ponies, or if spectators or visitors fail to heed Refuge personnel instructions or signage. Disturbance to plovers may still occur as a result of the large numbers of people on the beach in the vicinity of nesting areas, and disturbance may result in temporary changes in plover behavior and habitat use, but these effects are expected to be limited to a few hours of the morning of the event, and are not expected to be significant enough that they would result in injury, death, or reproductive failure of any plovers. Consequently, with the implementation of the action to reduce adverse effects, the remaining effects are expected to be insignificant or discountable.

VI. Effect Determination and ES Response Requested

A. Listed species/designated critical habitat:

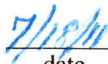
Field Station Determination	Species Name(s)	Ecological Services Response Requested (check one)
No effect		☐ None Needed
Is not likely to adversely affect	Piping Plover Loggerhead sea turtle Green sea turtle Leatherback sea turtle Seabeach amaranth	☒ Concurrence
Is likely to adversely affect		☐ Formal Consultation

Field Station Determination	Critical Habitat For (list species)	Ecological Services Response Requested (check one)
No effect		_____ None Needed
Is not likely to destroy or adversely modify		_____ Concurrence
Is likely to destroy or adversely modify		_____ Formal Consultation

B. Proposed species/proposed critical habitat/candidate species:

Field Station Determination	Species Name(s)	Ecological Services Response Requested (check one)
No effect	Red knot	<u> X </u> None Needed
Is not likely to adversely affect		_____ Concurrence
Is likely to jeopardize		_____ Conference

Field Station Determination	Critical Habitat For (list species)	Ecological Services Response Requested (initial/check one)
No effect		_____ None Needed
Is not likely to adversely affect		_____ Concurrence
Is likely to destroy or adversely modify		_____ Conference



 signature date
 Refuge Manager, Chincoteague NWR

VII. Reviewing Ecological Services Field Office Evaluation

- A. Concurrence ~~X~~ Nonconcurrence _____
 B. Formal consultation required _____
 C. Conference required _____
 D. Informal conference required _____
 E. Remarks:

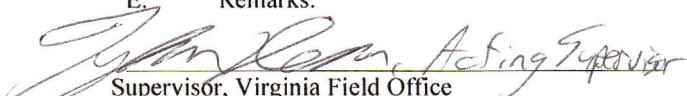
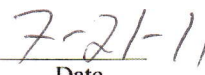


 Supervisor, Virginia Field Office Date

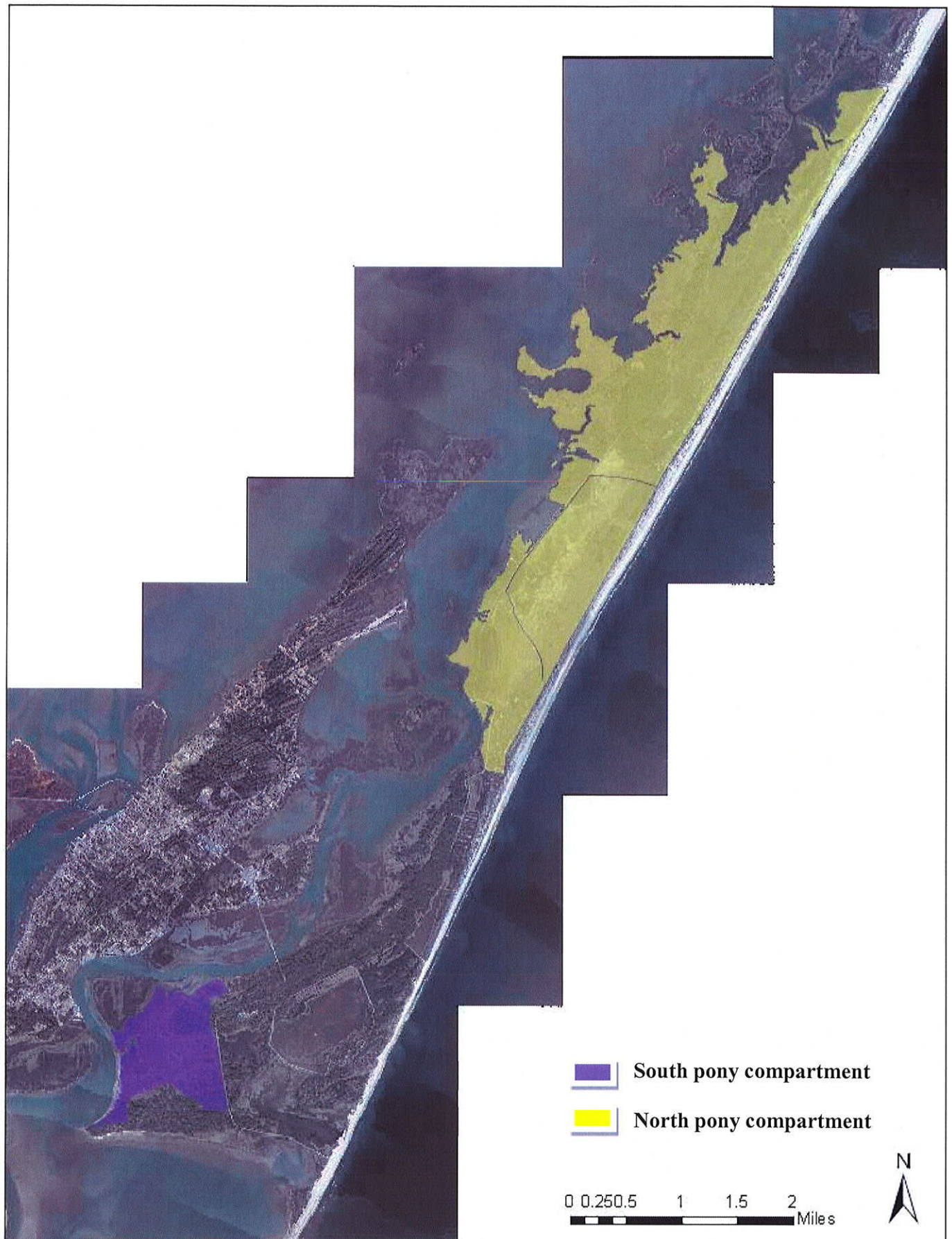
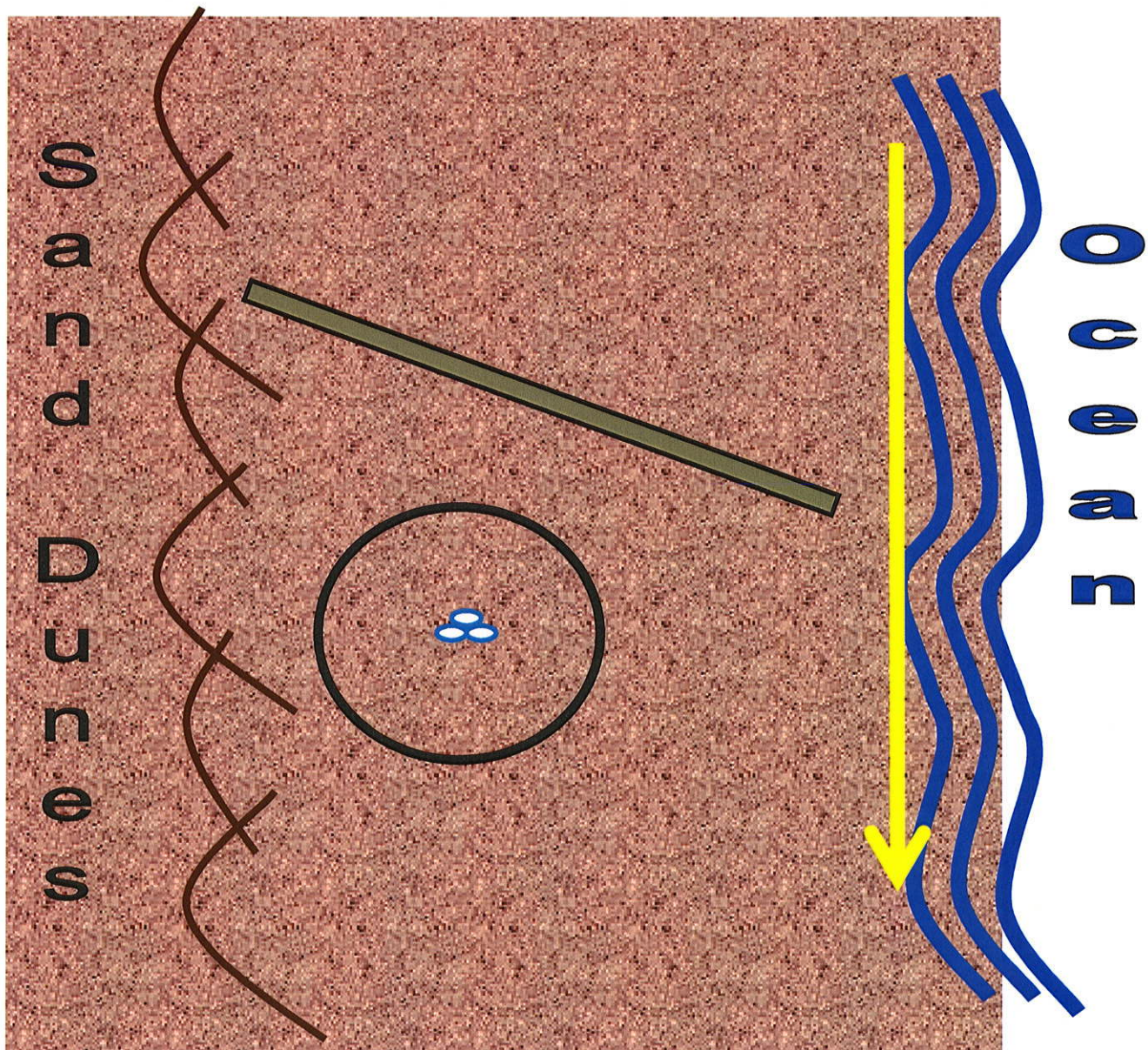
Fig 1. Pony grazing compartments on Chincoteague NWR, Assateague Island, VA.

Fig 2. Traditional Chincoteague Volunteer Fire Department “Pony Walk” route from South Wash Flats Impoundment to the South Pony Corral.



Fig 3. Protection measures for piping plover nest located within Pony Walk route.



-  Piping plover nest
-  Nest enclosure
-  Temporary fence
-  Pony walk route

Fig 4. Alternate Route #1: Option used if piping plover chicks are between South Wash Flats and C-Dike.



Fig 5. Alternate Route #2: Option used if piping plover chicks are between C-Dike and Swan Cove Trail.



Fig 6. Alternative Route #3A: Option used if piping plover chicks are between Swan Cove Trail and Parking Lots.



Fig 7. Alternate Route #3B: Option used if piping plover chicks are between Swan Cove Trail and Parking Lots.



Fig 8. Alternate Route #4B: Option used if piping plover chicks are in multiple locations between South Wash Flats and Parking Lots.



Appendix E

Bill Thompson/ USFWS



Green-winged Teal

Memorandum of Understanding between the National Park Service and U.S. Fish and Wildlife Service for Interagency Cooperation at Assateague Island National Seashore and Chincoteague National Wildlife Refuge

MEMORANDUM OF UNDERSTANDING

Agreement Number G4190120001
FWS Agreement Number FF05R00000-12-K002
Page 1 of 15

**Memorandum of Understanding
between the
National Park Service and U.S. Fish and Wildlife Service
for Interagency Cooperation at
Assateague Island National Seashore and Chincoteague National Wildlife Refuge**

This Memorandum of Understanding (hereinafter “Agreement”) is entered into by and between the National Park Service (hereinafter “NPS”), U.S. Department of the Interior, acting through the Superintendent of Assateague Island National Seashore, and the U.S. Fish and Wildlife Service (hereinafter “FWS”), U.S. Department of the Interior, acting through the Refuge Manager of Chincoteague National Wildlife Refuge.

ARTICLE I – BACKGROUND

Chincoteague National Wildlife Refuge (CNWR) was established on Assateague Island in 1943 to be administered by the FWS under the authority of the Migratory Bird Conservation Act. In 1959, under the authority of Public Law 85-57, the Secretary of the Interior granted to the Chincoteague-Assateague Bridge and Beach Authority (Beach Authority) an easement to build a bridge to and roadway across CNWR to the Toms Cove Hook area. Coincident to the easement, the FWS entered into an agreement with the Beach Authority allowing the development and operation of a public beach and recreational facilities. These actions were taken in recognition of the need for public recreational facilities on the Virginia portion of Assateague Island and under the assumption that regulated public use of the Toms Cove area could be permitted without preventing accomplishment of the purposes for which CNWR was established.

Assateague Island National Seashore (ASIS) was established in 1965 under Public Law 89-195 and its boundary drawn to encompass CNWR. Section 2(c) of P.L. 89-195 authorized the Secretary of the Interior to acquire all of the rights, title, or interests of the Beach Authority, including its real and personal property. When the acquisition was accomplished with NPS appropriations in 1966, the former Beach Authority easements merged with the United States' ownership interests.

Section 6(a) of Public Law 89-195 directs the Secretary of the Interior to administer ASIS for the general purposes of outdoor public recreation. This has been interpreted by the Secretary as also directing the NPS to aid the FWS in providing public recreation within the boundaries of CWNR. Public Law 89-195 stipulates, however, that the "land and waters in CNWR, which are a part of the seashore, shall be administered for refuge purposes under laws and regulations applicable to national wildlife refuges, including administration for public recreation uses in accordance with the provisions of the Refuge Recreation act of September 28, 1962 (P.L. 87-714)." The act authorizes the Secretary to administer refuges for recreational use, when such uses do not interfere with the area's primary purposes.

Amendments to the National Wildlife Refuge System Administration Act in 1976 (P.L. 94-223) direct that all areas in the system "shall be administered by the Secretary through the United States Fish and Wildlife Service", and that the FWS has ultimate decision-making authority within refuges. Subsequent opinions by Department of the Interior solicitors affirmed the authority of the FWS to cooperate with other Federal agencies in carrying out their responsibilities, and the NPS role in administering public recreation in the Toms Cove area as approved by the FWS.

The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) provides guidance to the Secretary for the overall management of the Refuge System. Key components of the Act include a strong wildlife conservation mission for the Refuge System; a process for determining compatible uses of refuges; a recognition that wildlife-dependent recreational uses involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation, when determined to be compatible, are appropriate public uses of refuges; and

that compatible wildlife-dependent recreational uses are the priority public uses of the Refuge System.

Although beach recreation is not one of the priority public uses of refuges, legislative directives related to the management of Assateague Island by the FWS and NPS have made clear that beach recreation is an appropriate activity within CNWR so long as it remains compatible with the overall purposes of the Refuge. The continued appropriateness of beach recreation at CNRW was affirmed in an approved 2004 Compatibility Determination.

ARTICLE II – PURPOSE AND OBJECTIVES

The cooperative relationship between the NPS and FWS on Assateague Island has been defined in a series of agreements dating back to 1966; all of which have assigned certain management responsibilities to each of the two agencies. The agreements have evolved over time, reflecting changes in management goals as well as legislative changes to agency authority and administrative requirements.

The purpose of this Agreement is to provide an updated and contemporary framework for effective and efficient interagency cooperation on Assateague Island. This Agreement, unless otherwise specified, applies to the management of that portion of Assateague Island in the general vicinity of Toms Cove referred to as the “Assigned Area”, depicted on a map attached to and made a part of this Agreement. Should the Assigned Area change, this Agreement will be amended to address any associated changes in management responsibilities or administrative requirements.

The specific objectives of both the FWS and NPS with respect to management of the Assigned Area on Assateague Island are:

- A. To protect and enhance refuge and park resources, as well as the appropriate enjoyment and appreciation of same by the public;

- B. To provide high quality recreational, interpretive, and educational opportunities for the visiting public;
- C. To reduce confusion regarding each agencies' roles and responsibilities
- D. To eliminate unnecessary duplication of services, permitting, paperwork, and reviews.
- E. To effectively utilize the experience, skills, and expertise of the two agencies' personnel.

This Agreement supersedes and replaces the General Agreement dated October 18, 2001 between the FWS and NPS pertaining to the administration, development, and use of the Assigned Area on Assateague Island. Cooperative operational activities covered by this Agreement include visitor services, interpretive services, visitor and resource protection, facility management, land and resource management, and interagency communications. Cooperative law enforcement activities are further defined under a separate agreement.

ARTICLE III – AUTHORITY

Pursuant to 16 U.S.C. §1a-2(*l*), the NPS is authorized to cooperate with Federal, State and local park agencies for the more effective and efficient management of adjacent park areas, so long as the administrative responsibilities for any unit of the National Park System are not transferred.

ARTICLE IV – STATEMENT OF AGREEMENT FOR OPERATIONAL ACTIVITIES

A. Visitor Services

- 1. The NPS will:
 - a. Plan, facilitate, support, and manage appropriate recreational activities within the Assigned Area and other areas of NPS jurisdiction. Activities include swimming,

- fishing, motorized and non-motorized boating, clamming and crabbing, bird watching, beach combing, sightseeing, and other similar visitor uses compatible with the FWS and NPS missions.
- b. Consult with FWS prior to initiating or allowing any new or non-traditional recreational activities within the Assigned Area.
 - c. Assist in the day to day management of over-sand vehicle (OSV) use within the designated OSV zone by issuing permits, educating permit holders on OSV use regulations, and assisting the FWS with enforcing OSV use regulations, limits, and closures. Vehicle and equipment standards will be as defined by 36 CFR, 7.65(b).
 - d. Operate and manage a lifeguarded beach during the peak visitor use season in accordance with NPS policies and practices. The NPS will:
 - i. Have sole supervisory responsibility for lifeguards and lifeguard operations, including closure of the lifeguard protected beach for public safety. All beach closures require the approval of the Chief Lifeguard or his delegated supervisor.
 - ii. Use all-terrain vehicles (ATVs) in conducting lifeguard operations (including emergency medical response) within the Assigned Area.
 - iii. Provide 'First Responder' response by lifeguards to medical emergencies within the Assigned Area with continued emergency medical services as per the existing Memorandum of Agreement with the FWS and Town of Chincoteague.
2. The FWS will:
- a. Provide annual guidance for management of the OSV zone, to be defined and agreed to in advance through the Annual Operating Plan (AOP) as per Article V of this Agreement.
 - b. Define, on an annual basis through the AOP, the locations, circumstances, and conditions under which NPS lifeguards may operate outside of the Assigned Area (including use of ATVs for emergency response).
 - c. Assume primary responsibility for permitting all special park uses (Special use, research, photographic, etc.) within the Assigned Area.
 - d. Consult with the NPS about any special park uses with potential to affect normal visitor use or NPS operations within the Assigned Area. If it is determined that the

- proposed use will affect visitor use or NPS operations in the assigned area, the NPS will manage the permitting process.
- e. Provide government-owned housing, as available, at standard rates for NPS seasonal employees and volunteers working in the Virginia District of ASIS. The amount of housing available for NPS employees and volunteers will be defined and agreed to in the AOP, as per Article V of this Agreement.
3. The NPS and FWS will jointly:
- a. Define the size of the lifeguarded beach, dates and times of operation, staffing levels, and the number, type and location of lifeguard stands on an annual basis in the AOP.
 - b. Honor entrance passes issued by the other agency
 - i. NPS will, in Maryland, honor valid daily and seven-day entrance passes, Federal Duck Stamps, and CNWR Annual Passes issued by the FWS.
 - ii. FWS will, in Virginia, honor valid seven-day entrance passes, National Park Passes, and ASIS Annual Passes issued by the NPS.
 - iii. Both agencies will honor valid “America the Beautiful” Annual, Senior, Access, and Volunteer passes.

B. Interpretive Services

1. The NPS will:
- a. Plan, develop, and provide to the public appropriate interpretive and educational programs and activities (including the placement of waysides, kiosks, etc.). Unless otherwise approved by the FWS, these actions will take place exclusively within the Assigned Area or other areas of NPS jurisdiction including NPS-owned bridges, NPS visitor center, and waters within the Seashore boundary.
 - b. Operate the NPS visitor center within the assigned area with sole responsibility for thematic content, activities, staffing, and maintenance.
 - i. Coordinate operation of an Eastern National (EN) sales outlet in visitor center.
 - ii. Avoid the duplication of sales items with the Chincoteague Natural History Association operated sales outlet in the FWS visitor center.

- c. Recruit, train, supervise, and manage volunteers in accordance with NPS policies and practices to assist in providing those visitor services in the assigned area for which the NPS has primary responsibility.
2. The FWS will:
 - a. Allow intermittent use of the FWS visitor center, as available, without charge by NPS for special interpretive programs and events. The schedule and purpose of these special events will be defined and agreed to in the AOP.
 - b. Avoid the duplication of sales items in the FWS visitor center with the Eastern National operated sales outlet in the NPS visitor center.
3. The NPS and FWS will jointly:
 - a. Define the emphasis of each agency's interpretative programs and the locations where each will provide interpretive services to avoid overlap and/or duplication of effort. The types and location of activities will be defined and agreed to in the AOP.
 - b. Consult with one another prior to conducting activities which overlap with the other agency's interpretive activities or locations.
 - c. Define the locations within the Assigned Area where cooperators may provide interpretive services, and adopt scheduling protocols and lines of communication to assure that cooperator programs do not conflict with agency activities. The types and location of cooperator activities will be defined and agreed to in the AOP.
 - d. Provide mutual assistance in interpretive planning and programming. Major or recurring assistance requires advanced approval and will be defined and agreed to in the AOP.
 - e. Review and approve, as appropriate, any materials distributed by the other agency or their authorized cooperators dealing with agency policies and/or management. Review/approval will be by the CNWR Refuge manager and ASIS Superintendent.
 - f. Collaborate in training or cross-training volunteers as necessary to meet shared objectives.
 - g. Share volunteers as necessary and desirable to meet shared objectives. Major or recurring sharing of volunteers will be defined and agreed to in the AOP.

C. Visitor and Resource Protection

1. The NPS and FWS will jointly:
 - a. Integrate the law enforcement operations and activities of both agencies within ASIS/CNWR to enhance the existing agency partnership, eliminate employee confusion and lack of direction during incidents, and provide quality resource and visitor protection services within the limits of existing resources and staffing.
 - i. All activities of the NPS/FWS integrated law enforcement operation will be conducted as per the ASIS/CNWR Cooperative Law Enforcement Agreement.
 - ii. For the purpose of this Agreement, ASIS/CNWR is defined as the NPS and FWS lands and waters within the Virginia portion of ASIS, and the lands and waters within CNWR and Wallops Island NWR.
 - c. Provide ‘First Responder’ response to medical emergencies with continued emergency medical services provided as per the existing Memorandum of Agreement between the NPS, FWS and Town of Chincoteague.
 - d. Respond to and support emergency operations within ASIS/CNWR including, but not limited to wild land fires, hazardous material spills, storms and other weather related emergencies as per the ASIS/CNWR Cooperative Law Enforcement Agreement.
 - e. Support the operation and maintenance of existing and future radio communications equipment and infrastructure.

D. Facility Management

1. The NPS will:
 - a. Visitor Use Facilities and Infrastructure
 - i. Conduct all normal maintenance, repair, and upkeep of NPS visitor use facilities and infrastructure, including roads, bridges, and parking lots within the Assigned Area and other locations of NPS jurisdiction. All such activities shall be consistent with NPS policies, procedures, and standards.
 - ii. Consult with FWS prior to initiating any new construction or substantive modification/repair/rehabilitation of NPS visitor use facilities and infrastructure,

including the use or movement of sand resources within the Assigned Area, to ensure compatibility with the CNWR mission.

- iii. Conduct all necessary compliance and permitting actions associated with facility management activities in the Assigned Area and other locations of NPS jurisdiction.
 - b. Operational Facilities and Infrastructure
 - i. Conduct all maintenance, repair, and upkeep of NPS operational facilities and infrastructure in the areas assigned for that purpose by the FWS within CNWR and Wallops Island NWR.
 - ii. Consult with FWS prior to initiating any substantive modification/repair/rehabilitation of NPS operational facilities and infrastructure to ensure compatibility with the CNWR mission.
 - iii. Conduct all necessary compliance and permitting actions associated with the management of NPS operational facilities and infrastructure.
 - c. Assateague Beach Coast Guard Station
Provide normal maintenance, repair, and upkeep of the former Assateague Beach Coast Guard Station complex and associated utility systems.
 - d. Signage
Provide and maintain appropriate and adequate signage in the Assigned Area and other locations of NPS jurisdiction.
 - e. State Line Fence
Maintain the state line fence separating ASIS and CNWR for the primary purpose of restricting the movement of NPS horses and permitted OSVs onto the Refuge
2. The FWS will:
- a. Provide sites within the CNWR complex on both the Island and mainland sufficient to support NPS operational activities including vehicle/equipment storage, facility management, and other operational needs including housing for seasonal/temporary NPS employees.

- b. Provide the NPS with year round access across CNWR lands to the former Assateague Beach Coast Guard Station. The presence of sensitive resources may require the NPS to coordinate travel through certain areas with the FWS.
 - c. Maintain access to the Maryland/Virginia state line, as feasible, and assist the NPS in state line fence maintenance activities when requested and as available.
 - d. Take the lead role in all required compliance and permitting actions related to any future relocation of the Assigned Area and associated construction of new visitor use facilities and infrastructure.
3. The NPS and FWS will jointly:
- a. Assist one another in maintenance and facility management activities to the extent practicable or as agreed to by the Park Superintendent and Refuge Manager. This may include the sharing of equipment, staff, or facilities. Major or recurring assistance will be defined and agreed to in the AOP.
 - b. Identify essential maintenance employees in the AOP who will report during winter weather emergencies to conduct response activities such as snow removal.
 - c. Cooperate in sign management for the Park and Refuge. Except as otherwise agreed to, all signs within the Park/Refuge should be consistent in appearance and refrain from identifying agency names. The exceptions to this general rule are directional signs outside of the Park/Refuge, signs at the Park/Refuge entrance where both agencies should be given full recognition, and signs for the visitor centers which may recognize the operating agency only.

E. Land and Resource Management

1. The FWS will:
- a. As with the entire Virginia portion of Assateague Island, assume primary responsibility for managing the wildlife and other natural resources within the Assigned Area, with the understanding by both agencies that recreational use will be planned and carried out to minimize adverse impacts.
2. The NPS and FWS will jointly:

- a. Collaborate in natural and cultural resource management and related research activities including, but not limited to, invasive species control, threatened species management, and hunting management. Where appropriate, research findings and other resource information will be shared, activities of mutual interest will be planned jointly, professional expertise will be shared, and technology transfer will occur.
- b. Recognize that each agency has distinct policies and approaches to resource management but that management of the barrier island ecosystem as a whole is environmentally sound.
- c. To the extent allowed by their respective missions, seek to manage the land and waters of Assateague in a manner that protects, restores, and enhances the ecological health of the barrier island system.

F. Interagency Communications and Information Sharing

1. The NPS and FWS will jointly:
 - a. Notify one another as soon as possible about all incidents, problems, violations, or management actions (e.g. weather emergencies, Refuge closures, storm response) with potential ramifications for the other agency.
 - b. Designate points of contact for each primary operational area covered by this Agreement (visitor services, interpretation, visitor and resource protection, maintenance, resource management, and administration). These individuals will meet at least twice annually (March-April and September-October) to identify and discuss the specifics of the AOP, operational problems or issues, and other matters of mutual concern.
 - c. Coordinate the production and release of all publications, press releases, and other publically distributed information related to the Assigned Area or other areas of shared responsibility.
 - d. Seek to keep one another informed about their respective activities and share all information of potential interest to the other agency.
 - e. Cooperate in the collection, analysis and reporting of visitor use statistics. Insofar as possible, similar methods will be used by both agencies to collect and tabulate visitor use data. Monthly visitor use statistics and reports will be shared between agencies.

ARTICLE V – ANNUAL OPERATING PLAN

The NPS and FWS will jointly develop an Annual Operating Plan by December 1st of each year covering cooperative activities for the following calendar year. The AOP will define specific details of the aforementioned cooperative operational activities authorized by this Agreement. The AOP will be approved annually by the ASIS Superintendent and the CNWR Refuge Manager.

ARTICLE VI – TERM OF AGREEMENT

This Agreement will be effective for a period of five years from the date of final signature, unless it is terminated earlier by one of the parties pursuant to Article VII below.

ARTICLE VII– MODIFICATION AND TERMINATION

- A. This Agreement may be modified only by a written instrument executed by the parties.
- B. Either party may terminate this Agreement by providing the other party with thirty (30) days advance written notice. In the event that one party provides the other party with notice of its intention to terminate, the parties will meet promptly to discuss the reasons for the notice and try to resolve their differences.

ARTICLE VIII – KEY OFFICIALS

- A. Key officials are essential to ensure maximum coordination and communication between the parties and the work being performed. They are:

1. For the National Park Service:

Patricia Kicklighter
Superintendent
Assateague Island National Seashore
7206 National Seashore Lane
Berlin, MD 21811
E-mail: trish_kicklighter@nps.gov
Telephone: (410) 629-6080
Facsimile: (410) 641-1099

2. For the U.S. Fish and Wildlife Service:

Louis Hinds
Refuge Manager
Chincoteague National Wildlife Refuge
PO Box 62
Chincoteague, VA 23336
E-mail: louis_hinds@fws.gov
Telephone: (757) 336-6122
Facsimile: (757) 336-5273

- B. Changes in Key Officials – Neither the NPS or FWS may make any permanent change in a key official without written notice to the other party reasonably in advance of the proposed change.

ARTICLE IX – SIGNATURES

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the date(s) set forth below.

FOR THE NATIONAL PARK SERVICE:

Signature: Patricia Kicklighter

Name: Patricia Kicklighter

Title: Superintendent, Assateague Island National Seashore

Date: 1/10/2012Concur: Dennis R. Reidenbach

Name: Dennis R. Reidenbach

Title: Regional Director, Northeast Region

Date: 3/8/2012

FOR THE U.S. FISH AND WILDLIFE SERVICE:

Signature: Louis S. Hinds

Name: Louis Hinds

Title: Refuge Manager, Chincoteague National Wildlife Refuge

Date: 12, JAN. 2012Concur: Wendi Weber

Name: Wendi Weber

Title: Regional Director, Northeast Region

Date: 1/31/12

Assateague Island National Seashore

US Department of the Interior
National Park Service**National Park Service Assigned Area**

Memorandum of Understanding G4190120001



Appendix F



USFWS

Loggerhead sea turtle hatchlings

Biological Opinion on monitoring and management practices for piping plover, loggerhead sea turtle, green sea turtle, leatherback sea turtle, and seabeach amaranth on Chincoteague NWR



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
6669 Short Lane
Gloucester, VA 23061



September 10, 2008

Memorandum

To: Refuge Manager, Chincoteague National Wildlife Refuge

From: Supervisor, Virginia Field Office

Subject: Biological Opinion on monitoring and management practices for piping plover (*Charadrius melodus*), loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), and seabeach amaranth (*Amaranthus pumilus*) on Chincoteague National Wildlife Refuge, Virginia

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the proposed species monitoring, piping plover and sea turtle nest exclosures, predator control, hunting program, public beach use, and off-road vehicle (ORV) use within all units of the Chincoteague National Wildlife Refuge (CNWR), Accomack County, Virginia, and the effects of these activities on the endangered green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*), and the threatened piping plover (*Charadrius melodus*), loggerhead sea turtle (*Caretta caretta*), and seabeach amaranth (*Amaranthus pumilus*). The final portion of your completed *Intra-Service Section 7 Biological Evaluation Form* (Enclosure 1) was received by this office on August 7, 2008.

This biological opinion is based on information provided in your *Intra-Service Section 7 Biological Evaluation Forms* (Enclosure 1), information contained within this office, conversations with CNWR staff and species experts, field investigations, and other sources of information. A complete administrative record of this consultation is on file at this office.

Consultation History

Consultation history is provided in Appendix A.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

The proposed actions consist of continued species monitoring, piping plover and sea turtle nest exclosures, predator control, public recreational use, off-road vehicle (ORV) use (public and

government vehicles, and public horseback riding will be treated as an ORV for this consultation), hunting programs, and general management activities within the beach and dunal systems of all units of the CNWR. Tables 1 and 2 provide a detailed listing of the types of public beach use that occur on the Assateague Unit and Southern Units of CNWR, respectively. This opinion will address all activities that occur on the beaches of CNWR, as explained in detail in the enclosed *Intra-Service Section 7 Biological Evaluation Forms* (Enclosure 1) with regards to piping plovers, seabeach amaranth, and nesting sea turtles. The action area comprises all beach areas managed by the refuge. These areas are: Assateague, Assawoman, Metompkin, and Cedar Islands. This opinion supersedes the 2001 biological opinion and establishes new levels of anticipated incidental take. The proposed actions represent both updates of actions consulted on in the 2001 biological opinion and additional activities not addressed in the 2001 biological opinion. The proposed actions are expected to continue for up to five years from the issuance date of this opinion, or until CNWR completes its Comprehensive Conservation Plan (CCP) for the refuge. Once completed, the CCP will guide refuge management, and the Service expects to consult on the management actions proposed in the CCP as a new action.

II. STATUS OF THE SPECIES

PIPING PLOVER (*Charadrius melodus*)

On January 10, 1986, the piping plover was listed as endangered or threatened in various parts of its range pursuant to the ESA. Protection of the species under the ESA reflects the species precarious status range-wide. Three separate breeding populations have been identified, each with its own recovery criteria: Atlantic Coast (threatened), Great Lakes (endangered), and Northern Great Plains (threatened). No Critical Habitat has been designated or proposed for piping plovers in the Atlantic Coast breeding area.

The recovery plan for the Atlantic Coast population of the piping plover (U.S. Fish and Wildlife Service 1996a) delineates four recovery units or geographic subpopulations within the population: Atlantic Canada, New England, New York-New Jersey, and Southern (Delaware, Maryland, Virginia, and North Carolina). Recovery criteria established within the recovery plan defined population and productivity goals for each recovery unit, as well as for the population as a whole. Attainment of these goals for each recovery unit is an integral part of a piping plover recovery strategy that seeks to reduce the probability of extinction for the entire population by: (1) contributing to the population total, (2) reducing vulnerability to environmental variation (including catastrophes, such as hurricanes, oil spills, or disease), (3) increasing likelihood of genetic interchange among subpopulations, and (4) promoting recolonization of any sites that experience declines or local extirpations due to low productivity or temporary habitat succession.

Table 1. Public recreation activities on Assateague Island by season and area, Chincoteague National Wildlife Refuge, Virginia

Assateague Island Areas	Wild Beach	Public Beach		Overwash	Hook	Tom's Cove
Areas from North to South	VA state line to D-dike	D-dike to Parking Lot 1	Parking Lots 1 to 5	Parking Lot 5 to Coast Guard Station	Coast Guard Station to end of Island	NPS waters adjacent to Refuge land
Walking/Wildlife Observation	1,2,3,4	1,2,3,4	1,2,3,4	1,3,4	3,4	1,2,3,4
Sunbathing/Swimming		1,2,3,4	1,2,3,4	1,3,4	3,4	1,2,3,4
Pony Penning (2 days in July)	2	2	2			
Fishing*		1,2,3,4	1,2,3,4	1,2,3,4	3,4	1,2,3,4
ORV - public*				1,2,3,4	3,4	
ORV – LE	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
EE and Interpretation			1,2,3,4			
SUP – EE		1,2,3,4	1,2,3,4			
Weddings		1,2,3,4	1,2,3,4	1,3,4		
Kite flying			1,2,3,4			
Shell collecting/beach combing		1,2,3,4	1,2,3,4	1,3,4	3,4	1,2,3,4
Research w/ SUP	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Beach clean-up - vehicles (1 day)	3	3	3	3	3	
Biological surveys	1,2,3,4	1,2,3,4		1,2,3,4	1,2,3,4	1,2,3,4
Shorebird management	1,2,3,4	1,2,3,4		1,2,3,4	1,2,3,4	1,2,3,4
NPS maintenance			1,2,3,4	1,3	1,3	
Picnicking		1,2,3,4	1,2,3,4	1,3,4	3,4	1,2,3,4
Campfires			1,2,3,4			
Horseback riding				1,3,4	3,4	3,4
Big game hunting					3,4	3,4
Boat landing				3,4	3,4	1,2,3,4
Coast Guard Station - NPS				1,3,4		1,2,3,4
Other Agency activities w/SUP			1,2,3,4	1,3,4	3,4	
Shell fishing access						1,3,4
Commercial filming - SUP			1,2,3,4			
Agency tours and Junkets	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Emergency Activities	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Predator Management	1,2,4	1,2,4		1,2,4	1,2,4	1,2

1 = Spring (Mar 15 - June 15)

2 = Summer (June 16 - Labor Day)

3 = Fall (Labor Day - Thanksgiving)

4 = Winter (Thanksgiving - Mar 16)

Refuge Manager, Chincoteague National Wildlife Refuge

4

Table 2. Public recreation activities on the Southern Islands Unit by season and area, Chincoteague National Wildlife Refuge, Virginia.			
Southern Islands	Assawoman	Metompkin	Cedar*
Walking/Wildlife Observation	3,4	1,2,3,4	1,2,3,4
Sunbathing/swimming	3,4	1,2,3,4	1,2,3,4
Fishing	1,2,3,4	1,2,3,4	1,2,3,4
ORV – Public	n/a	n/a	1,2,3,4
ORV – LE	1,2,3,4	n/a	n/a
Shell collecting/beach combing	3,4	1,2,3,4	1,2,3,4
Research w/ SUP	1,2,3,4	1,2,3,4	1,2,3,4
Surveys – biology	1,2,3,4	1,2,3,4	1,2,3,4
Shorebird management	1,2,3,4	1,2,3,4	1,2,3,4
Picnicking	3,4	1,2,3,4	1,2,3,4
Hunting	n/a	n/a	3,4
Boating	1,2,3,4	1,2,3,4	n/a
Other Agency use w/ SUP	1,2,3,4	1,2,3,4	1,2,3,4
Commercial filming w/ SUP	1,2,3,4	1,2,3,4	1,2,3,4
Agency Tours	1,2,3,4	1,2,3,4	1,2,3,4
Emergency Access	1,2,3,4	1,2,3,4	1,2,3,4
Predator Control	1,2,4	1,2,3,4	1,2,3,4
1 = Spring (Mar 15 - June 15)			
2 = Summer (June 16 - Labor Day)			
3 = Fall (Labor Day - Thanksgiving)			
4 = Winter (Thanksgiving - Mar 16)			
*The inability to determine ownership limits restrictions placed on the island, therefore, CNWR has limited control of public use across the entire island.			

The plan further states: “A premise of this plan is that the overall security of the Atlantic Coast piping plover population is profoundly dependent upon attainment and maintenance of the minimum population levels for the four recovery units. Any appreciable reduction in the likelihood of survival of a recovery unit will also reduce the probability of persistence of the entire population.” In accordance with the Endangered Species Consultation Handbook (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998), since recovery units have been established in an approved recovery plan, this Biological Opinion considers the effects of the proposed project on piping plovers in the Southern Recovery Unit, as well as the Atlantic Coast population as a whole.

Species Description - Piping plovers are small, sand-colored shorebirds, approximately 17 centimeters (cm) (7 inches) long with a wingspread of about 38 cm (15 inches) (Palmer 1967). The Atlantic Coast population, which is the focus of this Biological Opinion, breeds on sandy, coastal beaches from Newfoundland to North Carolina, and winters along the Atlantic Coast from North Carolina south, along the Gulf Coast to Texas, and in the Caribbean (U.S. Fish and Wildlife Service 1996a). Additional detailed information on the piping plover, its life history,

and the population dynamics of the Atlantic population are provided in the recovery plan (U.S. Fish and Wildlife Service 1996a).

Life History - Piping plovers generally begin returning to their Atlantic Coast nesting beaches in mid-March (Coutu *et al.* 1990, Cross 1990, Goldin 1990, MacIvor 1990, Hake 1993). Males establish and defend territories and court females (Cairns 1982). Piping plovers are monogamous, but usually shift mates between years (Wilcox 1959, Haig and Oring 1988, MacIvor 1990), and less frequently between nesting attempts in a given year (Haig and Oring 1988, MacIvor 1990, Strauss 1990). Plovers are known to begin breeding as early as one year of age (MacIvor 1990, Haig 1992); however, the percentage of birds that breed in their first adult year is unknown.

Piping plovers nest on the ground above the high tide line on coastal beaches, on sand flats at the ends of sand spits and barrier islands, on gently sloping foredunes, in blowout areas behind primary dunes, and in washover areas cut into or between dunes. In the central portions of their Atlantic Coast range, the birds may also nest on areas where suitable dredge material has been deposited. Nest sites are shallow, scraped depressions in substrates ranging from fine-grained sand to mixtures of sand and pebbles, shells or cobble (Bent 1929, Burger 1987, Cairns 1982, Patterson 1988, Flemming *et al.* 1988, MacIvor 1990, Strauss 1990). Nests are usually found in areas with little or no vegetation although, on occasion, piping plovers will nest under stands of American beachgrass or other vegetation (Patterson 1988, Flemming *et al.* 1990, MacIvor 1990). Plover nests may be very difficult to detect, especially during the six to seven day egg-laying phase when the birds generally do not incubate the eggs within the nest cup (Goldin 1994).

Eggs may be present on the beach from early April through late July. Clutch size for an initial nest attempt is usually four eggs, one laid every other day. Eggs are pyriform in shape, and variable buff to greenish brown in color, marked with black or brown spots. The incubation period usually lasts 27-28 days. Full-time incubation usually begins with the completion of the clutch and is shared equally by both sexes (Wilcox 1959, Cairns 1977, MacIvor 1990). Eggs in a clutch usually hatch within four to eight hours of each other, although the hatching period of one or more eggs may be delayed by up to 48 hours (Cairns 1977, Wolcott and Wolcott 1999).

Piping plovers generally fledge only a single brood per season, but may reneest several times if eggs are lost. Chicks are precocial, meaning they immediately can run from the nest cup upon hatching (Wilcox 1959, Cairns 1982). They may move with their parents hundreds of meters (m) from the nest site during their first week of life (U.S. Fish and wildlife Service 1996a), and chicks may increase their foraging range up to 1,000 meters before they fledge (are able to fly) (Loegering 1992). At CNWR, Daisey (2006) found that brood movements averaged 60.1 ± 28.0 m/day in 2004 and 68.8 m/day in 2005 (range = 5.4 – 120.8 m/day; 28.9 – 122.2 m/day, respectively). Chicks remain together with one or both parents until they fledge at 25 to 35 days of age. Depending on their date of hatching, flightless chicks may be present from mid-May

until late August, although most fledge by the end of July (Patterson 1988, Goldin 1990, MacIvor 1990, Howard *et al.* 1993).

Cryptic coloration is a primary defense mechanism for this species; eggs, adults, and chicks all blend in with their typical beach surroundings. Chicks sometimes respond to vehicles and/or pedestrians by crouching and remaining motionless (Cairns 1977, Tull 1984, Goldin 1993, Hoopes 1993). Adult piping plovers also respond to intruders (avian and mammalian) in their territories by displaying a variety of distraction behaviors, including squatting, false brooding, running, and injury feigning, in an effort to lure the predators away from the nest or chicks. Distraction displays may occur at any time during the breeding season but are most frequent and intense around the time of hatching (Cairns 1977).

Plovers feed on invertebrates such as marine worms, fly larvae, beetles, crustaceans, and mollusks (Bent 1929, Cairns 1977, Nicholls 1989). Important feeding areas include intertidal portions of ocean beaches, washover areas, mudflats, sand flats, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, or salt marshes (Gibbs 1986, Coutu *et al.* 1990, Hoopes *et al.* 1992, Loegering 1992, Goldin 1993, Elias-Gerken 1994). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs 1986, Coutu, *et al.* 1990, McConnaughey *et al.* 1990, Loegering 1992, Goldin 1993, Hoopes 1993, Elias-Gerken 1994), and by stage in the breeding cycle (Cross 1990). Adults and chicks on a given site may use different feeding habitats in varying proportion (Goldin 1990). Feeding activities of chicks are particularly important to their survival. Most time budget studies reveal that chicks spend a high proportion of their time feeding. Cairns (1977) found that piping plover chicks typically tripled their weight during the first two weeks post-hatching; chicks that failed to achieve at least 60 percent of this weight gain by the twelfth day were unlikely to survive.

During courtship, nesting, and brood rearing, feeding territories are generally contiguous to nesting territories (Cairns 1977), although instances where brood-rearing areas are widely separated from nesting territories are not uncommon. Feeding activities of both adults and chicks may occur during all hours of the day and night (Burger 1993), and at all stages in the tidal cycle (Goldin 1993, Hoopes 1993).

Both spring and fall migration routes of Atlantic Coast breeders are believed to occur primarily within a narrow zone along the Atlantic Coast (U.S. Fish and Wildlife Service 1996a). Relatively little is known about migration behavior or habitat use within the Atlantic Coast breeding range (U.S. Fish and Wildlife Service 1996a), but the pattern of both fall and spring counts at migration sites along the southeastern Atlantic Coast demonstrates that many piping plovers make intermediate stopovers lasting from a few days up to one month during their migrations (National Park Service 2003, Noel *et al.* 2005, Stucker and Cuthbert 2006).

A growing body of information shows that habitats on overwash beaches, accessible bayside flats, unstabilized and recently healed inlets, and moist sparsely vegetated barrier flats are

especially important to piping plover productivity and carrying capacity in the New York-New Jersey and Southern recovery units.

In New Jersey, Burger (1994) studied piping plover foraging behavior and habitat use at three sites that offered the birds access to ocean, dune, and backbay habitats. The primary focus of the study was on the effect of human disturbance on habitat selection, and it found that both habitat selection and foraging behavior correlated inversely with the number of people present. In the absence of people on an unstabilized beach, plovers fed in ocean and bayside habitats in preference to the dunes.

Loefering and Fraser (1995) found that chicks on Assateague Island, Maryland, that were able to reach bayside beaches and the island interior had significantly higher fledgling rates than those that foraged solely on the ocean beach. Higher foraging rates, percentage of time spent foraging, and abundance of terrestrial arthropods on the bay beach and interior island habitats supported their hypothesis that foraging resources in interior and bayside habitats are key to reproductive rates on that site. Their management recommendations stressed the importance of sparsely vegetated cross-island access routes maintained by overwash, and the need to restrict or mitigate human activities that reduce natural disturbance during storms.

Dramatic increases in plover productivity and breeding population on Assateague since the 1991-1992 advent of large overwash events corroborate Loefering and Fraser's conclusions. Piping plover productivity on Assateague, which had averaged 0.77 chicks per pair during the five years before the overwash events, averaged 1.67 chicks/pair in 1992-96. The nesting population on the northern five miles of the island also grew rapidly, doubling by 1995 and tripling by 1996, when 61 pairs nested there (MacIvor 1996). Habitat use is primarily on the interior and bayside of this island.

In Virginia, Watts *et al.* (1996) found that piping plovers nesting on 13 barrier islands between 1986 and 1988 were not evenly distributed along the islands. Beach segments used by plovers had wider and more heterogeneous beaches, fewer stable dunes, greater open access to bayside foraging areas, and proximity to mudflats. They note that characteristics of beaches selected by plovers are maintained by frequent storm disturbance.

At Cape Lookout National Seashore in North Carolina, 13 to 45 pairs of plovers have nested on North and South Core Banks each year since 1992 (National park Service, 2007). While these unstabilized barrier islands total 44 miles long, nesting distribution is patchy, with all nests clustered on the dynamic ends of the barrier islands, recently closed and sparsely vegetated "old inlets," expansive barrier mudflats, or new ocean-to-bay overwashes. During a 1990 study, 96 percent of brood observations were on bay tidal flats, even though broods had access to both bay and ocean beach habitats (McConnaughey *et al.* 1990).

At Cape Hatteras National Seashore, distribution of nesting piping plovers is also “clumped,” with nesting areas characterized by a wide beach, relatively flat intertidal zone, brackish ponds, and temporary pools formed by rainwater and overwash (Coutu *et al.* 1990).

Notwithstanding the importance of bayside (soundside) flats, ephemeral pools, and sparsely vegetated barrier flats for piping plover nest site selection and chick foraging, ocean intertidal zones are also used by adults and chicks of all ages. For example, between 1993 and 1996 on the Maryland end of Assateague Island, 4 to 12 percent of annual observations of plover broods occurred on the ocean beach (National Park Service and Maryland Department of Natural Resources 1993-1996). A three-year study of piping plover chick foraging activity at six sites on four Virginia barrier islands (Cross and Terwilliger 2000) documented chick use of the ocean intertidal zone at three of six study sites. Intensive observations at Chincoteague National Wildlife Refuge Overwash Zone in 2004, where chicks had unimpeded access to a large undisturbed bayside flat, documented occasional visits to the ocean intertidal zone by six of eleven broods ranging in age from one to 24 days (Hecht 2004 *in litt.*).

Population Dynamics/Status and Distribution - Historical population trends for the Atlantic Coast piping plover have been reconstructed from scattered, largely qualitative records. Nineteenth-century naturalists, such as Audubon and Wilson, described the piping plover as a common summer resident on Atlantic Coast beaches (Haig and Oring 1987). However, by the beginning of the 20th Century, egg collecting and uncontrolled hunting, primarily for the millinery trade, had greatly reduced the population, and, in some areas along the Atlantic Coast, the piping plover was close to extirpation. Following passage of the Migratory Bird Treaty Act (40 Stat. 775; 16 U.S.C. 703-712) in 1918, and changes in the fashion industry that no longer exploited wild birds for feathers, piping plover numbers recovered to some extent (Haig and Oring 1985).

Available data suggest that the most recent population decline began in the late 1940s or early 1950s (Haig and Oring 1985). Starting in 1972, the National Audubon Society's “Blue List” of birds with deteriorating status included the piping plover (Tate 1981). Johnsgard (1981) described the piping plover as “. . . declining throughout its range and in rather serious trouble.” The Canadian Committee on the Status of Endangered Wildlife in Canada designated the piping plover as “Threatened” in 1978 and elevated the species status to “Endangered” in 1985 (Canadian Wildlife Service 1989).

Reports of local or statewide declines between 1950 and 1985 are numerous and many are summarized by Haig and Oring (1985). While Wilcox (1939) estimated more than 500 pairs of piping plovers on Long Island, New York, the 1989 population estimate was 191 pairs (U.S. Fish and Wildlife Service 2004). There was little focus on gathering quantitative data on piping plovers in Massachusetts through the late 1960s because the species was commonly observed and presumed to be secure. However, numbers of piping plover breeding pairs declined 50 to 100 percent at seven Massachusetts sites between the early 1970s and 1984 (Griffin and Melvin 1984). Recent experience of biologists surveying piping plovers has shown that counts of these

cryptically colored birds sometimes go up with increased census effort, suggesting that some historic counts of piping plover numbers by one or a few observers, who often recorded occurrences of many avian species simultaneously, may have underestimated the piping plover population. Thus, the magnitude of the species' decline may have been more severe than available numbers imply.

Table 3 summarizes nesting pair counts for the Atlantic Coast piping plover population since listing in 1986 through 2007. Final range-wide numbers for the 2008 breeding season are not yet available, and 2007 data are considered preliminary at this time. The apparent increase in numbers of plover pairs between 1986 and 1989 is thought, at least partially, to reflect the effects of increased survey efforts following the proposed listing of the species in 1986.

The Atlantic Coast population has increased from 790 pairs since listing to a preliminary estimate of 1,887 pairs in 2007 (U.S. Fish and Wildlife Service 2008a) (final 2006 estimate of 1,749 pairs, U.S. Fish and Wildlife Service 2006). Population growth has been greatest in the New England and New York-New Jersey recovery units, with a more modest and recent increase in the Southern unit and an even smaller increase in Atlantic Canada.

Productivity - Productivity needed to maintain a stable population for Atlantic Coast piping plovers is estimated at 1.24 fledged chicks per pair (Melvin and Gibbs 1994). Small populations may be highly vulnerable to extirpation due to variability in productivity and survival rates. The average productivity needed for a stable population may be insufficient to assure a high probability of species survival. To compensate for small populations, the recovery plan establishes productivity goals needed to assure a secure 2,000-pair population at 1.5 chicks per pair in each of the four recovery units, based on data from at least 90 percent of each recovery unit's population.

Table 4 provides a summary of piping plover productivity from 1987 to 2007. Both regional population trends and productivity rates have been uneven. The 10-year (1997-2007) average productivity for piping plovers on the U.S. Atlantic Coast is below the recovery target of 1.5 chicks per pair. Peak productivity in the U.S. occurred in 1994 when average productivity exceeded the recovery plan goal of 1.5 chicks per pair. In most years, average productivity across the Atlantic population remained below the target. While weather events were contributors to egg and chick losses in some years (U.S. Fish and Wildlife Service 1998, 2002a), such periodic natural events are inevitable, and they underscore the need to reduce the species' vulnerability by increasing the breeding population and protecting the species against human caused factors that affect productivity.

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TABLE 3. Estimated abundance of breeding pairs of Atlantic Coast piping plovers, 1986 – 2007. Parentheses denote preliminary estimates.

State/ RECOVERY UNIT	Pairs																					
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Maine	15	12	20	16	17	18	24	32	35	40	60	47	60	56	50	55	65	61	55	49	40	35
New Hampshire												5	5	6	6	7	7	7	4	3	3	3
Massachusetts	139	126	134	137	140	160	213	289	352	441	454	483	495	501	496	495	538	511	(490)	(475)	482	(557)
Rhode Island	10	17	19	19	28	26	20	31	32	40	50	51	46	39	49	52	58	71	70	69	72	73
Connecticut	20	24	27	34	43	36	40	24	30	31	26	26	21	22	22	32	31	37	40	34	37	36
NEW ENGLAND	184	179	200	206	228	240	297	376	449	552	590	612	627	624	623	641	699	687	(659)	(630)	634	(704)
New York	106	135	172	191	197	191	187	193	209	249	256	256	245	243	289	309	369	386	384	374	422	(455)
New Jersey	102	93	105	128	126	126	134	127	124	132	127	115	93	107	112	122	138	144	135	111	116	129
NY-NJ	208	228	277	319	323	317	321	320	333	381	383	371	338	350	401	431	507	530	519	485	538	(584)
Delaware	8	7	3	3	6	5	2	2	4	5	6	4	6	4	3	6	6	6	7	8	9	9
Maryland	17	23	25	20	14	17	24	19	32	44	61	60	56	58	60	60	60	59	66	63	64	64
Virginia	100	100	103	121	125	131	97	106	96	118	87	88	95	89	96	119	120	114	152	192	202	199
North Carolina	30	30	40	55	55	40	49	53	54	50	35	52	46	31	24	23	23	24	20	37	46	61
South Carolina	3		0		1	1		1			0					0						0
SOUTHERN	158	160	171	199	201	194	172	181	186	217	189	204	203	182	183	208	209	203	245	300	321	333
U.S. TOTAL	550	567	648	724	752	751	790	877	968	1150	1162	1187	1168	1156	1207	1280	1415	1420	(1423)	(1415)	1493	(1621)
ATLANTIC CANADA*	240	223	238	233	230	252	223	223	194	200	202	199	211	236	230	250	274	256	237	217	256	(266)
ATLANTIC COAST TOTAL*	790	790	886	957	982	1003	1013	1100	1162	1350	1364	1386	1379	1392	1437	1530	1689	1676	(1660)	(1632)	1749	(1887)

* Includes minor revisions to 1990-2002 Atlantic Canada estimates made by Canadian Wildlife Service in 2005.

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TABLE 4. Estimated productivity of Atlantic Coast piping plovers, 1987 – 2007. Parentheses denote preliminary estimates.

State/RECOVERY UNIT	Chicks fledged/pair																				
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Maine	1.75	0.75	2.38	1.53	2.50	2.00	2.38	2.00	2.38	1.63	1.98	1.47	1.63	1.60	1.98	1.40	1.28	1.45	0.55	1.35	1.06
New Hampshire											0.60	2.40	2.67	2.33	2.14	0.14	1.00	1.00	0.00	0.67	0.33
Massachusetts	1.10	1.29	1.59	1.38	1.72	2.03	1.92	1.81	1.62	1.35	1.33	1.50	1.60	1.09	1.49	1.14	1.26	(1.30)	(1.00)	1.33	1.25
Rhode Island	1.12	1.58	1.47	0.88	0.77	1.55	1.80	2.00	1.68	1.56	1.34	1.13	1.79	1.20	1.50	1.95	1.03	1.50	1.43	1.03	1.48
Connecticut	1.29	1.70	1.79	1.63	1.39	1.45	0.38	1.47	1.35	1.31	1.69	1.05	1.45	1.86	1.22	1.87	1.30	1.35	1.62	2.14	1.92
NEW ENGLAND avg.	1.19	1.32	1.68	1.38	1.62	1.91	1.85	1.81	1.67	1.40	1.39	1.46	1.62	1.18	1.53	1.26	1.24	(1.33)	(1.04)	1.34	1.30
New York	0.90	1.24	1.02	0.80	1.09	0.98	1.24	1.34	0.97	1.14	1.36	1.09	1.35	1.11	1.27	1.62	1.15	1.46	1.44	1.55	(1.15)
New Jersey	0.85	0.94	1.12	0.93	0.98	1.07	0.93	1.16	0.98	1.00	0.39	1.09	1.34	1.40	1.29	1.17	0.92	0.61	0.77	0.84	0.67
NY-NJ avg.	0.86	1.03	1.08	0.88	1.04	1.02	1.08	1.25	0.97	1.07	1.02	1.09	1.35	1.19	1.28	1.49	1.07	1.23	1.28	1.36	(1.03)
Delaware		0.00	2.33	2.00	1.60	1.00	0.50	2.50	2.00	0.50	1.00	0.83	1.50	1.67	1.50	1.17	2.33	1.14	1.50	1.44	1.33
Maryland	1.17	0.52	0.90	0.79	0.41	1.00	1.79	2.41	1.73	1.49	1.02	1.30	1.09	0.80	0.92	1.85	1.56	1.86	1.25	1.06	0.78
Virginia		1.02	1.16	0.65	0.88	0.59	1.45	1.66	1.00	1.54	0.71	1.01	1.21	1.42	1.52	1.19	1.90	2.23	1.52	1.19	1.16
North Carolina			0.59	0.43	0.07	0.41	0.74	0.36	0.45	0.86	0.23	0.61	0.48	0.54	0.50	0.17	0.46	0.65	0.92	0.87	0.26
SOUTHERN avg.	1.17	0.85	0.88	0.72	0.68	0.62	1.18	1.37	1.05	1.34	0.68	0.99	1.04	1.09	1.22	1.27	1.63	1.95	1.38	1.12	0.92
U.S. average	1.04	1.11	1.28	1.06	1.22	1.35	1.47	1.56	1.35	1.30	1.16	1.27	1.45	1.17	1.40	1.34	1.24	(1.40)	(1.20)	1.30	(1.13)
ATLANTIC CANADA		1.65	1.58	1.62	1.07	1.55	0.69	1.25	1.69	1.72	2.10	1.84	1.74	1.47	1.77	1.18	1.62	1.93	1.82	1.82	(1.14)

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Southern Recovery Unit Status and Distribution - The Southern Recovery Unit (a portion of the Atlantic Coast population) includes Delaware, Maryland, Virginia, and North Carolina. Some limited plover nesting has occurred in South Carolina. There were approximately 158 plover pairs in the Southern Recovery Unit in 1986 and approximately 333 pairs in 2007 (Table 3). The 2007 total is the highest recorded within the Southern Recovery Unit to date. However, the Southern Recovery Unit, which includes CNWR, continues to fall short of its recovery goal of 400 pairs. During the period of monitoring, the population size has declined in some years, but has consistently rebounded following declines. The numbers have shown a dramatic increase over the last five years, from 204 pairs in 2003 to 333 pairs in 2007 (U.S. Fish and Wildlife Service 2008; Table 3).

In the Southern Recovery Unit, productivity has varied substantially over the past 5 years, with a low of 0.92 chicks per pair recorded in 2007 and a high of 1.96 in 2004 (Table 4). Overall, plover productivity has generally increased in Virginia and throughout the Southern Recovery Unit since 1999, despite declines in some years. High productivity in Virginia from 2000 to 2005 has contributed to population increases in Virginia and in the Southern Recovery Unit (U.S. Fish and Wildlife Service 2008). Continued productivity at or above levels identified in the Recovery plan are attainable with ongoing intensive management efforts, and are expected to result in additional increases in plover populations.

Threats - Intensive management measures to protect piping plovers from disturbance by beach recreationists and their pets have been implemented for the Atlantic population at many nesting sites in recent years. In 2004, about 30 percent of the U.S. Atlantic Coast population of piping plovers nested on federally owned beaches where some protection is afforded under section 7 of the ESA (within the Southern Recovery unit, the majority of plovers occur on public or private conservation lands). The remaining 70 percent of the birds nested on state, town, or privately-owned beaches where plover managers are implementing protections in the face of increasing disturbance from recreation and development. Recreational activities and public use of some federally owned beaches have also increased. Pressure on Atlantic Coast beach habitat from development and human disturbance continues (U.S. Fish and Wildlife Service 1996a). Piping plover protection is dependent on the efforts of Federal, State, and local government agencies, conservation organizations, and private landowners.

Recreational activities can be a source of both direct mortality and harassment of piping plovers. Pedestrians may flush incubating plovers from nests (Flemming *et al.* 1988, Cross 1990, Cross and Terwilliger 1993), exposing eggs to predators or excessive temperatures. Repeated exposure of shorebird eggs on hot days may cause overheating, killing the embryos (Bergstrom 1991); excessive cooling may kill embryos or retard their development, delaying hatching dates (Welty 1982). Pedestrians can also disturb unfledged chicks (Strauss 1990, Burger 1991, Loegering 1992, Hoopes 1993, Goldin 1993), forcing them out of preferred habitats, decreasing available foraging time, and causing expenditure of energy.

Concentrations of pedestrians may deter piping plovers from using otherwise suitable habitat. In Jones Beach Island, New York, Elias-Gerkin (1994) found less pedestrian disturbance in areas selected by nesting piping plovers than areas unoccupied by plovers. Burger (1991, 1994) found that presence of people at several New Jersey sites caused plovers to shift their habitat use away from the ocean front to interior and bayside habitats, and that the time plovers devoted to foraging decreased and the time spent alert increased when more people were present. Burger (1991) also found that when plover chicks and adults were exposed to the same number of people, chicks spent less time foraging and more time crouching, running away from people, and being alert than did adult birds.

Fireworks are highly disturbing to piping plovers (Howard *et al.* 1993). Plovers are also intolerant of kites, particularly as compared to pedestrians, dogs, and vehicles. Biologists believe this may be because plovers perceive kites as potential avian predators, such as gulls, crows, or raptors (Hoopes 1993).

Motorized vehicle use on beaches is an extreme threat to piping plovers, as well as other shorebirds that nest on beaches and dunes. Vehicles can crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson *et al.* 1991). In Massachusetts and New York, 18 piping plover chicks and 2 adults were killed by off-road vehicles (ORVs) in 14 documented incidents (Melvin *et al.* 1994). Goldin (1993) compiled records of 34 chick mortalities (30 on the Atlantic Coast and 4 on the Northern Great Plains) due to vehicles. Biologists who monitor and manage piping plovers believe that vehicles kill many more chicks than are found and reported (Melvin *et al.* 1994).

Beaches used by recreational vehicles during nesting and brood-rearing periods generally have fewer breeding plovers than available nesting and feeding habitat can support. In contrast, plover abundance and productivity has increased on beaches where recreational vehicle restrictions during chick-rearing periods have been combined with protection of nests from predators (Goldin 1993).

Once hatched, piping plover broods are mobile and may not remain near the nesting area. Wire fencing placed around nests to deter predators (Rimmer and Deblinger 1990, Melvin *et al.* 1992) is ineffective in protecting chicks from vehicles because chicks typically leave the nest within a day after hatching and move extensively along the beach to feed. Typical behaviors of piping plover chicks increase their vulnerability to vehicles. Chicks frequently move between the upper berm or foredune and feeding habitat within the wrack line and intertidal zone. Chick use of the ocean intertidal zone is lower in the Southern recovery unit compared with more northerly portions of the breeding range. Data from Assateague Island Seashore in Maryland and from Chincoteague NWR demonstrates that many broods make sporadic use of this habitat (National Park Service and Maryland Department of Natural Resources 1993, Hecht 2004 *in litt.*). These movements along the beach and intertidal zone place chicks in the paths of vehicles. Chicks stand, walk, and run along tire ruts, and sometimes have difficulty crossing deep ruts or climbing out of them (Eddings *et al.* 1990, MacIvor 1990, Strauss 1990, Hoopes *et al.* 1992, Goldin 1993,

Howard *et al.* 1993, Hoopes 1994). Chicks sometimes stand motionless or crouch as vehicles pass by, or do not move quickly enough to get out of the way (Tull 1984, Hoopes *et al.* 1992, Goldin 1993).

Vehicles may also significantly degrade piping plover habitat or disrupt normal behavior patterns by crushing wrack into the sand and making it unavailable as cover or a foraging substrate (Hoopes *et al.* 1992, Goldin 1993). Vehicles that are driven too close to the toe of the dune may destroy vegetation that may also provide piping plover cover habitat (Elias-Gerken 1994).

Substantial evidence shows that human activities exacerbate natural predation on piping plovers, their eggs, and chicks (U.S. Fish and Wildlife Service 1996a). Where Wilcox (1959) had observed 92 percent hatching success of nests observed between 1939-1958 on Long Island, New York, and loss of only 2 percent of nests to crows (*Corvus sp.*), Elias-Gerken (1994) documented loss of 21 percent of nests in her study area to crows in 1992-1993. Other important predators of plover eggs and chicks in the recovery unit include foxes (*Vulpes vulpes*), raccoons (*Procyon lotor*), Norway rats (*Rattus norvegicus*), herring gulls (*Larus argentatus*), great black-backed gulls (*Larus marinus*), domestic and feral dogs (*Canis familiaris*) and cats (*Felis catus*), and ghost crabs (*Ocypode quadrata*) (Riepe 1989, Jenkins and Nichols 1994, Jenkins *et al.* 1999, Canale 1997, U.S. Fish and Wildlife Service 1996a).

Predators can be a major source of loss of eggs and juvenile plovers. For example, predators accounted for over half of all piping plover nest losses in New Jersey from 1995-1998 (Jenkins *et al.* 1999). A variety of techniques have been employed to reduce predation on plovers. Most notably, the use of predator exclosures (fences around nests) has demonstrated success to reduce predation on piping plover eggs (Melvin *et al.* 1992, Rimmer and Deblinger 1990) and has been credited with an important role in population increases in some parts of their range (Jenkins and Nichols 1994, Jenkins *et al.* 1999). However, these same devices have also been associated with serious problems including entanglements of birds in the exclosure netting, and attraction of “smart” predators that have learned there is potential prey inside. The downside risks may include not only predation or nest abandonment, sometimes at rates exceeding those that might occur without exclosures, but also induced mortality of adult birds. Exclosures provide no protection for mobile plover chicks, which generally leave the exclosure within a day of hatching and move extensively along the beach to feed.

Although exclosures are contributing to improved productivity and population increases in some portions of the plover's Atlantic Coast range, problems have been noted in some localities. Loegering (1992) reported loss of six nests in exclosures without tops in Maryland in 1988, but nest loss stopped after string tops were added. Cross (1991) found that exclosed nests hatched significantly more often than unexclosed nests over three years on three sites at CNWR, but hatch rates were not significantly improved at all sites or in all years; furthermore, two instances of foxes depredating adult plovers occurred in the vicinity of exclosures. Due to the magnitude

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of predation threats to plovers and limitations associated with all currently available solutions, the piping plover recovery plan strongly recommends that on-site managers employ an integrated approach to predator management that considers a full range of management techniques (U.S. Fish and Wildlife Service 1996a).

SEABEACH AMARANTH (*Amaranthus pumilus*)

In 1993, seabeach amaranth was added to the List of Endangered and Threatened Wildlife and Plants (50 CFR 17.12) as a threatened species. The listing was based upon the elimination of seabeach amaranth from two-thirds of its historic range, and continuing threats to the 55 populations that were known at the time (U.S. Fish and Wildlife Service 1993).

Species Description - Seabeach amaranth is an annual plant and a member of the Amaranth family (*Amaranthaceae*). Upon germination, the plant initially forms a small, unbranched sprig, but soon begins to branch profusely, forming a low-growing mat. Seabeach amaranth's fleshy stems are prostrate at the base, erect or somewhat reclining at the tips, and pink, red, or reddish in color. The leaves of seabeach amaranth are small, rounded, and fleshy, spinach-green in color, with a characteristic notch at the rounded tip. Leaves are approximately 1.3 to 2.5 cm in diameter, and clustered towards the tip of the stem (Weakley and Bucher 1992). The foliage of seabeach amaranth turns deep red in the fall (Snyder 1996). Plants often grow to 30 cm in diameter, consisting of 5 to 20 branches, but occasionally reach 90 cm in diameter, with 100 or more branches. Flowers and fruits are inconspicuous, borne in clusters along the stems. Seeds are 2.5 millimeters (mm) in diameter, dark reddish-brown, and glossy, borne in low-density, fleshy, indehiscent utricles (bladder-like seed capsules or fruits), 4 to 6 mm long (Weakley and Bucher 1992). The seed does not fill the utricle, leaving an air-filled space (U.S. Fish and Wildlife Service 1996b).

Habitat – Historically, seabeach amaranth was native to Atlantic coast barrier island beaches from Massachusetts to South Carolina. The species' primary habitat consists of overwash flats at accreting ends of barrier islands, and lower foredunes and upper strands of non-eroding beaches. This species occasionally establishes small and temporary populations in secondary habitats including sound side beaches, blowouts in foredunes, and sand or shell dredge spoil or beach nourishment material (Weakley and Bucher 1992).

Seabeach amaranth occupies a narrow beach zone that lies at elevations from 0.2 to 1.5 m above mean high tide, the lowest elevations at which vascular plants regularly occur. Seaward, the plant grows only above the high tide line, as it is intolerant of even occasional flooding during the growing season. Landward, seabeach amaranth does not occur more than approximately one meter above the beach elevation on the foredune, or anywhere behind it, except in overwash areas. The species is, therefore, dependent on a terrestrial, upper beach habitat that is not flooded during the growing season. This zone is generally absent on beaches that are

experiencing high rates of erosion. Seabeach amaranth is never found on beaches where the foredune is scarped by undermining water at high or storm tides (Weakley and Bucher 1992).

Seabeach amaranth usually occurs on a pure silica sand substrate, occasionally containing shell fragments. The U.S. Natural Resources Conservation Service classifies the habitat of seabeach amaranth as either Beach-Foredune Association or Beach (occasionally flooded). Seabeach amaranth habitat occurs within a wetland system classified by Cowardin *et al.* (1979) as Marine System, Intertidal Subsystem, Unconsolidated Shore Class (Weakley and Bucher 1992).

The habitat of seabeach amaranth is sparsely vegetated with annual herbs and, less commonly, perennial herbs (mostly grasses) and scattered shrubs. The number and type of seabeach amaranth's vegetative associates have been found to vary with specific habitat type (*i.e.*, overwash flat, accreting barrier island end, or lower foredune) (Chicone undated). The most constant associates of seabeach amaranth, with which the species almost always co-occurs, are sea rocket (*Cakile edentula*) and seabeach spurge (*Chamaesyce polygonifolia*) (Weakley and Bucher 1992).

Biogeography and Range - Seabeach amaranth is limited by its habitat requirements to a very narrow strip of barrier islands and mainland oceanfront beach strands along the Atlantic coast. The original range of this species extended from Cape Cod in Massachusetts to central South Carolina, a stretch of coast approximately 1,600 km (994 miles) long. This stretch correlates with a geographic range of low tidal amplitude. Tidal amplitude and the relative importance of tidal versus wave energy in shaping coastal morphology are thought to limit the geographic range of seabeach amaranth, rather than availability of sandy beach substrates or sea water temperatures. The range of seabeach amaranth is characterized by islands developed by high wave energy, low tidal energy, frequent overwash, and frequent breaching by hurricanes with resulting formation of new inlets (Weakley and Bucher 1992). Some authors have observed that seabeach amaranth tends to occur on south or southeast facing coasts (Weakley and Bucher 1992, Snyder 1996), but a range-wide analysis of beach orientation has not been conducted.

Historic records of seabeach amaranth are known from nine states. Largely due to human activities, the species was eliminated from seven of these states by the 1980s, remaining only in North and South Carolina. Seabeach amaranth is still considered extirpated from two states: Massachusetts and Rhode Island. Since 1990, the species has been rediscovered in five states from which it had previously been believed to be extirpated. Table 5 gives the dates of rediscovery and the last previously known occurrence of the plant in each state.

Table 5. Rediscovery Dates of Seabeach Amaranth in Five States.		
State	Date Rediscovered	Date of Last Previously Known Occurrence
New York	July 2000	1950 (Van Schoik and Antenen, 1993)
Delaware	August 2000	1913 (U.S. Fish and Wildlife Service 1996b)
Maryland	August 1998	1875 (McAvoy 2000)
Virginia	September 2001	1973 (U.S. Fish and Wildlife Service 1996b)

To date, explanations for seabeach amaranth's rediscovery in the northern part of its range remain speculative. Sites in these five states may have been re-colonized by long-distance transport of seeds by wind or currents. At some sites, seeds may have been long buried in sediments used in beach nourishment projects. This hypothesis requires that seeds can remain viable after prolonged off-shore burial, an unknown factor. In Maryland's Assateague Island National Seashore, the NPS has allowed a previously stabilized foredune system to return to more natural conditions. This change in beach management, and the possible existence of a persistent seed bank, have been cited as factors in the species' return to the area (Ramsey *et al.* 2000).

The current known range of naturally occurring seabeach amaranth is from Water Mill Beach on Long Island, New York, south to Dewees Island in South Carolina; a few reintroduction efforts south of Dewees Island have been unsuccessful (Young 2001, Hamilton 2000a, Ed Eudaly 2008, pers. comm).

Life History

Seabeach amaranth occupies a highly specific and restricted niche as a "fugitive" species in the narrow upper beach zones of newly formed, accreting barrier island ends and non-eroding beach strands. A dynamic, early successional pioneer species, seabeach amaranth is termed a "fugitive" because its populations are constantly shifting to newly disturbed areas. The plant is eliminated from existing habitats by competition and erosion, and colonizes newly formed habitats by dispersal and (probably) long-lived seed banks. A poor competitor, seabeach amaranth is eliminated from sites where perennials have become established, probably because of root competition for scarce water and nutrient supplies (Weakley and Bucher 1992). Seabeach amaranth acts as a capable sand binder (Weakley and Bucher 1992), which is typical of pioneer beach plants. The species is not likely to be a young or recently evolved species, considering its isolation within the genus (it has no apparently close relatives) and its possession of numerous adaptations to the peculiar environment in which it grows (U.S. Fish and Wildlife Service 1996b).

Seabeach amaranth habitat exists in dynamic conditions. The same physical forces (*e.g.*, storms, extreme high tides) that create the plant's specific and ephemeral coastal habitat also destroy it. Coastal storms are probably the single most important natural limitation on the abundance of seabeach amaranth. Existing habitat is eroded away, but new habitat is created by island overwash and breaching. Therefore, seabeach amaranth requires extensive areas of barrier island beaches and inlets, functioning in a relatively natural and dynamic manner. Such conditions allow the species to move around in the landscape, occupying suitable habitat as it becomes available (U.S. Fish and Wildlife Service 1996b).

Density and Distribution - Density of seabeach amaranth is extremely variable within and between populations. The species generally occurs in a sparse to very sparse distribution pattern, even in the most suitable habitats. A typical density is 100 plants per linear km of beach, though occasionally on accreting beaches, dense populations of 1,000 plants per km can be found. Island-end sand flats generally have higher densities than oceanfront beaches (Weakley and Bucher 1992). Comparing overwash flats, accreting barrier island ends, and lower foredunes, Chicone (undated) found that seabeach amaranth plants growing in foredune habitats tended to be larger, healthier, and have fewer associates. Seabeach amaranth has been found to have a strongly clumped distribution (Hancock 1995).

Within its primary habitats, seabeach amaranth tends to be concentrated in the line of wrack material deposited by high tides (Mangels 1991, Weakley and Bucher 1992, Hancock 1995, McAvoy 2000). Observations from New Jersey and Maryland suggest that plants within the wrack line tend to be larger (U.S. Fish and Wildlife Service 2002b). Pauley *et al.* (1999), however, found that plots centered on seabeach amaranth had a lower percent area covered by litter material than random plots, suggesting that litter material may be an advantageous microhabitat for seabeach amaranth only when it contains higher levels of organic material and moisture than bare sand, as in the wrack line.

Life Cycle and Phenology - Individual plants live only one season, with a single opportunity to produce seed. The species over-winters entirely as seeds. Germination of seedlings begins in April and continues at least through July. In the northern part of the range, germination occurs slightly later, typically late June through early August. Reproductive maturity is determined by size rather than age, and flowering begins as soon as plants have reached sufficient size. Flowering sometimes begins as early as June in the Carolinas, but more typically commences in July and continues until the death of the plant. Seed production begins in July or August and reaches a peak in most years in September. Seed production likewise continues until the plant dies. Senescence and death occur in late fall or early winter (U.S. Fish and Wildlife Service 1996b).

Seabeach amaranth seems capable of essentially indeterminate growth (Weakley and Bucher 1992). However, predation and weather events, including rainfall, hurricanes, and temperature extremes, have significant effects on the length of the species' reproductive season. As a result

of one or more of these influences, the flowering and fruiting period can be terminated as early as June or July (U.S. Fish and Wildlife Service 1993).

Reproduction - As an annual, seabeach amaranth reproduces solely by sexual reproduction by seed, with no vegetative or clonal form of reproduction. The species is monoecious (male and female flowers on the same plant), and, based on morphology of the flower and inflorescence, most likely wind pollinated. Seabeach amaranth is capable of self fertilization, an advantageous adaptation for a pioneer species, allowing the founding of a new colony by a single propagule. Self fertilization likely plays a large, probably dominant, role in seed production (Weakley and Bucher 1992). Once it reaches maturity, seabeach amaranth flowers and fruits continuously until death or senescence. Late season plants may continue flowering and fruiting with few or no leaves, sometimes producing an aberrant, dense, terminal inflorescence (Weakley and Bucher 1992). Even very small plants produce flowers under conditions of a short (12-hour) photoperiod (Jolls and Sellars 2000), likely an opportunistic adaptation to permit small, late germinating plants to reproduce at the end of the growing season. Nearly all adult seabeach amaranth plants produce seeds, and fertility is assumed to be high (Weakley and Bucher 1992). Fruit production is correlated with plant weight (Hancock 1995), and large plants are estimated to produce several thousand fertile seeds over a fruiting season (Weakley and Bucher 1992). Within the genus *Amaranthus*, this is a very low reproductive rate, but seabeach amaranth has apparently evolved a strategy of producing fewer, larger seeds than other members of its genus. Under favorable conditions, seabeach amaranth shows good reproductive success (Weakley and Bucher 1992).

Seed Dispersal - Seabeach amaranth seeds are dispersed by a variety of mechanisms. The fleshy tissues and air pocket of the utricle cause the fruit to have a lower density than the bare seed. Seeds retained in utricles are easily blown about, deposited in depressions, the lee behind plants, or in the surf. Naked seeds are also commonly encountered in the field, and are also dispersed by wind, but to a much lesser degree than seeds retained in utricles. Naked seeds tend to remain in the lee of the parent plant, or get moved to nearby depressions (Weakley and Bucher 1992). Observations from South Carolina indicate that seabeach amaranth seeds are also dispersed in the guts of birds, and deposited with their droppings (Hamilton 2000b).

Many utricles remain attached to the parent plant and are never dispersed, leading to *in situ* “planting.” This phenomenon has also been observed in sea rocket, and may be an adaptation to dynamic beach conditions. If conditions remain favorable at the site of the parent plant, the seed source for retention of that site is guaranteed. If conditions become unsuitable, other seeds have been dispersed to colonize new sites (Weakley and Bucher 1992).

Germination - Fresh seabeach amaranth seeds are physiologically dormant (Baskin and Baskin 1994, 1998). The tough seedcoat requires some physical modification before germination can occur. The primary mechanism(s) for breaking seed dormancy in the field is not known, but possible factors include abrasion, cold, imbibing of water, and gradual breakdown over time (Weakley and Bucher 1992, Hamilton 2000c, Jolls and Sellars 2000, Hancock 1995; Baskin and

Baskin 1994, 1998). Once dormancy is broken, light and high temperatures (25-35°C) are required for germination (Hancock 1995, Baskin and Baskin 1994, 1998). This high temperature requirement causes seabeach amaranth to germinate later in the season than other dune associates, and limits the time in which new seedlings can grow. Rainfall is also significant in promoting germination (Hancock 1995).

Initial studies have found that seabeach amaranth seedlings cannot emerge from a depth of more than one centimeter (Hancock 1995) or two centimeters (U.S. Fish and Wildlife Service 2002b). Results of these studies, combined with the finding that light is required for germination, are strong evidence that deep burial may completely prevent germination and seedling emergence (Jolls *et al.* 2001). Seabeach amaranth may have less opportunity to emerge and become established compared to other dune species such as sea rocket, as mean emergence of seedlings (growth rate of the newly sprouted seed) is less than predicted for the species' seed mass (Hancock 1995).

Natural Limiting Factors - Except where suitable habitat has persisted long enough for perennials to become established, the primary limiting factors of seabeach amaranth under natural conditions are abiotic. Abiotic limiting factors are expected for a fugitive species that occupies dynamic, early successional habitats. Weather is an important limiting factor, given the relatively narrow temperature and rainfall requirements for germination and seedling establishment. Flooding, drought, or unseasonable temperatures may impair seabeach amaranth survival and reproduction. Weather also limits abundance of the species through its effects on winds, which may cause burial of seeds and plants by sand. In addition to decreasing germination and seedling establishment, burial may also impact reproduction by covering adult plants prior to seed set. This effect was observed in South Carolina (Hamilton 2000b), and may have occurred in Maryland (U.S. Fish and Wildlife Service 2002b).

Under natural conditions, interspecific competition for water and nutrients, especially with perennials, may be a significant biotic limiting factor of seabeach amaranth. Weakley and Bucher (1992) cite intraspecific competition as a possible factor in the mortality of young plants, but Hancock (1995) found no evidence of intraspecific density effects. If intraspecific competition does limit seabeach amaranth abundance, its effects are likely small compared to the effects of competition with perennial species, which possess superior abilities to extract water and nutrients from the porous sand. Predators and disease are discussed below under threats.

Population Dynamics - Although the longevity of seabeach amaranth seeds is unknown, several lines of evidence suggest that seed banks may be an important factor in this species' life history (Weakley and Bucher 1992, Baskin and Baskin 1998). The relative roles of fresh and banked seeds are unknown (U.S. Fish and Wildlife Service 1996b). In experimental plots in Maryland, a few late-season seedlings emerged from the current year's seed crop (U.S. Fish and Wildlife Service 2002b), however the contribution of same-season seed to the current year's population and seed crop is likely small. For a sexually reproducing annual plant, natality is comprised of two components, the seed production rate (or fecundity) and the germination rate.

The viability rates of both fresh and banked seeds are uncertain; more is known about mortality of the plants. Substantial mortality of young plants occurs in some years, prior to reproduction. Hancock (1995) found only seven percent survival of seedlings to 40 days of age, with mortality caused primarily by high tide flooding. Flooding resulted in almost 100 percent mortality of propagated plants at three of six experimental transplant sites in South Carolina in 1999. At a fourth site, drifting sand covered most of the transplants, with only 10 of 196 plants (about 5 percent) surviving to produce seed (Hamilton 2000b). Burial by blowing sand may have also affected reproduction in New Jersey and Maryland in 2000 (Service observation, U.S. Fish and Wildlife Service 2002b). Unfavorable conditions early in the growing season, including drought, burial, and especially flooding and other storm damage, may reduce seed production by 90 percent (Weakley and Bucher 1992) to 98 percent (Hancock 1995).

Once past the stage of germination and early growth, mortality rates are generally lower. In the Carolinas, mortality of older plants tends to be caused primarily by webworm predation (Weakley and Bucher 1992). Larger plants may be able to withstand saltwater inundation better than smaller plants; however, prolonged salt water inundation kills almost all plants, regardless of size (Hancock 1995). Storms later in the growing season can effectively and abruptly curtail reproduction for the year (Weakley and Bucher 1992). Plants that have not died from other causes senesce and die in late fall or early winter.

Genetic Variability - Preliminary results from two initial genetic studies of seabeach amaranth suggest that the species' genetic variability is low. A study by Salisbury State University looked for genetic differences in nuclear DNA within and across three groups: propagated plants from Maryland, wild plants from Maryland, and wild plants from Delaware. Overall, genetic variability was found to be low. Wild and propagated Maryland plants were similar, as might be expected, since the propagated plants were produced from wild plants taken from the same area (U.S. Fish and Wildlife Service 2002b). Higher levels of genetic variability were found within the sample of plants from Delaware. A second study by Strand (2002) analyzed non-coding regions of nuclear and chloroplast DNA taken from seed and dry leaf samples from New York, New Jersey, North Carolina, and South Carolina. This study found no observable genetic variation among any of the samples. Although the results of these two studies are consistent, these results must be interpreted with caution. Lack of detection does not prove a lack of genetic variability, which might be present in other regions of the genome, or detectable through other techniques (Jolls and Sellars 2000, Strand 2002, U.S. Fish and Wildlife Service 2002b).

Population Status and Distribution

As might be expected for a fugitive annual plant of dynamic barrier beach habitats, populations of seabeach amaranth at any given site are extremely variable (Weakley and Bucher 1992).

Population size at a site often fluctuates by several orders of magnitude from year to year. The primary reasons for the natural variability of seabeach amaranth are the dynamic nature of its habitat, and the significant effects of stochastic factors such as weather and storms on mortality and reproductive rates. Although wide fluctuations in species populations tend to increase the risk of extinction, variable population sizes are a natural condition for seabeach amaranth, and the species is well adapted to its ecological niche.

Because variability in population size is so great among years, a single survey is a poor measure of a population's health. Assessing site-specific population trends is difficult even with several years of surveys. Weakley and Bucher (1992) suggest that a 5 to 10 year average is a more meaningful measure for assessing the vigor of a local seabeach amaranth population. However long-term, consecutive, annual data are available for only a few sites in New York. Estimates of population sizes for seabeach amaranth across its range are imprecise, given available survey data. Early (pre-1987) survey data are limited. Range-wide surveys were conducted in 1987, 1988, and 1990 (excluding states where the species was considered extirpated at the time). Annual statewide surveys have been conducted subsequently in New York, but no comprehensive surveys of North or South Carolina have been carried out since 1990. Suitable areas in New Jersey, Delaware, and Maryland were thoroughly surveyed in 2000, but these efforts did not necessarily extend state-wide. Approximately 14 locations in Virginia were surveyed in 2000, and no seabeach amaranth was found (Belden 2000). In 2001, seabeach amaranth was found on Assateague Island, Virginia, most likely the result of a restoration program in Assateague Island National Seashore in Maryland (U.S. Fish and Wildlife Service 2002b).

Over the last seven years, the number of plants in each state has fluctuated greatly (see Table 6). In Delaware the numbers have always been low, with a high count for 2002 of 423 plants. New York has always produced the highest number of plants, with the 2000 numbers also being the highest count for the state (244,608 plants). In 2006, 1,551 plants were counted in Maryland and Virginia. Of these 1,551 plants, all but 13 were found on the Maryland side of Assateague Island. Numbers of plants within CNWR (see Virginia numbers in Table 6) has experienced major fluctuations since its rediscovery in 2001.

Threats - Habitat Loss and Degradation - In the geologic past, seabeach amaranth has persisted through even relatively rapid episodes of sea level rise and barrier island retreat. A natural barrier island landscape, even a retreating one, contains localized accreting areas, especially in the vicinity of inlets (U.S. Fish and Wildlife Service 1996b).

Erosion is accelerated in many areas by human-induced factors such as reduced sediment loads reaching coastal areas due to damming of rivers, and beach stabilization structures. When the shoreline is "hardened" by artificial structures (*e.g.* seawalls, bulkheads), overwash and inlet formation are curbed. Erosion may also be increasing due to sea level rise and increased storm activity caused by global climate change (U.S. Fish and Wildlife Service 1993).

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Table 6. Seabeach amaranth (<i>Amaranthus pumilus</i>) numbers by year and state.								
Year	New York	Delaware	New Jersey	Maryland	Virginia	North Carolina	South Carolina	TOTAL # of plants for each year
1987	0	0	0	0	0	3,395	1,341	4,736
1988	0	0	0	0	0	4,433	1,800	6,233
1989	0	0	0	0	0	0	0	0
1990	331	0	0	0	0	1,127	188	1,646
1991	2,251	0	0	0	0	1,170	0	3,421
1992	422	0	0	0	0	32,160	15	32,597
1993	195	0	0	0	0	22,214	0	22,409
1994	182	0	0	0	0	13,964	560	14,706
1995	599	0	0	0	0	33,514	6	34,119
1996	2,263	0	0	0	0	8,357	0	10,620
1997	11,918	0	0	0	0	1374	2	13,294
1998	10,699	0	0	2	0	11,490	141	22,332
1999	31,196	0	0	1	0	588	196	31,981
2000	244,608	32	1,039	4	0	103	2,312	248,098
2001	205,233	83	5,813	869	9	5037	231	217,275
2002	193,412	423	10,908	801	56	4440	0	210,040
2003	114,535	13	5,084	459	22	11,290	1,381	132,784
2004	30,942	4	6,820	531	2	11,213	2,110	51,622
2005	16,813	6	5,795	489	69	19,976	671	43,819
2006	32,553	40	6,522	1,538	13	3,190	721	44,577

Attempts to halt beach erosion through hard structures (*i.e.*, sea walls, jetties, groins, bulkheads) appear invariably to destroy habitat for seabeach amaranth. In the Carolinas, seabeach amaranth is not found on shorelines where bulkheads, sea walls, or rip rap zones have been constructed. Such armoring generally occurs in the primary habitat of the plant, and water and wind erosion lower the profile of the beach seaward of the armoring. The upper beach habitat required by

seabeach amaranth (above inundation by tidal action) ceases to exist as the beach is steadily eroded. Groins have mixed effects on seabeach amaranth. Immediately updrift from a groin, accretion sometimes provides or maintains, at least temporarily, habitat for seabeach amaranth; immediately downdrift, erosion usually destroys seabeach amaranth habitat. In the long term, groins (if they are successful) stabilize updrift beaches, allowing succession to perennials, and rendering even the updrift side only marginally suitable for seabeach amaranth. Widespread construction of sea walls, jetties, and other hard stabilization structures in New Jersey, New York, and other northern states is associated with the extirpation of seabeach amaranth from the northern part of its range (U.S. Fish and Wildlife Service 1996b).

Even minor structures and non-structural beach stabilization techniques, such as sand fences and beachgrass planting, are generally detrimental to seabeach amaranth (U.S. Fish and Wildlife Service 1993). Dune stabilization and vertical sand accretion caused by sand fences appear to be detrimental to seabeach amaranth. The effects of dune stabilization by planting vegetation are similar (U.S. Fish and Wildlife Service 1996b). Seabeach amaranth only very rarely occurs when sand fences and vegetative stabilization have taken place and, in these situations, is present only as rare, scattered individuals or short-lived populations (Weakley and Bucher 1992).

Beach nourishment can have positive site-specific impacts on seabeach amaranth. Although more study is needed before the long-term impacts can be accurately assessed, seabeach amaranth has colonized several nourished beaches, and has thrived in some sites through subsequent re-applications of fill material (U.S. Fish and Wildlife Service 1993). However, on the landscape level, beach nourishment is similar to other beach stabilization efforts in that it stabilizes the shoreline and curtails the natural geophysical processes of barrier islands. These effects are detrimental to the range-wide persistence of the species. In addition, beach nourishment may cause site-specific adverse effects by crushing or burying seeds or plants, or by altering the beach profile or upper beach micro-habitats in ways not conducive to seabeach amaranth colonization or survival. Deeply burying seeds during any season can have serious effects on populations; this also applies to the placement of dredge spoil (U.S. Fish and Wildlife Service 1996b). Burial of the seed bank may be particularly detrimental to isolated populations, as no nearby seed sources are available to re-colonize the nourished site. Adverse effects of beach nourishment may be compounded if accompanied by artificial dune construction and stabilization with sand fencing and/or beach grass, or if followed by high levels of erosion and scarping of the upper beach.

As a fugitive species dependent on a dynamic landscape and large-scale geophysical processes, seabeach amaranth is vulnerable to habitat fragmentation and isolation of small populations (U.S. Fish and Wildlife Service 1993). Rendering 50 to 75 percent of a coastline permanently unsuitable may doom seabeach amaranth, because any given area will become unsuitable at some time due to natural forces. If a seed source is no longer available in the vicinity, seabeach amaranth will be unable to reestablish itself when the area once again provides suitable habitat. In this way, the species can be progressively eliminated even from generally favorable stretches

of habitat surrounded by permanently unfavorable areas. Fragmentation of habitat in the northern part of the species range contributed to the regional extirpation during the last century. Areas of suitable habitat were separated from one another by distances too great to allow recolonization following natural catastrophes (Weakley and Bucher 1992).

Recreational Impacts - Intensive recreational use of beaches can threaten seabeach amaranth populations, both through direct damage and mortality of plants, and by impacting habitat. Light pedestrian traffic, even during the growing season, usually has little effect on seabeach amaranth (U.S. Fish and Wildlife Service 1993). Substantive impacts generally occur only on narrow beaches, or beaches which receive heavy recreational use. In such areas, seabeach amaranth populations are sometimes eliminated or reduced by repeated trampling. While pedestrian traffic appears to be a minor problem in the Carolinas, the heavier traffic borne by northern beaches near major population centers may have been partially responsible for the past extirpation of seabeach amaranth in those regions (U.S. Fish and Wildlife Service 1996b).

Off-road vehicle (ORV) use on the beach during the growing season can have detrimental effects on the species, as the fleshy stems of this plant are brittle and easily broken. Plants generally do not survive even a single pass by a truck tire (Weakley and Bucher 1992). Sites where vehicles are allowed to run over seabeach amaranth plants often show severe population declines. Dormant season ORV use has shown little evidence of significant detrimental effects, unless it results in massive physical erosion or degradation of the site, such as compacting or rutting of the upper beach. In some cases, winter ORV traffic may actually provide some benefits for the species by setting back succession of perennial grasses and shrubs with which seabeach amaranth cannot compete successfully. However, extremely heavy ORV use, even in winter, may have some negative impacts, including pulverization of seeds (Weakley and Bucher 1992).

Beach grooming, more common on northern beaches, may also have contributed to the previous extirpation of seabeach amaranth from that part of its range. Motorized beach rakes, which remove trash and vegetation from bathing beaches, do not allow seabeach amaranth to colonize long stretches of beach (U.S. Fish and Wildlife Service 1996b). In New Jersey, plants were found along a nearly continuous length of beach, noticeably interrupted by stretches that are routinely raked.

Herbivory - Predation by webworms (caterpillars of small moths) is a major source of mortality and lowered fecundity in the Carolinas, often defoliating plants by early fall (U.S. Fish and Wildlife Service 1993). Defoliation at this season appears to result in premature senescence and mortality, reducing seed production, the most basic and critical parameter in the life cycle of an annual plant. Webworm predation may decrease seed production by more than 50 percent (Weakley and Bucher 1992). In the Carolinas, four species of webworm collected from seabeach amaranth have been identified: beet webworm (*Loxostege similialis*), garden webworm (*Achyra rantalis*), southern beet webworm (*Herpetogramma bipunctalis*), and Hawaiian beet webworm (*Spoladea recurvalis*). Webworm herbivory of seabeach amaranth has

not been documented in Delaware or Maryland. Although the five webworms so far identified on seabeach amaranth are all native species, their use of barrier islands has probably been altered by changes in the coastal plain landscape (*i.e.*, extensive agricultural use), the development of barrier islands, and the introduction of weedy plants that can also serve as host plants. All five webworms are probably much more abundant now than they were in pre-Columbian times. For this reason, the level of predation that seabeach amaranth is experiencing is likely unnaturally high (U.S. Fish and Wildlife Service 1996b). Webworm herbivory is probably a contributing, rather than a leading factor in the decline of seabeach amaranth. However, in combination with extensive habitat alteration, severe herbivory could threaten the existence of the species (Weakley and Bucher 1992).

Utilization and Collection - Seabeach amaranth is generally not threatened by over-utilization or collection, as it does not have showy flowers, and is not a component of the commercial trade in native plants. However, because the species is easily recognizable and accessible, it is vulnerable to taking, vandalism, and the incidental trampling by curiosity seekers. Seabeach amaranth is an attractive and colorful plant, with a prostrate growth habit that could lend itself to planting on beach front lots. The species' effectiveness as a sand binder could make it even more attractive for this purpose. In addition, seabeach amaranth is being investigated by the USDA and several universities and private institutes for its potential use in crop development and improvement. Over-collection and the development of genetically altered, domesticated varieties are potential, but currently unrealized, threats to the species (U.S. Fish and Wildlife Service 1993).

New Threats - New threats to seabeach amaranth have been documented since the species was listed in 1993. These factors are lesser threats than habitat modification, but may increase the risk of extinction by compounding the effects of other, more severe threats.

Several additional herbivores of seabeach amaranth have been observed including deer (*Odocoileus virginianus*), Sika deer/elk (*Cervus nippon*), eastern cottontail (*Sylvilagus floridanus*), and migratory song birds (Van Schoik and Antenen 1993), as well as feral horses in Maryland (U.S. Fish and Wildlife Service 2002b). Hancock (1995) suggests that grasshoppers may feed on seabeach amaranth, but does not indicate whether this was actually observed. There is also strong circumstantial evidence for seabeach amaranth herbivory by grasshoppers (U.S. Fish and Wildlife Service 2002b). Minor insect damage was noted on a few New Jersey plants in 2000, and larval insects were observed feeding on seabeach amaranth in 2001; to date, no species have been identified. In addition, a cluster of New Jersey plants appeared to have been damaged by a congregation of loafing gulls (*Larus* spp.), based upon feathers and droppings. As with webworms, the abundance of these newly documented predators on barrier islands is increased by human activities.

Asiatic sand sedge (*Carex kobomugi*) has been suggested as another potential threat to seabeach amaranth. This sedge is strongly rhizomatous and dune-forming (National Park Service and Maryland Natural Heritage Program 2000). Asiatic sand sedge was introduced to the east coast

(New Jersey to Virginia) from east Asia in the 1930s for erosion control and as a sand stabilizer. The species is known to crowd out native dune species (Virginia Department of Conservation and Recreation and Virginia Native Plant Society undated). Asiatic sand sedge may be detrimental to seabeach amaranth by direct competition, and by reducing habitat suitability through sand stabilization and dune building. Control programs have been implemented in managed natural areas where this species occurs.

The first known disease of seabeach amaranth was documented in South Carolina in 2000. During the 2000 growing season, a fungus (*Albugo* sp.) was observed on seabeach amaranth in several South Carolina sites (Strand and Hamilton 2000). This pathogen is a white rust or water mold. Lesions developed on the leaves during flowering, starting in July; leaves later fell off (U.S. Fish and Wildlife Service 2002b). Effects on infected individuals were significant, resulting in death of the plants two to four weeks after lesions were first observed. Anecdotal observations suggest that isolated plants tended to avoid infection (Strand and Hamilton 2000).

Rangewide Trends - Total population trends can disguise important regional trends. Recent population increases have occurred almost entirely in the northern part of the species range (see Table 6). Seabeach amaranth has undergone a geographic expansion, reappearing in five states over 11 years, after decades of extirpation from the entire northern portion of its range. New York sites account for virtually all of the recent increases in total population size rangewide, offsetting lower numbers in the south. Although natural population variability and survey effort must be considered, the recent trend in North Carolina appears downward. The low 1999 and 2000 plant totals in that state are especially noteworthy given the relatively high survey effort in these years (approximately 75 percent of known sites visited). In South Carolina, the species experienced a 90 percent reduction in that state following 1988 storms, including Hurricane Hugo. However, survey efforts since 1998 suggest that populations may have recovered in some areas of South Carolina.

Despite the natural variability of seabeach amaranth's population size and distribution and inconsistent survey efforts, some trends can be discerned from the available data. The species has undergone a significant geographic expansion, both in terms of the number and distribution of occupied states and counties. Since the first intensive surveys in 1987, the species' extant range has increased approximately 650 km (404 miles) to the north, but contracted about 50 km (31 miles) to the south. Numerically, the population has seen a dramatic increase. Equally notable is the geographic shift of the species' stronghold (in terms of total numbers) from North Carolina to New York.

Despite the geographic expansion and booming New York populations, seabeach amaranth is still vulnerable to local and regional extirpation. The primary threat to seabeach amaranth, habitat alteration, has not significantly diminished since the species was listed, and new threats have been subsequently discovered. Small population sizes in many locations increase the risk that seabeach amaranth will become locally extirpated. Almost 44 percent of sites documented

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in 2000 contained fewer than 10 plants, including more than 60 percent of sites in North Carolina (Young 2001, McAvoy 2000, National Park Service 2001a, 2001b, Jolls and Sellars 2000, U.S. Army Corps of Engineers 2001, Hamilton 2000a).

One final trend of note is the propagation of seabeach amaranth in greenhouses and laboratories, and the transplanting of propagated individuals or seed back into the wild. Such programs have been undertaken in Delaware, Maryland, North Carolina, and South Carolina (McAvoy 2000, National Park Service and Maryland Natural Heritage Program 2000, Jolls and Sellars 2000, Hamilton 2000b). These efforts have met with mixed results; thus a long term trend cannot be predicted.

LOGGERHEAD SEA TURTLE (*Caretta caretta*), GREEN SEA TURTLE (*Chelonia mydas*), and LEATHERBACK SEA TURTLE (*Dermochelys coriacea*)

Loggerhead sea turtles were listed as federally threatened in the U.S. in 1978 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a), the green sea turtle was listed as endangered in 1978 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b), and the leatherback sea turtle was listed as endangered in 1970 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). There is designated critical habitat outside of Virginia for the green and leatherback sea turtles, but none has been designated for the loggerhead sea turtle.

This account emphasizes sea turtle nesting and breeding biology, which is the subject of this biological opinion. Additional information about the life history of these sea turtle species and their habitat use, behavior, and survival at sea can be found in other documents, including the recovery plans (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a, 1991b, 1992), five-year status reviews (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a, 2007b, 2007c), and other sources (National Research Council 1990).

Species Description - The loggerhead is the smallest of the three turtles, with a mean carapace length of 92 cm and a mean mass of 133 kg (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a), compared to 102 cm and 136 kg for the green sea turtle (National Research Council 1990). Green sea turtles nest primarily in the tropics and are rarer nesters at higher latitudes, while loggerheads have significant nesting populations outside the tropics (National Research Council 1990). Leatherback sea turtles are the largest turtle and the largest living reptile in the world. Mature males and females can be as long as six and a half feet (2 m) and weigh almost 2000 lbs. (900 kg). The leatherback is the only sea turtle that lacks a hard, bony shell. The U.S. Caribbean, primarily Puerto Rico and the U.S. Virgin Islands, and southeast Florida support minor nesting colonies of the leatherback, but represent the most significant nesting activity within the United States (James *et al.* 2005).

Life History and Population Dynamics - Loggerhead females are believed to reach sexual maturity at a minimum age of 30 years (Snover 2002). At the start of the breeding season, they migrate from foraging areas on the continental shelf to mating areas in the waters near their nesting beaches (Schroeder *et al.*, 2003). Reproductive females exhibit the desire to return to their birthplace to lay their eggs (Miller *et al.* 2003). Females may be inseminated by multiple males (Bollmer *et al.* 1999). After mating, males return to their foraging areas while the females remain in the waters near their natal beaches to emerge onto their nesting beaches to lay eggs. The following account of nesting biology is a synopsis of Miller *et al.* (2003).

Loggerhead females tend to nest on high wave energy, sandy ocean beaches. Gravid females emerge from the swash zone and crawl toward the dune line until they encounter a suitable nest site, typically on open sand at the seaward base of a dune, but sometimes in vegetation. The female clears away surface debris with the front flippers, creating a “body pit,” then excavates a flask-shaped nest cavity with her hind flippers. Loggerheads lay an average of 112 eggs per nest. After laying, the female covers the nest with sand using all four flippers. Once the nest-covering phase is complete, she crawls back into the sea. Individual females may nest 1 to 6 times per nesting season, at intervals of 12-16 days, during the late spring to late summer. Intervals between nests shorter than 10 days indicate that the previous nest attempt was likely aborted due to disturbance. Mature loggerheads nest every two to three years, on average (Schroeder *et al.* 2003). Nest incubation period (from laying to hatching) depends on temperature, and ranges from 48 to 90 days at the extremes. Emergence of hatchlings from the nest cavity usually occurs within four days of hatch, but may take up to two weeks longer. Hatchling emergence from nests usually occurs at night when temperatures are lower and diurnal predators are inactive. Hatching success typically approaches 80%; after hatchlings leave the beaches, they typically fall prey to a variety of predators, including birds, fish, and sharks (National Research Council 1990).

Sex ratio of hatchlings depends on temperature during incubation. Below 84° Fahrenheit (29° Celsius), more males are produced than females, and above that temperature more females are produced (Carthy *et al.* 2003). Furthermore, fluctuating incubation temperatures often produce more females than stable temperatures, and temperature, hydration, and gas exchange during incubation can determine hatchling size, early swimming behavior, growth rate, and hatchling robustness (Carthy *et al.* 2003). Newly emerged hatchlings immediately head for the sea, most likely orienting toward the water by moving toward the brightest horizon and away from dark silhouettes (Lohmann and Lohmann 2003). Sea turtles are most negatively sensitive to blue and green light, and loggerheads in particular are averse to yellow light (Witherington and Martin 1996). Once in the sea, hatchling loggerheads swim into the waves and eventually enter the open ocean, where they will spend the first 6.5 to 11.5 years of their lives primarily at the top of the water column, until finally moving to foraging areas on the continental shelf (Bolten 2003).

Green sea turtles nest in two, three, or four year intervals, and may lay as many as nine clutches within a nesting season (National Marine Fisheries Service and U.S. Fish and Wildlife Service

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1991b). Clutch size varies from 75-200 eggs, and incubation ranges from about 45-75 days (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b).

Leatherback sea turtles nest in two to three year intervals, and average five to seven clutches per nesting season (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Leatherbacks average fewer eggs per clutch, 70-80 eggs, and incubation ranges from 55-75 days (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992).

Nesting habitat - Less is known about factors that cue nest site selection than about anthropogenic disturbances that discourage nesting (Miller *et al.* 2003). Typical nesting areas are sandy, wide, open beaches backed by low dunes, with a flat, sandy approach from the sea (Miller *et al.* 2003). Nesting is nonrandom along the shoreline, but studies of the physical characteristics associated with nests versus random or non-nesting sites on the beach have produced varying results. Some factors that have been found to determine nest selection in certain studies are beach slope (3 of 3 studies), temperature (2 of 3 studies), distance to the ocean (1 of 3 studies), sand type (2 of 2 studies), and moisture (1 of 3 studies), although the results were occasionally contradictory (Miller *et al.* 2003). Data indicates that the leatherback sea turtle prefers beaches with proximity to deep water and generally rough seas (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Other factors examined but not found to be significant were sand compaction, erosion, pH, and salinity. Although the process of nest site selection is not well understood, a successful nest must be laid in a low salinity, high humidity, well-ventilated substrate that is not prone to flooding or burying due to tides and storms, and where temperature is optimal for development (Miller *et al.* 2003).

Status and Distribution – Approximately 58,000 loggerhead nests were estimated in the U.S. Atlantic in 1983 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a), and between 53,000 and 92,000 nests from 1989 to 1998 (Turtle Expert Working Group 2000). Within the northern subpopulation (north Florida to Virginia), studies in South Carolina and Georgia have documented a decline in number of nests (Ehrhart *et al.* 2003). Based on genetic evidence, male loggerheads disperse freely among sites within the U.S. Atlantic population, while females are faithful to their natal sites (Bowen *et al.* 2005). Because sex ratio is determined by temperature during incubation (Miller *et al.*, 2003), the northern part of the U.S. Atlantic population, which includes Virginia, apparently provides a disproportionate number of males to the larger population (Mrosovsky *et al.* 1984, Hanson *et al.* 1998, Hawkes *et al.* in review).

“Analyses of historic and recent abundance information by the Marine Turtle Specialist Group (MTSG) indicate that extensive population declines for the green sea turtle have occurred in all major ocean basins. The MTSG analyzed population trends at 32 index nesting sites around the world and found a 48-65% decline in the number of mature females nesting annually over the past 100-150 years. The two largest nesting populations of green turtles are found at Tortuguero, on the Caribbean coast of Costa Rica, and Raine Island, on the Great Barrier Reef in Australia,

where an annual average of 22,500 and 18,000 females nest per season, respectively. In the U.S., green turtles nest primarily along the central and southeast coast of Florida; present estimates range from 200 - 1,100 females nesting annually.” (National Marine Fisheries Service 2008) In the southeast U.S., the majority of green turtle nesting occurs in Florida. The green turtle nesting population of Florida appears to be increasing based on 19 years (1989 – 2007) of index nesting data from throughout the State (http://research.myfwc.com/features/view_article.asp?id=27537).

“Because adult female leatherbacks frequently nest on different beaches, nesting population estimates and trends are especially difficult to monitor. In the Pacific, the World Conservation Union (IUCN) notes that most leatherback nesting populations have declined more than 80%. In other areas of the leatherback's range, observed declines in nesting populations are not as severe, and some population trends are increasing or stable. In the Atlantic, available information indicates that the largest leatherback nesting population occurs in French Guyana, but the trends are unclear. Some Caribbean nesting populations appear to be increasing, but these populations are very small when compared to those that nested in the Pacific less than 10 years ago. Nesting trends on U.S. beaches have been increasing in recent years.” (National Marine Fisheries Service 2008) Similar to the green turtle, in the southeast U.S., the majority of leatherback nesting occurs in Florida. The leatherback nesting population of Florida appears to be increasing based on 19 years (1989 – 2007) of index nesting data from throughout the State (http://research.myfwc.com/features/view_article.asp?id=27537).

Threats - Threats to the loggerhead sea turtles on the nesting grounds are similar to those faced by the green and leatherback sea turtles. The following threats affect all three species, though there may be some differences in susceptibility among the three turtle species. In addition to these threats affecting turtle nesting, turtles face a variety of threats during their time at sea that affect growth and survival during all life stages. These threats are discussed in greater detail in the five-year status reviews for the three sea turtle species (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a, 2007b, 2007c).

Weather and Tides - Storm events may erode beaches and destroy nests, or cause nest failure due to flooding or piling of eroded sand on the nest site. Beach erosion due to wave action may also decrease the availability of suitable nesting habitat (Steinetz *et al.* 1998), leading to a decline in nesting rate on a particular beach.

Predation - Predation of eggs and young by mammals, birds, and ghost crabs may eliminate up to 100% of the nests and any hatchlings that emerge on beaches where it is not managed (National Research Council 1990).

Human Activities - Crowding of nesting beaches by pedestrians can disturb nesting females and prevent laying (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Furthermore, the use of flashlights and campfires may interfere with sea-finding behavior by hatchlings. Beach driving, including pedestrian traffic, ORV use, and beach cleaning, poses a

risk of injury to females and live stranded turtles, can leave ruts that trap hatchlings attempting to reach the ocean (Hosier *et al.* 1981, Cox *et al.* 1994), can disturb adult females and cause them to abort nesting attempts, and can interfere with sea-finding behavior if headlights are used at night (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Driving directly above incubating egg clutches can cause sand compaction, which may decrease hatching and emergence success and directly kill pre-emergent hatchlings (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a). Artificial lighting on human structures may affect turtle behavior in a similar manner (Witherington and Martin 1996). Beach cleaning can directly destroy nests. Poaching is a problem in some countries, and occurs at a low level in the United States (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a).

An increased human presence may also lead to an increase in the presence of domestic pets that can depredate nests, and an increase in litter that may attract wild predators (National Research Council 1990). When artificial lighting impairs sea-finding behavior of nesting females and emerging hatchlings, the affected animals face increased exposure to the elements and predation.

The rate of habitat loss due to erosion and escarpment formation may be increased when humans attempt to stabilize the shoreline, either through renourishment (Dolan *et al.* 1973), or placement of hard structures such as sea walls or pilings (Bouchard *et al.* 1998). ORV traffic may alter the beach profile, leading to steeper foredunes (Anders and Leatherman 1987), which may be unsuitable for nesting. Improperly placed erosion-control structures such as drift-fencing can act as a barrier to nesting females. Humans may also introduce exotic vegetation in conjunction with beach development, which can overrun nesting habitat, make the substrate unsuitable for digging nest cavities, invade nests and desiccate nests, or trap hatchlings.

Reduced nesting success on constructed/augmented beaches could result due to sand compaction, escarpment formation, and changes in the beach profile. Sand compaction has been shown to negatively impact sea turtles, particularly concerning beach nourishment projects. Research has shown that placement of very fine sand and/or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988). Significant reductions in nesting success (i.e., false crawls occurred more frequently) have been documented on severely compacted nourished beaches (Nelson and Dickerson 1987, Nelson *et al.* 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may also increase the length of time required to excavate nests and result in increased physiological stress (Nelson and Dickerson 1988).

III. ENVIRONMENTAL BASELINE

As defined in 50 CFR 402.02, “action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas. The “action area” is defined as all areas affected directly or indirectly by the federal action, and not merely the immediate area involved in the action. The direct and indirect effects

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of the actions and activities resulting from the federal action must be considered with the effects of other past and present federal, state, or private activities, and the cumulative effects of certain future state or private activities within the action area.

Description of the Action Area - For the purposes of this consultation, the Service has determined that the action area for this project will encompass all barrier beach units of CNWR, including Assateague, Assawoman, Metompkin, and Cedar Islands. Detailed information concerning the action area is described in the enclosed *Intra-Service Section 7 Biological Evaluation Forms* (Enclosure 1).

Status of the Species in the Action Area

Piping plover (*Charadrius melodus*): There has been an increasing trend in the number of nesting pairs of plovers at all CNWR units from 1996, when monitoring was initiated at all CNWR units, to present (Table 7). CNWR's breeding plover population increased from 32 pairs in 1988 to its high of 118 pairs in 2005. Numbers declined slightly in 2006 and 2007, but remain well above numbers recorded a decade ago. In the last five years (2003-2007) nest productivity improved and has reached a weighted average of 1.53, well above the 1.24 believed to be necessary to maintain a stable population (Melvin and Gibbs 1994), and has reached the 1.5 believed to be necessary to maintain a secure population (U.S. Fish and Wildlife Service 1996a). The increase in productivity on CNWR units can be linked to the monitoring effort, use of nest enclosures, predator control efforts, and the closure of the primary nesting areas implemented by the refuge staff. These efforts have resulted in increasing numbers, and are responsible for the significant increases shown for the Southern Recovery Unit. Understanding the highly dynamic habitat conditions of these coastal islands is a key to the long term maintenance of plovers at CNWR.

Plover habitat on CNWR has changed over time as a result of natural erosion and accretion, and the relative suitability of plover habitat in different areas has also changed as a consequence. Accretion and increasing beach elevation, particularly on the Overwash and the recreational beach areas has led to increased plover use (Hecht 2008, pers. comm.). Around 1999, coastal processes began to form suitable habitat at the northern end of the Overwash and southern end of the parking lots. Habitat suitability around the south end of the parking lot/public beach attracted a breeding pair which nested there in 2005 (Hecht 2008, pers. comm.). Suitability of habitat decreased between May 2006 and Feb 2008, but still appeared capable of supporting at least one nesting pair (Hecht. 2008 pers. comm.). Habitat suitability was probably also enhanced by the removal of the asphalt parking lot and installation of shell material (Hecht 2008, pers. comm.). As a result of natural coastal processes, the beach conditions and habitat suitability will likely continue to change, resulting in improving conditions for plovers in some areas and declining conditions in other areas.

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Table 7. Number of piping plover nesting pairs and productivity by year at Chincoteague National Wildlife Refuge, Virginia, 1988-2007.			
Year	No. plover pairs	No. plover chicks fledged	Plover fledging rate (chicks/pair)
1988 ^a	32	27	0.84
1989 ^a	32	36	1.13
1990 ^a	42	24	0.57
1991 ^a	38	30	0.79
1992 ^a	36	19	0.53
1993 ^b	41	56	1.37
1994 ^b	41	71	1.73
1995 ^b	45	44	0.98
1996 ^c	51	83	1.63
1997 ^c	62	43	0.69
1998 ^c	62	69	1.11
1999 ^c	55	74	1.35
2000 ^c	63	98	1.56
2001 ^c	73	134	1.84
2002 ^c	76	95	1.25
2003 ^c	72	147	2.04
2004 ^c	97	221	2.28
2005 ^c	118	167	1.42
2006 ^c	117	121	1.03
2007 ^c	98	110	1.12
^a Data from Assateague Island.			
^b Data from Assateague, Assawoman, and Metompkin Islands.			
^c Data from Assateague, Assawoman, Metompkin, and Cedar Islands.			

Seabeach amaranth (*Amaranthus pumilus*): Seabeach amaranth was rediscovered in Virginia in 2001, the last previously known prior occurrence was in 1973 (U.S. Fish and Wildlife Service 1996b). Population numbers at CNWR have been low (Table 8), and limited primarily to the Wild Beach portion of the refuge. In 2005, there were 69 plants located in the Wild Beach section of the refuge on Assateague Island (the highest count since 2001). The numbers dropped to 13 plants in 2006. The number of plants within CNWR complex has experienced major fluctuations in numbers since its rediscovery in 2001.

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Table 8. Number of seabeach amaranth (*Amaranthus pumilus*) plants and distribution by year on Assateague Island, Chincoteague National Wildlife Refuge, Virginia. There are no records of any surveys on the Southern Islands Unit.

	2001	2002	2003	2004	2005	2006
Wild Beach	9	56	22	1	69	13
Hook				1		

Loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*): From 1974 to 2006, there were 17 confirmed sea turtle nests on CNWR (Table 9), all of which were loggerheads. Ten of these nests were located north of the Public Beach area in what is referred to as the Wild Beach area. The other seven nests were located south of the Public Beach area (six in the Overwash area, and one on the Hook). At this time, there has been no confirmed successful nesting by green or leatherback sea turtles within CNWR. In 2006, there were indications that a green sea turtle may have nested at CNWR. In 2006, a park biologist at Assateague Island National Seashore (Maryland) observed a nesting attempt by a leatherback sea turtle (MacPherson, 2008, pers. comm.). These events make it essential to include these two species in the biological opinion. With global warming, the refuge lands in Virginia may become more favorable climatically to both the green and leatherback sea turtles for nesting.

Table 9. Loggerhead sea turtle (*Caretta caretta*) crawl and nest distribution by area on Chincoteague National Wildlife Refuge, Virginia, 1974-2006.

	Hook	Over-wash	Wild Beach	Assawoman Island	Metompkin Island	Cedar Island	TOTAL
False Crawls	13	4	4	1	0	0	22
Nests	1	6	10	0	0	0	17
Unknown Crawl Type	1	0	0	0	0	0	1

IV. EFFECTS OF THE ACTION

The effects of beach management activities on all units of CNWR and actions the refuge will take to minimize impacts are discussed in the enclosed *Intra-Service Section 7 Biological Evaluation Forms* (Enclosure 1), and are summarized below.

Direct Effects

Piping plover (*Charadrius melodus*): Refuge management activities will continue to have an overall positive effect on plover populations. Marking and enforcing restricted public use areas and seasonal closures to protect plover nesting benefits plovers by reducing human activity during the nesting season. Active and passive predator control activities also protect the birds by offering safe havens inside the nest exclosures and by reducing the numbers of predators. This intensive management has resulted in and will continue to gather data that is assisting in the understanding of plover biology and appropriate management techniques. CNWR has been improving plover habitat within the North Wash Flats area of Assateague Island since the 1990s, by removing vegetation, and recreating nesting and foraging habitat that was lost when dunes were built on the island in the 1960s. These management efforts have been aided by improving beach habitat conditions in that area that resulted from natural beach processes. Thus, there has been an overall increase in suitable nesting habitat at the Assateague Island section of CNWR since the plover was listed in 1986. Over the last three years, the refuge has supported about 35% of the nesting population of the Southern Recovery Unit, and CNWR management has increased plover numbers and nesting success on their lands.

During plover management and monitoring, there is a small chance that CNWR staff may not find a nest, and could destroy eggs or chicks during ORV use while conducting the surveys. Such an accident happened in 2000, but revised plover monitoring protocols have ensured that this has not happened since. Likewise, an unseen nest close to or within the west side of the public Overwash zone could have the same result.

Human disturbance of nesting and foraging plovers on Assateague Island may also occur. Disturbances from pedestrian and vehicle traffic (including horseback riders) may prevent a successful breeding attempt or result in the separation of chicks from the adults, or prevent chicks from reaching feeding areas or avoiding predators. The refuge closure of nesting areas to public use (especially closures to ORVs and horseback riding), predator control measures, and general management practices have greatly reduced the likelihood of disturbance and have generally provided plovers with safe areas to nest. However, some disturbance resulting from CNWR personnel, ORVs, and pedestrian activity outside of closed areas, such as the intertidal zone of the Wild Beach, may result in disturbance to nesting plovers. Since the Assateague Island unit is opened to ORVs and other public use after the nesting season, it is likely that there is some small impact to plovers that migrate along the barrier islands during their fall migration to their wintering grounds. This impact would be from interference with foraging due to the human and ORV use of the beaches. CNWR's restrictions on access to the dunes immediately adjacent to the beaches may reduce the effects of disturbance to foraging plovers on the beach by providing a readily available refuge from disturbance.

As plover numbers have increased on Assateague Island and habitat suitability has increased north of the Overwash Zone, there is an increasing chance that plovers may attempt to nest on the Public Beach or adjacent shell/sand parking lots. There was a nest adjacent to the parking lot in 2005, which led to closure of a portion of the lot, and a plover brood briefly used the area in 2007 (Hecht 2008, pers. comm.). Nesting has not occurred to date within the parking lot since the habitat is not particularly conducive to plover nesting due to the lack of intertidal foraging habitat close to the sandy/shell beach and parking lot substrates. However, there is a small risk that plovers may attempt to nest in these areas early in the season before the parking lots and Public Beach receive intense public use. Due to the overlay of a National Seashore on the Assateague Island beach, the CNWR is presented with a dilemma in managing this scenario should it occur. Current plans would be that if a plover nest occurred on the public beach, CNWR would put an exclosure over the nest and would fence off a 25 – 50 foot buffer around the exclosure to preclude human access. If a nest would occur in the parking lot, CNWR would put an exclosure around the nest, but would not further limit human or vehicle access. These protocols are less than what is recommended in the plover management guidelines within the Recovery Plan, and would increase risk to plovers from human disturbance, crushing of nests and/or young, nest abandonment, or egg mortality resulting from exposure. If a nest is crushed, it could result in the destruction or loss of one to four eggs. Any pairs that successfully hatch chicks from nests on the recreational beach or on the parking lots may be forced to move their broods into territories of pairs already established in the Overwash Zone, inducing agonistic interactions and reducing overall chick survival. However, it has been over ten years since the parking lots were converted from a paved surface to packed shell/sand, and there has not been a confirmed attempt by a plover to nest within the parking lot during that time. Therefore, while there is a risk of take of plovers under this scenario, it remains low. CNWR has committed to evaluate whether the Public Beach could be shifted to the north into an area that does not have suitable plover nesting habitat as part of its CCP process.

CNWR's Southern Units (Assawoman, Metompkin, and Cedar Islands) are not permanently staffed and are accessible to the public only by boat. Cedar and Assawoman Islands are currently staffed several days per week from April through August, and CNWR and The Nature Conservancy personnel visit Metompkin Island at least weekly during the nesting season. Future staffing levels are subject to change as a result of changing Refuge budgets. Assawoman and Metompkin Units are open to the public for daytime use, and the public may only access a limited area at the tips of the islands within the intertidal zone. However, since refuge enforcement staffing is limited, some unauthorized public use may occur at any time of the year. Members of the boating public have been known to stop at these and other islands for breaks from fishing, picnicking, or solitude. Unauthorized pedestrian activities (including dogs) may harass adults or chicks or may crush eggs. The extent of unauthorized use of the southern islands is unknown, but is believed to have been reduced over time due to better public information and patrols by Service and State staff (Ruth Boettcher 2008, pers. comm.). Plover productivity rates on Assawoman and Metompkin Islands are such that the Service does not believe unauthorized human use is a severe problem. Cedar Island has more human use since

parts of the island are in private ownership, and there are some unregulated ORVs on that island. However, plover nesting rates on Cedar Island also do not indicate that human disturbance is a significant issue on that island at the present time. Development of intermixed private land could increase human disturbance.

While each of the management practices and human activities at CNWR units will result in low risks to plovers, taken together, it is anticipated that there will still be some adverse effects on nesting plovers. Such effects may be due to incidental human disturbance of nesting and foraging adults and their young, or due to the accidental loss of eggs or chicks from nesting pairs that have not been seen by drivers of ORVs (official vehicles or the public). These effects are most likely to occur within the Public Beach and Overwash zones on Assateague Island and on the southern units of Assawoman, Metompkin, and Cedar Islands. It is anticipated that up to five pairs of nesting plovers on CNWR units over the next five years may have their productivity (number of fledged young per year) reduced by these human actions.

To evaluate the overall significance of this level of take, a comparison with what is considered to be the normal productivity at CNWR is warranted. Over the past five years (2001 – 2006), the average plover productivity rate for all CNWR units was 1.6 chicks per pair. This is one of the highest productivity rates within the Atlantic Coast recovery population, and is due to the intensive management conducted by the refuge. Using this average plover productivity rate for CNWR (which indicates the rate of loss for eggs and nestlings), five nesting pairs would be expected to produce approximately 21 eggs (based on the 2001-2006 average, including clutches of less than four eggs and renesting), and of these, eight chicks would be expected to fledge. Human disturbance and ORV use is anticipated to result in the loss of five of these eight chicks (although actual mortality could occur during either the egg or the pre-fledgling stages). This would be a decrease of approximately 0.7% of the plover chicks that would otherwise be expected to fledge at CNWR units over a five year period. Notwithstanding the special importance of protecting plovers in the limited suitable habitats in the Southern Recovery Unit, this loss is considered sustainable over the short-term life of this consultation and biological opinion, and will not significantly affect the status of the overall population of the Southern Recovery Unit. The Refuge plans to complete its CCP in about five years. During the CCP process, the refuge has committed to evaluate other options to situate intensive recreational use away from suitable plover habitat and to continue to implement plover nesting habitat enhancement within the Wash Flats area.

Seabeach amaranth (*Amaranthus pumilus*): Activities by CNWR staff for management and protection of nesting plovers and sea turtles have a net positive effect on seabeach amaranth. Seabeach amaranth occurrences are often located during these other management activities, which result in better protection of the plants. The CNWR staff annually surveys for the plant and records any locations. If plants are found in public use or ORV use areas, signs and symbolic fencing will provide protection and reduce the risk of inadvertent disturbance to plants. As a result of closure of nesting areas for protection of the plover and sea turtles, seabeach

amaranth that occur in these areas can complete most of its life cycle removed from the threat of crushing from public ORV use. Some recreationists walk on the Wild Beach, though most stay close to the parking lots. These pedestrians may knowingly or unknowingly walk over plants if they use the beach above the tidal zone in potential seabeach amaranth habitat. Horses that are herded over the dunes to the beach during the annual pony penning in July may potentially crush plants, but refuge efforts to mark each plant, plover, or turtle nest along the route and use staff and volunteers to watch each area should prevent this from happening. Crushing of a plant or plants by the public, staff, horses, or ORVs may occur in some circumstances, but is unlikely due to the actions taken by the refuge to protect the dune and beach areas. CNWR's restrictions on walking on the upper beach, prohibitions on ORV use in the dunes, and efforts to educate the public should decrease trampling in almost all cases. This form of take is considered insignificant.

Loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*): The effects of refuge management activities and public use on sea turtles are primarily limited to the Assateague Island unit, since no turtles have been known to nest on Assawoman, Metompkin or Cedar Islands since 1974. Management activities on Assateague should have a net positive effect on sea turtle nesting due primarily to *in situ* protection of nests. Active and passive predator control, conducted primarily for plover nest protection, will also help nesting sea turtles by reducing the number of potential sea turtle nest predators on the refuge. All sea turtle nests will be left in place and protected from threats as outlined in the attached *Intra-Service Section 7 Biological Evaluation Form* (Enclosure 1). Following the protocols established in Enclosure 1, CNWR staff will make a determination of how to provide protection to each nest based on the nest timing, location, and any possible site-specific issues. All turtle nests on Assateague will be excavated to confirm the presence of eggs. While this excavation process has a slight possibility of damage to the eggs, it is a standard procedure recommended and used by all sea turtle experts in the United States. The nests will then be protected by predator exclosures and symbolic fencing to prevent public trespass. Any turtle nests that occur in the Overwash zone when that area is re-opened to vehicles after the end of the plover nesting season (generally about September 1), will also be protected with a light barrier. In addition to the barriers, human nest sitters (staff or volunteers) will be used at night during the hatch window to protect nests in areas where the location of the nest and the width of the beach is such that an ORV cannot pass landward of the nest. The nest sitters will prevent vehicles from passing seaward of turtle nests while hatchling turtles are on the beach to prevent injury to hatchling turtles.

The approach to sea turtle protection used by the refuge in management of the species will allow for natural nesting on all CNWR units. While this approach will reduce anthropogenic effects on turtle nesting, some nests may still be affected by storm tides, erosion, and other natural processes that affect turtle nesting. The *in situ* protection and proposed management of nests on Assateague Island makes it unlikely that eggs and hatchling turtles will be lost due to crushing by ORVs or entrapment in vehicle ruts, unless unseen turtle nests occur, ORV drivers disobey

protocols, and/or nest sitters are not available each night during the hatch window due to unforeseen circumstances. Disturbance to nesting turtles can still occur prior to egg-laying. ORV use by CNWR personnel and by recreational users outside of closure areas and periods for nesting plovers, may compact beach sand and/or disturb female turtles attempting to nest, potentially resulting in false crawls or fewer nests on Assateague Island beaches. Because the beach closure to ORVs for the plover nesting period generally coincides with the peak of turtle nesting, the risk of ORV disturbance is relatively low.

Indirect Effects

Indirect effects to piping plovers and sea turtles could include an increased predation rate due to human activity. Human activity on the islands may result in trash on the ground, which could both attract predators and increase the carrying capacity of the predators due to increased food availability. The increased numbers of predators may increase risk of disturbance, nest loss, and adult mortality of plovers and increase losses of sea turtle eggs and nests. Plovers may expend more energy in predator surveillance and avoidance, and that energy expenditure could decrease overall fitness. This risk is low because recreational use of these sites is light, except at the Overwash zone. In the Overwash zone, recreational use of the beach is allowed prior to plover hatching season and it is intensively supervised. Activities on the beaches by CNWR personnel may have some similar effects, but the risk is relatively low. Continued ORV use on the beaches may also increase ruts, compact sand, and destabilize some portions of the beach.

Interrelated and Interdependent Actions - An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. No activities that are interrelated to or interdependent with the proposed action are known at this time.

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Future federal, State, local or private actions that are anticipated to occur within the action area, (i.e., units of CNWR) will either be carried out by, or will require a permit from, the Service. These actions will therefore require a section 7 consultation. The Service is not aware of any future State, local or private actions that could occur within the action area that would not be subject to a section 7 review. However, there are private lands on Cedar Island that may not be subject to a section 7 review, including private activities such house construction, and ORV and other human beach use. Likewise, on the section of Metompkin Island not owned by the

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Service, public use restrictions may be different than those established by the Service. Based on the distribution and productivity of piping plovers on these islands (Enclosure 1, Table 1, of *Piping Plover Intra-Service Section 7 Biological Evaluation Form*), it would appear that nesting success of plovers is affected more by habitat suitability than on the limited human use of Cedar or Metompkin Islands.

VI. CONCLUSION

Piping plover (*Charadrius melodus*): After reviewing the status of the piping plover, the environmental baseline for the action area, and the effects of the proposed actions, it is the Service's biological opinion that these activities, as proposed, are not likely to jeopardize the continued existence of the piping plover. The 117 pairs counted in 2006 and the 98 counted in 2007 on CNWR units represent a significant portion of the Southern Recovery Unit numbers (over 30 percent). Adverse effects are of very limited geographic scope and/or magnitude, and the refuge is developing options to further reduce them. Plovers in the Southern Recovery Unit are still imperiled; however, the management activities at CNWR will provide a net benefit to the plovers and aid in the recovery of the plover in this recovery unit. No critical habitat exists within the action area; therefore, none will be affected.

Seabeach amaranth (*Amaranthus pumilus*): After reviewing the status of seabeach amaranth, the environmental baseline for the action area, and the effects of the proposed actions, it is the Service's biological opinion that these activities, as proposed, are not likely to jeopardize the continued existence of seabeach amaranth. No critical habitat has been designated for this species; therefore, none will be affected.

The Service bases this determination on the low level of anticipated adverse effects coupled with the protection gained by the management activities and the broad distribution and relative size of the range-wide seabeach amaranth population.

Loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*): After reviewing the status of the three sea turtles, the environmental baseline for the action area, and the effects of the proposed actions, it is the Service's biological opinion that these activities, as proposed, are not likely to jeopardize the continued existence of loggerhead, green or leatherback sea turtles. No critical habitat has been designated for the loggerhead sea turtle, and no critical habitat for either the green or leatherback sea turtles occurs within the action area; therefore, none will be affected.

The Service bases this determination of no jeopardy on the low level of anticipated adverse effects coupled with the protection gained by the management activities. Furthermore, there is a low level of nesting use by sea turtles relative to the total population size nesting within the broader region, and the likelihood that any nest would suffer direct impacts is small. The management activities at CNWR should provide a net benefit to the turtles.

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INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by CNWR for the exemption in section 7(o)(2) to apply. CNWR has the continuing duty to regulate the activities covered by this incidental take statement. If CNWR (1) fails to assume and implement the terms and conditions, or (2) fails to require any permittee or other party to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, CNWR must report the progress of the action and its impact as specified in the incidental take statement [50 CFR 402.14(i)(3)].

Section 7(b)(4) and 7(o)(2) of the ESA generally do not apply to listed plants species. However, limited protection of listed plants from take is provided to the extent that the ESA prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of state law or regulations or in the course of any violation of a state criminal trespass law.

AMOUNT OR EXTENT OF TAKE

Piping plover (*Charadrius melodus*):

The Service anticipates that up to five pairs of nesting plovers on CNWR units over the next five years may have their productivity (number of fledged young per year) reduced by human actions. Of this number, no more than one nest or brood is expected to be taken in any one year as a result of the proposed actions. Take, in the form of harassment of adults and/or young may interfere with breeding, feeding, or sheltering. This is most likely to

occur if plovers nest in the Public Beach Area, where reduced buffers will provide limited protection. Take of eggs or young may be caused directly by a vehicle crushing a plover egg or chick, or by entrapment of chicks due to creation of ruts in sand that impede chick movements. Though unlikely, any unauthorized pedestrian use may prevent plovers from using the beach and intertidal areas for foraging. Detection of mortality or injury to piping plover eggs and chicks is extremely difficult due to their small size, and because their coloration blends with the beach substrate. Dead chicks and eggs may be covered with wind-blown sand, washed away by tides, or consumed by scavengers. Because detection of take of piping plovers is difficult, the discovery of a single crushed egg or chick due to suspected human causes is considered to indicate the level of anticipated annual take has been reached.

This level of incidental take is expected to continue until CNWR completes the CCP for the refuge (approximately five years from this Opinion), at which time the proposed action is expected to be replaced by revised management, which will be subject to a reinitiation of consultation.

Loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*):

The Service expects incidental take of all species of sea turtles will be difficult to detect for the following reasons: (1) turtles nest primarily at night and all nests are not found due to natural factors, such as rainfall, wind, and tides that may obscure crawls, and human-caused factors, such as pedestrian and vehicular traffic, which may obscure crawls and result in nests being destroyed because they were missed during a nesting survey and nest protection program; (2) the total number of hatchlings and the reduction in hatching and emergence success due to disturbance of nests is difficult to determine; (3) impacts to nesting females in the form of harassment are not likely to be noticed and recorded; and 4) locating individual hatchling sea turtles that have been injured or killed is unlikely.

Incidental take in the form of injury or death of loggerhead sea turtle eggs, hatchlings, and nesting turtles, as well as harm and harassment of both adult and hatchling turtles may result from the proposed action. Incidental take may include collisions with nesting turtles resulting in injury or death, crushing an undetected turtle nest by either staff- or civilian-operated ORVs, creation of ruts in sand that impede hatchlings from moving from nest to water, interference with sea-finding behavior in hatchling turtles leading to disorientation resulting from artificial and vehicle lighting, and impacts to nests resulting from sand compaction or vibration caused by ORV use. The *in situ* management of nests is expected to reduce take since no nests will be moved and nests will be protected from potential human disturbance. No more than three loggerhead sea turtle nests are expected to be taken or lost due to direct or indirect impacts during the five year period covered by this biological opinion, and no more than one loggerhead sea turtle nest is expected to be taken

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in any one year. No adult turtles are anticipated to be killed due to the intensive monitoring program for piping plovers during the majority of the sea turtle egg laying period, and no incidental take of adult sea turtles in the form of death or injury from ORV use is authorized. No green sea turtle or leatherback sea turtle nest loss is expected to occur due to their rarity, and no incidental take of these species is authorized.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat. The action area encompasses a relatively small portion of the rangewide habitat of each of the species addressed in this opinion, and a small portion of each species' population. The proposed action includes a variety of protective measures that are intended to minimize incidental take. For these reasons, the effect of the take anticipated in this biological opinion is not expected to significantly affect any of the species considered.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the likelihood of incidental take of piping plovers, seabeach amaranth, and sea turtles:

1. Proposed activities and access to plover and sea turtle nesting areas, must be timed and conducted to minimize impacts to the species.
2. Monitoring of the species' populations on CNWR units, as well as the effectiveness of the protection measures.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, CNWR must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary. The proposed action represents an interim plan anticipated to be in place for five years as the refuge works on its CCP. The proposed action, and the provisions of this biological opinion, including terms and conditions, are expected to be replaced by another section 7 consultation on the actions proposed by the CCP once it is completed.

Refuge Management Actions

1. Human activities, both pedestrian and vehicular, shall be restricted in all piping plover and sea turtle nesting areas, and known locations of seabeach amaranth, on all CNWR

units in accordance with the plans developed in the *Intra-Service Section 7 Biological Evaluation Forms* (Enclosure 1). Pedestrian and vehicle corridors shall be moved, constricted, or temporarily closed if territorial, courting, nesting, or brooding plovers or sea turtle nests may be disturbed by human activities, or if disturbance is anticipated because of unusual tides. The exception to this is the Overwash zone on Assateague Island (see Condition #2) and the Public Beach Area.

2. The Overwash zone on Assateague Island is divided into two areas: (1) the plover nesting area, and 2) the Off-road Recreational Vehicle (ORV) access corridor (see Enclosure 1, Figure 3, of the *Piping Plover Intra-Service Section 7 Biological Evaluation Form*). The plover nesting area is closed from March 15 through August 31 or until all plovers have fledged, but the ORV corridor seaward of this area stays open until two days before the first expected plover hatch date, and the closure continues until all plover chicks in the area have fledged. The area that shall be closed will be 200 meters north of the northern-most plover brood.
3. In the event that plovers nest on the Public Beach or adjacent parking lots on Assateague Island, the refuge will at a minimum exclose a twenty-five foot radius buffer zone around the nest to protect the nest, and will notify the Virginia Field Office (VAFO) within 24 hours or the next work day. It is important that the refuge complete its Comprehensive Conservation Plan (CCP) by the end of the five year period anticipated in this Biological Opinion. Within the CCP shall be alternative management methods to reduce the potential take of plovers in these public use areas and the Overwash zone.
4. During the plover breeding and sea turtle nesting seasons, official vehicle use (FWS and NPS) of the Assateague Island unit beach shall be limited to that considered essential in the judgment of the Refuge Manager. Official vehicle use will be confined to daylight hours when possible. Vehicle speed shall not exceed ten miles an hour. Vehicles should avoid creating deep ruts that could impede plover chick or sea turtle hatchling movements. If vehicles are creating deep ruts that could impede hatchlings, CNWR shall take appropriate measures to correct the situation as outlined in the *Intra-Service Section 7 Biological Evaluation Forms* (Enclosure 1), and these measures shall be taken at least five days prior to the anticipated hatch date.
5. Personnel who monitor plovers shall maintain and regularly update a log of the locations of nests and unfledged plover chicks and sea turtle nests on the Assateague Island unit. Drivers of official vehicles (FWS and NPS) and public ORV users shall be kept up-to-date by CNWR staff regarding the most current information on locations of nests and unfledged plovers and sea turtles.
6. Night use of the beach by official vehicles during the plover and sea turtle breeding season shall be limited to the greatest extent possible. Except in extreme emergencies,

during night trips a person with a flashlight should walk ahead of the vehicle while within this 400-meter area to look for plovers.

7. The refuge shall insure that the local fire department continues to maintain the fence line to prevent horses from being on the dunes and beach areas to prevent take of plovers, seabeach amaranth, or sea turtle nests. The refuge will take all precautions to insure that during the annual pony penning event, the public and horses while on the Wild Beach do not impact any listed species (if plover chicks and/or turtle nests are present the horses and public will be routed away from them).

Monitoring and Notification

1. Sea turtle crawl and nest searches will be conducted June through the end of September. Surveys for seabeach amaranth will be conducted in conjunction with piping plover and sea turtles.
2. If nesting of green or leatherback sea turtles are confirmed on the Assateague Island unit, CNWR staff shall notify the VAFO within 24 hours (or the next work day) to discuss appropriate management actions to ensure that no take of the eggs or hatchlings of these species occur, due to the rarity of these species at the northern end of their ranges and because no incidental take of these species has been anticipated.
3. A log shall be maintained by CNWR that records the date, time, permit number, and purpose of each vehicle trip (government and private vehicles) through all Assateague beach segments when unfledged plover chicks or sea turtle nests are present.
4. CNWR prepares annual monitoring/survey reports on piping plover productivity, sea turtle nesting activity, and seabeach amaranth locations. These reports shall be submitted to VAFO and the national piping plover and sea turtle coordinators no later than December 1 of each year. Reports shall be sent to VAFO via electronic transmission or at the address below, and to the appropriate addresses for the national coordinators:

Supervisor
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061
(804) 693-6694

5. The CNWR must notify the Virginia Field Office at the address and phone number above within 24 hours (or next work day) of any deaths, nests impacted, or other impacts to the species addressed in this opinion as a result of human activity. Any reports of mortality

or injury due to vehicles shall be accompanied by the vehicle log or monitoring log of the day and previous day that impact occurred. Care must be taken in handling dead specimens of any proposed or listed species that are found to preserve biological material in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the Act. The reporting of dead specimens is required to enable the Service to determine if the approved take has been reached or exceeded and to ensure that the terms and conditions are appropriate and effective.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities taken to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

CNWR can take the following actions to improve management of the three listed species that utilize the beaches of the refuge, and aid in the management and recovery of these species:

1. Within the Public Beach zone and adjacent parking lots on Assateague Island, should any plovers attempt to nest in these areas, follow the Piping Plover Recovery Plan guidelines on protection distances, which are substantially greater than 25 – 50 feet (U.S. Fish and Wildlife Service, 1996).
2. Expedite the evaluation of alternate transportation and alternate public beach options on Assateague Island in a period shorter than five years, in conjunction with the National Park Service. Flexibility to respond to natural habitat formation by moving the Public Beach to portions of the barrier island where habitat conditions are currently unsuitable (or only marginally suitable) for piping plover breeding, closure of the beach parking lots and the Overwash zone during the summer and fall shorebird and sea turtle nesting and migration periods, and providing a new parking area with tram service to the beach are measures that could be taken to further reduce incidental take.
3. Over the last two years there has been limited nesting by plovers on the Wild Beach. In the 1960s, overwash habitat here and elsewhere on Assateague Island was lost in this area when the extensive artificial sand dune system was created. The refuge should continue and expand the restoration of the dynamic beach and overwash system that existed in the Wild Beach and elsewhere prior to the dune construction. This would restore natural processes to an extensive

area that would be isolated from high public use and act as a safe zone for the plover, sea turtles, and other nesting shorebirds.

4. Monitor the use of CNWR beach by piping plovers (and other shorebirds) during the fall migration period to determine the extent and locations of important foraging areas with the refuge. See for example National Park Service (2003).
5. To further reduce the impacts of unauthorized public use of the southern islands (Assawoman, Metompkin, and Cedar), the refuge should increase staff presence to three days a week during the nesting season, including weekend patrols.
6. As part of the CCP process, the refuge should assess all management activities to determine if there are additional management actions that could be taken to reduce and avoid the take of beach dwelling listed species. The pony operation on the refuge should also be evaluated for its impacts on refuge resources.
7. Within constraints of available staff time and other refuge priorities, continue to facilitate piping plover research. For example, a 2007 pilot study using harnesses to attach radio transmitters to piping plovers (Cohen *et al.* 2007), hosted by CNWR on short notice, provided valuable information for future research on effects of off-shore wind turbines on Atlantic Coast piping plovers. Other past studies with broad benefits for rangewide piping plover recovery have included investigations of seabird colony effects on piping plover fledging success and brood movement (Daisey 2006), research on effects of ghost crabs on piping plover breeding success conducted on the Wild Beach (Wolcott and Wolcott 1999), and breeding ecology (Cross 1996).

In order for VAFO to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, VAFO requests notification of the implementation of any conservation recommendations not included in the description of the proposed action or biological opinion.

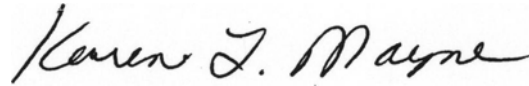
REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the Intra-Service consultation form. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that it causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or designated critical habitat that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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VAFO appreciates this opportunity to work with CNWR on the proposed actions. Please contact Mike Drummond at (804) 693-6694, extension 114 if you require additional information.

A handwritten signature in black ink that reads "Karen L. Mayne". The signature is written in a cursive, flowing style.

Karen L. Mayne

Enclosures

cc: Superintendent, Assateague Island National Seashore, Berlin, MD (Scott Bentley)
USFWS, Sudbury, MA (Anne Hecht)
CBFO, Annapolis, MD (Andy Moser)
Virginia Department of Game and Inland Fisheries (Ruth Boettcher)
ARD, ES, Region 5, Hadley, MA (Michael Thabault)
Chief, Refuges, Region 5, Hadley, MA (Tony Leger)
Endangered Species Coordinator, Region 5, Hadley, MA (Martin Miller)

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Refuge Manager, Chincoteague National Wildlife Refuge

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APPENDIX A – CONSULTATION HISTORY

12/15/06	Initial email contact between CNWR and VAFO about the need to initiate an <i>Intra-Service Section 7 Consultation</i> for management activities not covered under the 2001 Biological Opinion.
01/23/07	VAFO staff conduct a site visit to CNWR to discuss management activities and public use issues.
02/23/07	Email from Sandy MacPherson (Service sea turtle coordinator) to VAFO regarding concerns about sea turtle nest relocation as a conservation tool.
02/28/07	Email from CNWR to VAFO providing a table showing monthly management activities for Assateague Island, and the Southern Island Unit (Assawoman, Metompkin, and Cedar Islands).
02/26/07	Email from CNWR to VAFO providing 2006 seabeach amaranth survey data.
04/03/07	Email from CNWR to VAFO providing the portion of the <i>Intra-Service Section 7 Biological Evaluation Form</i> for management of nesting sea turtles on the refuge.
04/03/07	Email from CNWR to VAFO providing the portion of the <i>Intra-Service Section 7 Biological Evaluation Form</i> for management of piping plover on the refuge.
04/19/07	Email from CNWR to VAFO providing the final portion of the <i>Intra-Service Section 7 Biological Evaluation Form</i> for management of seabeach amaranth on the refuge.
04/23/07	Email from CNWR to VAFO providing an updated version of the <i>Intra-Service Section 7 Biological Evaluation Form</i> for sea turtles and piping plovers.
04/23/07	VAFO sent email notice to CNWR of the receipt of final <i>Intra-Service Section 7 Biological Evaluation Form</i> and the initiation of formal consultation.
05/17/07	Email from Service piping plover coordinator, Anne Hecht, to VAFO and CNWR concerning the possible issue of piping plovers nesting on the public beach parking lots.
05/30/07	Email from CNWR to VAFO providing modifications to the <i>Intra-Service Section 7 Biological Evaluation Form</i> on management of piping plovers.
06/19/07	Email from Service piping plover coordinator, Anne Hecht, to VAFO and CNWR providing more data concerning the possible issue of piping plovers nesting on the public beach parking lots.

- 06/20/07 Email from CNWR acting refuge manager, Susan Rice, to VAFO providing input to the possible use of beach parking lots by nesting piping plovers.
- 06/20/07 - 09/20/07 Period of discussion between VAFO and CNWR regarding plover issues, and how to handle sea turtle nesting at the refuge. CNWR agrees to develop a supplement to the *Intra-Service Section 7 Biological Evaluation Form* showing how it will manage turtle nesting and ORV use at the refuge.
- 09/21/07 VAFO via email, requested Service sea turtle coordinator, Sandy MacPherson, provide input on how to determine acceptable take levels for CNWR.
- 10/18/07 VAFO sent copy of the draft Terms and Conditions section of the biological opinion to CNWR for comments.
- 10/18/07 VAFO sent draft copy of biological opinion to Anne Hecht for review and comments.
- 10/07 - 2/08 Period of discussion between VAFO and CNWR on plover take and turtle management actions.
- 02/12/08 Meeting at CNWR between refuge staff (Lou Hinds, Kim Halpin, Sue Rice, Amanda Daisey, Eva Savage), VAFO staff (Karen Mayne, Mike Drummond), and the Service piping plover coordinator (Anne Hecht) to discuss issues of refuge operations and possible impacts to listed species. The outcome of this meeting was the agreement that this consultation would be comprehensive for all activities that impact piping plovers, seabeach amaranth and sea turtles on all units of the refuge. It was agreed that the previous 2001 biological opinion had not addressed the issue of possible nesting by plovers on the public beach parking lots. This opinion will be comprehensive, it will include all activities covered in the 2001 biological opinion, and also the parking lot issue.
- 02/13/08 - 04/24/08 Period of discussion between VAFO, CNWR, and species experts regarding the updated *Intra-Service Section 7 Biological Evaluation Forms* submitted by the refuge. The main focus of these discussions was the protection of sea turtle nests from ORV use at the refuge.
- 04/03/08 Email from CNWR to VAFO providing the final portion of the *Intra-Service Section 7 Biological Evaluation Form* for management of piping plovers on the refuge.
- 05/23/08 Email from CNWR staff to VAFO providing the final portion of the *Intra-Service Section 7 Biological Evaluation Form* for management of sea turtles on the refuge.

08/07/08 E-mail from CNWR to VAFO providing a revised Intra-Service Biological Assessment on sea turtles to correct the wording of the proposed action.

Enclosure 1

MDrummond: 6/27/2008

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Appendix G

Moa Lin/USFWS



View of refuge

Some Notes on Sea-level Rise and Projected Impacts on Chincoteague National Wildlife Refuge

Some Notes on Sea-level Rise and Projected Impacts on Chincoteague National Wildlife Refuge

Author: Ralph Tiner, Regional Wetland Coordinator, Northeast Region

Date: August 12, 2009

Introduction

Since the origin of the Earth, roughly 4.5 billion years ago, huge changes have occurred including the formation of continents, creation of the various oceans, and major climate shifts initiating numerous continental glaciations and causing fluctuations in sea levels. Given the recent changes in climate (e.g., melting of glaciers and polar ice, observed decreases in ice and snow, and rising air and ocean temperatures) and our interest in how this might affect the future of Chincoteague National Wildlife Refuge, the emphasis of this note is on the fluctuations of sea level in the Mid-Atlantic region and predictions of where sea level is going in the future. Chincoteague NWR has been listed as one of the 10 most endangered refuges threatened by global warming in a Defenders of Wildlife report (Schylar 2006).

For the last million years, the Earth's climate has changed from a cold ice age to a warm interglacial period back to an ice age roughly every 100,000 years. These changes have had enormous impacts on plant and animal life, human societies, and on sea level with lowest levels during cold periods and highest levels during warm periods. So changing sea level is not a recent phenomenon. During the warmest interglacial period about 130,000 years ago, the Earth's temperature was 2-3° F warmer than today's temperatures and ocean levels were 13-20 feet higher than today (Pew Center on Global Climate Change 2007).

The most recent cycle started over 100,000 years ago, when a 39-42°F (4-10° C) drop in global temperatures over thousands of years caused a major change in climate. Winter snows did not melt completely in summer in northern latitudes and as the snowpack accumulated, the weight of the snow caused ice to form below the surface. Ice formed on slopes then began to move downslope forming a glacier. This eventually led to the buildup and advance of continental ice sheets into lower latitudes. About 25,000 years ago, the Laurentide ice sheet moved out of Canada and about 18,000 years ago extended as far south as northern New Jersey and northeastern Pennsylvania on the East Coast. At this time, nearly half of North America was covered by a continental glacier over one mile thick in places (Figure 1). At this time, a significant amount of the Earth's fresh water was locked in glacial ice. Consequently, much fresh water was not returned to the oceans, leading to a significant drop in sea level: it was roughly 400 feet (120m) below its current level (Figure 2). What is now the "continental shelf" was the "coastal plain" 25,000 years ago (yellow areas in Figures 1 and 3). The Mid-Atlantic coast was roughly 40-50 miles offshore of its presentday location (Figure 3). This area was exposed for about 10,000 thousand years and was occupied by tundra and boreal forest much like what is found in Canada today. Elk, moose, and grizzly bears were dominant mammals

(Davis 2006). The waters were cold like Arctic waters and supported species like walrus, sea lions, and bearded seals (Harington 2008).

Figure 1. General extent of glacial ice and exposed continental shelves more than 25,000 years ago. (Source: Short 2008)

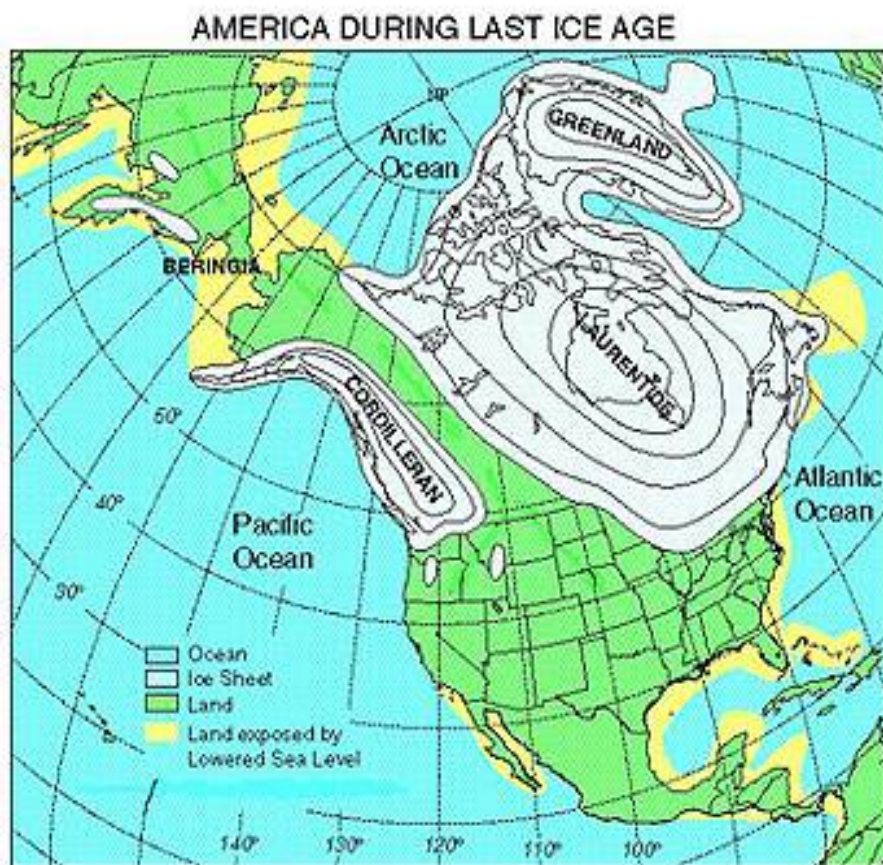


Figure 2. Changes in sea level over the past 18,000 years. (Source: Titus et al. 2009)

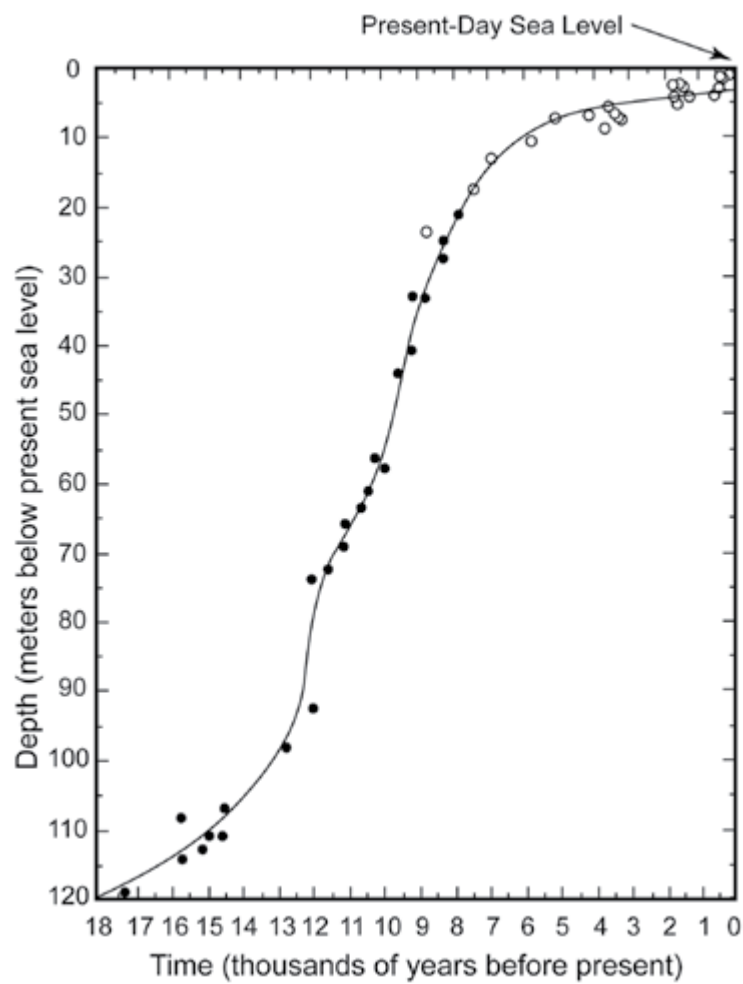
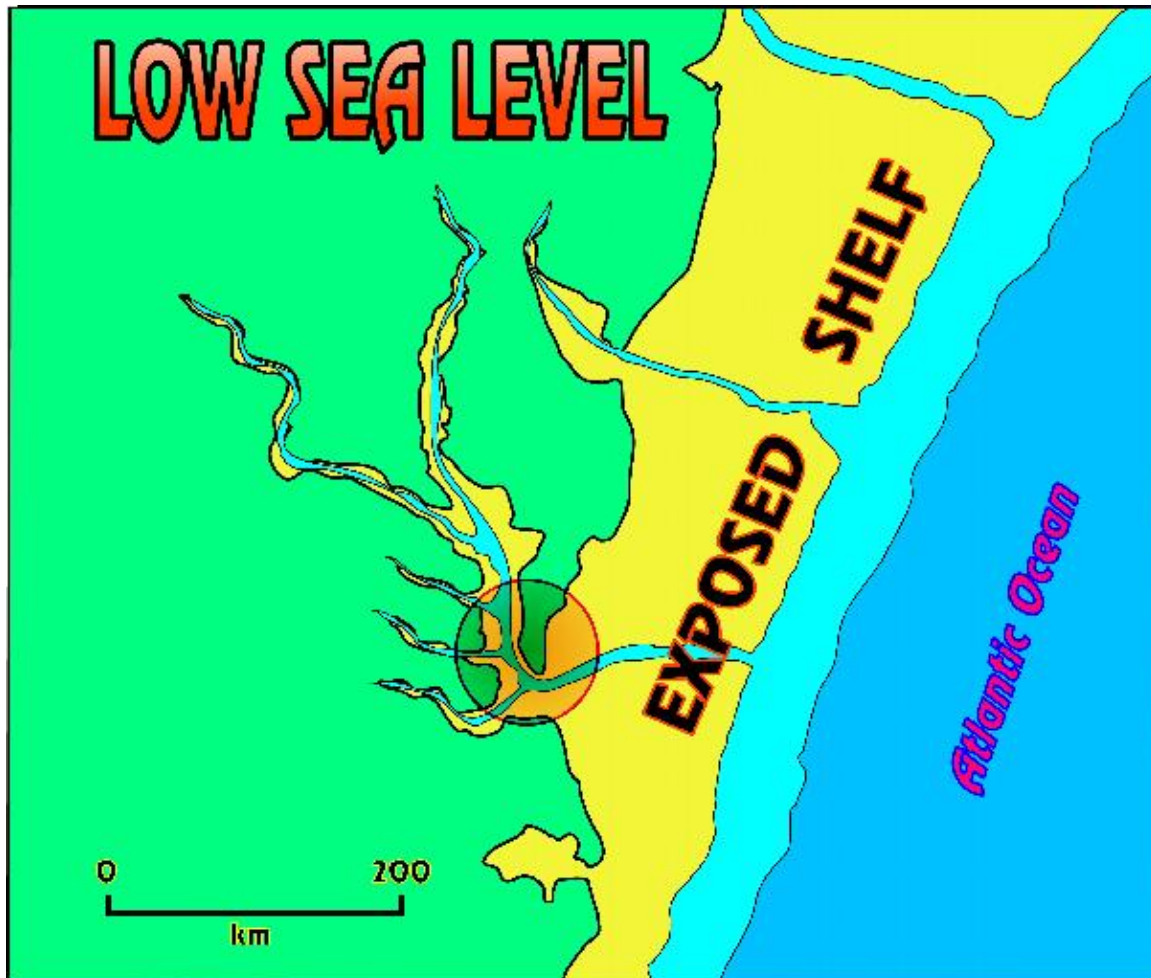


Figure 3. The western Atlantic shoreline showing continental shelf (yellow area), the “shore” more than 15,000 years ago when sea level was at its lowest recent level. (Source: U.S. Geological Survey, Coastal and Marine Geology, Woods Hole Field Center)



Climate began to change again about 15,000 years ago and the warmer temperatures caused the Laurentide glacier to begin melting. The meltwater ran off the land and into the ocean causing sea levels to rise. The rise was not a steady one, but was marked by a rapid increase from 15,000 to 8,000 years ago, at rates as high as 0.5m per decade (Hansen 2007)! Around 6,000 years ago, the rate of sea level slowed to 0.5mm/year due to a reduction in the rate of ice melting. This allowed shorelines to stabilize and the Mid-Atlantic shoreline may have looked much like it does today (minus the human-induced alterations, of course). These more stable conditions promoted the formation of barrier islands and spits that facilitated the establishment of coastal marshes in sheltered lagoons behind the protective barriers and along the low-lying shores of tidally influenced rivers. As sea level continued to rise at modest rates (less than 2mm/year), most tidal marshes were able to keep pace with the higher levels by raising their elevations through accumulation of organic matter and/or increased sedimentation, while others were able to move landward to suitable lowlands that would now be flooded frequently by tidal waters. This process continued for thousands of years and is still taking place where suitable lowlands are available for “marsh migration.” Dead trees or stumps in today’s marshes provide direct evidence of this migration (Figure 4). Human development of the coastal plain, however, has prevented this natural process in many places by the construction of bulkheads and similar structures that harden shorelines.

Figure 4. Dead trees in the marshes are a familiar site in some coastal wetlands.



Recent Sea-level Rise Rates

As global temperature rise, two main factors cause sea level to rise: 1) warming ocean waters expand (thermal expansion) and 2) melting of polar ice and continental glaciers (adds more water to the oceans). Reduction of snow cover and melting of mountain glaciers also contribute to sea level rise. Land subsidence is an important local factor affecting “relative” sea level rise. In some cases, human activities such as extraction of oil, gas, and groundwater in coastal regions that accelerate subsidence exacerbate the adverse impact of sea-level rise on coastal lands.

From 3000 years ago to the late 1800s (the beginning of the “industrial revolution”), the rate of sea-level rise was very low: 0.1-0.2mm/year (Titus et al. 2009). During the last century, the average global rise in sea level was 1.7mm/year (Church and White 2006). From 1993-2003, the rate of sea-level rise rose an average of 3.1mm/year (IPCC 2007). It is not clear whether this increase is simply a decadal response or an indicator of a longer term trend. It is, however, very likely that the losses of polar ice sheets during this decade significantly contributed to the increase (Titus et al. 2009).

Predicting the Future

At the outset, it is vital that due to the increased attention being given to sea level rise, readers recognize that information on this topic as well as climate change in general is expanding at a great pace. The discussion herein is based on information available in August 2009. We expect that in the future, additional information will be available to modify current predictions and expectations. In the 1990s, the United Nations Environment Programme and the World Meteorological Organization created the Intergovernmental Panel for Climate Change (IPCC), a multi-national scientific committee, to examine and interpret scientific information on climate change and its impacts on the environment and society.

The 2007 IPCC report on global climate change lowered predictions from their 1995 report. Now a 0.6-1.9 foot (7-23 inch or 18-59cm) increase in sea level is predicted over the next 100 years, whereas earlier, they were predicting a 0.3-2.9 foot rise by 2100. The new estimate excludes any increase in meltwater from the Greenland and Antarctica ice sheets. The IPCC admits that this is a very conservative estimate. Moreover, recent observations of accelerated ice flow and melting from Greenland and from western Antarctica glaciers could contribute substantially to increasing current sea levels (Titus et al. 2009). If the Greenland ice sheet disappeared, it would add 23 feet (7m) to sea level (IPCC 2007). (Note: During the last interglacial period, 125,000 years ago, reductions of polar ice led to a 13-20 foot (4-6m) rise in sea level.) It is interesting to note that the projected rise may not be a simple steady increase in sea levels, but instead may be rapid due to a quick collapse of large portions of the polar ice sheets (Pew Center on Global Climate Change 2007). A 2007 study that accounted for continued increases in greenhouse gas emissions predicted that sea level could rise 1.6-4.5 feet (0.5-1.4m) by the end of the 21st century (Rahmstorf 2007). This work and the view of other

climatologists suggest that global sea level could rise by 3.3 feet or more (one meter or more) by 2100 and that it may rise meters more over the next several centuries.

Mid-Atlantic Impacts

In the Mid-Atlantic region (New Jersey through Virginia), sea level is rising due to global changes and to land subsidence. During the past century, sea-level rise rates were higher than global rates, ranging from 2.4-4.4 mm/year which translated to about a one-foot rise (0.3m) by 2000. These rates are the highest rates of sea-level rise in the United States, excluding Louisiana and Texas where human-induced coastal subsidence is significant contributing factor (Titus et al. 2009).

Rising seas are already changing the coast, submerging the lowest tidal wetlands, eroding coastal beaches, increasing flooding of lowlands, and altering salinity regimes in coastal waters. Low salt marshes are being converted to tidal flats, while existing tidal flats are becoming permanently inundated shallow water habitats. In places of more pronounced erosion, marshes are changing directly to shallow waters. With increased tidal flooding, high marshes are changing to low marshes, and low-lying uplands or neighboring freshwater wetlands are becoming high marshes. Also, salt water is penetrating further upstream changing the local ecology. While this process has occurred in the past, the pace at which these changes are happening has accelerated and their magnitude has increased in recent times. These changes have important consequences to fish and wildlife dependent on estuaries. The rapidity of the changes will likely overwhelm the ability of many animals to adapt to the new conditions.

Climate change may also increase storm frequency and intensity which will further threaten shorelines and coastal resources. The shoreline of Assateague Island, already threatened by erosion from the current sea-level rise rate, is even more vulnerable with predicted increases of 2mm/year (Figure 5). If the rate increases by a little as 2mm/year, the island may begin migrating landward and may break up into smaller sections (segmentation). This same rate will likely pose increased risk to backbarrier marshes (Figure 6). The impacts of a 7mm/year rise would be devastating.

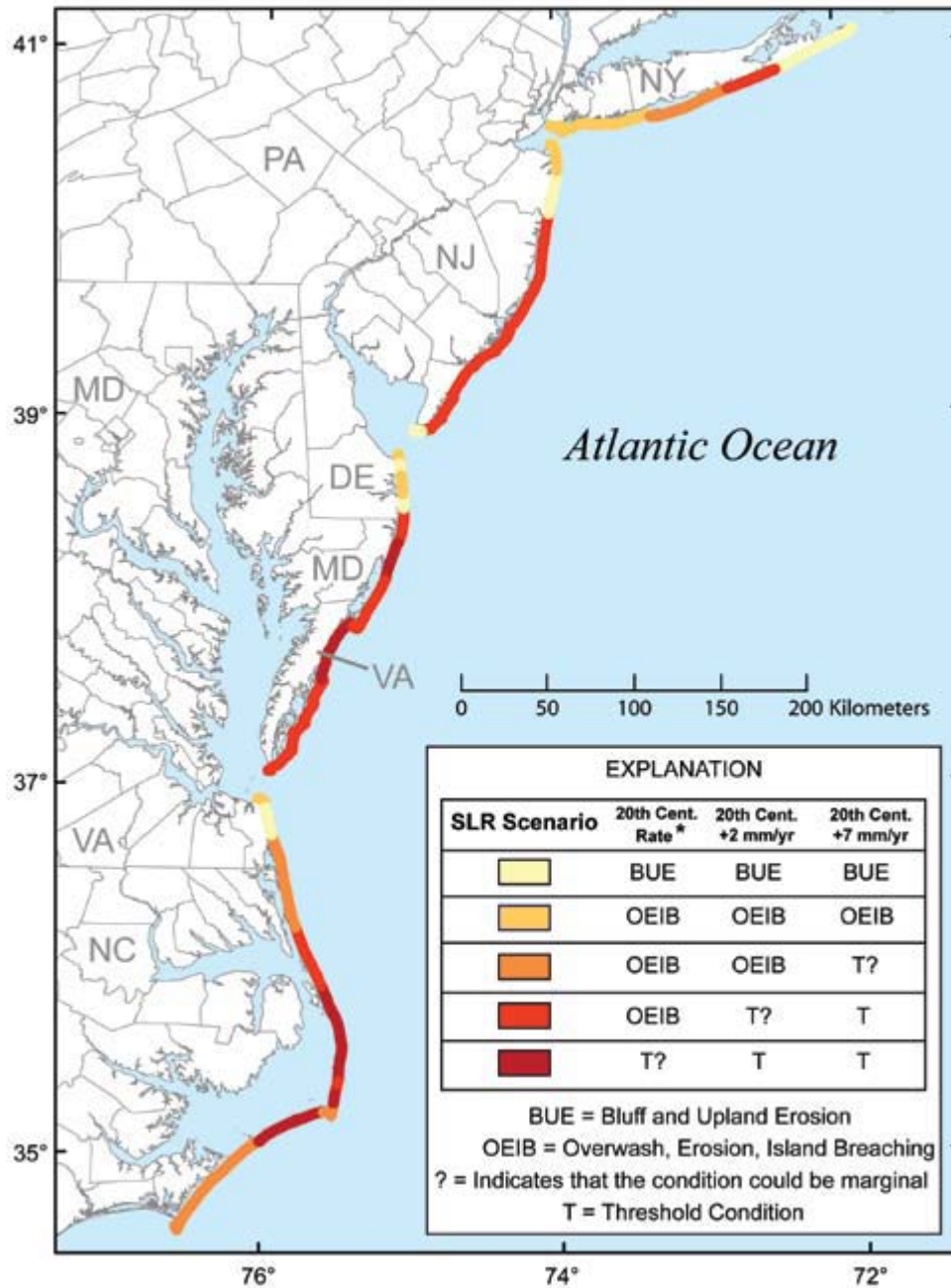


Figure 5. Map showing that Assateague Island may already be near its threshold condition and that just a 2mm/year rise in the rate of sea-level rise will push it over the threshold which may initiate barrier beach migration and segmentation. (Source: Titus et al. 2009)

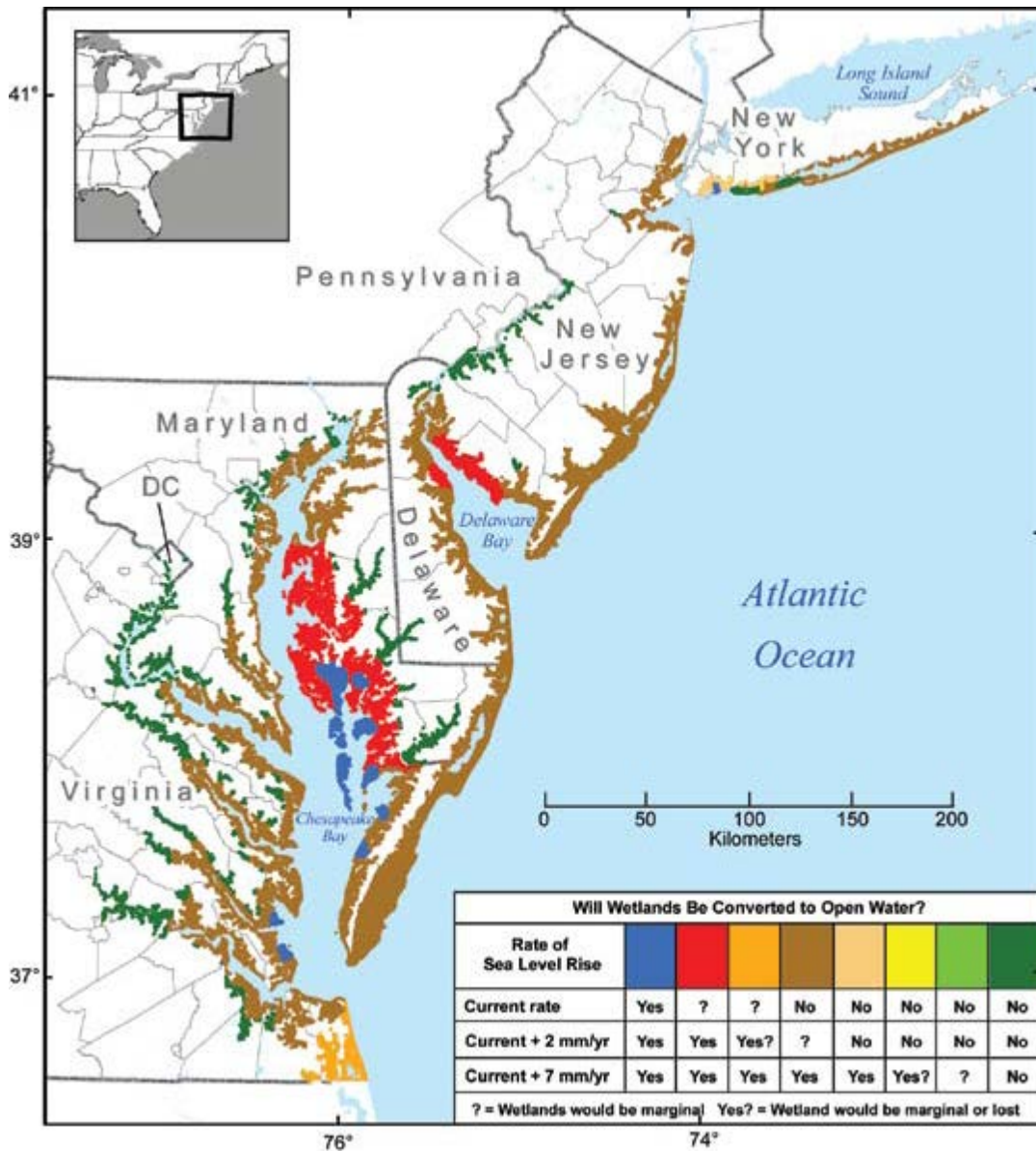


Figure 6. Map showing where tidal wetlands may be converted to open water at three rates of sea-level rise. A 2mm/year rise in the rate should continue the conversion of low marsh to tidal flat and may even transform these marshes to open water. (Source: Titus et al. 2009)

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Appendix H

Mao Lin/USFWS



View of Refuge

Adapting Now to a Changing Climate: Wallops Flight Facility and the Eastern Shore



Adapting Now to a Changing Climate

Wallops Flight Facility and the Eastern Shore



climate risks

the issue

Climate data collected over the past 60 years in the Wallops Flight Facility Area show a long-term pattern of sea level and temperature rise. Data from Salisbury, Maryland indicate that the average annual temperature has risen approximately 1.2 degrees over the past century. Data from Kiptopeke, Virginia show that sea level has risen about 7 inches during the past sixty years.

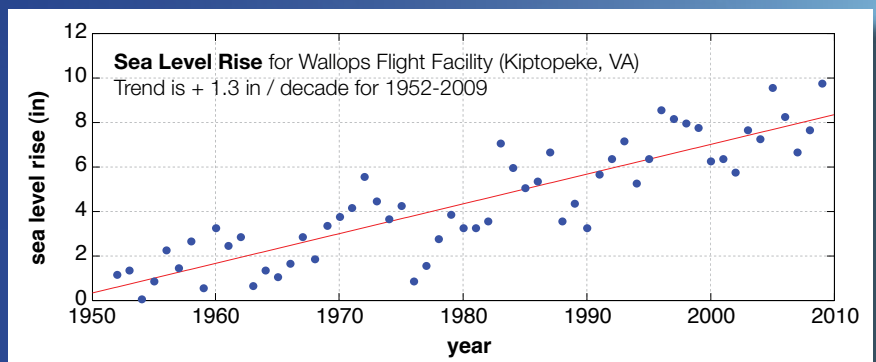
Climate models project continued sea level rise and warmer temperatures in the region. Along with sea level rise, storm surges from hurricanes and nor'easters may increasingly make natural and built systems vulnerable to disruption or damage. Government agencies and other organizations, including utilities, planning commissions, conservation groups, and research institutions are currently assessing the potential of climate hazards to affect the region and their operations.

This handout can help area leaders (NASA together with its tenants, neighbors, and area partners) understand what they may expect in the future, and plan accordingly.

What's already happened *locally*?

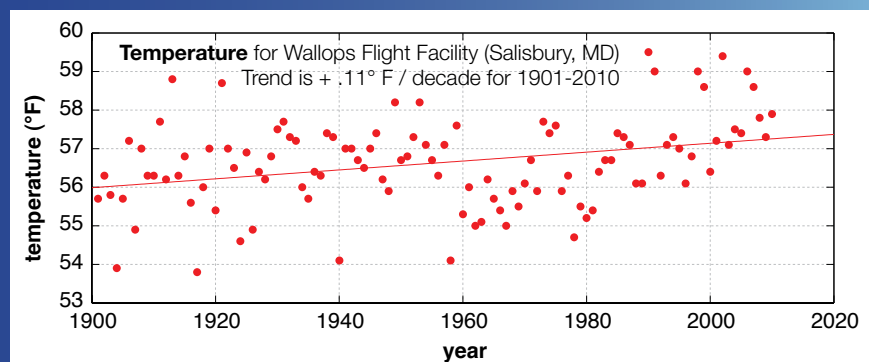
Sea Level

has risen over decades, though individual years vary somewhat



Temperature

has risen too, but values vary more year to year



Local historical data tells us the climate is changing.

the setting

NASA Wallops Flight Facility (WFF) occupies nearly 6500 acres on the mainland of the Eastern Shore of Virginia and on Wallops Island, which is part of a long chain of barrier islands along the coastlines of Virginia and Maryland. The Virginia/Maryland border is about 6 miles north of WFF.



what's at stake?

Wallops Flight Facility (WFF) is NASA's principal facility for suborbital and small orbital research missions. The professionals at Wallops enable relatively low-cost aerospace-based science and technology research critical to the nation. Over 16,000 rockets have launched from WFF since its establishment in 1945. WFF employs about 1,300 NASA civil servants, contractors, and partners, and contributes significantly to the local economy. WFF hosts internship and co-op programs, as well as education programs in local communities and schools.



WFF supports NASA and its partners from two sites. At its Main Base, a research airport, command centers, labs, rocket storage areas, and radars and telemetry facilities serve NASA, the Navy, and NOAA. Wallops Research Park, on adjacent non-federal property, will provide opportunities for public/private ventures with nearby NASA and Navy expertise. Seven miles to the south, Wallops Island is the location of six launch sites, supporting facilities, and a major Naval Surface Combat Systems Center, which serve NASA and academic, commercial space industry, and military partners. Wallops is irreplaceable for these missions; in addition to seclusion from incompatible land uses, it adjoins the Atlantic Warning Area, a secure airspace that enables sensitive launch activities with no commercial air traffic nearby. Constructed NASA and Navy assets at WFF are conservatively valued at over \$1B.

Beyond its importance to NASA and the military, Wallops Island is part of a largely undeveloped coastal ecosystem of 18 barrier islands. Several public and private entities steward the natural assets of these islands. The National Park Service's Assateague Island National Seashore is to the north; the U.S Fish and Wildlife Service's Chincoteague National Wildlife Refuge is on islands both immediately north and south of Wallops Island. The Nature Conservancy manages most of the barrier islands to the south. Undeveloped areas of Wallops Island consist largely of saltwater marsh, vegetated dunes, maritime forests, and beach habitat. Wallops Island supports two federally-protected species - the piping plover and loggerhead sea turtle. The other islands also support these species and all islands are important resting and feeding spots for many migratory bird species including the red knot, a candidate for listing under the Endangered Species Act. Other federally protected sea turtles and marine species can be found offshore.

projected changes

The Climate Science Context

Scientists have collected weather and climate data and indicators of longer-term climate patterns (such as ice cores and tree rings) from the entire globe. Based on analyses of these data, plus a growing understanding of physical processes that control climate, scientists have developed sophisticated models that project future climate changes. Many climate models project that climate change will accelerate this century. The US Global Climate Research Program’s report summarizes these results at <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts>. NASA climate scientists are an important part of the international research effort. NASA is a key player in modeling climate variables and collecting both earth-based and space-based data used to develop and validate climate models and identify climate impacts.

Eastern Shore Area Climate and Weather Today

The climate at WFF and its surrounding region is best described as humid subtropical. Average temperatures in the area range from about 36°F in January to about 76°F in July. Annual precipitation averages 40 inches and is relatively evenly distributed throughout the year. Local climate hazards that impact the center include nor’easters and hurricanes.

Future Climate Projections

Based on local temperature and sea level records, scientists from NASA’s Goddard Institute for Space Studies used local data to refine global climate model outputs, making the projections WFF-specific. This “downscaling” process can provide a more precise projection for a specific location (in this case the WFF area), than modeling for an entire region, such as the East Coast. Using these models,

Climate Scenarios

The United Nations Intergovernmental Panel on Climate Change (IPCC) developed several greenhouse gas (GHG) emissions scenarios based on differing sets of assumptions about future economic growth, population growth, fossil fuel use, and other factors. The emissions scenarios range from “business-as-usual” (i.e., minimal change in the current emissions trends) to more progressive (i.e., international leaders implement aggressive emissions reductions policies). Each of these scenarios leads to a corresponding GHG concentration, which is then used in climate models to examine how the climate may react to varying levels of GHGs. Climate researchers use many global climate models to assess the potential changes in climate due to increased GHGs. In this case, 3 emissions scenarios were used in 16 different global climate models, to provide a range of possible outcomes and provide a sound basis for policy decisions and adaptation planning.

Projected Changes in Climate Variables

		2020's	2050's	2080's
	Average Annual Precipitation	0 to +10%	0 to +10%	0 to +15%
	Sea Level (inches)	+2 to +5	+7 to +11	+12 to +21
	Sea Level–Rapid Ice Melt Scenario (inches)	+5 to +9	+19 to +28	+42 to +56
	Average Annual Temperature (F°)	+1.5° to +2.5°	+2.5° to +4.5°	+3.5° to +6.5°

Temperature and precipitation projections reflect a 30-year average centered on the specified decade; sea levels are averages for the specific decade. Data for 1971-2000 from Wallops Flight Facility provide a baseline for Temperature (56.3°F) and for Annual Precipitation (40.0 inches). Sea level data are for Gloucester Point and Kiptopeke, VA and include the impacts of subsidence in the area. Temperatures are rounded to the nearest half degree, precipitation projections to the nearest 5%, and sea level rise to the nearest inch. Shown are the central range (middle 67% of values) across the GCMs and GHG emissions scenarios. Data are from the NOAA National Climatic Data Center.

Average sea levels and temperatures are projected to rise.

projected changes

scientists project higher average annual temperatures and rising average sea levels for the Wallops area. While little change is expected in average annual precipitation, storms may be more intense, leading to increased risks of flooding.

The Case for Adaptation

Because of its location on the Atlantic coast, sea level rise and storm surge may be the biggest threats to WFF. The area has always been subject to hurricanes and nor'easters, and the associated high winds and flooding. The combination of rising sea level and severe storms could produce catastrophic impacts on WFF and the surrounding high profile infrastructure assets, human capital, and natural resources. Projected changes in the frequency of some extreme events like hot and cold days (see tables below) may also lead to large impacts. Most people are more likely to notice the increased frequency of extreme events - more heat waves, more downpours, more flooding - than the gradual rise in average annual temperatures and sea levels. The Facility's future is intricately connected with broader social, economic, and environmental trends expected throughout the region; WFF and its partners in the region will collaborate to develop and implement adaptation strategies for a climate resilient Eastern Shore.

A Note on Interpreting Climate Projections

Model projections indicate a progressive long-term warming trend for the Wallops area, but they cannot provide an exact temperature for a future date. For example, it cannot be stated that the average temperature at WFF will be 59.3°F in 2043; it is appropriate however to say that between 2040 and 2070, temperatures are projected to increase 2.5 to 4.5 degrees above the average baseline temperature.



Rapid Melting of Land-Based Ice

Data collected over the past several years reveal that land-based ice, such as that on Greenland and the Western Antarctic Ice Sheet, is melting faster than most Global Climate Models project. Because this could change sea levels substantially, climate scientists developed an alternative projection that incorporates observed and longer-term historical land-based ice melt rates. This rapid ice melt scenario suggests that sea levels could rise three times as fast by the 2080s, resulting in up to 3 additional feet of sea level rise. (see Rapid Ice Melt data in the Climate Variables chart to the left.)

Daily Temperatures	Baseline	2020s	2050s	2080s
Days/year at or above 95°F	2	3 to 5	6 to 11	8 to 21
Days/year at or above 90°F	14	17 to 21	22 to 34	27 to 53
Days/year at or below 40°F	126	106 to 113	94 to 106	82 to 98
Days/year at or below 32°F	73	54 to 61	43 to 54	34 to 48

Baseline is from Wallops Flight Facility

Extreme Event Changes This Century

Event	Direction of Change	Likelihood
Hot Days	↑	Very Likely
Intense Precipitation	↑	Likely
River Flooding	↑	Likely
Drought	↑	More likely than not
Intense Winds	↑	More likely than not

Based on global climate model simulations, published literature, and expert judgment

Hot and Cold Day Projections

The number of days per year exceeding 90°F is projected to rise in the coming century, and the number of days with temperatures below 32°F is projected to decrease. More hot days (and fewer cold days) would affect outside work, energy use, agricultural practices, and habitats.

our responsibility

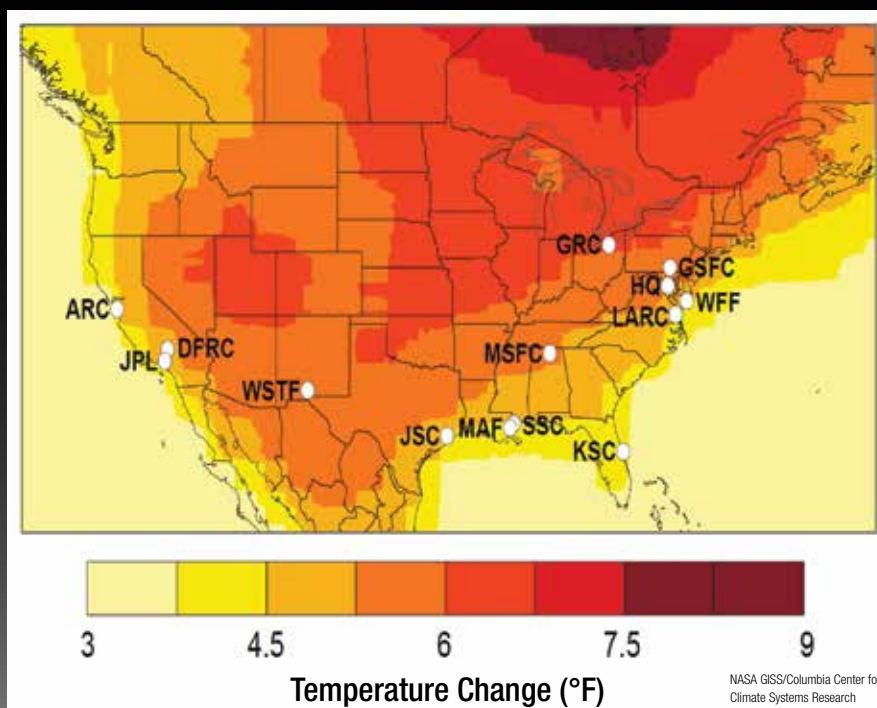
The time to develop and implement adaptation strategies is now. Executive Order 13514 directs federal agencies to assess and manage the effects of climate variables on operations and mission in both the short and long term. A changing climate in the Wallops area will affect facility operations (e.g., water and energy management), natural resources (e.g., new invasive species control), infrastructure that is vital to mission success (e.g., increased cost of protection against flooding), quality of life in the community (e.g., additional heat stress management), and the regions' economy (e.g., increased public expenditures on utilities). By considering these impacts during existing planning and decision-making cycles at Wallops Flight Facility and in collaboration with area partners, impacts to their missions may be abated or reduced. The recent construction of the new beach in front of the launch range, at considerable expense, provides an example of an adaptation measure taken to protect valuable national assets. Adaptation strategies developed for WFF may also prove beneficial to the local community as planners implement short-term tactical changes now, while simultaneously planning for longer-term strategic adaptation measures. Some potential impacts are listed in the chart below.



A new beach built by pumping sand from dredges offshore in 2012 will help protect more than \$1 billion in federal and state government assets located here. The Wallops Island facility is home to NASA, the US Navy Surface Combat Systems Center, and the Mid-Atlantic Regional Spaceport. (upper photo - U.S. Army photo/Patrick Bloodgood)

Climate Trends	Potential Impacts
Rising Sea Level	Exacerbated flooding from storm surges; reduced emergency response capabilities. Increased salinity impacts to drinking water resources and habitats
Increased Coastal Flooding	Impacts to wastewater treatment plants on the coast; damage to infrastructure; changes in shoreline habitats; overloading of stormwater management systems
Overall Increased Temperature	Increased cooling costs in the summer; decreased heating costs in the winter. Changes in plant and animal cycles, including pest and disease vector species
Increased Number of High Temperature Days	Potential for damage to infrastructure materials; potential for limiting work and recreation outdoors; increased health problems related to heat stress
Precipitation Changes	Increased flooding from extreme precipitation events; increased risk of drought as temperatures rise; habitats affected by fluctuating groundwater levels

Projected Temperature Change (°F), 2080s minus 1980s, A1B Emissions Scenario*



*Average projected temperature change across sixteen global climate models for the A1B emissions scenario. The A1B scenario, one of several developed by the IPCC, assumes high CO₂ levels for first the half of the 21st century, followed by a gradual decrease after 2050. Each time period (the 2080s and 1980s) reflects a 30-year average, not a specific point in time. **The precise values shown in the map should not be interpreted as the most likely outcome.** The patterns of future climate change will depend on a range of factors, including the climate system, population, economics, technology, and policy.

A Note about Downscaling Climate Data Specifically for Individual NASA Centers

The quantitative climate projections in this document are based on global climate model simulations conducted for the IPCC Fourth Assessment Report (2007) from the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project Phase 3 (CMIP3) multi-model dataset. The simulations provide results from sixteen global climate models that were run using three emissions scenarios of future greenhouse gas concentrations. The outputs are statistically downscaled to 1/8 degree resolution (~12 km by 12 km) based on outputs from the bias-corrected (to accurately reflect observed climate data) and spatially-disaggregated climate projections derived from CMIP3 data. Results provide a more refined projection for a smaller geographic area. This information is maintained at: http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections and described by Maurer, et al. (2007)¹.

The **rapid ice melt scenario** and qualitative projections reflect a blend of climate model output, historical information, and expert knowledge. For more information about rapid ice melt, see a paper and references at <http://www.nature.com/climate/2010/1004/pdf/climate.2010.29.pdf>.

Key Uncertainties Associated with Climate Projections

Climate projections and impacts, like other types of research about future conditions, are characterized by uncertainty. Climate projection uncertainties include but are not limited to:

- 1) Levels of future greenhouse gas concentrations and other radiatively important gases and aerosols,
- 2) Sensitivity of the climate system to greenhouse gas concentrations and other radiatively important gases and aerosols,
- 3) Climate variability, and
- 4) Changes in local physical processes (such as afternoon sea breezes) that are not captured by global climate models.

Even though precise quantitative climate projections at the local scale are characterized by uncertainties, the information provided here can guide resource stewards as they seek to identify and manage the risks and opportunities associated with climate variability/climate change and the assets in their care.

¹Maurer, E.P., L. Brekke, T. Pruitt, and P.B. Duffy (2007), 'Fine-resolution climate projections enhance regional climate change impact studies', *Eos Trans. AGU*, 88(47), 504.

Authorization for NASA's climate risk management efforts, which began in 2005, includes:

- Federal Managers' Financial Integrity Act of 1982, supported by:
 - GAO (1999) Standards of Internal Control in the Federal Government
 - OMB Circular A-123 (2004) Management's Responsibility for Internal Control
- National Security Directive 51 and Homeland Security Presidential Directive 20: National Continuity Policy (9 May 2007) on localized acts of nature
- Presidential Policy Directive 8 – National Preparedness (30 March 2011) for catastrophic natural disasters
- Executive Order 13514 (8 October 2009) Leadership in Environmental, Energy and Economic Performance
- 2010 National Aeronautics and Space Act (51 USC Sec 20101 et seq)
- 2010 National Space Policy of the United States of America

Members of NASA's Climate Adaptation Science Investigator (CASI) Work Group contributed to this document.



Appendix I



Refuge visitors at the beach

Summary Costs of Draft Alternatives and Comparison of Beach Access Costs

Non-Beach Capital Cost Components						
Project	Units/Notes	Cost per unit	Alternative A Cost	Alternative B Cost	Alternative C Cost	Beach Nourishment Alternative
WCS - between Ragged Point & Assateague Channel	90 LF	\$ 12,250.00	\$ 1,102,500	\$ 1,102,500	\$ 1,102,500	-
WCS - between NWF & Assateague Channel	100 LF	\$ 3,500.00	\$ 350,000	\$ 350,000	\$ 350,000	-
WCS - between E Pool & Assateague Channel	100 LF	\$ 3,500.00	\$ 350,000	\$ 350,000	\$ 350,000	-
WCS - between Sow Pond & Assateague Channel	90 LF	\$ 12,250.00	\$ 1,102,500	\$ 1,102,500	\$ 1,102,500	-
WCS between A & B South (36")	100 LF	\$ 3,500.00	\$ 350,000	\$ 350,000	\$ 350,000	-
WCS between F & B South (36")	100 LF	\$ 3,500.00	\$ 350,000	\$ 350,000	\$ 350,000	-
WCS between B South & B North (36") 2 structures	90 LF	\$ 3,500.00	\$ 630,000	\$ 630,000	\$ 630,000	-
WCS between C and B North (36") 2 structures	90 LF	\$ 3,500.00	\$ 630,000	\$ 630,000	\$ 630,000	-
WCS between C & D (36") 2 structures	90 LF	\$ 3,500.00	\$ 630,000	\$ 630,000	\$ 630,000	-
New Hunt Areas	8 blinds	\$ 5,000.00	-	\$ 40,000	\$ 40,000	-
Restore Lightkeepers House	1 restoration		-	\$ 1,000,000	-	-
Wildlife Observation Tower (Wallops Island)	1 tower		-	\$ 80,000	-	-
Boardwalk (Wallops Island)	Facilities will be shared with NASA		-	*shared with NASA	-	-
Construct additional office space for NPS at the existing Herbert H. Bateman Administrative Office Complex.	Funding will be coordinated with NPS.			*shared with NPS		
TOTAL COSTS			\$5,495,000	\$6,615,000	\$5,535,000	-

Note: This table covers major capital costs expected for each alternative; operational costs – including staffing – for each alternative is not captured.

All Major Capital Costs and Operations and Maintenance for Beach Access

Project	Units/Notes	Cost per unit	Alternative A Cost	Alternative B Cost	Alternative C Cost	Alternative A with Beach Nourishment Cost	Alternative B with Beach Nourishment Cost
Non-Beach Capital Cost Component			\$5,495,000	\$6,615,000	\$5,535,000	\$5,495,000	\$6,615,000
WCS - A Pool (84")	90 LF	\$12,250.00	\$1,102,500	-	-	-	-
WCS - F Pool (84")	90 LF	\$12,250.00	\$1,102,500	-	-	-	-
Bike Trail - Visitor's Center to Beach	11,523 linear feet of trail	\$123.00	\$1,417,329	-	-	-	-
Bike Trail - WL Loop to C Dike	3,730 linear feet of trail	\$123.00	-	\$458,790	-	-	-
Turn Around - terminus Beach Rd.	3,023 square feet of pavement	\$35.00	-	\$105,805	\$105,805	-	-
Crabbing Dock	40 linear feet of docking	\$875.00	-	\$35,000	-	-	-
Wildlife Observation Tower (Beach Road)	1 tower		-	\$80,000	-	-	-
Launch Area for kayak/canoe	438 linear feet of boardwalk	\$875.00	-	\$383,250	-	--	-
Shuttle Transit Service	3 shuttles purchased and maintained for seven years	Capital cost of \$900,000, Annual operating cost of \$179,000	\$2,600,000	-	\$2,600,000	-	-
Proposed Access Road, Joint NPS/USFWS Visitor Contact Station, and Parking Areas for Relocated Beach	2 way traffic, emergency lane and bike trail / 8.5 acre or 4.25 acre parking area / 3,000 sf building with public restrooms / small exhibit area	Includes construction, design, and construction management costs, estimated by FWS		\$14,558,100	\$11,739,900	-	-
Army Corp of Engineers Beach Nourishment Assessment	Stabilization of the current recreational beach and parking lots, and recurring maintenance every 3-7 years	\$24 million of initial costs, then three maintenance occurrences at \$8.3 million (3-7 years over 15 year CCP = average of every 5 years)	-	-	-	\$48,900,000	\$48,900,000
Grand Total			\$11,717,329	\$22,235,945	\$19,980,705	\$54,395,000	\$55,515,000

Appendix J

USFWS



Chincoteague NWR

Chincoteague National Wildlife Refuge Beachfill: Abbreviated Analysis and Cost Opinion for Maintaining the Existing Parking Areas and Recreational Beach

Chincoteague National Wildlife Refuge Beachfill

Abbreviated Analysis and Cost Opinion for Maintaining the Existing Parking Areas and Recreational Beach

Purpose of this report:

The intent of this report to convey a cost opinion of stabilizing (not protecting) the existing parking areas and recreational beaches based on a similar recent United States Army Corps of Engineers (USACE) beach-fill project at Wallops Island, Virginia. The term protection is used when armoring (for example, revetments and seawalls) the shoreline and protecting inland development. The term stabilization is used to decelerate shoreline erosion using breakwater systems and/or increase the longevity of a beach by beach fill and maintain a wide berm for damage reduction. The design is proposing an establishment of a dune position on the exiting beach berm and beach nourishment that would extend towards the ocean. The intent and objective is to stabilize the existing parking areas. This report is not an economic analysis, alternative analysis or detailed design analysis.

Problem Statement:

Beach erosion along the open ocean of the Assateague Island is well documented with average net long-term rates of -1.2 meters/year (USGS 2010). Federal resources are expended yearly to maintain the recreational beach and parking areas.

Existing Conditions:

Based on the historical map data, the sediment transport is traveling from Toms Cove to Fishing Point (North to South). The sand from the north will, over time, travel to the south. The shoreline will continue to transgress west; however, the beach-fill will slow down the transgression in the vicinity of placement. Historical Sea Level Rise along the Assateague and Chincoteague shoreline will be considered at a minimum for this concept. Both erosion and sea level change rates are anticipated to continue at the current (historic measured) rates. In addition to the sea level rise and sediment transport, the shoreline of Assateague Island will continue to transgress west; however, the beach-fill will slow down the transgression in the vicinity of the placement. The dune and beach berm project will not prevent tidal flooding from the interior or backside of the shoreline.

Similar Projects:

A recent (2012) project similar to a beachfill at Chincoteague includes the Wallops Island Shoreline Damage Reduction project with an initial cost of \$35M and a project length of 3.6 miles. Other similar projects within the Norfolk District include Virginia Beach, Sandbridge and Hampton Storm Damage Reduction Projects.

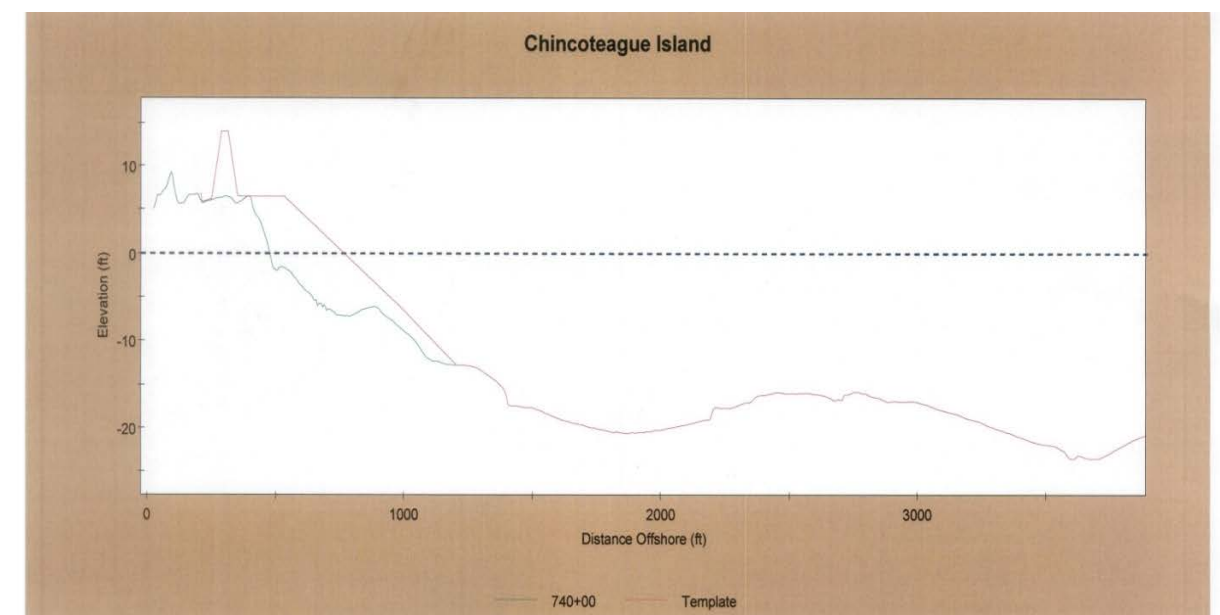
Assumptions:

- Natural beach berm elevation = 6.0 ft. NAVD '88
- Project length = 1.5 miles
- Dune height = 14 ft. NAVD '88
- Dune Crest width = 25 ft.
- Foreshore slope 20:1
- Borrow material is beach compatible i.e. 0.29 mm or greater
- Profile template = 160 CY/LF
- Total initial fill required = 1.5 MCY
- Dredging losses = 20%

Project Limits



Beach-fill Template



Cost Opinions:Initial
Fill

Hopper Dredging from offshore shoals

Mob					\$2,750,000
-----	--	--	--	--	-------------

	1,500,000				
Dredge	CY	@	\$11.50 /CY		\$17,250,000

Standby Cost					\$100,000
--------------	--	--	--	--	-----------

ST					\$20,100,000
----	--	--	--	--	--------------

Contingencies	10%				\$2,010,000
---------------	-----	--	--	--	-------------

Total Construction Cost					\$22,110,000
-------------------------	--	--	--	--	--------------

S&A	5%				\$1,105,500
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Total Construction plus S&A Cost					\$23,215,500
----------------------------------	--	--	--	--	--------------

PED cost	5%				\$1,105,500
----------	----	--	--	--	-------------

TOTAL PROJECT COST					\$24,321,000
--------------------	--	--	--	--	--------------

Renourishment cycle (3 to 7 years)

Mob					\$2,750,000
-----	--	--	--	--	-------------

Dredge	300,000 CY	@	\$11.50 /CY		\$3,450,000
--------	------------	---	-------------	--	-------------

Standby Cost					\$100,000
--------------	--	--	--	--	-----------

ST					\$6,300,000
----	--	--	--	--	-------------

Contingencies	20%				\$1,260,000
---------------	-----	--	--	--	-------------

Total Construction Cost					\$7,560,000
-------------------------	--	--	--	--	-------------

S&A	5%				\$378,000
-----	----	--	--	--	-----------

Total Construction plus S&A Cost					\$7,938,000
----------------------------------	--	--	--	--	-------------

PED cost	5%				\$378,000
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TOTAL PROJECT COST					\$8,316,000
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- Wetland Mitigation Cost not included.

Appendix K

USFWS

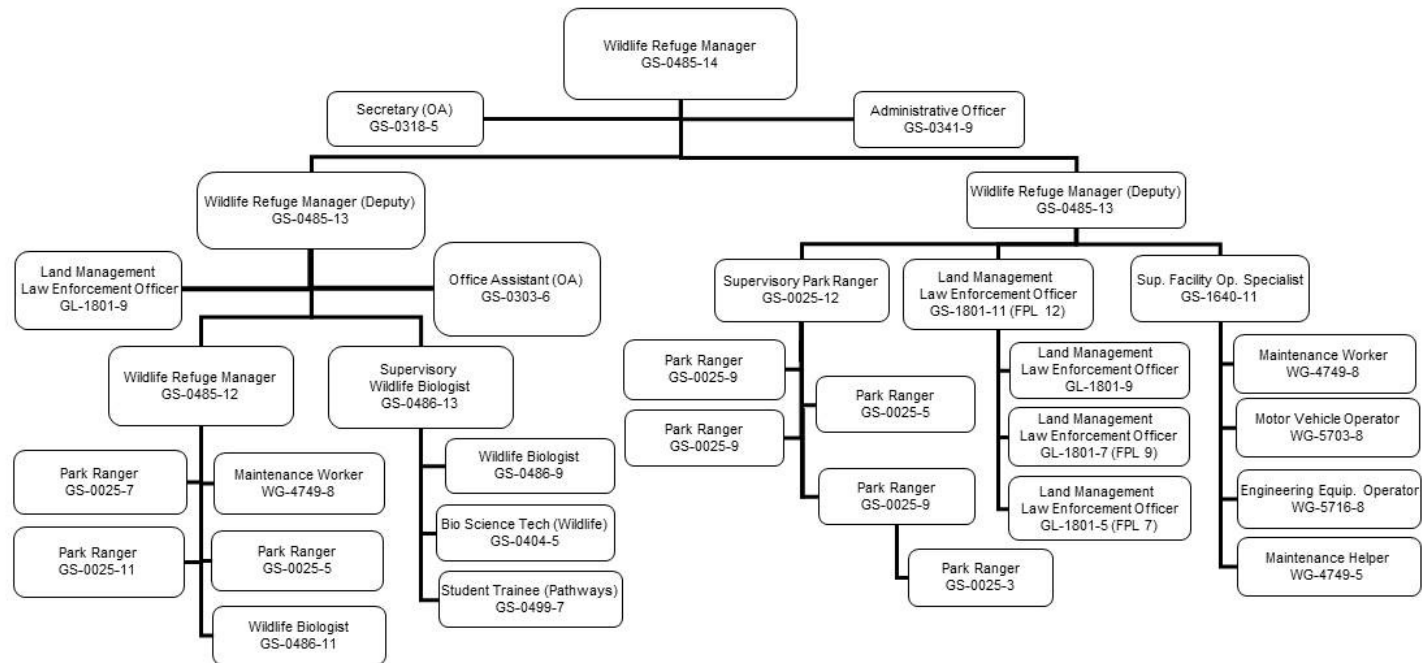


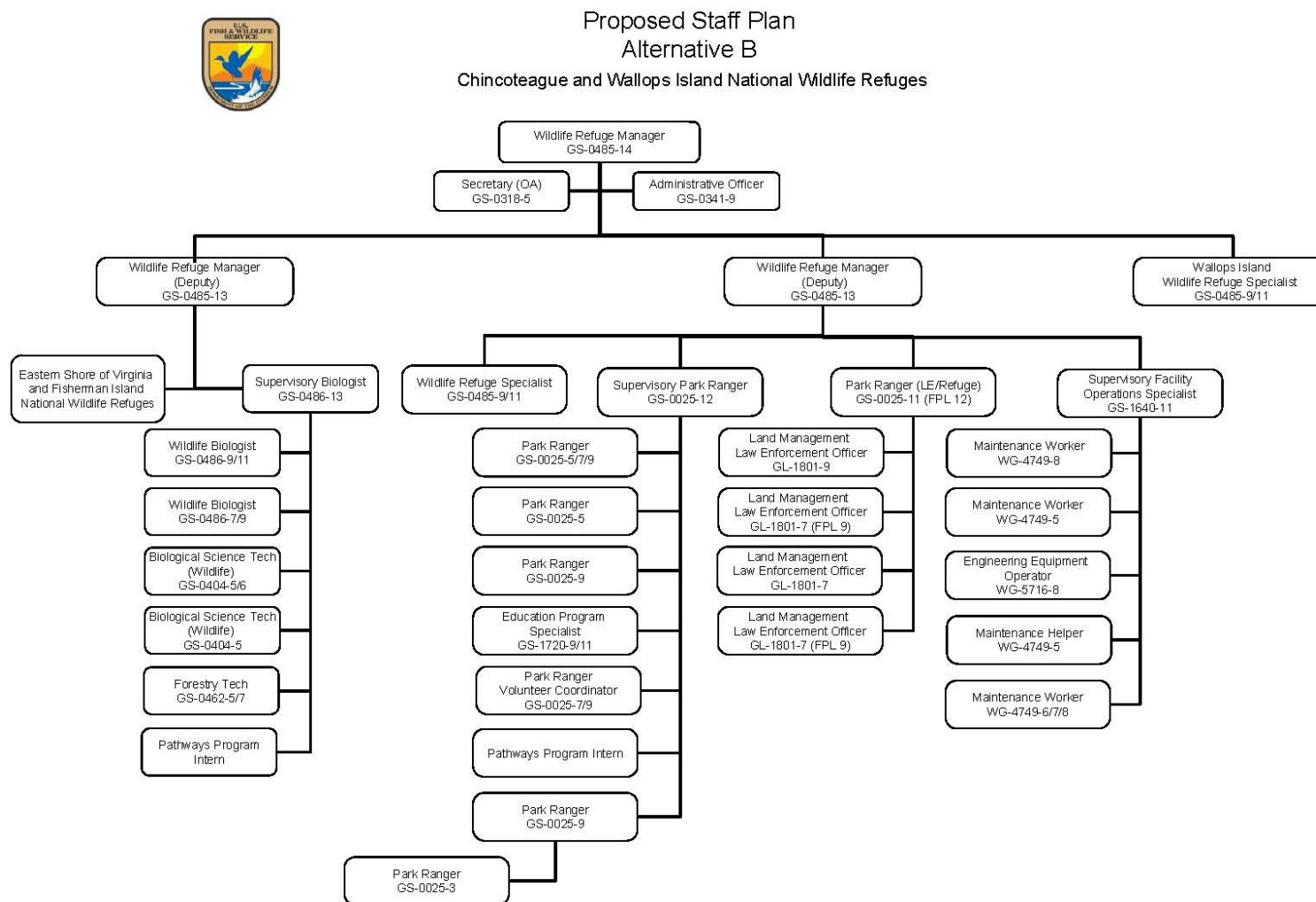
View of Refuge

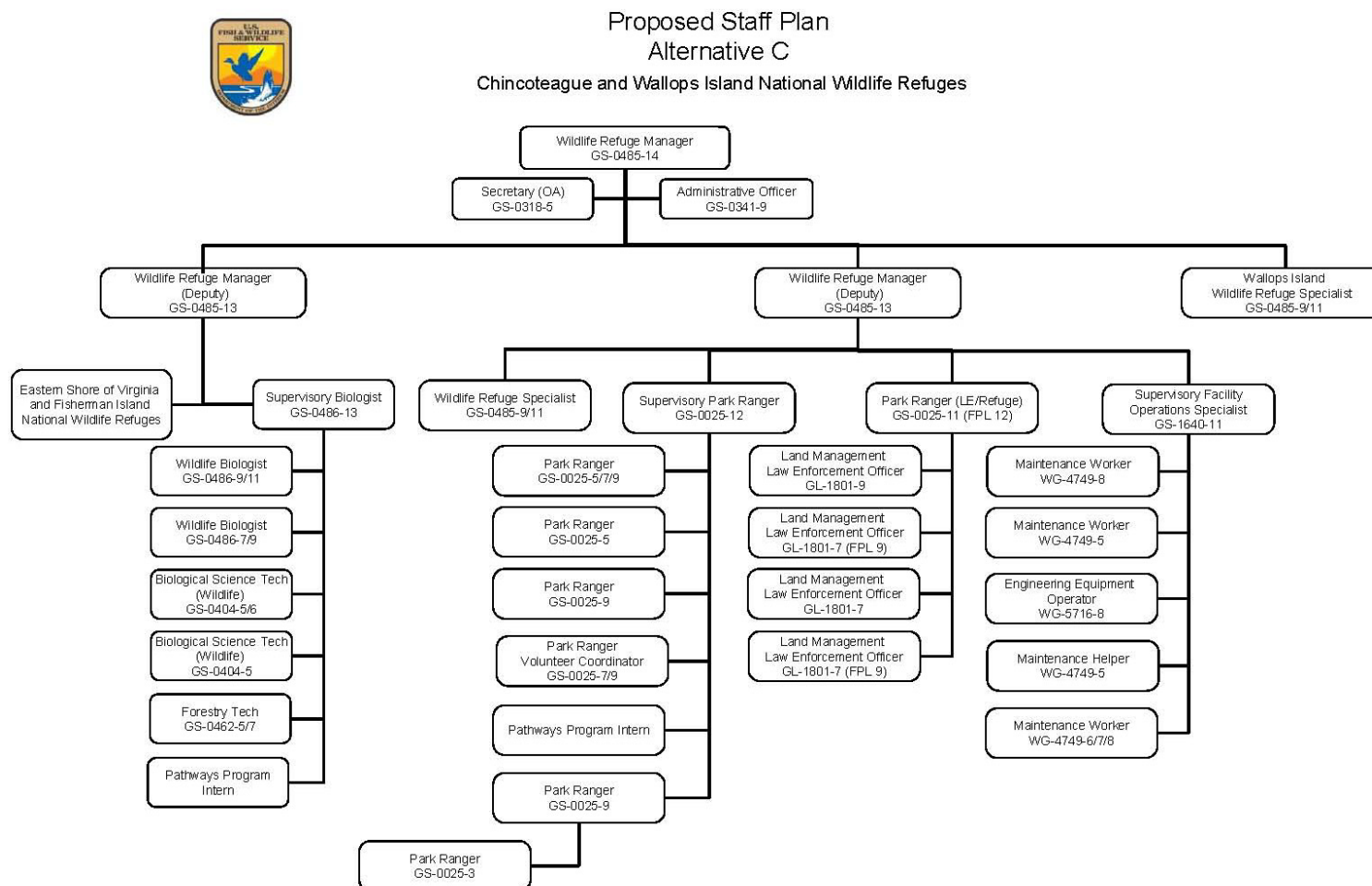
Staffing Charts for All Alternatives



**Proposed Staff Plan
Alternative A**
Chincoteague and Wallops Island National Wildlife Refuges







Appendix L

USFWS



Delmarva Fox Squirrel

Species Lists for Chincoteague and Wallops Island NWRs

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Table A: Species Reference List for CCP/EIS – Common and Scientific Names

Common Name	Scientific Name
FLORA	
American beach grass	<i>Ammophila breviligulata</i>
American holly	<i>Ilex opaca</i>
American sea rocket	<i>Cakile edentula</i>
American three-square	<i>Scirpus americanus</i>
autumn olive	<i>Elaeagnus umbellata</i>
Bacopa	<i>Bacopa monnieri</i>
Bidens, bur-marigold	<i>Bidens laevis</i>
black cherry	<i>Prunus serotina</i>
black gum	<i>Nyssa sylvatica</i>
black willow	<i>Salix nigra</i>
blackberry	<i>Rubus allegheniensis</i>
broom-sedge	<i>Andropogon virginicus</i>
carpetweed	<i>Mollugo verticillata</i>
cattails	<i>Typha angustifolia L.</i>
climbing fern	<i>Lygodium palmatum</i>
climbing hempweed	<i>Mikania scandens</i>
common chokecherry	<i>Prunus virginiana</i>
crested yellow orchid	<i>Platanthera cristata</i>
dead man's fingers	<i>Codium fragile</i>
devil's walkingstick	<i>Aralias spinosa</i>
dogwood	<i>Cornus florida</i>
dune sandbur	<i>Cenchrus tribuloides</i>
dwarf spike rush	<i>Eleocharis parvula</i>
false heather or beach-heath	<i>Hudsonia tomentosa</i>
fox grape	<i>Vitis labrusca</i>
greenbrier	<i>Smilax rotundifolia</i>
groundsel tree	<i>Baccharis halimifolia</i>
high-blueberry bush	<i>Vaccinium corymbosum</i>
horsemint	<i>Monarda punctata</i>
Indian pipe	<i>Monotropa uniflora</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Japanese sedge	<i>Carex kobomugi</i>
Japanese silkgrass	<i>Microstegium vimineum</i>
Japanese wisteria	<i>Wisteria floribunda</i>
jointweed	<i>Polygonella articulata</i>
loblolly pine	<i>Pinus taeda</i>
marsh elder	<i>Iva frutescens</i>
northern bayberry	<i>Myrica pensylvanica</i>
partridgeberry	<i>Mitchella repens</i>
Phragmites, common reed	<i>Phragmites australis</i>
poison ivy	<i>Toxicodendron radicans</i>
red cedar	<i>Juniperus virginiana</i>
red maple	<i>Acer rubrum</i>
red oak	<i>Quercus falcate</i>

rough buttonweed	<i>Diodia radula</i>
sago pondweed	<i>Potamogeton pectinatus</i>
salt marsh fleabane	<i>Pluchea odorata</i>
saltgrass	<i>Distichlis spicata</i>
saltmeadow cordgrass	<i>Spartina patens</i>
saltwort	<i>Salicornia europaea</i>
sassafras	<i>Sassafras albidum</i>
sea lavender	<i>Limonium carolinianum</i>
sea oats	<i>Uniola paniculata</i>
sea purslane	<i>Sesuvium maritimum</i>
seabeach evening primrose	<i>Oenothera humifusa</i>
seabeach orach	<i>Atriplex arenaria</i>
seabeach sandwort	<i>Honkenya peploides</i>
seaside goldenrod	<i>S. graminifolia</i>
seaside goldenrod	<i>S. tenuifolia</i>
seaside goldenrod	<i>Solidago sempervirens</i>
serviceberry	<i>Amelanchier canadensis</i>
smartweed	<i>Polygonum spp.</i>
smooth cordgrass	<i>Spartina alterniflora</i>
spicebrush	<i>Lindera benzoin</i>
spotted wintergreen	<i>Pyrol L.</i>
swamp rose	<i>Hibiscus palustris</i>
sweet gum	<i>Liquidambar styraciflua</i>
tulip poplar	<i>Liriodendron tulipifera</i>
umbrella grass	<i>Fuirena pumila</i>
water oak	<i>Quercus nigra</i>
wax myrtle	<i>Myrica cerifera</i>
white oak	<i>Quercus alba</i>
widgeon grass	<i>Ruppia maritima</i>
FUANA	
American black duck	<i>Anas rubripes</i>
American kestrel	<i>Falco sparverius</i>
American oystercatcher	<i>Haematopus palliatus</i>
American widgeon	<i>Anas americana</i>
American woodcock	<i>Scolopax minor</i>
Asian shorecrabs	<i>Hemigrapsus sanguineus</i>
Atlantic brant	<i>Branta bernicla</i>
bald eagle	<i>Haliaeetus leucocephalus</i>
beach vitex	<i>Vitex rotundifolia</i>
black skimmer	<i>Rynchops niger</i>
black vulture	<i>Coragyps atratus</i>
black-and-white warbler	<i>Mniotilta varia</i>
blackburnian warbler	<i>Dendroica fusca</i>
black-crowned night-heron	<i>Nycticorax nycticorax</i>
brown thrasher	<i>Toxostoma rufum</i>
brown-headed nuthatch	<i>Sitta pusilla</i>

bufflehead	<i>Bucephala albeola</i>
Canada geese	<i>Branta canadensis</i>
Canada warbler	<i>Wilsonia canadensis</i>
Carolina wren	<i>Thryothorus ludovicianus</i>
cattle egret	<i>Bubulcus ibis</i>
Chinese mitten crab	<i>Eriocheir sinensis</i>
common grackle	<i>Quiscalus quiscula</i>
common terns	<i>Sterna hirundo</i>
common yellowthroat	<i>Geothlypis trichas</i>
Delmarva Peninsula fox squirrel	<i>Sciurus niger cenerus</i>
dunlin	<i>Calidris alpina</i>
eastern kingbird	<i>Tyrannus tyrannus</i>
eastern towhee	<i>Pipilo erythrophthalmus</i>
eastern wood-pewee	<i>Contopus virens</i>
eelgrass	<i>Zostera marina</i>
field sparrow	<i>Spizella pusilla</i>
Forster's tern	<i>Sterna forsteri</i>
gadwall	<i>Anas strepera</i>
glossy ibis	<i>Plegadis falinellus</i>
gray catbird	<i>Dumetella carolinensis</i>
great black-backed gull	<i>Larus marinus</i>
great crested flycatcher	<i>Myiarchus crinitus</i>
great egret	<i>Casmerodius albus</i>
great horned owl	<i>Bubo virginianus</i>
green crab	<i>Carcinus maena</i>
green heron	<i>Butorides virescens</i>
green sea turtle	<i>Chelonia mydas</i>
green-winged teal	<i>Anas crecca</i>
herring gull	<i>Larus argentatus</i>
house wren	<i>Troglodytes aedon</i>
isopods	<i>Philosa</i>
laughing gull	<i>Larus atricilla</i>
little blue heron	<i>Egretta caerulea</i>
long-finned pilot whale	<i>Glovicephala melaena</i>
Louisiana waterthrush	<i>Parkesia motacilla</i>
mallards	<i>Anas platyrhynchos</i>
mink	<i>Mustela vison</i>
mole crab	<i>Emerita talpoida</i>
monarch butterfly	<i>Danaus plexippus</i>
northern bobwhite	<i>Colinus virginianus</i>
northern flicker	<i>Colaptes auratus</i>
northern pintail	<i>Anas acuta</i>
northern shoveler	<i>Anas clypeata</i>
nutria	<i>Myocastor coypus</i>
opossum	<i>Didelphis marsupialis</i>
osprey	<i>Pandion haliaetus</i>
oystercatchers	<i>Haematopus palliatus</i>
periwinkle	<i>Littorina</i> spp.

prairie warbler	<i>Dendroica discolor</i>
raccoon	<i>Procyon lotor</i>
red fox	<i>Vulpes vulpes</i>
red knot	<i>Calidris canutus rufa</i>
red-breasted merganser	<i>Mergus serrator</i>
red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
red-tailed hawk	<i>Buteo jamaicensis</i>
ring-billed gull	<i>Larus delawarensis</i>
ruddy duck	<i>Oxyura jamaicensis</i>
saltmarsh snail	<i>Melampus bidentata</i>
seabeach spurge	<i>Chamaesyce polygonifolia</i>
semipalmated sandpiper	<i>Calidris pusilla</i>
sika	<i>Cervus caballus</i>
short-billed dowitcher	<i>Limnodromus griseus</i>
snow geese	<i>Chen caerulescens</i>
snowy egret	<i>Egretta thula</i>
song sparrow	<i>Melospiza melodia</i>
southern leopard frog	<i>Rana utricularia</i>
tri-colored heron	<i>Egretta tricolor</i>
tundra swan	<i>Cygnus columbianus</i>
Virginia oyster	<i>Crassostrea virginica</i>
willet	<i>Tringa semipalmata</i>
worm-eating warbler	<i>Helminthos vermivorus</i>
yellow-breasted chat	<i>Icteria virens</i>
yellow-rumped warbler	<i>Dendroica coronata</i>

Table B: Bird Checklist for Chincoteague and Wallops Island National Wildlife Refuges

Common Name
LOONS – GREBES
Red-throated Loon
Common Loon
Pied-billed Grebe
Horned Grebe
Red-necked Grebe
Eared Grebe
SHEARWATERS - STORM-PETRELS
Cory's Shearwater
Greater Shearwater
Sooty Shearwater
Wilson's Storm-Petrel
GANNET - PELICANS - CORMORANTS
Northern Gannet
American White Pelican
Brown Pelican
Great Cormorant
Double-crested Cormorant
BITTERNS - HERONS - IBISES
American Bittern
Least Bittern
Great Blue Heron
Great Egret
Snowy Egret
Little Blue Heron
Tricolored Heron
Cattle Egret
Green Heron
Black-crowned Night-Heron
Yellow-crowned Night-Heron
White Ibis
Glossy Ibis
SWANS - GEESE - DUCKS
Tundra Swan
Mute Swan
Greater White-Fronted Goose
Greater Snow Goose

Atlantic Brant
Canada Goose
Wood Duck
Green-winged Teal
American Black Duck
Mallard
Northern Pintail
Blue-winged Teal
Northern Shoveler
Gadwall
Eurasian Wigeon
American Wigeon
Canvasback
Redhead
Ring-necked Duck
Greater Scaup
Lesser Scaup
Common Eider
Oldsquaw
Black Scoter
Surf Scoter
White-winged Scoter
Common Goldeneye
Bufflehead
Hooded Merganser
Common Merganser
Red-breasted Merganser
Ruddy Duck
VULTURES - HAWKS - FALCONS
Black Vulture
Turkey Vulture
Osprey
Bald Eagle
Northern Harrier
Sharp-shinned Hawk
Cooper's Hawk
Red-shouldered Hawk
Red-tailed Hawk
Rough-legged Hawk
American Kestrel
Merlin
Peregrine Falcon
GROUSE - QUAIL - TURKEY
Northern Bobwhite

RAILS - CRANES
Yellow Rail
Black Rail
Clapper Rail
King Rail
Virginia Rail
Sora
Purple Gallinule
Common Moorhen
American Coot
PLOVERS - SANDPIPERS
Black-bellied Plover
American Golden Plover
Wilson's Plover
Semipalmated Plover
Piping Plover
Killdeer
American Oystercatcher
Black-necked Stilt
American Avocet
Greater Yellowlegs
Lesser Yellowlegs
Solitary Sandpiper
Willet
Spotted Sandpiper
Upland Sandpiper
Whimbrel
Hudsonian Godwit
Marbled Godwit
Ruddy Turnstone
Red Knot
Sanderling
Semipalmated Sandpiper
Western Sandpiper
Least Sandpiper
White-rumped Sandpiper
Baird's Sandpiper
Pectoral Sandpiper
Dunlin
Curlew Sandpiper
Stilt Sandpiper
Buff-breasted Sandpiper
Ruff
Short-billed Dowitcher
Long-billed Dowitcher
Common Snipe

American Woodcock
Wilson's Phalarope
Red-necked Phalarope
JAEGERS - GULLS - TERNS - AUKS
Laughing Gull
Black-headed Gull
Bonaparte's Gull
Ring-billed Gull
Herring Gull
Lesser Black-backed Gull
Great Black-backed Gull
Gull-billed Tern
Caspian Tern
Royal Tern
Sandwich Tern
Roseate Tern
Common Tern
Arctic Tern
Forster's Tern
Least Tern
Black Tern
Black Skimmer
DOVES - CUCKOOS - OWLS - SWIFTS - HUMMINGBIRD
Rock Dove
Mourning Dove
Black-billed Cuckoo
Yellow-billed Cuckoo
Barn Owl
Eastern Screech-Owl
Great Horned Owl
Snowy Owl
Long-eared Owl
Short-eared Owl
Common Nighthawk
Chuck-will's-widow
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher
WOODPECKERS - FLYCATCHERS
Red-headed Woodpecker
Red-bellied Woodpecker
Yellow-bellied Sapsucker

Downy Woodpecker
Hairy Woodpecker
Northern Flicker
Pileated Woodpecker
Olive-sided Flycatcher
Eastern Wood-Pewee
Yellow-bellied Flycatcher
Acadian Flycatcher
Willow Flycatcher
Least Flycatcher
Eastern Phoebe
Great Crested Flycatcher
Western Kingbird
Eastern Kingbird
LARKS - SWALLOWS - JAYS - CROWS
Horned Lark
Purple Martin
Tree Swallow
Northern Rough-winged Swallow
Bank Swallow
Barn Swallow
Blue Jay
American Crow
Fish Crow
TITMICE - NUTHATCHES - WRENS
Carolina Chickadee
Tufted Titmouse
Red-breasted Nuthatch
White-breasted Nuthatch
Brown-headed Nuthatch
Brown Creeper
Carolina Wren
House Wren
Winter Wren
Sedge Wren
Marsh Wren
KINGLETS - THRUSHES - THRASHERS
Golden-crowned Kinglet
Ruby-crowned Kinglet
Blue-gray Gnatcatcher
Eastern Bluebird
Veery
Bicknell's Thrush

Swainson's Thrush
Hermit Thrush
Wood Thrush
American Robin
Gray Catbird
Northern Mockingbird
Brown Thrasher
WAXWINGS - SHRIKES - STARLING
American Pipit
Cedar Waxwing
European Starling
VIREOS - WOOD WARBLERS
White-eyed Vireo
Solitary Vireo
Yellow-throated Vireo
Warbling Vireo
Philadelphia Vireo
Red-eyed Vireo
Blue-winged Warbler
Golden-winged Warbler
Tennessee Warbler
Orange-crowned Warbler
Nashville Warbler
Northern Parula
Yellow Warbler
Chestnut-sided Warbler
Magnolia Warbler
Cape May Warbler
Black-throated Blue Warbler
Yellow-rumped Warbler
Black-throated Green Warbler
Blackburnian Warbler
Yellow-throated Warbler
Pine Warbler
Prairie Warbler
Palm Warbler
Bay-breasted Warbler
Blackpoll Warbler
Cerulean Warbler
Black-and-white Warbler
American Redstart
Prothonotary Warbler
Worm-eating Warbler
Swainson's Warbler
Ovenbird

Northern Waterthrush
Louisiana Waterthrush
Kentucky Warbler
Connecticut Warbler
Common Yellowthroat
Hooded Warbler
Wilson's Warbler
Canada Warbler
Yellow-breasted Chat
TANAGERS - SPARROWS
Summer Tanager
Scarlet Tanager
Northern Cardinal
Rose-breasted Grosbeak
Blue Grosbeak
Indigo Bunting
Dickcissel
Eastern Towhee
American Tree Sparrow
Chipping Sparrow
Clay-colored Sparrow
Field Sparrow
Vesper Sparrow
Lark Sparrow
Savannah Sparrow
Grasshopper Sparrow
Henslow's Sparrow
Saltmarsh Sharp-tailed Sparrow
Nelson's Sharp-tailed Sparrow
Seaside Sparrow
Fox Sparrow
Song Sparrow
Lincoln's Sparrow
Swamp Sparrow
White-throated Sparrow
White-crowned Sparrow
Dark-eyed Junco
Lapland Longspur
Snow Bunting
BLACKBIRDS - FINCHES
Bobolink
Red-winged Blackbird
Eastern Meadowlark
Yellow-headed Blackbird
Rusty Blackbird

Boat-tailed Grackle
Common Grackle
Brown-headed Cowbird
Orchard Oriole
Baltimore
Purple Finch
House Finch
Red Crossbill
Common Redpoll
Pine Siskin
American Goldfinch
Evening Grosbeak

Table C: Mammals – Working Species List Chincoteague and Wallops Island National Wildlife Refuges (USFWS refuge staff, National Parks Conservation Association 2007, USFWS 1992a and 1993a, USFWS 2007d)

Common Name	Scientific Name
TERRESTRIAL MAMMALS	
White-tailed Deer	<i>Odocoileus Virginianus</i>
* Sika Elk	<i>Cervus Caballus</i>
* Wild Ponies	<i>Equus Caballus</i>
* Delmarva Peninsula Fox Squirrel	<i>Sciurus Niger Cenerus</i>
* [Eastern Gray Squirrel]	<i>[Sciurus carolinensis]</i>
Muskrat	<i>Ondatra Zibethicus</i>
* Virginia Opossum	<i>Didelphis Virginiana</i>
Raccoon	<i>Procyon Lotor</i>
Red Fox	<i>Vulpes Vulpes</i>
River Otter	<i>Lutra Canadensis</i>
Eastern Cottontail	<i>Sylvilagus Floridanus</i>
Least Shrew	<i>Cryptotis parva</i>
Little Brown Bat	<i>Myotis Lucifugus</i>
Silver-haired Bat	<i>Lasionycteris Noctivagans</i>
Red Bat	<i>Lasiurus Borealis</i>
[Hoary Bat]	<i>[Lasiurus cinereus]</i>
Meadow Jumping Mouse	<i>Zapus Hudsonius</i>
* White-footed Mouse	<i>Peromyscus Leucopus</i>
[Deer Mouse]	<i>[Peromyscus maniculatus]</i>
House Mouse	<i>Mus Musculus</i>
* Meadow Vole	<i>Microtus Pennsylvanicus</i>
Rice Rat	<i>Oryzomys Palustris</i>
* Norway Rat	<i>Rattus norvegicus</i>
* Feral Cat	<i>Felis catus</i>
MARINE MAMMALS	
[West Indian Manatee]	<i>[Trichechus manatus]</i>
Gray Seal	<i>Halichoerus Gryphus</i>
Harbor Seal	<i>Phoca Vitulina</i>
Hooded Seal	<i>Cystophora Cristata</i>
Atlantic Harbor Porpoise	<i>Phocoena Phocoena</i>
Risso's Dolphin	<i>Grampus Griseus</i>
Bottlenose Dolphin	<i>Tursiops Truncatus</i>
Spotted Dolphin	<i>Stenella Plagiodon</i>
Rough-toothed Dolphin	<i>Steno Bredanensis</i>
Common Dolphin	<i>Delphinus Delphis</i>

Atlantic White-sided Dolphin	<i>Lagenorhynchus Acutus</i>
Long Finned Pilot Whale	<i>Globicephala melas</i>
True's Beaked Whale	<i>Mesoplodon Mirus</i>
Goosebeak Whale	<i>Ziphius Cavirostris</i>
Pygmy Sperm Whale	<i>Kogia Breviceps</i>
Sperm Whale	<i>Physeter catodon (=macrocephalus)</i>
Melon-headed Whale	<i>Peponocephala Electra</i>
Long-finned Pilot Whale	<i>Globicephala Melaena</i>
[Humpback Whale]	<i>[Megaptera Novaeangliae]</i>
Minke Whale	<i>Balaenoptera Acutorostrata</i>
Fin Back Whale	<i>Balaenoptera Physalus</i>
Sei Whale	<i>Balaenoptera Borealis</i>
Blue Whale	<i>Balaenoptera Musculus</i>
Northern Right (Black) Whale	<i>Balaena Glacialis</i>

Note – Species shown in brackets [] need confirmation

* Indicates a non-native species

Table D: Reptiles and Amphibians – Working Species List Chincoteague and Wallops Island National Wildlife Refuges (USFWS refuge staff, National Parks Conservation Association 2007, USFWS 1992a and 1993a, USFWS 2007d)

Species	Scientific Name
TOADS AND FROGS	
Fowler's toad	<i>Bufo woodhousii fowleri</i>
Green tree frog	<i>Hyla cinerea</i>
Bullfrog	<i>Rana catesbeiana</i>
New Jersey Chorus frog	<i>Pseudacris triseriata kalmi</i>
Green frog	<i>Rana clamitans melanota</i>
Southern Leopard frog	<i>Rana sphenoccephala</i>
[Gray tree frogs]	<i>[Hyla versicolor]</i>
SALAMANDERS	
Red back Salamander	<i>Plethodon cinereus</i>
SNAKES	
Northern Black racer	<i>Coluber constrictor constrictor</i>
Black rat snake	<i>Elaphe obsoleta obsoleta</i>
Eastern Hognose snake	<i>Heterodon platirhinos</i>
Rough Green Snake	<i>Opheodrys aestivus</i>
Northern Brown snake	<i>Storeria dekayi dekayi</i>
Northern Water snake	<i>Nerodia sipedon sipedon</i>
[Ringneck snake]	<i>[Diadophis punctatus]</i>
TURTLES	
Spotted Turtle	<i>Clemmys guttata</i>
Eastern Box turtle	<i>Terrapene carolina carolina</i>
Eastern Mud turtle	<i>Kinosternon subrubrum subrubrum</i>
Northern Diamondback Terrapin	<i>Malaclemys terrapin terrapin</i>
Eastern Painted turtle	<i>Chrysemys picta picta</i>
Red-bellied turtle	<i>Pseudemys rubriventris</i>
Common Snapping turtle	<i>Chelydra serpentina serpentina</i>
SEA TURTLES	
Loggerhead sea turtle	<i>Caretta caretta</i>
Atlantic Green turtle	<i>Chelonia mydas mydas</i>
Atlantic Ridley turtle	<i>Leidochelys Kempi</i>
Leatherback sea turtle	<i>Dermochelys coriacea</i>
Atlantic Hawksbill sea turtle	<i>Eretmochelys imbricata</i>
LIZARDS	
[Northern fence Lizard]	<i>[Sceloporus undulatus hyacinthinus]</i>
Five-lined skink	<i>Eumeces fasciatus</i>

Note – Species shown in brackets [] need confirmation

Amphibians and Reptiles Occurring on Chincoteague and Wallops Island NWR¹ (USFWS refuge staff)

Common Name	Scientific Name	Most Recent Documented Occurrence	Habitats and Habits
TURTLES			
Spotted turtle	<i>Clemmys guttata</i>	Toadvine 2000	Freshwater ponds, ditches & impoundments. Shrub, maritime forest & freshwater marshes. Omnivorous.
Eastern box turtle	<i>Terraepene carolina</i>	Toadvine 2000	Terrestrial in maritime forest, shrub, and dunegrass communities. Sometimes enter water. Omnivorous.
Eastern mud turtle	<i>Kinosternon subrubrum subrubrum</i>	Toadvine 2000	Freshwater ponds & impoundments; brackish pools & marshes. Seldom bask. Omnivorous.
Diamondback terrapin	<i>Malaclemys terrapin terrapin</i>	Toadvine 2000	Salt marsh, fresh marsh, creeks, ponds. Found on all barrier islands, where it lays eggs. Eats mollusks, crabs, marine worms, salt marsh plants.
Eastern painted turtle	<i>Chrysemys picta picta</i>	Toadvine 2000	Freshwater ponds & impoundments. Frequently bask on logs. Shrub & woodlands. Omnivorous.
Red-bellied turtle	<i>Pseudemys rubriventris</i>	Toadvine 2000	Freshwater ponds & impoundments. Shrub, woodland & fresh marshes. Primarily herbivorous.
Common snapping turtle	<i>Chelydra serpentina serpentina</i>	Toadvine 2000	Freshwater ponds & impoundments; brackish marshes. Occasionally bask, but mostly rest on bottom. Omnivorous
Loggerhead sea turtle	<i>Caretta caretta</i>	Most recent documented nest in 2012	Nests on barrier island beaches between high tide and dune line
SNAKES			
Northern black racer	<i>Coluber constrictor constrictor</i>	Toadvine 2000	Mostly in open dunegrass, shrub, or woodland community. Primarily feeds on rodents and frogs. Most abundant snake on Assateague
Eastern hognose snake	<i>Heterodon platirhinos</i>	Toadvine 2000	Found in sandy areas with sparse vegetation. Eats toads (mainly Fowler's on Assateague).
Black rat snake	<i>Elaphe obselea obselea</i>	Toadvine 2000	Hardwood forest or shrub/forest interface. Excellent climber; found in tree cavities. Eats small mammals & birds.

Rough green snake	<i>Opheodrys aestivus</i>	Toadvine 2000	Inhabit shrubs & low trees in all habitats on Assateague. Eats spiders and insects.
Northern brown snake	<i>Storeria dekayi dekayi</i>	Mitchell et al. 1993	Completely terrestrial; shrub and woodland habitats. Often under logs & stumps. Eats earthworms & insects.
Northern water snake	<i>Nerodia sipedon</i>	Toadvine 2000	In freshwater ponds & impoundments, or basking on logs on the water's edge. Eats amphibians and fish.
FROGS & TOADS			
Fowler's toad	<i>Bufo woodhousii fowleri</i>	Toadvine 2000; Anuran call counts 2003-2005 WINWR: Hranitz 2010	Inhabits all habitats on Assateague except open beach. Tolerates brackish water. Eats insects Fowler's Toads are a prey item to many species.
Green tree frog	<i>Hyla cinerea</i>	Toadvine 2000; Anuran call counts 2003-2005 WINWR: Hranitz 2010	Salt marsh & freshwater habitats; shrubs & woodland. Often found on tree branches. Eats insects & invertebrates.
Cope's gray tree frog	<i>Hyla chrysocelis</i>	WINWR: Hranitz 2010	In or near mixed deciduous-coniferous forests w/ ditches for breeding. Arboreal. Not on barrier islands.
Bullfrog	<i>Rana catesbeiana</i>	Toadvine 2000; Anuran call counts 2003-2005	Freshwater ponds and impoundments. Requires permanent water for breeding Feeds on small invertebrates.
Southern leopard frog	<i>Rana sphenoccephala</i>	Toadvine 2000; Anuran call counts 2003-2005	Inhabits most habitats on Assateague except open beach. Feeds on insects.
New Jersey chorus frog	<i>Pseudacris triseriata kalmi</i>	Lee 1972	Found only in NJ & Delmarva peninsula. 1 location record on Assateague (near lighthouse) in 1970s.
Green frog	<i>Rana clamitans melanota</i>	Conant et al. 1990 Wallops Island NWR: Hranitz 2010	Permanent bodies of freshwater, including impoundments. Not recorded on Assateague since 1990s.
SALAMANDERS			
Red-back salamander	<i>Plethodon cinereus</i>	Toadvine 2000; 2008 Refuge survey	Terrestrial in woodlands. Hides under debris such as fallen logs, and leaf litter. Feeds on small insects.

Table E: Aquatic Species – Working List Chincoteague and Wallops Island National Wildlife Refuges (USFWS refuge staff, National Parks Conservation Association 2007, USFWS 1992a and 1993a, USFWS 2007d)

Species	Scientific Name
MOLLUSKS AND CRUSTACEANS	
Atlantic bay scallop	<i>Aequipecten irradians</i>
Quahogs (hard shell clam)	<i>Mercenaria mercenaria</i>
Virginia Oyster	<i>Crassostrea virginica</i>
Ribbed mussel	<i>Guekensia demissa</i>
Blue crab	<i>Callinectes sapidus</i>
Ghost crab	<i>Ocypode quadrata</i>
Horseshoe crab	<i>Limulus polyphemus</i>
Fiddler Crab	<i>Uca</i> spp.
Mud Snail	<i>Nassarius</i> spp.
FINFISH (IMPOUNDMENTS)	
Sheepshead minnow	<i>Cyprinodon variegatus</i>
Rainwater killifish	<i>Luncania parva</i>
Striped killifish	<i>Fundulus majalis</i>
Mummichog	<i>Fundulus heteroclitus</i>
Banded killifish	<i>Fundulus diaphanous</i>
Tidewater silverside	<i>Menidia beryllina</i>
Threespine stickle-back	<i>Gasterosteus aculeatus</i>
Fourspine stickle-back	<i>Apeltes quadracus</i>
White perch	<i>Morone americana</i>
Yellow perch	<i>Perca flavescens</i>
American eel	<i>Anguilla rostrata</i>
FINFISH (MARINE WATERS)	
Black drum	<i>Pogonias cromis</i>
Red drum or channel bass	<i>Sciaenops ocellatus</i>
Bluefish	<i>Pomatomus saltatrix</i>
Winter flounder	<i>Pseudopleuronectes americanus</i>
Summer flounder	<i>Paralichthys dentatus</i>
Menhaden	<i>Brevoortia tyrannus</i>
Spot	<i>Leiostomus xanthurus</i>
Atlantic croaker	<i>Micropogonias undulatus</i>
Weakfish	<i>Cynoscion regalis</i>
Mullet	<i>Mugil</i> spp.
Spotted sea trout	<i>Cynoscion nebulosus</i>
Puffer	<i>Sphoeroides maculatus</i>
Rockfish	<i>Sebastes</i> spp.
Spotfin killifish,	<i>Fundulus luciae</i>

King fish	<i>Scomberomorus commerson</i>
Sand tiger shark	<i>Odontaspis taurus</i>
Bay anchovy	<i>Anchoa mitchilli</i>
Atlantic silverside	<i>Menidia menidia</i>

Table F: Threatened and Endangered Fauna and Flora in the Chincoteague and Wallops Island NWR's vicinity (Maryland Department of Natural Resources 2005 and n.d.a, Virginia Department of Conservation and Recreation n.d.)

Scientific Name	Common Name	MD Status	VA Status	Federal Status
FAUNA				
BIRDS				
<i>Charadrius melodus</i>	Piping Plover	Endangered	Threatened	Threatened
<i>Charadrius wilsonia</i>	Wilson's Plover	Endangered	Endangered	
<i>Falco peregrinus</i>	Peregrine Falcon		Threatened	
<i>Gelochelidon nilotica</i>	Gull-billed Tern	Endangered	Threatened	
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Threatened	Threatened	
<i>Sterna antillarum</i>	Least Tern	Threatened	Special Concern	
MAMMALS				
<i>Balaena Glacialis</i>	Northern Right (Black) Whale	Endangered	Endangered	Endangered
<i>Balaenoptera Borealis</i>	Sei Whale	Endangered	Endangered	Endangered
<i>Balaenoptera Musculus</i>	Blue Whale	Endangered	Endangered	Endangered
<i>Balaenoptera Physalus</i>	Fin Back Whale	Endangered	Endangered	Endangered
<i>Megaptera Novaeangliae</i>	Humpback Whale	Endangered	Endangered	Endangered
<i>Physeter catodon</i> (=macrocephalus)	Sperm Whale	Endangered	Endangered	Endangered
<i>Sciurus niger cinereus</i>	Delmarva Fox Squirrel	Endangered	Endangered	Endangered
<i>Trichechus manatus</i>	West Indian Manatee		Endangered	Endangered
REPTILES				
<i>Caretta caretta</i>	Loggerhead Sea Turtle	Threatened	Threatened	Threatened
<i>Chelonia mydas</i>	Atlantic Green Turtle	Threatened	Threatened	Threatened
<i>Dermochelys coriacea</i>	Atlantic Leatherback Turtle	Endangered	Endangered	Endangered
<i>Eretmochelys imbricate</i>	Atlantic Hawksbill	Endangered	Endangered	Endangered
<i>Lepidochelys kempii</i>	Atlantic Ridley Turtle	Endangered	Endangered	Endangered
INSECTS				
<i>[Cicindela dorsalis dorsalis]</i>	[Northeastern Beach Tiger Beetle]		Threatened	Threatened
<i>Cicindela dorsalis media</i>	White Tiger Beetle	Endangered		
<i>Cicindela lepida</i>	Little White (Ghost) Tiger Beetle	Endangered		
FLORA				

Vascular Plants				
<i>Amaranthus pumilus</i>	Seabeach Amaranth	Endangered	Threatened	Threatened
<i>Carex silicea</i>	Sea-beach Sedge	Endangered		
<i>Gymnopogon brevifolius</i>	Broad-leaved Beardgrass	Endangered		
<i>Polygonum glaucum</i>	Seaside Knotweed	Endangered		
<i>Prunus maritime</i>	Beach Plum	Endangered		
<i>Scleria verticillata</i>	Whorled Nutrush	Endangered		

Table G: Potential Resources of Concern Table. Chincoteague & Wallops Island NWRs, Jan 2011
(USFWS refuge staff)

Species	Seasons on Refuge ¹	Federal T&E for VA ²	State T&E ³
WATERBIRDS			
American bittern	YR		
Black skimmer	B		
Black tern	M		
Black-headed gull	M		
Black-crowned night heron	YR		
Caspian tern	M		
Clapper rail	B		
Common tern	B/YR		
Forster's tern	B		
Glossy ibis	YR		
Green heron	B		
Gull-billed tern	B		T
Herring gull	YR		
Horned grebe	W/M		
Least bittern	B		
Least tern	B		
Little blue heron	YR		
Northern gannet	M		
Red-throated loon	W/M		
Roseate tern	M	E	E
Royal tern	YR		
Snowy egret	YR		
Sora	M		
Tricolored heron	YR		
Virginia rail	B/YR		
Yellow rail	M		
Yellow-crowned night heron	YR		
WATERFOWL			
American black duck	B/YR		
American wigeon	W/M		
Atlantic brant	W/M		
Black scoter	W/M		
Blue-winged teal	B/YR		
Bufflehead	W/M		
Canada goose – Atlantic Population			
Canada goose – North Atlantic			
Canvasback	W/M		

Common eider	W/M		
Common goldeneye	W/M		
Gadwall	N/YR		
Greater scaup	W/M		
Greater snow goose	W/M		
Green-winged teal	W/M		
Hooded merganser	W/M		
Lesser scaup	W/M		
Long-tailed duck	W/M		
Mallard	B/YR		
Northern pintail	W/M		
Red-breasted merganser	W/M		
Redhead	W/M		
Ruddy duck	W/M		
Surf scoter	W/M		
Tundra swan – Eastern	W/M		
White-winged scoter	W/M		
Wood duck – Eastern	B/YR		
SHOREBIRDS			
American avocet	M		
American golden plover	M		
American oystercatcher	B/YR		
American woodcock	B/YR		
Baird's sandpiper	M		
Black-bellied plover	YR		
Buff-breasted sandpiper	M		
Dunlin	M/W		
Greater yellowlegs	YR		
Hudsonian godwit	M		
Killdeer	B/YR		
Least sandpiper	YR		
Lesser yellowlegs	YR		
Long-billed dowitcher	M/W		
Marbled godwit	M		
Pectoral sandpiper	M		
Piping Plover	B/M	T	T
Red knot	M	C	
Red-necked phalarope	M		
Ruddy turnstone	M/W		
Sanderling	M/W		
Semipalmated plover	M		
Semipalmated sandpiper	M		
Short-billed dowitcher	M/W		
Solitary sandpiper	M		
Spotted sandpiper	M		
Stilt sandpiper	M		
Upland sandpiper	M		T

Western sandpiper	M/W		
Whimbrel	M/W		
White-rumped sandpiper	M		
Willet	B/YR		
Wilson's phalarope	M		
Wilson's plover	B/M		E
Wilson's snipe	YR		
LANDBIRDS			
Bald eagle	YR/B		T
Baltimore oriole	M		
Barn owl	YR		
Black-and-white warbler	M		
Blue-winged warbler	M		
Broad-winged hawk	M		
Brown creeper	W/M		
Brown thrasher	B/YR		
Brown-headed nuthatch	B/YR		
Canada warbler	M		
Chimney swift	B		
Chuck-will's-widow	B		
Eastern kingbird	B		
Eastern meadowlark	B		
Eastern towhee	B/YR		
Eastern wood-pewee	B		
Field sparrow	B/YR		
Grasshopper sparrow	B		
Gray catbird	B/YR		
Great crested flycatcher	B		
Ipswich savannah sparrow	W		
Louisiana waterthrush	M		
Marsh wren			
Nelson's sparrow	W		
Northern bobwhite	B/YR		
Northern flicker	B/YR		
Northern harrier	B/YR		
Northern parula	M		
Northern rough-winged swallow	M		
Northern saw-whet owl	W		
Ovenbird	B		
Peregrine falcon	YR		T
Prairie warbler	B		
Red crossbill	W		
Red-headed woodpecker	B/M		
Rose-breasted grosbeak	M		
Rusty blackbird	W		

Saltmarsh sparrow	B/YR		
Scarlet tanager	M		
Seaside Sparrow	B/YR		
Sedge wren	W/M		
Short-eared owl	W		
Willow flycatcher	M		
Wood thrush	M		
Worm-eating warbler	M		
Yellow warbler	B		
Yellow-billed cuckoo	B		
Yellow-breasted chat	B/YR		
Yellow-throated vireo	M		
MAMMALS			
Delmarva fox squirrel	YR	E	E
AMPHIBIANS			
Eastern spadefoot toad			
Eastern tiger salamander			E
New Jersey chorus frog			
REPTILES			
Eastern box turtle	YR		
Eastern hognose snake	YR		
Green sea turtle		T	
Hawksbill sea turtle		E	
Kemp's ridley sea turtle		E	
Leatherback sea turtle		E	E
Loggerhead sea turtle	B	T	T
Northern diamondback terrapin	YR		
Spotted turtle	YR		
FISH			
Alewife			
American eel			
American shad			
INVERTEBRATES			
Monarch butterfly	M/B		
PLANTS			
Brown-fruited rush	YR		
Few-flowered beakrush	YR		
Seabeach amaranth	YR	T	

Southern bladderwort	YR		
Ten-angle pipewort	YR		
White beakrush	YR		
White-topped fleabane	YR		

1 Seasons on the Refuge: B = Breeding; M = Migrant; W = Winter; YR = Year-Round

2 USFWS: Threatened and Endangered Species System (TESS). Report for the Commonwealth of Virginia.

T = threatened; E = endangered

3 Virginia Comprehensive Wildlife Conservation Strategy. 2005. Data from the Excel file developed by the Federal Aid office of USFWS, Hadley, MA. Sept. 2006

E = endangered; T = threatened

Does not include state listed plants.

Table H: Fish Species Collected from Refuge Fish Surveys (USFWS 1997 and Mangold and Eyler 2006)

Common Name	Scientific Name	1996 Survey	2005/06 Survey
Alewife*	<i>Alosa pseudoharengus</i>	X	
American eel*	<i>Anguillia rostrata</i>	X	X
Atlantic menhaden	<i>Brevoortia tyrannus</i>	X	X
Atlantic needlefish	<i>Stronglura manna</i>	X	X
Atlantic silverside	<i>Menidia menidia</i>	X	X
Bay anchovy	<i>Anchoa mitchilli</i>	X	X
Black drum	<i>Pogonias cromis</i>	X	
Black seabass	<i>Centropristis stiata</i>	X	X
Bluefish	<i>Pomatomus saltatrix</i>	X	
Green goby	<i>Microgobius thalassinus</i>		X
Inland silverside	<i>Minidia beryllina</i>		X
Marsh killifish	<i>Fundulus confluentus</i>	X	
Ladyfish	<i>Elops saurus</i>	X	
Mosquitofish	<i>Gambusia affinis</i>		X
Mummichog	<i>Fundulus heteroclitus</i>	X	X
Northern puffer	<i>Sphoeroides maculatus</i>	X	
Northern kingfish	<i>Menticirrhus saxatilis</i>	X	X
Oyster toadfish	<i>Opsanus tau</i>	X	X
Permit	<i>Chilomycterus schoepfi</i>	X	
Pigfish	<i>Orthopristis chrysoptera</i>	X	X
Rainwater killifish	<i>Lucania parva</i>	X	X
Reef butterflyfish	<i>Cheatodon sedentarius</i>		X
Sheepshead minnow	<i>Cyprinodon variegatus</i>	X	X
Silver jenny	<i>Eucinostomus gula</i>	X	
Silver perch	<i>Bairdiella chrysoura</i>	X	X
Skilletfish	<i>Gobiosox strumosus</i>	X	
Small mouth flounder	<i>Etropus cyclosquamus</i>	X	
Spiny butterfly ray	<i>Gymnura altavela</i>	X	
Spot	<i>Leiostomus xanthurus</i>	X	X
Striped Anchovy	<i>Anchoa hepsetus</i>	X	
Striped blenny	<i>Meiacanthus glammistes</i>	X	X
Striped burrfish	<i>Chilomycterus schoepfi</i>	X	X
Striped killifish	<i>Fundulus majalis</i>	X	X
Striped mullet	<i>Mugil cephalus</i>	X	
Summer flounder	<i>Paralichthys dentatus</i>	X	
Tautog	<i>Tautoga onitis</i>	X	
Weakfish	<i>Cynoscion regalis</i>	X	
White mullet	<i>Mugil curema</i>	X	X
White perch	<i>Morone americana</i>	X	X
Winter flounder	<i>Pleuronectes americanus</i>	X	

X in column indicates the species was encountered during that survey

* Alewife & American Eel are State Conservation Priorities and Federal Trust Species

Table I: Top Twenty Most Abundant Bird Species: Chincoteague NWR Landbird Surveys Listed in relative order of abundance (USFWS refuge staff, Chincoteague NWR 1996, Ailes and Ailes 2007, Roberts 2008)

Order of Abundance	BBS Route 1996-2006 Myrtle Shrub	BBS Route 1996-2006 Loblolly Forest	Mist Net Study 1999-2007 All Sites
1	Common yellowthroat*	House wren***	Yellow-rumped warbler
2	Eastern towhee**	Eastern wood-peewee	#Gray catbird*
3	#Field sparrow***	Pine warbler	Common yellowthroat*
4	#Northern bobwhite**	#Eastern towhee**	White-throated sparrow
5	Song sparrow***	Northern cardinal*	Song sparrow***
6	Red-winged blackbird**	#Gray catbird*	House wren***
7	Yellow warbler	#Northern bobwhite**	Northern cardinal*
8	Yellow-breasted chat***	American robin	Swamp sparrow
9	#Gray catbird*	Carolina wren***	Common grackle*
10	Boat-tailed grackle	#Great-crested flycatcher	Carolina wren***
11	Eastern kingbird	Common grackle*	Golden-crowned kinglet
12	Common grackle*	American crow	#Field sparrow***
13	#Brown thrasher**	Common yellowthroat*	Western palm warbler
14	Brown-headed cowbird**	Red-winged blackbird**	Slate-colored junco
15	Eastern meadowlark	Brown-headed cowbird**	Yellow-breasted chat***
16	Yellow-billed cuckoo	#Brown thrasher**	Ruby-crowned kinglet
17	Fish Crow	Mourning dove	American redstart
18	Northern cardinal*	#Yellow-shafted flicker	White-eyed vireo
19	#Prairie warbler	#Brown-headed nuthatch	Magnolia warbler
20	Tree Swallow	Ovenbird	Carolina chickadee

#Listed as a Bird of Conservation Concern in BCR 30 (New England/Mid-Atlantic Coast)

*Top 20 most abundant on all three studies

**Top 20 most abundant on two BBS routes

***Top 20 most abundant on one BBS route and Robert's Mist Net Study (Roberts 2009)

Appendix M

USFWS



Egret at Nightfall

Chincoteague National Wildlife Refuge Economic Analysis in Support of Comprehensive Conservation Plan

Division of Economics

US Fish and Wildlife Service

January 2013

Public Review Draft

Chincoteague National Wildlife Refuge

Economic Analysis

In Support of Comprehensive Conservation Plan

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1.0 Introduction

The National Wildlife Refuge System Improvement Act of 1997 requires all units of the National Wildlife Refuge System to be managed under a Comprehensive Conservation Plan (CCP). The CCP must describe the desired future conditions of a refuge and provide long-range guidance and management direction to achieve refuge purposes. The U.S. Fish and Wildlife Service is in the process of developing a range of management goals, objectives, and strategies for the Chincoteague and NASA Wallops Island National Wildlife Refuges CCP. The CCP for the refuge must contain an analysis of expected effects associated with current and proposed refuge management strategies.

Chincoteague NWR (CNWR) was established on May 13, 1943 through acquisition of 8,808 acres under authority of the Migratory Bird Conservation Act. The Assistant Secretary of the Interior determined that FWS ownership of this land was necessary for protection during nesting and migration seasons of all those species of wildlife determined as being of great value as a source of food, or in destroying of injurious insects, or nevertheless in danger of extermination through lack of adequate protection (U.S. District Court 1943). The Migratory Bird Conservation Commission (MBCC) initially approved the Refuge at a meeting on March 25, 1941, acknowledging the importance of Assateague Island important wintering habitat for migrating greater snow goose, and nesting habitat for black ducks, shorebirds, and migratory birds (MBCC 1941). At that time they also approved acquisition of Jerico and Hebron Islands, two small marshes adjacent to Assateague Island, just north of the Virginia boundary in Maryland.

Since 1943, numerous tracts of land have been added to CNWR. All lands have been purchased with money from either the Migratory Bird Conservation Fund or the Land and Water Conservation Fund. Federal title of these lands is acquired to the mean low water line. In 1990 Assawoman and portions of Metompkin Island (1,608.5 acres total) were purchased with Land and Water Conservation Funds, which come from royalties on off-shore oil drilling.

Refuge purposes are taken from enabling legislation and acquisition authorities for a particular refuge and from Congressional legislation affecting the refuge system as a whole. CNWR purposes include: preserving and enhancing endangered species; protecting and enhancing habitat for migratory and non-migratory species; maintaining indigenous species; and, providing opportunities for wildlife-dependent recreation (CNWR 1993). The Service database (<http://refugedata.fws.gov/databases/purposes>) lists the following Refuge Purposes for CNWR:

“... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. 715d) (Migratory Bird Conservation Act).

“...suitable for B (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species...(16 U.S.C. 460k-1) “...the Secretary ... may accept and use real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ...” (16 U.S.C. 460k-2) Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended.

“... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ...”(16 U.S.C. 3901(b), 100 Stat. 3583 Emergency Wetlands Resources Act of 1986)

“... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...” (16 U.S.C. 742f(a)(4) “... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ...”(16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." (7 U.S.C. 2002 (Consolidated Farm and Rural Development Act)

In 1997, Congress passed the landmark National Wildlife Refuge System Improvement Act (NWRSIA) establishing a unifying mission and a wildlife-first mandate for the Refuge System. The NWRSIA affirmed that: refuges are anchors for biodiversity and ecosystem-level conservation; lands and waters of the System are biologically healthy; and refuge lands reflect national and international leadership in habitat management and wildlife conservation.

The NWRSIA also declares that all existing and proposed public uses must be compatible with each refuge's purposes, and highlights six priority public uses that each Refuge should evaluate for compatibility. These are wildlife observation, photography, interpretation, environmental education, hunting and fishing. Recreational activities allowed on CNWR are also influenced by portions of Assateague Island being within the Assateague Island National Seashore (ASIS).

Recreational use and related development on Assateague Island were authorized under Public Law 85 57, Chincoteague National Wildlife Refuge, Virginia – Bridge and Road, approved on June 17, 1957, that provided for construction of a bridge and road to the Refuge beach as well as recreational facilities “to permit the controlled development of a portion of the seashore of the Chincoteague National Wildlife Refuge, Virginia for recreational purposes.” These “easements and other rights” are subject to “such terms and conditions as the Secretary deems appropriate for the adequate protection of the wildlife refuge and other interests of United States.”

The 1962 Refuge Recreation Act (16U.S.C. 460K – 460K – 4) expanded the purpose of all refuges to include “... (1) incidental fish and wildlife-oriented recreation development, (2) the protection of natural resources, (3) the conservation of endangered species and threatened species...”

On September 21, 1965, the Assateague Island Seashore Act authorized establishment of the Assateague Island National Seashore (ASIS). The ASIS encompasses the Maryland side of Assateague Island and certain beach portions of the Virginia side of Assateague Island. The Act provided that the National Park Service (NPS) manage the Virginia portion for general purposes of public outdoor recreation with the qualification that land and water within the Refuge be administered for purposes under laws and regulations applicable to national wildlife refuges, including administration for public recreation use in accordance with the provisions of the Refuge Recreation Act (P.L. 87-714 (USFWS 1993).

NASA Wallops Island National Wildlife Refuge (WINWR) was created on July 10, 1975 with the transfer of 373 acres of land to the Service from the National Aeronautics and Space Administration (NASA/Goddard Space Flight Center/Wallops Flight Facility). NASA Wallops Island NWR is located entirely in Accomack County, Virginia. The primary purpose for this land transfer was for wildlife conservation and the “ . . . particular value in carrying out the national migratory bird management program.” (16 U.S.C. 667b-667d).

The Chincoteague NWR is open to the public for recreational uses centered around wildlife and wildland activities. Access to the Refuge is primarily through the town of Chincoteague, which has become a town

whose economy is increasingly dependent on the tourism dollars brought into their community by Refuge visitors.

The purpose of this analysis is to provide a better understanding of the economic relationship between the Refuge and the community. For CCP planning, a regional economic assessment provides a means of estimating how current management (no action alternative) and proposed management activities (alternatives) could affect the local economy. This type of analysis provides two critical pieces of information. First it illustrates a refuge's contribution to the local community. Second, it can help in determining whether local economic effects are or are not a real concern in choosing among management alternatives.

This report is organized as follows: (1) a general summary of demographic characteristics of Accomack County and the Town of Chincoteague (Chincoteague); (2) a discussion of the economic characteristics of Accomack County and Chincoteague, with the focus on Chincoteague; (3) a discussion of Chincoteague National Wildlife Refuge visitation and the associated economic impacts; (4) estimates of how the economies of Chincoteague and Accomack County are impacted by Refuge visitors; and (5) an estimate of the economic impacts to the local and regional area of Refuge budget expenditures.

1.1 Refuge Profile

The original purpose for the establishment of Chincoteague NWR was "...for use as an inviolate sanctuary or for any other management purpose, for migratory birds" (16 U.S.C. § 715d, Migratory Bird Conservation Act), especially migrating and wintering waterfowl. Approximately 2,600 acres of fresh and brackish water impoundments on Chincoteague NWR have been created and managed for migrating and wintering waterfowl and other migratory birds. Chincoteague NWR also provides and manages habitat for the American black ducks, as part of a long-term effort, in compliance with the North American Waterfowl Management Plan, to reverse significant drops in this species' populations. These efforts also benefit other wildlife, especially shore and wading birds.

Today, wildlife management strategies at Chincoteague NWR continue to provide quality habitat for migrating and wintering waterfowl but also include a greater variety of wildlife, such as wading birds, shorebirds, and neotropical migrants. For example, Chincoteague NWR supports breeding populations of the endangered Delmarva fox squirrel and the threatened piping plover. The American peregrine falcon (a recently delisted threatened and endangered species) is seen quite frequently during its annual autumn migration. Additionally, the Atlantic loggerhead sea turtle is a threatened species that nests occasionally on Chincoteague NWR. Refuge management programs are targeted to provide feeding and resting areas for birds in migration, and nesting and brood-rearing habitat for those birds that find Chincoteague NWR suitable for reproduction. To this end, Chincoteague NWR continues efforts toward acquiring land and water for increased conservation of migratory bird resources and to protect important wildlife habitat from the impacts of development.

Chincoteague NWR has been designated as a Globally Important Bird Area by the American Bird Conservancy, designated as one of the top ten birding Hotspots by the National Audubon Society, and a Site of International Importance within the Western Hemisphere Shorebird Reserve Network, a conservation partnership of stewards and landowners led by the Manomet Center for Conservation Sciences. This coastal barrier island/lagoon system has been designated a World Biosphere Reserve by the United Nations Educational, Scientific, and Cultural Organization in recognition of its great

ecological value. Moreover, the Department of the Interior designated the area a National Natural Landmark in recognition of its outstanding natural values.

Chincoteague NWR is also an important recreational destination, particularly for people living in the Washington D.C., Baltimore, Philadelphia, and New York City areas. With approximately 1.25 million visits annually, Chincoteague NWR is one of the most visited refuges in the United States, providing visitors with the six wildlife-dependent recreation opportunities (hunting, fishing, wildlife observation and photography, environmental education and interpretation), as well as other public uses that have been deemed appropriate and compatible, including a recreational beach, which is managed by the NPS under an agreement with USFWS. Visitation to Chincoteague NWR supports the tourism economy of the Town of Chincoteague, which is the refuge's gateway community and is located on Chincoteague Island, and through which visitors must travel to access Chincoteague NWR.

A bridge spanning Assateague Channel separates Refuge headquarters from the Town of Chincoteague. Chincoteague, the largest community in Accomack County (population 33,164), had approximately 2,941 permanent residents in 2009 (Chincoteague 2009). Numerous small rural communities and towns surround the Refuge. The Refuge headquarters and visitor center are located about two miles from the Chincoteague town center.

The Refuge has a single entry point for vehicle traffic, which is accessed via the Town of Chincoteague. Visitors come to the Refuge to participate in a variety of activities including wildlife watching, surf fishing, and general beach recreation. The Refuge is well known for its wild pony population, popularized by the bestselling children's book, Misty of Chincoteague by Marguerite Henry first published in 1947. This book popularized the annual roundup of the Assateague Island ponies that are located on the Refuge. These animals are herded to the Assateague Channel where they then swim across to Chincoteague Island where the foals are then auctioned off to benefit the Chincoteague Volunteer Fire Company. The event attracts tens of thousands of tourists every year to witness the pony swim.

The first European explorer to record landing in the Assateague Island vicinity was Giovanni da Verrazano, sailing for the King of France in 1524 (Bearss, 1968). During the next one-hundred years, many explorers investigated the area but colonists preferred the better soils and protected environments of the mainland. In the mid-1600's Chincoteague and Assateague Islands were used to graze livestock by landowners wanting to avoid fencing ordinances on the mainland. Camps for livestock herders were established (Bearss, 1968 and Wroten, 1972); salt extraction and shell-fishing brought more seasonal inhabitants. These activities remain currently popular on the Refuge.

Chincoteague NWR (CNWR) was established on May 13, 1943 through acquisition of 8,808 acres under authority of the Migratory Bird Conservation Act. The Assistant Secretary of the Interior determined that FWS ownership of this land was necessary for protection during nesting and migration seasons of all those species of wildlife determined as being of great value as a source of food, or in destroying of injurious insects, or nevertheless in danger of extermination through lack of adequate protection (U.S. District Court 1943). The Migratory Bird Conservation Commission (MBCC) initially approved the Refuge at a meeting on March 25, 1941, acknowledging the importance of Assateague Island important wintering habitat for migrating greater snow goose, and nesting habitat for black ducks, shorebirds, and migratory birds (MBCC 1941). At that time they also approved acquisition of Jerico and Hebron Islands, two small marshes adjacent to Assateague Island, just north of the Virginia boundary in Maryland.

Today, the Refuge is well known for its population of wild ponies. The Chincoteague ponies are most likely descendants of colonial horses brought to Assateague Island in the 17th century by Eastern Shore planters (AINS, 1986 and Bearss, 1968) when crop damage caused by free roaming animals led colonial legislatures to enact laws requiring fencing and taxes on livestock (AINS, no date). The modern day descendants of those domestic horses are wild and have adapted to their environment. Today, the ponies found on the Refuge are owned by the Chincoteague Volunteer Fire Company (CVFC). The Refuge permits the CVFC to graze their ponies within two designated areas on the Refuge. Following tradition, the Fire Company rounds up the entire herd (approximately 150 adult ponies plus foals) for the Annual Pony Penning and Auction held on the last Wednesday and Thursday of July; all foals and yearlings are sold at auction to benefit the town's ambulance and fire services.

2.0. Socio-Demographics of Accomack County and Chincoteague

This section provides an overview of basic socio-demographic information for the Town of Chincoteague as well as for Accomack County, the State of Virginia, and the United States for comparative purposes. This information is being provided so that both current and future refuge managers and workers who base decisions on this CCP will have a better appreciation for the nearby communities that surround the refuge. This information should help the refuge better understand how their management decisions may impact Town residents and their livelihood. This information may also help Refuge management better communicate to local officials and residents rationales behind their decisions.

In October 2011, the U.S. Fish and Wildlife Service released “Conserving the Future, Wildlife Refuges and the Next Generation.” The document reflects the Service’s vision that will guide the management of the Refuge System during the next decade and beyond. The Service recognizes in this document that successful conservation will require strategic, collaborative, science-based landscape conservation – along with effective public outreach, education, and environmental awareness. The Service recognizes that forming partnerships with other federal, State, and local government agencies as well as conservation-oriented non-profits is a necessary step for success. Themes that are adopted in the document include: relevance to a changing America, the impact of a changing climate, the need for conservation at the landscape scale, the necessity of partnership and collaboration, and the absolute importance of scientific excellence.

The socio-demographic information contained in this document will hopefully serve as a basis for both current and future Refuge managers to better understand the basic characteristics of the people and communities that surround the Refuge, which hopefully will be used to improve outreach and collaborative projects that will benefit both the Refuge and its trust species as well as the communities economic well-being.

2.1 Population

According to the U.S. Census Bureau the population of Chincoteague grew 21 percent from 3,572 to 4,317 individuals between 1990 and 2000 but declined to 2,941 residents in 2010.¹ The population in

¹ U.S. Census Bureau, 2010 Demographic Profile Data, DP-1. Accessed at www.factfinder2.census.gov on March 20, 2012.

2010 reflects a 32 percent decline from the 2000 Census count.² In comparison, Accomack County's population declined by 13.4 percent in contrast to the change in total population for the State, which increased by 13 percent an amount greater than the nation's'. Table 1 shows the comparison between these geographical entities.

Table 1
Change in Population, 2010 and 2000

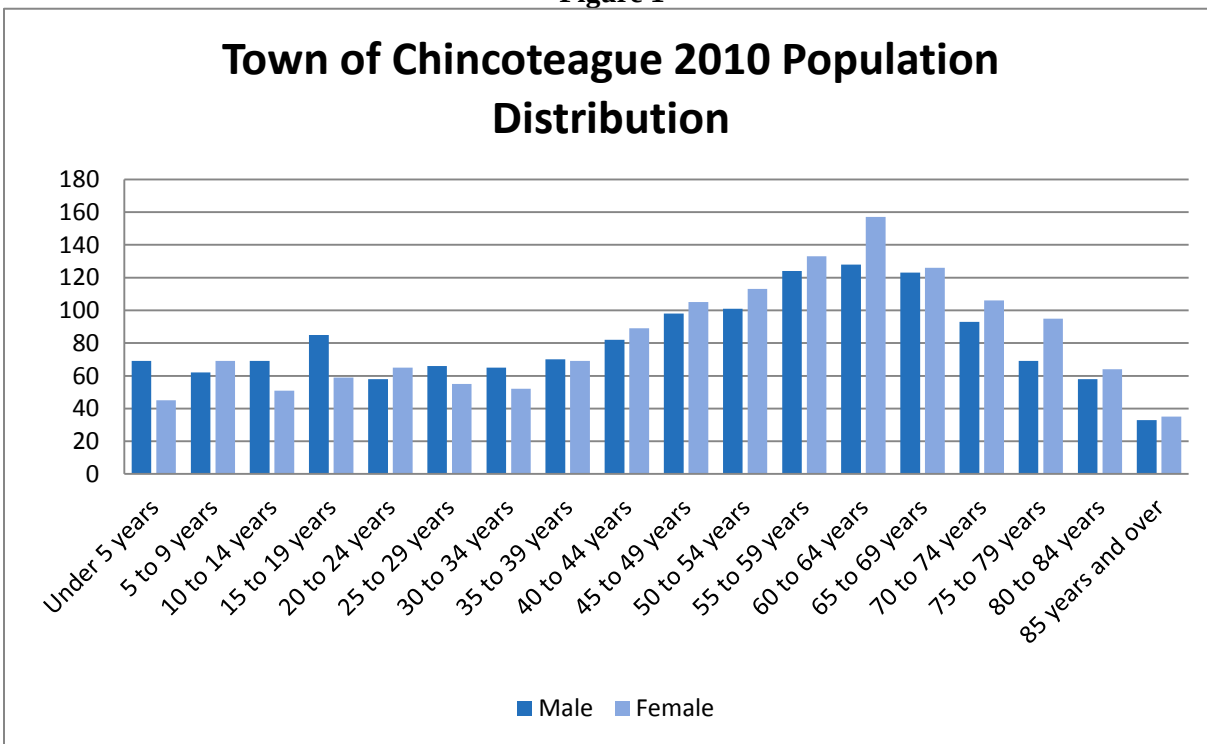
Year	Chincoteague Town	Accomack County	Virginia	U.S.
2010	2,941	33,164	8,001,024	308,745,538
2000	4,317	38,305	7,078,515	281,421,906
% chg	-31.9%	-13.4%	13.0%	9.7%
U.S. Census Bureau, 2010 and 2000 Demographic Profile Data, DP-1. Accessed at www.factfinder2.census.gov on March 20, 2012				

Figure 1 shows the breakdown of population by sex and age group category for the Town of Chincoteague. The table shows that the Town's residents skew towards the elderly. Individuals between 60 and 64 years constitute the greatest number of residents. The table also shows a decline in residents for the years 20 through 40, which likely reflects an outward migration of individuals after completing high school as they continue their educations or look for employment elsewhere.

Figure 2 compares the percentage of all residents by age category between the Town of Chincoteague and the U.S. The table shows that up until the age of 50, the Town of Chincoteague has significantly fewer children, young adults and middle aged adults than the national average. Beyond age 50 the Town has proportionally more adults in every age-group than the national averages, reflecting the Town's desirability as a retirement destination.

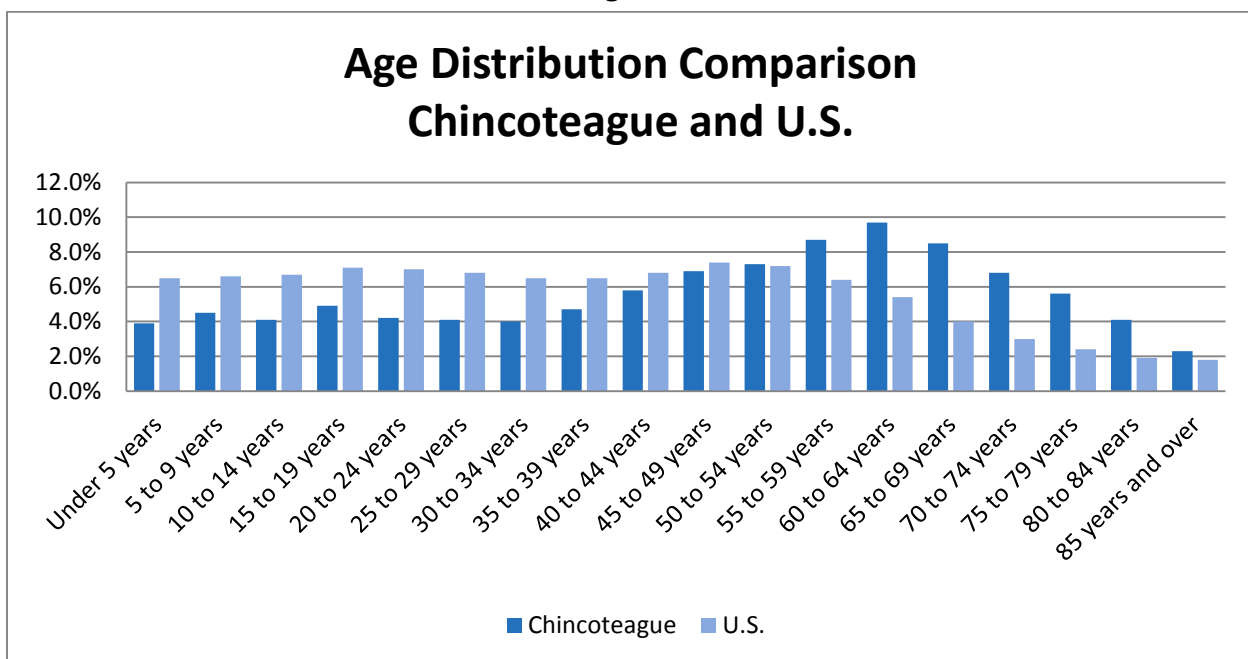
² It is noted that the Town of Chincoteague disagrees with the Census findings and believes that the resident population is approximately 3,974. Town Resolution, April 6, 2011.

Figure 1



Source: U.S. Census Bureau, 2010 Demographic Profile Data, DP-1. Accessed at www.factfinder2.census.gov on March 20, 2012.

Figure 2



Source: U.S. Census Bureau, 2010 Demographic Profile Data, DP-1. Accessed at www.factfinder2.census.gov on March 20, 2012.

2.2 Demographics

The Town of Chincoteague is not as racially or ethnically diversified as the rest of the County, State, or nation. The 2010 Census reports that over 95 percent of the Town residents are white compared to 65 percent for Accomack County, 68 percent for Virginia, and 72 percent for the nation as a whole. Hispanics also constitute a small percentage of the ethnic composition of the Town (1.7 percent) compared to the county (8.6 percent), State (7.9 percent), or nation (16.3 percent). Table 2 provides a breakdown of the racial and ethnic composition of the Town along with the corresponding data for the county, State, and nation for comparative purposes.

Table 2
Racial and Ethnic Characteristics

Race and Ethnicity	Chincoteague Town	Accomack County	Virginia	U.S.
Total population	2,941 ⁽¹⁾	33,164	8,001,024	308,745,538
One race	97.2%	98.4%	97.1%	97.1%
White	95.3%	65.3%	68.6%	72.4%
Black or African American	0.8%	28.1%	19.4%	12.6%
American Indian and Alaska Native	0.3%	0.4%	0.4%	0.9%
Asian	0.6%	0.6%	5.5%	4.8%
Other	3.0%	5.7%	6.2%	9.3%
Hispanic or Latino (of any race)	1.7%	8.6%	7.9%	16.3%
(1) The Town of Chincoteague officially disagrees with the Census findings and believes that the correct population count is 3,974. April 7, 2011 Resolution. Source: U.S. Census; 2010 Census Data, Summary File 1.				

2.3 Households and Housing

There are 1,417 households living in the Town of Chincoteague, according to the 2010 U.S. Census. Census defines a household as all the people who occupy a housing unit. A housing unit is a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied. The average household size was 2.06 persons, which if multiplied by the total number of households corresponds to the Town's population.

Family households constituted 61.2 percent of the total number of Chincoteague households, which is about five percent less than the county, State, or national percentages. A family household is defined by Census as a householder living with one or more individuals related to him or her by birth, marriage, or adoption. Census data shows that Chincoteague family sizes were slightly smaller than the county, State,

or national percentages, likely reflecting the fact that Chincoteague draws proportionally more elderly married couples, without kids, due to its desirability as a retirement community. In fact, over 40 percent of the total number of Chincoteague households consisted of individuals 65 years and over. Table 3 presents the household characteristics for the Town, county, State, and nation.

Table 3
Household Characteristics

	Chincoteague	Accomack	Virginia	US
Total households	1,417	13,798	3,056,058	116,716,292
Family households (families)	61.2%	66.1%	67.0%	66.4%
With own children under 18 years	17.7%	22.9%	29.9%	29.8%
Households with individuals under 18 years	20.1%	27.7%	33.4%	33.4%
Households with individuals 65 years and over	41.4%	33.8%	23.3%	24.9%
Average household size	2.06	2.37	2.54	2.58
Average family size	2.58	2.88	3.06	3.14
Source: U.S. Census, DP-1: Profile of General Population and Housing Characteristics: 2010.				

Chincoteague has nearly three times the number of housing units as total households, reflecting the town's linkages to the tourism-based industry. Census reports that nearly 60 percent of all vacant housing units were built for seasonal, recreational, or occasional use, compared to the State average of 2.4 percent. Table 4 shows some of the key housing characteristics for the Town, along with those for the county, State, and nation.

Table 4
Housing Characteristics

	Chincoteague	Accomack	Virginia	US
Total housing units	4,517	21,002	3,364,939	131,704,730
Occupied housing units	31.4%	65.7%	90.8%	88.6%
Vacant housing units	68.6%	34.3%	9.2%	11.4%
For rent	4.4%	2.7%	2.5%	3.1%
Rented, not occupied	0.2%	0.2%	0.2%	0.2%
For sale only	2.5%	2.1%	1.3%	1.4%
Sold, not occupied	0.2%	0.4%	0.3%	0.3%
For seasonal, recreational, or occasional use	59.5%	23.0%	2.4%	3.5%
All other vacants	1.8%	5.9%	2.6%	2.8%
Homeowner vacancy rate	9.5%	4.1%	2.1%	2.4%
Rental vacancy rate	36.0%	12.9%	7.6%	9.2%
Source: U.S. Census, DP-1: Profile of General Population and Housing Characteristics: 2010.				

2.4 Education and Earnings

Over 83 percent of Chincoteague residents have a high school degree or higher, which is near the national average of 85 percent. Compared to the county, Chincoteague has a higher percentage of residents with a bachelor's, graduate, or professional degree (13.7 percent vs. 10.3 percent). Only 16.6 percent of Chincoteague residents have not achieved a high school diploma, which is less than the county but more than the State average (13.9 percent) and nation (14.9 percent). Table 5 provides an overview of education attainment for the Town, county, State, and nation.

Table 5
Educational Attainment for Population 25 years and Over

	Chincoteague town, Virginia	Accomack County, Virginia	Virginia	United States
	Total	Total	Total	Total
	Estimate	Estimate	Estimate	Estimate
Population 25 years and over	2,529	24,217	5,208,536	199,726,659
Less than 9th grade	6.6%	7.9%	5.5%	6.2%
9th to 12th grade, no diploma	10.0%	13.2%	8.4%	8.7%
High school graduate (includes equivalency)	37.0%	37.9%	26.0%	29.0%
Some college, no degree	15.1%	17.4%	19.6%	20.6%
Associate's degree	5.5%	5.5%	6.7%	7.5%
Bachelor's degree	12.1%	10.3%	19.9%	17.6%
Graduate or professional degree	13.7%	7.7%	13.9%	10.3%
Percent high school graduate or higher	83.4%	78.9%	86.1%	85.0%
Percent bachelor's degree or higher	25.8%	18.0%	33.8%	27.9%
Source: U.S. Census, American Community Survey 5 year estimates, 2006 - 2010.				

In general, the average earnings for people 25 years and over is less in Chincoteague than other areas. Specifically, the average earnings for a Town resident is \$23,000 compared to \$27,406 for a county resident, \$39,409 for a State resident, and \$34,665 for an average national resident. However, these estimates are heavily influenced by the lower earnings power of Town residents with only a high school diploma or less. Town residents with a bachelor's degree or higher earn more on average than a resident of the county or nation (but not the State). Regardless of educational attainment, however, Chincoteague residents have a higher percentage of residents experiencing poverty than State or national residents. Table 6 presents an overview of poverty status and earnings.

Table 6
Poverty Status and Earnings

	Chincoteague town, Virginia	Accomack County, Virginia	Virginia	United States
	Total	Total	Total	Total
	Estimate	Estimate	Estimate	Estimate
POVERTY RATE FOR THE POPULATION 25 YEARS AND OVER FOR WHOM POVERTY STATUS IS DETERMINED BY EDUCATIONAL ATTAINMENT LEVEL				
Less than high school graduate	30.7%	28.0%	21.3%	24.7%
High school graduate (includes equivalency)	22.8%	13.2%	9.6%	12.0%
Some college or associate's degree	9.4%	12.2%	6.2%	8.4%
Bachelor's degree or higher	5.4%	3.6%	2.5%	3.8%
MEDIAN EARNINGS IN THE PAST 12 MONTHS (IN 2010 INFLATION-ADJUSTED DOLLARS)				
Population 25 years and over with earnings	23,000	27,406	39,409	34,665
Less than high school graduate	12,852	16,634	21,001	19,492
High school graduate (includes equivalency)	15,729	25,979	29,064	27,281
Some college or associate's degree	28,495	27,535	36,137	33,593
Bachelor's degree	52,417	40,809	53,522	48,485
Graduate or professional degree	66,563	50,898	75,613	63,612
Source: U.S. Census, American Community Survey 5 year estimates, 2006 - 2010.				

2.5 Employment and Earnings by Industry

Census estimates that throughout the year 2010 there were a total of 1,363 people employed in the Town of Chincoteague. 908 of these people were employed year-round with the remainder primarily seasonal. Accordingly, median salaries were greater for the year-round workers (\$39,028) than the total, which included seasonal workers (\$27,702). The difference between the number of year-round employment and total employment, which included seasonal workers, were in the fields of retail trade, real estate and rental leasing, and accommodations and food services. Median earnings were estimated to be highest for year-round manufacturing jobs (\$93,529) and lowest in the field of Other Services (\$6,467).

The greatest number of year-round jobs were in public administration (148), accommodations and food services (117), and professional, scientific, and technical services (112). Total jobs, which includes seasonal work, were greatest in the fields of accommodations and food services (213), public administration (173) and health care and social assistance (146). Table 7 provides a detailed breakdown of estimated employment and median earnings by industry for total employment and year-round employment.

Table 7
Total Employment by Industry and Full-Time, Year-Round Employment by Industry, 2010

Chincoteague Town, Virginia	Total Civilian employed population 16 years and over		Full-time, year- round civilian employed population 16 years and over	
	Total	Median earnings (dollars)	Total	Median earnings (dollars)
	Estimate	Estimate	Estimate	Estimate
Total	1,363	27,702	908	39,028
Agriculture, forestry, fishing and hunting, and mining:	72	9,136	35	9,931
Agriculture, forestry, fishing and hunting	72	9,136	35	9,931
Mining, quarrying, and oil and gas extraction	0	-	0	-
Construction	62	16,364	49	16,856
Manufacturing	64	93,529	64	93,529
Wholesale trade	30	40,294	30	40,294
Retail trade	56	17,976	0	-
Transportation and warehousing, and utilities:	17	-	17	-
Transportation and warehousing	17	-	17	-
Utilities	0	-	0	-
Information	0	-	0	-
Finance and insurance, and real estate and rental and leasing:	103	15,852	61	27,688
Finance and insurance	37	29,188	32	29,500
Real estate and rental and leasing	66	14,052	29	-
Professional, scientific, and management, and administrative and waste management services:	187	32,202	140	41,000
Professional, scientific, and technical services	140	56,250	112	56,042
Management of companies and enterprises	0	-	0	-
Administrative and support and waste management services	47	20,625	28	21,944
Educational services, and health care and social assistance:	277	39,688	187	50,605
Educational services	131	51,573	90	52,258
Health care and social assistance	146	31,607	97	32,232
Arts, entertainment, and recreation, and accommodation and food services:	251	13,695	155	14,629
Arts, entertainment, and recreation	38	14,083	38	14,083
Accommodation and food services	213	13,504	117	14,898
Other services, except public administration	71	6,467	22	7,708
Public administration	173	65,353	148	66,154
Source: 2006-2010 American Community Survey 5-Year Estimates				

3.0. Economic Characteristics of Chincoteague and Accomack County

The Town of Chincoteague has several sources of economic activity, including tourism, both Refuge-related and other outdoor-based recreation opportunities, commercial fishing and seafood manufacturing, and impacts from the nearby National Aeronautics and Space Administration (NASA) Wallops Island Flight Facility. This section will summarize some general economic characteristics for Chincoteague and discuss tourist-related characteristics of the economy, the commercial and seafood manufacturing sectors and the impacts of the NASA Wallops Island Flight Facility.

3.1 Establishments and Employment

Table 8 shows Chincoteague employment by business sector for the years 2007 and 2010. Total employment in 2007 was 908, which increased by 74 jobs to 982 in 2010. In 2010, the three largest employment sectors, accommodation and food services, retail trade and health care and social assistance, accounted for almost 75 percent of total wage and salary employment. This compares with 2007, where the three largest sectors, accommodation and food services, retail trade and public administration, also accounted for about 75 percent of employment. The largest gain in jobs came from the health care sector, which showed a net gain of 62 jobs. Other sectors which showed significant gains include the retail trade sector, which showed a gain of 25 jobs, and the agriculture, forestry, fishing and hunting sector, which added 28 jobs.

Note that the above figures are wage and salary employment and do not include the self-employed. Chincoteague has a substantial number of self-employed, as evidenced by the number of business licenses issued in 2011 compared with the number of businesses which employed at least one person during the year (Table 8). In 2011, 1,269 business licenses issues. Table 9 shows 149 businesses which employed at least one person during 2010. Over 700 of the business licenses issued were for tourist rental homes, leaving 565 licenses covering the rest of the business sectors in town. Consequently, about 416 licenses are for the self-employed aside from the tourist rental home business.

For businesses that did employ people, the accommodation and food service sector accounted for 47 businesses, the retail trade sector accounted for 31 businesses, the construction sector for 15 and the real estate, rental and leasing sector for 11. These four sectors accounted for 70 percent of all businesses which hired workers in 2010.

Table 8
Chincoteague Town Employment by Business Sector: 2010 - 2007 Comparison

Industry Sector	2010		2007		Change
	Count	Share	Count	Share	
Agriculture, Forestry, Fishing and Hunting	29	3.0%	1	0.1%	28
Mining, Quarrying, and Oil and Gas Extraction	0	0.0%	-	0.0%	-
Utilities	0	0.0%	-	0.0%	-
Construction	33	3.4%	40	4.4%	(7)
Manufacturing	2	0.2%	4	0.4%	(2)
Wholesale Trade	10	1.0%	9	1.0%	1
Retail Trade	163	16.6%	138	15.2%	25
Transportation and Warehousing	4	0.4%	10	1.1%	(6)
Information	14	1.4%	17	1.9%	(3)
Finance and Insurance	11	1.1%	19	2.1%	(8)
Real Estate and Rental and Leasing	26	2.6%	34	3.7%	(8)
Professional, Scientific, and Technical Services	9	0.9%	14	1.5%	(5)
Management of Companies and Enterprises	0	0.0%	-	0.0%	-
Administration & Support, Waste Management and Remediation	11	1.1%	19	2.1%	(8)
Educational Services	3	0.3%	3	0.3%	-
Health Care and Social Assistance	104	10.6%	42	4.6%	62
Arts, Entertainment, and Recreation	7	0.7%	1	0.1%	6
Accommodation and Food Services	454	46.2%	462	50.9%	(8)
Other Services (excluding Public Administration)	23	2.3%	19	2.1%	4
Public Administration	79	8.0%	76	8.4%	3
Total	982	100%	908	100%	74

Source: U.S. Census Bureau 2012. OnTheMap Application. <http://onthemap.ces.census.gov/>. Accessed July 2012.

Table 9 breaks down the total number of businesses employing workers by industry for the year 2010. In that year there were 149 business employing workers. Businesses in the Accommodation and Food Service sectors accounted for over one-third of the local businesses employing workers. Retail Trade and Construction businesses combined accounted for another one-third of the business sectors employing workers.

Table 10 shows business sectors which are typically associated with tourism (and which employed people during the year). This does not imply that all the revenue generated by these sectors comes from tourism, only that, under typical circumstances, most of tourist spending occurs in these categories. The sectors in Table 10 are sub-sectors of the more general sector categories in Table 9. Hotels, motels, bed and breakfast inns, RV parks and campgrounds, and other accommodations account for 27 businesses, or 33 percent of the total.³ Food services also account for 27 businesses.⁴ For all 82 businesses, about one-third provide accommodations, one-third are food-related and one-third are other retail purchases.

Table 9
Chincoteague Business Sectors Employing Workers by Major Category, 2010

Sector	Number of Businesses
Accommodation and Food services Total	47
Retail Trade Total	31
Construction Total	15
Real Estate, Rental and Leasing Total	11
Health care and social assistance Total	8
Other services Total	8
Arts, entertainment and recreation Total	6
Professional, scientific and Tech services Total	5
Wholesale trade Total	3
Transportation and warehousing Total	3
Information Total	3
Finance and Insurance Total	3
Administrative and support, and waste management and remediation services Total	3
Agriculture, Forestry, Fishing, Hunting Total	2
Educational Services Total	2
Manufacturing Total	1
Public administration Total	1
Total Businesses employing workers	149
Source: Virginia Employment Commission 2011	

³ NAICS codes for Accommodations include: 721110, 721191, 721211, and 721199.

⁴ NAICS codes for Food Services include: 722110, 722211, 722213, 445110, 445120, 445299, 445310, 722212.

Table 10
Tourism Related Businesses Employing Workers in Chincoteague, 2010

NAICS Code	Sector	Number
721110	Hotels (except Casino Hotels) and Motels	16
722110	Full-Service Restaurants	11
453220	Gift, Novelty, and Souvenir Stores	7
721191	Bed-and-Breakfast Inns	5
722211	Limited-Service Restaurants	5
721211	RV (Recreational Vehicle) Parks and Campgrounds	4
448190	Other Clothing Stores	3
713990	All Other Amusement and Recreation Industries	3
722213	Snack and Nonalcoholic Beverage Bars	3
445110	Supermarkets and Other Grocery (except Convenience) Stores	2
447110	Gasoline Stations with Convenience Stores	2
452990	All Other General Merchandise Stores	2
721199	All Other Traveler Accommodation	2
445120	Convenience Stores	1
445299	All Other Specialty Food Stores	1
445310	Beer, Wine, and Liquor Stores	1
446110	Pharmacies and Drug Stores	1
447190	Other Gasoline Stations	1
448120	Women's Clothing Stores	1
448140	Family Clothing Stores	1
451110	Sporting Goods Stores	1
487210	Scenic and Sightseeing Transportation, Water	1
488490	Other Support Activities for Road Transportation	1
491110	Postal Service	1
532292	Recreational Goods Rental	1
712190	Nature Parks and Other Similar Institutions	1
713930	Marinas	1
722212	Cafeterias, Grill Buffets, and Buffets	1
Total		82

Source: Virginia Employment Commission 2011

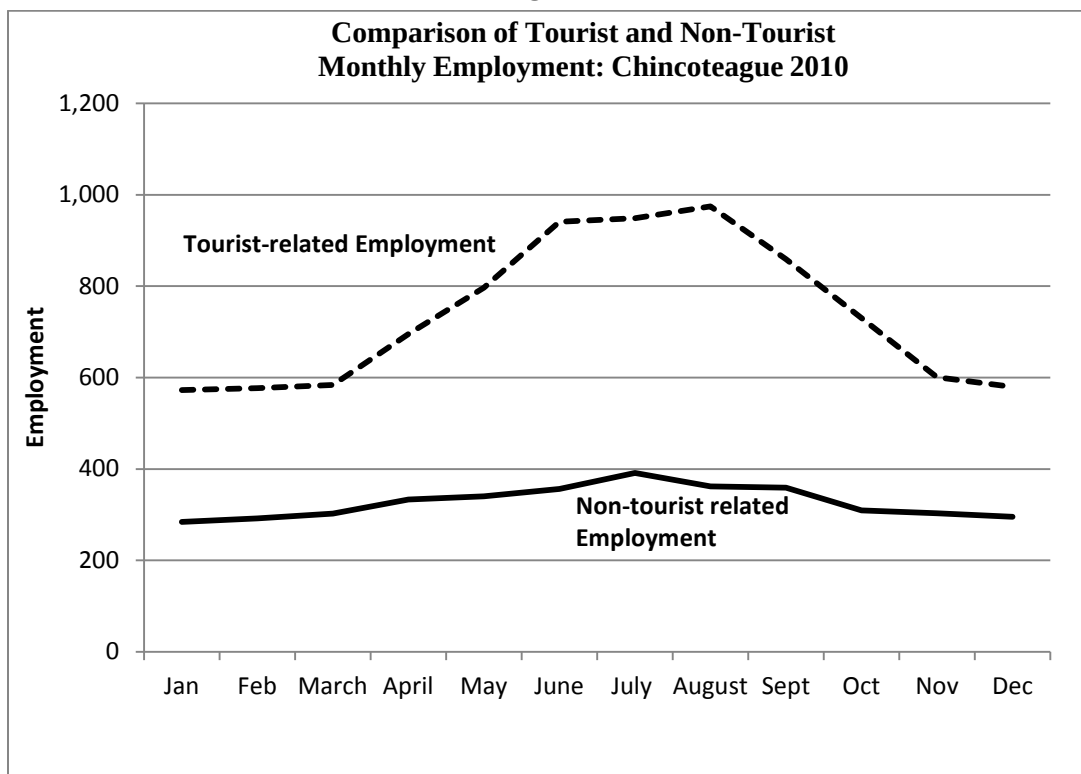
Chincoteague relies to a significant degree on tourism for town income. Tourism is not constant throughout the year, the summer months showing the highest concentration of visitors and the winter months the lowest. Consequently, much of the employment in Chincoteague follows a similar pattern. Table 11 shows Chincoteague 2010 employment by month categorized by tourist and non-tourist related businesses. Total employment is lowest in January and highest in July, ranging from 857 to 1,340. Tourist-related employment ranges from 573 in January to 975 in August, an increase of 70 percent from January. In contrast, non-tourist related employment ranges from 284 in January to 391 in July, an increase of 38 percent. Figure 3 shows a monthly graph of tourist and non-tourist employment in 2010.

Table 11
Chincoteague Town Tourist and Non-Tourist Employment by Month, 2010

Month	Tourist-related Businesses	Non-Tourist related Businesses	Total
Jan	573	284	857
Feb	577	292	869
March	584	302	886
April	695	333	1,028
May	797	340	1,137
June	941	356	1,297
July	949	391	1,340
August	975	362	1,337
September	859	359	1,218
October	730	309	1,039
November	601	303	904
December	580	295	875
Annual range	573 - 975	284 - 391	857 - 1,340

Source: Virginia Employment Commission 2011

Figure 3



Source: Virginia Employment Commission 2011

Table 12 shows the total number of establishments providing lodging in the Town of Chincoteague by type. In total, in the year 2010 there were 2,775 combined rooms, spaces, and sites provided by 707 establishments. Ninety percent of these establishments were vacation rental homes. Chincoteague had 21 hotels/motels that offered 849 rooms, six bed and breakfasts offering 33 rooms and six cottages offering 80 rooms. Four campsites offered 1,143 spaces. The rental of these places to tourists not only generates revenue for the owners but also generates revenue for the town in the form of food and lodging excise taxes.

Table 12
Available Lodging in Chincoteague by Type, 2010

Lodging Type	Number of Establishments	Number of rooms/spaces/sites
Hotels/motels	21	849
Bed and breakfast	6	33
Cottages	6	80
Campgrounds	4	1,143
Vacation Rental Homes	670	670
Total	707	2,775
Source: Town of Chincoteague 2011		

3.2 Town Revenues

The town levies taxes on many of the tourist-related business to help pay for the provision of many public goods. In particular, taxes are levied on real estate, business licenses, occupancy, and meals.

Real estate is assessed by the Accomack County Assessor. Real estate within the Town of Chincoteague is taxed by both the Town and Accomack County with each having different rates. Real estate taxes for the Town are billed in early November of each year and are due on or before December 5th of the same year. The current Town real estate tax rate is \$0.06 per \$100 of assessed value.⁵

⁵ The Town offers tax relief on real estate for certain elderly or handicapped individuals. The relief may be 50 percent or 100 percent. There are eligibility criteria, such as: income and amount of real estate owned. The contact is the Accomack County Commissioner of Revenue. The Commissioner of Revenue will notify the Town of those eligible for this relief.

Personal property taxes are assessed by the Accomack County Commissioner of Revenue on such items as automobiles, motorcycles, travel trailers, boats and mobile homes. Personal property is also taxed by the Town and Accomack County with different rates. Personal property bills are mailed the same time as real estate and have the same due date. The current Town personal property tax rate is \$0.85 per \$100 of assessed value. However, mobile homes are billed at the real estate rate.

The Town of Chincoteague levies an annual business license tax on all persons conducting business within the Town. The tax is due on April 30th of each year. For most business categories, the current rate for this tax is \$0.13 per \$100 of gross receipts of the previous year, with a minimum tax of \$50.00 and a maximum of tax \$500.00 per year.

Transient occupancy tax is charged by providers of lodging of less than 30 days. The current Town transient occupancy tax rate is 3 percent. Meals tax is charged on all prepared meals including beverages within the Town. The current meals tax rate is 5 percent.

Table 13 shows gross receipts derived from the transient occupancy tax (lodging excise tax) from 2001 to 2010. Over the 10-year period, hotels and motels account for 60.5 percent of average annual gross receipts, tourist homes 31.3 percent, campgrounds 4.7 percent and bed and breakfasts 3.5 percent. Annual receipts averaged \$17.6 million over the 10 year period. Table 14 shows the tax receipts derived from the lodging tax for both Chincoteague and Accomack County. Chincoteague tax receipts ranged from \$339,000 in 2005 to \$602,800 in 2010, an increase of 78 percent.

Table 13
Chincoteague Transient Occupancy Tax; Gross Receipts Reported, 2001 – 2010
(dollars in millions)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Tourist Homes	\$4.6	\$4.9	\$5.2	\$5.4	\$5.2	\$5.4	\$5.9	\$5.9	\$6.3	\$6.3
Hotels /motels	\$8.8	\$9.4	\$10.2	\$10.4	\$10.6	\$11.8	\$11.7	\$12.7	\$12.0	\$9.1
Campgrounds	\$0.899	\$0.904	\$0.724	\$0.733	\$0.758	\$0.846	\$0.929	\$0.769	\$0.991	\$0.781
Bed and Breakfasts	\$0.702	\$0.648	\$0.584	\$0.583	\$0.635	\$0.694	\$0.705	\$0.587	\$0.594	\$0.378
Total	\$15.0	\$15.9	\$16.7	\$17.1	\$17.2	\$18.7	\$19.2	\$20.0	\$19.9	\$16.6
Source: Town of Chincoteague 2011										

Table 14
Chincoteague Lodging tax receipts as percentage of Accomack County Lodging Tax Receipts
(dollars in thousands)

	2005	2006	2007	2008	2009	2010
Chincoteague excise tax collected	\$339.0	\$358.4	\$384.0	\$573.4	\$620.0	\$602.8
Accomack County Tax collected	\$670.4	\$724.5	\$791.3	\$991.9	\$1,047.5	\$1,017.7
Chincoteague portion of County Excise Tax	50.6%	49.5%	48.5%	57.8%	59.2%	59.2%
Source: Town of Chincoteague 2011						

In addition to the lodging tax, Chincoteague also has a food excise tax, which applies to restaurants and other establishments which prepare food for consumption (as opposed to grocery stores). Table 15 shows both food and lodging excise tax revenue for the years 2004 to 2010. The food service excise tax revenue has been fairly constant, ranging from \$433,100 in 2004 to \$487,100 in 2010, a 12.5 % increase. Total excise tax collections ranged from \$761,500 in 2004 to \$1,089,900 in 2010, a 43.1 % increase.

Table 15
Town of Chincoteague: Lodging and Food Excise Tax Collected: 2004-2010
(dollars in thousands)

	2004	2005	2006	2007	2008	2009	2010
Lodging Excise tax Collected	\$328.4	\$339.0	\$358.4	\$384.0	\$573.4	\$620.0	\$602.8
Food Service Excise tax Collected	\$433.1	\$434.3	\$435.0	\$451.0	\$452.2	\$480.7	\$487.1
Total Excise Tax collected	\$761.5	\$773.3	\$793.4	\$835.0	\$1,025.6	\$1,100.7	\$1,089.9
Source: Virginia Tourism Corporation 2011							

3.3 Commercial Shell and Finfishing

The waters surrounding the Town of Chincoteague and the national wildlife refuge support a great diversity of fin and shellfish that have been harvested for centuries for commercial purposes. In 2010 the total value of commercial finfish and shellfish harvested from the area waters was estimated to be in excess of \$3.3 million. In recent years, the bulk of the commercial harvest and associated value has been the result of private shellfish farms that are forming in the area waters. In 2010 the sales from these ventures accounted for over one-half of the total value of the harvest.

To assess the economic importance of the shell and finfish industries, data was collected from the Virginia Marine Resources Commission. The Commission works to protect the resources for current and future generations. As part of its duties, the Commission collects data on the amount and types of shell and finfish species harvested in State waters. For the purposes of this analysis, the Commission was approached for all of the readily available historical the data that they have collected for water areas in the vicinity of Chincoteague. Table 16 shows the specific water bodies in Accomack County where data was requested.

Table 16
Water Areas Proximal to Accomack County

Bogue Bay	Gargathy Bay	Upshur Bay
Bradford Bay	Kegotank Bay	Watts Bay
Burton's Bay	Metomkin Bay	Unclassified
Chincoteague Bay	Outlet Bay	
	Oyster Bay	
Source: Virginia Marine Resources Commission, Plans and Statistics. May 2012.		

Data provided by the Commission show that since 1993, Blue crab harvests are the greatest of all marine species both in total amount and value. Also of significant economic importance is the harvesting of private quahogs. Table 17 shows the total amount and value of every species harvested in the waters surrounding Chincoteague since 1993. Annual and average values are not reported because not every species is harvested in every year. For example, the harvesting of private quahogs is a relatively new business and reporting did not begin until 2007.

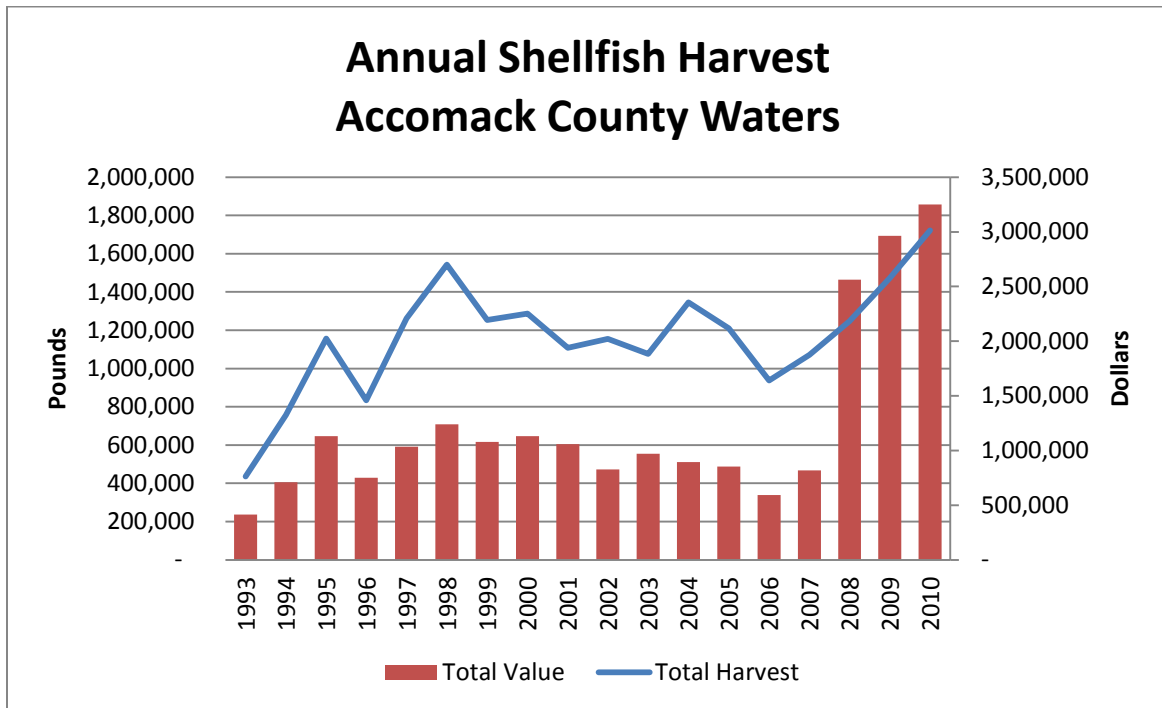
Table 17
Total Shellfish and Finfish Harvest (pounds) and Value (dollars)
1993 through 2010 (Accomack County Waters)

Species	Total Pounds	Total Value
SHELLFISH		
CONCHS	13,334	\$ 10,718
CRAB, BLUE	18,263,850	\$ 13,280,263
CRAB, HORSESHOE ¹	361,072	\$ 208,407
OYSTERS, PRIVATE	58,192	\$ 237,009
QUAHOG, PRIVATE	1,386,670	\$ 6,066,194
QUAHOG, PUBLIC	792,733	\$ 2,477,834
FINFISH		
ALEWIFE	32,160	\$ 3,729
BASS, STRIPED	97,145	\$ 189,584
BLUEFISH	227,587	\$ 82,069
CROAKER, ATLANTIC	1,617,701	\$ 747,540
DOGFISH	196,909	\$ 34,252
FISH, OTHER INDUSTRY	35,660	\$ 2,205
FLOUNDER, SUMMER	26,546	\$ 68,068
PUFFER, NORTHERN	32,763	\$ 86,083
SEATROUT, GREY	349,812	\$ 244,837
SHAD, AMERICAN	101,977	\$ 87,124
SPOT	1,968,817	\$ 992,654
¹ For purposes of the economic analysis, the horseshoe crab is included with other shellfish even though it is official classified as an arachnid. Source: Virginia Marine Resources Commission, Plans and Statistics. May 2012.		

Figures 4 and 5 show the aggregated total harvests for shellfish and finfish for each of the years 1993 through 2010. These data reflect the harvests from all of the waters in Accomack County that are within the vicinity of the Town of Chincoteague. The data were compiled by the Virginia Marine Resources Commission based on the specific water bodies shown in Table 16.

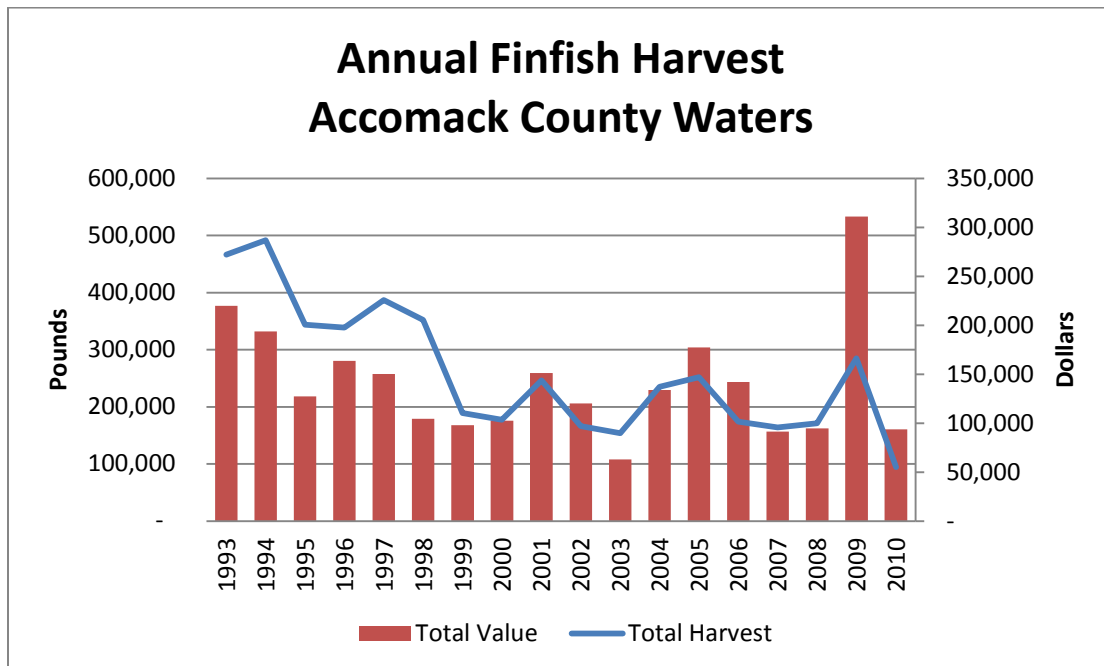
The data show that the annual total amount of the finfish harvest is declining over the years, while the amount of the shellfish harvest has been increasing. In 1993, Accomack County waters produced nearly 400,000 pounds of finfish and 400,000 pounds of shellfish. By 2010, shellfish harvests increased to nearly 1.8 million pounds, while finfish harvests declined to less than 100,000 pounds.

Figure 4



Source: Virginia Marine Resources Commission, Plans and Statistics. May 2012.

Figure 5



Source: Virginia Marine Resources Commission, Plans and Statistics. May 2012.

3.4 NASA Wallops Flight Facility and Mid-Atlantic Regional Spaceport

The NASA Wallops Flight Facility, just a few miles northwest of Chincoteague, is a source of economic activity for the town. This facility, which also includes the Mid-Atlantic Regional Spaceport administered by the Virginia Commercial Space Flight Authority, generates economic activity in several ways: (1) the annual impacts from operations of the various businesses at the site; (2) the employment impact generated by the percentage of the employees' payroll spent locally; and (3) the annual impact from the additional tourism generated in Accomack County (and Chincoteague) by the Flight Facility.⁶ Table 17 shows that Accomack County accounted for \$77.8 million in economic impacts, the rest of the Lower Eastern Shore in Virginia \$110.5 million, for a total of \$188.3 million. Accomack County accounted for 1,206 jobs, Lower Eastern Shore 1,141 for a total of 2,347 jobs. The portion of these impacts which occur in Chincoteague is not known, but it is reasonable to assume that Chincoteague derives significant economic activity from the Flight Facility.

Table 17
Estimated Annual Economic, Employment and Fiscal Impacts of Activities at NASA Wallops Island
(dollars in millions)

	Accomack County	Lower Eastern Shore	Total	Outside of Region	Total Impacts
Total Economic Impacts	\$77.8	\$110.5	\$188.3	\$207.2	\$395.5
Employment Impacts	1,206	1,141	2,347	704	3,051
State and Local Tax Revenue	\$2.7	\$4.5	\$7.1	\$6.3	\$13.4
Federal Tax Revenue	\$2.3	\$3.5	\$5.8	\$7.5	\$13.3
Source: Bunch 2011, p.2					

3.5 Accomack County

Table 18 shows taxable sales by business sector for Accomack County in 2010. Taxable sales totaled \$286.4 million with retail trade accounting for \$179.5 million, 62.7 percent of the total, and accommodation and food services accounting for \$47.1 million, 16.5 % of total taxable sales.

Table 19 shows estimates of travel-related expenditure impacts in Accomack County. These are expenditures by travelers going to or through Accomack County. In 2010, travel-related expenditures totaled \$145.1 million, a 14.3 percent increase from 2006. These expenditures resulted in \$31.4 million in payroll and 1,847 jobs. State tax receipts totaled \$6.9 million and local tax receipts totaled \$4.5 million.

⁶ Bunch 2011, p.4.

Table 18
Accomack County Taxable Sales by Business Sector, 2010

Business Sector	Taxable Sales	Percent of Total
No Sector Name Information	\$5,089,123	1.8%
Construction	\$2,399,516	0.8%
Manufacturing	\$1,975,603	0.7%
Wholesale Trade	\$16,204,731	5.7%
Retail Trade	\$179,502,391	62.7%
Real Estate Rental and Leasing	\$10,551,698	3.7%
Professional, Scientific and Technical Services	\$2,723,241	1.0%
Administrative and Support Services	\$309,500	0.1%
Arts, Entertainment and Recreation	\$1,674,294	0.6%
Accommodation and Food Services	\$47,125,069	16.5%
Other Services	\$5,568,627	1.9%
Sub-Total	\$273,123,793	95.3%
Misc. and unidentifiable	\$13,340,460	4.7%
Total	\$286,454,253.35	100.0%

Source: University of Virginia 2011

Table 19
Accomack County Travel Related Economic Impacts: 2006 - 2010
(Dollars in millions)

Impacts	2006	2007	2008	2009	2010	Percent Change 2006 - 2010
Expenditures	\$127.0	\$134.3	\$140.4	\$137.5	\$145.1	+14.3%
Payroll	\$28.5	\$28.8	\$30.0	\$30.6	\$31.4	+10.2%
Employment	1,780	1,795	1,827	1,852	1,847	+3.8%
State tax receipts	\$6.1	\$6.4	\$6.5	\$6.8	\$6.9	+13.1%
Local tax Receipts	\$4.0	\$4.2	\$4.4	\$4.4	\$4.5	+12.5%

Source: Virginia Tourism Corporation 2011

4.0. Chincoteague National Wildlife Refuge Recreation Visits and Associated Economic Impacts

In 1997, President William Jefferson Clinton signed into law the Refuge Improvement Act which establishes a unifying mission for the Refuge System. The mission of the Refuge System is:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. — Refuge Improvement Act; Public Law 105-57

The Refuge Improvement Act also establishes a new process for determining compatibility of public uses on refuges, and requires the Service to prepare a CCP for each refuge. The Act states that the Refuge System must focus on wildlife conservation. It also requires that the mission of the Refuge System, coupled with the purposes for which each refuge was established, will provide the principal management direction on that refuge. The Refuge Improvement Act identifies six wildlife-dependent public uses—hunting, fishing, wildlife observation and photography, and environmental education and interpretation—that will receive priority consideration on refuges and, therefore, in CCPs. Furthermore, the Act declares that all existing or proposed public or commercial uses must be “compatible” with the refuge’s purpose and consistent with public safety. The refuge manager determines if an existing or proposed use is “compatible” by evaluating its potential impact on refuge resources, insuring that the use supports the System mission, and does not materially interfere with or detract from the purpose for which the refuge was established.

Chincoteague National Wildlife Refuge is one of the most heavily visited refuges in the national system. Visitors come to Chincoteague for a variety of reasons. Many come in the summer months to access the beach. The beaches of Assateague Island offer a unique experience in the mid-Atlantic area as they exist primarily in an undeveloped setting unlike other beaches like Virginia Beach or Ocean City Maryland that are heavily developed. This natural setting draws many families seeking out a more traditional beach going experience.

Many summer beach visitors also take time to enjoy the wildlife found on the Refuge as they pass through on their way to or from the beach. While the Refuge is famous for its Chincoteague ponies, which families delight in watching, visitors will also see many different types of migratory birds and waterfowl, and animals thus exposing them to other types of wildlife that they may not normally see on a more traditional beach visit and hopefully leaving the visitor with a greater appreciation of the importance of conservation and the ability to participate and enjoy low-impact activities.

During the fall and spring seasons the many visitors come to the beach for surf fishing opportunities. In the fall, the Refuge opens up lower part of the beach from the southern-most parking lot to Toms Cove Hook to off-road vehicles. While some of these users are primarily engaged in wildlife watching, traditionally, most users are engaged in surf fishing activities.

The fall is also prime time for waterfowl hunting. Chincoteague NWR allows the hunting of waterfowl during the State season. Hunters must obtain a Migratory Game Bird Hunting permit from the Refuge for five dollars in order to hunt on the Refuge. Hunters must also possess valid State permits as well as a

federal Migratory Duck Stamp in order to hunt waterfowl. During the hunting season, hunters may target ducks, geese, swans, coots, and rails. The Refuge allows hunting during the days of Thursday, Fridays, and Saturdays. The Refuge allows hunting only within the designated areas of Wildcat Marsh, Morris Island, Assawoman Island, and Metompkin Islands. The harvesting of waterfowl on the Refuge is conducted in an environmentally friendly and sustainable manner, helping to ensure that the resources will be available to future generations for their enjoyment.

There is also limited big game hunting on the Refuge for Sika and White-tailed deer. Hunting occurs during the months of December and January. Hunting on the Refuge is controlled through a lottery process. Once selected by the lottery system, hunters must attend a firearms orientation session prior to hunting on the Refuge. The Refuge is divided into eleven primary hunting zones, with a few of those zones that are located closer to developed portions of the Refuge for use by mobility-impaired hunters.

4.1. Chincoteague NWR Visitor Use

Table 20 shows Chincoteague NWR visitor use for 2010. A “visitor” is one person visiting the Refuge for all or part of one day. “Visits” are the number of activities a visitor engages in; for example, a person who goes bird watching and engages in nature photography is counted as two visits. Most of the activities on the Refuge are wildlife observation, hiking, nature walks, photography and beach use. Table 21 shows the number of Refuge visitors for the months June through August from 2005 to 2010. Well over half of total annual visitation occurs during these three months, ranging from 55 percent in 2010 to 58 percent in 2005.

Beach use is an important component of Chincoteague NWR visitor use. Table 22 shows one measure of visitor use (traffic counts) measured at the National Park Service visitor center near the beach. While most of the beach use occurs from June through August, a considerable amount of use occurs before and after this period, ranging from about 40 to 45 percent of total annual use. Figure 6 shows a graph of the traffic count for the months June through August for the years 1997 to 2011 as well as the total annual traffic count for the same years. On average, the Refuge receives 56 percent of its total visitors during the summer season.

Several times during the summer, the beach parking lot is filled to capacity and closes.

Parking lot closures:	2007- 8
	2008 - 4
	2009 - 12
	2010 – 5
	2011 – 8
	2012 - 1

Table 20
Chincoteague NWR 2010 Visitation

Total number of visitors		1,359,553
Visits ¹	Special events on site	8,568
	Visitor Center or Contact Station	364,568
	Upland game hunt	0
	Big game hunt	2,097
	Total hunting	2,304
	Fishing	129,885
	Foot Trail/Pedestrian	1,019,664
	Auto Tour	1,359,553
	Boat Trail/Launches	0
	Bicycle	352,740
	Wildlife Observation	2,731,957
	Photography	815,731
	Environmental education programs.	8,948
	Interpretation participants in on- and off-site talks/programs	60,226
	Other recreation	2,719,106
1 The term "visits" represents the number of activities a visitor participated in during their visit to the refuge. Source: USFWS 2011		

Table 21
Chincoteague National Wildlife Refuge: June - August and Annual Visitors, 2005 – 2010

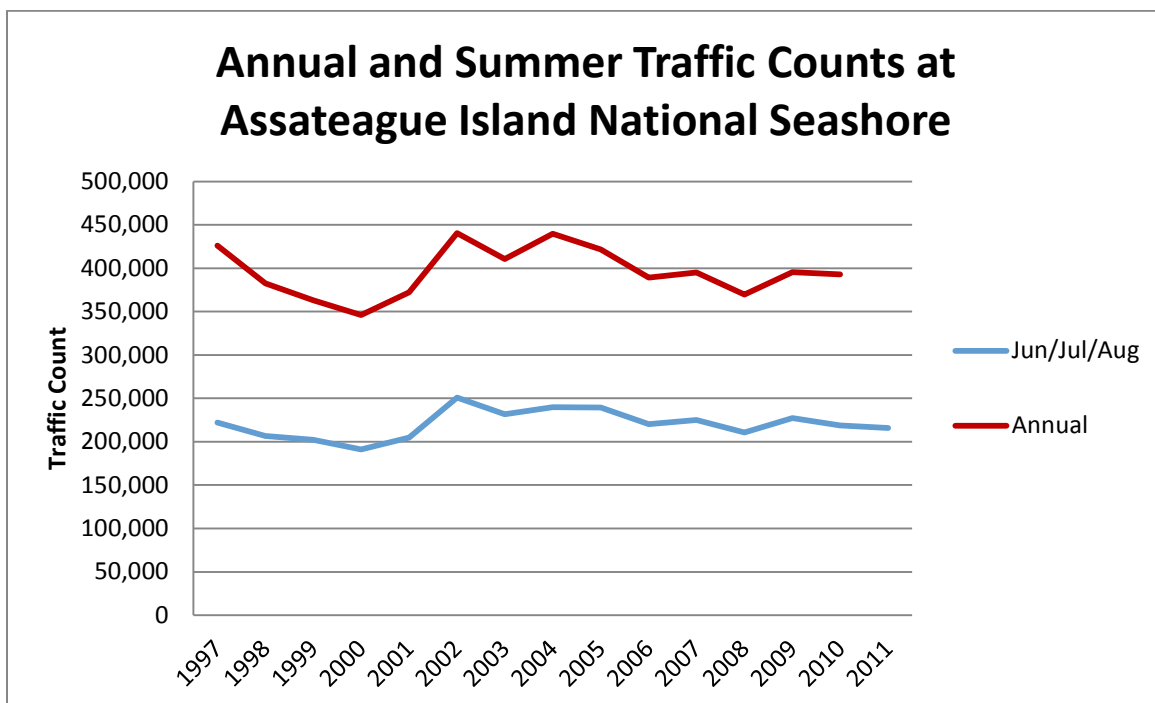
Month	2005	2006	2007	2008	2009	2010
June	181,724	162,293	172,760	145,904	162,572	160,581
July	375,862	307,132	297,697	291,281	314,110	304,248
August	289,398	311,846	317,484	311,367	328,783	282,916
3 month total	846,984	781,271	787,941	748,552	805,465	747,745
Annual Total	1,454,371	1,401,862	1,386,842	1,296,285	1,400,254	1,359,553
June - August total as % of annual total	58.2 %	55.7 %	56.8 %	57.7 %	57.5 %	55.0 %
Source: USFWS 2011						

Table 22
Assateague Island National Seashore: Traffic Counts At Chincoteague NWR
July - August and Annual Counts

Year	JUN	JUL	AUG	Total	Annual
1997	56,005	76,957	89,035	221,997	426,162
1998	45,160	81,378	80,021	206,559	382,650
1999	42,140	78,541	81,349	202,030	363,118
2000	44,041	77,717	69,399	191,157	346,181
2001	47,166	82,783	74,797	204,746	372,385
2002	63,893	94,053	93,011	250,957	440,341
2003	49,836	86,568	95,346	231,750	410,768
2004	48,391	108,164	83,179	239,734	439,679
2005	51,765	106,164	81,358	239,287	421,819
2006	45,999	86,357	87,827	220,183	389,107
2007	49,105	86,638	89,452	225,195	395,067
2008	41,136	81,789	87,689	210,614	369,548
2009	46,082	88,368	92,708	227,158	395,648
2010	45,821	91,884	81,155	218,860	392,804
2011	51,765	91,987	72,038	215,790	na

Source: National Park Service 2011

Figure 6



Source: U.S. Fish and Wildlife Service, Chincoteague National Wildlife Refuge.

4.2. Economic Impact of Refuge Visitation

Spending associated with recreational use of the Refuge can generate a substantial amount of economic activity in both local and regional economies. Refuge visitors spend money on a wide variety of goods and services. Trip-related expenditures may include expenses for food, lodging and transportation. Anglers, hunters, boaters and wildlife watchers also buy equipment and supplies for their particular activity. Because this spending directly affects towns and communities where these purchases are made, recreational visitation can have a significant impact on local economies, especially in small towns and rural areas. These direct expenditures are only part of the total picture, however. Businesses and industries that supply the local retailers where the purchases are made also benefit from recreation spending. For example, a family may decide to purchase a set of fishing rods for an upcoming vacation. Part of the total purchase price will go to the local retailer, say a sporting goods store. The sporting goods store in turn pays a wholesaler who in turn pays the manufacturer of the rods. The manufacturer then spends a portion of this income to cover manufacturing expenses. In this fashion, each dollar of local retail expenditures can affect a variety of businesses at the local, regional and national level. Consequently, consumer spending associated with Refuge recreation can have a significant impact on economic activity, employment, household earnings and local, state and Federal tax revenue.

Ideally, information would be available on Refuge-specific expenditures, how much visitors spend and what they spend it on, and where they spend it. This information is not currently available, consequently in order to derive quantitative estimates of Refuge recreation impacts on Chincoteague and Accomack County, a number of assumptions will have to be made. While any estimates based on these assumptions will lack the precision of estimates based on site-specific information, these estimates may work as reasonable, reconnaissance-level estimates.

4.2.1. Major assumptions

Several assumptions are used to enable estimates of the economic impact of Refuge visitation.

1. The estimate of Refuge visitors is essentially “visitor days”, in the sense that a visitor is one person on the Refuge for at least part of one day. A visitor who spends two days visiting the Refuge counts as two visitors.
2. Refuge-specific spending information is not available. Regional spending averages are available from the National Survey of Fishing, Hunting and Wildlife-Associated Recreation (2007). Table 23 shows average per day per person expenditures based on survey information for Fish and Wildlife Service Region 5 Northeast Region (including Virginia). In the present context, local non-consumptive expenditures are expenditures by local residents for day trips to the Refuge; non-local non-consumptive expenditures are for visitors from out of the local area which include both day trips and overnight visits averaged together. It is assumed that these expenditures are reasonably reflective of actual expenditures for Refuge visitors.

Table 23
Average Per Person Per Day Expenditures: FWS Northeast Region

Sector	Local Non-consumptive Expenditures	Non-local Non-consumptive Expenditures
Lodging	\$3.19	\$26.18
Food/Drink	\$6.76	\$39.40
Transportation	\$7.54	\$24.06
Other Retail	\$1.58	\$1.98
Total	\$19.07	\$91.62
Source: USDOJ 2007		

- Information is not currently available as to where Refuge visitors make their purchases. While it is reasonable to assume that Chincoteague receives a significant portion of these expenditures, it is not known precisely what portion is spent in Chincoteague. For example, a visitor from Norfolk Virginia south of the Refuge may spend some money in Norfolk, some in Northampton County and some in Accomack County, including Chincoteague. All of these purchases are related to a Refuge visit, but the expenditures occur in up to four different areas.

To address this issue, information from previous area studies will be used to help determine the proportion of Refuge spending occurring in Chincoteague and Accomack County. A study on the economic impact of NASA Wallops Island Flight facility (Beacon 2011) estimates where visitors spend their money when visiting the facility. The report estimates that 45 percent of expenditures are in Accomack County, 45 percent in Worcester County to the north and 10 percent out of the area. In lieu of any other currently available information, it is assumed that these percentages are reasonably representative of where Refuge visitors spend their money.

- The economic model used to estimate economic impacts can only derive estimates at the county level or above. The model can estimate impacts for the combined counties of Accomack and Worcester, but information is not currently available to derive Chincoteague economic impacts using the model. Consequently, an alternative approach is used to derive Chincoteague impacts (discussed below).
- The use of 80 percent as the percentage of Chincoteague's tourist economy attributable to Refuge visitation may be too high; reliance on a range of percentages based on expert opinion may be more reasonable.

4.2.2. Economic Impacts Measures

The economic impact estimates of the Accomack -Worcester model is shown first. Economic impacts include expenditures (retail sales), economic output, jobs and job income and tax revenue. These are discussed below.

Total expenditures shows the total annual retail expenditures associated with recreational visits to the Refuge. Currently, it is not known where (geographically) exactly Refuge visitors spend money. This approach assumes that 100 percent of expenditures occur in the Accomack - Worcester County area.

Economic output (also known as *industrial output*) shows the total output generated by total recreation-related expenditures. Total output is the production value (alternatively, the value of all sales plus or minus inventory) of all output generated by recreation expenditures. Total output includes the direct, indirect and induced effects of these expenditures. Direct effects are simply the initial effects or impacts of spending money; for example, spending money in a grocery store for a fishing trip or purchasing ammunition or a pair of binoculars are examples of direct effects. The purchase of the ammunition by a sporting goods retailer from the manufacturer or the purchase of canned goods by a grocery from a food wholesaler would be examples of indirect effects. Finally, induced effects refer to the changes in production associated with changes in household income (and spending) caused by changes in employment related to both direct and indirect effects. More simply, people who are employed by the grocery, by the food wholesaler, and by the ammunition manufacturer spend their income on various goods and services which in turn generate a given level of output. The dollar value of this output is the induced effect of the initial (or direct) recreation expenditures⁷. The economic impact of a given level of expenditures depends, in part, on the degree of self-sufficiency of the area under consideration. For example, a county with a high degree of self-sufficiency (out-of-county imports are comparatively small) will generally have a higher level of impacts associated with a given level of expenditures than a county with significantly higher imports (a comparatively lower level of self-sufficiency). Consequently, the economic impacts of a given level of expenditures will generally be less for rural and other less economically integrated areas compared with other, more economically diverse areas or regions.

Jobs and job income include direct, indirect and induced effects in a manner similar to total industrial output. Employment includes both full and part-time jobs, with a job defined as one person working for at least part of the calendar year, whether one day or the entire year. Job income in the IMPLAN system consists of both employee compensation and proprietor income (MIG, Inc. 1999).

Tax revenues are shown for business taxes, income taxes, and a variety of taxes at the county, state and national level. Like output, employment and income, tax impacts include direct, indirect and induced tax effects of expenditures, output and job income.

Two types of information are needed to estimate the economic impacts of recreational visits to the refuge: (1) the amount of recreational use on the Refuge; and (2) expenditures associated with recreational visits to the Refuge. With this information, total recreation-related expenditures can be estimated. At the county level or above, these expenditures, in turn, can be used in conjunction with a county or regional economic model to estimate economic output, jobs, job income and tax impacts associated with these expenditures.

4.2.3. Accomack and Worcester Counties Economic Impacts

⁷ Technically, direct effects are production changes associated with the immediate effects of changes in final demand (in this case, changes in recreation expenditures); indirect effects are production changes in those industries directly affected by final demand; induced effects are changes in regional household spending patterns caused by changes in regional employment (generated from the direct and indirect effects) Taylor et al. 1993, Appendix E, p. E-1)

The basic approach to estimating retail expenditures is to multiply per person per day expenditures by the number of visitors (visitor days) to obtain total expenditures. Previously, Table 23 showed per person per day recreation expenditures by activity and by resident and non-resident for Region 5 (Department of the Interior et al. 2007). Table 20 showed recreation visits and participation by activity for the Refuge in 2010. Since the number of visitors to the Refuge is primarily based on car counts, and since there is no overnight visitation on the Refuge, the total number of visitors (minus environmental education participants) can be interpreted to reflect total number of visitor days (one person visiting the Refuge for at least part of one day). Using the above information, retail expenditures, economic output, jobs, job income and tax revenue can be estimated for the Accomack - Worcester County area.

Table 24 shows estimates of Refuge recreation-related expenditures, and associated economic output, jobs, job income and total (county, state and Federal) tax revenue. Total retail expenditures are estimated at \$113.8 million; economic output at \$150.3 million; jobs at 1,794, job income at \$48.6 million and total tax revenue of \$10.6 million.

Table 24
Chincoteague NWR: 2010 Visitor Recreation Expenditures Within Accomack and Worcester Counties
(Dollars in millions, adjusted for inflation to 2010 dollars)

	Residents	Non-Residents	Total
Retail Expenditures	\$2.9	\$110.9	\$113.8
Economic Output	\$3.8	\$146.5	\$150.3
Jobs	45	1,749	1,794
Job Income	\$1.2	\$47.4	\$48.6
Total Tax Revenue	\$0.6	\$10.0	\$10.6

Source: Estimates compiled by the Division of Economics, USWFS.

4.2.4. Town of Chincoteague Economic Impacts from Refuge Visitation

This section estimates the economic impacts that are specific to the Town of Chincoteague from Refuge visitation and related spending. Because the economic model used to estimate Accomack and Worcester County impacts cannot estimate impacts at the sub-county level, the following approach is adopted: First, this analysis estimates the amount of direct expenditures (in 2010 dollars) spent by refuge visitors from out of the area. Second, the analysis estimates how expenditures in the Town breakdown for lodging and food and other retail services. As a final step, the analysis estimates the number of jobs associated with these out of town expenditures.

Estimation of Total Spending by Refuge Visitors in the Town of Chincoteague

Step 1. Total non-resident refuge visitor expenditures in 2010 were estimated to be \$110.9 million (Table 24). Resident expenditures are not included in this calculation because it is likely that their expenditures for local goods and services such as food and gas would have occurred regardless of whether or not they visited the refuge.

Step 2. The Wallop Island Flight Facility study (section 3.3) estimated that 45 percent of visitor spending occurred in Accomack County. This analysis assumes that refuge visitor spending breaks down in the same manner. Based on this assumption 2010 refuge visitor expenditures in Accomack County are estimated to be \$49.9 million ($0.45 * \110.9).

Step 3. The Springsted report (Review of Revenues Received by Accomack County from the Town, Springsted Inc, 2010) estimated that about 85 percent of travel-related expenditures in Accomack County occurred in the Town of Chincoteague (Table 16). Based on this assumption, this analysis estimates that in 2010 refuge-related visitor expenditures in the Town were \$42.4 million ($0.85 * \49.9).

Estimation of Food and Lodging Expenditures by Refuge Visitors in the Town of Chincoteague

Step 1. Table 25 shows the lodging and prepared food excise tax collected by Chincoteague in 2010. The excise taxes for lodging and food are 3 and 4 percent respectively. Dividing the respective excise tax collected by the rate gives gross sales shows that total expenditures on lodging were \$20.1 million and \$12.2 million for prepared foods.

Table 25
2010 Chincoteague Lodging and Food Excise Tax Revenue and Estimated Gross Sales

	Excise Tax Revenue Collected	Gross Sales
Lodging	\$602,800	\$20.1 million
Prepared Food	\$487,100	\$12.2 million
Total	\$1,089,000	\$32.3 million
Source: Excise Tax Revenue obtained from the Town of Chincoteague (Jim confirm), Estimation of gross sales conducted by the Division of Economics.		

Step 2. Information on the percentage of gross sales of lodging and prepared food attributable to Refuge-related spending is not currently available. Given the volume of visitors to the Refuge and associated visits to Chincoteague, an estimate of 80 percent will be used for estimating further impacts. Accordingly, the portion of lodging and prepared food gross sales attributable to Refuge visitation is estimated to be \$25.8 million ($0.8 * \32.3 million). By association, this implies that \$16.6 million in refuge-related visitor expenditures were associated with other types of retail expenditures, including groceries (\$42.4 million in total direct expenditures less \$25.8 million spent on lodging and prepared foods).

Step 3. Ideally, grocery expenditures would be included in a food and lodging estimate. To do this, this analysis estimates the number of jobs per \$1 million in expenditures for the prepared foods and accommodations sector and uses this ratio to estimate the amount of grocery sales based on the reported number of jobs in the grocery sector. Census reports that there were 454 jobs in the Accommodations and Food Service sector (NAICS 72, Table 8). Given that it was estimated that the total purchases in the Town for accommodations and prepared foods was \$32.3 million in 2010, it is estimated that 14.1 jobs are generated for each \$1 million in expenditures (454 divided by 32.3). The Virginia Employment Commission reports that there were 53 jobs in the grocery sector in 2010 (NAICS 4451), which by association implies that total sales were \$3.8 million (53 divided by 14.1).

Step 4. To estimate the amount of grocery sales (and associated jobs) related to refuge visitor expenditures, this analysis again assumes that 80 percent of grocery sales are related to refuge visitation. This implies that refuge visitors spent \$3.0 million on groceries.

Estimation of total jobs Associated with Refuge-Related Expenditures

Continuing with the job estimates, accommodation and food sectors accounted for 504 jobs in 2010. Using the 80 percent figure, 403 jobs are attributable to Refuge recreation visits. To estimate the number of jobs in other retail sectors, the 13.96 jobs per \$1 million in gross sales can be used. If other retail expenditures total \$13.6 million, then 13.6×13.96 results in 190 jobs associated with retail sales other than lodging and food. Consequently, total Chincoteague jobs affected by Refuge visitor expenditures are estimated to be 593 (403 plus 190). Table 26 summarizes the expenditure and employment impacts of Refuge visitation.

Table 26
Summary of Refuge Visitor Expenditures and Associated Employment
in the Town of Chincoteague, 2010

Sectors	Direct Expenditures (millions)	Employment
Lodging and Food (including groceries)	\$28.8	403
All other retail sales	\$13.6	190
Total Impacts	\$42.4	593
Source: Data compiled by the Division of Economics, U.S. Fish and Wildlife Service, May 2012.		

A general check on the accuracy of these impacts compared with the Accomack -Worcester County model can be achieved by running the lodging and food gross sales in the Accomack -Worcester County model, using the 80 percent figure to adjust for Chincoteague's share of Refuge expenditures, and comparing the job estimates with the actual jobs. This comparison is shown in Table 27. The model underestimates jobs for both sectors, but the estimates appear to be reasonable ball park estimates given the data used in the analysis.

Table 27
Comparison of Model Estimated Jobs with Actual Jobs

Sector	Gross sales	Actual jobs	Model Estimated jobs
Lodging	\$20.1 million	248	211
Prepared Food	\$12.2 million	203	171

4.3 Proximity Effects of Refuge on Local Property Values

It has been well documented that the value of certain types of real property is positively affected by the proximity of open space. (cite standard open space studies). Typically, this value is directly related to the density of the property development along with the scarcity of open space. In other words, all things equal, one would expect that the open-space premium for a given house abutting dedicated open space in an urban area would be greater than for a similar house in a rural area. With this in mind, the U.S. Fish and Wildlife Service recently commissioned a study to determine specifically how National Wildlife Refuges affect real property values.

This study identified 93 Refuges in the Lower-48 States whose boundary was within two miles of the boundary of an urbanized area with a population greater than 50,000. The study used micro-level Census data that contained information on owner-assessed housing values and housing characteristics along with location to develop an economic model that after controlling for housing characteristics and other variables determined the effect Refuge proximity had on housing values. Results from the study found that homes located within 0.5 miles of a Refuge and within eight miles of an urban center are valued four percent to five percent higher in the Northeast region.

While Chincoteague National Wildlife Refuge and its surrounding s were not included in the study, it is nonetheless feasible that the protection that the Refuge provides to Assateague Island and seashore is reflected to a degree in nearby home values. Unfortunately, the results of the Refuge Proximity study are not directly transferable to the Town of Chincoteague because the Town fails to meet the criteria that the study used to define urban areas for the analysis. Nonetheless, given the earlier findings concerning the Town's economic dependence on tourism and given the fact that the Refuge draws so many visitors it is entirely reasonable to expect that the Refuge exerts some influence on real property values although it is difficult to reliably quantify this relationship at this time.

5.0. Chincoteague NWR Budget Expenditures

5.1. Refuge Expenditures

As shown in Table 28, Chincoteague NWR spends \$3.4 million in operations and maintenance each year. Forty-five percent of this funding is spent on salaries to employees who live in the area. Employee benefits for these people are paid to the Social Security administration, insurance companies and other entities outside the refuge area so \$397,700 in benefit amounts are not counted in local spending.

Table 28
Chincoteague NWR: Budget Expenditures for fiscal year 2009

	Dollars	Percent
<i>Local Expenditures</i>		
Personnel Compensation	\$1,507,699	44.8%
Transportation of People	\$4,206	0.1%
Transportation of Things	\$4,962	0.1%
Communications	\$30,769	0.9%
Utilities	\$43,304	1.3%
Contracts	\$115	0.0%
Building Repairs	\$1,196,301	35.5%
Equipment Maintenance	\$74,809	2.2%
Supplies and Materials	\$296,760	8.8%
Motor Vehicle Fuel	\$37,571	1.1%
Equipment-Capitalized	\$48,111	1.4%
Equipment-Non-capitalized	\$123,806	3.7%
Local Sub-Total	\$3,368,415	100.0%
<i>Non-Local Expenditures</i>		<i>Non-Local Expenditures</i>
Employee Benefits	\$ 397,735	Employee Benefits
Air Travel	\$29,040	Air Travel
<i>Non-Expense Item</i>		<i>Non-Expense Item</i>
Real Property	\$ 20,325	Real Property
Grants	\$ 909	Grants
Organization Total	\$ 3,816,424	

Changes in the value of real property do not necessarily lead to local economic activity. Purchases of land, for example, are best understood as a change in the form of assets rather than expenditures. Therefore, these expenditures are not considered to benefit the local economy. Similarly, grants for research efforts at refuges often go to nearby research institutions to study significant wildlife issues. Although some of this funding may return to the local economy as researchers work in the area a significant portion may leave the immediate area, particularly if the recipients work off-site (e.g., research grants to a State university) and so grant funding is not counted as local spending in this study.

Refuge spending in the local economy paid for both locally produced items and things imported into the region for sale. So all of the expenditures did not result in increased local output. Table 29 shows \$2.7 million had a direct effect on local output. Typical purchasing patterns for households and industries in the region suggest the remaining spending flowed to suppliers outside the area. About \$663,900 became compensation for local workers in 36.3 jobs. The iteration of refuge spending through the local economy generated \$3.5 million in total output and 44.4 jobs.

Table 29
Chincoteague NWR: Economic Impacts of Refuge Budget Expenditures

Sector	Output (\$ 2010)		Employee Compensation (\$ 2010)		Employment (Number of Jobs)	
	Direct	Total	Direct	Total	Direct	Total
Agriculture	2,100	4,900	100	400	0.0	0.0
Utilities	56,500	78,900	8,400	11,600	0.1	0.1
Construction	100	19,200	0	4,900	0.0	0.2
Manufacturing	126,800	142,100	33,600	36,200	0.7	0.8
Trade	283,600	390,500	90,200	125,900	4.1	5.7
Transportation	7,700	14,000	2,400	4,300	0.1	0.2
Information	29,300	75,800	4,300	11,600	0.1	0.2
Finance	253,500	539,500	12,900	40,900	0.5	1.7
Lodging	99,000	176,700	30,100	53,900	1.5	2.7
Government	22,400	49,500	8,000	17,800	0.1	0.3
Other	1,789,800	2,042,800	473,900	566,600	29.2	32.5
Total	2,670,800	3,533,900	663,900	873,900	36.3	44.4
Multipliers		1.32		1.32		1.22

Most of the increased output and employment occurs in the Finance, Trade, and Other Services industries. The Other sector includes upkeep for buildings and payments for planning services. Much of what employees buy locally falls into the trade and finance categories so these sectors appear to have very large multipliers. Chincoteague's economy is highly seasonal so earnings by seasonal laborers may not be spent within the region but returned to the workers' distant place of residence. This may help explain the high leakage and low multipliers.

5.2. Refuge Revenue Sharing and Payments in Lieu of Taxes

Chincoteague contains 13,433 acres of fee lands that were appraised at \$42.3 million in FY2008. The refuge revenue sharing fund paid \$72,938 to Accomack County, Virginia, \$6,360 to Chincoteague, and \$6,099 to Worcester County, Maryland in fiscal year 2010. The refuge earned no funds for refuge revenue sharing. None of Chincoteague's lands were reserved from the public domain so PILT payments were not made for this refuge.

6.0 Alternatives Analysis

6.1 Alternative A: No Action

Alternative A is the No Action Alternative. It assumes that the Refuge will lose a significant number of beach parking spaces over the next 15 years. Losses are expected to occur because of the projected intensity and frequency of coastal storm and sea-level rise. Whether or not the U.S. National Park Service (NPS) will continue to be successful in obtaining repair/replacement funds for the parking lots is unknown. The Fish and Wildlife Service (Service) recently asked the U.S. Army Corp of Engineers for a cost proposal for beach re-nourishment activities to replace some of the recreational beach in front of the parking lots that has eroded over time. Beach re-nourishment would entail activities that would build up the beaches using dredge and fill technology. A recent cost estimate provided by the U.S. Army Corp of Engineers found that the total project cost for the first, initial phase of beach re-nourishment would be over \$24 million with an additional cost of \$8 million for every re-nourishment cycle, which could take place every three to seven years.

Under Alternative A, the Service is not able to accurately predict the availability of parking spaces over the next 15 years, the planning period for this CCP. Climate Change and the corresponding rise in sea levels, coupled with strong coastal storms, will likely continue to significantly damage existing beach parking areas ultimately requiring the complete rebuild of the 961 parking spaces/parking lots. Also, it is impossible to predict if a sufficient land base will remain so as to allow the rebuilding of the parking lots or that sufficient funding will be available to complete this task.

In conjunction with the NPS, the Service has surveyed the current recreational beach area and have determined that the land base directly behind parking lots 1 and 2 will likely have sufficient area to provide for 400 parking spaces over the 15 year planning period covered by this CCP but they will require constant rebuilds as strong coastal storms will erode and/or wash them away. These lots lie immediately north and south of Beach Road.

However, the fates of parking lots 3 and 4, which represent the southernmost parking areas, are less certain. These lots have a combined current capacity of 561 parking spaces and it can be projected that the land base for these parking lots may be partially or fully lost over time.

For the purposes of this analysis, the effect of losing these lots and the potential corresponding impact to visitation will be compared directly to the base year of the analysis without adjustment. This is done because the Service and NPS are unable to reliably predict at what point in the future period the parking lot spaces would be lost. The Services are also unable to predict whether the parking lot losses would all occur due to a single storm event or whether they would be lost incrementally over a period of years. Finally, the Service anticipates that it would take several years to identify alternative parking on-site or off-site and to develop a shuttle system; it is furthermore assumed that not all visitors are likely to ride the shuttle. Thus, by simply comparing how a total loss of 561 parking lot spaces affects the local economy under the assumption that neither alternative parking nor transit will be provided the analysis of this alternative makes clear the local economy's relationship to beach tourism in its current form.

6.1.1 *Estimating the Number of Visits Affected*

Over the years, the Chincoteague National Wildlife Refuge has tracked the total number of vehicles entering the Refuge. As previously shown in Table 21, 57 percent of Refuge visits occur during the summer months of June, July, and August. Using 2009 as a base year, Table 30 shows both the total number of vehicles entering the Refuge as well as the calculated daily average for the traditional summer beach season (Memorial Day weekend through Labor Day weekend). While a few data gaps exist due to equipment malfunction (data was collected via a pneumatic vehicle traffic counter) the data show the average daily number of vehicles entering the Refuge to be 1,505 in June, 2,881 in July, and 2,542 in August. On Memorial Day weekend the average number of vehicles entering the Refuge is 2,186 and on Labor Day weekend the average number of vehicles entering the Refuge is 2,843.

Not all vehicles entering the Refuge head to the beach parking area. Because the traffic counter was located at the main entrance to the Refuge it counted vehicle visits associated with other trip purposes. Along with visitors in vehicles intending to drive and park at the beach parking lot, it also includes vehicles crossing into the Refuge for other activities such as hiking, wildlife photography and/or observation. Visitors heading only to the visitor center and/or the lighthouse are also included in the count. Nonetheless, because it is likely that the vast majority of vehicles entering the Refuge during this time of year are associated with beach visits, this analysis does not attempt to make any adjustments to the summer count for non-recreational beach visits.

Given that current beach parking is limited to 961 spaces, it would appear that based on the average daily number of vehicles entering the Refuge that the parking lot would be full every single day during the summer months. This is not the case, however. In fact, since 2009, the parking lot has only been closed 24 times. Closures typically occur during mid-day as early arrivers start heading out but not necessarily before the arrival of afternoon beach visitors. According to a survey conducted by the NPS for Assateague Island National Seashore, beach visitors typically spend 4 hours at the beach.⁸ Thus, while the data show that there are twice or more as many vehicles entering the Refuge as there are beach parking spaces, parking has been more or less ample for the majority of the visitors for the majority of the time as each parking lot space can potentially hold two or more vehicle visits per day.

⁸ Assateague Island National Seashore Visitor Survey Report, p. 30.

Table 30
Total and Daily Average Vehicle Counts Entering Chincoteague NWR, 2009 – 2012

Year	Memorial Day Weekend		June		July		August		Labor Day Weekend	
	Total	Daily Avg	Total	Daily Avg	Total	Daily Avg	Total	Daily Avg	Total	Daily Avg
2009	7,016	2,339	39,732	1,324	88,033	2,840	86,742	2,798	7,968	2,656
2010	3,799	1,266	n/a	1,465	87,191	2,906	81,155	2,618	9,273	3,091
2011	5,852	1,951	51,767	1,726	91,987	2,967	72,058	2,324	8,349	2,783
2012	9,569	3,190	n/a	n/a	87,073	2,809	75,211	2,426	n/a	n/a
	Avg:	2,186	Avg:	1,505	Avg:	2,881	Avg:	2,542	Avg:	2,843

Source: Chincoteague National Wildlife Refuge, US FWS. September 2012.

While 961 parking spaces appears to be ample to handle the majority of beach parking demand under baseline conditions the Refuge anticipates that the land base will only support the maintaining of 400 parking lot spaces under Alternative A. These spaces are located in Parking Lots 1 and 2, which the Refuge and NPS have identified as most likely to be reclaimable/restorable (if funding is available) given likely future erosion scenarios. This analysis assumes that the demand for vehicle access to the beach will remain relatively constant during the period of analysis. This assumption is based on the analysis of seasonal and annual total counts found in Table 22. Thus, this analysis assumes that 1,505 vehicle per day in June, 2,881 vehicles per day in July, and 2,542 vehicles per day in August will on average attempt to access the beach and parking during future years of this CCP. During the Memorial Day weekend this analysis assumes that the daily average number of cars entering the Refuge will be 2,186 and for Labor Day weekend 2,843 vehicles.

While the number of parking lots may be reduced by 58 percent, the total number of vehicles restricted from beach parking may be less because some of these vehicles enter either in the early morning hours and exit before the mid-day surge or arrive later in the evening at the end of the day. Nonetheless, the expected effect of losing 58 percent of parking spaces would be a significant increase in both the number and length of parking lot closures. Unfortunately, because the Service does not have any information or data pertaining to how often there are 400 or more parking spaces occupied at any given time, this analysis must again make a series of assumptions to estimate the effect on parking space demand.

6.1.2 Estimating the Upper-bound Impact of the Loss of 561 parking lots

This analysis makes a series of relatively conservative assumptions in order to avoid understating the economic impact associated with the loss of 561 parking lots. Although the Assateague Survey found that the average vehicle visit lasted approximately four hours, it follows that some visits lasted longer and others for a shorter period. Unfortunately, the Services do not have any data or information on how many parking lot spaces are occupied at any given time during the summer months. The only information that is collected is when 961 spaces are occupied at which time the Services must turn back visiting vehicles.

At the very extreme, it is feasible that the first 400 vehicles parking at the beach parking lot elect to spend the entire day at the beach thus preventing all other vehicles with occupants targeting the beach parking lot from obtaining access during the day. For the purposes of this analysis, the beach day is defined as the prime hours to be on the beach, which is between the hours of 10:00 am and 5:00 pm. While this scenario is highly unlikely, particularly for every single day of the summer season, this analysis will adopt this assumption in order to estimate an upper-bound estimate of potential economic impacts to the community. This assumption is reasonable because while it is known from the beach closure data along with the Assateague Survey that there are essentially two waves of visitation during the day, a morning wave and an afternoon wave, it is not known whether or not 400 total spaces could adequately handle the visitation shifts and associated overlaps. What is only known is that over the past several years, the beach parking lot consisting of 961 spaces has only experienced closures 24 times and that the closures involved mid-day periods that for the most part lasted only an hour or two. This data is shown in Table 31.

Table 31
Closure Dates and Times for Chincoteague NWR Beach

Year	Date	Time Full	Total Hours
2009	7/03/09	11:30am - 3:00 pm	3.5
	7/04/09	11:00am - 2:45pm	3.8
	7/11/09	1:10pm - 3:05pm	2.0
	7/19/09	no time given	2.0
	7/25/09	12:00pm - 1:30pm	1.5
	8/02/09	1:30pm - 2:30 pm	1.0
	8/03/09	1:00 pm - 2:00 pm	1.0
	8/04/09	1:30 pm - 2:30 pm	1.0
	8/07/09	12:00 pm - 2:30 pm	2.5
	8/08/09	no time given	2.0
	8/09/09	no time given	2.0
	9/05/09	12:30 pm - 2:45 pm	2.3
2010	7/03/10	12:00 pm - 2:10 pm	2.0
	7/04/10	11:20 pm - 2:15 pm	3.0
	8/07/10	12:50 pm - 3:10 pm	2.5
	8/14/10	12:15 pm - 2:30 pm	2.3
	Labor Day	no time given	no time given
2011	7/02/11	11:40 am - 2:30 pm	3.0
	7/04/11	11:30 am - 12:45 pm	1.3
	7/16/11	12:45 pm - 2:35 pm	2.0
	8/06/11	1:30 pm - 3:30 pm	2.0
	9/03/11	10:30 am - 3:30 pm	5.0
	9/04/11	9:30 am - 5:00 pm	7.5
	9/05/11	10:45 am - 12:30 pm	2.0
	9/10/11	11:30 am - 1:15 pm	1.8
2012	8/8/2012	12:20 pm - 1:30 pm	1.0

Source: Chincoteague National Wildlife Refuge, US FWS. September 2012.

Notes: As a result of Hurricane Irene, parking was reduced to approximately 350 spaces for Labor Day Weekend 2011.

This analysis does make one adjustment to the total number of vehicles entering the Refuge to account for the fact that not all vehicles entering the Refuge during the day enter in order to spend the entire day parked at the beach parking lot. Because data is unavailable pertaining to the time that vehicles enter the Refuge and because the Refuge is open from dawn through dusk this analysis assumes that ten percent of the vehicles entering the Refuge arrive in the very early morning hours and that another ten percent arrive in the evening hours. This assumption is not unreasonable because it is commonly observed to see vehicles enter in the early morning to either watch the sun rise over the water, to fish before it becomes too light, or to observe wildlife before the heat of the day arrives. It is also very common to observe vehicles entering the Refuge in the evening hours to watch the sunset, fish, and/or observe wildlife.

Table 32, shows how the total number of vehicles, on average, would be affected through a reduction in the number of parking lot spaces at the Refuge beach. The percent of vehicle trips associated with full day recreational-beach use that would be affected under this scenario range from 82 percent to 67 percent.

Table 32
Estimated Number of Daily Vehicles Denied Access to Chincoteague NWR
400 Space Parking Limit

Month	Avg Daily Visits	Avg Daily Visits During Peak Hrs	Parking Available	Assumed Length of Stay (hrs)	Vehicles Denied Access	Pct of Day-long Beach Use Visits Affected
Memorial Day weekend	2,186	1,749	400	8	1,349	0.77
June	1,505	1,204	400	8	804	0.67
July	2,881	2,304	400	8	1,904	0.83
August	2,542	2,033	400	8	1,633	0.80
Labor Day weekend	2,843	2,275	400	8	1,875	0.82

Notes: Assumes ten percent of average daily visits occur in early morning hours and that another ten percent occur in evening hours. Also assumes that remainder of vehicles cannot access beach or parking lot once first 400 vehicles park for remainder of beach day.

Table 33 shows the estimated impact to the economy associated with a loss of vehicle visits to the Refuge due to a reduction of 561 parking spaces from a baseline of 961. It is estimated that during a typical summer season, the economic impact to the region in terms of a loss of direct expenditures from tourists would be \$38.4 million. This estimate is based on the assumption that visitors who cannot access the parking lot spaces during peak beach visiting hours would elect not to travel to the region at all (i.e., Accomack and Worcester Counties). In reality, some visitors may elect to stay in the area but either travel for the day up to Assateague Island National Seashore or Ocean City, down to the Norfolk area, or even elect to stay in Town for its various other tourist-related amenities, including shopping, recreational charter fishing, bike riding, etc., so the impact may be less. Nonetheless, the estimated impact to the baseline estimate of direct regional expenditures for the year (\$113.8 million) is nearly 34 percent of the annual total.

Table 33

**Estimated Economic Impact Associated with Loss of 561 Parking Spaces
Summertime Visits, Memorial Day weekend through Labor Day weekend
Accomack and Worcester Counties**

Month	Daily Vehicles Denied Access	Associated Number of Daily Visitors Affected	Economic Impact Per Day	Economic Impact per Month/Holiday Weekend
Memorial Day weekend	1,349	4,317	\$ 361,073	\$ 1,083,219
June	804	2,573	\$ 215,185	\$ 6,455,560
July	1,904	6,094	\$ 509,720	\$ 15,801,328
August	1,633	5,227	\$ 437,155	\$ 13,551,794
Labor Day weekend	1,875	5,999	\$ 501,748	\$ 1,505,243
Total			\$ 2,024,881	\$ 38,397,143

6.2 Alternative C

Alternative C considers a number of management changes to the refuge. Changes that could negatively affect visitation include:

- Reduce beach parking to 480 spaces
- Closing the service road to walkers/hikers
- Closing Beach Road causeway and Toms Hook to public access
- Eliminating off-road vehicle use
- Eliminating horseback riding.

While all of the above mentioned changes could negatively affect visitation, Alternative C also includes some changes that could serve to either mitigate the negative impacts to visitation or that would serve to increase visitation associated with other types of recreational activities on the refuge. Management changes under Alternative C that could positively affect visitation or serve to mitigate some of the negative impacts include:

- Instituting a shuttle bus system to allow visitors to access the refuge from remote sites
- Implementing a non-migratory goose hunting season
- Implementing light goose hunting
- Implementing fox and raccoon hunting

- Implementing fur bearer trapping

Of all these proposed changes to the management of the refuge, the most notable in terms of affecting visitation would be the loss of 481 parking spaces, which would primarily affect beach use activities during the busy summer season. This change would affect one-half of the current number of spaces, leaving a remaining 480 spaces. With partners, the refuge would pursue identification of off-site parking and institution of a shuttle system, but as for Alternative A, the timeline and ridership for such a service are unknown. Thus, following the same logic used to estimate the impacts under Alternative A, the loss of 481 parking spaces would result in a total economic impact of \$36.3 million in terms of reduced expenditures by visitors. This translates to a 32 percent reduction from current baseline expenditures of \$113.8 million that affect both Accomack and Worcester Counties. Table 34 shows the breakout of impacts for the summer season.

Table 34
Estimated Economic Impact Associated with Loss of 481 Parking Spaces
Summertime Visits, Memorial Day weekend through Labor Day weekend
Accomack and Worcester Counties

Month	Daily Vehicles Denied Access	Associated Number of Daily Visitors Affected	Economic Impact Per Day	Economic Impact per Month/Holiday Weekend
Memorial Day weekend	1,269	4,061	\$ 339,661	\$ 1,018,983
June	724	2,317	\$ 193,774	\$ 5,813,208
July	1,824	5,838	\$ 488,309	\$ 15,137,565
August	1,553	4,971	\$ 415,743	\$ 12,888,031
Labor Day weekend	1,795	5,743	\$ 480,336	\$ 1,441,008
Total				\$ 36,298,795

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Appendix N

USFWS



Aerial View of Refuge

Chincoteague NWR: Recreational Beach Structured Decision Making Process, Locating the Best Site for a Recreational Beach and Parking Lot



Chincoteague National Wildlife Refuge: Locating the Best Site for a Recreational Beach and Parking Lot

Summary Report

A Structured Decision Making process to identify beach segments with the least amount of wildlife use and greatest public use attributes.

November 2011

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Background

Chincoteague National Wildlife Refuge (CNWR) was established under authority of the Migratory Bird Conservation Act in 1943. The Assistant Secretary of the Interior determined U.S. Fish and Wildlife Service (FWS) ownership of this land was necessary for protection during nesting and migration seasons of all those species of wildlife determined as being of great value as a source of food, or in destroying of injurious insects, or nevertheless in danger of extermination through lack of adequate protection (U.S. District Court, 1943).

Access to Assateague Island, CNWR, for recreational use and related development was authorized by Congress under Public Law 85-57 in June 1957. The law provided for construction of a bridge and road to the refuge as well as recreational facilities on the southeastern shore of the island. The Chincoteague-Assateague Bridge and Beach Authority (a political subdivision of the Commonwealth of Virginia) developed and managed beach front recreational facilities and provided visitor services (USFWS 1993).

In September 1965, Congress approved the Assateague Island Seashore Act (P.L. 89-195) establishing Assateague Island National Seashore (ASIS). The National Seashore's boundaries were drawn to encompass CNWR. The Act provided the Virginia portion of Assateague Island National Seashore be managed by the National Park Service (NPS) for general purposes and follow the laws and regulations applicable to national wildlife refuges, including administration for public recreation use in accordance with the provisions of the Refuge Recreation Act (P.L. 87-714) (USFWS 1993).

The NPS acquired the Chincoteague-Assateague Bridge and Beach Authority and other rights in 1966 after the national seashore was established. Since the 1966 acquisition, the NPS managed public recreation activity at the Toms Cove Hook beach as an agent of the FWS, which owns the beach as part of CNWR (USFWS 1993). In 1976, Congress amended the National Wildlife Refuge System Administrative Act (P.L. 94-223) giving the FWS primary responsibility for the administration of lands and waters included within the National Wildlife Refuge System. This clarified the role of the FWS at CNWR although the majority of refuge lands lay within the boundary of Assateague Island National Seashore (USFWS 1993).

A 2001 Interagency Agreement between FWS and NPS specified the NPS role on the Virginia portion of Assateague Island National Seashore. Today, NPS continues to manage public recreation within an "assigned public beach area". FWS has primary responsibility for managing the wildlife resources within this area, allowing beach and other recreational use in compliance with the Refuge Recreation Act (Public Law 87-714).

Wind, waves, and storm surges are constantly shaping and re-shaping the Refuge's barrier islands in a natural dynamic process. Strong waves and storm surges can erode entire beaches back to the dune line, or break through this protective barrier and overwash sand and salt water onto back dunes, flats, or wetlands. Natural dune location is determined by the frequency and extent of storms, and the rate at which prevailing winds and vegetation can rebuild dunes. The coastal edge of barrier islands progressively moves westward in a process called shoreline retreat. Sand is rolled across the dunes and marshes, and deposited into bays on the backside of the islands, such as Toms Cove on Assateague. This process, sometimes described as the "barrier island rolling over onto itself," will be accelerated with predicted climate change and sea level rise. For every one-foot rise in sea level, barrier islands move 100 to 1,000 feet inland (USFWS 1988).

Assateague Island is more than 37 miles long. The southern 17 miles are managed as Chincoteague NWR. Early 18th century maps show a smaller Assateague Island. It has developed southward as a series of re-curved spits deposited by currents that erode sands from northern beaches. Toms Cove Hook is a sand spit that has accreted since the 1850s (CNWR 2008). Assateague Island National Seashore staff continues to track this southward growth by mapping the entire shoreline twice a year.

Based on early 1950s photos in Refuge Annual Narratives, and accounts from a flight over the island in 1941 (NPS 2003), Assateague was historically a low, overwashed island with some low natural dunes. Conditions are unfavorable for the natural development of a tall dune system because strong waves and storm surges erode beaches back to the dune line, and create breaks in the dune line (CNWR 1993). During the 1950s, Refuge maintenance staff constructed several miles of "beach dikes" by bulldozing sand and installing sand fences to create dunes in order to facilitate building the Wash Flats and Old Fields Impoundments. These beach dikes were periodically blown out or washed out by storms, and repairs were frequent during the 1950s (Refuge Annual Narratives).

After a March 1962 nor'easter took out most of Assateague Island's "beach dikes", an artificial dune was created along the entire ocean-side of the island. It was constructed by bulldozing a dike of sand five feet high by 30 feet wide at base. A four foot high sand fence was placed on top of the dune to catch additional sand, and by 1963 wind-blown sand had been deposited against the fence to increase the height of the dune. In spots where insufficient sand was available to push up the dune, a larger dike was built that was approximately 6-7 feet high and 180-200 feet at the base with a 20:1 slope on the surf side; sand fence placed on top caught an additional four feet of drift sand (Refuge Annual Narrative 1962 and 1963).

From the 1960s into the 1990s, staff attempted to maintain the dune line in critical areas to protect impoundments and public use facilities from overwash and storm surges by repairing blowouts in the dunes, planting beach grass, and using fencing to encourage sand accumulation. For instance, high seas from Hurricane Gloria, in the fall of 1985, overwashed several portions of the dune line near Old Fields Impoundment and east of B Pool. These low gaps were filled in with sand before winter storms could cause more extensive damage. In January 1992, a nor'easter destroyed much

of the artificial dune line south of the parking lots; north of the beach parking lots portions of the artificial dunes were either overwashed or lost. Following the 1992 storm, about 2.5 miles of dunes between the north beach parking lot and D-Dike) were reconstructed and planted with beach grass (CNWR 1993 & Refuge Annual Narrative). After implementation of the 1993 Master Plan, maintaining the artificial dune line was de-emphasized, and occurred in selected areas to provide protection to facilities and wildlife habitat (CNWR 1993).

At present, Assateague Island's artificial dune system ranges from non-existent south of the beach parking lots, to well-developed with small gaps ocean-side of North Wash Flats and Old Fields Impoundments. Wash over occurs frequently in the Overwash Area, and in the parking lots. Overwash is common between autumn and spring, when nor'easters and prevailing winter winds scour the shoreline. Storm systems that occur during the highest lunar tides of the month can send sand filled waves over the beach, scouring everything in their paths, moving huge loads of sand from the ocean shoreline, depositing them in the cove side overwash fan. In summer, these events are less common. Prevailing winds blow sand from the overwash fan back to the beach, and littoral currents bring new sand from the north to further rebuild the beach face. Storm overwash has also occurred at numerous points along Wild Beach, sending sand and saltwater into the back dunes and barrier flats. These overwash events create ideal nesting substrate for piping plovers and terns; plover broods also forage in ponds that form in natural depressions behind the dunes.



Overwash at the terminus of Beach road due to the December 2009 Nor'easter (Nor'Ida).

The table below lists the notable storm events that have occurred since the late 1800's. Few severe storms are recorded previous to the 1990's; however Assateague Island has experienced an increase in severe storm activity in recent history. Most of the storm events have impacted the infrastructure (roads, parking lots and buildings) associated with the recreational beach.

1800's	1900 – 1999 (100 years)	2000 – 2011 (12 years)
1878 - September Gale	1933 – August Hurricane	2000 – December Snowstorm
1888 - Great Blizzard	1936 – September Hurricane	2003 – North American Blizzard
	1962 – Ash Wednesday Storm	2005 – North American Blizzard
	1976 – NE U.S. Blizzard	2006 – Late November Nor'easter
	1984 – November Nor'easter	2007 – April Nor'easter
	1991 – 'Perfect Storm'	2009 – November Nor'easter (Nor'Ida)
	1993 – 'Storm of the Century'	2009 – December Nor'easter
	1994 – Christmas Nor'easter	2010 – March Winter Storm
	1996 – North American Blizzard	2010 – November Nor'easter
	1997 – April Fools' Day Blizzard	2010 – December Blizzard
		2011 – January Blizzard
		2011 – Hurricane Irene
		2011 – October Nor'easter

It is important to have an understanding of the history of storm occurrences and the effect they have had on the barrier beach. These changes in the beach front and dune system need to be considered while determining the best location for a recreational beach. The refuge is seeking to find an area of the beach that can maintain the infrastructure associated with a recreational beach and remain intact after storm events. The cost of rebuilding roads, parking lots, buildings etc. has become increasingly prohibitive.



Storm damage to the Tom's Cove Visitor Center and parking lot #1 (December 1992).

1991 Photo of parking lot and recreational beach.

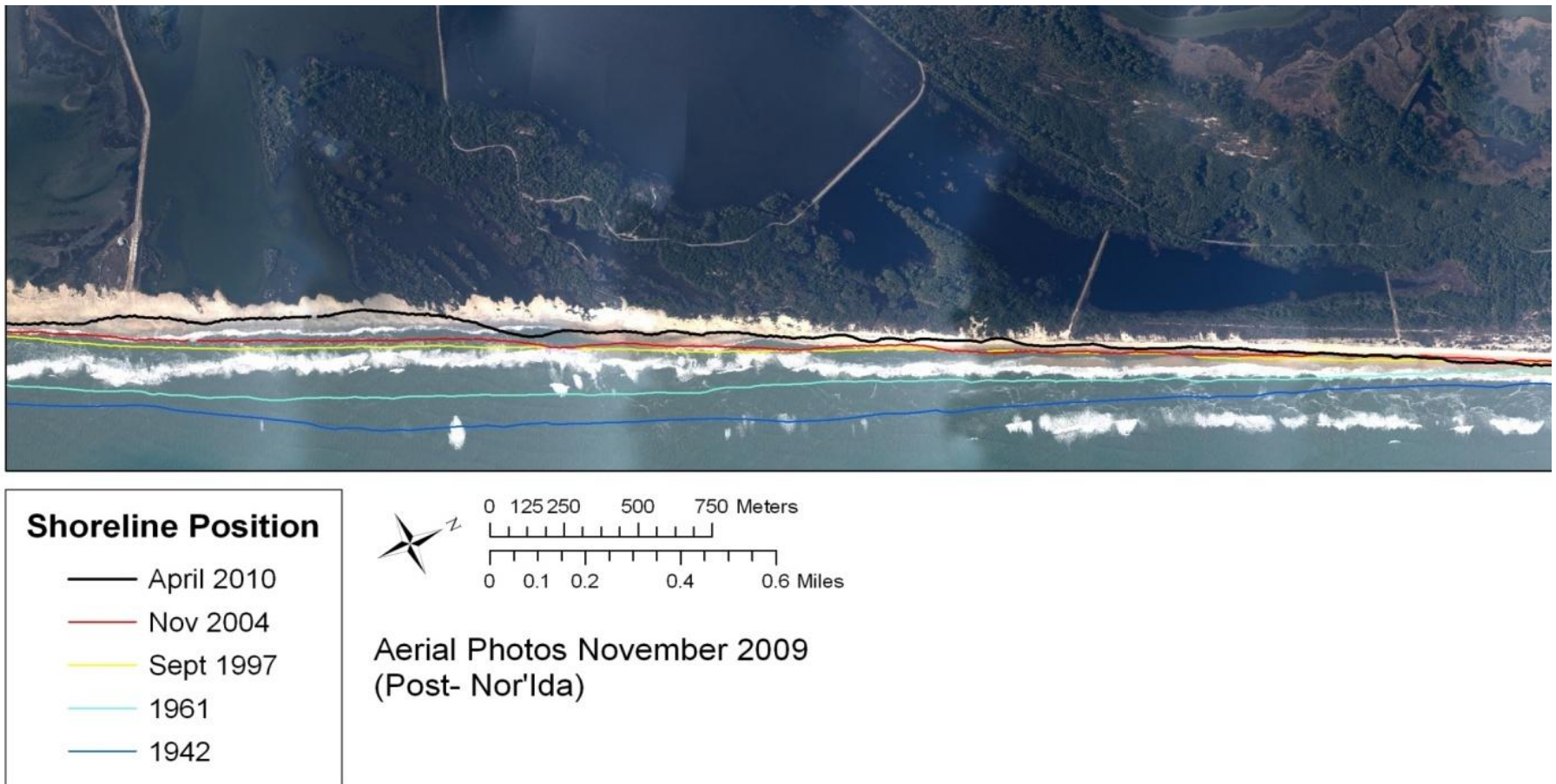
As a result of severe storms, the beach front has narrowed and the shoreline is moving westward. The 1991 photo shows the parking area and visitor center that was located behind the artificial dunes. Storm activity removed the dunes, parking lots and buildings. The second photo (2003) shows the deposition of sand that is building the island in its westward movement. Using artificial dunes in an attempt to 'protect' the beach front only temporarily prevents the natural barrier beach process from occurring. The red lines in the photos delineate the 2008 road to the parking lots.



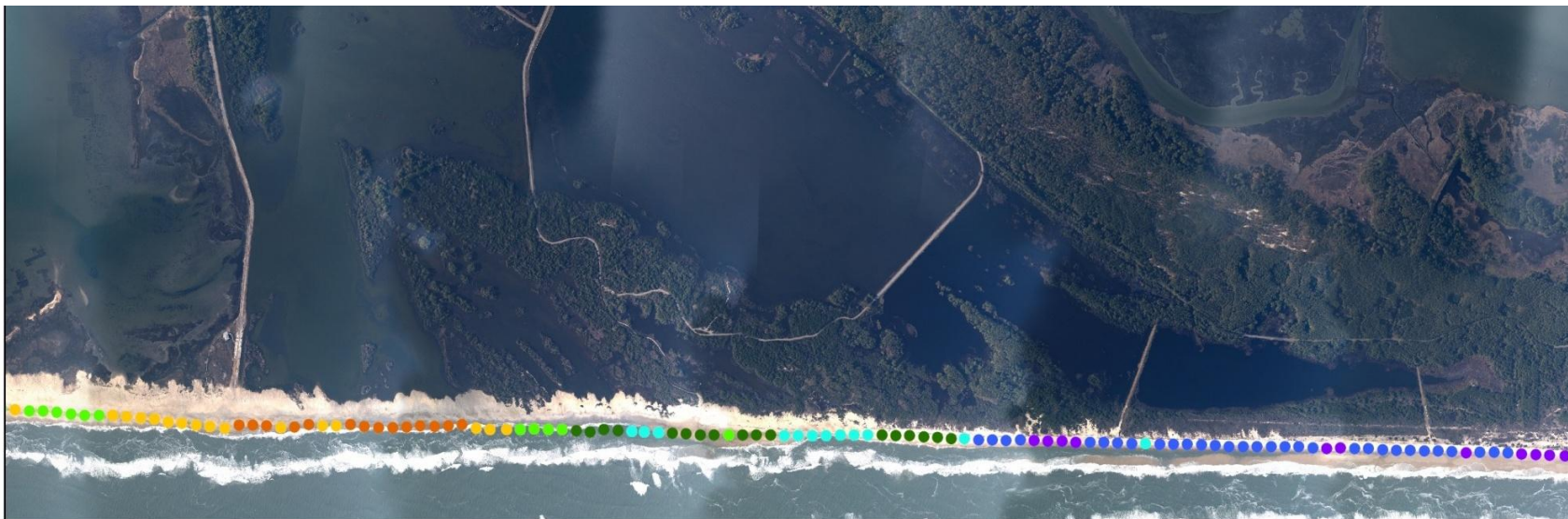
2003 Photo of parking lot and recreational beach.



The westward movement of the beach can be seen in the photo below. This is an aerial photo taken in 2009. The far left side of the photo shows the road to the recreational beach and the remainder of the photo shows the stretch of beach to the north. The colored lines represent the location of the shoreline over the past 68 years, beginning with the blue line in 1942 to last year (the black line).

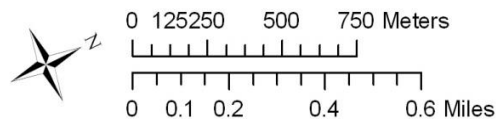


The shoreline is in a constant state of flux. Through time, some areas of the beach experience higher rates of change than other more stable areas of beach. The National Park Service's Assateague Island National Seashore (ASIS) has been recording the rate of shoreline change (linear regression rate) of the high-water shoreline twice a year from 1997 to 2008. The rate of change is measured in meters (3.28 feet) per year. The majority of the beach has been experiencing a negative rate of change (loss of beach).



Shoreline Change Rate

1997-2008	●	-2.9 - -2.5
m/yr (LRR)	●	-2.4 - -2.0
●	●	-10.1 - -7.0
●	●	-6.9 - -5.0
●	●	-4.9 - -4.0
●	●	-3.9 - -3.0
	●	-1.9 - -1.5
	●	-1.4 - -1.0
	●	-0.9 - 0.0
	●	0.1 - 10.0



Aerial Photos November 2009
(Post- Nor'Ida)

Problem Statement

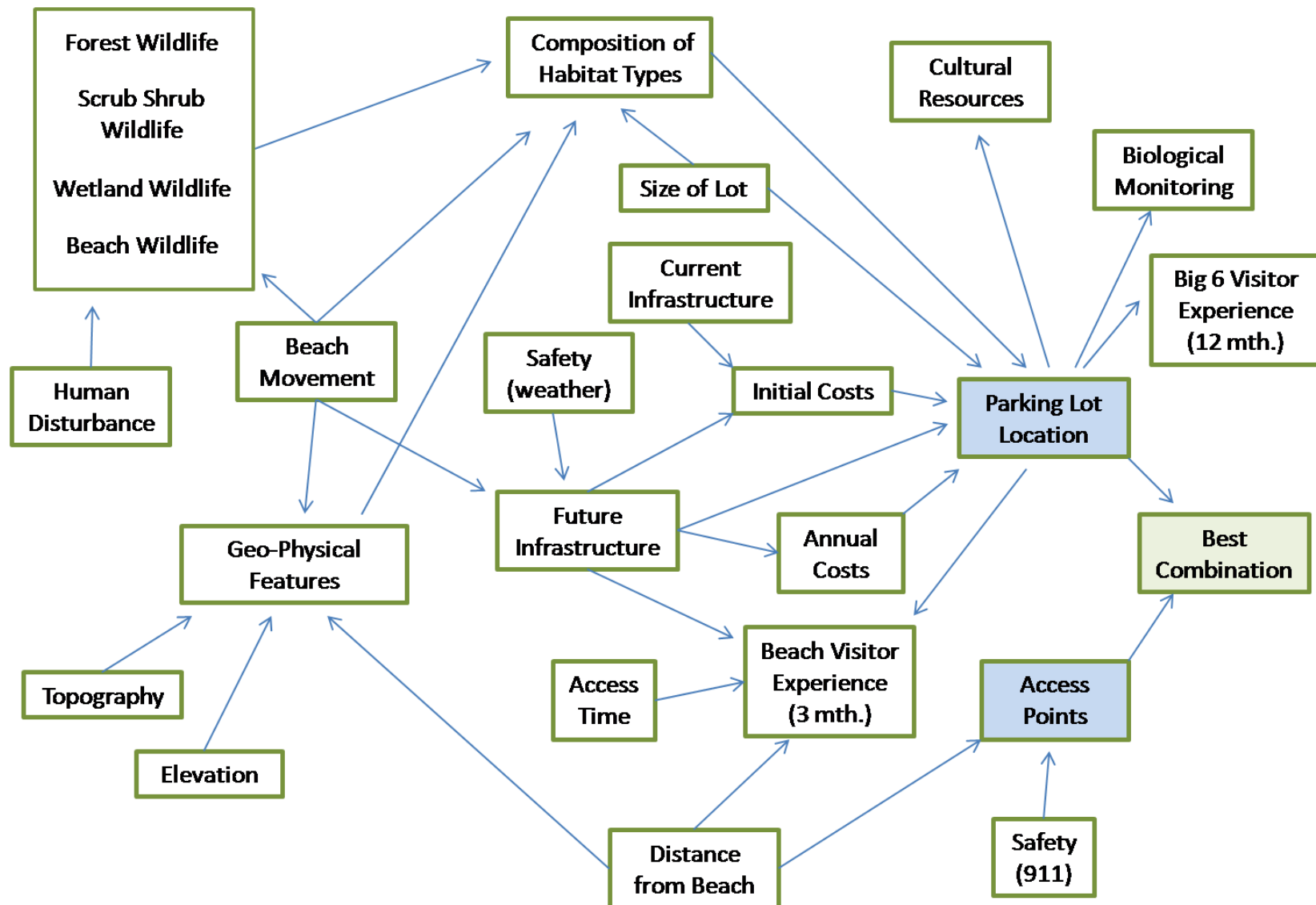
Workshop participants took some time to discuss the aspects of the problem and to develop a clear problem statement. It was determined that the refuge would like to continue to provide the same amount of recreational beach as it has in the past, approximately 1 mile. They want to provide access to the beach in a manner that has the least amount of impact to wildlife and habitat. The ocean is washing away the current recreational beach and parking lots, the refuge would like to explore the feasibility of relocating to a more stable section of beach. The scope of area to consider for relocation was determined to be Assateague Is. Providing access to a recreational beach and providing parking are two separate issues. It was decided to first identify appropriate segments of beach for a recreational beach and then explore parking scenarios. The following problem statement was developed to guide the SDM process:

What is the most responsible and sustainable (20-50 years) combination of a parking lot and access to a one mile recreational beach on Assateague Island with the least impact to wildlife and habitat?

Conceptual Model

A conceptual model is sometimes helpful to identify all the components of a complex problem. It is also used to ensure all the workshop participants have a mutual understanding of the problem or current conditions. While a conceptual model is being developed, participants can identify aspects of the problem that are important to them. The visual diagram demonstrates the interconnectedness of all the problem components.

The conceptual model built for this problem is on the following page.



Objectives

Workshop participants brainstormed the objectives for a recreational beach. The issues they are concerned about related to managing a recreational beach: things they want to provide; things they want to ensure are not negatively impacted; things to consider, etc.

- Consideration of visitor safety, EMS vehicles, disabled visitor access/drop-off
- Proximity to existing infrastructure (restrooms, roads, electricity, etc.)
- Wildlife guilds/habitats:
 - Wildlife dependent upon sparsely vegetated beach and dune habitat (beach nesting birds, turtle nests, wildlife)
 - Waterbird use of wetlands (shorebird, waders, waterfowl)
 - Forest dependent wildlife (birds, DFS, etc.)
 - Shrub-scrub dependent wildlife
- Expected longevity of beach (island/beach migration rate)
- Ability to have some direct access
- Initial cost
- Cost of annual maintenance (fiscal sustainability)
- Consider impact to mandated recreation (Big 6)
- Maintain the visitor's experience as it is currently
- Impact on local economy
- Cultural resources – (unknown constraints)

Objectives are used to build a consequence table; they become the criterion which allows for a comparison to be made between potential recreational beach segments. The objectives are measured and used to identify the beach segments that best meet the criterion. On the second day of the workshop, we reviewed the objectives, refined them and determined how each would be measured. Influence diagrams were developed for each objective, to help identify measurable attributes.

Through the process, the above items evolved into the following list of objectives and sub-objectives.

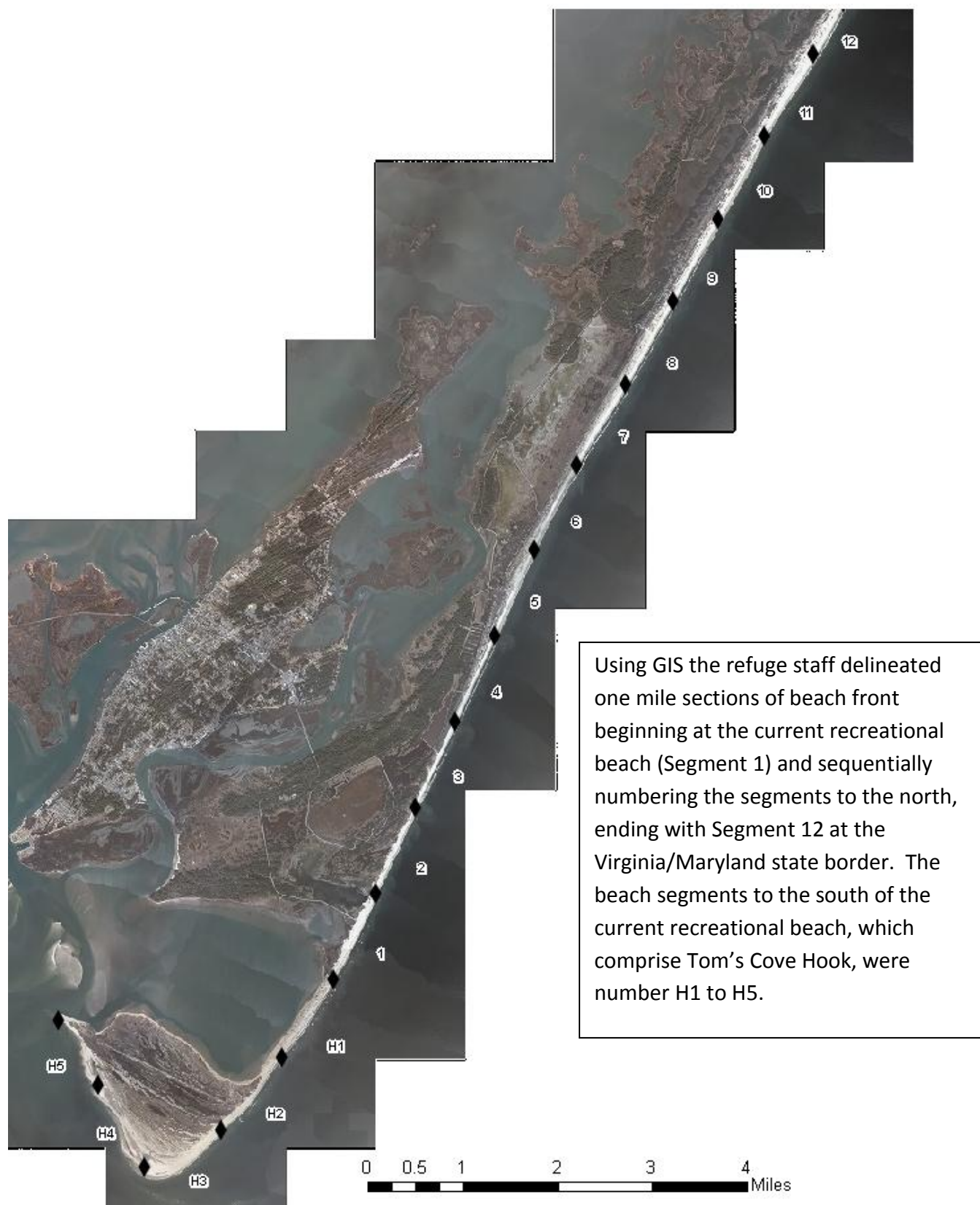
1. Wilderness Status
2. Wildlife Dependent on Sparsely Vegetated Habitat
 - a. Amount of use during migration
 - b. Amount of non-breeding (winter) bird use
 - c. Amount of breeding use

3. Additional Legal Mandates
4. Waterbird Use of Wetlands
 - a. Level of waterbird use
 - b. Cumulative use of beach segment
5. Forest Dependent Wildlife
6. Shrub-scrub Dependent Wildlife
7. Expected Longevity of Infrastructure
8. Proximity to Existing Infrastructure
9. Visitor Safety and Experience
10. Habitat Acreage Change
11. Recreational Beach Visitor Experience
12. Cultural Resources
13. Initial Costs
14. Cost of Annual Maintenance

These were used to score each of the beach segments and resulted in the selection of a few segments which were then used to develop parking lot scenarios. Influence diagrams were built for some of the objectives to assist with determining the data needed for scoring. The data and process used to score each of the objectives is described in this section.

A simple scoring method was developed. For each Objective and Sub-objective, the group identified the best information they had to measure the objective and developed categories if necessary. The categories, such as High, Medium, and Low, were given a numerical score. The objective scores are added, the segments with the highest score represent the best segments to locate a recreational beach.

The refuge wants to find the best location for a recreational beach, therefore objectives that reflect features that are desirable for a recreational beach such as, close proximity to existing infrastructure, visitor safety, and easy access have scores where high = 3 and low = 1. It is just the reverse for wildlife and habitat objectives. To answer the Problem Statement, the refuge needs to locate areas with the least amount of impact to wildlife and habitat. Therefore objectives that reflect wildlife or habitat features have scores where high levels of use = 1 and low levels of use = 3. Segments that have a low impact to wildlife get a higher score.



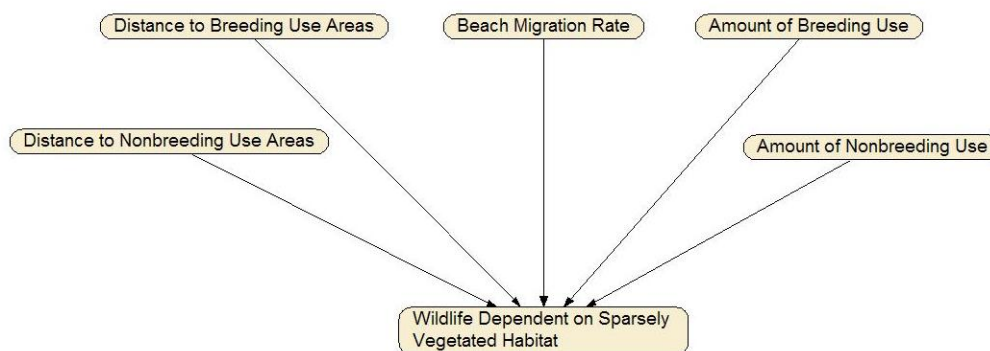
1. Wilderness

Portions of the Assateague Island Wilderness Proposal are located within CNWR. The proposal includes 1,740 acres in CNWR and ASIS of which 882 acres are south of the Maryland/Virginia state line, extending from mean low water (MLW) along the Atlantic Ocean to MLW along Chincoteague Bay. Congress has not yet acted on the proposal. Wilderness lands or lands that have been proposed for Wilderness have restrictions. There is limited human activity, restricted mechanical operations and restrictions on building structures.

This was the first Objective of the consequence table because it removes these beach segments from further analysis. Beach segments that fall within the area that is being proposed for Wilderness cannot be considered as areas for a recreational beach. In the consequence table these beach segments received a 'Y' for yes (Segments 9 – 12, the northern portion of the refuge beach). Beach segments that are not in the proposed Wilderness area received an 'N' for no, and continued to be scored for the next Objective.

2. Wildlife Dependent on Sparsely Vegetated Habitat

Influence diagram depicting elements that affect wildlife dependent on sparsely vegetated habitat.



a. Amount of Breeding Use (shorebirds, sea turtles, plants).

Chincoteague NWR is an important breeding area for beach nesting birds and species dependent on sparsely vegetated habitat. The Federally Threatened piping plover nest

during the summer months, as well as, State listed species such as the least tern. Sea turtles use the beach to lay their eggs. Areas of the Federally Threatened sea beach amaranth have become established and need to remain undisturbed to thrive. This period of plant and animal reproduction overlaps with the time of heaviest human use. It is critical that the breeding use score represents all species dependent upon this habitat.

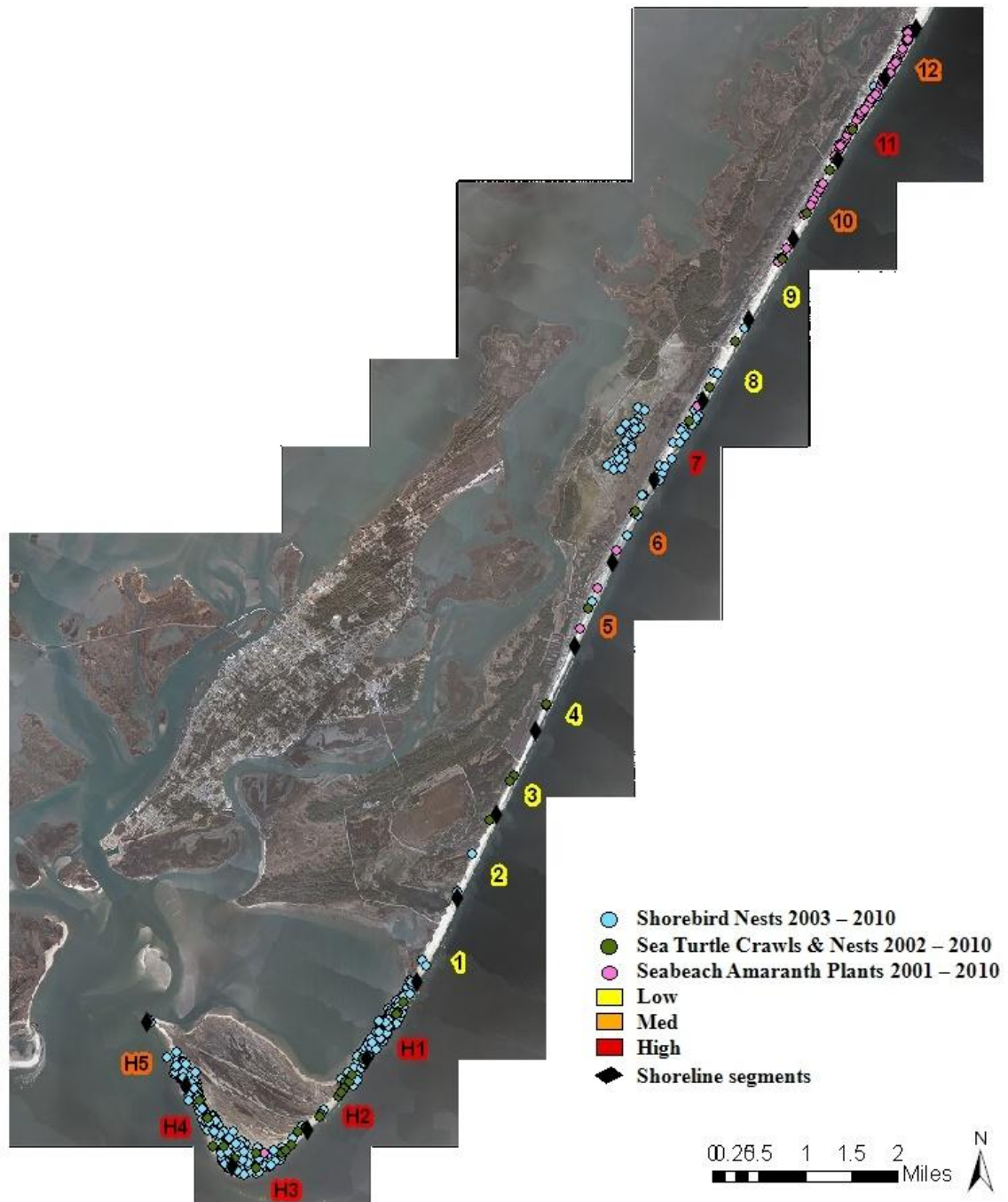
Breeding shorebirds were grouped together. Segments with more than 20 nests have a high level of use and received a breeding score of 3. Segments with 10-19 nests have a medium level of use and received breeding score of 2. Segments with 1-9 nests have a low level of use and received a breeding score of 1. Segments with no use received a breeding score of 0.

Breeding Use on Sparsely Vegetated Habitat						
Segment #	Bird Score	Sea Turtle Score	Amaranth Score	Average Score	Final Score	Matrix Score
1	1	0	0	0.33	L	3
2	1	1	0	0.67	L	3
3	0	1	0	0.33	L	3
4	0	1	0	0.33	L	3
5	1	1	1	1.00	M	2
6	1	1	1	1.00	M	2
7	3	1	1	1.67	H	1
8	1	1	0	0.67	L	3
9	0	1	1	0.67	L	3
10	0	1	2	1.00	M	2
11	1	1	3	1.67	H	1
12	1	0	3	1.33	M	2
H1	3	2	0	1.67	H	1
H2	2	3	0	1.67	H	1
H3	3	3	1	2.33	H	1
H4	3	3	0	2.00	H	1
H5	3	0	0	1.00	M	2
Score	0 - 0.9 = L	1.0 - 1.5 = M	> 1.5 = H			
<u>Shorebird Nest Scale</u> ☐ Null = 0 nests ☐ Low = 1 - 9 nests ☐ Med = 10 - 19 nests ☐ High = ≥ 20 nests ☒ Shoreline segments <u>Sea Turtle Activity Scale</u> ☐ Null = 0 crawls or nests ☐ Low = 1 - 2 crawls or nests ☐ Med = 3 - 4 crawls or nests ☐ High = ≥ 5 crawls or nests ☒ Shoreline segments <u>Seabeach Amaranth Scale</u> ☐ Null = 0 plants ☐ Low = 1 - 9 plants ☐ Med = 10 - 19 nests ☐ High = ≥ 20 plants ☒ Shoreline segments						

Sea turtles and sea beach amaranth were given category scales of high, med and low reflective of their abundance. The biological scores were placed into an excel table. The biological scores were averaged for each segment. Segments with a biological average of 0.0 -0.9 had a low level of use and received a matrix score of 3. Segments with a biological

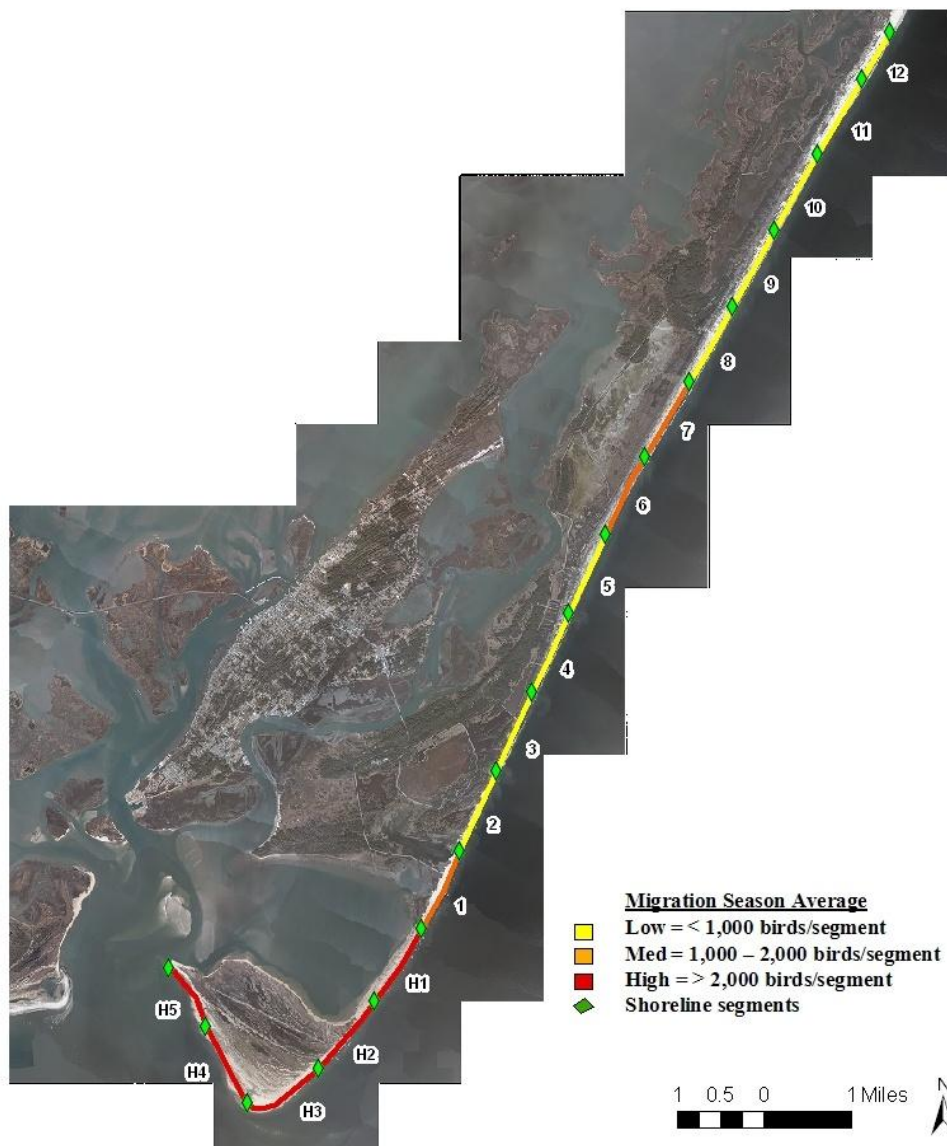
average of 1.0-1.5 had a medium level of use and received a matrix score of 2. Segments with a biological average of >1.5 had a high level of use and received a matrix score of 1.

Generalized locations for nesting shorebirds, sea turtles and sea beach amaranth plants, (blue, green and purple dots) along with the level of averaged breeding use (red, orange and yellow numbers) for beach segments.



b. Amount of shorebird use during migration.

The refuge has been conducting shorebird migration surveys since 1991. This data was summarized and each segment received a score based on the average level of use that has been observed. Segments that had an average use of <1000 birds displayed a low level of use and received a score of 3. Segments that had an average use of 1000 – 2000 birds represent a medium level of use and received a score of 2. Segments with high levels of use, > 2000 birds, received a score of 1.



c. Amount of Non-Breeding Bird Use (winter beach use).

The refuge has been conducting shorebird surveys during the winter season with the same observer that performs the migration surveys. We applied the same scoring we used for shorebird use during migration.



3. Additional Mandates

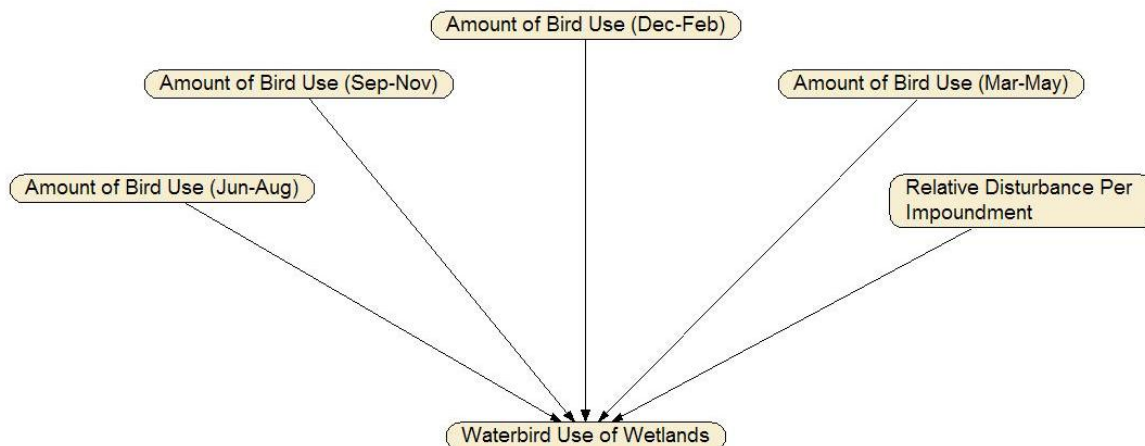
This objective recognizes mandates that the refuge is required to meet. It includes legal and policy obligations such as the Endangered Species Act. Beach Segments H1 – H5 receive a ‘Y’ for yes in the matrix because of piping plover monitoring and management activities, as stated in the 2008 USFWS Biological Opinion and Intra-Service Section 7 Biological Evaluation.

In addition, the NASA controlled airspace that overlays the Tom’s Cove Hook and Overwash would preclude development of public use infrastructure due to potential flight hazards. Currently, refuge visitors are restricted from access on the Hook and Overwash during a scheduled launch event.

Due to the additional mandates placed on Segments H1-H5, these segments do not proceed to the next Objective.

4. Waterbird Use of Wetlands

Influence diagram for elements that affect waterbird use of refuge wetlands.



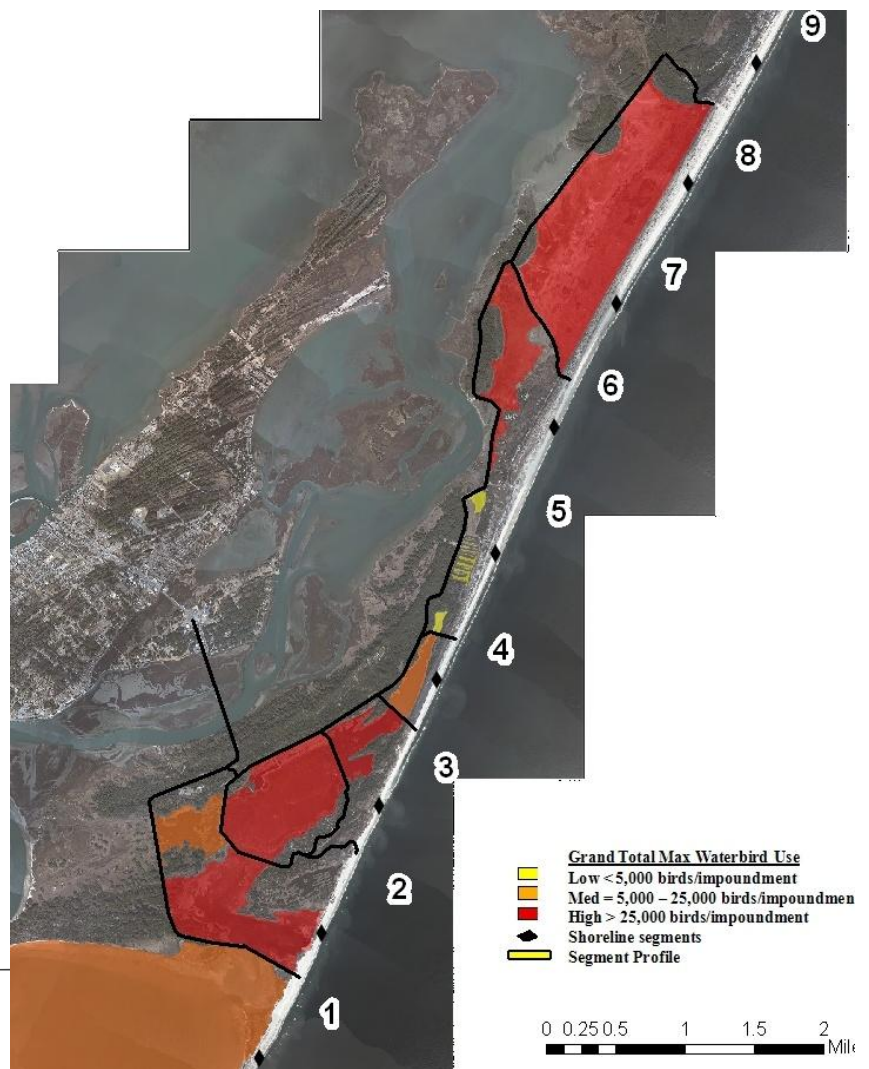
a. Level of Waterbird Use

Chincoteague NWR manages 10 freshwater impoundments. These wetlands along with Tom’s Cove (saltwater wetlands) support waterfowl, shorebirds and wading birds (waterbirds) during different times of the year. The impoundments provide food and resting areas for migrating

waterfowl and shorebirds, as well as, food during the wading bird breeding season. The refuge wanted to include the potential impact beach visitors would have on waterbirds using the impoundments by ranking the level of use for each impoundment.

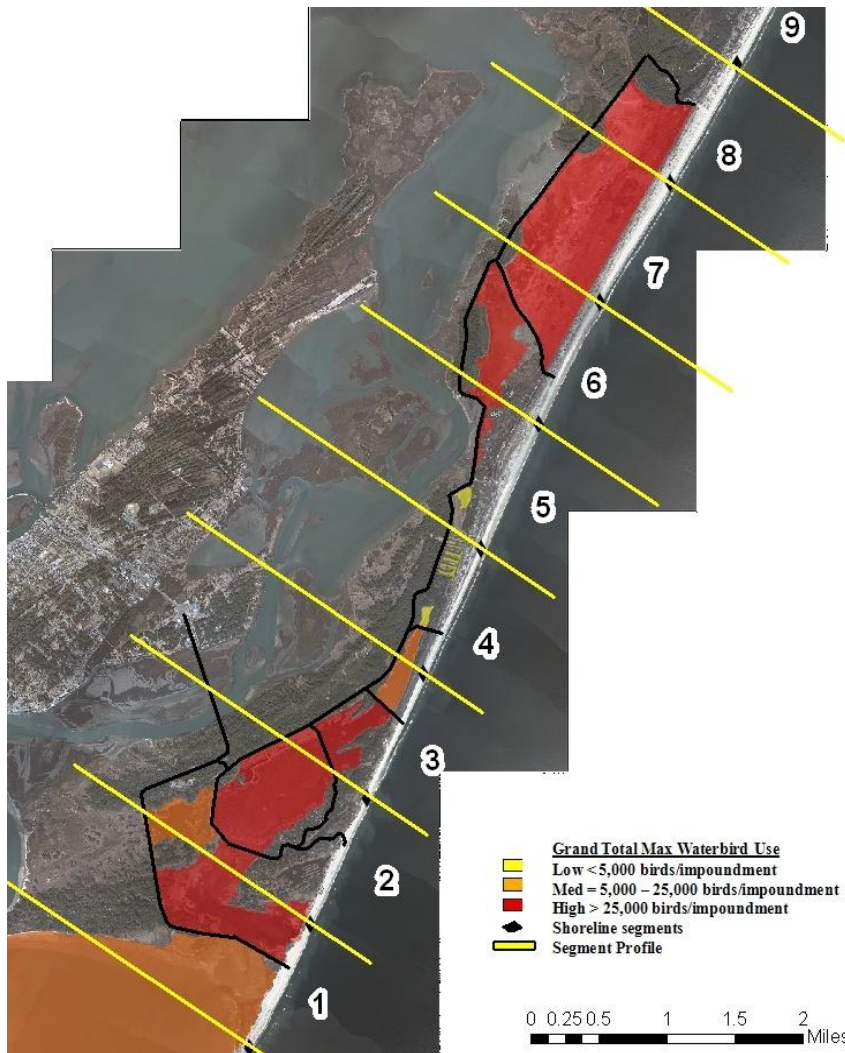
The refuge analyzed waterbird data from 2005 to 2009. From this data, they developed the following table and map of maximum waterbird use for each wetland. Each wetland (Tom's Cove and 10 impoundments) received a relative rank according to the level of use: <5,000 birds/impoundment = low; medium = 5,000 – 25,000; and high = > 25,000. The map shows the rank for each wetland (yellow = low, orange = medium, red = high). The rank was then converted into a score for the matrix. Wetlands with a high level of use were given a 1, medium a 2, and low a 3. Recall that we are scoring for the least impact to wildlife, therefore wetlands with low use get a higher score.

Waterbird Use of Wetlands		
Impoundment/ Wetland	Total Max Waterbird Use	Rank
Tom's Cove	20970	M
F-Pool'	29298	H
A-Pool	6047	M
B-South Pool	132191	H
B-North Pool	26739	H
C-Pool	7973	M
D-Pool	121	L
Farm Fields	1910	L
E-Pool	3312	L
South Wash Flats	25343	H
North Wash Flats	26695	H



For the purposes of this analysis, the refuge has been split into beach segments. Each of the segments contains one or two wetlands. Beach segments 1 – 8 (the other segments have been removed from the analysis based on earlier criteria) received a score which was the average score of the two wetlands within that segment, or just the score if only one wetland was in the segment. These are listed in the table (and entered into the matrix) followed by the map of beach segments and wetlands within each segment.

Segment Profile #	Wetland 1	Wetland 2	Average Score
1	2	1	1.50
2	2	1	1.50
3	2	1	1.50
4	2	3	2.50
5	3	1	2.00
6	1	1	1.00
7	1		1.00
8	1		1.00

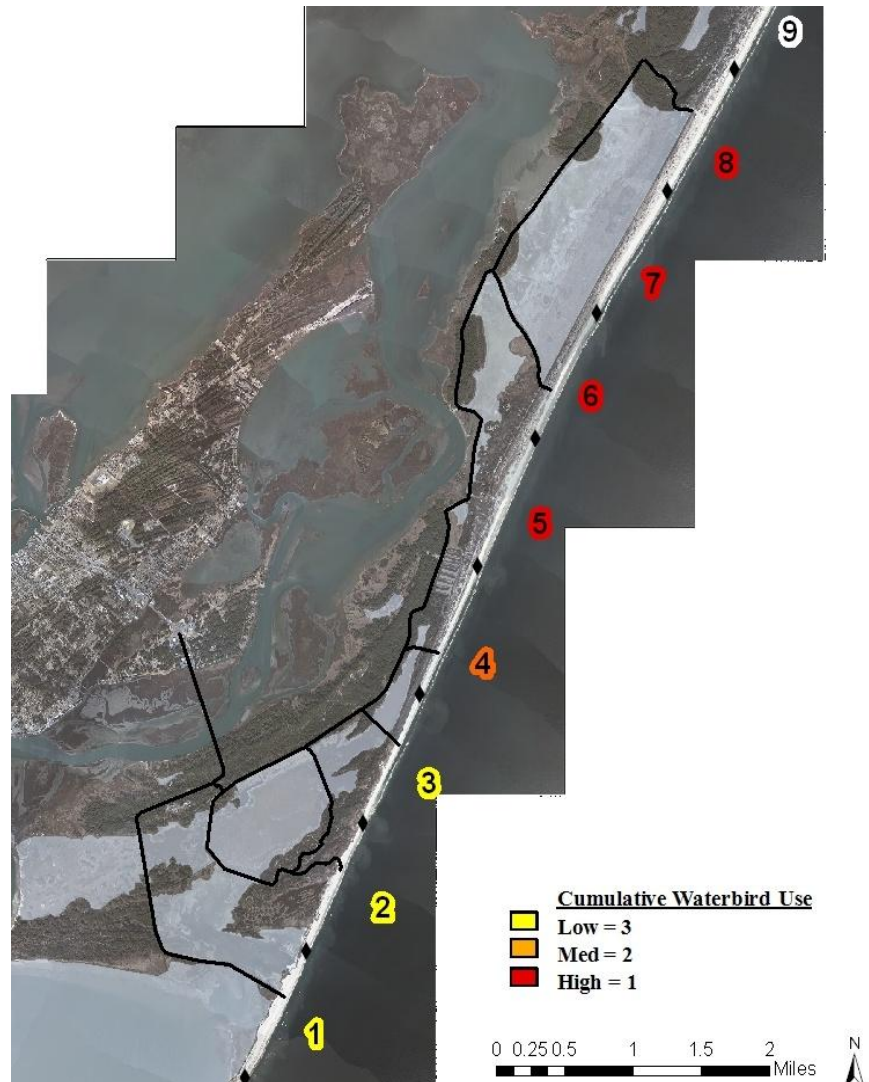


b. Cumulative Use to Beach Segment

Cumulative waterbird max use along route to beach segment										
Segment Profile #	Impound 1	Impound 2	Impound 3	Impound 4	Impound 5	Impound 6	Impound 7	Impound 8	Sum	Matrix Score
1	1	2	2						5.00	3.00
2	1	2	1	1					5.00	3.00
3	1	1	2						4.00	3.00
4	1	1	2	3	3				10.00	2.00
5	1	1	2	3	3	3	1		14.00	1.00
6	1	1	2	3	3	3	1	1	15.00	1.00
7	1	1	2	3	3	3	1	1	15.00	1.00
8	1	1	2	3	3	3	1	1	15.00	1.00

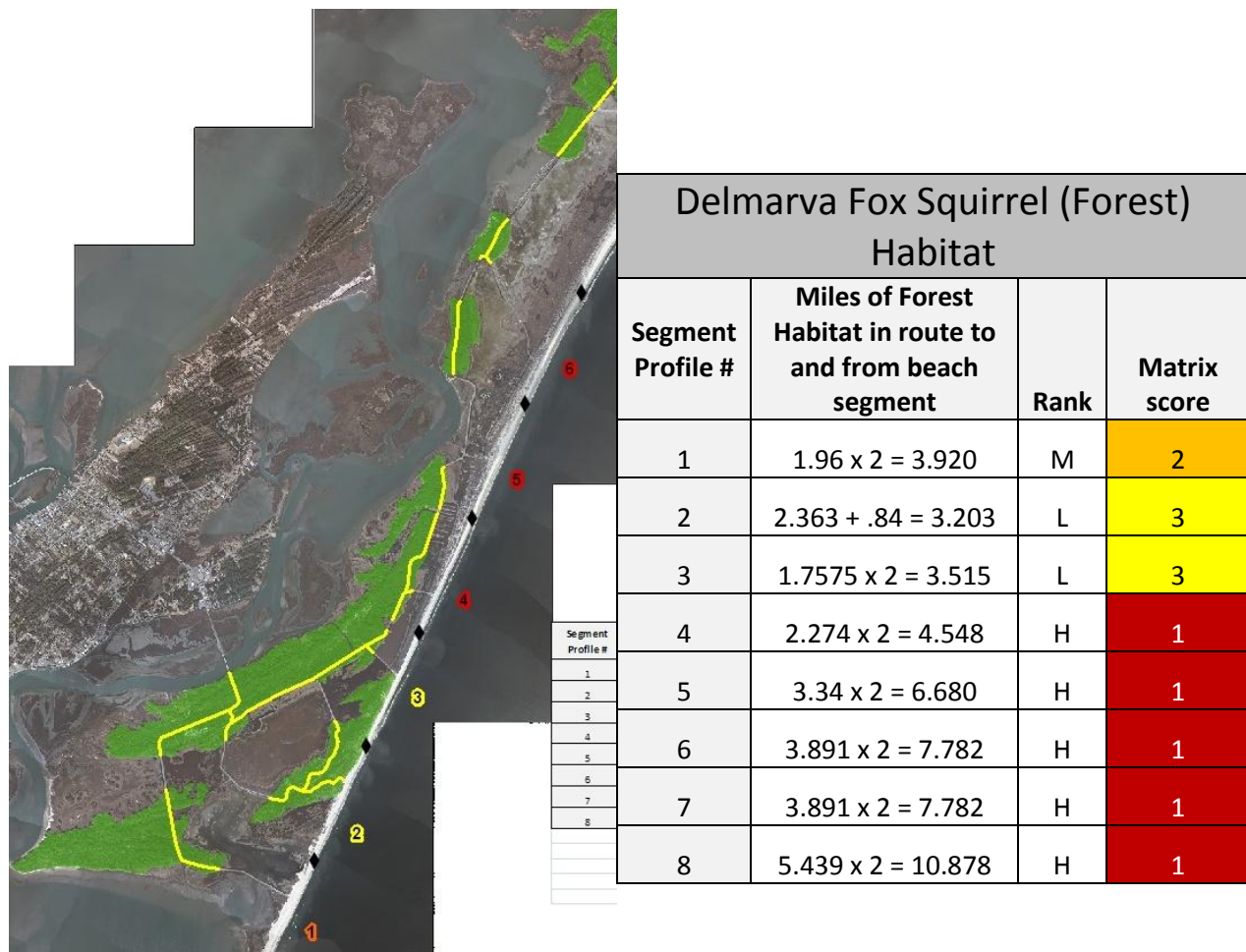
An access road to the recreational beach will cause some disturbance based on the number of cars that travel to the beach. In order to assess the level of relative disturbance to waterbirds using the wetlands, we developed a score for each segment based on the wetlands that an access road would pass as it traverses the refuge to the beach segment.

In the table below, each wetland (impoundment columns) receives a score based on the level of waterbird use. Then each section (segment profile rows) received a sum of those use levels. The sums were converted into a matrix score of 3 for sums of 0-5 (low cumulative sums i.e. low disturbance), 2 for sums 6-10, and 1 for sums 11-15 (high cumulative sums).



5. Forest Dependent Wildlife

The federally endangered Delmarva Peninsula fox squirrel (DFS), were translocated to Assateague Island from 1968-1971 to encourage recovery. The population has increased and expanded from the initial release sites on Lighthouse Ridge and Headquarters areas to all suitable loblolly pine habitats on the Refuge. The population is considered stable and estimated at 200 animals. Management consists of maintaining nest boxes, mowing roadside grasses to reduce vehicle/DFS collisions, thinning forest understory, and monitoring/controlling southern pinebark beetle outbreaks when they threaten habitat. Population estimates are made biannually with mark-recapture techniques. DFS are now a candidate species for delisting.

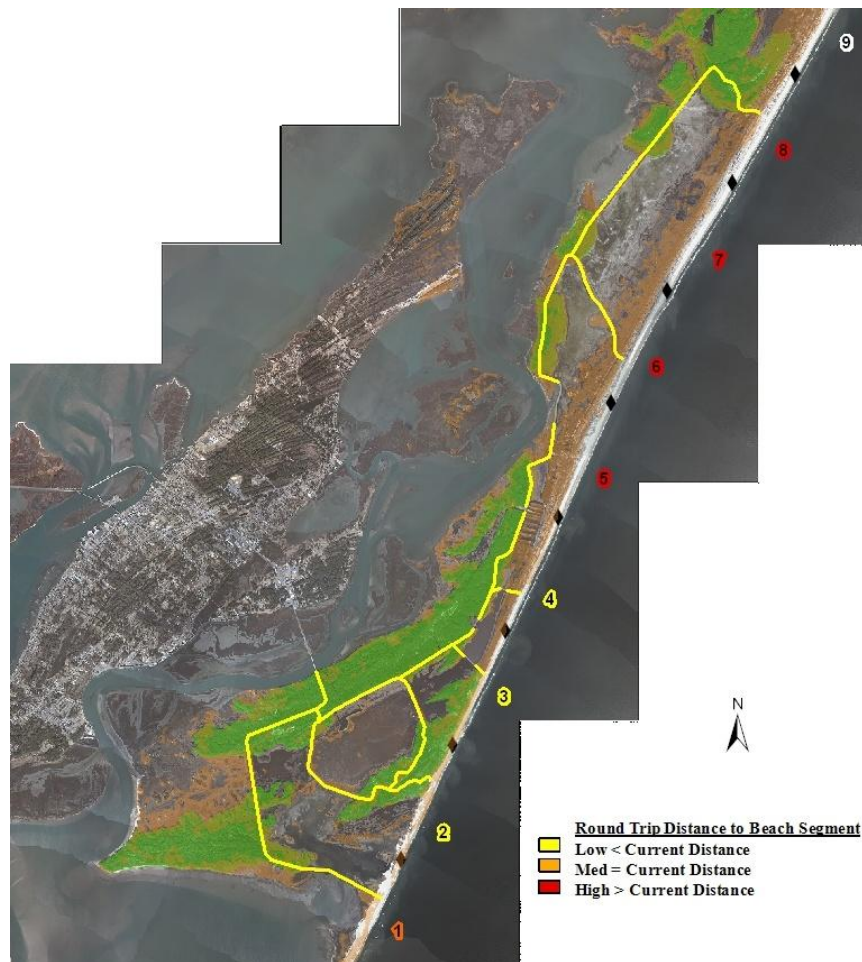


The access road to the recreational beach bisects forested areas. The analysis needed to reflect the potential negative impacts an access road may have on the squirrel population, which are car collisions and reduced habitat. To assess this, the refuge measured the linear distance through forested habitat the current access road bisects (approx. 4 miles round trip).

Using GIS, the refuge delineated the path an access road would take to and from each beach segments 1-8, and measured the linear distance that would pass through forested habitat. The results are in the table above. Paths that were less than the current access road distance through forested habitat were given a rank of low and matrix score of 3 (less impact than current conditions). Paths equal to 4 miles received a rank of medium and score of 2, and those longer than 4 miles were ranked as a high level of impact and received a score of 1.

6. Scrub-Shrub Dependent Wildlife

Scrub-shrub is a critical coastal habitat. The majority of this habitat, covering 2,872 acres (roughly 25- 30%) of Assateague Unit, extends north and south on barrier flats and backdunes, gradually merging on the east with dune grasses of the beach/dune community, and on the west with marshes or forests. Small pockets of this habitat are scattered throughout Assateague Island. Shrubs, small trees, and vines are predominant plant forms. Common species include wax myrtle, northern bayberry, black cherry, Canada serviceberry, blackberry, poison ivy, and greenbrier. Evergreens are less frequent, but include red cedar and American holly.



Bird species that depend on shrubs and other early-successional habitats are declining in the eastern U.S. due to loss of habitat. Shrubs provide an abundance of insect food for breeding birds, and berries during the fall migration and/or throughout the winter. The large number of yellow-rumped warblers that winter on the Refuge, as well as tree swallows feed on wax myrtle berries.

The refuge has not specifically conducted surveys in the scrub-shrub habitat. The primary concern is the loss of habitat due to the access road that would traverse through the scrub-shrub and reduce its value to wildlife. Therefore, we used a similar measurement, ranking and score system applied to the forested habitat.

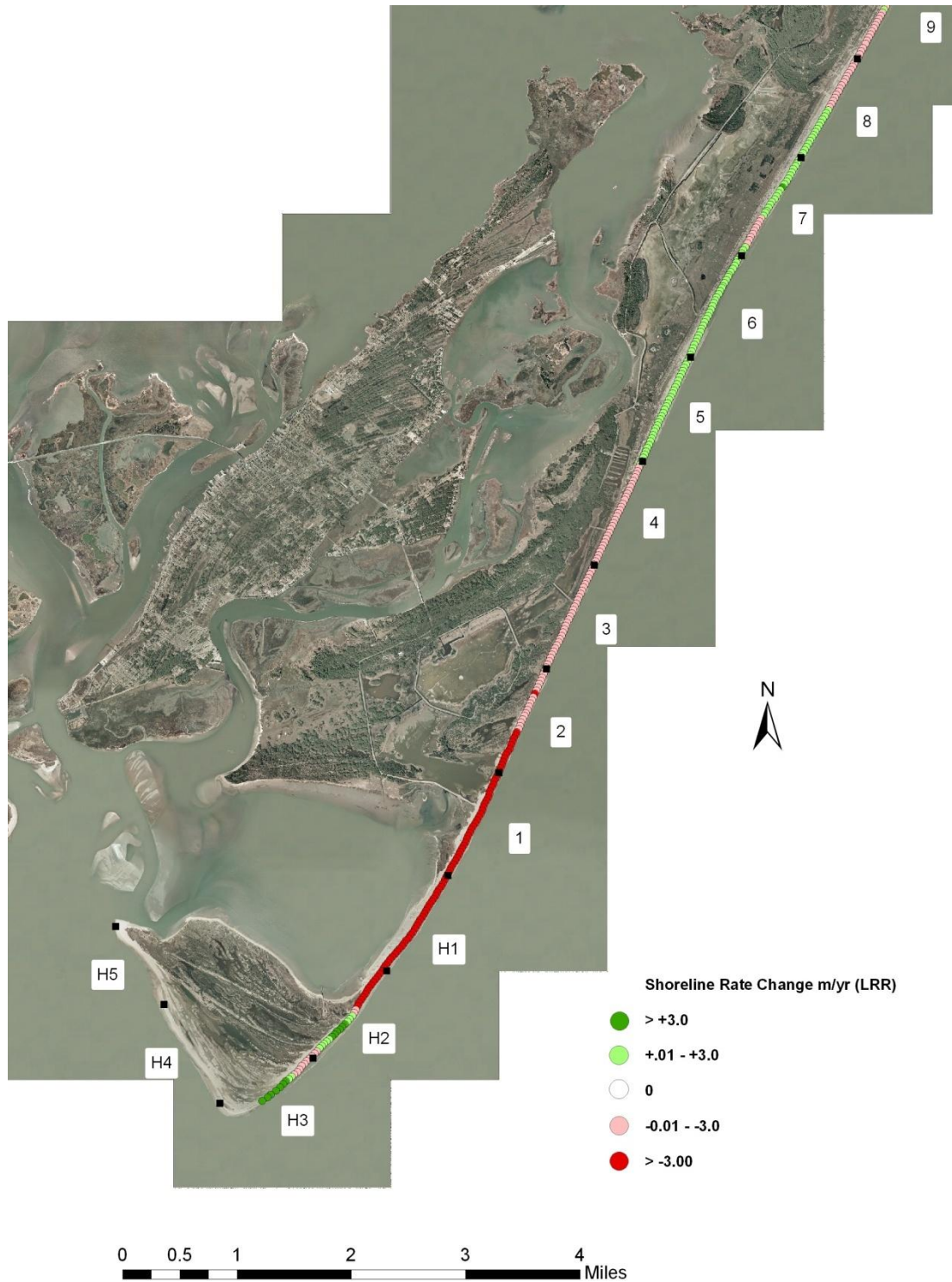
Miles of Scrub Shrub Habitat			
Segment Profile #	Miles of Scrub Shrub Habitat in route to and from beach segment	Rank	Matrix score
1	$2.88 \times 2 = 5.76$	M	2
2	$3.82 + .84 = 4.66$	L	3
3	$1.89 \times 2 = 3.78$	L	3
4	$2.31 \times 2 = 4.62$	L	3
5	$3.61 \times 2 = 7.22$	H	1
6	$5.75 \times 2 = 11.50$	H	1
7	$5.75 \times 2 = 11.50$	H	1
8	$7.26 \times 2 = 14.52$	H	1

Using GIS, the refuge delineated the path an access road would take for beach segments 1-8, and measured the linear distance that would pass through scrub-shrub habitat. The results are in the table below. Paths that were less than the current access road distance (approx. 6 miles round trip) were given a rank of low and matrix score of 3 (less impact than current conditions). Paths equal to 6 miles received a rank of medium and score of 2, and those longer than 6 miles were ranked as a high level of impact and received a score of 1.

7. Expected Longevity of Infrastructure

Due to the destruction from storm activity in recent years, meeting participants wanted to include a measurement that would reflect a level of permanence for the road, parking lots and structures associated with a recreational beach. After some discussion, it was decided to use the ASIS's beach migration rates. Each segment has 32 dots which represent a rate of change for that portion of the beach. These ranged from slow accretion (green + 3 meters/year) to rapidly decreasing (red – 3 meters/year). For beach segments 1-8, the dots were summed for each rate of shoreline change and used to derive a score for the matrix. The rate of change was then converted to the matrix score (see chart below). For example, segment profile #2 illustrates a rate of change of 43.75% or fourteen dots and a rate of change of 56.25% or eighteen dots for a total of 100% or 32 dots. Each rate of change score was then converted to the new matrix score and then averaged to create the matrix score.

Shoreline Change						
Segment Profile #	> -3.0	-0.01 - -3.0	0	+0.01 - +3.0	> +3.0	Matrix score
	= -2	= -1	= 0	= 1	= 2	
1	32 = 100%					-2
2	14 = 43.75%	18 = 56.25%				-1.44
3		32 = 100%				-1
4		32 = 100%				-1
5				32 = 100%		1
6				32 = 100%		1
7		9 = 28.125%		22 = 68.75%	1 = 3.125%	0.47
8		16 = 50%		16 = 50%		0



8. Proximity to Existing Infrastructure

There are a number of utilities needed for the comfort of recreational beach users, such as running water and electricity. The refuge currently has utilities at the Wildlife Loop Parking Lot; these would need to be run to the new recreational beach location. The National Park Service has a Visitor Center at Tom's Cove which has utilities. The Tom's Cove VC is approximately 2.5 miles from the Wildlife Loop Parking Lot. In an attempt to gauge the relative cost of running utilities to the different beach sections, each beach segment received a score according to its distance from the Wildlife Loop Parking Lot. If a segment was further than 2.5 miles from the Wildlife Loop Parking Lot, it received a score of 1 (least desirable condition because it was further than the Tom's Cove VC). A segment received a score of 2 if it was equal to 2.5 miles and a score of 3 if it was shorter than 2.5 miles (closer than the Tom's Cove VC). The distances were calculated using GIS and the scores entered into the matrix.

9. Visitor Safety and Experience

Visitor Safety and Experience is comprised of four sub-objectives. These four sub-objectives are to score visitor issues such as safety in the form of how quickly the Emergency Medical Services would be able to respond to an emergency at the recreational beach. The placement of a recreational beach in one of the beach segments will have some level of impact on other visitor services such as walking trails and hunting areas. The quality of the recreational beach visitor's experience is addressed in another set of sub-objectives, these sub-objectives are to score use by non-recreational beach visitors.

a. Response Time by Emergency Medical Services (EMS)

The amount of time that is estimated for EMS to respond to a visitor's need was scored based on current response time estimates and the distance to the beach segment from the beginning of the Wildlife Loop Parking Lot. The Refuge's visitor services staff and Town representatives estimated the current response time to be approximately 5-10 minutes. The distance to each of the beach segments was reviewed and was given a rank of high, medium or low based on the distance to the beach segment. A segment was scored 3 (high) if the response time would be less than 5 minutes, 2 if it would be 5-10 minutes (medium) and a score of 1 (low) if the response time would be greater than 10 minutes. These scores were entered into the matrix.

Distance to Beach Segment			
Segment Profile #	Distance to beach segment (Beginning at Wildlife Loop Parking Lot) in miles	Rank	Matrix score
1	2.550	M	2
2	1.650	H	3
3	1.640	H	3
4	2.100	H	3
5	2.310	H	3
6	5.940	L	1
7	5.940	L	1
8	7.490	L	1

b. Points of Interest along Route to Beach

As people travel to the beach, there are opportunities to view wildlife and points of interest like the historic lighthouse. Depending upon the beach segment, an access route will have different points of interest. The refuge developed a list of 'Points of Interest' based on past requests by visitors to see refuge resources. Many visitors come to the refuge to see the ponies, the historic lighthouse and visitor center. The opportunity to see a variety of wildlife is based on the habitats that the access route travels through. The refuge's freshwater wetlands, saltmarsh

and borrow ditches provide habitat for waterfowl, shorebirds and wading birds and opportunities to visitors to view them. The Wildlife Loop and forested habitat provide additional opportunities to view upland wildlife.

Points of interest	Beach Profile #							
	1	2	3	4	5	6	7	8
Pony viewing	1				1	1	1	1
Forest	1	1	1	1	1	1	1	1
Lighthouse access	1							
VCS	1							
Freshwater wetlands	1	1	1	1	1	1	1	1
Salt marsh	1				1	1	1	1
Borrow ditches	1	1	1	1	1	1	1	1
Wildlife Loop		1	1	1	1	1	1	1
Total	7	4	4	4	6	6	6	6

The number of points of interest was summed for each of the Beach Segments. The Segment was given a rank of high, medium or low and translated to a matrix score. Segments with medium were given a score of 2, and segments with high received a score of 3 (more points, more desirable).

Points of Interest along Route to Beach			
Segment Profile #	Points of interest along route to beach	Rank	Matrix score
1	7.000	H	3
2	4.000	M	2
3	4.000	M	2
4	4.000	M	2
5	6.000	H	3
6	6.000	H	3
7	6.000	H	3
8	6.000	H	3

c. Traffic to Beach Impact on Trails

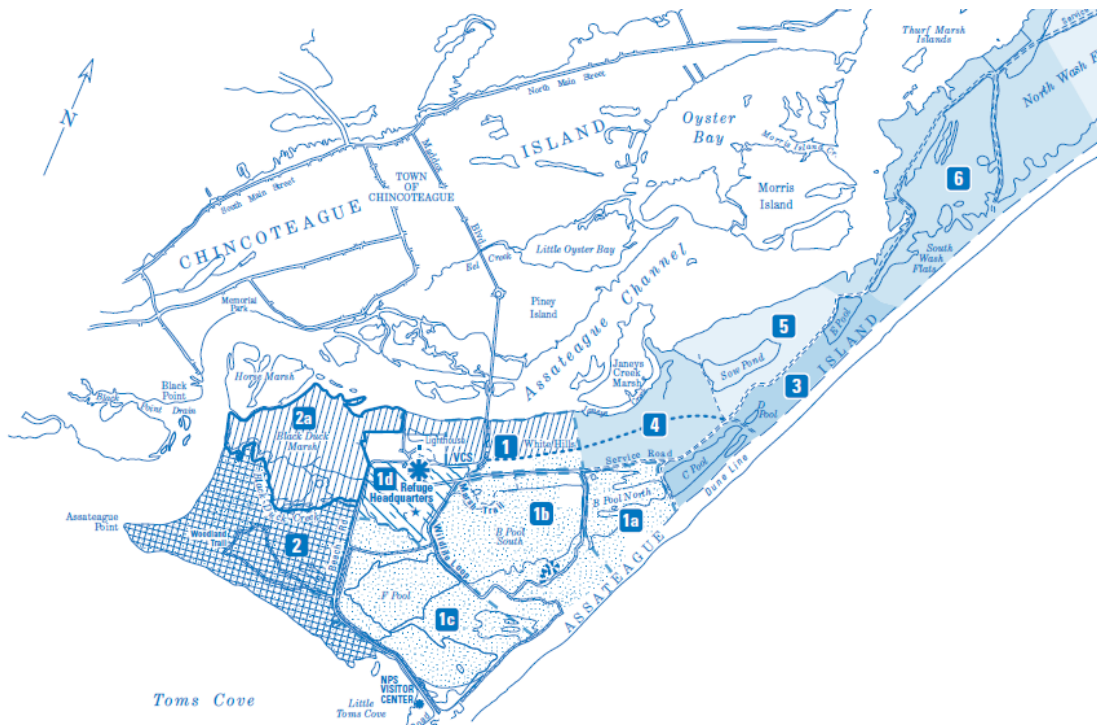
An access route to the recreational beach will use existing roads and trails to minimize habitat impacts and construction costs. Depending on the route to a beach segment, there may be sections of walking/biking trails that will include traffic to and from the beach. Currently, the refuge offers 4.5 miles of walking/biking trails with no automobile traffic.

Using GIS, the refuge obtained the length of walking/biking trails that would coincide with automobile traffic for each beach segment. Segments with routes that would result in less than 4.5 miles of traffic free trail were ranked low and given a matrix score of 1. Segments with a similar amount of traffic free trail (4.5 miles) were ranked medium and scored 2. Segments with routes that would provide more than 4.5 miles of traffic free trails ranked high and were given a matrix score of 3.

Traffic to beach impact on trails		
Segment Profile #	Rank	Matrix score
1	M	2
2	L	1
3	H	3
4	H	3
5	H	3
6	H	3
7	H	3
8	H	3

d. Impacts to Existing Hunting Areas

The Refuge has many hunt areas that provide a variety of opportunities to hunters. An access road bisecting a hunt unit would have a negative impact to that unit due to restrictions that are required to keep non-hunting visitors safe.



For beach segments 1-8, a one was given to the Hunt Zone that would be bisected by an access route to that beach segment. The ones were summed and each beach segment received a rank of low (matrix score of 3) if the sum was zero; medium rank if 1-5, and a high rank (matrix score of 1, least desirable) if greater than 5.

Hunting Zones Impacted																				
Segment Profile #	Zone 1	Zone 1a	Zone 1b	Zone 1c	Zone 1d	Zone 2	Zone 2a	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	Zone 11a	Sum	Rank	Matrix Score
1																			L	3.00
2		1	1	1	1													4.00	M	2.00
3		1	1					1	1									4.00	M	2.00
4		1	1					1	1	1								5.00	M	2.00
5		1	1					1	1	1	1							6.00	H	1.00
6		1	1					1	1	1	1	1						7.00	H	1.00
7		1	1					1	1	1	1	1						7.00	H	1.00
8		1	1					1	1	1	1	1	1				1	9.00	H	1.00

Selection of Beach Segments

The 24 objectives and sub-objectives were grouped into 4 categories: Wildlife, Shoreline Change, Access Route, and Parking Lot Location. The workshop participants were managers, biologists, and Town of Chincoteague planner charged to develop a method of determining 'where' on the barrier beach a recreational beach would have the least amount of impact on wildlife and habitat. The refuge beach was divided into 1 mile segments and numbered 1 – 12 (current recreational beach – the MD/VA border) and H1 – H5 (Tom's Cove hook). Beach segments were evaluated according to the criteria developed for an objective (or sub-objective), given a rank (usually high, medium or low) according to the scale developed for that objective, and the rank was translated into a numerical score (usually 1, 2, or 3) that was entered into a matrix (a consequence table).

Scoring for the matrix can be confusing because we are seeking areas of the beach where there is less wildlife activity and less disturbance to habitat, and are also looking for areas of the beach which would provide an enhanced experience to recreational visitors. Scores for wildlife and habitat result in a high score for undesirable conditions (low wildlife use/low habitat impact). Whereas scores for public use result in high scores for desirable conditions (short EMS response time, many points of interest, etc.).

The beach segments were first scored with the Wildlife objectives. During this scoring beach segments dropped out of further analysis based on legal restrictions and high levels of wildlife

use. The remaining segments (#1 - #8) continued through the scoring of Shoreline Change and Access Route objectives.

From the analysis, beach segments #2, 3, and 4, received the highest scores, indicating this is the area of beach in which a recreational beach would have the least impact on wildlife and habitat and provide a quality recreational beach experience in the most responsible and sustainable manner. This information was used by the Fish and Wildlife Service to develop draft alternatives for public consideration and discussion. See Appendix 1.

“Fine Tuning” – Site Selection

During the workshop, participants identified objectives that contribute to determining the best location for an access road and parking lot. This location will be determined by future engineer planning, and was beyond the scope of this workshop, which was to evaluate the biological aspects of the location of a recreational beach. The full criteria will be used in determining any future infrastructure development (i.e. parking lots, restrooms, visitor contact station, roads, etc.).

A. Habitat Acreage Change

Workshop participants felt it was necessary to consider the amount of habitat that would be lost or gained by relocating the access road and parking lot area. For each of the main habitat types, beach, wetland, forest and shrub-scrub, the change in acreage needs to be calculated and entered into the matrix table. Some habitats may need to be weighted higher, such as shrub-scrub, because the refuge does not have a lot of it and many migrating species are dependent upon this habitat type. The change in acreage may need to be converted to a score, rather than entering just the +/- acreage.

B. Recreational Beach Visitor Experience

The following sub-objectives were developed to assess the quality of experience a recreational beach visitor would have for different parking lot location scenarios. The current recreational

beach is located in Beach Segment 1. The refuge staff used the ranking and scores below to fill out the matrix for the current recreational beach.

1. Direct Access for Mobility Impaired

This is either 'yes' or 'no' to the question, 'Is there direct access for people who are mobility impaired?' A 'yes' receives a score of 3 (most desirable) and a 'no' receives a score of 1.

The current recreational beach received a 3.

2. Distance to Shelter

This objective assesses the distance a recreational beach visitor would have to travel to reach shelter from the beach. Shelter is defined as a covered shelter which could protect a visitor during a sudden rain storm, or the protection of a visitor's automobile. If the distance is < 50 yards receives 3 (most desirable); 50-100 yds. receives 2; and a distance of >100 yds. receives a 1 (least desirable). The current recreational beach received a 3.

3. Mode of Transportation

How a visitor arrives at the beach is important. Some transportation options are viewed as more convenient than others and visitors generally like to have the option of more than one mode of transportation. Modes of transportation include: personal automobile, bicycle, motorcycle, walking, shuttle bus, etc. This objective provides a score for the transportation options a visitor has depending on the parking lot scenario. Five modes of transportation receive a 5; four receives 4; three modes receive 3; two receives 2; and one receives a 1. The current recreational beach received 3.

4. Convenience

The workshop participants wanted to assess the level of 'convenience' a parking lot scenario provides a recreational beach visitor. This objective attempts to assess the amount of time it would take to reach the beach from the parking lot and the distance a visitor would have to travel from an access point. It is based on the number of parking spaces available and the mode of transport to the beach. If a parking lot scenario provides the same number of parking spaces that currently exist, it receives a 3. If a parking lot scenario provides a combination of parking spaces near the beach and alternative transport from another location, it receives a 2. If the parking lot scenario is not near the recreational beach and can only be accessed by alternative transportation, the scenario receives a 1.

5. Off-Road Vehicle Fishing Access

The ability to access fishing areas using an off-road vehicle (ORV) is highly valued by visitors fishing on the beach. The refuge wanted to include this objective to reflect the additional

use of a recreational beach by fishermen. This is simply a score of 2 for 'yes, there is ORV access', and a score of 1 for 'no, there is no ORV access'.

C. Cultural Resources

The construction of an access road and parking lot areas will most likely involve disturbance to the upper levels of soil. Grading and ground removal, if needed, could potentially impact cultural resources. In 1989, USFWS regional archeologists conducted an archeological reconnaissance in which they surveyed the refuge and produced a report. Based on this report, regional archeologists would be able to determine whether or not construction associated with an access road and parking lots would impact cultural resources. The parking lot scenario would receive a score of 2, if it is in an area where it is unlikely to impact cultural resources. A scenario would receive a score of 1, if it is in an area that will impact cultural resources.

D. Initial Cost

The initial costs of new construction associated with an access road, parking lots areas and structures should be included in parking lot scenarios. The participants did not go into detail on how this would be done, just expressed the need to include some type of cost estimate that could be translated into a score for the matrix.

E. Cost of Annual Maintenance

Similar to Initial Costs, workshop participants felt that an estimate of annual maintenance costs should be included in the evaluation of parking lot scenarios. Annual costs may include maintenance of the access road (based on its length), storm repairs (due to the rate of beach movement), building up keep, etc. As biologists, the participants did not get into the details of how this would be estimated, but wanted to include a cost estimate that could be translated into a score for the matrix.

Appendix 1. Beach Segment Matrix

Objectives		One Mile Recreational Beach Segments from the Current Rec. Beach to the MD/VA Border and Tom's Cove Hook																
		Beach Seg. 1 Current	Beach Seg. 2	Beach Seg. 3	Beach Seg. 4	Beach Seg. 5	Beach Seg. 6	Beach Seg. 7	Beach Seg. 8	Beach Seg. 9	Beach Seg. 10	Beach Seg. 11	Beach Seg. 12	Beach Seg. H1	Beach Seg. H2	Beach Seg. H3	Beach Seg. H4	Beach Seg. H5
Wildlife																		
	1. Wilderness (proposed)?	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	N	N	N	N
	2. Wildlife Dependent on Sparsely Veg. Habitat																	
	a. Amount of breeding use	3	3	3	3	2	2	1	3					1	1	1	1	2
	b. Amount of use during migration	2	3	3	3	3	2	2	3					1	1	1	1	1
	c. Amount of non-breeding (winter) bird use	3	3	3	3	3	3	3	3					2	2	1	1	1
	<i>Subtotal</i>	8	9	9	9	8	7	6	9					4	4	3	3	4
	3. Additional Mandates													Y	Y	Y	Y	Y
	4. Waterbird Use of Wetlands																	
	a. Level of Waterbird Use	1.5	1.5	1.5	2.5	2	1	1	1									
	b. Cumulative use to beach segment	3	3	3	2	1	1	1	1									
	<i>Subtotal</i>	4.5	4.5	4.5	4.5	3	2	2	2									
	5. Forest Dependent Wildlife																	
	<i>Subtotal</i>	2	3	3	1	1	1	1	1									

	6. Shrub-scrub Dependent Wildlife																	
	<i>Subtotal</i>	2	3	3	3	1	1	1	1									
	Sum of Wildlife Subtotals	16.5	19.5	19.5	17.5	13.0	11.0	10.0	13.0									
Shoreline Change	7. Expected Longevity of Infrastructure																	
	<i>Is route to Beach Segment Sustainable?</i>																	
	Shoreline Change Rate	-2.00	-1.44	-1.00	-1.00	1.00	1.00	0.47	0.00									
Access Route																		
	8. Proximity to Existing Infrastructure																	
	<i>Subtotal</i>	2	3	3	3	3	1	1	1									
	9. Visitor Safety and Experience																	
	a. Response time by EMS	2	3	3	3	3	1	1	1									
	b. Points of interest along route to beach	3	2	2	2	3	3	3	3									
	c. Traffic to beach impact on trails	2	1	3	3	3	3	3	3									
	d. Impacts to existing Hunting Areas	3	2	2	2	1	1	1	1									
	<i>Subtotal</i>	10	8	10	10	10	8	8	8									
	Sum of Access Route	12	11	13	13	13	9	9	9									
	Cumulative Subtotals	26.5	29.1	31.5	29.5	27.0	21.0	19.5	22.0									

Appendix 2. List of Workshop Participants / Invitee

Participants	Agency	Telephone
Bill Neville	Town of Chincoteague	757-336-6519
Lou Hinds	Chincoteague NWR	757-336-6122
Kim Halpin	Chincoteague NWR	757-336-6122
Kevin Holcomb	Chincoteague NWR	757-336-6122
Amanda Daisey	Chincoteague NWR	757-336-6122
Sue Rice	Eastern Shore of VA NWR	757-331-2760
Hal Laskowski	USFWS, Region 5	retired
Jennifer Casey	USFWS, Region 5	603-482-3415
Bill Thompson	USFWS, Region 5	413-253-8200
Jack Kumer	NPS - Assateague Island National Seashore	410-629-6070
Ruth Boettcher	VA - Division of Game & Inland Fisheries	757-787-5911
Michael Stroeh	Coastal Delaware NWR Complex	302-653-9345
Invitee		
Jim McGowan	County of Accomack, Director of Planning	757-787-5726
Trish Kicklighter	NPS - Assateague Island National Seashore	410-629-6080
Bill Hulslander	NPS - Assateague Island National Seashore	410-629-6061
Todd Englemeyer	VA - Division of Game & Inland Fisheries	

Appendix O

Amanda Boyd/USFWS



Piping Plover

Section 7 Biological Opinion for Alternative B

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Louis Hinds, Refuge Manager
Station Name: Chincoteague National Wildlife Refuge Complex
Prepared by: Kevin Holcomb, Supervisory Wildlife Biologist
Telephone Number: 757-336-6122 x319

Date: June 11, 2013

Project Title: Chincoteague National Wildlife Refuge and Wallops Island National Wildlife Refuge
Comprehensive Conservation Plan preferred alternative (Alternative B).

I. Service Program: National Wildlife Refuge System

II. Geographic Area Including Name of County/City and State and Specific Project Location:

Chincoteague National Wildlife Refuge, Accomack County, Virginia and Worcester County, Maryland

- Assateague, Assawoman, Metompkin, and Cedar Islands
- Wildcat Marsh and Morris Island

Wallops Island National Wildlife Refuge, Accomack County, Virginia

III. Proposed Activity:

Chincoteague National Wildlife Refuge (NWR) is in the process of preparing a Comprehensive Conservation Plan and Environmental Impact Statement (CCP/EIS) that is vital for the management of both refuges. The final CCP will provide strategic management direction over the next 15 years, by

- providing a clear statement of desired future conditions for habitat, wildlife, visitor services, and facilities;
- providing refuge neighbors, visitors, and partners with a clear understanding of the reasons for management actions;
- ensuring refuge management reflects the policies and goals of the System and legal mandates;
- ensuring the compatibility of current and future public uses;
- providing long-term continuity and direction for refuge management; and
- providing direction for staffing, operations, maintenance, and developing budget requests.

In accordance with the Refuge System Planning Policy (Service Manual 602 FW 3), the purpose of this CCP is to provide the refuge manager with a 15-year management plan for the conservation of fish, wildlife, and plant resources and their related habitats, while providing opportunities for compatible wildlife-dependent recreational uses.

The proposed actions and alternatives selected by the Service are described in Chapter 2 of the draft CCP/EIS.

IV. Pertinent Species and Habitat Within Action Area

- A. Action area (includes **all areas to be affected directly or indirectly** by the proposed project and not merely the immediate area involved in the action).

The refuge is located on a system of barrier islands off the eastern shore of the Delmarva Peninsula, a large peninsula on the East Coast comprised of most of Delaware and portions of Virginia and Maryland (see map). The refuge primarily lies in Accomack County, Virginia. However, the planning area for the CCP/EIS includes portions of Wicomico, Worcester, and Somerset Counties, Maryland; and Accomack and Northampton Counties, Virginia.

- B. Listed species potentially present within the action area:
Piping plover (*Charadrius melodus*), loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), seabeach amaranth (*Amaranthus pumilus*), and Delmarva fox squirrel (DFS) (*Sciurus niger cinereus*).
- C. Proposed species and/or proposed critical habitat within the action area:
None
- D. Candidate species within the action area:
Red knot (*Calidris canutus rufa*)
- E. Include species/habitat occurrence on a map.
Habitat maps are found in Chapter 3, “Affected Environment” of the draft CCP/EIS.

Chincoteague NWR Management Units

The management units for Chincoteague NWR are organized by island, with habitats as sub units. Table 1-1 summarizes the management units by name, and then breaks down individual acreage for each sub unit by habitat.

Table 1-1. Management Units

Unit	Sub Unit by Habitat (acres)					Total Acreage
	Beach /Dune	Shrub/early successional	Forested Uplands	Impoundments	Salt Marsh	
Assateague Island	970	2,872	1,600	2,012	1,985	9,394
Wildcat Marsh	-	-	71	-	475	546
Morris Island	-	-	21	-	406	427
Assawoman Island	359	-	-	-	1,075	1,434
Metompkin Island	96	-	-	-	78	174
Cedar Island	402				1,610	2,012
Wallops Island NWR	-	57	121	-	195	373
Refuge Total	1,824	2,929	1,813	2,012	5,824	14,405

For more information and details, please refer to Chapter 3, “Affected Environment” of the draft CCP/EIS.

V. Determination of Effects

- A. Explanation of the adverse and beneficial effects of the action on species and/or critical habitat listed above.

Refer to Chapter 4 of the draft CCP/EIS for more information and details that assesses the impact of management actions on threatened and endangered species; management actions are referenced by number throughout the text.

Impacts on Federally Threatened and Endangered Species in Alternative B

Allowing natural vegetation to grow in at the NWF to improve habitat for spring and fall migratory birds, waterfowl, and neotropical birds would result in negative impact for piping plovers (management action 23b). Current management of the NWF area has vegetation adjacent to open mudflats being annually cut back to create a more suitable habitat for coastal nesting shorebird populations. Allowing natural scrub shrub vegetation to grow in adjacent to the open mudflats, would transform the area into habitat that is not commonly used by coastal nesting shorebirds, altering approximately 300 acres of habitat. This impact would be off-set and even surpassed as a result from relocating the current recreational beach (management actions 2b and 3b).

The existing one-mile beach area and 8.5 acres of beach parking on the southern end of the refuge is prime coastal shorebird and seabeach amaranth habitat. By moving the recreational beach and accompanying facilities north (management action 52b), this area would be allowed to revert back to coastal nesting shorebird and amaranth habitat by natural processes (management actions 2b and 3b). Piping plovers and amaranth favor areas with frequent overwash events, which occur currently where the recreational beach is located. Areas adjacent to the recreational beach exhibit high density of piping plovers nesting. This area has the potential to support a higher number of species than what is currently supported in the NWF. Sea turtles exist in the same types of habitats as piping plovers, and the increase in habitat quality coming from the allowance of natural processes to take over would see a beneficial impact for both (management action 8b), as well as the benefits from the general decrease in human disturbance.

Through the creation of the year-round OSV access area, all day and nighttime OSV use south of this area would be discontinued between March 15 and September 15 (management actions 9b, 10b, 58b, 60b, 61b). This would eliminate the potential for OSV users to run over nests, hatchlings or plants, or otherwise disturb the nesting process.

From September 16 to March 14, negative impacts would result from the expansion of the OSV zone from the new recreational beach location to the current zone (management action 59b). This expanded OSV area would increase the possibility of human disturbance in the coastal habitat. Negative impacts would be minimized since OSV users would only be permitted to travel in the intertidal zone and by management action conducted by refuge staff, usually in the form of exclosures and signs.

- B. Explanation of actions to be implemented to reduce adverse effects:

The refuge would provide protective conservation measures for federally listed species and their habitats on the refuge as indicated in recovery plans and relevant regulations.

As explained above, we believe that implementation of the proposed alternative in the CCP will result in either beneficial effects to the listed species described above; or that any direct, indirect, or cumulative adverse effects that may result will be no more than insignificant or discountable.

The new recreational beach area was chosen through a Structured Decision Making (SDM) analysis (USFWS 2011b). Through this SDM process, a one-mile segment of beach was identified as having the least impacts to refuge habitat and wildlife. This one-mile segment would be the location for the new recreational beach in Alternatives B and C (management action 52b). Human disturbance to coastal nesting birds would be greatly diminished since the recreational beach would be relocated north, and OSV use would be limited to September 16 to March 14 (management action 60b). Natural processes would allow for overwash to occur in the location of the existing recreational beach, resulting in fresh sand and shell which is prime habitat for coastal nesting birds, turtles, and seabeach amaranth (management actions 2b, 3b, 6b, 8b, and 13b).

There are additional actions proposed under the alternatives that are not fully analyzed in the draft CCP/EIS because they would require additional information and a level of analysis that is beyond the scope of the EIS. These larger actions would require further planning by the refuge. Once detailed proposals for these actions have been developed, a separate environmental analysis and associated environmental assessment document would be prepared, which would include public involvement and comment at that time. Where possible, we analyzed the alternative actions based on current information.

VI. Effect Determination and ES Response Requested

A. Listed species/designated critical habitat:

Field Station Determination	Piping plover	Ecological Services Response Requested (check one)
No effect		_____None Needed
Is not likely to adversely affect		_____Concurrence
Is likely to adversely affect		_____Formal Consultation

Field Station Determination	Loggerhead sea turtle, Green sea turtle, Leatherback sea turtle	Ecological Services Response Requested (check one)
No effect		_____None Needed
Is not likely to adversely affect		_____Concurrence
Is likely to adversely affect		_____Formal Consultation

Field Station Determination	Seabeach amaranth	Ecological Services Response Requested (check one)
No effect		_____None Needed
Is not likely to adversely affect		_____Concurrence
Is likely to adversely affect		_____Formal Consultation

Field Station Determination	Delmarva fox squirrel	Ecological Services Response Requested (check one)
No effect		_____None Needed
Is not likely to adversely affect		_____Concurrence
Is likely to adversely affect		_____Formal Consultation

Field Station Determination	Critical Habitat For (list species)	Ecological Services Response Requested (check one)
No effect		_____None Needed
Is not likely to destroy or adversely modify		_____Concurrence
Is likely to destroy or adversely modify		_____Formal Consultation

B. Proposed species/proposed critical habitat/candidate species:

Field Station Determination	Red knot	Ecological Services Response Requested (check one)
No effect		_____None Needed
Is not likely to adversely affect		_____Concurrence
Is likely to jeopardize		_____Conference

Field Station Determination	Critical Habitat For (list species)	Ecological Services Response Requested (initial/check one)
No effect		_____None Needed
Is not likely to adversely affect		_____Concurrence
Is likely to destroy or adversely modify		_____Conference

VII. Reviewing Ecological Services Field Office Evaluation

- A. Concurrence _____ Non-concurrence _____
- B. Formal consultation required _____
- C. Conference required _____
- D. Informal conference required _____
- E. Remarks:

Supervisor, Virginia Field Office

Date

Appendix P



Boardwalk on Refuge

Compatibility Determinations

**Chincoteague NWR and Wallops Island NWR
Compatibility Determinations**

1. Wildlife Observation, Wildlife Photography, and Interpretation
2. Environmental Education
3. Fishing (Recreational) – Finfish, Oysters, Clams, and Crabs
4. Migratory Game Bird Hunting
5. Big Game Hunting
6. Grazing of Chincoteague Ponies
7. Horseback Riding
8. Research and Studies Conducted by Outside Agencies, Universities, and Organizations
9. Shell Collection
10. Temporary/short-term activities conducted by other Federal Government Agencies and/or their contractors
11. Big Game Hunting (Wallops Island NWR)
12. Research and Studies Conducted by Outside Agencies, Universities, and Organizations (Wallops Island NWR)

COMPATIBILITY DETERMINATION

USE:

Wildlife Observation, Wildlife Photography, and Interpretation

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is wildlife observation, wildlife photography, and interpretation. These are priority public uses identified by Executive Order 12996 (March 25, 1996) and by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where would the use be conducted?

The use would be conducted within the refuge's boundary. The uses would be conducted in current buildings and on current and future trails and roadsides of the refuge. Visitors can access information about the refuge using advanced technology (computers, radio, cell phone, downloadable programming, etc.). Designated areas open to visitors for wildlife observation, photography and interpretation are as follows (see Map 2-3 in the draft CCP/EIS for an illustration of where these uses would be conducted on the refuge):

- Herbert H. Bateman Educational and Administrative Center
- Assateague Lighthouse
- Beach Road and Beach Road Bike Trail
- Marsh Trail
- Wildlife Loop
- Lighthouse Trail
- Black Duck Trail
- Woodland Trail
- Bivalve Trail
- Beachfront
- New Beach Access Road
- New Beach Access Bicycle Trail
- Service Road

Access to the beachfront is permitted in two ways:

- 1) Foot access is allowed year round from the Maryland/Virginia state line to the southern terminus of the National Park Service (NPS) recreational beach parking area.
- 2) Foot access and over sand vehicle (OSV) use/access is allowed at certain times of the year from the NPS southernmost recreational beach parking area at Toms Cove to "Fishing Point" on Toms Cove Hook.

Access for wildlife observation and photography in the OSV Zone is further restricted by the following stipulations:

- 1) Upon completion of the CCP but prior to the relocation of the recreational beach, from March 15 to September 15, the area south of the recreational beach parking area is closed.

- 2) From September 16 to March 14, the zone will again start at the southern terminus of the NPS recreational beach parking area at Toms Cove, then south along the Atlantic Ocean beachfront to “Fishing Point” on Toms Cove Hook, then returning by the same route. Walking and OSV use will generally be within the intertidal zone, unless OSVs are re-directed by signage to avoid sea turtle nest sites; vehicles are prohibited from the dunes or vegetated areas. Wildlife observation and photography could also occur along the beachfront of Assawoman, Metompkin and Cedar Islands outside the shorebird nesting season.

(c) When would the use be conducted?

Opportunities for wildlife/wildlands observation, wildlife photography, and interpretation are available at existing buildings and via existing trails and newly established ones during normal refuge hours. Normal refuge hours are 5:00 a.m. to 10:00 p.m. from May through September; 6:00 a.m. to 6:00 p.m. from November through March; and 6:00 a.m. to 8:00 p.m. during the months of March, April and October. A new access road and bike trail will be established connecting current visitor use areas to the new recreational beach. Some conflicts are expected between refuge user groups as well as wildlife use which will be managed by seasonal closures. These seasonal closures are explained below and apply mostly to non-consumptive users during the hunting season or beachfront walking during the shorebird nesting season.

- All beach areas on Assateague Island south of the newly established year round OSV area will be closed to all visitor use from March 15 until September 15 or until the last shorebird fledges due to nesting of federally threatened piping plovers as well other shorebird species.
- All trails south and east of the Administrative Office and the new Beach Access Road may be closed for big game hunting during the fall and winter months.
- Staffing of the Assateague Island Lighthouse and operation of the Wildlife Tour Bus is provided by the Chincoteague Natural History Association (CNHA). Operations vary throughout the year. Daily access is provided during the busier visitor use periods with weekend access during the shoulder seasons and very limited or no access during the winter months.
- The Herbert H. Bateman Educational and Administrative Center is open daily throughout the year.
- Beachfront access on Assateague Island north of the recreation beach would be year round within the Intertidal zone.
- Staff and/or volunteer guided interpretative programs may occur year round but are concentrated in the busier visitor use periods.
- Beachfront access on the southern islands would be permitted for these uses outside of the shorebird nesting season (March 15 to September 15) and the safety and security zone established by NASA on Assawoman Island. As Metompkin and Cedar Islands have other ownership as well, visitors should consult with those entities prior to visiting.

(d) How would the use be conducted?

These three priority visitor uses would be allowed on established and newly developed roads, trails, parking areas, beachfront areas and in buildings that have been designed to accommodate such uses and in areas that are least sensitive to human intrusion. Uses would be conducted for the general public, as well as for organized groups, including school and youth groups. Brochures and maps depicting the roads and trails open for these uses are available at the Herbert H. Bateman Educational and Administrative Center, at trailheads and on the refuge's website.

Interpretation may be conducted by way of personal presentations by staff, volunteers, CNHA personnel, contracted and guest presenters, teachers and other youth leaders, and at special events and displays both on and off the refuge. Educational and interpretive information will also be provided via signage, kiosks, printed information, exhibits, audiovisual presentations, web based information, podcasts, radio messages and lecture programs. Wildlife observation and photography are usually self-conducted activities and are facilitated through the availability of trails, viewing areas, tours, and informational materials. Wildlife observation programs such as birding field trips, CNHA Wildlife Tours, and other nature walks are frequently given. Viewing scopes are provided in designated areas.

Refuge staff are responsible for on-site evaluations to resolve visitor use issues; monitor and evaluate impacts; maintain boundaries and signs; meet with interested public; recruit volunteers; prepare and present interpretive and educational programs; maintain existing trails and viewing areas; revise brochures and develop new information materials, install and/or update kiosks; develop needed signage; organize and conduct refuge events; conduct regularly scheduled programs for the public; display off-site exhibits at local events; develop relationships with media; provide law enforcement and security; and respond to public inquiries.

Foot access is permitted in all listed areas except the Service Road. Bicycle access is permitted on all paved roads, hard-surfaced trails and on the Bike Trail that parallels Beach Road. Access for non-motorized, hand carried watercraft (including but not limited to kayaks, canoes, kite boards, sail boats and sailboards) into Toms Cove and Assateague Channel will be available from a launch site near the terminus of Beach Road. Access north of the recreational beach via the Service Road will only be available via the CNHA Wildlife Tour Bus and by other organized groups authorized with a permit or agreement.

In addition to published 50 CFR regulations and State regulations, refuge-specific regulations also apply for "Wildlife Observation and Photography and Interpretation" and are as follows:

- All boats must be off the water by sunset. Only non-motorized, hand carried, non-commercial watercraft access will be permitted.
- Areas may be closed on the refuge with little or no warning for safety or other reasons.
- Visitors must stay on the designated trail routes and areas.
- Opportunities for wildlife observation, wildlife photography, and interpretation are available via the established road and trail network, the OSV zone, and along the proposed

beach access road and bike trail as well as along the beachfront during normal refuge hours. All new construction will be done in such a way as to minimize impacts to refuge resources. Some conflict between refuge users is expected to result in short-term moderate adverse impacts, which will be managed through seasonal closures. These seasonal closures apply mostly to non-consumptive users during the hunting season. Other seasonal closures are in place to minimize wildlife disturbance.

- Bicycling is allowed on roads, paved trails or others designated for bicycle use.
- The Herbert H. Bateman Educational and Administrative Center is open daily.
- The following activities are prohibited, including, but not limited to: ice skating, camping, rollerblading, geocaching/metal detecting, off-road and mountain biking, ATVs, picnicking, pets, operation of model boats and airplanes, soliciting of funds (per 50 CFR 27.97 for Private Operations and per 50 CFR 27.86 for Begging), and other activities identified in 50 CFR Part 27.
- All boaters would be required to operate their craft and possess all safety equipment in accordance with Commonwealth of Virginia and U.S. Coast Guard Regulations.

(e) Why is this use being proposed?

Wildlife observation, wildlife photography, and interpretation are Priority Public Uses as defined by The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), and if compatible, are to receive enhanced consideration over other general public uses.

These uses are conducted to provide compatible educational and recreational opportunities for visitors to enjoy the resource and to gain understanding and appreciation for fish, wildlife, wildlands ecology, the relationships of plant and animal populations within the ecosystem, and wildlife management. These uses will provide opportunities for visitors to observe and learn about wildlife and wildlands at their own pace in an unstructured environment and to observe wildlife habitats firsthand. These uses will enhance the public's understanding of natural resource management programs and ecological concepts to enable the public to better understand the problems facing our wildlife/wildlands resources, to realize what effect the public has on wildlife resources, to learn about USFWS's role in conservation, to better understand the biological facts upon which USFWS management programs are based, and to foster an appreciation for the importance of wildlife and wildlands. It is anticipated that participation in these uses will result in a more informed public, with an enhanced stewardship ethic and enhanced support and advocacy for wildlife conservation.

These uses will also provide an intrinsic, safe, outdoor recreational opportunity in a scenic setting, with the realization that those who come strictly for recreational enjoyment will be enticed to participate in the more educational facets of the visitor use program, and can then become informed advocates for wildlife conservation.

AVAILABILITY OF RESOURCES:

Allowing the use of wildlife observation, photography, and interpretation is within the resources available to administer our Visitor Services program with the current level of participation.

Additional funding for visitor services' improvements can also come from entrance fee revenues, grant funds, and contributions. Compliance with refuge regulations is handled within the regular duties of the station Law Enforcement Officers. As funding is available, the refuge will complete and maintain projects and facilities. Volunteers and partners will be utilized to help with construction and maintenance.

Facilities or materials needed to support this use include maintaining access roads, parking areas, roadside pull-offs, kiosks, signs, the visitor center exhibits, wayside exhibits, observation platforms, photography blinds and trails; creating new beach access road and bike trail, observation tower, accessible crabbing area and boat launch area; and providing information in refuge publications, social media sites, the refuge's website as well as other information sharing venues.

Sufficient staff and maintenance funding within our base budget as well as revenues generated from the refuge entrance fee program are available to make annual progress toward completion of all the projects described above and to maintain those already completed; however, additional funding will be needed to construct the road and trail system to the new recreational beach.

ANTICIPATED IMPACTS OF THE USE:

Anticipated impacts of the use can be divided into those associated without OSV, which encompass nearly all of the use, and those impacts associated with OSV which make up very little of the overall wildlife observation and photography use.

Non-OSV Use Impacts

Wildlife observation, photography and interpretation can result in varying impacts to wildlife resources. An effect of allowing visitor's access to the refuge will be the provision of additional wildlife-dependent recreational opportunities and a better appreciation and more complete understanding of the wildlife and habitats associated with the refuge, the Delmarva ecosystems, and the world at large.

Visitors engaging in these activities are expected to use and stay on trails or roads to access the interior of the refuge. This disturbance may displace individual animals to adjacent areas of the refuge.

The refuge expects that wildlife observation, wildlife photography, and interpretation will have short-term, long-term and cumulative positive impacts on the economies of the town and county in which the refuge lies. While not as significant as the summer beach tourism, visitors participating in these wildlife oriented recreational pursuits come in noteworthy numbers - staying and spending in the local community. Please refer Appendix M of the Draft CCP (*Chincoteague*

National Wildlife Refuge Economic Analysis In Support of Comprehensive Conservation Plan) for more detailed information. The relocation of the recreational beach and associated trails may elevate interest in the wildlife oriented recreational activities on the refuge resulting in an increased spending in the local community and region.

Wildlife observation, wildlife photography, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on soils, local or regional air quality, and hydrology or water quality. However, negative impacts to water quality can result from human activities. We will continue to address these through educational information and programming.

Wildlife observation, wildlife photography, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on vegetation. Disturbance to vegetation (both wetland and upland) will occur during the construction of new beach access road and bike trails as well as associated parking lots.

Disturbance factors resulting from visitor use are always considered for all state and Federal listed species. Of these, impacts on the shorebirds including the piping plover, red knot, upland sandpiper and Wilson's plover will be minimized through the seasonal closure of beachfront south of the designated year round OSV zone from March 15 through September 15. Other than during the construction period, the proposed activities would not likely affect the Delmarva fox squirrel. The bald eagle, while no longer listed as a state or Federal listed species, is still protected under the Bald and Golden Eagle Protection Act. Bald eagles may nest in areas visible to the public making for excellent wildlife observation, interpretative and photography opportunities. At this time these activities are not expected to have any negative impacts on bald eagles

Wildlife observation, wildlife photography, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on waterfowl. Reducing access north of the new recreational beach area will provide waterfowl sanctuaries which will minimize some of these impacts and allow waterfowl to have undisturbed areas during biologically critical periods of the day.

This use is expected to have negligible adverse short-term, long-term or cumulative impacts on shorebirds and landbirds. We expect indirect impacts to landbirds to increase due to the proposed beach access road and trail construction and use. Visitor use activities including wildlife observation, wildlife photography and interpretation are expected to increase in these areas as well; however, after construction, disturbance to landbirds in proposed areas for interpretation, wildlife observation and photography is expected to be negligible since all visitors will be required to be on designated walking trails and access roads.

Wildlife observation, wildlife photography and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on secretive marsh and waterbirds. We expect negligible increased impacts to secretive marsh and waterbirds due to proposed expansions

in visitor use activities as they will be offset by fewer disturbances in current visitor use areas. The construction of a bike trail to the new beach area has the potential to increase disturbance to secretive marsh and waterbirds; however, this is a short-term impact.

Wildlife observation, wildlife photography, and interpretation are expected to have negligible adverse short-term, long-term or cumulative impacts on mammals. In general, the presence of humans would disturb most mammals, which would typically result in indirect short-term adverse impacts, which would be negligible because they would not cause long-term effects on individuals and populations.

Refuge strategies for conserving and maintaining biological integrity, diversity, and environmental health, restoring native plant communities, improving habitat conditions for the endangered Delmarva fox squirrel, and controlling invasive or nuisance species would be management actions incorporated in all alternatives and would provide beneficial impacts on mammals. Each of these actions would directly or indirectly benefit mammalian populations over the long term by ensuring the continuation of quality natural habitats on the refuge for resident mammalian wildlife.

Vehicles would be restricted to roads and harassment or taking of any wildlife other than legal game species would not be permitted.

The beneficial impacts of providing the existing level of wildlife-dependent activities, with some modest increases, include helping meet existing and future demands for outdoor recreation as indicated in the 2012 USGS National Visitor Survey. Visitor use appears to be remaining fairly steady in recent years, but we want to continue to improve our opportunities to expand the knowledge base of our visitors on environmental concerns. The economic benefits of increased tourism would also benefit local communities.

Some conflict between wildlife observers, photographers and other refuge users is expected to result in short-term moderate adverse impacts, which will be managed through seasonal closures. In addition, while new visitors become familiar with those changes, violations could increase.

Guided tour activities should not conflict with other refuge users as the CNHA tour bus will be operating north of the new recreational beach. Operation/tours of the Assateague Island Lighthouse and future renovation/operation/Interpretation of the lightkeeper's house by CNHA are occurring in areas not currently open for self guided use.

New or expanded visitor services programs, such as installation of an eBird kiosk, and/or facilities, such as a new visitor contact station, are expected to increase public awareness of, and visitation to, the refuge, and would enable staff to provide better customer service. We would expect a certain level of inconvenience during the construction of refuge facilities. The adverse effects

generally are short-term, and more than offset by the long-term gains in public education and appreciation. Impacts to refuge resources are expected to be negligible.

OSV Impacts

The activity of wildlife observation and photography, by itself, has no significant impact to migratory birds due to disturbance. However, the use of OSVs to gain access to remote southernmost areas of Assateague Island must be reviewed.

Migratory birds - Since the use of OSVs will occur along the Atlantic ocean beachfront, impacts to migratory birds will generally be restricted to shorebirds. The refuge consulted with the USFWS Ecological Services Virginia Field Office who issued a Biological Opinion on the impacts of OSV use, among other uses, on piping plovers. The impacts described therein can be extrapolated to other shorebirds.

The refuge has been designated as internationally important for shorebirds by the Western Hemisphere Shorebird Reserve network. It is an important staging area and provides habitat for shorebirds during both spring and fall migrations. Nesting species include piping plover, American oystercatcher, willet, common and least tern, and black skimmer. Spring migration generally runs from early April to early June, when thousands of shorebirds use refuge habitats. Dunlin and sanderling are predominant during early spring migration, while semipalmated sandpiper makes up nearly half of those birds counted during late spring migration. The peak of fall migration occurs from July through September with semipalmated and least sandpipers accounting for the majority of individuals. The red knot, which is proposed for listing under the Endangered Species Act, also uses the refuge during spring and fall migration.

Motorized vehicle use on beaches is an extreme threat to piping plovers, as well as other shorebirds that nest on beaches and dunes. Vehicles can crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991). In Massachusetts and New York, 18 piping plover chicks and 2 adults were killed by off-road vehicles (ORVs) in 14 documented incidents (Melvin et al. 1994). Goldin (1993) compiled records of 34 chick mortalities (30 on the Atlantic Coast and 4 on the Northern Great Plains) due to vehicles. Biologists who monitor and manage piping plovers believe that vehicles kill many more chicks than are found and reported (Melvin et al. 1994). Beaches used by recreational vehicles during nesting and brood-rearing periods generally have fewer breeding plovers than available nesting and feeding habitat can support. In contrast, plover abundance and productivity has increased on beaches where recreational vehicle restrictions during chick-rearing periods have been combined with protection of nests from predators (Goldin 1993) (USFWS 2008a). It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicle's path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

To mitigate for these potential negative impacts, the refuge has instituted seasonal closures for surf fishermen, horseback riders, and OSV users. The beach habitats of Toms Cove Hook are the most productive on the refuge for nesting and staging shorebirds. As noted above, the Toms Cove Hook portion of the surf fishing, horseback riding and OSV zone is closed from March 15 through September 15 annually, and later if unfledged birds remain in the area. The closure period also encompasses the peak times of spring and fall migration, thus providing undisturbed habitat for shorebirds during the most critical times of year.

The closures extend from the nest site a distance of 200 meters (656 feet) north. It is possible that some nests may not be discovered, and the presence of nest searchers may also cause direct loss if eggs are inadvertently crushed. In either of these situations, there could be negative impacts to nesting shorebirds. When the recreational beach area is moved to a more northern location, as is proposed in the draft CCP/EIS (alternative B), the Overwash area would be managed identically with the Toms Cove Hook portion, which will provide added protection to birds using the Overwash area.

OSV users may encounter shorebirds at times outside of the closure period. During this time, all birds should be capable of flight, and therefore can travel short distances to other high quality, undisturbed portions of the refuge, such as the bay side of Toms Cove. There could be some negative impacts due to birds expending energy to travel away from preferred feeding or resting areas.

Based on a review of the literature, with seasonal closures in place, and if nest searches in the Overwash zone are conducted thoroughly and professionally, the direct, indirect, and cumulative impacts of OSV use to shorebirds should not be significant.

Threatened and endangered species - This section assesses impacts to federally listed threatened and endangered species: piping plover, sea turtles, and seabeach amaranth.

Piping plover impacts are covered above under migratory shorebird impacts.

Sea turtles - Five species of federally-listed sea turtles use Assateague Island's ocean and bay waters. The leatherback sea turtle, which is also a state listed, Kemp's Ridley sea turtle, and the Atlantic hawksbill are Federal endangered species. The loggerhead sea turtle and green sea turtle are Federal threatened, with the loggerhead also being state threatened. The loggerhead sea turtle nests on Assateague Island, which is the northern extent of its breeding range. To date, there has been no confirmed nesting by green or leatherback sea turtles within CNWR although both these species have been seen in waters off Virginia's barrier islands during the nesting season. Dead stranded turtles of these species are occasionally found on CNWR beaches. However, with the average global air and water temperatures rising, refuge beaches may become more favorable for these species (USFWS 2008c).

Nesting activity on Assateague and NASA Wallops Islands has risen noticeably in recent years, perhaps the result of a loggerhead translocation project. From 1969 -1979 sea turtle eggs from nests laid on Cape Island of Cape Romain National Wildlife Refuge, Charleston County, SC were relocated to CNWR. During, and the first two decades following, the relocation program (1970–1999) staff recorded 16 crawls on Assateague and NASA Wallops; ten resulted in nests and six were false crawls, meaning no nest was made. Loggerhead sea turtles take 30 years to reach maturity, so females that were part of the transplant project may now be returning to their hatch and release sites. Loggerhead nesting activity from 2000–2012 on Chincoteague Island had a total of 66 crawls; 23 resulted in nests and 43 were false crawls (CNWR unpubl. database). Eleven of the nests were located on Wild Beach, north of the recreational beach in an area closed to all OSV use. Eight nests were located on the Recreational beach area and OSV zone (5 at the Overwash and 3 on public beach). These nests were monitored and managed in accordance with the Chincoteague NWR Intra-Service Section 7 and Biological Opinion (USFWS 2008). The other four nests were located south of the recreational beach on the Toms Cove Hook area.

OSV use poses a risk of injury to females and live stranded turtles, can leave ruts that trap hatchlings attempting to reach the ocean (Hosier et al. 1981, Cox et al. 1994), can disturb adult females and cause them to abort nesting attempts, and can interfere with sea-finding behavior if headlights are used at night (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991). Driving directly above incubating egg clutches can cause sand compaction, which may decrease hatching and emergence success and directly kill pre-emergent hatchlings (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007). Artificial lighting on human structures may affect turtle behavior in a similar manner (Witherington and Martin 1996). When artificial lighting impairs sea-finding behavior of nesting females and emerging hatchlings, the affected animals face increased exposure to the elements and predation.

To mitigate for potential impacts to sea turtles, the following protocols will be implemented: Sea turtle crawl searches will be conducted in the morning hours during piping plover monitoring and avian predator management to ensure nest protection procedures begin as soon as possible. All sea turtle nests will be marked, thus establishing a buffer zone, to protect the nest from recreation-related human activity. Staff or volunteers will place a minimum of four informative “Area Closed” signs forming a 5 ft radius around the nest. Rope will be strung between the signs to discourage vehicles and pedestrians from trespassing into the nest site. OSV access will occur outside this buffer zone.

OSVs are prohibited from the recreational beach. However, headlights from the parking lot or adjacent OSV zone will have the potential to affect hatchling emergence to the ocean. Staff will erect a light and hatchling emergence barrier around the 5 ft. radius buffer zone into the intertidal zone in both the OSV Zone and recreational beach area.

In this scenario, the beach is wide enough to allow OSVs to travel landside of the nest without adversely affecting dune or vegetated habitats; therefore staff will continue to allow OSV traffic west of the nest. Pedestrians may access areas west of the nest or within the intertidal zone. Because a light and hatchling emergence barrier will be in place during the entire hatch window, a nest sitter will not be present at night.

Staff will erect a light and hatchling barrier around the 5 ft. radius buffer zone and toward the intertidal zone. A corridor will be created near the intertidal zone for OSV and pedestrian access. A nest sitter will open the access corridor to the public one hour after sunrise. A nest sitter will close the corridor at sunset.

Management activities on the refuge should have a net positive effect on sea turtle nesting due primarily to in situ protection of nests. Active and passive predator control, conducted primarily for plover nest protection, will also help nesting sea turtles by reducing the number of potential sea turtle nest predators on the refuge. All sea turtle nests will be left in place and protected from threats as outlined in the attached Intra-Service Section 7 Biological Evaluation Form (USFWS 2008). Following the protocols established in Enclosure 1, CNWR staff will make a determination of how to provide protection to each nest based on the nest timing, location, and any possible site-specific issues. All turtle nests on Assateague will be excavated to confirm the presence of eggs. While this excavation process has a slight possibility of damage to the eggs, it is a standard procedure recommended and used by all sea turtle experts in the United States. The nests will then be protected by predator exclosures and symbolic fencing to prevent public trespass. Any turtle nests that occur in the Overwash zone when that area is re-opened to vehicles after the end of the plover nesting season (generally about September 15), will also be protected with a light barrier.

Seabeach amaranth - Seabeach amaranth is an annual plant and a member of the Amaranth family (Amaranthaceae). Upon germination, the plant initially forms a small, unbranched sprig, but soon begins to branch profusely, forming a low-growing mat. It was added to the List of Endangered and Threatened Wildlife and Plants (50 CFR 17.12) as a threatened species.

Population numbers at the refuge have been low, and limited primarily to beach areas north of the recreational beach. The number of plants within the refuge has experienced major fluctuations in numbers since its rediscovery in 2001. In 2005, a record 69 plants were documented outside of the OSV zone. The numbers dropped to 13 plants in 2006, 2 plants in 2011, and no plants were found in 2012.

OSV use on the beach during the growing season can have detrimental effects on the species, as the fleshy stems of this plant are brittle and easily broken. Plants generally do not survive even a single pass by a truck tire (Weakley and Bucher 1992). Sites where vehicles are allowed to run over seabeach amaranth plants often show severe population declines. Dormant season OSV use has shown little evidence of significant detrimental effects, unless it results in massive physical

erosion or degradation of the site, such as compacting or rutting of the upper beach. In some cases, winter OSV traffic may actually provide some benefits for the species by setting back succession of perennial grasses and shrubs with which seabeach amaranth cannot compete successfully. However, extremely heavy OSV use, even in winter, may have some negative impacts, including pulverization of seeds (Weakley and Bucher 1992).

As noted above, no seabeach amaranth plants have been found within the OSV zone. Activities by refuge staff for management and protection of nesting plovers and sea turtles have a net positive effect on seabeach amaranth, in that the plants are often found during these other management activities, which result in better protection of the plants. The refuge staff annually surveys for the plant and records any locations. If plants are found in public OSV use areas, signs and symbolic fencing will provide protection and reduce the risk of inadvertent disturbance to plants. As a result of closure of nesting areas for protection of the plover and sea turtles, seabeach amaranth that occur in these areas can complete most of its life cycle removed from the threat of crushing from public OSV use. Crushing of a plant or plants by the public, staff, or OSVs may occur in some circumstances, but is unlikely due to the actions taken by the refuge to protect the dune and beach areas. Refuge prohibitions on OSV use in the dunes, and efforts to educate the public should decrease trampling in almost all cases. This form of take is considered insignificant (USFWS 2008a).

Wetlands - The OSV zone is located within the intertidal zone and beachfront area, therefore there will be no wetland impacts.

Recreation - The purpose of continuing to permit OSV use on the refuge is to facilitate wildlife observation and photography, which are both priority recreational uses of the Refuge System. Allowing this use will provide additional opportunities in areas that would be difficult to access without the use of vehicles. Therefore the impact on these recreational users will be positive. While seasonal closures will limit the times and locations that these activities may occur, they are necessary to protect numerous wildlife species that use these same locations.

There is the potential of user conflicts in the OSV zone, especially when vehicles are in use in the presence of pedestrians engaging in wildlife observation or photography, or surf fishermen and/or horseback riders. Times when vehicles are actually in use will be limited. The majority of refuge beach is open for pedestrian use and restricted from OSV use, so there is sufficient opportunity for users to engage in their respective activities without causing disturbance to other users.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day

review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The refuge will manage these three priority visitor uses (wildlife observation, photography, and interpretation) in accordance with Federal and State regulations and will review it annually to ensure high quality wildlife dependent recreational opportunities are achieved and that these programs are providing safe experiences for participants. The refuge based these stipulations on current practices, the draft CCP/EIS, and refuge-specific regulations.

To ensure compatibility with refuge purposes and the mission of the Refuge System, wildlife observation, photography and interpretation can occur on the refuge if the refuge-specific regulations are followed and following stipulations are met:

- This use must be conducted in accordance with Commonwealth of Virginia and Federal regulations (50 CFR), and special refuge-specific regulations published in refuge brochures.
- The visitor use program will be reviewed annually to ensure that it contributes to refuge objectives in managing quality recreational opportunities and protecting habitats, and is subject to modification if on-site monitoring by refuge personnel or other authorized personnel results in unanticipated negative impacts to natural communities, wildlife species, or their habitats or other refuge uses. Refuge Law Enforcement Officer(s) will promote compliance with refuge regulations, monitor visitor use patterns and public safety, and document visitor interactions. Refuge Law Enforcement personnel will monitor all areas and enforce all applicable State and Federal Regulations.
- All boats must be off the water by sunset.
- Visitors must stay on the designated trail routes and areas.
- Opportunities for wildlife observation, wildlife photography and environmental interpretation are available via existing roads and trails and along the newly constructed beach access road and bike trail during normal operational hours. Best construction practices will be used when developing the new beach access road and trail as well as any other visitor use facility to minimize impacts to refuge resources. Moderate beneficial impacts are expected. Some conflict between refuge users is expected to result in short-term moderate adverse impacts, which will be managed through seasonal closures. These seasonal closures are highlighted below and apply mostly to non-consumptive users during the hunting season. Other seasonal closures are in place to minimize wildlife disturbance.

- All beach areas on Assateague Island south of the new established year round OSV area will be closed to all visitor use from March 15 until September 15 or until the last shorebird fledges due to nesting of federally threatened piping plovers as well as other shorebirds.
- All trails south and east of the Administrative Office and the New Beach Access Road may be closed for Big Game Hunting during the Fall and Winter months.
- Staffing of the Assateague Island Lighthouse and operation of the Wildlife Tour Bus is provided by the Chincoteague Natural History Association (CNHA). Operations vary throughout the year but daily access is provided during the busier visitor use periods with weekend access during the shoulder season and very limited or no access during the winter months.
- The Herbert H. Bateman Educational and Administrative Center is open daily throughout the year.
- All access north of the new recreational beach would be closed except via the beachfront within the intertidal zone.
- Staff and/or volunteer guided interpretative programs may occur year round but are concentrated in the busier visitor use periods.
- Beachfront access on the southern islands outside of the nesting season (March 15 to September 15) would be permitted for these activities and outside of the safety and security zone established by NASA on Assawoman Island. As Metompkin and Cedar Islands have other ownership as well, visitors should consult with those entities prior to visiting.
- Pets are not permitted on the refuge.
- Bicycling is allowed only on roads, hard surfaced trails and the Beach Road Bike trail.
- The following activities are prohibited, including, but not limited to: ice skating, camping, rollerblading, geocaching/metal detecting, off-road and mountain biking, ATVs, picnicking, pets, operation of model boats and airplanes, soliciting of funds (per 50 CFR 27.97 for Private Operations and per 50 CFR 27.86 for Begging), and other activities identified in 50 CFR Part 27.
- All boaters would be required to operate their craft and possess all safety equipment in accordance with Commonwealth of Virginia and U.S. Coast Guard Regulations.
- Beach access will occur only on refuge owned lands on the sandy part of the beach from the toe of the dunes to the Atlantic Ocean (mean high water demarcation to mean low water demarcation). Parking lots with a dune crossover provides access to the beach. Access on the dune and adjacent marshes is prohibited. No refuge-specific permits are required.
- Access to closed areas or use during the refuge's closed hours requires a special use permit, which is subject to the refuge manager's approval, unless the activity is in conjunction with a refuge staff- or volunteer-led program.
- Changes outlined in the CCP dealing with closed and seasonally closed areas and visitor use regulations, when approved, will be incorporated into their respective visitor use program.

The refuge will implement seasonal closures and other mitigating measures as described above, and in the Biological Opinion on monitoring and management practices for piping plover, loggerhead sea turtle, green sea turtle, leatherback sea turtle, and seabeach amaranth on Chincoteague NWR within the OSV zone.

When and if the recreational beach is moved to a more stable location, and a new surf fishing and OSV zone is created adjacent to the new beach area, the Overwash area will be merged with the Toms Cove Hook area in terms of management of surf fishing, horseback riding and OSV use and seasonal restrictions.

JUSTIFICATION:

Wildlife observation, photography, and interpretation are priority wildlife-dependent uses for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). USFWS's policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management.

Specific refuge regulations address equity and quality of opportunities for visitors and help safeguard refuge habitats. Impacts from this proposal, short-term and long-term, direct, indirect, and cumulative, are expected to be minor and are not expected to diminish the value of the refuge for its stated objectives. Available parking and size of the facilities will typically limit use at any given time, except during special events.

Conflicts between visitors are localized and are addressed through law enforcement, visitor education, and continuous review and updating to visitor use regulations. Conflicts are further reduced by the establishment of seasonal area closures.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge.

This activity will not materially interfere with or detract from the mission of the Refuge System or the purpose for which the Refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE:

COMPATIBILITY DETERMINATION

USE:

Environmental Education

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?

The use is environmental education. This is a priority public use identified by Executive Order 12996 (March 25, 1996) and by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where would the use be conducted?

The use would occur on Chincoteague NWR at the following locations:

Environmental Education Trail: In 2001, the refuge completed construction of an environmental education trail and study area (approximately 1 mile in length) that is designated specifically for curriculum-based educational programming and group activities. The trail, located just west of the historic Assateague Lighthouse provides students with access to several refuge habitats including freshwater and saltwater wetlands and maritime forest. (Note: The Environmental Education Trail is closed to general public access and is not depicted on general refuge map graphics found in publications and on wayside exhibits).

Herbert H. Bateman Educational and Administrative Center(HHBEAC): This education center was completed in 2003 and provides students and teachers with access to 5,000 square feet of exhibits, a 125-seat auditorium, a classroom/wet lab, and a teacher resource room. In total, approximately 9,000 square feet of visitor services space is available to host environmental education programming.

Self-Guided Trails: The following trail systems may also be used for environmental education programming: Wildlife Loop (3.2 miles), Woodland Trail (1.6 miles), Lighthouse Trail (.25 miles), Marsh Trail (.5 miles), Black Duck Trail (1 mile), Swan Cove Trail (.5 miles), and Bivalve Trail.

National Park Service Assigned Area: This assigned area includes the recreational beach, adjacent parking lots, and the visitor contact station.

Toms Cove: Several formal and informal trails provide access to Toms Cove and the associated marshes for multiple uses, including environmental education.

Service Road: Several educational study areas have been identified along the Service Road and are used predominantly by the Marine Science Consortium, which provides students with invaluable field experiences in Ecology, Biology, Marine Science, and Environmental Science.

Websites: A variety of pre- and post-visit activities are available on the refuge's and NPS websites.

- <http://www.fws.gov/northeast/chinco/>
- <http://www.nps.gov/asis>

(c) When would the use be conducted?

Opportunities for environmental education (EE) exist year-round, during authorized refuge hours of operation, which vary on a seasonal basis.

- The highest demand for ranger led EE programs occurs in spring (March through mid-June) and fall (September through October).
- Self guided EE may occur in buildings and on trails during normal operational hours.

(d) How would the use be conducted?

A refuge staff member will serve as the primary point of contact, facilitating the coordination and scheduling of all EE requests being conducted on the refuge. For programs conducted by refuge staff, at least three people must be available for EE from September through mid-June on Wednesday-Friday. From March through mid-June, staff can be expected to be needed every Wednesday through Friday.

The EE Coordinator will manage classroom reservations and it may only be reserved by refuge staff and by partners (CNHA, NPS and Marine Science Consortium) for periods of more than three weekdays in a row during the months of September to February and mid-June to August to ensure it is available for educational use. From March to mid-June, the classroom cannot be scheduled for more than one weekday or for a Friday by an outside organization. Weekend days are exempt from this limitation.

The EE Coordinator will manage auditorium reservations. Auditorium videos will be shown upon request or upon need determined by the staff person working in the HHBEAC from September through mid-June on weekdays. However, the auditorium will be reserved if an EE program is scheduled as notified by the EE coordinator. Even if the EE program is scheduled for outside, the EE program leader will notify the HHBEAC personnel if they would like to keep the auditorium reserved as a backup for inclement weather. Weekend days are exempt from this limitation.

Group tours of exhibits may be self-guided or teacher-guided. If groups request a guided tour, it will be at the discretion of the person scheduling and/or conducting the program, and may depend upon availability of staff, group size, previous visit experience and specific interest.

Minimum scheduling time requirements (including introduction in auditorium, travel time to program location, bathroom time, and program implementation):

- Habitat Hunting: 1.5 hours (actual program time-1hour)
- The Human Connection: 1.5 hours (actual program time-1hour)

- Wildlife and Technology: 2 hours (actual program time-1.5 hours)
- Group consisting of 2 classes for outside or outside/inside field trip: 3 hours
- Group consisting of 3 classes for an outside or outside/inside field trip: 4 hours
- Group consisting of 4 classes for an outside or outside/inside field trip: 5 hours
- Group consisting of 2 classes for an inside program: 1.75 hours
- Group consisting of 3 classes for an inside program: 2.75 hours
- Group consisting of 4 classes for an inside program: 3.5 hours

Groups arriving less than 30 minutes late will have one of their programs (their first program) shortened by the corresponding amount of time. All of their other scheduled programs will remain on schedule. Groups arriving over 30 minutes late will have one (or more if warranted) of their programs cancelled. Teachers and students can utilize any leftover time in the exhibits, watching a video in the auditorium, or on the refuge.

Access for non motorized, hand carried watercraft (including but not limited to kayaks, canoes, kite boards, sail boats and sailboards) into Toms Cove and Assateague Channel will be available from a launch site near the terminus of Beach Road.

(e) Why is this use being proposed?

Environmental education is a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997. EE programs instill learning and awareness, knowledge, attitudes, skills, and commitment to conserve natural resources and to continuously revisit and explore scientific, biological, historical, and societal issues related to conservation (USFWS policy 605 FW 6).

It must be clearly noted that the goal of EE is not environmental advocacy. It is to teach learners how to become aware, ask questions, seek evidence and formulate their own, unique, creative thoughts about the environment and conservation.

The Marine Science Consortium, located near the Wallops Flight Facility, has been conducting Environmental Education on the refuge since 1971. During an average year their students make about 4,000 visits to the refuge. A special use permit allows the groups to use seine nets, dip nets, shovels, sediment sieves, and environmental monitoring equipment at the future terminus of Beach Road near Toms Cove and within the recreational beach area, Black Duck Pool and Swan Cove Pool impoundments, the Woodland Trail, and other approved educational areas along the Service Road.

AVAILABILITY OF RESOURCES:

Allowing the use of environmental education is within the resources available to administer our current level of participation and to ensure that the use remains compatible with the refuge purposes. Additional funding for visitor services improvements and EE can also come from

entrance fee revenues, grant funds, and contributions. Compliance with refuge regulations is handled within the regular duties of the Station Law Enforcement Officers. As funding is available, the refuge will complete and maintain projects and facilities. Volunteers and partners will be utilized to help with construction, maintenance, and with conducting EE activities.

Facilities or materials needed to support this use include maintaining access roads, parking areas, roadside pull-offs, kiosks, signs, the Visitor Center, wayside exhibits, observation platforms, photography blinds, accessible crabbing areas, and trails; creating new beach access road and bike trail, observation tower, accessible crabbing area and boat launch area; and providing information in refuge publications, social media sites, the refuge's website as well as other information sharing venues.

Sufficient staff and maintenance funding within our base budget is available to make annual progress toward completion of all the projects described above and to maintain those already completed; however, additional funding and staff will be needed to grow the program to its full potential as identified in USFWS's "Conserving the Future" document to inventory existing environmental education efforts on refuge, identify priorities for growth, and outlines basic standards of learning in accordance with Commonwealth of Virginia and State of Maryland educational guidelines.

ANTICIPATED IMPACTS OF THE USE:

Visitor use activities currently occurring on the refuge have been analyzed for impacts to wildlife and habitat and are expected to have a short term negative impacts on vegetation. EE could alter habitats by trampling vegetation, compacting soils, and increasing the potential of erosion.

Repeated visitation to any particular locale at the refuge could cause damage to vegetation and therefore, wildlife habitat. Substantial, widespread habitat degradation is not expected due to the limited and regulated occurrence of this activity. For EE, impacts would be minimal since groups use designated areas created to traverse through habitat which prevents additional vegetation impacts.

EE can result in positive impacts to the wildlife resource. Allowing visitors to participate in EE leads to a better appreciation and more complete understanding of the wildlife and habitats associated with the refuge, the Delmarva ecosystems, and the world at large.

Disturbance factors resulting from public use are always considered for all listed threatened or endangered species. Of these, impacts the threatened piping plover, along with other shorebirds such as the red knot, upland sandpiper and Wilson's plover, will be minimized through the seasonal closure of beach front south of the designated OSV parking area from March 15 through September 15. Other than during the construction period, the proposed activities would not likely affect the Delmarva fox squirrel. Areas near active bald eagle nests will be restricted to all activities and access, in accordance with Federal, State and refuge specific guidelines.

EE activities are expected to have negligible adverse short-term, long-term or cumulative impacts on waterfowl, shorebirds and landbirds. Providing areas north of the recreational beach area will provide waterfowl sanctuaries which will minimize some of these impacts and allow waterfowl to have undisturbed access to these areas during biologically critical periods. We expect indirect impacts to landbirds to increase due to the proposed beach access road and trail construction and use. EE activities are expected to increase in these areas as well; however, after construction disturbance to landbirds in proposed areas is expected to be negligible since all visitors will be required to be on designated walking trails and access roads.

Impacts to fisheries from visitors engaged in environmental education are expected to be temporary and minor. While students use sampling techniques such as seine and dip nets to collect organisms, all are returned to the collection area immediately following study. Specimens are collected, stored and observed in containers designed to minimize harm or long term impact. Any non-threatened and/or endangered organisms temporarily removed from the aquatic environment are insignificant to the overall population.

The beneficial impacts of providing the existing level of wildlife-dependent activities, with some modest increases, include helping meet existing and future demands for outdoor recreation as indicated in the 2012 USGS National Visitor Survey. Visitor use appears to be remaining fairly steady in recent years, but we want to continue to improve our opportunities to expand the knowledge base of our visitors on environmental concerns. The economic benefits of increased tourism would also benefit local communities.

Some conflict between EE activities and other refuge users is expected to result in short-term moderate adverse impacts, which will be managed through seasonal closures.

New or expanded visitor services programs and/or facilities are expected to increase public awareness of, and visitation to, the refuge, and would enable staff to provide better customer service. We would expect a certain level of inconvenience during the construction of refuge facilities. The adverse effects generally are short-term, and more than offset by the long-term gains in public education and appreciation. Impacts to refuge resources are expected to be negligible.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The refuge will manage environmental education in accordance with Federal and State regulations and review it annually to ensure wildlife and habitat goals are achieved and that these programs are providing safe, high quality experiences for participants. The refuge based these stipulations on current practices, the draft CCP/EIS, and refuge-specific regulations (See Description of Use section).

To ensure compatibility with refuge purposes and the mission of the Refuge System, environmental education can occur on the refuge if the refuge-specific regulations are followed and following stipulations are met:

- This use must be conducted in accordance with state and federal regulations (50CFR), and special refuge-specific regulations published in refuge brochures.
- The visitor use program will be reviewed annually to ensure that it contributes to refuge objectives in managing quality recreational opportunities and protecting habitats, and is subject to modification if on-site monitoring by refuge personnel or other authorized personnel results in unanticipated negative impacts to natural communities, wildlife species, or their habitats. Refuge Law Enforcement Officer(s) will promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions. Refuge Law Enforcement personnel will monitor all areas and enforce all applicable State and Federal Regulations.
- A special use permit may be required to conduct environmental education in designated areas to reduce the possibility of disturbance.
- All boats must be off the water at sunset.
- Visitors must stay on the designated trail routes and areas.
- Opportunities for environmental education are available via existing roads and trails and along the newly constructed beach access road and bike trail during normal operational hours. Best construction practices will be used when developing the new beach access road and trail as well as any other visitor use facility to minimize impacts to refuge resources. Moderate beneficial impacts are expected. Some conflict between refuge users is expected to result in short-term moderate adverse impacts, which will be managed through seasonal closures. These seasonal closures are highlighted below and apply mostly to non-consumptive users during the hunting season. Other seasonal closures are in place to minimize wildlife disturbance.
- All beach areas on Assateague Island south of the new year-round OSV area will be closed to all public use from March 15 until September 15 or when the last shorebird fledges due

to nesting of federally threatened piping plovers as well as other shorebirds. All trails south and east of the Administrative Office and the New Beach Access Road may be closed for big game hunting during the fall and winter months.

- Staffing of the Assateague Island Lighthouse and operation of the Wildlife Tour Bus is provided by the Chincoteague Natural History Association (CNHA). Operations vary throughout the year but daily access is provided during the busier public use periods with weekend access during the shoulder season and very limited or no access during the winter months.
- The Herbert H. Bateman Educational and Administrative Center is open daily throughout the year.
- All access north of the new recreational beach would be closed except via the beachfront.
- Staff and/or volunteer guided environmental education programs may occur year around but are concentrated in spring and fall months.
- All boaters would be required to operate their craft and possess all safety equipment in accordance with Commonwealth of Virginia and U.S. Coast Guard regulations.
- Beach access will occur only on refuge owned lands on the sandy part of the beach from the toe of the dunes to the Atlantic Ocean (mean high water demarcation to mean low water demarcation). Parking lots with a dune crossover provides access to the beach. Access on the dune and adjacent marshes is prohibited. No refuge-specific permits are required.
- Changes outlined in the finalized CCP dealing with closed and seasonally closed areas and public use regulations, when approved, will be incorporated into their respective public use program.

JUSTIFICATION:

Environmental education is a priority wildlife-dependent use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). USFWS policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management, and ensure that they receive enhanced attention during planning and management.

These programs and activities are directed toward organized groups and individuals associated with academic institutions. Cooperative outdoor education programs significantly expand general and specialized educational opportunities for the public beyond what the refuge alone can provide.

Specific refuge regulations address equity and quality of opportunities for visitors and help safeguard refuge habitats. Impacts from this proposal, short-term and long-term, direct, indirect, and cumulative, are expected to be minor, and are not expected to diminish the value of the refuge for its stated objectives. Available parking and size of the facilities will typically limit use at any given time, except during special events.

Conflicts between visitors are localized and are addressed through law enforcement, public education, and continuous review and updating to public use regulations. Conflicts are further reduced by the establishment of seasonal area closures.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE: _____

COMPATIBILITY DETERMINATION

USE:

Fishing (Recreational) – Finfish, Oysters, Clams, and Crabs

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

“... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”

16 U.S.C. § 715d (Migratory Bird Conservation Act)

“... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species”

“... 16 U.S.C. § 460k-1 “... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors...” 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

“... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ...” 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

“... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...” 16 U.S.C. § 742f(a)(4) “... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ...” 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

“... for conservation purposes ...” 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act).

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is recreational fishing (finfish, oysters, clams, and crabs). Surf fishing, crabbing, and shell fishing are among the most popular wildlife-dependent recreational activities conducted on the refuge. Some of the fin fish common to the waters around the refuge are bluefish, striped bass, summer flounder, Atlantic croaker, spot, and red drum. Clearnose skate, bullfish, and southern stingrays may be caught, as well as smooth or spiny dogfish sharks. Fishing is a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act).

(b) Where would the use be conducted?**Assateague Island**

Surf fishing occurs along the Assateague Island beachfront from the Maryland/Virginia state line to “Fishing Point” on Toms Cove Hook. Access to the beachfront is permitted in two ways:

- 1) Foot access is allowed year round from the Maryland/Virginia state line to the southern terminus of the National Park Service recreational beach parking area.
- 2) Foot access and over sand vehicle (OSV) use/access is allowed from the National Park Service southernmost recreational beach parking area at Toms Cove to “Fishing Point” on Toms Cove Hook.

Access for surf fishing in the OSV Zone is further restricted by the following stipulations:

- 1) Upon completion of the CCP but prior to the relocation of the recreational beach, from March 15 to September 15, the area south of the recreational beach parking area is closed.
- 2) From September 16 through March 14, the surf fishing and OSV zone will again start at the southern terminus of the NPS recreational beach parking area at Toms Cove, then south along the Atlantic Ocean beachfront to “Fishing Point” on Toms Cove Hook, then returning by the same route. Walking and OSV use will generally be within the intertidal zone, unless OSVs are re-directed by signage to avoid sea turtle nest sites; vehicles are prohibited from the dunes or vegetated areas.

Shell fishing activities (clams, oysters, and crabs) are confined primarily to saltmarsh and mudflats within Toms Cove via Bivalve Trail. Additionally, crabbing is allowed within the borrow ditch running along Beach Road within Swan’s Cove Pool. To promote better access, a new fishing/crabbing dock is proposed to be built at the new Beach Road terminus.

Southern Island Units (Assawoman, North Metompkin, and Cedar Islands)

Fishing activities also occur on the Southern Island Units (Assawoman, North Metompkin, and Cedar Islands). Access is limited to boat use and there are time of year restrictions to portions of these islands due to threatened species nesting during the summer months. Assawoman Island would be completely closed to all forms of public use, including fishing, from March 15 through September 15 or thereafter, until the last shorebird fledges.

No data are available for use of these islands; however, information gathered during law enforcement patrols indicates that little of this use occurs on these islands.

(c) When would the use be conducted?

Surf fishing, clamming, crabbing and oyster harvest will be permitted during normal refuge hours of operation which are:

- May through September: 5 a.m. to 10 p.m.;
- October: 6 a.m. to 8 p.m.;
- November through February: 6 a.m. to 6 p.m.;
- March and April: 6 a.m. to 8 p.m.

In addition, on Assateague Island overnight fishing permits are available, at no cost, for nighttime surf fishing only. These “life time” permits may be obtained from the NPS at the Toms Cove Visitor Center or during the winter months at the Herbert H. Bateman Educational and Administrative Center. Permittees must be actively engaged in surf fishing at all times while on the refuge after the normal refuge hours listed above.

Additionally on Assateague Island,

- Overwash and Toms Cove Hook Area - Open from September 16 through March 14. If unfledged shorebirds remain in the surf fishing and OSV zone after September 15, the refuge manager will designate a closed area to protect these birds.
- The refuge manager may close the surf fishing and OSV zone at anytime for safety or security reasons.

(d) How would the use be conducted?

Visitors are allowed to fish, crab, oyster and/or clam in designated areas of the Refuge as these activities are deemed wildlife oriented and are promoted within the U.S. Fish and Wildlife Service, nationwide. Fishing, crabbing, clamming and oyster harvest would take place within the regulatory framework established by the Virginia Marine Resources Commission (VMRC) and the USFWS. Visitors are required to follow all Commonwealth of Virginia regulations, including possession of applicable licenses. Anglers age 16 and older must possess a valid Virginia Saltwater Fishing or Potomac River Fisheries Sport Fishing license. Anglers who are exempt from licensing and holders of out of state reciprocal licenses must register with the Virginia Fisherman Identification Program (FIP). In addition, the Refuge may impose stricter regulations as deemed necessary to maintain healthy populations of oysters and clams on Refuge tidal lands.

Overnight fishing permits are available, at no cost, for nighttime surf fishing. These “life time” permits may be obtained from the NPS at the Toms Cove Visitor Center or during the winter months at the Herbert H. Bateman Educational and Administrative Center. Permittees must be actively engaged in surf fishing at all times while on the refuge after the normal refuge hours.

(e) Why is this use being proposed?

Fishing, crabbing, clamming and oyster harvest are current recreational uses on the Refuge and are appropriate activities. Refuge expenses are very minimal aside from already existing standard law enforcement patrols to verify that regulations are being followed. This use supports wildlife dependent recreation as outlined in the Improvement Act.

Surf fishing was one of the first documented public recreational uses of the Chincoteague NWR (Assateague Island) soon after it was established. The first record of surf fishing appeared in the May-August 1944 refuge report. In most instances, fishermen boated to the "bow-of-the-beach" and walked over the over wash to fish on the ocean beach. In later years (1948), prior to the construction of the bridge to the island, anglers would drive down the beach from the Maryland end of Assateague Island to fish on the refuge. The construction of the bridge to Assateague Island in 1962 contributed to a significant increase in the general use of Assateague Island and subsequently to surf fishing on the refuge. Surf fishing, clamming, crabbing and oyster harvest continue to be popular family oriented recreational activities.

AVAILABILITY OF RESOURCES:

Permitting and oversight of recreational surf fishing, crabbing, clamming and oyster harvest is within the resources available to the Visitor Services and Law Enforcement programs to administer this use.

As indicated in the 2012 Memorandum of Understanding between the NPS and U.S. Fish and Wildlife Service (USFWS) for Interagency Cooperation at Assateague Island National Seashore and Chincoteague National Wildlife Refuge or subsequent agreements, the NPS will assist in the day-to-day management of OSVs used for surf fishing within the refuge by issuing permits, educating permit holders on OSV use regulations, and assisting the USFWS with enforcing OSV use regulations, creel limits, and closures (USFWS 2012). Responsibility of monitoring vehicles, maintenance of facilities, and law enforcement is delegated to qualified and available full time employees of either the NPS or USFWS. Refuge staff will ensure that closed areas are delineated and maintained to achieve maximum protection for beach nesting birds and carry out appropriate monitoring and management actions as required by the USFWS's Biological Opinion on monitoring and management practices for piping plover, loggerhead sea turtle, green sea turtle, leatherback sea turtle, and seabeach amaranth on Chincoteague National Wildlife Refuge, Virginia. These activities include searching for and monitoring piping plover and sea turtle nests, erecting exclosures, signage and barriers to protect nests, and "nest sitting" just prior to anticipated emergence of sea turtle hatchlings.

The USFWS and NPS both administer the day-to-day operation of the OSV permit program. Refuge costs are primarily staff time, with some expenditures for materials such as signs, posts, and fencing. Use of volunteer interns lessens the cost to the refuge, and fee receipts augment the refuge's annual operations and maintenance budget.

Within the annual refuge operations and maintenance budget, in combination with fee receipts, there is sufficient staffing and funding available to accomplish the tasks necessary to facilitate this use. The funding received by the refuge is adequate to ensure that the use remains compatible with refuge purposes.

ANTICIPATED IMPACTS OF USE:

The day-to-day activity of crabbing, clamming and oyster harvest is considered a consumptive use of renewable resources found on the Refuge. However, there are few adverse impacts from that harvest and there is no significant impact on migratory birds due to the small number of those resources that are harvested.

The activity of surf fishing, by itself, has no significant impact to migratory birds due to disturbance or the fish resources that are harvested. However, the use of OSVs to gain access to remote southernmost surf fishing areas of Assateague Island must be reviewed.

Migratory birds - Since the use of OSVs for surf fishing will occur along the Atlantic ocean beachfront, impacts to migratory birds will generally be restricted to shorebirds. The refuge consulted with the USFWS Ecological Services Virginia Field Office who issued a Biological Opinion on the impacts of OSV use, among other uses, on piping plovers. The impacts described therein can be extrapolated to other shorebirds.

The refuge has been designated as internationally important for shorebirds by the Western Hemisphere Shorebird Reserve network. It is an important staging area and provides habitat for shorebirds during both spring and fall migrations. Nesting species include piping plover, American oystercatcher, willet, common and least tern, and black skimmer. Spring migration generally runs from early April to early June, when thousands of shorebirds use refuge habitats. Dunlin and sanderling are predominant during early spring migration, while semipalmated sandpiper makes up nearly half of those birds counted during late spring migration. The peak of fall migration occurs from July through September with semipalmated and least sandpipers accounting for the majority of individuals. The red knot, which is proposed for listing under the Endangered Species Act, also uses the refuge during spring and fall migration.

Motorized vehicle use on beaches is an extreme threat to piping plovers, as well as other shorebirds that nest on beaches and dunes. Vehicles can crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991). In Massachusetts and New York, 18 piping plover chicks and 2 adults were killed by off-road vehicles (ORVs) in 14 documented incidents (Melvin et al. 1994). Goldin (1993) compiled records of 34 chick mortalities (30 on the Atlantic Coast and 4 on the Northern Great Plains) due to vehicles. Biologists who monitor and manage piping plovers believe that vehicles kill many more chicks than are found and reported (Melvin et al. 1994). Beaches used by recreational vehicles during nesting and brood-rearing periods generally have fewer breeding plovers than available nesting and feeding habitat can support. In

contrast, plover abundance and productivity has increased on beaches where recreational vehicle restrictions during chick-rearing periods have been combined with protection of nests from predators (Goldin 1993) (USFWS 2008a). It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicle's path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

To mitigate for these potential negative impacts, the refuge has instituted seasonal closures for surf fishermen, horseback riders, and OSV users. The beach habitats of Toms Cove Hook are the most productive on the refuge for nesting and staging shorebirds. As noted above, the Toms Cove Hook portion of the surf fishing, horseback riding and OSV zone will be closed from March 15 through September 15 annually, and later if unfledged birds remain in the area. The closure period also encompasses the peak times of spring and fall migration, thus providing undisturbed habitat for shorebirds during the most critical times of year.

The closures extend from the nest site a distance of 200 meters (656 feet) north. It is possible that some nests may not be discovered, and the presence of nest searchers may also cause direct loss if eggs are inadvertently crushed. In either of these situations, there could be negative impacts to nesting shorebirds. When the recreational beach area is moved to a more northern location, as is proposed in the draft CCP/EIS (alternative B), the Overwash area would be managed identically with the Toms Cove Hook portion, which will provide added protection to birds using the Overwash area.

Surf fishermen and OSV users may encounter shorebirds at times outside of the closure period. During this time, all birds should be capable of flight, and therefore can travel short distances to other high quality, undisturbed portions of the refuge, such as the bay side of Toms Cove. There could be some negative impacts due to birds expending energy to travel away from preferred feeding or resting areas.

Based on a review of the literature, with seasonal closures in place, and if nest searches in the Overwash zone are conducted thoroughly and professionally, the direct, indirect, and cumulative impacts of OSV use for surf fishing to shorebirds should not be significant.

Threatened and endangered species - This section assesses impacts to federally listed threatened and endangered species: piping plover, sea turtles, and seabeach amaranth.

Piping plover impacts are covered above under migratory shorebird impacts.

Sea turtles - Five species of federally-listed sea turtles use Assateague Island's ocean and bay waters. The leatherback sea turtle, which is also a state listed, Kemp's Ridley sea turtle, and the

Atlantic hawksbill are Federal endangered species. The loggerhead sea turtle and green sea turtle are Federal threatened, with the loggerhead also being state threatened. The loggerhead sea turtle nests on Assateague Island, which is the northern extent of its breeding range. To date, there has been no confirmed nesting by green or leatherback sea turtles within CNWR although both these species have been seen in waters off Virginia's barrier islands during the nesting season. Dead stranded turtles of these species are occasionally found on CNWR beaches. However, with the average global air and water temperatures rising, refuge beaches may become more favorable for these species (USFWS 2008c).

Nesting activity on Assateague and NASA Wallops Islands has risen noticeably in recent years, perhaps the result of a loggerhead translocation project. From 1969 -1979 sea turtle eggs from nests laid on Cape Island of Cape Romain National Wildlife Refuge, Charleston County, SC were relocated to CNWR. During, and the first two decades following, the relocation program (1970–1999) staff recorded 16 crawls on Assateague and NASA Wallops; ten resulted in nests and six were false crawls, meaning no nest was made. Loggerhead sea turtles take 30 years to reach maturity, so females that were part of the transplant project may now be returning to their hatch and release sites. Loggerhead nesting activity from 2000–2012 on Chincoteague Island had a total of 66 crawls; 23 resulted in nests and 43 were false crawls (CNWR unpubl. database). Eleven of the nests were located on Wild Beach, north of the recreational beach in an area closed to all OSV use. Eight nests were located on the recreational beach area and OSV zone (5 at the Overwash and 3 on public beach). These nests were monitored and managed in accordance with the Chincoteague NWR Intra-Service Section 7 and Biological Opinion (USFWS 2008). The other four nests were located south of the recreational beach on the Toms Cove Hook area.

OSV use poses a risk of injury to females and live stranded turtles, can leave ruts that trap hatchlings attempting to reach the ocean (Hosier et al. 1981, Cox et al. 1994), can disturb adult females and cause them to abort nesting attempts, and can interfere with sea-finding behavior if headlights are used at night (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991). Driving directly above incubating egg clutches can cause sand compaction, which may decrease hatching and emergence success and directly kill pre-emergent hatchlings (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007). Artificial lighting on human structures may affect turtle behavior in a similar manner (Witherington and Martin 1996). When artificial lighting impairs sea-finding behavior of nesting females and emerging hatchlings, the affected animals face increased exposure to the elements and predation.

To mitigate for potential impacts to sea turtles, the following protocols will be implemented: Sea turtle crawl searches will be conducted in the morning hours during piping plover monitoring and avian predator management to ensure nest protection procedures begin as soon as possible. All sea turtle nests will be marked, thus establishing a buffer zone, to protect the nest from recreation-related human activity. Staff or volunteers will place a minimum of four informative “Area Closed” signs forming a 5 foot radius around the nest. Rope will be strung between the

signs to discourage vehicles and pedestrians from trespassing into the nest site. OSV access will occur outside this buffer zone.

OSVs are prohibited from the recreational beach. However, headlights from the parking lot or adjacent OSV zone will have the potential to affect hatchling emergence to the ocean. Staff will erect a light and hatchling emergence barrier around the 5 ft. radius buffer zone into the intertidal zone in both the OSV Zone and recreational beach area.

In this scenario, the beach is wide enough to allow OSVs to travel landside of the nest without adversely affecting dune or vegetated habitats; therefore staff will continue to allow OSV traffic west of the nest. Pedestrians may access areas west of the nest or within the intertidal zone. Because a light and hatchling emergence barrier will be in place during the entire hatch window, a nest sitter will not be present at night.

*OSV Zone - DAY: Beach is too narrow for ORVs to pass landward during **Hatch Window**:*

Staff will erect a light and hatchling barrier around the 5 ft. radius buffer zone and toward the intertidal zone. A corridor will be created near the intertidal zone for OSV and pedestrian access. A nest sitter will open the access corridor to the public one hour after sunrise. A nest sitter will close the corridor at sunset. If hatchling activity occurs during the day, nest sitters will follow the OSV Zone-Night protocol.

*OSV Zone-NIGHT: Beach is too narrow for OSVs to pass landward during **Hatch Window**:*

The OSV and pedestrian access corridor gate will close at sunset. Throughout the night a turtle sitter will open the gate to OSVs and pedestrians allowing passage north and south through the corridor of the turtle hatchling emergence zone when hatchlings are not crawling to the ocean. After an OSV or pedestrian passes through the area, the turtle sitter will immediately re-close the gates and sweep away all OSV and foot tracks. The access corridor and gates will be used as needed from sunset until one hour after sunrise or when turtle hatchling activity ceases. A turtle sitter will be posted at nests which fall into this scenario each night for the duration of the entire hatch window.

Management activities on the refuge should have a net positive effect on sea turtle nesting due primarily to in situ protection of nests. Active and passive predator control, conducted primarily for plover nest protection, will also help nesting sea turtles by reducing the number of potential sea turtle nest predators on the refuge. All sea turtle nests will be left in place and protected from threats as outlined in the attached Intra-Service Section 7 Biological Evaluation Form (USFWS 2008). Following the protocols established in Enclosure 1, CNWR staff will make a determination of how to provide protection to each nest based on the nest timing, location, and any possible site-specific issues. All turtle nests on Assateague will be excavated to confirm the presence of eggs. While this excavation process has a slight possibility of damage to the eggs, it is a standard

procedure recommended and used by all sea turtle experts in the United States. The nests will then be protected by predator exclosures and symbolic fencing to prevent public trespass. Any turtle nests that occur in the Overwash zone when that area is re-opened to vehicles after the end of the plover nesting season (generally about September 15), will also be protected with a light barrier. In addition to the barriers, human nest sitters (staff or volunteers) will be used at night during the hatch window to protect nests in areas where the location of the nest and the width of the beach is such that an OSV cannot pass landward of the nest. The nest sitters will prevent vehicles from passing seaward of turtle nests while hatchling turtles are on the beach to prevent injury to hatchling turtles.

Seabeach amaranth - Seabeach amaranth is an annual plant and a member of the Amaranth family (Amaranthaceae). Upon germination, the plant initially forms a small, unbranched sprig, but soon begins to branch profusely, forming a low-growing mat. It was added to the List of Endangered and Threatened Wildlife and Plants (50 CFR 17.12) as a threatened species.

Population numbers at the refuge have been low, and limited primarily to beach areas north of the recreational beach. The number of plants within the refuge has experienced major fluctuations in numbers since its rediscovery in 2001. In 2005, a record 69 plants were documented outside of the OSV zone. The numbers dropped to 13 plants in 2006, 2 plants in 2011, and no plants were found in 2012.

OSV use on the beach during the growing season can have detrimental effects on the species, as the fleshy stems of this plant are brittle and easily broken. Plants generally do not survive even a single pass by a truck tire (Weakley and Bucher 1992). Sites where vehicles are allowed to run over seabeach amaranth plants often show severe population declines. Dormant season OSV use has shown little evidence of significant detrimental effects, unless it results in massive physical erosion or degradation of the site, such as compacting or rutting of the upper beach. In some cases, winter OSV traffic may actually provide some benefits for the species by setting back succession of perennial grasses and shrubs with which seabeach amaranth cannot compete successfully. However, extremely heavy OSV use, even in winter, may have some negative impacts, including pulverization of seeds (Weakley and Bucher 1992).

As noted above, no seabeach amaranth plants have been found within the OSV zone. Activities by refuge staff for management and protection of nesting plovers and sea turtles have a net positive effect on seabeach amaranth. Seabeach amaranth occurrences are often located during these other management activities, which result in better protection of the plants. The refuge staff annually surveys for the plant and records any locations. If plants are found in public OSV use areas, signs and symbolic fencing will provide protection and reduce the risk of inadvertent disturbance to plants. As a result of closure of nesting areas for protection of the plover and sea turtles, seabeach amaranth that occur in these areas can complete most of its life cycle removed from the threat of crushing from public OSV use. Crushing of a plant or plants by the public, staff, or OSVs may occur in some circumstances, but is unlikely due to the actions taken by the refuge to protect the

dune and beach areas. Refuge prohibitions on OSV use in the dunes, and efforts to educate the public should decrease trampling in almost all cases. This form of take is considered insignificant (USFWS 2008a).

Wetlands - The surf fishing and OSV zone is located within the intertidal zone and beachfront area, therefore there will be no wetland impacts.

Recreation - The purpose of continuing to permit OSV use on the refuge is to facilitate surf fishing and hunting, which are both priority recreational uses of the Refuge System. Allowing this use will provide additional opportunities in areas that would be difficult to access without the use of vehicles. Therefore the impact on these recreational users will be positive. While seasonal closures will limit the times and locations that these activities may occur, they are necessary to protect numerous wildlife species that use these same locations.

There is the potential of user conflicts in the OSV zone, especially when vehicles are in use in the presence of pedestrians engaging in wildlife observation or photography and/or horseback riders. Since OSVs are permitted only to access fishing and hunting areas, times when vehicles are actually in use will be limited. The majority of refuge beach is open for pedestrian use and restricted from OSV use, so there is sufficient opportunity for users to engage in their respective activities without causing disturbance to other users.

Allowing overnight surf fishing could potentially impact migratory shore birds and nesting sea turtles. These impacts have been reduced for shorebirds and eliminated for sea turtles by restricting this use to periods outside the peak migration and nesting seasons, respectively. There is the possibility of increased disturbance to dune habitats; however, regular patrols and enforcement of this closed area will be implemented. No other adverse impacts are anticipated.

In addition, surf fishing takes place at the south end of Assawoman Island, and the north end of Metompkin Island except during closures or in restricted areas. Surf fishing in these areas has the potential of impacting the feeding and resting by a variety of shorebirds, gulls, and terns. Surveys conducted from 1990 to 1993 indicated an average peak of 2,000 shorebirds, 370 gulls, and 60 terns along the affected beach activity zone. The highest peak for all three species group occurred during the early fall migration (August) with 4,900, 600, and 180, respectively. Shorebird use of the beach fishing area was approximately 85% sanderling, with whimbrel, ruddy turnstone, red knot accounting for the remaining total. Gull species including laughing gulls in the summer months and great black-backed, herring and ring-billed during the remainder of the year. Terns present within the affected area were mostly royal, common, and least.

To mitigate for the potential negative impact of surf fishing activities to migratory birds, the refuge has instituted a seasonal closure to all access. All of Assawoman Island will be closed from March 15 through September 15 annually, and later if unfledged birds remain in the area. On Metompkin Island shore bird nesting areas are posted closed to public access during the shorebird

nesting season. These closure periods also encompasses the peak times of spring and fall migration, thus providing undisturbed habitat for shorebirds during the most critical times of year.

Shell fishing activities (clams, oysters, and crabs) are confined primarily to saltmarsh and mudflats within Toms Cove. Anticipated impacts include minor disturbance to feeding wading birds, migrant shorebirds, and nesting saltmarsh species (rails and songbirds). Disturbance from crabbing in the borrow ditch along Beach Road near Swans Cove Pool will primarily affect wading birds during the summer months. Because of the small area in which crabbing is allowed disturbance is very minimal.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Surf fishing, crabbing, clamming and oyster harvest would take place within the regulatory framework established by the Virginia Marine Resources Commission (VMRC) and USFWS. Visitors are required to follow all Commonwealth of Virginia regulations, including license to fish. Anglers age 16 and older must possess a valid Virginia Saltwater Fishing or Potomac River Fisheries Sport Fishing license. Anglers who are exempt from licensing and holders of out of state reciprocal licenses must register with the Virginia Fisherman Identification Program (FIP). In addition, the refuge may impose stricter regulations as deemed necessary to maintain healthy populations of oysters and clam on refuge tidal lands. The refuge does not host any fishing tournaments.

The refuge will implement seasonal closures and other mitigating measures as described above, and in the Biological Opinion on monitoring and management practices for piping plover, loggerhead sea turtle, green sea turtle, leatherback sea turtle, and seabeach amaranth on Chincoteague NWR within the OSV zone.

When and if the recreational beach is moved to a more stable location, and a new surf fishing and OSV zone is created adjacent to the new beach area, the Overwash area will be merged with the Toms Cove Hook area in terms of management of surf fishing, horseback riding and OSV use and seasonal restrictions.

Shell fishing will continue to be restricted to segments of the Toms Cove's saltmarsh and mudflats. These restrictions are dictated by the accessibility of these areas to the visiting public. All other saltmarsh and mudflats will remain closed to public entry the entire year, in order to minimize disturbance.

To ensure compatibility within the lower island refuge units, seasonal restrictions will continue to be imposed on users, and periodic law enforcement patrols will be conducted on weekends and holidays during the summer months for all fishing (finfish and shellfish) activities. To reduce shorebird nesting disturbance on Assawoman Island during the breeding season, we will implement a complete closure, including fishing, from March 15 through August 31 or thereafter, until the last shorebird fledges.

JUSTIFICATION:

Recreational fishing (surf fishing, clamming, crabbing and oyster harvest) is a priority wildlife-dependent use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). USFWS policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management.

The refuge's recreational fishing program is focused on providing a wholesome, fun outdoor experience for the individual or family. Specific refuge regulations address equity and quality of fishing opportunities for visitors and help safeguard refuge habitats. Impacts from this proposal, short-term and long-term, direct, indirect, and cumulative, are expected to be minor and are not expected to diminish the value of the refuge for its stated objectives.

Conflicts between users are localized and are addressed through law enforcement, public education, and continuous review and updating to public use regulations. Conflicts are further reduced by the establishment of seasonal area closures.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE: _____

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COMPATIBILITY DETERMINATION

USE:

Migratory Game Bird Hunting

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the National Wildlife Refuge System (Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is the public hunting of migratory game birds. Hunting was identified as one of six priority public uses by Executive Order 12996 (March 25, 1996) and by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where the use would be conducted?

The use would be conducted in designated areas of the refuge. Migratory game bird hunting is open on Wildcat Marsh, Morris Island, Assawoman Island, and North Metompkin Island. Wildcat Marsh (546 acres) is located at the north end of Chincoteague Island and Morris Island (427 acres) is located between Chincoteague and Assateague Islands. Assawoman Island Division contains 1,434 acres and encompasses the entire island; Metompkin Island Division consists of 174 acres on the north end of the island.

(c) When would the use be conducted?

Hunting would take place within the season dates established by the Virginia Department of Game and Inland Fisheries (VDGIF) and the USFWS. Specific regulations for each hunt will be published by the refuge in advance of the hunt seasons.

(d) How would the use be conducted?

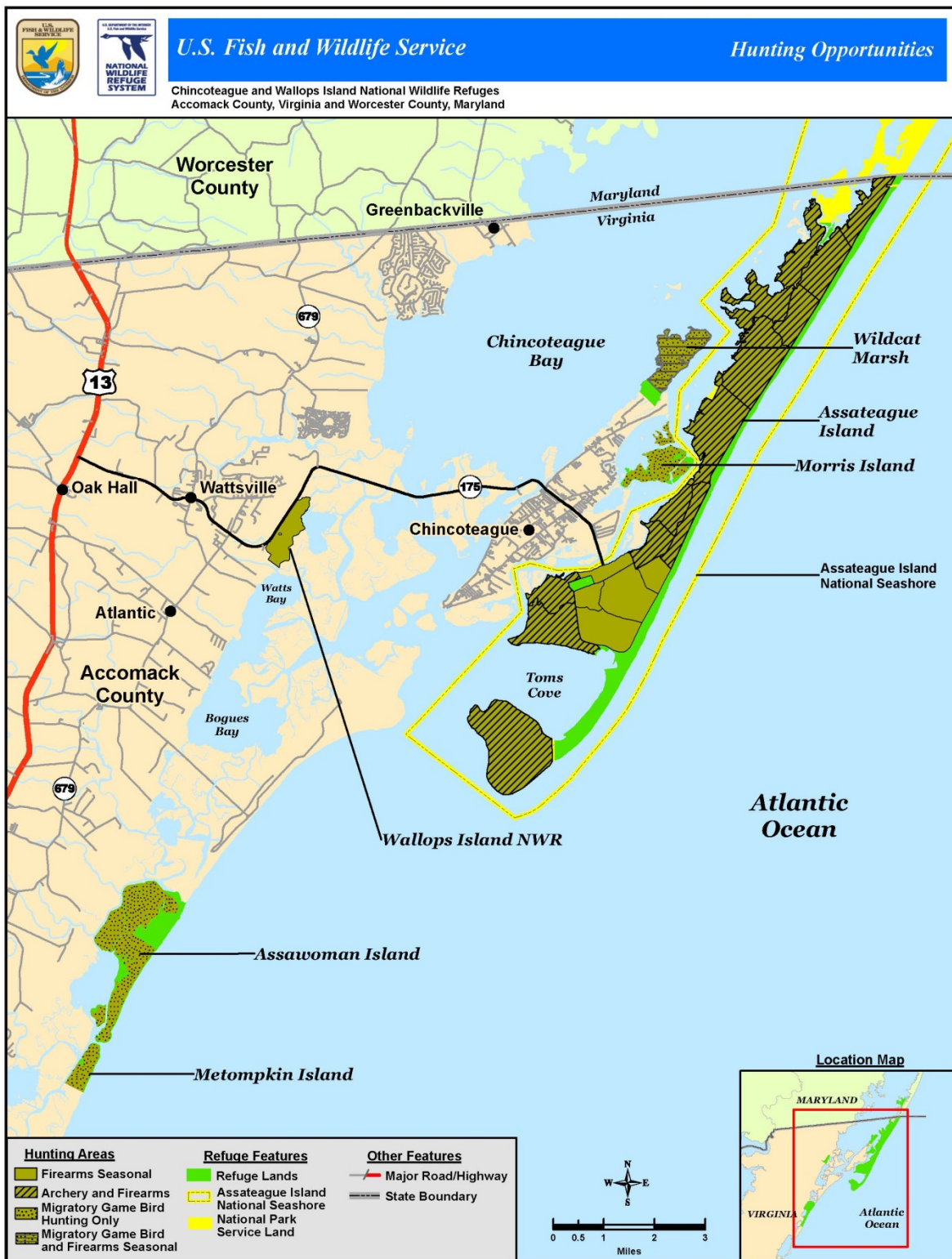
Hunting would take place within the regulatory framework established by VDGIF and USFWS. The refuge manager may, upon annual review of the hunting program and in coordination with VDGIF, impose further restrictions on hunting. Hunting at the refuge is at least as restrictive as the State of Virginia, and in some cases, more restrictive. The refuge coordinates with the VDGIF annually to maintain regulations and programs that are consistent with the State's management programs. Hunting restrictions may be imposed if hunting conflicts with other higher priority refuge programs, endangers refuge resources, or public safety. Specific hunt details will be outlined in the annual hunt program.

Migratory Game Bird Hunt - Specific Regulations:

Hunters must obtain an Annual Refuge Hunt Permit and maintain the permit on their person while hunting on the refuge.

(e) Why is this use being proposed?

Hunting is one of the priority public uses of the Refuge System. This legitimate and appropriate use of a National Wildlife Refuge is generally considered compatible, as long as it does not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the national wildlife refuge. USFWS will continue the tradition of wildlife-related recreation on the refuge by allowing hunting in compliance with State regulations.



The primary objective of the refuge waterfowl hunts is to provide the general public with quality waterfowl hunting opportunities. This objective was reviewed in the CNWR Environment Assessment Big Game and Migratory Game Bird Hunt Proposal of 2007 to ensure the hunt program was in conformance with the laws and policy of USFWS.

AVAILABILITY OF RESOURCES:

The Refuge Recreation Act requires that funds are available for the development, operation, and maintenance of the permitted forms of recreation. The permit fee (\$20 for deer), and a processing application fee (\$5/hunter) are the minimal amounts needed to offset the cost of facilitating the preseason drawings and managing the lottery hunts.

Administrative changes in the hunting program were implemented to ease the administrative burden on staff resources. Kinsail Corporation, a private firm working through a Memorandum of Understanding with the refuge, conducts the hunting applications, lottery selection, and permits. Cost savings resulted from phasing out the use of permanent hunting structures and eliminating the need to have staff conduct daily lottery drawings for permits. Regulations for the fee program allow the refuge to retain 80 percent of the total fees collected, Kinsail retains the \$5 application fee charge to each hunter. The resources necessary to provide and administer this use, at current use levels, are available within current and anticipated refuge budgets and no increase in use is proposed above historic levels.

There would be some costs associated with these programs in the form of road maintenance, and law enforcement. These costs should be minimal relative to total refuge operations and maintenance costs and would not diminish resources dedicated to other refuge management programs.

ANTICIPATED IMPACTS OF THE USE:

General Impacts of Public Use

Direct impacts are those impacts immediately attributable to an action. Indirect impacts are those impacts that are farther in time and in space. Effects that are minor when considered alone, but collectively may be important are known as cumulative effects. Incremental increases in activities by people engaged in the variety of allowed uses on the refuge could cumulatively result in detrimental consequences to wildlife and/or habitats. Refuge staff will monitor these activities to ensure wildlife resources are not impacted in a detrimental manner. Since the hunting areas comprise portions of the refuge with the least amount of waterfowl use and hunting times are restricted, disturbance and other impacts are not expected to be significant.

Hunting provides additional wildlife-dependent recreational opportunities and can foster a better appreciation and more complete understanding of the wildlife and habitats associated with Delmarva ecosystems. This can translate into more widespread and stronger support for wildlife conservation, the refuge, the Refuge System, and the USFWS. The following is a discussion of refuge-specific impacts.

Impacts on Socioeconomic Environment

Accomack County is one of the poorest counties in Virginia. The 2010 population estimate for Accomack County is 33,164 persons (U.S. Census Bureau.) Chincoteague NWR is one of the most heavily visited refuges in the Refuge System. Visitors come to Chincoteague for a variety of reasons. Many come in the summer months to access the beach. The beaches of Assateague Island offer a unique experience in the mid-Atlantic area as they exist primarily in an undeveloped setting unlike other beaches like Virginia Beach or Ocean City that are heavily developed. This natural setting draws many families seeking out a more traditional beach going experience.

Spending associated with recreational use of the refuge can generate a substantial amount of economic activity in both local and regional economies. Refuge visitors spend money on a wide variety of goods and services. Trip-related expenditures may include expenses for food, lodging, and transportation. Anglers, hunters, boaters, and wildlife watchers also buy equipment and supplies for their particular activity. Because this spending directly affects towns and communities where these purchases are made, recreational visitation can have an impact on local economies, especially in small towns and rural areas. These direct expenditures are only part of the total picture, however. Businesses and industries that supply the local retailers where the purchases are made also benefit from recreation spending. For example, a family may decide to purchase a set of fishing rods for an upcoming vacation. Part of the total purchase price will go to the local retailer, say a sporting goods store. The sporting goods store in turn pays a wholesaler who in turn pays the manufacturer of the rods. The manufacturer then spends a portion of this income to cover manufacturing expenses. In this fashion, each dollar of local retail expenditures can affect a variety of businesses at the local, regional and national level. Consequently, consumer spending associated with refuge recreation can have an impact on economic activity, employment, household earnings and local, State and Federal tax revenue.

Total visits to the refuge exceeded 1.36 million in 2010. Refuge recreation-related expenditures, and associated economic output, jobs, job income and total (county, state and Federal) tax revenue are as follows: total retail related expenditures are estimated at \$113.8 million; economic output at \$150.3 million; jobs at 1,794, job income at \$48.6 million and total tax revenue of \$10.6 million. (2012, Chincoteague National Wildlife Refuge -Economic Analysis - In Support of Comprehensive Conservation Plan,)

The refuge's contribution to the economy of the area through offering hunting opportunities for migratory game birds and big game is negligible in context of overall visitation and expenditures. Offering these hunting opportunities may enable hunters to contribute to the local community through local purchases of gas, food, lodging, and supplies.

Impacts on Cultural Resources

The body of federal historic preservation laws has grown dramatically since the enactment of the Antiquities Act of 1906. Several themes recur in these laws, their promulgating regulations, and more recent Executive Orders. They include:

- Each agency is to systematically inventory the historic properties on their holdings and to scientifically assess each property's eligibility for the National Register of Historic Places.
- Federal agencies are to consider the impacts to cultural resources during the agencies management activities and seek to avoid or mitigate adverse impacts.
- Protection of cultural resources from looting and vandalism are to be accomplished through a mix of informed management, law enforcement efforts, and public education.
- The increasing role of consultation with groups, such as Native American tribes, in addressing how a project or management activity may impact specific archaeological sites and landscapes deemed important to those groups.

The USFWS is legally mandated to inventory, assess, and protect cultural resources located on those lands that the agency owns, manages, or controls. The Service's cultural resource policy is delineated in 614 FW 1-5 and 126 FW 1-3.

In the USFWS Northeast Region, the cultural resource review and compliance process is initiated by contacting the Regional Historic Preservation Officer/Regional Archaeologist. The officer or archeologist will determine whether the proposed undertaking has the potential to impact cultural resources, identify the "area of potential effect," determine the appropriate level of scientific investigation necessary to ensure legal compliance, and initiates consultation with the pertinent State Historic Preservation Office and federally recognized Tribes.

With a relatively small number of hunters dispersed across the refuge during the hunting season, impacts would be negligible on the refuge's cultural resources based on our observations of past hunting impacts.

Impacts on Air Quality

Hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on local or regional air quality. Localized increases in emissions from hunter's vehicles or boat motors would be negligible compared to current off-refuge contributions to pollutant levels and likely increases in air emissions in the Accomack County air shed from land development over the next 15 years. Any adverse air quality effects from refuge activities would be more than offset by the benefits of maintaining the refuge in natural vegetation. The hunting program would not violate EPA standards and would comply with the Clean Air Act.

Impacts on Soils

The soils of Chincoteague NWR consist primarily of sand and silt loams. The soils are a mixture of Chincoteague silt loam (0-1 percent slope), Assateague fine sand (2-35 percent slope), Camocca fine sand (0-2 percent slope), beach sand (0-5 percent slope), Fisherman-Camocca complex (0-6

percent slope), and Udorthents and Udipsamments soils (0-30 percent slope). The soils are predominantly made of loam, silt, and sand. Assateague fine sand areas are rarely flooded. However, the rest of the areas are frequently to moderately prone to flooding. Hiking or walking can alter habitats by trampling vegetation, compacting soils, and increasing the potential of erosion. Using these baseline impacts, the refuge's hunt program has the potential to cause some soil compaction since off-trail foot travel occurs; however, hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on soils. With a limited number of hunters dispersed across the refuge during the hunting season, impacts would be negligible based on our observations of past hunting impacts. Vehicles would continue to be confined to existing refuge roads and parking lots to minimize impacts outside of that developed footprint.

Impacts on Hydrology and Water Quality

No natural freshwater streams or lakes exist on Chincoteague NWR. Rainfall and tidal over wash are the only sources of surface water on Assateague Island. The moist soil units or impoundments are slightly brackish to highly saline because of tidal over wash, salt spray, and the accumulation of salt residue as water evaporates. The same environmental influences make the groundwater lenses beneath the islands brackish. Evaporation and transpiration account for major surface water depletion during the summer months. The drinking water supply for Chincoteague Island and the refuge comes via pipeline from three deep wells and a shallow well field near the NASA base on the mainland. Large bodies of water bordering the Refuge are the Atlantic Ocean, Chincoteague Bay, and Assateague Channel. Hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on hydrology or water quality based upon staff observations of past hunting impacts. The hunting program would not violate federal or state standards for contributing pollutants to water sources and would comply with the Clean Water Act.

The use of boats by hunters has the potential to affect water quality negatively by increasing erosion, stirring up bottom sediments, or introducing pollutants into waterways. The Service does not expect emissions from vehicles or boat motors to substantially affect the water quality of the region. Non-toxic shot is required for all waterfowl hunting. Public outreach and education on littering and proper waste disposal will lessen potential negative water quality impacts.

Impacts on Vegetation

Repeated visitation to any particular locale at the refuge would continue to cause minor site-specific damage to vegetation. Accidental introduction of invasive plants, pathogens, or exotic invertebrates attached to boats, or on shoes or clothing, is another source of direct impact on vegetation. In places where unmarked paths are created by hunters and anglers, little used pathways will retain their dominant vegetation species, but on medium-use pathways some plant species will be replaced and heavily-used paths will often contain invasive species (Liddle and Scorgie 1980).

Using the information previously presented as a baseline and considering staff observations of past impacts, hunting is expected to have negligible adverse short-term, long-term, or cumulative impacts on vegetation. Disturbance to vegetation is expected to increase due to an expected increase in migratory game bird hunters in new free roam hunting areas during all hunting seasons. The possibility for new trails to be developed from repeated hunter entry may occur. However, anticipated dispersal of hunters across hunting areas, the inherent nature of hunters to only travel as far as needed to find a hunting location, and knowing that most vegetative species will have already undergone senescence or become dormant, the impacts to vegetation are expected to be negligible. On-going education about the peril of non-native invasive plant species introduction will continue through refuge outreach.

Impacts on Federal and State Endangered Species

The endangered Delmarva Peninsula fox squirrel (*Sciurus cinereus cinereus*) and threatened seabeach amaranth (*Amaranthus pumilus*) are the only federally listed species utilizing refuge hunt areas during the Virginia hunting seasons. Piping plovers (*Charadrius melodus*) and loggerhead sea turtles (*Caretta caretta*) nest on the refuge during the summer, outside of hunting seasons.

While the bald eagle is no longer a federally listed species, the refuge uses the national bald eagle management guidelines for bald eagle management to implement time-of-year restrictions for nesting eagles. The guidelines do not permit any activity within 330 feet of an active nest during the breeding season (USFWS 2011).

Impacts on Waterfowl

The migratory game bird hunting areas consists of approximately 1,750 acres or 13% of the refuge land, with a rail hunting area of 864 acres or 6% of the refuge land. Only the saltmarsh portion of Wildcat Marsh, Morris Island, Assawoman, and Metompkin Islands are used for waterfowl hunting. Rail hunting is only permitted on marshes of Assawoman Island and the north end of Metompkin Island.

Hunting occurs only on the northern end of Chincoteague Island, and on Morris, Assawoman, and the north end of Metompkin Islands. Morton (1986) found that the increased presence of humans associated with the refuge big game hunting program can contribute to movements of ducks, particularly black ducks, off the refuge. These disturbances are at a time when these birds need the isolation of the refuge to feed and rest. Paulus (1984) and Belanger (1989) found that hunting activity (gun shots or hunter movements) caused waterfowl to move to less disturbed areas and avoided some areas until after the hunting season. Laskowski et al (1993) documented human disturbance to a representative species of waterfowl by the visiting public (on managed impoundments) on Back Bay NWR, VA. Disturbance elicited behavioral changes ranging from increase alertness to flying to other parts of the refuge. McNeil et al. (1992) found that many waterfowl species avoid human disturbance by feeding at night instead of the day.

Waterfowl and other migratory bird hunting will continue to be limited to specific areas on the refuge in order to reduce potential disturbance. Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when “hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any bird, or any part, nest, or egg” of migratory game birds can take place, and to adopt regulations for this purpose.

Light goose, resident Canada goose, and mourning dove hunting would result in a potential increase in visitors related to hunting. These hunt programs would be regulated as the current hunt programs are, with a limited amount of permits awarded. This number of new permits would not cause significant impacts to birds because the total number of hunters that would be on the refuge at any time would not be enough to result in any significant disturbance.

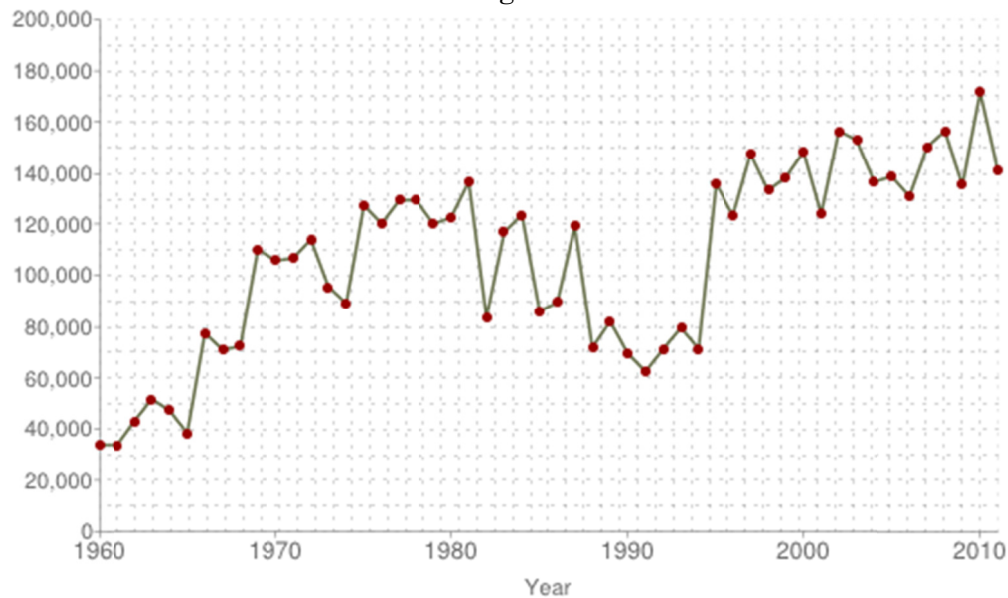
Net positive impacts from the refuge hunt program are expected. We expect that the harvest of local resident Canada geese would have the following beneficial effects:

- Increase natural seed regeneration within refuge impoundments thereby increasing fall/winter food availability for migrating ducks, geese and swans.
- Reduce fecal contamination in the refuge impoundments. Excessive fecal matter also changes the nitrogen and oxygen levels in the refuge waters resulting in algal blooms and death of aquatic organisms. (Source: USDA-APHIS. 1999. Environmental Assessment for the management of conflicts associated with non-migratory Canada geese, migratory Canada geese, and urban/suburban ducks in the Commonwealth of Virginia. 77 pp.)
- Reduce the possibility of transmitting disease to susceptible populations of migrating birds as they over-winter at the Refuge or pass through.
- Reduce negative interactions (aggressive behavior) with refuge visitors on roads and trails during spring breeding season.

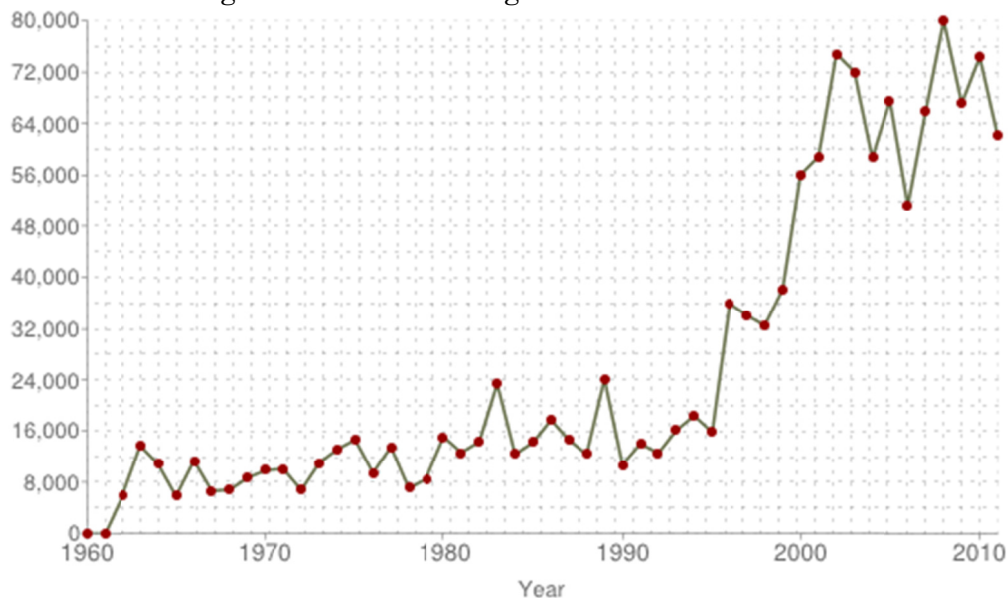
Harvest and disturbance of light geese under the authority of the light goose conservation order would have the following beneficial effects:

- Reduce damage caused by light geese to sensitive arctic breeding habitats. This would have the additional benefit of reducing negative impacts to other bird species nesting within that same arctic habitat.
- Reduce damage to wintering habitats within the Atlantic Flyway.

Total number of ducks harvested in Virginia



Total number of geese harvested in Virginia



<http://www.flyways.us/regulations-and-harvest/harvest-trends>

The resident Canada goose population increased significantly during the 1980s and early 1990s. The population peaked at over 260,000 geese in the mid-late 1990s in Virginia and has been steadily reduced by specific management programs since that time. The current population estimate is 158,267 (+/- 28%) in Virginia and over 1 million in the Atlantic Flyway. For migrant Canada geese, the breeding population estimate for 2012 (190,340) is similar to the past 3 year average (189,317).

http://www.dgif.virginia.gov/hunting/va_game_wildlife/waterfowlfactsheets.pdf

Liberal duck seasons (60 days, 6 bird bag limit) and resident goose seasons have resulted in higher waterfowl harvests in Virginia during the past ten years. Harvest has averaged approximately 150,000 ducks and 60,000 geese from 2000-2011, compared to 114,770 ducks and 25,000 geese during the 1990s. The long season length and liberal bags offer greater opportunity and a greater cumulative harvest over the course of the season.

Waterfowl hunter numbers in Virginia have been generally stable since the late 1990s, and Federal Duck Stamp sales have averaged 23,390 in Virginia (for 5-year period, 2006-10). Since 1999, the Harvest Information Program (HIP) has been used to estimate hunter effort and harvest. The average number of duck and goose hunters over the past 3 years, as measured by HIP, was 13,618 and 12,360 respectively. In 2011, only 99 visits occurred on the refuge for migratory bird hunting, possibly because the hunt areas are only accessible by boat.

Chincoteague Waterfowl Harvest (self-reported, 2008-2013)

2008/2009 - 212

2009/2010 - 65

2010/2011 - 53

2011/2012 - 67

2012/2013 - 69

Given the exceptionally low numbers of waterfowl harvested from the refuge in respect to the total statewide harvest and waterfowl population, no cumulative impacts to local, regional, or statewide populations of ducks or geese are anticipated from hunting on the refuge.

Based on past observations of impacts on shorebirds by refuge staff, disturbance by refuge hunters to shorebirds is expected to be negligible since most shorebird species have completely passed through Virginia by peak hunting season in November through January. Some hunting occurs when these species may be migrating before and after this peak hunting time. In addition, hunters are restricted from prime shorebird use areas.

Impacts to Landbirds

Disturbance to landbirds has been well documented. Pedestrian travel can influence normal behavioral activities, including feeding, reproductive, and social behavior and the location of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller et al. 1998). For songbirds, Gutzwiller et al. (1997) found that singing behavior of some species was altered by low levels of human intrusion.

Disturbance to these non-hunted migratory birds could have regional, local, and flyway effects. Free-roaming big game hunters may cause local, temporary, minor alterations to feeding and

resting behavior in landbirds. However, the limited number of hunters, and the availability of nearby undisturbed habitats, render the direct, indirect, and cumulative impacts on these species negligible. Hunting will have little to no effect on nesting landbirds due to seasonal differences in these activities. The early part of nesting season of some raptors coincides with the end of the majority of hunting seasons, but hunting would have little impact on the critical periods of incubation and fledging.

Impacts on Secretive Marsh and Waterbirds

Resident waterbirds tend to be less sensitive to human disturbance than are migrants, and thus will be less impacted by disturbance from public use on the refuge. However, wading birds have been found to be extremely sensitive to disturbance in the northeastern U.S. and may be adversely impacted by disturbance from public use on the refuge (Burger and Gochfeld 1998). The impacts of intrusion through public use are generally negligible for this group of birds, but can vary by species and between years (Gutzwiller and Anderson 1999).

Disturbance to secretive marsh birds and waders from hunting would start in September and usually end in January, unless hunting is allowed during the snow goose conservation order into mid-April. This disturbance may have direct effects on migrating and wintering secretive marsh birds and waders. Due to the limited number of hunting days and the restricted hours, we expect the short-term, long-term and cumulative impacts to be negligible.

Impacts on Fisheries

Impacts to fisheries from visitors engaged in hunting are expected to be temporary and negligible. Anticipated increases in hunting will cause increased suspension of bottom sediments from boat motors. However, since hunting occurs during the fall and winter months, this sediment suspension should not adversely affect biological oxygen demand (BOD) for fisheries resources. Effects on inter-jurisdictional fishes are expected to be unlikely from hunting because the majority of the refuge will experience minimal, transitory use by hunters.

Impacts on Mammals

In general, the presence of humans will disturb most mammals, which typically results in indirect negligible short-term adverse impacts without long-term effects on individuals and populations. Adverse impacts on resident game populations from hunting would be negligible.

Negative impacts from hunting on non-hunted mammals, such as voles, moles, mice, shrews, and bats, are expected to be negligible. Except for some species of migratory bats, these species have very limited home ranges and hunting would not affect their populations regionally. Impacts of hunting to migratory bat species would be negligible. These species are in torpor or have completely passed through Virginia by peak hunting season in November through January. Vehicles are restricted to roads and harassment or taking of any wildlife other than legal game species is not permitted.

Impacts to Amphibians and Reptiles

The direct, indirect, and cumulative effects of hunting to amphibians and reptiles such as snakes, skinks, turtles, lizards, salamanders, frogs, and toads are expected to be negligible. Hibernation or torpor by cold-blooded reptiles and amphibians limits their activity during the hunting seasons for migratory game birds, when temperatures are low and hunters would rarely encounter them during most of the hunting season.

Impacts to Invertebrates

Impacts to invertebrates such as butterflies, moths, other insects, and spiders are expected to be negligible. Invertebrates are not active during the majority of the hunting seasons and would have few interactions with hunters during the hunting season.

Impacts on Public Use and Access

Refuge lands allow the public to enjoy hunting at no or little cost in a region where private land is leased for hunting, often costing a person several hundred to several thousand dollars per year for membership. Refuge hunting programs also make special accommodations for mobility-impaired hunters. Hunting provides opportunities to experience a wildlife-dependent recreational activity, instills an appreciation for and understanding of wildlife, the natural world and the environment, and promotes a land ethic and environmental awareness. Visitors interested in hunting would find high quality opportunities to engage in their favored pastime.

The refuge would also be promoting a wildlife-oriented recreational opportunity that is compatible with the purpose for which the refuge was established. The public would have an increased awareness of the refuge and the Refuge System and public demand for more areas to hunt and learn about wildlife would be met. The hunting program provides an administratively simple program that balances other public use activities. The program supports Presidential Executive Order #13443: Facilitation of Hunting Heritage and Wildlife Conservation, regional directives, and parallels State hunting regulations. In addition, it provides seasonal closures to minimize wildlife disturbance and/or avoid conflicts with other uses, enhances disabled hunting opportunities, further develops an appreciation for fish and wildlife, and expands public hunting opportunities.

Migratory game bird hunting on Wildcat Marsh, Morris, Assawoman and Metompkin Islands is expected to cause no conflicts with other refuge public use programs. It is anticipated that hunting will be the only major use on these areas and will take place at a time when other public uses are declining. All hunting areas are remote, accessible only by boat, and located a considerable distance from the main public use areas. These factors alone should eliminate conflicts with other public use activities.

Other Past, Present, Proposed, and Reasonably Foreseeable Actions and Anticipated Impacts

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, viewed as a whole, become substantial over time. The hunt plan has been designed to be sustainable through time given relatively stable conditions.

Natural marsh habitats on some migration and wintering areas have been impacted by the destructive feeding strategies of overabundant Greater snow geese (Giroux and Bedard 1987, Giroux et al. 1998, Widjeskog 1977, Smith and Odum 1981, Young 1985). In addition, goose damage to agricultural crops has become a problem (Bedard and Lapointe 1991, Filion et al. 1998, Giroux et al. 1998, Delaware Div. of Fish and Wildlife 2000). Snow geese use the refuge wetland habitats extensively, and are not subjected to any hunting disturbance or mortality on the refuge. Impacts to refuge wetlands and impacts to wetland-dependent wildlife increase over time if the population is not adequately controlled at the flyway level, through the coordinated efforts of individual agencies.

Similarly, resident Canada geese have been shown to cause changes in wetland community structure (Laskowski et al. 2002). Resident geese can reduce the amount of plant biomass that would be available to migrant birds at the end of the growing season. Direct damage to agricultural resources by resident geese includes grain crops, trampling and spring seedlings. Heavy grazing by geese can result in reduced yields and in some instances a total loss of the grain crop (Allen et al. 1985, Flegler et al. 1987). Thus, uncontrolled Canada goose populations on the refuge can affect migratory bird populations utilizing the refuge as well as contribute to agricultural losses on lands surrounding the refuge.

Anticipated Impacts if Individual Actions are Allowed to Accumulate

The cumulative impact of hunting on migratory and resident wildlife populations at Chincoteague NWR is negligible. The proportion of the refuge's harvest of migratory game birds is negligible when compared to local, regional, and flyway populations and harvest.

Because of the regulatory process for harvest management of migratory birds in place within the Service, the setting of hunting seasons largely outside the breeding seasons of resident and migratory wildlife, the ability of individual refuge hunt programs to adapt refuge-specific hunting regulations to changing local conditions, and the wide geographic separation of individual refuges, we anticipate no direct or indirect cumulative effects on resident wildlife, migratory birds, and non-hunted wildlife of hunting on Chincoteague NWR.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague National Wildlife Refuge CCP/EIS. Public notification and review will include a notice of availability published in the

Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The refuge will manage the hunt program in accordance with Federal and State regulations and review it annually to ensure wildlife and habitat goals are achieved and that the program is providing a safe, high quality hunting experience for participants.

To ensure compatibility with refuge purposes and the mission of the Refuge System, hunting can occur on the refuge if the refuge-specific regulations highlighted in this document and following stipulations are met:

- This use must be conducted in accordance with State and federal regulations, and special refuge regulations published in the refuge Hunting Regulations brochures.
- This use is subject to modification if on-site monitoring by refuge personnel or other authorized personnel results in unanticipated negative impacts to natural communities, wildlife species, or their habitats.
- Law Enforcement Officer(s) will promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions. Law Enforcement personnel will monitor all areas and enforce all applicable State and Federal Regulations.
- Several management strategies identified by Klein (1989) can be used to control the negative effects of recreation on wildlife; these included: permits, user fees, zoning (Cullen 1985), travel ease, public education (Purdy et al. 1987), limiting number of visitors present, and periodic closing. Chincoteague NWR employs these measures to lessen the disturbance and impact to wildlife.
- The refuge manager may, upon annual review of the hunting program and in coordination with VDGIF, impose further restrictions on hunting. Further restrictions may include but are not limited to recommending that the refuge be closed to hunting or further liberalize hunting regulations. Hunting restrictions may be imposed if hunting conflicts with other; higher priority refuge programs, endangers refuge resources, or public safety. Specific hunt details will be outlined in the annual hunt program.

JUSTIFICATION:

Hunting is a priority wildlife-dependent use for the Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and The

National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). USFWS policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management.

Hunting seasons and bag limits are established by the Commonwealth of Virginia and generally adopted by the refuge. These restrictions ensure the continued well-being of overall populations of game animals. Hunting does result in the taking of many individuals within the overall population, but restrictions are designed to safeguard an adequate breeding population from year to year. Specific refuge regulations address equity and quality of opportunity for hunters, and help safeguard refuge habitat. Disturbance to other fish and wildlife does occur, but this disturbance is generally short-term and adequate habitat occurs in adjacent areas. Loss of plants from foot traffic is minor, or temporary, since hunting occurs mainly after the growing season.

Conflicts between hunters are localized and are addressed through law enforcement, public education, and continuous review and updating to State and refuge hunting regulations. Conflicts between other various user groups are minor given the season of the year for hunting, the location of most hunting away from public use facilities, and seasonal area closures.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature)

(Date)

CONCURRENCE:

Regional Chief: _____
(Signature)

(Date)

MANDATORY 15 YEAR RE-EVALUATION DATE: _____

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COMPATIBILITY DETERMINATION

USE:

Big Game Hunting

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the National Wildlife Refuge System (Refuge System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is the public hunting of big game (white-tailed deer and sika elk). Hunting was identified as one of six priority public uses by Executive Order 12996 (March 25, 1996) and by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where the use would be conducted?

The use would be conducted in designated areas of the refuge on the Virginia portion of Assateague Island. Assateague Island is a barrier beach island that extends over 30 miles along the Atlantic coast. Additionally, big game hunting is allowed on the northern portion of Chincoteague Island on a unit of the refuge known as Wildcat Marsh.

(c) When would the use be conducted?

Hunting would take place within the season dates established by the Virginia Department of Game and Inland Fisheries (VDGIF) and the USFWS; however, the hunting of sika elk may occur outside of the Commonwealth's deer season as a depopulation hunt. Deer hunting is normally between mid-November through the first week of January. Specific regulations for each hunt will be published by the refuge in advance of the hunt seasons.

(d) How would the use be conducted?

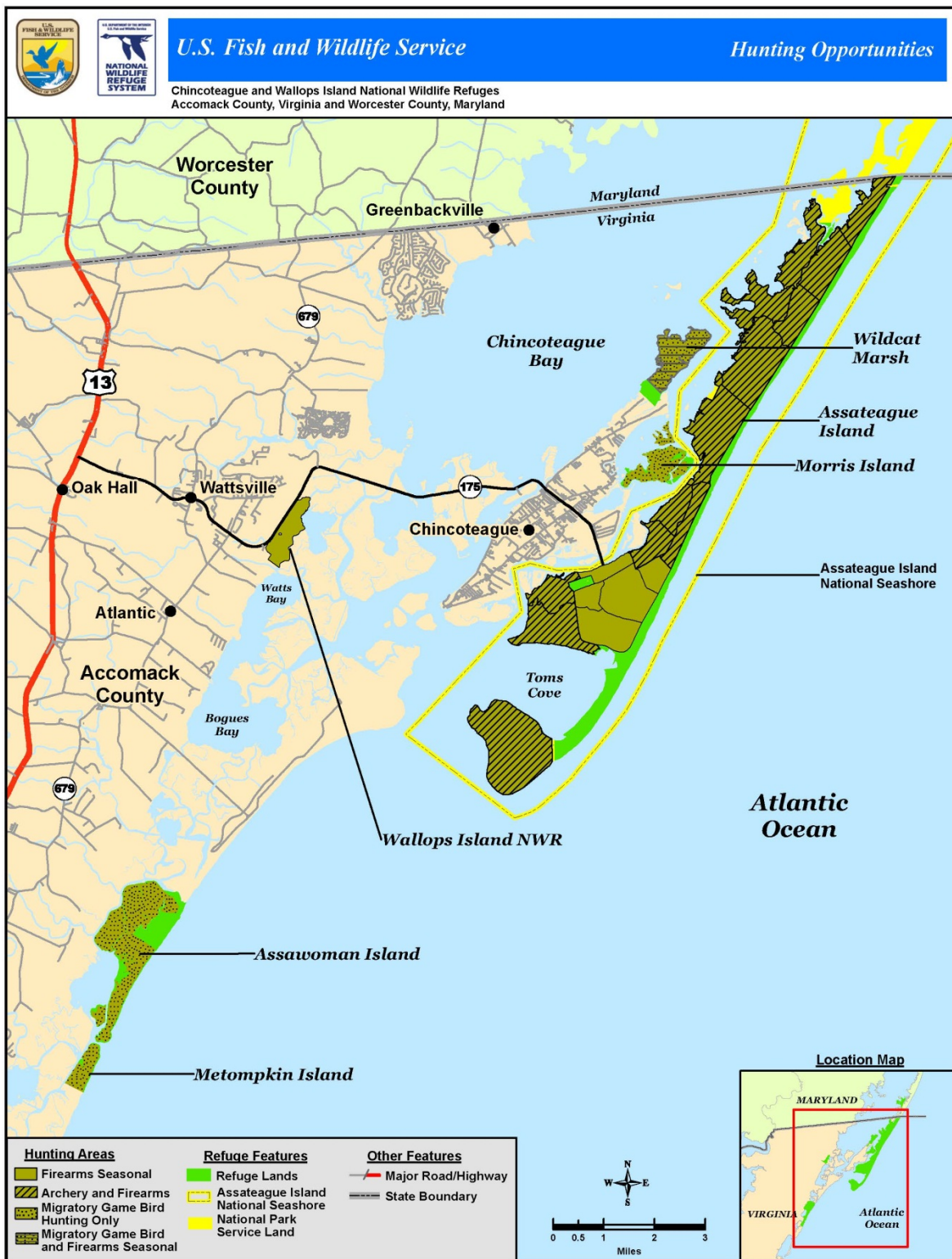
Hunting would take place within the regulatory framework established by VDGIF and USFWS; however, the hunting of sika elk may occur outside of the Commonwealth's deer season as a depopulation hunt.

The refuge manager may, upon annual review of the hunting program and in coordination with VDGIF, impose further restrictions on hunting. Hunting at the refuge is at least as restrictive as the State of Virginia, and in some cases, more restrictive. The refuge coordinates with the VDGIF annually to maintain regulations and programs that are consistent with the State's management programs. Hunting restrictions may be imposed if hunting conflicts with other higher priority refuge programs, endangers refuge resources, or public safety. Specific hunt details will be outlined in the annual hunt program.

Big Game Hunt - Specific Regulations:

Permits - Applications for the big game hunt are processed by Kinsail Corporation. Hunters can apply and pay on-line.

Orientations - All hunters must attend a firearms orientation session prior to their assigned hunt period to obtain their permit. Sessions will be held prior to each scheduled hunt period. Hunters must be on time. Once the orientation begins, individuals will not be allowed in or allowed to hunt,



under any circumstances. Scouting will be permitted following the orientation session. Hunters may only scout their area on the day prior to their scheduled two-day hunt period.

General Regulations

- Hunters must adhere to regulations published in the refuge hunt brochure, all Accomack County and VDGIF hunting regulations, and those specific regulations that apply to big game hunting.
- VDGIF requirements on the use of firearms, muzzleloaders and bows apply.
- A sign-in/out box is located at the kiosk in parking area one. Each hunter must sign in immediately before entering and sign out after exiting the hunt zone.
- Reporting all harvested animals must comply with VDGIF requirements via tele-check and also be indicated on refuge check in/out sheet located at the kiosk.
- Hunters must park in designated parking areas.
- Non-hunters or persons not in possession of a valid refuge permit are not permitted to hunt on the refuge.
- All hunters must make a reasonable effort to recover wounded animals.
- Discharging any weapon within 50' of the centerline of any road or on/from/into a safety zone is prohibited.
- The boundaries of the hunt zone are recognized in the field by prominent signs. Each hunter is responsible for knowing the boundaries of the hunt zone.
- Federal government worksites may be staffed during the hunt. The zone around these sites is posted closed to hunting. Hunters may enter this zone strictly for the purpose of accessing the hunting area and must have their weapons unloaded.
- Hunters may pursue downed or crippled deer into the safety area (closed to hunting around the worksites). Contact the refuge headquarters for assistance if needed to dispatch wounded animal.
- Those hunters scouting must be in possession of their hunt permit.
- Hunters engaged in scouting or hunting must wear a minimum of 400 total square inches of blaze orange material consisting of a vest and hat or jacket and hat. Blaze orange camouflage is not acceptable.
- Any hunters who require assistance with retrieving or dressing harvested animals may apply for up to 2 non-hunting permits. This permit will allow an assistant to be present only during the retrieval and dressing of harvested animals. Non-hunting assistant permits must be requested.

(e) Why is this use being proposed?

Hunting is one of the priority public uses of the Refuge System. This legitimate and appropriate use of a National Wildlife Refuge is generally considered compatible, as long as it does not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the national wildlife refuge. USFWS will continue the tradition of wildlife-related recreation on the refuge by allowing hunting in compliance with State regulations.

Primary objectives of the refuge hunts are to (1) maintain big game populations at a level compatible with refuge habitats, (2) reduce the exotic big game population, (3) reduce competition between exotic sika elk (*Cervus nippon*), and native wildlife, including white-tailed deer (*Odocoileus virginianus*), waterfowl and other wetland species, (4) provide the general public with quality big game hunts and (5) minimize direct conflicts between big game populations and humans, particularly when human safety is an issue. These objectives were reviewed in the CNWR Environment Assessment Big Game and Migratory Game Bird Hunt Proposal of 2007 to ensure the hunt program was in conformance with the laws and policy of USFWS.

AVAILABILITY OF RESOURCES:

The Refuge Recreation Act requires that funds are available for the development, operation, and maintenance of the permitted forms of recreation. The permit fee (\$20 for deer), and a processing application fee (\$5/hunter) are the minimal amounts needed to offset the cost of facilitating the preseason drawings and managing the lottery hunts.

Administrative changes in the hunting program were implemented to ease the administrative burden on staff resources. Kinsail Corporation, a private firm working through a Memorandum of Understanding with the refuge, conducts the hunting applications, lottery selection, and permits. Cost savings resulted from phasing out the use of permanent hunting structures and eliminating the need to have staff conduct daily lottery drawings for permits. Regulations for the fee program allow the refuge to retain 80 percent of the total fees collected, Kinsail retains the \$5 application fee charge to each hunter. The resources necessary to provide and administer this use, at current use levels, are available within current and anticipated refuge budgets and no increase in use is proposed above historic levels.

There would be some costs associated with these programs in the form of road maintenance, and law enforcement. These costs should be minimal relative to total refuge operations and maintenance costs and would not diminish resources dedicated to other refuge management programs.

ANTICIPATED IMPACTS OF THE USE:

General Impacts of Public Use

Direct impacts are those impacts immediately attributable to an action. Indirect impacts are those impacts that are farther in time and in space. Effects that are minor when considered alone, but collectively may be important are known as cumulative effects. Incremental increases in activities by people engaged in the variety of allowed uses on the refuge could cumulatively result in detrimental consequences to wildlife and/or habitats. Refuge staff will monitor these activities to ensure wildlife resources are not impacted in a detrimental manner. Since the hunting areas comprise portions of the refuge with the least amount of waterfowl use and hunting times are restricted, disturbance and other impacts are not expected to be significant.

Hunting provides additional wildlife-dependent recreational opportunities and can foster a better appreciation and more complete understanding of the wildlife and habitats associated with

Delmarva ecosystems. This can translate into more widespread and stronger support for wildlife conservation, the refuge, the Refuge System, and the USFWS. The following is a discussion of refuge-specific impacts.

Impacts on Socioeconomic Environment

Accomack County is one of the poorest counties in Virginia. The 2010 population estimate for Accomack County is 33,164 persons (U.S. Census Bureau.) Chincoteague NWR is one of the most heavily visited refuges in the Refuge System. Visitors come to Chincoteague for a variety of reasons. Many come in the summer months to access the beach. The beaches of Assateague Island offer a unique experience in the mid-Atlantic area as they exist primarily in an undeveloped setting unlike other beaches like Virginia Beach or Ocean City that are heavily developed. This natural setting draws many families seeking out a more traditional beach going experience.

Spending associated with recreational use of the refuge can generate a substantial amount of economic activity in both local and regional economies. Refuge visitors spend money on a wide variety of goods and services. Trip-related expenditures may include expenses for food, lodging, and transportation. Anglers, hunters, boaters, and wildlife watchers also buy equipment and supplies for their particular activity. Because this spending directly affects towns and communities where these purchases are made, recreational visitation can have an impact on local economies, especially in small towns and rural areas. These direct expenditures are only part of the total picture, however. Businesses and industries that supply the local retailers where the purchases are made also benefit from recreation spending. For example, a family may decide to purchase a set of fishing rods for an upcoming vacation. Part of the total purchase price will go to the local retailer, say a sporting goods store. The sporting goods store in turn pays a wholesaler who in turn pays the manufacturer of the rods. The manufacturer then spends a portion of this income to cover manufacturing expenses. In this fashion, each dollar of local retail expenditures can affect a variety of businesses at the local, regional and national level. Consequently, consumer spending associated with refuge recreation can have an impact on economic activity, employment, household earnings and local, State and Federal tax revenue.

Total visits to the refuge exceeded 1.36 million in 2010. Refuge recreation-related expenditures, and associated economic output, jobs, job income and total (county, state and Federal) tax revenue are as follows: total retail related expenditures are estimated at \$113.8 million; economic output at \$150.3 million; jobs at 1,794, job income at \$48.6 million and total tax revenue of \$10.6 million. (2012, Chincoteague National Wildlife Refuge -Economic Analysis - In Support of Comprehensive Conservation Plan,)

The refuge's contribution to the economy of the area through offering hunting opportunities for migratory game birds and big game is negligible in context of overall visitation and expenditures. Offering these hunting opportunities may enable hunters to contribute to the local community through local purchases of gas, food, lodging, and supplies.

Impacts on Cultural Resources

The body of federal historic preservation laws has grown dramatically since the enactment of the Antiquities Act of 1906. Several themes recur in these laws, their promulgating regulations, and more recent Executive Orders. They include:

- Each agency is to systematically inventory the historic properties on their holdings and to scientifically assess each property's eligibility for the National Register of Historic Places.
- Federal agencies are to consider the impacts to cultural resources during the agencies management activities and seek to avoid or mitigate adverse impacts.
- Protection of cultural resources from looting and vandalism are to be accomplished through a mix of informed management, law enforcement efforts, and public education.
- The increasing role of consultation with groups, such as Native American tribes, in addressing how a project or management activity may impact specific archaeological sites and landscapes deemed important to those groups.

The USFWS is legally mandated to inventory, assess, and protect cultural resources located on those lands that the agency owns, manages, or controls. The Service's cultural resource policy is delineated in 614 FW 1-5 and 126 FW 1-3.

In the USFWS Northeast Region, the cultural resource review and compliance process is initiated by contacting the Regional Historic Preservation Officer/Regional Archaeologist. The officer or archeologist will determine whether the proposed undertaking has the potential to impact cultural resources, identify the "area of potential effect," determine the appropriate level of scientific investigation necessary to ensure legal compliance, and initiates consultation with the pertinent State Historic Preservation Office and federally recognized Tribes.

With a relatively small number of hunters dispersed across the refuge during the hunting season, impacts would be negligible on the refuge's cultural resources based on our observations of past hunting impacts.

Impacts on Air Quality

Hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on local or regional air quality. Localized increases in emissions from hunter's vehicles or boat motors would be negligible compared to current off-refuge contributions to pollutant levels and likely increases in air emissions in the Accomack County air shed from land development over the next 15 years. Any adverse air quality effects from refuge activities would be more than offset by the benefits of maintaining the refuge in natural vegetation. The hunting program would not violate EPA standards and would comply with the Clean Air Act.

Impacts on Soils

The soils of Chincoteague NWR consist primarily of sand and silt loams. The soils are a mixture of Chincoteague silt loam (0-1 percent slope), Assateague fine sand (2-35 percent slope), Camocca fine sand (0-2 percent slope), beach sand (0-5 percent slope), Fisherman-Camocca complex (0-6

percent slope), and Udorthents and Udipsamments soils (0-30 percent slope). The soils are predominantly made of loam, silt, and sand. Assateague fine sand areas are rarely flooded. However, the rest of the areas are frequently to moderately prone to flooding. Hiking or walking can alter habitats by trampling vegetation, compacting soils, and increasing the potential of erosion. Using these baseline impacts, the refuge's hunt program has the potential to cause some soil compaction since off-trail foot travel occurs; however, hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on soils. With a limited number of hunters dispersed across the refuge during the hunting season, impacts would be negligible based on our observations of past hunting impacts. Vehicles would continue to be confined to existing refuge roads and parking lots to minimize impacts outside of that developed footprint, with the exception of hunters assigned to Toms Cove Hook.

Impacts on Hydrology and Water Quality

No natural freshwater streams or lakes exist on Chincoteague NWR. Rainfall and tidal over wash are the only sources of surface water on Assateague Island. The moist soil units or impoundments are slightly brackish to highly saline because of tidal over wash, salt spray, and the accumulation of salt residue as water evaporates. The same environmental influences make the groundwater lenses beneath the islands brackish. Evaporation and transpiration account for major surface water depletion during the summer months. The drinking water supply for Chincoteague Island and the refuge comes via pipeline from three deep wells and a shallow well field near the NASA base on the mainland. Large bodies of water bordering the Refuge are the Atlantic Ocean, Chincoteague Bay, and Assateague Channel. Hunting is expected to have negligible adverse short-term, long-term or cumulative impacts on hydrology or water quality based upon staff observations of past hunting impacts. The hunting program would not violate federal or state standards for contributing pollutants to water sources and would comply with the Clean Water Act.

The Service does not expect emissions from vehicles to substantially affect the water quality of the region. Lead slugs and buckshot are permitted for deer hunting. Public outreach and education on littering and proper waste disposal will lessen potential negative water quality impacts.

Impacts on Vegetation

Repeated visitation to any particular locale at the refuge would continue to cause minor site-specific damage to vegetation. Accidental introduction of invasive plants, pathogens, or exotic invertebrates attached to boats, or on shoes or clothing, is another source of direct impact on vegetation. In places where unmarked paths are created by hunters and anglers, little used pathways will retain their dominant vegetation species, but on medium-use pathways some plant species will be replaced and heavily-used paths will often contain invasive species (Liddle and Scorgie 1980).

Using the information previously presented as a baseline and considering staff observations of past impacts, hunting is expected to have negligible adverse short-term, long-term, or cumulative

impacts on vegetation. Disturbance to vegetation is expected to increase due to an expected increase in deer hunters in new free roam hunting areas during all hunting seasons. The possibility for new trails to be developed from repeated hunter entry may occur. However, anticipated dispersal of hunters across hunting areas, the inherent nature of hunters to only travel as far as needed to find a hunting location, and knowing that most vegetative species will have already undergone senescence or become dormant, the impacts to vegetation are expected to be negligible. On-going education about the peril of non-native invasive plant species introduction will continue through refuge outreach.

Deer overabundance can affect native vegetation and natural ecosystems and has been well-studied (Tilghman 1989, Nudds 1980, Hunter 1990; Behrend et al. 1970). White-tailed deer selectively forage on vegetation (Strole and Anderson 1992), and thus can have substantial impacts on certain herbaceous and woody species and on overall plant community structure (Waller and Alverson 1997). Overbrowsing by deer can decrease tree reproduction, understory vegetation cover, plant density, and plant diversity (Warren 1991). High densities of deer have also been recognized as vectors for spreading invasive species like Japanese stiltgrass. Thus, control of the white-tailed deer population on the refuge will have a moderate beneficial impact on the vegetation communities.

Impacts on Federal and State Endangered Species

The endangered Delmarva Peninsula fox squirrel (*Sciurus cinereus cinereus*) and threatened seabeach amaranth (*Amaranthus pumilus*) are the only federally listed species utilizing refuge hunt areas during the Virginia hunting seasons. Piping plovers (*Charadrius melodus*) and loggerhead sea turtles (*Caretta caretta*) nest on the refuge during the summer, outside of hunting seasons.

While the bald eagle is no longer a federally listed species, the refuge uses the national bald eagle management guidelines for bald eagle management to implement time-of-year restrictions for nesting eagles. The guidelines do not permit any activity within 330 feet of an active nest during the breeding season (USFWS 2011).

Impacts on Waterfowl

Morton (1986) found that the increased presence of humans associated with the refuge big game hunting program can contribute to movements of ducks, particularly black ducks, off the refuge. These disturbances are at a time when these birds need the isolation of the refuge to feed and rest. Paulus (1984) and Belanger (1989) found that hunting activity (gun shots or hunter movements) caused waterfowl to move to less disturbed areas and avoided some areas until after the hunting season. Laskowski et al (1993) documented human disturbance to a representative species of waterfowl by the visiting public (on managed impoundments) on Back Bay NWR, VA. Disturbance elicited behavioral changes ranging from increase alertness to flying to other parts of the refuge. McNeil et al. (1992) found that many waterfowl species avoid human disturbance by feeding at night instead of the day.

Impacts to Landbirds

Disturbance to landbirds has been well documented. Pedestrian travel can influence normal behavioral activities, including feeding, reproductive, and social behavior and the location of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller et al. 1998). For songbirds, Gutzwiller et al. (1997) found that singing behavior of some species was altered by low levels of human intrusion.

Disturbance to these non-hunted migratory birds could have regional, local, and flyway effects. Free-roaming big game hunters may cause local, temporary, minor alterations to feeding and resting behavior in landbirds. However, the limited number of hunters, and the availability of nearby undisturbed habitats, render the direct, indirect, and cumulative impacts on these species negligible. Hunting will have little to no effect on nesting landbirds due to seasonal differences in these activities. The early part of nesting season of some raptors coincides with the end of the majority of hunting seasons, but hunting would have little impact on the critical periods of incubation and fledging.

Impacts on Secretive Marsh and Waterbirds

Resident waterbirds tend to be less sensitive to human disturbance than are migrants, and thus will be less impacted by disturbance from public use on the refuge. However, wading birds have been found to be extremely sensitive to disturbance in the northeastern U.S. and may be adversely impacted by disturbance from public use on the refuge (Burger and Gochfeld 1998). The impacts of intrusion through public use are generally negligible for this group of birds, but can vary by species and between years (Gutzwiller and Anderson 1999).

Disturbance to secretive marsh birds and waders from hunting would start in September and usually end in January, unless hunting is allowed during the snow goose conservation order into mid-April. This disturbance may have direct effects on migrating and wintering secretive marsh birds and waders. Due to the limited number of hunting days and the restricted hours, we expect the short-term, long-term and cumulative impacts to be negligible.

Impacts on Fisheries

Impacts to fisheries from visitors engaged in hunting are expected to be temporary and negligible. Since hunting occurs during the fall and winter months, any sediment suspension should not adversely affect biological oxygen demand (BOD) for fisheries resources. Effects on inter-jurisdictional fishes are expected to be unlikely from hunting because the majority of the refuge will experience minimal, transitory use by hunters.

Impacts on Mammals

In general, the presence of humans will disturb most mammals, which typically results in indirect negligible short-term adverse impacts without long-term effects on individuals and populations. Adverse impacts on resident game populations from hunting would be negligible.

VDGIF, under the direction of a Governor-appointed Board of Directors, is specifically charged by the General Assembly with the management of the state's wildlife resources. The Virginia Deer Management Plan, first completed in 1999 and revised in 2006, guides management of deer habitat, deer populations, damage caused by deer, and deer-related recreation in the Commonwealth. In 2012, 213,597 deer were reported killed by hunters in Virginia. This total included 96,712 antlered bucks, 18,061 button bucks, 98,781 does (46.3%), and 43 “unknown” deer. It is also 8% below the last 10-year average of 232,573. In Accomack County, an average of 3,056 deer per year are killed (see Table, 2008-2012 data).

Accomack County Deer Kills, 2008-2012

Year	Antlered Males	Male Fawns	Females	% Female	Unknown	Total
2008	1412	371	1924	51.9%	0	3707
2009	1225	249	1614	52.3%	0	3088
2010	1246	307	1740	52.8%	0	3293
2011	1007	263	1535	54.7%	2	2807
2012	923	212	1249	52.4%	0	2384

<http://www.dgif.virginia.gov/wildlife/deer/harvest/index.asp>

Population reconstruction computer models indicate that Virginia’s statewide deer population has been relatively stable over the past decade, fluctuating between 850,000 and 1,050,000 animals (mean = 945,000). <http://www.dgif.virginia.gov/wildlife/deer/management-plan/virginia-deer-management-plan.pdf>

Hunting resident game species, such as deer, on Chincoteague NWR and Wallops Island NWR will result in negligible impacts on their populations because of their restricted home ranges. The refuges also contribute negligibly to the state’s total harvest for resident game species.

Chincoteague NWR white-tailed deer harvest

2008/2009 – 23

2009/2010 - 20

2010/2011 - 15

2011/2012 - 27

2012/2013 - 26

Wallops Island NWR white-tailed deer harvest

2008 - 13

2009 - 15

2010 - 15

2011- 8

2012 – 11

The refuges harvested a total of 173 white-tailed deer over the past 5 years, with 37 in 2012. Given the exceptionally low numbers of animals harvested from the refuges in respect to the total statewide harvest and deer population, no cumulative impacts to local, regional, or statewide populations of white-tailed deer are anticipated from hunting of the species on the refuges.

CNWR recognizes the need for an overall Assateague Island deer and elk population estimate. Staff continues to collaborate with Assateague Island National Seashore to develop a protocol for data collection resulting in a deer and elk population estimation. Using past harvest data, VDGIF Wildlife Biologist, Todd Engelmeyer, estimated the Assateague Island, Virginia sika herd population size. Engelmeyer applied the Downing Population Reconstruction Model to 2007 and 2008 CNWR sika harvest data to produce a minimum population estimate. Downing population reconstruction “uses harvest-by-age data and backward addition of cohorts to estimate minimum population size over time” (Davis et al 2007). Results indicated a minimum population estimate of 644 sika (218 bucks, 426 does) in fall 2007 and 567 sika (181 bucks, 386 does) in fall 2008 (Todd Engelmeyer, VDGIF, pers. comm.). Note the Downing Population Estimate is based on harvest data, not survey data and the estimate only takes into account the Virginia portion of Assateague. The estimate does not consider the Maryland portion of Assateague Island nor hunter effort, skill, etc. Also, no prevention or control of epizootic hemorrhagic disease exists to date except by keeping populations below the carrying capacity of their habitats. Based on these considerations, it is anticipated that hunting would have short-term and long-term minor-to-moderate beneficial impacts on deer health and quality and habitat condition.

The continued aggressive management of the non-native sika population would have a beneficial impact on native white-tailed deer. As white-tailed deer compete with sika for habitat and food sources, the decreased sika population would reduce this competition. Deer impacts to ecosystems (e.g., forest regeneration, ground-dwelling birds) are a concern in certain areas with poor habitat and high deer populations. The VDGIF has implemented innovative programs such as the Deer Population Reduction Program (DPOP). The refuge manages sika population with DPOP. The 5-year (2008-2012) average of sika harvested from CNWR is 212, while white tailed deer averaged 22 annually.

Negative impacts from hunting on non-hunted mammals, such as voles, moles, mice, shrews, and bats, are expected to be negligible. Except for some species of migratory bats, these species have very limited home ranges and hunting would not affect their populations regionally. Impacts of hunting to migratory bat species would be negligible. These species are in torpor or have

completely passed through Virginia by peak hunting season in November through January. Vehicles are restricted to roads and harassment or taking of any wildlife other than legal game species is not permitted.

Impacts to Amphibians and Reptiles

The direct, indirect, and cumulative effects of hunting to amphibians and reptiles such as snakes, skinks, turtles, lizards, salamanders, frogs, and toads are expected to be negligible. Hibernation or torpor by cold-blooded reptiles and amphibians limits their activity during the hunting seasons for deer, and migratory game birds, when temperatures are low and hunters would rarely encounter them during most of the hunting season.

Impacts to Invertebrates

Impacts to invertebrates such as butterflies, moths, other insects, and spiders are expected to be negligible. Invertebrates are not active during the majority of the hunting seasons and would have few interactions with hunters during the hunting season.

Impacts on Public Use and Access

Refuge lands allow the public to enjoy hunting at no or little cost in a region where private land is leased for hunting, often costing a person several hundred to several thousand dollars per year for membership. Refuge hunting programs also make special accommodations for mobility-impaired hunters. Hunting provides opportunities to experience a wildlife-dependent recreational activity, instills an appreciation for and understanding of wildlife, the natural world and the environment, and promotes a land ethic and environmental awareness. Visitors interested in hunting would find high quality opportunities to engage in their favored pastime.

The refuge would also be promoting a wildlife-oriented recreational opportunity that is compatible with the purpose for which the refuge was established. The public would have an increased awareness of the refuge and the Refuge System and public demand for more areas to hunt and learn about wildlife would be met. The hunting program provides an administratively simple program that balances other public use activities. The program supports Presidential Executive Order #13443: Facilitation of Hunting Heritage and Wildlife Conservation, regional directives, and parallels State hunting regulations. In addition, it provides seasonal closures to minimize wildlife disturbance and/or avoid conflicts with other uses, enhances disabled hunting opportunities, further develops an appreciation for fish and wildlife, and expands public hunting opportunities.

As the majority of big game hunting will take place north of the major public use area and will occur after the high visitation summer season, little conflict with other refuge visitation is expected.

However, limited hunting will occur within the major public use area, requiring the closing of some trails to the general public. In order to minimize conflicts, selected hunting zones will be

limited to half-day hunts. To accommodate hunters confined to wheelchairs, hunt zone(s) will be closed to the general public daily, throughout the hunt. Closures within the major public use area will be heavily signed and patrolled to alert non-hunters of the ongoing big game hunt. In addition, allowing firearms hunting only from Monday through Friday and not on the weekends will further reduce conflicts with other refuge visitors.

Other Past, Present, Proposed, and Reasonably Foreseeable Actions and Anticipated Impacts

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, viewed as a whole, become substantial over time. The hunt plan has been designed to be sustainable through time given relatively stable conditions.

Anticipated Impacts if Individual Actions are Allowed to Accumulate

The cumulative impact of hunting on migratory and resident wildlife populations (white-tailed deer and sika) at Chincoteague NWR is negligible. The proportion of the refuge's harvest of deer is negligible when compared to local, regional, and state populations and harvest.

Because of the setting of hunting seasons largely outside the breeding seasons of resident and migratory wildlife, the ability of individual refuge hunt programs to adapt refuge-specific hunting regulations to changing local conditions, and the wide geographic separation of individual refuges, we anticipate no direct or indirect cumulative effects on resident wildlife, migratory birds, and non-hunted wildlife of hunting on Chincoteague NWR.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague National Wildlife Refuge CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The refuge will manage the hunt program in accordance with Federal and State regulations and review it annually to ensure wildlife and habitat goals are achieved and that the program is providing a safe, high quality hunting experience for participants.

To ensure compatibility with refuge purposes and the mission of the Refuge System, hunting can occur on the refuge if the refuge-specific regulations highlighted in this document and following stipulations are met:

- This use must be conducted in accordance with State and federal regulations, and special refuge regulations published in the refuge Hunting Regulations brochures.
- This use is subject to modification if on-site monitoring by refuge personnel or other authorized personnel results in unanticipated negative impacts to natural communities, wildlife species, or their habitats.
- Law Enforcement Officer(s) will promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions. Law Enforcement personnel will monitor all areas and enforce all applicable State and Federal Regulations.
- Several management strategies identified by Klein (1989) can be used to control the negative effects of recreation on wildlife; these included: permits, user fees, zoning (Cullen 1985), travel ease, public education (Purdy et al. 1987), limiting number of visitors present, and periodic closing. Chincoteague NWR employs these measures to lessen the disturbance and impact to wildlife.
- Big game hunting, using firearms, will continue to be permitted on about 5,200 acres of the 13,682 acre refuge, or 38% of the total area; other areas will remain closed to this activity.
- Big game hunting will continue to be by permit only, with all successful hunters being required to register at the refuge game check station.
- The archery hunt will begin in early October in order to avoid the major migration period.
- The refuge manager may, upon annual review of the hunting program and in coordination with VDGIF, impose further restrictions on hunting. Further restrictions may include but are not limited to recommending that the refuge be closed to hunting or further liberalize hunting regulations. Hunting restrictions may be imposed if hunting conflicts with other, higher priority refuge programs, endangers refuge resources, or public safety. Specific hunt details will be outlined in the annual hunt program.

JUSTIFICATION:

Hunting is a priority wildlife-dependent use for the Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). USFWS policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management.

Hunting seasons and limits are established by the Commonwealth of Virginia and generally adopted by the refuge. These restrictions ensure the continued well-being of overall populations of game animals. Hunting does result in the taking of many individuals within the overall population,

but restrictions are designed to safeguard an adequate population from year to year. Specific refuge regulations address equity and quality of opportunity for hunters, and help safeguard refuge habitat. Disturbance to other fish and wildlife does occur, but this disturbance is generally short-term and adequate habitat occurs in adjacent areas. Loss of plants from foot traffic is minor, or temporary, since hunting occurs mainly after the growing season.

Conflicts between hunters are localized and are addressed through law enforcement, public education, and continuous review and updating to State and refuge hunting regulations. Conflicts between other various user groups are minor given the season of the year for hunting, the location of most hunting away from public use facilities, and seasonal area closures.

Big game hunting is conducted to maintain populations at a level compatible with refuge habitat, reduce the exotic sika population to lessen competition with native white-tailed deer, and to provide the general public with quality hunting. Without a method to reduce the big game populations on Assateague Island, overpopulation would occur, followed by a reduction in the quality of the habitat, and a reduced herd size due to disease and starvation. A public hunt is the most feasible alternative at this time to accomplishing a reduction in the herd size.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature)

(Date)

CONCURRENCE:

Regional Chief: _____
(Signature)

(Date)

MANDATORY 15 YEAR RE-EVALUATION DATE: _____

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COMPATIBILITY DETERMINATION

USE:

Grazing of Chincoteague Ponies

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is grazing of Chincoteague ponies. The grazing program on the refuge allows up to 150 adult Chincoteague ponies, a registered breed and owned by the Chincoteague Volunteer Fire Company (CVFC), a 501c3 nonprofit organization, to graze within two separate compartments on the refuge. In 2013, an Interim Pony Management Plan was developed as part of the draft CCP/EIS to provide guidance and set short term management objectives for this use. This is not a priority public use.

(b) Where would the use be conducted?

The horses are allowed to graze on approximately 3,946 acres. The current grazing program includes two compartments: the southern compartment which contains 547 acres and the northern compartment which has 3,399 acres. The southern compartment consists primarily of salt marsh with a limited amount of shrub/scrub and upland pine forest. USFWS allows the grazing of up to 50 adult Chincoteague ponies in this unit. This compartment is the primary public viewing area for the Chincoteague ponies. The northern compartment is a mix of salt marsh, brackish water areas, scrub/shrub, pine forest and maritime forest. USFWS allows the grazing of up to 100 adult Chincoteague ponies in this unit. However, if necessary during the winter months, ponies from the southern compartment may be moved to the north compartment for animal safety and welfare.

The compartments were established to keep the ponies off the beach and dune areas and some of the major moist soil management units, as well as separating them from the visiting public for safety reasons. The maximum number of ponies allowed has remained constant at 150 adult animals since the initial permit was issued in the 1940s. Any recruitment above that number is removed each summer.

(c) When would the use be conducted?

The grazing program is conducted year round.

(d) How would the use be conducted?

A Special Use Permit (SUP) for grazing is annually issued to the CVFC at the start of the new fiscal year. Prior to the signing of the new SUP, the Refuge Manager will meet with the Pony Committee Chair for the CVFC and discuss changes or updates to the proposed SUP. Once agreement has been reached as to the content of the SUP, the Pony Committee Chair will submit the proposed SUP to the CVFC Pony Committee and then the full CVFC membership. Once approved, the SUP will be signed by the Refuge Manager and the Pony Committee Chair and/or the President of the CVFC. Additional meetings with the CVFC Pony Committee are held to organize volunteer work details and/or round-up events.

As stated, the ponies are contained by either fencing or natural barriers, such as the Assateague Channel. The fire company is required to keep the ponies within the grazing units and to repair the fence as needed with the assistance of refuge personnel. The roundups are conducted by the CVFC members on horseback. Both the spring and fall roundups take two days to complete. The summer event(s) (round-up, penning, sunrise walk down the beach, swim, auction, and return) is a one week event. This week long event takes place in the last week of July in which the Wednesday and Thursday fall within the month of July. This provides consistency in long range planning efforts for the CVFC, the refuge, Town of Chincoteague, Chamber of Commerce, and tourism related agencies.

(e) Why is this use being proposed?

The grazing of the Chincoteague ponies, by the CVFC, has been an ongoing use since the 1920s, nearly 20 years prior to the refuge's establishment. The proposal being reviewed is a continuation of that use. However, a brief history is instrumental in understanding this use.

Domestic livestock grazing has long been a part of Assateague Island's history from the time the Eastern Shore was settled during the early 1600's. Early accounts of grazing horses and other livestock (sheep, goats, cattle, etc.) on barrier islands indicate this was a common and widespread practice all along the Atlantic Coast. Periodic roundups and so called "pennings" were often held to determine ownership and to count and sell excess or unwanted stock. In the mid 1920's the CVFC purchased horses/ponies from the estate of Joseph S. Pruitt, an oysterman from Greenbackville, Virginia. The first annual pony roundup and swim conducted by the CVFC was in 1925. Fire company members, later dubbed "Saltwater Cowboys," herded the ponies to the Assateague Channel and swam them to nearby Chincoteague Island for auction.

With the creation of the Refuge in 1943, USFWS granted a permit to livestock owner, Wyle Maddox, to graze cattle and horses on designated portions of the island (Narrative Report (NR) 1943). In 1946, USFWS issued the CVFC a Special Use Permit (SUP) for grazing no more than 150 head of horses (NR 1946). These animals (domestic animals and horses) were allowed free range of the entire refuge. Between 1946 and 1952, both permits were in effect; however, in 1953 the only grazing permit issued was to the CVFC. This permit was renewed annually and is currently in place, although the conditions of the permit have changed considerably over the years. Since the late 1950's, a number of attempts have been made to fence the ponies out of the most sensitive wildlife areas. The latest attempt, which continues to the present, was begun in 1989, when the fences around the two compartments were redone in order to more adequately contain the ponies.

Foals of the year are sold at auction and are not included in count of adult horses. This activity includes three roundups each year with the annual pony penning and swim in July. The historical details of the grazing program are covered in the 1990 Pony Management Plan (as amended in

1995). Additionally, this program was evaluated in the 1992 Final EIS and the 1993 Chincoteague NWR Master Plan. This use was subsequently considered compatible in two compatibility determinations approved in 1994 and 2004.

In 1947, the Chincoteague ponies reaped national and international attention with Marguerite Henry's children's classic, *Misty of Chincoteague*. The later movie version in 1961 further heightened the popularity of the authentic island pony and its lineage. To children and adults, "Misty of Chincoteague" is an iconic symbol of the spirited ponies freely roaming on Assateague Island.

The Assateague Island recreational beach, the ponies, and the Refuge are the Town of Chincoteague's and Accomack County's major tourist attractions. Every year the Refuge experiences between 1.2 and 1.5 million visits. This makes the Refuge one of the top five most visited National Wildlife Refuges in America. Due to Refuge related tourism, over \$100 million dollars is spent in the regional economy for lodging, meals, gasoline, souvenirs, recreation, and other items.

In 2010, the town completed a visitor survey. Eighty percent (80%) of Chincoteague visitors selected Assateague Beach as their top destination. Viewing the wild ponies consistently ranked among the top three activities most important to visitors.

By allowing the uses described in this determination, the visiting public, who might come just to see these world famous ponies, will also be exposed to natural resource related subjects and therefore, will have a better understanding and appreciation for wildlife, the cultural history of the refuge, and the importance of the Refuge System. Therefore, the draw of the Chincoteague ponies will positively contribute to the achievement of Refuge System and refuge purposes.

AVAILABILITY OF RESOURCES:

The CVFC owns and manages the Chincoteague ponies and is responsible for the health and well being of the ponies including, but not limited to: veterinarian services, supplemental watering and feeding, rounding-up horses that escape their pastures, opening gates/fences when large coastal storm threaten, and oversight of the three round-ups and the pony swim.

Additionally, CVFC jointly coordinates efforts with refuge staff to identify and conduct maintenance and replacement projects for gates and fence lines, clearing of down trees and limbs from fence lines, repair of corrals, and other pony related management and/or maintenance projects.

The refuge will provide the posts, barbed wire, and gates needed to maintain the approximate 13 miles of fence line that contains the Chincoteague ponies in the two pasture areas. This

expenditure is undertaken by USFWS to limit its exposure for possible litigation. Federal Courts have held that the government should compensate private individuals "...for the value of the improvements that they had constructed on lands covered by their grazing permits...." (Rusk 2008). The word "their" in this sentence refers to government agencies. The estimated cost for materials to replace 1 mile of three strand barbed wire fence is \$3,500. Annual costs to USFWS are estimated at \$65,000.

Additionally, staff time is devoted to issuing the permit, assisting with fence repair and maintenance, crowd control during pony round-ups, and ensuring compliance with the special conditions. The refuge is very fortunate to attract individuals and groups from around the country that wish to conduct volunteer service at the refuge, and these volunteers are often employed to help with fence and gate maintenance projects.

Within the annual refuge operations and maintenance budget, there is sufficient staffing and funding available to accomplish these tasks encompassed by this use.

ANTICIPATED IMPACTS OF THE USE:

Numerous studies have been conducted and articles written on the effect of grazing on marshes. Some of these studies have been specific to Assateague Island and even to the refuge. Depending on the study, one can find both positive and negative effects of grazing on marshes. Several studies have shown that grazing could have a stimulating effect on grass production (McNaughton, 1979; Hubbard, 1970; Chabreck, 1968; and Ranwell, 1961. McNaughton (1979) found that production of grasses increased up to an optimal level of grazing then declined when subjected to overgrazing. Bakker (1985) determined that grazing of a salt marsh lead to enhanced species diversity, due to the removal of litter. However, Wood (1980) found that the net primary productivity of the marsh on a barrier island in North Carolina was reduced by heavy grazing, but that the exploitation of the salt marsh was not exceeding productivity. Rubenstein et al (1976), working in the same location as Wood, indicated that grazing had no significant effect on above ground biomass but did on the below ground biomass in marsh areas. Turner (1987), in studying grazing on a barrier island in Georgia, indicated that the abundance of the periwinkle snail was reduced due to grazing and that grazing had a substantial impact on the standing stocks of *Spartina*. Turner (1988), in another study on the same island, determined that the horse population should be maintained at a level to prevent excessive damage to the salt marsh. Zervanos (1978), working on Assateague Island, found little evidence to demonstrate adverse effects from pony grazing on the Maryland end of the island. Keiper (1981) determined that grazing on the refuge may stimulate additional plant growth, although the vegetation may be shorter but denser; he discovered that more growth was exhibited in the grazed versus un-grazed sites.

Since the ponies are allowed to graze within migratory bird habitat, impacts are likely to occur. Pony grazing on the natural marshes and within moist soil management units can lessen the amount of food and cover available to migratory birds. The value, of areas of the marsh which may be heavily grazed, is less for migratory birds, such as rails and black ducks which utilize this habitat. Nests of ground nesting birds, such as willets, quail, shorebirds, etc. are in danger of being trampled if the nesting occurs within the grazing compartments. Based on the research cited in this determination, some habitat may actually be improved, while others are negatively impacted.

The National Park Service (2009) published a Finding of No Significant Impact - Environmental Assessment of Alternatives for Managing the Feral Horses of Assateague Island National Seashore. In this document the NPS determined that "...Scientific studies have found that the horses can disrupt important native plant communities, such as salt marsh wetlands, by reducing plant vigor, changing species composition, and altering marsh structure and morphology. This, in turn, can reduce the ecological functionality of those communities and their value as habitat for native fauna, thereby limiting biodiversity. Horse grazing has been shown to also harm rare species, including the beach-dwelling threatened species *Amaranthus pumilus*, by dramatically reducing seed production and limiting the plant's reproductive potential. Natural processes essential to maintaining a healthy barrier island ecosystem have also been affected by a too-large horse population. Favored by horses, the intensive grazing of American beach grass (*Ammophila brevigulata*) has been demonstrated to alter the processes of dune formation and stabilization. Collectively, the results of a broad array of research indicate that the recommended limit of 150 horses has failed to protect the other natural resources and values of Assateague Island. ..." Additionally, as part of its research efforts, the NPS determined that a feral horse population maintained in the range of 80-100 would best sustain both herd and ecosystem health.

Research now indicates that the Mid-Atlantic coastline is experiencing a rate of sea level rise that is second only to that of the Louisiana and Texas wetlands/coastline along the Gulf of Mexico. Delissa Padilla Nieves, (2009), conducted a Sea Level Affecting Marsh Model (SLAMM) analysis for the lower Delmarva Peninsula. The results of that modeling revealed an overall loss of approximately 57% of the salt marsh by the year 2100 under a 1 meter sea level rise scenario. Most of the grazing area within the southern compartment (547 acres) consists primarily of salt marsh. In the northern compartment (3,399 acres) much of this unit is also salt marsh, but it does have a more upland shrub/scrub and pine forest component. Over the term of this CD (10 years) conversion of salt marsh habitat to mud flats or open water is expected to be less than significant.

Since the establishment of the refuge, the actual amount of grazing on the refuge has been reduced from two grazing permits to only one, with the number of animals being reduced by half in the early 1950's when the second permit was discontinued. Additionally, restrictions have also been added to reduce any possible impacts to the migratory bird habitat. Since the early 1950's,

the number of ponies has been fairly constant at around 150 adult animals; therefore, their impacts can be considered to be fairly constant. However, continued grazing by Chincoteague ponies in the salt marshes of the two grazing compartments is expected to reduce and/or eliminate the accumulation of detritus (decaying vegetation). This buildup of decaying vegetation is thought to be vital if salt marsh root systems are to keep pace with rising sea levels. Reducing grazing pressure on the salt marsh is consistent with CVFC's goal of maintaining a viable healthy population of Chincoteague ponies on the refuge. Although not mandated, we believe maintaining the Chincoteague pony population at or below its current number of 135 animals, in lieu-of 150, over the next 10 years is important in maintaining a balanced approach to pony grazing in the light of a changing climate.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The Chincoteague Volunteer Fire Company will be required to adhere to the special conditions contained in the Special Use Permit which allows the grazing and must be consistent with provisions of the Pony Management Plan in order for this activity to remain compatible. The special conditions include:

1. This permit authorizes the use of the Chincoteague NWR for the grazing of Chincoteague Ponies (ponies) only. Ponies are authorized only within the permitted pasture/habitat units (i.e. North and South Pony Management Areas, see attached map.) The herd numbers will not exceed that allotted (150) for such grazing, unless permission is granted by Refuge Manager for extenuating circumstances (i.e. weather, tidal flooding, etc.) Permittee is solely responsible for ensuring the ponies are in compliance with these conditions. Failure to comply may result in cancellation of grazing privileges, the imposition of administrative fees and/or legal charges.
 - a. Permittee has one week to return ponies to permitted compartments once notified by the Refuge Manager; an additional week may be granted based on adequate justification. Ponies that

habitually get out of permitted compartments will be removed from the refuge until the fence is repaired or escape is blocked.

b. Ponies will be promptly returned to their assigned grazing units after the annual July round-up and auction.

2. The permittee is responsible for the maintenance of all assigned fences, including repair of damage caused by tidal flooding and other acts of nature. The U.S. Fish and Wildlife Service will purchase all post and fencing materials necessary for scheduled maintenance and repairs of fence lines. The permittee, in concert with the Refuge Manager, will develop a fence replacement and repair schedule/plan that stipulates the replacement of fence lines for a period of 10 years. The permittee will work in concert with the Refuge Manager for the scheduling of joint fence maintenance activities.

3. The permittee will designate individuals authorized to assist in management activities for the Chincoteague pony herd and will supply a list to the Refuge Manager within 30 days after issuance of the Special Use Permit. The top four names will be authorized to take action in the event of an emergency, if the Pony Committee Chairman is not available. Additionally, the permittee will provide the Refuge Manager a list of volunteers and helpers assigned to Pony Committee activities (round-ups, feeding and watering, etc.).

4. The permittee will provide the name and phone number of a contact veterinarian in case of emergency. CNWR will contact the permittee in case of an emergency, but should the permittee fail to respond within 12 hours, CNWR will initiate veterinarian services and the permittee will be responsible for all charges. Permittee will comply with all Commonwealth of Virginia and US Department of Agriculture livestock health laws.

5. Pony penning activities are allowed for herd size management. Additional stipulations apply and are identified in the 2013 Interim Pony Management Plan and Special Use Permit.

6. The permittee is responsible for conduct of members of work parties while on the refuge. Consumption of alcoholic beverages is not allowed on the refuge.

7. The permittee after each round-up (spring, summer and fall) will provide the Refuge Manager a written report stating the number of ponies present on the refuge. The report at a minimum will provide the number of adult females and males found in individual grazing units (north and south.) Stock present in excess of the maximum allowable as of November 1 will be removed from the refuge within 30 days. Animals in excess of the maximum allowable after 30 days will subject the permittee to appropriate administrative and legal action.

8. The Refuge Manager reserves the right to amend or modify this permit if conditions and management considerations dictate. The Chairman of the Pony Committee will be notified prior to any anticipated changes in this permit.

JUSTIFICATION:

The Chincoteague ponies are important assets to the local communities, evoking a meaningful sense of place and generating both economic and environmental benefits.

The Chincoteague ponies have long been a part of Assateague Island's history from the time the Eastern Shore was settled during the early 1600's through today. In 1947, the Chincoteague ponies reaped national and international attention with Marguerite Henry's children's classic, *Misty of Chincoteague*. The later movie version in 1961 further heightened the popularity of the authentic island pony and its lineage. To children and adults, "Misty of Chincoteague" is an iconic symbol of the spirited ponies freely roaming on Assateague Island.

The Assateague Island recreational beach, the ponies, and the Refuge are the Town of Chincoteague's and Accomack County's major tourist attractions. Every year the Refuge experiences between 1.2 and 1.5 million visits. This makes the Refuge one of the top five most visited National Wildlife Refuges in America. Due to Refuge related tourism, over \$100 million dollars is spent in the regional economy for lodging, meals, gasoline, souvenirs, recreation, and other items.

In 2010, the town completed a visitor survey. Eighty percent (80%) of Chincoteague visitors selected Assateague Beach as their top destination. Viewing the wild ponies consistently ranked among the top three activities most important to visitors.

By allowing the uses described in this determination, the visiting public, who might come just to see these world famous ponies, will also be exposed to natural resource related subjects and therefore, will have a better understanding and appreciation for wildlife, the cultural history of the refuge, and the importance of the Refuge System. Therefore, the draw of the Chincoteague ponies will positively contribute to the achievement of Refuge System and refuge purposes.

Past studies by USFWS confirm that controlled livestock grazing can be beneficial to some vegetative communities by increasing vigor of perennial grasses, speeding recycling of nutrients, increasing production of vegetation, preventing the decline and death of plants due to lodging and build-up of old plant material, and accomplishing the effect of burning without leaving soil severely exposed (Service 1987).

On a rotational basis, the refuge undertakes mowing, disking and at times prescribed burning of impoundments to set back succession and maintain a healthy vigorous plant community. Refuge

staff propose introducing a specified number of ponies (to be determined) into the impoundments (Pools A, B North , C, D, and E) for a specified period of time. This will provide rotational disturbance to the plant communities without the use of fossil fuels.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established. In addition, this activity will contribute to one or more purposes of the refuge or Refuge System.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE: _____

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COMPATIBILITY DETERMINATION

USE:

Horseback Riding

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act).

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is recreational horseback riding on Chincoteague NWR, on Assateague Island, Virginia. Horseback riding is not a priority public use; however, it does facilitate wildlife observation and photography.

(b) Where would the use be conducted?

Horseback riding will be conducted along the southernmost Atlantic ocean beachfront of Assateague Island.

Upon completion of the CCP but prior to the relocation of the recreational beach, from March 15 to September 15, the area south of the recreational beach parking area is closed.

From September 16 to March 14, the horseback riding and OSV zone will again start at the southern terminus of the National Park Service assigned area/recreational beach parking areas then south along the Atlantic Ocean beachfront to Fishing Point on Toms Cove Hook, then returning by the same route. The approximate linear distance of beachfront open to OSV use at this time of year is 4.5 miles one way, 9 miles round trip. Travel will generally be within the intertidal zone, unless horseback riders and vehicle drivers are re-directed by signage to avoid sea turtle nest sites; horseback riding and vehicles are prohibited from the dunes or vegetated areas.

(c) When would the use be conducted?

Upon completion of the CCP but prior to the relocation of the recreation beach, horseback riding will mimic the opening and closing of the OSV Zone:

- Overwash and Toms Cove Hook Area - Open from September 16 to March 14. Horseback riding will be permitted along the beachfront ending at the south tip of Assateague Island known as "Fishing Point";
- If unfledged shorebirds remain in the OSV zone after September 15, the refuge manager will designate a closed area to protect these birds;
- The refuge manager may close the OSV zone at anytime for safety or security reasons.

Horseback riding will be permitted during normal refuge hours of operation which are:

- May through September: 5 a.m. to 10 p.m.;
- October: 6 a.m. to 8 p.m.;
- November through March: 6 a.m. to 6 p.m.;
- April: 6 a.m. to 8 p.m.

(d) How would the use be conducted?

In cooperation with the National Park Service the Refuge will develop maps and brochures that detail the specific routes of travel and any regulations that those engaged in horseback riding

must adhere to. A check-in and check-out box will be located conveniently at the start of the trail so that horseback riders can sign-in and obtain current brochures, maps and any updates on closed areas or beachfront conditions.

The refuge, in conjunction with NPS, will be responsible for all routine maintenance activities and law enforcement within the area established for this use. Refuge staff will post nesting areas for the protection of endangered species (i.e. sea turtles) as well as informing riders of any special restricted areas.

(e) Why is this use being proposed?

Horseback riding has a long history on Assateague Island. Even before the establishment of the refuge in 1943, horseback riding was the preferred way of rounding-up livestock that was allowed to free range on the island. During World War II the United States Coast Guard patrolled the Assateague Island shoreline by horseback looking for German U-boats or evidence of human activity on the beach. However, recreational horseback riding has always been a favorite pastime of local/county residents and has been permitted with varying degrees of restrictions since the establishment of the Refuge.

Historically, horseback riding was allowed on the Beach Road, Spur Road to the OSV zone and, depending on the time of year, the area of Toms Cove Hook that was open to off road vehicle use and along a small section of Tom's Cove beyond the Coast Guard Station. Since the writing of the last CD for horseback riding (2004,) horseback riders have parked their trailers at or near the southern terminus of the NPS assigned area and have accessed the horseback riding area/OSV Zone from that location. In 2012, approximately 140 riders participated in this activity. This use has remained very low over the years, with the vast majority of this use taking place in the beachfront area of the OSV zone.

AVAILABILITY OF RESOURCES:

The resources necessary to provide and administer this use, at current levels, is available within current and anticipated refuge budgets. Staff time associated with administration of this use is minimal. Since all of this activity takes place in an area that is currently administered as the OSV Zone, which has a much larger volume of traffic/use, administering this use will be a minor duty in the oversight of the OSV use.

ANTICIPATED IMPACTS OF THE USE:

Wildlife Impacts

Studies that have been conducted elsewhere show that horseback travel can cause disturbances to wildlife. Disturbances vary with the wildlife species involved and the type, level, frequency, duration and the time of year such activities occur. Whittaker and Knight (1998) note that wildlife response can include attraction, habituation and avoidance. The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, terns and wading

birds on the Refuge. Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Disturbance can cause shifts in habitat use, abandonment of habitat and increase energy demands on affected wildlife (Knight and Cole 1991). Flight in response to disturbance can lower nesting productivity and cause disease and death. Knight and Cole (1991) suggest recreational activities occurring simultaneously may have a combined negative impact on wildlife. Hammitt and Cole (1998) conclude that the frequent presence of humans in a wildland area can dramatically change the normal behavior of wildlife mostly through unintentional harassment. Horseback riders would tend to present some of the same potential impacts as pedestrians. However, since this use will not be allowed during the nesting season no impact to nesting shorebirds is expected.

Besides possible direct disturbance, horseback riding can lead to soil compaction, which could have detrimental effects on invertebrates using the area and therefore limit the amount of forage for shorebirds. However, since this activity occurs mostly in the intertidal zone, the addition of horses is not expected to cause any additional serious consequences to migratory birds, as the result of soil compaction. Due to the limited amount of this activity and the closures in place to restrict this use, overall disturbance is expected to be minimal. Anticipated impacts of horse use on wildlife include temporal disturbances to species using refuge habitats open to horseback riding. These disturbances are likely to be short term and infrequent based on current levels of use. Routes found compatible for horseback riding are located in the OSV Zone on the refuge. Smaller more sensitive wildlife habitat such as riparian, wetland and grassland areas are closed for this use. Based on current observations by Refuge Law Enforcement Officers and other refuge staff existing levels of use are not anticipated to significantly increase wildlife habitat fragmentation or cause significant impacts through disturbance.

Impacts to plants

Under all development scenarios, approximately 96% of the horseback riding will take place along the Atlantic Ocean beachfront below the high tide zone. This area is devoid of vegetation. It is anticipated however, that allowing this use will have minimal impact to vegetation near parking area assigned for horse trailer parking. Current plant communities that occur in these areas are not rare or highly sensitive to disturbance based on available information. Through the development of brochures, maps, and established travel corridors we will minimize the impacts to vegetation along the entire horseback riding/OSV zone.

Invasive Species

Exposed soil and an abundance of sunlight along roads and trails provide ideal conditions for the establishment of invasive plant species. The known incidence of invasive plant species is relatively low on the Refuge. Based on current levels of use it is anticipated that no significant increases in invasive plant species will occur as a result of this use. In addition, the saline environment of the area helps prevent the establishment of invasive plants from seeds found in the fecal excrement of horses.

Threatened and Endangered Species

Two Federal threatened species found on the refuge could be affected by this activity. Piping plovers (*Charadrius melodus*) which use the refuge can be impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Other studies have shown that if pedestrians cause incubating plovers to leave their nests, the eggs can overheat (Burgstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993). Horses have the potential to cause some of the same impacts but the seasonal closure of the horseback riding and OSV Zone will prevent any disturbances to nesting piping plovers. It is anticipated that recreational horseback riding will not cause any direct or indirect impacts to nesting or migrating piping plovers due to the minimal nature of this use and the seasonal closures of nesting areas.

Seabeach amaranth (*Amaranthus pumilus*) is a small annual dune plant native to barrier island beaches of the Atlantic coast. It is currently listed as a Federal threatened species. Germination takes place over a relatively long period of time, generally from April to July. Flowering begins as soon as plants have reached sufficient size, sometimes as early as June, but more typically commencing in July and continuing until the death of the plant in late fall. Seed production begins in July or August and reaches a peak in most years in September but continues until the death of the plant. It is a "pioneer species," growing on newly created dunes, over wash fans and other areas of bare sand. Intensive recreational use of beaches threatens amaranth populations in some instances. Pedestrian traffic, even during the growing season, generally occurs in areas where it has little effect on populations of seabeach amaranth. Any impacts by recreational horseback riders will be similar to those of OSV use since they will occur in the same area under the same rules and regulation of OSV use.

Unregulated, OSV use and by extension horseback riding on the beach during the growing season could have detrimental effects on the species if those uses are not routed around the plants (Weakley and Bucher 1991). The fleshy stems of this plant are brittle and easily broken. Therefore, even minor beach traffic (OSV and horseback riding) over the plants during the growing season is detrimental, causing mortality and reduced seed production (Weakley and Bucher 1991). Dormant season OSV use has shown little evidence of significant detrimental effects, unless it results in massive physical erosion or degradation of the site. In some cases, winter OSV traffic may actually provide some benefits for the species by setting back succession of perennial grasses and shrubs with which seabeach amaranth cannot compete successfully (USFWS 1996). Extremely heavy use of an *Amaranthus* site, even in the winter, may have some negative impacts including pulverization of seeds. No negative impacts are anticipated to seabeach amaranth by horseback riding.

User Conflicts

Conflicts between trail users are commonly reported in the literature (Knight and Gutzwiller 1995, Ramthun 1995, Watson et. al 1994, Chavez et al. 1993). Conflicts range from concerns over personal safety to certain user groups feeling that they should be given priority over other groups based on a past history or other reasons. In the best professional opinion of the refuge law enforcement officers obtained from observation and direct contact, no significant user conflicts have been reported on the refuge.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

_____ Use is Not Compatible

 X Use is Compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Klein (1989) identified several management strategies used to control the negative effects of recreation on wildlife; these included: user fees, travel ease, permits, zoning (Cullen, 1985), public education (Purdy 1987), limiting number of visitors present, and periodic closing. Chincoteague NWR employs measures such as:
 - 1) Charging an entrance fee
 - 2) Develop informational brochures and maps
 - 3) Developing rules and regulations that govern horseback riding
 - 4) Specify areas open or closed to horseback riding
 - 5) Protecting and marking sea turtle nest and sea beach amaranth plants
 - 6) Conducting routine law enforcement patrols
- Horseback riding will be permitted from established parking area(s) and corridors and then along the beachfront/intertidal zone. This area will be subject to the same conditions and closures as the OSV zone as they apply:
 - 1) Sand dunes and vegetated areas are considered closed, even within OSV zone.
 - 2) Horseback riders must stay to the east of the black and white post
 - 3) Horseback riding is permitted
 - May through September: 5 a.m. to 10 p.m.;

- October: 6 a.m. to 8 p.m.;
 - November through March: 6 a.m. to 6 p.m.;
 - April: 6 a.m. to 8 p.m.
- 4) Litter or waste may not be burned, buried or discarded but must be removed and disposed of in designated receptacles located outside of OSV Zone.
- 5) The OSV/Horseback riding zone will be subject to partial or total closure to all OSV, horseback riding, boat, and pedestrian use during the piping plover nesting season.
- 6) Horseback riding is allowed east and south of the designated black and white OSV posts along the intertidal area and terminates at Fishing Point the western tip of Toms Cove Hook.
- 7) This activity will be limited to times when this area is open to OSVs.
- 8) Upon completion of the CCP, horseback riding will mimic the opening and closing of the OSV Zone.
- September 16 to March 14, it will be permitted along the beachfront ending at the south tip of Assateague Island known as “Fishing Point.”
 - After September 15, if unfledged shorebird chicks remain in the OSV zone the refuge manager will designate a closed area to protect those chicks.
- 9) Prior to opening of the OSV and horseback riding zone, locations of seabeach amaranth plants and sea turtle nests will be identified by refuge staff. All seabeach amaranth plants and sea turtle nests found by refuge staff will be protected with wire mesh fencing similar to predator exclosures used for piping plover nests. Fences provide additional protection from being crushed by either OSVs or horses.

JUSTIFICATION:

Although horseback riding is considered a nonwildlife-oriented form of recreation, it does facilitate wildlife observation and photography. Use is low and occurs in an area used by OSVs which results in very little additional disturbance.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

SIGNATURE

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE:

LITERATURE CITED

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COMPATIBILITY DETERMINATION

USE:

Research and Studies Conducted by Outside Agencies, Universities, and Organizations

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is research conducted by other than U.S. Fish and Wildlife Service (USFWS) personnel on the refuge. Research conducted by non-USFWS personnel is not a priority public use of the Refuge System; however, it assists in answering questions that are relevant and contribute to refuge management decisions. In addition, research activities based on needs identified and prioritized by in partnership with others will support the landscape level conservation needs identified by the Landscape Conservation Cooperatives (LCC). Monitoring and research are an integral part of refuge management. Plans and actions based on thorough research and consistent monitoring provide an informed approach to the effects of management on wildlife and habitat.

(b) Where would the use be conducted?

The Chincoteague NWR is located primarily in Accomack County, Virginia with approximately 418 acres in Worcester County, Maryland. Most of the 14,032-acre refuge is located on the southern end of Assateague Island (9,021 acres), a 37-mile long, mid-Atlantic, coastal, barrier island on the east side of the Delmarva Peninsula. In addition, the refuge operates three divisions that are located on islands which, including Assateague Island, extend over 30 miles along the Atlantic Coast. Assawoman Island Division contains 1,434 acres and encompasses the entire island; Metompkin Island Division consists of 174 acres on the north end of the island; and Cedar Island Division contains 1,412 acres in fee title and 600 acres in easements. Additional lands can be found on the north end of Chincoteague Island: Wildcat Marsh (546 acres) and Morris Island (427 acres), which is located between Chincoteague and Assateague Islands.

The location of the use will depend on the research project that is being conducted. A research project may be limited to a particular species or habitat type. Some research projects involve a combination of different habitats and species. The research location will be limited to the areas which are necessary to conduct the research project, and that do not create a significant negative impact to refuge operations and wildlife use.

(c) When would the use be conducted?

The timing of the research will depend on the project which is being conducted. Research will be allowed to occur on the refuge throughout the year. Individual research projects may require one or two visits to the refuge while other projects may require daily visits to a study site. The timing of each research project will be limited to the minimum required to complete the project.

(d) How would the use be conducted?

The methods of research will depend upon the research project which is conducted. Methods of each research project will be reviewed by staff before data collection will be allowed to occur on the refuge. No research project will be allowed to occur if it does not have an approved scientific method or if it compromises public health and safety.

Each request for this use will be considered, and if appropriate, will be issued a Special Use Permit (SUP) by the refuge manager. Each request must be presented in writing with details of who, what, where, when, why, and how the research will be conducted. Each request will be evaluated on its own merit. The refuge manager will use sound professional judgment and ensure that the request will have no considerable negative impacts to natural, cultural, or visitor services, and does not violate refuge regulations. Special needs will be considered on a case-by-case basis and are subject to the refuge manager's approval. Any approved SUP will outline the framework in which the use can be conducted and refuge staff will ensure compliance with the permit. The SUP will provide any needed protection to individual refuge policies, mission, wildlife populations and natural habitats. In addition, all research projects require the primary investigator to submit written summary reports of all findings and acknowledge the refuge's participation.

(e) Why is this use being proposed?

USFWS encourages approved research to further the understanding of natural resources, and strengthen the agency's tradition of scientific excellence in the conservation of fish, wildlife, plants, and their habitat. The refuge will support and seek research which will improve and strengthen natural resource management decisions and promote adaptive management. Research by non-USFWS personnel is conducted by colleges, universities, Federal, State, and local agencies, non-governmental agencies, and qualified members of the general public. Much of the information generated by research projects is and will be applicable to management on or near the refuge, with little or no expense to the refuge or USFWS.

The refuge will also consider research for other purposes that may not relate directly to refuge specific purposes, but contribute to the broader enhancement, protection, use, preservation, or management of native populations of fish, wildlife and plants and their natural diversity.

AVAILABILITY OF RESOURCES:

Staff time spent reviewing research proposals and administering permits will be minimal. Funding and staff are available within the current levels of funding and staffing. Researchers will be required to furnish their own materials and supplies. Supplies and staff time associated with cooperative studies involving the refuge and other agencies or universities will be covered by joint cooperators such as the Science on the Shore initiative (USFWS, NASA, MSC, ESCC, and TNC).

ANTICIPATED IMPACTS OF THE USE:

Research by various groups and agencies has been diverse. Research activities have ranged from broad scale investigations of a complete botanical survey of the refuge to habitat use, abundance, and distribution of neotropical migrants. Other studies have been concentrated on the refuge's endangered fox squirrel population, the exotic sika deer, and an investigation of the ecology of the deer tick and the incidence of Lyme Disease, population study of woodland birds, Red knot migratory stopover ecology study, Fowler's toad research and monarch butterfly tagging and monitoring. In most instances, these studies have been conducted by educational institutions

(colleges and universities) and with investigations having duration of one to three years. For example, Master's thesis research has involved the effects of fire on vegetation and the endangered Delmarva fox squirrel's habitat use. The refuge continues to partner with the Marine Science Consortium and several universities on a variety of climate change related projects including research on the ghost forest on Assateague Island. Virginia Tech is also conducting research on effects of climate change on breeding piping plovers and implications to beach strand habitat.

The USFWS encourages approved research projects to further the understanding of natural resource problems, which will, in turn, increase our ability to manage our trust resources. Properly conducted studies will have little negative impact on refuge flora, fauna, or wildlife species.

Ideally, any research project conducted on the refuge would positively contribute to one or more of our objectives. There may be short-term disturbance to plants and wildlife during field investigations, but this is unavoidable in most cases. We will conduct Intra-Service Section 7 Biological Evaluations for any proposal that could be anticipated to have an impact on any Federal threatened or endangered species. We will ensure that the refuge or any non-USFWS researchers obtain any special permits, (i.e. collection and banding permits), required by the Commonwealth or Federal law prior to issuing a refuge SUP.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Prior to initiation of any research and/or management studies on the refuge, the requesting agencies or organization is required to apply for a permit and submit a Research/Management Study Proposal as outlined in the Refuge Manual 4 RM 6 (or future revisions of the chapter). The study proposal requires an outline of the objectives, justification, and procedure of the study.
- Priority of approval will be based on studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat.
- Proposals that are privately funded or funded by other agencies may be approved at the refuge level where those that require USFWS funds will be forwarded to the Regional or Washington Office for approval.
- Approved research/study proposals will be issued a SUP with appropriate restrictions to lessen disturbance to wildlife, identify restricted areas, and other limits as needed. Permittee will be required to seek and receive any permits required by the NPS or other agencies when conducting research in areas within their jurisdiction.
- Permittee will advise the refuge supervisory wildlife biologist a minimum of 5 working days prior to planned sampling dates on the refuge.
- A short summary of findings will be submitted to the refuge no later than the end of the calendar year. The report will include the dates and location of field work, species and number of birds captured, incidental observations, preliminary findings, and management recommendations.
- Permittee may drive the Wildlife Loop before normal public vehicle access and the graveled Service Road north to the turn-around.
- Permittee may access the above areas through the maintenance shop closed area.
- Refuge speed limits must be strictly adhered to. The vehicle speed limit shall not exceed 20 miles per hour (mph) except as otherwise posted. Vehicles will slow to 15 mph when in 100 feet of pedestrians or horses.
- Unusual wildlife sightings or potential problems will be reported to the refuge as soon as possible.
- All rules and regulations apply. The permit may be revoked or terminated at any time for noncompliance with the terms thereof or of the regulations in 50 CFR.
- No removal of artifacts, plants, animals, fungi, nest, or collecting of any natural resources is permitted unless granted by special provision for the purpose of the study and if permittee provides a valid, current collection permit (State and if a federally listed species, Federal) which must accompany the permit application for animal collection.
- Refuge staff will monitor research activities for potential impacts to the refuge and for compliance with conditions listed on the special use permits. The refuge manager may determine that previously approved research and SUP be terminated due to observed impacts. The refuge manager will also will have the ability to cancel a SUP if the researcher is not in compliance with the stated conditions.

JUSTIFICATION:

USFWS encourages and supports research and management studies in order to provide scientific data upon which decisions regarding management of the refuge may be based. Allowing refuge approved research and management studies will provide valuable information to better manage the wildlife resources under the refuge's auspices.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

Signature:

Refuge Manager: _____
(Signature) (Date)

Concurrence:

Regional Chief: _____
(Signature) (Date)

Mandatory 10 year re-evaluation date: _____

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COMPATIBILITY DETERMINATION

USE:

Shell Collection

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?

This use allows the collection of non-inhabited shells for personal enjoyment. This use would be authorized only in areas open to public use, where it would not interfere with other public use activities. This is not a priority public use; however people participating in this activity are likely to experience other priority public uses like observing wildlife.

(b) Where would the use be conducted?

The majority of shell collecting will take place along the beachfront of Assateague Island. Collection will be focused in the area directly in front of the parking lots but will extend the entire length of the island. Limited collection may occur on the Southern Islands as well in conjunction with other wildlife dependent recreation. Shell availability is totally dependent upon the ocean currents, tides, and storm events.

(c) When would the use be conducted?

The activity occurs throughout the calendar year during normal operational hours.

(d) How would the use be conducted?

Shell collection will be limited to one gallon of shells/person/day for non-commercial use and only in areas open to the general public.

(e) Why is this use being proposed?

Allowing visitors to pick up shells and beach debris and take home a small amount of shells from the refuge will encourage an appreciation for the beach and marine environment. Shell collection has a long history on Assateague Island. It has historically taken place on the refuge since Native Americans used the area. Mollusks were used for food, their shells for tools and/or as currency. Since refuge establishment, visitors have wandered the beachfront in search of these treasures from the sea.

AVAILABILITY OF RESOURCES:

Permitting shell collecting is within the resources available to administer our visitor services program. The funding received by the refuge is adequate to continue to administer this program and to ensure that the use remains compatible with the refuge purposes.

ANTICIPATED IMPACTS OF THE USE:

Impacts to refuge resources from the activity of shell collecting will likely be minimal if conducted in accordance with refuge regulations. Shell collecting may intermittently interrupt the feeding

habits of a variety of shorebirds, gulls and terns. Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in a studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Roberson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Other studies have shown that if pedestrians cause incubating plovers to leave their nests, the eggs can overheat (Berstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1981, Hoopes et al. 1992, Loegering 1992, Goldin 1993). Although some disturbance to migratory birds will occur, it will be minimal due to the activity taking place on or near the recreational beach. Additionally, there are existing seasonal closures in place to protect piping plovers and other coastal nesting birds.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible
☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Visitors are limited to one gallon/person/day.
- No commercial collection will be permitted.
- Only non-occupied shells may be collected.
- Visitors are not permitted to collect any item prohibited by Federal law, such as historic artifacts.
- Access south of OSV parking area will be closed from March 15 to September 15 or until the last shorebird fledges.

JUSTIFICATION:

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

Signature:

Refuge Manager: _____ (Signature) _____ (Date)

Concurrence:

Regional Chief: _____
(Signature) (Date)

Mandatory 10 year re-evaluation date: _____

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COMPATIBILITY DETERMINATION

USE:

Temporary/short-term activities conducted by other Federal Government Agencies and/or their contractors

REFUGE NAME:

Chincoteague National Wildlife Refuge

DATE ESTABLISHED:

May 13, 1943

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) Refuge Recreation Act {16 U.S.C. 460 K-1, K-2}
- 3) Emergency Wetlands Resources Act of 1986 {16 U.S.C. 3901(b)}
- 4) Fish and Wildlife Act of 1956 {16 U.S.C. 742f (a)(4), (b)(1)}
- 5) Consolidated Farm and Rural Development Act {7 U.S.C. 2002}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."
16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

"... the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for conservation purposes ..." 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant

resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use? Is the use a priority public use?

The uses are minor, short-duration actions on the refuge by Federal Government agencies and/or their contractors, primarily those concerned with national defense, such as the Department of the Navy, or geologic or atmospheric sciences, such as USGS, NASA and NOAA, for minor operational support purposes, when activities do not interfere with the needs of wildlife or other public use activities. These activities are not priority public uses of the Refuge System. In the past, uses of this type have been very limited in scope, temporary in nature, and require no permanent alteration of the landscape, although they have involved accessing and traversing refuge lands. Examples of prior uses include:

1. The Naval Surface Warfare Center, Department of the Navy, has been granted permission to conduct calibration tests of naval equipment (usually radar systems.) This activity included the towing a small trailer over refuge roads, Off Road Vehicles trails, and dikes for the operation of an aerostat balloon or large kite which is elevated to various altitudes (> 4,000 feet) at different strategic locations, etc. Additionally, the trailer may deploy radar reflectors. The purpose of this work is to calibrate the Aegis radar/combant systems at Wallops Island for training.
3. The U.S. Geological Survey has been granted permission to install temporary aerial photographic survey markers at benchmark sites on Assateague Island.
4. NASA was given permission to test a robotic walker/lander on the recreational beach as a trial of this unit's ability to navigate terrain similar to that of the moon or Mars. NASA also operates maintains a freestanding tower with a radio frequency receiver/locator at the refuge shop. This tower also allows the NPS to operate a radio receiver to provide better communication ability between NPS LE and life guards, the Town of Chincoteague, and the refuge.
5. The United States Coast Guard (USCG) is given permission to set up a "watch post" at the tip of Assateague Island for ocean rescue training operations. Additionally, USCG was given access to the refuge to conduct after hour law enforcement operations.

(b) Where would the use be conducted?

The location of these sites will vary depending on the individual projects. However, the majority of requests are for locations south of D dike. The entire refuge (except for the proposed Wilderness Area and Research Natural Area) may be open and available for projects, contingent upon compliance with stipulations listed in a Special Use Permit (SUP) and this CD, including appropriate restrictions to lessen disturbance to wildlife, and other limits as needed. The

location(s) will be limited to only those areas of the refuge that are absolutely necessary to conduct the project.

(c) When would the use be conducted?

The timing of the project will depend entirely on the individual project that is being conducted. Activities may be allowed to occur on the refuge throughout the year, depending upon the potential impacts of the project on trust resources, e.g. migratory birds and endangered and threatened species. Ideally, an individual project should be short term in design, requiring intermittent visits or other actions. The timing of each individual project will be limited to the minimal timeframe required to complete the project. If a project occurs during the refuge hunting season, special precautions will be required and enforced to ensure health and safety. If a project occurs during migratory bird or other trust species breeding seasons, or other sensitive life cycle periods, special precautions will be required to ensure minimal disturbance to these species, or not allowed, depending on anticipated disturbance.

(d) How would the use be conducted?

The mechanics of the project will depend entirely on the individual project that is conducted. The methods of each project will be reviewed thoroughly before it will be allowed to occur on the refuge. No project will be allowed to occur if it compromises the purposes of the refuge, or public health and safety.

(e) Why is this use being proposed?

Projects must sometimes be conducted by other Federal agencies and/or their contractors to further national defense/security, to further understanding in atmospheric or geologic sciences, to fulfill the mandates and purposes for which the agency was created, to increase understanding of the natural environment, or to improve the management of the refuge's natural resources. Much of this information cannot be collected on lands other than refuge lands due to the secure nature of the refuge, the refuge's relative isolation, the geographic position, relatively natural state, and the relative freedom from human disturbance. The refuge is therefore sometimes in a unique position of furthering other Federal agency operations and mandates. Furthermore, some information generated by such projects may be applicable to our management of refuge lands and waters, or other refuges or lands controlled by conservation partners.

AVAILABILITY OF RESOURCES:

The bulk of the cost incurred by the refuge is incurred in staff time to review project proposals, coordinate with outside personnel, and research/write Special Use Permits. In some cases, a project may require additional staff time to escort outside personnel to the project site. Overall, the need for refuge resources will be minimal.

ANTICIPATED IMPACTS OF THE USE:

Disturbance to wildlife and vegetation by project personnel and equipment could occur. Each project will be reviewed on a case-by-case basis.

Impacts to Plants: Pedestrian travel can have indirect impacts to plants by compacting soils and diminishing soil porosity, aeration, and nutrient availability that affect plant growth and survival (Kuss 1986). Hammitt and Cole (1998) note that compaction limits the ability of plants to re-vegetate affected areas. Repeated foot travel can directly impact plants by crushing the plants themselves. Rare plants with limited site occurrence are particularly susceptible to such impacts. Plants growing in wet or moist soils are the most sensitive to disturbance from trampling effects (Kuss 1986). Moist and wet soil conditions are common at Chincoteague NWR particularly in swales between old/historic sand dunes, and, wildlife impoundments.

Allowing this use may cause some vegetation loss, particularly on repeatedly used routes. Foot travel may increase root exposure and trampling effects, however it is anticipated that under levels intended by this compatibility determination (e.g., intermittent, irregular), the incidence of these problems will be minor. Under SUP's, refuge personnel will select designated travel routes which do not have any known occurrences of rare plant species on their surface that would be impacted by this use.

Impacts to Soils: Soils can be compacted and eroded as a result of continued use of travel routes, particularly wetland soils. It is anticipated that some soil erosion will occur as a result of regular travel on designated routes. Under SUP's, refuge personnel will select designated travel routes which should minimize such erosion. .

Wildlife Impacts: Disturbances vary with the wildlife species involved and the type, level, frequency, duration and the time of year such activities occur. Whittaker and Knight (1998) noted that wildlife response can include attraction, habituation and avoidance. These responses can have negative impacts to wildlife such as mammals becoming habituated to humans making them easier targets for hunters. Human induced avoidance by wildlife can prevent animals from using otherwise suitable habitat.

Travel routes can disturb wildlife outside the immediate trail corridor (Trails and Wildlife Task Force 1998, Miller et al. 2001). Miller et al. (1998) found bird abundance and nesting activities (including nest success) increased as distance from a recreational trail increased in both grassland and forested habitats. Bird communities in this study were apparently affected by the presence of recreational trails, where "generalists" (American robins) were found near trails and "specialist" species (i.e. grasshopper sparrows) were found farther from trails. Nest predation was also found to be greater near trails (Miller et. al 1998).

Disturbance can cause shifts in habitat use, abandonment of habitat and increase energy demands on affected wildlife (Knight and Cole, 1991). Flight in response to disturbance can lower nesting

productivity and cause disease and death. Hammitt and Cole (1998) conclude that the frequent presence of humans in wildland areas can dramatically change the normal behavior of wildlife mostly through unintentional harassment.

Seasonal sensitivities can compound the effect of disturbance on wildlife. Examples include regularly flushing birds during nesting or causing mammals to flee during winter months, thereby consuming large amounts of stored fat reserves. Hammitt and Cole (1998) note that females with young (such as white-tailed deer) are more likely to flee from a disturbance than those without young.

It is anticipated that there will be temporal disturbances to wildlife species using habitat on or directly adjacent to routes accessed by other Federal agency personnel. These disturbances are likely to be short term and infrequent based on levels of use addressed by this compatibility determination. Under SUP's, refuge personnel will select designated travel routes which are not likely to significantly affect wildlife populations based on the current use patterns.

Threatened and Endangered Species Impacts: Travel (pedestrian or vehicular) on the refuge may affect threatened piping plovers or endangered Delmarva Peninsula fox squirrels. Squirrels may be sensitive to any habitat changes that remove a forest canopy or reduce food sources. Projects which would create such disturbances/changes to refuge habitats for the squirrel will not be permitted.

The Revised Recovery Plan for Atlantic coast population of piping plover (USFWS, May 2, 1996) lists disturbance by humans and pets as one of the reason for listing and continuing threats to this population. Projects which would involve human activity within the intertidal zone and the beach closest to the intertidal zone on the refuge will not be permitted during the piping plover breeding season, as these areas are very important feeding areas for both piping plover adults and chicks.

These restrictions will be placed on any activities, to ensure this designated use will not impact threatened or endangered species.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible
☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

All outside agencies/personnel will be required to submit a detailed project proposal following USFWS Policy (USFWS Refuge Manual Chapter 4 Section 6 or future revisions). The proposal must include the following: Who will be the participants, who is the sponsoring agency/institution; what will the project involve, what are the objectives of the project, what methods will be utilized during the project, how long will the project last, what access requirements are needed for the project and why should the project occur on the refuge as opposed to another location. The proposal is reviewed and conditions and/or restrictions are placed in the Special Use Permit (SUP), the Cooperative Agreement, or Memorandum of Understanding which will ensure that any identified negative impacts towards the USFWS's interest will be addressed and minimized.

In the absence of an approved Cooperative Agreement or Memorandum of Understanding, SUPs will be issued for all projects conducted by non-USFWS personnel. The SUP will list all conditions that are necessary to ensure compatibility. Conditions and stipulations to be addressed in each permit include:

- Time of day/year restrictions
- Location and means of access
- Frequency and duration of visitation
- Degree of soil/vegetation disturbance
- Impacts on trust resources
- Impacts on primary public use activities
- Impacts on refuge management activities
- Public safety

All rules and regulations apply. The permit may be revoked or terminated at any time for noncompliance with the terms thereof or of the regulations in 50 CFR. No removal of artifacts, plants, animals, fungi, nest, or collecting of any natural resources is permitted unless granted by special provision for the purpose of the study and if permittee provides a valid, current collection permit (State and if a federally listed species, Federal) which must accompany the permit application for animal collection.

The regional refuge biologists, other USFWS Divisions, and Commonwealth agencies may be asked to review and comment on complex proposals. All projects will be required to obtain appropriate Commonwealth of Virginia and Federal review and permits, if needed.

JUSTIFICATION:

USFWS recognizes the need of other Federal agencies to use the refuge's land base to accommodate the needs, goals, and mandates of those agencies. Within the scope of the refuge

purposes and the USFWS mission, USFWS wishes to cooperate when possible. The refuge has received a limited number of requests by outside agencies to conduct projects on refuge property.

Projects conducted by non-USFWS personnel will not materially interfere with or detract from the mission of the Refuge System or the purposes for which the refuge was established, as long as stipulations put in SUP are adhered to.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE: _____

LITERATURE CITED

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- U.S. Fish and Wildlife Service. 1985. Refuge Manual. Washington, D.C.: U.S. Government Printing Office.
- Whittaker, D. and Knight, R. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26(3): 312-317.

COMPATIBILITY DETERMINATION

USE:

Big Game Hunting

REFUGE NAME:

Wallops Island National Wildlife Refuge

DATE ESTABLISHED:

March 11, 1971

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) An Act Authorizing the Transfer of Certain Real Property for Wildlife {16 U.S.C. § 667b}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."
16 U.S.C. § 715d (Migratory Bird Conservation Act).

"... particular value in carrying out the national migratory bird management program." 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife).

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is the public hunting of white-tailed deer. Hunting was identified as one of six priority public uses by Executive Order 12996 (March 25, 1996) and by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(b) Where would the use be conducted?

Public hunting for white-tailed deer will be allowed on the entire 373 acre refuge except for designated safety zones and closed areas.

(c) When would the use be conducted?

The use would be conducted in designated areas of the refuge in accordance with Federal and Commonwealth regulations. Hunting would take place within the open hunting seasons

established by VDGIF. This is normally between mid-November through the first week of January.

(d) How would the use be conducted?

Hunting will be conducted within the framework of the Commonwealth of Virginia regulations (including hunt days and hunting hours), and Federal regulations published in Title 50 of the Code of Federal Regulations (50 CFR 32), pertaining to the National Wildlife Refuge System Administration Act, as well as existing, refuge-specific regulations. The refuge manager may, upon annual review of the hunting program and in coordination with VDGIF, impose further restrictions on hunting. Hunting at the refuge is at least as restrictive as the State of Virginia, and in some cases, more restrictive. The refuge coordinates with VDGIF annually to maintain regulations and programs that are consistent with the State's management programs. Hunting restrictions may be imposed if hunting conflicts with other higher priority refuge programs, endangers refuge resources, or public safety. Specific hunt details will be outlined in the annual hunt program.

Hunters will be selected for the opening week(s) of the Commonwealth's firearms deer season through a lottery selection system similar to the one currently used at the Chincoteague NWR. For the remainder of the deer season, each hunter will pay and obtain a refuge hunting permit online.

Further refuge-specific regulations applicable to deer hunting at Wallops Island NWR are detailed in this CD under the section "Stipulations Necessary to Ensure Compatibility."

(e) Why is this use being proposed?

Hunting is one of six priority public uses encouraged on National Wildlife Refuges as long as they are deemed compatible. Hunting will be used primarily as a management tool for reducing the impacts of white-tailed deer on forested habitats important to migratory birds and other wildlife. The public hunt will also reduce the threat of deer-aircraft strikes at the adjacent NASA/Goddard Space Flight Center/Wallops Flight Facility (WFF), and deer-automobile strikes on the adjacent Virginia State Route 175. Finally, the proposed hunt will provide limited public hunting opportunities on Wallops Island NWR.

The objectives for the Wallops Island NWR hunt program are to (1) reduce deer and vehicle collisions that occur along State Route 175 and the refuge boundary, (2) reduce the potential for increased deer/aircraft collisions at NASA WFF, (3) manage the deer population at levels that minimize negative effects upon the natural ecosystems at Wallops Island NWR, including native vegetation and wildlife communities, (4) provide a wildlife-dependent recreational activity.

AVAILABILITY OF RESOURCES:

An estimated 30 staff days will be required to plan and manage the hunt, including: handling public inquiries and law enforcement. This use is routine in nature and may be accomplished with approved staffing and funding.

ANTICIPATED IMPACTS OF THE USE:

Deer hunting will occur on the refuge within the designated firearms deer season established by VDGIF. This is normally between mid-November through the first week of January and occurs during the fall migration and wintering period for many migratory bird species, including waterfowl that use the tidal creeks on and adjacent to the refuge. Morton (1987) found that the increased presence of humans and vehicles associated with the refuge hunting program on Chincoteague NWR was contributing to movements of black ducks off the refuge at a time when these birds need the isolation of the refuge. Laskowski et al. (1993) documented human disturbance to representative species of waterfowl, wading birds, and shorebirds by the visiting public on Back Bay NWR, VA. Disturbance elicited behavioral changes ranging from increase alertness to flying to other parts of the refuge. Klein (1993) found that approaching birds on foot was the most disruptive of usual visitor activities at J. N. "Ding" Darling NWR, Florida. Morton (1993) summarizes research on the impacts of human disturbance and its effects on waterfowl and proposes management actions that could reduce the frequency or effects of disturbance. Some of the disturbances listed will occur on the refuge with waterfowl being the major category of birds impacted, due to the time of year that hunting occurs.

We anticipate there will be limited disturbance to waterfowl, raptors, or wading birds in the area on the days hunters will be on the refuge. Disturbance will be minimized because: hunting activities will take place outside nesting and brood-rearing periods for most wildlife species; hunter numbers will be limited; the number of hunting days will be limited; hunters will not be permitted to enter the hunting area with motor vehicles, ATVs or hunting dogs. Harassment of waterfowl will be limited because the hunting zones will restrict hunter activities to the upland/woodland habitats. The large acreage of saltmarsh and woodland in the vicinity of the refuge will provide adequate space and habitat for temporarily displaced birds. Escape cover for smaller mammals is available and disturbance by hunters should not adversely affect them. A 330' closed area around any active eagle nest will be maintained.

Positive effects on the vegetation are anticipated from a reduction in the white-tailed deer population at Wallops Island NWR. The impacts of dense deer populations on forest regeneration and the composition and diversity of the herbaceous understory have been well documented (Tilghman, 1989). Reducing the size of the deer population will prevent further degradation due to over browsing. Well-managed hunting can effectively control deer and produce striking changes in the forest vegetation (Behrend, et al., 1970). The impact of deer hunting on the vegetation would likely result in better recruitment of forest canopy species and an increase in the diversity of shrubs and the herbaceous understory. This will increase the quality of forage areas, escape cover,

and nesting habitat for neotropical songbirds and other forest-floor or mid-canopy wildlife species at Wallops Island NWR.

The sea level fen on the refuge will not be open to deer hunting activities. Therefore, there are no anticipated adverse impacts to this rare ecosystem.

The refuge delineates small, limited-use parking areas for hunters; however such parking is adjacent to State Route 175; and does not result in clearing any forested areas. We anticipate slight benefits to human health and safety adjacent to the refuge. By reducing the number of deer on the refuge, we will reduce the potential for deer-vehicle collisions on State Route 175 and deer-aircraft collisions at the Wallops Flight Facility.

VDGIF, under the direction of a Governor-appointed Board of Directors, is specifically charged by the General Assembly with the management of the state's wildlife resources. The Virginia Deer Management Plan, first completed in 1999 and revised in 2006, guides management of deer habitat, deer populations, damage caused by deer, and deer-related recreation in the Commonwealth. In 2012, 213,597 deer were reported killed by hunters in Virginia. This total included 96,712 antlered bucks, 18,061 button bucks, 98,781 does (46.3%), and 43 “unknown” deer. It is also 8% below the last 10-year average of 232,573. In Accomack County, an average of 3,056 deer per year are killed (see Table, 2008-2012 data).

Accomack County Deer Kills, 2008-2012

Year	Antlered Males	Male Fawns	Females	% Female	Unknown	Total
2008	1412	371	1924	51.9%	0	3707
2009	1225	249	1614	52.3%	0	3088
2010	1246	307	1740	52.8%	0	3293
2011	1007	263	1535	54.7%	2	2807
2012	923	212	1249	52.4%	0	2384

<http://www.dgif.virginia.gov/wildlife/deer/harvest/index.asp>

Population reconstruction computer models indicate that Virginia’s statewide deer population has been relatively stable over the past decade, fluctuating between 850,000 and 1,050,000 animals (mean = 945,000).

<http://www.dgif.virginia.gov/wildlife/deer/management-plan/virginia-deer-management-plan.pdf>

Hunting resident game species, such as deer, on Chincoteague NWR and Wallops Island NWR will result in negligible impacts on their populations because of their restricted home ranges. The refuges also contribute negligibly to the state’s total harvest for resident game species.

Chincoteague NWR white-tailed deer harvest

2008/2009 – 23

2009/2010 - 20

2010/2011 - 15

2011/2012 - 27

2012/2013 - 26

Wallops Island NWR white-tailed deer harvest

2008 - 13

2009 - 15

2010 - 15

2011- 8

2012 – 11

The refuges harvested a total of 173 white-tailed deer over the past 5 years, with 37 in 2012. Given the exceptionally low numbers of animals harvested from the refuges in respect to the total statewide harvest and deer population, no cumulative impacts to local, regional, or statewide populations of white-tailed deer are anticipated from hunting of the species on the refuges.

Several management strategies identified by Klein (1989) can be used to control the negative effects of recreation (including hunting) on wildlife; these include: permits, user fees, zoning (Cullen 1985), travel ease, public education (Purdy et al. 1987), limiting number of visitors present, and periodic closing. Chincoteague NWR currently employs many of these measures to lessen the disturbance and impact to wildlife of existing deer hunt programs.

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, viewed as a whole, become substantial over time. The hunt plan has been designed to be sustainable through time given relatively stable conditions.

The cumulative impact of hunting white-tailed deer at the refuge is negligible. The proportion of the refuge's harvest of deer is negligible when compared to local, regional, and State populations and harvest. Because of the ability of individual refuge hunt programs to adapt refuge-specific hunting regulations to changing local conditions, we anticipate no direct or indirect cumulative effects on resident wildlife, migratory birds, or non-hunted wildlife on Wallops Island NWR.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day

review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION: (CHECK ONE BELOW)

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Deer hunting will be permitted the entire refuge except within small safety zones and designated closed areas. The deer hunt program will be evaluated annually to ensure meets the hunt plan objectives.

Persons possessing, transporting, or carrying firearms on National Wildlife Refuges must comply with all provisions of state and local law. Persons may only use (discharge) firearms in accordance with refuge regulations (50 CFR 27.42 and specific refuge regulations in 50 CFR Part 32).

Wallops Island NWR Refuge Specific Regulations:

- All Federal and State hunting regulations apply.
- State requirements for hunting licenses and stamps apply.
- State requirements on the use of firearms, muzzleloaders and bows apply.
- Hunters must have their permits in possession prior to entering the refuge to scout or hunt.
- Reporting all harvested animals must comply with state requirements for check-in and also be indicated on check-in/out sheet (see below for additional information).
- A sign-in/out box is located at the kiosk in parking area one (see map). Each hunter must sign in immediately before entering and sign out after exiting the hunt zone.
- All harvests must be reported on the sign-in/out sheet.
- 330' closed area around eagle's nests.
- Hunters must park in designated parking areas.
- Non-hunters or persons not in possession of a valid refuge permit are not permitted on the refuge.
- All hunters must make a reasonable effort to recover wounded animals.
- Discharging any weapon within 50 feet of the center line of any road or on/from/into a safety zone is prohibited.
- The boundaries of the hunt zone are recognized in the field by prominent signs. Each hunter is responsible for knowing the boundaries of the hunt zone.
- Federal government worksites may be staffed during the hunt. The zone around these sites is posted closed to hunting (see map). Hunters may enter this zone strictly for the

purpose of accessing the hunting area and must have their weapons unloaded. There shall be no loitering in areas closed to hunting.

- Hunters may pursue downed or crippled deer into the safety zone (area closed to hunting around worksites). Contact the refuge headquarters for assistance if needed to dispatch wounded animal.
- Tree stands permanently attached by nails, wire, screws, or in any other way is prohibited. Portable stands are permitted and may remain installed for the duration of the season. All stands must be removed at the close of the season. USFWS is not responsible for any personal property left unattended.
- The use of a boat, all terrain vehicle (ATV), bicycle or saddled animal is prohibited.
- The minimum age allowed to hunt on the refuge is 12.
- Hunters must reach the age minimum by the date of their assigned hunt and the child must meet Virginia state licensing requirements.
- Hunters between the ages of 12 and 17 must be accompanied and directly supervised by a mentor over 18 who has on their person a valid Virginia hunting license and refuge permit from Chincoteague NWR headquarters.
- Scouters must be in possession of their hunt permit while scouting.
- Scouters and hunters must sign-in and out at the refuge kiosk. Scouters and hunters must wear a minimum of 400 total square inches of blaze orange material consisting of a vest and hat or jacket and hat. Blaze orange camouflage is not acceptable.
- Any hunters who require assistance with retrieving or dressing harvested animals may apply for 1 or 2 non-hunting permits. This permit will allow an assistant to be present only during retrieval and dressing of harvested animals. Non-hunting assistant permits must be requested prior to November 16th.
- Camping and fires are prohibited.

JUSTIFICATION:

Hunting is a priority wildlife-dependent use for the Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). USFWS policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management.

Hunting seasons and bag limits are established by the Commonwealth of Virginia and generally adopted by the refuge. These restrictions ensure the continued well-being of overall populations of game animals. Hunting does result in the taking of many individuals within the overall population, but restrictions are designed to safeguard an adequate breeding population from year to year. Specific refuge regulations address equity and quality of opportunity for hunters, and help safeguard refuge habitat. Disturbance to other fish and wildlife does occur, but this disturbance is

generally short-term and adequate habitat occurs in adjacent areas. Loss of plants from foot traffic is minor, or temporary, since hunting occurs mainly after the growing season.

Conflicts between hunters are localized and are addressed through law enforcement, public education, and continuous review and updating to State and refuge hunting regulations. Conflicts between other various user groups are minor given the season of the year for hunting, the location of most hunting away from public use facilities, and seasonal area closures.

Recreational hunting of white-tailed deer will be subject to the stipulations listed, and will not interfere with the primary purposes for which the refuge was established. A public deer hunt on Wallops Island NWR is considered a feasible and cost effective means of improving habitat quality, especially for forest understory, migratory songbirds, and for maintaining structural and species diversity on the refuge. In addition, it is believed that by instituting a deer hunt, incidences of vehicle-deer and aircraft-deer strikes on the neighboring State Route 175 and Wallops Flight Facility will be reduced over time.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE: _____

LITERATURE CITED:

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COMPATIBILITY DETERMINATION

USE:

Research and Studies Conducted by Outside Agencies, Universities, and Organizations

REFUGE NAME:

Wallops Island National Wildlife Refuge

DATE ESTABLISHED:

March 11, 1971

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- 1) Migratory Bird Conservation Act {16 U.S.C. 715d}
- 2) An Act Authorizing the Transfer of Certain Real Property for Wildlife {16 U.S.C. § 667b}

REFUGE PURPOSE(S):

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."
16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... particular value in carrying out the national migratory bird management program." 16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:**(a) What is the use? Is the use a priority public use?**

The use is research conducted by other than U.S. Fish and Wildlife Service (USFWS) personnel. Research conducted by non-USFWS personnel is not a priority public use of the Refuge System; however, it assists in answering research questions that are both relevant and contributes to refuge management decisions. In addition, priority research activities based on needs identified and prioritized by partners and partnerships will support the landscape level conservation needs identified by the Landscape Conservation Cooperatives. Monitoring and research are an integral part of the national wildlife refuge management. Plans and actions based on thorough research and consistent monitoring provide an informed approach to management effects on wildlife and habitat.

(b) Where would the use be conducted?

Wallops Island NWR encompasses 373 acres of which 195 acres are salt marsh, 121 acres are forest, and 57 acres are old-field/early successional forests. Loblolly pine is the dominant species

in the forest habitat, secondary components include: tulip poplar, red maple, southern red oak, wild cherry, dogwood sassafras, and sweet gum. Understory includes: American holly, spicebush, Devil's walking stick and greenbrier. Transition zones between the marsh and woodland are dominated by groundsel tree and wax myrtle. The salt marsh is dominated by cordgrasses.

A Simoneaston Bay sea level fen, named the Lucky Boy Fen, is found on Wallops Island NWR. Sea level fens are nutrient-poor, maritime seepage wetlands, confined to a few sites with an unusual combination of environmental conditions for the mid-Atlantic (VDCR 2001). The sea level fen is a globally significant (G1) community type (Fleming and Patterson 2010); only four occur in Virginia, all of them in Accomack County (VDCR 2001). Lucky Boy Fen is located just above highest tide levels, at the base of a slope where abundant groundwater discharges. It is less than one-half acre in size, but supports six rare plant species.

The location of the use will depend on the research project that is being conducted. A research project may be limited to a particular species or habitat type. Some research projects involve a combination of different habitats and species. The research location will be limited to the areas which are necessary to conduct the research project, and that do not create a significant negative impact to refuge operations and wildlife use.

(c) When would the use be conducted?

The timing of the research will depend on the project which is being conducted. Research will be allowed to occur on the refuge throughout the year. Individual research projects may require one or two visits to the refuge while other projects may require daily visits to a study site. The timing of each research project will be limited to the minimum required to complete the project.

(d) How would the use be conducted?

The methods of research will depend upon the research project which is conducted. Methods of each research project will be reviewed by staff before data collection will be allowed to occur on the refuge. No research project will be allowed to occur if it does not have an approved scientific method or if it compromises public health and safety.

Each request for this use will be considered, and if appropriate, will be issued a Special Use Permit (SUP) by the refuge manager. Each request must be presented in writing with details of who, what, where, when, why, and how the research will be conducted. Each request will be evaluated on its own merit. The refuge manager will use sound professional judgment and ensure that the request will have no considerable negative impacts to natural, cultural, or visitor services, and does not violate refuge regulations. Special needs will be considered on a case-by-case basis and are subject to the refuge manager's approval. Any approved SUP will outline the framework in which the use can be conducted and refuge staff will ensure compliance with the permit. The SUP will provide any needed protection to individual refuge policies, mission, wildlife populations and natural habitats. In addition, all research projects require the primary investigator to submit written summary reports of all findings and acknowledge the refuge's participation.

(e) Why is this use being proposed?

USFWS's goal is to strengthen the agency's tradition of scientific excellence in the conservation of fish, wildlife, plants, and their habitat.

We encourage approved research to further the understanding of natural resources. The refuge will support and seek research which will improve and strengthen natural resource management decisions and promote adaptive management. Research by non-USFWS personnel is conducted by colleges, universities, Federal, State, and local agencies, non-governmental agencies, and qualified members of the general public. Much of the information generated by research projects is and will be applicable to management on or near the refuge, without any expense to the refuge or USFWS.

The refuge will also consider research for other purposes that may not relate to directly to refuge specific purposes, but contribute to the broader enhancement, protection, use, preservation or management of native populations of fish, wildlife and plants and their natural diversity.

AVAILABILITY OF RESOURCES:

This refuge is managed as a satellite of Chincoteague NWR. Therefore, all funding and staff time spent reviewing research proposals and issuing permits is administered by Chincoteague NWR. Researchers will be required to furnish their own materials and supplies. Supplies and staff time associated with cooperative studies involving the refuge and other agencies or universities should be covered by appropriate refuge/joint funds to promote and grow the Science on the Shore initiative (USFWS, NASA, Marine Science Consortium, Eastern Shore Community College, and The Nature Conservancy).

ANTICIPATED IMPACTS OF THE USE:

USFWS encourages approved research projects to further the understanding of the natural resource problems, which will, in turn, increase our ability to manage our trust resources. Properly conducted studies will have little negative impact on refuge flora, fauna, or wildlife species.

Ideally, any research project conducted on the refuge would positively contribute to one or more of our interim objectives. There may be short-term disturbance to plants and wildlife during field investigations, but this is unavoidable in most cases. We will conduct Intra-Service Section 7 Biological Evaluations for any proposal that could be anticipated to have an impact on any Federal threatened or endangered species. We will ensure that the refuge or any non-USFWS researchers obtain any special permits, (i.e. collection and banding permits), required by the Commonwealth or Federal law prior to issuing a SUP.

PUBLIC REVIEW AND COMMENT:

This compatibility determination is part of the draft Chincoteague NWR CCP/EIS. Public notification and review will include a notice of availability published in the Federal Register, a 60-day comment period for the draft CCP/EIS during which public meetings will be held, a 30-day review period for the final CCP/EIS, and the record of decision published in the Federal Register. We will also inform the public through local media releases and our website.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible

☒ Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Prior to initiation of any research and/or management studies on the refuge, the requesting agencies or organization is required to apply for a permit and submit a Research/Management Study Proposal as outlined in the Refuge Manual 4 RM 6 or future revisions of this chapter. The study proposal requires an outline of the objectives, justification, and procedure of the study.
- Priority of approval will be based on studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat.
- Proposals that are privately funded or funded by other agencies may be approved at the refuge level where those that require USFWS funds will be forwarded to the Regional or Washington Office for approval.
- Permittee will advise the refuge supervisory wildlife biologist a minimum of 5 working days prior to planned sampling dates on the refuge.
- A short summary of findings will be submitted to the refuge no later than the end of the calendar year. The report will include the dates and location of field work, species and number of birds captured, incidental observations, preliminary findings, and management recommendations.
- Unusual wildlife sightings or potential problems will be reported to the refuge as soon as possible.
- All rules and regulations apply. The permit may be revoked or terminated at any time for noncompliance with the terms thereof or of the regulations in 50 CFR.
- No removal of artifacts, plants, animals, fungi, nest, or collecting of any natural resources is permitted unless granted by special provision for the purpose of the study and if permittee provides a valid, current collection permit (State and if a federally listed species, Federal) which must accompany the permit application for animal collection.

- Refuge staff will monitor research activities for potential impacts to the refuge and for compliance with conditions listed on the special use permits. The refuge manager may determine that previously approved research and SUP be terminated due to observed impacts. The refuge manager will also will have the ability to cancel a SUP if the researcher is not in compliance with the stated conditions.
- Approved research/study proposals will be issued a Special Use Permit with appropriate restrictions to lessen disturbance to wildlife, identify restricted areas, and other limits as needed and may not interfere with or distract from the missions of the tenants (NPS, USDA) and adjacent landowner (NASA).

JUSTIFICATION:

USFWS encourages and supports research and management studies in order to provide scientific data upon which decisions regarding management of the refuge may be based. Allowing refuge approved research and management studies will provide valuable information to better manage the wildlife resources under the refuge's auspices.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established.

SIGNATURE:

Refuge Manager: _____
(Signature) (Date)

CONCURRENCE:

Regional Chief: _____
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE: _____

LITERATURE CITED:

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- Henson, P. and T. A. Grant. 1991. The effects on human disturbance of trumpeter swan breeding behavior. *Wildl. Soc. Bull.* 19:248-257.
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- U. S. Fish and Wildlife Service. 1982. National Wildlife Refuge System - Refuge Manual Dept. of Interior, USFWS, Washington, D.C.

Appendix Q

George Gentry/ USFWS



American Pintail

Findings of Appropriateness

Refuge Name: Chincoteague National Wildlife Refuge

Use: Commercial Filming, Still Photography, and Photography Workshops

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate

Appropriate ✓

Refuge Manager: _____

Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Q-1

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Chincoteague National Wildlife Refuge

Use: Commercial Filming, Still Photography, and Photography Workshops

Narrative:

Commercial photography has the potential to inspire and educate the public about the Refuge System, natural habitats, and wildlife. Wildlife photography is a priority wildlife-dependent use for the Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57)). The Service's policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management, ensuring that they receive enhanced attention during planning and management.

Specific refuge regulations address equity and quality of opportunities for visitors and help safeguard refuge habitats. Impacts from this proposal, short-term and long-term, direct, indirect, and cumulative, are expected to be minor and are not expected to diminish the value of the refuge for its stated objectives.

Stipulations as described in the Compatibility Determination for this use will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the National Wildlife Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established. In addition, this activity will contribute to one or more purposes of the refuge or Refuge System.

Refuge Name: Chincoteague National Wildlife Refuge

Use: Grazing of Chincoteague Ponies

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description). compatible. wildlife-dependent recreation into the future?	✓	

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate

Appropriate ✓

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____ Date: _____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Chincoteague National Wildlife Refuge

Use: Grazing of Chincoteague Ponies

Narrative:

The Chincoteague ponies are important assets to the local communities, evoking a deeply meaningful sense of place and generating both economic and environmental benefits.

The Chincoteague ponies have long been a part of Assateague Island's history from the time the Eastern Shore was settled during the early 1600's through today. In 1947, the Chincoteague ponies reaped national and international attention with Marguerite Henry's children's classic, *Misty of Chincoteague*. The later movie version in 1961 further heightened the popularity of the authentic island pony and its lineage. To children and adults, "Misty of Chincoteague" is an iconic symbol of the spirited ponies freely roaming on Assateague Island.

The Assateague Island recreational beach, the ponies, and the Refuge are the Town of Chincoteague and Accomack County's major tourist attractions. Every year the Refuge experiences between 1.2 and 1.5 million visits. This makes the Refuge one of the top five most visited National Wildlife Refuges in America. Due to Refuge related tourism, over \$100 million dollars is spent in the regional economy for lodging, meals, gasoline, souvenirs, recreation, and other items.

In 2010, the town completed a visitor survey. Eighty percent (80%) of Chincoteague visitors selected Assateague Beach as their top destination. Viewing the wild ponies consistently ranked among the top three activities most important to visitors.

By allowing the use described in this determination, the visiting public, who might come just to see these world famous ponies, will also be exposed to natural resource related subjects and therefore, will have a better understanding and appreciation for wildlife, the cultural history of the Refuge, and the importance of the National Wildlife Refuge System. One of the secondary goals of the National Wildlife Refuge System is to provide opportunities for the public to develop an understanding and appreciation for wildlife wherever those opportunities are compatible. The draw of the Chincoteague ponies will contribute to the achievement of the public use goals of the Chincoteague National Wildlife Refuge.

This activity will not materially interfere with or detract from the mission of the Refuge System or purposes for which the refuge was established. In addition, this activity will contribute to one or more purposes of the refuge or Refuge System.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Chincoteague National Wildlife Refuge

Use: Horseback Riding

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description). compatible. wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate

Appropriate ☒

Refuge Manager:

Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Chincoteague National Wildlife Refuge

Use: Horseback Riding

Narrative:

Horseback riding has a long history on Assateague Island. Even before the establishment of the refuge in 1943, horseback riding was the preferred way of rounding-up livestock that was allowed to free range on the island. During World War II the United States Coast Guard patrolled the Assateague Island shoreline by horseback looking for German U-boats or evidence of human activity on the beach. However, recreational horseback riding has always been a favorite pastime of local/county residents and has been permitted with varying degrees of restrictions since the establishment of the Refuge.

Historically, horseback riding was allowed on the Beach Road, Spur Road to the OSV zone and, depending on the time of year, the area of Toms Cove I-look that was open to off road vehicle use and along a small section of Tom's Cove beyond the Coast Guard Station. Currently, horseback riders park their trailers at or near the southern terminus of the National Park Service assigned area and access the horseback riding area at that location. Horseback riding occurs along the southernmost Atlantic Ocean beachfront of Assateague Island and in the same area known as the Over Sand Vehicle (OSV) zone. In order to protect beach nesting migratory birds seasonal closures of the horseback riding/OSV zone will be implemented.

In the best professional opinion of the Refuge law enforcement officers obtained from observation and direct contact, in 2012, approximately 140 riders participated in this activity. Although horseback riding is considered a non-wildlife oriented form of recreation, it does facilitate wildlife observation and photography. Use is low and occurs in an area used by OSVs which results in little additional disturbance.

Refuge Name: Chincoteague National Wildlife Refuge

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description). compatible. wildlife-dependent recreation into the future?	✓	

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Appropriate ✓

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Chincoteague National Wildlife Refuge

Use: Research and Studies Conducted by Outside Agencies, Universities, and Organizations

Narrative:

The Service encourages and supports research and management studies in order to provide scientific data upon which decisions regarding management of the refuge may be based. Allowing refuge approved research and management studies will provide valuable information to better manage the wildlife resources under the refuge's auspices.

Priority of approval will be based on studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat. Proposals that are privately funded or funded by other agencies may be approved at the refuge level. Those that require Service funds will be forwarded to the Regional or Washington Office for approval.

Approved research/study proposals will be issued a Special Use Permit with appropriate restrictions to lessen disturbance to wildlife, identify restricted areas, and other limits as needed. Permittee will be required to seek and receive any permits required by the NPS or other agencies when conducting research in areas within their jurisdiction.

Refuge staff will monitor research activities for potential impacts to the refuge and for compliance with conditions listed on the special use permits. The refuge manager may determine that previously approved research and SUP be terminated due to observed impacts. The refuge manager will also will have the ability to cancel a SUP if the researcher is not in compliance with the stated conditions.

Refuge Name: Chincoteague National Wildlife Refuge

Use: Shell Collecting

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description). compatible. wildlife-dependent recreation into the future?	✓	

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate

Appropriate ✓

Refuge Manager:

Date:

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Chincoteague National Wildlife Refuge

Use: Shell Collection

Narrative:

Mollusks have probably been used by primates as a food source long before humans evolved. Shell collecting probably goes back as far as there have been humans living near beaches. Stone Age seashell necklaces have been found, sometimes in areas far from the ocean, indicating that they were traded. Shell jewelry is found at almost all archaeological sites, including at ancient Aztec ruins, digs in ancient China, and the Indus Valley. Shell collection has a long history on Assateague Island. It has historically taken place on the refuge since Native Americans used the area. Mollusks were used for food, their shells for tools and/or as currency. Since refuge establishment, visitors have wandered the beachfront in search of these treasures from the sea. Impacts are minimal as the beach is open to other recreational activity.

This use allows the collection of non inhabited-shells for personal enjoyment. Shell collecting would be authorized in areas open to public use, where it would not interfere with other public use activities. This is not a priority public use; however people participating in this activity are likely to experience other priority public uses like observing wildlife.

The current regulation allows the collection of 1 gallon/person/day of dead and/or unoccupied shells. This regulation is consistent with Assateague Island National Seashore (NPS) regulation concerning shell collection.

Refuge Name: Chincoteague National Wildlife Refuge

Use: Temp/Short-term activities conducted by other Fed, State, and Local Govs.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description). compatible. wildlife-dependent recreation into the future?	✓	

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate

Appropriate ✓

Refuge Manager: _____ Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____ Date: _____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Chincoteague National Wildlife Refuge

Use: Temporary/short-term activities conducted by other Federal, State, or local governments

Narrative:

These uses are minor, short-duration actions on the refuge by federal, state and local government agencies and/or their contractors, primarily those concerned with defense, such as the Department of the Navy, or geologic or atmospheric sciences, such as NASA and NOAA, for minor operational support purposes, when activities do not interfere with the needs of wildlife or other public use activities. These activities are not priority public uses of the Refuge System. In the past, uses of this type have been very limited in scope, temporary in nature, and require no permanent alteration of the landscape, although they have involved accessing and traversing refuge lands.

The Service recognizes the need of other agencies to use the Service's land base to accommodate the needs, goals, and mandates of those agencies. Within the scope of the refuge purposes and the Service mission, the Service wishes to cooperate when possible. The refuge has received a limited number of requests by outside agencies to conduct projects on refuge property.

Projects conducted by non-Service personnel will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the Refuge was established, as long as stipulations put in Special Use Permits are adhered to.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Chincoteague National Wildlife Refuge

Use: Horseshoe Crab Harvesting

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?		✓
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		✓
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		✓
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description). compatible. wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ✓

Appropriate_____

Refuge Manager:

Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Chincoteague National Wildlife Refuge

Use: Horseshoe Crab Harvesting

Narrative:

- The commercial harvest of horseshoe crabs is an economic use that takes place on tidal lands administered by the USFWS. In accordance with 16 U.S.C. 668 dd, 50 CFR, Subpart A, 29.1, entitled: *May we allow economic uses on national wildlife refuges?*, we may only authorize public or private economic use of the natural resources of any national wildlife refuge, in accordance with 16 U.S.C. 715s, where we determine that the use contributes to the achievement of the national wildlife refuge purposes or the National Wildlife Refuge System (NWRS) mission. The commercial harvesting of horseshoe crabs does not contribute to the refuge's migratory bird purpose, does not contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, and is not beneficial to refuge resources.
- In accordance with USFWS policy on appropriate refuge uses (603 FW 1), of the ten decision criteria used to determine appropriateness of horseshoe crab harvesting on Chincoteague National Wildlife Refuge (NWR), we answered "no" to seven.
- The refuge was established under the Migratory Bird Conservation Act "...for use as an inviolate sanctuary or for any other management purpose, for migratory birds" (16 U.S.C. § 715d). The harvesting of horseshoe crabs would directly contribute to a decline of spawning horseshoe crabs on refuge. A decline in horseshoe crabs, and in particular horseshoe crab eggs, would adversely impact use of the refuge by shorebirds.
- No Special Use Permit (SUP) to harvest horseshoe crabs from the refuge has ever been issued, nor has a request to harvest horseshoe crabs from the refuge ever been received. Therefore, it is an unauthorized activity.

The Atlantic States Marine Fisheries Commission has implemented a fishery management plan to regulate the harvest of horseshoe crabs with the goal of ensuring sustainable population levels. The science, quotas, and harvest regulations of horseshoe crab management are not the primary issues that the U.S. Fish and Wildlife Service (USFWS) must address. Policy and law requires that "uses" taking place on national wildlife refuge lands and waters must be determined to be both "appropriate" and "compatible" with the primary purposes for which the refuge was established. A refuge use that results in the generation of a commodity that can be sold for income or revenue, or traded for goods or services, is considered a refuge management economic activity. The standard for allowing a refuge management economic activity on a national wildlife refuge is higher than other non-economic uses. In order to be appropriate and compatible, an

economic activity on a national wildlife refuge must contribute to the achievement of refuge purposes or the National Wildlife Refuge System (NWRS) mission.

Horseshoe crab harvesting is not identified as a priority public use of the NWRS under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). Harvesting horseshoe crabs from Chincoteague NWR has been found not appropriate. This use would not contribute to the achievement of the national wildlife refuge purposes or the NWRS mission, and could, based on available information, contribute to a decline of horseshoe crabs on refuge. A decline in horseshoe crabs could negatively impact shorebirds by reducing available food supplies during critical migration periods.



Chincoteague National Wildlife Refuge
P.O. Box 62
Chincoteague Island, VA 23336
Phone: 757-336-6122
<http://www.fws.gov/northeast/chinco/>
Federal Relay Service
for the deaf or hard of hearing
1 800/877 8339

U.S. Fish & Wildlife Service
<http://www.fws.gov>

For Refuge Information
1 800/344 WILD

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