National Park Service
U.S. Department of the Interior

Glacier Bay National Park and Preserve
Alaska

Marine Management Plan

A VISION FOR MARINE STEWARDSHIP, PROVIDING DIVERSE VISITOR EXPERIENCES AND BALANCED ACCESS, AND AN ENDURING COMMITMENT TO TLINGIT HOMELAND VALUES

ENVIRONMENTAL ASSESSMENT INCLUDING UPDATES TO VESSEL QUOTAS AND OPERATING REQUIREMENTS

November 2022 PUBLIC REVIEW DRAFT

Muir Glacier by Thomas Hill, Anchorage Museum, 1976.50.1

A káx yan tudél wé éil'
Taking care of the ocean

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Managing for Balance

Letter from the Superintendent

Glacier Bay National Park is a jewel in the national park system, visited each year by roughly 650,000 people, most of whom enjoy the park on marine vessels. Since 1979, marine vessels have been managed to balance the protection of park resources with providing a range of rewarding experiential opportunities for visitors consistent with the park's purpose and values.

The Tlingit who have called Glacier Bay their Homeland for countless generations hold a core belief in the essential nature of balance in all things - *wooch yas kadál* - that underlies all community interaction and human relationship with the natural world.

This two-part document reaffirms these concepts of balance applied to the National Park Service's continued management of ~537,000 acres of marine park waters. Part I is a Draft Marine Management Plan (draft plan) that articulates existing management frameworks and new adaptive tools for current and future park managers to maintain balance as changes occur, including tidewater glacial retreat and evolving visitation patterns. Part II is an Environmental Assessment (EA) analyzing a range of alternatives, including programmatic and site-specific actions, to help the park achieve desired future conditions.

Thanks to all who contributed to the development of this document during public scoping (August - September 2022). Between **November 30** and **December 30, 2022** we invite your feedback on this draft plan and EA. There are a variety of ways you can comment including online at *parkplanning.nps.gov/GBwaters* and by email *GLBA_public_comments@nps.gov*.

Thank you for your commitment to Glacier Bay National Park and its core values.

Philip Hooge, Superintendent
Glacier Bay National Park and Preserve

Learn more online

parkplanning.nps.gov
visitorusemanagement.nps.gov
www.nps.gov/glba/getinvolved/planning.htm

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ELEMENTS OF THE DOCUMENT

PUBLIC REVIEW DOCUMENT

Part I – Draft Marine Management Plan (Draft Plan)

This draft plan outlines strategies and provides broad guidance for the management of specific marine areas in Glacier Bay National Park (the park) (see figure 1) under National Park Service (NPS) jurisdiction (see figure 2) including vessel management in Glacier Bay (see figure 3) as it relates to:

- Protecting marine ecosystems with science and stewardship;
- Providing diverse visitor experiences and balanced access; and
- Sustaining an enduring commitment to Huna and Yakutat Tlingit Homeland values (see figure 4).

The draft plan is being shared for public review and comment as a part of a collaborative and transparent planning process. The draft plan includes the following:

Chapter 1: Introduces the draft plan organization, purpose, scope, process, and foundational management context.

Chapter 2: Outlines a general management vision, objectives, zoning, and desired conditions.

Chapter 3: Identifies zone-specific strategies and actions.

Chapter 4: Describes monitoring to support implementation of the plan.

Part II – Environmental Assessment (EA)

The EA analyzes the environmental impacts associated with management actions subject to National Environmental Policy Act (NEPA) compliance. NEPA documents can be combined with other agency documents, such as management plans, to reduce duplication and paperwork.[1] The EA identifies the NPS' preferred alternative (alternative D) crafted to incorporate public scoping feedback (August through September 2022). The EA contains information relevant to the choice among alternatives and the draft plan is a detailed description of proposed management activities for the park. The plan and alternative D together comprise the proposed Marine Management Plan that updates some elements of the 1984 General Management Plan (GMP), and the two parts are appropriately cross-referenced.

The EA provides: (1) programmatic NEPA compliance for broad management direction, zoning, corrective management actions, and potential programs and facilities, including floating administrative cabins/seasonally moored vessels, communications upgrades, and monitoring stations within three new management zones; and (2) site-specific NEPA compliance to amend the current vessel management system as defined in a 2003 Record of Decision (2003 VQOR ROD) from the Vessel Quotas and Operating Requirements Environmental Impact Statement (VQOR EIS) codified in 36 Code of Federal Regulations (CFR) Part 13 Subpart N, and the annual Park Compendium.

[1] Guidance on combining NEPA and other agency documents is described in the Council on Environmental Quality (CEQ) Forty Most Asked Questions Concerning CEQ NEPA Regulations Question #21 (CEQ 2014).

Chapter 1: The EA articulates a purpose and need for action and outlines key environmental issues carried forward for detailed analysis.

Chapter 2: The EA presents programmatic actions in addition to site-specific actions in four alternatives. These are based on internal and agency discussions and public scoping comments submitted during a 30-day review period (August 9 to September 9, 2022):

- Alternative A (no action) would continue the current vessel management framework
- Alternative B
- Alternative C
- Alternative D (preferred alternative)

Chapter 3: This chapter discusses current and future conditions of the environment and analyzes impacts to key park resources resulting from the management approaches under consideration.

Chapter 4: This chapter lists agencies and persons consulted during the NEPA process.

The appendixes provide supporting information, analyses, and management resources for the draft plan and EA.

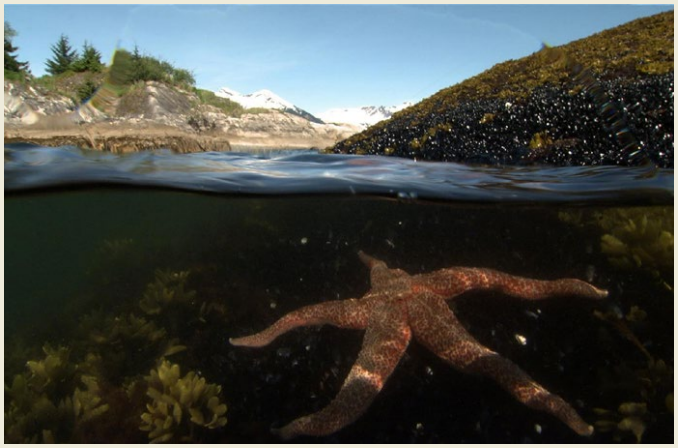
FUTURE DOCUMENTS

Part III – Decision Document

After considering public comments and completing consultation as required with tribes and agencies, the NPS will finalize the plan and EA. A signed decision document, based on analysis in the EA, is anticipated to be a Finding of No Significant Impact. The signed Finding of No Significant Impact delineates the selected alternative and concludes the NEPA process by documenting the conclusion that implementation of the selected action would not result in significant adverse effects to the environment. At this point, the park will formalize the plan as an update to the 1984 GMP and amend the current vessel management framework as defined in the 2003 VQOR ROD codified in 36 CFR Part 13 Subpart N, and the annual Park Compendium.

(above) **From sea to summit, Glacier Bay National Park offers limitless opportunities for adventure and inspiration, covering 3.2 million acres of rugged mountains, dynamic glaciers, temperate rainforest, wild coastlines, and deep sheltered fjords. The park is also a Biosphere Reserve and part of a 25-million acre World Heritage Site—one of the world's largest international protected areas. It also encompasses a Tlingit Homeland originally peopled by the ancestors of tribal members now primarily living nearby in Hoonah and Yakutat.**

The purpose of Glacier Bay National Park and Preserve is to protect a dynamic tidewater glacial landscape and associated natural successional processes for science and discovery in a wilderness setting.



(above) **Glacier Bay National Park is a sanctuary that protects both land and water. Much of the marine world is unseen by visitors—the three dimensional intact marine ecosystems and submerged lands below mean high tide.**

These marine areas were set aside starting in 1925 when Glacier Bay National Monument was established for: 1) public enjoyment of unusually accessible tidewaters glaciers in a magnificent setting of lofty peaks, 2) preservation of forests and bare areas recently covered in ice, 3) scientific study of the glacial environment, and 4) protection of America's shared heritage of exploration. When National Park status was achieved in 1980 through the Alaska National Interest Lands Conservation Act (ANILCA), Glacier Bay was one four Alaska park units explicitly intended to be "Large sanctuaries where fish and wildlife may roam freely, developing their social structures and evolving over long periods of time as nearly as possible without the changes that extensive human activities would cause" (ANILCA Senate Committee Report 96-413, p. 137).

The conservation status and federal title of these marine waters and submerged lands was reaffirmed in 2005 by the U.S. Supreme Court (*Alaska v. United States*, 545 U.S. 75, 125 S. Ct. 2153). By 2009, marine park waters were further recognized as a federal Marine Protected Area (MPA) within a larger nationwide system of MPAs that provide lasting protection for natural and cultural resources for the benefit of present and future generations (2009 Federal Register, List of National System Marine Protected Areas, Document Number E9-9335).

Figure 1. Glacier Bay National Park

Marine Management Plan

Planning Area

Glacier Bay National Park and Preserve
National Park Service
U.S. Department of the Interior

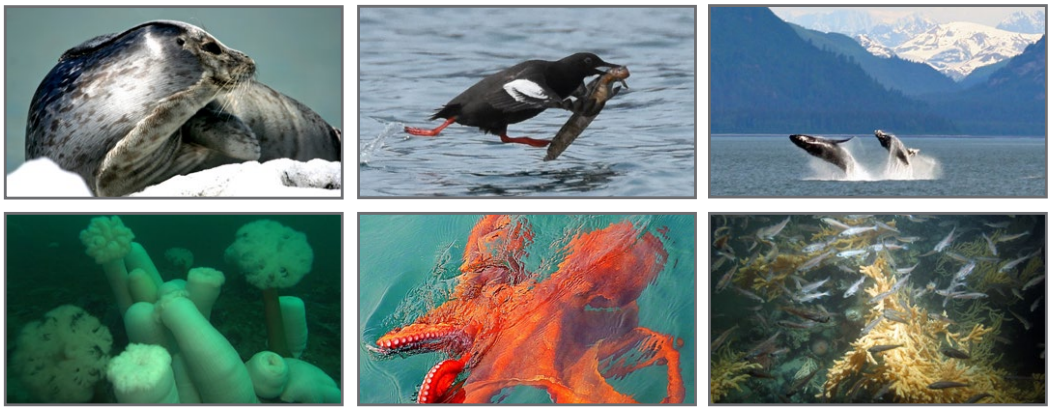
Data source: NPS, State of Alaska

BRITISH COLUMBIA
ALASKA
CANADA
UNITED STATES
Haines
LYNN CANAL
EAST ARM
WEST ARM
GLACIER BAY
to Dry Bay and Yakutat
LITUYA BAY
Bartlett Cove
Excursion Inlet
Gustavus
DUNDAS BAY
GULF OF ALASKA
ICY STRAIT
to Juneau
CAPE SPENCER
Elfin Cove
Hoonah
PACIFIC OCEAN
ALASKA
Glacier Bay
North
0 20 Kilometers
0 20 Miles

Legend

Glacier Bay National Park
~3.2 Million Acres

Marine Management Planning Area
~537,000 Acres



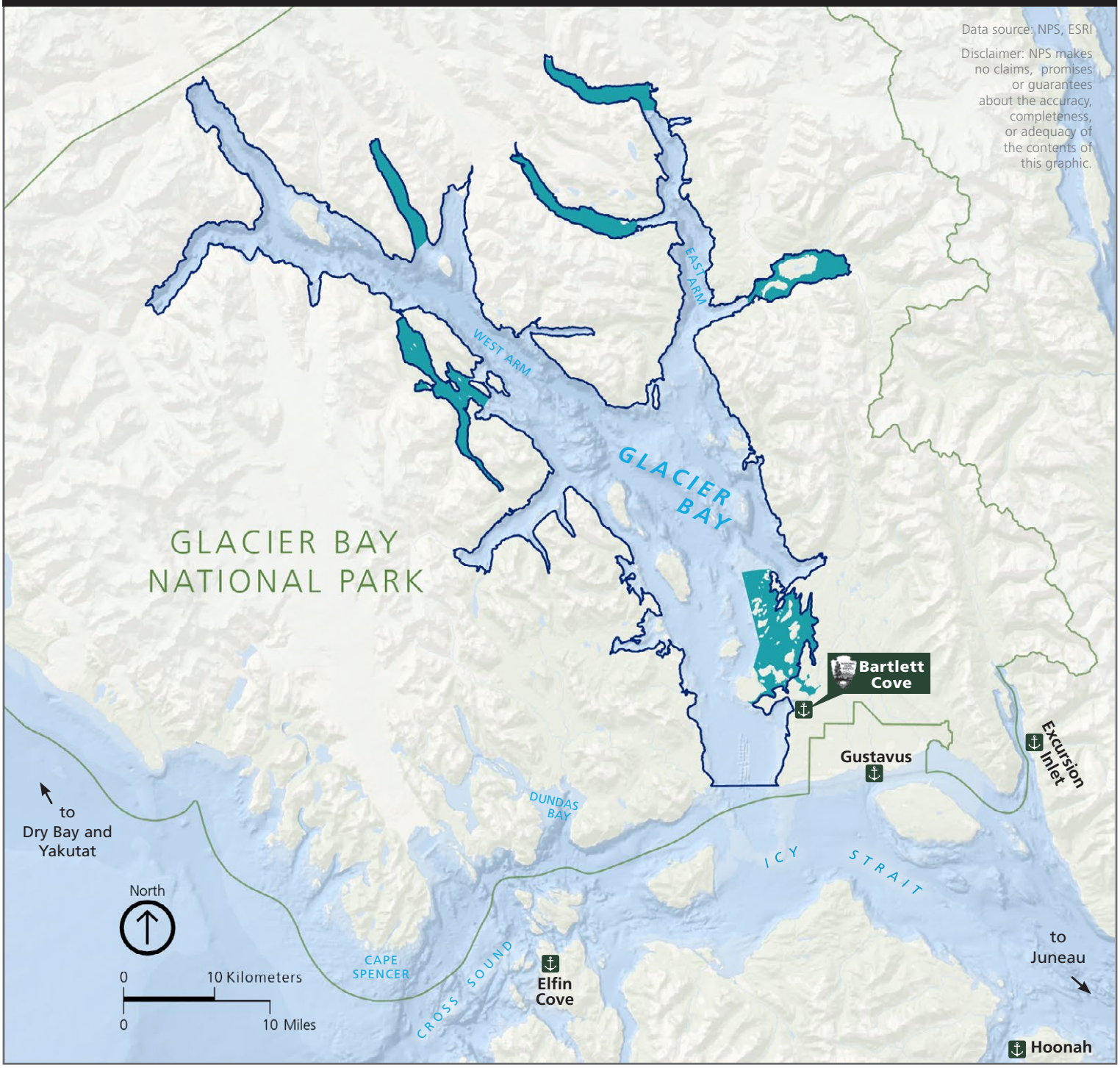
Park marine waters are a globally important sanctuary for many species.

FIGURE 2. PLANNING AREA

Marine Management Plan

Glacier Bay Access and Vessel Management Area

Glacier Bay National Park and Preserve
National Park Service
U.S. Department of the Interior



Legend

Public Docks

NPS and gateway community-operated

Boundary where vessel permits and quotas apply

Management set within 2003 VQOR ROD, CFR, Contracts, Operating Conditions (including Public Law 105-83, Section 127 stipulations), and Park Compendium. Proposed updates described in this draft plan (Chapter 3) and the action alternatives described in the EA.

Nonmotorized Waters

Nonmotorized Waters set to provide enhanced opportunities for human-powered recreation in immersive marine settings that emphasize human-powered recreation and the natural soundscapes of Glacier Bay under 36 CFR 13.1180, "Closed waters, motor vessels and seaplanes."

Figure 3. Glacier Bay Access and Vessel Management Area

Haa Éil': Our Ocean

Recognizing and honoring the rich cultural tapestry of Indigenous use and occupation in marine waters, and supporting the enduring connection between the Tlingit and their Homeland, this plan highlights Indigenous Homeland values embraced by Glacier Bay's original people and advances agency-wide conversations about diverse cultural perspectives and values. Toward this end, we collaborated with Tlingit elders and speakers to incorporate, as appropriate, Tlingit language to encourage readers to consider the concepts presented here through the world view of those who consider Glacier Bay National Park Homeland.

(left) Satellite image of Glacier Bay, Icy Strait, and the Gulf of Alaska.

(images below) Huna Tlingit past and present in Homeland.

The traditional territory of the Huna Tlingit encompasses all the lands and waters of Glacier Bay National Park and the Yakutat Tlingit clans have strong ties to Dry Bay (within Glacier Bay National Preserve) and much of the northern Outer Coast. The Tlingit evolved with and adapted to the dynamic Glacier Bay landscape—just as they, in turn, shaped the natural resources and ecosystems. Today, Glacier Bay National Park encompasses *Tlingit Aaní* (Homeland) and protects traditional lifeways and a living cultural landscape that physically and spiritually sustains past, present, and future generations.

Figure 4. Our Grandparents' Ocean Waters, Haa Léelk'u Hás, Has Du Éil'i

Glacier Bay National Park

Part I - Draft Marine Management Plan

November 2022

PART I: THE DRAFT MARINE MANAGEMENT PLAN

CHAPTER 1 INTRODUCTION

WHAT IS IN THIS DOCUMENT? DAA SÁYÁ TÓOWU YÁ X'ÚX'? (WHAT IS IN THIS BOOK?)

This draft Marine Management Plan (draft plan) sets the framework for the National Park Service (NPS) to manage approximately 537,000 acres of park waters—a three-dimensional marine environment that extends from the seafloor up to the mean high tide line (see figure 2), and to continue balanced approaches to Glacier Bay access and vessel management (see figure 3) within a framework initially established in 1979 and most recently adjusted in 2003.

The draft plan meets statutory requirements for broad direction under a 1984 General Management Plan (GMP) focusing on resource preservation and the conditions needed for visitors to access, understand, enjoy, and appreciate the significant and fundamental park resources and values that merited national designation.

The plan is organized into four chapters that include the following contents:

- **Chapter 1: Introduction.** This chapter outlines the draft plan's organization, describes the purpose and scope of the plan, and summarizes the planning process and key public input themes. In addition, this chapter presents foundational management context, including relevant policies, and relates this document to other park plans and Tlingit perceptions presented through the worldview of those who consider the park Homeland.
- **Chapter 2: General Management Direction.** This chapter outlines the general management direction for the planning area. This includes a long-term management vision, objectives, zoning, and desired conditions as statements of aspiration that describe resource conditions, visitor experiences and opportunities, and facilities and services that the park strives to achieve and maintain in a particular area.
- **Chapter 3: Management Strategies and Actions.** This chapter identifies specific strategies and actions by zone to achieve and maintain desired conditions for marine management.
- **Chapter 4: Monitoring, Adaptive Management, and Capacity.** This chapter describes monitoring to support implementation of the draft plan, including methods for evaluating changes in resource or experiential conditions. It also details adaptive management frameworks and addresses visitor capacity statutory requirements (54 United States Code [USC] § 100502).

PLANNING FOR PARK MARINE WATERS, HAA LÉELK'U HÁS ÉIL'I JEEYÍS ÁYÁ YÁ X'ÚX' (A WORKING BOOK FOR OUR GRANDPARENTS' OCEAN)

Purpose, Daat Gáa Sá X'úx' (What is the Book For?)

The purpose of the draft plan is to provide for the protection of natural and cultural resources and values and to support high-quality visitor experiences aligned with park purposes and values (see figure 1) within a biologically and scientifically significant marine environment, scenic wilderness setting, and Tlingit Homeland (see figure 4), with important human connections (see figure 5).

To achieve these purposes, the draft plan defines desired conditions, zoning, and adaptive management strategies. The draft plan also provides a vision for marine management that is responsive to evolving visitor interests, recreational use patterns, collaboration with tribes, park purpose as a living laboratory for research, and information from ongoing inventory and monitoring activities.

The management strategies identified in this draft plan will be accomplished over time and may be adjusted as needed during the implementation phase.

Scope

The draft plan project area encompasses approximately 537,000 acres of nonwilderness marine park waters in Glacier Bay National Park (the park), from just north of Cape Fairweather on the outer coast to Excursion Inlet in Icy Strait. The scope is inclusive of submerged lands (seafloor), the marine water column, and the shorelines and biological communities below mean high tide within the park. The draft plan also supports motorized vessel management (see figure 3) for balanced access to Glacier Bay, including through updates to management frameworks initially established in 1979 and most recently adjusted in 2003. Vessel management frameworks (including quotas and operating requirements) apply to designated Wilderness waters and Bartlett Cove waters (west of the fuel dock); other planning elements do not apply except as specified.

This extensive marine area was conserved as a National Monument starting in 1925 and expanded again in 1939 for the purposes of scientific study, protection of rich and varied flora and fauna, historic interest, and visitor access to and enjoyment of the glacial environment. In 1980, it was designated a national park. Jurisdiction of the NPS was confirmed in 2005 by a Supreme Court ruling (Alaska v. United States, 545 US 75, 125 S. Ct. at 2153).

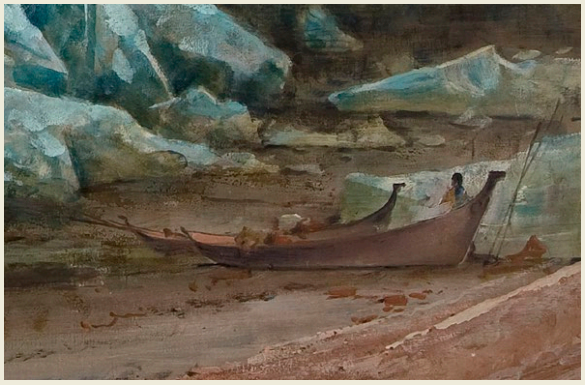
Due to its marine nexus, the scope of the draft plan also includes reefs and terrestrial sites near sea-level with US Coast Guard permitted installations and activities that support maritime aids to navigation and provide a national distress and response system, including the Cape Spencer Light and communication site, Ancon Rock Buoy #2 (Point Gustavus), Rush Point Shoal Buoy #2 (lower Glacier Bay near Ripple Cove), Libby Island Light (Graves Harbor), Graves Harbor Day Beacon #2, and Lituya Bay Entrance Front and Rear Range Lights. These permitted sites are considered as excluded from designated Wilderness because they were acquired by the park with covenants or characteristics incompatible with wilderness designation (as specified in section 5(a) of the Wilderness Act of 1964 and Alaska National Interest Lands Conservation Act (ANILCA) section 701).

Also due to their marine nexus, the draft plan includes management actions and proposals specific to existing terrestrial communication and weather station sites in designated Wilderness. Some of these predate the designation of park wilderness under the 1980 ANILCA with allowance for "reasonable access to and operation and maintenance" under *§1310 Navigation Aids and Other Facilities*. Other sites were installed in park designated Wilderness under a comprehensive 2015 Climate Monitoring Program EA (NPS 2015a) including a Minimum Requirements Analysis for prohibited uses under section 4(c) of the Wilderness Act of 1964.






(Photos above) **Glacier Bay waters sustain human relationships with the living ocean, including as Homeland for the Tlingit and their rich maritime culture** (top row)**. Since the first steam cruisers arrived in the 1880s, millions of visitors have experienced these waters from the deck of a boat** (middle row)**. Visitor surveys find that many develop a strong connection to park resources and conservation values even without setting foot on shore.**




(Cover art, details above) ***Muir Glacier*** **by Thomas Hill Anchorage Museum, 1976.50.1. Commissioned by John Muir, this 1889 painting captures three marine management themes emphasized in this plan:**

1) Balanced Tlingit Homeland. Traditional lifeways are an integral part of the scene which includes *Tlingit yaakw*, canoes, on the shoreline. The Tlingit adapted to the Glacier Bay marine environment, while also shaping these ecosystems in a relationship completely in balance with the natural world - *wooch yas kadál*.

2) Visitor access to the glacial environment. The first steam cruisers in Glacier Bay in the late 1800s launched a visitor experience and an industry that today brings well over half a million visitors to the park. Since 1979, management of marine vessels and this industry have evolved to balance the protection of park resources and values with providing a range of rewarding experiences for visitors consistent with the park's purpose and values.

3) Dynamic living laboratory. John Muir was intrigued by what Glacier Bay's glacial environment could offer science as a living laboratory for dynamic natural change. Since then, successive generations of researchers from many disciplines have been asking and answering important questions about glacial landscapes and fjord marine ecosystems. Relevant to this plan, scientists now have park specific data sets and analyses spanning decades that can inform resource stewardship and park management.

Figure 5. Human Connections to The Marine Environment

Areas Outside the Scope of This Plan

Some marine areas in the park subject to vessel management decisions (including vessel quotas and operating requirements) set by this draft plan are zoned and managed by other park plans to better address their unique visitor use patterns and stewardship considerations:

- Bartlett Cove, the Inner Lagoon, and part of the Beardslee Islands Tidal Cut (~1,900 acres) are managed under the Frontcountry Management Plan (FMP) (NPS 2019a).
- Designated Wilderness marine waters in the park (~53,000 acres) will be managed under the Backcountry and Wilderness Management Plan (BWMP) (in preparation). At the same time, marine management planning does consider the interconnectedness of marine ecosystems and the importance of holistic park visitor management with respect to:
    - Marine environment activities that adversely affect wilderness character in designated Wilderness.
    - Glacier Bay social science research results indicating that visitor experiences of "wildness" do not require setting foot in designated Wilderness (Furr et al. 2021; Swanson and Vande Kamp 2011).
    - Where saltwater and freshwater meet, this draft plan defers to regulatory definitions to clarify where Wilderness Act management frameworks apply (e.g., freshwater means all inland waters; inland waters are separated from salt water at the mouths of creeks, streams and rivers at a line between extremities of the latter's banks at a mean high tide).

The NPS will continue to exercise various marine management authorities inclusive of all park marine waters for a comprehensive and coordinated approach, including vessel quotas and operating requirements, the issuing of commercial contracts and permits, and conducting parkwide operations (resource management, research, search and rescue, law enforcement, risk management, spill response, etc.). In addition, the content in "Appendix D, Mitigation Measures and Best Management Practices," has applicability across all marine park settings.

Planning Process, Wáa Sá Át Wooneiyín Yáat'aa Shukwát? (How Did We Complete the Plan?)

The need for a marine-focused management plan was specifically identified during three larger parkwide efforts that helped to highlight critical resource issues and trends, specific management needs, and resource stewardship considerations applicable to the marine environment:

- **Natural Resource Condition Assessment (2017).** This resource survey for the entire park highlighted a number of threats and stressors influencing the marine environment, and data gaps for understanding resource conditions and trends. Where sufficient data were available, overall resource conditions were assessed (good condition, moderate concern, or significant concern).
- **State of the Park Report (2017).** This report card to the American public identified key issues and challenges facing the park to help inform park management planning, including related to park fundamental resources and values.

- **Resource Stewardship Strategy (2018).** This planning document addresses the specific management concerns raised during these two previous efforts. Management priorities, goals, and projects were developed through collaboration across all park divisions and with subject matter experts both inside and outside the park, including the Southeast Alaska Inventory and Monitoring Network.

Planning began in 2020 with a park review of the existing marine management framework, visitor opportunities, and resource conditions. Consultation with federally recognized tribes also was initiated at this early stage, and will continue as implementation occurs, recognizing the marine systems as a unique cultural landscape that informed, and is integral to, the culture and identity of the Huna and Yakutat Tlingit.

The park then discussed the central issues driving the need for a comprehensive Marine Management Plan, and possible changes to the vessel management quotas last set in 2003. Following is a summary of these considerations (primarily relying on pre-pandemic visitor data)[2] as they relate to three topic areas:

Protecting Marine Ecosystems With Science and Stewardship. Yaa Ntusakwéin Yá Haa Léelk'u Hás, Has Du Éil'i (We Are Learning About Our Grandparents' Ocean). Marine waters make up nearly one-fifth of the park (940 square miles), and no point of land is more than 30 miles from the coast. Further, most of the park's visitation occurs in Glacier Bay's productive marine waters and the adjoining biologically rich shorelines, effectively shrinking the 3.2-million-acre park into a relatively modest usable area.

National parks are charged with managing the park unimpaired for the enjoyment, education, and inspiration of this and future generations (NPS Organic Act). This mandate requires continual balance between conservation, visitor enjoyment, and NPS operational demands (e.g., access, safety, communications). Under ANILCA, Congress intended Glacier Bay National Park to be, in large part, a "…large sanctuar[y] where fish and wildlife may roam freely, developing their social structures and evolving over long periods of time as nearly as possible without the changes extensive human activity would cause" (ANILCA Senate Committee Report 96-413, p. 137). Glacier Bay National Park was also set aside as a living laboratory, including both basic research and research with park management applications for the future.

The presence of humpback whales, listed as endangered in 1970, was crucial to establishing vessel quotas in Glacier Bay and using speed limits and traffic separation regimes to reduce the risk of collision and disturbance. Motorized vessel traffic is restricted in some near shore areas such as lower Glacier Bay. Humpback whale population monitoring, begun in 1985 and continuing to the present day, has been a keystone program that provides whale distribution data used in real time to create dynamic 'whale waters' areas where speed and/or course restrictions mitigate vessel disturbance and collision risk. Speed reductions have been shown to decrease the likelihood of vessel strikes killing whales and reduce sound output which reduces disturbance and facilitates communication. Ongoing science in Glacier Bay demonstrates specific ways that motorized vessels can operate to limit impacts to wildlife in a sensitive marine environment.

[2] While global pandemic disruptions to visitation did effect Glacier Bay in 2020, recoveries in 2021 and 2022, in combination with 2023 forecasts led the park to conclude that the park will return to pre-COVID visitor levels by 2025, and that visitor data pre-COVID was robust to inform future management decisions.

The park's humpback whale monitoring program is one of the longest continuous studies of a whale species anywhere in the world and continues to be relevant in these decades of rapid ocean change. Most of the whales that feed in Glacier Bay are part of the Hawaii Distinct Population Segment, which was removed from the Endangered Species List in 2016 after decades of population growth. However, a severe marine heatwave in 2014–2016 revealed the continuing vulnerability of this population, which experienced sharp declines in abundance, reproduction, and survival (Gabriele et al. 2022). Continuing to monitor whales, the underwater sound environment, and oceanographic conditions in Glacier Bay are paramount to understanding how climate change is changing the world's oceans and will shape the park's marine ecology for decades to come. Marine management will benefit from adaptive tools that continue to reduce direct impacts of vessels on marine wildlife, for example, the number of close encounters per day between vessels and humpback whales and whale-vessel collisions per season.

Up to 2,000 seals aggregate seasonally in Johns Hopkins Inlet for pupping, resting, and molting (Mathews and Pendleton 2006; Womble et al. 2010, 2020a), prompting the park to enact seasonal motorized vessel restrictions. The park has historically supported one of the largest aggregations of harbor seals in southeastern Alaska (Calambokidis et al. 1987). In 2011, harbor seals in Glacier Bay and Icy Strait were designated as one of 12 unique stocks of harbor seals in Alaska (Allen and Angliss 2011). Harbor seals in Glacier Bay are one of the most protected marine mammal populations in the world (Womble and Gende 2013), yet the population has declined precipitously over the last three decades (Mathews and Pendleton 2006; Womble et al. 2010, 2020a). Relatively large changes in the spatial distribution of seals in Glacier Bay have occurred, due in part, to changes in the tidewater glaciers and the availability of icebergs, which serve as habitat for resting, pupping, nursing young, and molting (Womble et al. 2021). Ongoing monitoring indicates that the number of seals in Johns Hopkins Inlet has continued to decline over the 26-year period from 1992 to 2017 (Womble et al. 2020a). Declines of harbor seals in the park are important because seals play important ecological roles both as a predator and also as prey for other upper-trophic level species, such as transient killer whales.

Harbor seals are the most numerous marine mammal in the park and are a highly sought-after viewing experience for visitors. Studies demonstrate that seals may flush from icebergs if approached too closely by vessels, particularly cruise ships (Jansen et al. 2010; Young et al. 2014). Disturbance of seals by vessels can result in the separation of pups from their mothers, which may have negative consequences for pup energy budgets and survival (Jansen et al. 2010). Protections for this iconic marine mammal currently include annual population monitoring to estimate abundance and spatial distribution in glacial ice and terrestrial habitats, seasonal closures in Johns Hopkins Inlet to protect harbor seals when they are hauled out during pupping season in May and June, a minimum approach distance to reduce disturbance on ice and at terrestrial haul-outs, and speed reduction when the inlet is open. Harbor seals are also vulnerable to changes in the availability of icebergs as a result of receding of tidewater glaciers because they rest and rear their newborn pups on icebergs in Johns Hopkins Inlet, McBride Inlet, and Tarr Inlet. Marine management will benefit from appropriate and balanced responses as glacier ice becomes a limiting factor for both harbor seals and park visitors.

Another keystone of marine management is oceanographic monitoring (Etherington et al. 2007), which became a "vital sign" for the Southeast Alaska Inventory & Monitoring Network in 2009. In the Vital Signs program, NPS scientists measure physical, chemical, and biological conditions for a broad understanding of how Glacier Bay functions. This monitoring program has built extensive data sets that can be explored in a variety of ways, from tracking seasonal dynamics to detecting long-term change. Oceanographic monitoring was recently expanded to include outer coast waters. Core oceanographic indicators of environmental health also influence patterns in abundance and distribution of the wildlife

that thrive in Glacier Bay and draw thousands of visitors each year. Recent results indicate Glacier Bay marine waters are currently warming at 0.1° per decade while its surface waters are freshening by 0.28 PSU.[3] The rich data set has expanded the understanding of Glacier Bay's unique glacially influenced fjord and has connected it with oceanographic processes across Alaska. As with weather data for terrestrial studies, the oceanographic data sets provide a crucial base layer to understand marine ecology. Oceanographic data show that the salinity in the upper bay has decreased slightly as a result of increased glacier melt, in parallel with conditions in the Gulf of Alaska where water temperature and acidification have increased slightly (NPS 2017).

These changes in the physical environment impact the entire food web, including phytoplankton, zooplankton, invertebrate, forage fish, and marine mammal communities. Studies suggest these cascading effects caused ecological disruption during the 2014–2016 marine heat wave (Gabriele et al. 2022); however, oceanographic conditions mostly reverted to within normal variability several years later (NPS unpublished data). The NPS cannot stop or even slow large-scale marine ecosystem regime shifts such as those driven by climate change; however, the NPS is collecting data that may allow the agency to better understand how the future marine ecosystem will function. Each exploration of this rich data set inspires curiosity and new questions while linking the marine environment of this unique glacially influenced fjord to other research efforts at the park and across Alaska.

More recently, park science is also helping managers begin to understand underwater sound impacts to marine mammal communication and highlight the importance of airborne noise, which easily travels across water, on visitors and wildlife, especially in Glacier Bay's narrow fjord areas. Glacier Bay has a symphony of natural sounds both above and below the water that management can help to protect.

Finally, park science is considering how managers can balance human disturbances to wildlife uses along Glacier Bay's marine shorelines. These areas are essential to many terrestrial animals' foraging and nesting and are also hotspots for visitor wildlife viewing. Wildlife dispersal is tied to patterns of glacial recession and landscape connectivity. Emerging science indicates that threshold levels of human activity can displace species, and points to strategies to promote coexistence, especially for tour vessels that have the capacity to take large numbers of visitors to shoreline areas and concentrate off-vessel activities in specific areas (Sytsma 2022).

Providing Diverse Visitor Experiences and Balanced Access. Woosh Gunayáade Át Ka Wooch Yáx Naxdatee (Different Experiences and Make Them Equal). At a park level, marine visitation currently supports considerable visitor access balanced across a range of recreation opportunities and access types, from cruise ships to kayaks. These diverse opportunities (see figure 6) are intentionally aligned with the purpose and significance of the park and uphold a high standard of experiential and environmental conditions. The mechanisms for aligning this range of access types with resource and experience goals were primarily developed between 1979 and 2003 as motorized vessel quota decisions and operating requirements. Park managers today continue to apply these tools, while periodically addressing any emerging issues or concerns through commercial services contracts and operating conditions, monitoring, education, and the annual Park Compendium.

[3] Ocean salinity is generally defined as the salt concentration (e.g., sodium and chloride) in sea water. It is measured in units of PSU (Practical Salinity Unit), which is a unit based on the properties of sea water conductivity.

Glacier Bay marine waters support one of the most accessible national park experiences in Alaska for visitors of all ages and abilities. Surrounded by designated wilderness and traditional cultural landscapes, visitors experience tidewater glaciers (left), a spectacular setting visibly shaped by glacial and dynamic natural forces (middle), and a variety of marine and terrestrial wildlife (right).

Glacier Bay is a global destination where most visitors experience the park by boat on commercial tours. Most never go ashore, visiting on board cruise ships, where economies of scale and evolving technology contribute to reduced impacts per visitor. Limited entry competitive contracts for commercial operations (cruise ships, tour vessels, and charter vessels) often achieve some of the highest environmental standards in the industry. Park economic contributions total (in 2019) $402 million in economic output, $121 million in labor income, and add $213 million in total contributions to the national gross domestic product, with visitor spending predominantly made by non-local visitors (98.7%).

For independent visitors, Glacier Bay is a trip of a lifetime destination that requires advance planning. Some visit by private boat as the capstone experience of an Alaska Inside Passage voyage, typically for five days or less. Other private boaters live in the region and typically take more frequent day trips and a few overnight trips per season. Others seek the intimate experience of a human powered visit often combining kayaking with shoreline camping, and accessing the park's ~2.6 million acres of designated Wilderness.

Figure 6. The Glacier Bay Visitor Model

While much of this existing framework is robust to meet current and future marine management needs, some guidance and minor adjustments are needed to optimize this balance. Additionally, some new tools are needed to help park managers evaluate changes in resource or experiential conditions over time to inform if and when management action is needed to respond to a declining condition.

The following is a summary of current visitor uses by vessel type highlighting the current management direction and areas where additional management guidance is needed:

Cruise Ships — Visitation by cruise ship (around 96% of marine-based visitors) fulfills one of the 1925 enabling proclamation purposes, to provide visitor access to glaciers. NPS rangers and cultural interpreters board cruise ships to connect visitors with park significance themes, fundamental resources, values, and Homeland contexts. This form of transportation incorporates many modern services and amenities and enables a high number of visitors to enjoy a wilderness setting with limited personal risk or physical challenge. Since 1979, the park has actively managed cruise ship access and intensity of use (vessel quotas), and subsequently set trip timing and duration constraints (12-hour tour, mid-channel course up to the West Arm, required number of hours in the glacial environment). It also applied evolving restrictions and operating conditions that aim to protect natural and cultural resources as well as park values. Targeted monitoring, formal and informal monitoring, and education also help maintain experiential and environmental desired conditions.

The park did not identify the need to change quotas for cruise ships in this plan, as current use levels and patterns provide a high level of access in a way that is generally consistent with desired conditions for experience and resources. Additionally, working with a small number of companies each year provides a market-based mechanism to continually better align this use with park purposes and values. Limited entry to Glacier Bay and competitive contracts provide economic incentives for cruise ships to adopt environmentally friendly technology through economy of scale investments (see figure 7), and to comply with stringent regulations and operating conditions (repeat infractions disqualify companies from seeking future contracts).

However, cruise ships are not without negative impacts. For example, from a social science perspective, the presence of cruise ships may negatively affect visitor experiences (Swanson and Vande Kamp 2011; Furr et al. 2021) and impact Huna Tlingit ethnographic resources (Deur and Thornton 2014). From a natural resource perspective, cruise ship routes in Glacier Bay overlap temporally and spatially with humpback whale high-use areas (Webb 2015), resulting in frequent surfacing events near transiting ships' bows (Gende et al. 2011; Williams 2016). In 2001, a cruise ship in Glacier Bay struck and killed a pregnant humpback whale, and elsewhere in Alaska numerous lethal collisions involving cruise ships have occurred. Broader natural resource concerns (e.g., air quality, water pollution, underwater noise) in a pristine marine environment are also inherent to cruise ship travel, especially given the growing size of cruise vessels (some cruise ships exceed 1,000 feet in length and can carry over 5,000 passengers). Increasingly bigger ships translate to higher risks to park resources and public safety in the event of mechanical failures, vessel grounding, or incidents associated with natural hazard risks in Glacier Bay due to the park's dynamic landscape (e.g., landslide, tsunami, changing seafloor bathymetry, extreme tides).

In the late 1800s and early 1900s Glacier Bay explorers, adventurers, and scientists typically arrived by steam cruiser.

By the late 1980s modern cruise ships began competing for contracts to access Glacier Bay with measures applied to help protect the environment. While an improvement from steamships and black smoke, the park asked cruiselines to propose their own solutions to reduce haze from exhaust gases (sulfur oxides), particulate matter, and aerosols (2009 example, above) to reduce pollution and enhance the visitor experience.

Since 2016, the fuel quality of cruise ships in Glacier Bay has improved significantly (from 1.5%-2.5% to 0.0055% marine gasoil sulfur levels) with a notable reduction in visible air pollution (2022 cruise ship in the background). The NPS is also working to transition to lower emission and lower-impact vessels and recently replaced a 1997, 700 hp vessel with a more fuel efficient and quieter 2020, 170 hp design (foreground Serac transfer vessel) that delivers rangers, cultural interpreters, and Alaska Geographic books, merchandise, and staff to the cruise ships.

Figure 7. Limited Entry Commercial Contracts and Lower-Impact Vessels

The NPS recognizes the visitor use-resource impact tradeoffs inherent in this form of visitor use, and the need for biological metrics and long-term monitoring to discern whether risks to resources (e.g., humpback whales) from cruise ships continue to be acceptable (Gende et al. 2018; Gabriele 2017). The park also applies a range of science-based mitigations (mid-channel course and speed restrictions, situational awareness tools for ship captains) to further reduce risks. At this time the park feels that the past several decades' experience has demonstrated the correct balance between the many positives of cruise ship tourism and the negatives of larger ships, given that the alternative means of access for the large and increasing number of visitors desiring to experience Glacier Bay would have even greater negative impacts.

Tour Vessels — Visitation by tour vessel (around 3% of marine-based visitors) also fulfills the 1925 enabling proclamation purpose to provide visitor access to glacial environments. This form of transportation incorporates some amenities and accommodates larger groups in experiencing a wilderness setting with limited personal risk or physical challenge. The tour vessel experience is supplemented by optional off-vessel day excursion opportunities in the marine environment (skiff rides, kayaking, paddleboarding, shoreline hikes) where personal risk and challenges are largely mitigated by guides and easy access back to the tour vessel. Onboard tour vessel naturalists inform passengers about the park and share NPS provided materials to connect visitors with park resources. The park "day boat" also operates under a tour vessel permit. This scenic tour operates seasonally as a concession that travels daily the ~60-mile route from Bartlett Cove to the tidewater glaciers in the upper West Arm. The day boat also provides camper drop-off services to rotating locations. Since 1979, the park has actively managed the intensity of tour vessel use (vessel quotas) and has subsequently largely retained tour vessels' freedom of movement except where managing their access is needed to protect resources (approach distances, speed limits, closures) or social conditions (group sizes, encounter rates, prohibitions on commercial services in designated Wilderness). Park-specific monitoring and education also are in place to uphold social and environmental conditions.

At this time, there is no indication of a need to change tour vessel quotas including the park day boat. Desired conditions are being met under the current vessel quotas for this vessel type. Though most of the use of the park occurs in marine areas, 99% of the upland terrestrial areas of the park are designated Wilderness. Therefore, management of the marine environment needs to be compatible with the management of the backcountry and wilderness areas. Since 2010, tour vessel off-vessel activities have grown substantially, so that passengers are increasingly recreating in the same areas as backcountry campers, along the edge between nonwilderness waters and designated Wilderness shorelines and uplands. Part of this is due to high demand near visitor attractions such as tidewater glaciers. Visitation is further concentrated by geography and physical conditions including steep terrain, dense vegetation, and few beaches. This tendency for human activity to occur primarily on narrow bands of marine shoreline (in a 3.2-million-acre park) is increasing visitor densities in these areas which could lead to a decline in experiential and natural resource conditions in these specific areas. The shoreline land-water interface is essential to many terrestrial wildlife species for foraging and nesting, making it a hot spot for wildlife viewing by boat. Even low levels of human shoreline activity in Glacier Bay can decrease animals' use of shoreline habitats (Sytsma 2022), reducing opportunities for wildlife enjoyment while increasing the potential for human-wildlife conflicts. Tour vessel use of this land-water interface also affects visitor experiences on the shorelines and may result in conflicts of expectations and impacts to backcountry experiences (Furr et al. 2021). Most tour vessels travel on flexible schedules and choose settings for off-vessel activities based on variable conditions (weather, tides, passenger interest) which leads to pulses of more intense activity over several hours in localized areas. Backcountry and human-powered visitors

travel under their own power between campsites, limiting visitors' ability to quickly and easily relocate and avoid these pulses of activity.

These issues can be addressed without changes in tour vessel quotas using concessions contracts and the guidance of the BWMP (in development). The park has managed impacts of off-vessel activities to other visitors using commercial operating condition requirements to recreate out of sight and sound of other visitors. Under the BWMP, concentrating commercial use in the Glacier Access Zone is proposed as another strategy to manage these impacts.

This draft plan identifies one area of concern for tour vessels where updated guidance could better monitor and manage marine resource and experiential conditions:

- Nonmotorized vessel use, including from tour vessels, is not distributed evenly across all park waters. The park has some tools to assess trends in resource conditions and biophysical impacts that result from backcountry recreation (Goonan 2015). Social scientists also have measured perceptions of crowding and coastal resource conditions in overnight settings in Glacier Bay and found that group sizes of less than six people are preferred on beaches where kayaks and tents are visible (Furr et al. 2021). Therefore, this draft plan includes tools to monitor nonmotorized use levels to better evaluate how to balance maximizing opportunities for users to freely explore the park with tradeoffs of managing use to better protect park resources and provide quality experiences.

Passenger Ferry to Bartlett Cove — Congress has allocated one permit per day for ferry access to Glacier Bay (Public Law 105-83, Section 127). A ferry is defined as a motor vessel authorized by the Superintendent to engage in the transport of passengers for hire to Bartlett Cove (36 CFR § 13.1102), is subject to a commercial permit, and must travel on a direct course between the mouth of Glacier Bay and Bartlett Cove (36 CFR § 13.1156(e)). The park is not proposing any change to this authorization but has proposed ways to use this vessel quota to align with park purposes and management objectives. First, the FMP (NPS 2019a) sets a course for Bartlett Cove to become a more traditional national park frontcountry area with concentrated visitor use, facilities, and services as a welcoming destination that strengthens visitors' connections to larger park purposes. The FMP also identifies the potential for collaboration with the Hoonah Indian Association on a tribal transportation ferry between Hoonah and Bartlett Cove that facilitates tribal and frontcountry visitor access. Second, the NPS helped secure federal investment for an Alaska Marine Highway System ferry terminal in Gustavus (in 2011) to meet non-park transportation demands connected to the Gustavus road system. Docking in Gustavus rather than at Bartlett Cove helps retain a high-quality frontcountry visitor experience, addresses NPS restrictions against non-visitor-related commercial activities in Bartlett Cove, and locates infrastructure to address community needs outside a national park setting.

Charter Vessels — Visitation by charter vessel (around 0.4% of marine visitors) also fulfills the 1925 enabling proclamation purpose to provide visitor access to glacial environments, as well as a park GMP objective (NPS 1984) to "balance forms of access and use to obtain a feeling of the ruggedness and wildness of this dynamic landscape and the solitude that early inhabitants found." Intended for smaller parties (12 or fewer visitors), charter vessels usually provide customized services and support a variety of visitor activities including sightseeing (both day use and overnight), drop-off and pickup for backcountry visitors, guided saltwater sport fishing, and off-vessel activities such as hiking and kayaking. The park has concluded that desired conditions are being met related to this use type and there is no need to change quotas for this vessel class at this time. Further, a 2018 shift to 10-year exclusive contracts for charter vessel services better aligns this activity with park purposes and management objectives in marine

settings. Charter vessels were previously managed as commercial use authorizations with unlimited operator entries, but starting in 2018 a limited number of contracts were awarded through a competitive process to a diverse range of high-quality operators with extensive local knowledge. These operators are allocated charter vessel use days within Glacier Bay as well as in park waters outside of the bay, and are managed under contracts and operating conditions that add more consistency for public safety and resource protection. These contracts and operating conditions can evolve in the future to effectively address changing resource or visitor needs, further negating the need to alter quotas for this vessel class.

Private Vessels — Visitation by private vessel (around 0.4% of marine visitors) also fulfills the 1925 enabling proclamation purpose to provide visitor access to glacial environments, as well as the park GMP objective (NPS 1984) to "balance forms of access and use to obtain a feeling of the ruggedness and wildness of this dynamic landscape and the solitude that early inhabitants found." Private boaters explore wild expanses and sheltered coves after receiving orientations and resources to guide their travel in a safe and legal manner. Existing management frameworks (private vessel quotas and permit system) are implemented out of a Visitor Information Station (VIS) in Bartlett Cove. Specific to this class of vessel use, the NPS identified several areas where updated management guidance could better align this activity with park purposes and enhance visitor opportunities:

- First, private vessel permits are being utilized by private vessels longer than 79 feet (sometimes called megayachts), comparable in size to tour vessels and in some cases to small cruise ships. These vessels create many times the impacts of smaller private vessels but only benefit a few visitors. If the capacity existed for the park to accommodate more larger vessels these entries would be allocated to vessels serving a larger number of visitors or to multiple smaller vessels. The presence of megayachts was not considered or addressed in 2003, despite clear discrepancies within the purposes of the vessel quota system as well as the regulatory inconsistencies of classifying these very large vessels as private vessels with lower impact. Growing concerns include the number of these vessels in park waters and their substantially increasing size (a mirror of worldwide trends). In addition, vessels longer than 79 feet almost always require paid commercial crew and many such vessels have operational and ownership characteristics of commercial entities that are also not allowed in the private vessel class. Therefore, this draft plan clarifies any regulatory and management ambiguity about private vessels longer than 79 feet in Glacier Bay. Restrictions on vehicle size are common throughout the NPS in order to prevent greater impacts and promote economic fairness in access to the national parks.
- Second, Glacier Bay is a highly sought-after destination for private boaters. There are days in the middle of the summer when visitors are unable to obtain a permit to access the glacier environment and explore the entire park as stated in park purposes. One barrier to equal access is that not all users have an equal opportunity under the existing permit system, as evidenced by data showing a small number of repeat vessels monopolizing permits, with indications that this demand is related to day use recreation based out of Bartlett Cove. Another factor contributing to this situation is the park's priority system for issuing private vessel permits. Private vessel operators who apply for a permit in person at the VIS have priority over applicants who apply by phone, email, etc.; therefore this system favors local residents. The system also favors those who can make plans at short notice and for whom distance is not a factor, e.g., boats already located in Bartlett Cove or Gustavus. Another barrier is that not all the days of multi-day permits are being fully utilized, largely due to short-notice cancellations. In some cases, these are attempts to guarantee only the weekend portion of permits. For these reasons, this draft plan includes

strategies to provide equitable access opportunities to the glacial environment consistent with park purposes, and to correct permit inefficiencies and underutilization.

- Third, several social science studies confirm that Glacier Bay visitors traveling by private boat seek a diversity of experiences, and that some private vessel-based visitors prefer to avoid areas frequented by cruise ships and tour vessels. The East Arm of Glacier Bay has seen substantial reductions in use by larger commercial vessels due to retreat of tidewater glaciers in this area. This draft plan explores ways to formalize this trend in order to provide for certainty of an increased diversity of experiences for private boats and commercial charter operators.

Nonmotorized Vessels — Visitation by nonmotorized vessels (average 912 people annually, 2015–2019 data) further fulfills the 1925 enabling proclamation purpose to provide visitor access to glacial environments, and the park GMP objective (NPS 1984) to "balance forms of access and use to obtain a feeling of the ruggedness and wildness of this dynamic landscape and the solitude that early inhabitants found." While considered backcountry visitors, most nonmotorized vessels travel at will in the nonwilderness waters marine environment using small human-powered crafts (like sea kayaks) and camp overnight on biologically rich shorelines, particularly on accessible beaches. Risks and challenges are moderated (relative to truly remote wilderness trips) by the ability to either immediately hail (or to hike to a nearby motorized area to hail) a vessel for assistance. Specific to planning for the nonwilderness marine environment, this draft plan identifies several areas where updated management guidance could improve opportunities for visitors to access desired experiences, and to better monitor and manage experiential conditions if use levels substantially grow:

- First, several social science studies indicate that in Glacier Bay, nonmotorized visitors, like those traveling by private vessels, seek a diversity of experiences, and prefer to avoid areas frequented by cruise ships and tour vessels. This draft plan explores ways to take advantage of decreasing large vessel commercial use of the East Arm to provide certainty of an increased opportunity to avoid large vessels.
- Second, nonmotorized opportunities in the East Arm are important components of a diversity of visitor experiences in Glacier Bay. There have been some concerns that the timing and location of the alternating closures in the East Arm are not optimal. This draft plan explores alternative nonmotorized waters concepts in Muir Inlet and Wachusett Inlet to better align with desired experiences for users of both nonmotorized and motorized vessels.
- Third, nonmotorized vessel use is not distributed evenly across all park waters. Some studies have indicated concerns with differential impacts to resources (Goonan 2015). Social scientists have also measured perceptions of crowding and coastal resource conditions in overnight settings in Glacier Bay and found that group sizes of less than six people are preferred on beaches where kayaks and tents are visible (Furr et al. 2021). This draft plan identifies tools to monitor nonmotorized use levels to evaluate how to balance opportunities for users to freely explore the park with managing use to protect park resources and desired social conditions.
- Fourth, nonmotorized use is currently not limited. However, there are impacts of nonmotorized use both on park resources and on visitor experiences. While the NPS remains confident that past and existing levels of use do not impair resources or visitor experiences, future increases could do so. As per national guidelines on capacity management, the park is examining trigger points above current and past visitations levels that would instigate actions to examine nonmotorized use levels and distribution and develop management options.

Sustaining an Enduring Commitment to Huna and Yakutat Tlingit Homeland Values. Haa Kusteeyí Káx Yánde Gaxtoodéil (Taking Care of Our Way of Life). The park lies within the ancestral Homeland of two Tlingit tribes, the Huna and Yakutat Tlingit, who sustained themselves for many generations from the region's abundant resources. Although exact settlement dates are difficult to determine, archeological evidence and oral history document a long-term, sustained relationship between the Tlingit and both the marine and terrestrial systems of Glacier Bay, Icy Strait, Cross Sound, and the park's outer coast. According to the Tlingit, the park has been peopled since time immemorial; this human presence has shaped, and been shaped by, both land and sea. In particular, the marine and terrestrial ecosystems that developed in Glacier Bay following glacial retreat in the late 1700s evolved with ongoing human interaction until the late 20th century. The relationship between the park's land and waters, and the ancestral and living Tlingit is integral to the park's intact ecosystem.

In particular, the marine system of Glacier Bay is an inextricable part of Tlingit Aaní, Homeland, for the Huna and Yakutat Tlingit clans. It is an artery that circulates food and other sustaining resources and serves as a travel corridor for the Huna clans and their visitors. As importantly, it is Homeland in and of itself. The bays and channels and inlets of Glacier Bay hold stories, both tragic and triumphant, and are claimed as such by individual clans. Many clan crests attest to historic events associated with marine waters – Yáay, the humpback whale that is claimed by the T'akdeintaan Clan; Kéet, the killer whale of the Kaagwaantaan; Tóos', the shark claimed by the Wooshkeetaan, and the giant octopus, Náakw, that was slayed by the Chookaneidí hero, Xákutch.

A landmark study commissioned by the NPS (Deur and Thornton 2014) reports that the Huna Tlingit perceive numerous effects associated with vessel traffic in Glacier Bay. Tlingit participants in the study expressed concern that marine pollution may impact natural resources of importance to the Tlingit including marine mammals, fish, seaweed, and mountain goat; degrade the pristine nature of their Homeland; and generally impact ecosystems. As importantly, respondents expressed concern that visitor behavior may negatively impact the spiritual health of Homeland and impact ancestral spirits residing in Homeland. A key concept expressed by many respondents was that park visitors are typically unaware that they are entering Tlingit Homeland and mistakenly believe they are being hosted by the NPS rather than by the clans that claim Glacier Bay territory.

Today, most tribal members live in nearby Hoonah and Yakutat (figure 4). For legal, political, and practical reasons, the Tlingit maritime cultural connections to the park have been limited or severed in recent decades. However, many continue to connect with traditional Homeland both physically and spiritually. This plan advances the park's commitment to honoring Tlingit Homeland concepts and facilitating marine access for tribal members as presented in figure 8.

Haa Léelk'u Hás, Has Du Éil'i

We have traveled far to become who we are: People of the Tides

During long ago migrations, our ancestors journeyed through the terrestrial interior of Alaska and Canada – and some settled and remain there today. But many more of us traveled farther on, searching perhaps for a more temperate climate, a more plentiful Homeland. Our clans hold stories of perilous overland treks among glacial crevasses and treacherous canoe journeys on rivers flowing swiftly beneath miles of glacial ice. Was it two elderly women, an aged couple, or perhaps two young men who sat low in a canoe, braving the unknown to reach the edges of the Pacific Ocean? Each clan has its own story of how we reached the shoreline, how we entered the world that Raven created for us, how we became People of the Tides.

Raven walked these shores long before the Tlingit, tricking his flock of feathered friends, forcing Tide Woman to raise and lower the ocean waters in an orderly fashion, and pulling in the Kudataan Kahidí, the ocean's bounty, to the Outer Coast with his octopus tentacle staff. Our ancestors chose a life with Raven on the ocean's edge, spreading our people from Ketchikan in the south to Yakutat in the north, populating the bays and fjords between. Soon the ordered tides formed the framework of our very existence. In Tlingit Aaní, Tlingit Homeland, tides inform the rhythm of our lives.

> "Bring out the canoe now, bring out the canoe now, from under the glacier." That is why they sing this song. "Come drifting through, come drifting through."
>
> ~ J.B. Fawcett, 1972

It is because Raven pulled in Kudataan Kahidí, the Salmon House, that the ocean brings us fish; cháatl (halibut), x̲áat (five species of salmon), léik'w (rock fish), and more. Its currents nurture k'áach and laak̲'ásk, the seaweeds that enrich our diet as well as the yalooleit (cockles), gáal' (clams), and shaaw (gumboot chitons) we search for at low tide. It nourishes the kéidladi (gulls) that lay treasured k'wát' (eggs) on cliff edges just above the reach of

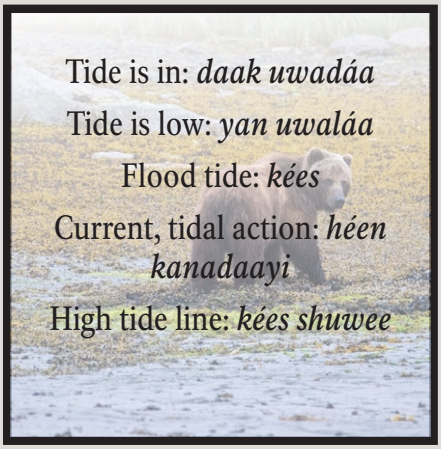
Kudataan Kahidí

"Then he [Raven] got the people all down on the beach and extended his cane toward the mysterious object until it reached it. And he began to draw it in little by little, saying to the people, "Sing strong all the time." When it struck land, a wave burst it open. It was an everlasting house, containing everything that was to be in the waters of the world. He told the people to carry up fish and they did so. If one had a canoe, he filled it; if he had a box, he filled that . . ." ~Deikeenáak'w in Swanton 1909

Figure 8. Tlingit Éil'i

waves and supports the tsaa (harbor seal) and yáxwch' (sea otter) that feed and clothe us. We render oil from saak (hooligan) that school along the nearshore and feast on eggs spawned by yaaw (herring) in the shallows. We gather beach greens, suktétl' (goose tongue) and sukkáadzi (beach asparagus) tasting of salt and rely on the ebb and flow of tides to process and preserve our own unique foods, kaháakw (fermented fish eggs) and k'ínk' (fermented fish).

Over time we used our knowledge of the sea to adapt to the rush of civilization. We built bigger vessels and expanded our fleet, we purchased outboards and hydraulics, morphing our traditional fishing rounds to fit with commercial openings and derbies, fishing for more than ourselves. We know the fjords of Glacier Bay, the boiling waters of Icy Strait, and the open ocean swell of the Fairweather Grounds. Our seiners and trollers follow ancestral routes, still harvesting the ocean's bounty for our own, and other families.



The ocean feeds our bodies and our spirits, but also birthed the stories of our relatives and kin, Kéet (killer whale), Yáay (humpback whale), Cheech (harbor porpoise), Tóos'(shark) and Ch'eet (murrelet) whose crests we claim and carry. In this way, the ocean cradles our history and nurtures the very fabric of our social identify.

Our language is rich with the names of bays and inlets and fast running currents. We named our waterways, as we did terrestrial places, for the resources or histories that occurred there. Sít' Eeti Geiyí (Bay in Place of the Glacier), Yaanash Kwéix near Cape Spencer (Breathe Deeply, You are Out of Peril), and S'íx' Tlein (Big Dish) in Icy Strait. There are spiritual places in the sea, certain eddies and whirlpools, certain unseen spots. See Éit, in the Pacific Ocean is one of those, a rite of passage for anadramous fish, a magical spot that all returning salmon pass through on their return to their natal streams.

The ocean is our medicine. As young warriors, we tested ourselves through immersion in the icy ocean waters near our villages, beating ourselves with hemlock branches. Today our people do the same, dipping beneath gentle waters to heal and strengthen our spirits. Eíl túdei, immersing ourselves in the ocean waters, strengthens each of us and bonds us as ocean people.

Kaagwaantaan elder, George Dalton, Sr. and Skip Wallen fishing in Glacier Bay (image courtesy Skip Wallen).

Hoonah purse seiners gathered in Bartlett Cove in 1992.

FIGURE 8. TLINGIT ÉIL'I *(continued)*

The Tlingit mastered all their Homeland waters, from open ocean swells to calmer bays and inlets.

The inlets and bays and straits and fjords are our trails, our paths, our roads to destinations near and far. Directed by shaman and steered by yaakw yasatáni (boat captains) we make our way to Aangóon (Aangoon), Deishú (Haines), Kéex (Kake), Ltu.aa (Lituya Bay), Sheet'ká (Sitka), and Yaakwdáat (Yakutat) to fight or trade or celebrate. We approach our neighbors from the water, asking permission to bring our canoes ashore. Even today, we sing on the ferries that gather us up for shopping trips, basketball tournaments, memorials, and medical visits. Our children are more comfortable on the water than in the air.

Where is this canoe from?	Goodáx aa yaakw sáyá?
This canoe is from Glacier Bay!	Sít' Eeti Geiyí dáx aa yaakw áyá!
Come ashore.	Yándei gaxyeekoox.
Here is the sandy beach.	Yáadu yak'éiyi l'éiw.
We will give you freshwater.	Héenák'w yee jeedéi gaxtoolashaat.
We will warm your hands.	Yee jín gaxtoolat'áa.

"See Éit, where the fishes move. It was given to them from the yéik [shaman]. . . But the fish say it's fun to go through there. Sometimes it cuts their nose off, the head, the tail. But they're going through there . . ."

~ Lily White 2009

These same currents and ocean swells carry in outsiders. First the Russians and French and later the settlers and miners, the cannery workers and scientists, the tourists. They come on frigates and steamers and rowboats, on tour boats and cruise ships and yachts. The ocean carries in their riches and their diseases, their technologies and their Gods. The ocean carries change to our shores.

But it also binds us to the souls of our ancestors who perished in its depths: clan members washed out to sea at Lituya Bay; those whose canoes were pulled under by náakw, the giant octopus, at Dakáa Xoo; the ancestral women whose canoe capsized off Gaanaxáa; our beloved grandparents and parents who perished in a single day at Lanastáak (Dundas Bay). The ocean is gravesite and cemetery to those who lost their lives to engines failed, to unseen reefs, to wind and waves and fog. We feed them whenever we can, proffering tobacco and treasured foods to the sea. We sing in honor of them, Teet Shi, the Wave Song and other mournful cadences.

Rough Ocean: *Jiwsitaan*

White Caps: *Xeel*

Whirlpool: *X'óol' or haat kool*

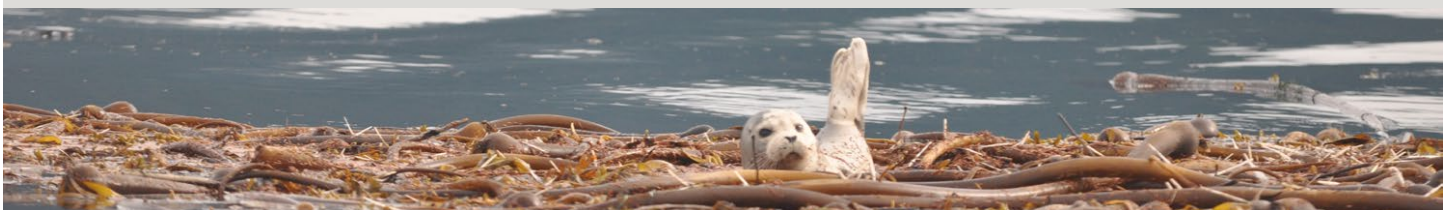


Figure 8. Tlingit Éil'i *(continued)*

Sít' Eeti Geiyí de yaa ntookúx. We are traveling to Homeland in our dugout canoes, our seine boats, our skiffs, our double enders, our trollers, our landing craft. ***Aadéi áwé yaa ntookoox Haa Shuká Aaní.*** We are traveling within Our Ancestor's Homeland. The ocean carries and holds us there. It shapes us, it nurtures us, it cradles us, it empowers us. ***Haa Shuká Aaní yaagú áyá yoo shatusiyéik.*** We are anchoring our boat in Homeland.

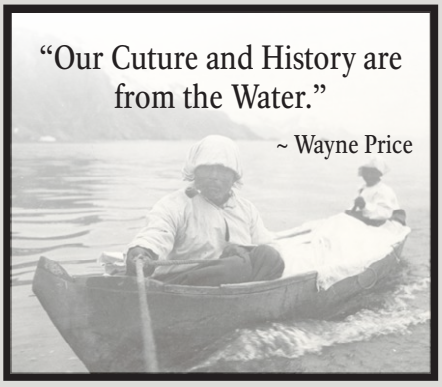


FIGURE 8. TLINGIT ÉIL'I *(continued)*

WHAT WE HEARD, ÁT WUTUWA.ÁX ÁT (WHAT WE HEARD)

The draft plan incorporates input from the public collected during a 30-day public scoping comment period (August 9 to September 9, 2022). The public reviewed three NPS proposals—alternatives A, B, and C described in the EA (part II of this document). Below is a summary of key topics brought forward from the public, including feedback that helped to shape a new alternative D, raise other issues for consideration, and inform other aspects of this draft plan and EA. Public comments expressed varied ideas and opinions, including:

- The number and content of public comments demonstrated that visitors care deeply about the park and the continued stewardship of park marine environments, wildlife, Homeland, and other resources and values. Commenters described a variety of marine experiences and settings they value, with local residents highlighting their enjoyment of recreation and the opportunity to share this special place and its natural abundance with family and friends. Commenters noted enjoying the scenic and changing landscape during on-water experiences such as wildlife watching, birding, fishing, and listening to natural sounds. Marine access was important for park experiences on land, including hiking, camping, and beachcombing.
- Several commenters expressed support for current marine stewardship and management approaches, noting that Glacier Bay is so popular because it is so quiet, so protected, and so pristine. Commenters stated that traffic should be minimized in the mouth of the bay because humpback whales need extra protection in that location. Commenters noted that vessel quotas help with safety and accident prevention, and prevent overcrowding, especially given limited places to anchor in peak summer. Some suggested that popular anchorages be managed to reduce conflicts, including in coordination with the BWMP (in progress) to enhance backcountry experiences along shorelines. Many asked for clarifications and requested supporting data about the rationales for the proposed alternatives.
- Commenters were also critical of some aspects of current marine stewardship and management approaches. Some called for full time law enforcement presence up bay, while others asked for less active patrolling on park waters. Some see a reduction in motorized vessel use across all vessel types as important to reduce the stressors on marine species given climate warming trends and extinction crises. Other comments noted a perception that halibut and king salmon availability is declining, potentially due to recreational fishing pressures in park waters. Some suggested a "no-take marine reserve" in Glacier Bay where no fishing is allowed to enhance the protection of the marine environment, with benefits inside the park and outside to adjacent fisheries (e.g., larger and older fish tend to produce significantly more eggs, increasing the density, size, and biomass of fish).
- Several commenters shared concerns about fair access to Glacier Bay. Several commenters questioned whether the proposed concept of day use and overnight use private vessel permits (alternatives B and C) would give visitors a fair chance at receiving a permit, and also were concerned this would add new complexities to the permitting process. Some expressed concern that the new managed vessel classes (administrative and nonmotorized) could limit access. Some suggested a private vessel permit for small boat day use within a flexible three-day window to enable travel on the best weather date, but limited to two permits per boat per year. Commenters suggested that the park proactively address private vessel motorized transits into and out of Bartlett Cove to enable visitors to wait for permits and experience frontcountry park activities and take the day boat if they are unable to get a permit. While some commenters found the permit

application process a burden, others stated that competition for permits during high demand periods is to be expected in any national park, and that in Glacier Bay those who are willing to go to the extra effort of reapplying after being denied a permit are usually satisfied with their ability to get access. Some suggested that the park could reduce private vessel permit denials and reapplication by opening the entire private boating permit season in February and developing tools to communicate dates of availability to inform applicant requests.

- Commenters generally agreed the park should clarify the vessel class for private vessels longer than 79 feet especially given research that supports the relationship between vessel sizes and the potential resource impacts to marine mammal (e.g., disturbance, noise, severity of collisions) and the scale of graywater dumping and other polluting impacts. One commenter noted that the use of private vessel permits for commercial gain undercuts the established charter operators who compete for the contracts and are managed to higher standards to protect public safety and park resources.
- Some commenters suggested that, given the rarity of glacial marine settings with nonmotorized opportunities, the entire East Arm should be managed for nonmotorized use, or with access limited to lower-impact vessels. Some noted that vessel speeds are too high in congested zones (such as waters adjacent to Gloomy Knob and glaciers) and that vessels viewing wildlife need careful monitoring to ensure that they are respectful to wildlife. Several commenters noted concerns about noise, wakes, wildlife disturbance, and visual impacts on adjacent designated Wilderness caused by motorized vessels, and tour vessel off-vessel activities. The floating cabin and fuel barge in South Sandy Cove were considered an eyesore to some. Some suggested that the park add new facilities (public use cabins), while others objected.
- Commenters expressed the need for greater transparency on commercial contracts, operating conditions, and pollution to counterbalance the economic interests and income generated for the park and better protect resources. Some suggested that administrative tools and permit data need to be updated to help substantiate and correct permit system abuses, rejection rates, and track visitor satisfaction.

PLAN BACKGROUND AND CONTEXT, SHKALNEEK (THE STORY)

America's national parks are among our nation's greatest treasures, managed for the enduring benefit and legacy of present and future generations. A gem among these national treasures, the park (figure 1) offers a sample of truly wild America, an awe-inspiring place to experience nature on its own terms in a dynamic landscape, where ancient Tlingit heritage blends with living cultural traditions.

Enabling Legislation and Park Purpose

Glacier Bay National Park and Preserve protects "a dynamic tidewater glacial landscape and associated natural successional processes for science and discovery in a wilderness setting" (NPS 2010a). Marine park waters support diverse people experiencing the fundamental resources and values of the park, primarily from the deck of a boat. Park significance themes emphasized in the 1925 enabling legislation that designated Glacier Bay National Monument (Presidential Proclamation 1733) that are relevant to marine management include:

- **Tidewater Glaciers in a Magnificent Setting.** Central to the formation of Glacier Bay as a National Monument in 1925 was the presence and ability to access and enjoy "tidewater glaciers of the first rank in a magnificent setting of lofty peaks, and more accessible to ordinary travel..." The desire by visitors to see and enjoy tidewater glaciers remains just as relevant today—even though their extent has changed dramatically over the past century (and will continue to change given the characteristic dynamism of Glacier Bay and due to climate change). Providing these experiences remains relevant to meeting the park's fundamental purpose.
- **A Living Laboratory.** When Glacier Bay and surrounding lands were first set aside, the principal lobby group was the scientific community; they wanted to ensure preservation of the area's potential to contribute to scientific knowledge with "unique opportunities for the scientific study of glacial behavior and of resulting movements and development of flora and fauna and of certain valuable relics of ancient interglacial forests." Scientists were first drawn to Glacier Bay in the late 1800s because of its dynamic, rapidly-deglaciating landscape and the associated colonization of new land by plants and animals. Glaciologists, geologists, plant ecologists, and other scientists came from all over the world to study the unfolding phenomena, and soon Glacier Bay became widely known as a living laboratory. Glacier Bay became the quintessential example of a park for science. Today, having hosted more than a century of research resulting in countless important contributions to science, including many specific to marine wildlife and the living oceans, the park is considered a globally important conservation area for learning about nature and helping the NPS and other management agencies wisely manage protected areas the world over. Importantly, the park has also modeled the values of incorporating traditional ecological knowledge into research design and analysis.
- **Historic Interest.** The proclamation also describes Glacier Bay's historical significance and the need to preserve valuable historic records. These cultural resources manifest relative to the marine environment as maps, photos, journals, and artifact assemblages, including submerged and shoreline artifacts which represent records of past events and utilization.

First protected as a National Monument, generations of visitors have been inspired by Glacier Bay's rugged mountains, dynamic glaciers, dense temperate rainforest, wild coastlines, and deep sheltered fjords. Designated a national park in 1980 and a Biosphere Reserve in 1986, the park today includes 3.2 million acres, which is part of the even larger 25-million-acre Kluane/Wrangell-St. Elias/Glacier Bay/Tatshenshini-Alsek World Heritage Site—one of the world's largest international protected areas.

Within southeast Alaska and North Pacific destinations for marine cruising and recreation, the park offers a one-of-a-kind experience that few places on the planet can match. Most of the park's visitation occurs in the park's productive marine waters and the adjoining shorelines of Glacier Bay, one of the most biologically rich, intact marine ecosystems in the world, and a globally important marine conservation area for myriad species. Traveling within protected scenic fjords, intimate inlets and bays, or along rugged coastal waters, visitors experience the magnificent setting of lofty peaks, intact ecosystems where natural forces and processes predominate, dynamic tidewater glacial landscapes (with most of the park's glaciers in retreat), abundant marine and terrestrial wildlife, and diverse succession habitats ranging from bare new beaches to lush estuary wildflower meadows and dense rainforests.

Generations have been captivated by this ever-changing park experience, making Glacier Bay one of the most beloved and popular cruise destinations worldwide (Sloan 2018). Glacier Bay is also a destination for adventure and the more intimate marine visitor experience of paddling and camping along the shoreline, or exploring numerous branches, inlets, lagoons, and passages from the vantage of a boat. As a

national park experience, the park delivers powerful experiences every day, while annually serving around 672,087 visitors (NPS 2019b). On average, visitors travel more than 3,000 miles from home to visit the park from around the world (20%), across the country (80%), within the state (>5%), or from nearby areas (2%) (NPS 2015b).

Economic and social studies attribute large intact ecosystems, their wilderness character, and abundant wildlife as significant drivers of Alaska visitation, and the park offers the competitive tourism advantage of being accessible through water-based visits that can be accomplished by reasonable modes of transportation and within a reasonable amount of time (Bright 1985). Overall visitor annual expenditures and contributions total $402 million in economic output, support an estimated 2,929 jobs, provide $121 million in labor income, and add $213 million in total contributions to the national gross domestic product, with visitor spending predominantly made by non-local visitors (98.7%) (NPS 2019b).

Visitor Characteristics – Glacier Bay by Vessel, Aadóo Sáwé Hás Wé Sh Tuwáa Kasyéiyi? (Who Are the Visitors?)

Most visitors experience the park from the deck of a boat continuing a tradition that started in the late 1800s when the first steam cruisers arrived in Glacier Bay with sightseers and curious scientists who became instrumental to preserving Glacier Bay as a living laboratory (figure 5). Following a natural waterway from Alaska's Inside Passage, these water-based scenic tours offer one of the most accessible national park experiences in Alaska for diverse visitors of all ages and abilities (figure 6), where many feel a deep connection to park resources and conservation values even without setting foot on shore (Furr et al. 2021; Swanson and Vande Kamp 2011).

Most marine visitors are cruise ship passengers who travel up to the West Arm to glacial destinations and spend 12 hours or less in park waters entirely onboard with park rangers and cultural interpreters providing in-person programs. Park social science characterizes the most important trip experiences to cruise ship passengers as experiencing scenic beauty, the wonder of nature, and a pristine environment. Visitor profiles highlight that the majority (85%) of these passengers are US residents not from Alaska, experiencing their first visit to Glacier Bay (94%), and that many never previously have visited a national park. The average age is 56 years old, with an average education equivalent of college or skilled vocation training (16.4 years) (Swanson and Vande Kamp 2011). Typically, cruisers travel in two-person parties, although there is a growing trend toward family and multi-generational cruises, with the average cruise party consisting of approximately four travelers who cruise for seven days. The cost per day of the Glacier Bay cruise-based experience introduces diverse audiences, including youth, to a national park and Alaskan wilderness setting. Park rangers annually deliver on average 227 Junior Ranger programs on ships, reaching an audience of 6,916 participants.

The next largest visitor segment arrive aboard excursion class marine tour vessels that carry an average of 80 visitors (as low as 25, as high as 120 individuals). Tour vessel passengers typically spend anywhere from 14 to 24 hours in the park (sometimes overnight) and are highly motivated by learning, viewing wildlife, experiencing glaciers, exploring off-vessel including experiencing Wilderness (hiking, kayaking), participating in frontcountry activities, and spending time with family and friends. Tour boat passengers are also typically (89%) US residents not from Alaska experiencing their first visit to the park (91%). They tend to be older (70% age 60 to 89) with a graduate or professional education training level (17.6 years) and are higher-earning individuals or retirees (Furr et al. 2021; Swanson and Vande Kamp 2011).

Some frontcountry visitors enjoy a "day boat" scenic tour that travels a daily route from Bartlett Cove to the tidewater glaciers at the head of Glacier Bay. Typically operating from late May until early September using a high-speed catamaran, this vessel carries visitors who generally find accommodations in Bartlett Cove (at the Glacier Bay Lodge or campground) or a nearby gateway community.

The marine visitors who enjoy the most unstructured experiences either explore the park aboard a smaller boat (private or hired charter) or via kayak. Charter vessels, intended for smaller groups, are usually customized to the specific group with trips being one to several days in length. These services are intended to address the needs of visitors who do not have their own vessel and do not have the skills or desire to lease a boat (bareboat charter), but still desire a more personalized visit than might be provided by the larger cruise ships or tour vessels and are also not interested in an entirely nonmotorized means of access such as kayaking or hiking. The charter boat passenger average party size is 4.6 people, with more than half traveling with family. Charter passengers are strongly motivated by opportunities to view wildlife, scenic beauty, and experience the wonder of nature. This group also values the flexibility to seek out and obtain solitude (78% indicate this is at least moderately important), and most select guides that will minimize encounters and use smaller vessels that can travel where larger vessels cannot go. Charter passengers are also typically (91%) US residents not from Alaska experiencing their first visit to the park (79%). Passenger average age is 52 years old, with passengers more likely to be male (62%) (Swanson and Vande Kamp 2011).

Private vessel users typically stay two to four nights in Glacier Bay and are highly motivated by viewing scenery, wildlife, and tidewater glaciers and taking photographs. Although most private vessel respondents (89%) did not plan their trip to minimize seeing or hearing other vessels, among those who did (11%), 76% reported that they planned their trips to avoid cruise ships. Similar to those on tour vessels, visitors on private vessels tend to be older (average age 54 years old) with a graduate or professional education training level (17 years) (Swanson and Vande Kamp 2011).

Backcountry campers and kayakers spend an average of 4.2 days in the backcountry (NPS 2022e) and are highly motivated by experiencing glaciers, solitude and natural sounds, natural connection and renewal, and adventure. The feeling of self-sufficiency and viewing wildlife were elements that added the most to backcountry visitors experiencing adventure (Furr et al. 2021). A portion use day boat drop-off services in targeted locations or hire charter vessels. Fluctuations in the level of backcountry camper and kayaker visitation use over the past few decades have prompted ongoing park studies to monitor campsite impacts and better understand and address desired social conditions.

Vessel Management in Glacier Bay, Wáa Sá Glacier Bay Káx Has Gaxdus.óox? (How Will They Drive the Boats in Glacier Bay?)

Over the decades that it took for this marine park visitor experience to evolve (alongside a multi-billion-dollar global tourism industry that pioneered southeast Alaska as a cruise destination), successions of park managers have been on the frontlines of applying the NPS Organic Act mission to provide enjoyment in such manner and by such means to conserve resources for future generations.

By 1979, intensifying pressures for marine access to Glacier Bay led the park service to manage different classes of motorized vessels through quotas and operating requirements. Since then, the requirements have evolved to include:

- **2003 VQOR ROD.** Rationale and framework articulated for five types of motorized watercraft managed by quota: cruise ships, tour vessels, charter vessels, private vessels, and a passenger ferry to Bartlett Cove.

- **36 CFR Part 13 Subpart N.** NPS special regulations for Glacier Bay National Park and Preserve.
- **Park Compendium.** Under discretionary Superintendent's authority some vessel permit details and restrictions may be adjusted annually within CFR set parameters.
- **Commercial Services Contracts and Operating Conditions.** As in all national parks, commercial business activities are limited and require specific authorization and approval. Over decades the park has managed commercial vessels in park waters through exclusive and highly competitive partnerships with the tourism industry at some of the highest environmental standards in the industry. These long-term relationships between commercial operators and the park consistently deliver powerful visitor experiences in a scenic wilderness setting that connects visitors to the park's dynamic natural and living cultural landscapes and founding purposes. These relationships also encourage park friendly investments, as evolving technology and competitive contracts for limited entries continue to reduce per-passenger impacts, especially by the cruise industry—primarily because of a 61% increase in the number of passengers per vessel between 2007 and 2019 (see figure 7).

Today, this proactive approach to marine vessel management is recognized as an international model for optimizing environmental and experiential conditions specific to the park.

Planning History and Context, Adax Yéi Jiwtuwanéi Át (The Things We Worked On)

The NPS is charged with managing park marine waters to provide for public enjoyment while protecting nationally significant resources and values, unimpaired for the enjoyment, education, and inspiration of this and future generations. This draft plan provides a management framework to achieve these mandates and applies visitor use management best practices set by an Interagency Visitor Use Management Council.

Managing the interconnected relationship between park lands and waters tiers from the broad direction of the park's 1984 GMP and a dynamic portfolio of tiering management plans that serve as internal agency tools that guide decision making and satisfy law and policy, as described below. The park planning portfolio creates a logical, trackable guide for park management actions consistent with The National Parks and Recreation Act of 1978 (54 USC § 100502) requiring each unit of the national park system to have a plan or series of plans that address the four statutory requirements:

- measures for the preservation of the area's resources;
- indications of types and general intensities of development (including visitor circulation and transportation patterns, systems and modes) associated with public enjoyment and use of the area, including general locations, timing of implementation, and anticipated costs;
- identification of an implementation commitment for visitor carrying capacities for all areas of the unit; and
- indications of potential modifications to the external boundaries of the unit and the reasons therefore.

The park's existing general management planning documents continue to provide relevant guidance and are listed below and in some cases are further detailed in appendix G. These may be supplemented through the development of additional planning documents:

- General Management Plan (NPS 1984)
- Vessel Quota and Operations Requirements (NPS 2003a)
- Foundation Document (NPS 2010a)
- Frontcountry Management Plan (NPS 2019a)
- *Chookanhéeni* (Berg Bay) Warranty Deed (2020) reserving Hoonah Indian Association real property rights that enable reasonable tribal member access for traditional cultural purposes
- Backcountry and Wilderness Management Plan (in progress)

This draft plan is consistent with the general guidance of the existing documents listed above and described in more detail in the park Foundation Document. Further, its proposed recreation use is consistent with the overall management objectives of the park as outlined in the GMP.

Numerous ongoing studies have been conducted by park and independent researchers on topics such as visitor use, wildlife, cultural landscapes, acoustic resources, Homeland values, and vessels. These studies and subsequent reports provide insights into visitor experiences of the park and park resource conditions and are available through online searches by park and topic through the Integrated Resource Management Applications online portal and many are included in the reference list for this draft plan and EA.

Legislative Context, A Káa Kuwdudziteeyí Yoo X'atánk (The Things We Live By)

The management of marine waters in the park is guided by laws, regulations, policy, and guidance. Some of the top legislative actions applicable to park marine management are listed below and further detailed in appendix G:

- Organic Act (1916)
- Presidential Proclamation 1733 (1925) and 2330 (1939)
- National Historic Preservation Act (1966)
- National Environmental Policy Act (1970)
- Marine Mammal Protection Act (1972)
- Endangered Species Act (1973)
- Redwood Act (1978)
- Alaska National Interest Lands Conservation Act (1980)
- Omnibus Parks and Public Lands Management Act (1996)
- NPS Concessions Management Improvement Act (1998)
- Glacier Bay Fisheries Act (1999)
- Passenger Ferry to Bartlett Cove Stipulations, Public Law 105-83 (Section 127)
- Glacier Bay National Park Resource Management Act (2000)
- Public Law 107-63 (155 Stat 414) (2001)
- Huna Tlingit Traditional Gull Egg Act (2014)

CHAPTER 2 GENERAL MANAGEMENT DIRECTION

The GMP for the park provides high-level guidance on how the park will be managed. This chapter supplements the GMP and lays out a vision and broad direction for marine management and specific descriptions of marine management zones and associated desired conditions.

VISION STATEMENT, DAA SÁWÉ TUWATÉEN HAA LÉELK'U HÁS, HAS DU ÉIL'I? (WHAT DO WE SEE IN THE FUTURE FOR OUR GRANDPARENTS' OCEAN)

Marine park waters—from the seafloor up to the high tide line—are a protected sanctuary, a living laboratory, and an awe-inspiring setting that invite and inspire people to explore and discover the dynamic and living natural and cultural heritage of the park.

MARINE MANAGEMENT OBJECTIVES, DAA SÁ HAA TUWÁA SIGÓO MARINE MANAGEMENT HAS DU YÉI JINÉIYI KÁAX̲? (WHAT DO WE WANT FROM THIS MARINE MANAGEMENT WORK?)

The objectives of the draft plan are the specific outcomes or goals that the NPS is seeking to achieve through consistent management action over time. Objectives can also be considered performance measures to guide decision-making as conditions change. The following objectives will guide future marine management in the park:

- Protect the ecological integrity of the park's unique and exemplary marine ecosystems and support ongoing study into the unseen, underlying web of ocean life and its human connections.
- Manage marine transportation as an essential element of the Glacier Bay experience identified in enabling legislation, where continuing marine vessel management and the stewardship of federally managed waters in the park are optimized to:
    - Welcome diverse audiences by providing reasonable, balanced, and transparent visitor access for visitors on an equitable basis to meaningfully connect with the park's fundamental resources and values.
    - Provide a range of quality, immersive visitor opportunities that emphasize the park foundational themes and the ruggedness, solitude, and wildness of the setting.
    - Reduce impacts to park resources and conserve natural ecological processes.
    - Advance park science through recognition of Glacier Bay as a dynamic, living laboratory.
    - Connect Tlingit tribal members to their Homeland and park visitors to Glacier Bay's cultural heritage.
    - Foster relationships with marine operators as stewardship partners committed to safely navigating park waters, protecting park resources and values, and providing opportunities for transformative visitor experiences.
- Foster understanding of Indigenous Tlingit perceptions of Homeland and protect the enduring spiritual connection between ancestral, living, and future Tlingit in Glacier Bay Homeland in the marine environment.
- Utilize submerged artifacts, maps, journals, and oral histories to tell the park history of marine exploration and our shared American heritage.

The rest of this chapter presents marine management direction applied within a GMP zoning framework, first across the entire Nonwilderness Water Zone (see figure 2), and then for three specific subzones defined by this plan. Specifically, it sets desired conditions for management based on internal park discussions, guidance from previous planning efforts, and other NPS policies and guidance.

Desired conditions are defined as statements of aspiration that describe resource conditions, visitor experiences and opportunities, and facilities and services that the NPS strives to achieve and maintain in a particular area. They help the NPS answer the question, "What are we trying to achieve?" Desired conditions focus on fundamental resources and values; the visitor experience opportunities associated with them; and the types and levels of management, development, and access that would be appropriate in a particular location.

Protecting Marine Ecosystems With Science and Stewardship. Yaa Ntusakwéin Yá Haa Léelk'u Hás, Has Du Éil'i (We Are Learning About Our Grandparents' Ocean)

A Living Marine Laboratory, Ax' Shtudultoowu Daaka Hidi (A Place to Learn). The NPS actively fulfills park science mandates with marine environments serving as a living laboratory (Glacier Bay National Monument Antiquities Act enabling proclamation, ANILCA, Biosphere Reserve, National Marine Protected Area). Partnerships and research continue to further understandings of Glacier Bay's remarkable abundance and diversity of marine life and complex array of underwater environments, such as the recent findings of dense thickets of cold-water coral communities associated with the steep walls of the fjord environment (Hartill et al. 2020). Legacy data sets are continued (e.g., glaciology, humpback whale monitoring program since 1985, and oceanographic surveys since 1993), to gain unique scientific perspectives on intact natural systems and worldwide trends, including those due to human influences (e.g., climate change, glacier recession, ocean acidification, wildlife abundance and health). New areas of study are initiated, including marine archeology and the traditional knowledge systems of maritime cultures to support protection and as a lens for considering human relationships with the living ocean.

Researchers recognize the value of, and seek out and integrate traditional knowledge held by the original inhabitants of Glacier Bay, the Huna and Yakutat Tlingit clans into study design and implementation. Traditional knowledge is collected and relates over time to numerous marine resources and topics of concern including harbor seals, commercial fishing activities and fish distribution and abundance, traditional harvest methods of glaucous-winged gulls' eggs and general information related to seabird and shorebird distribution and abundance, and the geological events associated with the Little Ice Age glacial advance. Traditional ecological knowledge informs key management decisions, remains vital to a wide range of park research, and supports ongoing relationships between tribal scientists, culture bearers, and park researchers.

Natural Resources, Tl'átk, Ka Daséigu, Ka Éil' (Earth, Air, and Ocean). Marine management throughout park waters utilizes a science-based approach to preserve the biodiversity and ecological integrity of marine ecosystems. Indigenous Traditional Ecological Knowledge is incorporated into management practice and science. The park manages in harmony with the dynamic ecosystem and natural successional processes that are observed within the park marine environment. While supporting the interconnectivity of the landscape within the broader region, the park is a world leader in information-based protection of natural resources. As one of the few protected areas in the world that includes extensive saltwater habitat within its jurisdiction, park waters serve as a unique living laboratory where study design and comparison controls can be applied.

The NPS maintains records that illuminate dynamic changes in both landscape and in scientific thought and human use that provide for understanding the ecosystem through the lens of human experience and study. Active research in park waters (by the park and other entities) advances human knowledge of ocean ecosystems, food webs, climate change, ocean acidification, aquatic invasive species, and other anthropogenic and cultural factors connected with the marine environment. The NPS translates this scientific knowledge into understanding for visitors and the broader public, including to inform management decisions.

Glacier Bay is a sanctuary where fish and wildlife may roam freely, developing their social structures and evolving over long periods of time without the changes that extensive human activities would cause. Although wildlife may occasionally experience short-term, localized displacement because of human presence, natural processes and patterns continue unimpeded by people. Fish and marine wildlife populations support spatial studies of comparative abundance (within and outside the park) because of differently applied restrictions (e.g., vessel quotas, motorized waters, commercial fishing, and potential future allowances for traditional tribal fishing and hunting). Results of these comparative studies are shared broadly to tell the story of how historical conservation decisions protect abundance while also documenting the impacts to human cultures and livelihoods, such as described in Huna Tlingit Traditional Environmental Knowledge, Conservation, and the Management of a "Wilderness" Park (Hunn et al. 2003); and *Navigating Troubled Waters: A History of Commercial Fishing in Glacier Bay, Alaska* (NPS 2010b).

Cultural Resources, Haa At.óowu Ka Haa Ḵusteeyí (Our Treasures and Way of Life). The legacy of marine navigation in park waters is recognized and shared as integral to the story of Glacier Bay. Records of Indigenous activity, exploration, scientific endeavor, and human use in many different forms (maps, photos, journals, artifact assemblages) are appropriately preserved and made available to researchers and others and inform both management actions as well as public education. Glacier Bay's rich maritime history is preserved through the lens of traditional life ways, exploration, human experience, and study, including consideration of designated maritime cultural landscapes as combinations of terrestrial and submerged archaeological and ethnographic cultural resources that reflect the relationship between humans and the water.

Cultural resources are inventoried, documented, and monitored to manage impacts and prevent degradation of these resources and protect the integrity of cultural sites. Restrictions on visitor access and behavior are implemented as necessary to protect cultural resources including sensitive cultural sites (e.g., cemeteries, sacred clan sites), ethnographic resources, and ongoing cultural gatherings, activities, and ceremonial events. Huna and Yakutat Tlingit continue to connect with the maritime environment by participating in traditional activities and perceive growing and sustained public awareness of their deep and enduring connection to Glacier Bay Homeland, their vital role as hosts to all visitors, and culturally respectful behavior.

Floating Cabins/Seasonally Moored Vessels and Shelters, Hidi Át Wulihaash (Floating Houses). Floating cabins/seasonally moored vessels are limited to those needed for essential research, law enforcement, and other park purposes, and minimally scaled to meet operational objectives. Larger sleep-aboard vessels would be used for more intensive stays and projects. Locations may be year-round or seasonal and would be carefully sited to minimize impacts to resources and the visitor experience and including consideration of other park values. While these are primarily for scheduled use by park staff and partners, they may receive incidental emergency public use (they are left unlocked). At the same time, cabins for public health and safety reasons under ANILCA 1315(d) are not recognized as being needed at this time because emergent health and safety situations in the marine environment (e.g., injury,

hypothermia, gear failure, wildlife incidents) are best dealt with using modern emergency communication tools (e.g., mayday calls, requests for mutual aid from passing boats or other recreationalists) with rescue by park or US Coast Guard assets, including vessels and helicopters.

Other Installations, Ch'a Góot'aa Hidi (Other Buildings). Installations are limited to only those needed for essential communication, research, navigation or other park purposes, and in line with park values when found appropriate. Installations may be temporary or seasonal and would be co-located with existing infrastructure to the extent practicable. Installations are carefully sited to minimize impacts to resources and the visitor experience.

Marine Operations and Park Fleet, Park Service Yaakw (Park Service Boats). Access to the marine waters by vessel for administrative purposes is essential to fulfilling the mission and mandates of the park. A diverse NPS marine vessel fleet is maintained that is capable of meeting a variety of functional needs day-to-day, including resource management, researcher support, law enforcement patrols and emergency services, interpretive transfers, and limited maintenance needs. The park fleet includes an all-weather and all-park-location capable large vessel, comparable to Nunatak 1, 2, and 3 that supported Glacier Bay from its early days until the last decade.

The NPS exercises due care in its everyday marine activities with a focus on marine research and monitoring, safety and resource protection through education and incident prevention, risk management, efficiency, and modeling proactive stewardship. See further guidance details in the Best Management Practices and Mitigations (appendix D).

Providing Diverse Visitor Experiences and Balanced Access. Woosh Gunayáade Át Ka Wooch Yáx Naxdatee (Different Experiences and Make Them Equal)

Visitor Experience, Wáa Sá Has Sh tudinook,Glacier Bay Át Has Wu.aadí? (How Do Visitors Feel about Glacier Bay?). Park waters convey visitors into a dynamic marine ecosystem interconnected with the surrounding terrestrial landscape and immersed within a living cultural environment. The marine environment provides myriad opportunities for visitors to experience terrestrial and marine wilderness and explore the recreational, scenic, scientific, educational, conservation, cultural, and historical purposes of the park.

The marine environment elicits inspiration, reflection, and understanding of ecosystem connections, from local to global interconnections. Interpreters help visitors appreciate these connections, and the park provides orientations to help visitors learn about and experience the dynamic tidewater glacial landscape in a manner that helps protect the ecological integrity of unique and exemplary marine and terrestrial ecosystems in a wilderness setting.

Experiencing the park from the water provides a window to the vast terrestrial designated Wilderness and access to unique marine designated Wilderness areas. The grand expanse of the undeveloped landscape facilitates opportunities for visitors to obtain a feeling of the ruggedness and wildness of this dynamic landscape and the solitude that early inhabitants found.

Within the marine environment, visitors are aware of the dynamic natural ecosystem and the park's obligation to maintain careful stewardship. Meeting stringent conservation goals, the park applies a globally recognized model of applied science to manage and reduce impacts from visitor access. For a relatively small number of visitors seeking adventure and independent travel by private boat and human-powered water travel including kayaks, self-reliance and the freedom to explore are a key component of the marine visitor experience. For this group, pre-visit education and orientations support visitor safety,

mitigate risks, convey legal requirements, and touch on key park values and concepts, including Tlingit Homeland, leave no trace ethics, and Glacier Bay's active research and role as a living laboratory. Visitor orientations and authoritative maps are developed that respect the diversity of user experience and are supplemented by resources on targeted topics of interest to marine visitors in Glacier Bay (such as tides, uncharted navigational hazards, ice bergs and tidewater glacier safety). Further, orientation staff and materials would intentionally limit advice on preferred routes and anchorages for these reasons:

- To promote discovery and exploration in untracked and remote places;
- To encourage dispersal and safety where boaters travel and anchor at will; and
- Independent visitors are ultimately responsible for accepting unknowns, determining their own course, using situational awareness to adapt as conditions change (as they often do in park waters), and learning in advance what they need to know to be legal and safe.

Although unlikely outside the frontcountry setting, visitors may encounter infrastructure to support research, communications, emergency response and law enforcement, as well as evidence of research activities or cultural practices. Potential installations in the backcountry are evaluated for impacts to visitor experience and impacts are mitigated to the highest degree possible. Visitor encounters with park staff outside the frontcountry are infrequent, with administrative vessel traffic carefully managed for trip efficiency and implementing best practices and mitigation measures to reduce impacts to visitor experience and park resources and values.

Closures and restrictions on visitor access and behavior may be required to achieve resource and visitor experience conditions but are minimized to the extent possible.

Visitor Access, Services, and Opportunity, Daa Sá Yéi Kg̲isanéi Yáax'? (What Will You Do Here?). Marine waters serve as the primary form of park access, and marine transportation is monitored and managed to be consistent with park purposes and values and to balance the forms of access and use across a recreation opportunity spectrum, optimized to park-specific environmental and social conditions.

Necessary and appropriate commercial services support visitor access and experiences and are managed to reduce impacts (including into designated Wilderness), recognizing the interconnectedness of marine ecosystems, the importance of holistic park visitor management, and Glacier Bay social science research results indicating that visitor experiences of "wildness" do not require setting foot in designated Wilderness (Furr et al. 2021; Swanson and Vande Kamp 2011).

Quotas and restrictions on visitor access and behavior may be required to achieve resource and visitor experience conditions. These are minimized to the extent possible, and when applied, balance the tradeoffs of decreased opportunity with retaining enhanced experiences aligned with social science and park purposes.

Visitor education and orientations help visitors behave to proactively steward the marine environment and the park holds visitors accountable for actions that negatively impact park resources (see Best Management Practices and Mitigations for details, appendix D).

Sustaining an Enduring Commitment to Huna and Yakutat Tlingit Homeland Values. Haa Kusteeyí Káx Yánde Gaxtoodéil (Taking Care of Our Way of Life)

Tlingit Homeland, Haa Aaní. The Huna and Yakutat Tlingit connection to the marine landscape is sustained and facilitated through park support of living traditions and activities compatible with the preservation of intact marine ecosystems. The park sustains a rich and evolving Indigenous maritime

culture. The integrity of Homeland values is honored by enhancing relationships between the agency and traditional people, collaborating on cultural and natural stewardship of park marine waters, facilitating tribal access to the park, enhancing tribal members spiritual connections to traditional foods in the park.

Cultural Welcome Protocol and Interpretation. The park and tribe implement authentic place-based cultural interpretation which conveys traditional tribal protocols for hosting and behaving respectfully in Homeland.

MANAGEMENT ZONES

Management zones enable the NPS to determine and achieve location-specific desired conditions and to manage intensities associated with public enjoyment and other uses of the park. The park's GMP states that "any zone may be subdivided to meet management needs or to further delineate future resource areas." This draft plan would subdivide the existing Nonwilderness Waters Zone in the GMP into three new subzones. Importantly, the Nonwilderness Waters Zone would not be removed or replaced and subdividing the existing zones would not change or affect the human environment. Any actions within the zones that could result in an environmental effect are analyzed in the EA. The remaining four zones in the GMP would remain unchanged.

This draft plan subdivides the Marine Management Plan waters into three subzones: the Glacier Bay Zone, the Icy Strait/Cross Sound Zone, and the Outer Coast Zone.

While these zones are set to reflect current park needs, the park may designate smaller units for the purposes of monitoring and other administrative needs. Also, while zones are presented as exact distances and locations, those are based on current law, policy, regulation, landforms, and ecological knowledge at the time of publication of the draft plan.

Following is a description of each zone and location-specific desired conditions to manage intensities associated with public enjoyment and other uses of the park.

Glacier Bay Zone, Sít' Eeti Geiyí

Area Description. Glacier Bay is a glacial fjord 65 miles long and 12 miles at its widest that branches into West and East Arms (see figure 9). Glacier Bay is the most popular and frequently visited area of the park, and encounters with other vessels are more likely, especially during the summer season and within the West Arm. The presence of accessible tidewater glaciers and glacial environments make Glacier Bay a highly desirable location for visitation.

Social science confirms that while visitors come to Glacier Bay to see glaciers and scenic beauty, its biologically rich marine environment supports highly valued visitor experiences of being able to observe wildlife from the deck of a boat (Furr et al. 2021; Swanson and Vande Kamp 2011). Glacier Bay's glacial history and natural successional processes are enshrined in the founding purposes of the park and make it a globally unique marine sanctuary for many species. Since the 1970s, balancing human use and protection of these attributes in Glacier Bay has been a topic of national discussion resulting in landmark decisions and ongoing park management efforts to minimize impacts to the natural environment, air quality, water quality, and soundscape.

The Glacier Bay Zone is defined as waters contiguous with Glacier Bay lying north of an imaginary line between Point Gustavus and Point Carolus excluding waters managed under the BWMP and FMP. Within

the Glacier Bay Zone, vessel quotas and operating requirements apply as well as motorized and nonmotorized waters.

Desired Conditions

Natural and Cultural Resources — The waters in this zone provide for an intact ecosystem, where natural processes and patterns continue and all biological and physical components of the ecosystem are retained without intervention or alteration, except as allowed under some circumstances (e.g., recreational fishing, limited lifetime access commercial fishing, Huna Tlingit traditional Gull Egg harvest,[4] noise pollution and other byproducts of motorized visitation, and oil spill response and reclamation). The effects of vessels on marine resources will be closely monitored and managed to ensure that impacts to habitats, populations and individuals are minimized. The NPS will collect and use data on human-wildlife interactions, including in the underwater and above-water acoustic environment and intertidal and shoreline habitats to inform Glacier Bay-specific approaches to minimizing visitor impacts to the natural environment and wildlife activity patterns (see figure 10). Fisheries harvest will be closely monitored and managed to minimize impacts on the marine ecosystem. Collaboration with fishery management agencies will be pursued for data sharing and general support of park conservation goals. NPS management will prioritize characterizing impacts associated with different fishing gear types and practices and ensure that unacceptable impacts to resources are unlikely to occur or to be perceptible at a population level. Ongoing research and monitoring of oceanography and biological resources help managers document and understand biodiversity, species distribution, and ecosystem processes that may change in the context of glacial retreat and accelerating climate change and ocean acidification, especially for keystone taxa like forage fish, watchable wildlife, protected species such as harbor seals, Steller sea lions, and humpback whales, and sensitive seafloor dwellers such as red tree coral. Seabird populations are regularly monitored to facilitate traditional Huna Tlingit gull egg harvest. Research on glaciers and ecological succession that are foundational to the park's purpose occurs on an ongoing basis. Vital signs research is also ongoing, including to detect airborne and marine contaminants that result from vessel traffic.

Visitor Experience (Lower Bay, Mid-Bay and West Arm) — From the mouth of Glacier Bay up to the upper West Arm, visitors are highly likely to encounter other vessels, commercial activity, and other parties. Due to the accessibility of only a few tidewater glaciers (most experiencing retreat) visitors should expect to see concentrations of vessels in these areas, including cruise ships and tour vessels, especially during the summer season. Anchorages are limited in this area so visitors should expect concentrations of vessels in these areas as well. Visitors should also expect to see the implementation of a variety of management tools to ensure high-quality visitor experiences and resource protection. Park staff actively manage impacts from visitors in this zone, patrol and monitor use, and issue guidance as needed to protect critical resources.

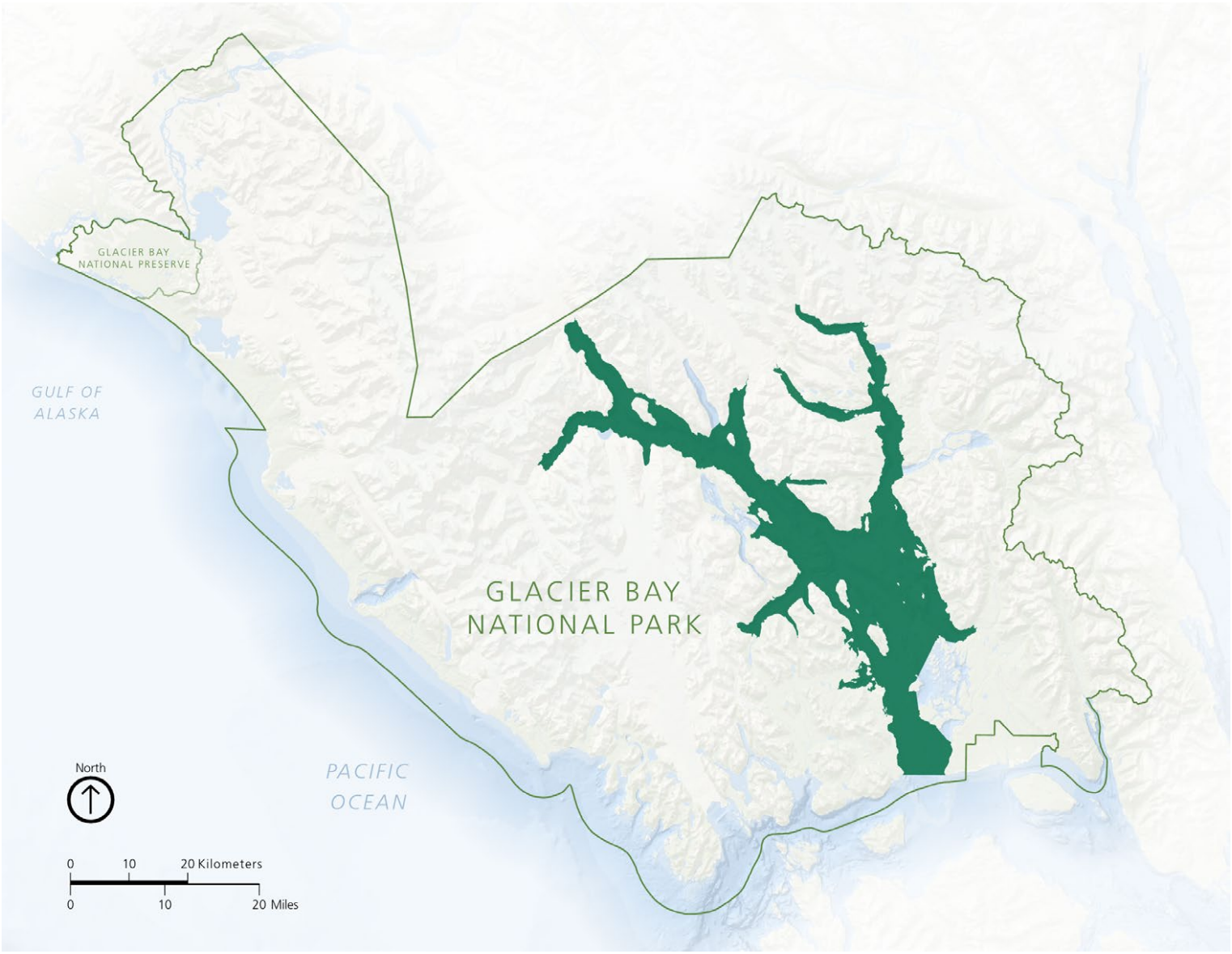
Visitor Experience (East Arm and Sheltered Inlets) — Visitors traveling into the East Arm and many of the sheltered inlets throughout Glacier Bay are likely to experience the sights and sounds of humans less frequently than in the main travel corridors and anchorages in the Lower Bay, Mid-Bay, and West Arm, producing more intimate and remote conditions with a higher degree of solitude and challenge. The

[4] ANILCA and NPS regulations prohibit federal subsistence uses in the park (codified in 36 CFR § 13). Legislation enacted in 2000 (Public Law 106-455) and a legislative environmental impact statement authorize the limited harvest of glaucous-winged gull eggs by the Huna Tlingit in the park under a management plan cooperatively developed by the NPS and the Hoonah Indian Association, the federally recognized tribe of the Huna Tlingit. Glacier Bay is the traditional Homeland of the Huna Tlingit who traditionally harvested eggs prior to park establishment.

seasonal absence of motorized vessels in specific areas also provide a more natural soundscape that benefits natural and cultural resources. Visitors in these areas should expect greater self-reliance as a key component of the visitor experience with fewer patrols and less traffic, where trip planning and safety information are limited or only accessible prior to entry.

Park lands and waters in the East Arm previously determined to be "eligible" for wilderness designation are managed by the NPS to preserve their eligibility status by avoiding nonconforming or incompatible uses until formal designations are considered by Congress. Any future change of status from eligible wilderness to full designated Wilderness protection will require an act of Congress.

Glacier Bay Access and Vessel Management Area — Continue to optimize the successful Glacier Bay model that has evolved since 1979. Optimize vessel class quotas, operating conditions, permits, contracts, and the application of nonmotorized waters to provide diverse visitor experiences and balanced access, consistent with park resources and values. Minimize impacts from commercial operators in Glacier Bay using a suite of management actions and through the concession contract process (see figure 11). The NPS has successfully used Concessions Law and concessions contracts to minimize impacts to park resources and values, due to the competitive environment for commercial operators who want to bring visitors to Glacier Bay. For example, cruise ship operating requirements related to air pollution, wastewater discharge, and whale strike avoidance in Glacier Bay are some of the most stringent in the world owing in large part to cruise lines putting their best foot forward in competition for contracts. Self-reporting of violations, such as incidental discharges, are required as part of the concession contract. Commercial services staff at the park provide educational resources to charter, tour, and cruise operators to help inform their visitors about current research in the park, as well as to provide context for the scientific basis for operating requirements.





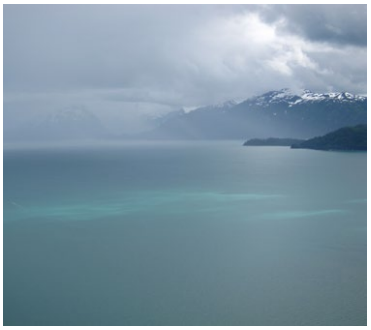



FIGURE 9. GLACIER BAY ZONE

Whale Waters speed limits and traffic separation reduce disturbance and collision risk to humpback whales and other marine wildlife.

Seasonal vessel closures are used to minimize human-related disturbance to harbor seals and to avoid the separation of pups from their mothers during the pupping season (left and middle). Island closures and wildlife approach distances are also used to protect multiple marine species from disturbance during critical life stages. Foot traffic is further prohibited in sensitive areas (such as seabird nesting colonies) to protect multiple species where human presence may impact nesting and chick-rearing (right).

The shorelines in Glacier Bay provide an important travel corridor and foraging and nesting habitat for wildlife, as well as the greatest recreational opportunity for visitors, therefore increasing the frequency of human-wildlife interactions (above). Temporary closures are used to minimize the potential for food conditioning of bears and other human-wildlife conflicts, and seasonal closures to foot traffic in sensitive areas such as seabird nesting colonies to protect wildlife. Recent research results have found that even low levels of outdoor recreation can alter wildlife spatial and temporal activity. Using remote cameras, researchers found that if humans were present in an area, the cameras detected fewer than five animals per week across four species (brown bear, black bear, moose and wolves). In most cases, this likely meant that animals avoided areas where humans were present. Second, in backcountry areas, wildlife detections dropped to zero each week once outdoor recreation levels reached the equivalent of about 40 visitors per week (Sytsma 2022).

Figure 10. Minimizing Human-Wildlife Conflicts in Glacier Bay

NPS and Alaska Native Voices interpretive rangers embark large cruise ships via a small transfer vessel (left) to lead educational programs and commentary that reaches passengers of all ages (right). The efficiencies of mass transit reduce the per-person environmental impact of this national park visit, yet still provide access to an Alaskan wilderness setting.

The park has been successful in leveraging the contracting process and limited entry to Glacier Bay to achieve water quality and air quality standards in the park that exceed federal and state standards. This figure explains how and shares examples where the park has incentivized commercial partners to propose technological solutions and operating practices that result in higher quality standards, and how the park retains leverage to ensure compliance.

Federal regulations prohibit engaging in or soliciting any business in park areas, except in accordance with the provisions of a permit, contract, or other written agreement with the United States. As in other National Park Service areas, commercial visitor services or other commercial activities are only provided in the park where authorization has been granted.

For commercial vessels that hold a concessions contract (including cruise ships, tour vessels, and charter vessels) the park uses concessions law and the competition for and issuance of contracts to minimize impacts to park resources and values. For example, cruise ship operations in Glacier Bay are considered some of the most sustainable in the world owing in large part to operational requirements produced as a result of competition for concession contracts.

In sum, every 10 years park managers issue a concessions prospectus seeking bids for a specific business opportunity (cruise ship services, tour vessel services, charter vessel services, etc.). For cruise ships, the prospectus includes five **Principle Selection Factors** including factors related to conserving park resources (0-5 points possible), providing visitor services at reasonable rates (0-5 points possible), experience/performance at providing said services (0-5), financial capability to carry out the service (0-5), and proposed minimum franchise fee paid to the NPS on a per passenger basis (0-4 points). The prospectus also includes **Secondary Selection Factors** (with possible 0-3 points) focused largely on natural resource protection including minimizing impacts to underwater noise and park wildlife, and minimizing waste.

Companies write proposals in response to the prospectus specifically addressing each of the primary and secondary selection factors. Those responses are then reviewed by an independent committee with scores assigned to each factor response based on possible points. Companies receiving the highest point total are then awarded 10-year contracts, and are contractually obligated to operate based on their proposed responses.

The result is that companies (cruise, tour, charter) individually commit to conserve park resources and values, support NPS interpretation services, and to pay a per passenger franchise fee that the park is able to use for marine management and visitor impact research studies, monitoring, equipment, and personnel focused on understanding and mitigating impacts by park visitors.

Figure 11. Optimizing Concessions Law and Selection Factors

For example, in the most recent (2020-2029) cruise ship concession prospectus, the Principal Selection Factor focused on conserving air quality includes this language:

Describe the equipment and technology for controlling or minimizing air pollution to meet or exceed North American Emission Control Area standards to be used by each vessel you propose to operate in the park.

Describe operational methods you will use to minimize air pollution emissions for each vessel you propose to operate in the park including engine, generator, incinerator, and oil-fired boiler operations.

Likewise for conserving water quality, each company proposing was required to address these criteria:

Explain the operational discharge practices you commit to use while in the waters of Glacier Bay National Park and how those practices will protect the water quality of the bay, including, but not limited to, wastewater, treated and untreated sewage, gray water, ballast water, bilge water, scrubber wash water, hazardous and solid wastes. Describe the nature of the planned discharge(s) in detail including location(s), composition, toxicity, quantity, rate and frequency. A better proposal may commit to eliminating vessel discharge in the waters of Glacier Bay National Park.

Describe the discharge practices you commit to use prior to entering the waters adjacent to Glacier Bay, from Cross Sound to the entrance to Glacier Bay, and while in those adjacent waters, and how those practices will protect the water quality of the Bay, including, but not limited to, wastewater, treated and untreated sewage, gray water, ballast water, bilge water, scrubber wash water, hazardous wastes and solid wastes.

Describe the nature of the planned discharge(s) in detail including location(s), composition, toxicity, quantity, rate and frequency. A better proposal may commit to eliminating vessel discharge in the adjacent waters described above.

Each company that was awarded a 10-year contract agreed to operate solely on ultra-low sulfur Marine Gas Oil (MGO) to minimize air quality impacts. As a result, no ships in Glacier Bay operate using emission gas cleaning systems ("scrubbers") with a subsequent production and discharge of a large volume of scrubber 'washwater' (up to 30,000 gallons per hour per engine).

The result is that while in park waters, cruise ships refrain from discharging any treated or untreated wastewater and do not discharge any emissions gas cleaning system washwater. A recent study of Polycyclic Aromatic Hydrocarbons (PAHs) along the route of cruise ships has confirmed the pristine water quality in Glacier Bay (Gende et al. 2020).

In addition to benefiting wildlife, marine organisms, and air and water quality, higher standards also benefit visitor experience as ships only operate on ultra-low sulfur fuel which reduces the chance that haze forms during inversions. Likewise, holding all wastewater and washwater has benefits to the visitor experience of people enjoying the marine environment and shorelines of Glacier Bay.

In terms of compliance, the self-reporting of violations, such as incidental discharges, is a required part of concession contracts. Companies caught violating the contract but not reporting could receive a negative year-end review, two of which could result in the termination of the contract, and prohibition on competing for the next 10-year contract. Thus, the incentive to follow contractually obligated operations and regulations, is extremely high owing to the financial implications of eliminating Glacier Bay from itineraries for up to 19 years.

NPS observers at the bow of cruise ships in Glacier Bay use high power binoculars to detect humpback whales and communicate positions to captains to support avoidance maneuvers.

An NPS Scientist records fuel consumption data to estimate emissions from cruise ships in Glacier Bay.

An NPS Scientist inspects the emission gas cleaning system ('scrubber') installed on a cruise ship operating in Glacier Bay.

A contractor records engine type and configuration during an inspection of a cruise ship in Glacier Bay.

FIGURE 11. OPTIMIZING CONCESSIONS LAW AND SELECTION FACTORS *(continued)*

Icy Strait/ Cross Sound Zone, S'íx' Tlein (Big Dish)

Area Description. This zone extends from Excursion Inlet to Cape Spencer and includes associated bays such as lower Dundas Bay and Taylor Bay (see figure 12). Within Icy Strait and Cross Sound, the marine environment serves as a travel corridor for private vessels, charter vessels, tour vessels, cruise ships, passenger ferries, fishing vessels, and other commercial service operators, including cargo shipping. This zone provides access from the inner waters of the Alexander Archipelago to the Pacific Ocean. To support safe navigation, this zone also includes a Cape Spencer terrestrial site near sea-level with permitted use by the US Coast Guard to support maritime aids to navigation. The park considers this permitted installation as excluded from designated Wilderness because it was acquired with covenants or characteristics incompatible with wilderness designation (as specified in section 5(a) of the Wilderness Act and section 701 of ANILCA).

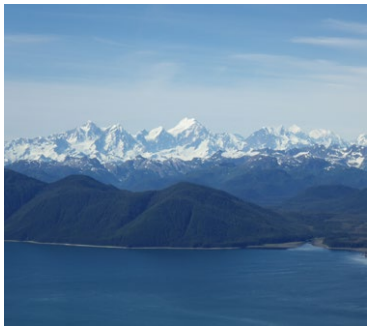
The waters of Taylor Bay, Fern Harbor, southern Dundas Bay (nonwilderness portion), and to some degree Excursion Inlet provide safe harbor and shelter for mariners from rough and exposed marine conditions including allowances for non-park purposes (e.g., transportation related and incidental commercial use rather than visitation or recreation use).

Commercial fishing allowances continue a cultural tradition where area waters serve as economic drivers for communities and fishing as a valued way of life. Excursion Inlet also supports more non-park purposes due to marine transportation to support commercial operations at a seafood processing plant at a nearby settlement outside park lands and waters. At the same time, these waters also provide vessel experiences less impacted by visitor use than many of the main travel routes and an opportunity to experience natural marine ecosystems as well as view unique older growth habitats compared with areas inside Glacier Bay.

Desired Conditions

Natural and Cultural Resources — This zone allows for commercial fisheries at current levels, but no new or expanded commercial fisheries are permitted (Public Law 105-277 section 123). The waters in this zone provide for intact ecosystem processes, where natural processes and patterns continue without intervention or alteration, except as allowed under special conditions. This includes commercial and recreational fishing as maritime cultural traditions where boats occupy a central place in society connected to the natural cycles of oceans, coasts, and wild country, and humans participating in ecological frameworks (e.g., harvest). This is especially the case for residents in nearby gateway communities (Gustavus, Excursion Inlet, Hoonah, Elfin Cove, Pelican, Tenakee Springs), but also for residents and businesses based in in Yakutat, Sitka, and Juneau.

Marine resources are monitored and managed to ensure that impacts to habitats, populations and individuals are minimized. Research and monitoring help managers document and understand biodiversity, species distribution, and ecosystem processes that may change in the context of accelerating climate change and ocean acidification, especially for key taxa like forage fish, watchable wildlife, protected species such as harbor seals, Steller sea lions, and humpback whales, and sensitive seafloor dwellers such as red tree coral. Research foundational to the park's purpose occurs on an ongoing basis (e.g., interstadial wood, ecological succession). Visitor use impacts to natural and cultural resources are unlikely to occur or to be visible.



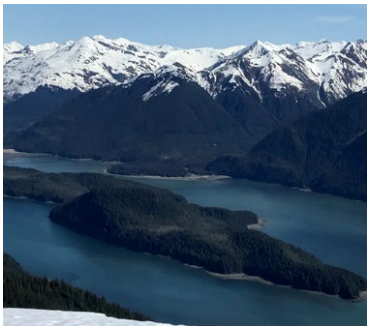


FIGURE 12. ICY STRAIT/CROSS SOUND ZONE

Visitor Experience — Within Cross Sound, Icy Strait, and to some degree Excursion Inlet, visitors should expect to find some elements that indicate higher use as a travel corridor for vessels of all sizes. Within the associated bays in this area, some visitors may find the opportunity to experience solitude, challenge, and self-reliance. The zone also supports recreational use for park gateway communities and regional boaters with reduced competition for access, connected to a broader bounty of public lands where Alaskan resident subsistence opportunities are available that are vital to the southeast Alaskan experience.

Outer Coast Zone, Yan T'iká (Far Away Shore)

Area Description. The coastal waters from Cape Spencer north to Cape Fairweather are exposed waters where few vessels travel close to shorelines (see figure 13). Park-managed waters and shorelines (a linear stretch of coast around 70 miles long, and 3 miles wide) are considered among the most pristine marine and coastal areas in the world, and are especially valuable for transiting wildlife migrations in combination with offshore deep waters nearby (outside park waters).

Human uses are sparse in this rugged maritime environment. These outer coast park waters are adjacent to an area known as the Fairweather Grounds, a larger scale offshore fishery regulated by the federal North Pacific Fisheries Management Council, that predominantly uses large industrial-scale gear and involves corporate ownership (Brakel 1999).

For boaters, northwest of Cape Spencer there only a few small rocky inlets, with long stretches of ocean beaches with only a couple of widely separated harbors, Lituya Bay and Yakutat Bay (around 80 miles north of park waters). Some vessels may risk recreational trips along the coast to anchor in the few bays along this section of park waters (e.g., Lituya Bay, Graves Harbor), but most boats using this area are transiting the Gulf of Alaska between other destinations. Occasionally, visitors may access the coastline from their vessel and travel to the interior for other recreational opportunities such as skiing or mountain climbing. Other shoreline recreational park uses typically involve beach landing planes dropping off users for wilderness trips.

Desired Conditions

Natural and Cultural Resources — The park conducts studies in this area where data are traditionally more difficult to obtain, including natural resource vital signs monitoring and work to better document and understand cultural landscapes and a long history of coastal exploration. This area offers unique insights compared with other park waters, including understanding the development of marine terraces and nearshore refugia when glaciers retreated in interglacial periods, long distance marine pollution (especially marine debris), marine ecosystems less driven by glacial processes, and the impacts of commercial fishing on long lived rockfish and scallops.

This zone allows for commercial fisheries at current levels, but no new or expanded commercial fisheries are permitted (Public Law 105-277 section 123). The park develops strategies to measure the extent of direct and indirect resource impacts from commercial fisheries which are largely unknown (e.g., scallop dredging that flattens the topographical features of the ocean floor, including habitat impacts and bycatch that change biological composition and productivity). As directed by Congress, these commercial fisheries are managed under a fisheries management plan that is cooperatively developed by the State of Alaska and the Secretary of the Interior, intended to "…provide for the protection of park values and purposes…and for the opportunity for the study of marine resources." The NPS seeks opportunities to work with the State of Alaska to meet this Congressional mandate. Recreational fishing along the rocky sections of the coastline north of Cape Spencer is loosely monitored by the NPS (through concessions charter fishing logs) and by the Alaska Department of Fish and Game for conservation and management

purposes. The NPS will continue to seek relevant fisheries harvest and effort information from state and federal fisheries management agencies to evaluate these activities within the park.

Visitor Experience — The further a visitor travels north along the outer coast, the less likely they are to encounter other vessels or parties close to shorelines. Visitors traveling by boat have the opportunity to experience this landscape as other explorers did before them, including a very high degree of challenge, self-reliance, and risk (long stretches of open water along surf-pounded beaches), extreme waves and weather, few safe harbors and anchorages, no services and limited rescue capacity (nearest emergency services based in Bartlett Cove, Sitka, Pelican, and Yakutat).Visitors not traveling by boat (e.g., hiking the coast) face the additional risks of crossing dynamic coastal streams and rivers, glaciers, and moraines.

Conservation Buy-Out — Explore a conservation easement or buy-out of the mineral interests associated with the Brady Icefield copper-nickel deposit. If mine development is proposed, protect park resources and visitor experiences by managing the scale and intensity of marine transportation-related access and facilities.

Figure 13. Outer Coast Zone

CHAPTER 3 MANAGEMENT STRATEGIES AND ACTIONS

This chapter identifies management strategies and actions to achieve and maintain desired conditions within the three subzones described in chapter 2, placing an emphasis on natural and cultural resource protection, safety, and visitor experience, and in some zones, facilities and infrastructure. A strategy is a general direction of course, and the actions are the specific steps that may be taken to move the strategy forward. During day-to-day implementation, further mitigation measures and best management practices (appendix D) will be applied to ensure protection of the park's fundamental resources and values.

MANAGEMENT ACTIONS COMMON TO ALL ZONES, DAA SÁ PARK SERVICECH YÉI HAS GUXSANÉI? (WHAT WOULD THE PARK SERVICE DO?)

Protecting Marine Ecosystems with Science and Stewardship Haa Éil'i Káx Yánde Gaxtoodéil, Haa Át Sakóowuteen (Our Ocean, We Will Watch Over It With Our Knowledge)

Research. The NPS supports and facilitates ongoing science in the marine environment consistent with park mandates (Glacier Bay National Monument Antiquities Act enabling proclamation(s), ANILCA, National Marine Protected Area, and the Biosphere Reserve) including basic and applied research in all marine zones, subject to permitting review to determine whether the proposed research is consistent with the park's enabling purposes and to minimize adverse impacts to natural and cultural resources, wilderness qualities, and visitor experience through mitigations (including as outlined in appendix D).

Monitoring Stations. As part of an interdisciplinary, long-term monitoring program to gather oceanographic data, including salinity, temperature, turbidity, and other biological ocean health indicators, the NPS will annually install oceanographic moorings, with up to three moorings set in the Outer Coast Zone and up to three moorings in Glacier Bay. Each mooring will be anchored to the ocean floor year-round and include removable flotation buoys and tethered equipment at depths and locations that minimize risks to vessels. Anchors may be abandoned on the ocean floor.

Resource Management. Glacier Bay has several documents (available online) that outline the resource management direction for the park. These documents stipulate the management priorities for natural, cultural, and wilderness resources parkwide and identify priority stewardship goals and projects. For additional information on resource management guidance see:

- Glacier Bay National Park and Preserve Resource Stewardship Strategy (2018)
- State of the Park Report for Glacier Bay National Park and Preserve (2017)
- Natural Resource Condition Assessment: Glacier Bay National Park and Preserve (2017)
- Bear Management Plan (2013)
- Harvest of Glaucous-Winged Gull Eggs by Huna Tlingit in Glacier Bay EIS (2010)

Traditional Ecological Knowledge. Recognizing the value of traditional knowledge held by the original inhabitants of Glacier Bay, the Huna and Yakutat Tlingit clans, the park will continue to seek and incorporate such knowledge in all phases of park-sponsored research, including study design, implementation, and reporting and will encourage and facilitate the acquisition and incorporation of such knowledge in research projects proposed by external park researchers.

Collaborative Fish and Wildlife Management. The NPS has the ultimate authority to protect fish and wildlife populations from impairment and to address threats to park resources or values (under the Organic Act and federal jurisdiction authorities over lands and waters secured pre-Alaska statehood and pre-ANILCA). At the same time, many federal and state agencies are co-management partners with shared responsibilities and management roles applicable to conservation, human safety, or visitor experience concerns related to fish and wildlife. If park staff or outside agencies notice a change in fish and wildlife populations which may be the result of human pressures that can be managed at the park level (e.g., overfishing in certain areas of the park, fishing gear impact concerns, reported wildlife incidents) the park will use a science-informed decision-making approach to take corrective action. Park actions will generally follow the management action progressions listed below using transparent processes (public press releases, Park Compendium, and CFR public comment opportunities). The NPS is also committed to fostering cooperative relationships to manage fish and wildlife populations, including data sharing, research, incident management, protective measures or emergency closure protocols (such as through the Board of Fisheries process to change sport fishing regulations), memoranda of understanding, and a joint fisheries management plan. The park will also strengthen the role of federally recognized tribal governments representing the Huna and Yakutat clans in collaborating on indigenous stewardship approaches to fish and wildlife management.

Regulations and Closures. Permanent and temporary restrictions and closures have been proven to minimize human-wildlife conflicts in Glacier Bay (see figure 10). While varying degrees of protection continue to be needed to ensure that natural life processes prevail, years of marine resource data and management experience point to the importance of flexible, science-informed approaches given the park's dynamic post-glacial environment and even more dynamic species distributions.

The option to close areas and restrict visitor use will be exercised using regulations and closures when necessary to ensure that the activity or area is being managed in a manner compatible with the purposes for which Glacier Bay was established. Closures will occur under existing park service authorities (annual Superintendent's Compendium and under the requirements of 36 CFR § 13.50).

At the same time, in localized areas of the environment, natural processes and continual physical changes reduce signs of anthropogenic activities, such as associated with glacier outwash formation, slope wasting, ocean scouring, and fast rates of isostatic rebound. In this way, Glacier Bay's dynamism poses a unique challenge for NPS resource managers evaluating localized resource damage from marine visitation (e.g., seafloor damage from anchoring, shoreline uses), where mitigating processes may remove any need to implement closures.

Evolving Stewardship Model. The NPS will continue to evolve park-specific management approaches that reduce impacts to marine species and environments through applied science, partnerships, emerging technology, and market-based tools, including concessions contracts (especially in the cruise industry where quotas and exclusive contracts have historically leveraged economies of scale to reduce impacts per visitor and drive higher environmental standards across the industry). Specific to whale avoidance (under chapter 4 of this draft plan), the NPS will continue to evolve programs to provide cruise ship related data on whale-vessel close encounters (e.g., Shipboard Observer) and collaborate with pilots/bridge crew (e.g., whale avoidance simulator training; Whale Alert app).

Glacier Bay Special Marine Funding Authorization. The NPS will optimize the use of park-specific legislation providing cruise ship fees as base/non-appropriated funds (1996 Omnibus Law Public Law 104-333, sec. 703, codified at 16 USC 1a-2(g)) to meet the park responsibilities associated with the

increase in cruise ships under a park 1996 Vessel Management Plan EA Finding of No Significant Impact, and to support ongoing marine stewardship and visitor services.

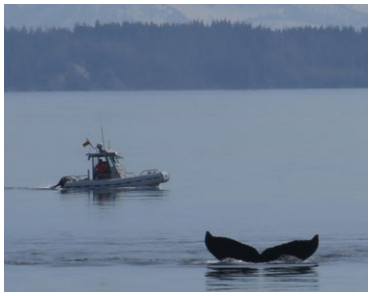
Marine Capacity for Necessary Park Operations. Maintain a marine fleet capable of protecting park resources and values in all three marine management zones (see figure 14). Ensure the park has a large vessel capable of multi-day trips throughout the park year-round. Optimize the fleet to balance flexible and adaptive use with specialized performance needs (law enforcement, commercial services, park ranger transfers, scientific research). Standardize features that enable operational efficiencies adapted to the remote setting and dynamic environmental conditions, and that minimize operational impacts on resources and visitors.

Manage for Dynamic Landscapes and Hazards. The park is in a geologically active area due to the Fairweather Fault and due to instability associated with receding glaciers. For example, an earthquake caused one of North America's largest tsunamis ever recorded in Lituya Bay in 1958. Also, when glaciers recede, slopes are de-buttressed and often produce landslides in subsequent decades. In the past 250 years, huge submarine piles of material close to the Glacier Bay shoreline appear to have been deposited by slope failures (Avdievitch et al. 2020). Rock avalanches have been frequent during the last decade including one in 2022 that covered two square miles of the Lamplugh Glacier and another in 2016 that covered five square miles (Coe et al. 2018; Dufresne et al. 2019). Earthquakes, tsunamis and submarine landslides can pose significant safety risks to people and vessels in the vicinity. This elevated risk of landslides will continue for at least the next century, although it is extremely challenging to quantify the risks. NPS is collaborating with the USGS on research to quantify landslide/tsunami risk due to a slope failure in Tidal Inlet with a goal of determining whether an early warning system can be developed. The park will seek to work with the cruise and tour industry to inform and mitigate risks associated with landslide-induced tsunamis. The park will continue to mitigate risk for staff, as it did with the move of the administrative floating cabin from Blue Mouse Cove to South Sandy Cove due to the Tidal Inlet slump.

Monitor and Anticipate Major Ocean Regime Shift Changes. Continue and facilitate the long-term study of oceanographic conditions in park waters and add strategic monitoring sites (including on the outer coast) to help scientists and park managers quantify spatial and temporal change in physical oceanographic parameters (e.g., salinity, water temperature, ocean acidification). Use data to track status and trends in the marine ecosystem including physical oceanography, phytoplankton, zooplankton, invertebrates, forage fish, seabirds, and marine mammals to better understand factors influencing the park marine ecosystem. Share data publicly and support basic and applied research that contributes to scientific knowledge, discovery, and public understandings of the park's dynamic marine ecosystems, the role of changing conditions outside the NPS control, and ways to conserve our oceans as complex living ecosystems that support life on this planet. Acknowledge and use scientific findings to inform management decisions related to marine regime changes and cascading effects to species.



The NPS marine fleet has historically included an all-water, all-weather capable vessel (left to right: Nunatak I, Nunatak II, and Nunatak III).


A variety of vessels support resource protection for park wildlife (left three) and response to wildlife emergencies (right, whale disentanglement).



Floating cabins (far left) and diverse classes of vessels (right three) support ranger patrols and data collection by NPS staff and outside researchers.


The park marine fleet (left) also supports coordinated marine operations with other agencies (middle) or associated with cruise ship transfers (right).


Marine operations depend on maintenance (left) and managing equipment in an underwater environment (middle and right).



The park responds to distress calls and emergencies (left, grounding) and prepares for incidents (middle, oil spill response; right, cold water survival).

Figure 14. Marine Park Operations

Providing Diverse Visitor Experiences and Balanced Access, Woosh Gunayáade Át Ka Wooch Yáx Naxdatee (Different Experiences and Make Them Equal)

Cruise Ship, Tour Vessel, Day Boat. Commercial operators partner with the NPS to enable diverse audiences to experience the park by ordinary means (motorized larger boats) consistent with park purposes and values. These larger scale operations provide access to key visitor destinations within the park—particularly tidewater glaciers and more accessible glacial environments—and feature onboard programming that connects visitors to park resources and values. While stringent restrictions balance the benefits and tradeoffs related to this scale and intensity of visitor access in a national park setting, the park service also leverages competitive commercial contracts, vessel quotas and operating conditions, and other management tools to further enhance visitor experience quality and reduce environmental impacts per visitor.

Private Vessel, Charter Vessel, Nonmotorized Vessel. Independent visitors are able to explore the park by boat to visit glacial environments and recreate consistent with park purposes and values. Social science indicates that these visitors highly value opportunities for self-directed exploration in a scenic wilderness setting, and the flexibility to seek out and obtain solitude, and observe wildlife (Sytsma 2022; Furr et al. 2021; Swanson and Vande Kamp 2011). The NPS therefore uses vessel quotas and operating conditions, nonmotorized waters, overnight camping permits, and other management tools to balance the benefits and tradeoffs related to levels of vessel use and visitor experience quality, particularly where higher intensities and concentrations of use create less acceptable environmental and social conditions.

Frontcountry Marine Access. The park will optimize access for national park experiences consistent with park purposes and values through point-to-point marine transportation to and from Bartlett Cove, including for park visitors who may not have opportunities to travel deeper into the park (NPS 2019a). This will be primarily achieved through tour and charter vessel commercial contracts, and passenger ferry service to Bartlett Cove. Private vessel access will continue to be managed under the permit system and through the Superintendent authorities. Further, the NPS will support community partners as they seek to provide the marine services and facilities outside the park desired by local residents and boaters and necessary to support marine-based tourism that are common in other southeast Alaska maritime communities. An example is the federal investment into the Alaska Marine Highway System ferry terminal in Gustavus.

Visitor Orientation and Education. The park is committed to providing comprehensive orientations and maps that respect the diversity of the visitor experiences within park waters and the marine environment, supplemented by resources on targeted topics of interest to visitors (such as tides) and skills for recreating in the intertidal zone and along the shoreline (e.g., leave no trace, bear safety, approved guide services best practices). The park is also committed to providing tribally approved Homeland acknowledgments and cultural orientation materials to ensure that park visitors understand Indigenous concepts of hosting, protocols, and respectful behavior in Homeland.

Guide Activity. Commercial guide services for sea kayaking, marine guided sport fishing, sightseeing, and vessel services for visitor drop-off and pickup in the marine environment have been authorized by the NPS to provide necessary and appropriate water-based visitor services. Charter and tour vessels operate under a concessioner's contract to navigate within the park; in addition, guides may offer off-vessel activities including nonmotorized water-based and land-based activities. Recommendations and requirements in this plan apply to commercial guide services as well as the public. Additional information on these services is covered in the BWMP and the FMP.

Drop-Off Service. The NPS seeks to enhance the existing day boat operation while exploring other service models for backcountry camping and kayaking drop-off services within existing vessel quotas that help manage visitor dispersal and access, optimized to park-specific environmental and social conditions.

Communications Upgrades to Include Very High Frequency Radio and Automatic Identification Site Transponder Sites. The NPS will upgrade existing and deploy new communications infrastructure within the next one to three years, and this will remain a primary communication system for marine operators for at least the next decade. The automatic identification system (AIS) is an automatic vessel tracking system that uses transceivers on vessels and land-based receiver stations and will likely expand its functionality in the next decade. AIS information supplements marine radar, which is the primary method of collision avoidance for marine vessels. AIS is a now a required element of all marine concessions contracts to ensure contract provisions and increase safety. AIS infrastructure will enhance safety and search and rescue capabilities in the park. Currently, only one AIS transponder site is located in the park at a US Coast Guard installation that has provided aids to navigation since 1912 on a headland at Cape Spencer.

AIS transponder sites will first be co-located with park very high frequency (VHF) infrastructure at up to 10 sites in the park with the goal of full coverage of park waters. Potential installation locations include Glacier Bay (West Arm, East Arm, Beartrack Mountain), Icy Strait (Excursion Inlet), Cross Sound (Cape Spencer), and the outer coast (Cape Spencer to Icy Point and Icy Point to Cape Fairweather). Only when co-location will not work for AIS will a completely new site be developed and additional NEPA compliance completed. Existing VHF radio (e.g., ParkNet) infrastructure will be upgraded (e.g., in the park at Beartrack Mountain, Idaho Ridge, Bartlett Cove, and Deception Hills; also at Althorp Peak [US Forest Service]).

Accountability and Transparency. The NPS will enhance visitor service operations (VIS) and data use (vessel AIS, new vessel database) when implementing this draft plan to better protect park resources and values and share outcomes with the public.

Vessel Definition Updates. The NPS defines vessel types in CFR 36 § 13.1102. The park is currently working on administrative updates to the existing definitions through a rule-making process. The current CFR vessel definitions for the five vessel types managed by the park, as well as the park's proposed changes to the CFR definitions are provided in table 1.

TABLE 1. NATIONAL PARK SERVICE VESSEL DEFINITIONS

Vessel Category	CFR Definition	Proposed CFR Changes (see bold text)
Cruise Ship	Cruise ship means any motor vessel of at least 100 tons gross (U.S. System) or 2,000 tons gross (International Convention System) certificated to carry more than 12 passengers for hire.	No changes proposed
Tour Vessel	Tour vessel means any motor vessel of less than 100 tons gross (U.S. System) or 2,000 tons gross (International Convention System) engaged in transport of passengers for hire and certificated to carry more than 12 passengers overnight or more than 49 passengers for daytime use.	No changes proposed

Vessel Category	CFR Definition	Proposed CFR Changes (see bold text)
Charter Vessel	Charter vessel means any motor vessel under 100 tons gross (U.S. System) or 2,000 tons gross (International Convention System) engaged in transport of passengers for hire and certified to carry no more than 12 passengers overnight and no more than 49 passengers for daytime use. Charter vessels also include any uninspected motor vessel measuring less than 200 tons gross (U.S. Tonnage "Simplified Measurement System") and not more than 24 meters (79 feet) in length engaged in transport of passengers for hire.	*Charter vessel means **(1)** any motor vessel under 100 tons gross (U.S. System) or 2,000 tons gross (International Convention System) engaged in transport of passengers for hire and certified to carry no more than 12 passengers overnight and no more than 49 passengers for daytime use; **or (2)** any uninspected motor vessel measuring less than 200 tons gross (U.S. Tonnage "Simplified Measurement System") and not more than 24 meters (79 feet) in length engaged in transport of passengers for hire.*
Private Vessel	Private vessel means any motor vessel that is not engaged in business (business includes, but is not limited to, transportation of passengers for hire or commercial fishing).	*Private vessel means any motor vessel that is not engaged in business (business includes, but is not limited to, transportation of passengers for hire**, crew leasing,** or commercial fishing) **and is not more than 24 meters (79 feet) in length. Private vessels may be a bareboat charter.***[a]
Passenger Ferry	Passenger ferry means a motor vessel authorized by the Superintendent to engage in the transport of passengers for hire to Bartlett Cove.	No changes proposed

[a] Bareboat charter is when the owner of a vessel leases his or her vessel out to an individual (charterer) for a fixed period of time where no crew or provisions are included, and where the operator assumes all liability and operational responsibility.

An Enduring Commitment to Huna and Yakutat Tlingit Homeland Values, Haa Kusteeyí Káx Yánde Gaxtoodéil (Taking Care of Our Way of Life)

Tlingit Homeland, Haa Aaní. Tlingit Homeland connections will be encouraged and supported in all management zones. Traditional activities can occur in all zones. The park will collaborate with tribes to develop appropriate tribal welcome and land acknowledgment materials as well as other educational materials/orientations outlining Indigenous concepts of Homeland, hosting, and culturally appropriate visitor behavior. The park will continue to collaborate with tribes to collect archeological and ethnographic information to ensure these resources are preserved for future generations and made available, as appropriate, to park managers, researchers, and the public. Visitors may see modern cultural practices or evidence of these practices including resource harvesting, ceremonies, and youth activities. These modern cultural practices will not leave an observable long-term impact on the marine landscape. Other Tlingit spiritual practices will continue to occur in the marine environment without the practitioners' physical presence; these practices are outside the scope of park management. Further management direction for protecting Tlingit Homeland values specific to the marine environment will

focus on strengthening government-to-government communication; documenting a Maritime Cultural Landscape; and commemorating village or other sacred sites in appropriate ways.

Traditional Cultural Fishery. The park will collaborate with tribes to explore options for non-commercial cultural fisheries in park waters following the shared NPS-tribal stewardship model of the glaucous-winged gull egg harvest (see Huna Tlingit Traditional Gull Egg Use Act, Public Law 113–142). This will require further NEPA compliance and may require regulatory or legislative changes to implement.

Traditional Tribal Ceremonial Harbor Seal Hunt. The park and tribes will explore options for implementing a tribal ceremonial harbor seal hunt combining it with research projects that enhance understandings of marine contaminants in the environment. This will require further NEPA compliance and may require regulatory or legislative changes to implement.

Marine Cultural Landscape Inventory. The park will collaborate with tribes to explore options for documenting a Maritime Cultural Landscape which will link the marine natural systems, the ethnographic landscape, and the physical cultural resources. This will be undertaken with the goal of protecting the landscape as intact Homeland, furthering connections between the park and associated people, and potentially nominating the landscape to the national register of historic places.

CORRECTIVE MANAGEMENT ACTIONS COMMON TO ALL ZONES

Management Action Progressions, Daa Sá Park Servicech Yéi Has Guxsanéi? (What Will the Park Service Do?)

The NPS is committed to providing visitors to the park with reasonable access for recreational activities, traditional activities, and for other purposes as described in previous chapters.

The NPS strives to use the least restrictive mechanism or tool necessary to achieve desired future resource and social conditions for an area, to reduce visitor conflict, or to protect visitor safety if action is necessary. The NPS need not wait for conditions to match or exceed a threshold or trigger before taking management action; an expectation that conditions would exceed standards is sufficient to mandate a response. Restrictions and closures will be accomplished consistent with the process outlined in 36 CFR §13.50 and/or other relevant regulations. Below is a list of tools that may be used to manage access or vessel distribution, when necessary, arranged in rough order from the least restrictive to the most restrictive. The park Superintendent may pick whichever tool is required generally applying the "least restrictive" approach. There is no implication that the tools must be tried in the listed order and a failure elicited before trying the next one. Some tools are included in other actions outlined in more detail further in this chapter. Additional corrective actions may be required to address specific situations and conditions not addressed below.

Education. The NPS would provide printed material, public presentations, videos, targeted presentations to user groups, and internet-based programs with the goal of actively involving visitors in helping the park achieve the desired conditions for all management areas. Tribes would provide similar educational materials specific to protecting cultural resources and values and educating visitors about traditional protocols for visiting Homeland.

Increased Enforcement of Existing Regulations. The NPS would prioritize resources to increase enforcement efforts for existing regulations to assist in achieving the desired conditions for all management areas.

Voluntary Measures. The NPS would ask visitors to restrict their use voluntarily in areas where limits are not already in place. Examples of such measures could include voluntary registration, use of low-impact equipment, and avoidance of certain areas of the park or avoidance of areas during particular seasons or times of day. Voluntary registration could be accomplished by phone or radio call-in, or a digitally based system.

Required Registration. Registration is a means to gather information about visitor use levels and to ensure visitors receive necessary resource protection and safety information. The NPS would require visitors to register in areas where permits are not already required. Upon registration, visitors would be provided information about park rules and conditions for use necessary to protect park resources. Registration conditions could include minimum-impact travel, recreational use, and resource protection requirements; however, a registration process would not limit the number of vessels or the type or amount of access.

Requirements Governing Means of Access. To achieve desired conditions for all management areas, the NPS would place requirements on the means of access, potentially including designated routes to concentrate use impacts, specific technologies or access modes to mitigate impacts, vessel operating restrictions such as speed limits, and strategies to stagger or disperse access to help achieve desired conditions, and complete compliance as needed.

Management of Commercial Activity. The NPS would adjust concession contracts and other commercial use permits to govern use levels or direct authorized commercial activity to locations, seasons, or times of day as necessary to assist in achieving the desired conditions for all management areas, and complete compliance as needed.

Regulate Numbers of Visitors. The NPS would initiate new compliance actions to consider changing existing quotas or establishing quotas where there are no existing quotas for vessel or visitor numbers in areas of the park, for specific time periods when the volume of use is high enough that other mechanisms are not working, and where required to achieve desired conditions. Visitors would be required to obtain a permit, and the number of available permits may be limited.

Temporal Restrictions. Using the appropriate authorities, the NPS would restrict access to times of day, days of the week, or other unit of time, or the duration of access could be limited.

Temporary and Permanent Closures. Using the appropriate authorities, the NPS would temporarily or permanently close areas of the park to all types of visitor use or to specific modes of access. Restrictions and closures will be accomplished consistent with the process outlined in 36 CFR §13.50 and/or other relevant regulations.

GLACIER BAY ZONE, SÍT' EETI GEIYÍ

New Vessel Definitions

To better manage vessels, resources, and visitor experiences within Glacier Bay, the park will formalize vessel definitions for nonmotorized vessels, lower-impact vessels, and administrative use motorized vessels, and will clarify both the vessel definition for private vessels longer than 79 feet as well as the conditional transit permit (see figure 15 overview of existing vessels and new proposed management categories).

Cruise Ship

- Managed year-round under daily quotas (maximum of 2) and seasonal quotas
- Management set within 2003 VQOR ROD, CFR, Contracts and Operating Conditions, and Park Compendium

Tour Vessel

- Managed year-round under daily quotas (maximum of 3) and seasonal quotas
- Management set within 2003 VQOR ROD, CFR, Contracts and Operating Conditions, and Park Compendium

Charter Vessel

- Managed June through August under daily quotas (maximum of 6) and seasonal quotas
- Management set within 2003 VQOR ROD, CFR, Contracts and Operating Conditions, and Park Compendium

Private Vessel

- Managed June through August under daily quotas (maximum of 25) except under Alternative B (maximum of 30), and seasonal quotas
- Four management alternatives described in the Environmental Assessment

Passenger Ferry to Bartlett Cove

- Managed year-round under daily quotas (maximum of 1)
- Management set within 2003 VQOR ROD, CFR, Contracts, Operating Conditions (including Public Law 105-83, Section 127 stipulations), and Park Compendium

Nonmotorized Vessel (NEW)

- Monitored with annual management triggers:

  Day Use trigger = 18 days with >75 day users per day

  Overnight Use trigger = 18 days with >62 overnight users per day
- Common to all action alternatives described in the Environmental Assessment

Administrative Vessel (NEW)

- Monitored with a management trigger of 600 vessel use days per calendar year
- Common to all action alternatives described in the Environmental Assessment

Figure 15. Glacier Bay Vessel Management Framework

Nonmotorized Vessel. A nonmotorized vessel is a vessel without an engine of any kind that is solely propelled by sails or human power such as paddles, pedals, or oars. Vessels in this category include, but are not limited to, kayaks, paddleboards, pedal boats, rowboats, and sailboats without an engine. Any vessel with an engine, even if it is not being used or contains a non-operational motor, is a motorized vessel. Nonmotorized vessels are allowed to operate in nonmotorized waters, as well as in waters that are open to all vessel classes. Nonmotorized vessels are not subject to the private vessel permitting criteria. The NPS is now seeking to manage and account for these diverse activities with an updated, more specific nonmotorized vessel definition, annual tracking, and management triggers. The NPS will set two separate management triggers (day use and overnight) to manage use levels in all park waters subject to vessel quotas.

Nonmotorized vessel numbers will be tracked such that one vessel will equal one or more persons (depending on vessel type/size) engaging in a water-based nonmotorized activity on one calendar day. In the future, tracking may evolve toward more detailed data not available at this time, such as the type of vessel used (e.g., paddleboard, single kayak, double kayak, rowboat, canoe) and the amount of time it spends on the water (e.g., hours, an entire day).

For day use, the management trigger will be set at 18 days with 75 or more vessels per day. For overnight use, the management trigger will be set at 18 days with 62 or more vessels per day.

The triggers chosen represent the number of visitor-related, nonmotorized vessels (private and commercial) per day that occurred on less than 80% of the days reviewed, thus removing the highest outliers. Observations from 2016 through 2022 indicate that desired conditions can be maintained at these use levels without management action.

Lower-Impact Vessel. A lower-impact motorized vessel is a vessel that by design or technology consumes less fuel and produces less pollution (air or water), makes minimal noise, creates smaller wakes, and travels at lower maximum speeds, thereby having fewer negative impacts on wildlife, park resources, and other visitors. In recognition that the impacts of vessels vary based on certain characteristics, the park will encourage the use of these types of vessels by creating a lower-impact vessel category. Initial examples of lower-impact vessels may include those that are operating certain types of propulsion, are ≤75 horsepower, have a displacement hull (non-planing), and have a maximum speed of ≤10 knots. The park will annually share the characteristics of a lower-impact vessel and will welcome public feedback. The park may exclude lower-impact vessels from requirements directly related to the effects of this vessel type under existing regulatory processes (36 CFR § 13.50), such as distance to shore requirements, based on science and visitor experience conditions. The park may discontinue operating requirements tailored to lower-impact vessels if desired conditions are not being met.

Administrative Use Motorized Vessel. The 2003 VQOR ROD broadly defined an administrative use vessel as "any vessel involved in administrative use." During the 2003 VQOR EIS NEPA process, members of the public requested transparent reporting for categories of ongoing motorized vessel operations in Glacier Bay that fell outside the proposed quota requirements, including for NPS-owned vessels. The NPS is now seeking to manage and account for these diverse activities with an updated, more specific administrative use vessel definition, annual tracking, and a management trigger.

The new administrative use vessel category will consist of any motorized vessel that is engaged in official business for the state, tribal, or federal government in support of park operations, programs, and for activities that include cultural uses, research, resource protection, education, and emergency services. This category also captures existing NPS-authorized non-recreational uses such as public access for

educational activities, tribal access for traditional activities, guaranteed access to inholdings, and commercial fishing (where allowed under Public Law 105-277 Sec. 123).

Administrative use vessels include but are not limited to: NPS-owned vessels, NPS-chartered vessels, State of Alaska vessels, US Coast Guard vessels, National Oceanic and Atmospheric Administration vessels, vessels operated by Special Use Permit holders, commercial fishing vessels operated by Lifetime Access Permit holders, contractor vessels, and essential service providers such as marine towing/repair/salvage services and the fuel tug and barge.

Administrative use vessels for cultural purposes include vessels used to provide Hoonah Indian Association access under tribal reserved rights to *Chookanhéeni* (acquired Berg Bay inholding), *Xunaa Shuká Hit* (the Tribal House), and for other non-commercial cultural purposes such as tribally sponsored trips into Glacier Bay.

Recordkeeping on motorized administrative vessel usage has been informal and sporadic, but focused vessel tracking began in 2015 for all dates in the calendar year. Each day that a motorized administrative use vessel was operating in park waters was counted as one use day, regardless of how many trips the vessel made in and out of the park or Bartlett Cove (this is the same method used to count other motorized vessel classes). Five years of data (2015–2019) found an average of 2.8 administrative use vessels operating per day in park waters in May–September, and an average of 453 vessels operating annually across all dates (minimum = 413 in 2019; maximum = 499 in 2018). The NPS will set an initial calendar year management trigger for administrative use vessels at 600 use days in all park waters subject to vessel quotas. This includes existing vessel authorization for cultural purposes to access *Chookanhéeni* and *Xunaa Shuká Hit.* The park will track the number of administrative use vessels daily and evaluate the need to adjust the management trigger annually.

Additionally, the park will periodically report administrative use vessel numbers in Glacier Bay to the public along with rationales for any proposed changes to the annual management trigger.

Clarification of Vessel Definition for Private Vessels Longer than 79 Feet (24 Meters). Private vessels longer than 79 feet (overall length) meet the 2003 VQOR ROD size definitions as tour vessels and cruise ships and will not be considered a private vessel class. Specific requirements for these vessels will be published and updated in the Park Compendium and will include stringent operating conditions, similar to those for commercial vessels of equivalent size, that minimize injury or damage to park resources, minimize conflict with other existing users, and ensure that the visit meets the purposes for which the park was established.

Private vessels longer than 79 feet will not be allowed to access Glacier Bay using a private vessel permit. However, at any time during the quota season, the Superintendent may reallocate any unused cruise ship or tour vessel use days for use by private vessels longer than 79 feet that have applied for a permit specifying the range of dates interested, provided proof of liability insurance, and have met other set pre-qualifications. The issuance of this permit may also require Cost Recovery Fees for permit processing and a security deposit.

Unused cruise ship or tour vessel use days will only be issued on the same day the use day is available to retain flexibility and priority for commercial operators that serve the broader public visiting the park under an established contract. Unused cruise ship use days will first be made available to tour vessels, and then to private vessels longer than 79 feet. Unused tour vessel use days will first be made available to charter operators, followed by private vessels longer than 79 feet.

Clarification of Transit Permit Conditions. Prior to 2011, the park was mandated to administer a private vessel transit permit between Icy Strait and Bartlett Cove (36 CFR § 13.1160). The mandate for a transit permit expired in 2011. However, the Superintendent has the discretion following current law and regulation to use this tool as needed to optimize private vessel entries to Bartlett Cove. Specific requirements and provisions will be implemented in the form of stringent conditions that minimize injury or damage to park resources, minimize conflict with other existing users, and ensure that the visit meets the purposes for which the park was established.

Specifically, no more than one conditional transit permit will be allowed at any one time, with a limit of one way per day per vessel, and will depend on availability within the daily private vessel quota. If seasonal private vessel day use quotas (2,300 seasonal limit) are exceeded, the availability of these transit permits will be reduced in the future. The first purpose of this permit is to enable private vessels to directly exit or enter Bartlett Cove without reducing permits for visitors seeking a full-day visit for purposes for which the park was established. The second purpose of this permit is to promote high-quality visitor experiences in the frontcountry consistent with park management plans. Private vessels using the conditional transit permit will be time-limited and travel solely on a mid-channel or other prescribed course. The conditional transit permit will only be available to owner-occupied private vessels for recreational purposes upon confirmation that the transit is not related to any commercial interests, and where transit for staging the vessel in or out of the park does not offer any commercial advantage (per existing NPS policy).

Modified Private Vessel Permit Season and Quotas for Glacier Bay

Private Permit Length. The duration for private vessel permits will be decreased from a current maximum of seven days (six nights) to five days (four nights) per permit. This decrease is based on the typical permit length in 15 years of park private vessel permit data (2007–2021, excluding 2007–2011 transit permits), illustrating that the majority of vessels obtain a seven-day permit but leave after five days. Although their remaining permit days are often made available to others, they are less likely to be filled by certain user groups because they are effectively short-notice permits. Shortening the maximum stay to five days will accommodate most visitors and will increase the opportunity for more people to access the park without exceeding the private vessel quota.

Permit Season and Quota Season. The quota season is June 1–August 31. However, the private vessel permit season will be expanded to begin on May 1 and end on September 30 to coincide with the seasonal call-in/call-out requirement, which will remain May 1 through September 30. In May and September, private motorized vessels will be required to hold a permit, but this permit will be obtained online or through in-person registration, and no quotas or capacity thresholds will apply during these months. Boaters will be required to complete an online or in-person boater orientation prior to entering Glacier Bay May 1 through September 30. The purpose of expanding the permit and orientation season is to help the park track visitor and vessel use numbers. This information will assist the NPS in providing a high-quality visitor experience and maintaining desired conditions, particularly as shoulder season visitation increases. Additionally, it will allow the NPS to provide important resource protection information to boaters as well as access key trip information from visitors, potentially increasing the NPS' ability to quickly respond to emergency situations.

Obtaining a Private Vessel Permit. Twenty-five private vessel permits will be available each day during the quota season. Fifteen of the 25 permits will be advance-notice permits and made available on February 1 using a random draw lottery with one lottery entry per vessel. Any remaining advance-notice

permit days will be posted before a second random draw lottery with applications accepted April 30 to May 1. After the second lottery, any remaining advance-notice permits will be issued on a first come, first served basis.

Ten of the 25 permits will be short-notice permits. The short-notice permit application window will be increased from two days to three days in advance of the permit start date. Increasing the short-notice permit application window from two days to three days in advance under all action alternatives allows more time for planning and transit for vessels originating from surrounding communities or for those on longer voyages to visit the park. Short-notice permit applications will be accepted between midnight (12:01 a.m. AK) to 10:00 a.m. AK, three days before the permit start date. A random draw lottery will occur around 11:00 a.m. AK, three days before the permit start date.

At any one time, a private vessel may hold up to two permits (two permits sequentially, or two permits for different date ranges). However, only one advance-notice permit can be held per vessel each year, with each vessel able to submit only one application per lottery specifying all of their dates of interest.

Confirmation of Permit. From June 1 through August 31, all private vessel permits must be confirmed any time before 5:00 p.m. AK time the day before the start of the permit. The purpose of this change is to release unused permits to the public sooner to maximize use of available entries to the park. This change will allow unused permits to be issued sooner than 10:00 a.m. AK time the day of the permit, as is currently the case.

Use of Permit. If a permittee does not utilize the first day of the permit, the entire permit will be relinquished to the NPS. In the event of severe weather or an emergency that precludes the vessel operator from using the permit, the NPS may consider approving a delay in the permit start date. The permit also must be used on each consecutive day, or it will be terminated, and any remaining permit days will be made available to another visitor. The purpose of this change is to eliminate the practice of holding and not fully utilizing a multiple day permit by releasing unused permits to the public to maximize use of available private vessel quotas in Glacier Bay. Upon request, a private vessel permit may be extended if it will not cause the maximum number of allowed private vessel permits (quota) or the maximum stay length in Glacier Bay to be exceeded.

Operating Requirements for All Motorized Vessels. Operators of all motorized vessels will continue to be required to call-in/call-out of Glacier Bay with the VIS from May 1 through September 30 and when the vessel passes the fuel dock leaving or entering Bartlett Cove. Motorized vessels will continue to be prohibited from entering designated nonmotorized waters. In the East Arm, cruise ships and tour vessels will be prohibited from waters north of Muir Point to allow for a small vessel experience for private, charter, and nonmotorized vessels, and further enhance the perception of being able to travel deeper into the park, and decrease the scale and intensity of use away from routes generally frequented by large vessels in Glacier Bay and the West Arm.

Muir Inlet will be designated as nonmotorized waters from May 1 through July 15 with motorized vessels allowed in Muir Inlet from July 16 to April 30. Wachusett Inlet will be designated as nonmotorized waters from July 16 through September 15 with motorized vessels allowed in Wachusett Inlet from September 16 to July 15. This change will result in an update to 36 CFR § 13.1180, "Closed waters, motor vessels and seaplanes," to provide visitors enhanced opportunities for human-powered recreation in immersive marine settings that emphasize human-powered recreation and the natural soundscapes of Glacier Bay.

Humpback Whale Closure Procedures

Given the importance of close encounters and collisions between humpback whales and vessels, here, the NPS formalizes the park's long-standing methods of minimizing collisions and disturbance in combination with other strategies (e.g., quarter-mile minimum approach distance in park regulations in 36 CFR § 13.65). Humpback whale monitoring data and other sources of information are used to document whale distribution and detect where and when elevated numbers of humpback whales are consistently found in one area. When an aggregation of three or more whales is observed on three or more days in a place where whales and motorized vessels overlap, park whale biologists will propose a 'whale waters' closure to the Superintendent, in consultation with the Resource Management and Law Enforcement division chiefs. Whale waters closures impose speed and/or course restrictions on some or all types of vessels. Generally, a 20-knot or 13-knot speed limit is imposed on all vessels. In some circumstances, limiting or prohibiting vessel traffic within 1 mile of a shoreline is also appropriate to separate vessels from a whale aggregation. In some circumstances, whale waters may impose additional motor vessel speed restrictions for larger vessels. In the case of a widespread, dense whale aggregation, park management may find it necessary to impose a 13-knot speed limit for vessels greater than or equal to 80 meters in length throughout Glacier Bay.

Whale waters areas are communicated to the public using news releases, electronic mail, and social media. Whale waters areas are monitored regularly to ensure that the closure is removed when no longer needed. Whale waters areas are designed to be understandable to mariners and to cover the minimum area needed to protect the whale aggregation, while allowing for the movement of whales to and from the area.

The park uses other standard operating procedures to help decrease the risk of whale collisions and disturbance. Park staff communicate proactively with vessel operators about whale strike risk, in the form of boater orientations, conversations with vessel captains, and pre-season briefings for tour and charter operators; this communication increases when the need arises. For cruise lines, the park provides additional tools that increase situational awareness about concentrations of whales in advance of the ship's arrival in Glacier Bay (e.g., the Whale Alert Alaska sighting network).

Harbor Seal Glacial Habitat Closure Procedures

When glacier ice becomes a limiting factor for both harbor seals and park visitors, the NPS will use long-term monitoring data to inform ship-to-seal disturbance models. The NPS will develop management alternatives to evaluate tradeoffs between tidewater glacier access and harbor seal protection that clarify biologically significant impacts to seals and define thresholds of 'acceptable' impacts.

OUTER COAST ZONE, YAN T'IKÁ

Floating Cabins/Seasonally Moored Vessels for Administrative Use

The NPS will install up to two additional floating cabins/seasonally moored vessels for administrative use at locations that may include Graves Harbor and Lituya Bay in the Outer Coast Zone. Locating floating cabins/seasonally moored vessels for administrative use in these areas will allow more options for identifying management issues and implementing management actions in the Outer Coast Zone. Floating administrative cabins/seasonally moored vessels have existed in these locations in the past. Floating cabins/seasonally moored vessels are currently used to help the park meet its management responsibilities, primarily when overnight shoreline camping is not optimal to support field work, or

when NPS motorized vessels travel beyond the range of a reasonable day trip from Bartlett Cove. The floating cabins/seasonally moored vessels also can serve as a remote Ranger Station or emergency shelter for the general public (while recognizing that the nature of marine emergencies across the park's nearly 1,200 miles of shoreline typically demand immediate aid by nearby marine vessels and air-based rescues).

Floating cabins/seasonally moored vessels are preferred in the park to allow seasonal or periodic relocation based on management decisions about the intended mission and changing environmental or safety considerations. They also by design are minimalist structures with limited capacity, recognizing that the park can make use of larger sleep-aboard vessels with amenities when operationally required.

Existing floating cabins are currently moored in South Sandy Cove and offshore of the southeast end of Russell Island (both within Glacier Bay). Regularly scheduled users of these cabins (primarily from May through September) include park and research staff operating in their official capacity.

CHAPTER 4 MONITORING, ADAPTIVE MANAGEMENT, AND CAPACITY

INDICATORS AND THRESHOLDS WÁA SÁ GAX̲TUSAKÓO? (HOW WILL WE KNOW?)

Monitoring is the process of routinely and systematically gathering information to assess the status of specific resource conditions and visitor experiences and is a critical step in successfully implementing this draft plan. A monitoring strategy is designed and implemented to generate usable data over time for periodically comparing existing and desired conditions, assessing the need for management actions, and evaluating the efficacy of management actions. A well-planned monitoring strategy provides for transparency, communication, as well as associated documentation and analysis. A monitoring strategy includes selecting indicators, along with establishing thresholds or triggers and associated management strategies. It also includes routine, systematic observations or data collection of the indicators over time as well as associated documentation and analysis.

Indicators, thresholds, triggers, monitoring protocols, and management strategies that would be implemented as a result of this planning effort are described below.

> ***Indicators*** are measurable attributes that allow the park to evaluate change in resource or experiential conditions over time to determine whether desired conditions (see chapter 2 of this draft plan) are being met.
>
> ***Thresholds*** represent the minimum acceptable condition for each indicator. They can either represent a maximum ("no more than") or minimum ("no less than") amount that is still acceptable. Establishing thresholds does not imply that no action would be taken prior to reaching the threshold. Thresholds identify when conditions are about to become unacceptable and accordingly serve as a "line in the sand," informing managers that corrective action must be taken to keep conditions acceptable so that progress toward desired conditions can be achieved over time. For all indicators, park staff and subject matter experts identified thresholds based on current conditions of the resource and data collected from recent years of monitoring.
>
> ***Triggers*** *(if needed)* reflect a condition of sufficient concern for an indicator to prompt a management action or strategy to ensure that desired conditions continue to be maintained before the threshold is crossed. For some indicators, triggers have been developed.

Thresholds and triggers were established by considering qualitative descriptions of the desired conditions, data on existing conditions, relevant research studies, professional judgment of staff from management experience, and scoping on the qualities that meaningfully contribute to visitor experiences. The park considered the central issues driving the need for this plan (see chapter 1). The indicators described below were considered the most critical, given the importance and vulnerability of the resource or visitor experience affected. The park reviewed the experiences of other park units with similar issues to help identify meaningful indicators.

Not all of the management strategies related to the indicators and thresholds will be implemented immediately, but rather as thresholds are approached or triggers are reached. The progression of management strategies presented in chapter 3 may be applied or more targeted management strategies to restore desired conditions.

The following indicators are carried forward in this draft plan:

- Number of vessels per viewscape at one time at key locations
- Number of vessels at anchorages at one time at key locations
- Percent of hourly underwater sound samples without vessel noise
- Daytime and nighttime average vessel noise free interval (NFI) in underwater acoustic environment
- Daytime and nighttime vessel NFI cumulative probability in airborne acoustic environment
- Maximum daytime vessel NFI in airborne acoustic environment
- Number of close encounters per day between vessels and humpback whales
- Number of humpback whale-vessel collisions per season
- Number of administrative use vessels
- Number of nonmotorized day use vessels
- Number of nonmotorized overnight vessels

Indicator Topic: Visitor Experience, Wáa Sá Has Sh tudinook, Glacier Bay Át Has Wu.aadí? (How Do Visitors Feel About Their Experience in Glacier Bay?)

Indicator 1: Number of Vessels per Viewscape at One Time at Key Locations.

Threshold:

- No more than the identified number of motorized vessels specific to each location (excluding nonmotorized vessels) in view in 70% of annual surveys during the quota season.
    - Lamplugh Glacier: 5 vessels
    - Upper Tarr Inlet, Margerie/Grand Pacific: 5 vessels
    - Reid Inlet: 5 vessels
    - Upper Johns Hopkins Inlet: 4 vessels
    - McBride Inlet: 3 vessels

Rationale:

The majority of visitors to the park, nearly 97%, view the glaciers, surrounding landscape, and wildlife from the deck of a boat and do not disembark within the park. Access to the tidewater glacier environment must be managed purposefully to meet the purposes for which the park was established.

Monitoring the number of vessels per viewscape helps ensure that desired conditions such as opportunities for meaningful experiences that connect visitors to the park's fundamental resources and values are being maintained. Ensuring that the differing visitor use types and vessel types do not meaningfully distract from visitor experiences is a key component of this planning effort. In addition, monitoring the number of vessels at key destination areas can help ensure vessels can safely maneuver and navigate the inlet waters.

Scenic views are one of the most important attributes of a trip to a national park unit. In surveys conducted over the last decade, 90% of visitors say that scenic views are "extremely important" or "very important" to their NPS experience service wide (Kulesza and Hollenhorst 2013). This increases to 93% when considering studies specific to Alaska national parks. Half of all visitors to Alaska national parks

said that scenic views were the most important attribute of their trip (Kulesza and Hollenhorst 2013). Furthermore, research conducted by Utah State University found that viewing tidewater glaciers at the park was the primary recreational activity (41%) among visitors, followed by viewing nature and wildlife (20%). It is important to note that data for this survey do not include visitors onboard cruise ships and are primarily representative of visitors on the concessioner-operated day boat (tour vessel) and backcountry users (Furr et al. 2021).

A study conducted in Molokini Shoal Marine Life Conservation District in Hawai‘i examined visitors' level of acceptance regarding the number of boats in a study area (Needham et al. 2011). This study evaluated how various factors, such as visitor encounters with boats and boat size, influence visitor experience. The research found that the number of boats most strongly influenced visitor experience and their level of acceptance with boat encounters, boat size was less influential, and the size of the boat travelers were on did not significantly alter their perception of encounters. This study found that more than 16 boats of any size in a viewscape were considered unacceptable by a majority of visitors. The results also indicated that the size of the boats matter, and more smaller boats are acceptable within a viewscape compared with fewer larger boats (Needham et al. 2011). Although this study was conducted outside Alaska and within a small anchorage, these results bolster the rationale that the number of vessels per viewscape can degrade the visitor experience and that the minimally acceptable condition may differ depending on the size of vessels, which can vary greatly in the park.

Cruise ships in a viewshed can alter a visitor's experience at the park, making it a key consideration for monitoring vessels per viewscape (Swanson and Vande Kamp 2011). According to a study conducted at the park, for all user groups, cruise ships detracted from a higher percentage of visitors' enjoyment of the park than any other type of transport (Swanson and Vande Kamp 2011). Across the park, 66.5% of backcountry visitors who encountered a cruise ship stated that it detracted from their enjoyment of the park. The study specifically evaluated how cruise ships detracted from visitor experience, and visitors reported that they impacted four key dimensions: solitude, pristine environment, tranquility, and scenic beauty experiences. These results are consistent with findings from a 2008 qualitative study of Glacier Bay backcountry visitors—a separate study used as a baseline for comparison—in which visitors commonly reported disruption of the "wilderness experience" due to cruise ships (Swanson and Vande Kamp 2011). It is important for the park to remain consistent with desired conditions and provide a range of recreational opportunities for meaningful experiences, considering all potential user groups.

The study (Swanson and Vande Kamp 2011) also evaluated how vessels impacted the visitor experience at Margerie and Grand Pacific Glaciers within the park and how the experience differed depending on the type of vessel the visitor was using. A comparison showed that cruise ship passengers and backcountry users were less likely to report detraction when encountering cruise ships at glaciers compared to when these visitors encountered cruise ships in other areas within the Glacier Bay Zone. In contrast, charter vessel visitors reported that cruise ships detracted from their experience more at the glaciers than throughout the Glacier Bay Zone. Of visitors that encountered cruise ships at the glaciers, those that reported a diminished experience by user group are as follows: charter vessel visitors (78%), backcountry visitors (62.5%), day boat visitors (61.7%), tour vessel visitors (57.3%), private vessel visitors (41.8%), and cruise ship passengers (5.1%) (Swanson and Vande Kamp 2011).

Additionally, this indicator of number of vessels per viewscape at one time at key locations manages for vessel safety. As vessels travel further up bay, the width of the bay becomes narrower. In some areas, larger vessels are unable to turn around and safely exit the area. This becomes even more difficult when these narrower passages are crowded with other vessels. Smaller vessels (e.g., kayaks), which can travel easily in these narrower passages, can be impacted by strong and frequent wakes in more constrained

areas if too many vessels are present. Administratively, too many vessels in a concentrated area cause a variety of safety and navigational issues, potentially impacting park staff's ability to safely conduct research. Managing vessels in the bay allows visitors to safely enjoy the tidewater glacier experience, helps ensure that all vessel categories may safely navigate to desired locations, and allows for research to be properly conducted. This indicator promotes visitor and park staff safety and allows the park to manage toward desired conditions for visitor experience.

Monitoring:

Park staff will monitor the number of vessels per viewscape at five key destinations within Glacier Bay: Lamplugh Glacier, Upper Tarr Inlet, Reid Inlet, Upper Johns Hopkins Inlet, and McBride Inlet. These locations were identified by park staff as areas for monitoring because they are key destinations within the park and these areas provide access and opportunities for visitors to experience glaciers at close range.

For the purposes of monitoring, the viewshed for all of the areas listed above, excluding Reid and McBride Inlets, is a polygon approximately 4 square miles in size. Given the topography of Reid and McBride Inlets, the area to be surveyed for these tidewater glaciers is roughly 1 square mile. These areas were selected by considering the location of the glacier and the surrounding area in which vessels would be able to view the glacier from the water. While consistency in size of the area to be monitored is desired, the thresholds may vary by location depending on the desired conditions.

Park staff currently board cruise ships and the concessioner-operated day vessel to provide interpretive services to visitors onboard. During the summer season, park staff will conduct observational surveys at a to-be-determined frequency to count the number of vessels within each polygon at key locations near these glaciers. During initial monitoring efforts, one scan to count the number of vessels in view will be done per location, regardless of how long the vessel sits at each location in order to reduce staff time for completing the data collection. As the monitoring program becomes more robust, the park may adjust their monitoring methods to account for time spent at each location. A sampling design will be identified for scientific validity and monitoring of this indicator is subject to various frequencies, seasonality, and timing and could change on a regular basis.

The number of vessels per viewscape at key locations will be recorded by park staff while on the boat and then entered into a database upon return to Bartlett Cove. In order to maintain a high-quality visitor experience, if the monitoring indicates that vessels per viewscape exceeds the threshold specific to each location in more than 70% of annual surveys, then associated management and adaptive management strategies would be implemented as described above (in the "Management Action Progressions" section). This monitoring protocol allows park staff to conduct these surveys from the visitor perspective aboard a vessel in key locations throughout Glacier Bay, thus providing a meaningful data set. At this time, nonmotorized vessels, such as kayaks, are not included in the monitoring efforts as previous research suggests they have less of an impact to the visitor experience than motorized vessels. However, park staff may elect to monitor nonmotorized vessels in the future to ensure desired conditions are being achieved.

Potential Future Monitoring:

Some vessels, approximately 40%, that operate within the park, carry AIS that indicate where they travel to within the park. Currently, this system is used by larger vessels such as the concessioner-operated day boat, cruise ships, tour and charter vessels, and some private vessels. All commercial concessions contract vessels are required to have and continually use AIS in park waters. Using this technology to monitor the number of vessels at key locations will be a technique to bolster the data set, assuming AIS becomes more

common on private vessels throughout the park as it has in other US and international waters and the park reaches its goals in this plan of all-park AIS coverage.

Potential Management Strategies:

- Develop forecast modeling and communicate the key destinations and peak times (e.g., cruise ships tend to be located in front of the Margerie Glacier between 10:00 a.m. and 2:00 p.m.), so that private vessel operators can make well-educated decisions regarding where and when to travel within the marine environment for a more enjoyable experience within the park.

Indicator 2. Number of Vessels at Anchorage at One Time at Key Locations.

Threshold:

- No more than the identified number of motorized vessels anchored at one time at the following identified locations in 70% of surveys. Following monitoring, additional locations may be added at the park's discretion.
    - Reid Inlet: 5 vessels
    - Blue Mouse Cove: 4 vessels
    - North Sandy Cove: 4 vessels
    - Shag Cove: 2 vessels

Rationale:

As highlighted above, opportunities for viewing the glaciers, nature, and wildlife—which are all identified as important features of visiting the park by visitors—can be degraded by the presence of other vessels. While the indicator of number of vessels per viewscape helps ensure desired conditions are achieved at locations with glaciers nearby, monitoring the number of vessels at anchorages at one time at key locations complements that monitoring effort. Monitoring for number of vessels at anchorage at the identified locations will help ensure park staff are managing a marine environment that promotes visitor inspiration, reflection, and opportunities for visitors to obtain a feeling of the ruggedness and wildness of this dynamic landscape and the solitude that early inhabitants found as identified in the desired conditions for the plan.

Ensuring that the differing visitor use types and vessel types do not meaningfully distract from visitor experiences is a key component of this planning effort. This indicator can also promote safety by ensuring popular areas of the bay do not get crowded, allowing vessels to safely maneuver through the marine environment. In addition, both day use and overnight vessels at anchorages may detract from the visitor experience, including within the adjacent terrestrial backcountry and designated Wilderness areas of the park and the opportunity for solitude, as identified in the park's BWMP, which is in preparation.

Private, tour and charter vessels may drop anchor at locations throughout the park. After dropping an anchor, some operators may take smaller vessels, such as a single motorized dinghy or kayaks, from the vessel to shore for day use. In addition, these vessels may drop anchor and choose to stay in the area overnight. While the current permit system dictates how many vessels may access Glacier Bay during a given day, park staff encourage freedom for vessels to travel where they desire. Park staff do not identify locations for desirable anchorages to encourage visitors to explore and create their own experience. As a result, there is a need to monitor the spatial distribution of vessels with a goal to maximize the feeling of self-discovery and to prevent concentrated vessel use from degrading the visitor experience.

To successfully monitor this indicator, it is important to consider how topography of the key locations impacts how anchored vessels impact visitor experience. For example, some areas of the park are more open, so that when one vessel anchors it may be visible or audible by all who travel to that area. In contrast, other locations have topography that allows vessels to disperse or to drop anchor in spots that may be less visible and audible to other vessels. Therefore, the threshold for this indicator varies by location.

Monitoring:

Monitoring of this indicator will initially occur in conjunction with other monitoring efforts of wilderness and backcountry encounter surveys. Park staff currently survey for encounters with other people and groups within a three-hour window at key destinations in the backcountry and wilderness areas. There is opportunity for park staff, occasionally during these surveys, to conduct an observational scan to count the number of vessels at identified anchorage locations during the quota season (defined in the EA) and record the information in a database. This strategy allows staff to better understand how vessels in anchorages may impact the visitor experience to visitors who are both on land seeking a backcountry and wilderness experience and those onboard vessels. A sampling design will be identified for scientific validity and monitoring of this indicator is subject to various frequencies, seasonality, and timing and could change on a regular basis.

Potential Future Monitoring:

As technology further develops, all motorized vessels that enter the park may have AIS onboard that transmits their location to receiving stations. This technology would allow park staff to better understand where vessels are located throughout the park and inform vessel operators with these systems about crowded locations to avoid, if desired. Until AIS is more ubiquitous on private vessels and the park has completed its AIS receiving infrastructure, on-the-ground monitoring will be conducted by park staff.

Potential Management Strategies:

- Use other educational strategies such as informing visitors of key destinations that are used for anchorages while still encouraging self-discovery and allowing vessel operators to make a well-educated decision regarding where to travel within the marine environment.
- Work with commercial service operators to encourage spatial distribution of vessels at key locations by updating the operating annual plan for respective vessels.
- Encourage vessel operators to consult AIS to direct vessels to available anchorages if others are at or near threshold.
- Apply other tools from the "Management Action Progressions" section until the threshold drops to within an appropriate amount of use.

Indicator Topic: Underwater Acoustic Environment, Híntáak A Kayéik (Underwater Sound/Noise)

Indicator 1: Percent of Hourly Underwater Sound Samples without Vessel Noise.

Threshold:

- June–August: Monthly percentage of hourly underwater sound samples without vessel noise does not drop below 40% for more than one month per year for two consecutive years.

- January–May and September–December: Monthly percentage of hourly underwater sound samples with vessel noise does not drop below 60% for more than one month per year for two consecutive years.

Rationale:

NPS *Management Policies 2006* directs the NPS to preserve, to the greatest extent possible, the natural acoustic environment of the park. This includes all the natural sounds that occur in the park, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. The park preserves one of the largest areas of federally protected marine ecosystems in Alaska, including marine designated Wilderness. Comprehensive protection of the underwater acoustic environment aligns with purposes expressed in the core statutory documents that define the park. Wind-generated surface noise and rain are the primary natural underwater acoustic sources in Glacier Bay, while biological sources (e.g., humpback whales, harbor seals) are important contributors to the underwater acoustic environment.

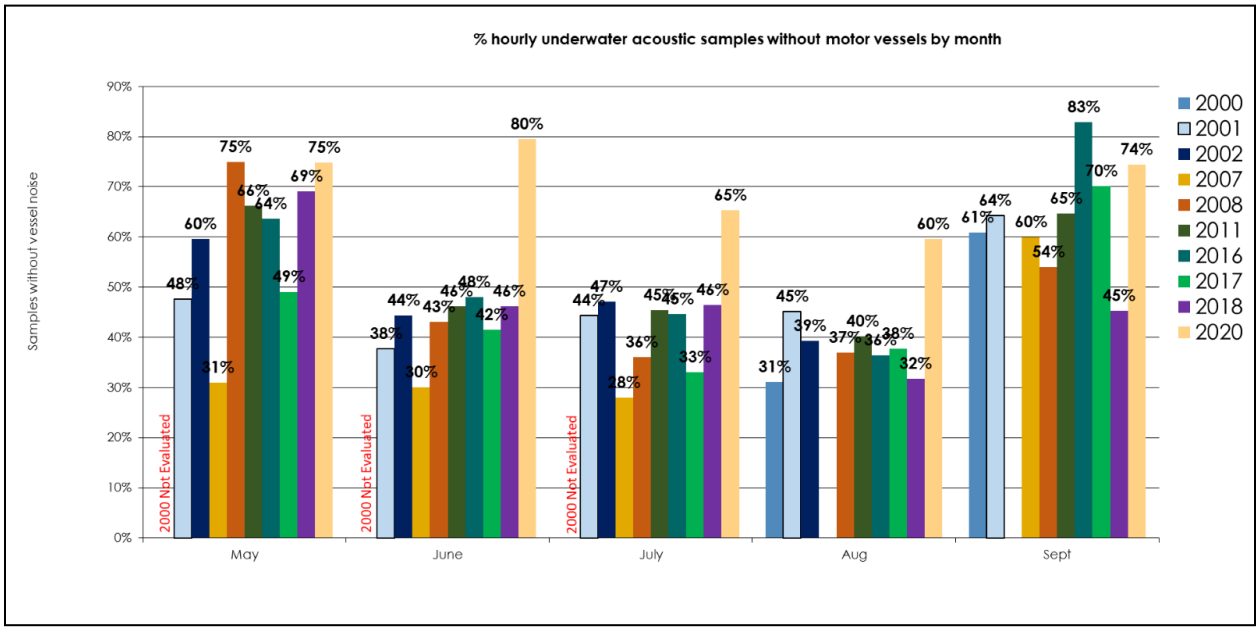
Since 2000, the NPS has worked with the US Navy to monitor underwater acoustics in Glacier Bay. Ongoing underwater acoustic monitoring conducted offshore near Bartlett Cove shows that vessel noise is pervasive underwater in Glacier Bay. Underwater noise from motor vessels is expected to be present throughout all waters open to motorized vessels and also within some nonmotorized waters. Vessel-generated underwater noise degrades the underwater acoustic environment. It also negatively affects a wide variety of marine wildlife (e.g., larval fish, invertebrates, harbor seals, and humpback whales), that are adapted to rely on sound for everyday activities such as feeding, intraspecific location, intraspecific communication, and detection of predators (Gabriele et al. 2010; Holt et al. 2011). For example, vessel-generated underwater noise can affect marine mammals by decreasing the distance over which they can communicate and detect predators and prey. Typical summer vessel traffic in the park causes communication space losses to singing humpback whales (reduced by 13%–28%), calling humpback whales (18%–51%), and roaring harbor seals (32%–61%), especially during daylight hours (Gabriele et al. 2018). In addition, marine mammals may alter their communication patterns in response to vessel-generated underwater noise. Researchers have observed humpback whales increasing the source level of their vocalizations to overcome increases in ambient sound levels, but the whales are also likely to stop vocalizing as ambient sound levels increase (Fournet et al. 2018) especially if the noise source is a motorized vessel. When vessel noise was present, whales were one-third to nearly one-half as likely to vocalize, compared to vessel-free conditions (Fournet et al. 2018). Vessel noise can also affect humpback whale foraging, including slower descent rates and fewer side-roll feeding events per dive (Blair et al. 2016). Vessel noise may increase the opportunity for collisions between vessels and whales and may cause short-term hearing loss (NPS 2021).

The percentage of time when there is no audible vessel noise is an important indicator of the quality of the underwater acoustic environment. This indicator identifies the anthropogenic noise contribution to the existing ambient noise environment during both day and night, as samples are taken every hour of each day. It is also a proxy for potential impacts to marine wildlife, as it helps identify noise-free periods when wildlife are able to communicate freely and experience their natural habitat.

Thresholds were established using data from underwater acoustic monitoring in Glacier Bay (Bartlett Cove) conducted in all years in which analyzed data were available (2000–2020) (figure 16). The hydrophone system transmits underwater sounds through a 5-mile cable to a computer workstation that takes a sound sample every hour of the day for 30 seconds. An experienced analyst listened to thousands

of these samples and determined whether a vessel was present in each one of them (Kipple and Gabriele 2003; McKenna et al. 2017).

The park experiences tourism-related vessel traffic mainly in May through September, with lower vessel traffic in May and September as compared to June, July, and August; subsequently June, July, and August generally have fewer acoustic samples without motor vessel noise (figure 16). Therefore, different threshold values were set for the period from June through August. It should be noted that 2020 had anomalously low vessel traffic due to very low tourism level resulting from the COVID-19 pandemic.



Note: 24 samples are taken each day.

FIGURE 16. PERCENT OF HOURLY UNDERWATER ACOUSTIC SAMPLES WITHOUT MOTOR VESSELS NOISE, BY MONTH

Monitoring:

Park staff will continue monitoring the underwater acoustic environment using the cabled calibrated hydrophone system in place in lower Glacier Bay (mouth of Bartlett Cove) since May 2000, or another similar recording system that is calibrated to the sensitivity of the existing hydrophone to ensure consistency. Analysis of the underwater sound samples will occur annually. The NPS has a nationwide standard operating procedure for the collection and analysis of acoustic data that covers all the steps necessary to identify vessel noise events that reach a minimum sound pressure level. The active monitoring season is May through October. If the NPS sees that the indicator is approaching the threshold during May or October, the NPS will extend the monitoring season.

Potential Management Strategies:

See the "Management Action Progressions" section in chapter 3 of this draft plan.

Indicator 2: Daytime and Nighttime Average Vessel Noise Free Interval in Underwater Acoustic Environment.

Threshold:

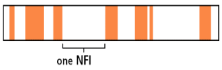
- June–August: Average vessel NFI is no less than 7 minutes.
- January–May and September–December: Average vessel NFI is no less than 10 minutes.

Rationale:

The park is an important habitat for many protected species that rely on sound for essential life functions. The occurrence of noise events and NFIs (described in the next paragraph and in table 2) are standard metrics used in acoustic environment analysis and attributes that have the potential to affect animal communication patterns. NFIs are a biologically relevant measurement of underwater acoustic conditions for humpback whales and other soniferous species in the park which rely on sound for critical life functions and may be impacted by extended durations of uninterrupted vessel noise (Betchkal and Ward 2019; Erbe et al. 2019; Lynch et al. 2011). As noted above, vessel-generated noise both reduces the communication space for marine mammals and also causes marine species to change their communication patterns. Thus, the duration of vessel noise-free conditions is biologically relevant to humpback whales and ostensibly other marine wildlife in the park.

One indicator of the acoustic quality is NFI. NFIs measure the uninterrupted periods of time when only silence or natural sounds are audible. In other words, NFIs describe the fracture of quietude in time. Fracturing is the process by which adding noise events divides a visit into shorter and shorter NFIs. As an indicator, NFIs are only sensitive to important changes in the vessel traffic rate. When the vessel traffic rate is small, the indicator is sensitive to small changes in the traffic rate. Conversely, when the traffic rate is high, the indicator is insensitive to small changes. Table 2 provides an overview of this acoustic indicator.

TABLE 2. DESCRIPTION OF NOISE FREE INTERVAL ACOUSTIC INDICATOR

Indicator	Acoustic Categories	Definition	Benefits
Noise Free Interval (NFI)	Duration, Timing	The duration of time between when one noise event ends to when the next one starts. 	Sensitive only to important changes in traffic rate or natural ambience, true to experience of noise for animals.

Preliminary NFI results in the underwater acoustic environment of lower Glacier Bay indicate daytime NFIs are shorter than those at night (NPS unpublished data). Underwater NFIs are considerably shorter than airborne NFIs because of the much greater speed and distance that sound travels underwater. The initial threshold for mean daytime underwater vessel NFIs is 7 minutes in June through August, and 10 minutes for May through September (NPS unpublished data). When further work solidifies these preliminary findings, these thresholds may be adjusted.

Monitoring:

Park staff will continue monitoring the underwater acoustic environment using the cabled calibrated hydrophone system in place in lower Glacier Bay (mouth of Bartlett Cove) since May 2000, or another similar recording system calibrated to current levels. Analysis of the underwater sound samples will occur annually. The NPS has a nationwide standard operating procedure for the collection and analysis of acoustic data that covers all the steps necessary to calculate median NFI. The process involves measuring sound pressure level, and then annotating all noise events within the resulting record that reach a specific sound pressure level. The active monitoring season is May through October. If the NPS sees that the indicator is approaching the threshold during May or October, the NPS will extend the monitoring season.

Potential Management Strategies:

See the "Management Action Progressions" section above in chapter 3 of this draft plan.

Indicator Topic: Airborne Acoustic Environment, A Kayéik (Sound/Noise)

Indicator 1: Daytime and Nighttime Vessel NFI Cumulative Probability in Airborne Acoustic Environment.

Threshold:

- ≥30% of vessel NFI in the West Arm are greater than 1.1 hours during the quota season.
- ≥30% of vessel NFI in the East Arm are greater than 1.6 hours during the quota season.

Rationale:

Natural quiet and natural sounds play a key role for visitor experience at the park. A 1998 survey of the American public revealed that 72% of respondents thought that providing opportunities to experience natural quiet and the sounds of nature was a very important reason for having national parks, while another 23% thought that it was somewhat important (Haas and Wakefield 1998, as cited in Lynch 2012). In another survey specific to park visitors, 91% of respondents considered enjoyment of natural quiet and the sounds of nature as compelling reasons for visiting national parks (McDonald et al. 1995). According to surveys conducted by Utah State University, many visitors to the park are highly motivated by the opportunity to experience solitude, natural quiet, and the sounds of nature (Furr et al. 2021). On a given day, park visitors might hear an astounding assortment of sounds: glacial ice exploding into a tidal inlet, wolves howling along a wave-washed shore, loon cries echoing between forested islands, humpback whales breathing, and harbor seals growling on ice rafts.

As noted above, NFI is an important indicator of the acoustic environment. The airborne NFI is tied closely to visitor experience. Individuals do not often remember the absolute number of noise events over the course of the day, but they more easily remember how often the stillness of the natural acoustic environment was disrupted. The average length of time where visitors hear only natural sounds is an important part of the visitor experience with respect to natural quiet, sense of solitude, and special auditory experiences such as the calving of glaciers.

In the marine environment of Glacier Bay, human-generated noise from vessels can disrupt visitor opportunities to experience the natural soundscape. According to a study conducted at the park, of all private vessel visitors who reported hearing large cruise ship engines, 43.5% noted that it detracted somewhat from their trip enjoyment, while 51.6% reported that it had no effect (Swanson and Vande Kamp 2011). Similarly, of the charter vessel visitors who heard large cruise ship engines, 59.7% reported

it detracted somewhat from their trip enjoyment, while 28.0% reported that it had no effect (Swanson and Vande Kamp 2011). Research conducted by Utah State University found that independent visitors using nonmotorized vessels (e.g., sea kayakers) were most bothered by public addresses aboard commercial vessels; however, only 34% of visitors reported hearing these addresses, and the level of bother only reached "moderate." Many more visitors (79%) heard motorboats, but the level of bother from these sounds was only "slight" to "moderate." The researchers concluded that anthropogenic sounds did detract from visitors' experiences, but not to a level that might reach great concern (Furr et al., 2021). Therefore, existing conditions for the acoustic environment were used to establish thresholds for this indicator topic.

There are two different indicators that track the airborne acoustic environment. The first tracks the vessel NFI lengths throughout the entire monitoring season. In 2011, the NPS completed an initial acoustic inventory at five sites in Glacier Bay. Some of the same sites were monitored again in 2021. Figure 17 shows the cumulative probability distribution function for the vessel NFI at two of these sites: Rendu Inlet and Point McLeod. Rendu Inlet is representative of the West Arm, while Point McLeod is representative of the East Arm. The 80th and 70th percentiles for vessel NFI at each site are indicated at the intersection of the dotted horizontal lines. NFI is a continuous variable, but there are some natural differences between sites, resulting in different thresholds for different areas. Less impacted sites have longer NFI. At the Rendu Inlet acoustic inventory site in 2011, 30% of NFI lengths were at least 1.1 hours long, while 20% of NFI lengths were at least 1.4 hours long. At the Point McLeod acoustic inventory site in 2011, 30% of NFI lengths were at least 1.6 hours long, while 20% of NFI lengths were at least 3.1 hours long. The 2011 acoustic inventory occurred during mid-August, which is outside of peak vessel traffic. Therefore, thresholds were set for the 70th percentile (i.e., 1.1 hours for West Arm and 1.6 hours for East Arm).

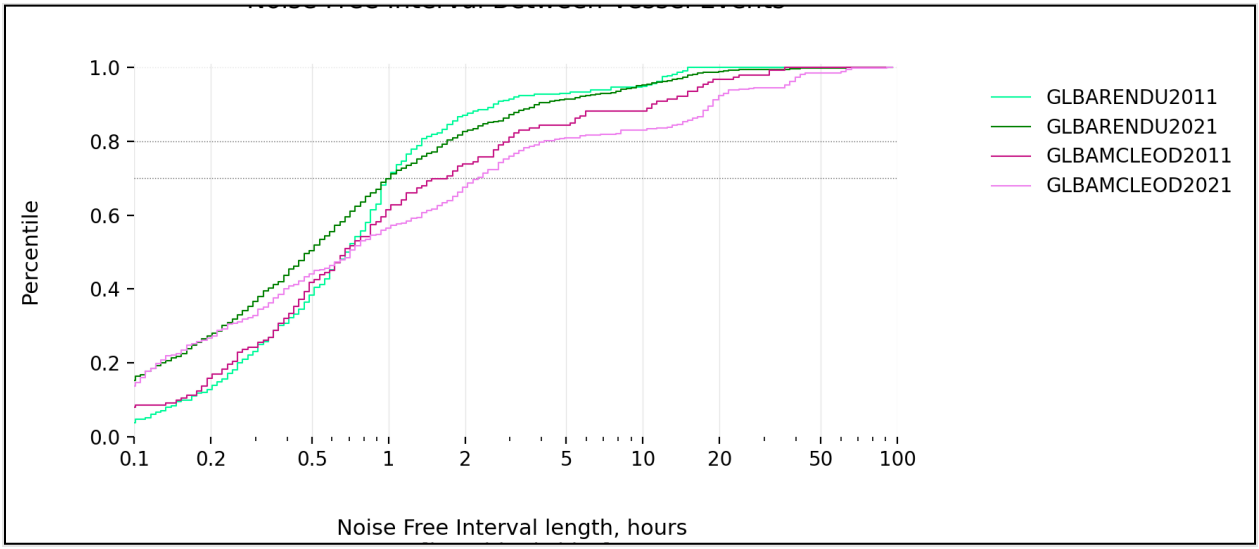


FIGURE 17. NFI LENGTH BETWEEN VESSEL EVENTS AT TWO SITES IN THE PARK (RENDU INLET/WEST ARM AND POINT MCLEOD/EAST ARM)

This indicator also has an associated trigger that tracks overall NFI. The NPS will analyze acoustic monitoring data for NFIs between any type of noise events (e.g., vessel, aircraft), and if triggers are reached the NPS will further analyze acoustic monitoring data to determine whether noise events were being caused by vessels or were resulting from other anthropogenic sources (e.g., jet aircraft, propeller aircraft). If 90% of the noise events are coming from vessels, the NPS will evaluate the need for proactive action.

Trigger for Indicator 1:

- ≥30% of NFIs in the West Arm are greater than 1.6 hours during the peak season (defined in the EA).
- ≥30% of NFIs in the East Arm are greater than 3.3 hours during the peak season (defined in the EA).

Monitoring:

Acoustic monitoring will occur in the park at least 2 years out of every 10 years, with late June – early July being prioritized. If possible, monitoring would occur in consecutive years. The NPS has a nationwide standard operating procedure for the collection and analysis of acoustic data that covers all the steps necessary to calculate NFI specific to this trigger. The process involves measuring sound pressure level and then annotating all noise events within the resulting record that reach a minimum sound pressure level.

Potential Management Strategies:

Should triggers or thresholds be reached, the park will identify which desired conditions are not being met under these conditions, provide transparent accounting of patterns and how they affect all marine users, and select which management strategies should be used to better align airborne acoustic environment levels with desired conditions, potentially including:

- Explore spatial and temporal strategies to maintain desired conditions and mitigate impacts to specific resources and visitors. This may include:
    - Provide educational resources and interpretive tools (e.g., NPS Application) that help marine visitors appreciate when and where the marine environment offers unique soundscape opportunities where quiet behavior is encouraged to optimize their enjoyment of the soundscape (e.g., glacier calving areas, bird rookeries, breeding and haul-out sites).
    - During orientations share best practices and ethics to encourage users to not detract from others' soundscape experience (e.g., voluntary quiet hours).
    - Provide visitors with maps showing the typical variability of soundscape across park waters, and where CFR closures are in place (no generator zones, nonmotorized waters) so they can maximize their soundscape experience.
- Explore ways to conduct business that extend NFI intervals. This may include use of technologies to achieve soundscape goals (e.g., switch to electric motors in specific areas, review NPS administrative vessel schedules), strategies related to NPS administrative traffic scheduling or quiet zones, or competitive contract and operating requirement adjustments.
- Use competitive contracts and operating requirements to incentivize partners to create technological solutions that result in higher quality soundscape experiences for visitors.

Indicator 2: Maximum Daytime Vessel NFI in Airborne Acoustic Environment.

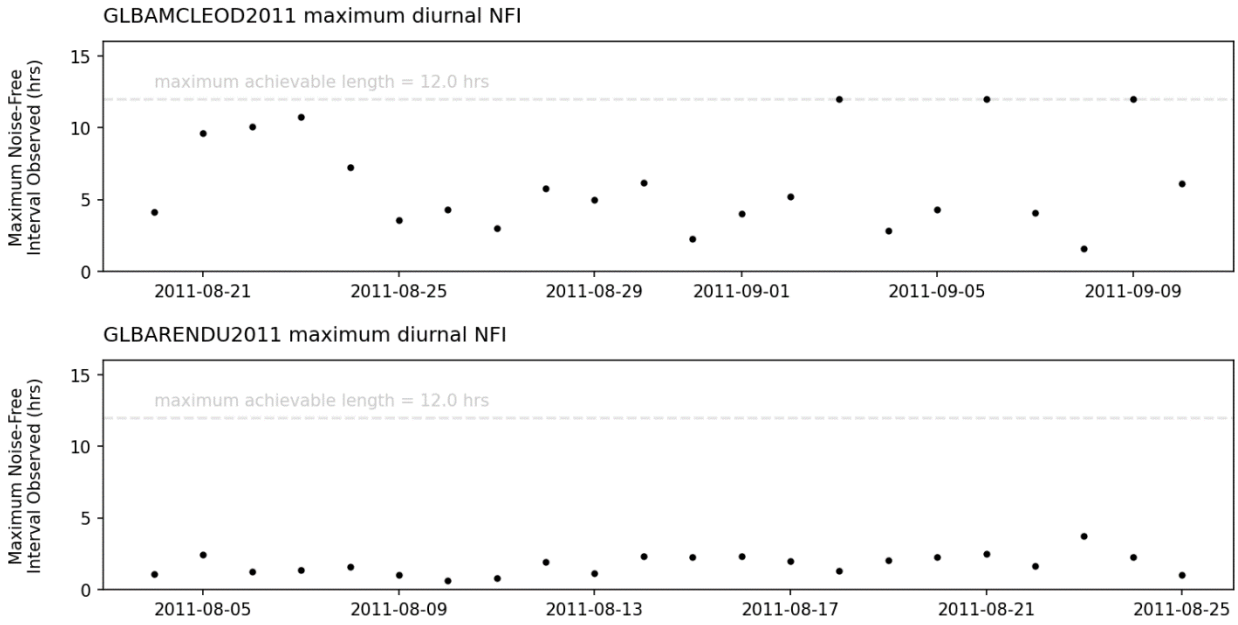
Threshold:

- In the West Arm, on 70% of monitored days there is a vessel NFI of at least 1.1 hours in length during the daytime period (07:00–19:00)
- In the East Arm, on 70% of monitored days there is a vessel NFI of at least 3.7 hours in length during the daytime period (07:00–19:00)

Rationale:

As highlighted above, opportunities for experiencing natural quiet and natural sounds—which are all identified as important features of visiting the park by visitors—can be degraded by vessel noise. This indicator tracks the maximum vessel NFI during daytime hours (07:00–19:00). The indicator focuses on the daytime visitor's opportunity to experience at least one extended period of natural quiet, even if the rest of the day is filled with noise. The other airborne acoustic environment indicator, in contrast, assesses all vessel NFIs that occur during both daytime and nighttime, thus tracking the overall condition of the above-water acoustic environment in Glacier Bay.

Figure 18 shows the maximum vessel NFI experienced during daytime hours at the Rendu Inlet and Point McLeod monitoring sites in 2011. At Rendu Inlet, the shortest maximum vessel NFI recorded on any day was 0.7 hours, while on 80% of days the maximum vessel NFI was at least 1.1 hours. At Point McLeod, the shortest maximum vessel NFI recorded was 1.6 hours, while on 80% of days the maximum vessel NFI was at least 3.7 hours. The 2011 acoustic inventory occurred during mid-August, which is outside peak vessel traffic season. Therefore, thresholds for the quota season were set for the 30th percentile (i.e., on 70% of monitored days there is a NFI of at least 1.1 hours for West Arm and 3.7 hours for East Arm).



Note: Maximum achievable vessel NFI length (as limited by diurnal period length, here, 12 hours) is indicated by a dashed, horizontal line.

FIGURE 18. MAXIMUM VESSEL NFI LENGTHS BY DAY FOR TWO DEPLOYMENTS IN THE PARK

Monitoring:

Acoustic monitoring will occur in the park at least 2 years out of every 10 years, with late June through early July being prioritized. If possible, monitoring will occur in consecutive years. The NPS has a nationwide standard operating procedure for the collection and analysis of acoustic data that covers all the steps necessary to calculate NFI cumulative probability. The process involves measuring sound pressure level, and then annotating all noise events within the resulting record that reach a minimum sound pressure level.

Potential Management Strategies:

Should thresholds be reached, the park will identify which desired conditions are not being met under these conditions, provide transparent accounting of patterns and how they affect all marine users, and select which management strategies should be used to better align airborne acoustic environment levels with desired conditions, potentially including:

- Explore spatial and temporal strategies to maintain desired conditions and mitigate impacts to specific resources and visitors. This may include:
  - Provide educational resources and interpretive tools (e.g., NPS Application) that help marine visitors appreciate when and where the marine environment offers unique soundscape opportunities where quiet behavior is encouraged to optimize their enjoyment of the soundscape (e.g., glacier calving areas, bird rookeries, breeding and haul-out sites).
  - During orientations share best practices and ethics to encourage users to not detract from others' soundscape experience (e.g., voluntary quiet hours).
  - Provide visitors with maps showing the typical variability of soundscape across park waters, and where CFR closures are in place (no generator zones, nonmotorized waters) so they can maximize their soundscape experience.
- Explore ways to conduct business that extend NFI intervals. This may include use of technologies to achieve soundscape goals (e.g., switch to electric motors in specific areas, review NPS administrative vessel schedules), strategies related to NPS administrative traffic scheduling or quiet areas, etc.
- Use competitive contracts and operating requirements to incentivize commercial partners to create technological solutions that result in higher quality soundscape experiences for visitors.

Indicator Topic: Close Encounters Between Vessels and Humpback Whales, Yáay Déin Yaakw (Boats Near Whales)

Indicator. Number of Close Encounters Per Day Between Vessels and Humpback Whales.

Threshold:

- Two or more close encounters between vessels and humpback whales on a single day.

Trigger:

- A single close encounter between a humpback whale and a cruise ship, with an encounter distance less than 1000 meters anywhere forward of the vessel.

Rationale:

Unintentional vessel-humpback whale encounters have increased over the past few decades as humpback whale populations rebound from the large-scale commercial whaling that mostly ended in the 1960s and as the number of vessels plying the world's waters have increased. In Glacier Bay, encounters between vessels and humpback whales have also likely increased for the same reason (Gende et al. 2010). Vessel-humpback whale encounters within the park represent a trade-off between resource protection and visitor experience. For visitors, sighting a humpback whale represents one of the most thrilling experiences, and the closer the encounter, the more thrilling the encounter. However, the same encounters coveted by

visitors on vessels could have adverse impacts on individual humpback whales. If encounters between humpback whales and vessels are too close, lethal collisions may occur.

Within the park, vessels are prohibited from operating within ¼ nautical mile (463 meters) of a humpback whale. However, humpback whales often surface with little or no warning directly in front of the bow of a vessel. For example, four years (2006–2009) of observers recording cruise ship-humpback whale encounters in Glacier Bay indicated that encounters between cruise ships and humpback whales are frequent, with many encounters occurring close to the ships (Gende et al. 2010; Gende et al. 2011). A total of 891 unique cruise ship-humpback whale encounters were recorded at distances ranging from 21 meters to 1000 meters, with 80 (9%) of those encounters within 200 meters (Gende et al. 2011).

This indicator provides a tool for monitoring the number of close encounters between vessels and humpback whales, representing situations where the humpback whale was at greater risk of being struck by the vessel. A close encounter is defined as a humpback whale surfacing within 1000 meters of a vessel and within 30 degrees of the vessel's direction of travel; at that proximity, some vessel captains (e.g., cruise ship captains/pilots) are unable to take evasive measures to avoid the whale.

Monitoring close encounters between humpback whales and vessels helps ensure that desired conditions for the park's marine ecosystems are being maintained. Providing for the protection of natural and cultural resources is a component of this planning effort. In addition, taking action to prevent close encounters promotes visitor safety aboard vessels, as human injury and/or property damage may result from collisions between humpback whales and smaller vessels (Neilson et al. 2012).

Monitoring:

The NPS will continue humpback whale monitoring (e.g., small boat-based photo identification surveys) to collect information on the distribution and abundance of humpback whales. The NPS will develop indicator monitoring protocols that can be implemented as part of ongoing management activities. A study from 2006-2022 placed observers onboard cruise ships to record encounters between humpback whales and cruise ships; the NPS can use this study to build monitoring protocols to collect similar data in the future. The NPS will also opportunistically capture information about encounters between humpback whales and vessels when reported by vessel operators.

Potential Management Strategies:

In addition to the management action progressions (chapter 3), the NPS would:

- Increase surveillance with direct humpback whale monitoring observation and actively solicit opportunistic sightings from the day boat operator, park staff, and other groups to determine whether other parties had observed multiple whales in the same area over multiple days. Park staff will conduct observations of the area opportunistically as other work duties permit. These efforts have already proven effective in helping park staff understand when higher numbers of whales are remaining in one area.
- Increase communications with vessel operators, including informing ship captains of the location and date of close encounters between humpback whales and vessels.
- Provide tools that increase situational awareness around higher concentrations of whales (e.g., Whale Alert).
- Designate temporary whale waters, which limits vessel speeds to 13 knots.
- Impose additional motor vessel speed restrictions in temporary whale waters.

- Impose a 13-knot speed limit for vessels greater than or equal to 80 meters in length throughout Glacier Bay (set under 2003 VQOR ROD).

Indicator Topic: Motorized Vessel Collisions with Humpback Whales, Yaakw Yáay Kát Yan Wuxeexí (Boat Striking a Whale)

Indicator: Number of Humpback Whale-Vessel Collisions Per Season.

Threshold:

- One collision between a motorized vessel and a humpback whale in a single season

Rationale:

Vessel collisions with whales are a growing concern worldwide. Humpback whales are vulnerable to being struck by vessels. The total number of whale-vessel collisions reported in Glacier Bay from 1986 to 2021 is 14, ranging from kayaks to cruise ships (Neilson et al. 2012; NPS unpublished data). Two lethal injuries to humpback whales from vessel strikes have been confirmed in the park, one in 2001 when a cruise ship collided with and killed an adult humpback whale (Doherty and Gabriele 2001) and another in 2004 when a humpback whale calf washed ashore in park waters with injuries attributed to a collision with a vessel (Doherty and Gabriele 2004). Other vessel collisions have occurred where the fate of the whales involved in these collisions is unknown. In addition, with many whale mortalities, the cause of death cannot be conclusively determined, so the number of whale fatalities related to vessel strikes is likely higher than what is recorded. Vessel strikes are a significant concern from other perspectives as well. Collisions are costly and dangerous to humans. Furthermore, humpback whales are economically and culturally valuable to Alaska residents and visitors (McDowell Group 2020) and have ethnographic and Homeland values to the Tlingit. As a result, the threshold proposed in this planning document is low.

Monitoring:

The NPS relies on reports from vessel operators to know when a humpback whale strike has occurred, unless park staff happen to be onboard when a whale strike occurs. Per contractual requirements, all cruise ship, tour vessel, and charter vessel concessioners must immediately report to the NPS any suspected or confirmed whale strikes. Private vessel operators are strongly encouraged, but not required, to report collisions. Private vessel operators are required to report an accident if the damage is $2,000 or more, or if it results in injury, death, or disappearance of a person. In the event of a whale fatality, whenever feasible an Alaska Marine Mammal Stranding Network response team led by a veterinarian experienced in assessing collision injuries would evaluate the animal to determine whether the fatality was related to a vessel strike.

Potential Management Strategies:

In addition to the management action progressions (chapter 3), in the event of a whale-vessel collision, the NPS would:

- Complete a prompt and thorough management review that includes contacting the vessel involved about the circumstances of the collision, investigating whether established whale protection protocols were followed by the park. The NPS will then take any additional precautions that are deemed necessary, and follow through on any legal or contractual violations. The public will be notified of the results of the management review in a timely fashion.

Indicator Topic: Nonmotorized Vessel Use Levels in Glacier Bay (Excluding Frontcountry Zone), X'oon Yaakw Sá? (How Many Canoes?)

Indicator: Nonmotorized Vessel Use Days.

Threshold for Nonmotorized Vessel Day Use:

- No more than 18 days per year that exceed 75 people per day participating in nonmotorized vessel activities for three consecutive years.

Trigger for Nonmotorized Vessel Day Use:

- No more than 18 days per year that exceed 75 people per day participating in nonmotorized vessel activities for two consecutive years.

Threshold for Nonmotorized Vessel Overnight Use:

- No more than 18 days per year that exceed 62 people per day participating in nonmotorized vessel-based overnight trips for three consecutive years.

Trigger for Nonmotorized Vessel Overnight Use:

- No more than 18 days per year that exceed 62 people per day in nonmotorized overnight trips for two consecutive years.

Rationale:

Monitoring visitor nonmotorized use levels in Glacier Bay is an important component of the proactive management of the park because it allows the park to understand levels of use in terms of distribution across the season. The goal of this indicator is to provide a measure by which to evaluate and protect park resources and provide quality experiences for nonmotorized vessel users, while maximizing opportunities for users to freely explore the park.

Backcountry permit data from the three highest use months (July 2018, June 2019, and July 2021) over the last five years (2018–2022) and all off-vessel activity reports from tour vessels (2016–2022) and charter vessels (2019 and 2021) were analyzed to better understand what current daily use levels are for both day use and overnight use. The numbers chosen represent the number of people per day that occurred on less than 80% of the days, thus removing the highest outliers. Observations from these years indicate that desired conditions can be protected and maintained at these use levels (Sytsma 2022; Furr et al. 2021; NPS 2019b).

Vessel use levels do not distribute evenly across all park waters. This indicator signals when there is a notable, sustained change in use levels. Beyond the annual monitoring that the park staff will conduct on this indicator, these triggers also prompt the park staff to ensure the distribution of vessels is consistent with desired conditions and re-evaluate management tools (see the "Management Action Progressions" section in chapter 3 of this draft plan), if needed, based on new information.

Monitoring:

At the end of each vessel permit season, the park will calculate the number of people per day participating in nonmotorized vessel use in the Glacier Bay Access and Vessel Management Area (see figure 3), excluding Bartlett Cove day use. The number of days that exceed 75 day use people and/or 62 overnight-users per day will be calculated, recorded, and periodically reported to the public.

Potential Management Strategies:

Should triggers be reached, the park will identify which desired conditions are not being met under these conditions and would select which management action progressions (chapter 3 of this draft plan) should be used to better align nonmotorized vessel use levels with desired conditions (chapter 2 of this draft plan). Given that the significance of this indicator is moderated by wide dispersion of vessels, the likely first step will be to conduct studies on the spatial distribution of nonmotorized users and develop spatially based solutions (e.g., use units and associated quotas) beyond the scope of this plan and its associated EA.

Indicator Topic: Administrative Use Levels, X'oon National Park Service Ka Huna Ka Ch'a Góot'aa Yaakw Sá? (How Many National Park Service, Tribal and Other [Similar] Boats?)

Indicator: Administrative Vessel Use Days.

Threshold:

- No more than 600 administrative vessel use days per year for three consecutive years.

Trigger:

- No more than 600 administrative vessel use days per year for two consecutive years.

Rationale:

Monitoring administrative motorized vessel use levels (see chapter 3 for definition) in Glacier Bay is an important component of the proactive management of the park, because it allows the park to ensure that administrative vessel use is balanced with other vessel uses and is consistent with desired conditions.

This indicator signals when there is a notable, sustained change in administrative use levels. Beyond the annual monitoring that the park staff will conduct on this indicator, these triggers also prompt the park staff to ensure the distribution of vessels is consistent with desired conditions and re-evaluate management tools, if needed, based on new information.

Motorized administrative use vessel tracking began in 2015 for all dates in the calendar year. Each day that a motorized administrative use vessel was operating in park waters was counted as one use day, regardless of how many trips the vessel made in and out of the park or Bartlett Cove (this is the same method used to count other motorized vessel classes). Five years of park-collected data (2015–2019) found an average of 2.8 administrative use vessels operating per day in park waters in May–September, and an average of 453 vessels operating annually across all dates (minimum = 413 in 2019; maximum = 499 in 2018).

The identified numbers for thresholds and triggers represent the number of administrative use days that are consistent with desired conditions, allow for needed patrol, response, and research to be conducted, and balance administrative use—including providing tribal access to Glacier Bay and its ancestral lands—with other vessel classes.

Monitoring:

At the end of each calendar year, the park will calculate the number of administrative vessel use days. The number of use days will be calculated, recorded, and periodically reported to the public.

Potential Management Strategies:

Should triggers be reached, the park will identify which desired conditions are not being met under these conditions, provide transparent accounting of patterns driving increases, and select which internal

management strategies should be used to better align administrative use levels with desired conditions, potentially including:

- Require more advance-notice trip planning to consolidate activities.
- Explore ways to conduct business that reduce motorized traffic by park vessels.
- Explore spatial and temporal strategies to maintain desired conditions and mitigate impacts to specific resources and visitors.
- Evaluate trends and determine whether there is a rationale for raising the trigger or threshold.

VISITOR CAPACITIES, X'OON GUNAHÍTX' SÁ AADÉ KGWA.ÁAT? (HOW MANY CAN BE THERE?)

Visitor use management is the proactive and adaptive process of planning for and managing characteristics of visitor use and its physical and social setting using a variety of strategies and tools to sustain desired resource conditions and experiential conditions. Visitor capacity is a component of visitor use management defined as the maximum amounts and types of visitor use that an area can accommodate, while sustaining desired resource conditions and visitor experiences consistent with the purpose for which the area was established.

By identifying and implementing visitor capacities, the NPS can help ensure that resources are protected and visitors have the opportunity for a range of high-quality experiences. The NPS is legally required to complete general management planning that includes identification and implementation of commitments for visitor carrying capacities for all areas of the system unit (54 USC 100502) as outlined by the 1978 National Parks and Recreation Act.

The park's GMP sets the overall direction for management of natural and cultural resources, visitor use, land protection, and facility development. The GMP identified five primary zones for the park: nonwilderness waters, wilderness lands, wilderness waters, development, and special use.

The identification of visitor capacities for all areas of the park are considered an amendment to the GMP and are documented as such. Strategies to manage to those visitor capacities for the wilderness lands and Wilderness Waters Zone falls within the scope of the BWMP. Strategies to manage to identified visitor capacities in the Nonwilderness Waters Zone are included as quotas with associated triggers and thresholds in this draft plan.

Glacier Bay National Park

Part II - Environmental Assessment Including Updates to Vessel Quotas and Operating Requirements

November 2022

Part II - EA

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ACRONYMS

AIS	automatic identification system
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
BWMP	Backcountry and Wilderness Management Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dB	decibel
dBA	A-weighted decibel
DPS	distinct population segment
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
FMP	Frontcountry Management Plan
GMP	General Management Plan
GPS	Global Positioning System
HIA	Hoonah Indian Association
ITEK	Indigenous Traditional Ecological Knowledge
kHz	kilohertz
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFI	noise free interval
NPS	National Park Service
Park	Glacier Bay National Park
Plan	Marine Management Plan
PM	particulate matter
USC	United States Code
ROD	Record of Decision
VHF	very high frequency
VIS	Visitor Information Station
VQOR	Vessel Quotas and Operating Requirements

CHAPTER 1 PURPOSE AND NEED

1.1 INTRODUCTION

The draft Marine Management Plan (draft plan), once finalized, will set the framework for the National Park Service (NPS) to manage approximately 537,000 acres of Glacier Bay National Park (the park) marine waters. This environmental assessment (EA) provides: (1) programmatic National Environmental Policy Act (NEPA) analysis for broad management direction, zoning, and potential programs and facilities, including floating administrative cabins/seasonally moored vessels, communication upgrades, and oceanographic monitoring stations within three proposed new management zones; and (2) site-specific NEPA analysis to amend the current vessel management system as defined in a 2003 Record of Decision (2003 VQOR ROD) (NPS 2003a) from the Vessel Quota Operating Requirements Environmental Impact Statement (VQOR EIS) (NPS 2003b) and codified at 36 Code of Federal Regulations (CFR) Part 13 Subpart N, and the annual Park Compendium.

The draft plan and EA are being released together, consistent with guidance from the Council on Environmental Quality (CEQ). In Question 21 of its "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," CEQ addresses combining environmental and planning documents. The guidance states that EISs (and EAs) may be combined with any other agency document to reduce duplication and paperwork. When doing so, the EA can be attached to the plan, but must stand on its own analytically to inform decisionmakers and the public of the environmental effects of the proposal and those of the reasonable alternatives. The guidance provides an example from one agency, where "the EIS contains information relevant to the choice among alternatives; the plan is a detailed description of proposed management activities suitable for use by the land managers." This is the approach the NPS has taken for the draft plan and this EA. Following the comment period on the EA, the NPS will revise both the EA (through errata) and draft plan as appropriate, before issuing a NEPA decision and final plan.

1.2 BACKGROUND

The marine environment of the park has been important for humans since time immemorial and has since become a significant marine tourism destination with the arrival of steamships in the late 1800s. Marine waters make up nearly one-fifth of the park, approximately 600,000 acres, and no point of land is more than 30 miles from the coast. Most of the park's visitation (672,087 visitors in 2019) occurs in the park's biologically rich marine waters and adjoining shorelines.

Marine vessel quotas and operating requirements have been in place in the park since 1979. Currently, vessels are managed according to:

- Special federal regulations at 36 CFR Part 13 Subpart N for Glacier Bay National Park under a rationale and framework articulated in the 2003 VQOR ROD for the VQOR EIS. Five types of

motorized vessels are managed by quota in Glacier Bay[1]: cruise ships, tour vessels, charter vessels, private vessels, and a passenger ferry.

- The Park Compendium and related laws and policies (https://www.nps.gov/glba/learn/management/lawsandpolicies.htm), including NPS *Management Policies 2006*.
- Contracts for passenger vessel services in the form of exclusive and competitive partnerships with the tourism industry. These contracts include some of the strongest environmental standards in the world and help ensure high-quality visitor experiences that meet park purposes.

The management of some vessels (e.g., cruise ships, tour vessels, and charter vessels) under the existing quota system will continue, and visitor satisfaction is high. Continuing demand for motorized and nonmotorized vessel access, changes in visitor use patterns, rapidly changing environmental conditions, and evolving vessel technologies continue to provide challenges in balancing the protection of park resources with providing a range of recreational opportunities for visitors consistent with the park's purpose. Furthermore, additional studies have been conducted since the 2003 VQOR ROD that allow the park to better understand visitor use patterns and experiences, as well as vessel noise levels above and below water. The actions proposed by the NPS in this EA intend to add modest refinements to past decisions to ensure that the management of all vessel types is effective and adaptable to changing environmental and social conditions, supports Tlingit Homeland values, and provides balanced forms of visitor access to the park in a manner that helps achieve the desired conditions for resources as identified in the draft plan and EA, as well as in the Frontcountry Management Plan (FMP) (NPS 2019a) and Backcountry and Wilderness Management Plan (BWMP) (NPS, in preparation).

1.3 PURPOSE AND NEED FOR ACTION

The purpose of this planning effort is to: (1) establish marine management zones within the park to guide future management decisions; (2) meet desired conditions by establishing new vessel types, updating the vessel quotas for private vessels, and revising operating requirements across all vessel types; and (3) addressing programs and facilities that support communication and the management and monitoring of the park's marine environment.

Action is needed at this time to provide a long-term Marine Management Plan that addresses (1) changing visitor use patterns, (2) potential new vessel technology, (3) rapidly changing environmental conditions in the context of research results that established and improved the understanding of the relationships between resources and vessel activities after the 2003 VQOR ROD was completed, (4) restoring opportunities to visit the park according to founding park purposes, and (5) providing visitors on private vessels with balanced and equitable access to the park in a manner that helps achieve the park's desired conditions.

[1] Glacier Bay is defined as all marine waters inside a line drawn between Point Gustavus at 135°54.927′ W longitude; 58°22.748′ N latitude and Point Carolus at 136°2.535′ W longitude; 58°22.694′ N latitude (36 CFR § 13.1102).

1.4 PROJECT AREA

The draft plan and EA project area primarily encompasses all marine waters (approximately 537,000 acres) in the park from just north of Cape Fairweather on the outer coast to Excursion Inlet in Icy Strait, including the waters of Glacier Bay. Marine waters are inclusive of submerged lands (seafloor), the marine water column, and shorelines below mean high tide within the park. Vessel permits and quotas apply to all marine waters within Glacier Bay as described in 36 CFR § 13.1150 (figure 1-1). The draft plan and EA project area does not include waters in Bartlett Cove east of the fuel dock where vessel permits and quotas do not apply (figure 1-1).

1.5 SCOPE OF THE ANALYSIS

This EA analyzes programmatic and site-specific actions, consistent with guidance in the December 18, 2014, Memorandum from CEQ on the Effective Use of Programmatic NEPA Reviews (CEQ 2014). CEQ notes that agencies may prepare a single NEPA document to support both programmatic and project-specific proposals. Such an approach may be appropriate when an agency plans to make a broad program decision, as well as timely decisions to implement one or more specific projects under the program, which is the case for this EA. The guidance states that when doing so, agencies "should clearly communicate the purpose and need for the programmatic and subsequent decisions, clearly state the decisions the agency proposes to make based directly on the [programmatic document] and distinguish the analysis of impacts and alternatives of the broad programmatic proposals from project- or site-specific proposals." Therefore, this EA discloses programmatic decisions that are supported by this NEPA document, including several programmatic actions that may require additional NEPA compliance once the scope and design for these actions are sufficiently developed; and separately, actions that are site-specific and fully covered by this NEPA review. These actions are addressed generally in table 1-1 and are described in detail in sections 2.2 through 2.7, below.

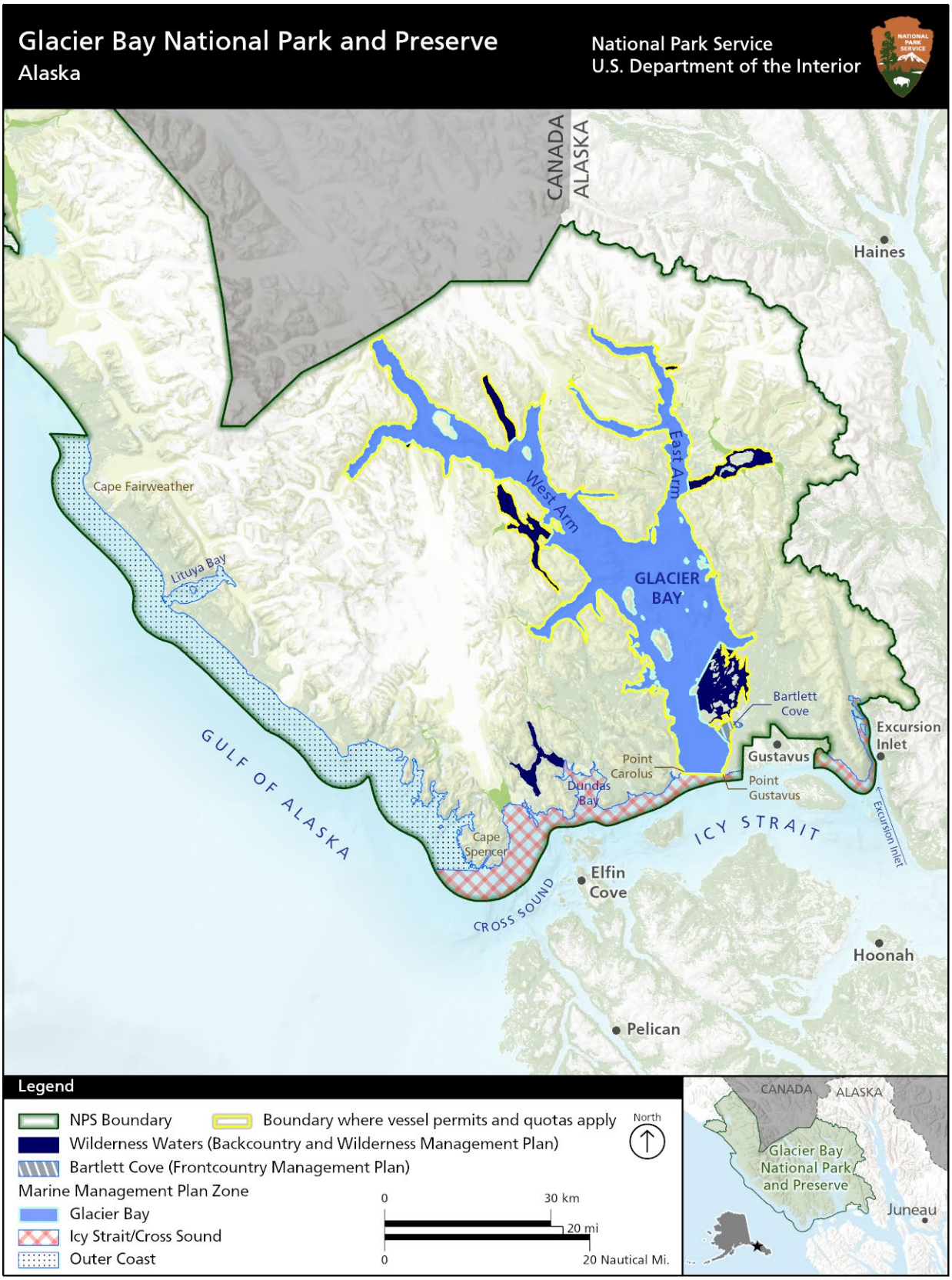


FIGURE 1-1. MARINE MANAGEMENT PLAN PROJECT AREA

TABLE 1-1. NEPA COMPLIANCE STATUS FOR PROGRAMMATIC ACTIONS AND SITE-SPECIFIC ACTIONS COVERED IN THIS EA

Type of Action	Specific Action	NEPA Compliance
Programmatic Actions Common to All Action Alternatives	Broad marine management framework including zoning	Compliance covered in this NEPA review.
	New vessel definitions	Compliance covered in this NEPA review.
	Floating cabins/seasonally moored vessels for administrative use	Additional site-specific NEPA compliance completed as appropriate.
	Communication upgrades	Additional site-specific NEPA compliance completed as appropriate.
	Oceanographic monitoring stations	Additional site-specific NEPA compliance completed as appropriate.
Site-Specific Actions Common to All Action Alternatives	Modified private vessel permit season and vessel quotas for Glacier Bay	Compliance covered in this NEPA review.
	Operating requirements for all motorized vessels	Compliance covered in this NEPA review.
	Indicators, thresholds, and corrective management actions	Compliance covered in this NEPA review. Restrictions and closures would be accomplished consistent with the process outlined in 36 CFR §13.50 and/or other relevant regulations.
Alternatives	Alternatives B, C, and D	Compliance covered in this NEPA review.

Broad management decisions related to designated Wilderness waters will be addressed in the BWMP (in preparation) and actions within Bartlett Cove are addressed in the FMP (NPS 2019a).

1.6 IMPACT TOPICS RETAINED FOR DETAILED ANALYSIS

The impact topics described below are resources in the project area that may be affected either beneficially or adversely by the range of alternatives analyzed in this EA (described in chapter 2). Impact topics that were considered but not carried forward for detailed analysis can be found in appendix B. Topics were dismissed from further analysis if it was determined that (1) the potential environmental impacts to resources or values would not be substantial; (2) the impacts were not central to the decision; or (3) if a detailed analysis of these impacts was not necessary to make a reasoned choice between alternatives.

Visitor Use and Experience – Determining how private vessels are permitted and other vessels are managed, including changes to how permits are issued, could affect the types of recreational opportunities

available to visitors in Glacier Bay. It could also affect the number of visitors who could access Glacier Bay or the number of times a single visitor could access Glacier Bay. Changes to the current permitting system could affect the visitor experience by changing the number of vessels in the viewscape,[2] the amount of noise visitors experience, or the distribution of visitors within the bay. Programmatic actions, as described in chapter 2 of this EA, may introduce structures at the park that affect the viewscape. Lastly, communication upgrades may change the visitor experience. Therefore, this impact topic is retained for detailed analysis.

Airborne Acoustic Environment – Vessel traffic currently affects the airborne acoustic environment in the park, which in turn affects other resources (e.g., visitor experience and marine and terrestrial wildlife). Private vessel permitting, operating requirements for vessels, or other programmatic actions may increase airborne noise in areas of the park from increased vessel traffic and helicopter operations to support installation and maintenance of communication upgrades. These actions could also decrease noise in the park in areas where motorized vessel use would be restricted. Therefore, this impact topic is retained for detailed analysis.

Underwater Acoustic Environment – Vessel traffic currently affects the underwater acoustic environment in the park, which in turn affects other resources (e.g., marine wildlife). Private vessel permitting, operating requirements for vessels, or other programmatic actions may increase underwater noise in the park in areas where vessel traffic would increase or programmatic actions (e.g., initial installation of oceanographic monitoring stations) would occur or decrease the underwater noise in the park in areas where motorized vessel use would be restricted. Therefore, this impact topic is retained for detailed analysis.

Marine Wildlife – Marine waters in the park provide habitat for an array of marine wildlife, including marine mammals and seabirds. Vessel traffic currently is known to affect several marine wildlife species within the park by way of vessel strikes, disturbance, and noise, both airborne and underwater. Changes to the way private vessels are permitted and other vessels are managed, as well as other programmatic actions could cause adverse or beneficial impacts on marine wildlife by increasing or decreasing disturbances or noise within the park or increasing or decreasing other hazards to marine wildlife such as vessel strikes. Therefore, this impact topic is retained for detailed analysis.

Ethnographic Resources and Homeland Values – For the Huna and Yakutat Tlingit, the marine waters of Glacier Bay, Icy Strait, Cross Sound, and the Outer Coast are inextricably connected to clan history and identity, traditional seasonal rounds and associated resource gathering areas, and places of historic importance including settlement sites and camps. These waters include tangible and intangible ethnographic resources associated with the Tlingit, such as social organization, territory, subsistence, sacred sites, and many traditional cultural properties. Changes to private vessel permitting and the way other vessels are managed could impact Tlingit Homeland values, particularly those associated with hosting visitors, maintaining balance, and respecting territorial boundaries as well as marine resources upon which the Tlingit depend. Therefore, this impact topic is retained for detailed analysis.

[2] Viewscape is defined as a view or prospect from a particular place or the line of site from a specific location to a landscape or skyline.

CHAPTER 2 MANAGEMENT ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the four alternatives under consideration for marine management at the park: a no-action alternative and three action alternatives.

The action alternatives were developed by the NPS interdisciplinary team and include feedback received during the agency and public scoping process. Action alternatives may originate from the proponent agency, local government officials, or members of the public at public meetings or during the early stages of project development and can be developed in response to comments from agencies. The alternatives analyzed in this document, in accordance with NEPA, are the result of internal, agency and public scoping. Alternatives B and C were developed during the NPS interdisciplinary team's internal scoping process, and alternative D was developed in response to comments received during the agency and public scoping period that occurred from August 9, 2022, to September 9, 2022, and during the public meetings that occurred in Gustavus, Alaska, on August 18, 2022; in Juneau, Alaska, on August 19, 2022; and in Hoonah, Alaska, on August 20, 2022.

Elements of each alternative presented in table 2-1 are intended to move the park toward desired conditions (described in chapter 2 of the draft plan). In some cases, details (such as nonmotorized vessel management triggers or the partitioning between advance-notice and short-notice permits) are preliminary numbers based on the best information currently available. Depending on the action chosen, implementation level details may be adjusted in the Park Compendium and made available to the public based on new information that emerges, public feedback, and lessons learned.

The action alternatives presented in this EA meet the overall purpose and need for taking action and are consistent with laws, regulations, policies, and guidance that guide the park in managing vessels and other actions in the park (see appendix G). Action alternatives considered to be reasonable (40 CFR § 1508.1 (z)) must be technically and economically feasible and show evidence of common sense.

TABLE 2-1. MANAGEMENT ALTERNATIVES

Element	Alternative A- No Action	Actions Common to All	Alternative B – Proposed Action[3]	Alternative C	Alternative D – Preferred Alternative
Broad Marine Management Framework	Prescribed in the 1984 General Management Plan, 36 CFR Part 13 Subpart N, 2003 VQOR ROD and detailed in the Park Compendium.	Establishment of a Marine Management Plan that provides long-term, comprehensive management guidance for stewarding natural and cultural resources, supporting exceptional visitor experience opportunities, and managing visitor use and park operations associated with marine waters of the park, excluding those marine waters that are addressed under other park plans. For purposes of the analysis, the marine waters of the Marine Management Plan include those lands, waters, and biological communities below mean high tide within three management zones: Glacier Bay, Icy Strait/Cross Sound, and the Outer Coast, and vessel permits and quotas apply to all marine waters within Glacier Bay as described in 36 CFR § 13.1150.			
Vessel Definitions	Not applicable	The NPS would define nonmotorized vessels, lower-impact vessels, administrative use vessels, and further clarify the vessel definition for private vessels longer than 79 feet.			
Additional Programmatic Actions	Not applicable	The NPS identified three additional programmatic actions: floating cabins/seasonally moored vessels for administrative use, communication upgrades to include very high frequency (VHF) radio and automatic identification system (AIS) transponder sites, and oceanographic monitoring stations. Once the scope and design for these actions are sufficiently developed, additional project-level environmental review, analysis, and compliance may be completed prior to implementation.			
Administrative Use Vessels Management Trigger	No administrative use vessel management trigger.	The NPS would set an initial annual management trigger for administrative use vessels at 600 vessel-use days.			
Nonmotorized Vessels Management Trigger	No nonmotorized vessel management trigger.	The NPS would set an initial annual management trigger for nonmotorized day use as 18 days with greater than 75 vessels per day, and nonmotorized overnight use as 18 days with greater than 62 vessels per day.			
Call-in/Call-Out of Glacier Bay	All motorized vessels would continue to be required to call-in/call-out of Glacier Bay with the Visitor Information Station (VIS) from May 1 to September 30 and when the vessel passes the fuel dock leaving or entering Bartlett Cove.				
Indicators, Thresholds, and Corrective Management Actions	Not applicable	Indicators would be used to monitor vessel densities, visitor experience, and resource conditions throughout the park after any alternative strategies are implemented. If these indicators approach their respective thresholds, corrective management actions may be taken to protect key resources, park values, and visitor experiences.	Same as actions common to all, plus: If the monitoring results of the "Number of Vessels at Anchorage at One Time" threshold indicates that there are too many vessels anchored in one place over the course of a season, the number of overnight private vessel permits in subsequent years would be reduced by 1 permit per year, but would not be reduced below 20 permits, until the anchorage numbers drop to within an appropriate amount of use.	Same as actions common to all.	Same as actions common to all.
Private Vessel Permits	25 private vessel permits: • 13 advance-notice • 12 short-notice Permits are issued to a person, not a vessel.	Conditional transit permit for entry to and exit from Bartlett Cove may be available to private vessels (max use one way per day per vessel). Permits would be issued to a vessel, not a person, and would be non-transferable between vessels.	30 private vessel permits: • 25 overnight permits • 5 day use permits	25 private vessel permits: • 20 overnight permits • 5 day use permits	25 private vessel permits: • 15 advance-notice • 10 short-notice permits

[3] Alternative B is labeled as the "proposed action" because it was the initial NPS proposal at the time of the NEPA process was initiated. However, based on input and deliberations during the NEPA process to date, alternative D has been identified as the preferred alternative.

Element	Alternative A- No Action	Actions Common to All	Alternative B – Proposed Action[3]	Alternative C	Alternative D – Preferred Alternative
Private Vessel Permit and Quota Season	**Permit and Quota Season:** June 1–August 31 Private vessel boaters can hold two permits at any point (two permits sequentially, or two permits for different date ranges).	**Permit Season:** May 1–September 30 Required to hold a private vessel permit and be subject to private vessel permit requirements. **Quota Season:** June 1–August 31	Same as actions common to all, plus: At any time during the quota season, the Superintendent can convert up to 10 unused overnight permits into day use permits based on overnight demands. Private vessel boaters can hold two advance-notice permits at any point (two permits sequentially, or two permits for different date ranges). A private vessel may only obtain one overnight permit for use during the peak season, defined below. Establishment of a peak season: • Busiest weeks of the season (typically late June to early August) • Peak season reflects weeks when permits are typically 90% full • Reevaluated every 3-5 years Off-peak season: • Unused overnight permits are offered to a waiting list of visitors for overnight permits held at the VIS.	Same alternative B	Same as actions common to all, plus: At any one time, a vessel may hold up to two permits (i.e., a vessel may hold two short notice permits, or one short notice permit and one advance-notice permit.) A private vessel may only obtain one advance-notice permit per year.
Timing of Private Vessel Permit Releases	**25 private vessel permits** • **Advance-Notice: 13 of 25 Permits** ▪ Available 60 days in advance of the start of a trip • **Short-Notice: 12 of 25 Permits** ▪ Available two days (48 hours) in advance of the start of a trip Permits are confirmed by 10:00 a.m. AK the day of the permit.	All permits would be confirmed any time before 5:00 p.m. AK the day before the start of the permit. The short-notice permit application window would be increased from two days to three days in advance of the permit start date. Short notice permit applications would be accepted between midnight (12:01 a.m. AK) to 10:00 a.m. AK, three days before the permit start date. A random draw lottery would occur around 11:00 a.m. AK, three days before the permit start date. Any unused short-notice permits would be offered first come, first served. In all permit lotteries, only one lottery entry per vessel would be allowed.	**30 private vessel permits** **Overnight (25 permits)** • **Advance-Notice: 13 of 25 permits** ▪ Released 60 day prior to trip start date ▪ 7 of the 13, priority to ○ Vessels that have not visited Glacier Bay in the prior calendar year ○ Lower-impact vessels prioritized (remainder of above permits) ▪ 6 of the 13 ○ Random draw lottery 60 days in advance • **Short-Notice: 12 of 25 permits** **Day Use (5 permits)** • Issued as short notice	**25 private vessel permits** **Overnight (20 permits)** • **Advance-Notice: 10 of 20 permits** ▪ 5 of the 10 ○ Released on February 1 to vessels that have not visited Glacier Bay in the prior calendar year ▪ 5 of the 10 ○ Released 60 day prior to trip start date ○ Priority to lower-impact vessels ○ Followed by first come, first served • **Short-Notice: 10 of 20 permits** **Day Use (5 permits)** • 1 permit as advance-notice, issued 60 days in advance as first come, first served • 4 permits as short notice	**25 private vessel permits** • **Advance-Notice: 15 of 25 Permits** ▪ Released on February 1 by random draw lottery ▪ Any remaining advance-notice permits would be posted before a second random draw lottery with applications accepted April 30 to May 1 ▪ Any unused advance-notice permits would be offered first come, first served • **Short-Notice: 10 of 25 Permits**

Element	Alternative A- No Action	Actions Common to All	Alternative B – Proposed Action[3]	Alternative C	Alternative D – Preferred Alternative
Length of Private Vessel Permits	Length of permit up to seven days (six nights) for private vessels. A permit is considered cancelled when 1) the vessel leaves Glacier Bay and is not intending to return within one day or 2) the vessel enters Bartlett Cove waters as defined in 36 CFR § 13.1156(b) and is not intending to leave within one day.	Length of permit up to five days (four nights) with possible extension upon request.	Same as actions common to all plus: • Day-Use Permit ▪ Defined as a single day, 00:01 to 23:59 • Overnight Permit ▪ The intent of an overnight permit is to promote a multi-day experience in the park. As currently proposed, a vessel with an overnight permit would need to spend at least one night outside of Bartlett Cove. A private vessel overnight permit would be relinquished when the vessel exits Glacier Bay for longer than 24 hours or overnights in Bartlett Cove.	Same as alternative B.	Same as actions common to all plus: A permit is considered cancelled when 1) the vessel leaves Glacier Bay and is not intending to return within one day or 2) the vessel enters Bartlett Cove waters as defined in 36 CFR § 13.1156(b) and is not intending to leave within one day. • If a permit day is unused, the permit is forfeited (e.g., if the permit is used on days one and two and not used on day three, the permit is no longer valid).
Lower-Impact Vessels	Not applicable.	A lower-impact motorized vessel is a vessel that by design or technology produces less pollution (air or water), less noise, smaller wakes, and has a lower maximum speed, thereby having fewer negative impacts on wildlife, park resources, and other visitors.	Component of the priority system for some advance-notice overnight permits.	Component of the priority system for some advance-notice overnight permits.	The park may exclude lower-impact vessels from requirements directly related to the effects of the vessel type under existing regulatory processes (36 CFR § 13.50), such as distance to shore requirements.
Private Vessels Longer than 79 Feet	Would still be considered a private vessel class.	Private vessels longer than 79 feet currently meet the 2003 VQOR ROD size definitions as tour and cruise ships and would not be considered a private vessel class.	Superintendent may reallocate any unused cruise ship or tour vessel permits for use by private vessels longer than 79 feet that have applied for a permit. Unused cruise ship or tour vessel permits would only be issued on the same day the permit is available to retain flexibility and priority for commercial operators that serve the broader public visiting the park under an established contract. Unused cruise ship permits would first be made available to tour vessels, and then to private vessels longer than 79 feet. Unused tour vessel permits would be made available first to other tour operators and then charter operators, followed by private vessels longer than 79 feet.	Private vessels longer than 79 feet would not be allowed to enter the Glacier Bay Zone.	Same as alternative B.

Element	Alternative A- No Action	Actions Common to All	Alternative B – Proposed Action[3]	Alternative C	Alternative D – Preferred Alternative
Changes to Nonmotorized and Motorized Waters in the East Arm	**Nonmotorized waters** • Muir Inlet (June 1–July 15) • Wachusett Inlet (July 16–August 31) **Motorized waters** • Muir Inlet (July 16–May 31) • Wachusett Inlet (September 1–July 15) Administrative use vessels could access nonmotorized waters with Superintendent's authorization if it is it necessary for park purposes.	Administrative use vessels would continue to access nonmotorized waters with Superintendent's authorization if it is necessary for park purposes.	In the East Arm, cruise ships and tour vessels would be prohibited from waters north of Muir Point to allow for a small vessel experience for private, charter, and nonmotorized vessels. **Nonmotorized waters** • Muir Inlet (May 1–September 15) • Wachusett Inlet (No dates as non-motorized waters) **Motorized waters** • Muir Inlet (September 16–April 30) • Wachusett Inlet (year-round)	**Nonmotorized waters** • Muir Inlet (May 1–July 15) • Wachusett Inlet (July 16–September 15) **Motorized waters** • Muir Inlet (July 16–April 30) • Wachusett Inlet (September 16–July 15)	Same as alternative C, plus: • In the East Arm, cruise ships and tour vessels would be prohibited from waters north of Muir Point to allow for a small vessel experience for private, charter, and nonmotorized vessels.

2.2 ALTERNATIVE A: NO-ACTION

Under the no-action alternative, current management with regard to zoning, vessel quotas and seasonal use days, and operating requirements would continue, as described in sections 2.2.1 through 2.2.3.

2.2.1 General Management Plan Zoning

The 1984 General Management Plan (GMP) for the park defined five zones: Non-Wilderness Waters Zone; Wilderness Lands Zone; Wilderness Waters Zone; Development Zone; and Special Use Zone. The Non-Wilderness Waters Zone includes most of the marine waters within Glacier Bay and is the zone where vessel quotas and operating requirements apply. All zones, as defined in the GMP, would remain the same under the no-action alternative (NPS 1984).

2.2.2 Vessel Quotas and Seasonal Use Days

Current vessel management actions prescribed in 36 CFR § 13 Subpart N and detailed in the Park Compendium would continue. The existing private motorized vessel permit and quota season would continue to run from June 1 through August 31, with a daily quota of 25. Within this quota, 13 advance-notice permits would be available 60 days in advance of the start of a trip, and 12 short-notice permits would be available 48 hours in advance of the start of a trip. Private vessel permits could be used for up to seven days (six nights) at a time. Permits would continue to be issued to a person, not a vessel.

From 2007 to 2011, per 36 CFR § 13.1160, a transit permit was used at the park to enable private vessels to transit from Icy Strait directly to Bartlett Cove or vice versa. The requirement to issue a transit permit ended in 2011. However, the Superintendent has the discretion following current law and regulation to use this tool as needed to optimize private vessel entries to Bartlett Cove.

2.2.3 Operating Requirements

From May 1 through September 30, operators of all motorized vessels would continue to be required to notify the Visitor Information Station (VIS) of the vessel's entry to, or exit from, Glacier Bay. Private vessels entering and exiting Glacier Bay at Bartlett Cove during this period would continue to be required to call the VIS when the vessel passes the fuel dock leaving or entering Bartlett Cove. No changes would be made to the locations or timing of seasonal nonmotorized waters in Glacier Bay. These waters are set in park regulations (36 CFR § 13.1180) as areas seasonally closed to motorized vessels and seaplanes to offer a range of visitor experiences, including recreational opportunities in nonmotorized settings. Table 2-2 and figure 2-1 show the specific locations and timeframes of these nonmotorized waters in the park.

TABLE 2-2. EXISTING PARK NONMOTORIZED WATERS

Location	Park Management Zone	Nonmotorized Water Dates	Motorized Water Dates
East Arm Area			
Muir Inlet (north of 59°02.7' N)	Glacier Bay Zone (draft plan)	6/1-7/15	7/16-5/31
Wachusett Inlet (west of 136°12.0' W)	Glacier Bay Zone (draft plan)	7/16-8/31	9/1-7/15
Adams Inlet (east of 135°59.2' W)	Wilderness Waters (BWMP)	5/1-9/15	9/16-4/30
West Arm Area			
Rendu Inlet (north of the Rendu Inlet wilderness boundary)	Wilderness Waters (BWMP)	5/1-9/15	9/16-4/30
Hugh Miller, Scidmore, and Charpentier Complex (west of the Hugh Miller Inlet wilderness boundary)	Wilderness Waters (BWMP)	5/1-9/15	9/16-4/30
Lower Bay Area			
Beardslee Islands	Wilderness Waters (BWMP) and Glacier Bay Zone (draft plan)	5/1-9/15	9/16-4/30

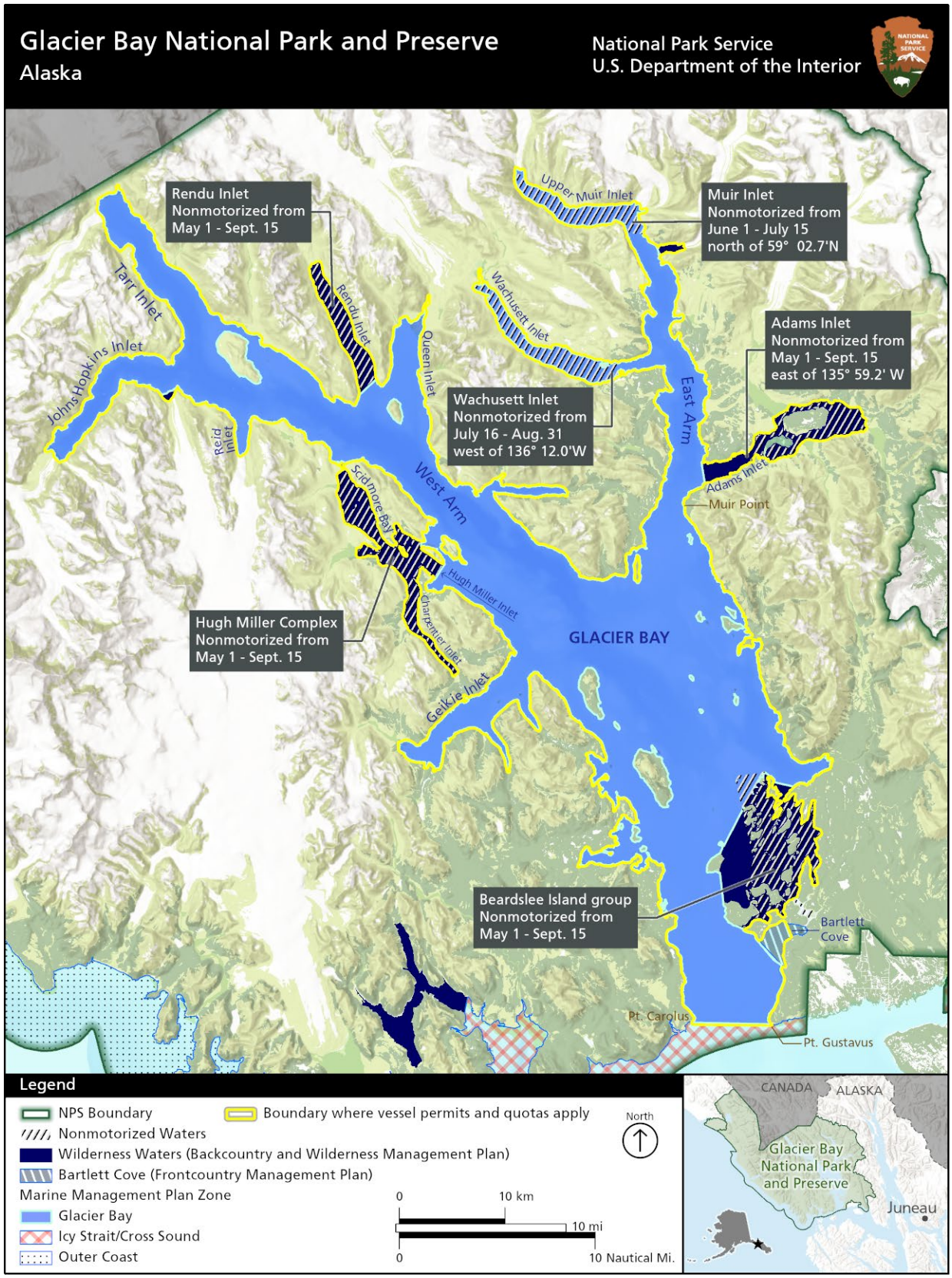


FIGURE 2-1. EXISTING NONMOTORIZED WATERS WITHIN GLACIER BAY

2.3 PROGRAMMATIC ACTIONS COMMON TO ALL ACTION ALTERNATIVES

Under all of the action alternatives considered, the following programmatic actions would be implemented. Some of these actions may require site-specific NEPA reviews in the future prior to implementation, as noted below.

2.3.1 Broad Marine Management Framework

The draft plan provides long-term, comprehensive management guidance for stewarding natural and cultural resources; supporting exceptional visitor experience opportunities; managing park operations; and managing park operations in Glacier Bay associated with marine waters of the park, excluding those marine waters that are addressed under other park plans (Bartlett Cove is managed under the FMP [NPS 2019a] and broad management for designated Wilderness waters will be addressed in the BWMP [in preparation]). The park's GMP states that "any zone may be subdivided to meet management needs or to further delineate future resource areas" (NPS 1984). Under all action alternatives, the Non-Wilderness Waters Zone would be further subdivided into three subzones. Importantly, the Non-Wilderness Waters Zone would not be removed or replaced and subdividing the existing zone would not change or affect the human environment. Any actions within the zones that could result in an environmental effect have been analyzed in this document. The remaining four zones in the GMP would remain unchanged. The three new management subzones are the Glacier Bay Zone (including the Glacier Bay East Arm and Glacier Bay Nonmotorized area), the Icy Strait/Cross Sound Zone, and the Outer Coast Zone (figure 1-1) (see chapter 2 of the draft plan for full descriptions of the desired conditions and management zones).

The Glacier Bay Zone is defined in the draft plan as waters contiguous with Glacier Bay lying north of an imaginary line between Point Gustavus and Point Carolus. The boundary of the Glacier Bay Zone is defined to encompass the park waters where the park's vessel quota system applies. The Icy Strait/Cross Sound Zone is defined as park waters extending from Excursion Inlet to Cape Spencer and includes associated bays such as lower Dundas Bay and Taylor Bay. The Outer Coast Zone is defined as park waters extending from Cape Spencer to just north of Cape Fairweather and includes the bays along the coast such as Lituya Bay and Graves Harbor. While the park's vessel quota system does not apply to park waters outside the Glacier Bay Zone, some programmatic actions occur in these zones (e.g., floating cabins/seasonally moored vessels and oceanographic monitoring stations), and the park has stewardship responsibilities associated with its jurisdiction and manages commercial use of these zones through concessions contracts.

2.3.2 New Vessel Definitions

To better manage vessels, resources, and visitor experiences within Glacier Bay, the park would formalize the following definitions:

Nonmotorized Vessel

A nonmotorized vessel is a vessel without an engine of any kind that is solely propelled by sails or human power such as paddles, pedals, or oars. Vessels in this category include, but are not limited to, kayaks, paddleboards, pedal boats, rowboats, and sailboats without an engine. Any vessel with an engine, even if it is not being used or contains a non-operational motor, is a motorized vessel. Nonmotorized vessels are allowed to operate in nonmotorized waters, as well as in waters that are open to all vessel classes. Nonmotorized vessels are not subject to the private vessel permitting criteria. The NPS is now seeking to manage and account for these diverse activities with an updated, more specific nonmotorized vessel

definition, annual tracking, and management triggers. Nonmotorized vessel use (including commercially guided nonmotorized trips and administrative use) would be monitored and managed as described in chapter 4 of the draft plan.

Lower-Impact Vessel

A lower-impact motorized vessel is a vessel that by design or technology consumes less fuel and produces less pollution (air or water), makes minimal noise, creates smaller wakes, and travels at lower maximum speeds, thereby having fewer negative impacts on wildlife, park resources, and other visitors. In recognition that the impacts of vessels vary based on certain characteristics, the park would encourage the use of these types of vessels by creating a lower-impact vessel category. Initial examples of lower-impact vessels may include those that are operating certain types of propulsion, are ≤75 horsepower, have a displacement hull (non-planing), and have a maximum speed of ≤10 knots. The park would annually share the characteristics of a lower-impact vessel and would seek public feedback.

Administrative Use Motorized Vessel

The 2003 VQOR ROD broadly defined an administrative use vessel as "any vessel involved in administrative use." During the 2003 VQOR EIS NEPA process, members of the public requested transparent reporting for categories of ongoing motorized vessel operations in Glacier Bay that fell outside the proposed quota requirements, including for NPS-owned vessels. The NPS is now seeking to manage and account for these diverse activities with an updated, more specific administrative use vessel definition, annual tracking, and a management trigger. Administrative vessel use would be monitored and managed as described in chapter 4 of the draft plan.

The new administrative use vessel category would consist of any motorized vessel that is engaged in official business for the state, tribal, or federal government in support of park operations, programs, and for activities that include cultural uses, research, resource protection, education, and emergency services. This category also captures existing NPS-authorized non-recreational uses such as public access for educational activities, tribal access for traditional activities, guaranteed access to inholdings, and commercial fishing (where allowed under Public Law 105-277 Sec. 123).

Administrative use vessels include, but are not limited to, NPS-owned vessels, NPS-chartered vessels, state of Alaska vessels, US Coast Guard vessels, National Oceanic and Atmospheric Administration vessels, vessels operated by Special Use Permit holders, commercial fishing vessels operated by Lifetime Access Permit holders, contractor vessels, and essential service providers such as marine towing/repair/salvage services and the fuel tug and barge.

Administrative use vessels for cultural purposes include vessels used to provide Hoonah Indian Association (HIA) access under tribal reserved rights to *Chookanhéeni* (acquired Berg Bay inholding), *Xunaa Shukáa Hit* (the Tribal House), and for other non-commercial cultural purposes such as tribally sponsored trips into Glacier Bay.

Clarification of Vessel Definition for Private Vessels Longer Than 79 Feet (24 Meters)

Private vessels longer than 79 feet (overall length) meet the 2003 VQOR ROD size definitions as tour vessels and cruise ships and would not be considered a private vessel class. Specific requirements for these vessels would be published and updated in the Park Compendium and would include stringent operating conditions similar to those for commercial vessels of equivalent size, that minimize injury or damage to park resources, minimize conflict with other existing users, and ensure that the visit meets the purposes for which the park was established.

2.3.3 Clarification of Transit Permit Conditions

The purpose of a transit permit is to enable private vessels to directly exit or enter Bartlett Cove and not take away permits from others seeking a full day visit for purposes for which the park was established. Another purpose of this permit is to promote high-quality visitor experiences in the frontcountry consistent with park management plans. Private vessels using the conditional transit permit would be time-limited and travel solely on a mid-channel or other prescribed course. Prior to 2011 the park was mandated to administer a private vessel transit permit between Icy Strait and Bartlett Cove (36 CFR § 13.1160). The mandate for a transit permit expired in 2011. However, the Superintendent has the discretion following current law and regulation to use this tool as needed to optimize private vessel entries to Bartlett Cove. Specific requirements and provisions would be implemented in the form of stringent conditions that minimize injury or damage to park resources, minimize conflict with other existing users, and ensure that the visit meets the purposes for which the park was established. The conditional transit permit would only be available to owner-occupied private vessels for recreational purposes upon confirmation that the transit is not related to any commercial interests, and where transit for staging the vessel in or out of the park does not offer any commercial advantage (per existing NPS policy). Conditional transit permit conditions would be defined in the Park Compendium.

2.3.4 Floating Cabins/Seasonally Moored Vessels – Administrative Use

The NPS is proposing up to two additional floating cabins/seasonally moored vessels for administrative use at locations that may include Graves Harbor and Lituya Bay in the Outer Coast Zone. Locating floating cabins/seasonally moored vessels for administrative use in these areas would allow more options for identifying management issues and implementing management actions in the Outer Coast Zone (see table 2-3 for more details). Once the scope and design for these actions are sufficiently developed, the park would complete additional site-specific NEPA reviews as appropriate, prior to implementation.

2.3.5 Communication Upgrades

The NPS proposes to upgrade existing and deploy new communication infrastructure within the next one to three years. The primary communication system would be an automatic identification system (AIS), an automatic vessel tracking system that uses transceivers on vessels and land-based receiver stations. AIS information supplements marine radar, which is the primary method of collision avoidance for marine vessels. AIS infrastructure would also enhance safety and search and rescue capabilities in the park. Currently, only one AIS transponder site is located in the park at a US Coast Guard installation that has provided aids to navigation since 1912 on a headland at Cape Spencer.

AIS transponder sites would be co-located at ten existing installation sites in the park or on adjacent lands outside designated Wilderness with the goal of full coverage of park waters. Potential installation locations include Glacier Bay (West Arm, East Arm, Beartrack Mountain), Icy Strait (Excursion Inlet), Cross Sound (Cape Spencer), and the outer coast (Cape Spencer to Icy Point and Icy Point to Cape Fairweather).

Existing very high frequency (VHF) radio (e.g., ParkNet) infrastructure may be upgraded (e.g., in the park at Beartrack Mountain, Idaho Ridge, Bartlett Cove, and Deception Hills; also at Althorp Peak [US Forest Service]). The continued maintenance of VHF repeaters is vital to park operations. Failure of repeaters would present risks to health and safety of park employees and visitors. Once the scope and

design for these actions are sufficiently developed, the park would complete additional site-specific NEPA, permitting, and other reviews as appropriate, prior to implementation.

2.3.6 Oceanographic Monitoring Stations

As part of an interdisciplinary, long-term monitoring program to gather oceanographic data, including salinity, temperature, turbidity, and other biological ocean health indicators, the NPS is proposing the annual installation of oceanographic moorings, with up to three moorings set along the Outer Coast Zone and up to three moorings in the Glacier Bay Zone. Each mooring would be anchored to the ocean floor year-round and include removable flotation buoys and tethered equipment (see table 2-3 for more details) at depths and locations that minimize risks to vessels. Anchors may be abandoned on the ocean floor. Once the scope and design for these actions are sufficiently developed, the park would complete additional site-specific NEPA review prior to implementation.

TABLE 2-3. DESCRIPTION OF POTENTIAL FLOATING CABINS/SEASONALLY MOORED VESSELS, COMMUNICATION UPGRADES AND OCEANOGRAPHIC MONITORING STATIONS

Programmatic Action	Item	Potential Location(s)	Elevation	Dimensions	Construction Materials	Utilities	Access	Land/Water Status	Park Co-Location Opportunities
Floating cabins/seasonally moored vessels (non-public use)	Floats, deck, and cabin	Graves Harbor and Lituya Bay (up to two new floating cabins/seasonally moored vessels total in Outer Coast Zone)	Sea level	Cabin: ≤160 square feet Float: ≤600 square feet	Similar to current floating cabins but with design and materials modified as needed to match the intended mission	Solar panels with batteries (stored for spill containment); propane; human waste disposal by bucket overboard	Boat, float plane, kayak	Park (non-wilderness)	Mounted antennae, data recording equipment
	Removable mooring		Underwater and intertidal	Sized to cabin/vessel weight	Removable moorings with design and materials as needed to match the intended mission	Not applicable	Boat, float plane, scuba diving	Park (non-wilderness)	Not applicable
Communication upgrades	VHF radio	Upgrades to existing repeater sites (Beartrack Mountain, Idaho Ridge, Bartlett Cove, Deception Hills, and Althorp Peak [US Forest Service])	High altitude sites	Ground disturbance per site ≤10-foot radius around existing site	Mast/tower and antenna with mounted hardware, weatherproof battery and other minor equipment	Solar panels with batteries	Helicopter where there is no other feasible access to high altitude ridges (minimum use as required in designated Wilderness): up to ten landings per site for installation; two annual landings per site for maintenance. Limited vegetation clearing without soil disturbance where this can enable helicopter landing may occur, but most sites would be on rock or alpine ridges with no vegetation.	Existing sites in designated Wilderness and non-wilderness, Glacier Bay National Preserve, US Forest Service (with permit)	Co-located with AIS receiver stations, weather and climate monitoring stations, US Coast Guard Rescue 21 stations
	AIS	Co-locate at ten existing installation sites in the park or on adjacent lands outside designated Wilderness as needed with the goal of full coverage of park waters. Potential locations include Glacier Bay (West Arm, East Arm, Beartrack Mountain), Icy Strait (Excursion Inlet), Cross Sound (Cape Spencer), outer coast (Cape Spencer to Icy Point and Icy Point to Cape Fairweather) and existing permitted weather stations	High altitude sites to sea level	Ground disturbance per site ≤10-foot radius around existing site	Mast/tower and antenna with mounted hardware, weatherproof battery and other minor equipment	Solar panels with batteries	Helicopter (minimum use as required in park designated Wilderness): up to ten landings per site for installation; two annual landings per site for maintenance; limited vegetation clearing without soil disturbance where this can enable helicopter landing. • Lower elevation sites: boat, float plane, kayak, foot access, existing roads	Existing sites in designated Wilderness and non-wilderness Glacier Bay National Preserve, US Forest Service (with permit)	Co-located with VHF radio systems, or attached to floating cabins/seasonally moored vessels, weather and climate monitoring stations, US Coast Guard Rescue 21 stations, or aids to navigation
Oceanographic monitoring stations	Oceanographic data collection mooring	Up to three new moorings along the Outer Coast Zone and up to three new moorings in the Glacier Bay Zone	Seafloor and water column with depth and design dependent on site and other concerns	Seafloor footprint ≤4 feet depending upon anchor type, vertical as needed	Annual deposit and subsequent abandonment of one 800-pound train wheel or other appropriate removable anchor per site on the ocean floor, with removable flotation buoys and tethered equipment	Not applicable	Boat, float plane, scuba diving	Park waters	Mounted data recording equipment

2.4 SITE-SPECIFIC ACTIONS COMMON TO ALL ACTION ALTERNATIVES

2.4.1 Modified Private Vessel Permit Season and Vessel Quotas for Glacier Bay

The duration for private vessel permits would be decreased from a current maximum of seven days (six nights) to five days (four nights) per permit (excluding day use permits discussed under alternatives B and C).

The private vessel permit season would be expanded to begin on May 1 and end on September 30 to coincide with the seasonal call-in/call-out requirement, which would remain May 1 through September 30. In May and September, private motorized vessels would be required to hold a permit, but this permit would be obtained online or through in-person registration, and no quotas or capacity thresholds would apply during these months. Boaters would be required to complete a boater orientation prior to entering Glacier Bay from May 1 through September 30. The permit season would be reevaluated as needed based on permit tracking and monitoring trends and could be adjusted through an update in the Park Compendium.

From June 1 through August 31, private motorized vessel users would be required to hold a permit, and permits would be subject to a quota further defined in alternatives B, C, and D. Permits would be issued to a vessel, not a person, and would be non-transferable between vessels.

From June 1 through August 31, all private vessel permits must be confirmed any time before 5:00 p.m. AK time the day before the start of the permit. If a permittee does not use the first day of the permit, the entire permit would be relinquished to the NPS. In the event of severe weather or an emergency that precludes the vessel operator from using the permit, the NPS may consider approving a delay in the permit start date. The permit also must be used on each consecutive day, or it would be terminated, and any remaining permit days would be made available to another visitor. Upon request, a private vessel permit may be extended if it would not cause the maximum number of allowed private vessel permits (quota) to be exceeded.

The short-notice permit application window would be increased from two days to three days in advance of the permit start date. Short-notice permit applications would be accepted between midnight (12:01 a.m. AK) to 10:00 a.m. AK, three days before the permit start date. A random draw lottery would occur around 11:00 a.m. AK, three days before the permit start date. Any unused short-notice permits would be offered on a first come, first served basis. One lottery entry per vessel would be allowed.

Bartlett Cove is not excluded from the private vessel permit system and would remain covered as described under 36 CFR §13.1156. Private vessels without a permit would still be able to operate east of a line extending from the long axis of the fuel dock to the wilderness boundary of Lester Island. Private vessel use in this area may be subject to further conditions, including those set by the FMP (NPS 2019a) specific to anchoring and mooring.

Monitoring for and Management of Administrative Use and Nonmotorized Vessels

Under all action alternatives, the NPS would set management triggers for administrative and nonmotorized vessel use to track and manage vessels that do not have a quota defined in 36 CFR § 13.1160. These management triggers would signal a potential "condition of concern" that would prompt managers to evaluate if desired conditions are being met and if a management response should be taken to correct conditions. Indicators (draft plan, chapter 4) would be monitored annually with periodic reporting to the public. Should management triggers be reached, the park would identify which desired conditions

are not being met and select the best approach to align administrative and nonmotorized vessel use levels with desired conditions (draft plan, chapter 2), such as the application of management action progressions (draft plan, chapter 4).

Administrative Use Vessels. Motorized administrative use vessel tracking began in 2015 for all dates in the calendar year. Each day that a motorized administrative use vessel was operating in park waters was counted as one use day, regardless of how many trips the vessel made in and out of the park or Bartlett Cove (this is the same method used to count other motorized vessel classes). The NPS would set an initial calendar year management trigger for administrative use vessels at 600 use days in Glacier Bay. This number would include vessel use for cultural purposes for access to *Chookanhéeni* and *Xunaa Shuká Hit*, as currently occurs under administrative vessel use, as well as administrative vessel use outside the May to September timeframe that may not have been previously accounted for consistently. The park would track the number of administrative use vessels daily and evaluate the need to adjust the management trigger annually as described in chapter 4 of the draft plan.

Additionally, the park would periodically report administrative use vessel numbers in Glacier Bay to the public along with rationales for any proposed changes to the annual management trigger.

Nonmotorized Vessels. The NPS would set two separate management triggers (day use and overnight) to manage use levels in all park waters subject to vessel quotas.

Nonmotorized vessel numbers would be tracked such that one vessel would equal one or more persons (depending on vessel type/size) engaging in a water-based nonmotorized activity on one calendar day. In the future, tracking may evolve toward more detailed data not available at this time, such as the vessel used (e.g., paddleboard, single kayak, double kayak, row boat, canoe) and the amount of time it spends on the water (e.g., hours, an entire day).

For day use, the management trigger would be set as 18 days with greater than 75 vessels per day. For overnight use, the management trigger would be set as 18 days with greater than 62 vessels per day. The chosen triggers represent the number of vessels (private, commercial, and administrative) per day that occurred on less than 80% of the days reviewed, thus removing the highest outliers. Observations from these years indicate that desired conditions can be maintained at these use levels.

Additional detail on these management triggers and management responses can be found in chapter 4 of the draft plan.

2.4.2 Conditional Transit Permit Conditions

No more than one conditional transit permit would be allowed at any one time (with a limit of one way per day per vessel) and would depend on availability within the daily private vessel quota. If private vessel seasonal day-use quotas (2,300 seasonal limit) are exceeded, the availability of this permit would be reduced in the future. The conditional transit permit would only be available to owner-occupied private vessels for recreational purposes upon confirmation that none of the occupants aboard have any business interests and where transit for staging the vessel in or out of the park does not offer any commercial advantage (per existing NPS policy).

2.4.3 Operating Requirements for All Motorized Vessels

Operators of all motorized vessels would continue to be required to call-in/call-out of Glacier Bay with the VIS from May 1 through September 30 and when the vessel passes the fuel dock leaving or entering Bartlett Cove.

Motorized vessels would continue to be prohibited from entering designated nonmotorized waters; however, administrative use vessels would continue to access nonmotorized waters with the Superintendent's authorization as necessary for park purposes. No changes are proposed to the extent or timing of the nonmotorized waters in Adams Inlet; Rendu Inlet; Hugh Miller Inlet/Scidmore Bay/Charpentier Inlet; or in the Beardslee Islands. Changes to nonmotorized and motorized waters for Muir Inlet and Wachusett Inlet are detailed below under each alternative.

2.4.4 Indicators, Thresholds, and Corrective Management Actions

The draft plan establishes indicators, thresholds or triggers, and monitoring protocols using the framework created by the Interagency Visitor Use Management Council (detailed in chapter 4 of the draft plan). Indicators would be used to monitor vessel densities, visitor experience, and resource conditions throughout the park. The indicators would help determine when conditions are approaching thresholds and therefore could be indicative of a condition that is not consistent with the desired conditions for marine areas of the park or fundamental resources and values. If indicators approach their respective thresholds or triggers, additional corrective actions may be taken to protect key resources, park values, and visitor experiences. By identifying and managing the maximum amount and types of visitor use, the NPS could help ensure that resources are protected, and visitors have the opportunity for a range of high-quality experiences.

The NPS would use the least restrictive mechanism or tool necessary to achieve desired future resource conditions for an area, reduce visitor conflict, or protect visitor safety. Corrective management actions are as follows, and are detailed in chapter 3 of the draft plan:

- Education
- Increased enforcement of existing regulations
- Voluntary measures, such as voluntary registration, avoidance of certain areas
- Required registration in areas where permits are not already required
- Requirements governing means of access, such as designating routes and strategies to stagger or disperse access
- Management of commercial activity through adjustments of contracts and other commercial use permits
- Regulate numbers of visitors through the establishment of quotas in areas of the park where no existing quotas exist[4]

[4]The impacts of corrective management actions are analyzed in this EA. The regulation of visitors through the establishment of additional quotas would require additional NEPA compliance prior to implementation and is not analyzed in this document.

- Temporal restrictions such as changes to access during times of day or days of week
- Temporary and permanent closures[5]

The "Number of Vessels at Anchorages at One Time" threshold detailed in chapter 4 of the draft plan could result in changes to private vessel quotas under alternative B, but would not result in any changes to private vessel quotas under alternatives C or D.

2.5 ALTERNATIVE B: PROPOSED ACTION

Alternative B is labeled as the "proposed action" because it was the initial NPS proposal at the time the NEPA process was initiated. However, based on input and deliberations during the NEPA process to date, alternative D has been identified as the preferred alternative rather than alternative B.

2.5.1 Private Vessel Quotas and Permit Conditions

From June 1 through August 31, private motorized vessel permits would be defined as either overnight permits (up to five days, four nights) or day use permits. The intent of an overnight permit is to promote a multi-day experience in the park. An overnight permit would be relinquished when the vessel exits Glacier Bay for longer than 24 hours or overnights in Bartlett Cove. Private vessel day use permits would be for use on one calendar day.

A peak season would be defined in timing and duration as the busiest weeks in the permit season when private vessel permits are typically 90% full. During the peak season, the NPS would implement adaptive strategies to fairly allocate use and preserve Glacier Bay access opportunities for a diversity of visitors, consistent with park purposes. The peak season would initially be defined as the six-week period from the last week in June to the first week in August. The peak season would be reevaluated every three to five years, and if a change to the peak season is required, it would be disclosed in the Park Compendium.

Private vessel overnight permits would be issued as either advance-notice permits (available 60 days prior to the day of use) or short-notice permits (available 3 days prior to the day of use). At any one time, a vessel may hold up to two advance-notice permits (two permits sequentially, or two permits for different date ranges); however, a private vessel may only obtain one overnight permit for use during the peak season per year.

During the non-peak season, any unused overnight permit dates would be offered on a first come, first served basis. In addition, at the discretion of the Superintendent, up to ten unused private vessel overnight permits could be converted to private vessel day use permits (i.e., one unused overnight permit could be converted into five sequential day use permits), as long as it would not cause the maximum number of allowed private vessel permits during any one day to be exceeded. The intent of this is to ensure that all available permits are used during June 1–August 31 when the private vessel quota is in place.

Under alternative B, during the private vessel quota season (June 1–August 31) up to 30 private vessel permits would be available, representing an increase of 5 permits from current conditions. Twenty-five of the 30 permits would be designated as overnight permits, and 5 of the 30 permits would be designated as day use permits.

[5] Restrictions and closures would be accomplished consistent with the process outlined in 36 CFR §13.50 and/or other relevant regulations.

Thirteen of the 25 overnight permits would be issued as advance-notice permits and available 60 days prior to the start of a trip. Seven of the 13 advance-notice permits would be given out on a priority basis, first to vessels that have not visited Glacier Bay in the prior calendar year, followed by lower-impact vessels. The remaining 6 advance-notice permits or any unclaimed permits would be distributed through a random draw lottery if there is more demand than permits available, with one lottery entry per vessel. The other 12 private vessel overnight permits would be available as short-notice permits and issued as described in "Site-Specific Actions Common to All Alternatives" section. Five of the 30 permits would be designated as short-notice day use permits issued as described in the "Site-Specific Actions Common to All Alternatives" section.

If the monitoring results of the "Number of Vessels at Anchorages at One Time" indicate that there are too many vessels anchored in one place over the course of a season, the number of overnight private vessel permits in subsequent years would be reduced by 1 overnight permit per year, but would not be reduced below 20 overnight permits, until the anchorage numbers drop to within an appropriate amount of use. Additional details on this indicator and threshold can be found in chapter 4 of the draft plan.

Private vessels longer than 79 feet would not be allowed to access Glacier Bay using a private vessel permit. However, at any time during the quota season, the Superintendent may reallocate any unused cruise ship or tour vessel use days for use by private vessels longer than 79 feet that apply for a permit specifying the range of dates interested, provide proof of liability insurance, and meet other set pre-qualifications. The issuance of this permit may also require Cost Recovery Fees for permit processing and a security deposit. These vessels would then be managed as a cruise ship or as a tour vessel and would be subject to similar operating requirements (see appendix D), including those defined in this EA such as changes to access in the East Arm.

Unused cruise ship or tour vessel use days would only be issued on the same day the use day is available to retain flexibility and priority for commercial operators that serve the broader public visiting the park under an established contract. Unused cruise ship use days would first be made available to tour vessels, and then to private vessels longer than 79 feet. Unused tour vessel use days would first be made available to charter operators, followed by private vessels longer than 79 feet.

2.5.2 Operating Requirements

In the East Arm, cruise ships and tour vessels would be prohibited from waters north of Muir Point to allow for a small vessel experience for private, charter, and nonmotorized vessels.

Table 2-4 and figure 2-2 show the locations and timeframes of nonmotorized waters within Glacier Bay under alternative B. Changes from existing nonmotorized conditions include the dates that Muir Inlet and Wachusett Inlet are designated as nonmotorized. Muir Inlet would be designated as nonmotorized waters from May 1 through September 15, with motorized vessels allowed in Muir Inlet from September 16 through April 30. Motorized vessels would be allowed in Wachusett Inlet year-round.

TABLE 2-4. PROPOSED NONMOTORIZED WATERS—ALTERNATIVE B

Location	Existing Nonmotorized Water Dates	Proposed Changes to Nonmotorized Waters	Existing Motorized Water Dates	Proposed Changes to Motorized Waters
Muir Inlet (north of 59°02.7' N)	6/1-7/15	5/1-9/15	7/16-5/31	9/16-4/30
Wachusett Inlet (west of 136°12.0' W)	7/16-8/31	No dates as nonmotorized waters	9/1-7/15	Year-round

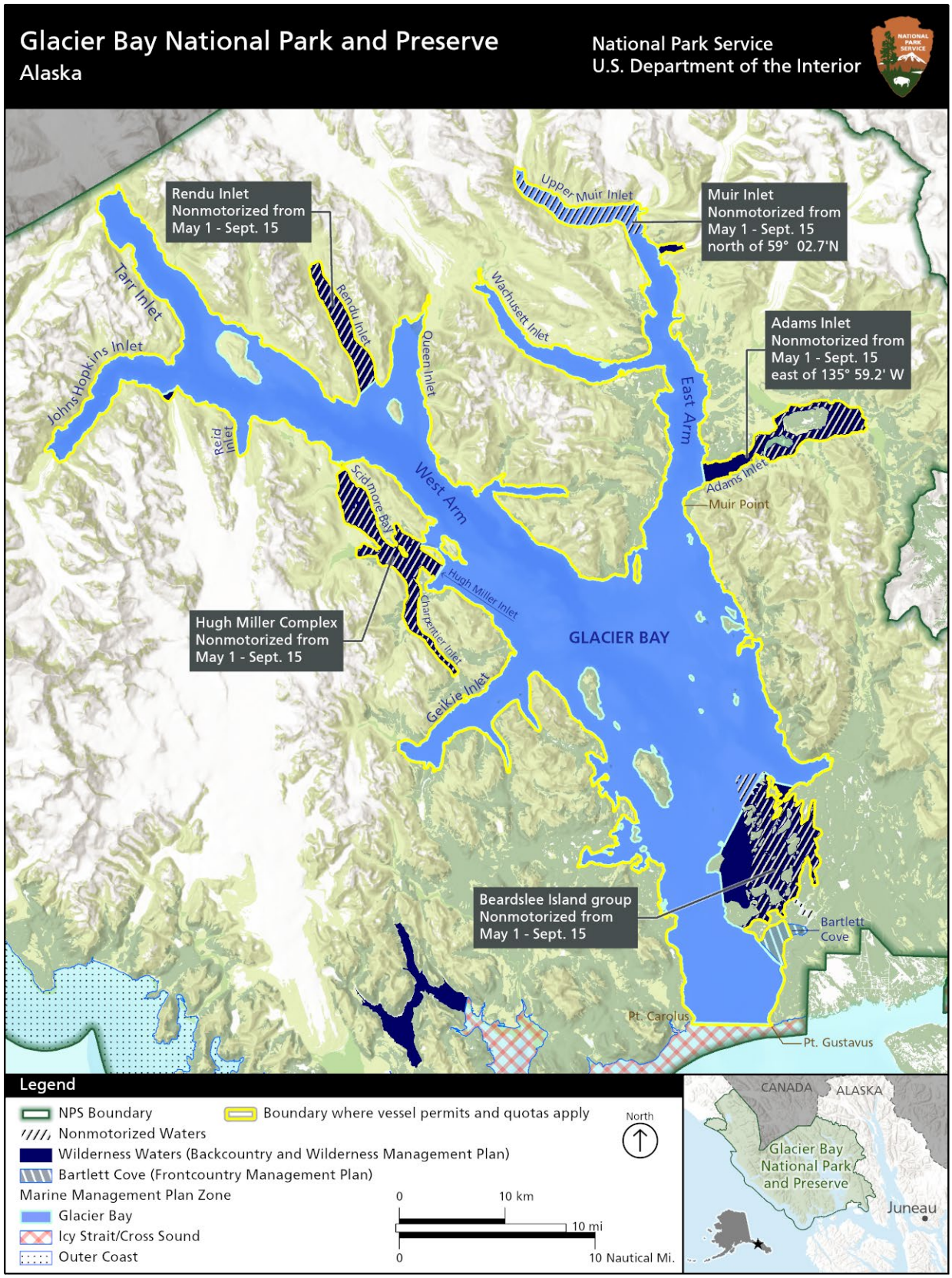


FIGURE 2-2. NONMOTORIZED WATERS WITHIN GLACIER BAY—ALTERNATIVE B

2.6 ALTERNATIVE C

2.6.1 Private Vessel Quotas and Permit Conditions

From June 1 through August 31, private motorized vessel permits would be defined as either overnight permits or day use permits, the same as alternative B. A peak season would be implemented, as defined under alternative B.

Also, like alternative B, private vessel overnight permits would be issued as either advance-notice permits (available 60 days prior to the day of use) or short-notice permits (available 3 days prior to the day of use). At any one time, a vessel may hold up to two advance-notice permits (two permits sequentially, or two permits for different date ranges); however, a private vessel may only obtain one overnight permit for use during the peak season per year. Also, like alternative B, during the non-peak season, and at the discretion of the Superintendent, up to ten unused private vessel overnight permits could be converted to private vessel day use permits (i.e., one unused overnight permit could be converted into five sequential day use permits), as long as it would not cause the maximum number of allowed private vessel permits (quota) during any one day to be exceeded.

Under alternative C, during the private vessel quota season (June 1–August 31), 25 private vessel permits would be available for use. Twenty of the 25 permits would be designated as overnight permits, and 5 of the 25 permits would be designated as day use permits. Other private vessel permit actions and permit season dates would be the same as described for alternative B.

Under alternative C, 10 of the 20 private vessel overnight permits would be released as advance-notice permits. Five of these advance-notice permits would be made available on February 1 to vessels that have not entered Glacier Bay in the prior calendar year. The remaining 5 advance-notice permits would be released 60 days prior to the start of a trip and would prioritize lower-impact vessels first, followed by first come, first served availability. The remaining 10 overnight permits would be released as short-notice permits and made available as described in the "Site-Specific Actions Common to All Alternatives" section. Each vessel would receive one lottery entry. Five day use permits would be allocated with 1 day use permit available as an advance-notice permit issued on a first come, first served basis (60 days in advance), and 4 day use permits available as short-notice permits as described in the "Site-Specific Actions Common to All Alternatives" section.

Under alternative C, private vessels longer than 79 feet would not be allowed access to Glacier Bay. Private vessels longer than 79 feet typically have "independent support vessels" that are of a size and use similar to private vessels, not comparable to the simple "tender" that many private vessels have. Under this alternative, private vessels longer than 79 feet would be encouraged to apply for a private vessel permit to visit Glacier Bay using their smaller (≤79 feet) support vessel and would be subject to the same quota and operating requirements as other private vessels.

2.6.2 Operating Requirements

Table 2-5 and figure 2-3 show the locations and timeframes for nonmotorized waters within Glacier Bay under alternative C. Muir Inlet would be designated as nonmotorized waters from May 1 through July 15 with motorized vessels allowed from July 16 to April 30. Wachusett Inlet would be designated as nonmotorized waters from July 16 through September 15 with motorized vessels allowed from September 16 to July 15.

Under alternative C, cruise ships and tour vessels in the East Arm would not be prohibited from waters north of Muir Point, which is the same as current conditions.

TABLE 2-5. PROPOSED NONMOTORIZED WATERS—ALTERNATIVES C AND D

Location	Nonmotorized Water Dates	Proposed Changes to Nonmotorized Waters	Motorized Water Dates	Proposed Changes to Motorized Waters
Muir Inlet (north of 59°02.7' N)	6/1-7/15	5/1-7/15	7/16-5/31	7/16-4/30
Wachusett Inlet (west of 136°12.0' W)	7/16-8/31	7/16-9/15	9/1-7/15	9/16-7/15

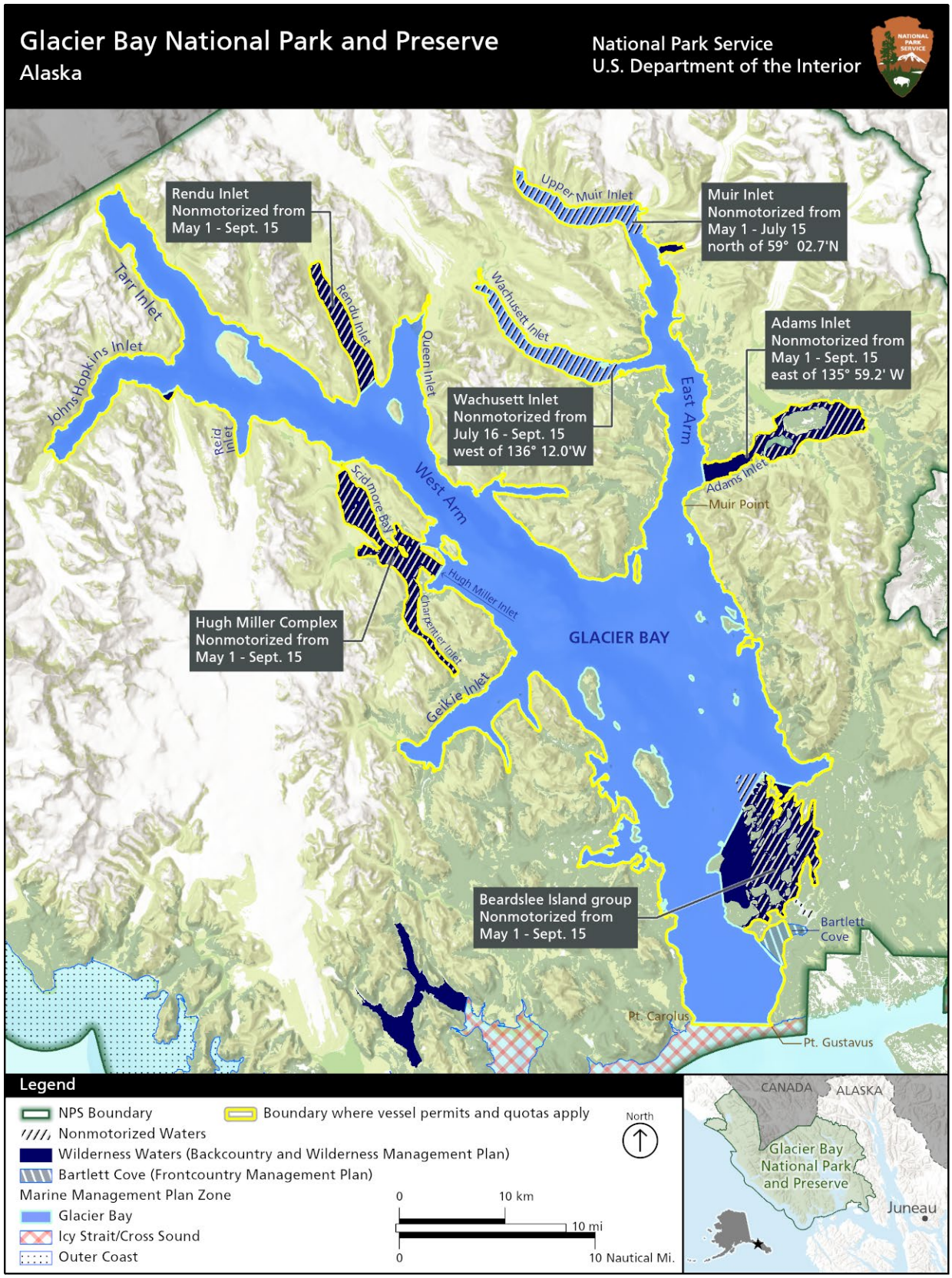


FIGURE 2-3. NONMOTORIZED WATERS WITHIN GLACIER BAY—ALTERNATIVES C AND D

2.7 ALTERNATIVE D: PREFERRED ALTERNATIVE

2.7.1 Private Vessel Quotas and Permit Conditions

Under alternative D, during the private vessel quota season (June 1–August 31), 25 private vessel permits would be available for use. There would be no distinction between day use or overnight permits, same as current conditions. Fifteen of the 25 permits would be advance-notice permits and made available on February 1 using a random draw lottery with one lottery entry per vessel. Remaining available advance-notice permit days would be posted in advance of a second lottery with applications accepted from April 30 to May 1. After the second lottery, any remaining advance-notice permits would be issued on a first come, first served basis.

Only one advance-notice permit could be obtained per vessel each year, with each vessel able to submit only one application per lottery specifying all of its dates of interest. Ten of the 25 permits would be short-notice permits and made available as described in "Site-Specific Actions Common to All Alternatives" section. At any one time, a vessel may hold up to two permits (i.e., a vessel may hold two short notice permits, or one short notice permit and one advance-notice permit).

Lower-impact vessels would not have priority in the private vessel permit allocation system under alternative D. The park may exclude lower-impact vessels from requirements directly related to the effects of the vessel type under existing regulatory processes (36 CFR § 13.50), such as distance to shore requirements, based on science and visitor experience conditions. The NPS would monitor lower-impact vessels and associated operating requirements to ensure impacts to resources do not exceed those presented in chapter 3, below. If impacts are greater than analyzed, full operating requirements would be reinstated for this vessel class. Because lower-impact vessels are defined as a vessel that by design or technology consumes less fuel, produces less pollution (air or water), makes minimal noise, creates smaller wakes, and travels at lower maximum speeds, the NPS seeks to encourage private vessel owners to adopt lower-impact technologies that benefit park resources and visitor experiences.

A specific private vessel peak season with additional management strategies would not be defined under alternative D. Private vessels longer than 79 feet would be managed the same as alternative B.

2.7.2 Operating Requirements

Like alternative C and as shown in table 2-5 and figure 2-3, Muir Inlet would be designated as nonmotorized waters from May 1 through July 15 with motorized vessels allowed in Muir Inlet from July 16 to April 30. Wachusett Inlet would be designated as nonmotorized waters from July 16 through September 15 with motorized vessels allowed in Wachusett Inlet from September 16 to July 15.

Like alternative B, in the East Arm, cruise ships and tour vessels would be prohibited from waters north of Muir Point to allow for a small vessel experience for private, charter, and nonmotorized vessels.

2.8 MITIGATION MEASURES

Appendix D includes a list of specific mitigation measures that would be required for project implementation.

2.9 ALTERNATIVES CONSIDERED BUT DISMISSED

Included in the range of alternatives are those alternatives, or alternative elements, considered during the NEPA process but dismissed from detailed analysis (40 CFR § 1502.14). A full description of alternatives, or alternative elements, considered but dismissed is included in appendix C.

CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter describes the current and expected future condition of visitor use and experience; airborne acoustic environment; underwater acoustic environment; marine wildlife; and ethnographic resources and Homeland values that may be affected by the implementation of the alternatives described in chapter 2. Additionally, this chapter analyzes the beneficial and adverse impacts that would likely result from implementing any of the alternatives considered in this EA. Analysis areas and methodologies for analysis of each impact topic are described in appendix E.

3.2 GENERAL METHODOLOGY

This section is organized by impact topic. The "Current and Expected Future Conditions of the Environment" section is presented first and includes a discussion of trends and past, present, and reasonably foreseeable future actions that affect each impact topic. The "Environmental Consequences" section evaluates direct, indirect, and cumulative effects from the implementation of each alternative. A factual description of the direct and indirect effects provides the reader with an understanding of how the current and expected future condition of the resource would likely change as a result of implementing the alternatives. Cumulative effects, which are effects that result from the incremental effects of the action when added to other past, present, and reasonably foreseeable actions, are also analyzed. A comparative conclusion of the alternatives is included for each impact topic.

3.3 VISITOR USE AND EXPERIENCE

3.3.1 Current and Expected Future Conditions of the Environment

The park provides a rare opportunity to view tidewater glaciers in a wilderness setting, which is an important and popular element of visitor use at the park and is emphasized in the 1925 park enabling legislation (NPS 2010a). As a remote, yet readily accessible glacier fjord marine ecosystem, the park is a popular tourist destination in Alaska that attracts commercial vessel passengers, private vessel operators, kayakers, and campers. Visits range from a single day to multi-day trips. Motorized and nonmotorized vessels provide access to marine environments and shoreline areas that offer a myriad of experiences (e.g., hiking, wildlife viewing, and camping). Large tidewater glaciers, including Margerie, Lamplugh, and Johns Hopkins, are the main viewscape attractions at the park for visitors to experience(figure 3-1). In addition, the overall glacial environment and recently deglaciated areas are popular viewing opportunities in the park (figure 3-2).

FIGURE 3-1. VIEW OF JOHNS HOPKINS GLACIER

FIGURE 3-2. VIEW OF MOUNT WRIGHT AT THE ENTRANCE TO MUIR INLET WITH RIGGS GLACIER IN THE DISTANCE

Despite the changes in the extent of tidewater glaciers over the past century (Loso et al. 2014), tidewater glacier viewing continues to be one of the most popular experiences in the park. In 2017, 41% of non-cruise ship visitors indicated that viewing the tidewater glaciers was a primary activity of their trip, and 24% said it was a common secondary activity (Furr et al. 2021). As the opportunity to view glaciers changes due to climate change impacts, other experiences within the park may become more popular. Other popular activities that were recorded in 2017 included kayaking in the backcountry (8.5%) and Bartlett Cove (14.6%), recreational fishing (saltwater 10%; freshwater 4.2%), and flightseeing (5.9%). Visitors seeking different recreational opportunities may value different experiences within the park.

3.3.1.1 Vessel Types and Visitor Experience

For purposes of the analysis, vessel types and visitor experience are primarily discussed as they relate to the park waters in Glacier Bay because this is where existing vessel quotas apply. Vessel use within Glacier Bay includes cruise ships, tour vessels, charter vessels, private vessels (e.g., sailboats, yachts, cabin cruisers, and skiffs), nonmotorized vessels (primarily kayaks), administrative use vessels, and occasionally a passenger ferry that travels from outside Glacier Bay to Bartlett Cove. Cruise ship, tour vessel, charter vessel, and passenger ferry vessel definitions, quotas, and season of use are found in 36 CFR § 13.1160, and no proposed changes for these vessel classes are included in this EA. Marine vessel quotas and operating requirements have been in place at the park since 1979. Since 1985, a vessel permit system has regulated the number of cruise ships, tour vessels, charter vessels, and private vessels in Glacier Bay. These regulations have played an important role in protecting park resources, including the viewscape.

Cruise ships are the most popular and most economical means to enable diverse audiences to view the park. Cruise ships often spend a full day (9 to 10 hours) in Glacier Bay. During their tour, cruise ships travel north up the bay, past several islands, up to the West Arm to access tidewater glaciers, primarily Margerie Glacier and/or Johns Hopkins Glacier, for viewing.

Tour vessels support the second greatest number of visitors to Glacier Bay, offering visitors opportunities to view wildlife closer to shore than cruise ships. Tour vessel passengers usually stay overnight in the park on multi-day tours and are often offered off-vessel activities, such as kayaking near tidewater glaciers and in glacial environments or shore excursions for day hikes into designated Wilderness. This vessel class includes the "day boat," which transits daily from Bartlett Cove to the Upper West Arm and back during the summer. The day boat offers optional drop-off access for kayakers and campers to have overnight experiences in the backcountry.

Charter vessel services support a variety of visitor activities, including sightseeing (both day use and overnight), transportation for kayakers and campers, guided saltwater sport fishing, and off-vessel activities such as hiking and kayaking. These services are intended to address the needs of visitors who do not have their own vessel and do not have the skills or desire to lease a boat (bareboat charter). These visitors typically desire a more personalized visit than might be provided by the larger cruise ships or tour vessels and are not interested in an entirely nonmotorized means of access such as kayaking or hiking. Intended for smaller parties, charter vessels usually provide customized services to the specific group.

As defined in Public Law 105-83, Section 127, and 36 CFR § 13.1102 and 13.1160, a passenger ferry may engage in the transport of passengers for hire to Bartlett Cove with a quota of one ferry per day. This quota is used occasionally at present, up to two times per year. The park is not proposing any changes to this authorization but has proposed better utilization of this vessel quota, providing increased access to the park's Frontcountry area at Bartlett Cove.

Private motorized vessels subject to quotas and private vessel permits include sailboats, yachts, cabin cruisers, and skiffs. Private vessels offer access to a number of experiences, including fishing, glacial viewing, wildlife viewing, general sightseeing, and camping. Private vessels are allowed in both the East Arm and West Arm.

Nonmotorized vessels are defined in chapter 2 of this document. Nonmotorized use in the park, such as kayaking, is a popular experience and currently does not require a vessel permit, but a backcountry permit for wilderness camping is required. A select number of waterways (island complexes as well as inlets) are closed to motorized vessels and seaplanes at different times of the season to protect wildlife and to provide unique enhanced opportunities for solitude and wilderness experiences for human-powered (nonmotorized) recreation, while allowing for motorized access to other waterways.

Administrative use vessels primarily support marine operations in the park related to visitor services and park stewardship and protection (e.g., research and monitoring, emergency response, and law enforcement). They also support official business by non-park government entities for monitoring or data collection; HIA for cultural access, programs, and traditional activities; and visiting scientists associated with the park's enabling purposes as a "living laboratory for science." Administrative use vessels support private party access for nonrecreational purposes such as guaranteed access to inholdings or commercial fishing (where allowed under Public Law 105-277 Sec. 123). While administrative use vessel traffic levels vary and there is currently no limit on them, from 2015 through 2019, an average of 453 administrative use vessels operated annually across all dates. In 2018 (the busiest year analyzed), on 80% of days during the main visitor season (May 1–September 30) there were fewer than five administrative use vessels operating in the park per day. While there would continue to be no limit on the number of administrative use vessels, it is not anticipated that the number of administrative vessel use days would increase substantially from current conditions.

The vessel types listed above, excluding administrative use vessels, provide opportunities for visitors to experience stunning views of tidewater glaciers and wildlife. The viewscape is key to the purpose and significance of the park. Protecting natural landscapes is important for ecological, cultural, and aesthetic reasons. Visual resources are valued both for their pleasing aesthetic characteristics—often spectacular views—and as an important means of enhancing visitor connections to the land (NPS 2018a). The number of vessels within Glacier Bay and the extended period of time they are present currently impact the park's viewscape. During the summer season, various types of vessels are almost always present and can be seen across the water surface.

Large vessels, such as cruise ships, tour vessels, and some charter vessels and private vessels longer than 79 feet generate more noise, contribute to the concentration of vessels at anchorages, and have greater impacts than smaller vessels on the viewscape, visitor experience, and recreational opportunities for visitors on smaller private and nonmotorized vessels (Swanson and Vande Kamp 2011). Additionally, the wakes from larger vessels can impact navigation of smaller private and nonmotorized vessels and have the potential to damage or flood nonmotorized vessels. Based on surveys, the number of cruise ships that backcountry visitors encounter during their visit has increased from an average of 2.6 cruise ships per trip in 1978 to 6.5 cruise ships per trip in 2018 (Furr et al. 2021).

At popular anchorages, private, charter, and tour vessels are often present and often stay overnight. Larger vessels (i.e., cruise ships, tour vessels, some charter vessels, and private vessels longer than 79 feet) can alter natural views or block views completely due to their size. Park visitors who are seeking solitude and a wilderness experience may find it difficult to experience certain natural views with vessels present. Some tour vessels provide off-vessel activities including multi-hour kayak trips. These groups of

kayakers can result in visitor concentration and may detract from the natural landscape for other visitors; however, contract operating conditions that require tour vessels to maintain wilderness values for off-vessel activities (e.g., limiting kayaking groups to eight kayaks) are in place in an effort to minimize impacts on other park visitors and disperse users to decrease visitor concentration.

In addition to impacts on viewscape from vessels, the park has a number of scientific monitoring and radio repeater stations within the project area that can impact viewscape. These sites are generally less than 100 square feet and less than 40 feet tall and are placed in areas that are not easily viewable by visitors in the marine environment; however, some locations on high ridgeline areas may be visible from vessels and detract from the natural viewscape. Currently four weather and climate monitoring stations are in the terrestrial wilderness landscape surrounding Glacier Bay (Lone Island, a point between Queen Inlet and Rendu Inlet, and two on the Nunatak on the east side of Muir Inlet) and one more is planned for future installation (Brady Icefield). Two radio repeater sites are in the terrestrial landscape surrounding Glacier Bay on Beartrack Mountain and Idaho Ridge, and a climate station is at Bartlett Cove. Additionally, the park has two small floating cabins located at Russell Island and South Sandy Cove. The floating cabins detract from the natural viewscape much like a vessel might (as an object on the water in sightline).

3.3.1.2 Private Vessel Permitting

The NPS regulates private vessels via a permit system with associated quotas from June 1 through August 31 (daily quota 25, seasonal-use day quota 2,300), as defined in 36 CFR § 13.1160. Some private vessel permits can be obtained 60 days in advance of the start of a trip, while some permits are available 48 hours in advance of the start of the trip (detailed in chapter 2).

Private vessel permits can be acquired for up to seven days, but the average length of permit use is around four days. Many short-notice permits are only used for a single day—for transit purposes and to recreate in the Lower Bay, with a frequent focus on fishing and other harvesting practices. The amount of time needed to make the roundtrip for tidewater glacier viewing makes it difficult to accomplish this trip in a single day. Currently, a permit is allocated to a person, not a vessel, making it easier for permits to be transferred between vessels and for multiple people from the same vessel to apply for a permit.

For private vessel permits, if an advance-notice permit is not obtained, the ability to receive a short-notice permit favors those visitors who live nearby and can use the permit within 48 hours. Visitors who need to travel distances to the park and first-time park visitors often need to plan their trips in advance or do not have flexible schedules and are therefore less likely to seek out or obtain a short-notice private vessel permit. Some visitors, such as some boaters based in Gustavus, obtain a seven-day private vessel permit and use the permit only on select days and do not maximize the full length of the permit. From 2010 to 2021, fewer than 1,900 private vessel seasonal-use days were used each season, resulting in approximately 400 private vessel seasonal-use days not used, or roughly 4.3 private vessel permits not used on any given day. Additionally, visitors who show up in-person are given first come, first served priority above those who have applied online, emailed, or called. Although all avenues are accepted for permit applications, in practice, the current system makes it easier for locals to obtain permits and does not provide equal opportunities for non-locals to obtain private vessel permits (NPS 2022a).

Private vessel permit use has remained relatively stable since 2007 when the vessel quotas were defined in 36 CFR § 13.1160 (except in 2020 during the height of the COVID-19 pandemic). On average, between 2010 and 2019 78% of all permit days were used (ranging from 73% to 82%). July is the most heavily used month of the summer with an average 92% of permit days used (ranging from 84% to 98%) during the 2007 to 2016 period (figure 3-3).

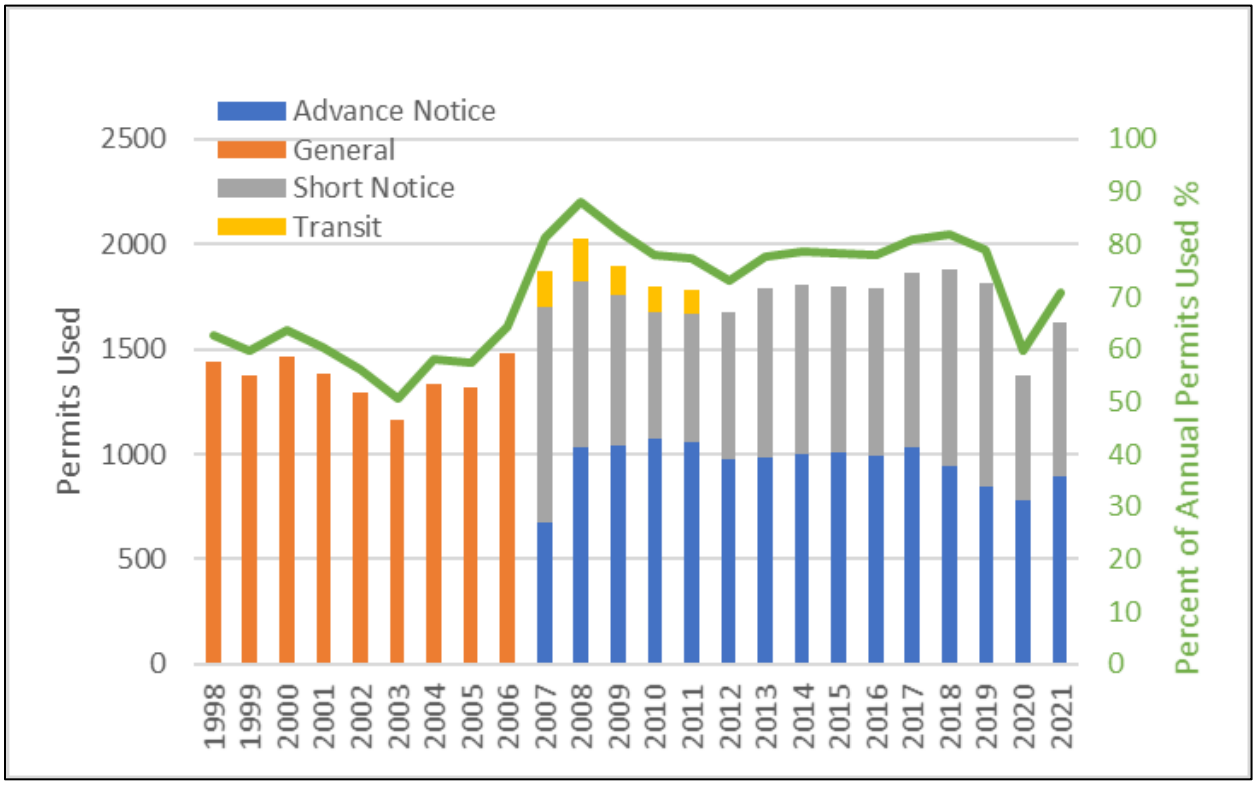


FIGURE 3-3. ANNUAL GLACIER BAY PRIVATE VESSEL PERMIT USE, 1998–2021

While the park's goal is to provide access to a diversity of visitors, a small number of private vessels use a disproportionate number of permits, limiting the equitable distribution of permits and the number of different people who can visit Glacier Bay to experience the park. Many vessels (60%) only use a single permit per year; however, park permit data show that some vessels use many more (up to 71 permit days in a single summer) (figure 3-4). Though a single vessel operator is limited to two 7-day permits in a 21-day period, there are no restrictions on the number of permits a private vessel can hold, even during the more active summer season, which limits the number of different visitors who can access and experience Glacier Bay.

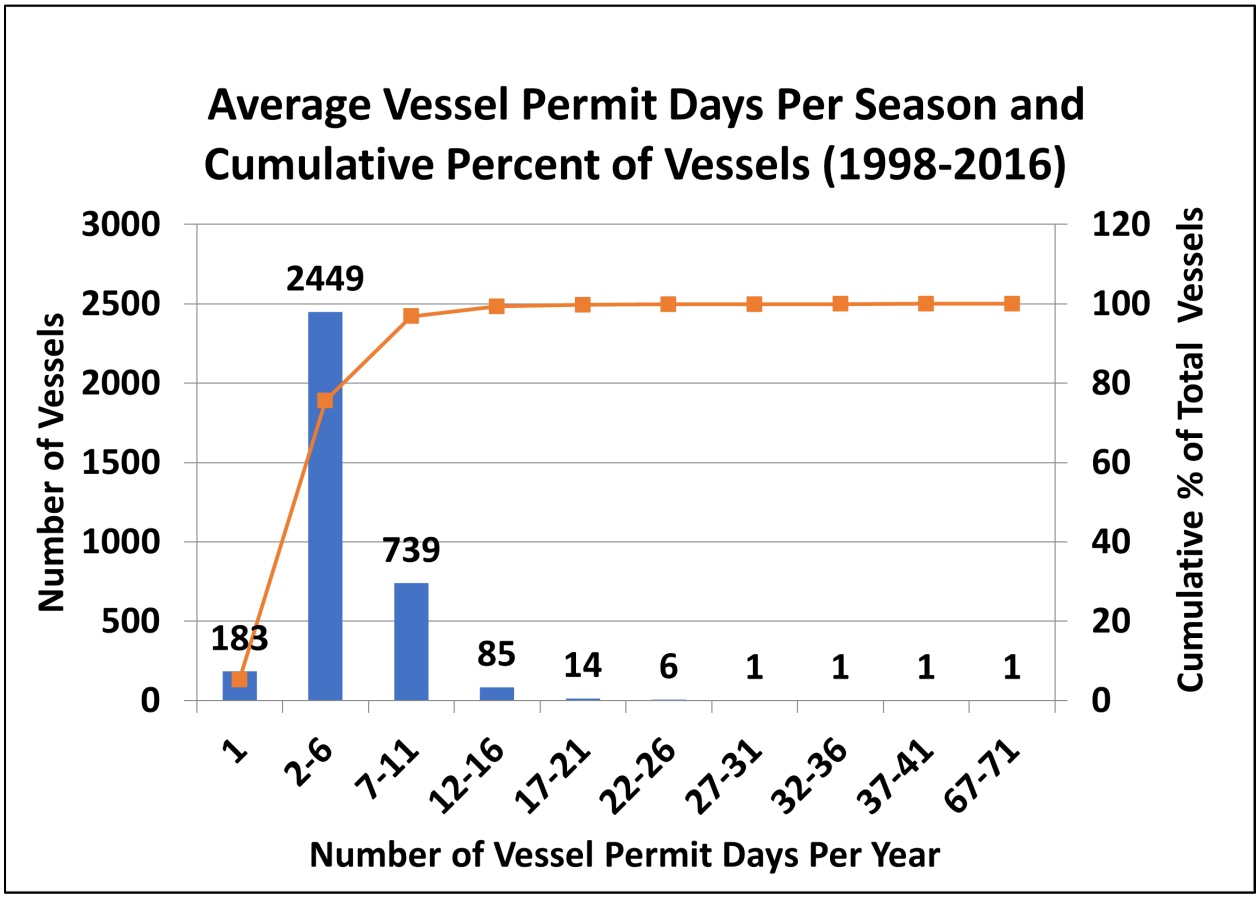


FIGURE 3-4. NUMBER OF PRIVATE VESSEL PERMITS ISSUED PER VESSEL PER YEAR, 2007–2021

From 2007 to 2011, per 36 CFR § 13.1160, it was mandatory for the park to provide transit permits to enable private vessels to transit from Icy Strait directly to Bartlett Cove or vice versa, and an average of 67.6 vessels used this permit annually. The mandatory requirement to issue a transit permit ended in 2011.

Under the current permitting system, a private vessel can return to Bartlett Cove each night (six nights) since there are no designated overnight or day use permits.

Private vessels longer than 79 feet have used private vessel permits for a number of years. In 2021, 3% (22) of the 790 private vessels that entered Glacier Bay during the quota system on a private vessel permit were longer than 79 feet. They have also occasionally exceeded 100 private vessel permit days in a single year (figure 3-5). As noted above, these larger motorized vessels affect the visitor experience aboard smaller motorized and nonmotorized vessels because compared to smaller private vessels, they generate more noise, can contribute to vessel crowding at anchorages due to their length, and have greater impacts on the viewscape for visitors in smaller vessels (Swanson and Vande Kamp 2011). In addition, wakes from the larger vessels can impact navigation of smaller private and nonmotorized vessels and have the potential to damage or flood nonmotorized vessels (NPS 2021).

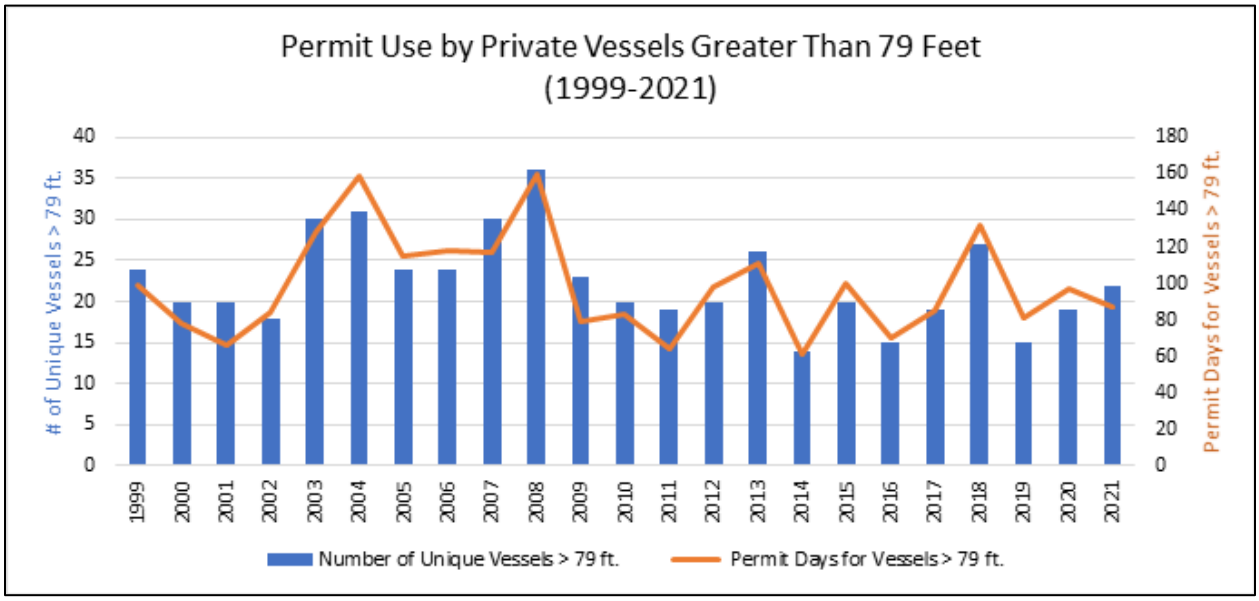


FIGURE 3-5. USE OF PRIVATE VESSEL PERMITS BY VESSELS LONGER THAN 79 FEET, 1999–2021

3.3.1.3 Visitation Trends

Since the park's establishment in 1925, originally as a national monument, it has seen a near steady increase in visitor use; 2019 had the highest visitation rate to date (672,087), followed by 2018 (597,915) (NPS 2022b). There was a drop in visitation in 2020, with only 5,748 visitors, which was the result of cruise ship and tour vessel cancellations due to the COVID-19 pandemic. Typically, around 96% of the park's visitors are cruise ship passengers (Patterson 2010; Waterman 2021).

The demographic data from a 2008 survey on the impacts of cruise ships on private vessel visitors showed that visitors arriving by private vessels were older (60–69 years old), white (96.8%) and male (58.7%), and highly educated (47.7%). According to the 2008 survey, most private vessel visitors (79.0%) were non-Alaskan US residents, and the average number of trips within 10 years was 4.3. On average, private vessel visitors planned to stay 4.1 nights in the park with most (87.9%) staying overnight within the park boundaries. Most private vessel visitors (89.3%) did not plan their trip to minimize seeing or hearing cruise ships, and most primarily sought the following activities (1) viewing general scenery, (2) viewing wildlife, (3) taking photographs, and (4) viewing tidewater glaciers. Most private vessel visitors (65.2%) visited the Margerie and Grand Pacific tidewater glaciers; followed by Reid Glacier (63.8%), Johns Hopkins Inlet (48.0%), and Lamplugh Glacier (46.4%) (Swanson and Vande Kamp 2011).

3.3.1.4 Additional Trends and Planned Actions

Additional actions that affect visitor use and experience include the development of the BWMP (in preparation) and the FMP (finalized in 2019). The BWMP proposes a Glacier Access Zone to accommodate an influx of visitor use and, at times, high-use levels. The BWMP is expected to include management actions to: (1) preserve wilderness character; (2) provide visitors access to tidewater glaciers; (3) define desired conditions for resources and visitor experiences within and adjacent to wilderness areas; and (4) protect wildlife and biologically diverse shoreline areas. These actions would have a positive impact on visitor use and experience by providing an experience of wilderness to both visitors on vessels and visitors who participate in off-vessel activities.

The BWMP management strategies for the Glacier Access Zone propose the designation of two to three focused use areas in close proximity to glaciers. Designating focused use areas is expected to better manage visitor expectations onboard tour and charter vessels and inform private vessel operators of areas that concentrate use, allowing them to seek less heavily visited areas if desired. Other key aspects of the BWMP include providing visitors access to tidewater glaciers.

The FMP outlines the long-term, comprehensive management direction for facilities, services, operations, resource stewardship, and visitor experiences in the frontcountry area of the park and visitor day use originating from Bartlett Cove (including into adjacent designated wilderness). To enhance visitor experiences, FMP management strategies include: (1) engaging diverse modern audiences; (2) creating interactive and experiential support to extend longer and repeat visits; (3) offering exhibits that are accessible year-round; and (4) showcasing the park's fundamental resource and values. The actions of the FMP have had and will continue to have a positive impact on visitor use and experience (NPS 2019a).

Lastly, climate change is causing the tidewater glaciers in Glacier Bay, such as the Margerie Glacier, to recede, limiting the total number of tidewater glaciers for visitors to experience, which results in a concentration of visitors around the glaciers that remain, negatively affecting the quality of visitor experience by, for example, increasing the number of vessels within the viewscape. Other examples of potential future conditions related to climate change that could impact visitor use include changes to marine mammal activities and distribution that could affect the location and timing of resource protection closures and thus affect the recreational use of those areas, increases in visitation during the shoulder seasons, and localized changes in vessel traffic densities. Furthermore, the potential increase in coastal geohazards such as landslides could directly impact visitor experience. Glacial retreat can lead to destabilized side walls, which, when combined with isostatic rebound, can destabilize terrestrial systems leading to landslides that have the potential to interact with visitors directly or through a secondary water mechanism in the form of a localized tsunami.

3.3.2 Environmental Consequences

3.3.2.1 Alternative A: No Action

Under alternative A, current management of private vessels, administrative use vessels, and vessel distribution within the park would continue. As a result, impacts to visitor use and experience would be the same as described above, in the "Current and Expected Future Conditions of the Environment" section.

Cumulative Impacts

Under alternative A, current vessel management would continue, and there would be no new direct impacts to visitor use and experience; therefore, the environment would remain the same as or similar to the "Current and Expected Future Conditions of the Environment" section above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the "Current and Expected Future Conditions of the Environment" section.

3.3.2.2 Alternative B: Proposed Action

Impacts of Programmatic Actions Common to Alternatives B, C, and D

Programmatic actions that would affect visitor use and experience include the installation of floating cabins/seasonally moored vessels, communication upgrades, and oceanographic monitoring stations, which would involve the use of motorized vessels, float planes, and helicopters and would affect visitor

experience through noise and impacts on the viewscape. Impacts would be temporary, limited in nature, and occur during administrative use, installation, or maintenance activities. Although the floating cabins/seasonally moored vessels would primarily be used for administrative use purposes, the cabins could also be used as an emergency shelter for the public, benefiting the visitor experience. While floating cabins/seasonally moored vessels would be an added structure that would affect the viewscape, the structures would be minimalistic (less than 160 square feet for the cabin and less than 600 square feet for the floating structure) compared to the overall surrounding landscape.

VHF radio and AIS transponder sites would be co-located with existing infrastructure to further reduce viewscape impacts. Due to the remote location and inaccessibility of most of the VHF radio or AIS transponder sites, the silent operation of most of the equipment, and the limited time during which personnel would be actively working at each site, it is expected that a very small percentage of park visitors would be aware of them. The communication systems would improve radio communication throughout the marine waters, enhancing safety for visitors, especially in those areas that are less traveled and currently lack good communication. The oceanographic monitoring systems would be below the surface of the water (with the possibility of surface buoys) and would only affect visitor experience during installation or maintenance activities when additional vessels would be present. Data from the oceanographic monitoring stations would be incorporated into interpretive programs to give visitors a better understanding of the unique and dynamic Glacier Bay environment, thus enhancing visitor experience.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

Reducing the maximum length of private vessel permits from seven days to five days would better align with the current average length of stay within Glacier Bay and would allow the park to issue more permits per season, which would provide more visitors the opportunity to experience Glacier Bay. This reduction in permit length may negatively impact the experience of some visitors wishing to spend longer in the bay. However, permit extensions could be granted during the entire quota season (pending availability), improving the quality of the visitor experience for those receiving an extension, especially for slower moving vessels (e.g., sailboats) that may require more transit time to visit the different areas of Glacier Bay.

Expanding the private vessel permit season to begin on May 1 and end on September 30 to coincide with the seasonal call-in/call-out requirement would help the park track visitor and vessel use numbers and meet desired conditions, which would help provide a high-quality visitor experience. Additionally, expanding the permit season would allow the NPS to provide important resource protection information to boaters and access key trip information from visitors, potentially increasing the NPS' ability to quickly respond to emergency situations, which would contribute to a higher quality visitor experience through increased safety.

Expanding the short-notice permit application window from two days to three days in advance of the permit start date and awarding permits via a random draw lottery would allow for more trip planning and a greater opportunity for a diversity of visitors to obtain a short-notice permit that might not otherwise happen under the current first come, first served process.

For all action alternatives, a permit would be issued to a vessel, not a person, and would be non-transferable between vessels, resulting in some changes to access compared to current conditions. For visitors who currently obtain permits and use permits across different vessels, this could decrease access

opportunities. It would, however, increase opportunities to access Glacier Bay for more people by making more permits available for a variety of different vessels. The action alternatives would change access for visitors wanting to obtain a permit for a vessel by not allowing each person on a vessel to request a permit. For example, under the current system if every person on a five-person vessel and every person on a two-person vessel request a vessel permit, the five-person vessel would have better odds of being issued a permit. The park would also implement a conditional transit permit for private vessels transiting from Icy Strait to Bartlett Cove or vice versa. This permit would improve visitor access by clarifying allowances for visitors to access Bartlett Cove, without taking away permits from others seeking a full day visit.

Formally defining administrative use vessels and nonmotorized vessels would not impact the visitor experience because this would be an administrative action that is not expected to result in an increase in the number of vessels in Glacier Bay. The number of administrative use vessels would be monitored in Glacier Bay. If the management trigger was met, management actions would be implemented to ensure the number of administrative vessels was consistent with desired conditions. Nonmotorized vessel use in Glacier Bay would also be monitored, and if the management trigger was reached, the park would follow the management actions progression (identified in chapter 3 of the draft plan) to more evenly distribute nonmotorized vessels and better align nonmotorized vessel use levels with desired conditions. This action is likely to provide a more beneficial visitor experience by reducing the number of people present in some areas.

The number of vessels per viewscape at key locations and vessels at anchorages would be monitored, and management actions would be taken to more evenly distribute vessels and ensure that the threshold is not met. This would help reduce any localized adverse impact on the quality of visitor experience resulting from an increase in vessel density and noise at anchorages or key locations.

Corrective management actions may affect the visitor experience at the park and would help the park move toward desired future conditions. Some actions such as providing educational materials or increasing enforcement efforts are expected to benefit the visitor experience in Glacier Bay. Establishing voluntary measures, requiring registration, placing restrictions on means of access or designating routes, managing commercial activity, and enacting temporal restrictions and temporary closures may temporarily impact the visitor experience at the park, lasting as long as necessary to achieve desired conditions. However, these actions are meant to help the park achieve and maintain desired conditions related to park resources, including the visitor experience, visitor access, services, and opportunities (further detailed in chapter 2 of the draft plan). Overall, corrective management actions would result in short-term, adverse impacts to the visitor experience but would benefit the visitor experience over the long term.

Alternative B Actions

Designating 25 of the 30 private vessel permits as overnight permits, compared to current conditions where permits are not designated as overnight or day use, would enhance the visitor experience by providing more opportunities for visitors, especially visitors who have not visited in the past calendar year, to take advantage of extended stays to explore and experience Glacier Bay without having to compete for permits with those visitors who only want to use permits for day-use experiences. For those wishing to use a permit for a day use experience, there would still be five day use permits available.

Establishing a peak season when only one overnight permit could be held per vessel would benefit the visitor experience at the park by ensuring that a greater number of different visitors would be able to visit

during the busiest visitation period. For those visitors wishing to hold more than one overnight permit, the establishment of the peak season may detract from their experience during that six-week period.

Increasing the private vessel daily quota from 25 to 30 would improve visitor access by allowing more people to enter Glacier Bay on a private vessel permit. However, this change could increase the potential number of vessels at key visitation sites and adversely affect the quality of the visitor experience by increasing the perceived feeling of crowding, thus impacting opportunities for solitude, and impacting the viewscape. Furthermore, designating overnight and day use permits could redistribute vessels within the park, with more vessels likely spending time in mid-bay Glacier Bay and the West Arm to view glaciers and wildlife on overnight permits and fewer vessels departing from Bartlett Cove for day trips in the Lower Bay, which often involve recreational fishing. These changes could increase the number of vessels at some key locations and anchorages, again affecting the quality of the visitor experience through the perceived feeling of crowding and impacting the viewscape, including for those in nonmotorized vessels.

If the "Number of Vessels at Anchorage at One Time" threshold indicates that there are too many vessels anchored in one place, the number of overnight permits in subsequent years would be reduced by 1 permit per year but would not be reduced below 20 permits. This reduction in available permits may alleviate high concentrations of vessels at certain anchorages and improve the visitor experience compared to allowing over 20 permits.

Unused advance-notice overnight permits may be transitioned to day use permits, which would increase the number of day use permits available to visitors, including local boaters. Based on the changes to permits and the use of overnight and day use permits the opportunity for visitors to engage in day use activities, like fishing, may change. However, up to ten unused overnight permits may be converted to day use permits on short notice, possibly expanding opportunities for visitors to recreate in Glacier Bay without having to overnight. Based on recent data showing low private permit saturation (in 2017 only 9% of days were full and in 2018 only 24% of days were full), and even with the implementation of numerous actions intended to more fully utilize private vessel permits, it can be assumed that at most times, more than five permits would be available for day use activities.

Implementing a priority ranking system for the acquisition of seven of the advance-notice overnight private vessel permits would increase opportunities for visitors who have not obtained a permit in the past calendar year. A permit system that prioritizes vessels that have not visited Glacier Bay in the past year would result in a more diverse group of visitors; however, it would have a negative impact on repeat visitors who currently have the potential to occupy a large percentage of available permits.

Encouraging the use of lower-impact vessels through prioritization in the advance-notice permit system could improve the quality of visitor experience. While lower-impact vessels travel at slower speeds, making their vessel noise audible for a longer period of time, their noise footprint is smaller, which reduces the sound levels experienced by visitors. Lower-impact vessels also produce smaller wakes, reducing potential navigational impacts on smaller private and nonmotorized vessels and the potential to damage or flood nonmotorized vessels. Lower-impact vessels would also indirectly enhance visitor experiences in adjacent wilderness areas. However, benefits from lower-impact vessels would be minimal because the priority system would only be for a limited number of permits (seven), and lower-impact vessels would be second on the priority list. Additionally, those visitors without access to a lower-impact vessel may see a decrease in the quality of their experience in obtaining a permit.

Private vessels longer than 79 feet would not be allowed to enter Glacier Bay unless an unused cruise ship or tour vessel use day were available. This would enhance the visitor experience for those on smaller

motorized and nonmotorized vessels by reducing the number of large vessels in Glacier Bay, thus reducing the visual impact, while slightly reducing potential congestion and noise impacts. For those visitors wishing to enter Glacier Bay on a private vessel longer than 79 feet, this change would decrease access and decrease the quality of their experience because permits would be harder to obtain compared to current conditions, and operating requirements would change compared to current conditions.

The exclusion of cruise ship and tour vessels from the East Arm would enhance the small vessel experience in these locations. The adverse impacts on visitor experience aboard large, motorized vessels such as cruise ships and tour vessels would be limited because tour vessels do not frequently travel to the East Arm and cruise ships do not go to the East Arm because the West Arm is more popular for its tidewater glaciers and allows easier maneuvering of cruise ships.

Extending the duration of the nonmotorized vessel waters designation in Muir Inlet would enhance the quality of the visitor experience for nonmotorized users. These users may experience reduced congestion, less noise from motorized vessels, and improved viewscape, especially for visitors seeking solitude or a remote wilderness experience. This change could also decrease those same opportunities for visitors on motorized vessels. However, eliminating the nonmotorized water designation in Wachusett Inlet and making it open to motorized vessels year-round would adversely impact the nonmotorized vessel experience that would otherwise occur. It would, however, provide a new visitor experience for motorized users during this time, enhancing the experience.

If tidewater glaciers in the park continue to recede due to climate change, impacts would be similar to those described under "Current and Expected Future Conditions of the Environment," but the impacts would be slightly greater due to the likelihood that more vessels would be motoring into the West Arm to view the glaciers with the changes to overnight and day use permits and the designation of 25 permits as overnight permits.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed, some past and ongoing actions such as the presence of cruise ships and tour vessels detract from the experience of private vessel visitors. However, current and proposed park management plans (FMP, BWMP) would implement tools intended to improve the visitor experience at the park in both the frontcountry and backcountry. Additionally, the current private vessel permitting system can decrease access opportunities to Glacier Bay because a small number of private vessels use a disproportionate number of permits, limiting the equitable distribution of permits and the number of people who can visit Glacier Bay.

As described above, the programmatic and site-specific vessel management actions proposed in alternative B would have beneficial and adverse effects on visitor use and experience quality. The programmatic actions would detract from the visitor experience through increased noise from vessels or helicopters during installation and maintenance activities and would affect the viewscape in some localized areas; however, the increased safety provided by the upgraded communication systems would enhance the visitor experience. The addition of floating cabins/seasonally moored vessels would be an added structure that would potentially impact the viewscape in the Outer Coast Zone. This alternative could increase access by changing the way permits are acquired to provide greater opportunities for visitors outside the local area to visit Glacier Bay. Additionally, distinguishing between overnight and day use permits may increase recreational opportunities beyond the Lower Bay and allow increased access to tidewater glaciers. Some adverse impacts would result from the permit system change for those visitors who wish to recreate in the Lower Bay and return to Bartlett Cove each night as potentially fewer day use

permits would be available under this alternative. The other actions proposed in alternative B are not expected to result in noticeable changes to visitor use and experience in areas such as the Lower Bay and Upper West Arm where there is currently high vessel traffic, but the actions are expected to affect the visitor experience in mid-Glacier Bay, the East Arm and the Lower West Arm compared to current conditions by increasing the number of private vessels (through increasing the private vessel daily quota from 25 to 30 and through encouraging overnight use), which could increase noise and affect the viewscape. Compared to current conditions, these impacts in addition to past, present, and reasonably foreseeable planned actions are expected to improve the overall visitor experience at the park, with some localized impacts to certain user groups.

3.3.2.3 Alternative C

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to action alternatives would be the same as those described under alternative B.

Alternative C Actions

Under alternative C, designating private vessel permits as overnight and day use permits, defining a peak season, granting permit extensions, and prioritizing lower-impact vessels would have similar impacts to alternative B, although the impacts would be slightly less because the number of private vessel permits under alternative C would remain at 25 (compared to 30 under alternative B) and the priority permit system for lower-impact vessels would be limited to 5 advance-notice overnight permits (compared to 7 under alternative B). Five advance-notice overnight permits would be issued on February 1 with a priority to vessels that have not been to the park the previous calendar year to expand access to a diversity of visitors. In addition, one of the five day use permits would be available as an advance-notice permit, allowing visitors additional time for planning and access to Glacier Bay. Based on the changes to permits and the use of overnight and day use permits the opportunity for visitors to engage in day use activities, like fishing, may change. However, the change from current conditions may be unnoticeable during the non-peak season when, like alternative B, up to ten unused overnight permits could be converted to day use permits, possibly expanding opportunities for visitors to recreate in Glacier Bay without having to stay overnight.

Prohibiting private vessels longer than 79 feet from entering Glacier Bay during the permit season would enhance the visitor experience for those on smaller vessels as described for alternative B, but the impacts would be slightly greater because those large private vessels would not be allowed in Glacier Bay using unused cruise ship or tour vessel use day. Visitors wishing to enter Glacier Bay on a vessel longer than 79 feet would be adversely impacted and would need to experience the park in other locations outside Glacier Bay. These visitors could still enter Glacier Bay on the day boat, or on a tour or charter vessel. They could also enter Glacier Bay on a support vessel ≤79 feet if they have one but would need to obtain a private vessel permit for the support vessel following the procedures detailed under this alternative. If entering Glacier Bay on a support vessel, it is likely the vessel longer than 79 feet would be staged in Dundas Bay or other locations in the Icy Strait/Cross Sound Zone which could negatively impact visitor experience in that zone.

Extending the seasonal nonmotorized waters start date from June 1 to May 1 in Muir Inlet and the end date from August 31 to September 15 in Wachusett Inlet would enhance the visitor experience for nonmotorized vessels by reducing vessel congestion, eliminating noise from motorized vessels, and improving the viewscape. For those visitors wishing to use motorized vessels in these areas, the experience could be adversely affected by reducing the amount of time these vessels could be in Muir and Wachusett Inlets, potentially concentrating motorized vessels elsewhere in Glacier Bay during these times.

If tidewater glaciers in the park continue to recede due to climate change, impacts would be similar to those described under "Current and Expected Future Conditions of the Environment," but the impacts would be slightly greater due to the likelihood that more vessels would be motoring into the West Arm to view the glaciers with the changes to overnight and day use permits and the designation of 20 permits as overnight permits.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed there, some past and ongoing actions such as the presence of cruise ships and tour vessels can detract from the experience of private vessel visitors. However, current and proposed park management plans (FMP, BWMP) would implement tools intended to improve the visitor experience at the park in both the frontcountry and backcountry. The current private vessel permitting system can decrease access opportunities to Glacier Bay because a small number of private vessels use a disproportionate number of permits, limiting the equitable distribution of permits and the number of people who can visit this zone.

Programmatic actions would detract from and benefit the visitor experience as described in alternative B. Under alternative C, there would be no change from current conditions in the private vessel daily quota (25), but permits would be divided between overnight and day use permits. Like alternative B, this change is expected to affect the visitor experience in mid-Glacier Bay, the East Arm, and the Lower West Arm compared to current conditions. This could result in a beneficial visitor experience for those able to view the tidewater glaciers but may also increase the number of private vessels in these areas compared to current conditions. Changes proposed under alternative C could increase opportunities to access Glacier Bay by changing the way permits are acquired to provide greater opportunities for visitors outside the local area to visit Glacier Bay, but to a lesser degree than alternative B because fewer permits would be available. The exclusion of private vessels longer than 79 feet from Glacier Bay and changes in nonmotorized use in Muir and Wachusett Inlet would generally improve the quality of the visitor experience within Glacier Bay by reducing noise and improving the viewscape, as well as providing an opportunity to experience more solitude and feeling of wilderness in Muir and Wachusett Inlet for nonmotorized vessel users. Compared to current conditions, these impacts in addition to past, present, and reasonably foreseeable planned actions are expected to improve the overall visitor experience at the park, with some localized impacts to certain user groups.

3.3.2.4 Alternative D

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all action alternatives would be the same as those described under alternative B.

Alternative D Actions

Under alternative D, 25 private vessel permits would be available for use during the private vessel quota season (June 1–August 31), with no distinction between day use or overnight permits, which is the same as current conditions. This alternative would allow visitors the ability to return to Bartlett Cove each night and still use the permit for the five-day (four-night) permit duration. Visitors who enjoy this park experience would not see a major change from current conditions. Unlike alternatives B and C, this may continue to congregate some vessels in the Lower Bay and may not impact the visitor experience in up-bay locations as much as the other alternatives. Unlike alternatives B and C, which define a peak season and limit vessels to one overnight permit during this time, alternative D does not define a peak season; therefore, vessels could seek two consecutive permits at any time during the quota season, the same as current conditions. However, under alternative D, a vessel could only hold one advance-notice permit per year which is a change from current conditions and may result in impacts to visitors wishing to have more ability to plan ahead for multiple trips.

The way permits are allocated would differ from current conditions, with 15 advance-notice and 10 short-notice permits compared to 13 advance-notice and 12 short-notice permits under current conditions. They would also be distributed differently—both advance-notice and short-notice permits would be distributed through a random draw lottery, and any unused advance-notice or unused short-notice permits after the random draw lottery would be distributed on a first come, first served basis. These changes from current conditions may adversely impact access of visitors close to the park who wish to maintain current conditions but would benefit those visitors from areas further away who have not had as equal an opportunity to obtain a permit in the past. Whether a permit is being drawn through a random lottery or reallocating permits, this system would increase the opportunity for visitors who live farther away and for local visitors by filling more unused permits than under current conditions.

While lower-impact vessels would not be prioritized in the vessel permit allocation system under alternative D, the park may exclude lower-impact vessels from some specific operating requirements, such as distance to shore requirements, which would enhance the visitor experience for those using lower-impact vessels. The designation of nonmotorized waters for both Muir and Wachusett Inlets and its impacts would be the same as described for alternative C. The impacts of excluding cruise ships and tour vessels from the East Arm would be the same as described for alternative B. Impacts to the way permits are issued for private vessels longer than 79 feet would be the same as described for alternative B.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the “Current and Expected Future Conditions of the Environment” section. As discussed there, some past and ongoing actions such as the presence of cruise ships and tour vessels can detract from the experience of private vessel visitors. However, current and proposed park management plans (FMP, BWMP) would implement tools intended to improve the visitor experience at the park in both the frontcountry and backcountry. Additionally, the current private vessel permitting system can decrease access opportunities to Glacier Bay because a small number of private vessels use a disproportionate number of permits, limiting the equitable distribution of permits and the number of people who can visit this zone.

Programmatic actions would detract from and benefit the visitor experience as described in alternative B. Alternative D would provide a similar visitor experience to current conditions. Changes proposed under alternative D present less of a change from current conditions than alternatives B and C because permits would not be distinguished between overnight and day use. This alternative could increase opportunities for visitor use and recreational opportunities by changing the way permits are acquired to provide greater opportunities for visitors outside the local area to visit Glacier Bay, but to a lesser degree than alternative B because fewer permits would be available. Alternative D could increase opportunities for visitor use by decreasing the number of unused advance-notice permits through a more flexible and transparent advance-notice permitting process. More permits would be made available for visitors throughout the quota season with the reduced permit length. Compared to current conditions, these impacts in addition to past, present, and reasonably foreseeable planned actions are expected to improve the overall visitor experience at the park, with some localized impacts to certain user groups.

3.3.2.5 Comparative Conclusion of Alternatives

Under alternative A, the seven-day permit allows visitors time to fully immerse themselves within the park, creating a positive visitor experience. However, the full seven days is rarely used, and most visitors choose to experience Glacier Bay in four days or fewer. Nonmotorized vessel users would continue to have an opportunity for wilderness experiences within the Muir and Wachusett Inlets and other nonmotorized waters under all alternatives. Expected future conditions that could affect visitor use and experience quality include an increase in visitation during the shoulder season, potential for higher concentration of vessels at anchorages and key viewpoints, and tidewater glaciers in the park that continue to recede due to climate change.

Permitting System

All action alternatives update the park's private vessel permit system and would provide more equitable access opportunities to high-quality experiences of the glacial environment consistent with park purposes. Differences between the alternatives focus on visitation levels, diverse approaches to when and how permits are released, large vessel access, and non-motorized access options specific to Muir Inlet and Wachusett Inlet.

Under all action alternatives, reducing the maximum permit length to five days would allow the park to issue more private vessels permits per season, thus allowing more visitors the opportunity to experience the park compared to the no-action alternative. Additionally, under all action alternatives, changing the short-notice permit distribution to a random draw lottery three days before the permit start date would increase the fair and equitable distribution of short-notice permits, potentially allowing visitors outside the local area to obtain permits and experience the park.

Alternative B would designate permits as overnight and day use permits, resulting in more visitors exploring areas farther away from Bartlett Cove. Depending on the desired experience, this could be a beneficial change for those visitors who want to obtain permits to explore mid-Glacier Bay and the West Arm to view glaciers but would be an adverse change for those visitors who want to recreate in the Lower Bay and return to Bartlett Cove each night. However, this impact may be unnoticeable because unused overnight permits could be converted to day use permits, allowing access on a shorter notice. Changes to the way permits are distributed under alternative B, such as priority ranking systems for visitors who have not been to Glacier Bay in the past calendar year or lower-impact vessels, would increase the fair and equitable distribution of permits and reduce environmental impacts from private vessels within Glacier Bay. This change may adversely impact repeat visitors who have historically occupied a large percentage of available permits. The inability to hold more than one peak season overnight permit under alternative B

means that repeat visitation during the quota season would decrease, most likely affecting the experience of visitors in the local area.

Alternative C would not increase the number of private vessel permits, so overall it would result in fewer private vessels throughout Glacier Bay compared to alternative B. Designating 20 of the 25 available permits as overnight would provide a greater number of visitors with the opportunity for an extended stay to explore and experience Glacier Bay, compared to the no-action alternative. This benefit would be slightly less than for alternative B, which would allow 25 overnight permits. Additionally, under alternative C, one of the five day use permits would be available as an advance-notice permit, allowing visitors additional time for planning and access to Glacier Bay, unlike alternative B. Like alternative B, visitors would not be allowed to hold more than one peak season permit, resulting in the same impacts.

Under alternative D, unlike alternatives B and C, there would be no distinction between day use or overnight permits, same as the no-action alternative. Changes in the distribution of permits could allow a greater diversity of visitors the opportunity to experience the park, compared to the no-action alternative. Alternative D would allow visitors an equal opportunity for a permit during high demand periods, and allow multiple trips during lower demand periods with measures that help ensure permits are more fully utilized.

Number of Available Permits

Alternative B would increase the number of private vessel permits by five, expanding recreational opportunities for visitors. This change would also increase the potential number of vessels at key visitation sites and could adversely affect the quality of the visitor experience by increasing the perceived feeling of crowding and impacting the viewscape. Should this impact be realized, available private vessel permits would be reduced to mitigate this impact. Alternatives C and D would not increase the number of available of permits compared to the no-action alternative.

Large Vessel Management

Under alternatives B and D, decreasing the number of private vessels longer than 79 feet within Glacier Bay would enhance the viewscape and slightly reduce potential congestion and noise impacts. Visitors wishing to recreate in Glacier Bay on these larger vessels would be negatively impacted by this change because access would be reduced. Alternatives B and D would restrict large vessels from the waters north of Muir Point, creating a small vessel experience away from routes generally frequented by large vessels in Glacier Bay and the West Arm.

Under alternative C, placing restrictions on private vessels longer than 79 feet in Glacier Bay during the permit season would enhance the visitor experience as described for alternatives B and D, but the impacts would be slightly greater because those large private vessels would not be allowed into Glacier Bay.

Muir and Wachusett Inlets

Under alternative B, nonmotorized waters in Muir Inlet would be expanded by one month in the beginning of the permit season and two months at the end of the permit season. This would increase opportunities for nonmotorized users to experience areas of the park without noise and motorized vessel traffic. Alternative B would also remove seasonal nonmotorized water dates in Wachusett Inlet, expanding areas where private motorized vessels could travel. These combined changes would benefit both nonmotorized and motorized visitors seeking different experiences.

Alternative C would expand nonmotorized dates in Muir Inlet by one month in the beginning of the permit season, which would have similar impacts as alternative B but to a lesser degree. This alternative

would expand seasonal nonmotorized dates in Wachusett Inlet by 15 days at the end of the permit season, which would increase opportunities for nonmotorized users to experience areas without motor vessels but would decrease opportunities for motorized vessel visitors to experience areas of the park compared to alternative B and the no-action alternative. Seasonal nonmotorized dates under alternative D would be managed the same as alternative C; therefore, impacts would be the same.

3.4 AIRBORNE ACOUSTIC ENVIRONMENT

3.4.1 Current and Expected Future Conditions of the Environment

Sound levels[6] in national parks can vary greatly, depending on location, topography, vegetation, biological activity, weather conditions, proximity to noise sources, and other factors (Mennitt et al. 2013; Buxton et al. 2017). Background sound levels within suburban areas fluctuate between 50 and 60 A-weighted decibels (dBA). Compared to these values, background sound levels in national parks (15–50 dBA) are 10 to 30,000 times less energetic. They are so different that an entirely separate measurement standard exists for correctly documenting ambient conditions in protected natural areas (ANSI/ASA S12.100-2014).

Noise levels decrease at a rate of approximately 6 decibels (dB) for each doubling of distance from a point source of acoustical energy because of the geometry of how energy spreads out from a point source into an increasingly larger volume of park land. For example, if a sound level of 70 dBA is measured at 10 meters from a noise source, at 20 meters the sound level would decrease to 64 dBA, and at 40 meters the sound level would decrease an additional 6 dBA to 58 dBA. Sound levels decay more rapidly with distance at locations closer to the sound source. Water reflects rather than absorbs sound, so when sound travels over water there is no additional attenuation of sound from the ground, topography, or foliage. These factors allow sound from more distant water activities to travel farther and potentially be perceptible on land.

Visitors come to the park to view both glaciers and wildlife and experience a pristine unspoiled natural environment, but noise can affect visitor experience and alter the behavior of wildlife (Buxton et al. 2017; Barber et al. 2011). Many factors affect how visitors and wildlife perceive and respond to noise. Primary acoustical factors include the loudness, frequency (i.e., pitch), and duration of the noise. Non-acoustical factors, such as climate, vegetation, topography, and individual hearing sensitivity also play a role in how visitors and wildlife respond to noise (Mestre Greve Associates 2014).

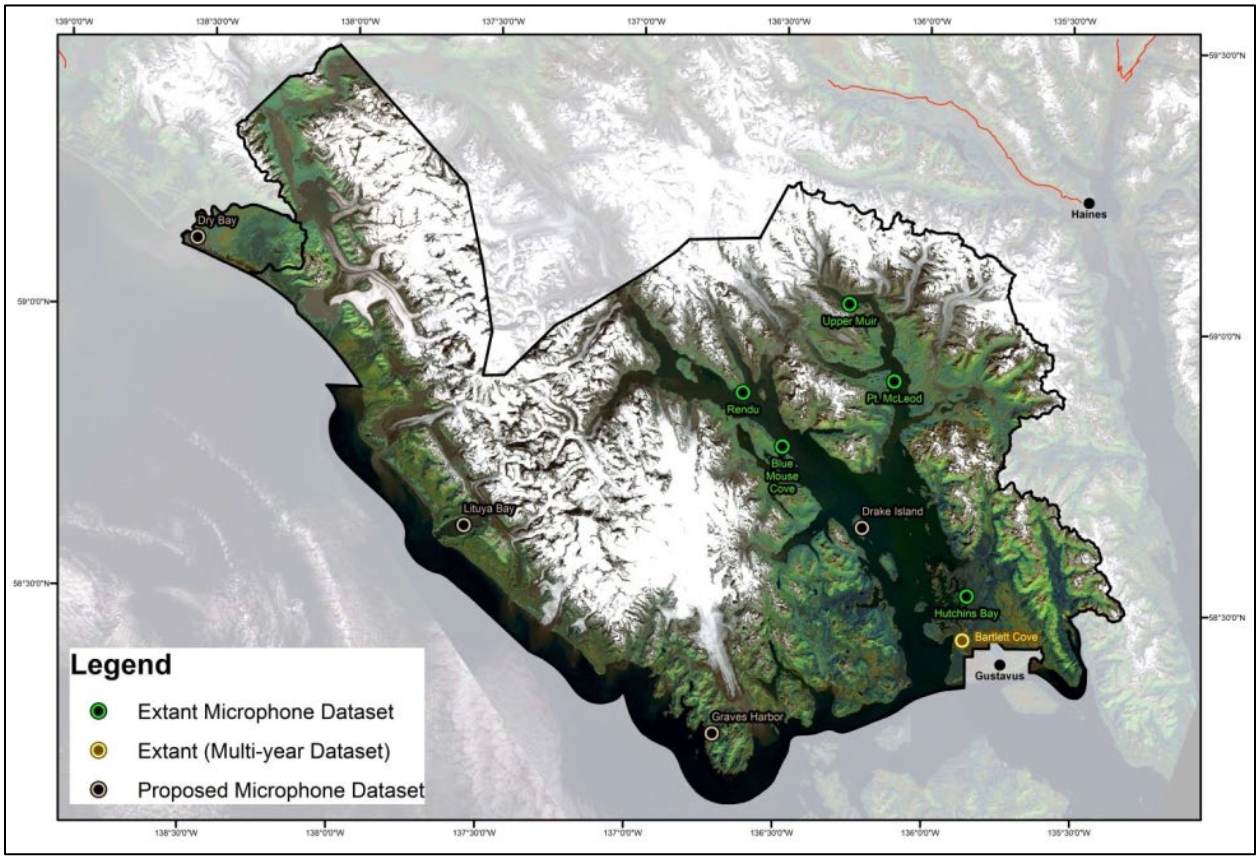
Motorized vessels are a popular way for visitors to experience the park, and vessel use is a primary mode of visitor access. At the same time, motorized vessels are the most common and loudest noise source in the park. Noise sources associated with motorized vessels include vessel motors, exhaust, movement through water, and public address systems broadcasting interpretive programs for visitors (on commercial vessels). Combined, these vessel noise sources contribute noise to the natural landscape.

As an example of vessel noise, Miller-Klein (2018) measured above-water sound levels for the *M/V American Constellation*, a 269-foot tour vessel, as defined in park regulations, that visits the park,

[6] Sound levels are measured in decibels, which is a logarithmic quantity. For airborne sound levels, all decibel values are expressed relative to a reference quantity of 20 micro-Pascals (dB re: 20 µPa). For underwater sound levels, all decibel values are expressed relative to a reference quantity of 1 micro-Pascal (dB re: 1 µPa).

among other places. The study was undertaken off the shores of Suquamish and Poulsbo, Washington, to measure compliance with NPS vessel sound levels in and around national park units. An engine idle sound level of 49 dBA was measured 5 feet above the water level, 10 feet off the stern. The background noise level at the same location without the vessel operating was 45 dBA. The noise level while underway at 9.2 knots was measured onshore 0.2 nautical miles (1,216 feet) from the vessel—the noise level was 59 dBA with a background noise level of 46 dBA taken before the vessel approached the area (Miller--Klein 2018). Miller-Klein (2017) also studied noise levels from the Lindblad Expeditions' *National Geographic Quest* vessel off the shores of Anacortes, Washington. The *Quest* is a 240-foot tour vessel, as defined in park regulations, that also visits the park. The study showed that the *Quest* exhibited an idle noise level of 70 dBA at 10 feet from the vessel on the dock with a background noise level of 62 dBA (Miller-Klein 2017). The noise level for the *Quest* while underway at 12 knots was measured onshore 0.1 nautical miles (608 feet) from the vessel and was 60 dBA with a background value of 50 dBA taken before the vessel approached the area (Miller-Klein 2017). Acoustic monitoring at the park has found that for certain sites, the percentage of time that noise is audible is among the highest across parks in Alaska (NPS 2018b). Additionally, most land-based wilderness visits occur along the shorelines where vessel noise levels are loudest.

Acoustic records of the current terrestrial environment in the park have been collected at both survey and precision grades (IEC 2002) at acoustic inventory sites (green circles) shown in figure 3-6.



Source: NPS 2018b

FIGURE 3-6. AIRBORNE ACOUSTIC INVENTORY SITES IN GLACIER BAY

The survey-grade effort included sampling during the active tourist season in 2011. Of the five locations sampled, Rendu Inlet and Hutchins Bay were most affected by noise (NPS 2018b). These observations were supplemented and confirmed by attended listening sessions. Areas such as Rendu Inlet, Queen Inlet, and Johns Hopkins Inlet were observed to have noise audible for 90%–100% of daytime summer listening sessions (NPS 2018b). Areas such as Gloomy Knob, the Upper East Arm, and Muir Inlet had noise audible for 10%–35% of daytime listening sessions (NPS 2018b). Precision-grade acoustic records were collected in 2020, 2021, and 2022. Many of the 2011 recording locations were revisited as part of this effort.

The existing median noise free interval (NFI), or time between noise events, and the noise event rate measured at acoustic inventory sites within Glacier Bay is shown in table 3-1. Comparing the 2011 and 2020 data at the Rendu Inlet site in table 3-1 illustrates how the decrease in vessel traffic due to the COVID-19 pandemic in 2020 resulted in a lower noise event rate and higher median NFI.

TABLE 3-1. EXISTING NOISE EVENT RATE AND MEDIAN NOISE FREE INTERVAL FOR AIRBORNE ACOUSTIC INVENTORY SITES IN GLACIER BAY

Acoustic Monitoring Site and Data Collection Year	Noise Event Rate, n (Events/Day)	Median NFI, I_{50} (Hours)
Lower Bay (Hutchins Bay), 2011	16.1	0.5
Lower East Arm (Point McLeod), 2011	7.9	0.7
Lower West Arm (Blue Mouse Cove), 2011	12.4	0.6
Upper East Arm (Upper Muir Inlet), 2011*	2.5	2.1
Upper West Arm (Rendu Inlet), 2011	16.0	0.7
Upper West Arm (Reid Inlet), 2020	7.4	0.4
Upper West Arm (Rendu Inlet), 2020	5.5	1.0

Source: NPS unpublished data
* Upper Muir Inlet is a proxy for the Upper East Arm; however, data collection in Upper Muir Inlet occurred during periods designated for motorized and nonmotorized waters, which likely overestimates NFI duration for areas in the Upper East Arm outside Upper Muir Inlet.

While no acoustic monitoring has occurred along the outer coast, the existing airborne acoustic environment is expected to include primarily natural sources along with some noise from passing vessels and aircraft. While acoustic monitoring has not been completed in the Icy Strait/Cross Sound Zone, noise from tour, charter, a passenger ferry, and private vessels affects the existing airborne acoustic environment within the wilderness waters of upper Dundas Bay (NPS 2003b) and in the remainder of the Icy Strait/Cross Sound Zone, which is a transportation corridor. As defined in Public Law 105-83, Section 127, and 36 CFR § 13.1102 and 13.1160, a passenger ferry may engage in the transport of passengers for hire to Bartlett Cove with a quota of one ferry per day. This quota is used occasionally at present, up to two times per year. The park is not proposing any changes to this authorization, but has proposed better utilization of this vessel quota, providing increased access to the park's Frontcountry area at Bartlett Cove.

NPS administrative flights, search and rescue flights, commercial passenger flights, and commercial air tours can also adversely impact the airborne acoustic environment. The park uses fixed-wing aircraft from May through September to conduct aerial photographic surveys of harbor seals, sea otters, and Steller sea

lions in Glacier Bay to estimate spatial distribution, trends, and abundance of these species for long-term monitoring and to inform park management. Efforts are underway to transition many of the park's fixed-wing aircraft usage to unmanned aerial systems as technology, innovation, and regulations allow.

3.4.1.1 Additional Trends and Planned Actions

In the future, the trend toward increased visitation during May and September and better utilization of the passenger ferry quota could result in a decrease in NFI during those periods due to increased vessel traffic. Additionally, if tidewater glaciers in the park continue to recede due to climate change, this could limit the total number of glaciers for visitors to experience. With fewer glaciers, vessel concentrations around those that remain could intensify and negatively affect the localized acoustic environment from the increase in vessels. While not currently an issue, higher vessel concentrations at anchorages could occur in the future, especially during the May and September timeframe when there are no daily private vessel quotas, which could slightly increase localized adverse impacts on the acoustic environment from an increase in vessels.

The BWMP (in preparation) proposes actions that could affect the airborne acoustic environment in the Glacier Access Zone. Specifically, the BWMP is expected to identify and manage two to three locations proximal to glaciers as focused use areas, consider time limits for tour vessels using focused use areas, and consider actions to encourage dispersal of tour vessels throughout the park. Informing private vessel operators of areas that concentrate use would also allow them to seek less heavily visited areas if desired. Establishing focused use areas near glaciers would decrease NFI duration in the vicinity of the focused use areas; however, the magnitude of decrease in NFI duration would be reduced to some degree by establishing time limits for tour vessels in these areas. Encouraging dispersal of tour and private vessels throughout the park would have varying effects on NFI duration in different geographic areas of the park depending on where the vessels go, which is not possible to anticipate. In specific geographic areas where tour vessels are currently common, such as the Lower Bay and Upper West Arm, fewer tour vessels may minimally increase NFI duration. In specific geographic areas where tour and private vessels are currently less common and the acoustic environment is more natural, such as the Upper East Arm, even a relatively small increase in vessels could decrease NFI duration.

3.4.2 Environmental Consequences

3.4.2.1 Alternative A: No Action

Under alternative A, current management of private vessels, administrative use vessels, and vessel distribution within the park would continue. As a result, impacts on the airborne acoustic environment from alternative A would be the same as described above, in the "Current and Expected Future Conditions of the Environment" section.

Cumulative Impacts

Under alternative A, there would be no new direct impacts to the airborne acoustic environment; therefore, the environment would remain the same as or similar to the "Current and Expected Future Conditions of the Environment" section above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the "Current and Expected Future Conditions of the Environment" section.

3.4.2.2 Alternative B: Proposed Action

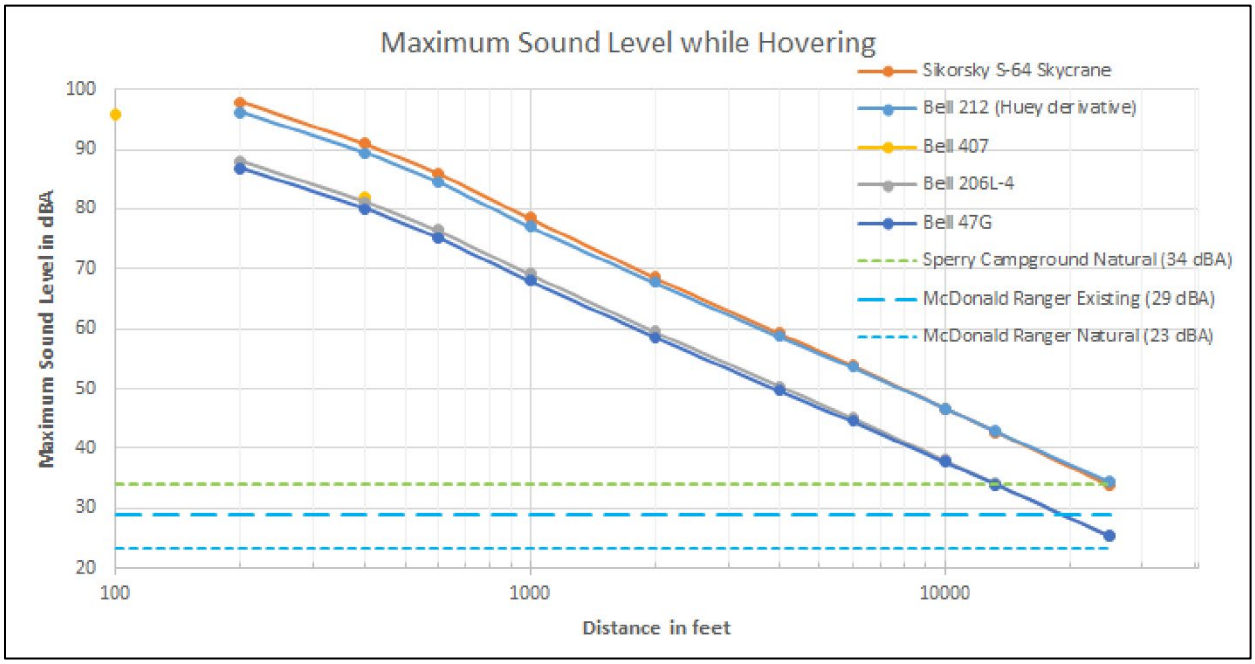
Impacts of Programmatic Actions Common to Alternatives B, C, and D

Programmatic actions that would affect the airborne acoustic environment include installation of floating cabins/seasonally moored vessels, communication upgrades, and oceanographic monitoring stations. Refining park zoning and defining and clarifying vessel definitions is not expected to affect this resource topic.

Installation of floating cabins/seasonally moored vessels and oceanographic monitoring stations would involve the use of motorized vessels and float planes and would affect the airborne acoustic environment through increased noise, although impacts would be temporary, limited in nature, and occurring only during installation or maintenance activities. Especially at locations in the Outer Coast Zone, given the ambient noise from the ocean environment, impacts on the airborne acoustic environment would be minimal. Within Glacier Bay any motorized vessels associated with installing or maintaining oceanographic monitoring stations would be defined as an administrative use vessel. Impacts from administrative use vessels are addressed under the "Impacts of Site-Specific Actions" sections for alternatives B, C, and D. To upgrade, install, and maintain the communication systems, helicopter transport would be necessary for access to high altitude sites where there are no other feasible access options. Up to ten helicopter landings per site are expected for installation with up to two annual landings for servicing per site. The helicopter flights would introduce noise into remote areas, which would decrease NFI, although most of the helicopter noise would be of short duration and occur intermittently.

Noise levels from helicopters are highly variable depending on the type of aircraft. Helicopter noise would be most audible and disruptive as the helicopter flies over or hovers at low elevation near project sites. Figure 3-7 illustrates how sound levels from different types of helicopters increase when the aircraft hovers at lower distances above the ground. While the type of helicopters that could be used under this plan are not known at this time, they could be similar to those shown in figure 3-7. Additional site-specific analysis, including a minimum requirements analysis, would be completed for VHF radio systems and AIS transponder sites within the park prior to implementation.

Generally, because project noise would not dramatically change current conditions and it would be intermittent and temporary, ending once project activities are complete, adverse impacts to the airborne acoustic environment would be periodic and limited in duration. During installation and maintenance activities, project noise would generally be sporadic, occurring intermittently with periods of relative quiet when equipment is not in use. Noise from the installation of new VHF radio systems or AIS transponder sites would be temporary, ceasing when work at each project site is completed, likely after one to two days at most project sites.



Source: NPS 2018c

FIGURE 3-7. HELICOPTER NOISE LEVELS WHILE HOVERING

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

Formally defining nonmotorized vessels and setting management triggers for them would not affect the airborne acoustic environment because nonmotorized vessels do not generate noise at a level that would affect the surrounding environment. Formally defining administrative use vessels and setting a threshold for them would not affect the airborne acoustic environment because the action is not expected to increase the total number of administrative use vessels accessing the park.

The number of vessels at anchorages and vessels per viewscape at key locations would be monitored and potentially more evenly distributed if the thresholds for "Number of Vessels at Anchorages at One Time" or "Number of Vessels Per Viewscape at Key Locations" are met, reducing any localized adverse impact to the airborne acoustic environment that might otherwise occur from increased vessel densities at anchorages or key viewscapes, although impacts are not likely to increase NFI in a meaningful way given the small number of vessels involved.

Establishing a conditional transit permit for entry and exit to Bartlett Cove could increase the number of vessels in the Lower Bay as they transit to or from Icy Strait, compared to current conditions. Only one conditional transit permit would be allowed at any one time, and the total number of vessels would not exceed the daily private vessel quota (25 or 30 depending on the alternative). McKenna et al. (2017) noted that vessel traffic for medium and small boats increased in 2007–2008 (compared to 2000–2001) as a result of the creation of a transit permit to accommodate boaters in the Lower Bay, and the increase in occurrence of small vessel noise underwater is likely due in part to the use of the transit permit. While the study did not assess effects on the airborne acoustic environment, the results suggest that the transit permit also contributed to airborne vessel noise in the Lower Bay and potentially decreased NFI. Establishing a conditional transit permit is expected to adversely affect the airborne acoustic environment

by decreasing NFI in the Lower Bay; effects on the airborne acoustic environment could be monitored using the permanent acoustical measurement system near Bartlett Cove and with seasonal deployment of acoustical monitors in other locations to determine whether future conditions warrant corrective action.

As tidewater glaciers in the park continue to recede due to climate change, impacts would be similar to those described under "Current and Expected Future Conditions of the Environment" because additional crowding and noise could occur around remaining tidewater glaciers.

Alternative B Actions

Under alternative B, up to 30 private vessel permits per day would be available, representing an increase of 5 permits from current conditions. A 20% increase in private vessel permits from 25 to 30 would increase the percentage of time that vessel noise is audible on shorelines, wilderness areas, and on park waters.

The increase in private vessels would affect NFI duration differently depending on the geographic area of the park. The change in NFI duration has been estimated based on the total number of permitted vessels in Glacier Bay increasing from around 36 to 41 (~14% increase).[7] Table 3-2 shows the predicted future NFI duration at the five acoustical monitoring sites. Relative to the 2011 baseline, the results show that future NFI duration is predicted to remain the same or nearly the same in the Upper West Arm (Rendu Inlet – no change), the Lower East Arm (Point McLeod – 0.2 hour decrease), the Lower West Arm (Blue Mouse Cove – 0.1 hour decrease), and the Lower Bay (Hutchins Bay – 0.1 hour decrease), and decrease by approximately 51% in the Upper East Arm (Upper Muir Inlet – 1.1 hour decrease).[8]

The change in NFI duration is predicted to be the most pronounced relative to the baseline in the Upper East Arm (Upper Muir Inlet) because the baseline NFI duration is longer at this site. A higher baseline NFI duration represents a more natural acoustic environment with less human-generated noise. In these environments, NFI duration is more sensitive to increases in noise events. Conversely, because vessels are more common in the Lower Bay and Upper West Arm, the baseline NFI duration is shorter, and the effect of an increase in private vessel permits on NFI duration is also lower.

Changes in overnight and day use permits under alternative B could redistribute private vessels within the park, with more vessels likely visiting mid-Glacier Bay and the West Arm to view glaciers, and fewer vessels departing from Bartlett Cove for day trips in the Lower Bay. This could result in less vessel noise in the Lower Bay and more vessel noise in mid-Glacier Bay and the West Arm. As a result, NFI duration may increase in the Lower Bay and decrease in mid-Glacier Bay and the West Arm.

[7] Total number of permitted vessels in the park per day under current conditions is estimated at 2 cruise ships, 3 tour vessels, 6 charter vessels, and 25 private vessels. The total number of future vessels in the park under alternative B accounts for an increase of 5 private vessels per day. The number of administrative use vessels in the park under current conditions is accounted for in the 2011 baseline noise event rate shown in table 3-2, and this vessel use is not expected to increase above current conditions in the future.

[8] Because the baseline data likely overestimate NFI duration for areas in the Upper East Arm outside the nonmotorized water boundary of Muir Inlet, the predicted future change in NFI in the Upper East Arm as a result of additional private vessels under alternative B is also likely overestimated.

TABLE 3-2. PREDICTED FUTURE MEDIAN NOISE FREE INTERVAL FOR ACOUSTIC INVENTORY SITES IN GLACIER BAY DUE TO INCREASE IN PRIVATE VESSEL PERMITS UNDER ALTERNATIVE B

Acoustic Monitoring Site	2011 Baseline		Predicted Future	
	Noise Event Rate (Events/Day)	Median NFI (Hours)	Noise Event Rate (Events/Day)	Median NFI (Hours)
Lower Bay (Hutchins Bay)	16.1	0.5	18.4	0.4
Lower East Arm (Point McLeod)	7.9	0.7	9.0	0.5
Lower West Arm (Blue Mouse Cove)	12.4	0.6	14.1	0.5
Upper East Arm (Upper Muir Inlet)	2.5	2.1	2.9	1.0
Upper West Arm (Rendu Inlet)	16.0	0.7	18.3	0.7

Lower-impact vessels travel at a slower speed, which results in vessel noise being audible for a longer period of time and a decrease in NFI. However, lower-impact vessels also generate lower sound levels and have a smaller audible footprint. While lower-impact vessels would be prioritized in the advance-notice permit system under alternative B, any impacts on the airborne noise environment throughout Glacier Bay would be minimal because the priority system would be for a limited number of permits (seven), and lower-impact vessels would be second on the priority list.

If the "Number of Vessels at Anchorage at One Time" threshold indicates that there are too many vessels anchored in one place, the number of overnight permits in subsequent years would be reduced by 1 permit per year but would not be reduced below 20 permits. This reduction in available permits may alleviate crowding at certain anchorages and reduce any localized adverse impact to the airborne acoustic environment that might otherwise occur from overcrowding at anchorages. Even at the reduced 20 overnight permits, and 5 day use permits, the vessel noise would be comparable to current conditions (25 permits).

Under alternative B, private vessels longer than 79 feet would not be allowed to access Glacier Bay using a private vessel permit; however, unused cruise ship or tour vessel use days could be reallocated to private vessels longer than 79 feet. Because unused cruise ship or tour vessel use days that would be available for use by private vessels longer than 79 feet are expected to be rare, reducing the number of private vessels longer than 79 feet within the park is expected to result in a minimal increase in NFI duration throughout Glacier Bay.

Under alternative B, Muir Inlet would be designated as nonmotorized waters from May 1 through September 15. Motorized vessels would be allowed in Wachusett Inlet year-round. The changes to seasonal nonmotorized water designations would affect NFI duration in the East Arm. Removing the seasonal nonmotorized water designation from Wachusett Inlet could result in a notable decrease in NFI duration from mid-July through August in this area. This change would indirectly allow for fewer opportunities for solitude in wilderness areas near Wachusett Inlet. Extending seasonal nonmotorized water dates at Muir Inlet would notably increase NFI duration in May and from mid-July through mid-

September in Muir Inlet, which would indirectly allow for greater opportunities for solitude in nearby wilderness areas.

Also in the East Arm, cruise ships and tour vessels would be prohibited from waters north of Muir Point to allow for a small vessel experience for private, charter, and nonmotorized vessels. This restriction on larger vessels could slightly decrease airborne noise and slightly increase NFI duration in the East Arm north of Muir Point.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Condition of the Environment" section. As discussed there, past and ongoing actions such as the presence of cruise, tour, charter, private, administrative, and other vessels within Glacier Bay, as well as NPS and commercial aircraft flights for a variety of purposes affect the airborne acoustic environment. As described above, the programmatic and site-specific vessel management actions proposed in alternative B could adversely affect the airborne acoustic environment in the Lower Bay (mainly due to the conditional transit permit), mid-Glacier Bay and West Arm (mainly due to redistribution of vessels to these areas), and Upper East Arm (mainly due to an increase in private vessel permits). The actions are not expected to result in a notable change in the airborne acoustic environment in the Lower East Arm with the exception of Wachusett Inlet in July and August, where a reduction of nonmotorized water dates would lead to an increase in vessel noise. Additionally, the use of helicopters and other machinery to install and service potential VHF radio and AIS transponder sites would affect the airborne acoustic environment, as discussed above.

Even in the geographic areas where an overall adverse impact is expected, there could also be periods where localized beneficial impacts to the airborne acoustic environment (increased NFI) may occur due to expansion of nonmotorized water designations (e.g., Muir Inlet May 1–September 15).

These actions in addition to the existing and ongoing planned actions would continue to adversely affect the airborne acoustic environment when compared to the natural airborne acoustic environment. Compared to current conditions, the overall cumulative impact on the airborne acoustic environment would be adverse in most areas of Glacier Bay.

3.4.2.3 Alternative C

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all would be the same as those described under alternative B.

Alternative C Actions

Like alternative B, changes in overnight and day use permits under alternative C could redistribute vessels within the park, with more vessels likely going to mid-Glacier Bay and the West Arm to view glaciers, and fewer vessels departing from Bartlett Cove for day trips in the Lower Bay. This could result in less vessel noise in the Lower Bay and more vessel noise in mid-Glacier Bay and the West Arm. Thus, NFI duration may increase in the Lower Bay and decrease in mid-Glacier Bay and the West Arm due to this change.

Similar to alternative B, prioritizing lower-impact vessels in an advance-notice permit system under alternative C would decrease NFI duration throughout Glacier Bay due to the slower vessel speeds that allow the vessel noise to be audible for a longer period of time, but the impact would be minimal due to the smaller acoustic footprint and because the priority system would be for a limited number of permits (five).

Alternative C would not allow private vessels longer than 79 feet to enter Glacier Bay. There may be a minimal increase in NFI duration throughout the park if the smaller vessels that replace private vessels longer than 79 feet travel faster, resulting in longer intervals between noise events. The magnitude of this change is not expected to be substantial because the percentage of total vessels longer than 79 feet currently accessing the park is relatively low. For example, in 2021, 3% (22) of the private vessels that entered Glacier Bay were longer than 79 feet, while 97% (768) were ≤79 feet.

Under alternative C, changes in nonmotorized waters in Muir Inlet would notably increase NFI duration during the month of May in Muir Inlet. Extending the end of the nonmotorized water date in Wachusett Inlet from August 31 to September 15 might decrease airborne noise and increase NFI duration during that two-week timeframe. Because Wachusett Inlet experiences very little vessel traffic, this would not represent a large change compared to current conditions. These changes would indirectly allow for greater opportunities for solitude during some time periods in the East Arm.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed, past and ongoing actions such as the presence of cruise, tour, charter, private, administrative, and other vessels within Glacier Bay, as well as NPS and commercial aircraft flights for a variety of purposes affect the airborne acoustic environment. As described above, the programmatic and site-specific vessel management actions proposed in alternative C could adversely affect the airborne acoustic environment in the Lower Bay (due to the conditional transit permit) along with mid-Glacier Bay and the West Arm (due to redistribution of vessels to these areas). Beneficial impacts to the airborne acoustic environment may occur in some areas of the East Arm by expanding nonmotorized water dates during the permit season in Wachusett Inlet and Muir Inlet. Additionally, the use of helicopters and other machinery to install and service potential VHF radio and AIS transponder sites would affect the airborne acoustic environment, as discussed above.

These actions in addition to the existing and ongoing planned actions would remain adverse when compared to the natural airborne acoustic environment. Compared to current conditions, these actions in addition to the existing and ongoing planned actions would be both beneficial and adverse, depending on the geographic area of the park.

3.4.2.4 Alternative D

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described for alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all would be the same as those described for alternative B.

Alternative D Actions

Alternative D would not distinguish overnight or day use permits for private vessels. The distribution of vessels and associated impacts would remain similar to current conditions. Impacts associated with allowing private vessels longer than 79 feet to enter Glacier Bay on an unused cruise ship or tour vessel permit would be the same as under alternative B. Impacts associated with changes to nonmotorized waters in Muir and Wachusett Inlets would be the same as under alternative C.

Unlike alternatives B and C, prioritizing lower-impact vessels in the vessel permit allocation system would not occur under alternative D. The park may exclude lower-impact vessels from some specific operating requirements, such as distance to shore requirements, which could encourage private vessel owners to use lower-impact vessels and result in the same types of impacts as described under alternatives B and C.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed, past and ongoing actions such as the presence of cruise, tour, charter, private, administrative, and other vessels within the Glacier Bay, as well as NPS and commercial aircraft flights for a variety of purposes affect airborne acoustic environment. As described above, the programmatic and site-specific vessel management actions proposed in alternative D are not expected to result in a notable change in the airborne acoustic environment in the Lower Bay compared to current conditions. In general, the actions are expected to result in a beneficial impact to the airborne acoustic environment in the East Arm compared to the current condition by limiting the number of larger vessels in the area to promote a small vessel experience and by expanding nonmotorized water dates during the permit season in Wachusett and Muir Inlets. Additionally, the use of helicopters and other machinery to install and service potential VHF radio and AIS transponder sites would impact the airborne acoustic environment, as discussed above.

These actions in addition to the existing and ongoing planned actions would remain adverse when compared to the natural airborne acoustic environment. Compared to current conditions, the overall cumulative impact on the airborne acoustic environment would be beneficial or generally remain the same as current conditions, depending on the geographic area of the park.

3.4.2.5 Comparative Conclusion of Alternatives

Under alternative A, noise from cruise, charter, tour, and private vessels at the current permit quotas, as well as noise from administrative use vessels and NPS and commercial aircraft flights would continue to adversely affect the airborne acoustic environment. Trends such as increased visitation during May and September, tidewater glaciers in the park potentially continuing to recede due to climate change, and potential overcrowding at anchorages could result in additional localized and seasonal adverse impacts to the airborne acoustic environment.

Alternative B would permit five additional private vessels to access Glacier Bay. This change would further increase the percentage of time that vessel noise is audible on shorelines, wilderness areas, and on park waters compared to alternative A. The increase in private vessels would affect NFI duration to various degrees depending on the geographic area of the park. The adverse impact to NFI is expected to be greatest in the Upper East Arm because the area currently has a more natural acoustic environment with less human-generated noise present; however, the potentially adverse effect would be mitigated within Muir Inlet through most of the quota season by Muir Inlet being designated as nonmotorized from May 1 to September 15. Opening Wachusett Inlet to motorized vessels year-round would notably

decrease NFI in this area and cause greater impacts compared to alternative A. Because vessels are more common in the Lower Bay and Upper West Arm, the effect of an increase in private vessel permits under alternative B on NFI duration is relatively small. Prioritizing lower-impact vessels in the vessel permit allocation system would decrease the NFI in Glacier Bay compared to alternative A, but the impact would be minimal due to the limited number of permits prioritized for lower-impact vessels and the fact that they are second on the priority list. Vessels operating under the conditional transit permit could also contribute additional noise and decrease NFI in the Lower Bay compared to alternative A. While it is difficult to predict the specific effects of most of the proposed changes on vessel routes and behavior within the park, changes in overnight and day use permits under alternative B could redistribute vessels within the park with more vessels likely going to mid-Glacier Bay and the West Arm to view glaciers and fewer vessels departing from Bartlett Cove for day trips in the Lower Bay. This could result in less vessel noise in the Lower Bay and more vessel noise in mid-Glacier Bay and the West Arm. Compared to alternative A, alternative B would result in fewer private vessels longer than 79 feet in Glacier Bay and fewer large vessels in waters north of Muir Point in the East Arm. These actions would likely result in beneficial impacts to the airborne acoustic environment in Glacier Bay.

Alternative C would not increase the number of private vessel permits, so overall it would result in less vessel noise throughout Glacier Bay compared to alternative B. Compared to alternative A, alternative C would result in additional vessel noise in the Lower Bay due to the conditional transit permit, and like alternative B, it would decrease NFI by prioritizing lower-impact vessels. Under alternative C, Muir Inlet would be designated as nonmotorized waters from May 1 through July 15, and Wachusett Inlet would be designated as nonmotorized waters from July 16 through September 15. Within Muir Inlet, this change would notably benefit the airborne acoustic environment during May compared to alternative A, but it would not provide as large a beneficial impact as alternative B in this area. In Wachusett Inlet, the airborne acoustic environment would see benefits during the first half of September compared to alternative A and see notable benefits during the entire two months it is nonmotorized compared to alternative B. Similar to alternative B, changes in overnight and day use permits under alternative C could redistribute vessels within the park and likely result in less vessel noise in the Lower Bay and more vessel noise in mid-Glacier Bay and the West Arm compared to alternative A. Alternative C would restrict private vessels longer than 79 feet from entering the park, resulting in some beneficial impacts to the airborne acoustic environment. Alternative C would not restrict larger vessels from traveling in the area north of Muir Point in the East Arm; thus, alternative C would not provide the minor benefits to the airborne acoustic environment that are expected from these actions under alternative B.

Alternative D would not increase the number of private vessel permits, so overall it would result in less vessel noise throughout Glacier Bay compared to alternative B. Compared to alternative A, alternative D would result in additional vessel noise in the Lower Bay due to the conditional transit permit. Alternative D would result in fewer private vessels longer than 79 feet in Glacier Bay and restrict larger vessels from waters north of Muir Point in the East Arm. Similar to alternative B, these actions would likely result in some beneficial impacts to the airborne acoustic environment in Glacier Bay compared to alternatives A and C. Alternative D would result in the same impacts to the airborne acoustic environment in Muir and Wachusett Inlets as alternative C. There would be no distinction between day and overnight private vessel permits under alternative D, so the potential redistribution of vessels from the Lower Bay to mid-Glacier Bay and the Upper West Arm expected under alternatives B and C would not occur. Overall, the airborne acoustic environment under alternative D would be similar to or slightly worse than alternative A throughout most of the park with some additional benefits due to restrictions on larger vessels and changes to the timeframes that Muir Inlet and Wachusett Inlet are designated as nonmotorized waters.

3.5 UNDERWATER ACOUSTIC ENVIRONMENT

3.5.1 Current and Expected Future Conditions of the Environment

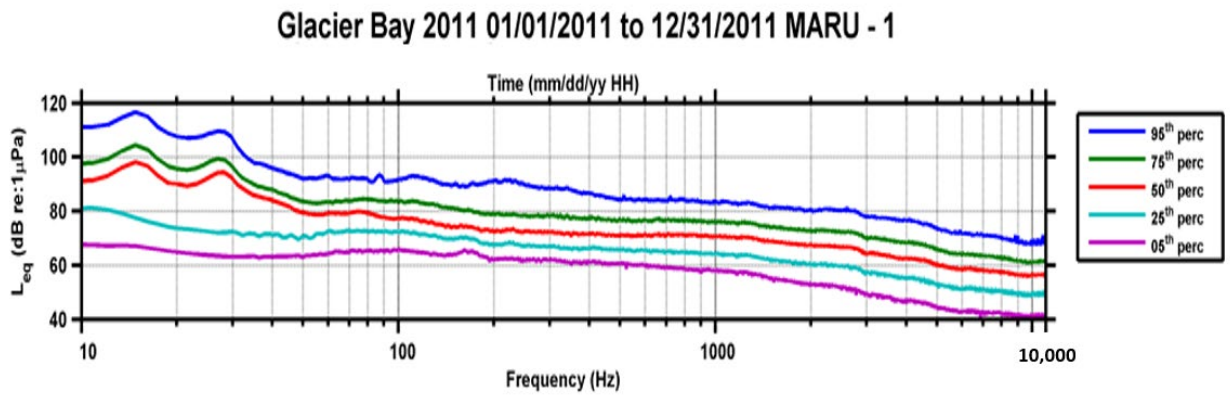
The underwater acoustic environment is a critical resource that affects the behavior of marine animals and is classified as a "Vital Sign"[9] for the park (Moynahan et al. 2008). Most of the acoustic studies at the park have focused on the underwater acoustic environment. Because a majority of visitation occurs by motorized vessels that produce underwater noise, preserving the underwater acoustic environment as natural and undisturbed as possible is an objective for the park.

The underwater acoustic environment varies greatly seasonally and day-to-day. Similar to the airborne acoustic environment, natural and anthropogenic sources contribute to the underwater acoustic environment. Biological sources (e.g., humpback whales, harbor seals, killer whales, fish, and invertebrates) contribute to the natural underwater acoustics of the park (Nadeau et al. 2017). Like most marine environments, wind and rain are the primary underwater sound sources in the park. The next most common source of underwater sound is marine vessel traffic (Kipple and Gabriele 2007; McKenna et al. 2017). Vessels produce underwater noise that decreases the distance over which marine animals can communicate and detect predators and prey. Humpback whales, harbor seals, and other marine mammals produce sounds for vital life functions essential to survival and reproduction. Fish and invertebrates also depend on the natural soundscape at vital life history phases (Stanley et al. 2010; Vermeij et al. 2010).

The reference condition for the underwater acoustic environment is the natural ambient sound level, which is the environment of sound that exists in the absence of human-caused noise (NPS 2006). The natural ambient sound environment is thought to have had long quiet periods throughout the day and night, which is the natural condition for marine wildlife on an evolutionary time scale.

Figure 3-8 displays underwater ambient noise based on a one-year study in Glacier Bay in 2011 and the 5th, 25th, 50th, 75th, and 95th percentile frequency distribution statistics for sound level as a function of frequency (Hertz [Hz]) averaged over the entire year (NPS unpublished data). The percentile curves illustrate how often underwater ambient sound levels are above certain decibel values at different frequencies. For example, the 75th percentile (green curve) shows the sound level exceeded 25% of the time at 200 Hz is 80 dB. The peaks in the 75th and 95th percentile curves in the frequency range of 10–40 Hz are likely due to occasional periods with natural noise from wind and rain and biological noises such as whale whups, grunts, squeaks, and songs (as discussed below in the "Underwater Ambient Sound Level at Frequencies of Interest" section). The 5th percentile represents the quietest conditions in Glacier Bay throughout the study and may serve as a reference for historic ambient noise conditions, or natural ambient sound level (Nadeau et al. 2017).

[9] "Vital signs" are a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values.



Source: NPS unpublished data

FIGURE 3-8. UNDERWATER AMBIENT NOISE SPECTRA AND NATURAL AMBIENT SOUND LEVEL

Marine vessel traffic is essential for visitors and park administration to access Glacier Bay, but it degrades the underwater acoustic environment for marine species. A variety of motorized vessels (e.g., cruise ships, tour vessels, charter vessels, private vessels, administrative use vessels, and a passenger ferry) travel through Glacier Bay and affect the underwater acoustic environment. This use is most intense in June, July, and August; however, increases in visitation are resulting in more vessel traffic in April, May, September, and October.

To meet its legal obligations and protect marine resources from adverse effects, the NPS actively manages motorized vessel traffic, primarily during the busiest months of the year (May–September). Based on frequent monitoring of humpback whale densities within Glacier Bay, the park implements dynamic mandatory speed reductions (maximum of 20 knots to 13 knots, depending on conditions and location) in discrete areas to protect whale aggregations. For the great majority of vessels, reducing speed is the most effective way to reduce the amount of sound output (Kipple 2002; Frankel and Gabriele 2017). Cruise ships traveling at 13 knots produced cumulative underwater sound exposure levels three times lower than those traveling at 20 knots. Even in cases where a vessel is only a few decibels quieter at a slower speed, cumulative sound exposure levels are lower despite the fact that the vessel's transit takes longer (Frankel and Gabriele 2017).

Underwater Acoustical Studies 2000–2020[10]

The presence of marine vessels has introduced noise sources that have altered the natural ambient sound level for the underwater acoustic environment. To characterize and measure changes in the underwater acoustic environment in the park, a number of studies have been completed in Glacier Bay between 2002 and 2020. The results of these studies are described further in the sections below.

In these studies, several measures were used to assess the effect of sound sources on the park's underwater acoustic environment, including:

- Underwater natural ambient sound level (dB re: 1 µPa) at frequencies of interest

[10] Sound levels are measured in decibels, which is a logarithmic quantity. For underwater sound levels, all decibel values are expressed relative to a reference quantity of 1 micro-Pascal (dB re: 1 µPa).

- Proportion of hourly samples without vessel noise
- Duration of NFI
- Masking index of communication space for vocal species

Underwater Ambient Sound Level at Frequencies of Interest

A study conducted in 2003 used 10-31.5 kilohertz (kHz) as the frequency range of interest (Kipple and Gabriele 2003). Natural sounds included wind, rain, and biological noises such as humpback whale whups, grunts, squeaks, and songs. The most prevalent natural ambient sound was wind-generated noise that ranged from 67 to 102 dB re: 1 microPascal, with an average sound level of 84 dB (Kipple and Gabriele 2003). Decibels are measured on a logarithmic scale, so small increments indicate large differences in sound levels. For example, a 6 dB reduction indicates a 50% decrease in sound intensity. On average, rain sound levels generated louder and higher frequency (16 kHz) noise than wind (1 kHz); rainfall noise ranged from 91 to 110 dB. The most prevalent source of biological ambient sound were harbor seals; their calling peaked in July and made up more than 85% of the acoustic sampling. Humpback whale calls, the next most common, made up about 10% of the acoustic samples across all years and peaked during September at 12%. Killer whale sounds were also documented, although they were detected infrequently (Kipple and Gabriele 2003).

An updated analysis of underwater sound monitoring data from 2000 to 2003 and from 2007 to 2008 also used 10-31.5 kHz as the frequency range of interest (McKenna et al. 2017). Wind noise was the dominant natural ambient sound heard 28%–38% of the time from May through September. Mean sound pressure levels during wind-dominated periods averaged 83.5 dB and ranged from 70 to 100 dB. Rain also contributed to the natural ambient sound and was present in 8%–14% of the acoustic samples. Rain noise had a slightly higher frequency than wind, with a mean sound pressure level at 88.8 dB and a range between 70 and 100 dB. During the visitor season, harbor seals dominated the acoustic environment, particularly in July. The occasional sound of humpback whales could be heard in roughly 10% of the samples, with sound ranging from 80 to 85 dB.

Proportion of Hourly Samples without Vessel Noise

The proportion of hourly samples without vessel noise is an important measure because it relates to how vessel noise affects the amount of quiet time that marine wildlife experience to communicate in a more natural underwater sound environment. Data were collected in 2000–2002 (Kipple and Gabriele 2003), 2007–2008 (Gabriele et al. 2010), 2011 (NPS unpublished), 2016–2018 (NPS unpublished), and 2020 (NPS unpublished) documenting the proportion of samples without underwater vessel noise by season in Glacier Bay as shown in table 3-3.

The winter season, which was only measured in 2002, had the highest percent of ambient noise samples without vessel noise (approximately 89%). The percent of samples without vessel noise ranged from 49% to 75% in spring, and from 57% to 74% in fall. During all years of measurements, the highest amount of vessel noise occurred in the summer (corresponding to the visitor season)—which was reflected in 34% to 68% of samples without vessel noise. Between 2002 and 2018 (excluding the 2020 data that exhibit decreased tourism due to COVID-19), the proportion of samples without vessel noise fluctuated between 49% and 66% in spring, 34% and 44% in summer, and 57% and 67% in fall. While no underwater acoustic monitoring has been conducted in Dundas Bay, vessel noise is expected to be a regular element of the underwater acoustic environment in that area (NPS 2003b) and in the remainder of the Icy Strait/Cross Sound Zone as well. The existing underwater acoustic environment along the Outer Coast Zone is expected to include primarily natural sources along with some noise from passing vessels.

TABLE 3-3. PROPORTION OF UNDERWATER SOUND SAMPLES WITHOUT MARINE VESSEL NOISE BY SEASON IN GLACIER BAY

Year(s)	Winter (October–April)	Spring (May)	Summer (June–August)	Fall (September)
2000-2002[a]	89%	58%	41%	63%
2007-2008[b]	N/A	49%	34%	57%
2011[c]	N/A	66%	44%	65%
2016-2018[c]	N/A	56%	41%	67%
2020[c]	N/A	75%	68%	74%

[a] Kipple and Gabriele 2003
[b] McKenna et al. 2017
[c] Park unpublished data

McKenna et al. (2017) compared the presence of vessels by vessel size and time of day in 2000–2001 and 2007–2008 using underwater acoustic data collected in the Lower Bay. On average, small vessel (<15 meters [<50 feet] long) underwater noise increased from being present in less than 20% of samples (2000–2001) to approximately 30% of the samples (2007–2008). Medium-sized vessel (generally 15–30 meters [50–100 feet] long) noise was present in the highest proportion of acoustic samples at 40%–50% during daytime hours in 2000–2001, while 2007–2008 showed a decrease in medium-sized vessel noise to approximately 30%–40% during most daytime hours (McKenna et al. 2017).

Higher proportions (87%–90%) of hourly samples containing vessel noise occurred between 5:00 a.m. and 9:00 p.m. for both the 2000–2001 and 2007–2008 study periods. Hourly vessel noise seems to have increased between 8:00 a.m. and 2:00 p.m., and between 4:00 p.m. and 7:00 p.m. since 2002 (Nadeau et al. 2017). Communication space simulations and analysis of monitoring data both suggest that synchronizing the timing of large vessels entering and departing Glacier Bay results in less time with large vessel noise present in the Lower Bay (Nadeau et al. 2017; Gabriele et al. 2018).

Analysis of underwater sound monitoring data from 2016, 2018, and 2020 revealed reduced underwater noise due to the COVID-19 lockdown, which greatly decreased tourism in 2020 (Gabriele et al. 2021). Comparing 2020 underwater noise to 2016 and 2018, the complete absence of cruise ships was evident in the 6–9 dB reduction of the loudest (95th percentile) underwater sound levels during morning and afternoon peak times. The study also found a 3 dB decrease in median sound level in the 125 Hz one-third octave band, which reflects that all types of vessels had a role in the quieter underwater sound environment in 2020.

Duration of Noise Free Intervals

A study in progress (Haver et al., in press) will provide the first assessment of the duration of underwater NFI in Glacier Bay. The study is using continuous underwater sound recordings from the Bartlett Cove hydrophone, measuring the duration of each period without vessel noise, and summarizing the occurrence of intervals of different lengths. Determining the duration of noise free intervals is important for assessing the amount of time that the underwater acoustic environment is unaffected by anthropogenic noise and has implications for whale communication (Haver et al. in press). Preliminary indications are that NFI are longer at night and in May and September, with the shortest NFI occurring in the daytime hours of June through August. The increase in the proportion of hourly samples with vessel noise between 2000 and

2001 and between 2007 and 2008 (McKenna et al. 2017) may mean that the duration of NFI has decreased from 2000 to 2008.

Masking Index of Communication Space for Vocal Species

The communication masking index uses computer simulations to estimate the degree to which vessel noise decreases the distance that vocal marine species can communicate. Vessel traffic emits substantial noise at frequencies (71–224 Hz) that interfere with humpback whale and harbor seal communication because it occurs within the frequency bands in which humpback whales and harbor seals vocalize (40–708 Hz). Gabriele et al. (2018) found that vessel noise under typical conditions in summer in Glacier Bay greatly decreased the area over which both whales and seals can communicate, as summarized in table 3-4. Humpback whale song was less affected by communication masking because these are loud, long, and repetitive vocalizations.

TABLE 3-4. REDUCTION OF COMMUNICATION SPACE FOR MARINE SPECIES IN THE PRESENCE OF VESSEL NOISE IN GLACIER BAY

Marine Species Vocalization	Frequency Range	Reduction of Communication Space
Humpback whale whup	50–700 Hz	80%–99%
Humpback whale song	224–708 Hz	30%–60%
Harbor seal roar	40–500 Hz	60%–80%

Source: Gabriele et al. 2018

The results shown in table 3-4 clearly indicate that aggregate vessel noise within the park is affecting the underwater acoustic environment through a reduction in communication space for both species studied (Gabriele et al. 2018). The losses in communication space were highest on days of high vessel traffic, and all three vocalizations had the largest reduction in communication space during summer daytime when vessel traffic was highest (Gabriele et al. 2018).

Ongoing Data Collection

Underwater acoustic data have been collected in the Lower Bay from May 2000 to present day, with occasional outages. Limited data on underwater sounds are available prior to 2000 (Malme and Miles 1983). Vessel noise affecting the underwater acoustic environment in the Lower Bay may come from vessels inside and outside the park; however, Glacier Bay is a narrow-mouthed fjord system that is relatively acoustically isolated from noise sources originating outside the park boundary. In 2019–2022, underwater sound recordings were collected east of Drake Island in mid-Glacier Bay (NPS unpublished data), but no underwater sound data exist for the majority of park waters. Ongoing underwater sound monitoring is essential for assessing future conditions and trends on how vessel noise affects the underwater soundscape in the park. Establishing baselines for the proportion of hourly samples that contain vessel noise and the duration of NFI at one or more locations in the park will aid park managers in understanding the patterns of human-made noise that are biologically relevant to many marine species of interest.

3.5.1.1 Additional Trends and Planned Actions

Trends toward increased visitation during May and September and better utilization of the passenger ferry quota could result in a decrease in NFI and an increase in the percentage of hourly samples that contain

underwater vessel noise during those periods due to increased vessel traffic. Additionally, if tidewater glaciers in the park continue to recede due to climate change, this could concentrate visitors near remaining tidewater glaciers and negatively affect the localized underwater acoustic environments.

While not currently an issue, with trends toward increased visitation during the shoulder seasons of May and September, an increase in the number of vessels at anchorages could occur in the future during those months. This increase in vessels could slightly increase localized adverse impacts on the underwater acoustic environment at these locations.

Key aspects of the BWMP (in preparation) that could affect the underwater acoustic environment are associated with the Glacier Access Zone, where the park is expected to identify and manage two or three locations proximal to glaciers as focused use areas, consider time limits for tour vessels using focused use areas, and consider actions to encourage dispersal of tour vessels throughout Glacier Bay. Establishing focused use areas proximal to glaciers would decrease NFI duration and increase the percentage of hourly samples that include underwater vessel noise in the vicinity of the focused use areas; however, concentrating vessel traffic may reduce traffic and vessel-generated noise elsewhere in Glacier Bay, producing longer NFI. The magnitude of these changes would be reduced to some degree by establishing time limits for tour vessels in focused use areas.

Encouraging dispersal of tour vessels throughout the park would have varying effects on NFI duration and underwater vessel noise in different geographic areas of the park depending on where the tour vessels go, which is not possible to anticipate. In areas where tour vessels are currently common, such as the Upper West Arm, fewer tour vessels may minimally increase NFI duration and decrease underwater vessel noise. In areas where tour vessels are currently less common, such as the Upper East Arm, even a relatively small increase in tour vessels could decrease NFI duration and increase underwater vessel noise.

3.5.2 Environmental Consequences

3.5.2.1 Alternative A: No Action

Under alternative A, current management of private vessels, administrative use vessels, and vessel distribution within the park would continue. As a result, impacts to the underwater acoustic environment from alternative A would be the same as described above, in the “Current and Expected Future Conditions of the Environment” section.

Cumulative Impacts

Under alternative A, there would be no new direct impacts to the underwater acoustic environment; therefore, the environment would remain the same as or similar to the “Current and Expected Future Conditions of the Environment” section above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the “Current and Expected Future Conditions of the Environment” section.

3.5.2.2 Alternative B: Proposed Action

Impacts of Programmatic Actions Common to Alternatives B, C, and D

Programmatic actions associated with floating cabins/seasonally moored vessels, communication upgrades, and oceanographic monitoring stations could result in additional boat and/or float plane movements within the park, which would generate additional underwater noise. Given the intermittent and spatially localized nature of the proposed programmatic actions, the actions are not expected to

measurably impact the underwater acoustic environment throughout most of the park. Additional site-specific analysis would be conducted prior to implementation.

Formally defining nonmotorized vessels and management triggers for them would not affect the underwater acoustic environment because nonmotorized vessels do not typically generate underwater noise levels high enough to affect the surrounding environment. Establishing a threshold for administrative use vessels would not affect the underwater acoustic environment because the action is not expected to increase the total number of administrative use vessels accessing the park.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The number of vessels at anchorages and vessels per viewscape at key locations would be monitored and potentially become more evenly distributed if the trigger for "Number of Vessels at Anchorage at One Time" or "Number of Vessels Per Viewscape at Key Locations" is met. This would reduce any localized adverse impact to the underwater acoustic environment that might otherwise occur from an increased number of vessels at anchorages or key viewscapes, although the impacts would likely be minimal given the small number of vessels involved, and once anchored vessels are quieter.

Establishing a conditional transit permit for entry and exit to Bartlett Cove could increase the number of boats in the Lower Bay as they transit to or from Icy Strait, compared to current conditions. Only one conditional transit permit would be allowed at any one time, and the total number of vessels would not exceed the daily private vessel quota (25 or 30 depending on the alternative). McKenna et al. (2017) noted that vessel traffic for medium and small boats increased in 2007–2008 (compared to 2000–2001) due to the creation of a transit permit to accommodate boaters in the Lower Bay; the increase in occurrence of small vessel noise underwater is likely due in part to the use of the transit permit. While the study did not assess the change in NFI, the results suggest that the transit permit may have decreased NFI. Establishing a conditional transit permit is expected to adversely affect the underwater acoustic environment by increasing underwater vessel noise and decreasing NFI in the Lower Bay; however, the effects on the underwater acoustic environment could be monitored using the permanent hydrophone measurement system in Bartlett Cove and with seasonal deployment of hydrophones in other locations to determine whether future conditions warrant corrective action.

As tidewater glaciers in the park continue to recede due to climate change, impacts on the underwater acoustic environment would be similar to current and future conditions as additional vessels producing underwater noise could congregate around remaining tidewater glaciers.

Alternative B Actions

The change in vessel noise due to an increase in private vessel permits within the park under alternative B has been estimated and compared to the baseline data from underwater noise monitoring. For comparison of future conditions, the relevant baseline is the presence of vessel noise in 59% of underwater sound samples during the summer season (June–August) based on 2016–2018 monitoring at the Bartlett Cove hydrophone (table 3-3; 41% of samples contained no vessel noise; therefore, 59% of samples contained vessel noise). The future condition estimate for alternative B assumes a 14% increase in vessel noise

resulting from a 14% increase in the total number of vessels in Glacier Bay from 36 to 41[11]. As a result, the proportion of time that underwater vessel noise is present is expected to increase throughout Glacier Bay such that vessel noise would be present in 73% of underwater sound samples during the summer season under alternative B compared to current conditions of 59%. NFI duration would likely decrease due to these changes as well.

Designating overnight and day use permits under alternative B would likely redistribute vessels within the park, with more vessels likely going to mid-Glacier Bay and the West Arm to view glaciers and fewer vessels departing from Bartlett Cove for day trips in the Lower Bay. This would result in less underwater vessel noise in the Lower Bay and more underwater vessel noise in mid-Glacier Bay and the West Arm. NFI duration would likely increase in the Lower Bay and decrease in mid-Glacier Bay and the West Arm.

Lower-impact vessels travel at slower speeds, which results in vessel noise being present in a larger proportion of underwater sound samples and a decrease in NFI. However, lower-impact vessels also generate lower underwater sound levels and have a smaller acoustic footprint. While lower-impact vessels would be prioritized in the advance-notice permit system, any impacts on the underwater sound environment of Glacier Bay would be minimal because the priority system is for a limited number of overnight permits (seven permits per day), and lower-impact vessels would be second on the priority list to those who have not visited Glacier Bay in the past calendar year.

If the "Number of Vessels at Anchorage at One Time" threshold indicates that there are too many vessels anchored in one place, the number of overnight permits in subsequent years would be reduced by 1 permit per year but would not be reduced below 20 permits. This reduction in available permits may mitigate any impacts resulting from the addition of five permits under this alternative.

Under alternative B, private vessels longer than 79 feet would not be able to obtain a private vessel permit but may enter Glacier Bay on an unused cruise ship or tour vessel permit. However, unused cruise ship and tour vessel permits are expected to be rare and would first be offered to other tour vessels and charter vessels. This management action is expected to result in smaller private vessels occupying permits that previously would have been occupied by private vessels longer than 79 feet, which would reduce vessel noise overall in Glacier Bay because smaller private vessels are generally quieter. There may be a minimal increase in NFI duration if these smaller vessels travel faster, which could result in longer intervals between noise events throughout Glacier Bay; however, the magnitude of this change is not expected to be substantial or easily discernible because the percentage of total vessels longer than 79 feet currently accessing the park is relatively low. For example, in 2021, 22 private vessels longer than 79 feet entered Glacier Bay compared to the 768 private vessels ≤79 feet that entered this area.

Under alternative B, Muir Inlet would be designated as nonmotorized waters from May 1 through September 15. Motorized vessels would be allowed in Wachusett Inlet year-round. The changes to seasonal nonmotorized water designations would affect underwater vessel noise and NFI duration in the East Arm. Removing the seasonal nonmotorized water designation from Wachusett Inlet could result in a

[11] Total number of permitted vessels in the park per day under current conditions is estimated at 2 cruise ships, 3 tour vessels, 6 charter vessels, and 25 private vessels. The total number of future vessels in the park under alternative B accounts for an increase of 5 private vessels per day. The number of administrative use vessels in the park under current conditions is accounted for in the 2011 baseline noise event rate shown in table 3-3, and this vessel use is not expected to increase above current conditions in the future.

notable increase in underwater vessel noise and decrease in NFI duration from mid-July through September in this area. Extending seasonal nonmotorized waters dates at Muir Inlet would notably decrease underwater vessel noise and increase NFI duration for three additional months.

Under alternative B, cruise ships and tour vessels would be prohibited from waters north of Muir Point in the East Arm to allow for a small vessel experience for private, charter, and nonmotorized vessels. This restriction on larger vessels could slightly decrease underwater vessel noise and increase NFI duration in the East Arm north of Muir Point.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed, past and ongoing actions such as the presence of cruise, tour, charter, private, administrative, and other vessels within Glacier Bay affect the underwater acoustic environment.

As described above, the programmatic and site-specific vessel management actions proposed in alternative B would increase underwater noise and decrease NFI in most areas of Glacier Bay, primarily due to increasing the number of private vessel permits during the quota season, opening Wachusett Inlet to motorized vessels year-round, and establishing a conditional transit permit. However, park areas with an expansion of nonmotorized vessel restrictions (e.g., Muir Inlet) or restrictions on large vessels (the East Arm north of Muir Point) could experience beneficial impacts to the underwater acoustic environment during certain time periods.

These actions in addition to the existing and ongoing planned actions would continue to adversely affect NFI. Compared to current conditions, the overall cumulative impact on the underwater acoustic environment would be adverse in most areas of Glacier Bay and remain the same as current conditions in other areas.

3.5.2.3 Alternative C

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all would be the same as those described under alternative B.

Alternative C Actions

Impacts resulting from changes in overnight and day use permits and distribution within the park would be similar to those described for alternative B with less underwater vessel noise in the Lower Bay and more underwater vessel noise in mid-Glacier Bay and the West Arm; however, alternative C would maintain the 25 private vessel permit quota, similar to current conditions.

Similar to alternative B, prioritizing lower-impact vessels in an advance-notice permit system under alternative C would decrease underwater noise and decrease NFI duration throughout Glacier Bay because the slower vessel speeds allow the vessel noise to be audible for a longer period of time, but impacts would be minimal due to the smaller underwater acoustic footprint of lower-impact vessels and because the priority system is for a limited number of permits (five).

Under alternative C, private vessels longer than 79 feet would not be allowed access to Glacier Bay, which is expected to minimally decrease underwater vessel noise overall sound levels because the vessels that replace them will be smaller and probably somewhat quieter. There may be minimal increase in NFI duration if these smaller vessels travel faster and there are longer intervals between noise events and minimally increase NFI duration throughout Glacier Bay by reducing the number of larger vessels within the park. The magnitude of this change is not expected to be substantial or easily discernible because the percentage of total vessels longer than 79 feet currently accessing the park is relatively low.

Under alternative C, changes in nonmotorized waters in Muir Inlet would notably decrease underwater vessel noise and increase NFI duration during May in Muir Inlet. Extending the end of the nonmotorized water date in Wachusett Inlet from August 31 to September 15 might decrease underwater vessel noise and increase NFI duration during that two-week timeframe. Because Wachusett Inlet experiences very little vessel traffic, this would not represent a large change compared to current conditions.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed there, past and ongoing actions such as the presence of cruise, tour, charter, private, administrative, and other vessels within Glacier Bay affect the underwater acoustic environment. The overall effects of the programmatic and site-specific vessel management actions under alternative C on the underwater acoustic environment would be similar to alternative B; however, the existing quota of 25 private vessels would remain, which would result in less underwater vessel noise under alternative C compared to alternative B. Park areas with an expansion of nonmotorized vessel dates (e.g., Muir Inlet) would experience beneficial impacts to the underwater acoustic environment, whereas areas with additional vessel traffic due to the redistribution of vessels within the park (mainly the West Arm) would experience adverse impacts to the underwater acoustic environment.

These actions in addition to the existing and ongoing planned actions would continue to adversely affect NFI. Compared to current conditions, the overall cumulative impact on the underwater acoustic environment would be both beneficial and adverse, or generally remain the same as current conditions, depending on the geographic area of the park.

3.5.2.4 Alternative D

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all would be the same as those described under alternative B.

Alternative D Actions

Under alternative D, the number of private vessel permits would remain the same compared to current conditions resulting in no change in the underwater acoustic environment. Unlike alternatives B and C, private vessel permits under this alternative would not be distinguished between overnight or day use, resulting in little to no change from current conditions. The beneficial impacts resulting from the extension of nonmotorized water dates in Muir Inlet and Wachusett Inlet would be the same as alternative C. Similar to alternative B, private vessels longer than 79 feet would only be allowed to enter Glacier Bay

if there is an unused cruise ship or tour vessel use day available resulting in the same impacts as alternative B.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed there, past and ongoing actions such as the presence of cruise, tour, charter, private, administrative, and other vessels within Glacier Bay affect the underwater acoustic environment. As discussed above, the programmatic and site-specific vessel management actions in alternative D are not expected to result in a notable change in the underwater acoustic environment in mid-Glacier Bay or the West Arm like in alternatives B and C; however, the actions are expected to result in a beneficial impact to the underwater acoustic environment in the Upper East Arm by expanding nonmotorized water dates during the permit season in Muir Inlet. The underwater acoustic environment in the Lower Bay could still be adversely affected by additional vessel use under the conditional transit permit.

Actions under alternative D, in addition to the existing and ongoing planned actions, would continue to adversely affect NFI. Compared to current conditions, the overall cumulative impact on the underwater acoustic environment would be both beneficial and adverse, or generally remain the same as existing conditions, depending on the geographic area of the park.

3.5.2.5 Comparative Conclusion of Alternatives

Under alternative A, the underwater acoustic environment would continue to be adversely impacted by noise from cruise ships, tour vessels, charter vessels, private vessels, administrative use vessels, and other vessels operating in the park. Trends such as increased visitation during April, May, September and October, tidewater glaciers in the park potentially continuing to recede due to climate change, and potential overcrowding at anchorages could result in additional localized and seasonal adverse impacts to the underwater acoustic environment.

Alternative B would allow five additional private vessels per day to access Glacier Bay (a 14% increase in the total number of vessels allowed in Glacier Bay at any one time). As a result, the proportion of time that underwater vessel noise is present is expected to increase from 59% under alternative A to 73% under alternative B in the summer season. Within Muir Inlet in the Upper East Arm, the adverse effect would be mitigated through most of the peak season by designating Muir Inlet as nonmotorized waters from May 1 to September 15. Opening Wachusett Inlet to motorized vessels year-round would decrease NFI in this area and cause greater impacts compared to alternative A. While it is difficult to predict the specific effects of most of the proposed changes on vessel routes and behavior within the park, changes in overnight and day use permits under alternative B could redistribute vessels within the park, with more vessels likely going to mid-Glacier Bay and the West Arm to view glaciers and fewer vessels departing from Bartlett Cove for day trips in the Lower Bay. This could result in less underwater vessel noise in the Lower Bay and more underwater vessel noise in mid-Glacier Bay and the West Arm. Vessel trips under the conditional transit permit would also contribute to additional underwater vessel noise in the Lower Bay compared to alternative A. Compared to alternative A, alternative B would result in fewer private vessels longer than 79 feet in Glacier Bay and fewer large vessels in waters north of Muir Point in the East Arm. These actions could result in minor beneficial impacts to the underwater acoustic environment in Glacier Bay.

Alternative C would not increase the number of private vessel permits, so overall it would result in less underwater vessel noise throughout Glacier Bay compared to alternative B. Compared to alternative A,

alternative C would result in additional underwater vessel noise in the Lower Bay due to the conditional transit permit. Under alternative C, Muir Inlet would be designated as nonmotorized waters from May 1 through July 15 and Wachusett Inlet would be designated as nonmotorized waters from July 16 through September 15. Within Muir Inlet, this change would notably benefit the underwater acoustic environment during the month of May compared to alternative A, but not provide as large a beneficial impact as alternative B in this area. Within Wachusett Inlet, this change would benefit the underwater acoustic environment for the additional two weeks it is nonmotorized in September compared to alternative A and for the entire two-month period compared to alternative B. Similar to alternative B, changes in overnight and day use permits under alternative C could redistribute vessels within the park and likely result in less underwater vessel noise in the Lower Bay and more underwater vessel noise in mid-Glacier Bay and the West Arm compared to alternative A. Alternative C would restrict private vessels longer than 79 feet from entering Glacier Bay, resulting in some beneficial impacts to the underwater acoustic environment. Alternative C would not restrict larger vessels from traveling in the area north of Muir Point in the East Arm; thus, alternative C would not provide the minor benefits to the underwater acoustic environment that are expected from these actions under alternative B.

Alternative D would not increase the number of private vessel permits, so overall it would result in less underwater vessel noise throughout Glacier Bay compared to alternative B. Compared to alternative A, alternative D would result in additional vessel noise in the Lower Bay due to the conditional transit permit. There would be no distinction between day and overnight private vessel permits under alternative D, so the potential redistribution of vessels from the Lower Bay to mid-Glacier Bay and the Upper West Arm expected under alternatives B and C may not occur. Similar to alternative B, the management of private vessels longer than 79 feet and restrictions for larger vessels in the East Arm would likely result in minor beneficial impacts to the underwater acoustic environment in Glacier Bay compared to alternatives A and C. Alternative D would change the seasonal nonmotorized water designations the same as in alternative C, so the beneficial impact of these actions on the underwater acoustic environment in Muir and Wachusett Inlets would be the same as alternative C. Overall, the underwater acoustic environment under alternative D would be similar to or slightly worse than alternative A with some additional minor benefits due to restrictions on larger vessels and changes to timeframes that Muir Inlet and Wachusett Inlet are designated as nonmotorized waters.

3.6 MARINE WILDLIFE

3.6.1 Current and Expected Future Conditions of the Environment

Marine waters make up nearly one-fifth of the park and provide habitat for an array of marine wildlife. The analysis area for marine wildlife includes all areas where vessel quotas and operating requirements apply within Glacier Bay. Species most likely to be affected by changes in vessel management in the park are described below.

Marine Mammals

Marine mammals in the project area include humpback whales (*Megaptera novaeangliae*), Steller sea lions (*Eumetopias jubatus*), harbor seals (*Phoca vitulina richardii*), harbor porpoises (*Phocoena phocoena*), killer whales (*Orcinus orca*), minke whales (*Balaenoptera acutorostrata)*, and sea otters (*Enhydra lutris kenyoni*).

Humpback Whales

Humpback whales are a migratory species whose habitat preferences change depending on the activity and time of year. During the spring, summer, and fall, humpback whales feed in cold coastal waters at higher latitudes. Humpback whales were already listed when the Endangered Species Act (ESA) was enacted in 1973 and were classified by the International Union for Conservation of Nature as endangered in 1970 and 1986, respectively (Clapham and Mead 1999; IUCN 2022; NOAA Fisheries 2022a). In 2016, the National Marine Fisheries Service removed the endangered classification for the species as a whole and divided it into 14 distinct population segments (DPS) based on their wintering areas, classifying two population segments as endangered and two as threatened (NOAA Fisheries 2020). The majority of humpback whales in southeastern Alaska are part of the Hawaii DPS, with a smaller proportion from the Mexico DPS (Wade et al. 2016). The Hawaii DPS is not listed under the ESA, and the Mexico DPS is classified as threatened. A post-delisting monitoring plan was adopted at the same time as the delisting occurred and describes conservation issues facing humpback whales and criteria for determining whether revisiting the listing status is warranted, during the life of the plan from 2017 through 2027.

Humpback whales are found throughout the Glacier Bay and Icy Strait/Cross Sound Zones. Feeding congregations often use specific areas such as the Lower Bay, Whidbey Passage, and areas around the Beardslee Islands. The number of whales using the park typically increases between May and mid-June, peaking in July and August. Abundance tends to be lower in May and September, depending on feeding conditions, but is reliably lowest from October through April (Gabriele et al. 2017).

Monitoring data indicate that after more than two decades of population growth as well as high rates of survival and reproductive success, humpback whales in the Glacier Bay area experienced sharp declines in abundance, reproduction, and survival coinciding with the onset and lingering after-effects from the 2014–2016 Northeast Pacific marine heatwave (Gabriele et al. 2022). It is thought that humpback whale abundance in southeastern Alaska may take years to recover from the heatwave, assuming a return to favorable feeding conditions. According to the most recent monitoring in 2021, between June 1 and August 31, NPS documented 167 unique humpback whales in Glacier Bay and in adjacent waters in part of the Icy Strait/Cross Sound Zone, representing a 5% decline in abundance compared to 2020 (Neilson et al. 2022).

The Glacier Bay long-term humpback whale monitoring program was created in 1985 following concern in the 1970s that increased vessel traffic in the park had resulted in whales abandoning the park (Jurasz and Palmer 1981; as cited by Neilson et al. 2013). While research has shown that humpback whales do respond to motorized vessels (e.g., Baker and Herman 1989), concerns about the humpback whale population abandoning the park proved unfounded through continued monitoring.

"Whale waters" are waters within Glacier Bay that are designated by the Superintendent based on recent sightings and/or past patterns of whale occurrence. Speed and course restrictions in whale waters are intended to reduce whale disturbance and lower the risk of whale/vessel collisions, as authorized by 36 CFR § 13.1174. Currently, whale water restrictions vary by year. The park may change permanent whale waters and associated restrictions through a rulemaking process. Any changes to permanent whale waters and vessel restrictions are not anticipated to impact humpback whales because temporary whale waters and restrictions would still be enacted as needed for resource protection.

When the whale concentration increases in the Lower Bay whale waters, the Superintendent decreases the speed limit from 20 knots to 13 knots. Whale waters areas outside the Lower Bay are dynamic and may consist of a speed limit, a course restriction, or both. Throughout Glacier Bay, vessel operators are advised to keep a lookout for whales and reduce speed when necessary. Vessels are prohibited from

operating within 0.25 nautical mile of a humpback whale in all park waters and are required to reduce speed if they find themselves within this distance.

The NPS identified several potential threats and stressors to the humpback whales in and around Glacier Bay. Most of the threats are anthropogenic, while others may be naturally occurring. Anthropogenic stressors and threats include ecosystem changes due to climate change; disturbance from underwater vessel noise; vessel strikes (lethal and non-lethal); entanglement in fishing gear, anchor lines, and mooring gear; and competition with commercial fisheries (Nadeau et al. 2017).

Disturbance from underwater vessel noise can cause stress and interfere with communication among humpback whales in the park, which may influence whale distribution. Humpback whales are adapted to rely on sound for everyday activities such as feeding, intraspecific location, intraspecific communication, and detection of predators (Gabriele et al. 2010; Holt et al. 2011); vessel traffic noise can interfere with these activities (Fournet et al. 2018).

Vessel strikes, whether lethal or non-lethal, are another threat to humpback whales in the park. All types of vessels (motorized and nonmotorized) have been known to hit humpback whales (Neilson et al. 2012). Accurate assessments of vessel strikes are challenging because of under-reporting of collisions, as well as difficulty in getting complete information on a whale's cause of death. In addition, some carcasses sink or drift out to sea and are not found. The mouth of Glacier Bay was identified as a "hotspot" with an elevated risk of whale-vessel collisions (Neilson et al. 2012) and a location for many close ship-whale encounters (Gende et al. 2010).

Cruise ship routes in Glacier Bay overlap temporally and spatially with humpback whale high-use areas (Webb 2015), resulting in frequent surfacing events near transiting ships' bows (Gende 2012; Williams 2016). Close encounters between ships and whales occurred most often Icy Strait near the entrance to Glacier Bay and in lower portions of Glacier Bay, which are hotspots for whale abundance in most years (NPS unpublished data).

Lethal collisions between vessels and humpback whales are likely low probability events, and modeling efforts have demonstrated that even under the worst-case scenario (high number of whales struck; all whales struck are adult females), the frequency of cruise ship-whale collisions is insufficient to affect the sustainability of the population of whales in Glacier Bay (Gende et al. 2018). Nevertheless, minimizing the chance that vessels collide with whales and providing habitat as close to free of vessel disturbance as achievable, given visitation mandates, represents an important park value.

Steller Sea Lions

Steller sea lions range along the North Pacific Rim, from northern Japan through Alaska, and down to California (Loughlin et al. 1987). In 1990, Steller sea lions were listed as a threatened species throughout their range under the ESA (55 *Federal Register* 12645) due to significant declines. In 1997, two DPS of Steller sea lions were recognized based on genetics and population trajectories: an endangered western DPS (west of Cape Suckling, 144° W. longitude) and a threatened eastern DPS (east of Cape Suckling) (50 CFR § 223). Glacier Bay is located east of 144° W. longitude, in the eastern DPS however, some Steller sea lions from the western DPS also occur in Glacier Bay. On October 25, 2013, the National Marine Fisheries Service concluded that the biological criterion and ESA listing factor recovery criteria for the eastern DPS had been met, and the eastern DPS of Steller sea lions was removed from the list of threatened species under the ESA (NOAA Fisheries 2013, 78 *Federal Register* 66139–661993).

Currently, four known Steller sea lion haul-out sites occur in Glacier Bay and one rookery occurs in the Outer Coast Zone (Graves Rocks). South Marble Island is the largest haul-out site occupied by sea lions

in Glacier Bay, and sea lions occupy it throughout the year. Since the 1970s, the number of sea lions has increased in the Glacier Bay region with the most rapid growth (16.6% per year from 1991 to 2009) occurring at South Marble Island. Three haul-out sites in Glacier Bay (Tarr Inlet, Point Carolus, and Gloomy Knob) are used seasonally for a few weeks or months each year (Womble et al. 2009; Mathews and Adkison 2010; Mathews et al. 2011). During the post-breeding season (September–May), sea lions may travel to haul-out sites in the inside waters of southeastern Alaska in response to seasonally available prey (Womble et al. 2009; Rehberg et al. 2018). Anthropogenic threats to Steller sea lions in southeastern Alaska include incidental take (e.g., bycatch in fishing gear, entanglement in and ingestion of marine debris), vessel/human disturbance, and illegal killing. Traditional hunting outside park boundaries is a source of mortality, but there is little evidence of contemporary sea lion harvest in the vicinity of the park (Wolfe et al. 2009). Steller sea lions in the park may be disturbed by private and commercial vessels that approach haul-outs for wildlife viewing, particularly at South Marble Island (Mathews 2000). Repeated disturbance while at haul-outs or rookeries may reduce the amount of time sea lions spend resting and feeding, disrupt social interactions, and temporarily separate mothers from dependent pups (Mathews 2000). There is no evidence that disturbance of sea lions at South Marble Island is of sufficient magnitude to influence their use of this area or individual vital rates. During the summer, the island is visited daily by tour vessels (including the day boat) and by private vessels that are subject to a 100-yard approach distance to hauled-out sea lions.

Potential impacts of climate change on sea lions include shifts in the timing of primary productivity peaks and oceanographic processes; changes in fish migration; shifts in the abundance and range of algae, plankton, and fish at high latitudes; and invasions of new species (e.g., pathogens or competitors) (Harley et al. 2006; NOAA Fisheries 2013).

Harbor Seals

Harbor seals inhabit coastal and estuarine waters from Baja California, north along the western coasts of the United States, British Columbia, and Alaska to Japan. Seals haul-out on rocks, reefs, beaches, and icebergs and feed in marine, estuarine, and occasionally fresh waters. During pupping, nursing, and molting (May–September), seals spend more time hauled-out on shore, glacial ice, or other substrates. Male harbor seals vocalize night and day during their May-July breeding season and their communication range is affected by the underwater sound environment (Gabriele et al. 2017).

In Glacier Bay, harbor seals use several terrestrial sites (e.g., reefs, outwash plains, islets) in addition to glacial ice sites. Currently, these sites are distributed throughout Glacier Bay from the Beardslee Islands in the Lower Bay to Johns Hopkins Inlet in the Upper West Arm and McBride Inlet in the East Arm. Up to 2,000 seals aggregate seasonally in Johns Hopkins Inlet for pupping, resting, and molting (Mathews and Pendleton 2006; Womble et al. 2010, 2020a), prompting the park to enact seasonal motorized vessel restrictions. The park may make changes to motorized vessel restrictions in this area through a rulemaking process. Any changes to vessel restrictions are not anticipated to impact marine mammals because temporary restrictions would still be enacted as needed for resource protection.

Harbor seals in the park are one of the most protected marine mammal populations in the world (Womble and Gende 2013), yet the population has declined over the last three decades (Mathews and Pendleton 2006; Womble et al. 2010, 2020a). Relatively large changes in the spatial distribution of seals in Glacier Bay have occurred, due in part, to changes in the tidewater glaciers and the availability of icebergs, which serve as habitat for resting, pupping, and molting (Womble et al. 2021). Ongoing monitoring indicates that the number of seals in Johns Hopkins Inlet has continued to decline over the 26-year period from 1992 to 2017 (Womble et al. 2020a).

Potential anthropogenic threats and natural stressors that may influence harbor seals include legal and illegal harvest (when the seals move outside park boundaries), human disturbance (Young et al. 2014), interactions with commercial fisheries, pathogens and pollutants, predation, interspecies competition, and changes in tidewater glaciers that influence the availability of ice habitat. During the post-breeding season (September–April), harbor seals travel extensively outside Glacier Bay (Womble and Gende 2013), and during that time, seals may interact with fisheries and become injured or entangled in fishing gear. Commercial fishing is limited within the park, so the risk of conflict is low in the park. Vessel traffic in and outside the park may influence harbor seal behavior, potentially influencing the condition of individual seals. Vessel disturbance can cause hauled-out seals to flush into the water, which may result in increased energy expenditure or increase the risk of mother/pup separation (Lewis and Mathews 2000; Young et al. 2014). Seal pups are particularly vulnerable to disturbance such that they may expend excess energy if they spend additional time in the cold glacial waters as a result of being flushed from the ice (Jansen et al. 2010).

Harbor Porpoise

The harbor porpoise is considered common in the park (Dahlheim et al. 2009). Harbor porpoises are of particular interest because within southeastern Alaska, Glacier Bay is a regional hot spot for the species, and opportunistic sightings by the NPS and systematic surveys by the National Marine Fisheries Service (Dahlheim et al. 2012) indicate population fluctuations.

Harbor porpoises are threatened by both natural and anthropogenic factors. Natural threats include predation by killer whales, disease, and viruses, while anthropogenic threats include pollutants, incidental take/mortality as bycatch in fishing gear outside the park, climate change, and human disturbance mainly from vessels.

Killer Whales

Killer whales are found throughout the North Pacific, including along the entire Alaska coast. Killer whales in Alaska are classified as one of three distinct ecotypes based on aspects of morphology, ecology, genetics, and behavior: fish-eating "residents," marine mammal-eating "transients," and "offshore" killer whales, whose feeding habits are poorly understood (Bigg et al. 1990; Ford et al. 2000; Dahlheim et al. 2008). These whales are not designated as depleted under the Marine Mammal Protection Act or listed as threatened or endangered under the ESA. Threats and stressors to the killer whales include food supply instability due to climate change; disturbance from underwater vessel noise; vessel strikes, entanglement in fishing gear, anchor lines, and mooring gear; and competition with commercial fisheries.

The NPS does not regulate the minimum approach distance to killer whales but recommends that vessel operators follow the Alaska Marine Mammal Viewing Guidelines and Regulations, which recommend staying 100 yards away. Killer whales are of high interest to park visitors, and when vessels see them, they are often actively pursued for whale watching. Killer whales may be stressed by vessels that approach, and these approaches may interfere with feeding.

Resident Killer Whales—The Eastern North Pacific Alaska Resident stock includes killer whales from southeastern Alaska to the Aleutian Islands and Bering Sea. The total estimated population size for the southeastern Alaska portion of this stock is approximately 120 individuals (primarily distributed in two resident pods, AF and AG pods) (Muto et al. 2020). Whales from these two pods occasionally frequent the Glacier Bay and Icy Strait/Cross Sound Zones (NPS unpublished data and reports).

Transient Killer Whales—Whales from the West Coast Transient stock are known to travel through southeast Alaska and are documented in the park every year (Dahlheim et al. 1997; NPS unpublished

data). Transient killer whales mainly feed on marine mammals, including harbor porpoises, harbor seals, and Steller sea lions; they travel in smaller pods of 1 to 15 individuals and are rarely seen in association with resident whales (Olesiuk et al. 1990). There are no reliable estimates of the population size of this stock.

Minke Whales

In Glacier Bay and adjacent waters in Icy Strait, minke whales from the Alaska stock are uncommon, with zero to ten sightings documented per year (Keller et al. 2017), yet the area is considered a relative hotspot for minke whales in southeastern Alaska (Dahlheim et al. 2008). Opportunistic sightings recorded by the NPS show that minke whales were concentrated in lower Glacier Bay and central Icy Strait, with only four sightings documented north of Strawberry Island in Glacier Bay (Keller et al. 2017). No estimates have been made for the number of minke whales in the entire North Pacific, and so few minke whales were seen during three offshore Gulf of Alaska surveys for cetaceans in 2009, 2013, and 2015 that a population estimate for the species in this area could not be determined (Rone et al. 2017). It is not possible to produce a reliable estimate of abundance of minke whales in Glacier Bay. Threats and stressors to minke whales include food supply instability due to climate change; disturbance from underwater vessel noise; vessel strikes, entanglement in fishing gear, anchor lines, and mooring gear; and competition with commercial fisheries.

Sea Otters

Sea otters are a keystone species of the nearshore ecosystem of Alaska, ranging along the North Pacific Rim. The distribution of sea otters is typically limited to shallow nearshore areas (Bodkin et al. 2004). Sea otters in Alaska are divided into three stocks: Southwest, Southcentral, and Southeast. The Southwest Alaska stock was listed as threatened under the ESA in 2005 (USFWS 2013), but the Southcentral and Southeast stocks are not listed (USFWS 2014). Sea otters in Glacier Bay are part of the Southeast Alaska stock, which ranges from the Dixon Entrance, along the southern Alaska boundary, northwest to Cape Yakataga (USFWS 2014). Sea otters began to colonize Glacier Bay in the mid-1980s and have increased substantially over the last 30 years. Sea otters are currently the most abundant and widely distributed marine mammal in Glacier Bay with the population growing exponentially at a rate of 20% per year (Williams et al. 2019; Womble et al. 2020b). The growth and expansion in the number of sea otters in Glacier Bay is likely due in part to an abundance of prey and protection from harvest (Bodkin et al. 2007; Williams et al. 2019).

Potential anthropogenic threats and stressors to sea otters in and around the park include chronic or catastrophic oil pollution, legal harvest occurring outside the park, illegal killing inside the park, entanglement/incidental drowning in fishing gear, vessel strikes that can lead to mortality or increased vulnerability due to injury, vessel disturbance, and climate change. Natural threats include predation, disease, and intraspecific competition.

Seabirds

Over 100 species of seabirds, shorebirds, and sea ducks frequent park waters to breed, molt, and rest during migration and are susceptible to disturbance by vessels. Glacier Bay's coastal beaches and protective coves support nesting seabirds from May through July, including the Arctic tern (*Sterna paradisaea*), short-billed gull (*Larus canus*), glaucous-winged gull (*Larus glaucescens*), and black oystercatcher (*Haematopus bachmani*). In addition, species of guillemots, murres, jaegers, plovers, puffins, eagles, and cormorants nest along park shores and cliffs. Many of these nesting species are found

in the park from early spring through fall, a period that overlaps with heavy visitor and vessel presence, creating the potential for disturbance (Arimitsu et al. 2007).

Ground-nesting marine birds whose eggs and chicks are extremely hard to see are especially vulnerable wherever visitors can access breeding sites (Arimitsu et al. 2007). Intense parental care is required for egg and chick survival, and repeated disturbance can result in reduced productivity or total abandonment (Leseberg 2000). Black oystercatcher nests may be particularly susceptible to disturbance because people tend to use the same beaches for hiking and camping. This species is listed as a 'species of high concern' in the Shorebird Conservation Plans of the United States and Alaska Shorebird Group (Brown et al. 2001 and Alaska Shorebird Group 2019, respectively). The largest known concentrations of black oystercatchers in southeast Alaska were observed in Glacier Bay, with at least 270 breeding oystercatchers; 120 of which occurred in the Beardslee Islands (Tessler et al. 2007). Nests are made of gravel and may be trampled when boats are hauled above the high-tide line (Tessler et al. 2014). This is also true for other ground-nesting species. Arimitsu et al. (2007) documented an Arctic tern nest that was trampled by a visitor in June at the entrance to Reid Inlet. The park currently closes 14 islands year-round and 4 islands from June through August to foot traffic and requires minimum approach distances of 100 yards in Glacier Bay to protect high concentrations of nesting seabirds by minimizing human-caused disturbance and chick mortality. Increased use by private boats, sightseeing vessels, water taxis, and cruise ships heightens the probability that nests will be flooded by large wakes, especially when vessel traffic coincides with periods of the highest tides. Easing vessel size and displacement restrictions in certain protected areas could further exacerbate this problem (Tessler et al. 2014).

Other nesting species found in Glacier Bay include black-legged kittiwake (*Rissa tridactyla*), tufted puffin (*Fratercula cirrhata*), Aleutian tern (*Onychoprion aleuticus),* marbled murrelet (*Brachyramphus marmoratus*), and Kittlitz's murrelet (*Brachyrampus brevirostris*), all of which are identified as "High Conservation Concern" in Alaska Audubon's "Red List," indicating populations are vulnerable and declining (National Audubon Society 2017). Relatively major colonies of black-legged kittiwakes occur on South Marble Island, Cenotaph Island, and beside Margerie, Johns Hopkins, and McBride Glaciers. Due to declining populations, tufted puffins were also considered for listing in 2018 under the ESA. Puffins have been observed nesting on the cliffs of South Marble Island and Lone Island. They can also be observed in the water along a mainland cliff area known as Gloomy Knob. Aleutian terns have been found nesting in Adams Inlet and on the outer coast.

NPS staff identified several threats to marbled and Kittlitz's murrelets, including altered habitats resulting from climate change, varied availability of forage species, and disturbances from marine vessels. Disturbance to murrelets by vessel traffic in Glacier Bay has been studied in the past by Agness et al. (2013) and Marcella (2014). Both studies documented that breeding and nonbreeding murrelet are disturbed by vessels. Marcella et al. (2017) found that 68% of all murrelets encountered within 850 meters perpendicular distance of either side of an approaching cruise ship dove or flew from the water. The flushing distance found in the study was much greater than in studies for other species of seabirds, where flushing distance generally ranged from 34 to 400 meters, potentially due to the larger size of cruise ships compared to smaller vessels used in other studies (Marcella et al. 2017).

Waterfowl, including sea ducks, use the park for molting and resting from June through September (Duncan and Climo 1991). The molt is a time of great energetic stress on waterfowl. Molting birds, which often cannot fly, are extremely sensitive and easily disturbed (Welty 1975; Bellrose 1976). In Glacier Bay, the main molting species include Canada goose (*Branta canadensis*), harlequin duck (*Histrionicus histrionicus*), long-tailed duck (*Clangula hyemalis*), white-winged and surf scoters (*Melanitta spp.*),

Barrow's goldeneye (*Bucephala islandica*), and common and red-breasted mergansers (*Mergus spp*.) (Climo and Duncan 1991; Duncan and Climo 1991; NPS 1995). These species concentrate particularly in the areas of Adams Inlet, Wachusett Inlet, central and lower Muir Inlet, the Hugh Miller Inlet/Scidmore Bay complex, Tidal Inlet, Berg Bay, the Beardslee Islands, and Rendu Inlet (Climo and Duncan 1991; Duncan and Climo 1991). Studies of ducks during the nonbreeding season have indicated vessel traffic can alter a duck's behavior, habitat selection, and energy expenditure (Tuite et al. 1984; Bell and Austin 1985; Galicia and Baldassarre 1997). Due to the increased vessel traffic in the summer, potential impacts of vessel traffic on sea ducks in the park would increase during breeding and molting.

Glacier Bay is also an important stopover site in the spring and fall for many migrating birds including brant (*Branta bernicla*) and a variety of shorebirds. Large flocks of black oystercatchers have been observed in Geikie Inlet in September including 124 birds in 1965 (Wik and Streveler 1967) and more than 600 in 1992 (van Vliet 2005). This is one of the largest known concentrations of black oystercatchers ever documented and demonstrates the importance of this location as a traditional post-breeding staging area.

3.6.1.1 Additional Trends and Planned Actions

The BWMP (in preparation) is expected to include actions that identify and manage two or three locations proximal to glaciers as focused use areas, considers time limits for tour vessels using focused use areas, and considers actions to encourage either concentrating or dispersing tour vessel off-vessel activity throughout the park. Establishing and rotating focused use areas proximal to glaciers would increase the number of vessels in one location; however, the magnitude of these changes would be reduced to some degree by establishing time limits for tour vessels in focused use areas. In locations where tour vessels are currently common, fewer tour vessels would decrease vessel noise and decrease encounters between independent backcountry visitors and commercial groups.

While not currently an issue, there could be a concentration of vessels at anchorages in the future, which could slightly increase adverse impacts on marine wildlife in the area of anchorages. In addition, as tidewater glaciers in the park continue to recede due to climate change, the total number of glaciers for visitors to experience could be limited. With fewer glaciers, vessel congestion around those that remain could intensify, thus increasing underwater and above-water noise in those localized areas as well as disturbance of wildlife.

Climate change is expected to result in less ice for harbor seal haul-outs that provide important habitat for life history events (e.g., pupping, molting, and resting), increased marine heatwaves that could lead to population declines in marine wildlife, and changes in availability of food sources for many wildlife species in Glacier Bay through ocean warming and acidification.

3.6.2 Environmental Consequences

3.6.2.1 Alternative A: No Action

Under alternative A, current management of private vessels, administrative use vessels, and vessel distribution within the park would continue. As a result, impacts to marine wildlife would be the same as described above in the "Current and Expected Future Conditions of the Environment" section.

Cumulative Impacts

Under alternative A, there would be no new direct impacts to marine wildlife; therefore, the environment would remain the same as or similar to the "Current and Expected Future Conditions of the Environment"

section above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the "Current and Expected Future Conditions of the Environment" section.

3.6.2.2 Alternative B: Proposed Action

Impacts of Programmatic Actions Common to Alternatives B, C, and D

Programmatic actions associated with floating cabins/seasonally moored vessel, communication upgrades, and oceanographic monitoring stations would result in additional boat, float plane, and/or helicopter movements within the park during construction, maintenance, and monitoring, which could generate additional above water and underwater noise and increase vessel presence within the park. Given the intermittent and spatially localized nature of the proposed programmatic actions, the actions are not expected to measurably impact marine wildlife species throughout most of the park; however, there could be a slight increase in the potential for vessel strikes with humpback whales, disturbance to Steller sea lions at haul-out sites or rookeries, flushing of seabirds, disturbance to many marine wildlife species (including harbor seals) from vessel noise and increased vessel presence, and mooring line impacts to whales. Additional site-specific analysis would be conducted prior to implementation of each project, and as detailed in appendix D, mitigation measures associated with the deployment of vertical buoy lines for anchors and moorings may reduce whale entanglement risks. Additionally, current vessel operating regulations to protect humpback whales and future temporary and spatial protection measures would further prevent impacts on marine mammals. Defining and clarifying vessel definitions is not expected to impact this resource topic because it is an administrative measure that would not result in any changes to the number or distribution of vessels within Glacier Bay.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The number of vessels at anchorages and vessels per viewscape at key locations would be monitored, and vessels may be more evenly distributed if the threshold for the "Number of Vessels at Anchorages at One Time" or "Number of Vessels Per Viewscape at Key Locations" is met. This would help reduce any localized adverse impact on marine wildlife resulting from an increase in vessel density at anchorages or key locations. However, adverse impacts could occur if vessels move from the anchorages or key locations to areas where marine wildlife interactions may be more common.

Establishing a conditional transit permit may increase vessel traffic in the Lower Bay as vessels enter or exit Bartlett Cove. Private vessels using the conditional transit permit would be required to follow a mid-channel or other prescribed course to reduce potential collisions with humpback whales. Additionally, if implemented, all corrective management actions (e.g., education, voluntary measures, the redistribution of visitors, management of commercial activity) would benefit marine wildlife by ensuring visitor access does not move the park away from desired conditions for natural resources, including marine wildlife.

Alternative B Actions

A 20% increase in private vessel permits from 25 to 30 would increase the total number of permitted vessels within Glacier Bay. These actions could increase impacts on marine wildlife such as whales, seals, sea lions, and seabirds in Glacier Bay. Impacts could include increasing opportunities for vessel strikes on whales; disturbance to many marine wildlife species (including harbor seals and seabirds) from vessel noise and increased vessel presence, including causing flushing and diving to avoid vessels; and altering the underwater and above-water acoustic environment used by marine wildlife. If the number of private vessel permits increases, there would likely be more visitors landing boats and accessing beaches, which would disturb and displace wildlife including nesting, resting and migrating birds, and exposing flightless

chicks and eggs. This would result in reduced productivity of nesting birds and increased energy expenditure, which could reduce fitness. Seabird molting can take place anywhere between late June and early September in Glacier Bay; therefore, molting seabirds would be exposed to more private vessels that may disturb them. If there are too many vessels anchored in one place and the threshold described in chapter 4 of the draft plan is met, overnight permits may be reduced by one per year. This reduction may mitigate some of the impacts to marine wildlife by reducing the number of vessels within Glacier Bay. Changing the permit length from seven days to five days during the quota season could also increase the frequency of vessels entering and exiting Glacier Bay. Given the importance of the Lower Bay as humpback whale habitat, this could increase opportunities for vessel collisions with whales and behavioral disturbance.

Changes in overnight and day use permits could redistribute vessels within the park, with more vessels accessing the West Arm. This would result in less underwater vessel noise in important feeding habitat in the Lower Bay and more potential for disturbance that could impact marine wildlife in the West Arm. Overnight permit holders would also likely spend time in mid-Glacier Bay and the East Arm, as well as more vessels visiting South Marble Island with potential for increased disturbance to sea lions and seabirds.

If prioritizing lower-impact vessels in the advance-notice permit system results in a greater proportion of lower-impact vessels, this could decrease vessel impacts on marine wildlife throughout Glacier Bay through reduced airborne and underwater noise levels that would be beneficial to whale and harbor seal communication, and reduced potential for collisions with marine wildlife (including humpback whales) from reduced speeds. While airborne and underwater sound from lower-impact vessels would be audible for a longer period of time due to their slower vessel speed, these vessels generate lower sound levels and have a smaller acoustic footprint, which would reduce the vessel noise experienced by marine wildlife. Lower-impact vessels also produce a smaller wake due to their reduced speed, and a reduced wake size could reduce impacts by minimizing marine and shoreline disturbance that leads to seabird flushing or diving and Steller sea lion stress and flushing at haul outs. However, because the priority system would be for a limited number of permits (seven permits per day), and lower-impact vessels would be second on the priority list, it is unlikely that these beneficial impacts would be noticeable.

Under alternative B, changes in the management of private vessels longer than 79 feet would result in a minimal decrease in underwater vessel noise throughout Glacier Bay and could reduce the likelihood of vessel strikes to whales by large vessels, which are more likely to be fatal than strikes by small vessels (Laist et al. 2001). Requiring private vessels longer than 79 feet to follow the operating requirements of cruise ships or tour vessels depending on which type of permit they enter the park on, would prevent these vessels from traveling in the majority of the East Arm and require their operators to follow existing marine wildlife protection measures currently in place for those commercial vessels (e.g., whale waters, seasonal closures, underwater and airborne noise restrictions, and wastewater restrictions). Additionally, restricting larger vessels from the majority of the East Arm (north of Muir Point) would benefit marine wildlife by limiting vessel disturbance and not increasing underwater noise from these vessels in those areas of Glacier Bay.

Changes to the dates for nonmotorized waters in the Muir Inlet would decrease disturbance to marine wildlife in the inlet by removing underwater noise from motorized vessels for three months and decrease behavioral disturbance (e.g., seabird flushing and diving) from reduced vessel presence and wakes. Adverse marine wildlife impacts would increase in Wachusett Inlet (home to concentrated populations of molting and nesting seabirds) because motorized vessels would be allowed in the inlet year-round.

Adverse impacts would now also occur from mid-July through August, unlike in the past when motorized vessels were not allowed during that period. If the "Number of Vessels at Anchorage at One Time" threshold indicates that there are too many vessels anchored in one place, the number of overnight permits in subsequent years would be reduced by 1 permit per year but would not be reduced below 20 permits. This reduction in available permits may alleviate vessel concentration at certain anchorages and would reduce the overall number of vessels in Glacier Bay compared to allowing over 20 permits.

As tidewater glaciers in the park continue to recede due to climate change, the nature of the impacts under alternative B would be similar to, but slightly greater than, those described under current and expected future conditions of the environment. With fewer glaciers, crowding around those that remain could intensify, thus increasing vessel presence and underwater noise as well as displacement and disturbance of wildlife in those localized areas. Climate change would result in less ice for seal haul outs and could lead to increased marine heatwaves and changes in availability of food sources for marine mammals and seabirds. Impacts would be slightly greater than current and expected future conditions of the environment due the additional 5 private vessel permits and as noted previously, the likelihood that more vessels would motor up to mid-Glacier Bay and the West Arm to view the glaciers and wildlife with the designation of 25 permits as overnight permits. Other impacts of climate change would result in the same impacts as those described for current and future expected conditions of the environment.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. The presence of marine vessels in Glacier Bay impacts marine wildlife through pollution, entanglement in fishing gear, anchor lines, and mooring gear, vessel strikes, above and underwater noise, flushing, and disturbance. As described above, an increase in five private vessel permits and potential changes in the distribution of vessels within Glacier Bay would adversely affect marine wildlife. Some actions, such as changes to nonmotorized waters in Muir Inlet may benefit some marine wildlife species by reducing vessel presence; however, opening Wachusett Inlet to year-round motorized use may increase impacts from vessels, resulting in increased airborne and underwater noise and flushing and disturbance of some species.

Even in the geographic areas where an overall adverse impact is expected, there could also be time periods where localized beneficial impacts to marine wildlife (increased NFI, smaller wake sizes, decreased potential for larger vessel interactions) may occur due to lower-impact vessels using the bay and an expansion of nonmotorized water designations (e.g., Muir Inlet May 1–September 15). Compared to current conditions, the overall cumulative impact on marine wildlife would be adverse in some areas of the park and generally remain the same as current conditions in other areas.

3.6.2.3 Alternative C

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all would be the same as those described under alternative B.

Alternative C Actions

The total number of permitted private vessels allowed within the park under this alternative would be the same as current conditions, resulting in similar impacts. However, similar to alternative B, changes in overnight and day use private vessel permits could redistribute vessels within the park, resulting in the same impacts as alternative B.

Similar to alternative B, prioritizing lower-impact vessels in the advance-notice permit system could decrease vessel impacts on marine wildlife throughout Glacier Bay through reduced above and underwater noise, reduced wakes, and potentially minimizing vessel strikes by reduced vessel speeds. However, benefits would be minimal because the priority system would be for a limited number of permits (five permits per day), and lower-impact vessels would be second on the priority list.

Private vessels longer than 79 feet would not be allowed to access Glacier Bay. Reducing larger vessels within the park may reduce some impacts to marine wildlife from noise and wakes; however, this impact may not be noticeable because only a small fraction of the total private vessels that enter the park each year are this size.

Extending the duration of the nonmotorized vessel waters in Muir and Wachusett Inlets would decrease disturbance to marine wildlife in these inlets for an additional month and a half by removing airborne and underwater noise from motorized vessels. These changes would also decrease behavioral disturbance (e.g., seabird flushing and diving) from reduced vessel presence and wakes.

If tidewater glaciers in the park continue to recede due to climate change, the impacts on marine wildlife at the remaining tidewater glaciers would be similar to but slightly less than those described under alternative B. Impacts would be slightly less than alternative B due to there being five less private vessel permits per day under alternative C compared to alternative B. Other climate change impacts would be the same as those described under current and future expected conditions of the environment.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in under "Current and Expected Future Conditions of the Environment." The presence of marine vessels within Glacier Bay affects marine wildlife through pollution, entanglement in fishing gear, anchor lines, and mooring gear, vessel strikes, above and underwater noise, flushing, and disturbance. As described above, potential changes in the distribution of vessels within Glacier Bay would adversely impact marine wildlife. Some actions, such as changes to nonmotorized waters in Muir and Wachusett Inlets may benefit some marine wildlife species by reducing vessel noise, presence, and wakes.

Even in the geographic areas where adverse impacts could increase, such as mid-Glacier Bay and the West Arm, there could also be periods where localized beneficial impacts to marine wildlife (increased NFI, smaller wake sizes, decreased potential for larger vessel interactions) may occur. Compared to current conditions, the overall cumulative impact on marine wildlife would be adverse in some areas of the park and generally remain the same as current conditions in other areas.

3.6.2.4 Alternative D

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all would be the same as those described under alternative B.

Alternative D Actions

Compared to current conditions, alternative D would not noticeably increase adverse impacts associated with the presence of private vessels within Glacier Bay because changes to the permitting system would not change the number or distribution of vessels within the bay. Similar to current conditions, because there would be no designation of overnight permits, more of the private vessel permits would likely be used for day use purposes compared to alternatives B and C.

Impacts associated with the management of private vessels longer than 79 feet would be the same as those described for alternative B. Impacts associated with the restriction of large vessels from the East Arm would also be the same as those described for alternative B. Impacts associated with nonmotorized waters in the Muir and Wachusett Inlet would be the same as those described for alternative C.

Unlike alternatives B and C, lower-impact vessels would not be prioritized in the vessel permit allocation system under alternative D. However, the park may exclude lower-impact vessels from some specific operating requirements , such as distance to shore requirements, tied to science-based resource and visitor experience conditions, which could encourage private vessel owners to use lower-impact vessels. Noise impacts from lower-impact vessels on marine wildlife would be similar to those described under alternative B, although reducing the distance between a motor vessel and marine wildlife increases the underwater sound exposure for the animal, as compared to if that same vessel had traveled a greater distance offshore. Allowing lower-impact vessels to travel closer to shore would increase the likelihood of close encounters with humpback whales that feed within 1 mile of shore. However, by definition, a lower-impact vessel would not be traveling faster than 10 knots, which is less than the 13-knot speed restriction imposed on vessels when high numbers of whales are present. This would help minimize potential vessels strikes of whales because whales are more able to move out of the way of a slower moving vessel. Other restrictive measures, such as not operating within 0.25 nautical mile of a humpback whale would still be in place. The park would monitor lower-impact vessels and associated operating requirements to ensure impacts on resources do not exceed the desired conditions as discussed in chapter 2 of the draft plan. If unacceptable impacts occur, full operating requirements would be reinstated for this vessel class.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the “Current and Expected Future Conditions of the Environment” section. The presence of marine vessels within Glacier Bay affects marine wildlife through pollution, entanglement in fishing gear, anchor lines, and mooring gear, vessel strikes, above and underwater noise, flushing, and disturbance. As described above, potential changes in the distribution of vessels within Glacier Bay would adversely impact marine wildlife. Some actions, such as changes to nonmotorized waters may benefit some marine wildlife species by reducing vessel noise in Muir and Wachusett Inlets. As discussed above, the programmatic and site-specific vessel management actions in alternative D are not expected to result in notable impacts to marine wildlife in the Lower Bay and West Arm; however, the actions are expected to result in a beneficial impact to marine wildlife in the East Arm compared to current condition by limiting the number of larger vessels in the area and reducing motorized waters in some inlets.

These actions in addition to the existing and ongoing planned actions would decrease NFI and decrease the potential for larger vessel strikes when compared to current conditions. Compared to current conditions, the overall cumulative impact on marine wildlife would be beneficial in some areas of the park and generally remain the same as current conditions on other areas due to the extension of nonmotorized waters.

3.6.2.5 Comparative Conclusion of Alternatives

Under alternative A, the concentration of vessels at anchorages could increase in the future, which could slightly increase adverse impacts on marine wildlife in that those areas due to disturbance from the increase in the number of vessels. With fewer glaciers, vessel congestion around those that remain could intensify, thus increasing underwater and above-water noise in those localized areas and adversely impacting wildlife. Climate change is expected to adversely impact marine wildlife resulting in less ice for harbor seal haul outs which provide important habitat for life history events (e.g., pupping, molting, and resting), increased marine heatwaves that could lead to population declines in marine wildlife, and changes in availability of food sources for many wildlife species in Glacier Bay through ocean warming and acidification.

Alternative B would increase private vessel permits by 20%, resulting in an increase in the total number of permitted vessels per day within Glacier Bay. This change could result in additional impacts on marine wildlife. With private vessel permits designated as overnight permits under alternatives B and C, it is likely more vessels would motor up into the West Arm and other areas to view glaciers and wildlife with fewer vessels departing from Bartlett Cove for day trips in the Lower Bay, resulting in less underwater vessel noise in the Lower Bay and more underwater vessel noise that could impact marine wildlife in the West Arm and other areas. Overnight permit holders would also likely spend time in mid-Glacier Bay and the East Arm, as well as more vessels visiting South Marble Island with potentially increased disturbance to sea lions and seabirds compared to alternatives A and D. Prioritizing lower-impact vessels in the advance-notice permit system under alternatives B and C and encouraging the use of lower-impact vessels under alternative D through adapted operating requirements could decrease vessel impacts on marine wildlife throughout Glacier Bay compared to alternative A through reduced airborne and underwater noise and potentially minimizing vessel strikes on marine mammals due to slower vessel speeds. Reduced speeds from lower-impact vessels could also minimize impacts on seabird behavior from reduced wake size when compared to alternative A. However, alternative D may increase potential close encounters with marine mammals by allowing the lower-impact vessels to travel closer to shore. Changes in the management of private vessels longer than 79 feet would result in a minimal decrease in underwater vessel noise throughout the park and could reduce the likelihood of vessel strikes, compared to alternative A.

Alternatives C and D would not increase the number of private vessel permits compared to alternative A. Alternatives B and D would restrict cruise ships and tour vessels from the East Arm north of Muir Point, while alternatives A and C would still allow them. Alternatives B and D would reduce the number of private vessels longer than 79 feet in Glacier Bay and alternative C would not allow them at all. Reducing the number of large vessels within the park could have beneficial impacts on marine wildlife species. Changes to the dates for nonmotorized waters in Muir and Wachusett Inlets under alternatives C and D would decrease disturbance to marine wildlife by removing underwater noise from motorized vessels for an additional month and a half, minimizing impacts on marine wildlife behavior from reduced wake size (e.g., seabird flushing and diving), and reducing the potential for vessel strikes when compared to alternative A. Compared to alternative B, the benefits of alternatives C and D in Muir Inlet would not be

as great, but for Wachusett Inlet they would be greater than alternative B because restrictions to motorized use would remain in place.

There would be no distinction between day and overnight private vessel permits under alternative D, so the potential redistribution of vessels from the Lower Bay to the Upper West Arm expected under alternatives B and C would not occur. Overall, the impacts to marine wildlife under alternative D would be similar to alternative A with some additional minor benefits due to restrictions on larger vessels.

As tidewater glaciers in the park continue to recede due to climate change, the nature of the impacts under alternatives B, C, and D would be similar to but slightly greater than alternative A. With fewer glaciers, crowding around those that remain could intensify, thus increasing underwater noise as well as disturbance of wildlife in those localized areas. Climate change would result in less ice for seal haul outs, increased marine heatwaves, and changes in availability of food sources for marine wildlife.

3.7 ETHNOGRAPHIC AND HOMELAND VALUES

3.7.1 Current and Expected Future Conditions of the Environment

Tlingit Homeland – Haa Aaní (Our Homeland)

Since time immemorial—time before memory—the Tlingit clans have embraced and been embraced by Glacier Bay Homeland; not simply occupying, settling, or inhabiting the land—but shaping, and in turn, being shaped by the dynamic forces of the environment. Deur and Thornton (2014) note, "Huna [Tlingit] traditionally do not consider Glacier Bay to exist separate from them, but rather to be an integral element of their identity as a people." The land and waters of Glacier Bay, Icy Strait, Cross Sound, and the Outer Coast link the Huna and Yakutat Tlingit to their ancestors and to future generations in a continuous connection of past, present, and future Tlingit, a concept called Haa Shagoon. Interacting with Homeland in the exact way that ancestors did—and future generations will—perpetuates and reinforces this unending link.

The Tlingit have a profound respect, ya aat wunéi, for both the "intrinsic power and significance" of the land and its resources and the "depth and profundity of Tlingit historical ties to these landmarks" (Deur and Thornton 2014). Specific places in Homeland, along with the stories, songs, dances, and crests associated with those places, are clan at.óowu, "owned or purchased things." Thus, individual clans claim and steward specific territories, the resources within those territories, and the noncorporeal treasures (stories, songs, crests) associate with specific places. Ongoing interaction with these places is required to maintain the health of the system as a whole.

The Tlingit relationship to the marine environment is especially profound. They are People of the Tides in every way; the marine waters of Glacier Bay, Icy Strait, Cross Sound, and the Outer Coast have nourished the Tlingit both physically and spiritually for generations. Marine resources, including fish, harbor seal, mollusks, and seaweeds, make up the majority of Tlingit diets. The Tlingit adapted their knowledge of the marine environment to eventually support commercially important fisheries and ultimately grew a renowned fishing fleet. Marine waters were and are the primary travel corridors and are revered as "gravesites" for many ancestors.

The Tlingit reciprocal relationship to both land and sea is such that a single intentional act—or a moment of disrespect—can direct biological or geological events and the resulting cascade of forever-altered ecological processes. Tlingit oral tradition is replete with stories that document such happenings, and living Tlingit report evidence of the cataclysmic effects of disrespectful behavior enacted today.

Demonstrations of respect and careful avoidance of displays of disrespect are essential to maintaining positive reciprocal relationships between the spiritual forces embedded in the landscape (flora, fauna, geologic and water features) and humans . Disrespectful behavior (ligaas), in Homeland offends those ancestral spirits who continue to steward Homeland (NPS 2022c).

The Huna Tlingit claim the majority of marine waters encompassed by the park, and the Yakutat Tlingit clans claim the waterways of Dry Bay and the northern outer coast of the park and preserve. As owners of this territory, the Tlingit have the privilege and responsibility of appropriately "hosting" visitors, a role many Tlingit feel the NPS has usurped. Tribal members note that the majority of park visitors are not aware that they are entering the territory of the Huna Tlingit and do not understand traditional protocols required of visitors as guests in Tlingit Homeland. Such protocols include asking and receiving permission to enter a particular clans' territory, behaving in a respectful manner within a given territory, and sharing harvested resources with the hosting clan upon departure. Many Tlingit "are deeply invested in the care and management of not only the land, but also the people who visit. This sense of responsibility, to care for those who enter Tlingit territory, is ingrained in the culture" (Deur and Thornton 2014).

Tribal members themselves continue to travel to Homeland primarily by boat, both independently and in large groups for ceremonies or other activities or events. Independent tribal use typically involves small groups traveling by small vessel to harvest resources, primarily sockeye salmon (gaat) and black chitons (shaaw, marine mollusks). A return to Homeland is an opportunity to be in the presence of those who have gone before and to engage with the landscape in the same way that their ancestors engaged for centuries (NPS 2022c). The ability of clans and individuals to retain customary and meaningful interaction with ancestral places, bestowing respect to the land through their role as stewards, is vitally important to the perpetuation of Tlingit cultural identity. Those Tlingit traveling in Homeland often consider views of other vessels as an affront because they are not following Tlingit protocol.

For a period of time in the early 2000s, the NPS struggled to find a means to legally authorize tribal vessel access outside the realm of the vessel permitting system. During that time, the Huna Tlingit were required, as were members of the general public, to obtain vessel entry permits to access Glacier Bay during the busy visitor use season; thus, their access during that period was limited by vessel quotas and competition with the public for private vessel permits. Most Huna Tlingit resented that they were required to obtain a private vessel permit to enter their traditional Homeland. To the Tlingit, the vessel permitting process itself suggested that the NPS was hosting visitors rather than the clans who claim Glacier Bay as territory. A 2020 deed of easement granting the HIA certain rights associated with land in Berg Bay now provides a legal mechanism for tribal members to freely transit through park waters to exercise these rights. Today, the HIA manages tribal vessel access during the busy visitor use season.

When the Huna Tlingit enter Glacier Bay Homeland, they often perform highly ritualized ceremonies at glacier faces and elsewhere. The Huna Tlingit report concern about "the tourist gaze," a sense that their ceremonies are diminished by the presence of onlookers who do not understand or respect protocol. Additionally, receding tidewater glaciers in the park due to climate change could affect the ability to hold ceremonies at the glacier faces in the future. The Huna Tlingit perform these ceremonies as a means of showing respect for their ancestors and the glacier and are greatly concerned about losing this connection (NPS 2022d).

Currently, the presence of cruise ships, tour vessels, charter vessels, and private vessels (including private vessels longer than 79 feet) in Glacier Bay interferes with the Tlingit's ability to connect with ancestors and experience the landscape in a traditional way. Importantly, many Tlingit believe that disrespectful

behavior exhibited by visitors, either intended or unintended, could have serious consequences. Incidences of marine pollution, excessive noise, pointing at sacred sites, and improper interactions with icebergs or glacial faces may all impact the delicate balance between the land and water, noncorporeal beings, and living humans. Of particular concern are cruise ships that have operated and would continue to operate in the park under a concessions contract with the NPS. The Huna Tlingit state concerns that cruise ships are causing harm to, or displacement of marine mammals (e.g., seals and whales) that are considered both resources and kin to the Tlingit and contaminating the air and water that may negatively impact a range of resources including spruce, mountain goats, and bears, as well as ancestral spirits emplaced in Homeland (HIA 2002).

Another concern for the Huna Tlingit is the presence of large, motorized vessels in the East Arm and other seasonal motorized use of Muir and Wachusett Inlets, resulting in diminished Homeland values from a perception of increased water and noise pollution in these areas.

Lastly, the Huna Tlingit express deep concern that the majority of park visitors are unaware that they are entering the traditional territory of Huna clans. In Tlingit culture, the concept of "hosting" those entering clan territory is vital, and highly ritualized behavior is expected. Cruise ships, tour vessels, charter vessels, and private vessels that enter Glacier Bay provide little opportunity for the Huna Tlingit to fulfill their role as hosts and their sense of responsibility to care for those that enter their Homeland. Cultural interpretive services aboard cruise ships and some tour vessels and additional interpretive and educational materials may enhance the Tlingit ability to serve and be perceived as hosts.

3.7.1.1 Additional Trends and Planned Actions

Additional actions that would affect Homeland values include the development of the BWMP and the finalized FMP. Potential aspects of the BWMP that relate to Homeland values include: (1) preservation of wilderness character; (2) guidance for commercial service providers to achieve goals; (3) incorporation of Tlingit Homeland values in wilderness management; (4) addressing and defining desired conditions for resources and visitor experiences within and on areas adjacent to marine wilderness areas; and (5) protection of wildlife and sensitive shoreline areas. Management strategies for inclusion of Tlingit Homeland values in wilderness management are likely to incorporate Tlingit perceptions of the landscape into management practices, continue to increase the NPS' and visitors' understanding of Tlingit relationships to Homeland, and incorporate that understanding in managing Homeland. In particular, the BWMP includes options for replacing the rock cairns typically used to mark camper drop-off locations with totem poles, which would enhance visitors' understanding that they are being hosted by the Huna Tlingit. All the aspects listed above would have a beneficial impact on Homeland values as they relate to protection and appropriate management of the wilderness, which is seen as respectful of the resources and tribal connection to Homeland. The proposed incorporation of Tlingit Homeland values in the BWMP are likely to have a beneficial impact on Homeland values. The installation of totem poles to serve as cairns for backcountry travelers are likely to have a beneficial effect in terms of educating backcountry visitors as well as passengers on certain vessels about Tlingit territory.

The FMP currently guides park management of the Bartlett Cove area. Through the management direction set forth in the FMP, the NPS collaborates with the HIA to support tribal members' sustained connection to Homeland in Bartlett Cove, and in particular, at the Huna Tribal House and supports HIA efforts to facilitate tribal connections to Homeland through operation of a tribal transportation ferry between Hoonah and Bartlett Cove. These actions facilitate tribal access and connection to Homeland in and near Bartlett Cove.

Numerous other ongoing and planned programs would affect Homeland values including ongoing Journey to Homeland trips, the gull egg harvest programs, and the development of the Chookanheení Culture Camp at Berg Bay. These actions and programs are, and would continue to be, collaboratively developed and implemented with the HIA and Yakutat Tlingit Tribe.

3.7.2 Environmental Consequences

3.7.2.1 Alternative A: No Action

Under alternative A, current management of private vessels and vessel distribution within the park would continue. As a result, impacts to ethnographic and Homeland values would be the same as described above, in the "Current and Expected Future Conditions of the Environment" section.

Cumulative Impacts

Under alternative A, there would be no additional direct impacts to ethnographic and Homeland values; therefore, there would be no cumulative effects. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the "Current and Expected Future Conditions of the Environment" section.

3.7.2.2 Alternative B: Proposed Action

Impacts of Programmatic Actions Common to Alternatives B, C and D

Installation of floating cabins/seasonally moored vessels in Lituya Bay and Graves Harbor may result in adverse impacts on the cultural landscape and Homeland values because both are culturally sensitive areas. Although exact locations remain unknown, further compliance may be required prior to installation, including but not limited to cultural resource surveys and tribal consultation to minimize impacts on cultural resources (e.g., cairns) and landscapes.

Defining a lower-impact vessel category is unlikely to impact Homeland values. While the Huna Tlingit perceive smaller, lower-impact vessels to be more in keeping with stewardship of Glacier Bay Homeland, the small number of vessels in this category does not outweigh the continued presence of other vessels in Glacier Bay that generate more pollution, which is perceived as disrespectful of the marine landscape and its resources.

Communication upgrades, oceanographic monitoring stations, and refining park zoning are not expected to impact this resource topic because cultural resource surveys and tribal consultation would be conducted to minimize impacts on cultural resources and landscapes.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

Corrective management actions as detailed in the draft plan (chapter 3) may have positive impacts on ethnographic resources and Homeland values through education about Tlingit life ways, protocols, and expected and appropriate behavior in Homeland. The park would collaborate with tribes to develop appropriate tribal welcome and land acknowledgment materials as well as other educational materials/orientations outlining Indigenous concepts of Homeland and culturally appropriate visitor behavior. Additionally, managing commercial contracts, temporal restrictions, and temporary and permanent closures in some areas of Glacier Bay could decrease the number of visitors in certain areas, which could increase the ability of clans and individuals to retain customary and meaningful interaction with ancestral places by decreasing concentrations of visitors.

Alternative B Actions

Under alternative B, up to 30 private vessel permits would be available, representing an increase of 5 permits from current conditions. An increase in private vessel permits may increase the number of vessels within Glacier Bay and could slightly interfere with Tlingit connections to Homeland. The addition of five permits may also increase crowding at glacier faces where Huna Tlingit hold ceremonies. However, corrective management actions described in chapter 2 present strategies to reduce crowding in key locations if certain indicators and thresholds are met. Additionally, if the "Number of Vessels at Anchorages at One Time" threshold indicates that there are too many vessels anchored in one place, the number of overnight permits in subsequent years would be reduced by 1 permit per year, but would not be reduced below 20 permits, until the threshold drops to within an appropriate amount of use. Reducing the number of overnight permits by one permit per year would also help reduce potential crowding at key locations.

Private vessels longer than 79 feet would only be allowed access to Glacier Bay if there is an unused cruise ship or tour vessel use day available. When they are allowed access, they would be treated like a cruise ship or tour vessel and would be required to follow tour operator requirements (vessel routes, seasonal closures, underwater and airborne noise restrictions, and wastewater restrictions). These restrictions would have a slight beneficial impact on Huna Tlingit Homeland values because they would be seen as more respectful to Homeland and its resources. Additionally, prioritizing lower-impact vessels in the distribution of private vessel permits under alternatives B is unlikely to impact Homeland values similar to alternative A because the number of vessels prioritized would be outweighed by continuing to allow larger vessels into the park.

Restricting cruise ships and tour vessels (including private vessels longer than 79 feet) in the East Arm from waters north of the Muir Point would have a beneficial impact on Huna Tlingit Homeland values by reducing impacts associated with large vessels in this area and restoring a quieter setting, which the tribe considers more respectful of the resources.

Allowing motorized vessels in Wachusett Inlet year-round would have an adverse impact on Homeland values of the Huna Tlingit because it would increase vessels in the inlet for an additional 1.5 months, which would be seen as disrespectful of the resources and would further disrupt the tribe's connection to the waters of Glacier Bay. However, extending the nonmotorized vessel water timeframe in Muir Inlet to last three months would have a beneficial impact on Homeland values because it would eliminate motorized vessels in the inlet.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed, some past actions have negatively affected the Tlingit's ability to connect to Homeland. However, current park plans provide increased opportunities for the Tlingit to connect to their Homeland and should improve Homeland value. None of the actions in alternative B would detract from those ongoing efforts.

Also as noted above, some of the actions proposed in this alternative would continue to detract from the Tlingit's connection to Homeland, including providing additional private vessel permits. However, most actions would improve the opportunity for connections with Homeland, including the definition of administrative use vessels and the types of vessels allowed in the East Arm, Wachusett Inlet, and Muir Inlet. These actions in addition to the existing and ongoing planned actions that benefit the Tlingit would continue to improve Homeland value and the ability for the Tlingit to connect to their Homeland.

3.7.2.3 Alternative C

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all action alternatives would be the same as those described under alternative B.

Alternative C Actions

Under alternative C, the number of private vessel permits would remain the same compared to current conditions, resulting in no change in impacts on Homeland values. Allowing motorized vessels in Wachusett Inlet for an additional two weeks would have slightly negative effects on Homeland values. Conversely, reducing access of motorized vessels in Muir Inlet for an additional month would have a beneficial impact on Homeland values, although this impact would be minimal given the short additional timeframe.

Alternative C would not allow private vessels longer than 79 feet to enter Glacier Bay. This may result in a beneficial impact to Homeland values by reducing impacts associated with larger vessels within this zone. Prioritizing lower-impact vessels in the distribution of private vessel permits under alternative C is unlikely to impact Homeland values in a meaningful way due to the small number of vessels that may receive a permit under this vessel category.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions would be as described above in the "Current and Expected Future Conditions of the Environment" section. As discussed, some past actions have negatively affected the Tlingit's ability to connect to Homeland. However, current park plans provide increased opportunities for the Tlingit to connect to their Homeland and should improve Homeland value. None of the actions in alternative C would detract from those ongoing efforts.

As described above, some of the actions proposed in alternative C would continue to detract from the Tlingit's connection to Homeland, such as changes to motorized and nonmotorized waters in Wachusett and Muir Inlets. However, most actions would improve the opportunity for connections with Homeland, including the definition of administrative use vessels, the exclusion of private vessels longer than 79 feet from Glacier Bay and the types of vessels allowed in the East Arm, Wachusett Inlet, and Muir Inlet. These actions, in addition to the existing and ongoing planned actions that benefit the Tlingit Homeland, would continue to improve Homeland value and the ability for the Tlingit to connect to their Homeland.

3.7.2.4 Alternative D

Impacts of Programmatic Actions Common to Alternatives B, C, and D

The impacts of programmatic actions would be the same as those described under alternative B.

Impacts of Site-Specific Actions

Actions Common to Alternatives B, C, and D

The impacts of actions common to all action alternatives would be the same as those described under alternative B.

Alternative D Actions

Under alternative D, the number of private vessel permits would remain the same compared to current conditions, resulting in no change in impacts on Homeland values. The timing of motorized and nonmotorized waters in Wachusett and Muir Inlet would be the same as alternative C, resulting in the same impacts. Similar to alternative B, private vessels longer than 79 feet would be allowed to enter Glacier Bay only if there is an unused cruise ship or tour vessel permit available, resulting in the same impacts discussed in alternative B. Additionally, restricting access of cruise ships and tour vessels from the East Arm from waters north of Muir Point would reduce impacts to Homeland resources there.

Cumulative Impacts

Overall, the impacts of past, present, and reasonably foreseeable planned actions are described above in the "Current and Expected Future Conditions of the Environment" section. As discussed, some ongoing vessel management actions have negatively affected the Tlingit's ability to connect to, and steward, their Homeland. However, current park planning efforts would enhance Homeland connections. Actions in alternative D would not detract from those ongoing efforts.

As described above, some of the actions proposed in alternative D would continue to detract from the Tlingit's connection to Homeland such as changes to motorized and nonmotorized waters in Wachusett and Muir Inlets. However, most actions would improve the opportunity for connections with Homeland, including the definition of administrative use vessels and the types of vessels allowed in the East Arm, Wachusett Inlet, and Muir Inlet. These actions, in addition to the existing and ongoing planned actions that benefit the Tlingit, would continue to improve Homeland value and the ability for the Tlingit to connect to their Homeland.

3.7.2.5 Comparative Conclusion of Alternatives

Under the alternative A, continued vessel traffic, including cruise ships, tour boats, and charter and private vessels would have an adverse impact on Huna Tlingit Homeland values by altering the traditional sense of place and potentially allowing for disrespectful visitor behavior and impacts to natural resources and the pristine ecosystem.

All action alternatives would have a beneficial impact to Homeland values because each requires that the NPS collaborate with the HIA to develop educational materials intended to educate park visitors about Homeland values, respected behavior, and traditional protocol. Educational materials would facilitate visitor understanding of tribal and clan territory and clarify that visitors are entering traditional territory, enhancing a tribal sense of hosting visitors.

Prioritizing lower-impact vessels in the distribution of private vessel permits under alternatives B and C and encouraging the use of lower-impact vessels under alternative D through adapted operating requirements is unlikely to impact Homeland values as discussed under each alternative.

Alternatives B and D would have beneficial impacts on Homeland values because private vessels longer than 79 feet would only be allowed access to Glacier Bay if an unused cruise ship or tour vessel permit is available and would be required to operate in the same capacity. Additionally, cruise ships and tour vessels would be prohibited from waters in the East Arm north of Muir Point, creating a more wilderness type experience. These restrictions would have a beneficial impact on Huna Tlingit Homeland values as it would be seen as more respectful to Homeland and its resources. Extending the nonmotorized vessel water timeframe in Muir Inlet to last three months under alternative B would have a beneficial impact on

Homeland values as it would eliminate motorized vessels in the inlet and strengthen the Huna Tlingit's perception of control/ownership of their ancestral Homeland.

Compared to alternative B, alternatives C and D would have fewer beneficial impacts on Homeland values due to increased motorized vessels in Wachusett Inlet and reduced access of motorized vessels to Muir Inlet for an additional month. However, restricting private vessels longer than 79 feet from Glacier Bay under alternative C would provide a benefit compared to alternatives B and D.

CHAPTER 4 LIST OF AGENCIES AND PERSONS CONSULTED

The NPS consulted with various agencies, tribes, organizations, and interested persons in preparing this document. The process of consultation and coordination is an important part of this project. A list of the federal and state agencies and tribes that were consulted is provided below.

- US Fish and Wildlife Service
- National Oceanographic and Atmospheric Administration National Marine Fisheries Service
- Hoonah Indian Association
- Yakutat Tlingit Tribe
- State of Alaska
- Alaska State Historic Preservation Office

Glacier Bay National Park

Marine Management Plan & EA

APPENDIXES

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LIST OF APPENDIXES

APPENDIX A: REFERENCES

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APPENDIX B: IMPACT TOPICS CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

The impact topics below were considered but dismissed from detailed analysis because it was determined that the potential environmental impacts to the resources or values would not be significant, are not central to the decision, or a detailed analysis of these impacts was not necessary to make a reasoned choice between alternatives. The reason for dismissing the topic from further analysis is provided.

Air Resources

The Clean Air Act requires the US Environmental Protection Agency to set National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter (PM), and lead (USEPA, 2018). Particulate matter is further designated into two different size classes: PM_{10} (particle size less than 10 microns) and $PM_{2.5}$ (particle size less than 2.5 microns).

The status of criteria pollutants in an area is described by three categories: attainment, non-attainment, and unclassified (USEPA, 2020). According to the US Environmental Protection Agency's definition, an area that meets or exceeds the standard is designated as in attainment/unclassifiable. Areas that do not meet air quality standards are in non-attainment. Areas are designated as unclassifiable if the US Environmental Protection Agency is unable to determine the status based on the available information (USEPA, 2020). Maintenance areas are areas that were previously a non-attainment area but are now consistently meeting the NAAQS. The airshed surrounding the park is in attainment, and existing air quality conditions are within the NAAQS. There is one maintenance area for PM_{10} located outside the city of Juneau in the Mendenhall Valley, approximately 45 miles outside the project area.

Within Glacier Bay cruise ships represent the single largest source of local pollutants (Pirhalla et al. 2014), including PM_{10}. When emitted into the airshed, PM_{10} can cause haze and directly influence visibility, which is an important Air Quality Related Value. While the average size of cruise ships has increased linearly over the past several decades (Gende et al. 2018), the daily quota of cruise ships visiting Glacier Bay will not change as part of this EA. More importantly, since the signing of the 2003 VQOR ROD from the VQOR EIS, the quality of fuel being utilized by cruise ships in Glacier Bay has improved substantially. As late as 2009, cruise ships were still burning heavy fuel oil in the park that had sulfur content averaging over 1.5% by wet weight. Now, however, all cruise ships operating in Glacier Bay are burning only marine gas oil that is a higher quality distillate than heavy fuel oil and produces much less PM_{10} and oxides of sulfur. A sampling of fuel quality during the summer of 2022, as part of the newly enacted Glacier Bay Environmental Monitoring and Compliance program, demonstrated that the percent of sulfur in fuel (marine gas oil) used in Glacier Bay averaged 0.0055%. While there will still be days when haze is formed when PM_{10} is emitted during strong inversions (Pirhalla et al. 2014) and under other atmospheric conditions (Mölders and Gende 2015), the concentration of PM_{10} and persistence of haze is likely to be substantially decreased compared to just 10 years ago.

In addition to a substantial reduction in total pollutants emitted in Glacier Bay over the past several decades, there has been a significant reduction in emissions from private vessels owing to the near ubiquity of four-stroke engines on private vessels with outboard motors, and an increase in private vessel activity would have little to no impacts on air resources in the park. Alternative B proposes an increase of five private vessels at any one time in the park (a 20% increase in private vessels within Glacier Bay at

one time). Additionally, alternatives B and C propose to separate overnight and day use permits in the private vessel quota, potentially resulting in more vessels traveling north up Glacier Bay to mid-Glacier Bay and the West Arm for glacier and wildlife viewing. These actions would not substantially change existing air quality conditions across Glacier Bay. Emissions from an increase of five private vessels per day under alternative B would be distributed throughout Glacier Bay. There would be a small possibility that emissions from day use vessels could concentrate in the Lower Bay, while the overnight vessels would likely travel more widely across Glacier Bay, dispersing their emissions but also potentially using generators in the evening. Private vessels longer than 79 feet would either be prohibited from entering the Glacier Bay Zone or would only be allowed within Glacier Bay on an unused cruise ship or tour vessel permit, minimizing impacts from those larger private vessels. Emissions would be temporary in nature and would be dispersed across a large geographic area. Changing vessel technology and encouraging lower-impact vessels would also continue to lessen emission impacts over time.

NPS administrative flights, search and rescue flights, fire management flights, and commercial air tours all currently impact air resources in some way; however, the addition of up to ten helicopter flights/landings per site used for the upgrade and installation of VHF radio and AIS transponder sites and two helicopter flights/landings per site per year for maintenance is unlikely to affect air resources in a meaningful way. Therefore, this topic was dismissed from further analysis.

Socioeconomics

Vessel management actions that affect the way locals visit the park, local spending habits, and tourism at multiple ports in southeast Alaska could affect the local and regional economies around the park. Alternative B would increase the private vessel quota by five, increasing opportunities for private boaters to enter and experience the park. The establishment of new vessel categories and new operating requirements are unlikely to increase or decrease local spending habits and tourism in the region since the change to the number of vessels the park accommodates daily would be modest.

During public scoping, some commenters expressed concern that the establishment of a lower-impact vessel category may affect visitors who cannot afford to purchase a lower-impact vessel, thus causing a disadvantage in the permitting systems described for alternatives B and C. The intent of creating this vessel category is to encourage the use of such vessels and influence future buying decisions. For this reason, the changes proposed in alternatives B and C are unlikely to affect the socioeconomics of private vessel owners seeking a permit.

During public scoping, some commenters also expressed concern that overnight permits (alternatives B and C) do not allow spending the night in Bartlett Cove and therefore would disadvantage individuals who cannot afford a sleep-aboard vessel but have a small skiff and would like to use a permit for a multi-day trip and return home each night. The intent of the overnight permit is to provide more equitable access opportunities to high-quality experiences of the glacial environment consistent with park purposes. The intent of the day use permit is to provide access for recreational activity primarily based out of Bartlett Cove. The proposal to adopt day and overnight permits is unlikely to impact socioeconomics because small skiff owners would have expanded opportunities (alternative B) and a dedicated allocation of permits during the peak season to support day use (alternatives B and C) compared to the existing system. At the same time, it is acknowledged that small skiff owners would have reduced opportunities for guaranteed consecutive day use permits during the busiest period of the visitor season (typically July) when Inside Passage cruising vessels typically arrive looking for high-quality experiences of the glacial environment consistent with park purposes. For this reason, the changes proposed in alternatives B and C are unlikely to affect the socioeconomics of private vessel owners seeking a permit.

While there is a financial burden for those wishing to visit the park due to its remoteness and difficult access, as part of the draft plan there would be no change to the quota for cruise ships that historically provide options for the most visitors from disparate locations and a range of economic backgrounds to visit the park. Therefore, this topic was dismissed from further analysis.

Environmental Justice

The closest environmental justice population is Hoonah, which is located more than 7 miles from the park (USEPA 2022). The potential increase in the number of private vessels allowed in Glacier Bay under the alternatives would be small and would not result in any substantial increase in noise, water, or air pollution impacts. Access to the park and related tribal resources would be managed under administrative use vessels and would not be subject to private vessel quotas. Alternative B would slightly increase opportunities for the public to visit the park through a small increase in the private vessel quota, while alternatives C and D would be similar to current conditions and would not affect environmental justice populations. As a result, no aspect of the proposed action and alternatives would result in disproportionately high and adverse human health or environmental effects on minority or low-income populations (EJ IWG and NEPA Committee 2016). Therefore, this topic was dismissed from further analysis.

Geological Resources

Terrestrial activities would be limited to the potential installation and maintenance of VHF radio and AIS transponder sites at existing locations. At this time, there would be no impacts to geological resources for the clearing or installation of equipment at existing sites. Oceanographic monitoring stations are proposed and would include the annual deposit and subsequent abandonment of one 800-pound train wheel or another appropriate anchor on the ocean floor. This anchor is not likely to damage any geologic resources but may alter the sediment structure near the anchor. Additionally, floating cabins/seasonally moored vessels for administrative use may be anchored to the shoreline below mean high tide or to the ocean floor. The design of these cabins would be similar to existing floating cabins within the park, and the installation and maintenance of these cabins has not impacted geologic resources.

Vessel management focuses on open-water activities. Anchoring damage from private vessels may increase under the range of alternatives, but this damage would be highly localized and would likely have more of a biological impact than a geologic impact that alters sediment structure. Under all alternatives, changes to the way private vessels longer than 79 feet use the park would decrease impacts from anchoring for this vessel group. These vessels would either not be allowed to enter Glacier Bay or would only be allowed into Glacier Bay on an unused cruise ship or tour vessel permit, which would not occur very often because unused cruise ship and tour vessel permits are expected to be rare and would first be offered to other tour vessels and charter vessels, further reducing the number of private vessels longer than 79 feet entering Glacier Bay. For these reasons, this topic was dismissed from further analysis.

Lightscapes/Night Skies

While an increase in vessel activity could affect night skies, the main visitor use season does not coincide with dark night skies at the park because of the long daylight hours in Alaska during the summer. Additionally, the proposed action and alternatives would minimally increase the private vessel quota, establish new vessel categories, and impose new operating requirements; however, these actions would not substantially change existing conditions for night skies. Therefore, this topic was dismissed from further analysis.

Vegetation

Vessel management actions would have minimal impacts on vegetation. As noted above, terrestrial activities would be limited to the installation and maintenance of VHF radio and AIS transponder sites at existing locations. There may be less than a 10-foot radius of ground disturbance for the repeaters at existing locations. Some existing sites would require site clearing for helicopter landings, depending on the location. These locations would range from sea level to high altitudes. Direct impacts on vegetation would result from foot traffic, anchoring of equipment, and maintaining clearances over time. Vegetation impacts would be highly localized: limited to the area immediately surrounding the station. To minimize the possibility of introducing invasive plants, mud, dirt, and plant material would be removed from project equipment, footwear, and clothing prior to traveling to any station sites. Stations would be monitored for the presence of invasive species during annual maintenance visits. The installation of VHF radio site and AIS transponder sites in existing locations is unlikely to have any impacts on vegetation outside the immediate 10-foot radius of the site. Because the ground disturbance would be small compared to the park as a whole and because this issue is not central to the decision, this topic was dismissed from further analysis.

Human Health and Safety

Permanent structures to facilitate or support vessel access are not provided outside Bartlett Cove. Other facilities or installations are limited to those needed for essential communication, law enforcement, research, navigational, or safety purposes, which would improve human health and safety.

An increase in the private vessel daily quota may slightly increase the risk associated with vessel wakes, which could affect the safety of kayakers, damage archeological resources, and potentially have adverse impacts on the surrounding onshore environments. However, these impacts are more likely from larger vessels (i.e., cruise ships, tour vessels, some charter vessels, and private vessels longer than 79 feet) than smaller private vessels. With a proposed increase of only five private vessel permits per day under alternative B, no changes to the quotas for cruise ships, tour vessels, or charter vessels, and a reduction or elimination of private vessels longer than 79 feet entering Glacier Bay, any potential increase in impacts on human health and safety would be minimal. Therefore, this topic was dismissed from further analysis.

Cultural Resources (Archaeological Resources, Landscapes, Museum Collections, Prehistoric/ Historic Structures)

Cultural sites may be indirectly affected if they become increasingly accessible or easily identifiable through changes to current vessel management practices. The draft plan proposes no changes in the management of known historic structures. Changes to vessel management could affect the nine cultural landscapes that have been identified in the park with only three inventories completed to date. Undocumented landscapes include Berg Bay, Cape Spencer, Dry Bay, Excursion Inlet, Ibach Cabin/Garden Remains, and Lituya Bay. The proposed alternatives could minimally increase the private vessel quota, establish new vessel categories, and impose new operating requirements, which would not substantially change current conditions around access to onshore cultural resources. An increase in the private vessel quota under alternative B may slightly increase the risk associated with vessel wakes, which has the potential to damage near-shore archeological resources. However, the proposed increase of five private vessel permits per day across the entire Glacier Bay Zone is unlikely to create wakes large enough to affect terrestrial archeological resources in ways that differ from current conditions. Some onshore activities are covered under the BWMP (in preparation) and FMP (NPS 2019a) as well under as concession contracts. Programmatic actions such as the installation of VHF radio and AIS transponder

sites would occur in areas that would not impact cultural resources, including landscapes, because these actions would occur in existing locations and additional site-specific analysis would be completed before implementation, including archeological surveys, if necessary. Therefore, this topic was dismissed from further analysis.

Nonnative or Exotic Species, Terrestrial Wildlife, Seabird Species, and Fish Species

Nonnative and Exotic Species—An increase in vessel activity could affect other biological resources in the park or introduce more invasive species from boat hulls. However, the proposed action and alternatives would minimally increase the private vessel quota, establish new vessel categories, and impose new operating requirements that would not substantially change current conditions around non-native and exotic species resources. For this reason, this issue was dismissed from further analysis.

Terrestrial Wildlife—Terrestrial activities would be limited to the potential installation and maintenance of VHF radio and AIS transponder sites, which may displace wildlife in the immediate vicinity during installation and maintenance. Disturbance would be temporary, lasting only during installation and annual maintenance. These locations would range from sea level to high altitudes. Access would occur by motorized vessel, on foot, and by kayak, float plane, and helicopter. Impacts to wildlife associated with similar installations are described in the 2015 *Climate Monitoring Program in Glacier Bay National Park and Preserve Environmental Assessment* and would have no meaningful effect on wildlife within the park (NPS 2015a). This document assesses the installation of climate monitoring equipment associated with the expansion of the Southeast Alaska Network Inventory and Monitoring program and is incorporated by reference (available online). For these reasons, terrestrial wildlife was dismissed from further analysis.

Seabird Species—Short-tailed albatross have the potential to occur within or around the project boundary. This species' range spans the Pacific Rim from southern Japan, along the Aleutian Islands, to the Bering Sea, and around to Northern California. According to the 2008 US Fish and Wildlife Services Short-Tailed Albatross Recovery Plan, "Short-tailed albatross may be relatively common near shore but only where upwelling "hotspots" occur in proximity to the coast; and that it would be more accurate to label the species as a "continental shelf-edge specialist" than a coastal or nearshore species (page 7)." (USFWS 2008). There have been no known observations in the park. As such, expected seabird activity in Glacier Bay National Park marine waters would be offshore with no expected landings within the project area. For this reason, this species was dismissed from further analysis.

Fish Species—Over 200 known fish species inhabit the park, and all of these species have populations that extend beyond the park. There are no known endemic species, though depending on the species' life history traits, strong genetic structure or unique stocks are common. Only a small fraction of the fish populations are monitored, and most are considered healthy, although some species have diminished populations and are considered species of concern. These species are often intensively fished or have life history traits that make them more vulnerable to environmental change (climate change, marine heatwaves, ocean acidification) and overfishing.

Though not sought after as much as ground fish species, salmon are harvested in Glacier Bay through commercial and recreational fisheries under both federal and state regulations. Five species of salmon occur in the waters of Glacier Bay. In addition, steelhead trout (*Oncorhynchus mykiss*), a rainbow trout that spends much of its life in salt water, is also found in the waters of Glacier Bay.

Ground fish found in Glacier Bay include skates, cods, rockfishes, sculpins, and flatfishes. Because of its commercial value, the Pacific halibut (*Hippoglossus stenolepis*) is the most high-profile ground fish species in the park and is sought after recreationally. Halibut are found on a variety of bottom types. This

population is managed by the International Pacific Halibut Commission and the state of Alaska and is relatively data rich. The 2021 stock assessment indicates that the Pacific halibut stock declined continuously from the late 1990s to around 2012, gradually increased to 2016, and then decreased again to the beginning of 2022 (IPHC 2022). While the stock is estimated to have declined by 17% from 2016 to 2022, it is currently at 33% of the unfished state across its range and is therefore not considered overfished (IPHC 2022). By area, the park's marine waters encompass 54% of the Alaska Department of Fish and Game's recreational statistical area, yet harvest and fishing effort of Pacific halibut in Glacier Bay marine waters only make up 20% of the larger area total (Alaska DFG 2022). Though there could be circumstances where fishing in the park leads to temporary local depletions, the current intensity of fishing has likely not. The halibut population is considered a coastwide stock (little genetic structure) (Alaska DFG 2022). This alleviates any concern of fisheries in the park having larger population level effects.

Vessels and vessel management effects on fish are largely indirect, through recreational and commercial fishing. Current vessel management, such as vessel quotas within Glacier Bay, has reduced recreational fishing intensity and harvest within the park. Additionally, to participate in one or more of the authorized commercial fisheries in Glacier Bay, a person must possess a Lifetime Access Permit. Lifetime Access Permits are not transferable to another person; thus, commercial fishing within Glacier Bay will continue to decrease until no Lifetime Access Permits are left. Recreational fishing tends to occur more as a day use activity than an overnight activity. Therefore, based on the changes to permits and the allocation of private vessel permits between overnight and day use under alternatives B and C that would encourage the use of permits by visitors wanting to travel up the bay to view the glaciers, the opportunity for visitors to engage in day use activities, like fishing, may decrease, which would result in a decrease in fish harvest. However, any changes would likely be minimal because there would still be five day use permits available for use under alternatives B and C, as well as the opportunity to convert unused overnight permits into day use permits. Additionally, alternative D would be similar to current conditions with no designation of overnight versus day use permits. Thus, impacts on fish from fishing activities as a result of changing the management of private vessels would be minimal.

Direct effects on fish from marine vessels are less well studied and understood than marine mammals, but there are studies (NPS 2003b) that demonstrate underwater noise from vessels can change some fish species behavior; increase stress, predation vulnerability; and have detrimental energetic costs. These potential negative effects have not been demonstrated to have population level consequences (NPS 2003b). Fish species are abundant and with only a small increase in private vessels permits (five) under alternative B and no change from current conditions under alternatives C and D, any impacts on fish species would be minimal and would certainly have no population level impacts. For the reasons listed above, fish were dismissed from further analysis.

Water Resources

Vessel traffic affects water quality by introducing water pollutants from gray and blackwater discharges and has the potential to affect water quality if a fuel spill were to occur, especially from a large vessel. However, the increase in number of private vessels (five under alternative B, and zero under alternatives C and D) would not likely be large enough to have a measurable adverse impact on water quality within Glacier Bay. Reducing the maximum length of private vessel permits from seven days to five days would decrease the amount of time a vessel is allowed to anchor. This could result in a slight benefit to water quality because vessels would have less opportunity to build up and release greywater directly into the bay.

Because of their size, private vessels longer than 79 feet have the potential to affect water quality to a greater extent than smaller private vessels. However, the alternatives would either not allow private vessels longer than 79 feet to enter Glacier Bay or would only allow them into the bay on an unused cruise ship or tour vessel permit. Prohibiting private vessels longer than 79 feet from entering Glacier Bay would remove their potential impacts (e.g., reducing wake size from very large vessels would limit the re-suspension of sediment and nutrients in the water column of shallow areas). If these vessels were allowed to enter on an unused cruise ship or tour vessel permit, they would be required to follow cruise ship or tour vessel operating requirements, such as prohibiting wastewater discharge, that mitigate the impacts on water resources. In addition, requiring private vessels longer 79 feet to follow the operating requirements of cruise ships and tour vessels would limit the extent they can travel in the East Arm and require their operators to follow existing water quality protection measures currently in place for tour vessels. Encouraging the use of lower-impact private vessels would benefit water quality by reducing the amount of pollution entering the water. The reduced wake sizes produced by lower-impact vessels would resuspend less bottom material and nutrients in shallow areas of Glacier Bay, benefiting water quality-. However, under alternative D if lower-impact vessels are allowed to operate closer to shore, this could negate this benefit. Restricting cruise ships, tour vessels, and private vessels longer 79 feet from the majority of the East Arm (areas north of Muir Point) would also protect water quality and sensitive habitat in those areas. Overall, because the alternatives would result in minimal impacts on water quality, this topic was dismissed from further analysis.

Wilderness

The park preserves one of the largest units of the National Wilderness Preservation System, encompassing more than 2.6 million acres. The defining qualities of wilderness from the Wilderness Act (Section 2(c)) include: (1) untrammeled, or "affected primarily by the forces of nature"; (2) undeveloped, or "without permanent improvements or human habitation"; (3) natural, whereby the land is "protected and managed so as to preserve its natural condition"; (4) "outstanding opportunities for solitude or a primitive and unconfined type of recreation"; and (5) other features of value, including scientific, educational, scenic, or historical. Wilderness is managed according to these five different qualities of wilderness character. For Glacier Bay Wilderness, the category of "other features of value" includes (1) marine wilderness, and (2) natural change as a foundation for scientific study.

No actions proposed in this plan would affect the untrammeled quality of wilderness character at the park. Proposed communication upgrades including VHF radio and AIS transponder sites could be placed in wilderness at existing communication infrastructure locations and would detract from the undeveloped quality of wilderness character at the park. VHF radio and AIS transponder sites would be co-located with other infrastructure and could be placed in up to ten sites ranging from sea level to higher locations. At each existing location, a mast or tower and antenna with mounted hardware would be installed and would include a weatherproof battery, and additional support equipment. The total footprint for the installation would be less than a 10-foot radius. Access to the site for installation and maintenance would occur by foot, boat, float plane, or kayak. Where areas are too dangerous or remote for access by these means, a helicopter may be used. It is assumed that up to ten helicopter landings per site may be required for installation and up to two annual landings for maintenance purposes per site. Helicopter deliveries to transport equipment to VHF radio and AIS transponder sites would adversely impact the undeveloped quality of wilderness because helicopter use would be in conflict with the absence of mechanization. The noise would also adversely impact the natural condition of wilderness because it would degrade the natural acoustic environment, disturb or displace wildlife, and degrade the wilderness quality of solitude for park visitors.

Currently, some developments within the park detract from the primeval influence of the wilderness. Research installations and existing communication infrastructure can provide data that ultimately improve wilderness management; however, installations themselves are visible signs of human dominance over the landscape. Installations and the motorized access methods used to repair and maintain them affect the undeveloped quality of wilderness. When the impacts of these existing installations are combined with the impacts from ten proposed installations at existing sites in wilderness, impacts to the undeveloped and natural qualities of wilderness would likely remain unchanged. Prior to any communication upgrade installations in wilderness, a detailed wilderness minimum requirements analysis would be conducted to determine the minimum tools required to undertake the action, consistent with Section 4(c) of the Wilderness Act and NPS *Management Policies 2006.*

Changes to private vessel management and operating requirements for other vessels could indirectly impact opportunities for solitude or a primitive and unconfined type of recreation. Under alternative B, an increase of five permitted vessels could increase noise in some areas and increase the number of vessels within a viewscape, which could detract from the feeling of solitude.

A detailed analysis of the environmental impacts related to wilderness character is not necessary to make a reasoned choice between alternatives and impacts related to wilderness are not central to the EA. For these reasons, impacts to wilderness were dismissed from further analysis.

Impacts Resulting from Subdividing Management Zones

The park's GMP includes five management zones: Non-Wilderness Waters Zone; Wilderness Lands Zone; Wilderness Waters Zone; Development Zone; and Special Use Zone. The Non-Wilderness Waters Zone includes most of the marine waters within Glacier Bay and is the zone where vessel quotas and operating requirements apply. Under all the action alternatives, the Non-Wilderness Waters Zone would be further subdivided into three subcategories as described in chapter 2 of the EA. Importantly, the Non-Wilderness Waters Zone would not be removed or replaced and subdividing the existing zones would not change or affect the human environment. Any actions within the zones that could result in an environmental effect are analyzed in this EA. For this reason, the impacts associated with zoning were dismissed from further analysis.

APPENDIX C: ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

The NPS considered but dismissed from further analysis the following alternatives or alternative elements.

Decrease in Private Vessel Quotas from Current Levels

Decreasing the quota for private vessel permits was considered, but it would not meet the purpose and need for the project. Decreasing the quotas for private vessel permits would decrease access opportunities and the diversity of visitors to the park. Therefore, decreasing the private vessel permit quotas was dismissed from detailed analysis.

Increase in Private Vessel Quotas More than Five Vessels Per Day from Current Levels

Increasing the number of private vessel permits beyond what is being proposed was considered, but it was determined that this would not adequately meet the purpose and need for the project or the park's desired conditions. Analysis of private vessel usage statistics indicated that under the current daily quotas, a high proportion of days are not fully utilized, so an increase of more than five private vessels per day is not necessary. Instead, actions proposed under several alternatives aim to make better use within the existing daily quotas without impacts on the viewscape or creating more congestion points that would adversely impact the high-quality visitor experience and resource protection the park aims to achieve. Not expanding private vessel use levels beyond the increase proposed in one alternative also supports balancing the benefits and tradeoffs related to levels of vessel use and visitor experience quality. Increasing the quotas would create higher intensities and concentrations of use during the summer season that would detract from acceptable social conditions, including the flexibility for private boaters to seek out and obtain solitude (Swanson and Vande Kamp 2011, Furr et al. 2021). Increasing the quotas would also expand public access to valued and sensitive environmental and cultural areas where management restraints would be required to protect resources, further reducing the freedoms to explore and experience the park at will that are highly valued by this user group. Therefore, increasing the private vessel permit quotas beyond what is being proposed was dismissed from detailed analysis.

Because an increase in the number of private vessel permits greater than five permits per day from current levels would not adequately meet the purpose and need or the desired conditions of the park, it was dismissed from detailed analysis.

Changes to Quotas for Commercial Vessels: Cruise Ships, Tour Vessels, Charter Vessels, and Passenger Ferry

Increasing or decreasing some or all of the vessel quotas for the other four vessel types managed by the park (cruise ships, tour vessels, charter vessels, and passenger ferry) was considered. However, the quotas for these vessel types are being managed according to the 2003 VQOR ROD from the VQOR EIS and the annual Park Compendium, allowing the park to meet its mission, while also protecting and maintaining the park's desired conditions for its fundamental resources and values. Additionally, potential increases to the quotas for some or all of the other four park-managed vessel types could cause too great of an environmental or visitor use experience impact and would not largely meet the purpose and need for taking action. Therefore, this topic was dismissed from detailed analysis.

Changes to Vessel Management in Dundas Bay or the Outer Coast

The primary location for vessel use in the park is within the Glacier Bay Zone. Existing restrictions within concessions contracts, and the 2003 VQOR ROD outline the appropriate vessel uses in Dundas Bay, provide adequate protection to park resources, and do not need to be adjusted at this time. These areas do not meet the purpose and need because vessel quotas do not apply to these areas and are beyond the scope of analysis. Therefore, expanding vessel management to encompass Dundas Bay and/or other park waters outside Glacier Bay, including the Outer Coast and Icy Strait/Cross Sound Zones, was considered but dismissed from detailed analysis.

Changes to Nonmotorized Waters to Match Call-in Season

Changing the dates for the nonmotorized waters of Muir and Wachusett Inlets to match the call-in season and revised permit season from May 1 to September 30 was considered to simplify the system and unify the regulatory dates for various types of use. Extending the nonmotorized water dates to match the revised permit season would reduce the opportunity for visitors using motorized vessels to experience these waters especially during the late season when there would be limited conflict with users preferring nonmotorized experiences. These changes would not meet the purpose and need for the proposed action to broaden access opportunities for visitors and ensure management of all vessel types provides visitor access to the park in a manner that complements and helps achieve the desired conditions under the plan.

The park also considered changing the dates of the other four nonmotorized areas that are designated Wilderness (Adams Inlet, Rendu Inlet, Hugh Miller/Scidmore Complex, and the Beardslee Island areas) within the BWMP (in preparation) Wilderness Waters Zone. However, management of these waters is successfully providing wilderness and solitude opportunities, thus changes would not meet the purpose and need for taking action.

APPENDIX D: MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES

To ensure protection of the park's fundamental resources and values, the following mitigation measures and best management practices would be implemented under all action alternatives. The NPS has the authority to implement the mitigation measures presented in this appendix under the Organic Act, The National Historic Preservation Act, NPS *Management Policies 2006*, park-specific regulations at 36 CFR Part 13 Subpart N, and other federal and state applicable requirements.

GENERAL RESOURCE PROTECTION PRACTICES

One of the greatest risks to park waters, wildlife, Tlingit Homeland, and visitor enjoyment are the risks associated with grounding and sinking of vessels and/or potential for discharge of fuels, hazardous materials, and other wastes that are spilled into park waters. For this reason, the park would focus on prevention, education/training for vessel captains and crew, preparedness, and immediate reporting of incidents to park personnel and the following range of actions:

Spills would be cleaned up in accordance with all applicable state and federal environmental quality laws. Incident command and spill response activities would seek to include tribal and resource specialist input where real time decisions are needed to help protect resources. Additionally, the park would work on many preventive ongoing activities with partners to help with response readiness:

- Continue to reduce the need to ship diesel fuel into Glacier Bay to power the park diesel-powered generator system in Bartlett Cove by optimizing the overall grid use of Falls Creek hydropower and increasing the energy efficiency of park facilities and the fleet (including marine vessels).
- Recognizing that the park's dynamic shorelines are important natural transition zones between marine and land ecosystems, continue to collaborate to keep current data on biological, physical, geological, and sensitive cultural sites along coastlines to support prioritization of response in the event of a spill; build on past baseline data collection efforts (Coast Walker, ShoreZone Program); and leverage opportunities to partner.
- Continue the operation of the park's FIRST team to quickly respond to vessel spills in the park. Continue training park staff in the Science of Oil Spills and other courses in strategies to respond to hazardous spills.
- Continue to study geohazards and work to minimize the chance of a tsunami-induced vessel incident (e.g., early warning systems, hazard maps, NPS mooring site selection for floating raft/seasonally moored vessel or fuel barge).

ALL MARINE VESSELS

- Prosecute the abandoning of boats, cargo, property, or illegal dumping in park waters to the fullest extent allowed under the law or contracts and seek maximum fines and penalties for damages to remediate impacts to park resources. Develop a salvage coordination response plan to coordinate with key parties to reduce impacts to resources and visitors.

- Depending on the alternative selected for implementation, private vessels longer than 79 feet entering the park would follow vessel restrictions outlined in commercial contracts where they meet vessel class definitions (EA analysis is based on 2022 contracts and subject to change; see park website for current contracts).
- Operation of all vessels within park boundaries would be in accordance with US Coast Guard regulations.
- Vessel use patterns in park waters would be monitored using an AIS and other tools to identify potential future management concerns.
- If a vessel is damaged and must be salvaged, 36 CFR § 3.14 prevails and prompt removal through park permitting is required.
- Abandoned property, including litter, fishing gear, or otherwise, would be collected and disposed of properly (36 CFR § 13.45).

Administrative traffic and marine operations supporting park business:

- Reduce fuel handling via fuel barge or jugs as a normal part of marine field operations and standardize park vessels to incorporate catchments for inadvertently spilled fuels.
- Reduce refueling at sea by increasing vessel fuel capacity to meet the mission whenever possible and by reducing the dependence on and evaluating alternatives to the mid-bay fuel barge.
- Add the capability for vessels to use portable fuel tanks when additional capacity is required, rather than dispensing fuel from jerry cans or the barge whenever possible.
- Upgrade the marine fleet for energy efficiency, and pilot emerging technology (e.g., away from combustion engines and toward electric engines) that optimizes the use of local renewable energy within the community (Falls Creek Hydroelectric Project) by taking advantage of off-peak night-time low-energy use.
- Coordinate park missions with vessel sustainability and fuel use in mind.
- NPS administrative motorized vessel use would be carefully planned and implemented for optimal efficiency and sensitivity to minimize impacts to park resources and values including fuel consumption, air and water pollution, above- and below-water noise pollution, and visual impact. The park would explore emerging technology for vessels that would meet this overall objective.

Commercial services contracted vessels:

- Compete commercial services contracts to higher standards of sustainability and operational efficiency and ensure that contract standards are enforced through a standardized compliance system.
- Commercial vessel operators would receive a customized orientation to the conditions, hazards, and resource concerns in park waters.
- Encourage through the commercial services contracts, carriage of lighter higher quality distillate fuels such as marine gas oil over bunkering of heavy fuel oil.

- Require a local industry-point of contact by which all issues related to discharge (incidental, small- and large-scale) are immediately reported and associated conditions and causes in which discharge occurs in Glacier Bay.
- Ensure, through annual monitoring of concession contracts, that oil spill response plans for commercial vessels are reviewed annually, are appropriate, and represent the best available technology and preparedness for mitigating a spill or potential grounding should one occur.
- Conduct scenario and response exercises annually with the industry and partners specific to mid to large sized commercial vessels running aground with possible discharge of oil or other hazardous materials.
- Continue a Glacier Bay Cruise Ship Environmental Monitoring and Compliance program, whereby independent marine engineers or vessel inspectors are contracted to randomly board large cruise ships to inspect operations, risk management procedures, permits, and compliance to contract-specific operating requirements.
- Inform through regular communications, especially tour and charter vessel operators that are more likely to take near-shore routes (as opposed to typical mid-channel routes taken by large cruise ships), of newly identified navigational hazards, particularly in response to rapidly changing conditions in and near the tidewater glacial areas.

Private vessel owners:

- Private vessel operators would receive, through the Glacier Bay Visitor Information Station, an orientation to the marine environment and regulations when getting a permit to enter Glacier Bay.
- The proper use, care, and disposal of hazardous materials, such as chemicals, preservatives, batteries, and refrigerants, brought into the park remain the responsibility of the user.
- The park would remain diligent in ensuring private vessels meet federal regulations (i.e., US Coast Guard, US Environmental Protection Agency).

CULTURAL RESOURCES

The NPS would conduct National Historic Preservation Act Section 106 reviews prior to implementation of some programmatic actions, where appropriate. This may include a site-specific inventory, buffers to mitigate impacts to archeological materials, and existing development area surveys prior to upgrades where sites have not previously been surveyed.

Unless specifically authorized, disturbance of historic or cultural features would not occur; artifacts would not be collected; management actions and activities (e.g., terrestrial or seafloor installations) would avoid and buffer cultural sites; and if archeological or historic resources are discovered, work would stop at the discovery site, the discovery would be protected as required and the park Superintendent or Park Archeologist would be notified as soon as possible. Information and photographs regarding the location (including Global Positioning System [GPS] coordinates), size, and nature of the discovery should be provided, if possible. All projects with the potential for ground disturbance or any adverse effects would undergo site-specific planning and compliance procedures. Adverse impacts to archeological or ethnographic resources would be avoided to the extent possible in accordance with the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation.*

To appropriately preserve and protect national register-listed or eligible historic cultural landscape features, traditional cultural properties, and ethnographic resources, areas of potential effect would be identified and fully recorded prior to implementation of proposed projects.

Park staff would continue to develop inventories for and oversee research regarding archeological, historic, and ethnographic resources to better understand and manage the resources, including the development of maritime cultural landscapes. Park staff would conduct any needed archeological or other resource-specific surveys and National Register of Historic Places evaluations and identify recommended treatments. The results of these efforts would be incorporated into comprehensive planning and resource assessments, as well as site-specific planning, mitigation, and environmental analysis.

Known archeological sites would be routinely monitored to assess and document the effects of natural processes, human activities, and visual impacts associated with proposed projects on the resources. Archeological resources would be left undisturbed and preserved in a stable condition to prevent degradation and loss of research values unless intervention could be justified based on compelling research, interpretation, site protection, or park development needs. Recovered archeological materials and associated records would be treated in accordance with NPS *Management Policies 2006*, NPS *Museum Ha*ndbook, and 36 CFR § 79.

Prior to site selection for oceanographic research moorings, a review of shipwrecks in Alaskan waters would be undertaken to ensure that no known shipwrecks are located within or near the proposed deployment. The review would be based on internet web searches and entries archived at appropriate online sites. Removable non-permanent moorings would be prioritized when possible as they do not represent potential future artifact assemblages, nor do they add extraneous cultural material and waste to a pristine marine environment. If a non-retrievable mooring is utilized, the mooring anchor would be engraved with the year it was deposited and all associated federal permit numbers so that if recovered the project, purpose, and date can be readily determined. It is recommended the location information of each mooring be recorded in project reports with the greatest accuracy possible. As appropriate, archeological, and ethnographic inventories and monitoring would precede any ground disturbance, installation, or proposed project in a potential Traditional Cultural Property. Significant archeological resources would be avoided to the greatest extent possible during installation. If such resources could not be avoided, an appropriate mitigation strategy (e.g., the excavation, recordation, and mapping of cultural remains prior to disturbance to ensure that important archeological data is recovered and documented) would be developed in consultation with the Alaska State Historic Preservation Office, associated Alaska Native tribal representatives, and other concerned parties as necessary.

Following inadvertent discoveries that halt work, resources would be identified and documented and if they cannot be preserved in situ, an appropriate mitigation strategy would be developed. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 United States Code 3001) of 1990 would be followed. If non-Indian human remains were discovered, standard reporting procedures to notify appropriate authorities would be followed, as would all applicable federal, state, and local laws.

To minimize visual and auditory intrusions on cultural resources from modern development, the NPS would use screening or sensitive designs that would be compatible with historic resources and cultural landscapes and not intrude on ethnographic resources. If adverse impacts could not be avoided, impacts would be mitigated through a consultation process with all interested parties. In the case that mitigations

do not sufficiently address adverse impacts, the park would reconsider the scope of the proposed undertaking.

The NPS would consult with associated Alaska Native tribal representatives to develop and accomplish park programs in a way that respects the beliefs, traditions, and other cultural values of the tribes who have ancestral ties to park lands. The NPS recognizes the past and present connections of associated tribes with park lands and that potential resources, places, and traces of tribal use are important parts of the cultural environment to be preserved, protected, and interpreted as appropriate.

The park would cooperate with partners, park neighbors, and other stakeholders to establish and enforce measures to prevent and reduce human impacts, such as vandalism and looting, on cultural resources.

FISH AND MARINE INVERTEBRATES

Specific to recreational and allowed commercial harvesting of fish and marine invertebrates, the park would monitor for both immediate and long-term impacts to fish populations, marine invertebrates, and their associated habitats. This includes collecting data to estimate abundance, spatial distributions, and biometrics in park waters to inform park management decisions, and ongoing efforts to preserve pristine water quality and the health of food webs. Knowledge of natural distributions, densities, age class distributions, and the behavior of harvested and non-harvested species that may be impacted from harvesting will be applied to prevent unacceptable impacts to park resources or natural processes.

The park would consult and collaborate with state and federal fisheries management agencies to help conserve harvested species, including continuing to pursue an Alaska Department of Fish and Game and NPS cooperatively developed fisheries management plan for commercial fisheries in park waters outside of Glacier Bay as directed by Congress. The NPS would explore new research opportunities and continue collaborations with partners, park neighbors, and other stakeholders. This may include projects focused on data consolidation, fisheries, species and habitat monitoring, and science specific to microplastics, harmful algal blooms, ocean acidification, or other ocean health indicators.

Federal Subsistence fisheries are not allowed in Glacier Bay. Fishing in Glacier Bay by park visitors is a recreational activity. Recognizing this, the park will prioritize the experiential nature of this activity over harvest goals.

For visitors participating in recreational angling and harvest of invertebrates apply the following mitigations:

- Provide details on the best available conservation fishing practices to visitors and charter fishing concessionaires to share with visitors including a focus on catch and release fishing.
- Collaborate with the Alaska Department of Fish and Game to clearly communicate allowed recreational gear types, seasons, any closures, and licensing requirements with the public (and that no federal subsistence fisheries are authorized).
- Communicate State of Alaska fish consumption guidelines associated with toxins such as mercury.
- Help interpret for park visitors the abundance of fish and marine invertebrate populations in and near Glacier Bay in the context conservation decisions that had impacts to human livelihoods (such as described in *Navigating Troubled Waters: A History of Commercial Fishing in Glacier Bay, Alaska* [NPS 2010b]).

- Communicate risks from biological toxins to visitors and continue to investigate harmful algal blooms that may increase risk to visitors that fish and collect marine invertebrates.

Develop science briefings to instill visitor respect for and knowledge of the aquatic environment, the food web, and long-lived species in the park (halibut, scallops, rockfish) that are more prone to harvest or other environmental pressures.

The park would educate visitors on proper disposal of fish waste, and work with regional partners to minimize attraction of wildlife associated with fish processing discharge activities.

MARINE MAMMALS AND SEABIRDS

The NPS would monitor humpback whales, sea otters, harbor seals, Steller sea lions, and seabirds to estimate abundance, trends, and spatial distribution and to provide current data to inform park management decisions in Glacier Bay. The park would increase efforts to better understand marine mammals and seabirds within the Icy Strait/Cross Sound and Outer Coast Zones by exploring new research opportunities and continuing collaborations with external partners. This may include projects focused on data consolidation, the creation of species lists for the outer coast, etc.

The park has specific vessel operating regulations to protect humpback whales, Steller sea lions hauled out on land or rock, harbor seals hauled out on ice and in the water, and nesting seabird colonies. In addition, temporary and spatial protection measures (36 CFR § 13.50) may be implemented to protect marine mammals and seabirds and their habitats anywhere in the park. For example, the park may designate temporary whale waters (areas with vessel speed limits and/or course restrictions) to reduce the disruption of feeding humpback whales and to lower the risk of whale/vessel collisions. If a marine mammal or seabird becomes a candidate or listed species under the ESA, additional monitoring and spatial/temporal management restrictions may be implemented to reduce mortality and overall disturbance.

The NPS would continue to require the operator(s) of all motorized vessels entering Glacier Bay to complete an annual boater orientation and all visitors utilizing non-motorized vessels and staying overnight in Glacier Bay to complete an annual backcountry camping orientation through the Glacier Bay Visitor Information Station. During these orientation processes, both visitor groups get an overview of the park's regulations within CFR and the annual Park Compendium as well updates on seasonal or area closures. In addition to sharing information on park regulations, park staff would continue to educate vessel operators on the NOAA Alaska Marine Mammal Viewing Guidelines and Regulations (NOAA Fisheries 2022b) and best practices for minimizing disturbance to nesting seabirds as well as molting seabirds.

The NPS would work on ways to effectively communicate with commercial operators (e.g., annual meetings with tour vessel companies) to provide updated resource information and summaries of marine regulations so that they may understand park regulations and share in goals of marine stewardship.

Vertical buoy lines associated with vessel anchors, moorings, and some types of fishing gear pose an entanglement risk to marine mammals, especially the baleen whale species known to frequent the project area (i.e., humpback whales, minke whales). Therefore, to reduce the risk of a whale becoming entangled in the park, the following mitigations would be implemented:

- Prior to deploying NPS moorings in park waters, the park whale biologists must be consulted for the best available information (including Whale Alert) regarding current humpback whale "hot spots" to avoid deployment in high whale-use areas.
- If any of the NPS moorings in Glacier Bay go missing, the park whale biologists would initiate a search of the area for a potentially entangled whale.
- If marine mammal entanglement in a NPS mooring is observed, park staff would implement strategies to reduce risk of entanglement, such as changing the location of moorings or experimenting with devices to alert whales to the presence of an obstacle.
- Vertical length of NPS moorings would be minimized when possible, and the integration of rope-less technologies would be explored when feasible. The park would use weak-link or other technologies when possible to maximize the possibility of self-release in the case of marine mammal entanglement. Depending upon the mooring type and location, additional mitigations may be required.
- During project design, the composition and configuration of NPS moorings would be done in consultation with NPS marine mammal subject matter experts. Post-installation, an accurate schematic design of each NPS mooring would be provided to the park's Compliance Team for documentation and to aid in entanglement response.

TERRESTRIAL WILDLIFE, BIRDS, AND VEGETATION

The NPS would continue to educate visitors about where they may encounter nesting birds, nest identification, nesting bird behavior, and appropriate responses (such as moving elsewhere) to minimize disturbance to nesting birds. Spatial or temporal closures would continue to be implemented in places where foot traffic or other human presence is detrimental or disturbing to nesting birds or hauled out marine mammals, or if bear kills or other factors create a human safety risk (36 CFR § 13.50). If changes in nesting success and survivorship because of disturbance were observed, park staff would implement strategies to reduce human impacts on bird populations or marine mammals on land, such as increasing informational signage at the VIS and information online or implementing spatial or temporal closures.

The NPS would continue to educate visitors on best wildlife viewing practices from vessels to minimize terrestrial wildlife disturbance. If concentration of wildlife activity occurs (e.g., high bear activity near a salmon stream or whale carcass), spatial or temporal closures may be implemented to limit approach distances of vessels to the shoreline or prevent foot traffic from off-vessel shoreline activities to minimize disturbance of terrestrial wildlife at critical feeding locations.

The NPS would conduct surveys prior to vegetation disturbance (e.g., for installation of communication infrastructure) to ensure species of concern are not present. With respect to nesting birds, vegetation disturbance or removal would be conducted outside nesting periods (April 15 to July 15 or longer depending on species) to the extent practicable if the project site harbors protected species that could be adversely impacted by construction.

Mitigations for both fixed-wing and helicopter flights to minimize effects to wildlife are captured in the "Wilderness Character" section below.

The park would co-locate new AIS infrastructure with existing installations (i.e., very high frequency [VHF] radio repeaters, climate monitoring stations).

SEAFLOOR

Anchor design for oceanographic moorings and floating cabin/seasonally moored vessels would be chosen based on substrate type, proposed location, and depth. The NPS would incorporate design features for mooring facilities that eliminate bottom chain scouring and minimize the contact footprint with the seabed and reduce impacts to wildlife living along the seafloor. Moorings would be installed on flat substrates, not on a slope, to minimize impacts to the seafloor, sensitive coral, and other marine species. All tethered and removable equipment would be actively managed to minimize litter, debris, and possible entanglement. The park would explore the use of long-term anchoring systems for floating rafts and oceanographic moorings to minimize the need to reset anchors seasonally.

The park would explore the use of alternative methods that minimize seafloor disturbance and habitat damage, which can be caused by dragging, dropping large anchors, grappling along the seafloor (e.g., anchors, fishing nets/gear, retrieval of lost items). Alternative methods may include surveying the seafloor using a remotely operated underwater vehicle, video, diving, etc.

The NPS will minimize the impacts of all activities to the sea floor cognizant that this is a park resource of critical nature to many species. Seafloor mining would be prohibited.

ACOUSTIC ENVIRONMENT

All NPS administrative motorized vessel use would be carefully planned and implemented for optimal efficiency and sensitivity to minimize impacts to the natural soundscape from motorized vessels. The park would explore emerging technology for types of administrative use vessels and engines that would have lower impacts to the natural soundscape and other factors.

National parks are considered by the Federal Aviation Administration as “Noise-Sensitive Areas.” Under the Federal Aviation Administration’s Circular 91-36D Visual Flight Rules, pilots are encouraged to fly at altitudes higher than the minimum permitted by regulation and on flight paths which would reduce aircraft noise in these noise-sensitive areas. In developing an operations plan for helicopter use associated with park operations, the NPS would recommend a preferred route over water with ocean approaches for each site, if safe and possible. Airborne noise from vessels would be regulated per 36 CFR § 3.15.

The NPS would implement standard noise abatement measures during construction, maintenance, and administrative activities. Standard noise abatement measures may include the following elements: a schedule that minimizes impacts on adjacent noise-sensitive users; the use of best available noise control techniques wherever feasible; the use of quieter impact tools when feasible; the use of hand when feasible; the placement of stationary noise sources as far from sensitive uses as possible; and the use of noise-muffling, shielding, or fencing.

The NPS would retain quiet hours restrictions currently in place at popular anchorages and educate motorized vessel operators on best practices for use of generators when anchored to minimize effects to the acoustic environment. For commercial vessels, use of generators may be managed through their contract operating conditions, and the park can leverage the competitive contract process to ask applicants to demonstrate specific ways they can help reduce soundscape impacts to park visitors and wildlife.

The NPS would advise visitors and park staff about the impact of loud vehicles, motors, and other unnecessary noise disturbances (e.g., radios) within the park.

The NPS would continue to monitor and evaluate airborne sound levels from human activities according to indicators identified in the draft plan. Calibrated noise signatures from commercial and private vessels would be collected and later used in simulations to estimate the prevalence of manmade noise in parts of the park where acoustic monitoring stations are not present.

The NPS would continue to monitor and evaluate underwater sound levels from motorized vessels according to indicators identified in the draft plan. Calibrated underwater noise signatures from commercial and private vessels would continue to be collected and be used in simulations to estimate the prevalence of underwater sounds in parts of the park where hydrophone moorings are not present. The NPS would pursue collaborations to estimate and address the effects of underwater noise on marine mammal communication and biology.

INVASIVE SPECIES

Marine Invasive Species

Several marine invasive species are present or expanding their range toward coastal Alaska, including European green crabs, Atlantic salmon, and solitary and colonial tunicates.

The NPS would educate visitors, commercial operators, and operators of administrative use vessels on best practices to minimize the risk of introducing marine invasive species to the park including:

- Keep clear hulls, particularly before arriving in park waters.
- Enforce park regulations to prevent the discharge of bilge and ballast water into park waters unless it has been treated to kill organisms and remove toxins. Report observations of suspected marine invasive species promptly to the park and Alaska Department of Fish and Game.
- Monitor for invasive marine species when and where appropriate (i.e., Bartlett Cove) for early detection, control, and mitigation of impacts on resources.

Terrestrial Invasive Species

During all installation activities, best practices for invasive plants management would be employed, including:

- Minimize new soil disturbance and select previously disturbed areas for associated construction staging and stockpiling.
- Fence or clearly mark and enforce disturbance zones during construction to prevent disturbances to vegetation outside construction limits.
- Clean clothing and equipment carefully whenever moving between locations in the park to prevent the introduction/spread of the seeds/propagules of non-native invasive organisms—both terrestrial and aquatic.
- Ensure project personnel make daily checks of clothing, footwear, and equipment to ensure no exotic plant seeds and no off-site soil is transported to the work site.
- Pressure-wash equipment offsite thoroughly to ensure all equipment and machinery are clean and weed-free before being brought into the park and secondarily the project area.
- Obtain all fill, rock, topsoil, or other earth materials from certified weed-free sites.

VISITOR USE AND EXPERIENCE

The NPS would preserve the sense of discovery and exploration for independent travelers in motorized and non-motorized vessels by keeping use at levels where these visitors can travel in the park at will without having to reserve a campsite or place to anchor or otherwise adhere to a pre-defined itinerary.

All NPS administrative motorized vessel use would be carefully planned and implemented for optimal efficiency and sensitivity to minimize impacts to visitor experience, including the sights and sounds of motorized vessels. This includes, but is not limited to, scheduling where possible operations requiring more intensive motorized activity to low-visitor seasons and coordinating across divisions to look for opportunities to share trips.

The park strives for efficient customer service and transparent permitting and will continue to monitor the success of visitor serving operations.

Implement timely and accurate communication with visitors regarding significant permitted activities and potential impacts to visitor experience via new releases, visitor contacts, web and social media, and the NPS mobile application.

Marine vessel operators are responsible following all rules and regulations. At the same time, boating in such a dynamic natural setting, remote environment, and biologically rich place poses significant risks. Boater orientations are critical to a safe and enjoyable visit, as are resources that enhance operator situational awareness (weather reports, chart updates, etc.), and help visitors understand park purposes and resource protection requirements (closures). The NPS will ensure that the public has adequate information to make safe decisions. To the extent possible the NPS will provide in-person orientation opportunities to enhance communication and encourage stewardship by operators.

Search and rescue operations in the park can be complex and often require substantial time to mobilize due to scarcity of NPS search and rescue resources and the remoteness of many backcountry areas of the park. Continue to partner including with the US Coast Guard for marine search and rescue operations in the park, while enhancing park and regional capacity to respond.

WILDERNESS CHARACTER

The mitigations below primarily address programmatic actions in designated wilderness included in this plan that are associated with managing the marine environments of the park. Proposed activities connected with managing the marine environment (VHF radio and AIS communication upgrades) may occur in designated wilderness terrestrial areas at existing sites. All NPS activities in designated Wilderness are analyzed for impact to wilderness character. All activities involving structures and other 4(c) Wilderness Act prohibitions are analyzed using a Minimum Requirements Analysis.

Activities would be limited to the minimum necessary to meet the objectives of the action. Specific restrictions may affect the approval of transportation means, field work timing and frequency, group size, base camp locations, installations or structures, and the use of motorized equipment.

Helicopter flights would be limited to trips that address essential park objectives, with maximum efficiency per visit (coordinated with other co-located installation and maintenance activities), so the park could continue to minimize impacts to wilderness character. Helicopter use and landings would require advance approval from the Superintendent and appropriate compliance review. If deemed the minimum tool necessary to accomplish the actions, helicopter flights would be kept to the minimum number required to accomplish field activities. The project lead would be required to give advance notice to the

park dispatch center and provide expected dates, times, and locations of helicopter activities. All helicopter activity would be logged (day, time, coordinates of landing site(s)) with data sent to the wilderness coordinator within 30 days of activity.

The park would develop an operational plan for helicopter use in advance of trips to minimize impacts based on local knowledge of visitor and wildlife activities. This would allow joint planning of flight paths/routes in advance that minimize the impacts on wilderness character. Mitigations include but are not limited to:

- Minimizing flight duration using the most efficient and direct route.
- Setting minimum altitude to 1,000 feet above and away from terrain, while also avoiding coastline travel where helicopters would be seen and heard by the concentration of park visitors and wilderness users on park beaches and within narrow fjords where sounds would be pronounced.
- Minimizing the amount of time on the ground.
- Employing environmental best practices (fuel handling, waste, minimize installations and footprints).

Effort would be made to minimize disturbance of wildlife (e.g., mountain goats, Steller sea lions, harbor seals) by:

- Choosing travel routes that minimize helicopter and fixed wing transit over known wildlife hotspots (e.g., open alpine goat habitat, rookeries, and major haul-outs).
- Designating one person in flight to notify pilot of wildlife observations.
- Maintaining a minimum of 1,500 meters (1.5 kilometers/0.93 miles) vertical and horizontal distance from mountain goat habitat. Pilots would not hover over, circle, harass, or pursue wildlife in any way.
- Maintaining a minimum of 915 meters (0.9 kilometers/0.57 miles) between aircraft and major rookery and haul-out terrestrial zones for Steller sea lions (NOAA Fisheries 1993). The 915-meter buffer is applicable to vertical as well as horizontal distances.
- Avoiding known bald eagle nests and maintaining a minimum 400 meters (0.4 kilometers/0.25-miles) clearance from all active known eagle nests. All nests are considered active March 1–May 31, and occupied nests are considered active through August 31.
- Reporting any observed wildlife disturbances to the NPS.

The Wilderness Act prohibits permanent or temporary structures and installations of any kind in order to retain its primeval character and influence. All equipment left in the field must be specifically authorized in advance. Mitigations related to installations include but are not limited to:

- Use natural elements instead of plastic or metal to secure or build installations when possible.
- Camouflage installations as appropriate to minimize effects to the viewscape.
- Minimize the number and duration of field activities.
- Minimize ground disturbance to the smallest practicable footprint.

- Document authorized installations consistent with protocol developed by the Alaska Regional Office. Report GPS coordinates and dates of all installations to the wilderness coordinator to be included in the park's database.
- Remove installations once no longer needed.
- Use non-motorized tools to the extent practicable; however, motorized tools may be used if considered the minimum tool required to accomplish mission objectives.

Installations would be labeled with an engraving (preferred), paint pen, or removable label. Installations should be as unobtrusive as possible and should not interfere with visitor enjoyment of the park.

Implement mitigation measures and best management practices identified under "Acoustic Environment" to reduce adverse impacts to wilderness character from noise.

Floating cabins/seasonally moored vessels would be designed to blend in with the natural surroundings (e.g., size would not exceed what is necessary for intended mission, neutral colors) to minimize the sight and sound of rafts/seasonally moored vessels and associated use from outside wilderness.

TLINGIT HOMELAND VALUES

The NPS would work with tribes to develop educational materials including social media posts, websites, printed materials, videos, and on-site orientations directed at educating vessel operators and passengers about Tlingit Homeland and appropriate and respectful behavior in Homeland.

The NPS would continue to partner with tribal entities to provide, when possible, ship board cultural programming on cruise ships and tour boats focused on educating visitors about Tlingit Homeland values.

APPENDIX E: IMPACT METHODOLOGIES

Visitor Use and Experience

The analysis area for visitor use and experience includes all areas where vessel quotas and operating requirements apply within Glacier Bay. The effects on visitor use and experience is assessed in terms of whether changes to vessel management and programmatic actions would affect the overall quality of visitor experience, including the viewscape, the quantity and diversity of access available to visitors, visitor use patterns, and recreational opportunities. Effects on visitor use and experience from climate change are also analyzed. The analysis in this section focuses on changes to visitor experience for the various visitor groups associated with the vessel types addressed under the plan. The analysis is supported by existing park data, including visitor use surveys (prior visitor use surveys [RSG 2019] and pre- and post-experience surveys [Furr et al. 2021]), permit data (percent of full permitted vessel days from 2017 to 2021 and monthly vessel permit use) acquired from the Visitor Information Station, as well as literature on visitor use and experience, previous project experience at the park, and relevant non-park scientific literature data.

Airborne Acoustic Environment

The analysis area for the airborne acoustic environment includes all areas where vessel quotas and operating requirements apply within Glacier Bay. The effect of the alternatives on the airborne acoustic environment within the analysis area is assessed in terms of whether the changes to vessel management, notably an increase in private vessel permits, changes to seasonal nonmotorized water dates, changes to overnight and day use permits, and changes in the permit priority system, as well as programmatic actions would affect the park's airborne acoustic environment. Analysis in this section focuses on assessing how the alternatives would impact the duration of NFIs, or the median amount of time without the presence of audible vessel noise, in specific geographic areas of the park. NFI is a key indicator of the opportunity for visitors to experience solitude in the park and is also related to the effects of noise on wildlife, and it could be indirectly impacted by the alternatives. The park wants to increase the duration of NFI because longer periods of NFI allow for greater opportunities for visitors to experience solitude and for marine wildlife to be undisturbed by anthropogenic airborne noise.

It is not possible to accurately predict the specific effects of most of the proposed changes on vessel routes and behavior within the park. Therefore, except for the increase in private vessel permits under alternative B, the potential change in NFI due to these actions is assessed qualitatively. Additionally, NFI for the Upper East Arm is represented by the data collected in Muir Inlet, which is designated as nonmotorized waters for part of the year. Therefore, the baseline data likely overestimates NFI duration for areas in the Upper East Arm outside the nonmotorized water boundary of Muir Inlet. As a result, the prediction of the future change in NFI for the Upper East Arm is also likely overestimated.

Three observational data sets were used to relate NFI to vessel noise events per day. The three converging lines of evidence contextualize the relationship between the number of noise events audible at a given location (n) and the duration of a typical NFI (I_{50}).

- Acoustic records collected in Glacier Bay and annotated for noise audibility (using methods described in Lynch et al. 2011). Shown in table 3-1 in the EA and as black dots in figure E-1.

- Acoustic records collected in other national park system units in Alaska, annotated for noise audibility (orange dots in figure E-1.)
- Results of NFI simulations for Glacier Bay using AIS-derived vessel tracks (green dots in figure E-1.)

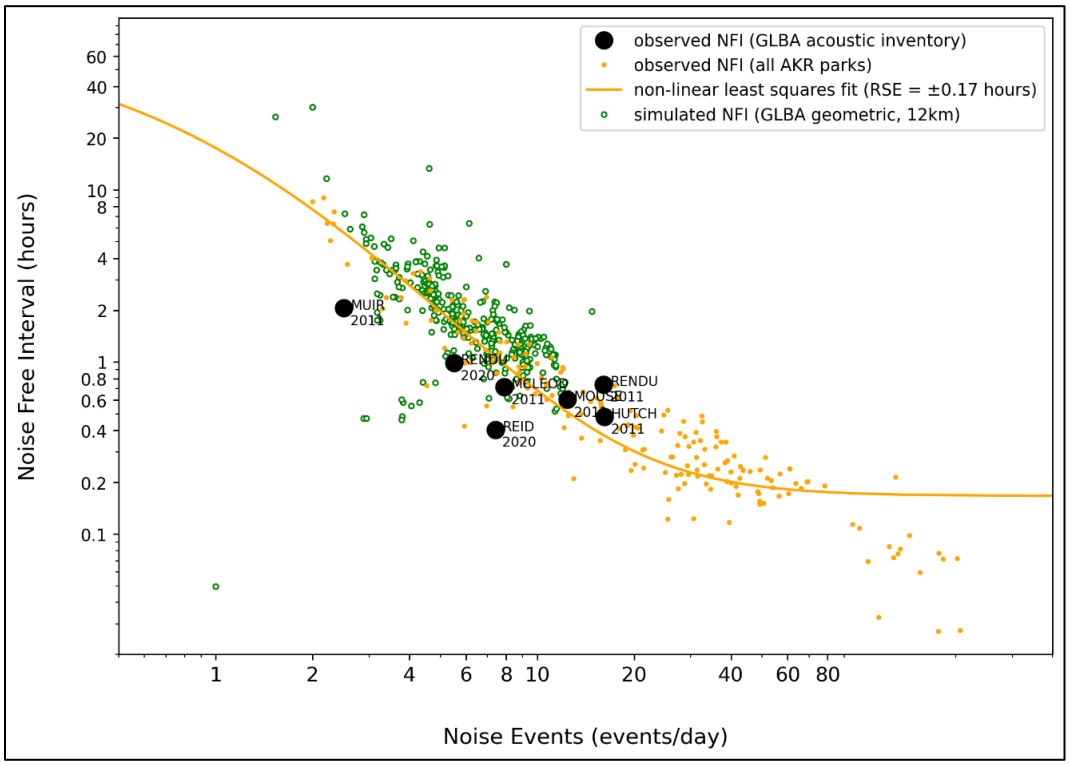

FIGURE E-1. OBSERVED AND SIMULATED NOISE FREE INTERVAL

The solid orange line in figure E-1 is the result of non-linear least squares curve-fitting to Equation 1 implemented using {Scipy} (Jones et al. 2014). The equation of best-fit is as follows:

$$I_{50}(n) = \left(\frac{8.0}{1+n}\right)^{2.1} + 0.17, \text{ where n = vessel noise events/day}$$

This equation was then used, along with the baseline data shown in table 3-1, to estimate future median NFI (I_{50}) due to the increases in future vessel noise events per day relative to the baseline, using the below equation:

$$\text{Future } I_{50} = \text{Baseline } I_{50,\,\text{Measured}} + [I_{50}(n_{\text{future}}) - I50(n_{\text{baseline}})]$$

Underwater Acoustic Environment

The analysis area for underwater acoustic environment includes all areas where vessel quotas and operating requirements apply within Glacier Bay. The effects of the alternatives on the underwater acoustic environment within the analysis area is assessed in terms of whether the changes to vessel management, notably increasing the number of private vessel permits, changing the seasonal nonmotorized water dates, changes to overnight and day use permits, and including a permit priority system, as well as programmatic actions would impact the park's underwater acoustic environment.

Analysis in this section focuses on assessing how changes in vessel noise due to the alternatives would impact the underwater acoustic environment in specific geographic areas of the park; the effects of vessel noise on marine wildlife are analyzed in the "Marine Wildlife" section. The two key indicators for vessel noise impacts to the underwater acoustic environment are the proportion of time vessel noise is present in underwater sound samples and NFI, which is the median amount of time without the presence of audible vessel noise.

As noted above, it is not possible to accurately predict the specific effects of most of the proposed changes on vessel routes and behavior within the park. Therefore, except for the increase in private vessel permits under alternative B, the potential change in vessel noise due to these actions is assessed qualitatively.

To assess the potential increase in underwater vessel noise from additional private vessel permits under alternative B, the future percent increase in total vessels was added to the relevant baseline of 59% of underwater sound samples with vessel noise. The baseline data is from 2016–2018 monitoring during the summer season (June–August) at the Bartlett Cove hydrophone anchored in the Lower Bay. The Lower Bay has more vessel traffic than most areas of the park, so the baseline data and predicted future condition likely represent the worst-case condition for the proportion of samples with vessel noise within the park.

Marine Wildlife

The effects of the alternatives on marine wildlife within the analysis area is assessed in terms of whether the changes to vessel management, notably designating overnight and day use permits, increasing the number of private vessel permits, changing seasonal nonmotorized water dates, and encouraging lower-impact vessels, as well as implementing programmatic actions would affect marine wildlife within the park. Marine wildlife included in the analysis are marine mammals and seabirds. For marine mammals the analysis focuses on three species; humpback whales, Steller sea lions, and harbor seals as these are sensitive populations within Glacier Bay. While other marine mammals such as harbor porpoises, killer whales, minke whales, and sea otters may be affected by the range of alternatives and have impacts similar to those discussed for the above three species, these other marine mammals are either abundant with no serious injury and no population level impacts anticipated or are generally not found in large numbers in the Glacier Bay. Therefore, they are not the focus of the analysis. Analysis in this section focuses on assessing how changes in vessel management due to the alternatives would directly and indirectly impact marine wildlife species within the park. Changes in the number of vessels and visitor use patterns resulting from changes in vessel management are analyzed for direct impacts on marine wildlife such as from vessel noise, vessel strikes, and vessel disturbance. Existing park data supports the analysis, including knowledge of park staff, and scientific literature on vessel impacts on marine wildlife. The analysis also relies on the "Airborne Acoustic Environment" and "Underwater Acoustic Environment" analyses for potential changes to NFI that could impact marine wildlife.

Ethnographic and Homeland Values

The analysis area for Homeland values includes all areas where vessel quotas and operating requirements apply within Glacier Bay. The effect of the alternatives within the analysis area is assessed in terms of whether the changes to private vessel permitting and vessel operation as well as programmatic actions would affect ethnographic and Homeland values. Analysis in this section focuses on the Huna Tlingit belief in ownership and their role as host to visitors and how proposed changes to vessel management would positively or negatively impact these beliefs, which are at the heart of the Huna Tlingit Homeland

values. Actions that increase the ability of the Huna Tlingit to host visitors in their Homeland, show respect for Homeland and its resources, and provide continued access to Homeland to perform ceremonies would have positive impacts. Those actions that do the opposite would have negative impacts.

APPENDIX F: ALASKA NATIONAL INTEREST LANDS CONSERVATION ACT SECTION 810 ANALYSIS DRAFT

SUMMARY EVALUATION AND FINDINGS

Introduction

This section was prepared to comply with Title VIII, Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980. It summarizes an evaluation of the potential restrictions to subsistence activities that could result from implementation of the preferred planning vision in the draft plan in Glacier Bay National Park. The EA describes the range of alternatives for consideration.

The Evaluation Process

Section 810(a) of ANILCA states:

"In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands . . . the head of the Federal agency . . . over such lands . . . shall evaluate the effect of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for the purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be effected until the head of such Federal agency:

1. Gives notice to the appropriate State agency and the appropriate local committees and regional councils established pursuant to Section 805;
2. Gives notice of, and holds, a hearing in the vicinity of the area involved; and
3. Determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands, (B) the proposed activity would involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition, and (C) reasonable steps would be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions."

Presidential proclamations in 1925 and 1939 established and expanded Glacier Bay National Monument. In 1980, Title II of ANILCA created new units and additions to existing units of the National Park System in Alaska. More specifically, Section 202 of ANILCA expanded Glacier Bay National Monument by the addition of an area containing approximately 523,000 acres. ANILCA re-designated the monument as Glacier Bay National Park. Along the south bank of the Alsek River at Dry Bay, Alaska, approximately 57,000 acres was designated as Glacier Bay National Preserve (the preserve).

ANILCA Section 202(1), created the park and preserve for the following purposes:

"To protect a segment of the Alsek River, fish and wildlife habitats and migration routes and a portion of the Fairweather Range including the northwest slope of Mount Fairweather. Lands, waters, and interests

therein within the boundary of the park and preserve which were within the boundary of any national forest are hereby excluded from such national forest and the boundary of such national forest is hereby revised accordingly."

Federal law and regulations prohibit ANILCA Title VIII subsistence uses on federal public lands in the park only. However, ANILCA (Sections 1313) and Title 36 CFR § 13.41 authorize subsistence uses on federal lands in the preserve.

ANILCA 816 (a) states:

"All national parks and park monuments in Alaska shall be closed to the taking of wildlife except for subsistence uses to the extent specifically permitted by this Act. Subsistence uses and sport fishing shall be authorized in such areas by the Secretary and carried out in accordance with the requirements of this title and other applicable laws of the United States and the State of Alaska."

With regards to the preserve, Section 1313 of ANILCA states:

"A National Preserve in Alaska shall be administered and managed as a unit of the National Park System in the same manner as a national park except as otherwise provided in this Act and except that the taking of fish and wildlife for sport purposes and subsistence uses, and trapping shall be allowed in a national preserve under applicable State and Federal law and regulation. Consistent with the provisions of Section 816, within national preserves the Secretary may designate zones where and periods when no hunting, fishing, trapping, or entry may be permitted for reasons of public safety, administration, floral and faunal protection, or public use and enjoyment. Except in emergencies, any regulations prescribing such restrictions relating to hunting, fishing, or trapping shall be put into effect only after consultation with the appropriate State agency having responsibility over hunting, fishing, and trapping activities."

ANILCA Sections 1314 (c) states:

"The taking of fish and wildlife in all conservation system units; and in national conservation areas, national recreation areas, and national forests, shall be carried out in accordance with the provisions of this Act and other applicable State and Federal law. Those areas designated as national parks or national park system monuments in the State shall be closed to the taking of fish and wildlife, except that:

1. notwithstanding any other provision of this Act, the Secretary shall administer those units of the National Park System and those additions to existing units, established by this Act and which permit subsistence uses, to provide an opportunity for the continuance of such uses by local rural residents; and
2. fishing shall be permitted by the Secretary in accordance with the provisions of this Act and other applicable State and Federal law."

The potential for significant restrictions must be evaluated for the proposed action's effect upon ". . . subsistence uses and needs, the availability of other lands for the purposes sought to be achieved and other alternatives which would reduce or eliminate the use . . ." (ANILCA §810(a)).

Proposed Action on Federal Lands

The draft plan proposes a broad marine management framework for the NPS to manage approximately 537,000 acres of park waters and focuses on resource preservation and conditions needed for visitors to access, understand, enjoy, and appreciate the significant and fundamental park resources and values that merited national designation. The EA analyzes actions within the draft plan that are subject to NEPA compliance. For purposes of the analysis, the marine waters of the draft plan and EA include those lands,

waters, and biological communities below mean high tide within three proposed management subzones: Glacier Bay, Icy Strait/Cross Sound, and the Outer Coast.

Alternatives that meet the purpose and need for taking action are detailed in chapter 2 of the EA. The NPS identified alternative D as the preferred alternative. Customary and traditional subsistence use on NPS park lands would continue where authorized by federal law under all alternatives.

Under alternative D – Preferred Alternative, the NPS proposes the following programmatic and site-specific actions (some of which are common to all action alternatives):

Programmatic actions under the preferred alternative (common to all action alternatives):

- Designate subzones to the 1984 General Management Plan Non-Wilderness Waters Zone.
- Establish new vessel definitions.
- Install floating cabins/seasonally moored vessels, communication upgrades, and monitoring stations.

Site-specific actions under the preferred alternative (common to all action alternatives):

- Update vessel management conditions including quotas and operating requirements, including:
    - Decrease private vessel permit durations from a current maximum of seven days (six nights) to five days (four nights) per permit.
    - Expand the private vessel permit season to begin on May 1 and end on September 30 while retaining the quota season of June 1–August 31.
    - Establish a more transparent process of permit conditions and confirmations.
- Establish indicators, thresholds and corrective management actions to meet desired conditions for the marine environment.

Site-specific actions under the preferred alternative:

- Delineate a lottery system with specific dates and protocols to allocate 25 private vessel permits as either advance-notice or short-notice permits during the quota season.
- Establish specific operating requirements for certain locations and dates:
    - Muir Inlet would be designated as nonmotorized waters from May 1 through July 15. This one-month extension for Muir Inlet would align with the early season private permit season dates and with designated Wilderness water nonmotorized start dates. Wachusett Inlet would be designated as nonmotorized waters from July 16 through September 15 with a 15-day extension to align with designated Wilderness water nonmotorized end dates.
    - In the East Arm, cruise ships and tour vessels would be prohibited from waters north of Muir Point to allow for a small vessel experience for private, charter, and nonmotorized vessels.
- Adapt operating requirements for lower-impact vessels.

Affected Environment

Subsistence uses, as defined by ANILCA Section 810, means:

"The customary and traditional use by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making

and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

Subsistence activities include hunting, fishing, trapping, and collecting berries, edible plants, wood or other materials.

Other important subsistence use areas within the region include Icy Strait, Excursion Inlet, Cross Sound, Port Frederick, and Tongass National Forest. Most of the rural communities of southeastern Alaska rely on renewable natural resources for at least a portion of their subsistence needs. About one-third of the rural communities of the region take at least half of their meat and fish by hunting and fishing (Holleman and Kruse 1992).

Residents of such communities as Gustavus (population of 655), Hoonah (931), Elfin Cove (24), Pelican (98), Excursion Inlet (40), Sitka (8,458), and Yakutat (662) engage in subsistence uses near the boundaries of the park (ADOL 2017). Community subsistence resource activities include hunting, fishing, and gathering gull eggs, shellfish, firewood, wild plants, and berries. Historical resource utilization patterns, such as gull egg gathering, fish camps or communal marine mammal and deer hunts, are linked to traditional social and subsistence use patterns. Sharing of resource occurs between communities, as well as within communities throughout the region.

ANILCA and NPS regulations authorize subsistence use of resources in all Alaska national parks, monuments and preserves, except pre-ANILCA reserved federal conservation units including Glacier Bay National Park. ANILCA provides a preference for local rural residents over other consumptive users should a shortage of subsistence resources occur, and allocation of harvest becomes necessary (ANILCA 804).

The main subsistence species, by edible weight, are salmon, deer, non-salmon fish, marine invertebrates, bears (black and brown), moose, and seals. Local people use a variety of salmon (chum, coho, pink, and sockeye), while halibut, herring, smelt, cod, greenling, lingcod, char, and Dolly Varden are also used for subsistence purposes (Alaska DFG 2012).

ANILCA and NPS regulations authorize subsistence use of resources in the preserve and prohibit subsistence uses in the park (codified in 36 CFR § 13). Legislation enacted in 2000 (Public Law 106-455) and a legislative environmental impact statement authorize the limited harvest of glaucous-winged gull eggs by the Huna Tlingit in the park under a management plan cooperatively developed by the NPS and the Hoonah Indian Association, the federally recognized tribe of the Huna Tlingit. Glacier Bay is the traditional Homeland of the Huna Tlingit who traditionally harvested eggs prior to park establishment. The practice was curtailed in the 1960s as the Migratory Bird Treaty Act and federal regulations prohibited it. Current US Fish and Wildlife Service regulations allow residents of Hoonah and Yakutat to gather glaucous-winged gull eggs on National Forest lands in Icy Strait and Cross Sound, including Middle Pass Rock near the Inian Islands, Table Rock in Cross Sound, and other traditional locations on Yakobi Island between May 15 and June 30. The land and waters of the park remain closed to all federal subsistence harvesting.

Subsistence Uses and Needs Evaluation

To determine the potential impact on existing subsistence activities, three evaluation criteria were analyzed relative to existing subsistence resources that could be impacted.

The Evaluation Criteria are:

- the potential to reduce important subsistence fish and wildlife populations by (a) reductions in numbers; (b) redistribution of subsistence resources; or (c) habitat losses;
- the affect the action might have on subsistence fishing or hunting access; and
- the potential to increase fishing or hunting competition for subsistence resources.

The Potential to Reduce Populations:

- The implementation of the draft plan, including the EA preferred alternative, is not expected to adversely affect or significantly restrict the distribution or migration patterns of subsistence resources on federal public lands within the region. Therefore, no change in the availability of subsistence resources is anticipated as a result of the implementation of the preferred alternative.

Restriction of Access:

- The preferred alternative is not expected to significantly restrict Title VIII traditional subsistence use patterns on federal public lands within the region. No restrictions or changes in subsistence access are proposed in the preferred alternative. The park is closed to ANILCA Title VIII subsistence uses.

Increase in Competition:

- The preferred alternative is not expected to significantly increase competition for subsistence resources on federal public lands within the region. Provisions of ANILCA and NPS regulations mandate that if and when it is necessary to restrict the taking of fish or wildlife, subsistence users will have priority over other user groups (ANILCA 804).

Availability of Other Lands

Choosing a different alternative would not decrease the impacts to park resources for subsistence. The preferred alternative is consistent with the mandates of ANILCA, including Title VIII, and the NPS Organic Act.

Alternative Considered

The EA describes and analyzes the alternatives considered in chapter 2. The range of alternatives is consistent with NPS mandates, ANILCA, and the purposes for which the park and preserve were established. No other alternatives that would reduce or eliminate the use of public lands needed for subsistence purposes were identified.

Findings

This analysis concludes that the preferred alternative would not result in a significant restriction of subsistence uses.

APPENDIX G - SELECT LAWS, REGULATIONS, POLICIES, AND GUIDANCE

As an agency, the NPS has a long legacy of protecting Glacier Bay and its resources, unimpaired for the enjoyment, education, and inspiration of this and future generations. Associated with the Marine Management Plan, the NPS reaffirms its enduring commitment to implement the laws, regulations, policies, and guidance that will conserve park waters as a national treasure for future generations. Select laws, regulations, policies, and guidance by topic area include:*

Acoustic Environment
Director's Order #47
Noise Control Act

Aesthetics
NPS Organic Act
Park GMP

Air Quality
Clean Air Act
NPS Organic Act

Aquatic and Marine Resources
Anadromous Fish Conservation Act
Clean Water Act
Endangered Species Act
Fish and Wildlife Coordination Act
Magnuson-Stevens Fishery Conservation and Management Act
Marine Mammal Protection Act
Marine Protection, Research, and Sanctuaries Act
North Pacific Halibut Act
Pacific Salmon Treaty
Secretarial Order 3356
Water Resources Development Act
Omnibus Parks and Public Lands Management Act (1996)
Glacier Bay National Park Resource Management Act (2000)
Public Law 105-277 as amended by Public Law 106-31
Public Law 107-63 (2001)
Executive Order 13158 –Marine Protected Areas
Non-Conflicting State of Alaska Fishing Regulations

Cultural, Historic, and Archaeological Resources
Archaeological Resources Protection Act
Director's Order 28
National Historic Preservation Act
NPS Organic Act

Energy Requirements and Conservation
Energy Policy Act
Energy Independence and Security Act
Executive Orders 13031, 13123, 13149
Public Law 117-169

Native Alaskan Tribal Sovereignty, Self-Determination, Consultation, and Coordination
1995 NPS Hoonah Indian Association Memorandum of Understanding (MOU)
2002 NPS Yakutat Tlingit Tribe MOU
Executive Orders 13007 and 13175
Indigenous Traditional Ecological Knowledge and Federal Decision-Making Memorandum
DOI Secretarial Orders 3206,3175, 3342, 3403 (including co-stewardship Policy Memorandum 22-03)
NPS Director's Orders 66 and 71B
Hoonah Indian Association Reserved Rights in Berg Bay
Huna Tlingit Traditional Gull Egg Use Act, 2014 (Public Law 113-142)
DOI Policy on Alaska Native Land Claims Act Corporation Consultation for actions substantially affecting their land, water areas, resources, and programs

Native Species and Exotics management
Alaska Region Invasive Plant Management Plan Executive Order 13751
National Invasive Species Act

Park Operations
Occupational Safety and Health Act
NPS Organic Act
Park GMP
Pollution Prevention Act
Resource Conservation and Recovery Act
Toxic Substances Control Act
Secretarial Order 3110

Park Purposes
Park Foundation Document
Organic Act (1916)
Presidential Proclamations 1733 (1925), 2330 (1939), 3089 (1955)
Alaska v. United States (545 U.S. 75, 125 S. Ct. at 2153)
Alaska National Interest Lands Conservation Act (1980), including Senate Committee Report 96-413, p.137).
Park General Management Plan (1984)
Glacier Bay Fisheries Act (1999)
Glacier Bay National Park Resource Management Act (2000)
Public Law 107-63 (155 Stat 414) (2001)
Federal Register, List of National System Marine Protected Areas (Document Number E9-9335)

Public Health and Safety
Pollution Prevention Act
Resource Conservation and Recovery Act
Toxic Substances Control Act
Secretarial Order 3110

Socioeconomic Resources
Alaska National Interest Lands Conservation Act
NPS Director's Orders 2 and 12

Threatened and Endangered Species and Ecologically Critical Areas
Endangered Species Act
National Environmental Policy Act
NPS Endangered Species Reference Manual 77-8
NPS Organic Act

Visitor Use and Experience
NPS Organic Act
The National Parks and Recreation Act of 1978 (54 USC§ 100502)
Park Foundation Document
Park GMP
Park Frontcountry Management Plan
Park Backcountry and Wilderness Management Plan (In Preparation)
Wilderness Act 1964

Water Quality, Hydrology
Clean Water Act
Executive Order 12088
Erosion and Sedimentation Control Act

Wetlands
Clean Water Act
Executive Orders 12088, 11990
NPS Director's Order 77-2

Wildlife and Habitat Management
Alaska v. United States (545 U.S. 75, 125 S. Ct. at 2153)
NPS/ADF&G Master MOU (1982)
Migratory Bird Conservation Act and Migratory Bird Treaty Act
Park Bear Management Plan

**This list was prepared in 2022 and is included for planning reference only. The NPS makes no claims, promises or guarantees about its accuracy, adequacy, or completeness. Further, it also assumes the comprehensive application of the NPS Management Policies (2006), the National Environmental Policy Act, and park-specific plans and requirements.*

APPENDIX H - PLANNING TEAM AND CONSULTATION LIST

Glacier Bay National Park and Preserve would like to express sincere thanks towards all who contributed their time and expertise in the preparation of this plan. Below left are the names of the main contributors inside the National Park Service. Below right are interests and entities outside the agency, contacted to request consultation during the planning process, and/or during the 30-day public and agency review:

NPS PLANNING CONTRIBUTIONS

Park Planning Team

Philip Hooge, Superintendent
Tom Schaff, Deputy Superintendent
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Melanie Berg and Joni Seay, Commercial Services Team
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Lisa Etherington, Chief of Resource Management
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Jacob Ohlson, Chief of Maintenance
Elizabeth Withers, Administrative Officer
Sara Doyle, Outdoor Recreation Planner
Mary Beth Moss, Cultural Anthropologist / Tribal Liaison
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NPS Expertise

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Sarah Conlin, Alaska Region Planning Portfolio Manager
Elizabeth Bella, Alaska Region Environmental Planning and Compliance Team Lead
Leah Schofield and Joan Kluwe, Alaska Region Environmental Coordinators
Brenna McGown, Alaska Region Outdoor Recreation Planner
Bella Furr, Park Environmental Protection Specialist

GUIDING POLICY

*The **Marine Management Plan** is part of an NPS planning portfolio with individual plans, studies, and inventories that together guide park decision-making.*

*The **Environmental Assessment** was developed consistent with National Environmental Policy Act (NEPA) of 1969, and Council on Environmental Quality (CEQ) implementing regulations: Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making (NPS 2011) and its accompanying handbook (NPS 2015a).*

TRIBES AND EXTERNAL CONSULTATION LIST

Tribal Consultation

Hoonah Indian Association
Yakutat Tlingit Tribe

Alaska Native Interests

Alaska Native Voices
Cook Inlet Region Inc. (Gustavus landowner)
Huna Totem Corporation
Sealaska Corporation

Gateway Community Interests

City of Gustavus
Gustavus Visitors Association
City of Hoonah
Travel Juneau

Advocacy Interests

National Parks Conservation Association
Friends of Glacier Bay
Alaska Travel Industry Association
The Wilderness Society

Commercial Partners

Aramark, Incorporated (Glacier Bay Lodge contract)
Allen Marine Tours (Dayboat sub-contract)
Park contract holders (various)

Agencies

Alaska State Historic Preservation Office (SHPO)
US Fish & Wildlife Service
Alaska Department of Fish and Game
Alaska Department of Natural Resources, ANILCA Program
National Marine Fisheries Service

Elected Officials

Lisa Murkowski, United States Senator
Dan Sullivan, United States Senator
Mary Peltola, United States Representative
Jesse Kiehl, Alaska State Representative
Sara Hannan, Alaska State Representative
Andi Story, Alaska State Representative

Gunalchéesh to Dzéiwsh, James Crippen, McGill University and Yukon Native Language Centre (YNLC); K'ashGé, Daphne Wright; Kèyishí (Keiyishí), Bessie Cooley; Yeilt'ooch' Tláa, Collyne Bunn; and Xeetli.Éesh, Lyle James for assistance with Tlingit language and orthography.

Draft Marine Management Plan Environmental Assessment

Glacier Bay National Park and Preserve
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Produced by the National Park Service