CAPE HATTERAS NATIONAL SEASHORE
SEA TURTLE MONITORING
2011 ANNUAL REPORT

Loggerhead nesting in the morning north of Ramp 23 (7/5/2011).

National Park Service
1401 National Park Drive
Manteo, NC 27954

ABSTRACT
In 2011, 147 sea turtle nests were documented at Cape Hatteras National Seashore (CAHA). The first recorded nesting activity for the 2011 season occurred on Hatteras Island with a loggerhead nest on May 15. The last recorded nest of the season was laid on Hatteras Island on August 21. A total of 278 activities were documented of which 147 were confirmed nests and 131 were false crawls. The 147 nests on CAHA (137 loggerhead nests, nine green nests, and one Kemp's ridley nest) constituted 15.2 % of North Carolina's total of 967 nests. A total of 32 nests were washed out entirely or could not be found post Hurricane Irene. An additional 12 nests saw a severe decrease in nest success (little or no hatching success) due to Hurricane Irene. A total of 148 stranded sea turtles were documented of which 75 (51%) were on ocean beaches and 73(49%) were on the soundside shoreline.

INTRODUCTION

Five species of sea turtles can be found at CAHA – the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea)*, hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*). In the 1970's, the leatherback, Kemp's ridley and hawksbill were listed under the Federal Endangered Species Act (ESA) as endangered and the loggerhead as threatened. The green, listed on July 28, 1978, is designated as threatened in its entire range except in the breeding populations in Florida and on Mexico's Pacific coast, where it is listed as endangered.

Non-breeding sea turtles of all five species can be found in the near-shore waters during much of the year. CAHA lies near the extreme northern limit of nesting for four of the five sea turtle species including: the loggerhead, green, Kemp's Ridley and leatherback; loggerheads being the most common. Annual nest numbers have fluctuated greatly within the last 25 years with only 11 nests recorded in 1987, and a maximum of 153 nests in 2010. Hawksbill sea turtles are not known to nest at CAHA, but are known to occur here through strandings. The occasional Kemp's ridley nest has been documented in North Carolina over the past five years. In 2011, CAHA documented the Park's first Kemp's ridley nest.

CAHA follows management guidelines defined by the North Carolina Wildlife Resources Commission (NCWRC) in the *Handbook for Sea Turtle Volunteers in North Carolina*, as well as species recovery plans. In December 2008, the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) signed a revised recovery plan for the Northwest Atlantic population of loggerheads. While this document did not change any of CAHA's management protocols, it did provide more information on the status of the species in the area.

The beaches of CAHA have been monitored since 1987 for nesting activity. The quality of surveys has improved over time and has developed into the current standardized protocols. Each year data has been collected and analyzed to gain a better understanding of sea turtle use within CAHA. This report summarizes the monitoring results for 2011, comparisons to results from previous years, and the resource management activities undertaken for turtles in 2011.

Consent Decree
In October 2007, Defenders of Wildlife and the National Audubon Society, represented by the Southern Environmental Law Center (plaintiffs) filed a lawsuit against the National Park Service (NPS) alleging inadequacies in the management of protected species at CAHA as specified by the 2007 Interim Protected Species Management Strategy (Interim Strategy) and the failure of CAHA to comply with the requirements of the ORV executive orders and NPS regulations regarding ORV use. On April 30, 2008, a settlement agreement that had been reached between all parties to the lawsuit was approved by the U.S. District Court as a consent decree (CD). The purpose of the CD was to provide additional protection measures pending the development of an ORV management plan and special regulation. This was the fourth year that the CD determined the management of sea turtles and other protected species at CAHA.

The CD affected management of sea turtle nests and public recreation near nests and altered the protocols in the Interim Strategy in the following ways:

- Nighttime driving was restricted between the hours of 10 pm-6 am, from May 1 – September 15. From September 16-November 15 nighttime driving is allowed only with a no fee NPS permit. From November 16 – April 30 nighttime driving is not restricted.

- After September 15, all un-hatched turtle nests on ORV beaches that have reached their hatch window (i.e. reached 50 – 55 days of incubation) receive a full beach closure between the hours of sunset and 6 am, in addition to the fencing methodology described in the Interim Strategy. A full beach closure extends from the water to the dune line, thus prohibiting ORV access behind these nests. After final excavation of these nests, the closure is removed.

COOPERATING AGENCIES

CAHA cooperates with the NMFS, USFWS, and NCWRC on sea turtle protection. All original stranding reports and annual nesting activity reports are submitted to the North Carolina Sea Turtle Program Coordinator at the NCWRC. An annual permit is issued to CAHA by NCWRC under the authority of the USFWS for the possession and disposition of stranded marine turtles and relocation of nests.

SITE DESCRIPTION

CAHA is located along the northern Outer Banks region of North Carolina. Consisting of more than 30,000 acres distributed along approximately 67 miles of shoreline, it is part of a dynamic barrier island system. Federal ownership in CAHA extends from ocean to sound across part of three barrier islands, Bodie, Hatteras, and Ocracoke and across two counties, Dare and Hyde. Eight village enclaves are excluded from CAHA boundaries. The villages include Rodanthe, Waves, Salvo, Avon, Buxton, Frisco, and Hatteras on Hatteras Island and Ocracoke Village on Ocracoke Island. On the oceanside of the villages, federal ownership was established as a 500-foot strip measured landward from the mean low water at the time of acquisition. Fishing piers located in Rodanthe, Avon, and Frisco have historically been operated as concessions within CAHA however, the Frisco Pier is currently inactive due to storm damage. The Avon Pier is

currently the only location to remain operational as an NPS concession. The 5,880-acre Pea Island National Wildlife Refuge, located at the northern end of Hatteras Island, is within the authorized boundary of CAHA, but owned and administered for refuge purposes by the USFWS.

METHODS

Nest Activity

Oceanside beaches of CAHA were patrolled daily from May 1 to October 1 in search of turtle crawls/nesting activity and strandings. Protocols dictate that daily patrols must continue until September 15; however, daily patrols continued until October 1 due to the potential for late nests. After October 1, the beaches were surveyed three to four times a week for possible late nests and/or hatchling emergence events from possible missed nests through November 15. After October 1, all remaining known nests were checked daily for hatchling emergence events.

The beaches could not be surveyed from August 26 to August 28, due to high tides and dangerous conditions caused by Hurricane Irene. Once conditions improved, status of all known remaining nests was assessed and daily turtle patrol resumed on September 1.

CAHA staff monitored approximately 67 miles of shoreline covering Bodie, Hatteras, and Ocracoke Islands. For purposes of sea turtle management, Bodie Island District extends from Ramp 1 to Ramp 30; Hatteras District from Ramp 30 south to Hatteras Spit; and Ocracoke District from Hatteras Inlet south to Ocracoke Inlet (Appendix D, Map 1). The Hatteras District is further delineated as Hatteras North, which encompasses the area from Ramp 30 to Cape Point, and Hatteras South, which extends from Cape Point to Hatteras Inlet. Morning surveys began as early as possible (between 5:00 am and 6:30 am) so that all beaches had been patrolled by no later than 10:30 am. Nests were considered confirmed when the nest cavity with eggs was located.

Nests were either left in place (*in situ*) or relocated for environmental reasons. In general, nest relocation has been discouraged under recommendations of NCWRC and USFWS; therefore, relocation was confined to nests that were directly threatened with loss from erosion and nests that were laid below the high tide line that would receive frequent tidal inundation. Nests were also moved if they had sustained any incident that resulted in egg contents dripping into the egg chamber, such as high predation or being broken by an off road vehicle (ORV). Some nests were relocated during the approach of storm events. In these cases, verbal permission was obtained from NCWRC for each individual nest.

A transponder ball was buried 45 cm in front of all nests sites. A series of three PVC poles were placed in line with and behind the nest with measurement distances recorded. The nest site was protected with symbolic fencing comprised of four to eight 2”x2” wooden posts with signs stating the area was closed to entry for a sea turtle nest and should not be disturbed. String with flagging was placed between the sign posts and the area was monitored for signs of violations, predation and washover events during daily morning patrols. Additionally, all active nests were checked during daily patrols.

Between 50-55 days of incubation, closures were expanded to encompass the area 30-50 feet duneward of the nest site down to the tide line. Width of the expanded closures (running parallel to the shoreline) varied from 75/150/350 feet, depending on the type and level of recreational use on that site. For example, a nest on a remote beach would receive a closure of 75 feet in width; a nest in a heavy pedestrian use area, such as a village, would be 150 feet in width; and a nest in an ORV area would be 350 feet in width. If a nest was located on a beach open to ORV use, large signs were posted to notify drivers that the established closure included the shoreline at all tides. When possible, an ORV corridor was maintained duneward of the nest, except for nests that remained beyond September 15, which all received full beach closures. Reflective arrows and detour signs were clearly posted to alert drivers of the change in traffic pattern. If a nest was laid high up on the beach or in the dunes and did not allow for traffic to be detoured around it, the beach was completely closed from dune to the surf as well as for a width of 350 feet. The perimeter of the closure was well posted and large signs warned visitors near ORV ramps of "No through traffic to the next ramp". The public was notified of closures that would temporarily limit ORV traffic through weekly access reports distributed by CAHA. The reports were posted at Park Visitor Centers and ramps and distributed to local businesses. Many of the local fishing and ORV groups also posted this information on their fishing web boards. Areas with limited or no access were also clearly marked on CAHA's website, which contained a link to Google Earth, allowing people to find out about changes to access. Within turtle closures, all vehicle tracks were smoothed over manually with rakes or with a steel mat attached to an UTV, so as not to impede hatchlings attempting to reach the surf (NMFS, USFWS 2008).

As hatchlings can become disorientated by artificial light, silt fencing was installed at most nest sites 50-55 days into incubation in order to block sources of light pollution from nearby villages or ORV's operating with headlights after dark. The fencing was placed in a "U" shape behind the nest and extended ocean-ward to the high tide line. Sites were then checked on a daily basis for hatching events. Most nests hatched during the evening/night hours either in one event, known as a "boil", or intermittently over several nights, known as a "trickle."

In the event of approaching storms that threatened turtle nests, several measures were taken. Silt fencing has the potential to funnel ocean overwash onto a nest site. To avoid this potential damage to the nests, all silt fencing was removed from nest sites prior to impending storms. After the storm passed, silt fencing was replaced for active nests. Prior to overwash from storms, all nests that had shown signs of hatching or emergence (i.e. a depression was present or the nest already had some emergence) were excavated early. Hatchlings that have already "pipped" out of their eggs have little chance of surviving overwash, so they were removed from the nest before storm overwash occurred. Hatchlings were held until after the storm had passed and then released. In certain circumstances, some nests were relocated in the approach of a major storm event. NCWRC was consulted prior to any nest being relocated for this reason.

With the exception of the nests that washed out, all nests were examined after hatching to determine productivity rates. Nests were excavated no earlier than 72 hours after hatching, except in cases when nests were excavated early due to impending storms. After storm activity, nests that were known to be dead were excavated and removed. In cases where hatching events or dates were unknown, or if a nest failed to hatch, nest cavities were unearthed 80-90 days after the lay date in accordance with NCWRC guidelines. In some cases late in the season (November

and December), nests may incubate beyond 90 days and still hatch. In these cases, the nests were left in place until they hatched or were confirmed to no longer be viable. Closures were promptly removed after completion of each nest excavation.

Stranding Events

All species of sea turtles that stranded on CAHA in 2011 were documented in cooperation with NCWRC, USFWS, and NMFS. Handling and collection permits were issued to CAHA by NCWRC and all reports were submitted to them within 24 hours of stranding events. Live animals were transported to a permitted rehabilitation facility for immediate care. A stranding report was completed for each animal (live and dead) documenting such information as species, condition, sex, carapace measurements, tags, wounds or abnormalities, and evidence of fishing gear entanglement or other possible causes leading to injury or death. When possible, photos were taken of each stranding. For dead strandings, samples were collected for ongoing DNA and aging studies. Flippers, eyes and muscle tissue were collected and transferred to the NMFS Beaufort laboratory. When possible, stranded turtles were necropsied by CAHA staff in order to determine sex, health condition, and occurrences of human interaction. The locations of the strandings, that had GPS coordinates, are documented in Appendix D, Maps 12-16.

During the winter months, CAHA received numerous cold-stunned strandings (live and dead). These strandings were most commonly found on the soundside shoreline. Due to the number of live strandings in the winter months, CAHA worked with volunteers and staff members to develop standardized survey protocol to locate and respond to these animals. Dead strandings were sampled and necropsied, while live strandings were immediately taken to the Roanoke Island Animal Clinic in Manteo, NC (or other accredited rehabilitation facility) for triage and blood work.

DNA Study

In 2011, CAHA, along with all other North Carolina, South Carolina, and Georgia beaches, participated in a genetic mark-recapture study of Northern Recovery Unit nesting female loggerheads using DNA derived from eggs. The study was coordinated by the Georgia Department of Natural Resources, the University of Georgia, and NCWRC. Results from this study will provide estimates of annual nesting population size, clutch frequency, and remigration of females as well as characterize the scale of nest site fidelity and population structure. A single egg is removed from each nest to comply with this study.

Volunteer Project

In an effort to involve the public in sea turtle management, CAHA continued two of the sea turtle volunteer programs begun in 2009.

The first program was designed to allow volunteers to assist biologists with public interpretation and “nest sitting.” Nest-sitters watched over nests that were likely to hatch, helped minimize disturbance to hatchlings attempting to reach the ocean, prevented predation from ghost crabs and mammalian predators, educated the public in sea turtle life history, and explained sea turtle management practices at CAHA. Volunteers also assisted staff by teaching the general public about sea turtle biology during public excavations.

The second volunteer program was developed to have volunteers assist staff members in the response to cold-stunned sea turtle strandings. Since CAHA receives so many cold-stunned strandings, the volunteers in this program helped patrol areas difficult to access by park employees such as soundside areas in the villages, in order to look for turtles as well as transport them to the rehabilitation facility if the animal was alive.

RESULTS

Nesting

Sea turtle nest numbers at CAHA vary from year to year. The yearly nest numbers used in this report were taken from a thorough search of CAHA's turtle database and represent the most accurate turtle management data for CAHA (Figure 1). Additionally, in the spring of 2010, staff biologists met with biologists from NCWRC to review and fix known discrepancies between the two agencies' nesting databases. As a result of this meeting, some prior year nest totals have been changed, and may differ from data provided in Annual Reports prior to 2010. These changes reflect the most accurate data as compiled by CAHA and NCWRC.

The first recorded nesting activity for the 2011 season occurred on Hatteras Island with a loggerhead nest on May 15. The last recorded nest of the season was laid on Hatteras Island on August 21. In some years there are nests that are only located after the first day they were laid or at the time of their hatching, known as "missed nests". This year there were two "missed nests." A record of each of these nests is found in the Discussion section of this report. The 2011 sea turtle nesting season lasted for 99 days. A total of 278 activities were documented of which 147 were confirmed nests and 131 were false crawls (Table 1 and Appendix D, Maps 2-11). The 147 nests on CAHA (137 loggerhead nests, nine green nests, and one Kemp's ridley nest) constituted 15.2 % of North Carolina's total of 967 nests. In 2011 the state documented a total of 967 nests comprised of 931 loggerhead nests, 14 green nests, 21 nests where the species could not be identified, and one Kemp's ridley nest (Table 2). Of the confirmed nests found at CAHA this season, 96 (65.3%) were found in Hatteras District, 29 (19.7%) were found in Ocracoke District, and 22 (15.0%) were found in the Bodie District (Figure 2). For maps of all turtle nests and false crawls refer to Appendix D, Maps 2-11.

There were several storms that caused severe damage to sea turtle nests at CAHA in 2011, resulting in a total of 32 nests that could not be excavated due to storm activity. All 32 of these nests were assumed to have 0% hatching or emergence success as the storms hit prior to any documented emergence. An additional 23 nests experienced reduced nest success due to storm activity.

Figure 1. CAHA Sea Turtle Nest Numbers from 2000-2011.

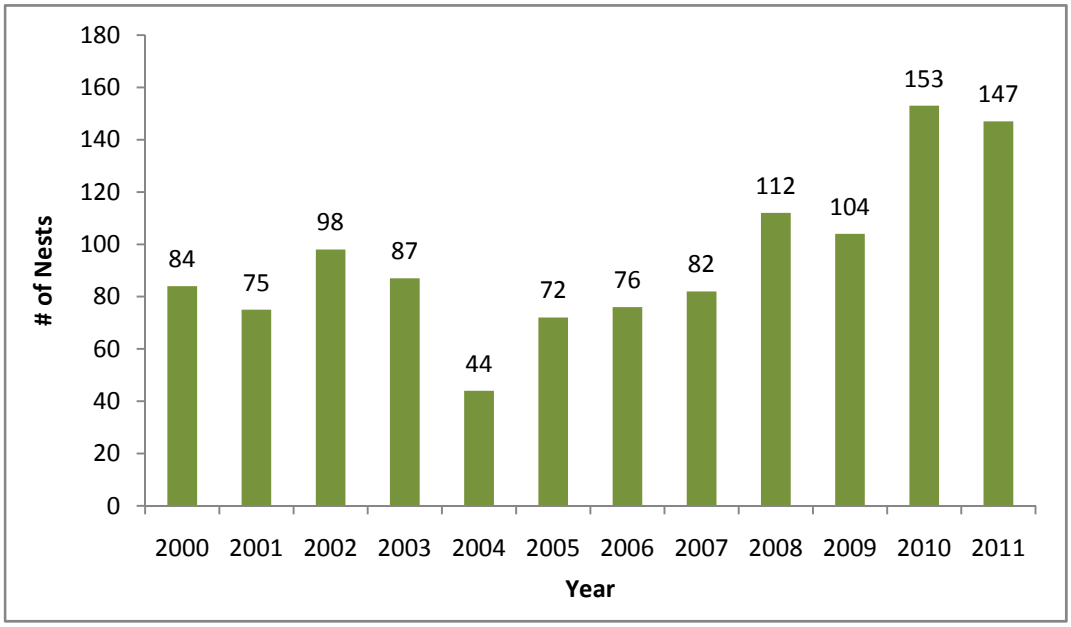


Table 1. Nest Activity by District in 2011.

	Bodie	Hatteras	Ocracoke	CAHA Total
Nests	22	96	29	147
False Crawls	27	83	21	131

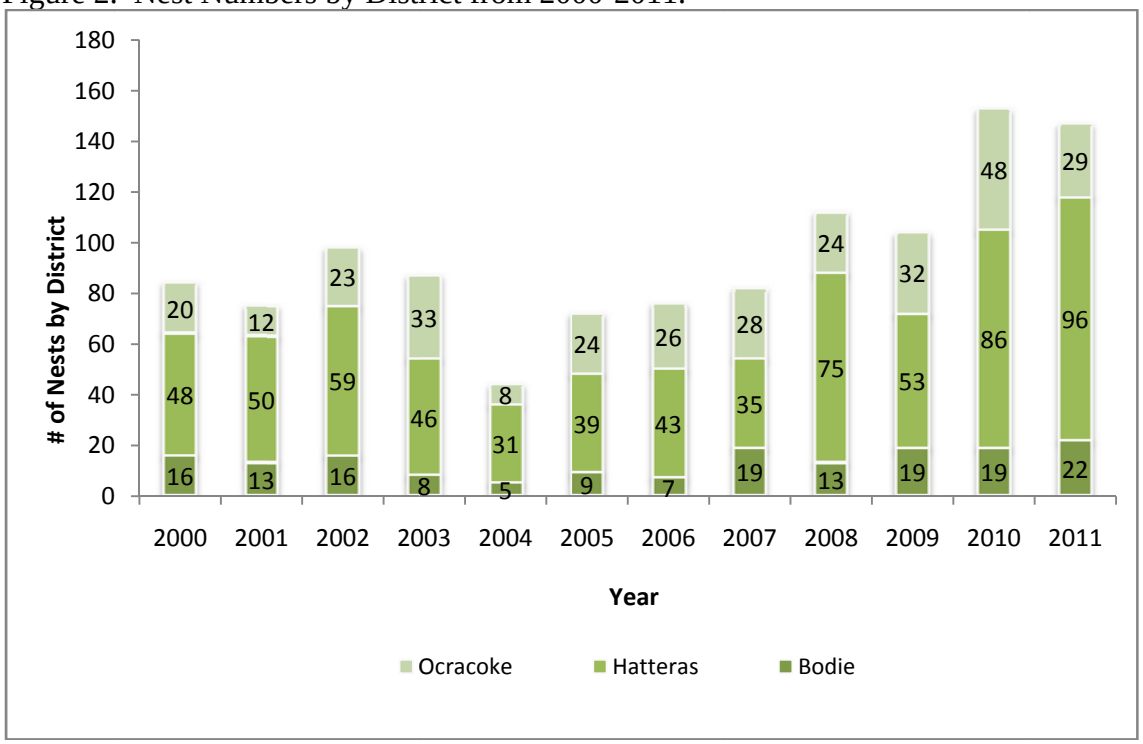
Table 2. Percentage of Total Nests for North Carolina (2000-2011).

Year	CAHA Nests	NC Nests*	%
2000	84	780	10.8
2001	75	664	11.3
2002	98	710	13.8
2003	87	867	10.0
2004	44	342	12.9
2005	72	666	10.8
2006	76	773	9.8
2007	82	566	14.5
2008	112	912	12.3
2009	104	622	16.7
2010	153	881	17.4
2011	147	967**	15.2

*from Matthew Godfrey (NCWRC)

**preliminary nest results from Matthew Godfrey (NCWRC)

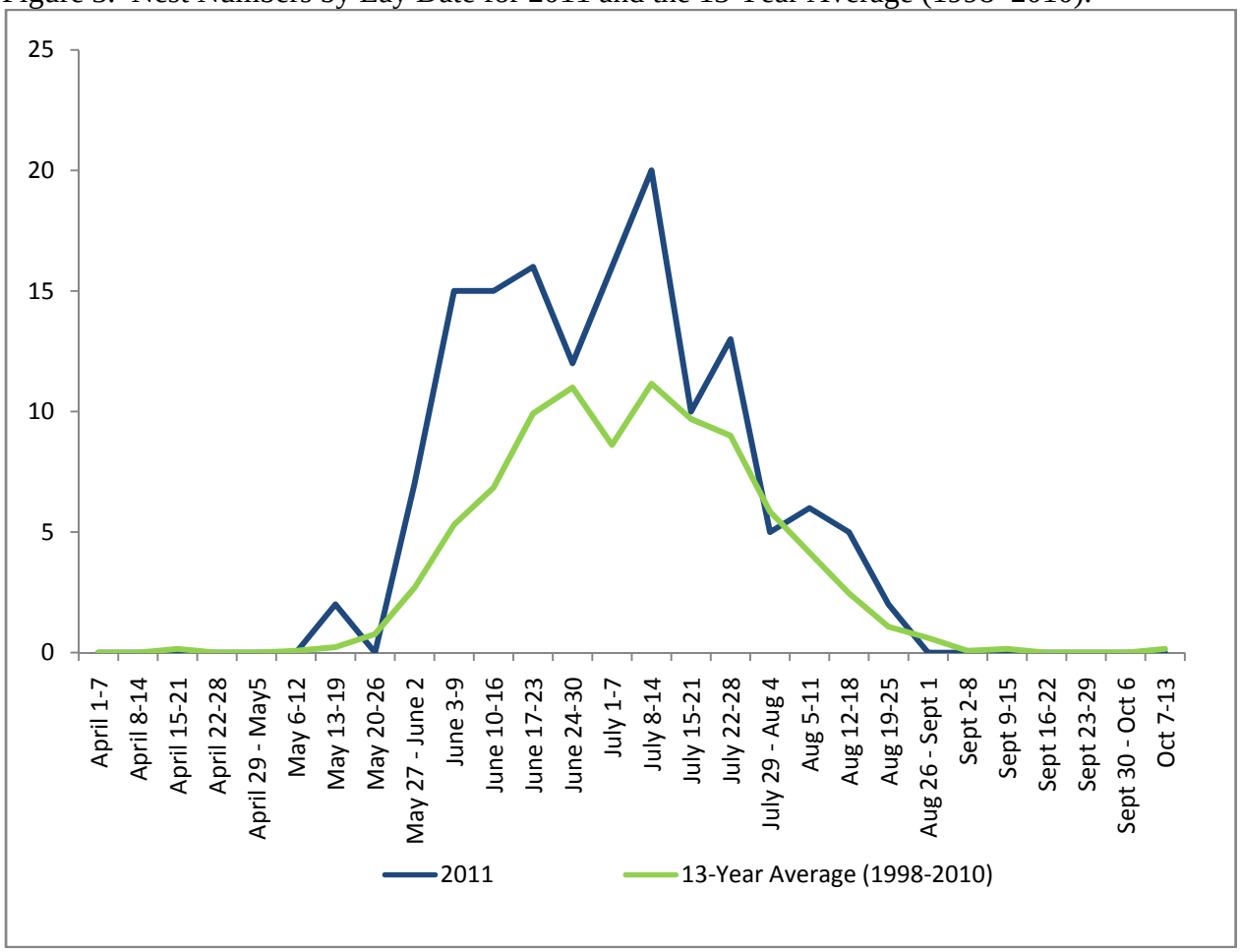
Figure 2. Nest Numbers by District from 2000-2011.



Nests by Lay Date

The most nests laid during any given week was the week of July 8-14, consistent with one of the peaks for CAHA's 13 year average (1998-2010) (Figure 3 and Appendix A). Nests that did not have known lay dates (e.g. were found only when hatchlings emerged) are not included in this graph. It is important to note that these numbers are potentially misleading. Prior to 2007, turtle patrols were conducted between May 15 and Sept 1. Prior to 2006, patrols were conducted between June 1 and September 1. In 2006, patrols were conducted between May 15 and September 1. In 2007 and 2008, patrols were conducted between May 1 and September 15. In 2009, 2010, and 2011, patrols have begun on May 1 and continued until October 1 due to the potential for late nests. Any nests found before the start date or end date of turtle patrol were found by chance (i.e., reported by visitors, staff on the beach performing other duties, etc.) since no coordinated, scheduled patrols were conducted. It is unknown how many nests were missed during these times.

Figure 3. Nest Numbers by Lay Date for 2011 and the 13 Year Average (1998–2010).[1]



False Crawls

During the 2011 breeding season, 131 false crawls or aborted nesting attempts were recorded (Table 1). False crawls accounted for 47.1% of the total turtle activities within CAHA. Of the 131 false crawls, 83 (63.4%) were documented in the Hatteras District, 21 (16.0%) in the Ocracoke District, and 27 (20.6%) in the Bodie Island District. There were 12 documented green turtle false crawls while loggerheads accounted for the remaining 119 false crawls.

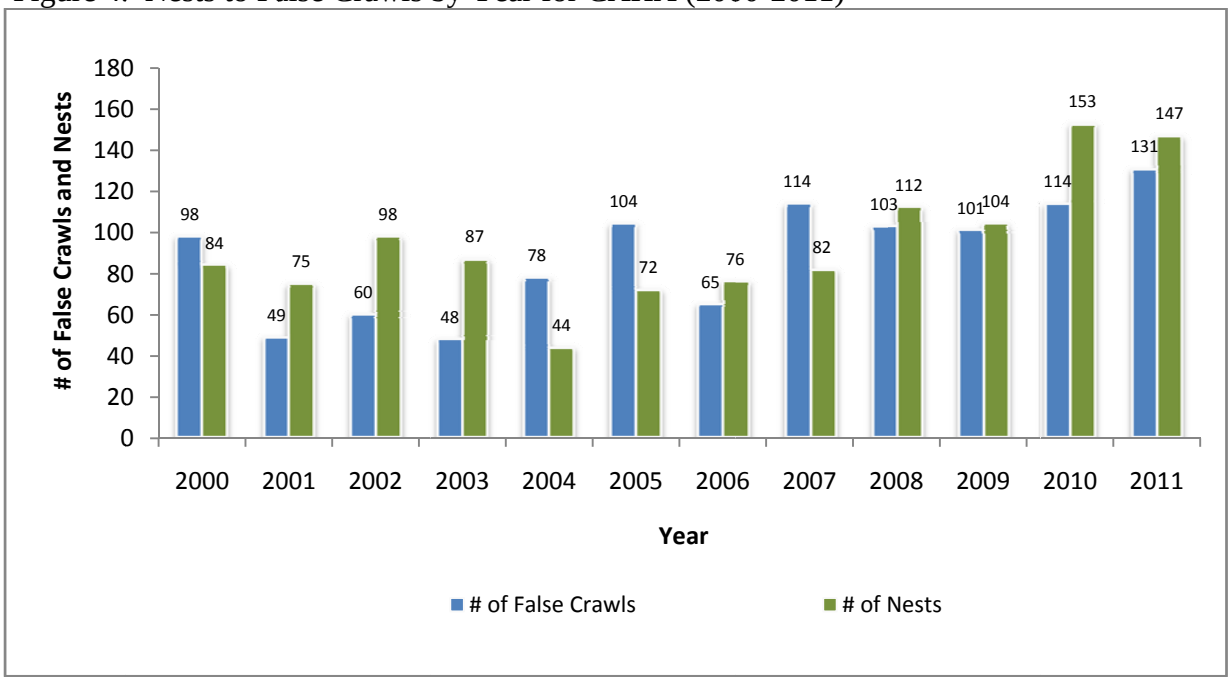
In 2011, 131 false crawls and 147 nests were documented resulting in a 0.89:1 false crawl to nest ratio (Figure 4). Therefore CAHA met the target level of a false crawl to nest ratio of less than or equal to 1:1 annually, which is a performance measure in CAHA's USFWS biological opinion (BO). CAHA has met the desired target level in eight of the last 12 years (Table 3).

[1] Includes 144 nests with known lay dates. Also includes NH95, which was incorrectly labeled as a false crawl, but later found to be an active nest at the time of hatching. The lay date for NH95 is considered to be the date the false crawl was reported (total of 145 nests represented in the graph).

Table 3. False Crawl to Nest Ratios for CAHA (2000-2011)

Year	# of False Crawls	# of Nests	Ratio
2000	98	84	1.17 : 1
2001	49	75	.65 : 1
2002	60	98	.61 : 1
2003	48	87	.55 : 1
2004	78	44	1.77 : 1
2005	104	72	1.44 : 1
2006	65	76	.86 : 1
2007	114	82	1.39 : 1
2008	103	112	.92 : 1
2009	101	104	.97 : 1
2010	114	153	.75 : 1
2011	131	147	.89 : 1

Figure 4. Nests to False Crawls by Year for CAHA (2000-2011)



DNA Study

In 2010 and 2011 CAHA participated in a DNA study conducted by researchers at the University of Georgia. One egg from each nest[2] was taken and sampled for maternal DNA. This allowed each nest from North Carolina, South Carolina, and Georgia to be "assigned" to a nesting female. This research ultimately will answer questions about the total number of nesting females in the population, the number of nests each female lays per season, how far apart nests are, and other important information that is important to understanding the population dynamics of sea turtles.

[2] Total of 140 nests were sampled in 2011.

Currently, the results of this study are preliminary and remain the copyright of the project coordinators. However, they have provided the following information:

- In 2010, of the 147 samples CAHA collected, 130 have so far been analyzed. From the 130 samples, 79 unique individuals have been identified. Of those 79 individuals, 40 had known nests *only* at CAHA. The other 39 individuals laid at least one nest at CAHA, but also nested on another beach.
    - Twenty turtles nested at both CAHA and Cape Lookout National Seashore (CALO). This includes the turtle that was struck and killed by an ORV while attempting to nest between Ramp 70 and Ramp 72.
    - Four turtles nested at both CAHA and Pea Island NWR, NC
    - Two turtles nested at both CAHA and Bald Head Island, NC.
    - One turtle nested at both CAHA and in the area between Nags Head, NC and the Virginia border.
    - One turtle nested at both CAHA and Emerald Isle, NC.
    - One turtle nested at both CAHA and Figure 8 Island, NC.
    - One turtle nested at both CAHA and Oak Island, NC.
    - One turtle nested at both CAHA and Onslow Beach, NC.
    - One turtle nested at both CAHA and Topsail, NC.
    - Six turtles nested at both CAHA and a beach in South Carolina.
    - One turtle nested at both CAHA and a beach in Georgia.

- In 2011, of the 140 samples CAHA collected, 94 have so far been analyzed. From the 94 samples, 56 unique individuals have been identified. Of those 56 individuals, 25 had known nests *only* at CAHA. The other 31 individuals laid at least one nest at CAHA, but also nested on another beach.
    - Thirteen turtles nested at both CAHA and Cape Lookout National Seashore (CALO).
    - Four turtles nested at both CAHA and Bald Head Island, NC.
    - Three turtles nested at both CAHA and in the area between Nags Head, NC and the Virginia border.
    - Two turtles nested at both CAHA and Pea Island NWR, NC.
    - One turtle nested at both CAHA and Fort Fisher, NC.
    - One turtle nested at both CAHA and Onslow Beach, NC.
    - One turtle nested at both CAHA and Pine Knoll Shores, NC.
    - One turtle nested at both CAHA and Topsail, NC.
    - Four turtles nested at both CAHA and a beach in South Carolina.
    - One turtle nested at both CAHA and a beach in Georgia.

Nest Relocation

Of the 147 nests, 109 (74.1%) were protected at the original nest site and 38 (25.9%) were relocated (Table 4). Nests were relocated in all districts. The highest number of relocations took place in the Hatteras District where 22 of the 96 nests in the district were relocated (23%). In the Bodie District nine of the 22 nests (41%) were relocated and seven of the 29 nests (24%) on Ocracoke were relocated (Table 5). Of the 38 relocated nests, all were moved because of natural

factors such as being laid at or below the high tide line or due to erosion occurring in the area. A total of 5 nests were moved during the approach of Hurricane Irene.

Table 4. Relocated Nests by Management District in 2011.

Nest Type	Bodie	Hatteras	Ocracoke	Total
In Situ Nests	13	74	22	109
Relocated Nests	9	22	7	38
Total	22	96	29	147

Hatching

Follow-up of nesting activity involved observing nest sites for signs of hatching, recording relevant data (i.e. overwashes, violations), and excavating the site. Nests were excavated no earlier than 72 hours post-hatching, unless it was felt that an early excavation was needed in order to uncover live hatchlings that were entombed due to environmental conditions or in the approach of an impending storm.

For sea turtles, there is a difference between hatching success and emergence success. Emergence success is the total number of hatchlings, relative to the total number of eggs in a nest that emerge from their nest *on their own*. Any live hatchlings that are found during excavations are not considered to have "emerged". Emergence success can be calculated using the following formula:

$$\frac{\text{Total \# of Emerged Hatchlings}}{\text{Total Clutch Size}} \quad \text{X } 100$$

Hatching success is the percentage of eggs in a nest that produce live hatchlings. This includes any live hatchlings that are found during excavations, which means it also includes any hatchlings that were removed from nests prior to storm events. Hatching success can be calculated using the following formula:

$$\frac{\text{Total \# Emerged Hatchlings + \# of Live Hatchlings}}{\text{Total Clutch Size}} \quad \text{X } 100$$

In order to determine Total Clutch Size, the # of eggshells is added to the # of unhatched eggs. In this report, an effort has been made to show both the hatching and emergence success for each nest, as well as CAHA as a whole.

Of the 147 nests, 96 (65%) nests had a hatching success of greater than or equal to 1%[3] and 81 (55%) nests had an emergence success of greater than or equal to 1%[4]. The average clutch size for nests at CAHA was 115.8[4].

[3] Assumes that all 32 nests that were washed out have 0% hatch and emergence success.

[4] Average calculated from 118 nests with known clutch sizes (total of 13,661 eggs). Although NH82, NO14, and NO25 were washed out and could not be excavated, the total clutch size from these nests were known since they had been relocated when found.

Thirty two excavations could not be conducted due to storm activity which resulted in the nests being washed out. Nests took an average of 58.5 days to incubate (average calculated from the 72 nests with known lay and emergence dates) (Figure 5). The shortest incubation period was 49 days and the longest was 78 days. Some emergences may have gone undetected because of low emergence rates or as a result of rain, wind, or tide.

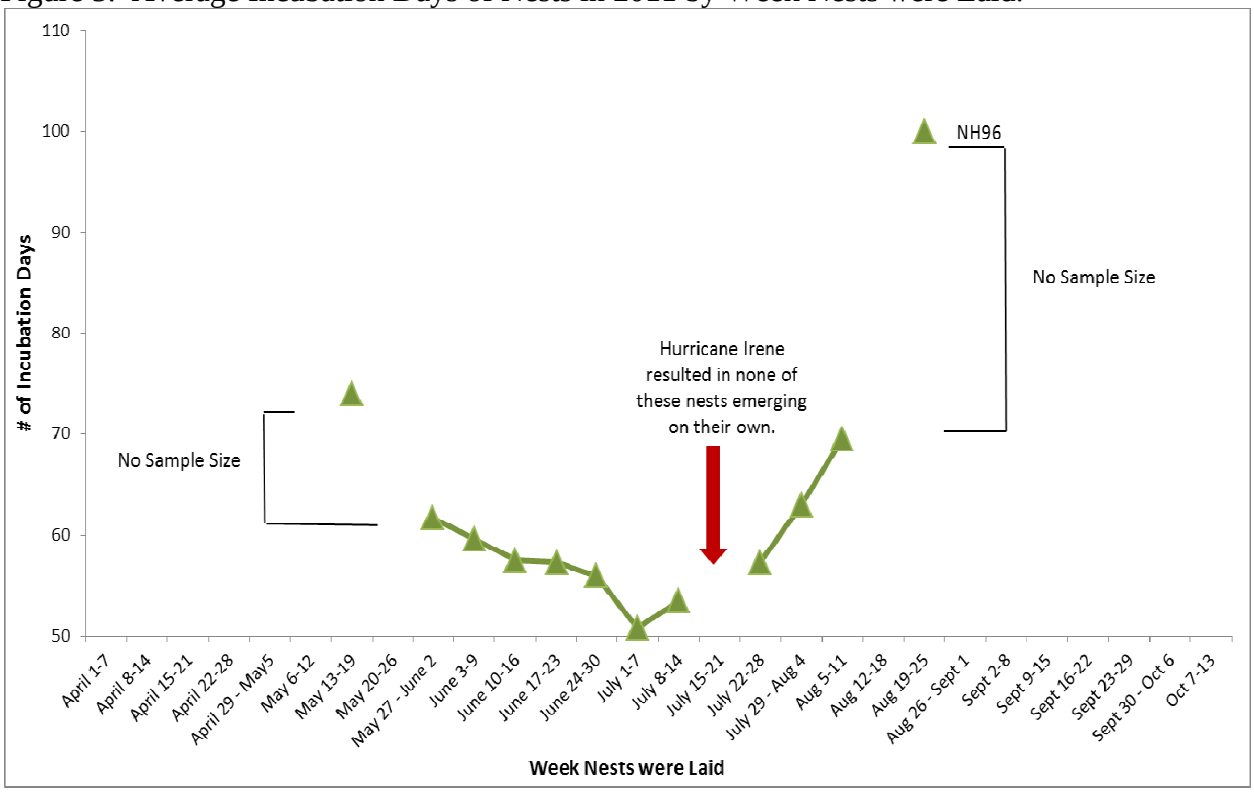
In 2011, a total of 13,661 eggs were laid[5] and 6,483 (47.5%) of these eggs produced hatchlings that emerged from the nests on their own (Table 5). An additional 1,533 live hatchlings were discovered during nest excavations and were released. The overall percentage of eggs that produced hatchlings ("hatching success") is therefore 58.7%.

Although the above calculations are the way in which CAHA typically reports hatching and emergence success, they do not include those nests with unknown clutch sizes, all of which were washed out due to storms. Therefore, the above percentages are higher than what actually occurred. To provide a more accurate assessment of the hatching and emergence success in 2011, all nests with unknown clutch sizes (total of 29 nests) were assumed to have an average clutch size of 115.8 and 0% emergence and hatching success. When the calculations were repeated with these assumptions, the 2011 hatching success was 47.1% and the emergence success was 38.1%. These numbers are considered to be a more accurate representation of the success of turtle nests in 2011.

See pages 19-27 for discussion on how storm activity and other factors influenced the success of nests in 2011. For detailed information regarding specific numbers, dates and locations refer to Appendix A for nests and Appendix B for false crawls.

[5] Excludes nests with unknown clutch sizes.

Figure 5. Average Incubation Days of Nests in 2011 by Week Nests were Laid.[1]



[1] This graph was created by calculating the average incubation days for each nest that was laid during the defined weeks. In total, 72 nests had lay dates and emergence dates. Nests that were excavated early due to storms are excluded, as the hatchlings from those nests did not emerge on their own. All of the nests that were laid between July 15 and July 21 had 0% emergence success due to Hurricane Irene, although several were excavated early and the hatchlings released. NH96 did not have hatchlings that emerged on their own, but did produce 15 live hatchlings that were collected from the nest and released on day 100 of incubation. Although this nest has 0% emergence success, it illustrates that nests that continue late into the season may still produce hatchlings.

Table 5. Sea Turtle Hatch Summary 2001-2011.

Year	Nests	Avg. Clutch	Average Incubation (days)	Total Eggs	# Emerged	EMR%
2001	75	111.7	64.5	6257	3402	54%
2002	99	108.7	58.6	10108	7201	71%
2003	87	115.7	69.1	4627	2708	58%
2004	43	103.4	58.5	2999	1609	53%
2005	73	114.6	58	6072	4142	68%
2006	76	114.8	62.9	7059	4444	63%
2007	82	112.1	60.7	9078	6075	58%
2008	112	109.0	59.7	11573	5965	52%
2009	104	114.9	65	11121	3430	31%
2010	152	110.9	57	16300	7843	48%
2011	147	115.8*	58.5	13661*	6483	48%*

*Calculated from the 118 nests with known clutch sizes. Although NH82, N014, and NO25 were washed out and could not be excavated, the total clutch sizes were known due to the nests being relocated.

Relocated Nest Success

All nests that were relocated had known clutch sizes (three washed out) and in total represented 4,373 eggs. Of these eggs, 2,193 hatchlings emerged for an emergence success of 50.1% for relocated nests. An additional 437 live hatchlings were found and released during excavations, resulting in a hatching success of 60.1% for relocated nests.

Strandings

During much of the year, both breeding and non-breeding sea turtles can be found in nearby waters, especially inshore sounds. A stranded turtle is a non-nesting turtle that comes to shore either dead, sick or injured. Stranding information assists regulatory agencies in implementing and modifying conservation measures, as well as provides vital biological information about the health of the species. All strandings are documented in Appendix C.

In 2011, 148 stranded sea turtles were documented (Table 6, Figure 6) of which 75 (51%) were on ocean beaches and 73(49%) were on the soundside shoreline.

Strandings on the oceanside were easily found and responded to, whereas most of the soundside shoreline was only monitored for strandings in accessible areas (i.e., ORV areas, pedestrian beaches, and soundside ramps). Therefore it is likely that there are a high number of soundside strandings that are not reported.

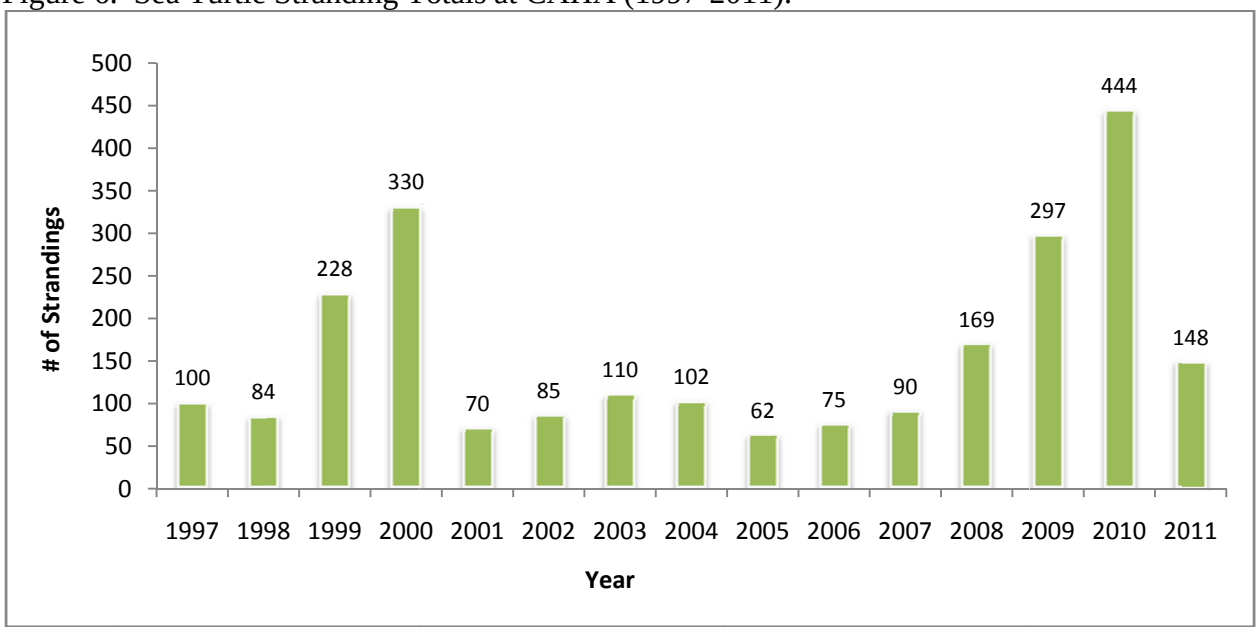
Park-wide, 50 (33.8%) strandings were identified as loggerhead, 46 (31.1%) were Kemp's ridley, 49 (33.1%) were green, three (2%) were unknown, and no hawksbills or leatherbacks were documented.

Table 6. Sea Turtle Strandings at CAHA (1997-2011).

		Species Composition						Location	
Year	Stranding Totals	Logger-head	Kemp's Ridley	Green	Leather-back	Hawksbill	Unk.	Ocean	Sound[1]
1997	100	65	17	11	3	0	4	unk.	unk.
1998	84	45	26	10	2	0	1	unk.	unk.
1999	228	150	56	22	0	0	0	140	88
2000	330	252	31	43	2	0	1	240	90
2001	70	41	11	11	4	1	2	46	23
2002	85	54	6	23	0	0	2	54	31
2003	110	87	8	11	2	1	1	88	21
2004	102	38	11	42	5	0	6	47	55
2005	62	33	3	20	1	1	4	41	22
2006	75	45	11	16	2	0	1	65	10
2007	90	32	5	50	1	0	2	46	44
2008	169	39	34	94	2	0	0	39	130
2009	297	53	57	183	2	0	2	109	188
2010	444	100	108	235	0	0	1	117	327
2011	148	50	46	49	0	0	3	75	73

[1] Soundside strandings include any strandings found on inlets, spits, interior islands, soundside village beaches and soundside shorelines.

Figure 6. Sea Turtle Stranding Totals at CAHA (1997-2011).

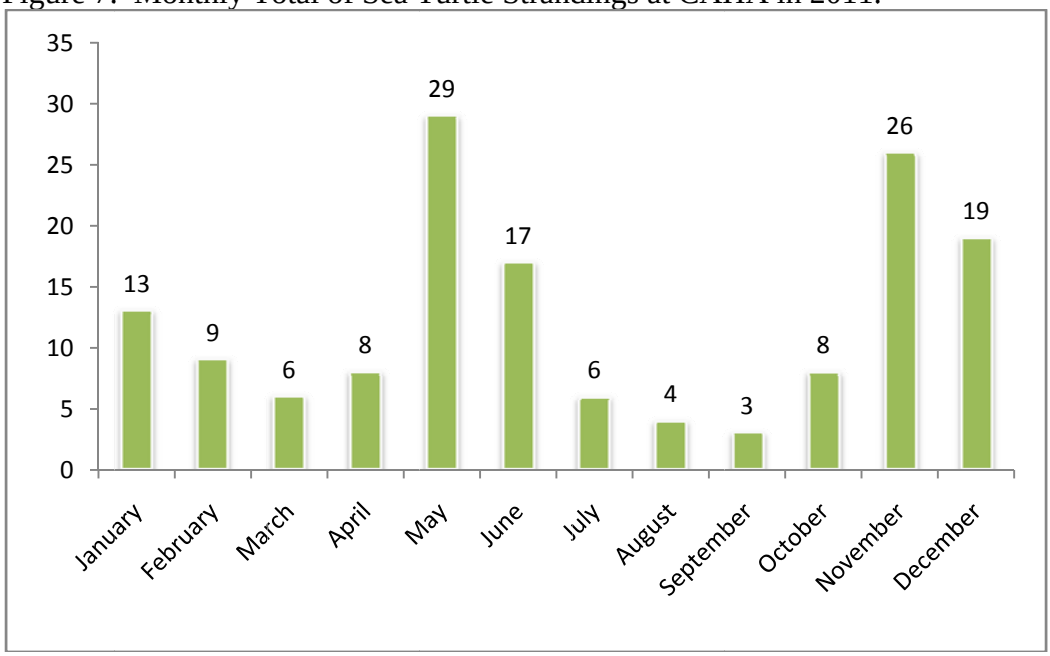


Of the total strandings, 140 (95%) turtles were dead when found. Of the eight live strandings, all were transferred to the North Carolina Aquarium on Roanoke Island or a similar facility for rehabilitation. Most of these live strandings were a result of 'cold stunning' when water temperatures became too cold for sea turtles to function normally. In several occurrences, these turtles had pre-existing conditions that made them more susceptible to a cold stun event. Examples of pre-existing conditions include old boat strike wounds, plastic (e.g. wrappers, toys) in the gastrointestinal tract, etc. Three of the eight live strandings died in rehab (37.5%). All turtles that died after being found alive were necropsied by CAHA, Roanoke Island Aquarium, or NCWRC.

Necropsies were performed by CAHA staff on 94 of the 140 strandings that were found dead (67%). Additionally, some strandings have been frozen and saved for later necropsy training sessions. Cause of death in most cases was unknown; however eight strandings had obvious signs of human interaction (prop wounds, hooks, or plastic). Additionally, three turtles had signs of fisheries interactions from entanglement or drowning (as determined by NCWRC biologists-often evidenced by remaining gear or obvious entanglement lesions around the neck or flippers). Cold temperatures attributed to nine strandings (both live and dead). Only live and fresh dead strandings were conclusively determined to be cold stuns. The mortality of dead strandings that were found around the same time that were not fresh are listed as CBD (cannot be determined), but are also most likely due to cold temperatures.

The largest number of strandings occurred in the month of May, when 29 turtles were documented (Figure 7). "Cold stunned" strandings occurred throughout the winter months (November–February) and were found predominantly on the soundside.

Figure 7. Monthly Total of Sea Turtle Strandings at CAHA in 2011.



Injuries and abnormalities for each stranded turtle were recorded on a stranding report. Samples, including eyes, flippers, tags, and muscle samples were collected from stranded turtles according to NCWRC guidelines. All turtles in 2011 were responded to by NPS staff or volunteers. Turtles that stranded soundside in the villages are included in the stranding totals.

DISCUSSION

Storm Activity

Loss of nests to storm events continues to negatively impact hatching and emergence success. During the 2011 season, CAHA felt the effects of Hurricane Emily, Irene, and Katia, and other nor'easters. Dates with exceptionally large high tides included August 6-10 (Hurricane Emily), August 25-29 (Hurricane Irene), September 6-9 (Hurricane Katia) and September 18-23 (September nor'easter). Hurricane Irene had the largest impact on nest success. There were a total of 32 nests that were washed out entirely or could not be found post Irene. All of these nests were assumed to have 0% emergence and 0% hatching success due to Hurricane Irene. An additional 12 nests saw a severe decrease in nest success (little or no hatching success) due to Hurricane Irene. There were 11 other nests that also experienced reduced nest success due to storm overwash, but the decrease could not be correlated with one particular storm event. A total of 14 nests continued incubating through the storm season and hatched.

As sea turtle eggs move into the later stages of development, they have less chance of withstanding inundation. Clutches of eggs that were in earlier stages of incubation have a higher chance of survival from overwash. However, since so many nests were in advanced development stages around the time of the storms, they were unable to survive the impacts of storm overwash. The NCWRC biologist was consulted prior to conducting any mid-season relocation and/or early excavations (prior to impending storms) in order to save nests and/or pre-emergent hatchlings from overwash that would have resulted in mortality. A total of 5 nests that

were highly likely to suffer extreme washover and inundation resulting in high mortality were relocated during the approach of Hurrican Irene. A total of 4 nests were almost uncovered by the hurricane and were relocated to a new location in the immediate vicinity of the original nest site.

Early excavations (in the approach of imminent storms) were performed on only those nests that had shown signs of hatching (depression and/or previous emergence). Also, nests that had similar lay dates as already hatched nests were checked for hatchlings and/or pipped eggs. Prior to storm activity, 24 nests[6] were excavated early, resulting in 1,239 hatchlings. Without conducting early excavations, the overall hatching success of 58.7% would have been approximately 49.6%. Post-storm, all remaining nests were checked for compaction, which can cause live hatchlings to become entombed in the egg chamber.

"Missed" Nests

In some years there are nests that are only located after the first day they were laid or at the time of their hatching, known as "missed nests". This year there were two "missed nests", NBH12 and NH95.

-NBH12: This nest was located at 0.2 miles north of Ramp 23 and was not found on the day it was laid by turtle patrol. The nest however was within a bird closure and found and protected the next day by turtle patrol.

-NH95: This nest was laid on June 25 and located at 0.1 miles south of Ramp 44. This nest was originally labeled as a false crawl and left unprotected in an ORV area during its incubation. During the mid morning hours of August 20, a beachgoer called the Sea Turtle Hotline and relayed that an unmarked nest was hatching. Staff was quickly sent out to verify and protect the nest. Since this nest was unprotected and not monitored, it is unknown what impacts natural processes and recreational activities had on the success of this nest.

Predation

Sea turtle nests and hatchlings were predated at multiple nest sites in 2011 by both ghost crabs and mammalian predators. There was no red fox predation this year as occurred in 2007. Mink and raccoon tracks were documented in and around eight nests within the hatch window. It is unknown how many hatchlings were lost to these predators. Cat tracks were found in and around turtle closures throughout the season, particularly in the villages. Many of these incidents occurred on nights when hatchlings were known to emerge. It is unknown exactly how many hatchlings during the season were predated by domestic/feral cats. In 2011, CAHA Resource Management staff continued to trap predators such as fox, coyote, mink, feral cats, opossum, and raccoons within the CAHA boundary year-round. Predator control efforts at CAHA are focused on areas where predation of protected species has been known to occur.

Loss of eggs and hatchlings to ghost crabs continues to be documented. In 2011, 51 nests had recorded predation loss due to ghost crabs (eggs, hatchlings, or both). There were numerous incidents where ghost crab tracks were found within the silt fencing on nights when hatchlings were known to emerge. It is unknown how many total hatchlings were predated by ghost crabs

[6] Total includes NBH07, NBH08, NBH09, NBH13, NBH14, NBI02, NBI03, NH21, NH30, NH35, NH36, NH38, NH39, NH44, NH46, NH47, NH48, NH50, NH53, NH55, NH56, NO13, NO17, and NO20.

in 2011, but at least five were found and documented. During excavations, a total of 293 eggs[7] (2.1%) were found to have been predated. Ghost crab predation was found on all districts. In some cases, ghost crabs were found within the nest cavities predating on hatchlings during excavation.

Other Egg Mortality

Upon excavation, six nests were found to have unhatched eggs with the egg contents exhibiting a bright pink color and/or aqua blue color (yolk sac, amniotic fluid, etc.). The locations of these nests were predominantly in the Hatteras District, but one nest in the Bodie District and one nest on Ocracoke were also affected.

It was hypothesized that the unusual color was or came from bacteria or fungus. It is unclear if the pink substance was the cause of the eggs' mortality or if the substance only showed up in eggs which were unhatched.

Temperature

Despite above average temperatures for much of October and some of September, cold temperatures affected the success of some nests during the 2011 season. Beginning in mid-October, air temperatures occasionally dropped to levels that began to make it difficult for hatchlings to make it from a nest to the water. In the case of NBI04, hatchlings were first documented to have emerged on October 24. However, after this initial emergence, temperatures cooled to the point that made it difficult for the remaining hatchlings to leave the nest. After it was determined that the water temperatures in the area were still high enough, the last 19 hatchlings were collected from the nest and released. Similar incidents were documented in NH85 and NH88.

In the case of NH96, during a nest check on November 28 (day 100 of incubation) 15 live hatchlings were found. After it was determined that the water temperatures in the area were still high enough, the hatchlings were released. Although this nest had low hatching success and no emergence success, it does illustrate the potential for late-laid nests to still have success. It is therefore important from a management perspective to understand that nests that incubate into November/December should still be managed since the potential to produce hatchlings is still possible.

Although normal protocol indicates that nests with no known emergence should be excavated 80-90 days into incubation, CAHA staff and NCWRC has found that it is important to not attempt to excavate late season nests until at least 100 days into incubation. If eggs are found to still be viable at 100 days, eggs should be checked every 10 days until the nest shows signs of hatching or the eggs are found to longer be viable. Furthermore, nests that show signs of hatching after air and water temperatures have dropped below certain thresholds should be excavated, and live hatchlings transported to the Aquarium or other facility until release (generally into the Gulf Stream).

The before mentioned protocol was followed in the case of NH94, which remained incubating for 136 days before cold temperatures stopped the development of the embryos. During a nest

[7] This total does not include any predation that may have occurred to eggs that washed out and were not excavated.

check on November 30 (day 103 of incubation) the eggs were determined to still be viable and left in place. The nest was checked every ~10 days for viability (12/12, 12/20, 12/27), each time the eggs were determined to remain viable. However, during the last nest check on January 3, 2012 (day 136 of incubation) the eggs were found to have succumbed to cold temperatures and the closure removed. Upon excavation, the majority of eggs were found to be in the later-stages of development.

Late Nest Management

At CAHA, the sea turtle nesting season typically occurs between mid-May and the end of August. Since implementation of the CD, morning patrols for nests are conducted between May 1 and September 15, although nests have been documented as late as October 7. Nests that are found later in the nesting season (mid-August or later), generally have lower hatching and emergence success due to fall hurricanes, nor'easters, beach erosion, and cold temperatures. After storm events, all nests that are known to be dead (such as nests that were under standing water for long periods of time) are excavated and removed.

Nests that survive the fall storm season may still fail due to cooling temperatures. For sea turtles, the time a nest takes to incubate is determined by the temperature at which the nest is incubating at. Warmer temperatures, coupled with the absence of storms, often results in nests hatching between 50 and 70 days after being laid. Nests laid later in the season, when fall temperatures are cooler, may result in nests incubating for more than 90 days.

According to normal protocol, all nests that have not hatched are checked at day 90 of incubation. The technician in charge of the procedure will dig down until the eggs are located. While digging, he will look for any signs of live hatchlings, eggshells (evidence that the nest has already hatched), and predation. Once eggs are located, the technician will inspect the exterior of the top eggs for smell and appearance. Nests that contain eggs that appear to be incubating normally, have no external signs of decomposition, or look to contain late-stage live hatchlings are covered back up and left in place until a nest check on day 100 of incubation. Nests that contain eggs that appear to be shriveled, water damaged, covered in fungus or bacterial growth, have pungent odors, or generally appear to be dead are immediately opened. If opened eggs do not contain live hatchlings, the technician will continue through the nest until the entire nest is excavated. If the technician opens an egg containing a live hatchling, the nest is immediately covered back up and left in place. When this happens, the nest will be checked again at day 100 of incubation. The process is then repeated. If the nest is still viable at that time the process continues every 10 days until eggs hatch or is found to be dead. At that time the nest is excavated in its entirety and the closure removed.

If late nests hatch after air or water temperatures have dropped below 50°F, additional management of hatchlings is required. Hatchlings that emerge from nests at these temperatures are often transported to the Gulf Stream by boat. If air temperatures are cold, but water temperatures are within an acceptable range, hatchlings are hand carried from the nest and released into the water. The decision to handle hatchlings differently for cold temperatures is made on a case by case basic by NCWRC biologist Matthew Godfrey, since holding live hatchlings in captivity (prior to a boat ride to the Gulf Stream) requires additional care and permits that CAHA cannot provide.

Although late nests have reduced likelihood of success, there is no mechanism for CAHA to move nests indoors for incubation in the event of cold temperatures. Additionally, there is no mechanism for CAHA to legally abandon these nests, and remove protective closures that are mandated by the Interim Protected Species Management Plan, CD, and BO. Unless an exemption from the US Fish and Wildlife Service is requested and received, late season nests may result in beach closures until the nest hatches or is excavated.

Below are some examples of the management of late season nests over the last several years. All of this information can be found in the Sea Turtle Annual Reports from that year.

2005

Nest # NH41, a green sea turtle nest, hatched on November 11, 2005, on day 77 of incubation. It had a 30% hatch success.

2006

Nest # NH45 hatched November 6, 2006 on day 81 of incubation with a 15.4% hatch success.

2007

Nest # NBH16 was checked on November 7, 2007 at which time live hatchlings were found.

Nest # NH37, the last nest of the season was excavated on December 12, 2007 on Day 112 of incubation. The nest was originally scheduled for excavation on day 90 (November 20th), but viable eggs were found. The nest was therefore left in place until November 27th, when it was determined that air and water temperatures were too low for live hatchings to survive. One live hatchling did hatch from the nest and was taken to the North Carolina Aquarium on Roanoke Island and eventually released by NOAA.

2008

Nest # NH73 was checked on November 5th, 2008 and found to have hatched and had some live hatchlings still in the nest.

Nest # NH75, the last nest of the season was excavated on December 15th, 2008 on day 113 of the nest's incubation. During the excavation the majority of the eggs were found to be in late stage of development.

2009

Cold temperatures affected the success of several nests during the 2009 season. Beginning in early November, air temperatures dropped to a level that made it difficult for emerging hatchlings to make it to the water. In the case of Nest # NO30, a green sea turtle nest, some of the emerging hatchlings were found the following morning upside

down and cold on the morning of November 6, 2009 (day 82 of incubation). The cold temperatures had slowed the hatchlings down so much that they were not capable of moving more than a few feet away from the nest.

After that incident, all remaining nests were watched closely. When nests began to show signs of hatching, staff biologists excavated the nest and removed the hatchings. Hatchlings were then sent to the NC Aquarium on Roanoke Island for later release directly into the Gulf Stream. This was done for hatchlings from nests NO30, NO32 (live hatchlings found and removed from nest on November 11), NH50, and NH51.

Three nests (NO31, NH52, and NH53) had no success due to cold temperatures. Interestingly, although nests NO31 and NO32 were laid on the same night nest NO31 did not hatch while nest NO32 did. Nest NO32 hatched before Nor' Ida hit in November, while NO31 lingered past 100 days of incubation when it succumbed to cold temperatures. The excavation of nest NH52, which was laid on September 15th, showed no development of any of the eggs. The last nest of the season, nest # NH53, which was laid on October 7, was excavated on December 16 after roots were found to be invading the nest site. During the excavation, it was found that none of the eggs showed any development.

Note: Nest # NH53, which was laid on October 7, 2009, is the latest nest that CAHA has on record. Due to the unusual circumstances of the nest, and the likelihood that the nest would not survive the increasingly cold temperatures, CAHA applied to the USFWS for an exemption from the BO for the expansion of a full beach closure at day 50 (the nest was located on South Beach and a full beach closure would be difficult to maintain and prohibit thru access from Ramp 45 to Ramp 49). As is stated above, the nest was excavated on December 16, at which time it was found that the nest had no development. No other nest has ever received an exemption to normal management protocols.

2010

Beginning in mid-October, air temperatures occasionally dropped to a level that made it difficult for hatchlings to make it from a nest to the water. In the case of nest # NH82, hatchlings were first documented to have emerged on October 21. However, after this initial emergence, temperatures cooled to the point that made it difficult for the remaining hatchlings to leave the nest. After it was determined that the water temperatures in the area were still high enough, the last 30 hatchlings were collected from the nest and released. A similar incident was documented at nest # NH80.

Three nests (NBH17, NH83, and NO48) had no success due to cold temperatures. In all three of these nests, the eggs showed that they continued to incubate up until the point that cold temperatures stopped the development of the embryos. During the excavations it was found that the majority of the eggs contained late stage dead hatchlings. Had air and sand temperatures not dropped, it is likely that these nests would have hatched with good success.

In the case of nest # NO48, during the excavation on December 13 (day 106 of incubation) one live pipped hatchling was found. The hatchling was not released since it was still partially encased it its eggshell and water temperatures were too low. The decision was made to transport the hatchling to the North Carolina Aquarium on Roanoke Island for triage, observation, and eventual release. However, the hatchling died before being transported. Although this nest had no hatching or emergence success, it does illustrate the potential for late-laid nests to still be viable.

2011

Despite above average temperatures for some of September and much of October, cold temperatures affected the success of some nests during the 2011 season. Beginning in mid-October, air temperatures occasionally dropped to levels that began to make it difficult for hatchlings to make it from a nest to the water. In the case of nest # NBI04, hatchlings were first documented to have emerged on October 24. However, after this initial emergence, temperatures cooled to the point that made it difficult for the remaining hatchlings to leave the nest. After it was determined that the water temperatures in the area were still high enough, the last 19 hatchlings were collected from the nest and released. Live hatchlings were also found on November 3 in nest # NH90 and released.

Human Disturbance

It is unknown to what extent human activities disrupted nesting activities. Although CAHA remains open to pedestrians 24 hours a day, CAHA staff is not available around the clock to safeguard and monitor all the various natural resources.

Many visitors at CAHA, especially in front of the villages, left their recreational beach equipment and chairs or loungers on the beach overnight. This equipment and furniture can cause turtles to forgo laying eggs by hampering or trapping animals attempting to locate a nesting site (NMFS, USFWS 1991). This is the tenth season that Resource Management staff has tied notices to personal property found on the beach after dawn, advising owners of the threats to nesting sea turtles as well as safety issues and NPS regulations regarding abandoned property. The date and time items were tagged was clearly written on each tag. Items left on the beach 24 hours after tagging were removed by NPS staff. Not all tagged items were removed within 24 hours as staff patrolling on UTVs could not safely remove the property from the beach. At other times, not all abandoned property could be removed because of the abundance encountered and staff availability. In 2011, two incidents of nesting sea turtles being impacted by beach equipment being left on the beach overnight.

NBH15: During turtle patrol on July 26, this nest was found 2.1 miles North of Ramp 23 in the tri-villages. The tracks indicated that after successfully nesting, the turtle hit a beach canopy and drug it approximately 100 feet from its original location. The turtle was able to return to the ocean on its own accord. It is unknown if the nesting turtle sustained any injury from the incident.

CBH19: This false crawl was found on the morning of August 1 in the tri-villages. The turtles' tracks were documented as going into a pile of beach furniture, at which point the turtle turned around and returned to the ocean.

Beaches fronting villages are closed to ORV use in the summer months to provide for the safety of an increased pedestrian population. While many of these beaches were wide enough to support sea turtle nesting, the high amount of human activity and density of development, including lighting within the villages, make these beaches less than optimal nesting sites for sea turtles. With an increase in visitor use, the potential of human disturbance of nesting turtles increases. There continue to be concerns that turtles may be deterred from nesting on beaches of their first choice and forced to lay eggs at a less optimal location.

Artificial Lighting

Artificial light is known to disturb nesting females and can disorient hatchlings. Outdoor lights, un-shaded indoor lights, beach fires and vehicle headlights outshine the natural glow of moonlight on the ocean waves, which can guide hatchlings away from the sea as well as possibly deter nesting females. Filter fencing is a high maintenance and costly response to lighting issues. Fencing is often washed out by incoming tides, buried by winds and/or completely uprooted by storm activity. Nest sites in their hatching window are checked and maintained daily; however, this does not help hatchlings at nest sites where the filter fence has been knocked down during the night. Hatchlings may become entangled in the fencing if it is not properly maintained. CAHA will continue to use the filter fencing until a better option is identified. Since 2005, the majority of all turtle nests within their hatching window have received filter fence treatment. This treatment was continued in 2011. There were no documented incidents of hatchlings becoming tangled in the fencing during this season. Filter fencing was removed from all nests prior to an impending storm for the safety of nests and emerging hatchlings.

Potential Incidental Take / Human Disturbance

All species of sea turtles nesting on CAHA are protected under the Endangered Species Act of 1973. Under the ESA, "take" is any human induced threat to a species that is listed. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, capture or collect, or to attempt to engage in any such conduct." On CAHA, this can include the death, harassment, or disorientation of nesting females and/or hatchlings due to human influence. It is difficult to document all of these potential take incidents, but those reported from the 2011 season are listed below.

NBH03: This nest was laid on the night of May 31 in the tri-village area. That night, Park staff received a call from Dare County Central reporting that pedestrians on the beach were harassing a nesting turtle. The following morning the nest was found, but was so low on the beach that it needed to be relocated. The nest was relocated to higher ground. Since the nest had a good success, it is unlikely that any damage was sustained.

NBH15: During turtle patrol on July 26, this nest was found 2.1 miles North of Ramp 23 in the tri-villages. The tracks indicated that after successfully nesting, the turtle hit a beach canopy and drug it approximately 100 feet from its original location. The turtle was able to return to the

ocean on its own accord. It is unknown if the nesting turtle sustained any injury from the incident.

NH33: This nest was located 1.1 miles South of Ramp 34 in Avon Village. During turtle patrol on Aug 14 the nest was discovered to have hatched. Multiple pedestrian and dog tracks were found inside filter fencing. Multiple hatchling tracks ended abruptly at pedestrian footprints well above the high tide line.

NH86: This nest was located 1.4 miles North of Ramp 43 in Buxton village. During turtle patrol on September 2 and 3, the markers used by staff to identify specific nest locations were found to have been moved from their original locations. Footprints were never documented. The actual nest was located and the markers were replaced in the correct locations. In 2010, a similar incident occurred to NH03 near the Cottage Avenue walkover in Buxton village.

NH92: During turtle patrol on August 15, a "freshly laid" unmarked nest was found to be run over at 1.7 miles South of Ramp 55. The nest was checked and no direct damage was found. It is unknown if any indirect damage was sustained, because this nest washed out during Hurricane Irene.

CBH19: This false crawl was found on the morning of August 1 in the tri-villages. The turtles' tracks were documented as going into a pile of beach furniture, at which point the turtle turned around and returned to the ocean.

Closure Violations

In 2011, there were numerous violations of turtle closures, some more serious than others. Although closure signs were highly visible and could be read easily, law enforcement and resource management staff documented violations at turtle closures throughout the nesting and hatching seasons. Entry into a turtle nesting area would require people to pass under, drive through flagged string tied between signed posts, or pass below signs by the tide line. Signs were posted as low on the beach as possible. Because of extremely high sign loss near the shoreline at all expanded turtle nests, the closure signs closest to the water were replaced with carsonite and/or PVC, which holds better in the moist sand. Although carsonite is extremely costly, staff roped them together so that if the tide washed them out, there was a better chance of recovering them.

The most common type of violation occurred with the entry of pedestrians in the intertidal zone of expanded turtle closures. At 50-55 days of incubation, when turtle closures are expanded, the new closure extends to the mean low tide line. Each nest was clearly marked on each side at the tide line that visitors should not walk in front of the nest. Access was nearly always available behind the nest at the dune line or behind the primary dune. However, due to the difficulty in keeping signs in below the high tide line, many visitors walked in the intertidal zone in front of nests. It is unknown how many, if any, hatchlings were affected by the huge number of visitors in the intertidal zones. This problem was reported most often on Village beaches, popular pedestrian beaches (such as Lighthouse Beach), and popular ORV beaches (such as near Ramp 49). As footprints are often washed out prior to the area being checked, this type of violation is likely under-documented.

It was found that some visitors also walked up into expanded turtle closures near the filter fencing and nest. For some observations, it was apparent that visitors ducked under string and flagging in order to enter/exit turtle closures. It is unknown if hatchlings were affected by the presence of visitors within closures. This type of violation was most reported in front of village beaches where a high number of visitors walked through closures to get to the other side of the closure where they could continue their walk. Some visitors walked up to and inside the protective filter fencing. The beach in these areas is fairly narrow, so most of the closures were full beach closures (after they were expanded). At NBH01 in the tri-village area, multiple sets of pedestrians and dog tracks were documented inside the filter fencing leading up to the nest cavity. At NH33 in Avon, four sets of pedestrian tracks were documented inside the closure very close to the nest itself. At NH11 in Frisco, multiple pedestrian tracks were found inside the closure directly over the nest cavity. At NH24 in Hatteras, broken string and multiple pedestrian tracks were found inside the closure near the nest cavity. In all these examples the nests were checked and no damage was sustained.

Domestic pets constitute another form of violation. In 2011 there were several reports of dogs and/or dog tracks within turtle closures. Often these were accompanied by multiple sets of footprints. Dogs were primarily found to be a problem in the tri-village area, Buxton, Frisco, Hatteras, and Lighthouse Beach. Domestic and/or feral cats continued to be a problem in 2011. Cat tracks were found within at least 36 turtle closures over the season, most commonly in the villages. Cat predation was difficult to document, but it is known that cats pose a serious threat to emerging hatchlings. In the tri-village area, every nest had documented cat tracks though the closure.

ORV violations of turtle closures were relatively rare. There were several accounts of vehicles driving behind full-beach turtle closures. Also, there were several accounts of vehicles driving below (i.e. ocean-side of) the expanded turtle closures in the morning before any washed out signs in the intertidal zone could be replaced. It is unknown how many hatchlings, if any, were affected by these actions either by being run over or by being stuck in tire tracks. There were no observed losses to hatchlings to this type of violation.

In 2011 there were no violations that were considered to be serious or intentional violations under the CD.

U.S. FISH AND WILDLIFE SERVICE BIOLOGICAL OPINION

In accordance with the BO received from USFWS August 14, 2006, Resource Management staff performed daily nest surveys on the ocean beach from May 1 to September 15 (daily surveys were actually continued to October 1 due to the potential for late nests; however, the BO only dictates that surveys continue to September 15). Daily nest checks were performed until the last nest was removed from the beach. This annual report fulfills the reporting requirements of the BO.

Performance measure targets for sea turtles consist of having a total of 10% of the statewide average number of nests for the previous five years and having a sea turtle false crawl to nest

ratio of less than or equal to 1 : 1 annually. Re-initiation of consultation with USFWS is required if the total number of nests is fewer than 10% of the State's total annual nesting number and/or if the false crawl to nest ratio is greater than 1.3 : 1 annually. The first measure was met with 147 nests, making up 15.2% of the state's total (2011). The total of 147 nests represents 19.6% of the state's previous 5-year average (2006 to 2011, average of 750.8 nests per year). The second performance measure was met with a 0.89 : 1 false crawl to nest ratio. This is the fourth year in a row that CAHA has met this measure.

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North Carolina Wildlife Resource Commission, 2006 *Handbook for Sea turtle Volunteers in North Carolina*, North Carolina Wildlife Resources Commission, Raleigh, NC.

Appendix A: CAHA 2011 Sea Turtle Nest Activity

Date	Nest #	Sp.	Rel	Location	Hatch Date	HS%	ES%	Incubated Days
Bodie Island District								
27-May	NBH01	Cc	Y	1.3 miles N of Ramp 23	25-Jul	94.0%	89.0%	59
1-Jun	NBH02	Cc	N	1.3 miles N of Ramp 23	2-Aug	87.5%	86.7%	62
1-Jun	NBH03	Cc	Y	3.0 miles N of Ramp 23	7-Aug	71.3%	70.4%	66
13-Jun	NBH04	Cc	Y	2.0 miles S of Ramp 23	Unknown	90.2%	87.5%	
14-Jun	NBH05	Cc	Y	1.0 miles N of Ramp 27	9-Aug	92.8%	85.7%	56
23-Jun	NBH06	Cc	N	0.1 miles N of Ramp 30	17-Aug	97.0%	94.7%	55
27-Jun	NBH07	Cm	N	0.3 miles N of Ramp 30	Unknown	94.1%	90.6%	
5-Jul	NBH08	Cc	Y	1.3 miles S of Ramp 23	25-Aug	88.5%	74.0%	51
7-Jul	NBH09	Cc	N	0.2 miles S of Ramp 27	25-Aug	75.9%	9.8%	49
10-Jul	NBH10	Cc	Y	1.6 miles S of Ramp 23	Unknown	94.5%	87.3%	
10-Jul	NBH11	Cc	Y	0.5 miles S of Ramp 27	Unknown	48.3%	48.3%	
11-Jul	NBI01	Cc	N*	0.8 miles S of Ramp 2	4-Sep	62.5%	59.2%	55
Unknown	NBH12	Cc	N	0.2 miles N of Ramp 23	None	0.0%	0.0%	
14-Jul	NBH13	Cc	N	1.0 miles N of Ramp 27	6-Sep	61.4%	51.2%	54
18-Jul	NBI02	Cc	N	0.1 miles N of Ramp 2	None	95.5%	0.0%	
20-Jul	NBH14	Cm	N	2.7 miles N of Ramp 23	None	30.6%	0.0%	
24-Jul	NBI03	Cc	N	0.1 miles N of Ramp 4	None	88.2%	0.0%	
26-Jul	NBH15	Cc	N	2.1 miles N of Ramp 23	1-Oct	15.9%	4.4%	67
31-Jul	NBH16	Cc	N	0.8 miles N of Ramp 27	Nest Lost	0.0%	0.0%	
2-Aug	NBH17	Cc	N	2.5 miles N of Ramp 23	4-Oct	50.0%	38.6%	63
5-Aug	NBI04	Cc	Y	0.4 miles N of Ramp 4	14-Oct	82.2%	67.4%	69
18-Aug	NBI05	Cc	Y	0.4 miles N of Ramp 4	None	0.0%	0.0%	
Hatteras Island District								
15-May	NH01	Cc	N	0.1 miles N of Ramp 43	None	0.0%	0.0%	
29-May	NH02	Cc	Y	0.2 miles N of Ramp 34	24-Jul	93.8%	84.4%	56
1-Jun	NH03	Cc	N	2.7 miles S of Ramp 49	3-Aug	75.0%	75.0%	63
1-Jun	NH04	Cc	N	0.3 miles S of Ramp 49	4-Aug	76.2%	75.2%	64
4-Jun	NH05	Cc	N	0.9 miles S of Ramp 30	28-Jul	76.5%	74.0%	54
4-Jun	NH06	Cc	N	2.9 miles S of Ramp 38	28-Jul	84.5%	78.3%	54
5-Jun	NH07	Cc	N	2.3 miles S of Ramp 49	None	0.0%	0.0%	
6-Jun	NH08	Cc	Y	0.5 miles S of Ramp 49	10-Aug	77.7%	70.2%	65
6-Jun	NH09	Cc	N	1.8 miles S of Ramp 55	None	0.0%	0.0%	
7-Jun	NH10	Cm	N	2.3 miles S of Ramp 38	8-Aug	94.3%	86.7%	62
7-Jun	NH11	Cc	N	2.1 miles S of Ramp 49	3-Aug	41.3%	40.4%	57
8-Jun	NH12	Cc	Y	0.5 miles N of Ramp 43	10-Aug	88.1%	64.3%	63
8-Jun	NH13	Cc	Y	0.5 miles S of Ramp 44	3-Aug	92.7%	90.0%	56
9-Jun	NH14	Cc	N	0.4 miles N of Ramp 43	12-Aug	95.6%	95.6%	64
10-Jun	NH15	Cc	N	0.2 miles S of Ramp 44	6-Aug	86.1%	85.4%	57
10-Jun	NH16	Cc	N	0.5 miles E of Ramp 45	8-Aug	91.8%	91.8%	59
11-Jun	NH17	Cc	Y	1.5 miles N of Ramp 43	10-Aug	55.2%	55.2%	60
11-Jun	NH18	Cc	N	3.0 miles S of Ramp 38	5-Aug	96.2%	95.3%	55
11-Jun	NH19	Cc	Y	0.8 miles N of Ramp 34	10-Aug	78.6%	78.6%	60
12-Jun	NH20	Cc	N	0.1 miles N of Ramp 38	5-Aug	89.3%	88.5%	54
12-Jun	NH21	Cc	N	0.1 miles S of Ramp 30	None	93.6%	0.0%	
12-Jun	NH22	Cc	Y	2.4 miles S of Ramp 55	9-Aug	94.7%	94.7%	58
13-Jun	NH23	Cc	N	0.4 miles E of Ramp 49	12-Aug	90.8%	90.8%	60
14-Jun	NH24	Cc	N	1.3 miles N of Ramp 55	9-Aug	52.5%	51.3%	56
16-Jun	NH25	Lk	Y	0.1 miles N of Ramp 44	12-Aug	68.2%	68.2%	57
20-Jun	NH26	Cc	Y	1.0 miles S of Ramp 44	16-Aug	76.5%	75.6%	57
20-Jun	NH27	Cc	N	0.3 miles E of Ramp 49	Unknown	94.0%	94.0%	
21-Jun	NH28	Cc	Y	1.5 miles S of Ramp 34	13-Aug	78.0%	61.0%	53
22-Jun	NH29	Cc	N	0.6 miles N of Ramp 43	16-Aug	81.5%	78.8%	55
22-Jun	NH30	Cm	N	0.5 miles S of Ramp 44	23-Aug	96.3%	95.5%	62
22-Jun	NH31	Cc	Y	2.4 miles N of Ramp 43	21-Aug	79.4%	79.4%	60
22-Jun	NH32	Cc	N	0.1 miles E of Ramp 45	17-Aug	58.1%	58.1%	56
22-Jun	NH33	Cc	N	1.1 miles S of Ramp 34	12-Aug	92.1%	81.9%	51

Appendix A: CAHA 2011 Sea Turtle Nest Activity

Date	Nest #	Sp.	Rel	Location	Hatch Date	HS%	ES%	Incubated Days
23-Jun	NH34	Cc	N	0.4 miles S of Ramp 44	20-Aug	17.5%	17.5%	58
23-Jun	NH35	Cc	Y	0.4 miles W of Ramp 45	24-Aug	86.6%	84.8%	62
24-Jun	NH36	Cc	N	0.9 miles N of Ramp 43	24-Aug	65.2%	64.3%	61
24-Jun	NH37	Cc	N	1.2 miles N of Ramp 43	17-Aug	86.8%	85.4%	54
25-Jun	NH38	Cc	N	0.8 miles E of Ramp 45	20-Aug	61.1%	52.8%	56
25-Jun	NH95	Cc	N	0.1 miles S of Ramp 44	20-Aug	71.9%	62.2%	56
26-Jun	NH39	Cc	N	0.2 miles W of Ramp 45	22-Aug	91.1%	89.5%	57
26-Jun	NH40	Cc	N	1.5 miles N of Ramp 38	Unknown	82.2%	79.5%	
26-Jun	NH41	Cc	N	0.9 miles E of Ramp 49	Unknown	94.1%	94.1%	
27-Jun	NH42	Cc	N	0.1 miles S of Ramp 44	19-Aug	85.5%	83.6%	53
27-Jun	NH43	Cc	N	0.1 miles S of Ramp 49	None	0.0%	0.0%	
27-Jun	NH44	Cc	N	1.8 miles N of Ramp 34	23-Aug	91.1%	89.9%	57
1-Jul	NH45	Cc	N	1.2 miles N of Ramp 43	24-Aug	0.9%	0.9%	54
1-Jul	NH46	Cc	N	0.3 miles W of Ramp 45	None	91.5%	0.0%	
2-Jul	NH47	Cm	N	0.4 miles N of Ramp 38	None	97.8%	0.0%	
4-Jul	NH48	Cc	Y	0.4 miles S of Ramp 34	None	96.8%	0.0%	
5-Jul	NH49	Cc	N	1.0 miles W of Ramp 45	Nest Lost	0.0%	0.0%	
5-Jul	NH50	Cm	N	1.5 miles N of Ramp 38	None	81.6%	0.0%	
6-Jul	NH51	Cc	N	0.7 miles E of Ramp 49	None	0.0%	0.0%	
7-Jul	NH52	Cc	N*	0.3 miles N of Ramp 43	None	0.0%	0.0%	
8-Jul	NH53	Cc	N	1.9 miles N of Ramp 43	None	47.2%	0.0%	
8-Jul	NH54	Cc	N	0.2 miles E of Ramp 49	2-Sep	39.3%	39.3%	56
8-Jul	NH55	Cc	N	1.1 miles N of Ramp 34	None	58.7%	0.0%	
8-Jul	NH56	Cc	Y	1.2 miles S of Ramp 44	None	59.2%	0.0%	
9-Jul	NH57	Cc	N	1.1 miles N of Ramp 43	Nest Lost	0.0%	0.0%	
9-Jul	NH58	Cc	N	1.3 miles S of Ramp 55	Nest Lost	0.0%	0.0%	
11-Jul	NH59	Cc	Y	1.2 miles S of Ramp 44	None	0.0%	0.0%	
11-Jul	NH60	Cc	N	1.7 miles N of Ramp 34	Nest Lost	0.0%	0.0%	
11-Jul	NH61	Cc	N	2.5 miles N of Ramp 55	Nest Lost	0.0%	0.0%	
12-Jul	NH62	Cc	N	2.9 miles S of Ramp 38	1-Sep	79.3%	79.3%	51
12-Jul	NH63	Cc	N	1.1 miles S of Ramp 49	None	0.0%	0.0%	
12-Jul	NH64	Cc	N	0.1 miles N of Ramp 55	Nest Lost	0.0%	0.0%	
13-Jul	NH65	Cc	N	0.2 miles E of Ramp 45	Nest Lost	0.0%	0.0%	
13-Jul	NH66	Cm	N	1.0 miles S of Ramp 38	None	13.8%	0.0%	
17-Jul	NH67	Cc	N	2.8 miles S of Ramp 38	Nest Lost	0.0%	0.0%	
17-Jul	NH68	Cc	N	2.4 miles S of Ramp 38	Nest Lost	0.0%	0.0%	
18-Jul	NH69	Cc	N	0.7 miles N of Ramp 55	Nest Lost	0.0%	0.0%	
19-Jul	NH70	Cc	N	1.7 miles N of Ramp 34	Nest Lost	0.0%	0.0%	
21-Jul	NH71	Cc	N	0.2 miles E of Ramp 49	None	0.0%	0.0%	
21-Jul	NH72	Cc	N	2.6 miles S of Ramp 49	Nest Lost	0.0%	0.0%	
23-Jul	NH73	Cc	Y	1.3 miles N of Ramp 43	None	0.0%	0.0%	
23-Jul	NH74	Cc	N	1.7 miles N of Ramp 43	Nest Lost	0.0%	0.0%	
23-Jul	NH75	Cc	N	2.9 miles N of Ramp 43	15-Sep	70.0%	70.0%	54
23-Jul	NH76	Cc	N	0.1 miles S of Ramp 30	Nest Lost	0.0%	0.0%	
25-Jul	NH77	Cc	N	2.6 miles S of Ramp 38	Nest Lost	0.0%	0.0%	
26-Jul	NH78	Cc	N	1.4 miles N of Ramp 38	Nest Lost	0.0%	0.0%	
26-Jul	NH79	Cc	N	1.6 miles N of Ramp 34	18-Sep	46.3%	39.7%	54
27-Jul	NH80	Cc	N	0.3 miles S of Ramp 44	19-Sep	60.4%	58.2%	54
28-Jul	NH81	Cc	N	0.1 miles S of Ramp 49	None	0.0%	0.0%	
3-Aug	NH82	Cm	Y	2.8 miles S of Ramp 49	Nest Lost	0.0%	0.0%	
3-Aug	NH83	Cc	N	1.8 miles S of Ramp 55	Nest Lost	0.0%	0.0%	
4-Aug	NH84	Cc	N	1.0 miles E of Ramp 49	Nest Lost	0.0%	0.0%	
6-Aug	NH85	Cc	Y	0.1 miles S of Ramp 43	6-Oct	92.3%	86.3%	61
6-Aug	NH86	Cc	Y	1.4 miles N of Ramp 43	17-Oct	70.7%	65.9%	72
7-Aug	NH87	Cc	N	0.1 miles N of Ramp 37	24-Oct	20.0%	5.7%	78
8-Aug	NH88	Cc	Y	0.5 miles S of Ramp 44	15-Oct	76.6%	69.5%	68
9-Aug	NH89	Cc	N	2.6 miles N of Ramp 55	Nest Lost	0.0%	0.0%	
12-Aug	NH90	Cc	N	1.5 miles N of Ramp 38	None	9.6%	0.0%	

Appendix A: CAHA 2011 Sea Turtle Nest Activity

Date	Nest #	Sp.	Rel	Location	Hatch Date	HS%	ES%	Incubated Days
14-Aug	NH91	Cc	N	2.4 miles N of Ramp 55	Nest Lost	0.0%	0.0%	
15-Aug	NH92	Cc	N	1.7 miles S of Ramp 55	Nest Lost	0.0%	0.0%	
17-Aug	NH93	Cm	Y	0.4 miles W of Ramp 45	None	0.0%	0.0%	
20-Aug	NH94	Cc	N	1.4 miles N of Ramp 34	None	0.0%	0.0%	
21-Aug	NH96	Cc	Y	0.5 miles S of Ramp 38	None	13.4%	0.0%	
Ocracoke Island District								
16-May	NO01	Cc	Y	1.2 miles S of Ramp 59	29-Jul	56.0%	56.00%	74
2-Jun	NO02	Cc	Y	0.1 miles N of Ramp 72	None	0.0%	0.0%	
4-Jun	NO03	Cc	N	3.1 miles N of Ramp 67	6-Aug	71.7%	71.7%	63
7-Jun	NO04	Cc	N	2.3 miles N of Ramp 67	5-Aug	82.2%	82.2%	59
7-Jun	NO05	Cc	N	1.2 miles S of Ramp 59	6-Aug	27.3%	27.3%	60
9-Jun	NO06	Cc	Y	1.7 miles N of Ramp 67	6-Aug	90.8%	90.8%	58
9-Jun	NO07	Cc	N	3.3 miles S of Ramp 59	Unknown	90.6%	90.6%	
10-Jun	NO08	Cc	N	1.0 miles N of Ramp 70	5-Aug	94.5%	92.2%	56
13-Jun	NO09	Cc	Y	1.9 miles S of Ramp 59	12-Aug	95.7%	94.2%	60
17-Jun	NO10	Cc	N	1.0 miles N of Ramp 67	None	0.0%	0.0%	
17-Jun	NO11	Cc	N	2.8 miles N of Ramp 67	15-Aug	90.3%	90.3%	59
17-Jun	NO12	Cc	N	3.9 miles S of Ramp 59	Unknown	2.4%	2.4%	
21-Jun	NO13	Cc	N	0.2 miles N of Ramp 68	22-Aug	7.8%	7.0%	62
22-Jun	NO14	Cc	Y	0.2 miles N of Ramp 70	Nest Lost	0.0%	0.0%	
22-Jun	NO15	Cc	N	1.3 miles N of Ramp 67	16-Aug	67.5%	67.5%	55
26-Jun	NO16	Cc	N	1.2 miles N of Ramp 67	19-Aug	86.5%	86.5%	54
2-Jul	NO17	Cc	Y	2.0 miles S of Ramp 59	Unknown	59.3%	2.7%	
3-Jul	NO18	Cc	N	1.0 miles N of Ramp 70	Nest Lost	0.0%	0.0%	
3-Jul	NO19	Cc	N	1.2 miles S of Ramp 59	22-Aug	68.1%	68.1%	50
4-Jul	NO20	Cc	N	0.3 miles S of Ramp 70	23-Aug	96.2%	58.7%	50
6-Jul	NO21	Cc	N*	0.2 miles S of Ramp 70	None	0.0%	0.0%	
7-Jul	NO22	Cc	N	0.1 miles N of Ramp 67	Nest Lost	0.0%	0.0%	
8-Jul	NO23	Cc	N*	0.2 miles S of Ramp 67	Nest Lost	0.0%	0.0%	
8-Jul	NO24	Cc	N	0.7 miles S of Ramp 59	None	0.0%	0.0%	
9-Jul	NO25	Cc	Y	0.1 miles N of Ramp 72	Nest Lost	0.0%	0.0%	
18-Jul	NO26	Cc	N*	0.7 miles N of Ramp 72	Nest Lost	0.0%	0.0%	
18-Jul	NO27	Cc	N	2.6 miles S of Ramp 59	Nest Lost	0.0%	0.0%	
22-Jul	NO28	Cc	N	0.6 miles N of Ramp 67	Nest Lost	0.0%	0.0%	
26-Jul	NO29	Cc	N	3.1 miles N of Ramp 67	Nest Lost	0.0%	0.0%	

Date: date false crawl was located (crawls that occured before 12:00 AM were given the date of the following day / crawls that occurred after 12:00 AM were given same date
Nest #: Nest number by turtle management district
Sp.: Species of sea turtle that made nest (Cc = loggerhead, Cm = green, Dc = Leatherback)
Rel.: Indicates if nest was relocated or left in situ
(Y=Relocated, N=In Situ, * indicates that nest was moved in the approach of an incoming storm)
Hatch Date: Date of first known hatchling emergence
(None=no emergenece, Unknown=emergence date unknown, Nest Lost=washout)
HS%: Hatching success of nest
(# of emerged hatchlings + # of live hatchlings recovered in excavations)/total number of eggs laid in nest)
ES%: Emergence success of nest
((# of emerged hatchlings / total number of eggs laid in nest)
Incubated Days: Number of days eggs incubated before first known emergence

Appendix B: CAHA 2011 Sea Turtle False Crawl Activity

Date	Crawl #	Sp.	Location
Bodie Island District			
1-Jun	CBH01	Cc	1.4 miles S of Ramp 23
1-Jun	CBH02	Cc	3.3 miles N of Ramp 23
5-Jun	CBH03	Cm	0.4 miles N of Ramp 30
9-Jun	CBH04	Cc	0.4 miles S of Ramp 27
9-Jun	CBH05	Cc	0.4 miles S of Ramp 23
11-Jun	CBH06	Cc	3.6 miles N of Ramp 23
13-Jun	CBH07	Cc	0.3 miles N of Ramp 27
15-Jun	CBH08	Cc	1.1 miles N of Ramp 30
18-Jun	CBI01	Cc	1.2 miles S of Ramp 4
23-Jun	CBH09	Cc	0.8 miles N of Ramp 30
28-Jun	CBH10	Cc	0.8 miles N of Ramp 23
7-Jul	CBH11	Cc	0.3 miles S of Ramp 27
7-Jul	CBH12	Cc	0.3 miles S of Ramp 23
9-Jul	CBI02	Cc	0.4 miles S of Ramp 4
11-Jul	CBI03	Cc	0.4 miles S of Ramp 1
12-Jul	CBH13	Cc	1.3 miles S of Ramp 23
14-Jul	CBH14	Cc	0.7 miles N of Ramp 23
15-Jul	CBI04	Cc	0.9 miles S of Ramp 2
15-Jul	CBI05	Cc	1.0 miles S of Ramp 2
16-Jul	CBH15	Cc	1.3 miles N of Ramp 27
16-Jul	CBH16	Cc	0.6 miles N of Ramp 23
22-Jul	CBH17	Cc	0.4 miles N of Ramp 30
24-Jul	CBI06	Cc	1.0 miles N of Ramp 4
31-Jul	CBH18	Cc	0.1 miles N of Ramp 30
1-Aug	CBH19	Cc	4.6 miles N of Ramp 23
4-Aug	CBI07	Cc	0.1 miles S of Ramp 2
5-Aug	CBI08	Cc	1.6 miles S of Ramp 4
Hatteras Island District			
21-May	CH01	Cc	0.1 miles N of Ramp 44
2-Jun	CH02	Cc	1.1 miles N of Ramp 43
3-Jun	CH03	Cc	2.4 miles S of Ramp 38
3-Jun	CH04	Cc	1.2 miles S of Ramp 38
4-Jun	CH05	Cc	0.6 miles S of Ramp 44
4-Jun	CH06	Cc	0.7 miles S of Ramp 44
5-Jun	CH07	Cc	1.4 miles S of Ramp 38
5-Jun	CH08	Cc	1.8 miles N of Ramp 34
7-Jun	CH09	Cc	0.1 miles N of Ramp 43
8-Jun	CH10	Cc	0.3 miles S of Ramp 44
8-Jun	CH11	Cc	0.7 miles S of Ramp 44
9-Jun	CH12	Cc	0.3 miles S of Ramp 44
13-Jun	CH13	Cc	0.1 miles S of Ramp 55
14-Jun	CH14	Cc	0.4 miles W of Ramp 45
15-Jun	CH15	Cc	1.7 miles N of Ramp 55
16-Jun	CH16	Cc	0.5 miles E of Ramp 49
20-Jun	CH17	Cc	0.1 miles N of Ramp 43
21-Jun	CH18	Cc	0.2 miles S of Ramp 44
21-Jun	CH19	Cc	1.1 miles S of Ramp 44

Appendix B: CAHA 2011 Sea Turtle False Crawl Activity

Date	Crawl #	Sp.	Location
21-Jun	CH20	Cm	0.7 miles S of Ramp 44
22-Jun	CH21	Cc	0.9 miles S of Ramp 44
22-Jun	CH22	Cc	0.9 miles S of Ramp 44
22-Jun	CH23	Cc	1.2 miles S of Ramp 44
22-Jun	CH24	Cc	1.2 miles S of Ramp 44
22-Jun	CH25	Cc	0.7 miles N of Ramp 43
22-Jun	CH26	Cc	1.8 miles N of Ramp 43
24-Jun	CH27	Cc	Ramp 43
24-Jun	CH28	Cc	1.3 miles N of Ramp 43
24-Jun	CH29	Cc	1.3 miles N of Ramp 43
24-Jun	CH30	Cc	2.0 miles S of Ramp 49
25-Jun	CH31	Cc	1.2 miles S of Ramp 49
25-Jun	CH32	Cc	0.9 miles N of Ramp 38
25-Jun	CH33	Cc	Ramp 45
27-Jun	CH34	Cc	0.5 miles N of Ramp 43
28-Jun	CH35	Cc	0.2 miles N of Ramp 44
28-Jun	CH36	Cc	0.7 miles S of Ramp 44
28-Jun	CH37	Cc	1.0 miles S of Ramp 49
28-Jun	CH38	Cc	1.0 miles S of Ramp 55
30-Jun	CH39	Cc	0.2 miles W of Ramp 45
1-Jul	CH40	Cc	0.1 miles E of Ramp 45
1-Jul	CH41	Cc	Ramp 45
1-Jul	CH42	Cc	1.2 miles W of Ramp 45
3-Jul	CH43	Cm	0.5 miles W of Ramp 45
4-Jul	CH44	Cm	0.4 miles S of Ramp 44
4-Jul	CH45	Cm	0.6 miles S of Ramp 44
5-Jul	CH46	Cm	1.1 miles N of Ramp 38
6-Jul	CH47	Cc	1.7 miles W of Ramp 45
6-Jul	CH48	Cc	1.0 miles E of Ramp 49
7-Jul	CH49	Cc	0.1 miles N of Ramp 44
7-Jul	CH50	Cc	1.8 miles S of Ramp 55
8-Jul	CH51	Cc	0.1 miles N of Ramp 43
8-Jul	CH52	Cc	1.3 miles N of Ramp 43
9-Jul	CH53	Cc	0.1 miles N of Ramp 44
9-Jul	CH54	Cm	0.5 miles N of Ramp 43
10-Jul	CH55	Cc	1.2 miles S of Ramp 44
10-Jul	CH56	Cc	0.9 miles E of Ramp 49
10-Jul	CH57	Cc	0.3 miles S of Ramp 38
10-Jul	CH58	Cc	1.4 miles N of Ramp 38
11-Jul	CH59	Cm	2.7 miles S of Ramp 38
11-Jul	CH60	Cc	1.5 miles S of Ramp 34
12-Jul	CH61	Cc	0.4 miles S of Ramp 44
13-Jul	CH62	Cc	1.0 miles S of Ramp 44
13-Jul	CH63	Cc	0.2 miles N of Ramp 34
13-Jul	CH64	Cc	1.7 miles N of Ramp 34
16-Jul	CH65	Cc	2.3 miles N of Ramp 43
16-Jul	CH66	Cc	2.7 miles S of Ramp 38
16-Jul	CH67	Cc	2.5 miles N of Ramp 55

Appendix B: CAHA 2011 Sea Turtle False Crawl Activity

Date	Crawl #	Sp.	Location
17-Jul	CH68	Cc	1.2 miles S of Ramp 44
19-Jul	CH69	Cm	0.2 miles S of Ramp 43
21-Jul	CH70	Cc	0.9 miles W of Ramp 45
21-Jul	CH71	Cc	1.2 miles W of Ramp 45
22-Jul	CH72	Cc	1.3 miles N of Ramp 38
23-Jul	CH73	Cc	0.1 miles S of Ramp 43
23-Jul	CH74	Cc	0.5 miles N of Ramp 43
28-Jul	CH75	Cc	0.7 miles S of Ramp 49
3-Aug	CH76	Cc	0.9 miles S of Ramp 30
4-Aug	CH77	Cc	0.4 miles W of Ramp 45
5-Aug	CH78	Cc	1.0 miles E of Ramp 49
6-Aug	CH79	Cc	0.7 miles N of Ramp 43
8-Aug	CH80	Cc	0.2 miles S of Ramp 43
8-Aug	CH81	Cc	1.5 miles S of Ramp 34
18-Aug	CH82	Cc	0.6 miles N of Ramp 38
20-Aug	CH83	Cc	2.3 miles S of Ramp 38
Ocracoke Island District			
15-May	CO01	Cc	0.8 miles N of Ramp 72
24-May	CO02	Cc	3.3 miles N of Ramp 67
24-May	CO03	Cc	1.6 miles S of Ramp 59
1-Jun	CO04	Cc	1.6 miles S of Ramp 59
2-Jun	CO05	Cc	0.7 miles N of Ramp 72
5-Jun	CO06	Cc	0.6 miles N of Ramp 59
10-Jun	CO07	Cc	0.6 miles S of Ramp 70
21-Jun	CO08	Cm	0.1 miles N of Ramp 68
22-Jun	CO09	Cm	1.0 miles N of Ramp 70
23-Jun	CO10	Cc	2.0 miles S of Ramp 72
3-Jul	CO11	Cc	1.2 miles S of Ramp 68
5-Jul	CO12	Cc	0.7 miles S of Ramp 59
6-Jul	CO13	Cc	0.6 miles S of Ramp 59
8-Jul	CO14	Cc	0.3 miles N of Ramp 67
8-Jul	CO15	Cc	2.3 miles N of Ramp 67
9-Jul	CO16	Cc	1.5 miles S of Ramp 72
10-Jul	CO17	Cm	3.3 miles N of Ramp 67
12-Jul	CO18	Cc	0.8 miles S of Ramp 70
18-Jul	CO19	Cc	0.4 miles N of Ramp 72
25-Jul	CO20	Cc	3.6 miles S of Ramp 59
2-Aug	CO21	Cc	0.5 miles S of Ramp 59

Date: date false crawl was located (crawls that occured before 12:00 AM were given the date of the following day / crawls that occurred after 12:00 AM were given same date)
Crawl #: false crawl number by turtle management district
Sp.: species of sea turtle that made crawl (Cc = loggerhead, Cm = green)
Location: location of false crawl

Appendix C: CAHA 2011 Sea Turtle Stranding Activity

Date	Species	Animal Code	District	Beach	Status	Sex	Necropsy	Cause of Stranding
1-Jan	Lk	Lk-EBF-11-01-01-01	HS	S	D	M	Yes	CBD
2-Jan	Lk	Lk-RXB-11-01-02-01	O	S	D	Unk	No	CBD
2-Jan	Lk	Lk-JCB-11-01-02-01	O	S	D	Unk	No	CBD
5-Jan	Cm	Cm-WPT-11-01-05-01	HS	S	D	M	Yes	CBD
5-Jan	Lk	Lk-WPT-11-01-05-02	HN	S	D	F	Yes	CBD
5-Jan	Lk	Lk-MPP-11-01-05-01	BH	S	D	F	Yes	CBD
6-Jan	Lk	Lk-ECF-11-01-06-01	HS	O	D	F	Yes	CBD
9-Jan	Cm	Cm-JMG-11-01-09-01	O	S	D	F	Yes	CBD
21-Jan	Lk	Lk-JNW-11-01-21-01	O	O	D	Unk	No	CBD
24-Jan	Lk	Lk-ECF-11-01-24-01	HS	S	D	F	Yes	CBD
27-Jan	Cm	Cm-FGW-11-01-27-01	HS	S	D	M	Yes	CBD
27-Jan	Lk	Lk-RPR-11-01-27-01	BH	S	D	F	Yes	CBD
2-Feb	Cc	Cc-WPT-11-02-02-01	HS	O	Alive-R	Unk	NA	Cold Stunning
2-Feb	Cc	Cc-WPT-11-02-02-02	HS	O	Alive-R	Unk	NA	Cold Stunning
2-Feb	Cc	Cc-WPT-11-02-02-03	HS	O	Alive-R	Unk	NA	Cold Stunning
7-Feb	CC	Cc-BMF-11-02-07-01	HS	S	D	Unk	No	CBD
7-Feb	Cc	Cc-BMF-11-02-07-02	HS	S	D	Unk	No	CBD
9-Feb	Cm	Cm-WPT-11-02-09-01	HS	S	D	F	Yes	CBD
11-Feb	Cc	Cc-JMG-11-02-11-01	O	S	D	F	Yes	Cold Stunning
11-Feb	Cm	Cm-JMG-11-02-11-02	O	S	D	Unk	No	CBD
23-Feb	Cm	Cm-JMG-11-02-23-01	O	S	D	Unk	Yes	CBD
2-Mar	Cc	Cc-JXY-11-03-02-01	O	S	D	Unk	No	CBD
2-Mar	Cc	Cc-JXY-11-03-02-02	O	S	D	Unk	No	CBD
6-Mar	Cm	Cm-JXY-11-03-06-01	O	S	D	Unk	Yes	CBD
13-Mar	Cm	Cm-JXY-11-03-13-01	O	O	D	Unk	No	CBD
29-Mar	Cm	Cm-JXY-11-03-29-01	O	O	D	M	Yes	CBD
31-Mar	Cm	Cm-JXY-11-03-31-01	O	O	D	Unk	No	CBD
6-Apr	Cm	Cm-CTW-11-04-06-01	HS	S	D	Unk	No	CBD
7-Apr	Lk	Lk-ECF-11-04-07-01	HS	O	D	Unk	No	CBD
11-Apr	Cm	Cm-JXY-11-04-11-01	O	O	D	Unk	No	CBD
14-Apr	Cm	Cm-ECF-11-04-14-01	HS	S	D	Unk	No	CBD
23-Apr	Cc	Cc-BJP-11-04-23-01	O	O	D	F	Yes	Disease
24-Apr	Lk	Lk-JMG-11-04-24-01	O	O	D	M	Yes	CBD
24-Apr	Lk	Lk-JXY-11-04-24-01	O	S	D	Unk	Yes	CBD
28-Apr	Cm	Cm-DRH-11-04-28-01	HS	O	Alive-R	Unk	NA	Disease
2-May	Cc	Cc-JMG-11-05-02-01	O	O	D	F	Yes	Boat Strike
2-May	Cm	Cm-BJP-11-05-02-01	O	S	D	Unk	No	CBD
3-May	Cc	Cc-BJP-11-05-03-01	O	O	D	F	Yes	CBD
3-May	Cm	Cm-BJP-11-05-03-02	O	O	D	Unk	No	CBD

Appendix C: CAHA 2011 Sea Turtle Stranding Activity

Date	Species	Animal Code	District	Beach	Status	Sex	Necropsy	Cause of Stranding
4-May	Cc	Cc-ECF-11-05-04-01	HS	O	D	F	Yes	CBD
4-May	Cc	Cc-ECF-11-05-04-02	HS	O	D	F	Yes	CBD
6-May	Cc	Cc-ZDD-11-05-06-01	HN	O	D	Unk	No	CBD
6-May	Cc	Cc-CTW-11-05-06-01	HS	O	D	Unk	Yes	CBD
6-May	Cc	Cc-WPT-11-05-06-01	HS	S	D	F	Yes	CBD
11-May	Cc	Cc-ECF-11-05-11-01	HS	O	D	F	Yes	CBD
13-May	Cc	Cc-WPT-11-05-13-01	HS	O	D	F	Yes	CBD
14-May	Lk	Lk-BJP-11-05-14-01	O	O	Alive-D	Unk	NA	Disease
15-May	Cc	Cc-ECF-11-05-15-01	HS	O	D	M	Yes	CBD
17-May	Cc	Cc-JNW-11-05-17-01	O	S	D	F	Yes	CBD
19-May	Lk	Lk-ECF-11-05-19-01	HS	O	D	Unk	No	CBD
19-May	Cc	Cc-JMG-11-05-19-01	HS	O	D	F	Yes	CBD
21-May	Lk	Lk-BJP-11-05-21-01	O	S	D	M	Yes	CBD
22-May	Cc	Cc-JMG-11-05-22-01	O	O	D	F	Yes	CBD
23-May	Lk	Lk-JMG-11-05-23-01	O	O	D	F	Yes	CBD
23-May	Cc	Cc-MPP-11-05-23-01	BI	S	D	F	Yes	CBD
24-May	Cm	Cm-ZDD-11-05-24-01	HS	O	D	Unk	Yes	CBD
24-May	Cc	Cc-BJP-11-05-24-01	O	O	D	Unk	No	CBD
25-May	Cm	Cm-BJP-11-05-25-01	O	O	D	M	Yes	CBD
25-May	Cc	Cc-ECF-11-05-25-01	HS	O	D	Unk	Yes	Disease
28-May	Cc	Cc-WPT-11-05-28-01	HS	O	D	Unk	No	CBD
28-May	Cc	Cc-WPT-11-05-28-02	HS	S	D	Unk	NA	Fisheries Interaction
28-May	UNK	UNK-WPT-11-05-28-03	HS	S	D	Unk	NA	Fisheries Interaction
29-May	Cc	Cc-KLG-11-05-29-01	HS	O	D	Unk	No	CBD
30-May	Lk	Lk-ECF-11-05-30-01	HS	O	D	F	Yes	CBD
2-Jun	Lk	Lk-WPT-11-06-02-01	HS	O	D	F	Yes	CBD
2-Jun	Lk	Lk-WPT-11-06-02-02	HS	O	D	Unk	No	CBD
4-Jun	Cc	Cc-PKD-11-06-04-01	BH	O	D	F	Yes	CBD
4-Jun	Lk	Lk-WPT-11-06-04-01	HS	O	D	M	Yes	CBD
5-Jun	Lk	Lk-DRH-11-06-05-01	HS	O	Alive-D	Unk	NA	Unk
15-Jun	Cc	Cc-CTW-11-06-15-01	HS	O	D	F	Yes	CBD
16-Jun	Cc	Cc-KMR-11-06-16-01	BI	O	D	F	Yes	CBD
17-Jun	Cc	Cc-MPP-11-06-17-01	BH	O	D	Unk	No	CBD
17-Jun	Lk	Lk-CTW-11-06-17-01	HS	O	D	F	Yes	CBD
21-Jun	UNK	UNK-MPP-11-06-21-01	BH	O	D	Unk	No	CBD
23-Jun	Cm	Cm-CTW-11-06-23-01	HS	S	D	Unk	No	CBD
26-Jun	Cm	Cm-EHW-11-06-26-01	HS	O	D	M	Yes	CBD
27-Jun	Cc	Cc-ZDD-11-06-27-01	HS	O	D	F	Yes	Boat Strike
28-Jun	Lk	Lk-KLG-11-06-28-01	HS	O	D	Unk	Yes	CBD
28-Jun	Cm	Cm-WPT-11-06-28-01	HS	O	D	F	Yes	CBD

Appendix C: CAHA 2011 Sea Turtle Stranding Activity

Date	Species	Animal Code	District	Beach	Status	Sex	Necropsy	Cause of Stranding
30-Jun	Cc	Cc-WPT-11-06-30-01	HS	O	D	F	Yes	CBD
30-Jun	Cm	Cm-JMG-11-06-30-01	O	S	D	Unk	NA	CBD
11-Jul	Lk	Lk-EHW-11-07-11-01	HS	O	D	F	Yes	CBD
21-Jul	Cc	Cc-MPP-11-07-21-01	BH	O	D	M	Yes	Fisheries Interaction (internal)
23-Jul	Cc	Cc-CTW-11-07-23-01	HS	O	D	F	Yes	CBD
29-Jul	Cm	Cm-JMG-11-07-29-01	O	S	D	F	Yes	CBD
30-Jul	Cm	Cm-JMG-11-07-30-01	O	O	D	Unk	Yes	Boat Strike
31-Jul	Cm	Cm-JMG-11-07-31-01	O	S	D	Unk	Yes	CBD
4-Aug	Cc	Cc-DRH-11-08-04-01	HS	O	D	F	Yes	CBD
7-Aug	Cm	Cm-KMR-11-08-07-01	BH	O	D	Unk	Yes	CBD
19-Aug	Lk	Lk-JMG-11-08-19-01	O	O	D	F	Yes	Boat Strike
24-Aug	Cc	Cc-MPP-11-08-24-01	BI	O	D	Unk	Yes	CBD
13-Sep	Lk	Lk-ECF-11-09-13-01	HN	O	D	Unk	No	CBD
19-Sep	Cc	Cc-JPW-11-09-19-01	HN	O	Alive-D	Unk	NA	Fisheries Interaction (internal)
27-Sep	Cc	Cc-WPT-11-09-27-01	HS	O	D	F	Yes	CBD
3-Oct	Cm	Cm-ECF-11-10-03-01	HS	O	D	F	Yes	CBD
8-Oct	Cm	Cm-WPT-11-10-08-01	HS	S	D	F	Yes	CBD
9-Oct	Cc	Cc-WPT-11-10-09-01	HN	O	D	M	Yes	CBD
14-Oct	Cm	Cm-SKW-11-10-14-01	O	S	D	Unk	No	CBD
17-Oct	Lk	Lk-WPT-11-10-17-01	HN	S	D	F	Yes	CBD
28-Oct	Cm	Cm-EHW-11-10-28-01	HN	S	D	Unk	Yes	CBD
30-Oct	Cc	Cc-EBF-11-10-30-01	HS	S	D	F	Yes	CBD
31-Oct	Cm	Cm-EBF-11-10-31-01	HS	S	D	Unk	No	CBD
1-Nov	Lk	Lk-JMG-11-11-01-01	O	O	D	F	Yes	CBD
4-Nov	Cc	Cc-PKD-11-11-04-01	BH	O	D	F	Yes	CBD
8-Nov	Cc	Cc-JMG-11-11-08-01	O	S	D	F	Yes	CBD
10-Nov	Cc	Cc-MPP-11-11-10-01	BI	O	D	M	Yes	CBD
12-Nov	Cc	Cc-EHW-11-11-12-01	HN	O	D	Unk	No	CBD
16-Nov	Lk	Lk-ECF-11-11-16-01	HS	O	D	F	Yes	CBD
16-Nov	Lk	Lk-ECF-11-11-16-02	HS	O	D	F	Yes	CBD
16-Nov	Lk	Lk-JMG-11-11-16-01	O	O	D	F	Yes	CBD
16-Nov	Lk	Lk-JMG-11-11-16-02	O	O	D	M	Yes	CBD
16-Nov	Lk	Lk-JMG-11-11-16-03	O	O	D	F	Yes	CBD
18-Nov	Lk	Lk-JMG-11-11-18-01	O	S	D	M	Yes	CBD
19-Nov	Cm	Cm-EBF-11-11-19-01	HS	S	D	F	Yes	CBD
19-Nov	Cm	Cm-JMG-11-11-19-01	O	S	D	F	Yes	CBD
19-Nov	Lk	Lk-EJE-11-11-19-01	HS	S	D	Unk	No	CBD
19-Nov	Cm	Cm-EJE-11-11-19-02	HS	S	D	Unk	No	CBD
20-Nov	Lk	Lk-FGW-11-11-20-01	HS	S	D	F	Yes	Fisheries Interaction
20-Nov	Lk	Lk-FGW-11-11-20-02	HS	S	D	Unk	No	CBD
20-Nov	Lk	Lk-FGW-11-11-20-03	HS	S	D	Unk	No	CBD

Appendix C: CAHA 2011 Sea Turtle Stranding Activity

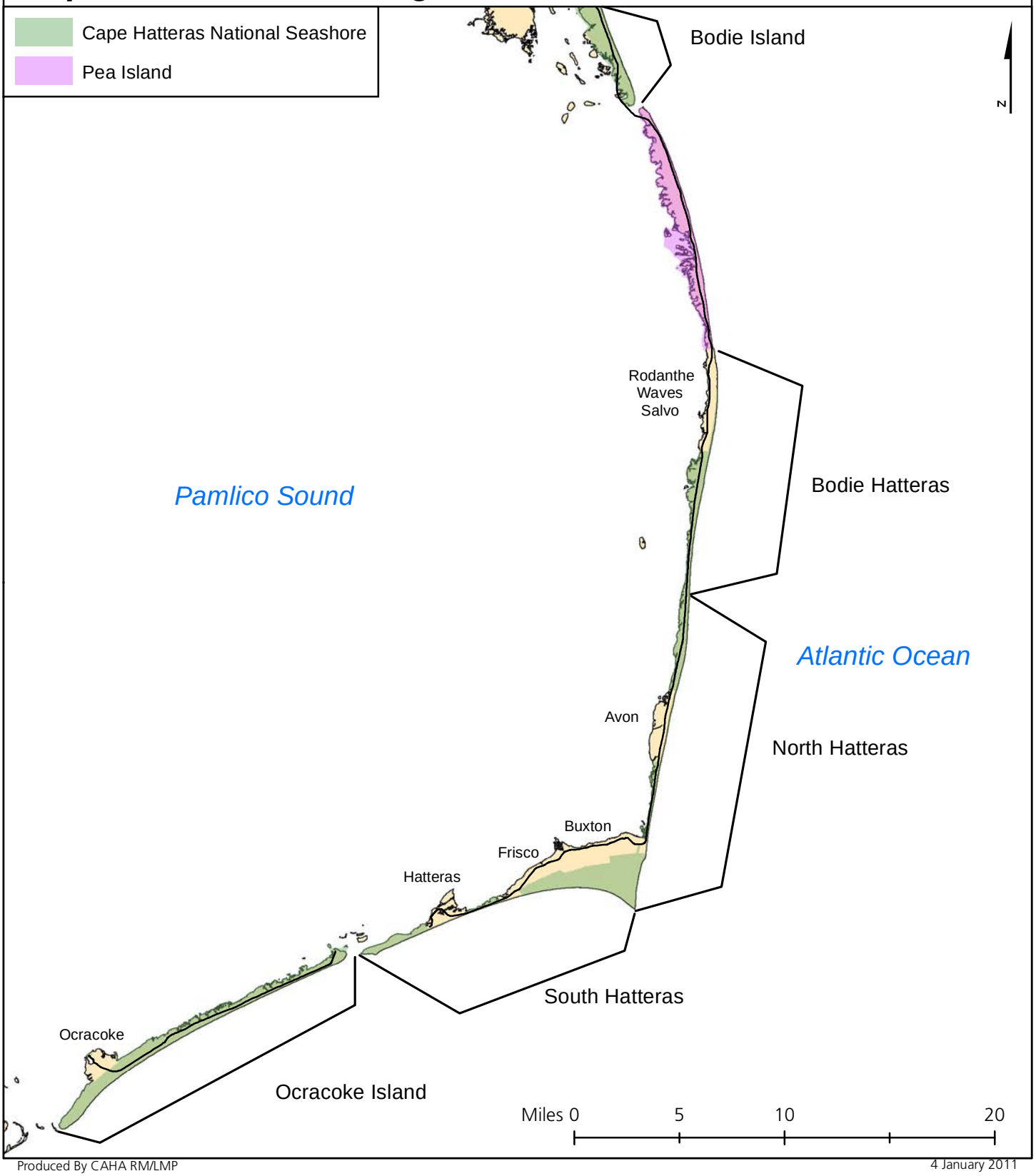
Date	Species	Animal Code	District	Beach	Status	Sex	Necropsy	Cause of Stranding
20-Nov	Cc	Cc-EJE-11-11-20-01	HS	S	D	Unk	No	CBD
21-Nov	Lk	Lk-ECF-11-11-21-01	HS	S	D	Unk	No	CBD
21-Nov	Lk	Lk-ECF-11-11-21-02	HS	S	D	Unk	No	CBD
21-Nov	Lk	Lk-EBF-11-11-21-01	HS	S	D	Unk	Yes	CBD
25-Nov	Cm	Cm-WPT-11-11-25-01	HS	S	D	F	Yes	CBD
28-Nov	Cc	Cc-ECF-11-11-28-01	HN	O	D	M	Yes	Boat Strike
30-Nov	Cm	Cm-ECF-11-11-30-01	HS	O	D	Unk	No	CBD
30-Nov	Cm	Cm-JMG-11-11-30-01	O	S	D	F	Yes	CBD
3-Dec	Cm	Cm-WPT-11-12-03-01	HN	S	D	Unk	Yes	CBD
3-Dec	Lk	Lk-WPT-11-12-03-02	HN	S	D	F	Yes	Cold Stunning
3-Dec	Cc	Cc-FGW-11-12-03-01	HS	S	D	F	Yes	CBD
9-Dec	Cm	Cm-EHW-11-12-09-01	HS	S	D	F	Yes	CBD
10-Dec	Cm	Cm-EJE-11-12-10-01	HS	S	D	Unk	No	CBD
14-Dec	Cm	Cm-ECF-11-12-14-01	HS	S	D	F	Yes	Cold Stunning
15-Dec	Cc	Cc-JMG-11-12-15-01	O	S	Alive-RI	Unk	NA	Cold Stunning
15-Dec	Cm	Cm-JNW-11-12-15-01	O	S	D	Unk	Yes	Boat Strike
16-Dec	Cm	Cm-JMG-11-12-16-01	O	S	D	Unk	Yes	CBD
16-Dec	Cm	Cm-EHW-11-12-16-01	HS	S	D	Unk	Yes	CBD
23-Dec	Cm	Cm-ECF-11-12-23-01	HS	O	D	Unk	Yes	CBD
23-Dec	Cc	Cc-ECF-11-12-23-02	HS	S	D	F	Yes	CBD
25-Dec	Lk	LK-SKW-11-12-25-01	O	S	D	Unk	No	CBD
25-Dec	Cm	Cm-SKW-11-12-25-02	O	S	D	Unk	No	CBD
25-Dec	Cm	Cm-SKW-11-12-25-03	O	S	D	Unk	No	CBD
25-Dec	Cm	Cm-SKW-11-12-25-04	O	S	D	Unk	No	CBD
25-Dec	Lk	Lk-SKW-11-12-25-05	O	S	D	Unk	No	CBD
30-Dec	UNK	UNK-JMG-11-12-30-01	O	S	D	Unk	No	CBD
30-Dec	Cm	Cm-JMG-11-12-30-02	O	S	D	Unk	No	CBD

Date: Date stranded turtle was responded to
Sp.: Species of sea turtle (Cc = loggerhead, Cm = green, Lk = Kemp's Ridley, Dc = Leatherback, Unk = Unknown)
Animal Code: Code used to refer to individual strandings (Species-Observer-Year-Month-Date-Turtle # by day)
District: Refers to the District that the stranding was found in (Bodie Island, Bodie Hatteras, Hatteras North, Hatteras South, and Ocracoke)
Beach: Refers to whether a stranding was found on the ocean or side side beaches (O = Oceanside, S = Soundside or Inlet)
Status: Refers to the condition of the stranding when found (Alive-RI = found alive, currently at rehab at the NC Aquarium on Roanoke Island; Alive-R = found alive, rehabed and released; Alive-D = found alive, later died; Dead = found dead)
Sex: Refers to the determined sex of the stranded turtle (F = female, M = male, Unk = Unknown or Undetermined)
Necropsy: Refers to whether or not a necropsy was preformed on the stranding (Yes/No/NA)
Cause of Stranding: Refers to whether or not there was any indication of the cause of death, such as cold stunning, watercraft, etc.
CBD: Could not be determined

Cape Hatteras National Seashore
Outer Banks Group

National Park Service
U.S. Department of the Interior

Map 1: 2011 Turtle Management Districts



Produced By CAHA RM/LMP

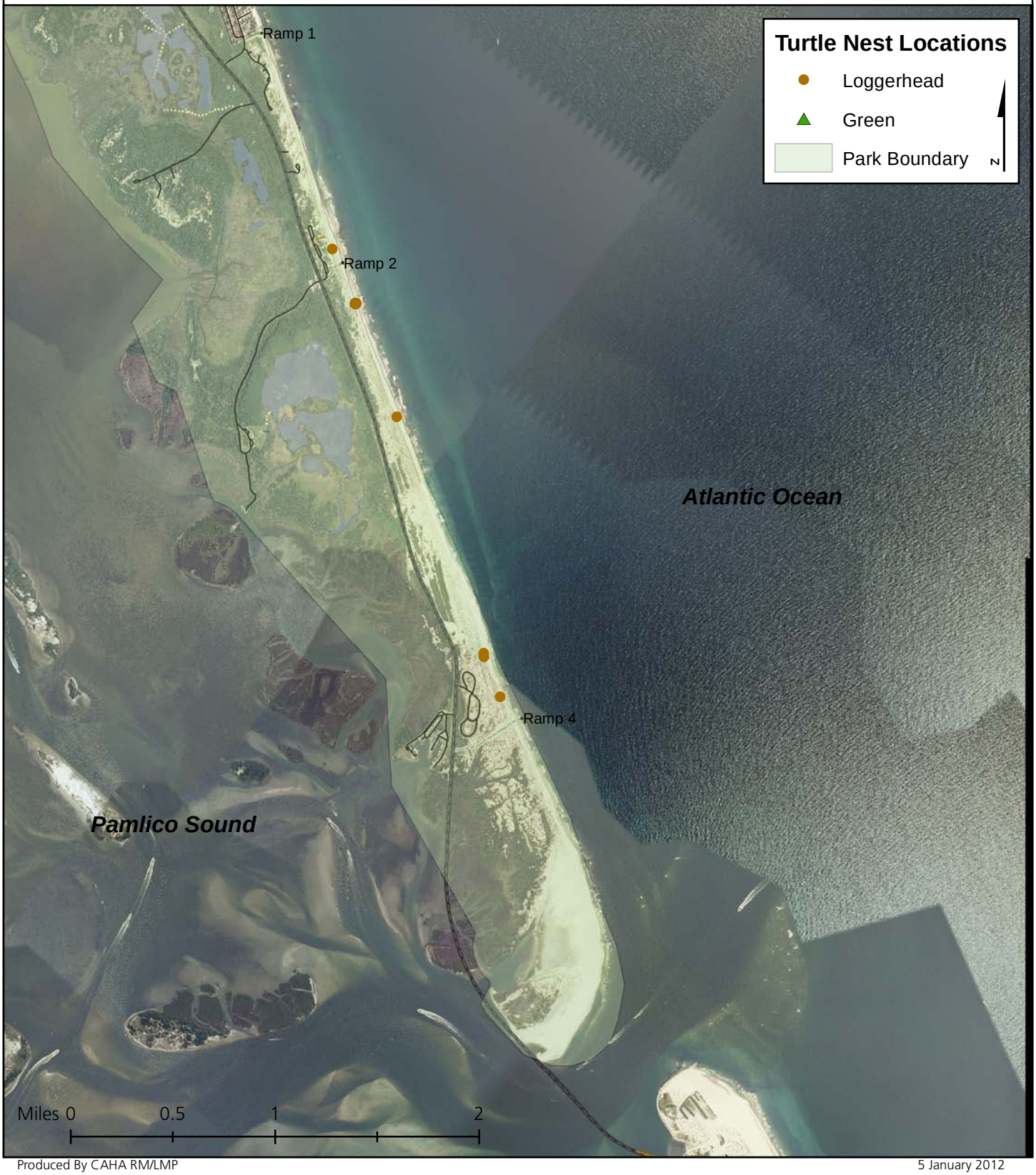
4 January 2011

NAD 83 UTM Zone 18N

Cape Hatteras National Seashore
Outer Banks Group

National Park Service
U.S. Department of the Interior

Map 2: 2011 Bodie Island Sea Turtle Nests



Produced By CAHA RM/LMP

5 January 2012

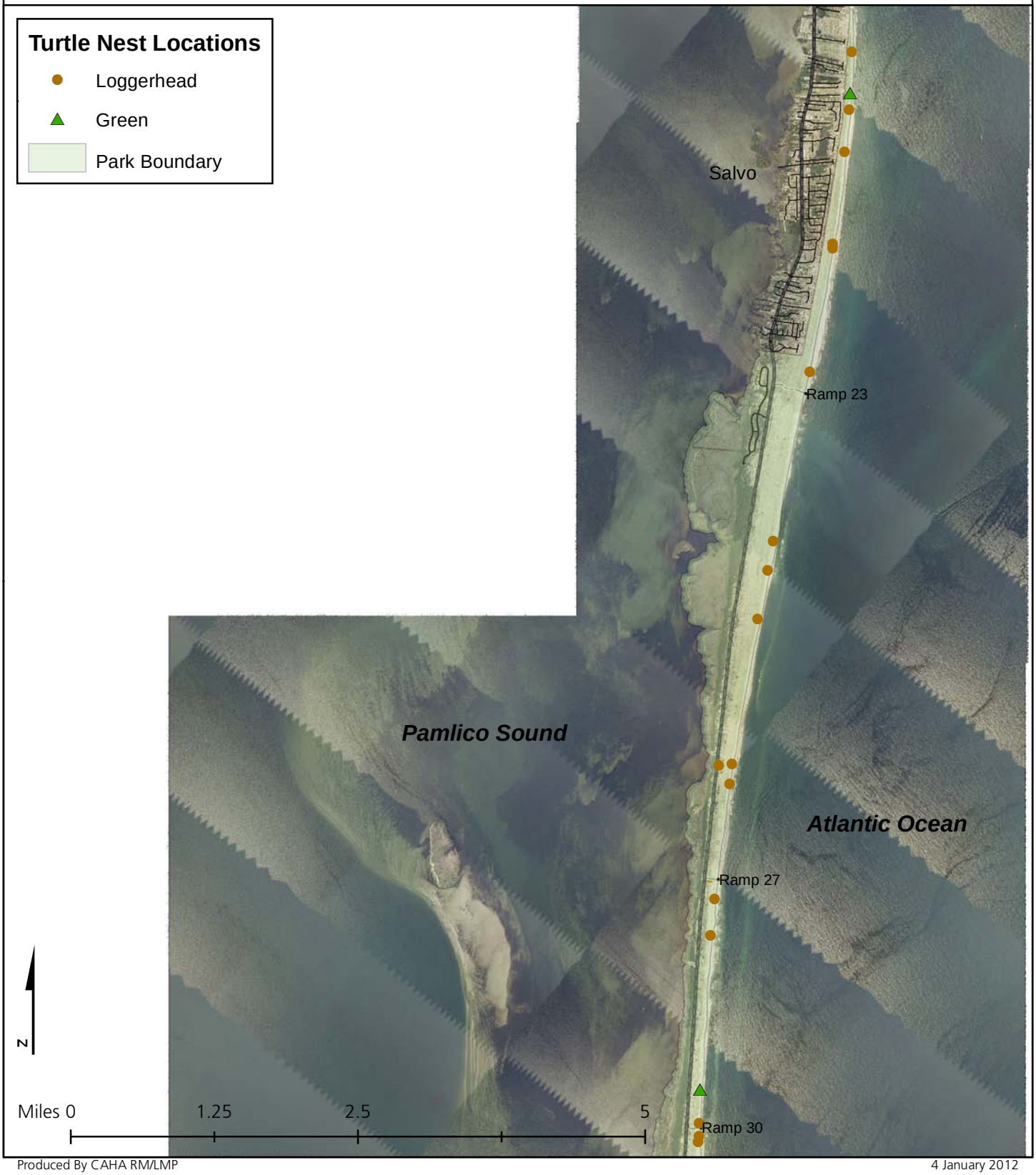
NAD 83 UTM Zone 18N

Imagery: 2010

Cape Hatteras National Seashore
Outer Banks Group

National Park Service
U.S. Department of the Interior

Map 3: 2011 Bodie Hatteras Sea Turtle Nests



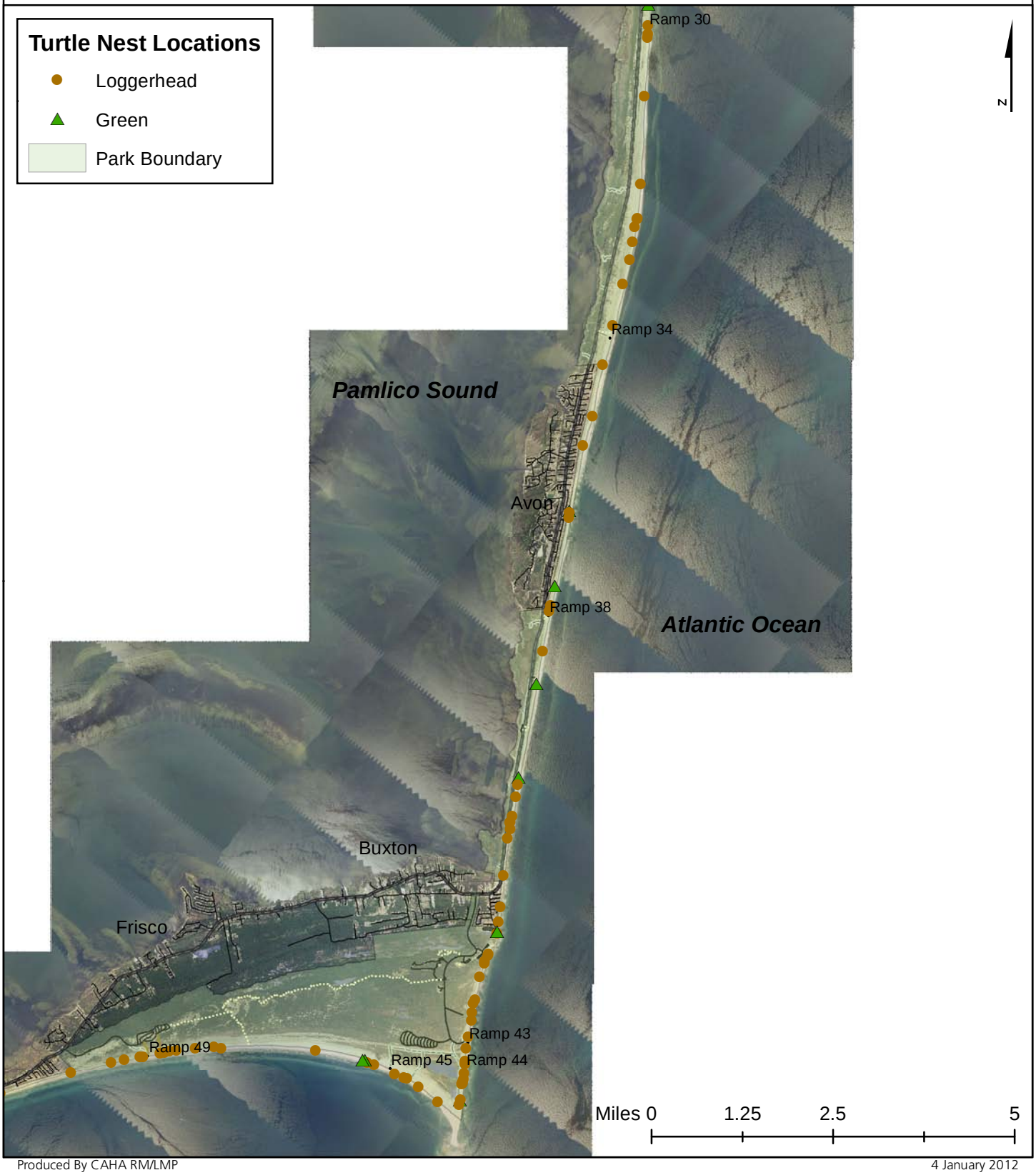
Produced By CAHA RM/LMP

4 January 2012

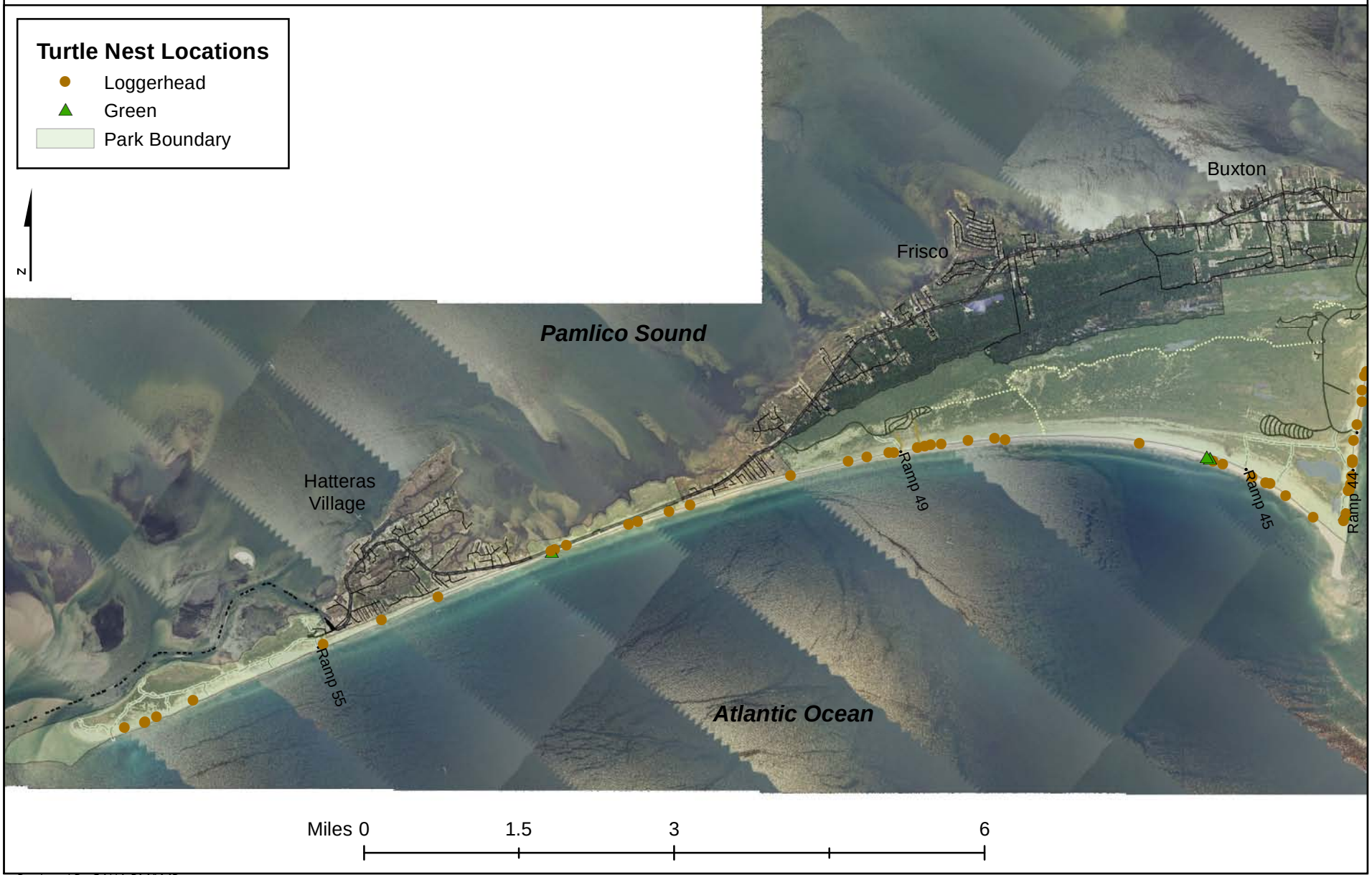
NAD 83 UTM Zone 18N

Imagery: 2010

Map 4: 2011 North Hatteras Sea Turtle Nests



Map 5: 2011 South Hatteras Sea Turtle Nests



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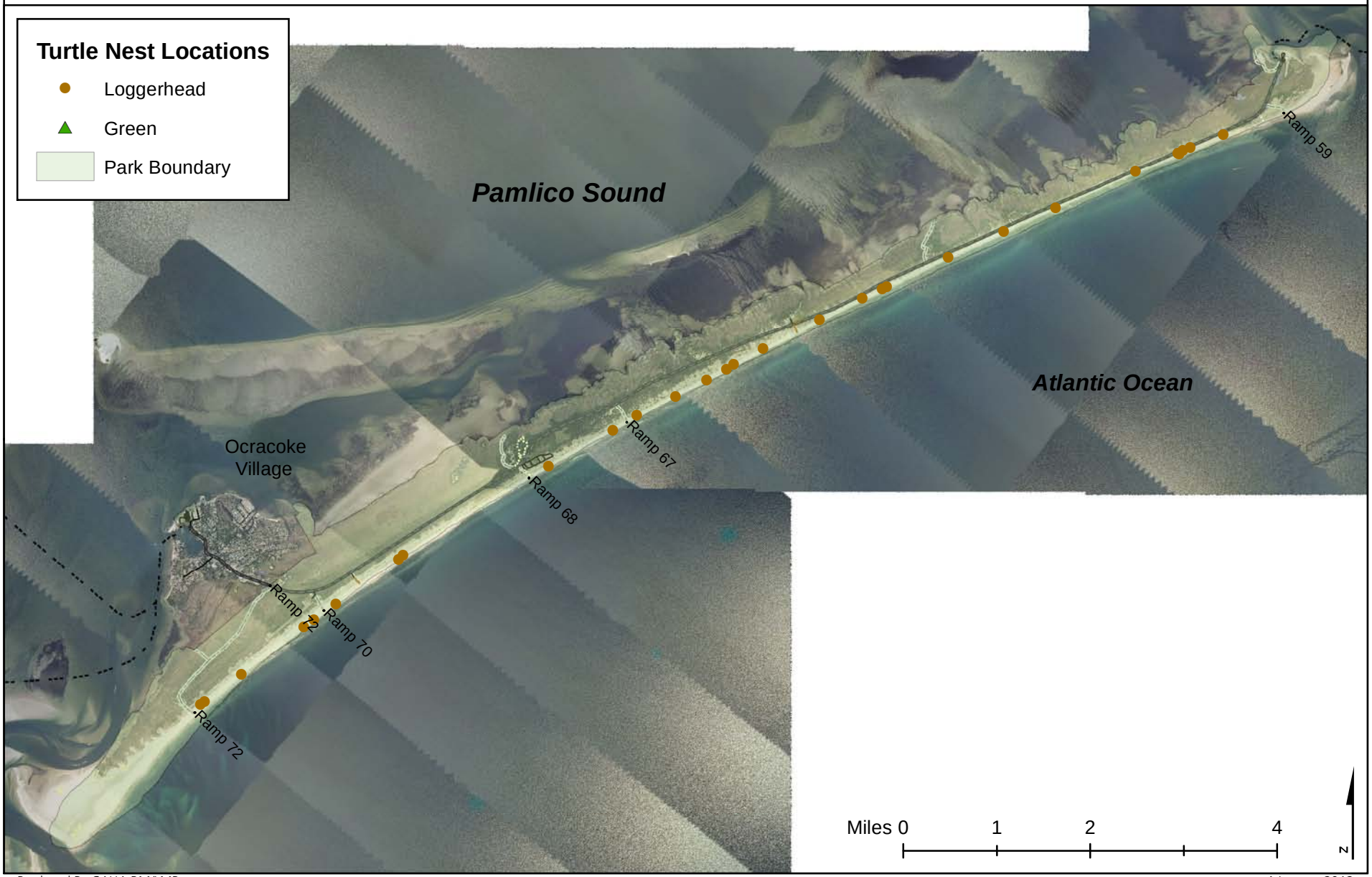
4 January 2012

Imagery: 2010

Map 6: 2011 Ocracoke Sea Turtle Nests



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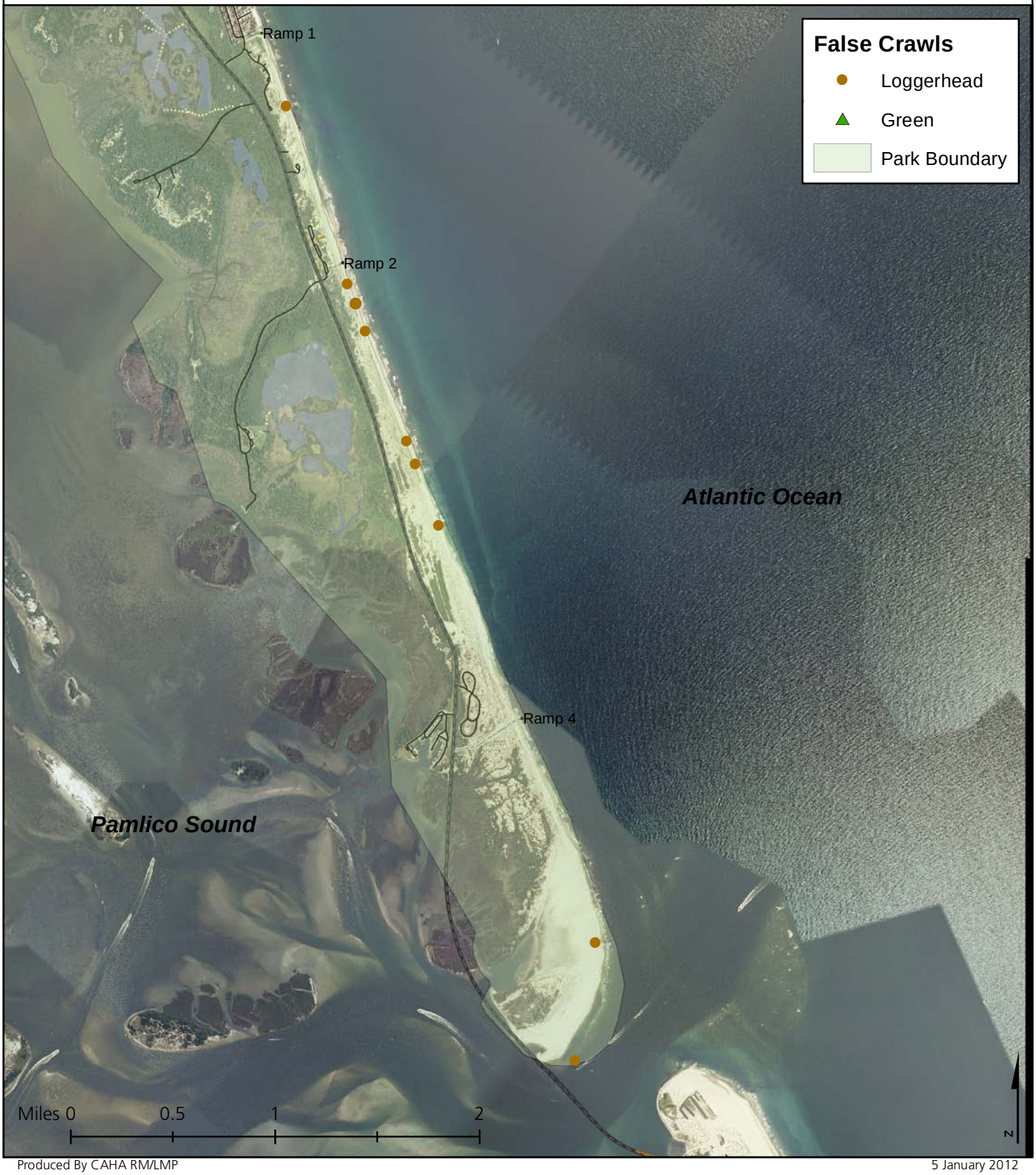
Map 7: 2011 Bodie Island Sea Turtle False Crawls



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Map 8: 2011 Bodie Hatteras Sea Turtle False Crawls

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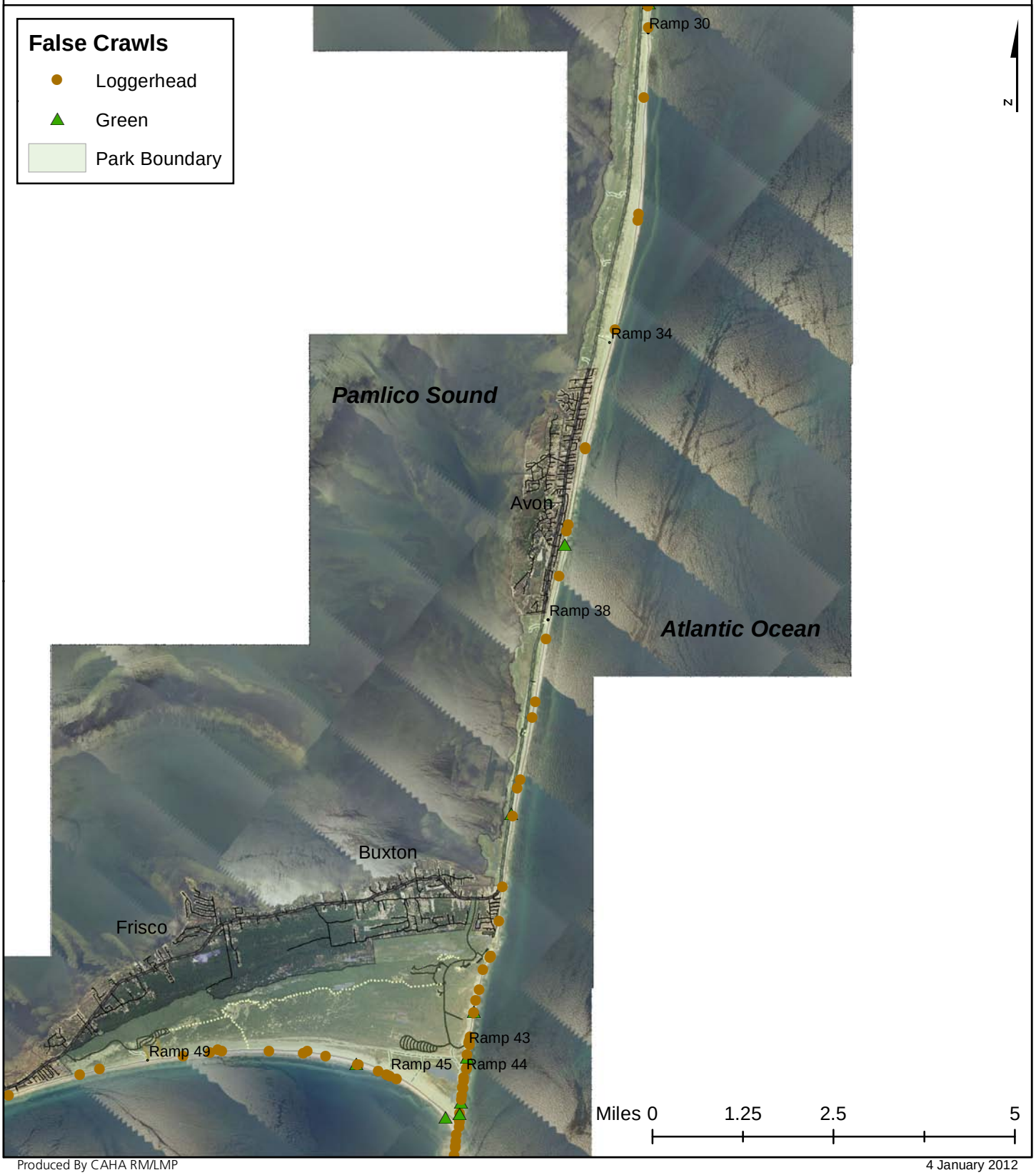
Imagery: 2010

Map 9: 2011 North Hatteras Sea Turtle Flase Crawls



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4 January 2012

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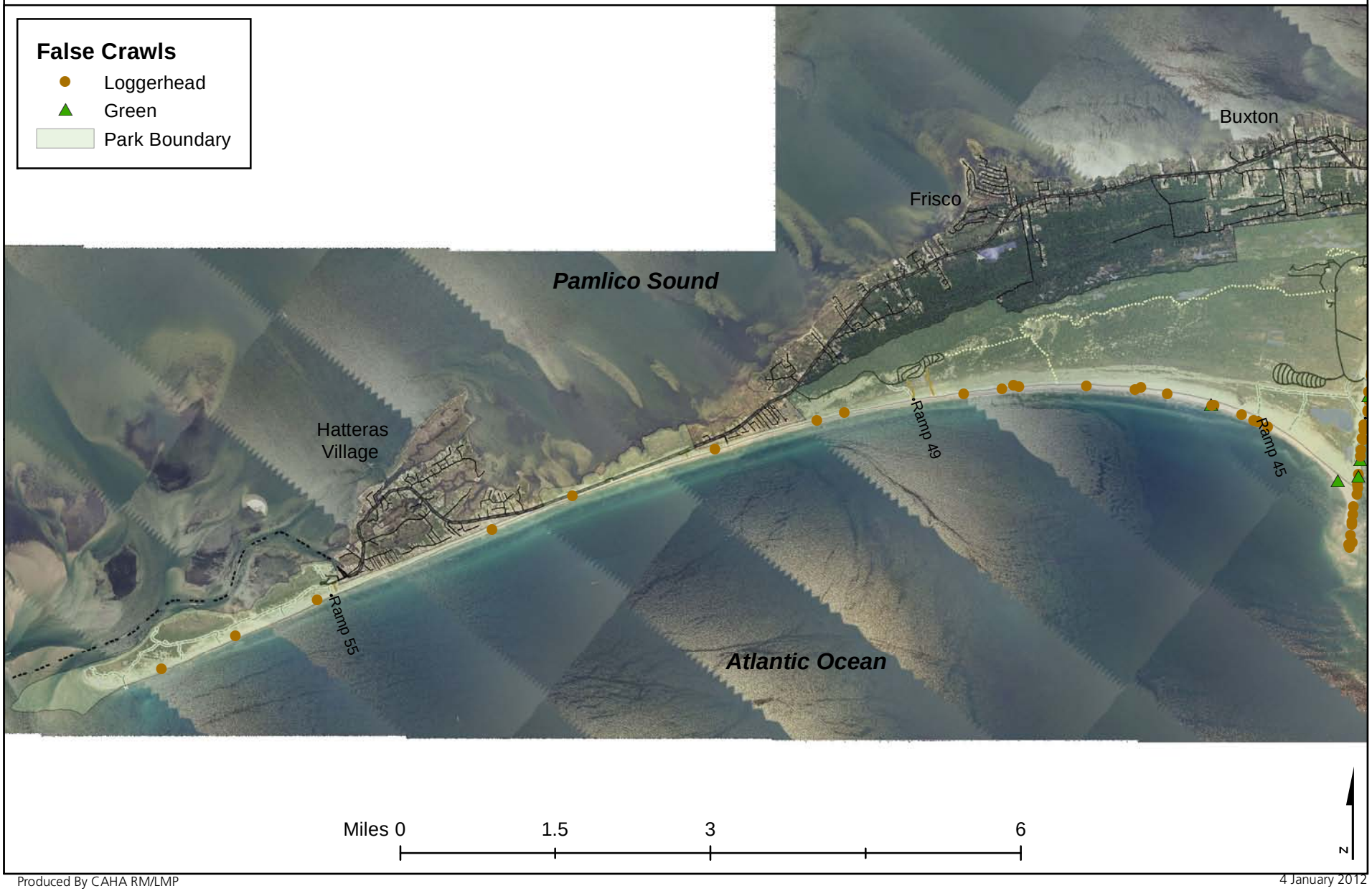
Imagery: 2010

Map 10: 2011 South Hatteras Sea Turtle False Crawls



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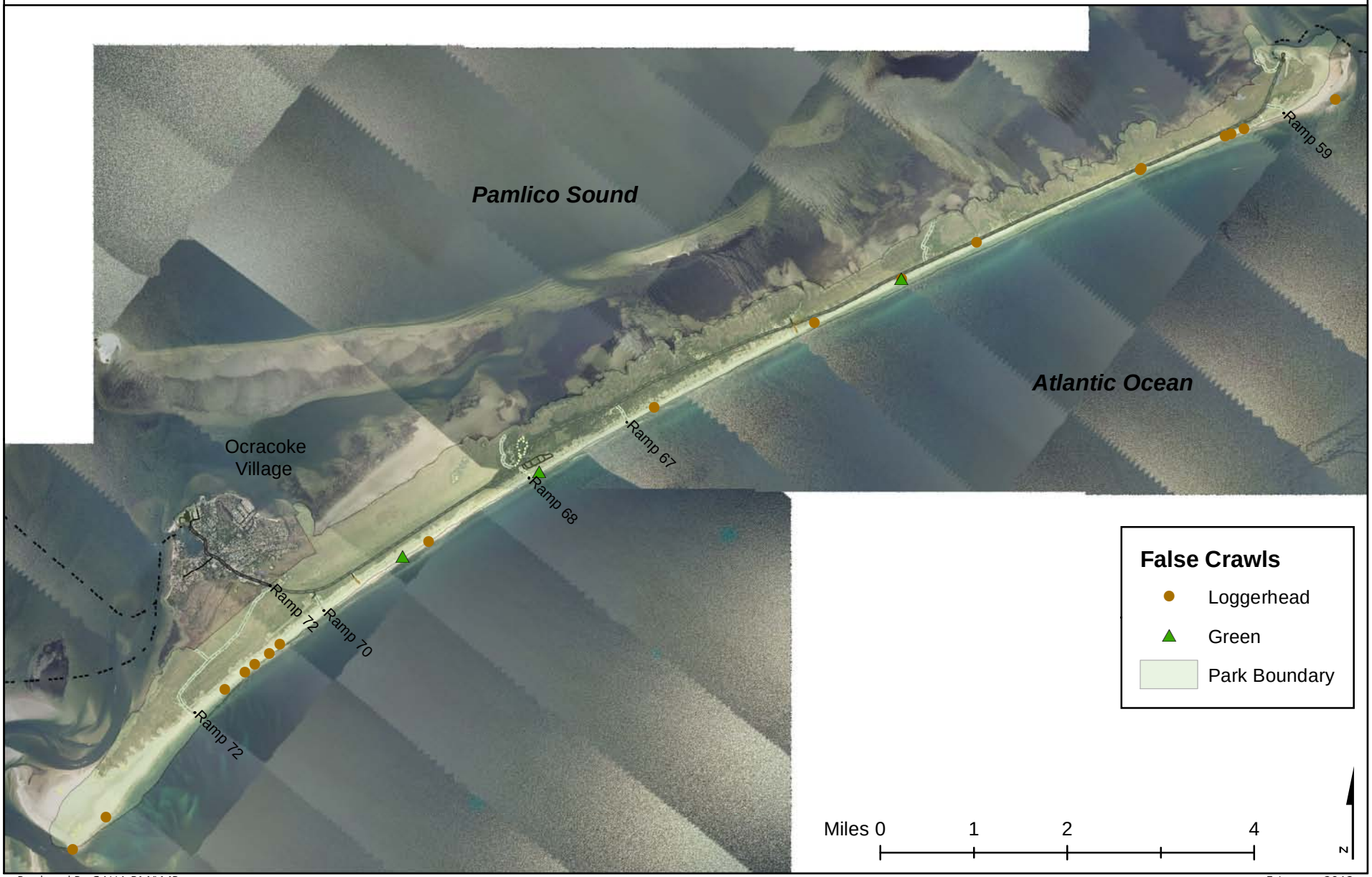
Map 11: 2011 Ocracoke Sea Turtle False Crawls



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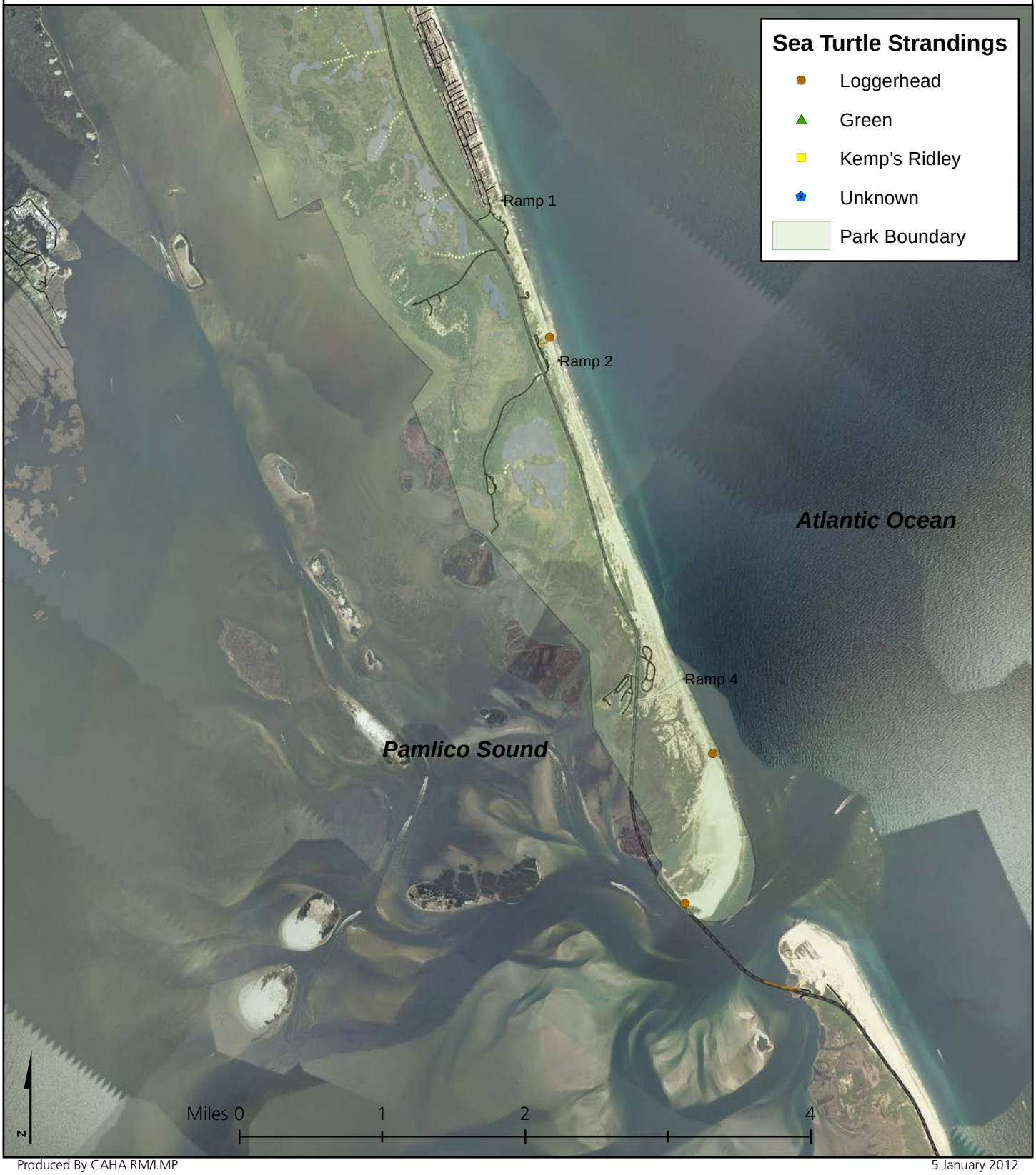
Map 12: 2011 Bodie Island Sea Turtle Strandings



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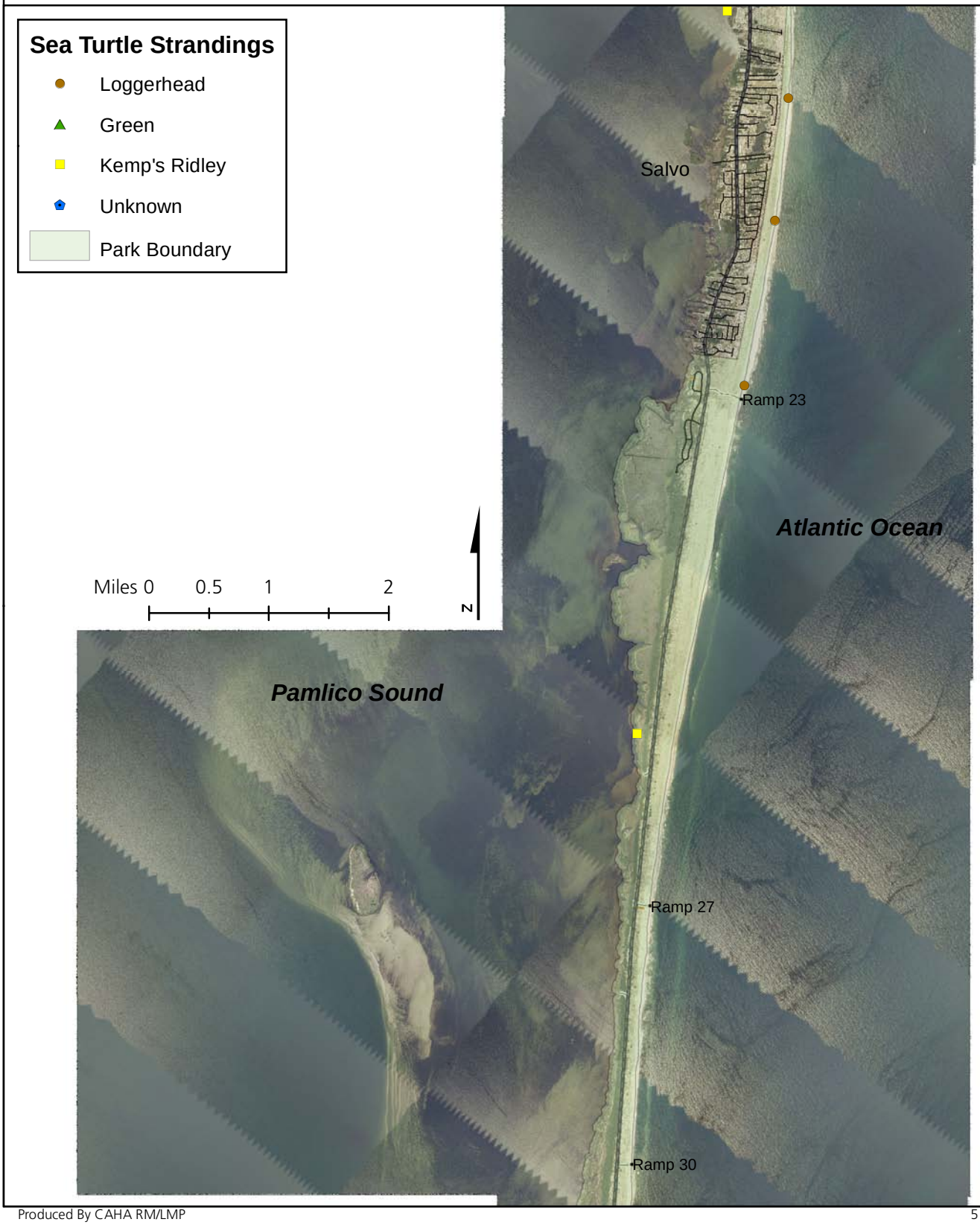
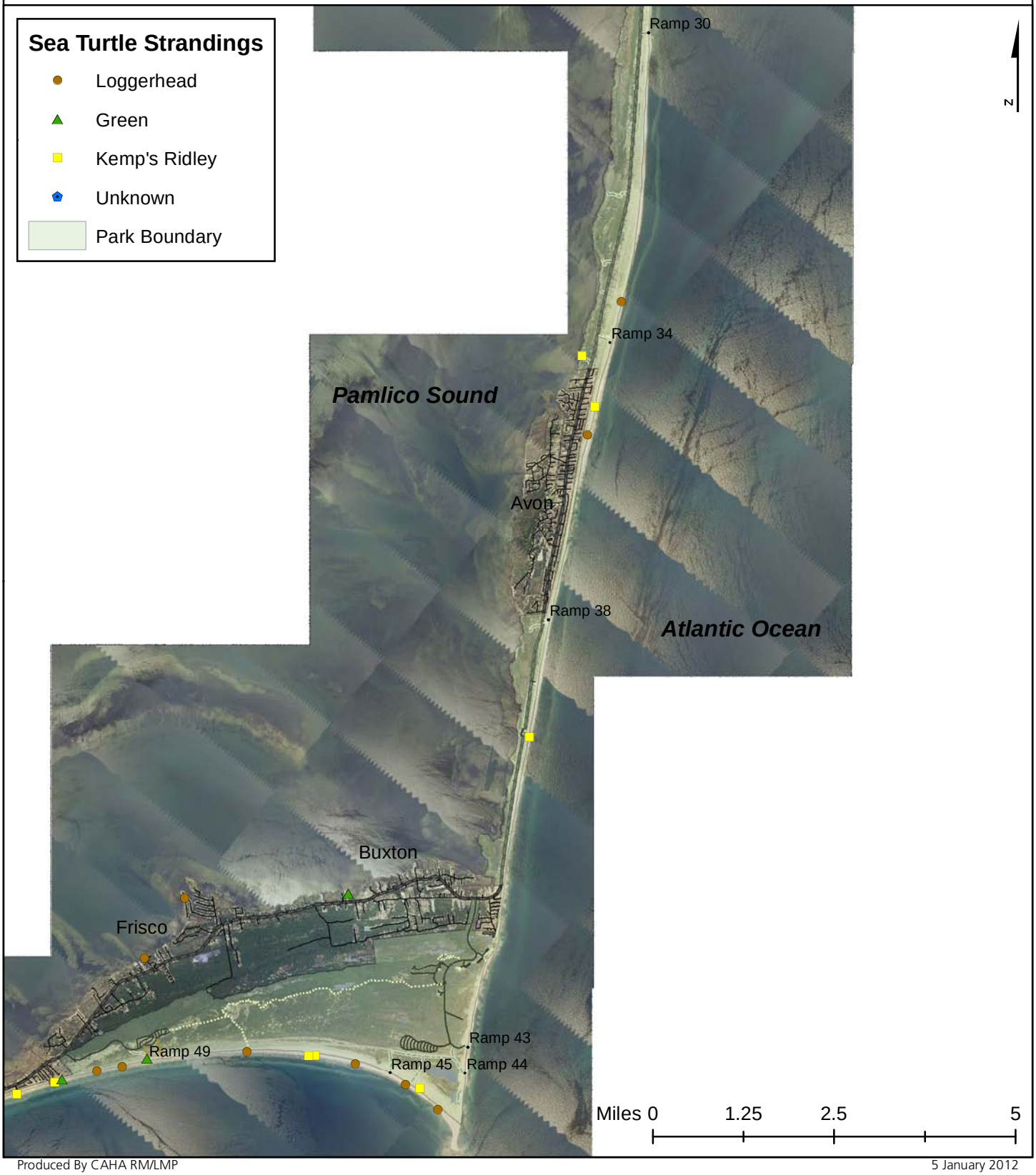
5 January 2012

Imagery: 2010

Map 13: 2011 Bodie Hatteras Sea Turtle Strandings



Map 14: 2011 North Hatteras Sea Turtle Strandings



Map 15: 2011 South Hatteras Sea Turtle Strandings

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Map 16: 2011 Ocracoke Sea Turtle Strandings

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Imagery: 2010