
Attachment C-1
Sea Turtle Management Plan

Final DRAFT

Attachment C-1: Sea Turtle Management Plan

C.1 Introduction

Each year, between 1,400 to 3,600 sea turtle nests are deposited on the 13 miles of beach at Cape Canaveral Air Force Station (CCAFS); and 600 to 2,000 nests are deposited on the 4 miles of beach at Patrick Air Force Base (PAFB) (Figure 1).

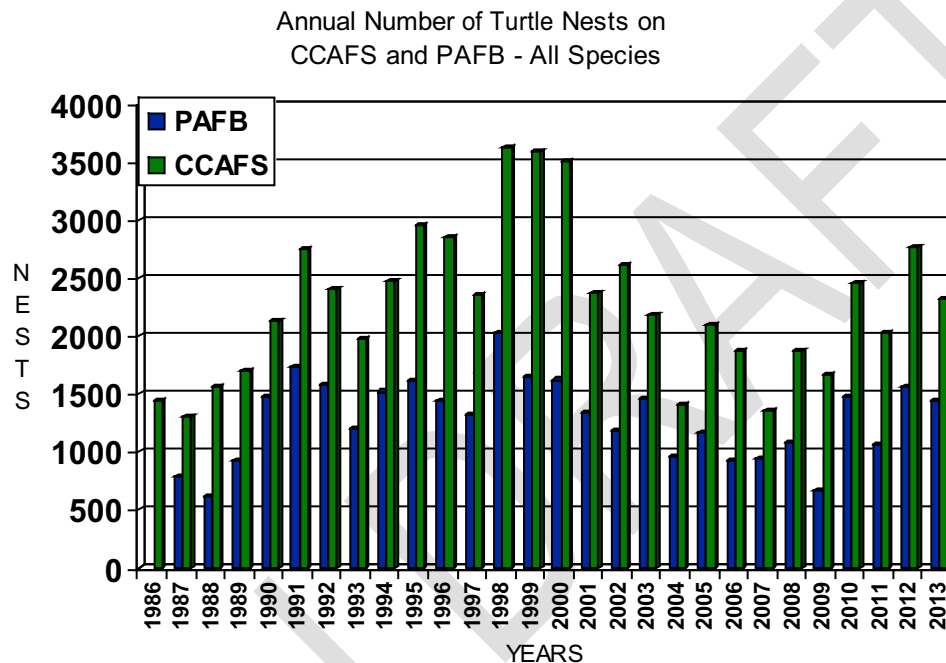


Figure 1. 45 SW Historic Sea Turtle Nesting Activity (1986 through 2013)

The loggerhead (*Caretta caretta*), Atlantic green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*) sea turtles nest on the beaches of CCAFS and PAFB. The beach of CCAFS has a high-energy surf zone, a gently sloping sandy beach, and a substantial dune system. The beach within PAFB also has a high-energy surf zone, and an offshore worm rock reef (beyond the breakers), parallel to the southern quarter of PAFB.

In 1986, the 45th Space Wing (45 SW) began sea turtle monitoring at CCAFS and PAFB. Since the sea turtle program began, the 45 SW preservation techniques have been modified and improved. The overall program has been expanded to include: predator control, exterior light management, sea turtle walks and education, rescue and release of hatchlings, daily nest surveys, stranding and salvage activities, nest relocation, and participation in the State of Florida (FDEP) Index Nesting Beach Survey. In 1988, CCAFS and PAFB were included in the FDEP Index Nesting Beach Survey. This survey program was designed to provide an index of sea turtle population trends through standardized sampling of selected nesting beaches. This long-term, systematic program provides high quality data from nesting beaches around the

state. Continued participation in this program is crucial in the determination of the recovery of threatened and endangered sea turtles. All activities are permitted by the Florida Fish and Wildlife Conservation Commission (FWC) and fulfill all the requirements of the U.S. Fish and Wildlife Service (USFWS) which oversees the implementation of the ESA. This Sea Turtle Management Plan briefly discusses the characteristics of each of these federally listed sea turtle species and identifies the management techniques employed by the 45 SW.

After discussion with USFWS, an exemption was granted to the 45 SW allowing 45 SW properties be exempt from the critical land habitat designation for the loggerhead sea turtle. This exemption was granted by USFWS because the 45 SW sea turtle management practices include measures that provide a benefit to the conservation of loggerhead sea turtles, and all sea turtles (nests, eggs, and hatchlings) and the 45 SW maintains an INRMP that provides for those measures. The 45 SW is committed to continued participation in the INBS/SNBS and hatchling productivity programs; and 45 SW leadership continues to support these programs. Additional information regarding this exemption can be found in **Section C.2.1** of this Appendix C-1, and also a copy of the USFWS letter regarding this topic can be found in **Appendix C-1A** of this appendix (USFWS letter dated 10 October 2012).

The following management measures are implemented to manage sea turtle populations at CCAFS and PAFB and contribute to their recovery:

- Conduct annual sea turtle surveys (Index and State Nesting Beach Surveys) along the CCAFS and PAFB beaches and in Trident Basin (study by University of Central Florida) to monitor the effect of 45 SW and other tenant operations and to provide long-term sea turtle population trends.
- Continue annual productivity data collection
- Perform disorientation surveys daily for adults and hatchlings and report all incidents using the FWC Marine Turtle Disorientation Report form.
- Carry out night surveys when disorientation incidents become a recurring problem at a particular location or when a light source cannot be identified;
- Deploy portable light shields, when necessary, to reduce hatchling disorientation;
- Protect sea turtle nests from predation, as needed, with welded fence wire;
- Relocate nests deposited in poor locations (below high tide, behind the dune);
- Participate in stranding and salvage activities;
- Conduct trapping when predation is noted;
- Conduct biannual beach cleanups;
- Stabilize dunes by planting native vegetation and installing sand fences;
- Conduct beach renourishment and rubble removal projects;
- Continue educational efforts and signage for 45 SW leadership, personnel, users and the public;
- Maintain appropriate trash receptacles at CCAFS and PAFB;

- Conduct periodic light surveys IAW the BO (see **Appendix C**);
- Comply with 45 SWI 32-7001 (*Exterior Lighting Management*);
- Stage equipment on the PAFB beach as required to minimize impacts;
- Relocate sea turtle nests only as the last resort and IAW the FWC Marine Turtle Conservation Guidelines (FWC 2007); and
- Avoid sea turtle nesting/hatching season when implementing dune and beach restoration and enhancement projects.

C.2 Species of Sea Turtles Found on the 45 SW

There are three species of sea turtles that nest on the shores of the 45 SW:

- Loggerhead (*Caretta caretta*)
- Atlantic green turtle (*Chelonia mydas*)
- Leatherback (*Dermochelys coriacea*)

C.2.1 Loggerhead (*Caretta caretta*)

The loggerhead turtle is the most common nesting sea turtle on CCAFS and PAFB. Adult and subadult loggerheads have reddish-brown carapaces and dull brown to yellowish plastrons. Adult loggerheads in the southeastern US have a mean straight carapace length of approximately 3 feet and a mean body weight of about 249 pounds. The brown hatchlings weigh approximately 0.70 ounces and are 1.7 inches long. (USFWS 2014a)

Nests are deposited on CCAFS and PAFB each year between ~~March~~ April and September. During the 1999 nesting season, a record number (3,581) of loggerhead nests were documented on CCAFS and in 1998, a record number (1,993) of loggerhead nests were documented on PAFB. Figures 4 and 5 reflect the annual number of loggerhead nests deposited on CCAFS and PAFB, respectively. Based on nest surveys at CCAFS from 1986 through 2013, the average annual number of loggerhead turtle nests is 2,200. Based on re-nesting frequency estimates, this represents approximately 880 nesting females. For PAFB the average number of loggerhead nests deposited from 1987 through 2013 is 1,266. This represents approximately 506 nesting females. Both CCAFS and PAFB have followed the same patterns of high and low nesting years for loggerheads as the rest of Brevard County (FWC 2014).

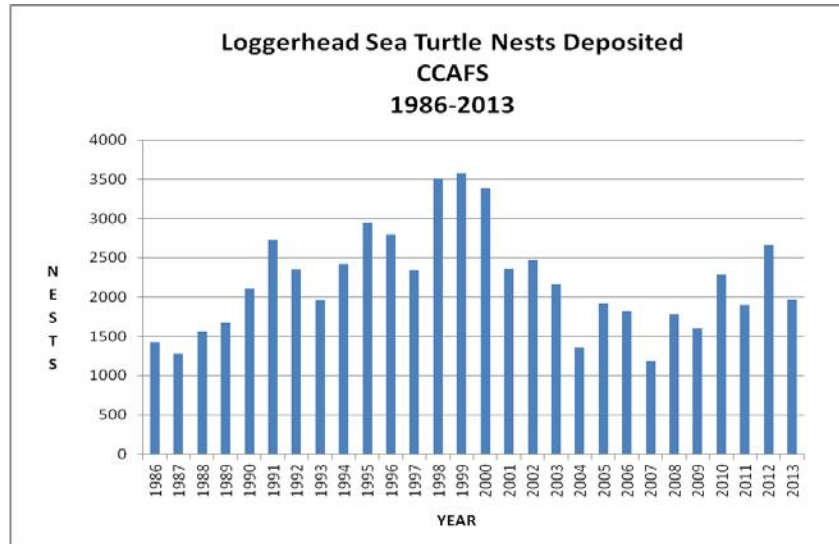


Figure 2. Annual Number of Loggerhead Sea Turtle Nests, CCAFS

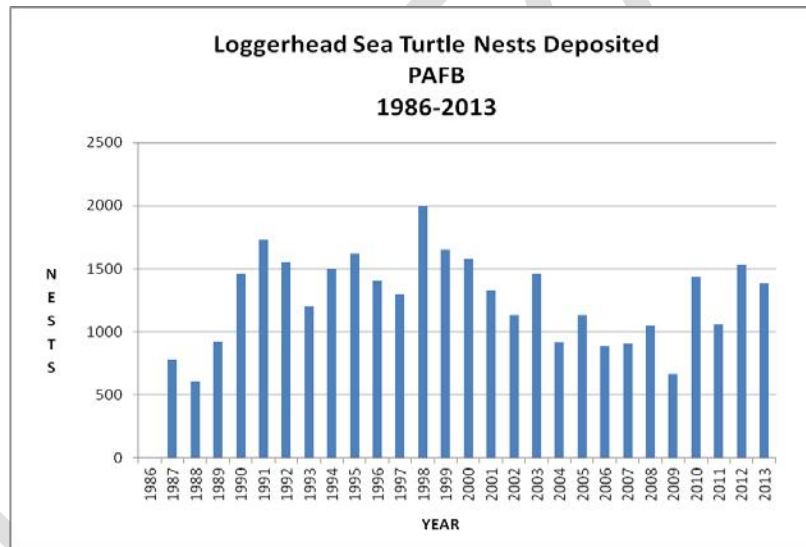


Figure 3. Annual Number of Loggerhead Sea Turtle Nests, PAFB

In-water critical habitat established by NMFS for the loggerhead sea turtle in the Atlantic Ocean adjacent to CCAFS and PAFB installations is reflected in Figures 1 and 2.

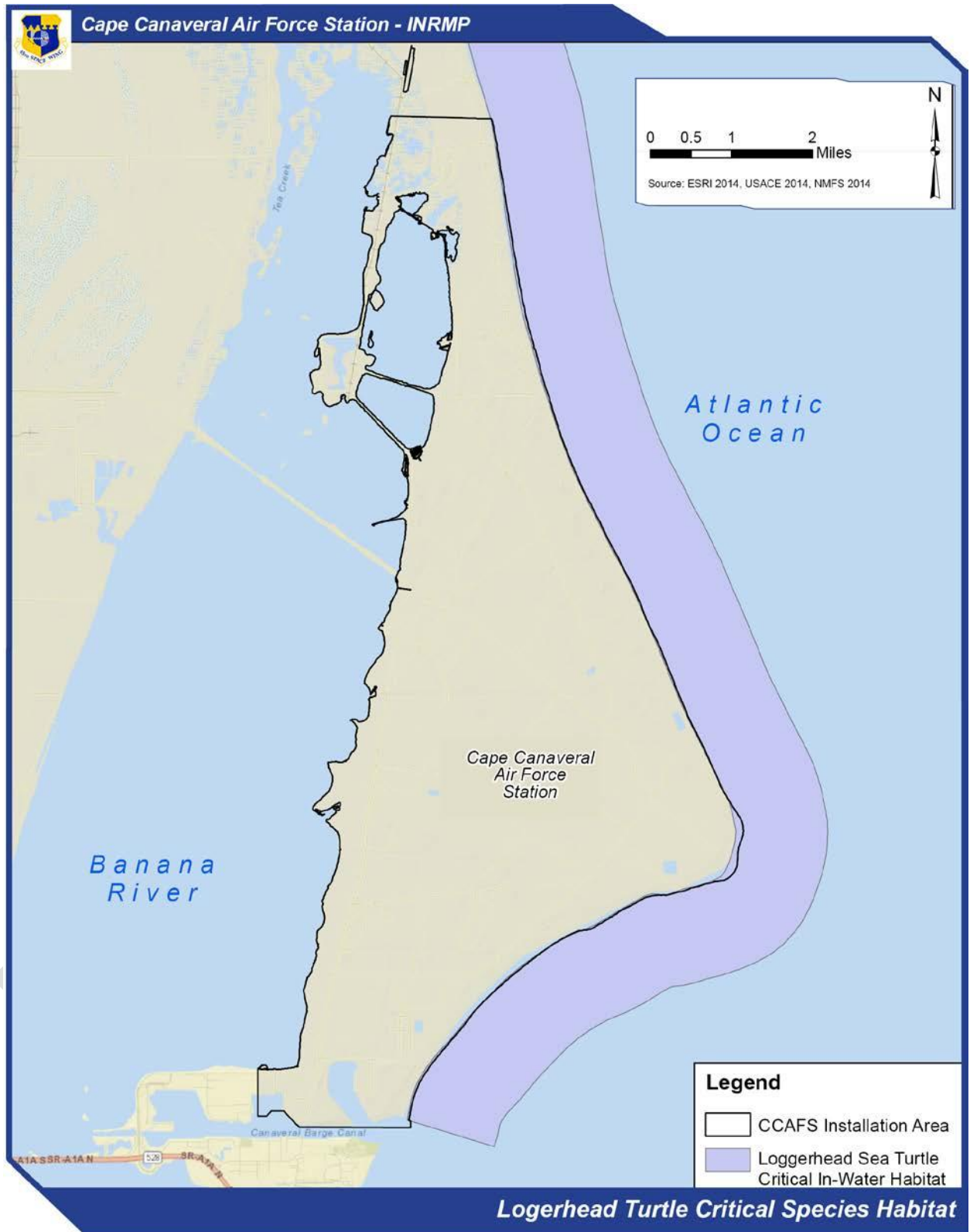


Figure 4. In-Water Critical Habitat for Loggerhead sea turtle (per NMFS), CCAFS

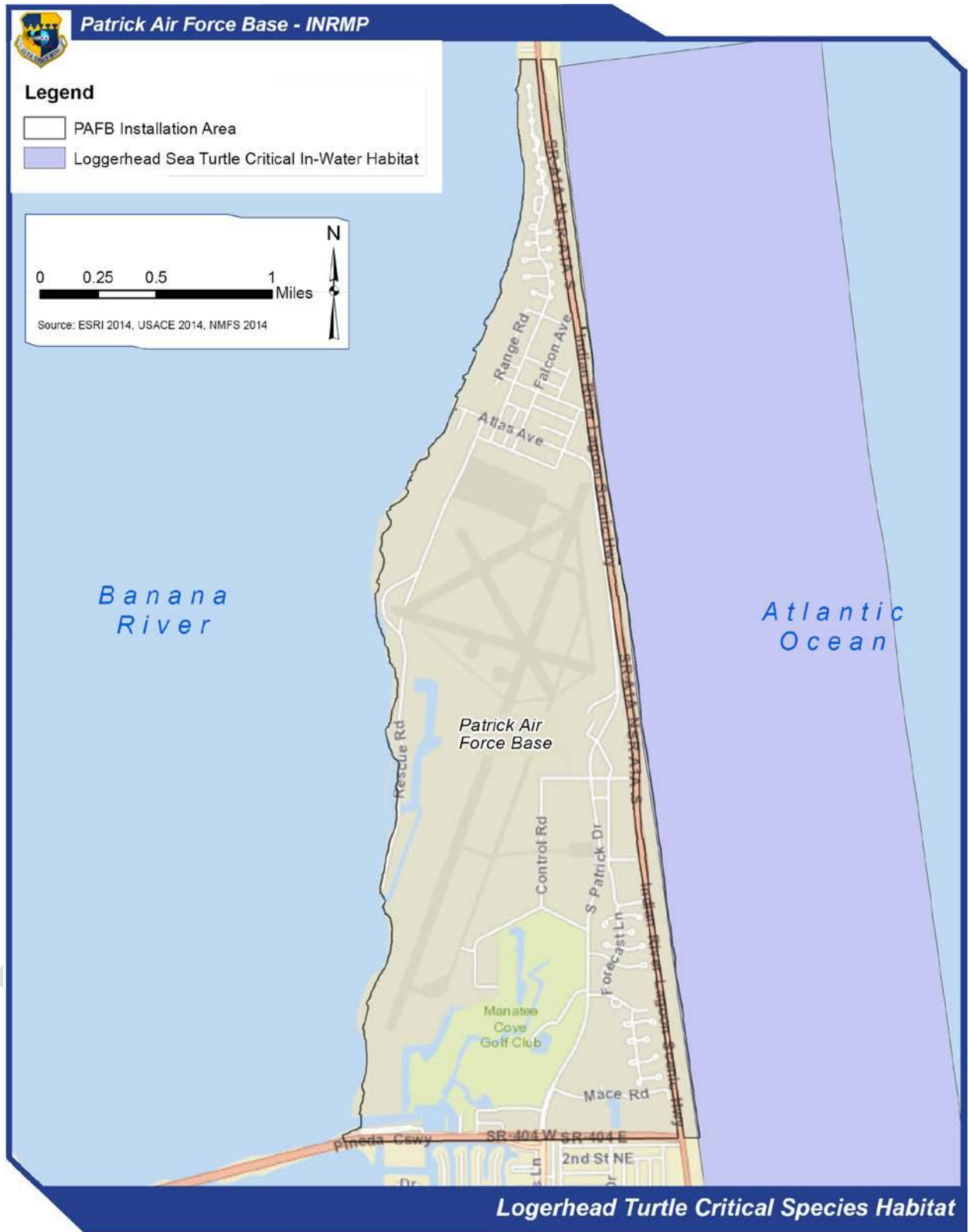


Figure 5. In-Water Critical Habitat for Loggerhead sea turtle (per NMFS), PAFB

C.3 Atlantic Green Turtle (*Chelonia mydas*)

The Atlantic green sea turtle (green turtle) is the largest hard-shelled sea turtle. Adults have a carapace varying in color from black to gray to greenish or brown, often with bold streaks or spots, and a yellowish white plastron. The physical attributes of the Florida population of green turtles average 3.3 feet straight carapace length and 300 pounds body weight. Characteristics that distinguish them from other sea turtles are their small, rounded head and smooth carapace. Hatchlings weigh approximately 0.88 ounces, their black carapace is about 2 inches long, and the ventral surface is white. (USFWS 2014b)

From 1986 through 2013, the number of green turtle nests deposited on CCAFS beaches has ranged from 4 to 335. From 1987 through 2013, the number of green turtle nests deposited on PAFB beaches has ranged from 0 to 64. Based on surveys from 1986 through 2013, the average annual number of green turtle nests deposited was 69 on CCAFS and was 20 on PAFB (from 1987-2007). The 2013 nesting season was a record year for green turtle nests deposited on the beaches of CCAFS and PAFB: 335 and 69, respectively. CCAFS and PAFB also followed the same state-wide trend of abnormal low and high years for green nesting (FWC 2014). Figures 6 and 7 reflect annual number of nests deposited on CCAFS and PAFB, respectively.

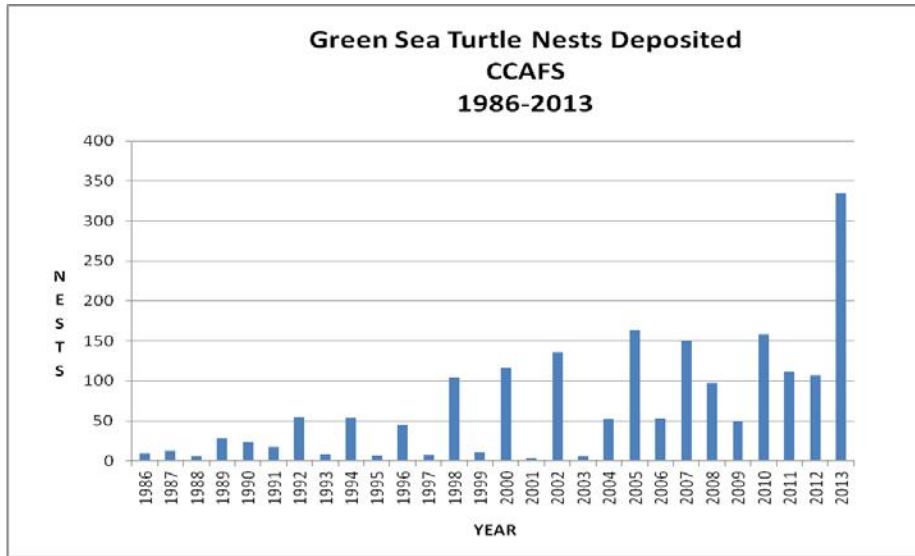


Figure 6. Annual Number of Atlantic Green Sea Turtle Nests, CCAFS

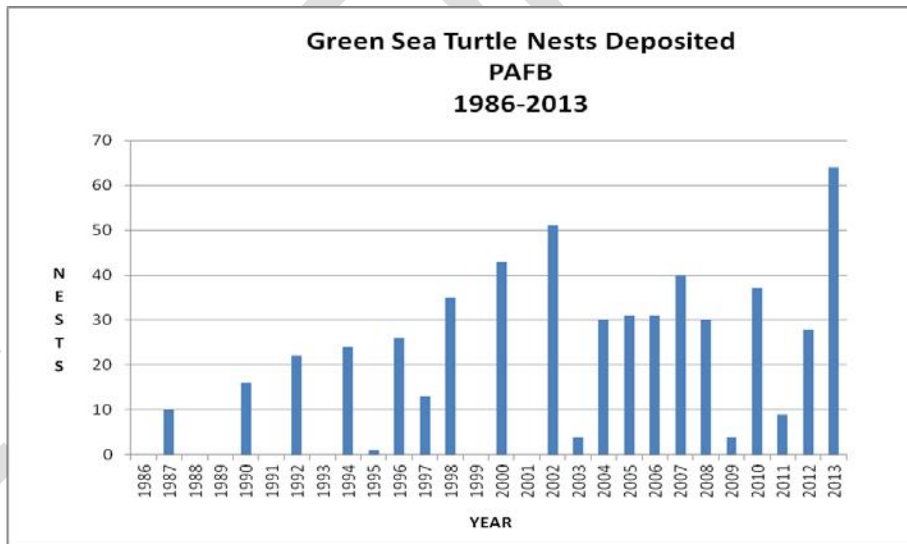


Figure 7. Annual Number of Atlantic Green Sea Turtle Nests, PAFB

C.4 Leatherback (*Dermochelys coriacea*)

The leatherback sea turtle is the largest of all sea turtles, attaining a length of 5 to 5.5 feet straight carapace length and a weight that occasionally reaches 1,100 pounds. Its shell is unique in being covered with a continuous layer of thin, black, and often white-spotted skin, instead of keratinized scutes. The carapace is raised into a series of seven longitudinal ridges. Other distinctive features are the absence of claws, the absence of scales, the long forelimbs, the reduced skeleton, and notable pink spot on the dorsal surface of the head in adults. (USFWS 2014c)

From 1986 through 2013, the highest number of leatherneck sea turtle nests was observed in 2012 on CCAFS and PAFB beaches, 12 and 6 leatherneck turtles, respectively. There are many years during this survey period that no leatherback sea turtle nests have been observed at CCAFS and PAFB. A total of 81 leatherback nests have been documented on CCAFS since surveys began. At PAFB, 23 leatherback nests have been documented since 1987 through 2013. Figures 8 and 9 reflect the annual number of leatherback sea turtle nests deposited on CCAFS and PAFB since nest surveying started in 1986.

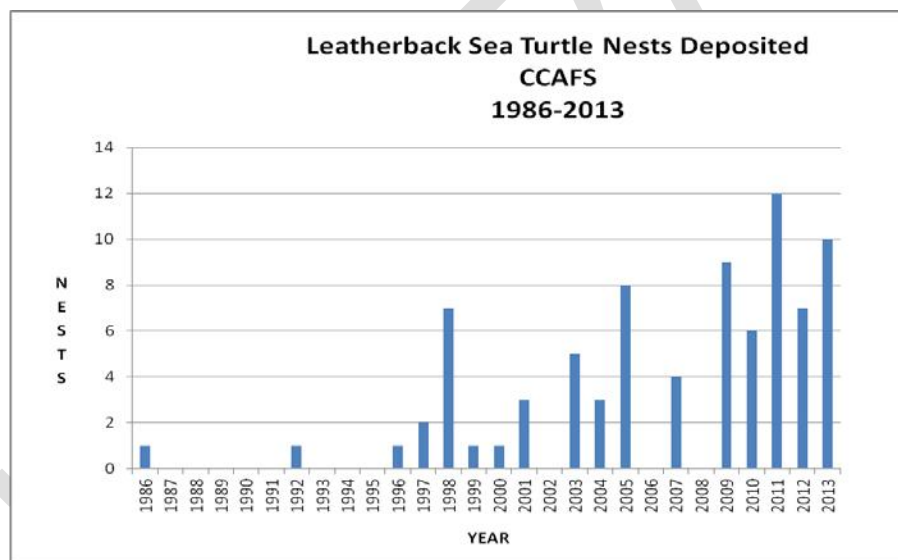


Figure 8. Annual Number of Leatherback Sea Turtle Nests, CCAFS

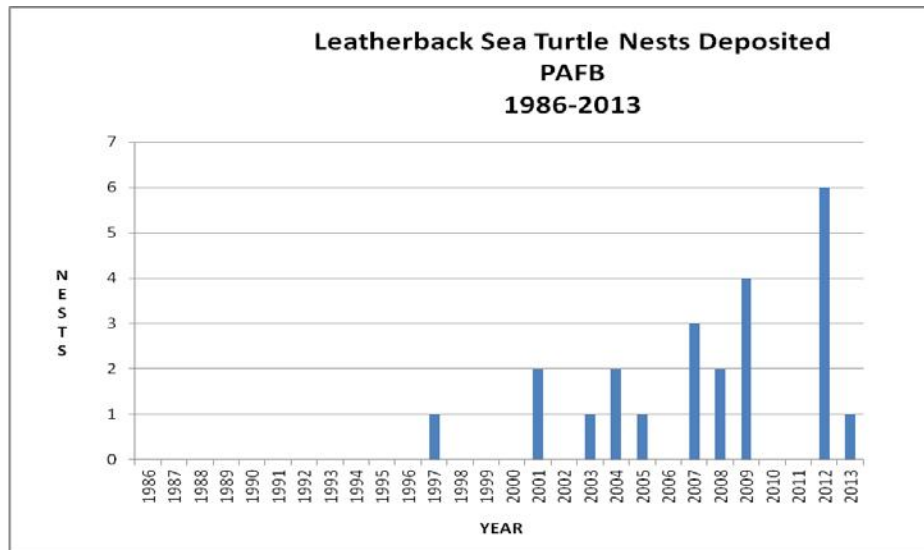


Figure 9. Annual Number of Leatherback Sea Turtle Nests, PAFB

C.5 Sea Turtle Permit

The FWC issues permits for activities involving marine turtles in Florida under authority granted to the State through a Cooperative Agreement with the FWS under Section 6 of the ESA and Chapter 370.12 of the Florida Statutes (Appendix B, Attachment B-4.2). Each permit designates a principal permit holder, up to 25 authorized personnel, and a list of authorized activities. Principal permit holders are responsible for ensuring that all authorized personnel listed on their permit are thoroughly trained by an experienced turtle biologist. Permit holders are authorized to conduct specific activities depending upon experience, area of investigation, and demonstrated sea turtle conservation needs. The permit must be in the possession of all authorized personnel while conducting sea-turtle related activities.

In addition, the FWC provides written guidelines about acceptable research and conservation techniques. Personnel are only authorized to conduct those activities specifically listed on their marine turtle permit. The guidelines specify the conditions and responsibilities that permitted personnel are expected to know for the activities that they conduct. This permit is renewed annually. Occasionally, the USAF approves studies on the CCAFS beach that are conducted by other people that hold their own sea turtle permits.

C.6 Nest Protection

C.6.1 CCAFS

For the purpose of sea turtle surveys, the nesting beach at CCAFS is divided into 21 kilometers (13 miles) marked with white polyvinyl chloride (PVC) pipe or wood posts (Figure 10). These markers provide reference points for all marine turtle monitoring activity recorded on CCAFS. Impacts to the beaches of CCAFS by the public is limited since CCAFS is a secured area and no public access is permitted. Beach access and fishing is permitted at two dune crossovers;

however, access is limited to 0.25 miles north and south of each dune crossover and is only open to badged personnel and their guests. Trash receptacles are maintained at CCAFS beach access points and trash is picked up during sea turtle monitoring season.

C.6.2 PAFB

PAFB is located roughly 15 miles south of CCAFS. The PAFB beach is located just east of US A1A, a road that is heavily used by tourists, locals and military personnel; the nesting beach at PAFB stretches from the Pineda Causeway (SR 404) for 4.4 miles to the north (Figure 11). Similar to CCAFS, the PAFB beach is divided into kilometer markers (7 kilometers), as depicted on Figure 11. The PAFB beach is open to the public until dark each day, but can close under high security conditions or if the 45 SW Commander requires closure for safety or security. Sea turtle nest locations are marked with triangulate stakes in the dune a measured distance from the clutch. Nests can be surrounded with stakes and flagging for avoidance during beach restoration actions as required under specific BOs and FDEP permits. Public education signage is placed at public beach entrances regarding sea turtles and sea turtle nesting, avoidance of artificial lighting on the beach, and prevention of destruction of dune vegetation. Trash receptacles are maintained at PAFB beach access points and trash is picked up during sea turtle monitoring season. Recreational beach equipment is staged away from the potential sea turtle nests (and marked nests), and is removed from the beach at the end of each day.

C.6.3 Nest Relocation

Nest relocation is considered a management technique of last resort. The most desirable alternative is to eliminate the problems that prompt relocation of the nest. Normally a nest is relocated only if it is deposited below the high tide line or if it is deposited in thick vegetation out of sight of the ocean. A small number of nests are relocated on CCAFS (<20) every year. An occasional nest at PAFB has been relocated due to storm erosion. If a nest requires relocation, the eggs are moved no later than 0900 the day following its deposition. Eggs are moved no later than 12 hours after deposition to prevent the potential for movement-induced egg mortality. Nest relocations are performed in accordance with the FWC Marine Turtle Conservation Guidelines (MTCG) (FWC 2007).

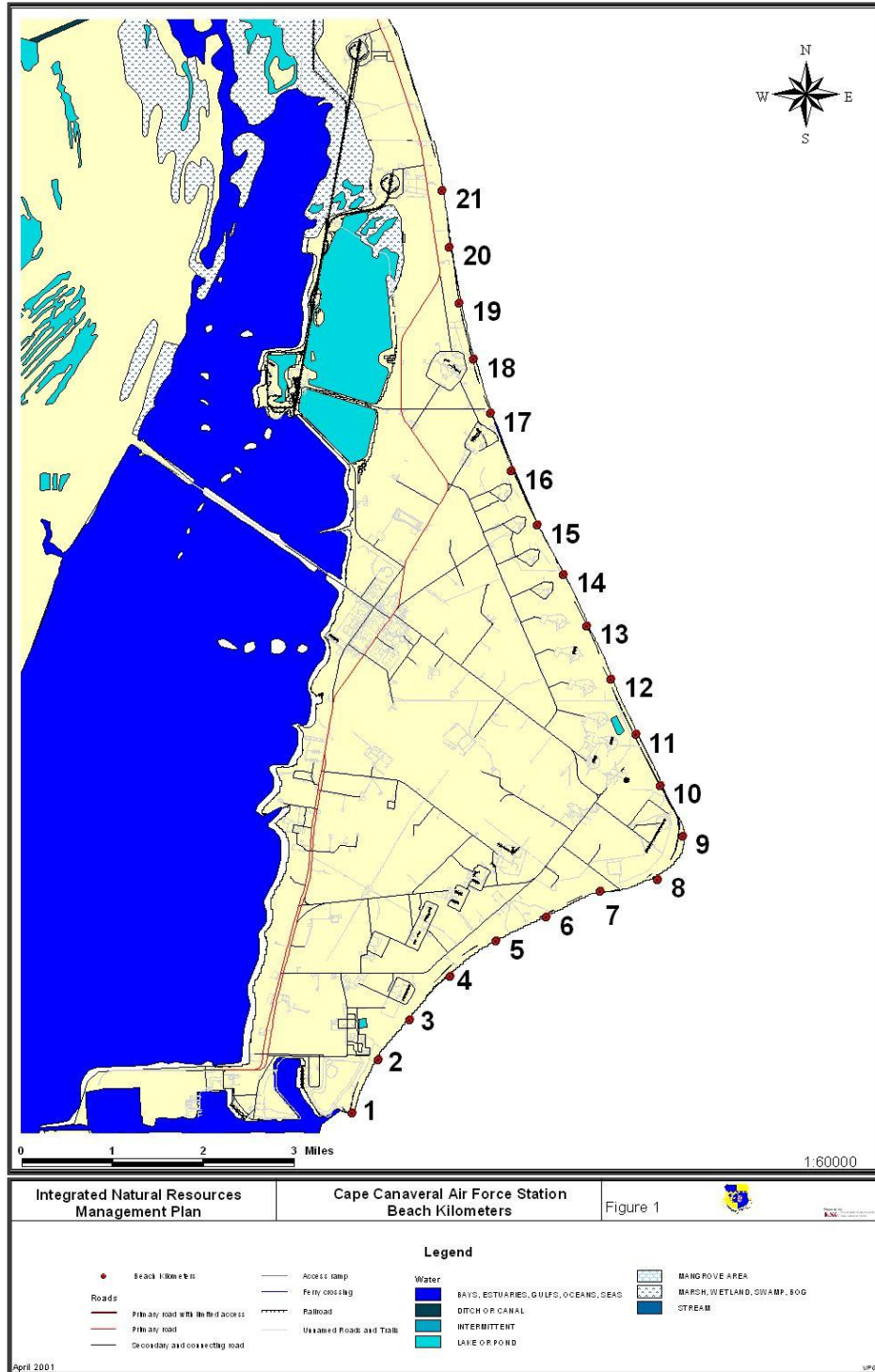


Figure 10. CCAFS Nesting Beach

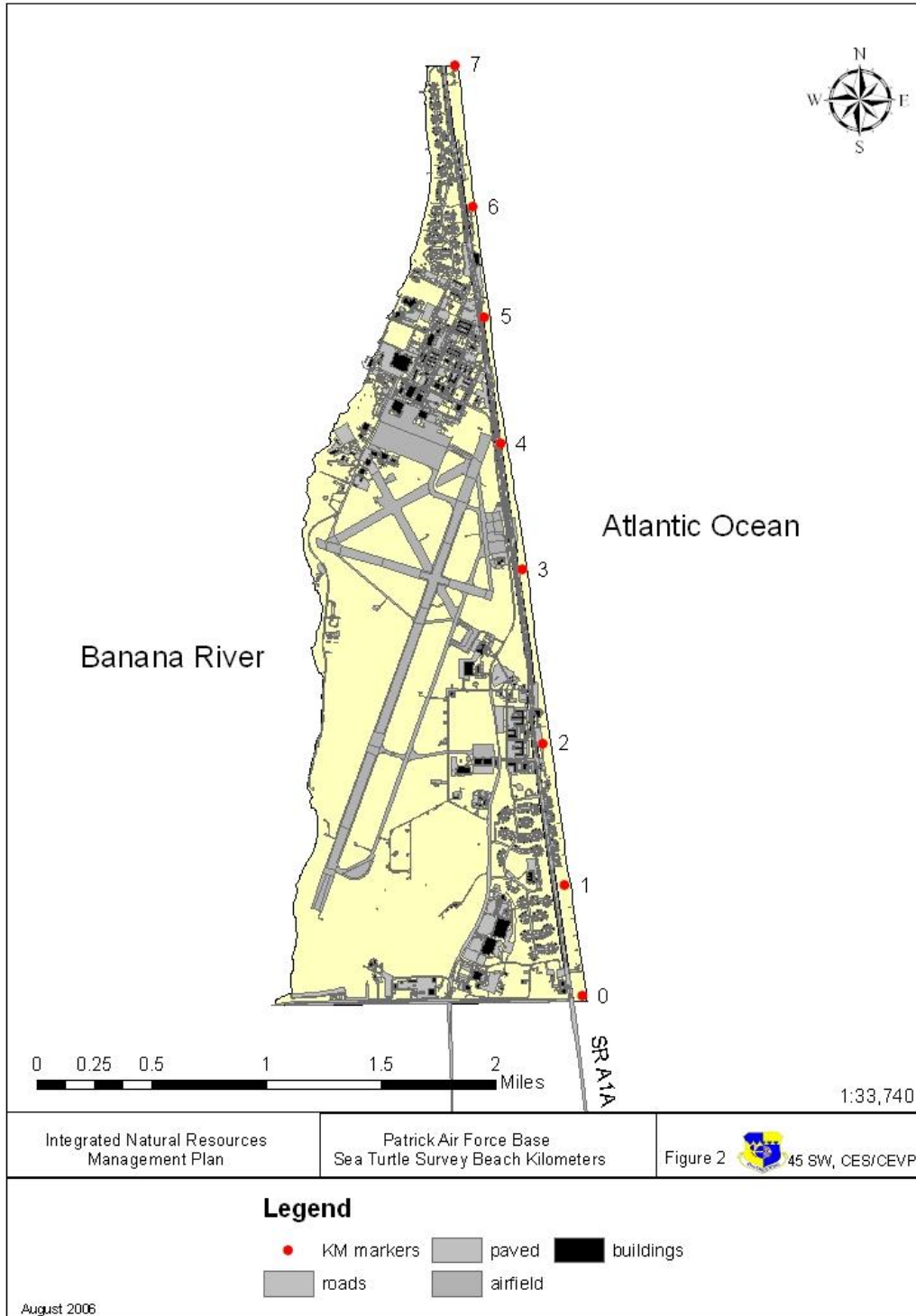


Figure 11. PAFB Nesting Beach

C.7 Nesting Surveys

Sea turtle nesting surveys are conducted on the CCAFS and PAFB beaches starting in March. The beach is surveyed 2-3 times per week March-April and seven days a week (dependent on weather), beginning 1 May in early May and ending 30 in September. At PAFB, surveys are conducted seven days a week beginning 1 May to 31 August and from 1 September to 31 October the survey is conducted two days a week. Daily surveys are conducted beginning at 0700 hours, using all-terrain vehicles (ATV). At CCAFS, surveyors are occasionally delayed or prevented from conducting a survey due to safety and/or security constraints related to launch support activities. Weather is the common factor impacting sea turtle surveys. These surveys are conducted in conjunction with the FWC beach indexing protocol that requires daily surveys 15 May through 31 August. After 30 September, the CCAFS and PAFB beaches is are patrolled periodically until 2-3 days/week until the conclusion of nest fate determinations (usually October or November). The PAFB beach is patrolled two days a week from 1 September to 31 October for disorientation surveys and recording of late nesting events. These surveys are part of the Index and State Nesting Beach Survey programs and have been ongoing since 1988. In addition to surveys conducted to support sea turtle monitoring, 45 SW biologists perform beach surveys a minimum of one day/week Nov-Feb to support other activities; therefore, the beaches are surveyed weekly regardless of sea turtle season.

The 45 SW acknowledges recent trends in sea turtle nesting in Florida which has resulted in the season beginning earlier and ending later, and future sea turtle monitoring recommendations are expected to be expanded to include 1 April through possibly 30 November. Based on the history of nesting on 45 SW beaches, the current monitoring effort already includes the expanded time frame since personnel are on the beach March-November. Personnel are not aware of any nests that have been missed due to early or late nesters. The current protocol for monitoring for the state nesting beach survey does not require a set number of days/week, only that monitoring typically begins on 1 Mar, which the 45 SW follows. The protocol for the index nesting beach survey requires seven days/week 15 May-31 August, which the 45 SW follows. In the event these monitoring dates change in the future, the 45 SW will discuss these changes with leadership and make the appropriate changes, as required. The weekly monitoring conducted outside the season, Nov-Feb, would also pick up any early or late nesters and assist in determining if surveys need to be performed more regularly during this time of the year.

All sea turtle crawls are recorded and a sample of nests are numerically marked using wooden survey stakes sprayed with high-visibility orange paint. At CCAFS stakes are numbered sequentially and each is placed approximately one half meter landward of the nest cavity. At PAFB two small stakes are placed in line with the nest (at set distances) at the seaward base of the dune and within the dune to avoid obstructing the beach and to prevent beachgoer vandalism of nest demarcation. The marking scheme for CCAFS is currently every 17th nest for loggerhead turtles and every nest for green and leatherback sea turtles. The marking scheme for PAFB is more complex for loggerheads, but results in a sample of around 100 nests. Every green and leatherback nest located on PAFB is marked. Nests and false crawl determinations are made visually and by hand digging where confirmation was necessary. Nests are observed

daily to determine nest fates, and all disturbed nests are noted by marking on the stake and survey sheets.

Nest success evaluations are conducted either 70 days after the eggs are deposited (80 days in the case of a leatherback nest) or 72 hours after the first emergence, whichever occurs first. A nest that has been subjected to inundation, excessive rainfall, shading, or cold fronts is not excavated until 80 days after egg deposition or 96 hours after the first emergence. Nests deposited in October are not evaluated until 80 days. Nest success evaluation is determined by excavating marked nests. Success rate is calculated using the data obtained by 45 CES/CEIE-C from the evaluated nests (calculation includes marked sample of nests, average clutch size, average emergence, etc.). For example, on CCAFS in 2013, nest success for the loggerhead, Atlantic green, and leatherback sea turtles was 43, 46, and 30 percent, respectively. On PAFB in 2013, nest success for the loggerhead, Atlantic green, and leatherback sea turtle was 69, 58, and 100 percent, respectively.

Nest success evaluations are performed in accordance with the FWC MTCG (FWC 2007).

C.8 Disorientation and Light Surveys

Disorientation surveys are performed daily for both adults and hatchlings and all incidents are reported to FWC using the standardized Marine Turtle Disorientation Report form, which is available in the appendix of FWC MTCG (FWC 2007). When possible, a description of any light(s) that appears to be responsible for the disorientation is included in these reports. When disorientation incidents become a recurring problem at a particular location or a light source cannot be identified, a night survey is done to determine the source and extent of the problem. Coordinates of light sources are added to the form when the source is fairly certain and can be obtained. For additional information on lighting, see Section 6.3 below.

In accordance with the Biological Opinion (BO) associated with hatchling incidental take (see Appendix B, Attachment B-4.1), periodic light surveys are required to identify and resolve problem light sources to ensure 3% or less hatchling incidental take as stipulated in the BO. In addition, compliance with the 45 SW Instruction 32-7001 *Exterior Lighting Management* is mandatory (45 SWI 32-7001, is available at http://static.e-publishing.af.mil/production/1/45sw/publication/45swi32-7001/45swi32_7001.pdf) is mandatory. More discussion on light management is included below in Section 6.3.

Portable light shields are occasionally used as a temporary method of reducing hatchling disorientation. The shields are set up landward and along the sides of the nest cavity and block illumination of known disorienting light sources.

Figures 12 and 13 depict historic sea turtle disorientation rates on CCAFS and PAFB beginning in 1990 through 2013.

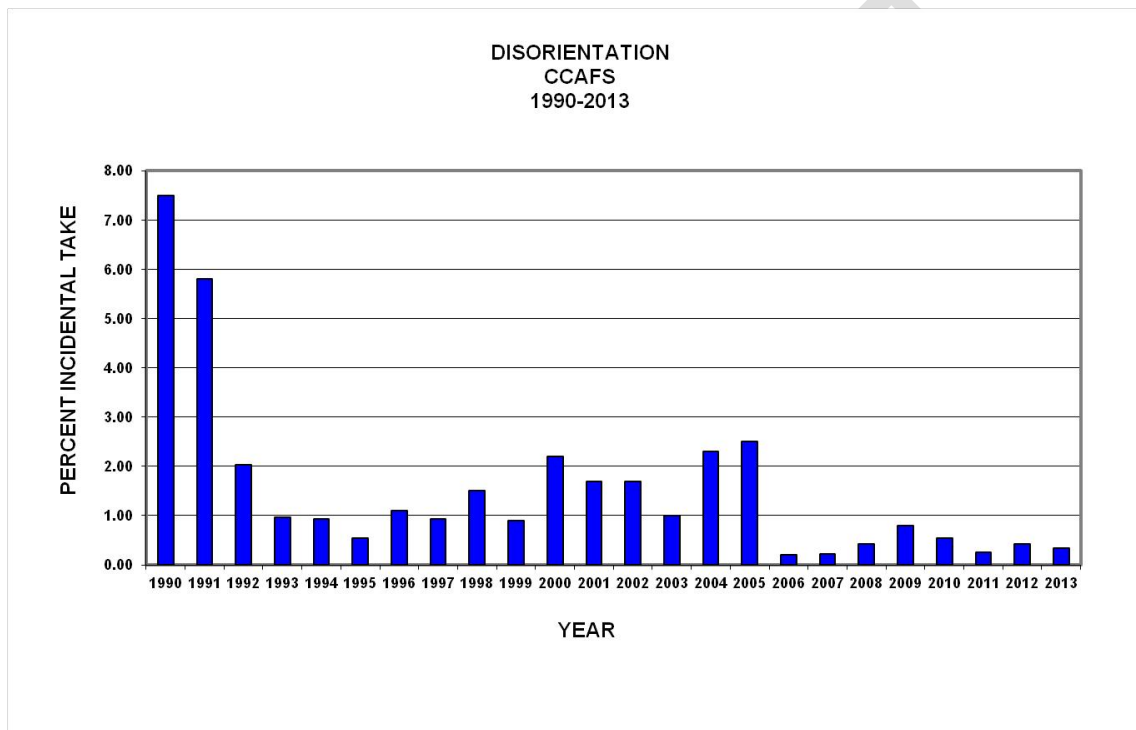


Figure 12. Historic Sea Turtle Disorientation on CCAFS

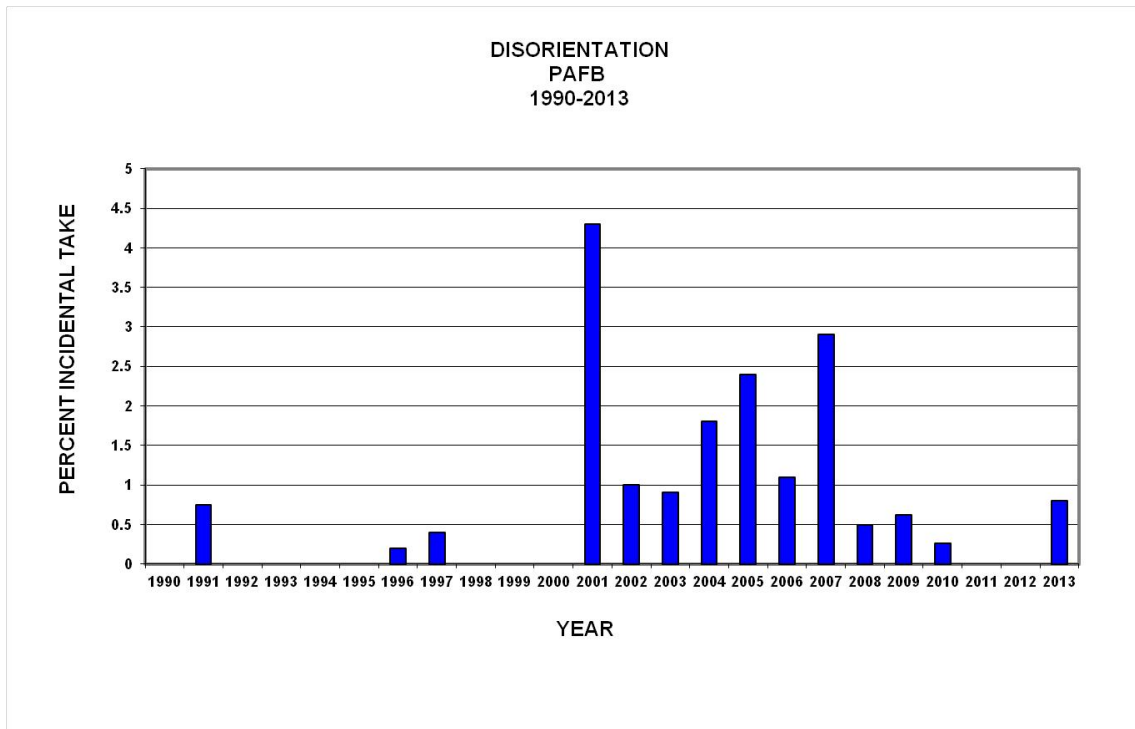


Figure 13. Historic Sea Turtle Disorientation on PAFB

C.9 Nest Predation

Between 1977 and 1983, observations of sea turtle nests on CCAFS indicated a high level of predation by raccoons (*Procyon lotor*). In 1984, a program was initiated to preserve sea turtle nests by trapping and relocating raccoons and placing wire screens over turtle nests to deter excavation by raccoons. Predation at PAFB has been minimal; trapping has only occurred when necessary and no nests have been screened. Reduction of sea turtle nest predators on CCAFS and PAFB is accomplished by live-trapping and removal of animals from the beach and coastal strand areas. The raccoon and feral hog have historically been the dominant predators on CCAFS, while other predators include bobcats, armadillos, coyotes, and ghost crabs. In recent years, coyotes have become a primary predator on CCAFS. PAFB has experienced minor predation by raccoons, feral cats, and ghost crabs. Tomahawk live traps baited with sardines are used for raccoon trapping. Beach trapping by 45 SW personnel is conducted by setting multiple traps in areas of intense raccoon activity. On CCAFS, predator control on the beach is conducted ~~from late April through October~~throughout the season, as needed, using single or multiple traps at various locations. Additionally, coyote and feral hog control is performed year-round by personnel under contract with the 45 SW. Use of padded steel leg traps is allowed by FWC to trap coyotes under permit number LSSP-12-00005B that was issued to USAF on 10 March 2014 (see Appendix B, Attachment B-4.4). This permit expires 31 December 2014 and ~~will be renewed~~renewal was pending during writing of this updated plan.

Figures 14 and 15 illustrate the historic predation activity on CCAFS and PAFB beginning in 1990 through 2013.

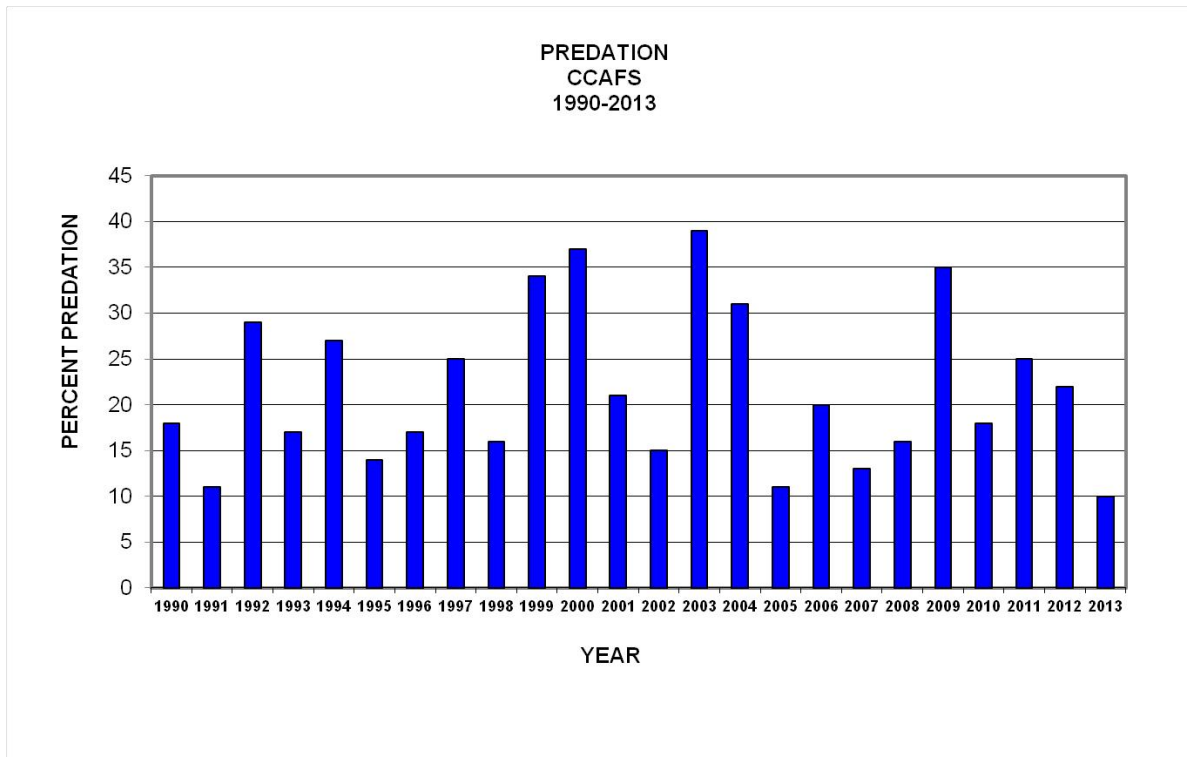


Figure 14. Historic Sea Turtle Nest Predation on CCAFS

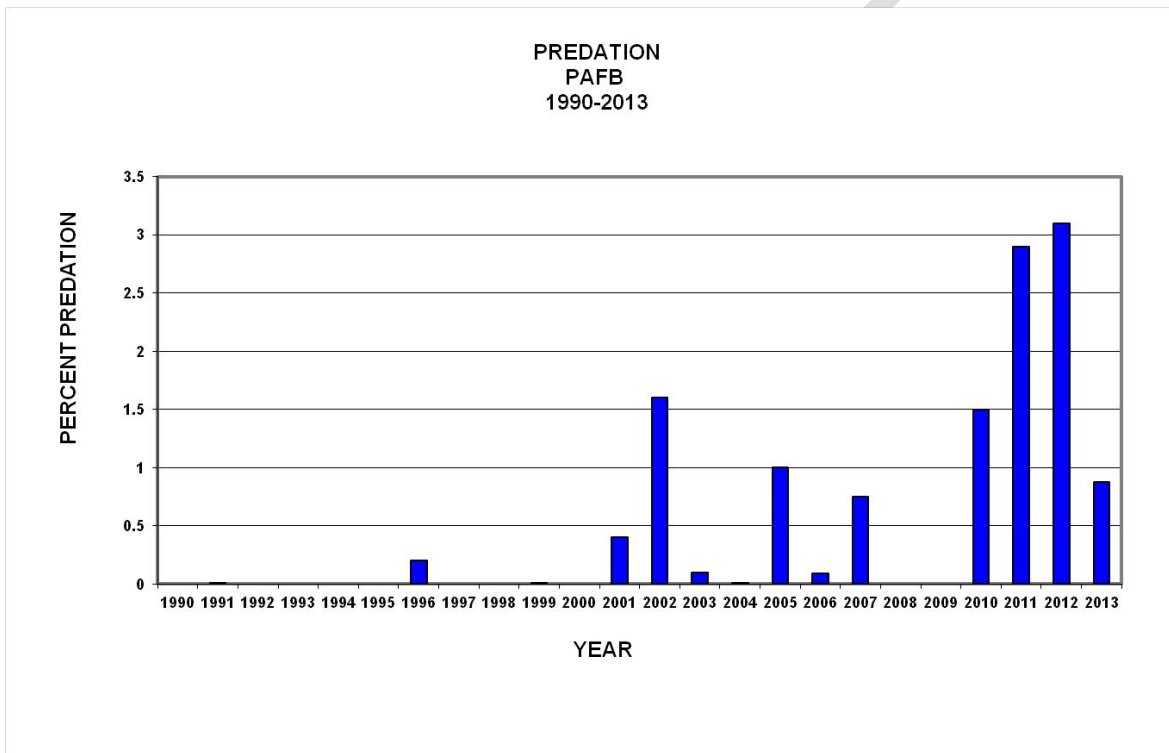


Figure 15. Historic Sea Turtle Nest Predation on PAFB

To protect sea turtle nests from predation, a limited number of nests at CCAFS are protected using 4 foot square sections of welded wire fence. These screens are placed over the nest and secured in place with rebar anchors at each corner. This allows hatchlings to escape from the nest upon emergence, yet reduces potential nest disturbance by predators, such as raccoons and feral hogs. The screen is centered over the egg chamber to make it less likely for predators to burrow to the eggs from the side. The location of the egg chamber is found by hand-digging. Due to the extended time required to locate a nest and screen it, loggerhead sea turtle nests are currently not screened. However, most green and leatherback turtle nests at CCAFS are protected with predator screens, due to smaller number of annual nests for these two species when compared to the loggerhead sea turtle.

As illustrated in Figure 15, predation events at PAFB are minimal to non-existent. Generally, less than 1% of nests deposited experience predation. Trapping for predators is conducted by the PAFB pest shop when predation is reported by the University of Central Florida (UCF) to 45 CES/CEIE-C. Traps are set beachside of the areas in which sea turtle nests or emerging hatchlings were impacted by predators.

Trapping for feral cats has been aggressive throughout the years due to feeding by some residents in the beachside PAFB Temporary Lodging Facilities. Signs are posted and residents have been notified that feeding of wildlife is considered illegal on 45 SW property. Feral cat populations within PAFB have decreased since 2007.

C.10 Stranding and Salvage of Sea Turtles

The 45 SW collects information from stranded turtles on land or found floating in the water, whether dead or alive. Approximately 30 to 40 turtles are found stranded on CCAFS each year and on average six sea turtles are found stranded on PAFB annually. All permit holders participating in this activity are required to complete a Sea Turtle Stranding and Salvage Network-Stranding Report form for each turtle encountered. This form is available in the appendix of FWC MTCG (FWC 2007). Any live stranded turtles are transported to a holding facility for further evaluation and care (e.g., Sea World, Volusia County Marine Science Center, Brevard Zoo), as directed by FWC sea turtle staff. Personnel conducting stranding salvage activities are required to attend training every two years.

C.11 Educational and Outreach Activities

C.11.1 Turtle Watches

Approximately two turtle watches are conducted each summer on the CCAFS beach during nesting season; reserved for groups selected by the CCAFS Commander and/or the 45 SW Commander. Since there are numerous organizations off base which provide this activity, and because CCAFS is a secured area, CCAFS has chosen to reserve its public watches for special circumstances. Turtle watches are conducted in accordance with the guidelines in the FWC MTCG (FWC 2007). All participants in turtle watches are informed of the federal and state of Florida laws protecting sea turtles (adult and hatchling) and their nests. Participants are

reminded that conducting turtle watches, touching sea turtles, and handling sea turtle eggs without a permit is unlawful.

C.11.2 Maintaining Preserved Specimens

Maintaining preserved specimens allows for the display of sea turtles or sea turtle body parts for educational or scientific research purposes. A small number of sea turtle specimens are maintained at CCAFS and PAFB for educational purposes. Specimens are labeled and accompanied by appropriate interpretive displays. A written inventory is kept of all preserved specimens. The FWC sea turtle permit provides approval for this activity (see Appendix B, Attachment B-4.2).

C.11.3 Additional Training

There are a number of additional activities undertaken by the 45 SW that involve education about sea turtles on 45 SW property. This includes:

- Turtle walks with 45 SW leadership and other personnel
- Educational signs at beach crossovers
- Education information for people staying at beachside facilities, including table top brochures and rental packet letters
- Newcomer briefings
- Annual briefings to base housing residents
- Annual participation in Space Coast Wildlife and Birding Festival
- Presentations at the Child Development Center on PAFB

C.12 Related Management

C.12.1 Off-Road Vehicles

In general, the use of ATVs is generally not permitted on 45 SW installations. The only approved use for off-road vehicles, like the ATV, is for 45 CES/CEIE-C environmental personnel and for security personnel performing safety and security operations.

The 45 CES/CEIE-C personnel utilize ATVs during the sea turtle monitoring season, wildlife surveys, prescribed burns for scrub restoration, and beach clean-up activities. When conducting sea turtle surveys/monitoring on the beach, ATV operators of the 45 CES/CEIE-C, or their contractors, check for and avoid ground nesting birds, loafing/foraging shorebirds, dune vegetation, and sea turtle adults and hatchlings. ATVs are driven over the sea turtle tracks to ensure that the nest (new or freshly hatched) is not counted more than once. ATVs are operated in a manner to reduce any potential impacts to natural resources and 45 CES/CEIE provide training to security in the proper use of ATVs on the beach. Use of ATVs has allowed environmental personnel the ability to track thousands of sea turtle nests and disorientation events a year over tens of miles efficiently and quickly. Additional information regarding ATV training and operation can be found in 7.1.4 of INRMP document.

In addition, the 45 SW restricts night driving on the beach unless absolutely necessary for security issues or 45 CES/CEIE-C natural resources monitoring requirements.

C.12.2 Dune Restoration/ Beach Enhancement

The 45 SW Civil Engineering programs projects involving dune and beach restoration and enhancement when necessary to protect beachside facilities from severe erosion and by re-establishing appropriate beach/dune profiles to benefit sea turtles. This has included installation of dune crossovers, planting of dune vegetation, beach tilling, beach escarpment removal and installation of dune berms. The majority of these projects block exterior lighting from reaching the beach, thus reducing the likelihood of disorienting sea turtles. Tilling and escarpment removal have been conducted in accordance with beach restoration permits and BOs to improve sea turtle nesting on nourished beaches by preventing sand compaction and steep slopes. Native dune plants have been planted in areas where storm surge has scoured away existing vegetation. The 45 SW Civil Engineering installed sand fencing along with a recent beach nourishment project at PAFB to encourage dune rebuilding and re-vegetating. Sand fencing has also been installed at CCAFS on sections of the beach where dune vegetation is scarce or nonexistent, or in areas where the profile of the beach is extremely flat. When conducted appropriately with Best Management Practices (BMPs) implemented, these dune restoration and beach enhancement projects are beneficial to the sea turtle. The 45 SW Civil Engineering will continue to program for such projects, and environmental funding for dune/beachfront plantings will occur when the budget allows and if problematic areas are identified.

To reduce the potential impacts to sea turtles, these projects are generally completed in the winter months, avoiding the sea turtle nesting/hatching season in accordance with permit and BO requirements.

Examples of projects undertaken that benefit sea turtles:

- Biannual beach cleanups
- Sand fencing
- Beach renourishment and rubble removal

C.12.3 Light Management

Extensive research has demonstrated that the principal component of the emergent sea turtle hatchlings' orientation behavior is visual (Carr and Ogren 1960, Dickerson and Nelson 1989, and Witherington and Bjorndal 1991). Artificial beachfront lighting has been documented to cause disorientation (loss of bearings) and misorientation (incorrect bearing) of hatchling turtles. As hatchlings head towards artificial lights, their exposure to predators and the likelihood of dehydration is greatly increased. Misoriented hatchlings can become entrapped in vegetation or debris, and some hatchlings have been found dead on nearby roadways and in parking lots after being struck by vehicles. Intense artificial lighting can even draw hatchlings back out of the

surf. Additionally, preliminary research indicates that lights adjacent to sea turtle nesting beaches may hinder the beach nest site selection of nesting females.

During 1988 the 45 SW and USFWS met and agreed upon the development of light management plans (LMPs) for CCAFS and PAFB to maintain compliance with section 7 of the ESA. The purpose of the plans was to provide guidelines for identification, retrofitting/replacing, and operation of particular lamps and fixtures known to adversely affect threatened and endangered sea turtle nesting activities on CCAFS and PAFB beaches. After development of these LMPs, USFWS issued a BO in 1991 authorizing an incidental take of hatchlings from 75 loggerhead and two green sea turtle nests at CCAFS and hatchlings from two loggerhead nests at PAFB. In subsequent years, the authorized level of take was to be reduced by 50% each following year. The BO was modified during 1991 after the 45 SW reported the incidental take had been exceeded for that season. The BO was modified to include all hatchlings that had been disoriented for that year and authorized a 4% take for the 1992 season and 2% for all years following. The BO was again modified during 2000 and authorized an incidental take of 2% of hatchlings and 2% of adults for PAFB and CCAFS.

In 2004, the 2% incidental take was exceeded at both PAFB and CCAFS. Subsequent meetings resulted in a new BO in 2006 that resulted in an interim authorized take of 3% of hatchlings for the 2006 and 2007 seasons. Historically, LMPs were required for any new construction that required exterior lighting. The 2006 BO modified this requirement to require LMPs for all new facilities that are in close proximity to the beach, are not constructed in accordance with 45 SWI 32-7001 (see next paragraph), have lighting directly visible from the beach, and/or may cause significant sky glow. The BO was modified again in 2008 and authorized a 3% take of nesting females, and up to a total of 3% of all hatchlings disoriented/misoriented from a representative sample of all surveyed marked nests. The BO also requires at least five nighttime light surveys at CCAFS and PAFB during the peak of nesting season (May 1 through October 31). For additional information regarding reasonable and prudent measures and terms of the BO, see Appendix B, Attachment B-1.1.

The 45 SWI 32-7001 was developed in 2000 to implement an internal policy to limit incidental take under the ESA and to support the light management BO. In 2003, the 45 SWI 32-7001 was revised to provide a more thorough discussion of responsibilities of 45 SW organizations, tenants and residents. The 45 SWI 32-7001 was also revised to incorporate the up-to-date BO guidance and was published in January 2008, and was revised and published again in 2012 (available at website: http://static.e-publishing.af.mil/production/1/45sw/publication/45swi32-7001/45swi32_7001.pdf). The primary change in the 2012 revision of SWI 32-7001 is the identification of acceptable compliant light sources, as well as programmable timers and motion sensors that are encouraged for area lighting if essential to personnel safety, and a change to annual notification requirements.

The 45 SW will issue annual notices, prior to the sea turtle nesting season, reminding all tenants and residents of their lighting responsibilities under 45 SW SWI 32-7001 (http://static.e-publishing.af.mil/production/1/45sw/publication/45swi32-7001/45swi32_7001.pdf). Organizations, tenants and residents are responsible for minimizing exterior lighting during the sea turtle season. To comply with 45 SWI 32-7001 and existing LMPs, personnel of the 45 CES/CEIE-C

will inspect and record noncompliance and will notify facility managers of lighting violations. Five to ten nighttime lighting surveys will be conducted at CCAFS and five to six at PAFB ~~from 1 May to 31 October~~during the sea turtle nesting and hatching season to enforce compliance with existing light management policies. Surveys for disorientation will continue in order to evaluate the effectiveness of LMPs and light management policies.

Exterior lighting that is not mission-, safety-, or security-essential will be extinguished from 2100 to 0600 from 1 May to 31 October. Mission-essential lighting supporting launch activities includes launch preparation, processing of boosters, payloads, etc., and any searchlights or banks of lights (portable light-alls) used to light the pad during night launches. This would also include, as an example, lighting within the Vertical Integration Facility (VIF) that is required when the vehicle is being moved in and out (VIF doors are open). Safety-essential lighting is any lighting required for night operations training such as conducted by the 920th Search and Rescue Wing and transient aircraft operations as well as lighting for the airfield, parking lots and/or facility entrances for personnel who work during hours of darkness. Security-essential lighting includes lighting at the base entrance gates, pad specific entrances, perimeter security lighting around critical facilities, national security threats/elevated terrorist levels, and aircraft parking aprons/pads.

Exterior lighting requiring replacement will be done so in accordance with the 45 SW 32-7001. All operations with artificial lighting will be accomplished using downward-directed, well-shielded LPS light fixtures, full cutoff amber/yellow compact fluorescent fixtures, full cutoff amber (bug light) incandescent fixtures, or shielded amber or red Light Emitting Diode (LED) lights. Where color rendition or explosion-proof fixtures are required for mission-essential operations, well-shielded, high-pressure sodium (HPS) lights may be used; however, a letter of justification must be submitted to the 45 CES/CEIE-C with the request for this variance. Further, any lighting other than HPS that is required for color-rendition purposes will require a letter of justification. Mission operations that require unshielded lighting or "uplighting" will require a letter of justification and approval through 45 CES/CEIE-C and the USFWS. Lighting directly visible from anywhere on the beach must be shielded and/or recessed so that the point source of light or any reflective surface is not directly visible from the beach.

The 45 SW acknowledges recent trends in sea turtle nesting in Florida which has resulted in the season beginning earlier and ending later, and future sea turtle monitoring recommendations are expected to be expanded to include 1 April through possibly 30 November. Based on the history of nesting on 45 SW beaches, lighting restrictions will continue to be enforced 1 May-31 October. Both CCAFS and PAFB have only had a handful of nests present in April and November and neither site has documented a disorientation event during either of these months in the history of monitoring (since the late 1980s). If nesting on 45 SW beaches begins to increase in the future, expansion of lighting restrictions will be reconsidered at that time.

For a more general discussion of how the 45 SW exterior lighting affects natural resources, particularly sea turtles, see Section 6.2.6 of the INRMP.

C.13 References

- Carr, A., and L. Ogren. 1960. The Ecology and Migrations of Sea Turtles. 4. The Green Turtle in the Caribbean Sea. Bulletin of the American Museum of Natural History. 121: 1-48 p.
- Dickerson, D.D., and D.A. Nelson. 1989. Recent Results on Hatchling Orientation Responses to Light Wavelengths and Intensities. In: Eckert, S.A., K.L. Eckert, and T.H. Richardson (compilers). Proceedings on the Ninth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS-SEFC-232. 41-43 p.
- FWC. 2014. Florida Index Nesting Beach Survey Totals (1989-2013). Website accessed July 2014: <http://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/>.
- FWC. 2007. FWC Marine Turtle Conservation Guidelines. November 2007. Website accessed: http://myfwc.com/media/418106/Seaturtle_Guidelines.pdf.
- USFWS. 2014a. Species profile for Loggerhead sea turtle (*Caretta caretta*). Website accessed, July 2014: <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?scode=C00U>.
- USFWS. 2014b. Species profile for Atlantic green sea turtle (*Chelonia mydas*). Website accessed July 2014: <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?scode=C00S>.
- USFWS. 2014c. Species profile for Leatherback sea turtle (*Dermochelys coriacea*). Website accessed July 2014: <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?scode=C00F>.
- Witherington, B.E., and K.A. Bjorndal. 1991. Influences of Artificial Lighting on the Seaward Orientation of Hatchling Loggerhead Turtles (*Caretta caretta*). Biological Conservation. 55:139-149 p.

ACRONYMS for SEA TURTLE MANAGEMENT PLAN

45 th Space Wing	45 SW
ATV	All Terrain Vehicle
BMP	Best Management Practice
BO	Biological Opinion
CCAFS	Cape Canaveral Air Force Station
CES/CEIE-C	Civil Engineer Squadron, Environmental Conservation Element
ESA	Endangered Species Act
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
HPS	high-pressure sodium
INRMP	Integrated Natural Resources Management Plan
LED	Light Emitting Diode
LMP	Light Management Plan
MTCG	Marine Turtle Conservation Guidelines (FWC)
PAFB	Patrick Air Force Base
PVC	polyvinyl chloride
UCF	University of Central Florida
USFWS	US Fish and Wildlife Service

Appendix C-1A

**USFWS Justification Letter Dated 10 October 2012 to 45 CES/CEIE-C
Regarding Exemption from Loggerhead Sea Turtle Critical Habitat Designation**

Final DRAFT