HABITAT CONSERVATION PLAN FOR THE PROTECTION OF SEA TURTLES ON THE ERODING BEACHES OF INDIAN RIVER COUNTY, FLORIDA

2015 ANNUAL REPORT

Prepared in Support of Indian River County’s Incidental Take Permit (TE057875-0) for the following agency:

U.S. FISH AND WILDLIFE SERVICE
SOUTH FLORIDA ECOLOGICAL SERVICES OFFICE
ATTN: HCP PROGRAM
1339 20TH STREET
VERO BEACH, FLORIDA 32960

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HABITAT CONSERVATION PLAN

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INDIAN RIVER COUNTY, VERO BEACH, FLORIDA 2
Indian River County Sea Turtle Habitat Conservation Plan

Annual Report

2014 SUMMARY

Before the 2015 nesting season began the county underwent a change in personnel and a new Habitat Conservation Plan (HCP) coordinator was chosen. Additionally, the Florida Fish and Wildlife Service (FWS) selected a new imperiled species HCP supervisor. Personnel changes within the County and FWS provided an opportunity to review the HCP program and improve efficiencies, some of which have already been implemented within this report. However, some of the 2014 data contained inconsistencies and has not be made part of this report. Below is a summary of the existing 2014 sea turtle nesting data.

The county authorized no emergency shoreline protection projects in 2014, and no temporary or permanent armoring structures authorized by the county. There still remains a balance of 2,676 linear feet of armoring remaining for the life of the permit. As a result, most effort was focused on the nest monitoring, predator control, lighting, and education programs. Standard Operating Procedures remained essentially the same and monitoring personnel were provided with training to improve data collection. Nesting activity was summarized within six survey zones and the methodology adhered closely to Florida Fish and Wildlife Conservation Commission (FWC) Marine Turtle Guidelines.

A total of 8,321 sea turtle emergences were recorded during the 2014 nesting season. It was moderately productive nesting season for loggerheads (4,465 nests), a relatively high nesting season for leatherbacks (54 nests), and a relatively low nesting season for green turtles (286 nests), which was expected after having a record nesting year in 2013. Nesting began on February 28 and ended on September 27. Nesting success was 58% for loggerheads, 55% for green turtles and 92% for leatherbacks. Permit holder groups marked 1,074 nests for reproductive success (24% of the total). The mean emerging success was 81% for loggerhead and 75% for green turtle nests, however, when tidal wash-outs and nest predations were included it dropped to 71% and 68%, respectively. Leatherback emerging success was lower at 66% and fell to 56% when wash-outs and predations were included.

Potentially disruptive human activities including beach fires, unauthorized vehicles, canopy tents, illegal construction projects and deep holes were recorded. Fortunately, there were no direct impacts (i.e. dead eggs or turtles) from these activities. Beachfront lighting continued to be the largest observed impact on nesting. Artificial lights disoriented 75 nests across the county’s coastline. The highest number of disorientations were observed in the southern portion of the county where more development has occurred. South Indian River County was responsible for 42% of the reported disorientations.
In 2004 Indian River County received an Incidental Take Permit (ITP) from the U.S. Fish and Wildlife Service, which authorized the “take” of five species of threatened and endangered sea turtles causally related to shoreline protection projects initiated under the county’s emergency authorization to protect coastal properties. As a requirement for the ITP, the county developed a Habitat Conservation Plan for Sea Turtles (HCP). Among other things, the HCP describes measures that will be undertaken to minimize impacts to sea turtles during emergency shoreline protection projects and implements a series of conservation programs to offset unavoidable take.

The county authorized no emergency shoreline protection projects in 2015, therefore, most of the effort was focused on the nest monitoring, predator control, lighting, and education programs. Standard Operating Procedures remained essentially the same and monitoring personnel were provided with training to improve data collection. Nesting activity was summarized within six survey zones and the methodology adhered closely to Florida Fish and Wildlife Conservation Commission (FWC) Marine Turtle Guidelines.

A total of 15,994 sea turtle emergences were recorded during the 2015 nesting season. It was the most productive season since the inception of the HCP with a total of 6,967 nests above the mean high tide line, most of which were loggerheads (5,187). The county also experienced a record high number of green turtle nests (1731) and a relatively high number of leatherback nests, 49 respectively. Nesting began on March 4 and ended on October 16. Nesting success was 58% for loggerheads, 37% for green turtles and 95% for leatherbacks. Permit holder groups marked 1,311 nests for reproductive success (19% of the total). The mean emerging success was 78% for loggerhead and 68% for green turtle nests, however, when tidal wash-outs and nest predations were included it dropped to 72% and 56%, respectively. Leatherback emerging success was lower at 59% but only fell to 57% when wash-outs and predations were included. The largest impact to reproductive success were the multiple nor’easter swells which occurred during the end of the nesting season during fall, which washed away 7.6% of all marked nests.

Potentially disruptive human activities including beach fires, unauthorized vehicles, canopy tents, illegal construction projects and deep holes were recorded. Fortunately, there were no direct impacts (i.e. dead eggs or turtles) from these activities. Raccoon predation was relatively low (0.1% overall, 0.2% in ACNWR), but canine predation (mostly coyote) was higher and only found within the borders of the ACNWR (1.5%) and luckily poaching was not a problem this year. Beachfront lighting continued to be the
largest observed impact on nesting. Artificial lights disoriented 107 nests across the county’s coastline. Different from the past, the highest number of disorientations were observed in the northern part of the county where less development has occurred, but there is bright illumination (skyglow) from the Sebastian River Area.

Education has been primarily through brochures, newspaper articles, news radio, beach signs and direct discussions with beachgoers. However, more education is clearly needed as there remains a general lack of knowledge regarding sea turtle biology and conservation. In future years, this section of the HCP will be expanded to include various new programs in hopes of increasing public awareness within the community.

Since there were no temporary or permanent armoring structures authorized by the county during 2015, there remains a balance of 2,676 linear feet of armoring remaining for the life of the permit. The HCP programs have largely been effective through collaborations with government agencies, non-profits and volunteers. Because staff and funding deficits are ongoing, future efforts will rely heavily on help from these groups.
INTRODUCTION

Barrier islands in the southeastern United States are frequently battered and rearranged. Geologists describe this process as “shoreface retreat”, but in the context of coastal development, it is commonly called erosion. Approximately 71 percent of Indian River County's coastline is classified by the State of Florida as “critically eroded.” As structures close to the beach become increasingly vulnerable to physical damage, property owners are seeking ways to protect their homes. Indian River County was the first in Florida to implement local emergency permitting authority under Section 161, Florida Statutes (FS) and Chapter 62B-33, Florida Administrative Code (FAC). The county issued its first Emergency Permit in 1996.

Each year threatened and endangered sea turtles deposit thousands of nests on the beaches of Indian River County. The nesting season, which officially starts on March 1st and ends on October 31st, lasts eight months in this part of Florida. Local beaches provide nesting habitat for at least three species and are significant on a global scale. The construction of seawalls, revetments and other erosion control devices during the nesting season will likely cause harm or harassment of these federally protected animals. The result is a prohibited “take” as defined under the Endangered Species Act (ESA) of 1973. Federal authorization for take resulting from an otherwise lawful activity can only be granted through an Incidental Take Permit (ITP) pursuant to Section 10(a)(1)(B) of the ESA and issued by the governing agency, which in this case is the United States Fish and Wildlife Service (USFWS).

In an effort to settle a disputed "take" of nesting sea turtles, Indian River County obtained an ITP on December 1, 2004 along with developing a required Habitat Conservation Plan (HCP). The Permit is effective for 30 years and is conditioned upon minimization, mitigation, and other measures described in the HCP and ITP. Condition 11.J of the ITP requires the county to submit an annual report describing efforts undertaken to implement the HCP and identifying any areas of material non-compliance with the Permit. The following report addresses the activities conducted in 2015.

MITIGATION LANDS

STATUS OF CONSERVATION AREA AND RECREATION LAND PROPERTIES

Between 1996 and 1998 Indian River County cost-shared in the purchase of several beachfront properties, collectively referred to as the Jungle Trail Conservation Area (JTCA), which is 110 acres of barrier island coastal habitat. The properties were purchased and managed for conservation and passive recreation. The preservation of these properties as sea turtle habitat was offered as partial mitigation for unavoidable impacts to sea turtles resulting from shoreline protection measures.
Condition 11.G.11.f of the ITP requires the county to manage these parcels in their current state and describes the allowable modifications or improvements to the parcels. In 2015, all activities in the JTCA were conducted in accordance with the ITP.

**HCP ADMINISTRATION**

Conditions 11.G.1 and 11.G.2 of the ITP require the county to establish and fund the positions of an HCP Coordinator and Coastal Engineer to oversee implementation of the HCP. The HCP coordinator is responsible for oversight of all of the activities identified within the HCP. Oversight of coastal construction activities is performed by the county’s Coastal Engineer, whose primary tasks are implementing the county’s Beach Management Plan, overseeing other shoreline stabilization projects and administering the artificial reef program. Currently, both of these individuals are employees of Indian River County.

In the absence of emergency shoreline protection projects, the administration of the HCP principally involves management of the county’s nest monitoring program, beachfront lighting program, education program and predator control program. Section 11.2.7 of the HCP mandates that the county is responsible for obtaining permitted personnel, if necessary, to fulfill the requirements of the nest monitoring program. Since 2005, the HCP Coordinator has held Marine Turtle Permit (#166 and #227) issued by the Florida Fish and Wildlife Conservation Commission (FWC) to conduct nesting surveys and nest evaluations that cover roughly half of the county's beaches, and respond to live and dead stranded sea turtles. (Figure 1; Appendix A).

**ANNUAL HCP WORKSHOP**

An annual presentation and workshop has been held each year to discuss the results, requirements and status of the HCP. This year the workshop was hosted by the HCP Coordinator on February 18, 2016. The meeting was attended by 26 people, including all of the Principal Permit Holder’s in the county, code enforcement, representatives from local municipalities, law enforcement, FWC and USFWS. The workshop provided a review of the 2015 nesting season, a review of the basic nest monitoring protocol, a discussion of direct and indirect impacts to nesting, an update on county beach restoration projects and status of the education, predator control and lighting programs. An emphasis was placed on providing accurate and timely data, coordinating needs and encouraging permit holders to seek help from the HCP Coordinator, if necessary.
EMERGENCY SHORELINE PROTECTION PROJECTS

COUNTRY-AUTHORIZED EMERGENCY SHORELINE PROTECTION PROJECTS

Between January 1 and December 31, 2015, the county received no written requests or applications from property owners seeking review of eligibility and vulnerability of a threatened structure. As such, the county authorized no emergency shoreline protection projects during the 2015 calendar year.

UNFORESEEN AND CHANGED CIRCUMSTANCES

As defined in Section 11.K of the ITP, unforeseen circumstances are changes in circumstances affecting a species or geographic area covered by the HCP that could not reasonably be anticipated by the county or the USFWS at the time of HCP development, and that result in a substantial and adverse change in the status of the covered species. There were no unforeseen circumstances in 2015.
CHAPTER 1: INTRODUCTION TO SEA TURTLE NEST MONITORING

STANDARD OPERATING PROCEDURES FOR PERMIT HOLDERS

After the initiation of the HCP, the county developed a set of Standard Operating Procedures (SOP) pursuant to Condition 11.G.10.a of the ITP and in accordance with FWC’s Marine Turtle Conservation Guidelines. The SOP has essentially remained unchanged through the 2015 nesting season. The focus was on obtaining accurate, complete and timely nesting data from each survey area. A description of basic monitoring procedures was extracted from the SOP and given to all Permit Holders (PH), which were encouraged to use standardized data collection forms.

SURVEY AREAS

Sea turtle monitoring in Indian River County was divided into six survey areas based on PH jurisdictions and local municipalities (Figure 1). There are three PH's in the county and most have one or two discrete survey areas. Prior to the 2005 nesting season, the county placed zone markers at one kilometer intervals throughout the 36 kilometer (22.5 mile) coastline. These were used for sections of beach not previously surveyed or areas where old markers had not been maintained. They have also been used in data analysis to examine spatial trends. Historical zone markers have remained in place to maintain consistency in reporting.

A brief description of each area from north to south follows:

Sebastian Inlet State Park (SISP) – SISP occupies the northernmost 3.2 kilometers (2 miles), or 8.9%, of the county’s coastline. This survey area was monitored by biologists from EAI as part of inlet nourishment projects and in an effort to assist the state park rangers with required monitoring.

Archie Carr National Wildlife Refuge (ACNWR) – The ACNWR survey area comprises about 22.3% of the county’s coastline or 8.0 kilometers (5 miles). This area was monitored by biologists from EAI as part of a county beach nourishment project.

Disney Vero Beach Resort (Disney) – This area is referred to as the core Disney area and covers a distance of approximately 2.1 kilometers (1.3 miles), which is 5.8% of the county’s coastline. Monitoring was performed by Disney Animal Kingdom staff.

Indian River Shores (IRS) – The Indian River Shores survey area extends for a distance of approximately 8.9 kilometers (5.5 miles) or 24.6% of the county’s coastline. The northern half of this area was surveyed by Disney Animal Kingdom Staff and the southern half was surveyed by the HCP Coordinator and
the volunteers on his team. The break in the two areas occurs at the kilometer 18 marker just south of the John's Island Beach Club.

City of Vero Beach (Vero) – This survey area covers a distance of approximately 6.3 kilometers (3.9 miles) comprising 17.4% of the county's coastline. Surveys in this area were conducted by the HCP Coordinator and his team.

South Indian River County (SIRC) – South Indian River County extends to the St. Lucie County Line for a distance of approximately 7.6 kilometers (4.7 miles) or 21.0% of the county's coastline. Surveys in this area were conducted by the HCP Coordinator and his team.

SURVEY METHODOLOGY

Monitoring Procedures

Nesting surveys were conducted each morning on all beaches from March 1 to September 30, 2015. Nest monitoring continued periodically after September 30 at the discretion of each PH. During the surveys, all nesting and non-nesting emergences (false crawls) visible from the previous night were recorded by species and survey zone. A GPS location was collected at every nest and at the landward apex of every false crawl. IPads and handheld Garmin units were used for obtaining location data. The precision ranged from less than a meter to approximately 6 meters (depending on the equipment and satellite geometry).

Crawls were classified as either above or below the most recent high tide line from the previous night. False crawls were determined to be either continuous, abandoned body pits and/or abandoned egg cavities. Obstacles (e.g., scarps, seawalls, beach furniture) that were less than a meter from nests or false crawls and, based on track changes, clearly affected the animals behavior were recorded. Disturbances by predators or potential human impacts were also recorded.

Nest Marking Schemes

Nest Marking Technique- Prior to marking nests, an attempt was made by the surveyor to carefully locate the topmost eggs in order to help the surveyor locate the eggs again at the end of the incubation period for nest evaluation. Once the location of eggs had been identified, the most common technique used to mark off the clutch of eggs was a combination of three stakes surrounding the nest with flagging tape, and up to two more stakes placed in the dune. The stakes were secured 1-2ft in the sand so they would not be easily removed by tides or vandals, but could be recovered by survey personnel. All marked nests were monitored daily for signs of hatchling emergence, tidal over-wash, nest predation, vandals, and other signs of disturbance. Nests were presumed to be washed out if all the markers surrounding the nest were washed away and field personnel found nothing when they excavated the area.
Nests Marked for Reproductive Success – In all county survey areas, a representative sample of nests was marked and monitored daily to allow for an evaluation of reproductive success. The sample marked for each species and within each survey area was at the discretion of the PH. The representative sample was chosen based on species type, nesting density, and proximity to a beach nourishment project. For example, nests marked in the southern half of the county in 2015 were done so based on the following marking scheme:

- Leatherbacks – ALL nests
- Green Turtles – every 5th nest
- Loggerheads – every 15th nest

Nests Marked for Educational Activities – Education nests were marked in high traffic areas in southern Indian River County to impart information to beachgoers and were used for public education activities called “Turtle Talks” (i.e., public nest hatching success evaluations). Once marked off with stakes, these nests received an extra educational sign describing the species of sea turtle which laid the nest and facts about that species’ life history.

Nests Marked for Conservation Purposes – Conservation nests were barricaded off in high traffic areas along the county’s beaches. This was done to avoid excessive disturbance to the nests (e.g., base of dune crossover)

Nests Marked in Sentinel Areas – Sentinel nests were marked in accordance with Condition 11.G.10.d (1) of the ITP to note the location of nests high on the beach in critically eroded areas. This provided a means of assessing nests should an emergency shoreline protection project be initiated at that location. Prior to the 2015 season, the coastal engineer provided maps to permit holders showing the properties in critically-eroded areas that may be eligible for a county emergency permit (Appendix B). Monitoring personnel were asked to mark any nest deposited landward of the toe of the dune in these designated areas.

Nests at emergency shoreline protection project sites – Survey personnel were required to monitor emergency shoreline protection project sites and implement appropriate measures to protect nests from construction impacts.

DATA MANAGEMENT AND ORGANIZATION

Nesting success, defined as the percentage of total emergences on the beach that result in a nest, was used to assess the post-emergence suitability of an area. Nesting success was calculated by dividing the number of nests by the number of emergences above the high tide line and multiplying by 100.

The fate of each marked nest was assigned to one of the following categories:
- **Emerged** – hatchling tracks observed or, upon excavation, turtles clearly hatched and emerged.
- **Did Not Emerge** – hatchling tracks were not observed and, upon excavation, no turtles hatched or emerged.
- **Emerged Not Excavated** – hatchlings emerged, but nest contents not evaluated due to being washed out, scavenged or otherwise severely impacted.
- **Washed Out** – clutch partially or completely washed away during incubation by waves or tides.
- **Depredated** – clutch partially or completely destroyed by predators.
- **Vandalized** – stakes used to mark nest completely removed or disturbed by people so the precise nest location could not be determined.
- **Nested On By Another** – clutch mixed, scattered or otherwise nested on by another turtle.
- **Could Not Evaluate** – nest contents could not be evaluated due to logistical problems or other uncontrollable factors.
- **Did Not Find** – the clutch was never located at the time of deposition or the stakes were not in the correct location.
- **Poached** – the clutch was partially disturbed or completely removed by non-permitted humans.

Mean clutch size, hatching success, emerging success, and mean incubation period were determined for excavated nests by the following formulae:

- **Clutch size** (total number of eggs in a nest) = number of hatched eggs + number of unhatched eggs.
- **Hatching success** (turtles completely removed from their eggshells) = \( \frac{\text{number of hatched eggs}}{\text{clutch size}} \times 100 \).
- **Emerging success** (turtles that hatched and successfully emerged) = \( \frac{\text{(number of hatched eggs minus the number of live and dead hatchlings in the nest)}}{\text{clutch size}} \times 100 \).
- **Incubation period** = inclusive period from the date of egg deposition until the first sign of hatchling emergence.

Depredated and washed out nests were considered complete failures for purposes of reproductive success. Predation and scavenged were defined as follows:

- **Predation** – means that viable eggs, embryos or hatchlings were consumed during incubation or at the time of emergence.
- **Scavenged** – refers to non-viable eggs, embryos or hatchlings consumed after a major disturbance (i.e. storm, predation event, etc.).
CHAPTER 2: RESULTS OF SEA TURTLE NESTING SEASON

The nest monitoring program requires the most time and effort, covering approximately half the county’s beaches. One reason for this is simply the high density nesting that occurs in Indian River County. Improvements in this program have been made over the years in terms of the collection of quality data from individual permit holder groups. For example, there continue to be improvements in GPS locations, reporting of crawl obstructions, human disturbances and predation events and the types of descriptive data collected. More importantly, nesting data received from permit holders has closely matched the format used by the HCP coordinator, and all PH have begun collecting data electronically using the same data collection app for iPads. This has meant less post-processing, more consistency, and the ability to convert the data for geographical representation.

In 2015, the Sector 3 Beach Nourishment Project continued to be monitored by Ecological Associates, Inc., who conducted surveys in the central and north county beaches. However, this year there were no permitted projects in the northern portion of the refuge or in Sebastian Inlet State Park. All of the individuals involved in surveys attended a workshop held by the HCP Coordinator to familiarize themselves with HCP monitoring and nesting protocols. Permit holders and volunteers have worked hard to provide HCP nesting data to the county.

NEST TOTALS, TRENDS AND CRAWL CHARACTERISTICS

Nesting and Nesting Success

There were 15,994 sea turtle emergences recorded during the 2015 nesting season (Table 1). The majority of sea turtle emergences were loggerheads, *Caretta caretta*, (70.4%), while green turtles, *Chelonia mydas*, and leatherbacks, *Dermochelys coriacea*, accounted for 29.2% and 0.3% of the crawls, respectively. Of the total number of crawls, 6,967 resulted in a nest, yielding an overall nesting success of 43.6% for all species and areas combined. Loggerhead and green turtle nesting success was 46.1% and 37.0%, respectively. Leatherback nesting success was 89.1%. Nesting success averages were slightly lower than previous years due to lack of rain during the first half of the nesting season. These totals do not include an additional 1,040 crawls that were recorded below the most recent high tide line. The vast majority of those were false crawls (95%).

Nesting numbers were higher than the previous long-term average (2005 – 2015) for all species. Green turtle nesting totals reached a record high since county-wide surveys began in 2005. Loggerhead nesting totals were the second highest on record and leatherback nesting was average. Green turtle and leatherback nesting has been exponentially increasing in Florida since the 1980’s (Witherington et al. 2006; Stewart et al. 2011) with a more gradual increase over the last seven years in Indian River County (see previous annual reports).
Temporal Patterns

The first recorded sea turtle emergence and nest in the county was from a leatherback on March 4, 2015 (Table 1). The first green turtle nest in the county was recorded on April 11, 2015, the second earliest green turtle nest in state history and the earliest green turtle nest observed in the county. The first loggerhead nest was deposited on April 13, 2015 and nesting increased rapidly in May, peaking at the end of the month and slowly decreased throughout the rest of the season (Figure 6). In contrast, green turtle nesting steadily increased in June and plateaued throughout July and slowly decreased during the month of August (Figure 6). All nesting declined rapidly in September with the last nest deposited on October 16. A graph of long-term nesting across the whole county was updated throughout the 2015 nesting season and added to the county’s coastal website at www.ircgov.com/coastal.

Spatial Patterns

Loggerheads nested in high densities throughout the county, but the highest nesting occurred in the ACNWR survey area and the lowest occurred in the City of Vero Beach (Table 2; Figure 2). The amount of nesting in the Town of Indian River Shores and on South Indian River County Beaches was similar and in between the highest and lowest densities. Loggerhead nesting success was highest in South Indian River County and lowest in the Disney area (Table 2). A spatial analysis by kilometer zone revealed fluctuations in nest numbers, with peaks in kilometer zones 5, 6, 7, 31 and 32 and dips in zones 12, 23, and 29 (Figure 2). These results are strongly associated with disruptions such as seawalls, lights and people.

Green turtles nested throughout the county, but nesting was far more abundant in the northern portion (Figure 4). The average crawl density was 97 times higher in the Disney area than in the City of Vero Beach, and 65 times higher than the ACNWR, the second highest crawl density area in the county (Table 3). The City of Vero Beach had the least amount of green turtle nests deposited, totaling only 45 while in the ACNWR area, there were a total of 724 green turtle nests and nesting success in this area was 35.6%, just below the average county nesting success rate of 37.7% (Table 3).

Leatherback nesting occurred in all survey areas (Table 4; Figure 5). By far, the highest density of nesting was in south Indian River County and zone 35 incubated the most nests per one kilometer (Figure 5). Most of the area in south Indian River County consists of low-density, single family homes that are usually vacant between April and October. As is typical of this species, nesting success was very high at 89.1%.

Overall nesting success was at or above the 50% baseline in 6 of the 36 kilometer zones (Figure 3). The overall lowest nesting success occurred in zone 12 and this is due in part to a large dune escarpment form by excessive erosional stress in that area. The highest nesting success occurred in zone 32 (Figure 3). Each species had different
level of nesting success across the county, green turtle having the lowest success rate. This trend is observed every year and is likely due to green turtles being much more picky in their location to create a nest (Figure 3).

Non-nesting Emergences and Obstructions

Turtles coming ashore go through distinct nesting phases and at any time they may abandon their nesting attempt. In 2015, the average proportion of loggerhead false crawls over all study sites was 71% continuous, 24% abandoned body pits and 6% abandoned egg chambers (Table 5). The latter two categories were not mutually exclusive since some turtles constructed both abandoned body pits and abandoned egg chambers. Loggerhead false crawls with abandoned body pits were highest in Indian River Shores, and in contrast, the Disney area had the highest proportion of continuous crawls and, conversely, the lowest proportion of abandoned body pits and egg chambers (Table 5). Seawalls are common in this area and can often deter turtles prior to any digging or nest preparation activity.

As with loggerheads, most green turtles that did not nest continuously turned around and went back into the water (Table 6). There were more continuous false crawls in SISP, ACNWR and Disney than the rest of the county. The spatial distribution of abandoned digging attempts varied across kilometer zones (Figure 7). The top five zones with the highest number of abandoned body pits were located in the northern portion of the county including 4, 5, 7, 8, and 9. Interestingly, only two of these zone had a high percentage of abandoned egg chambers, zone 5 and 9 respectively.

Overall, 90% of the loggerhead false crawls had no obstructions associated with them (Table 5). However, on average, 6% were associated with scarps, 1% with seawalls, 1% with dune cross-overs and 2% with 'other' obstructions (either beach furniture, boats or debris). Among study sites, the proportion of loggerhead scarp obstructions was much higher in the Disney study area. The Disney area also had the highest proportion of seawall, dune cross-over and 'other' obstructions. The green turtle obstruction data were similar (Table 6). Green turtle false crawls had an average of 86% associated with no obstructions, 4% were scarps, 3% were seawalls, 3% were dune cross-overs and 4% were in the 'other' category. As in previous years, most green turtles attempted to nest closer to the dune which meant they were more likely to encounter seawalls and dune cross-overs.

The distribution of crawl obstructions by kilometer zone highlights problem areas for turtles (Figure 8). Crawl obstructions in this figure were summarized for both nests and false crawls since there were instances where turtles nested at the base of a barrier which restricted them from going further up the beach. As in years past, seawalls and scarps were more of a problem on the eroded beaches in the northern kilometer zones. Seawall obstructions were also a problem in the City of Vero Beach. Dune cross-over obstructions were less frequent, but their occurrence was widespread across most survey zones, especially on beaches that were narrower and more developed. Recreation equipment was an obstacle in the kilometer zones that contained the Disney
Resort, John's Island Beach Club, Vero Beach Hotels (e.g. the Surf Club Hotel) and a few neighborhoods in south Indian River County (notably Atlantis). The "other" category included fences, nesting stakes and debris (e.g. large pieces of dead wood).

**NEST FATE AND REPRODUCTIVE SUCCESS**

Nest evaluations adhered closely to FWC Marine Turtle Guidelines. Three days after the first hatchling emergence or after 70 days incubation, marked nests were excavated by hand to determine reproductive success. The numbers of hatched eggs, unhatched eggs, and live and dead hatchlings were recorded. Unhatched eggs consisted of live and dead pipped embryos, whole eggs and damaged eggs. After an inventory, nest contents were re-buried in the egg cavity and marking stakes were removed from the beach (see definitions below).

*Overall Nest Fate*

Countywide, there were 1,311 sea turtle nests marked for reproductive success. The total number of marked nests represented 19% of all the nests recorded in the county. Of the total, 232 (18%) were marked, but the clutch was not found until after an emergence was observed. As mentioned in previous reports, this kind of marking effort is difficult to avoid (particularly for leatherbacks and green turtles), but introduces a bias in the data. Therefore, the following results pertain only to marked nests initially found within a day of deposition.

Of the marked nests where the clutch was initially found, 913 (85%) were excavated to determine reproductive success (Table 7). The remaining nests that were not evaluated fell into the following categories: 85 (7%) were washed out by the tide; 38 (3%) were destroyed by predators; 33 (3%) could not be evaluated due to logistical problems or data was unreliable; 6 (<1%) were nested on by another turtle; 3 (<1%) could not be evaluated due to heavy accretion burying the clutch too deep to find; and 2 (<1%) could not be found after emergence was seen.

*Loggerhead Reproductive Success*

There were 605 loggerhead nests excavated for reproductive success (Table 7). Of these, 18 did not emerge at all (0% success). Most loggerhead nests that could not be evaluated were either washed out by the high surf or depredated. The mean clutch size across the six study areas ranged from 103.4 to 110.4 eggs and the mean incubation period ranged from 50.6 to 52.9 days (Table 8). Hatching success was highest in the city of Vero (43 nests excavated) and the lowest in the Disney area (68 nests excavated). No area had a greater than 3% difference from hatching to emerging success, which meant the turtles were not having difficulty escaping the nest. Emerging success when predations and washed out nests were included (both assumed to be 0% success) was lowest in the Disney area at 64.2%. Based on the combined county-wide loggerhead data, the mean clutch size was 106.6 eggs per nest, with a range of 39 to 175 eggs (Table 11a). The mean hatching success for all inventoried loggerhead nests
was 79.8% and the mean emerging success was 78.1%. Emerging success stayed relatively high (72.1%) when predation and washed-out nests were included. The mean incubation period was 51.0 days and ranged from 44 to 63 days.

Green Turtle Reproductive Success

There were 425 green turtle nests whose clutch contents successfully hatched and 22 nests that were excavated and were complete failures (Table 7). Most of the green turtle nests that were not excavated were due to tidal wash-outs. The mean clutch size across study areas ranged from 114.7 to 141.0 eggs and the mean incubation period ranged from 52.2 to 54.3 days. The mean inventoried hatching success ranged from 54.5% in Indian River shores (154 excavated nests) to 95.5% in the city of Vero (7 excavated nests) and the second highest hatching success rate being 94.6 in Sebastian Inlet State Park (20 excavated nests) (Table 9). When predations and washed out nests were included, green turtle emerging success in the South County area dropped to 52.7% which was the lowest in any area. Based on the combined county-wide green turtle data, nests had a mean clutch size of 118.4 eggs, with a range of 51 to 191 eggs (Table 11b). Mean hatching success was 69.9% and the mean emerging success was 68.1%. When predations and wash-outs were included in the data, emerging success dropped to 56.4%. The mean incubation period was 53.4 days. As in past years, green turtle reproductive success was lower than that of loggerheads and is a common trend through the long-term data.

Leatherback Reproductive Success

There were 49 marked leatherback nests of which 19 (46%) were found at original deposition (Table 7). Across the six study areas there was a low nesting density, and this has been seen throughout the long-term data. This year all study areas contained at least 2 marked nests which had reproductive data collected from them. Based on data from across the study areas, hatching success was highest in this City of Vero and lowest in the Disney area. Mean emerging success was also the lowest in the Disney area, however SISP had the largest drop from hatching to emerging success (26.1%). Overall, leatherback mean clutch size was 74.1 eggs with a range of 33 to 101 eggs (Table 11c). The mean hatching success was 63.9% and emerging success was 59.3%. Emerging success dropped to 57.8% when wash-outs and predations were included. The incubation period ranged from 58 to 78 days with a mean of 62.0 days.

Educational Nests

Since state permits were not approved for this activity until after the 2015 nesting season was complete, no nests were marked for this purpose.
CONSERVATION NESTS

There were more than 100 nests barricaded off for conservational purposes along the Indian River County beaches. None of these nests were used for reproductive success sampling. When hatchlings successfully emerged, or at 70 days post-deposition, the nests were given a Fate status (included in statistics above) and stakes surrounding clutch were removed.

SENTINEL NESTS

No sentinel nests were marked during the 2015 nesting season.

NESTS AT EMERGENCY SHORELINE PROTECTION PROJECT SITES

Since there were no emergency shoreline protection projects initiated by the county during 2015, no nests were marked for this purpose.

NEST MONITORING PROGRAM SUMMARY

The 2015 nesting season was the highest on record since county-wide surveys began for green turtles and second highest for loggerheads. For leatherbacks it was a low nesting season, which complements their typical bi-annual high/low nesting pattern. As in previous years, there were more nests deposited in the northern portion of the county than in the southern portion. The Vero Beach area contains more people, buildings and lights and these are all potential nesting disruptions. The north to south difference in nesting density was especially sharp for green turtles. Nesting success was above average for loggerheads, but much lower for green turtles. The lower nesting success for green turtles occurred in the northern part of the county which had a mixture of scarps, seawalls and dune restoration projects.

Like last year, emerging success was highest for loggerheads and lowest for leatherbacks with green turtles falling in between. The largest impact to hatching and emerging success came from a strong nor’easter and super moon during the month of September. These events caused tidal over wash, heavy accretion, and washed some nests away completely. It should be emphasized that these are natural typical conditions which largely affect nests in the latter half of the season.

This year represented the eleventh year of complete county-wide nesting surveys. The detail and accuracy of the data has remained at a fairly high level. However, there remains many human activities with the potential to impact nests and turtles. Some of these are illegal under local ordinances. Unfortunately, many beachgoers mistakenly
believe that all nests are physically protected. Informing the public and generating interest in sea turtles will help reduce potential impacts.
CHAPTER 3: CUMULATIVE SEA TURTLE TAKE AND IMPACTS TO NESTING SUCCESS

**Human-Based – Beach Armoring**

The current amount of armoring in Indian River County is 9,375 linear feet or approximately 8% of the shoreline. Of that total, only 520 feet or 6% falls under the County’s HCP. The remaining structures were either permitted through the State of Florida or they were older structures that did not pass through a formal permitting process. Pursuant to Condition 11.E of the ITP, the county is authorized to “take” the covered sea turtle species incidental to authorizing construction and maintenance of armoring structures encompassing no more than 3,196 linear feet of coastline in the Plan Area over the 30-year life of the ITP. This cumulative total represents the estimated amount of frontage of eligible and vulnerable properties along critically eroded beaches that may be in need of shoreline protection prior to construction of a beach nourishment project at their respective locations.

There were no temporary or permanent armoring structures authorized by the county in 2015. In accordance with an Interim Agreement between the FDEP, Indian River County, the Sea Turtle Conservancy, and two private petitioners, FDEP allowed two (2) temporary structures previously installed under the county’s emergency authorization to remain in place. Condition 11.G.9 of the ITP authorized permanent seawalls at these properties. However, shoreline protection projects authorized by the FDEP through Florida’s standard permitting process are not included as cumulative take under the ITP. Nonetheless, construction and placement of these continues, which could potentially harm sea turtles or their nesting habitat. In response FDEP, in cooperation with FWC, began developing a comprehensive state-wide HCP for its coastal program in 2008. Among other things, this HCP would encompass take from CCCL shoreline projects.

**Human-Based – Nest Poaching**

Despite the fact that sea turtles have been protected by state and federal laws since the early 1970’s, there remains some human egg poaching every year. Fortunately, in 2015, there were 0 nests verified as poached within the county. This has not been the case in past years. We are lucky to not have had this issue during the 2015 nesting season. All other cases of egg poaching outside the county were turned over to wildlife law enforcement officials at the state and federal level.

**Human-Based – Disruptive Beachfront Activities**

The three most commonly reported activities were beach fires, recreational equipment and large holes. Most fires were within close proximity of neighborhood beach access points. There have been documented cases in Florida of fires killing hatchling sea
turtles, yet no deaths were reported in 2015. While the city has an ordinance prohibiting fires the county does not. Large holes were dug in the beach above the high tide line with shovels during leisure activities. The most dangerous ones were over three feet deep and six feet wide. They were deep enough to excavate a nest, ensnare a sea turtle or injure a person and, as a result, they were filled whenever possible. Though no injuries or deaths were reported, it is worth noting that an adult loggerhead was killed when it fell into a large hole in Palm Beach County in 2009.

Other potential problems included boats part of a race docked on beach overnight, loose dogs and treasure salvor anchors buried on the beach. Luckily this season these instances were not problematic. Vehicle tracks from unauthorized motorcycles, ATV's and trucks were not observed on the beach during the 2015 nesting season, however this has not been the case in past years and disruptive activities like these will continue to be monitored in the future. FWC Law Enforcement and the sheriff’s office are always notified of these instances once they occur and will continue to be notified if future incidents occur. Many beachgoers mistakenly believe that all sea turtle nests on our beaches are physically protected with stakes and warning tape. Because of the area’s high density of nesting, this has never been the case. Marking all nests would be impracticable, extremely expensive and create numerous barriers on the beach, and for these reasons the county will continue to only mark off a sub-sample of nests for various reasons explained in previous sections.

**HUMAN-BASED – NIGHTTIME BEACHGOERS AND PETS**

Since 2006, the presence of people and dog tracks on new crawls has been recorded in the southern half of the county. These can range from severe disruptions to just a few tracks recording the presence of people and animals. As in years past, most of these were in zones 29 and 30 (south of South Beach Park). Neighborhoods with heavily used beach access points had the highest levels of these interactions (e.g. Castaway Cove).

**NATURE-BASED – RACCOON PREDATION**

The Predator Control Plan (PCP) outlined in Section 11.4 of the county’s HCP constituted mitigation for the take of sea turtles causally related to shoreline protection. The overall goal was to increase hatchling productivity by reducing predation rates by 40% over a period of five years within non-Federal lands of the ACNWR. The assumed level of raccoon (*Procyon lotor*) predation in this area was 15% of all nests. However, since the inception of the HCP raccoon predation has turned out to be far lower than this. As a result, even though condition 11.G.11.e of the ITP required the county to develop and submit a PCP to the Service within six months of the effective date of the ITP, the draft plan has never been approved. It is not known if predator control efforts by the refuge have reduced raccoon predation or the assumed historical level of predation was incorrect.
The number of nests depredated by raccoons in 2015 was a total of 6 (Figure 10). As in years past, most raccoon predations occurred in the northern portion of the county, specifically the SISP and the ACNWR. Raccoon predation events represented <0.1% of all the nests deposited in the county and 0.2% of the nests deposited in the ACNWR. Raccoon predations have remained at a low level since 2005. The ACNWR implemented a predator control program in 2009, 2010 and 2012. However, almost all of the effort was focused on trapping in the Brevard County portion of the refuge because of the larger number of predations in that area. The object of the plan was to focus on raccoons. However, since 2008, it became clear that canine predation, specifically coyote, was becoming more of a problem in Indian River County.

**Nature-Based – Canine Predation**

There were multiple domestic canine nest predations in the county in 2015. Nest predation by domestic dogs (*Canis familiaris*) has probably been occurring at low levels for many years. In 2006, 38 nests and roughly 4,370 eggs were depredated by canines in Vero Beach and the southern part of the county (Figure 10). Based on field evidence, a majority of these were domestic dogs although a few may have been coyote. Education and enforcement of animal control laws has largely been effective at deterring most of the dog predations. For example, there were many dog prints on newly deposited nests in 2015, yet it appeared that most owners kept their animals from digging in the sand and digging up nests. Nevertheless, domestic dogs were involved in three complete predations with two more nests were dug into directly in front of the permit holder while talking to the owner about their dog digging in the sand. Almost all of these were on south county beaches (Figure 10).

Coyotes (*Canis latrans*) were implicated in depredations in the refuge in 2008 and then observed in 2009 west of highway A1A. That year almost all of the canine predations in the north part of the county were thought to be coyote. The refuge began a coyote capture program in 2009 and 2010, however, none were caught during those years. In 2015, there were 31 predations attributed to coyote, all located in the refuge survey area (Figure 10). An additional 6 nests were predated by an unknown mammal within the refuge survey area, most likely a coyote. In the near future, the refuge plans to curtail coyote predation using a USDA Animal Control Services removal program and the county has pledged to support the effort with maps of past canine predations and the location of predation "hot spots."

The county never met the original intent of the PCP due to the unexpected low level of raccoon predation. It is the intent of the HCP Coordinator, in conjunction with animal control enforcement, the ACNWR, and public education about nest predators, to continue efforts to reduce coyote and domestic dog predation as a part of the PCP. The issue of canine predation has been difficult to solve. Coyotes are not easily trapped and there exists strong sentiments regarding the issue of curtailing the behavior of domestic dogs. Despite this, the recent focus on canine predation has met the intent of the
predator control program. Overall predation rates are still fairly low and with the limited financial resources of the county and its partners (The City of Vero Beach Police Department, FWC Law Enforcement, USFWS personnel, USDA Animal Control Services and Indian River County Animal Control), predator control is currently focused on education, wildlife law enforcement and limited trapping. Ultimately, help is needed from the public to report digging dogs or coyotes and be willing to speak up about the negative impacts these animals can have on the reproductive success of federally protected sea turtles.
CHAPTER 4: LIGHT MANAGEMENT PROGRAM

During the sea turtle nesting season (March 1-October 31), beachfront lighting in unincorporated areas of Indian River County is regulated by county ordinance (Section 932.09 of County Codes). Additionally, the town of Indian River Shores and the City of Vero Beach have their own lighting ordinances (Section 91.40 of IRS code of Ordinance; Division 2 Sec. 46-106 -- 46-117 of City Code of Ordinances), which regulate beachfront lighting within their jurisdiction. Initiation of a pro-active light management program is intended as compensatory mitigation for the take of sea turtles associated with shoreline protection measures. The county’s light management program is outlined in section 11.5 of the HCP and is stipulated in Conditions 11.G.11.a-c of the ITP. This section describes the key items associated with the light management program and the actions undertaken in 2015.

The county’s Light Management Program has been slow to improve largely due to lack of personnel. While lighting violations and nest disorientations are more adequately being reported each year, warning letters can only be effective for property owners who willing to cooperate. Unfortunately, the county only has one environmental planner position which handles lighting problems and that one position was vacated in September 2011 and was not filled until after the 2015 nesting season. The county has been trying to make progress without an adequate number of enforcement personnel and in November of 2015 updated its lighting ordinance to better reflect the state model and include specifics pertinent to the county HCP. Additionally, with the change of HCP coordinator came subsequent discussions about improving program efficiencies (e.g., new data collection spreadsheets, report layouts, and direct reporting to the code enforcement board).

Although County and city personnel work hard notifying property owners about the violations and consequences, a handful of properties are repeat offenders who have either refused to fix problem areas or have not been pursued further. To try and combat this issue, for the first time, the city of Vero Beach sent out citations year to 3rd time repeat offenders. The fine was minimal due to it being the first year of citations, but fines will continue to increase as the offenders continue to not comply with the city ordinance.

PRE-SEASON LIGHTING LETTERS

Prior to March 1st of each year, the county is required to mail written notices to property owners in unincorporated areas of Indian River County notifying them of the upcoming sea turtle nesting season and their lighting obligations associated with the county ordinance (ITP Condition 11.G.11.a). In 2015, the county’s Environmental Planning and Code Enforcement Office mailed the lighting letters to all beachfront property owners on February 18 (Appendix C). The letter describes the parameters associated with the county code, methods for assessing beachfront lighting for compliance, methods for
achieving compliance, and a general discussion of the problems caused by artificial light with regard to sea turtles.

**NIGHT-TIME LIGHTING EVALUATIONS**

Condition 11.G.11.b of the ITP stipulates that the county shall conduct inspections of beachfront lighting within unincorporated areas each year between March 1 and May 31 to document compliance with the county’s lighting ordinance. According to the code, exterior lights visible from the beach between 9:00 pm and sunrise during the sea turtle nesting season are deemed non-compliant. Interior lights on single and multi-story structures are also non-compliant if they illuminate the beach during the nesting season.

A night-time lighting evaluation was performed by the HCP Coordinator on the evenings of May 19 and May 20 2015. Non-compliant and other potentially disruptive lights were identified during the inspection, and each non-compliant exterior light was given a rating with respect to its potential effect on sea turtles (ratings ranged from 1 to 5, from most disruptive to least disruptive based on the light intensity and the area illuminated). For each non-compliant light source, recommendations were made for corrective measures to bring problematic lights into compliance.

The most problematic lights were wall-mounted lights and floodlights. A few streetlights remained a problem, but many of them, particularly in the south part of the county, were improved through a NFWF grant completed in 2009 (see the 2009 Annual HCP Report). As in years past, private single-family residences accounted for the highest number of non-compliant and/or potentially disruptive light sources (Table 12). This was followed in order of decreasing frequency by condominiums, streetlights, clubhouses, hotels, parks and "other types" (e.g. resorts). Although there were more private homes with lighting problems, condominiums and clubhouses had a higher number of disruptive lights. Problematic external lights were more frequent in the southern part of the county than in the northern part, however more internal lighting violations were noted in the northern part of the county (Figure 9).

This year there were more exterior lighting violations (90%) than interior (10%; Table 12). This is very similar to past reports. Interior lighting tends to be less of a problem than exterior lights, based on the area illuminated, the intensity of the light and being easily covered by window screens or shades, so the county will continue its efforts to decrease the impacts of exterior lighting fixtures. Properties with lighting problems tend to fluctuate from year to year, but there remain a "core group" of the same lighting offenders every nesting season. The peak in the number of violations per kilometer was in zone 34. This stretch of beach includes the neighborhood, the Moorings, and multiple private residences.
SEA TURTLE DISORIENTATIONS

When hatchlings emerged from marked and unmarked nests, the paths of the hatchlings were examined to determine if they were oriented toward the water. Sea turtle disorientation reports were provided to the FWC Tequesta Field Laboratory, Imperiled Species Program and copies were sent to Code Enforcement offices in the county and municipalities as required by Condition 11.J.2.i of the ITP.

In 2015, there were 107 disoriented nests observed in the county. Although this was not the highest number of reports, the number has been increasing within recent years. This may be due to increased awareness of disorientations and effort to report all disorientations, but could also be a sign of increased lighting issues. Comprehensive training will continue in the future to insure high levels of surveyor awareness and effort in reporting disorientations from marked and unmarked nests. No reports were submitted from the Disney area. The following data only represent reports submitted outside the Disney area of Indian River County. Almost all reports were of loggerhead nests disorienting, while 11% were from green turtle and leatherback nests (Table 13). The ACNWR has the most documented cases of disorientations (30%) followed by the City of Vero Beach (25%).

There was not a one-to-one relationship between lighting violations and disorientations partly because one disruptive light can lead to many disorientations (Figure 9). In addition, there were almost no lighting surveys conducted in the central part of the county, including the City of Vero Beach. Interestingly the highest number of disorientations occurred in the norther portion of the county which is less developed, but the most common reported light source was skyglow, most likely illuminating from lighting located in the City of Sebastian.

CODE ENFORCEMENT ACTION

Under the provisions of the light management program, the county is required to enforce the lighting ordinance within unincorporated areas through code enforcement action, if necessary. To make the most of limited resources and make it easier for code enforcement, violations were grouped from the least to most problematic. Exterior lights with codes 1 through 4 were given the highest priority. City and county code enforcement staff sent warning letters to property owners with problematic exterior lighting violations and notified them to voluntarily address the issues. The letters often had an effect. Unfortunately, many of these changes were short-term fixes and not designed to last. The HCP Coordinator was not aware of any property that was subject to formal code enforcement action in 2015.

The HCP Coordinator collaborated with code enforcement officials in Vero Beach, Indian River Shores and worked closely with a small number of property owners. During phone calls and visits, owners were reminded that the HCP Coordinator could only act to recommend solutions and not as a certifying authority. In the case of Vero
Beach, FWC has had numerous past meetings and conducted several night-time lighting surveys with their code enforcement staff. In 2007, the City Council voted to strengthen its lighting ordinance under the direction of the state. The city’s ordinance is now clearer and more enforceable than the current county ordinance.
CHAPTER 5: EDUCATION AND PUBLIC OUTREACH

EDUCATION AND OUTREACH ACTIVITIES

For years now, the education program has gotten significant help from partners in other agencies and non-profits. Under Condition 11.G.11.d of the ITP, the county developed written literature intended to enhance public awareness of coastal erosion and the HCP. In a collaborative effort, the brochure was created in 2006 by the Sea Turtle Conservancy (formerly the Caribbean Conservation Corporation) and Ecological Associates, Inc. Out of the original 6,400 brochures, approximately 200 remained at the end of 2015. In addition to the HCP brochure, other sea turtle brochures were obtained from the Ocean Conservancy, Disney, Caribbean Conservation Corporation, UF / St. Lucie County Cooperative Extension Office and Florida Power and Light. These have been placed in a large acrylic display case and two smaller display cases in beachside businesses and distributed in mail outs by Alex MacWilliams Reality. In addition, a watertight Pelican case was filled with brochures and business cards so they could be taken on the beach and handed out during nesting surveys. In 2015, the county biologist spent between 45-60 minutes on each nesting survey speaking to visiting and local beachgoers about sea turtle nesting and conservation activities.

There were three articles in in the Vero Beach Press Journal with contributions from the HCP Coordinator in 2015, along with one article in Hometown News and one full page spread in 32963 news. Beginning in November of 2015, a sea turtle news page will be in the Vero Beach Portfolio Magazine indefinitely. In addition to the written press, the HCP Coordinator was on public news radio (1490 AM) two times in 2015 answering questions regarding sea turtle nesting, lights and nest predators. In addition to newspaper articles and radio talk shows, the HCP Coordinator gives several public presentations a year to county commissioners, city council members, select non-profit groups, and beginning in 2015 public school 5th grade science classes. Additionally, the county volunteer nesting team spends hours on the beach discussing sea turtle biology and conservation with beachgoers.

SEA TURTLE STRANDING AND SALVAGE NETWORK

Every year, sick, injured and dead sea turtles wash up on the shore of our beaches, bays and lagoons. The Sea Turtle Stranding and Salvage Network (STSSN) was initiated by the National Marine Fisheries Service (NMFS) in 1980 to document these events. The HCP Coordinator has permits to collect this data and, along with his stranding team, responds to calls from FWC and the public regarding sea turtles in distress. In 2015, the county team recorded 63 sea turtle strandings washed up in Indian River County, including within the lagoon. These data are valuable because they provide a relative measure of sea turtle impacts along our coast and in our waterways. All live turtles are taken to permitted rehabilitation facilities north and south of our area. Stranding reports and photos are sent to FWC’s Tequesta Field Station. A few dead
animals are stored in freezers until a later examination, but most turtles are buried on the beach or relocated to remote wooded areas to be recycled out of courtesy to beach residents and visitors.

**FLORIDA LICENSE PLATE GRANT – EDUCATION MATERIALS**

The HCP Coordinator applied for and received a mini-grant in the amount of $1,000 for the 2007, 2010 and 2016 nesting seasons. The grant was through the Florida Sea Turtle License Plate Grants Program in support of Marine Turtle Permit Activities (Permit #166). Previously the nesting program was in need of educational materials. Past rewarded money was spent creating durable signs that were weather-resistant, contained education information and were designed to be specific to each turtle species. Copies of the signs have been disseminated to several other marine turtle permit holders in the state for use as templates. The signs were recycled and carried over for use in the 2015 season. Additional applied funding, if received, will be used to purchase iPads for county-wide electronic data collection.
LITERATURE CITED


ACKNOWLEDGEMENTS

The HCP Coordinator would like to acknowledge the cooperation of the FWC Marine Turtle Permit Holders and their crew who provided data for this report, especially Anibal Vasquez, Terry O’Toole, Blair Witherington, Rachel Smith, Joe Scarola, Erik Martin, Niki Desjardin, Carrie Goethel, and Samantha Pessolano. Assistance on beachfront lighting issues and code enforcement came from Melody Sanderson, Tom Ramsey, Kim Wall, and Andy Sobczak. Most importantly, Indian River County is indebted to the volunteers who donated their time conducting nesting surveys for the county in 2015: Barbara Grass, Sherri Davis, Matthew Ritcher, Kate Hoffman, Stacey Kalwies, Chris Walker, Kevin Walker, Penny Tranchilla, Paul and Ann Lins, Nancy Pham, Scot Caviness, Tim Adams, and Bob Mallory. Much of this work would not have been possible without their help.
TABLES
Table 1. Total nesting activity for Indian River County in 2015. This table includes only crawls above the most recent high tide line.

<table>
<thead>
<tr>
<th>Nesting Activity</th>
<th>Loggerhead</th>
<th>Green</th>
<th>Leatherback</th>
<th>Summary</th>
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<tr>
<td>Date of Last Nest</td>
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<td>10/16/2015</td>
<td>7/15/2015</td>
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<tr>
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<td>Total False Crawls</td>
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<td>46.1%</td>
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Table 2. Loggerhead nesting activity, nesting success and crawl density by survey area in 2015. This includes only crawls above the most recent high tide line. SISP = Sebastian Inlet State Park, ACNWR = Archie Carr National Wildlife Refuge.

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Nests</th>
<th>False Crawls</th>
<th>Total Emergences</th>
<th>Nesting Success (%)</th>
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<td>Vero Beach</td>
<td>634</td>
<td>727</td>
<td>1,361</td>
<td>46.6%</td>
<td>216.0</td>
</tr>
<tr>
<td>South IRC Beaches</td>
<td>1,006</td>
<td>833</td>
<td>1,839</td>
<td>54.7%</td>
<td>242.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5,187</td>
<td>6,076</td>
<td>11,263</td>
<td>47.2%</td>
<td>241.1</td>
</tr>
</tbody>
</table>

¹ Expressed as the number of emergences (nests and false crawls) per kilometer of beach.
Table 3. Green turtle nesting activity, nesting success and crawl density by survey area in 2015. This includes only crawls above the most recent high tide line. SISP = Sebastian Inlet State Park, ACNWR = Archie Carr National Wildlife Refuge.

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Nests</th>
<th>False Crawls</th>
<th>Total Emergences</th>
<th>Nesting Success (%)</th>
<th>Avg. Crawl Density ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>SISP</td>
<td>67</td>
<td>104</td>
<td>171</td>
<td>39.2%</td>
<td>53.4</td>
</tr>
<tr>
<td>ACNWR</td>
<td>724</td>
<td>1,307</td>
<td>2,031</td>
<td>35.6%</td>
<td>253.9</td>
</tr>
<tr>
<td>Disney</td>
<td>592</td>
<td>939</td>
<td>1,531</td>
<td>38.7%</td>
<td>729.0</td>
</tr>
<tr>
<td>IR Shores</td>
<td>205</td>
<td>374</td>
<td>579</td>
<td>35.4%</td>
<td>65.1</td>
</tr>
<tr>
<td>Vero Beach</td>
<td>45</td>
<td>78</td>
<td>123</td>
<td>36.6%</td>
<td>19.5</td>
</tr>
<tr>
<td>South IRC Beaches</td>
<td>98</td>
<td>144</td>
<td>242</td>
<td>40.5%</td>
<td>31.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,731</strong></td>
<td><strong>2,946</strong></td>
<td><strong>4,677</strong></td>
<td><strong>37.7%</strong></td>
<td><strong>241.1</strong></td>
</tr>
</tbody>
</table>

¹ Expressed as the number of emergences (nests and false crawls) per kilometer of beach.
Table 4. Leatherback nesting activity, nesting success and crawl density by survey area in 2015. This includes only crawls above the most recent high tide line. SISP = Sebastian Inlet State Park, ACNWR = Archie Carr National Wildlife Refuge.

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Nests</th>
<th>False Crawls</th>
<th>Total Emergences</th>
<th>Nesting Success (%)</th>
<th>Avg. Crawl Density $^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SISP</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>100.0%</td>
<td>0.9</td>
</tr>
<tr>
<td>ACNWR</td>
<td>9</td>
<td>1</td>
<td>10</td>
<td>90.0%</td>
<td>1.3</td>
</tr>
<tr>
<td>Disney</td>
<td>7</td>
<td>1</td>
<td>8</td>
<td>87.5%</td>
<td>3.8</td>
</tr>
<tr>
<td>IR Shores</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>100.0%</td>
<td>0.7</td>
</tr>
<tr>
<td>Vero Beach</td>
<td>10</td>
<td>2</td>
<td>12</td>
<td>83.3%</td>
<td>1.9</td>
</tr>
<tr>
<td>South IRC Beaches</td>
<td>14</td>
<td>2</td>
<td>16</td>
<td>87.5%</td>
<td>2.1</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>6</td>
<td>55</td>
<td>91.4%</td>
<td>241.1</td>
</tr>
</tbody>
</table>

$^1$ Expressed as the number of emergences (nests and false crawls) per kilometer of beach.
Table 5. Summary of loggerhead false crawl characteristics and obstructions by survey area for Indian River County in 2015. This includes only crawls above the most recent high tide line. SISP = Sebastian Inlet State Park, ACNWR = Archie Carr National Wildlife Refuge, IRS = Indian River Shores, SIRC = South Indian River County.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>SISP</th>
<th>ACNWR</th>
<th>Disney</th>
<th>IRS</th>
<th>Vero</th>
<th>SIRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of False Crawls</td>
<td>620</td>
<td>2,232</td>
<td>1,168</td>
<td>497</td>
<td>727</td>
<td>833</td>
</tr>
<tr>
<td>Continuous Crawls (%)</td>
<td>67.9%</td>
<td>74.4%</td>
<td>75.3%</td>
<td>64.6%</td>
<td>71.1%</td>
<td>74.2%</td>
</tr>
<tr>
<td>Abandoned Body Pits (%)</td>
<td>24.8%</td>
<td>20.5%</td>
<td>21.7%</td>
<td>31.4%</td>
<td>24.6%</td>
<td>23.4%</td>
</tr>
<tr>
<td>Abandoned Egg Chambers (%)</td>
<td>7.7%</td>
<td>5.1%</td>
<td>4.5%</td>
<td>7.8%</td>
<td>5.8%</td>
<td>4.1%</td>
</tr>
</tbody>
</table>

Obstructions

| No Obstructions Recorded (%)          | 95.6% | 84.3% | 75.4%  | 93.4% | 92.6% | 96.5% |
| Scarp (%)                             | 2.4%  | 9.9%  | 17.7%  | 2.8%  | 2.3%  | 0.6%  |
| Seawall (%)                           | 0.0%  | 0.7%  | 1.1%   | 0.0%  | 2.5%  | 1.4%  |
| Dune Cross-Overs (%)                  | 0.0%  | 1.1%  | 1.6%   | 1.2%  | 1.5%  | 0.4%  |
| Other Obstructions (%)                | 1.9%  | 4.0%  | 4.0%   | 2.4%  | 0.8%  | 1.2%  |
Table 6. Summary of green turtle false crawl characteristics and obstructions by survey area for Indian River County in 2015. SISP = Sebastian Inlet State Park, ACNWR = Archie Carr National Wildlife Refuge, IRS = Indian River Shores, SIRC = South Indian River County.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>SISP</th>
<th>ACNWR</th>
<th>Disney</th>
<th>IRS</th>
<th>Vero</th>
<th>SIRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of False Crawls</td>
<td>104</td>
<td>1,307</td>
<td>939</td>
<td>374</td>
<td>78</td>
<td>144</td>
</tr>
<tr>
<td>Continuous Crawls (%)</td>
<td>63.5%</td>
<td>64.7%</td>
<td>64.5%</td>
<td>55.9%</td>
<td>55.1%</td>
<td>67.4%</td>
</tr>
<tr>
<td>Abandoned Body Pits (%)</td>
<td>31.7%</td>
<td>31.3%</td>
<td>31.2%</td>
<td>42.5%</td>
<td>42.3%</td>
<td>31.9%</td>
</tr>
<tr>
<td>Abandoned Egg Chambers (%)</td>
<td>12.5%</td>
<td>7.6%</td>
<td>6.8%</td>
<td>4.3%</td>
<td>5.1%</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

Obstructions

| No Obstructions Recorded (%)         | 97.1% | 79.5% | 81.3%  | 86.9% | 83.3%| 86.8%|
| Scarps (%)                           | 0.0%  | 11.2% | 9.9%   | 1.9%  | 2.6% | 0.0% |
| Seawalls (%)                         | 0.0%  | 1.7%  | 1.3%   | 0.0%  | 7.7% | 7.6% |
| Dune Cross-Overs (%)                 | 0.0%  | 2.4%  | 3.5%   | 2.9%  | 6.4% | 1.4% |
| Other Obstructions (%)               | 2.9%  | 5.3%  | 4.2%   | 8.3%  | 0.0% | 4.2% |
Table 7. Summary of the fate of all marked nests by species where the clutch was found the morning after deposition in Indian River County in 2015.

<table>
<thead>
<tr>
<th>Fate</th>
<th>Loggerhead</th>
<th>Green Turtle</th>
<th>Leatherback</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excavated</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emerged</td>
<td>587</td>
<td>405</td>
<td>33</td>
<td>1,025</td>
</tr>
<tr>
<td>Did not emerge</td>
<td>18</td>
<td>22</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td><strong>Total Excavated</strong></td>
<td>605</td>
<td>425</td>
<td>37</td>
<td>1,067</td>
</tr>
<tr>
<td><strong>Not Excavated</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washed out</td>
<td>36</td>
<td>64</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Completely Depredated</td>
<td>17</td>
<td>24</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Completely Vandalized</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nested on by another</td>
<td>2</td>
<td>9</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Emerged Not Excavated</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Could Not Evaluate</td>
<td>10</td>
<td>21</td>
<td>0</td>
<td>31</td>
</tr>
<tr>
<td>Did Not Find</td>
<td>1</td>
<td>41</td>
<td>6</td>
<td>48</td>
</tr>
<tr>
<td><strong>Total Not Excavated</strong></td>
<td>71</td>
<td>164</td>
<td>9</td>
<td>244</td>
</tr>
<tr>
<td><strong>Total Marked</strong></td>
<td>676</td>
<td>589</td>
<td>46</td>
<td>1,311</td>
</tr>
</tbody>
</table>
Table 8. Summary of reproductive success for loggerhead nests by study area in Indian River County, 2015. Includes only nests where the clutch was found the morning after deposition. SISP = Sebastian Inlet State Park, ACNWR = Archie Carr National Wildlife Refuge.

<table>
<thead>
<tr>
<th></th>
<th>SISP</th>
<th>ACNWR</th>
<th>Disney IR Shores</th>
<th>Vero Beach</th>
<th>South IRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nests Excavated</td>
<td>87</td>
<td>300</td>
<td>68</td>
<td>118</td>
<td>43</td>
</tr>
<tr>
<td>Mean Clutch Size</td>
<td>110.4</td>
<td>104.9</td>
<td>106.6</td>
<td>106.0</td>
<td>103.4</td>
</tr>
<tr>
<td>Inventoried Hatching Success (%)</td>
<td>82.7</td>
<td>83.0</td>
<td>70.8</td>
<td>72.2</td>
<td>89.4</td>
</tr>
<tr>
<td>Inventoried Emerging Success (%)</td>
<td>81.5</td>
<td>81.2</td>
<td>68.3</td>
<td>70.9</td>
<td>88.9</td>
</tr>
<tr>
<td>Emerging Success, including Predation and Wash Outs (%)</td>
<td>76.5</td>
<td>73.2</td>
<td>64.2</td>
<td>67.9</td>
<td>78.3</td>
</tr>
<tr>
<td>Mean Incubation Period (days)</td>
<td>50.6</td>
<td>50.7</td>
<td>51.1</td>
<td>51.1</td>
<td>52.9</td>
</tr>
</tbody>
</table>
Table 9. Summary of reproductive success for green turtle nests by study area in Indian River County, 2015. Includes only nests where the clutch was found the morning after deposition. SISP = Sebastian Inlet State Park, ACNWR = Archie Carr National Wildlife Refuge.

<table>
<thead>
<tr>
<th></th>
<th>SISP</th>
<th>ACNWR</th>
<th>Disney</th>
<th>IR Shores</th>
<th>Vero Beach</th>
<th>South IRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nests Excavated</td>
<td>20</td>
<td>286</td>
<td>98</td>
<td>154</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Mean Clutch Size</td>
<td>125.9</td>
<td>114.7</td>
<td>121.7</td>
<td>116.7</td>
<td>128.4</td>
<td>141.0</td>
</tr>
<tr>
<td>Inventoried Hatching Success (%)</td>
<td>94.6</td>
<td>75.8</td>
<td>73.8</td>
<td>54.5</td>
<td>95.3</td>
<td>60.9</td>
</tr>
<tr>
<td>Inventoried Emerging Success (%)</td>
<td>89.2</td>
<td>74.2</td>
<td>72.3</td>
<td>52.3</td>
<td>94.5</td>
<td>59.8</td>
</tr>
<tr>
<td>Emerging Success, including Predation and Wash Outs (%)</td>
<td>81.0</td>
<td>55.9</td>
<td>62.6</td>
<td>49.4</td>
<td>78.7</td>
<td>52.7</td>
</tr>
<tr>
<td>Mean Incubation Period (days)</td>
<td>52.2</td>
<td>53.0</td>
<td>54.3</td>
<td>53.8</td>
<td>53.5</td>
<td>54.0</td>
</tr>
</tbody>
</table>
Table 10. Summary of reproductive success for leatherback nests by study area in Indian River County, 2015. Includes only nests where the clutch was found the morning after deposition. SISP = Sebastian Inlet State Park, ACNWR = Archie Carr National Wildlife Refuge.

<table>
<thead>
<tr>
<th></th>
<th>SISP</th>
<th>ACNWR</th>
<th>Disney IR Shores</th>
<th>Vero Beach</th>
<th>South IRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nests Excavated</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Mean Clutch Size</td>
<td>96.5</td>
<td>78.7</td>
<td>75</td>
<td>70.6</td>
<td>74.7</td>
</tr>
<tr>
<td>Inventoried Hatching Success (%)</td>
<td>74.1</td>
<td>62.6</td>
<td>45.0</td>
<td>54.0</td>
<td>79.5</td>
</tr>
<tr>
<td>Inventoried Emerging Success (%)</td>
<td>54.7</td>
<td>59.2</td>
<td>45.0</td>
<td>46.0</td>
<td>75.3</td>
</tr>
<tr>
<td>Emerging Success, including Predation and Wash Outs (%)</td>
<td>54.7</td>
<td>51.8</td>
<td>45.0</td>
<td>46.0</td>
<td>75.3</td>
</tr>
<tr>
<td>Mean Incubation Period (days)</td>
<td>67.0</td>
<td>60.8</td>
<td>61.0</td>
<td>61.4</td>
<td>64.0</td>
</tr>
</tbody>
</table>
Table 11. Descriptive statistics for all inventoried nests in Indian River County in 2013. Includes only nests where the clutch was found the morning after deposition.

(a) *Loggerhead.*

<table>
<thead>
<tr>
<th></th>
<th>(n)</th>
<th>Min</th>
<th>Max</th>
<th>(\text{Mean})</th>
<th>(\text{Stand. Dev.})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clutch Size</td>
<td>607</td>
<td>39</td>
<td>175</td>
<td>106.6</td>
<td>23.5</td>
</tr>
<tr>
<td>Inventoried Hatching Success (%)</td>
<td>606</td>
<td>0</td>
<td>100</td>
<td>79.8</td>
<td>23.2</td>
</tr>
<tr>
<td>Inventoried Emerging Success (%)</td>
<td>605</td>
<td>0</td>
<td>100</td>
<td>78.1</td>
<td>23.8</td>
</tr>
<tr>
<td>Emerging Success, including Predation and Wash Outs (%)</td>
<td>657</td>
<td>0</td>
<td>100</td>
<td>72.1</td>
<td>30.9</td>
</tr>
<tr>
<td>Incubation Period (days)</td>
<td>520</td>
<td>44</td>
<td>63</td>
<td>51.0</td>
<td>2.3</td>
</tr>
</tbody>
</table>

(b) *Green Turtle.*

<table>
<thead>
<tr>
<th></th>
<th>(n)</th>
<th>Min</th>
<th>Max</th>
<th>(\text{Mean})</th>
<th>(\text{Stand. Dev.})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clutch Size</td>
<td>428</td>
<td>51</td>
<td>191</td>
<td>118.4</td>
<td>23.0</td>
</tr>
<tr>
<td>Inventoried Hatching Success (%)</td>
<td>426</td>
<td>0</td>
<td>100</td>
<td>69.9</td>
<td>31.1</td>
</tr>
<tr>
<td>Inventoried Emerging Success (%)</td>
<td>426</td>
<td>0</td>
<td>100</td>
<td>68.1</td>
<td>31.3</td>
</tr>
<tr>
<td>Emerging Success, including Predation and Wash Outs (%)</td>
<td>514</td>
<td>0</td>
<td>100</td>
<td>56.4</td>
<td>38.4</td>
</tr>
<tr>
<td>Incubation Period (days)</td>
<td>326</td>
<td>43</td>
<td>70</td>
<td>53.4</td>
<td>3.7</td>
</tr>
</tbody>
</table>

(c) *Leatherback.*

<table>
<thead>
<tr>
<th></th>
<th>(n)</th>
<th>Min</th>
<th>Max</th>
<th>(\text{Mean})</th>
<th>(\text{Stand. Dev.})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clutch Size</td>
<td>38</td>
<td>33</td>
<td>101</td>
<td>74.1</td>
<td>16.5</td>
</tr>
<tr>
<td>Inventoried Hatching Success (%)</td>
<td>38</td>
<td>0</td>
<td>95</td>
<td>63.9</td>
<td>32.7</td>
</tr>
<tr>
<td>Inventoried Emerging Success (%)</td>
<td>38</td>
<td>0</td>
<td>92</td>
<td>59.3</td>
<td>33.4</td>
</tr>
<tr>
<td>Emerging Success, including Predation and Wash Outs (%)</td>
<td>39</td>
<td>0</td>
<td>92</td>
<td>57.8</td>
<td>34.3</td>
</tr>
<tr>
<td>Incubation Period (days)</td>
<td>30</td>
<td>58</td>
<td>78</td>
<td>62.0</td>
<td>4.1</td>
</tr>
</tbody>
</table>
Table 12. Results of night-time lighting inspections conducted in May 2013 in unincorporated areas of Indian River County. These results summarize the number of properties with exterior and interior lighting violations in seven property types. Exterior lights were given a problem code based on the intensity and the scope of the light. See text for further explanation.

### Night-time Lighting Surveys 2015

<table>
<thead>
<tr>
<th>Property Type</th>
<th>Exterior Lighting</th>
<th>Interior Lighting</th>
<th>Both Exterior &amp; Interior Lighting</th>
<th>Total Lighting Violations</th>
<th>Average Problem Code $^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>House</td>
<td>85</td>
<td>10</td>
<td>0</td>
<td>95</td>
<td>3.4</td>
</tr>
<tr>
<td>Condominium</td>
<td>16</td>
<td>3</td>
<td>0</td>
<td>19</td>
<td>3.1</td>
</tr>
<tr>
<td>Street light</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>3.5</td>
</tr>
<tr>
<td>Clubhouse</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2.0</td>
</tr>
<tr>
<td>Hotels</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Public Park</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>Other Types</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4.8</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>23</strong></td>
<td><strong>28</strong></td>
<td><strong>5</strong></td>
<td><strong>135</strong></td>
<td></td>
</tr>
</tbody>
</table>

$^1$ problem codes for exterior lighting range from 1 to 5, from most disruptive to least disruptive, respectively.
Table 13. Summary of sea turtle disorientation events by study area, 2013. Qualitative data were based on a range. Many disoriented > 50, Some disoriented = 11 – 50, Few disoriented = 2 – 10. See text for further explanation of this table.

<table>
<thead>
<tr>
<th>Disoriented Nests</th>
<th>SISP</th>
<th>ACNWR</th>
<th>Disney</th>
<th>IR Shores</th>
<th>Vero Beach</th>
<th>South IRC</th>
<th>Overall *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nests w/ MANY disoriented hatchlings</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Nests w/ SOME disoriented hatchlings</td>
<td>14</td>
<td>19</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>8</td>
<td>53</td>
</tr>
<tr>
<td>Nests w/ FEW disoriented hatchlings</td>
<td>10</td>
<td>13</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>39</td>
</tr>
<tr>
<td>All Reached Water</td>
<td>13</td>
<td>12</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>Some Reached Water</td>
<td>11</td>
<td>20</td>
<td>0</td>
<td>2</td>
<td>24</td>
<td>15</td>
<td>72</td>
</tr>
<tr>
<td>Few to None Reached Water</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Nests w/ Turtles Found Dead</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Most Common Light Source</td>
<td>SKY GLOW HOME ---- CONDO CONDO HOME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Overall includes data from all study areas combined.
Table 14. Cumulative take since date of issuance of the Indian River County ITP (December 1, 2004). No armoring under the HCP occurred in 2013.

<table>
<thead>
<tr>
<th>Applicant Name</th>
<th>Survey Area</th>
<th>Jurisdiction</th>
<th>FDEP Permit No.</th>
<th>Type of Armoring</th>
<th>Take (Linear Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summerplace¹</td>
<td>Disney</td>
<td>Unincorporated</td>
<td>IR-512 ATF</td>
<td>Seawall</td>
<td>420</td>
</tr>
<tr>
<td>Gerstner, Larry &amp; Cheryl</td>
<td>South County</td>
<td>Unincorporated</td>
<td>IR-511 M1 ATF</td>
<td>Seawall</td>
<td>100</td>
</tr>
</tbody>
</table>

Dec 1, 2004 – Dec 31, 2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Take</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>0</td>
</tr>
</tbody>
</table>

Cumulative Take: 520

Take Authorized Under ITP: 3,196

Balance: 2,676

¹ Parvus, Dirk & Brenda; Strand, Anne E.; Trimarche, Peter J.; King, Bruce, E.; Simpson, Patricia N.; and McCoy, Richard & Louise.
FIGURES
Map of Nesting Survey Areas and responsible permit holders in Indian River County

Figure 1: Map of Indian River County showing survey areas and the marine turtle permit holders responsible for collecting nesting data within each area. Indian River County’s coastline spans approximately 36 kilometers from Sebastian Inlet south to the St. Lucie County line. Kilometer markers indicate each 1 km section of coastline, which divide Indian River County’s beach into 36 individual kilometer zones.
Loggerhead Nest Distribution
Caretta caretta, 2015 Summary

Spatial distribution of loggerhead (CC) nests in Indian River County in 2015. Data for this type of distribution was compiled by GPS location, which may have a small degree of error. Map Date: 3/8/2016

Note: Three (3) Loggerhead nest records had erroneous or missing spatial data and, therefore, are not included in the chart totals.

TOTAL NESTS
CC (2015) 5,200
Nesting Success 2015 Summary

Spatial distribution of Loggerhead (CC), Green (CM), and Leatherback (DC) Turtle nesting success (%) in 2015

Figure 3: The center dashed line represents 50% nesting success, which is used as a baseline. This data includes nests recorded above the high tide line. (24) nests were recorded below the high tide line.

Note: Eighteen (18) crawls, which included five (5) successful nests, had erroneous or missing spatial data and are not included in percentages.
Fig. 4. The number of green turtle nests by county km in 2015.
Leatherback Nest Distribution
Dermochelys coriacea, 2015 Summary

Spatial distribution of leatherback (DC) nests in Indian River County in 2015
Figure 5: The number of leatherback nests by county km in 2015
Map Date: 3/10/2016
2015 Temporal Nesting Distribution

Temporal distribution of all nesting by species in 2015
Figure 6: The temporal pattern of all nesting by species in 2015. Peak numbers are shown on graph. A long-term nesting trend figure for each species is available at www.igov.com/coastal.
Figure 7: The number of loggerhead, green, and leatherback turtle false crawls by county km in 2015. Abandoned body pits and abandoned egg chambers are not mutually exclusive.
Obstructed Nesting Attempt Distribution, 2015 Summary

Spatial Distribution of obstructed nesting attempts in 2016

Figure 8: The number of crawls associated with an obstruction (36.4% beach scarp, 26.6% marked nests, 12% dune scarp, 11% walkover, 8.2% seawall, 1.7% furniture, 0.6% debris, 0.3% boats, 1% other)

Note: Six (6) obstruction records had erroneous or missing spatial data and are not included in the chart totals.
Spatial Distribution of disorientations and unincorporated county lighting violations in 2015

Figure 9: The number of disorientated nests vs. the number of properties with exterior and interior lighting violations per county km. Data collected by municipalities’ lighting surveys is not included in figure.
Nest Predation Distribution 2015 Summary

Spatial Distribution of nest predation and poaching events in 2015

Figure 10. The number of mammalian predations (63.5% canine, 37.5% raccoon, 6.5% unknown) No nests were poached by people. Scavenged nests and ghost crab predations are not included in figure.
APPENDIX A – MARINE TURTLE PERMIT #166
Marine Turtle Permit
Florida Fish and Wildlife Conservation Commission
Imperiled Species Management Section - Tequesta Field Laboratory
19100 SE Federal Highway
Tequesta, Florida 33469
(561) 882-5975

Permittee: Kendra Cope
INDIAN RIVER COUNTY PUBLIC WORKS/COASTAL DIVISION
1801 27TH STREET BUILDING A
VERO BEACH, FLORIDA 32960
UNITED STATES

Permit#: MTP-15-166A
Effective Date: 08/03/2015
Expiration Date: 12/31/2015

Is Authorized to:
1. conduct nesting surveys;
2. conduct stranding/salvage activities;
3. relocate nests for conservation purposes; and
4. collect hatched nest contents (including unhatched eggs) on behalf of collaborators - see Conditions.

Authorized Nesting Survey Area:
1. Indian River Shores (including Baytree);
2. Vero Beach; and
3. South Indian River County Beaches.

Permittee Signature: Kendra Cope
Date: 08/03/2015

Not valid unless signed. By signature, the permittee confirms that all information provided to issue the permit is accurate and complete, and indicates acceptance and understanding of the provisions and conditions listed below. Any false statements or misrepresentations when applying for this permit may result in felony charges and will result in revocation of this permit.

By signature, I acknowledge that I have read and understand this permit. Signature of this permit indicates that I and all authorized personnel listed below have read and agree to abide by all Florida Fish and Wildlife Conservation Commission (FWC) 'Sea Turtle Conservation Guidelines' that pertain to the authorized activity(s) listed on this marine turtle permit. I understand that it is my responsibility to transmit all future information updates to all authorized personnel listed on my permit. Permittee must provide a signed copy of this permit to the FWC address above to activate this permit.

Authorized By: ROBBIN TRINDELL
Authorized for: Nick Wiley, Executive Director

Authorized Research Projects: None.

PERMIT NO. MTP-15-166A
Authorized Monitoring Projects: None.

Authorized Personnel:
Niki Desjardin; R. Erik Martin; Joseph Scarola; Carrie Goethel; Danielle Miller; Samantha Pessolano; Erica Oliva; Ryan Duffer; Cassidy Killinger; Deanna DeRosia; Kim Hellman; James Gray.

PERMIT CONDITIONS AND PROVISIONS:
1. Permitted individuals must adhere to the FWC marine turtle permit guidelines developed under a Section 6 Cooperative Agreement between FWC and the U.S. Fish and Wildlife Service.
2. Permittee shall coordinate with Indian River County in implementing the Indian River County Habitat Conservation Plan.
3. This permit supersedes all prior permits issued.
4. Sample collection for collaborators is authorized as follows:
   1. Dr. Simona Ceriani - Florida Fish & Wildlife Conservation Commission:
      1. Hatched nest contents (including unhatched eggs) from green turtle nests.
   2. Dr. Brian Shamblin - Authorized Research Projects listed on Marine Turtle Permit #130:
      1. Hatched nest contents (including unhatched eggs) from green turtle nests.

A person whose substantial interests are affected by FWC’s action may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. A person seeking a hearing on FWC’s action shall file a petition for hearing with the agency within 21 days of receipt of written notice of the decision. The petition must contain the information and otherwise comply with section 120.569, Florida Statutes, and the uniform rules of the Florida Division of Administration, chapter 28-106, Florida Administrative Code. If the FWC receives a petition, FWC will notify the Permittee. Upon such notification, the Permittee shall cease all work authorized by this permit until the petition is resolved. The enclosed Explanation of Rights statement provides additional information as to the rights of parties whose substantial interests are or may be affected by this action.
APPENDIX B – MAPS OF SENTINEL AREAS
February 18, 2015

ROBERT PRESSLEY
1131 SOUTH REEDY BLVD
FROSTPROOF, FL 33843

RE: COUNTY SEA TURTLE PROTECTION REGULATIONS

Dear ROBERT PRESSLEY:

County records indicate you are the owner of a beachfront property located in unincorporated Indian River County. This letter is part of an annual mailing to all beachfront property owners regarding the county’s sea turtle protection regulations. Please take time to look at the information provided in this letter.

Background

In 1987, Indian River County adopted sea turtle protection regulations that restrict beachfront lighting during sea turtle nesting season. Nesting season runs from March 1 to October 31 each year.

Section 932.09 of the Indian River County Code of Ordinances sets forth parameters for artificial lighting, including requirements that:

- Lights illuminating buildings or associated grounds for decorative or recreational purposes shall be shielded or screened such that they are not visible from the beach, or turned off after 9:00pm during the period from March 1st to October 31st of each year.

- Lights illuminating dune crossovers or any areas oceanward of the dune line shall be turned off after 9:00pm during the period from March 1st to October 31st of each year.

- Window treatments in windows facing the ocean of single and multistory structures are required so that interior lights do not illuminate the beach. The use of tint or film on windows or awnings is preferred; however, the use of black-out draperies or shade screens are acceptable.
Beachfront lighting is regulated based on scientific documentation that such lighting can disorient sea turtle hatchlings. Disoriented hatchlings crawl toward artificial lighting instead of the ocean, and are subsequently eaten by predators, such as raccoons or stray cats, or they die from dehydration. In addition, adult turtles will frequently avoid nesting on lighted beaches.

The best way to ensure that your property does not have lights visible from the beach is to view it from various locations on the beach at night. Observations should be made from locations north and south of your property, as well as from directly east. Observations should also be made from locations low (near the water line) and high (near the dune) on the beach. If you are able to see the source of light (e.g., light bulb) within a fixture, that light is likely to cause problems for sea turtles.

Under a 1992 fine schedule approved by county resolution, failure to correct the above referenced violation (s) can result in citation assessed at $50.00 for each day of the violation after a warning notice has been issued with 24 hours to comply. Indian River County can also bring sea turtle lighting violations before the code board, which can enter an order and fines (usually $100 per day) if compliance is not achieved by a board-established compliance date.

Indian River County has the privilege of being one of the most important sea turtle nesting areas in the Western Hemisphere. In addition, the county has a federally mandated Habitat Conservation Plan (HCP) for Sea Turtles in accordance with its permit to help protect beachfront homes from storm erosion. The reduction of lighting impacts on nesting turtles is a part of the County's HCP. Therefore, your cooperation in minimizing beachfront lighting is greatly appreciated.

If you have any questions concerning sea turtle regulations, please do not hesitate to call the Indian River County Environmental Planning and Code Enforcement Division at (772) 226-1249.

Sincerely,

Roland M. DeBlois, AICP
Chief, Environmental Planning