

Sea Turtle Monitoring, Nest Evaluation, and Protection Measures for Lido Key 2006



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TABLE OF CONTENTS

	<u>Page No.</u>
TABLE OF CONTENTS.....	ii
LIST OF TABLES.....	iii
LIST OF FIGURES	iv
LIST OF ACRONYMS AND ABBREVIATIONS	iv
EXECUTIVE SUMMARY	5
 INTRODUCTION	 7
 BACKGROUND	 8
 SEA TURTLE MONITORING.....	 9
Project Location.....	9
Procedures.....	10
Hatching Surveys and Nest Evaluations	11
Sea Turtle Protection Measures	11
Data Analysis.....	12
 NESTING SUCCESS	 12
Turtle Emergences (Nests and Non-Nesting Emergences).....	12
Categorization of Non-Nesting Emergences (NNEs)	13
Visual Assessment of Obstructions to Nesting.....	14
Nest Site Selection	15
Nest Chamber Characteristics.....	16
2006 Study of Incubation Conditions on Sarasota County Beaches.....	16
Nests Lost to Erosion or Inundation	17
Nest Damage by Predation or Invasion	17
 REPRODUCTIVE SUCCESS.....	 18
Incubation Period	18
Hatching Success	18
Emergence Success	19
Hatchling Disorientation Events.....	19
 ACKNOWLEDGEMENTS	 20
 LITERATURE CITED	 20

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

APPENDICES

- Appendix A: Nests and Non-nesting emergences 2006
- Appendix B: FWC Marine Turtle Hatchling Disorientation Reports 2006
- Appendix C: Sarasota County trends 2006
- Appendix D: Research posters 2006
- Appendix E: Lido Key photographs 2006

LIST OF TABLES

	<u>Page No.</u>
Table 1. Sea turtle activities (nest and NNEs) and nesting success for sea turtles nesting on Lido Key, 1982 through 2006.	21
Table 2. Categories of abandoned sea turtle nesting for Lido Key. 2003-2006.	22
Table 3. Sea turtle nest chamber measurements for Lido Key, 2003-2006.....	23
Table 4. Sea turtle nests affected by tidal activity on Lido Key, 2003-2006.....	24
Table 5a. Nest damage and preventative measures taken due to predation or invasion on Lido Key, 2004-2006.....	25
Table 5b. Identified nest predators on Lido Key, 2004-2006.....	25
Table 6. Total incubation period of relocated and <i>in situ</i> nests that experienced hatch on Lido Key, 2003-2006.....	26
Table 7. Hatching Success for relocated and <i>in situ</i> nests on Lido Key, 2003-2006.....	29
Table 8. Hatchling Emergence Success for relocated and <i>in situ</i> nests on Lido Key, 2003-2006.....	31
Table 9. Marine turtle disorientations on Lido Key, 2006.....	31

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

LIST OF FIGURES

	<u>Page No.</u>
Figure 1 Lido Key, Sarasota County, Florida nourishment history.	32
Figure 2. A non-nesting emergence evident by the abandoned nest chamber (top image) and a successful loggerhead nest (bottom image). Species is confirmed by the alternating flipper tracks, and nest is confirmed by the thrown sand during body pitting and nest covering.	33
Figure 3. Sea turtle nest sign used to identify nests on Sarasota County beaches (left) and a marked sea turtle nest (right).....	34
Figure 4. Number of sea turtle nests and non-nesting emergences on Lido Key by week in 2006	34
Figure 5. Lido Key nest locations for 2006.....	35
Figure 6. Lido Key sea turtle nesting and non-nesting emergence data from 1982-2006.	36
Figure 7. Distribution of nests and non-nesting emergences on Lido Key in 2006 by FDEP monument range.....	36
Figure 8. A comparison of the number and type of nesting obstructions encountered by sea turtles on Lido Key in 2006.	37
Figure 9. Trends in hatchling disorientation events on Lido Key from 2001 to 2006.....	37

LIST OF ACRONYMS AND ABBREVIATIONS

CITES	Convention on International Trade in Endangered Species of Flora and Fauna
cm	Centimeter(s)
ESA	U.S. Endangered Species Act
FDEP	Florida Department of Environmental Protection
ft	Feet
FWC	Florida Fish and Wildlife Conservation Commission
GPS	Global Positioning System
MML	Mote Marine Laboratory
NNE	Non-nesting emergence
No./#	Number
STCRP	Sea Turtle Conservation and Research Program

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

EXECUTIVE SUMMARY

This report summarizes marine turtle monitoring on Lido Key in 2006, the third year following construction activities for the New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key. Monitoring data are presented for both inside and outside of the Project shoreline for the year of construction (2003) and subsequent years to evaluate potential impacts to the sea turtles on Lido Key from the Project.

Loggerhead sea turtles accounted for 100% of the sea turtle activity on Lido Key in 2006. Turtle nesting activities occurred between May 13 to July 25. Beach monitoring efforts documented a total of 24 nests and 35 NNEs on Lido Key in 2006. Fourteen nests and 26 NNEs were inside the Project shoreline and 10 nests and 9 NNEs outside the Project shoreline. Nesting density was 4.53 nests per km for Lido Key.

The relative proportion between the number of NNEs and nests serves as an indicator of a beach's nesting suitability. The nesting success percentage for the 2006 nesting season was 35.0% inside the Project shoreline and was 52.6% outside the Project shoreline. The region of lowest nesting success was between FDEP monuments R-42 to R-44 which hosted nine NNEs but no nests. This stretch of beach fronts several condominiums and hotels but also an escarpment. The region for highest nesting success was FDEP monuments R-31 to R-33 outside the Project on northern Lido Key which is more secluded and shielded by dense vegetation from lights.

Turtles accessing the Lido Key shoreline were obstructed from nesting eight times in 2006, representing 13.6% of all activities documented. Turtles were obstructed by escarpments (n = 6) or seawalls (n = 2).

No turtles were obstructed by beach furniture or temporary structures in 2006 on Lido Key. A decrease in furniture related obstructions follows after a 2005 amendment to Sarasota County's Sea Turtle Ordinance that requires the nightly removal of beach furniture and other temporary structures. Since the amendment was implemented, no further instances have been recorded of turtles on Lido being obstructed by beach furniture.

Only one tropical storm caused coastal erosion and/or sand accretion that impacted the nesting season. Tropical Storm Alberto inundated 12.5% (3/24) of the total nests on Lido Key. Of these, one was partially washed away.

The extent of nest predation was 12.5% (3/24) in 2006 compared to predation levels of 14.8% recorded in 2005. The predation incidents involved fire ants, a raccoon, and roots.

A 6/24/06 nest located at 333 Ben Franklin Drive was vandalized in early July when the stakes were removed and used as soccer goals. The vandalism occurred close to Lido Public Beach and was reported to the STCRP office by a lifeguard. An incident report

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

was filed with the Sarasota County Sheriff's Department, and the nest stakes were replaced.

The average incubation period was 53.5 days for 11 nests inside the Project shoreline and was 58 days for two nests outside the Project shoreline.

The overall hatching success for nests was 91.9% inside the Project shoreline and 82.2% outside the Project shoreline. For nests that were not inundated, the hatching success was 91.7% inside the Project and was 91.6% outside the Project shoreline.

The overall emergence success was 72.6% inside the Project shoreline and was 70.5% outside the Project shoreline. For nests that were not inundated, the emergence success was 70.2% inside the Project and was 89.5% outside the Project.

Excavations of 15 evaluated *in situ* nests that were not predated revealed that 1186 hatchlings emerged independently prior to nest excavation while 207 live hatchlings and 76 dead hatchlings were found remaining in those nests.

No adult turtles were disoriented and seven sea turtle hatchling disorientation events were recorded for Lido Key in 2006. Disorientations were related to interior or exterior lighting from hotels or condominiums (n = 3), street lights or hotel signs (n = 1), single family residence (n = 1), and unknown causes (n = 2). As a percentage of nests, 29% of Lido nests disoriented in 2006 compared to 18.5% in 2005.

This report presents the results of sea turtle monitoring for the year 2006, the third year following construction activities for the New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key. However, the Lido Key shoreline has experienced repeated restoration efforts from FDEP Monuments R-32 to R-44. These restoration efforts have resulted in the placement of sand of various sources, content, and color. A comparison of the sea turtle nesting patterns and success rates through all the years is beyond the scope of this annual report. However, these cumulative effects influence the suitability of the Lido Key shoreline as nesting habitat for both sea turtles and shorebirds.

INTRODUCTION

The Gulf of Mexico shoreline of Lido Key, Sarasota County, Florida is used as nesting habitat by loggerhead (*Caretta caretta*) sea turtles. This species is protected under the U.S. Endangered Species Act (ESA) of 1973, the Marine Turtle Protection Act Chapter 370.12 (Florida Administration Code), and the Sarasota County Sea Turtle Protection Ordinance (No 97-082). The loggerhead was listed in 1978 as a threatened species (43 Federal Register 32800). Internationally it is considered “Vulnerable” and is listed as a species threatened with extinction in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

In addition to loggerhead turtles, green turtles (*Chelonia mydas*) occasionally nest on Sarasota County beaches. In 2006 there were 2 green turtle nests in Sarasota County (on Manasota Key), and there have been a total of 55 nests in Sarasota County since 1994. A Kemp’s ridley (*Lepidochelys kempii*) nested twice on Siesta Key in 1999. In 2001, a leatherback turtle (*Dermochelys coriacea*) deposited a clutch on Longboat Key, which marked the first documented nesting of this species on the central west coast of Florida. Juvenile Kemp’s ridley and juvenile green turtles also utilize the near-shore waters of the central Gulf coast of Florida as developmental habitat. The green turtle is listed as endangered in Florida and federally listed as a protected species in 1978 (43 Federal Register 32800). The Kemp’s ridley is the most critically endangered of all sea turtle species and as such is protected throughout its range in the Gulf of Mexico and northwestern Atlantic Ocean. The leatherback is listed as endangered worldwide and federally listed in 1978 (35 Federal Register 8491). All sea turtles are listed in Appendix I of CITES.

Land-based threats to these protected sea turtles include beach erosion, beach armoring, beach nourishment activities, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, exotic dune and beach vegetation, nest depredation, nest loss to abiotic factors, and poaching. Threats within the marine environment include, but are not limited to, incidental take from dredging, marina and dock development, pollution, sea grass bed degradation, fisheries activities including hook and line fisheries, boat collisions, offshore artificial lighting, ingestion of marine debris, poaching and predation (National Marine Fisheries Service/U.S. Fish and Wildlife Service, 1991).

The Florida Fish and Wildlife Conservation Commission (FWC), National Marine Fisheries Service, and U.S. Fish and Wildlife Service evaluate data pertaining to sea turtle species; their use of habitat, nesting success, and any protection measures undertaken to protect the adult turtle, the nest, and emerging hatchlings. This is in support of identifying appropriate construction techniques that occur in sea turtle nesting habitat.

A sand placement project on Lido Key began in 2002 and was completed in 2003. Sand placed on Lido Key was dredged from the New Pass Inlet Channel. The City of Sarasota

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

contracted the Sea Turtle Conservation and Research Program (STCRP) of Mote Marine Laboratory (MML) to identify critical issues related to the protection of sea turtles, their nesting habitat, nests, and hatchlings on Lido Key. This 2006 report summarizes STCRP's sea turtle monitoring, evaluation and protection efforts for the New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key for the third year following construction activities.

BACKGROUND

The U.S. Army Corps of Engineers conducted a maintenance dredging of the New Pass inlet channel which began in 2002 and was completed in the spring of 2003. The project was authorized under permit IFB Number (No.) DACW17-02-B-0020 and consolidated joint coastal permit No. 0039755-001-JC. During the dredging 125,000 cubic yards of dredged sand was stockpiled on North Lido Key. The stockpile location was approximately 5,000 feet (ft) south of the entrance to New Pass, and sand was placed along the shoreline for approximately 3,000 ft (T-36 south to approximately R-39). The sand from New Pass, which is fine-grained and white in appearance, was mechanically spread over the Lido shoreline to form a "white cap" over the darker sand of the renourished beach. The White Sand Project occurred between Florida Department of Environmental Protection (FDEP) reference monuments T-36 and R-44. To accomplish the white sand layering, the City skimmed sand off the top of the existing beach that had been renourished in 1998 and 2001 and replaced it with the white sand from the inlet dredging. For purposes of this report the New Pass Inlet Channel Maintenance Dredging and White Sand Project is referred to hereafter as the Project.

The Lido Key shoreline is used as nesting habitat by sea turtles that are protected by the ESA of 1973, the Marine Turtle Protection Act Chapter 370.12 (Florida Administrative Code) and the Sarasota County Sea Turtle Protection Ordinance (No. 97-082). Beach nourishment or restoration can result in changes such as sand density, beach shear resistance, moisture content, beach slope, sand color, grain size, and shape (Peterson and Bishop 2005). These changes may affect the nesting activity of sea turtles and the hatch and subsequent emergence success of the nests. Consequently, special sea turtle conditions are included in beach construction permits to minimize impacts to the turtles, nests, and hatchlings.

The special permit conditions for the Project included fill material composition requirements, permitted construction material and machinery locations, and requirements for escarpment formation surveys, post-construction beach compactness monitoring, and sea turtle activity monitoring. STCRP personnel documented sea turtle activity and implemented nest protection and evaluation measures. Special permit conditions pertaining to sea turtle monitoring activities included:

- Daily early morning sea turtle nest surveys of the beach were to be conducted starting May 1 and continue through the end of the sea turtle nesting season October 31, or until all nests hatched. Only those nests that were in danger of loss

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

were to be relocated. Those nests that required relocation were to be moved no later than 9 a.m. in the morning following deposition or were relocated at a later date when they were found to be in immediate danger of washing out. All nests, *in situ* or relocated, were to be marked and the actual location of the clutch determined.

- All nesting surveys, nest relocations, nest caging activities, and nest success evaluations were to be conducted by persons with prior experience and training in these activities and duly authorized to conduct such activities through FWC Marine Turtle Permits #054 and #126, both current and valid permits issued by FWC, Imperiled Species Management, pursuant to Florida Administrative Code Rule 62R-1.
- Monitoring of nesting activity following construction was to include daily surveys and any additional measures authorized by the FWC. The required report included nesting success rates, hatching success of all *in situ* and relocated nests, and names of all personnel involved in nest surveys and relocation activities. These data were to be reported separately for filled areas and non-filled areas. Permit Conditions require sea turtle monitoring and reporting for the initial nesting season following completion of the beach placement of maintenance-dredged material (2003) and for a minimum of two additional nesting seasons (2004-2005).

This report summarizes the 2006 monitoring as the third year following construction activities. The report is being submitted to the City of Sarasota Engineering Department, Coastal Planning and Engineering, Inc., the FWC Imperiled Species Management Division, and archived in the offices of Sea Turtle Conservation and Research Program at Mote Marine Laboratory.

SEA TURTLE MONITORING

Project Location

The Project shoreline extends from FDEP Monument T-36 south to approximately R-44 on Lido Key in Sarasota County (**Figure 1**). The north end of the Project, T-36, corresponds to the address 101 Ben Franklin Drive. The southern end of the Project located at approximately R-44 corresponds to a location in South Lido Park approximately 300 ft south of 2150 Ben Franklin Drive. The FDEP monuments are numbered from R-30 in New Pass at the north end of Lido to R-44 in South Lido Park near Big Sarasota Pass.

The Lido shoreline has been restored during previous dredging and nourishment in 1998, 2001, and 2003. The shoreline is characterized by high density residential development and high-rise condominiums and hotels.

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Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

Procedures

Daily monitoring of Lido Key's beaches occurred at dawn between May 1 and October 1, 2006 (the date of final nest excavation) to fulfill the Florida Fish and Wildlife Conservation Commission (FWC) guidelines for sea turtle protection. This monitoring effort was conducted by MML STCRP personnel, interns, and volunteers authorized under marine turtle permit #054 issued to Paula Clark.

Personnel monitored for turtle nesting activity by walking the Lido Key shoreline daily at dawn above the mean high water line. Upon discovery of an emergence, permitted personnel determined visually whether the emergence was a nest or a non-nesting emergence (also known as a false crawl). A *non-nesting emergence* (NNE) was defined as an emergence that did not result in egg deposition. Signs of an NNE can include an abandoned body pit or nest chamber. A body pit refers to the sandy depression cleared by a sea turtle's front flippers prior to digging a nest chamber. A nest chamber is a vase-shaped hole excavated by a turtle's rear flippers. The following are examples of NNEs: 1) a turtle that emerged on the beach but did not body pit or excavate a nest chamber and returned to the water, or 2) a turtle that emerged and made one or more body pits but did not excavate a nest chamber, or 3) a turtle that emerged, created a body pit, and excavated a nest chamber but did not deposit any eggs (often these aborted nest excavations are left uncovered by the turtle). A *nest* was defined as a turtle emergence that resulted in the turtle successfully depositing eggs. **Figure 2** illustrates a NNE where the turtle excavated a nest chamber but returned to the water without depositing any eggs and also a nest that was later confirmed and marked. During the survey along the beach, NNEs and nests were recorded on MML Nest Data Forms (see **Appendix A**). Nest or nesting success is defined as the proportion of nesting attempts by a sea turtle (emergences onto the beach) that result in eggs being deposited.

$$\text{Nesting success} = (\# \text{ nests}) / (\# \text{ nests} + \# \text{ NNEs})$$

Where a nest location was judged to be imminently threatened by tidal overwash, or in order to meet requirements for beach nourishment projects, a nest may be relocated. Nests were carefully excavated by hand and the eggs were removed individually with care to avoid rotation of the egg. Eggs were placed in a bucket lined with sand and were transported higher on the beach into an artificially produced nest chamber closely resembling the original nest chamber in shape, size, and depth.

All nests were marked by two to four wooden stakes connected with yellow flagging tape and signage identifying the site as a protected sea turtle nest (**Figure 3**). Each nest was additionally marked with the date the nest was laid and the original location of the nest. Nest location was documented by three methods. In the field, monitoring personnel located nests by relative position to the inland street address, building, or other landmark and by global positioning system (GPS) coordinates. In the office, these descriptions were checked against annotated aerial photographs to associate the locations to the nearest FDEP coastal construction control line monuments.

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

Hatching Surveys and Nest Evaluations

During incubation, nests were monitored in the early morning and occasionally again in the evening. Observance of one or more of the following was used to determine the first day of hatch to calculate incubation periods:

- 1) A hatchling or hatchlings present at the surface,
- 2) A hatchling crawl or crawls in the sand leading out from the nest area, and/or a depression or emergence hole directly over the nest.

Each nest was excavated three days after the initial hatch to enumerate the contents for a hatch success calculation. The delayed nest excavation allows the majority of hatchlings to emerge from the nest on their own. Hatchlings that emerge independently are more vigorous and capable to cross the beach to the water. Once in the water these hatchlings also have a better chance at survival since their external yolk sacs have been completely absorbed, allowing the hatchlings to dive more readily and to swim more vigorously.

Nest evaluations were also recorded on MML Nests Data Form (see **Appendix A**). Upon excavation, the contents of the nest were sorted and counted by the following categories. (1) *Hatched* eggs referred to empty or hatched eggshells (fragments were not included in the tally). (2) *Pipped* eggs referred to either live or dead hatchlings that had punctured the eggshell but had not fully emerged from the egg. (3) *Unhatched* eggs referred to unopened eggs remaining in the nest at excavation. Hatch success was defined as the proportion of eggs in a nest that produced live hatchlings.

$$\text{Hatch Success} = \frac{\# \text{ hatched eggs}}{\# \text{ total clutch size}}$$

Emergence success was used to adjust for within nest mortality of hatchlings and to evaluate the number of hatchlings that left the nest. Emergence success represents the number of hatchlings that *emerged* independently from the nest prior to nest excavation:

$$\text{Emergence Success} = \frac{\# \text{ hatched eggs} - (\text{live hatched} + \text{dead hatched in nest chamber})}{\# \text{ total clutch size}}$$

Any live hatchlings within a nest were either released immediately or were transferred to a bucket containing moist sand. These buckets of hatchlings were kept in a warm darkened location until their release on the beach the same evening. Nest excavations and hatchling releases were conducted according to FWC Marine Turtle Conservation Guidelines <<http://www.myfwc.com/psm/turtles/Guidelines/MarineTurtleGuidelines.htm>>.

Sea Turtle Protection Measures

Sea turtle protection measures implemented during the 2006 season followed protocols dictated by FWC Marine Turtle Conservation Guidelines and included:

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

- Relocating endangered nests
- Caging nests with self-releasing and restraining cages when nests were threatened by predators or lighting
- Placing an FWC approved fire ant control (Amdro) around nests when fire ants (*Solenopsis invicta*) were observed
- Communicating with the Sarasota County Code Enforcement regarding artificial illumination of the beach and hatchling disorientation events due to non-compliant lighting

Nests that were initially laid by a female at or below the mean water line, were found washing out or were in immediate danger of washing out, were relocated higher on the beach near the original location.

Data Analysis

Marine turtle emergence and hatching data were compiled in a Microsoft Access database. Figures and Tables were created in Microsoft Access, Excel, or Word. Statistical analyses were completed in Excel with the PopTools Add-In or with S-Plus 6.

Maps were prepared with ARCGIS 9. Aerial photography was 18" resolution and flown in 2003. Spatial references were Florida State Plane Reference W NAD 83.

NESTING SUCCESS

Turtle Emergences (Nests and Non-Nesting Emergences)

Loggerhead sea turtles accounted for 100% of sea turtle activity on Lido Key in 2006. The first crawl of the season was documented on May 13, the first nest on May 25, nesting peaked in the third week of June, and the last nest was documented on July 25 (**Figure 4**). Beach monitoring efforts documented a total of 24 nests and 35 NNEs along the Lido Key shoreline in 2006 (**Appendix A**). This is a decrease from the number of nests (27) and an increase from the number of NNEs (25) documented in 2005. All nest locations along the Lido Key shoreline were documented using a GPS and are mapped on **Figure 5**.

During 2006, 14 nests and 26 NNEs were documented inside the Project shoreline while 10 nests and 9 NNEs were documented outside the Project. The nesting success inside the Project shoreline was 35.0% in 2006, 45.7% in 2005, 46.7% in 2004, and 22.2% in 2003. Nesting success outside the Project shoreline was 52.6% in 2006, 64.7% in 2005, 36.7% in 2004, and 44.9% in 2003. Inside the Project shoreline, nesting activity was observed from May 13 to July 22 (**Figure 5**). Outside of the Project shoreline, nesting activity was observed between May 9 and July 25.

The 2006 nesting data for the Lido Key shoreline indicates an 11.1% decrease (three fewer nests) from the 2005 season (**Figure 6**). An overall trend in Lido Key nesting from 2000 through 2006 shows a decline in nesting numbers since a high of 59 nests in 2000 (**Table 1** and **Figure 6**). This decline in loggerhead nesting is consistent with a general downward trend in loggerhead nesting documented throughout the southeastern U.S. (Florida Fish and Wildlife Conservation Commission, FWRI online report) and reflects the trend in Sarasota County which hosts the densest loggerhead nesting in the Gulf of Mexico (**Appendix C**). Possible causes for a declining trend in loggerhead nesting numbers include long-line fishing techniques, coastal development, and beach armoring.

The FWC reports (which were standardized for effort in 1991) indicate that nesting densities of loggerheads on Lido Key range between 3.0-11.9 nests per km and nesting density for Lido in 2006 was 4.53 nests per km (**Table 1** and **Figure 6**).

Four of the 25 nests (16.7%) were not found at the end of incubation. The situation is termed by FWC as a “mystery” nest because although a site was initially described as a nest based on the judgment of trained volunteers, no evidence of hatching or nest contents could be found subsequently. Without independent evidence, it can only be presumed that a nest was inaccurately located, or inundated, or poached. Mystery nests are included in calculations of nesting success, but are simply omitted from calculations for hatching success, emergence success, or predation events.

Categorization of Non-Nesting Emergences (NNEs)

Marine turtles searching the shoreline for a suitable nesting site may abandon a nesting attempt and return to the water without depositing a clutch. These non-nesting emergences (NNEs) can be categorized by the stage at which the turtle abandoned or terminated nesting (**Table 2**).

In 2006, the 26 NNEs documented inside the Project shoreline were categorized as: 1) 21 emergences with no digging, 2) three emergences with one or more body pits but no nest chamber, and 3) two emergences with a minimum of one abandoned nest chamber. The nine NNEs outside of the Project shoreline were categorized as: 1) six emergences with no digging, 2) two emergences with one or more body pits but no nest chamber, and 3) one emergence with a minimum of one abandoned nest chamber. The 2006 data are similar to the 2005 data with the predominant category of abandoned nesting as emergences without digging a body pit or nest chamber.

Based on FWC data collected throughout Florida’s nesting beaches, the proportions of nests and NNEs should be relatively similar (i.e., 0.5 is an equal numbers of nests and NNEs) and the balance between the two serves as an indicator of a beach’s nesting suitability. When numbers of NNEs substantially exceed that of nests, it typically indicates that some combination of factors deters the turtles from nesting. The factors can be associated with natural causes (such as escarpments, beach compactness, or

flooding) or human-related factors (such as increased beach lighting, beach armoring structures, beach furniture, or physical harassment).

On Lido Key, the first NNE occurred on May 13, almost two weeks before the first nest was laid on May 25. The nesting success percentage for the 2006 nesting season was 0.41, where 41% of turtle emergences resulted in nest deposition and 59% were NNEs. Inside the Project shoreline 65% of the total activity resulted in NNEs while outside of the Project shoreline NNEs resulted in 47% of the activity.

The distribution of NNE events along the length of Lido Key identified specific problem areas (**Figure 7**). In relation to the FDEP monuments, the relative numbers of nests and NNEs along the Lido Key coastline highlight specific zones for elevated NNEs. Troublesome areas with high NNEs should be reviewed to flag the problem sources (i.e., unshielded lights) and beachfront property owners should be advised of more ‘turtle-friendly’ alternatives. This proactive approach could potentially reduce the number of NNEs during the 2007 nesting season.

A detailed examination of **Figure 7** shows two areas with poor nesting success. Between FDEP monuments R-34 and R-35 (just outside the Project shoreline) there were five NNEs but no nests. This area corresponds to an active area of Lido Public Beach. The higher density of people in the area could have resulted in fewer nesting turtles than expected.

A second area of low nesting success was between FDEP monuments R-42 and R-44, where there were nine NNEs but no nests. This area inside the Project shoreline fronts several condominiums and hotels south to South Lido Park, but an escarpment and a swale in this area also made nesting difficult for turtles. Also, heavy boat and human traffic could have contributed to the lack of nesting.

The area with the best nesting success was from FDEP monuments R-31 to R-33, which is outside of the Project shoreline. The nest to NNE ratio for this beach was 10:3 (77% nesting success). This area is more densely vegetated than most areas on Lido Key and likely provides a quieter, darker, and more sheltered nesting area than can be found elsewhere on the Key.

Visual Assessment of Obstructions to Nesting:

The causes of the NNEs can be broadly viewed as three generic categories: natural processes that affect turtle nesting (injury, roots, raccoon harassment and decisions to return before reaching the dune nesting habitat), armoring related to permanent structures that alter or replace the dune nesting habitat (rocks, stepped revetments, and seawalls), and human temporary interventions or disruption (beach furniture, structures associated with human dwellings, or crossing a road).

Turtles accessing the Lido Key shoreline were obstructed eight times, or 13.6% of all activities in 2006 (**Figure 8**). On six occasions the obstruction was an escarpment. During each of these instances, the turtle was able to bypass the escarpment or simply nested at its base. In two remaining instances, turtles were obstructed by a seawall and did not nest. All eight recorded obstructions occurred in the Project shoreline. In comparison, 3.9% of the 2005 activities were obstructed, when only two turtles were obstructed inside the Project shoreline by a seawall and by an escarpment, respectively.

A common finding with new nourishment projects is a relative increase in the number of NNEs from escarpments because nourished beaches usually have a flatter profile and are more susceptible to escarpment formation. However, usually by the third year post-nourishment, the number of NNEs has dropped back to their level before the Project. It therefore seems unlikely that a rise in NNEs in 2006 was related to the 2003 nourishment project. The storm activity from 2005 and 2006 may have caused the creation of more escarpments than usual. In any case, it is recommended to level any escarpments between the FDEP monuments R-42 to R-44. The county's responsibility to do so does not require this outside of the turtle nesting season, but it is also a matter of public safety.

A 2005 amendment to Sarasota County's Sea Turtle Ordinance requires the nightly removal of beach furniture and other temporary structures. In 2004, before the amendment, five turtles on Lido Key encountered beach furniture (only two of them then nested). Since the amendment was implemented, there have been no instances of turtles encountering beach furniture on Lido Key.

Nest Site Selection

Monitoring personnel measured the beach width on the morning after nest deposition by measuring from the nest up to the closest upland vegetation or barrier and from the nest down to the day's mean high water line. By dividing the available beach into thirds, the preference for nest site selection on the upper, middle or lower third of the beach, regardless of beach width, could be determined.

For nests inside the Project, 14.3% (2/14) were placed in the upper third of the beach width, 57% (8/14) were in the middle third, and 29% (4/14) were in the lower third. Outside the project, 90% (9/10) of nests were placed in the upper third, none in the middle third, and 10% (1/10) were in the lower third of the beach width.

These data are important because research has shown that nesting sea turtles have limited energy resources to utilize when ascending a beach (Wood and Bjorndal, 2000). These energetic constraints are thought to create a pattern of nest site selection closer to the high water line on recently nourished beaches that are broader and flatter than on more steeply profiled beaches. This situation is troublesome as nests close to the high water line have a higher probability of being inundated or washed out during storms.

Nest Chamber Characteristics

Nest chamber measurements were tabulated for nests inside and outside the Project shoreline on Lido Key in 2006 (**Table 3**). Nests laid inside the Project shoreline averaged 41.6 cm in depth (range 33-60 cm), 20.9 cm from the sand surface to the top of the clutch (range 10-38 cm), and 23.5 cm in width (range 16-30 cm). Nests laid outside the Project shoreline averaged 37.5 cm in depth (range 26-45 cm), 20.3 cm from the sand surface to the top of the clutch (range 12-30 cm), and 20.9 cm in width (range 19-24 cm).

2006 Study of Incubation Conditions on Sarasota County Beaches

The detailed outcomes of sea turtle nesting are directly associated with the physical properties of beach sediments. Beach nourishment changes the sediment properties and is widely acknowledged to affect a turtle's choice of nesting beach and hatching success of the nest. Nourished sand differs from native sand in many properties such as compactness, shear resistance, grain size, temperature, moisture content, calcium carbonate, and gas diffusion rates. These factors influence incubation conditions and are critical to monitor because the sex of turtle hatchlings is determined during incubation.

Three of six Sarasota County beaches are nourished (Longboat Key, Lido Key, and Venice Beach) and others are expected to be in the near future (Siesta Key in late 2006). To address these concerns, the STCRP conducted pilot studies of thermal profiles on nourished and non-nourished beaches in 2004. Follow-up studies were completed in 2005, and further studies on beach thermal profiles were expanded for 2006 to evaluate the 2005 nourishment projects on Venice Beach and Longboat Key.

Representative nourished and non-nourished sections were selected on five beaches: Longboat Key, Lido Key, Siesta Key, Casey Key, and Venice Beach. Thermal data loggers (I-button 1921H, Dallas Semiconductors, or Hobo Pendants, Onset Computers) were deployed in a sealed plastic bag and tethered near selected nests, at typical nest depths (40 cm). The loggers were placed adjacent to a nest to monitor ambient beach temperatures, rather than within a nest to track incubation temperature. The intended experimental design was to place a minimum of five data loggers per beach, or if a beach had both nourished and non-nourished sections (Longboat Key, Lido Key, Venice Beach), then data loggers apportioned within each beach type. However, inevitable changes in the nourishment schedule and storm-related erosion caused some delays or loss of instruments, which made minor compromises to the planned design.

For loggerhead turtles, sex is determined by the thermal conditions in the middle third of incubation around a pivotal temperature of roughly 84-86 F which theoretically produces equivalent numbers of male and female hatchlings. Warmer conditions produce more females and cooler conditions result in more male offspring. In the 2005 study the thermal traces during the middle third of incubation suggested that nests on nourished beaches were likely producing predominantly or exclusively female offspring. This is in contrast to middle incubation conditions on non-nourished beaches which generally

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

produced incubation conditions approximately 5.4°F cooler on average. We interpret the warmer incubation conditions on nourished sections of beach to be a result of darker sand color, possibly from a mixture of fine clay particles, relative to native beaches, which have high quartz content and overall lighter colored sands.

This preliminary report is subject to more thorough evaluation as new data are collected and evaluated. The 2006 data are currently being analyzed by Jennifer Estes, a Ph.D. student under Dr. Thane Wibbels at the University of Alabama at Birmingham. A poster relating the early results from this ongoing work is attached in **Appendix D**.

Nests Lost to Erosion or Inundation

One tropical storm caused coastal erosion and/or sand accretion that impacted the 2006 nesting season. Tropical Storm Alberto (6/11-6/13) created tidal activity that caused inundation of 12.5% (3/24) of the total number of nests along the Lido Key shoreline (**Table 4**). Tidal activity during the summer of 2006 impacted Lido Key to a much lesser extent than in 2005 when 60% (16/27) of nests were inundated.

During Tropical Storm Alberto, one nest that was washing out in the Project shoreline was relocated to Longboat Key. An attempt was made to relocate the nest elsewhere on Lido Key, but the high surf made accessing other portions of the beach impossible. This nest was not included in calculations for incubation period, hatch, and emergence success as it incubated for a portion of time on a different Key. Two other nests were inundated during the tropical storm; one was laid in the Project shoreline and one was outside the Project shoreline. Both nests experienced some degree of hatch.

Nest Damage by Predation or Invasion

The extent of nest predation was 12.5% (3/24) in 2006 compared to predation levels of 14.8% recorded in 2005. The 2006 predation incidents involved fire ants, a raccoon, and roots. (**Table 5a** and **5b**).

A self-releasing cage of 2" x 4" wire mesh was placed over the depredated nest to guard against further predation by raccoons. The exact location of the clutch was determined before placement to avoid damaging the clutch.

One nest, located near Lido Public Beach at 333 Ben Franklin Drive, was vandalized in early July. The nest stakes were removed and used as soccer goals, but the nest was not dug into nor were the eggs affected. The Sarasota County Sheriff's Department was contacted, an incident report filed, and the nest stakes were replaced (**Appendix E**).

Nests were also treated with an FWC approved fire ant control (Amdro) when fire ants (*Solenopsis invicta*) were observed in or near the nests. The incidence of fire ant predation is presumed to be increasing throughout the coastal areas of Sarasota County including Lido Key. Fire ants may invade nests during incubation, hatching, or

MOTE MARINE LABORATORY

emergence. In 2006, one nest was excavated early to prevent fire ants from colonizing the nest.

REPRODUCTIVE SUCCESS

Incubation Period

Calculations of mean incubation period were limited to only include nests for which both the date laid and date hatched were known (**Table 6**). Several inter-related factors such as nest location on the beach, amount of rainfall, substrate color, and environmental temperature contribute to the complex variations in incubation temperature that in turn dictate incubation period.

Inside the Project shoreline, the average incubation period for eleven *in situ* nests was 53.5 days with a range of 49-60 days. Two *in situ* nests laid outside the Project shoreline had a mean incubation period of 58 days with a range of 57-59 days. The first nest to hatch was on July 18 and the last was on October 1.

Since 2003, *in situ* nests inside the Project shoreline have incubated more rapidly than those outside the Project (**Table 6**). Relocated nests tended to show the opposite trend as relocated nests inside the Project incubated marginally more slowly. A more rigorous interpretation is precluded by the small sample sizes that were represented in 2006. Since temperature is the acknowledged major influence determining the incubation period, a broad interpretation is that *in situ* nests inside the Project shoreline recorded shorter incubation periods as a result of the beach substrate being relatively warmer than the substrates outside the Project.

Hatching Success

The hatching success was calculated for 15 *in situ* nests on Lido Key that were not predated. These nests were separated into two categories – those that were not inundated and those that were inundated or affected by tidal activity (**Table 7**). Nests were excavated and inventoried, with contents sorted into categories of hatched or unhatched eggs, live or dead pipped hatchlings, and live or dead hatchlings. Statistics were compiled from the results pooled for all individual nests.

The overall hatching success for 15 *in situ* nests on Lido was 89.1% with 6.0% as unhatched eggs and 4.9% as pipped eggs. The overall hatching success was 91.9% for 11 nests inside the Project shoreline and 82.2% for four nests outside the Project shoreline. For nests that were not inundated, the hatching success was 91.7% inside the Project and was 91.6% outside the Project shoreline.

The very different hatching successes for two inundated nests likely reflects the variable extent of inundation within each nest. A nest in the Project shoreline had a 93.6% hatch success and a nest outside the Project shoreline had a 47.0% hatch success.

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Emergence Success

Excavations of 15 evaluated *in situ* nests that were not predated revealed that 1186 hatchlings emerged independently prior to nest excavation while 207 live hatchlings and 76 dead hatchlings were found remaining in those nests (**Table 8**). The average emergence success for those fifteen nests was 72.0%. The overall emergence success was 72.6% for 11 nests inside the Project shoreline and was 70.5% for four nests outside the Project shoreline

Thirteen nests were not inundated or predated and had a slightly higher emergence success of 75.3%. For nests that were not inundated, the emergence success was 70.2% inside the Project and 89.5% outside the Project.

As with the hatching success, the nests that were inundated had very different emergence successes, which can most likely be attributed to the extent each nest was inundated. The nest in the Project area had a 92.0% emergence success while the inundated nest outside the Project shoreline had a 0% emergence success.

Hatchling Disorientation Events

No adult turtles were disoriented and seven sea turtle hatchling disorientation events were recorded for Lido Key in 2006 (**Table 9** and **Appendix B**). Disorientations were related to interior or exterior lighting from hotels or condominiums (n = 3), street lights or hotel signs (n = 1), single family residence (n = 1), and unknown causes (n = 2). As a percentage of nests, 29.0% of Lido nests disoriented in 2006 compared to 18.5% in 2005. In 2006, five of the seven disorientation events occurred in the Project shoreline. Although the trend varies among years, there is an overall trend for increasing levels of disorientations on Lido Key (**Figure 9**). A comparison of Lido Key disorientations to the rest of Sarasota beaches notes it to be consistently high. (**Appendix C**)

In each instance, STCRP staff communicated with the Sarasota County Code Enforcement Officers regarding artificial illumination of the beach and disorientation events due to non-compliant lighting.

Evidence documented by FWC from past Florida beach renourishment projects has demonstrated that nourished beaches are taller and wider, thus allowing more light to be visible for a greater distance along the beach axis. To reduce the potential disorientations impacts from past or future renourishment projects, the Lido Key lighting ordinance must be regularly enforced.

Each FDEP permit for a specific nourishment project stipulates that nighttime lighting inspections must address outstanding lighting issues before May 1, for consistency with the local lighting ordinance and FWC guidelines. Ongoing checks should reoccur in July at the advent of hatching season and continue until the last nest hatches. Lighting workshops cohosted by MML are planned for 2007 and hopefully will result in improved

MOTE MARINE LABORATORY

compliance with Sarasota's Sea Turtle Protection Ordinance. Failure to comply can result in penalties as indicated by Ordinance No. 2000-052. *"...the Special Master may impose a fine up to \$1000 per day for the first violation and \$5000 per day for a repeat violation if the potential harm to the public or the environment is threatened by continued noncompliance; and the amount of the fine is necessary to discourage continuing violation."*

Put simply, frequent nighttime lighting inspections must begin early in the marine turtle nesting season and continue until the last nest has hatched.

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MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

Table 1. Sea turtle activities (nest and NNEs) and nesting success for sea turtles nesting on Lido Key, 1982 through 2006.

Year	Nests	NNE	Nest Success	Km	Nest density	Activity density
1982	0	5	0.00	1.5	0.00	3.33
1983	2	0	1.00	2.2	0.91	0.91
1984	2	1	0.67	2.2	0.91	1.36
1985	6	2	0.75	2.2	2.73	3.64
1986	3	4	0.43	1.5	2.00	4.67
1987	2	5	0.29	1.5	1.33	4.67
1988	3	0	1.00	2.6	1.15	1.15
1989	7	11	0.39	2.6	2.69	6.92
1990	12	13	0.48	2.6	4.62	9.62
1991	23	31	0.43	4.2	5.48	12.86
1992	32	42	0.43	4.2	7.62	17.62
1993	35	35	0.50	4.2	8.33	16.67
1994	37	34	0.52	4.2	8.81	16.90
1995	34	50	0.40	4.2	8.10	20.00
1996	50	35	0.59	4.2	11.90	20.24
1997	45	44	0.51	4.2	10.71	21.19
1998*	42	94	0.31	4.2	10.00	32.38
1999	48	57	0.46	4.2	11.43	25.00
2000	59	52	0.53	5.3	11.13	20.94
2001*	16	55	0.23	5.3	3.02	13.40
2002	31	29	0.52	5.3	5.85	11.32
2003*	32	62	0.34	5.3	6.04	17.74
2004	26	36	0.42	5.3	4.91	11.70
2005	27	25	0.52	5.3	5.09	9.81
2006	24	35	0.41	5.3	4.53	11.13

Grey areas illustrate years before monitoring was standardized for effort in 1991.

* Indicates the years of nourishment projects on Lido Key

Table 2. Categories of abandoned sea turtle nesting for Lido Key. 2003-2006.

NNE Type	Project Shoreline	Outside Project Shoreline	Total NNEs
2006 YEAR THREE POST-CONSTRUCTION			
# Emergence-no digging	21	6	27
# With preliminary body pit	3	2	5
# With abandoned egg chamber	2	1	3
Total # NNEs	26	9	35
2005 YEAR TWO POST-CONSTRUCTION			
# Emergence-no digging	18	5	23
# With preliminary body pit	0	1	1
# With abandoned egg chamber	1	0	1
Total # NNEs	19	6	25
2004 YEAR ONE POST-CONSTRUCTION			
# Emergence-no digging	13	14	27
# With preliminary body pit	3	4	7
# With abandoned egg chamber	1	1	2
Total # NNEs	17	19	36
2003 YEAR OF CONSTRUCTION			
# Emergence-no digging	31	18	49
# With preliminary body pit	3	6	9
# With abandoned egg chamber	1	3	4
Total # NNEs	35	27	62

Table 3. Sea turtle nest chamber measurements for Lido Key, 2003-2006. Values are means followed in parenthesis by sample size, one standard deviation, and range.

Nest Chamber Measurements	Project Shoreline	Outside Project Shoreline
2006 YEAR THREE POST-CONSTRUCTION		
Surface to top of clutch (cm)	20.88 (8, 10.12, 10-38)	20.25 (8, 5.55, 12-30)
Nest chamber depth (cm)	41.57 (7, 9.01, 33-60)	37.5 (8, 7.43, 26-45)
Nest chamber width (cm)	23.46 (13, 4.56, 16-30)	20.86 (7, 1.86, 19-24)
2005 YEAR TWO POST-CONSTRUCTION		
Surface to top of clutch (cm)	16 (5-26)	19 (10-32)
Nest chamber depth (cm)	47 (34-60)	52 (40-69)
Nest chamber width (cm)	Measurement not taken	Measurement not taken
2004 YEAR ONE POST-CONSTRUCTION		
Surface to top of clutch (cm)	34 (17-52)	40 (33-45)
Nest chamber depth (cm)	51 (44-60)	50 (40-60)
Nest chamber width (cm)	Measurement not taken	Measurement not taken
2003 YEAR OF CONSTRUCTION		
Surface to top of clutch (cm)	23 (15-31)	32 (20-49)
Nest chamber depth (cm)	46 (30-61)	52 (39-58)
Nest chamber width (cm)	Measurement not taken	Measurement not taken

Table 4. Sea turtle nests affected by tidal activity on Lido Key, 2003-2006.			
Cause of Nest Loss	Project Shoreline	Outside Project Shoreline	Total Nests
2006 YEAR THREE POST-CONSTRUCTION			
Overwash = nests negatively affected by inundation/erosion	1(1*)	1(1*)	2
Lost markers/fate of clutch unknown	0	0	0
Washed out	1	0	1
2005 YEAR TWO POST-CONSTRUCTION			
Overwash = nests negatively affected by inundation/erosion	4(4*)	3(2*)	7
Lost markers/fate of clutch unknown	5	2	7
Washed out	2	0	2
2004 YEAR ONE POST-CONSTRUCTION			
Overwash = nests negatively affected by inundation/erosion	4(4*)	5(2*)	9
Lost markers/fate of clutch unknown	0	1	1
Washed out	1	3	4
2003 YEAR OF CONSTRUCTION			
Overwash = nests negatively affected by inundation/erosion	6(5*)	12(8*)	18
Lost markers/fate of clutch unknown	0	1	1
Washed out	0	1	1

* = some hatch even though inundated

Table 5a. Nest damage and preventative measures taken due to predation or invasion on Lido Key, 2004-2006.

	2004	2005	2006
Total nests on beach	26	27	24
Nests affected*	1	4	3
% Nests affected	3.8%	14.8%	12.5%
Total predation/invasion events*	1	4	3
Nests caged before predation	1	2	0
% Caged before predation	3.8%	7.4%	0
Nests caged after predation	0	2	1
% Caged after predation	0	7.4%	4.2%

* Predation/invasion events include all instances of predation on a given nest, i.e. a nest predated by a ghost crab, fire ants, and a raccoon equals three predation events but only one nest affected.

Table 5b. Identified nest predators on Lido Key, 2004-2006.

Nest predators	2004	2005	2006
Armadillo	0	0	0
Bobcat	0	0	0
Cat	0	0	0
Coyote	0	0	0
Bird	0	0	0
Dog	0	0	0
Fire ants	0	1	1
Fox	0	0	0
Ghost crab	0	0	0
Hog	0	0	0
Human poached	0	0	0
Raccoon	0	1	1
Roots	0	2	1
Turtle	0	0	0
Unknown	1	0	0
Total predation events	1	4	3

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

Table 6. Total incubation period of relocated and *in situ* nests that experienced hatch on Lido Key, 2003-2006.

2006 YEAR THREE POST-CONSTRUCTION					
	Relocated		<i>In situ</i>		Total
	In Project	Out Project	In Project	Out Project	
# of Nests	0	0	11	2	13
Average Incubation (days)	N/A	N/A	53.54	58	54.23
Range of Incubation (days)	N/A	N/A	49-60	57-59	49-60
2005 YEAR TWO POST-CONSTRUCTION					
	Relocated		<i>In situ</i>		Total
	In Project	Out Project	In Project	Out Project	
# of Nests	1	1	6	4	12
Average Incubation (days)	54	53	53.2	53.6	53.5
Range of Incubation (days)	54	53	51-57	51-57	51-57
2004 YEAR ONE POST-CONSTRUCTION					
	Relocated		<i>In situ</i>		Total
	In Project	Out Project	In Project	Out Project	
# of Nests	8	1	4	2	15
Average Incubation (days)	54.3	52	59.5	63.5	57.3
Range of Incubation (days)	52-56	52	58-61	60-67	51-67
2003 YEAR OF CONSTRUCTION					
	Relocated		<i>In situ</i>		Total
	In Project	Out Project	In Project	Out Project	
# of Nests	6	1	2	7	16
Average Incubation (days)	54	55	54	56.4	54.9
Range of Incubation (days)	50-58	55	52-56	49-63	49-63

Table 7. Hatching Success for relocated and *in situ* nests on Lido Key, 2003-2006.

2006 YEAR THREE POST-CONSTRUCTION											
	Nests Not Inundated						Nests Inundated				
	In Project			Out Project			In Project		Out Project		Overall Total
	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated	<i>In situ</i>	Relocated	
# of Nests	10	0	13	3	0	13	1	0	1	0	2
# Hatched	965	N/A	1305	340	N/A	1305	117	N/A	47	N/A	164
# Live Pipped	0	N/A	0	0	N/A	0	0	N/A	0	N/A	0
# Dead Pipped	15	N/A	33	18	N/A	33	0	N/A	44	N/A	44
# Destroyed	0	N/A	3	3	N/A	3	0	N/A	0	N/A	0
# Unhatched	72	N/A	82	10	N/A	82	8	N/A	9	N/A	17
Total Eggs	1052	N/A	1423	371	N/A	1423	125	N/A	100	N/A	225
Hatch Success	91.7%	N/A	91.7%	91.6%	N/A	91.7%	93.6%	N/A	47%	N/A	72.9%
2005 YEAR TWO POST-CONSTRUCTION											
	Nests Not Inundated						Nests Inundated				
	In Project			Out Project			In Project		Out Project		Overall Total
	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated	<i>In situ</i>	Relocated	
# of Nests	4	0	6	2	0	6	3	1	3	0	7
# Hatched	196	N/A	318	122	N/A	318	122	93	164	N/A	379
# Live Pipped	0	N/A	0	0	N/A	0	0	5	0	N/A	5
# Dead Pipped	32	N/A	38	6	N/A	38	19	0	2	N/A	21
# Destroyed	0	N/A	0	0	N/A	0	0	0	0	N/A	0
# Unhatched	155	N/A	274	119	N/A	274	195	4	162	N/A	361
Total Eggs	383	N/A	630	247	N/A	630	336	102	328	N/A	766
Hatch Success	51.2%	N/A	50.5%	49.4%	N/A	50.5%	36.3%	91.2%	50%	N/A	49.9%

2004 YEAR ONE POST-CONSTRUCTION											
	Nests Not Inundated						Nests Inundated				
	In Project			Out Project			In Project			Out Project	
	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated
# of Nests	3	5	9	1	0	9	0	4	8	3	1
# Hatched	327	372	804	105	N/A	804	N/A	280	413	133	0
# Live Pipped	0	0	0	0	N/A	0	N/A	1	2	1	0
# Dead Pipped	0	8	8	0	N/A	8	N/A	7	17	10	0
# Destroyed	0	0	0	0	N/A	0	N/A	0	0	0	0
# Unhatched	22	95	123	6	N/A	123	N/A	195	411	161	55
Total Eggs	349	475	935	111	N/A	935	N/A	483	843	305	55
Hatch Success	93.7%	78.3%	86%	94.6%	N/A	86%	N/A	58%	49%	43.6%	0%
68.4%											
2003 YEAR OF CONSTRUCTION											
	Nests Not Inundated						Nests Inundated				
	In Project			Out Project			In Project			Out Project	
	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated	Total	<i>In situ</i>	Relocated
# of Nests	3	2	8	2	1	8	3	3	12	4	2
# Hatched	276	198	612	138	0	612	107	125	281	44	5
# Live Pipped	0	0	0	0	0	0	0	0	0	0	0
# Dead Pipped	0	6	7	1	0	7	3	5	167	87	72
# Destroyed	0	0	0	0	0	0	0	5	6	0	1
# Unhatched	24	47	199	29	99	199	200	154	768	282	132
Total Eggs	300	251	818	168	99	818	310	289	1222	413	210
Hatch Success	92%	78.9%	74.8%	82.1%	0%	74.8%	34.5%	43.3%	23%	10.7%	2.4%
43.8%											

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

Table 8. Hatchling Emergence Success for relocated and in situ nests on Lido Key, 2003-2006.											
2006 YEAR THREE POST-CONSTRUCTION											
	Nests Not Inundated					Nests Inundated					
	In Project		Out Project		Total	In Project		Out Project		Total	Overall Total
	<i>In situ</i>	Relocated	<i>In situ</i>	Relocated		<i>In situ</i>	Relocated	<i>In situ</i>	Relocated		
# of Nests	10	0	3	0	13	1	0	1	0	2	15
# Hatched	965	N/A	340	N/A	1305	117	N/A	47	N/A	164	1469
# Live in Nest	205	N/A	1	N/A	206	1	N/A	0	N/A	1	207
# Dead in nest	21	N/A	7	N/A	28	1	N/A	47	N/A	48	76
# Hatchlings emerged	739	N/A	332	N/A	1071	115	N/A	0	N/A	115	1186
Total Eggs	1052	N/A	371	N/A	1423	125	N/A	100	N/A	225	1648
Emergence Success	70.2%	N/A	89.5%	N/A	75.3%	92%	N/A	0%	N/A	51.1%	72%
2005 YEAR TWO POST-CONSTRUCTION											
	Nests Not Inundated					Nests Inundated					
	In Project		Out Project		Total	In Project		Out Project		Total	Overall Total
	<i>In situ</i>	Relocated	<i>In situ</i>	Relocated		<i>In situ</i>	Relocated	<i>In situ</i>	Relocated		
# of Nests	4	0	2	0	6	3	1	3	0	7	13
# Hatched	196	N/A	122	N/A	318	122	93	164	N/A	379	697
# Live in Nest	13	N/A	0	N/A	13	18	87	0	N/A	105	118
# Dead in nest	16	N/A	5	N/A	21	14	0	0	N/A	14	35
# Hatchlings emerged	167	N/A	117	N/A	284	90	6	164	N/A	260	544
Total Eggs	383	N/A	247	N/A	630	336	102	328	N/A	766	1396
Emergence Success	43.6%	N/A	47.4%	N/A	45.1%	26.8%	5.9%	50%	N/A	33.9%	39%

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

2004 YEAR ONE POST-CONSTRUCTION											
	Nests Not Inundated				Nests Inundated						
	In Project		Out Project		Total	In Project		Out Project		Total	Overall Total
	<i>In situ</i>	Relocated	<i>In situ</i>	Relocated		<i>In situ</i>	Relocated	<i>In situ</i>	Relocated		
# of Nests	3	5	1	0	9	0	4	3	1	8	17
# Hatched	327	372	105	N/A	804	N/A	280	133	0	413	1217
# Live in Nest	1	25	0	N/A	26	N/A	5	4	0	9	35
# Dead in nest	0	2	0	N/A	2	N/A	2	0	0	2	4
# Hatchlings emerged	326	345	105	N/A	776	N/A	273	129	0	402	1178
Total Eggs	349	475	111	N/A	935	N/A	483	305	55	843	1778
Emergence Success	93.4%	72.6%	94.6%	N/A	83%	N/A	56.5%	42.3%	0%	47.7%	66.3%
2003 YEAR OF CONSTRUCTION											
	Nests Not Inundated				Nests Inundated						
	In Project		Out Project		Total	In Project		Out Project		Total	Overall Total
	<i>In situ</i>	Relocated	<i>In situ</i>	Relocated		<i>In situ</i>	Relocated	<i>In situ</i>	Relocated		
# of Nests	3	2	2	1	8	3	3	4	2	12	20
# Hatched	276	198	138	0	612	107	125	44	5	281	893
# Live in Nest	9	3	1	0	13	2	8	0	1	11	24
# Dead in nest	1	2	0	0	3	2	1	1	0	4	7
# Hatchlings emerged	266	193	137	0	596	103	116	43	4	266	862
Total Eggs	300	251	168	99	818	310	289	413	210	1222	2040
Emergence Success	88.7%	76.9%	81%	0%	72.9%	33.2%	40.1%	10.4%	2%	20.8%	42.3%

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

Table 9. Marine turtle disorientations on Lido Key, 2006.

Date of incident	Nest location	Hatchlings attracted to	Minimum # disoriented	Probable light source	In/out Project shoreline
7/18	1540 BFD (Helmsley Sandcastle)	1540 BFD	UNK	Hotel (interior/exterior)	In Project
7/31	151 BFD	Holiday Inn on BFD	9	Street light, Holiday Inn sign	In Project
8/5	1234-1330 BFD (Ritz Carlton Beach Club)	1050 BFD, 1234-1330 BFD, 1540 BFD	45	Condominium (interior/exterior)	In Project
8/9	850 BFD (Suntide Island Beach Club)	South of 850 BFD	5	Unknown	In Project
8/21	965' S R-31 North Lido Beach	North towards R-31	20	Unknown	Out Project
8/23	1212 BFD (Lido Beach Club)	Due east towards 1212 BFD	74	Condominium (interior/pool lights)	In Project
8/28	FDEP marker R-33	Marker R-30	5	SFR (interior/exterior) condominium (interior)	Out Project

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

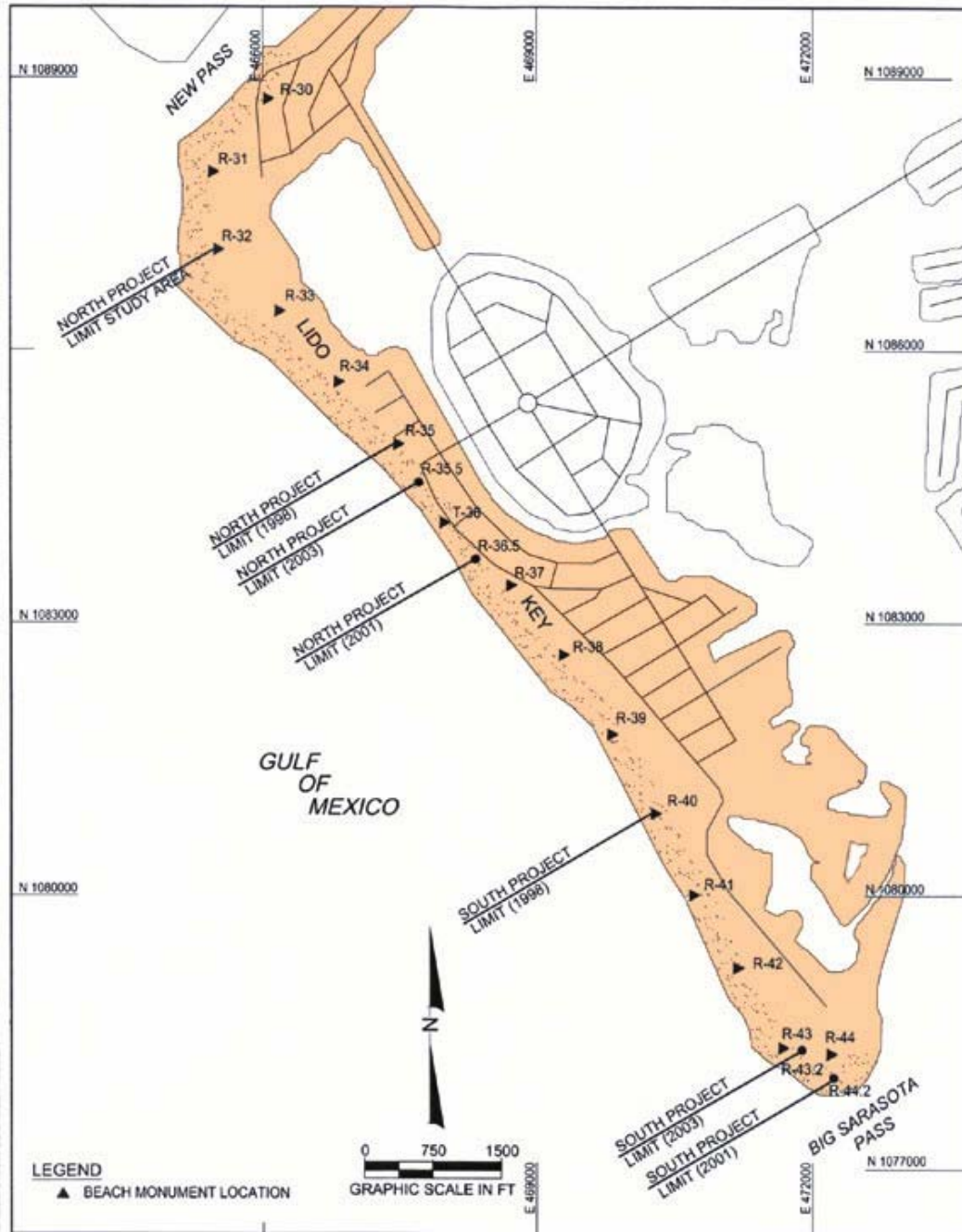


Image copyright 2003 Beaches and Shores Resource Center, Florida State University
beaches10.beaches.fsu.edu/index.html

Figure 1. Lido Key, Sarasota County, Florida nourishment history.

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.



Figure 2. A non-nesting emergence evident by the abandoned nest chamber (top image) and a successful loggerhead nest (bottom image). Species is confirmed by the alternating flipper tracks, and nest is confirmed by the thrown sand during body pitting and nest covering.



Figure 3. Sea turtle nest sign used to identify nests on Sarasota County beaches (left) and a marked sea turtle nest (right).

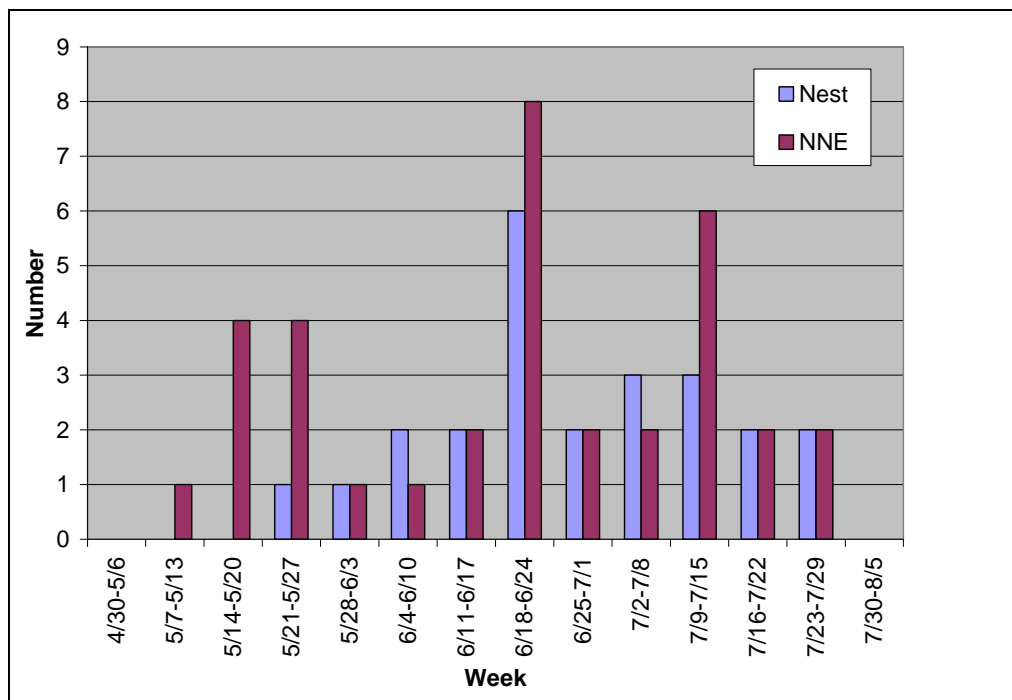


Figure 4. Number of sea turtle nests and non-nesting emergences on Lido Key by week in 2006.

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

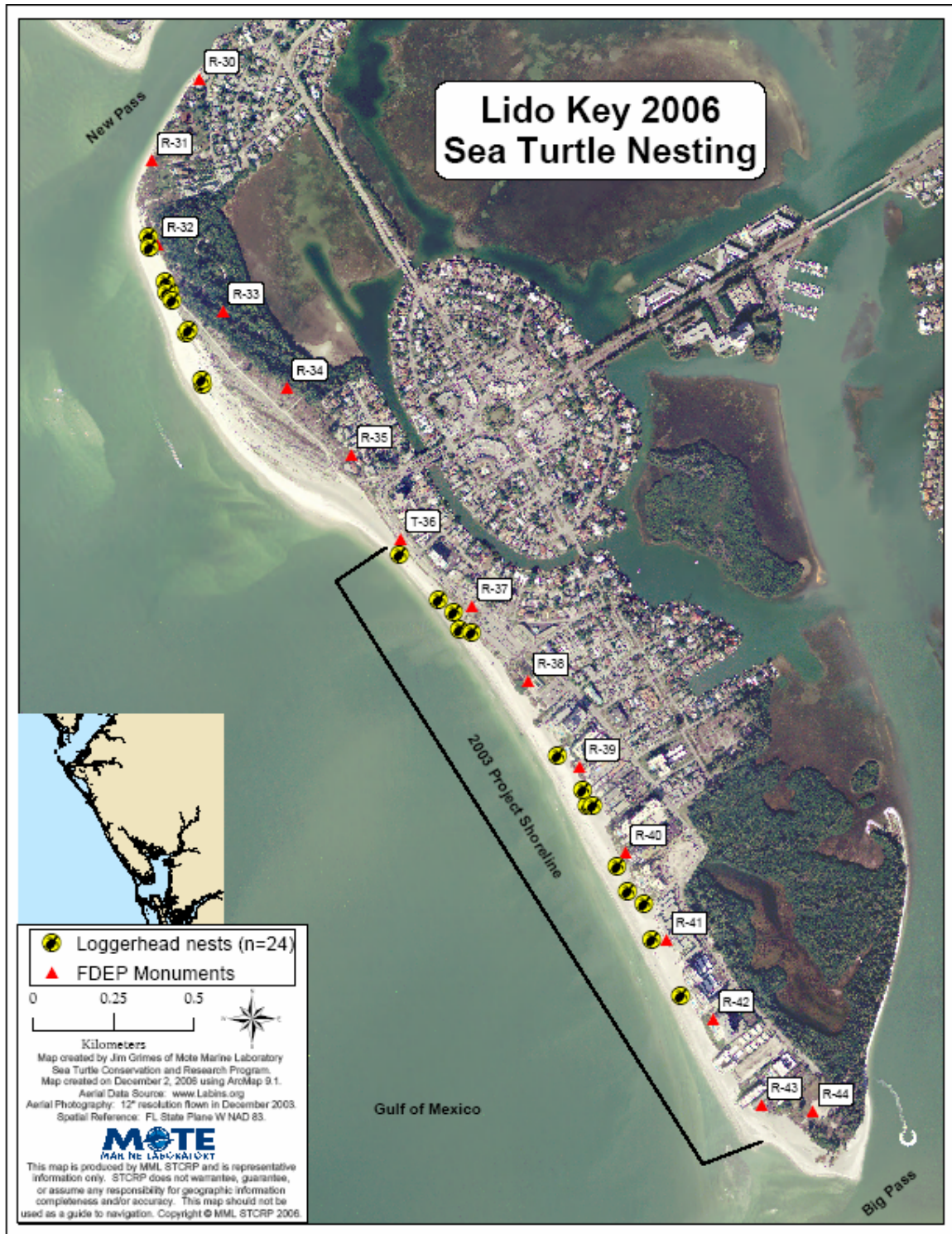


Figure 5. Lido Key nest locations for 2006.

MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

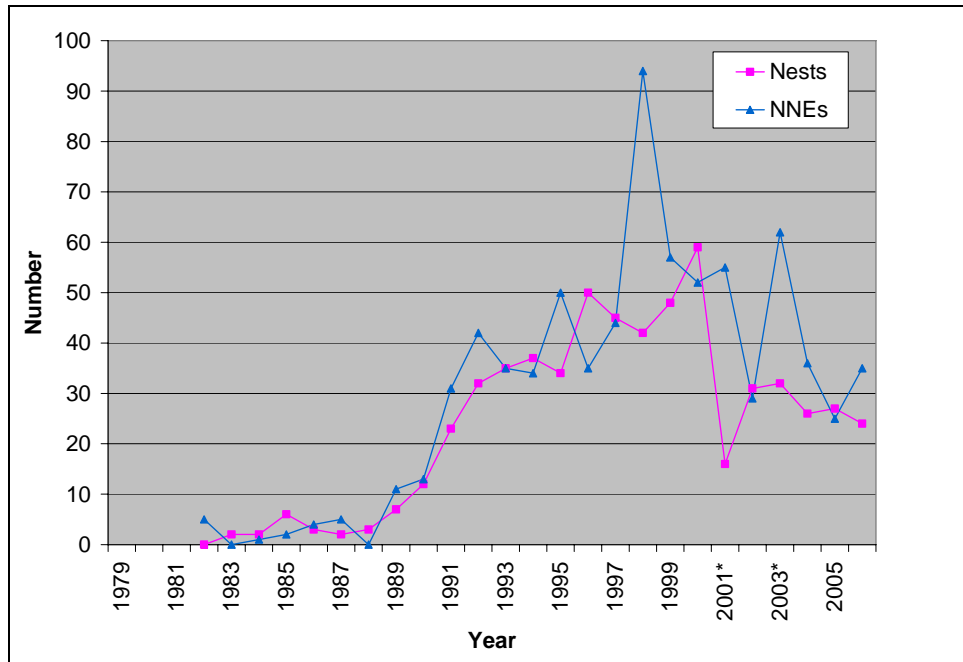


Figure 6. Lido Key sea turtle nesting and non-nesting emergence data from 1982-2006. Nourishment projects in 1998, 2001, and 2003 illustrate that nesting success is skewed after a project with number of NNEs exceeding number of nests.

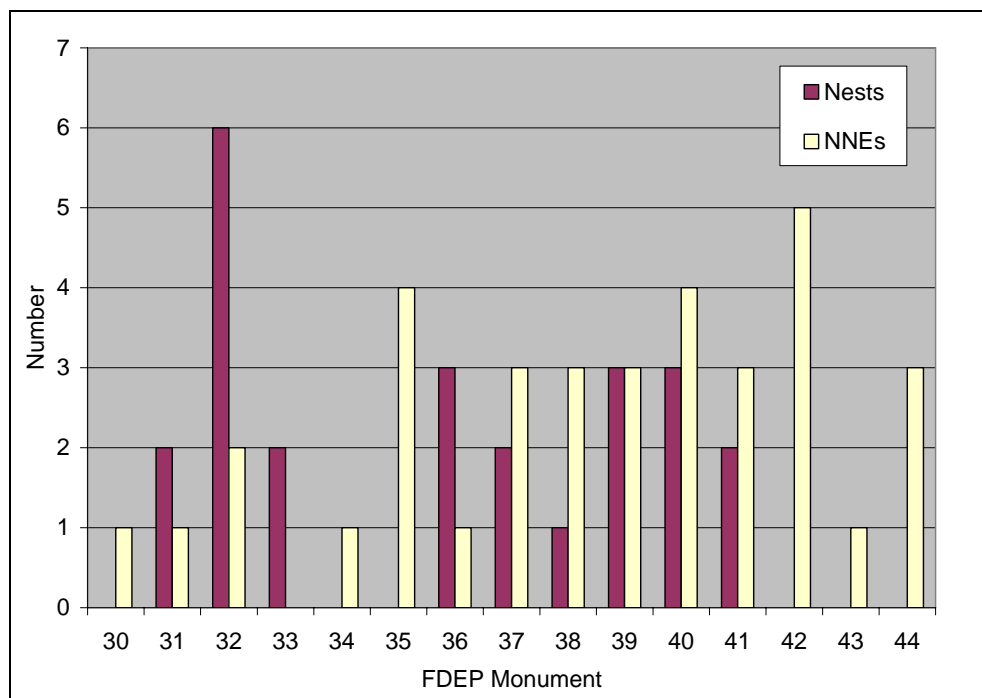


Figure 7. Distribution of nests and non-nesting emergences on Lido Key in 2006 by FDEP monument range.

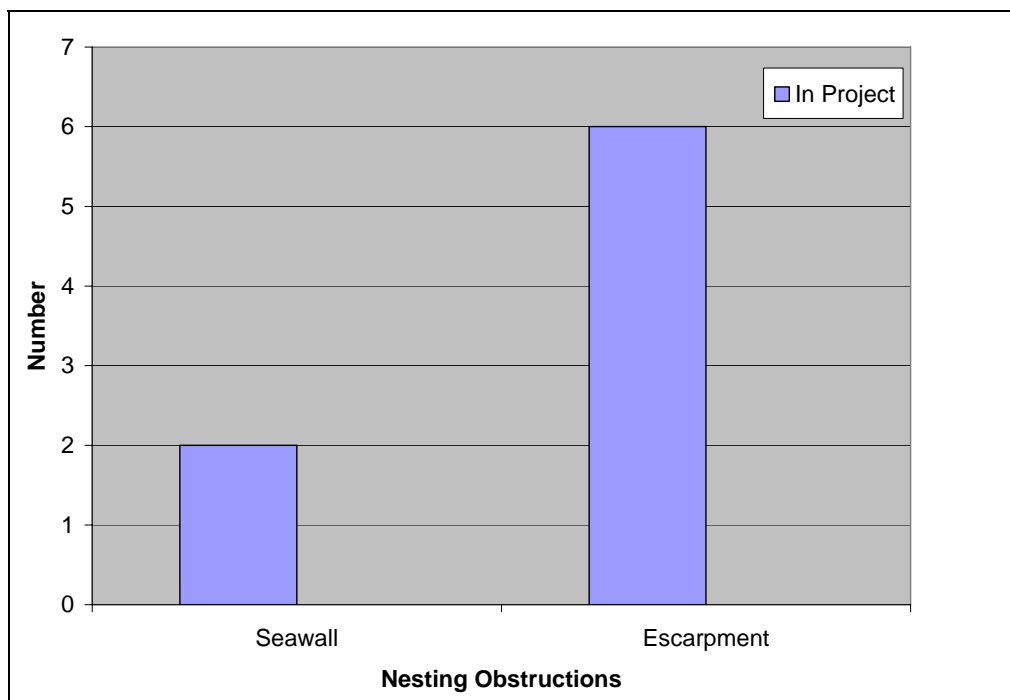


Figure 8. A comparison of the number and type of nesting obstructions encountered by sea turtles on Lido Key in 2006.

Lido Key: Percentages of disoriented nests by year

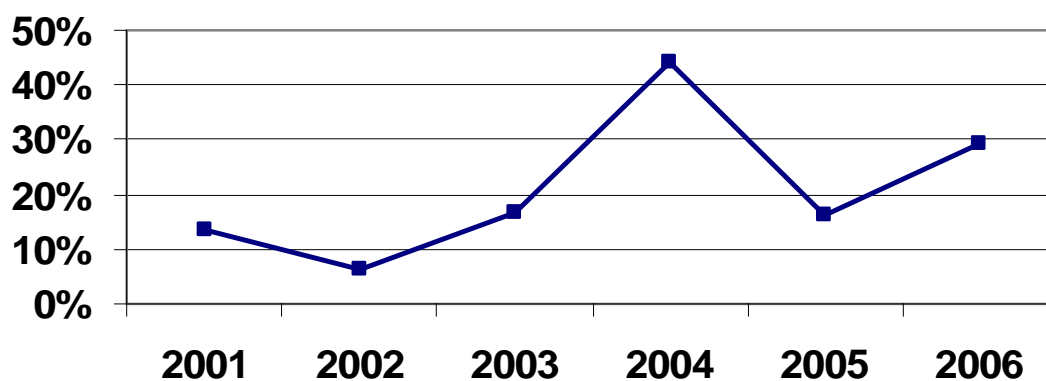


Figure 9. Trends in hatchling disorientation events on Lido Key from 2001 to 2006.

APPENDIX A

NESTS AND NON-NESTING EMERGENCES 2006

FATE OF NEST

Nest Predation: Eggs & Hatchlings (Not Just Digging At Site)

<u>Predator</u>	<u>Date(s)</u>	<u># eggs destroyed</u>	<u># hatchlings destroyed</u>
Raccoon:	_____	_____	_____
Armadillo:	_____	_____	_____
Dog:	_____	_____	_____
Fox:	_____	_____	_____
Ghost Crab:	_____	_____	_____
Fire Ants:	_____	_____	_____
Other:	_____	_____	_____
* Roots:	_____	_____	_____

Water Damage:

Type of Damage: _____ All Date(s) _____

Nest Wash Over _____

Just Stake Loss _____

Standing Water _____

Partial/Total Egg Wash Out _____

*Type of Root Damage **In Nest:** (Circle Appropriate): Encased Eggs / Invaded Eggs / Hatchling Caught In

- ☐ Vandalized: Details:(Dates,What,How) _____
- ☐ Poached: Details:(Dates,# Eggs) _____

HATCH / EXCAVATION / DISORIENTATIONS DATES

Drop date: _____

Disorientation date: _____ (Attach Copy of Form)

Hatch date: _____

Date excavated: _____

Add'l hatch date(s): _____

Excavated by: _____

HATCH AND EXCAVATION DATA

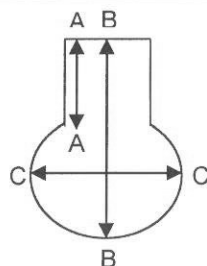
Nest Cavity Data:

Surface to Eggs(A): _____ cm

Surface to Bottom(B): _____ cm

Cavity Width(C): _____ cm

Nest Cavity
Measurements



Longboat Key Only

Was a 100g Sand Sample Taken?
Y / N

What sand type were eggs deposited in?

Layered Fill OR Single Sand Layer

Hatching Data:

Live in nest: _____

Dead in nest: (+) _____

Total hatchlings in nest: = _____

Hatched Eggs Counted: _____

Total Hatchlings in nest: (-) _____

Hatchlings Emerged on own: = _____

Hatched eggs counted: _____

Live pipped: (+) _____

Dead pipped: (+) _____

Eggs Destroyed: (+) _____
(Include Fate of Nest Data)

Eggs Unhatched: (+) _____

Total Eggs in Nest: = _____

OVERALL COMMENTS

APPENDIX B
FWC MARINE TURTLE DISORIENTATION REPORTS 2006



FWC 06 07 18 03 3AR

Permit Holder Initials Year Month Day Dis. # by Day Country Code

FWC MARINE TURTLE HATCHLING DISORIENTATION INCIDENT REPORT FORM

If you have any questions please contact FWC at the Tequesta Field Laboratory (561) 575-5407 or in Tallahassee (850) 922-4330

Turtle Permit #: 054 Date of Incident: 7/18/06
 Observer's Name: J. Budzynkiwicz
 Telephone (include area code): 941-388-4331
 Location of incident (address of source, beach name and/or nearest landmark):
1540 Ben Franklin Drive, Lido Beach, Helmsley Hotel
 City and County: Sarasota, Sarasota County
 Local nest ID# &/or zone nest was located in: 5/25 1540 BFDPL
 Address/landmark hatchlings disoriented towards: upland of 1540 BFD Helmsley Hotel

Was a probable/possible lighting source identified? YES ☒ *NO ☐
 If so, what type(s) of light(s) were identified? (please circle)
 parking lot street light condominium (interior)
 dune crossover single family home (interior) condominium (exterior)
 restaurant/bar single family home (exterior) sky glow/urban glow
 pier other: Hotel
 *If not, why?: (please circle) Too many lights present to determine No possible lights observed
 Describe lighting source(s); include number & type of lights observed: unknown

Incident was documented during (circle one): morning survey night survey
 Was this a caged nest? YES ☐ NO ☒ If yes, what type of cage?
 Was a temporary light barrier used (i.e. Silt screen)? YES ☐ NO ☒
 Was this a relocated nest? YES ☐ NO ☒
 Was the incident photographed? YES ☐ NO ☒
 Was the nest located? YES ☒ NO ☐
 Was the nest excavated? YES ☐ NO ☒
 If yes, how many hours after emergence?



	LOGGERHEAD	GREEN	LEATHERBACK	UNIDENTIFIED
No. OF HATCHLINGS DISORIENTED	N/A			
No. OF HATCHLINGS FOUND DEAD	N/A			
No. OF HATCHLINGS FOUND ALIVE	N/A			
No. OF DISORIENTED HATCHLINGS REACHING WATER	N/A			

Additional comments (please elaborate and use back if necessary):
Footprints were found around the nest
Hatchling prints ran out, couldn't determine how many or exactly where they disoriented to.
Fish Wildlife should have an incident report

Was local authority provided a copy of this report? YES ☒ NO ☐
 If yes, please indicate person and city/county/state department report was copied to:
Meagan Conti, Tallahassee, Kenney Leonard
(561) 343-6228 (941) 861-2267

Signature of Observer: Jam Budzynkiwicz
 Date: 7/18/06

BB



FWC
v SA
v U

PMC 06 07 31 01 SAR

Permit Holder: Initials Year Month Day Dis. # by Day County Code

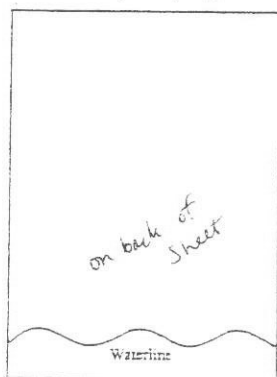
FWC MARINE TURTLE HATCHLING DISORIENTATION INCIDENT REPORT FORM

If you have any questions please contact FWC at the Tequesta Field Laboratory (561) 575-5407 or in Tallahassee (850) 922-4330

Turtle Permit #: 054 Date of Incident: 7-31-06
 Observer's Name: Renee Remanowski
 Telephone (include area code): 321-298-0333
 Location of incident (address of source, beach name and/or nearest landmark): 151 Ben Franklin Drive Lido Beach (Key)
 City and County: Sarasota
 Local nest ID# &/or zone nest was located in: 2
 Address/landmark hatchlings disoriented towards: Holiday Inn (Ben Franklin Drive)

Was a probable/possible lighting source identified? YES ☒ *NO ☐
 If so, what type(s) of light(s) were identified? (please circle)
 parking lot ☐ street light ☐ condominium (interior)
 dune crossover ☐ single family home (interior) ☐ condominium (exterior)
 restaurant/bar ☐ single family home (exterior) ☐ sky glow/urban glow
 pier ☐ other: Holiday Inn (exterior)
 *If not, why?: (please circle) Too many lights present to determine No possible lights observed
 Describe lighting source(s); include number & type of lights observed: one large hotel sign and bright street lights - 3

Incident was documented during (circle one): morning survey night survey
 Was this a caged nest? YES ☐ NO ☒ If yes, what type of cage?
 Was a temporary light barrier used (i.e. Silt screen)? YES ☐ NO ☒
 Was this a relocated nest? YES ☐ NO ☒
 Was the incident photographed? YES ☒ NO ☐
 Was the nest located? YES ☒ NO ☐
 Was the nest excavated? YES ☒ NO ☐
 If yes, how many hours after emergence?



Sketch

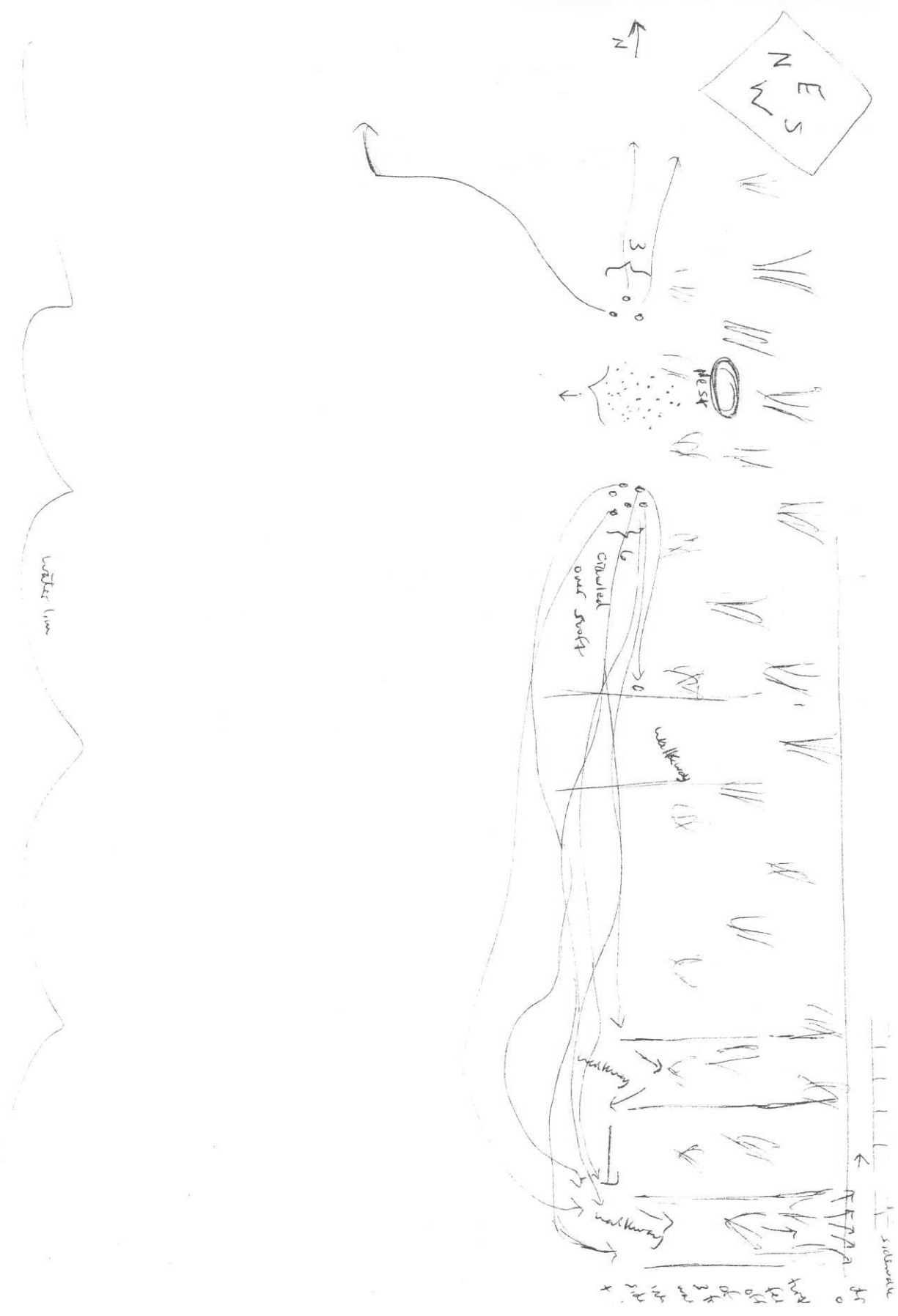
	LOGGERHEAD	GREEN	LEATHERBACK	UNIDENTIFIED
No. OF HATCHLINGS DISORIENTED	9			
No. OF HATCHLINGS FOUND DEAD	0			
No. OF HATCHLINGS FOUND ALIVE	0			
No. OF DISORIENTED HATCHLINGS REACHING WATER	0			

Additional comments (please elaborate and use back if necessary): hatchlings dropped off a 3 foot walkway into street + sidewalk

Was local authority provided a copy of this report? YES ☒ NO ☐
 If yes, please indicate person and city/county/state department report was copied to:
Tony Saputo 746933 Kenya Leonard 8616267
Megan Conti - 561 743 6228

Signature of Observer: Renee Remanowski

Date: 7-31-06





DMC 06 08 05 01 SAR
 Permit Holder Initials Year Month Day Dis. # by Day County Code

FWC MARINE TURTLE HATCHLING DISORIENTATION INCIDENT REPORT FORM

If you have any questions please contact FWC at the Tequesta Field
 Laboratory (561) 575-5407 or in Tallahassee (850) 922-4330

Turtle Permit #: 054 Date of Incident: 8-5-06
 Observer's Name: Dru Hebler/Ann Halbach
 Telephone (include area code): (941) 351-2007 (941) 388-4331
 Location of incident (address of source, beach name and/or nearest landmark): 1234-1330 BFD
Ritz Carlton Beach Club + Residences LIDO BEACH
 City and County: Sarasota, Sarasota
 Local nest ID# &/or zone nest was located in: 6/15/06 1234-1330 BFD LIDO zone 3
 Address/landmark hatchlings disoriented towards: N to 1050 BFD, E to 1234-1330 BFD,
S to 1540 BFD

Was a probable possible lighting source identified? YES X *NO Seen on
 If so, what type(s) of light(s) were identified? (please circle) Bcn at
 parking lot street light condominium (interior) night
 dune crossover single family home (interior) condominium (exterior) 8/3 + 8/4
 restaurant/bar single family home (exterior) sky glow/urban glow
 pier other:

*If not, why?: (please circle) Too many lights present to determine No possible lights observed
 Describe lighting source(s); include number & type of lights observed:

Incident was documented during (circle one): morning survey night survey
 Was this a caged nest? YES NO X If yes, what type of cage?
 Was a temporary light barrier used (i.e. Silt screen)? YES NO X
 Was this a relocated nest? YES NO X
 Was the incident photographed? YES NO X
 Was the nest located? YES X NO
 Was the nest excavated? YES X NO
 If yes, how many hours after emergence? 7-8 hours



	LOGGERHEAD	GREEN	LEATHERBACK	UNIDENTIFIED
No. OF HATCHLINGS DISORIENTED	<u>~45</u>			
No. OF HATCHLINGS FOUND DEAD	<u>0</u>			
No. OF HATCHLINGS FOUND ALIVE	<u>3</u>			
No. OF DISORIENTED HATCHLINGS REACHING WATER	<u>~32</u>			

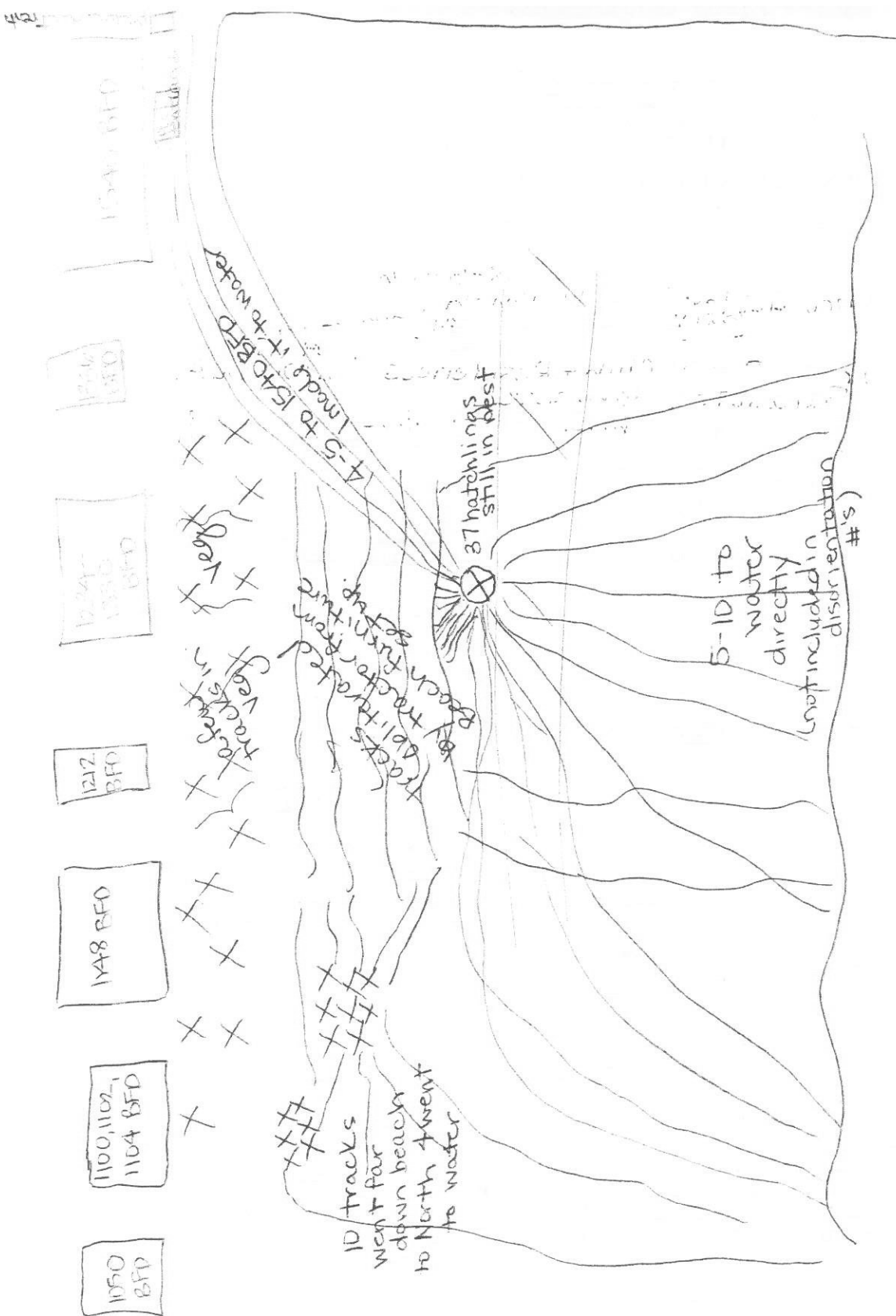
Additional comments (please elaborate and use back if necessary): 8/3/06 12 hatchlings hatched
Nest watched in the evening of 8/3 and 8/4. Hatchlings
disoriented. N, E, and S. 2 live hatchlings found at Ritz pool
and released in AM. 1 live hatchling found in tracks. Tracks
to N and S followed for ~100-200 yds. Tracks to E were obliterated
by tractor tracks + foot traffic from Ritz employees putting up
beach furniture.

Was local authority provided a copy of this report? YES X NO
 If yes, please indicate person and city/county/state department report was copied to:
Megan Conti - FWC - 561-743-6228
Kerbya Leonard - County Code Officer - 861-6267

Ann Marie Halbach
 Signature of Observer

8/5/06
 Date

56



FWC
LIBD



PMIC 06 08 09 02 SAR

Permit Holder Initials Year Month Day Dis. # by Day County Code

FWC MARINE TURTLE HATCHLING DISORIENTATION INCIDENT REPORT FORM

If you have any questions please contact FWC at the Tequesta Field
Laboratory (561) 575-5407 or in Tallahassee (850) 922-4330

Turtle Permit #: 054 Date of Incident: 8/9
Observer's Name: JEN BEGGS
Telephone (include area code): 388-4441 x308 941-388-9331
Location of incident (address of source, beach name and/or nearest landmark): 850 BEN FRANKLIN DR

City and County: LIBD KEY, SARASOTA
Local nest ID# &/or zone nest was located in: 6112 850 BFD AB
Address/landmark hatchlings disoriented towards: South of 850 BFD - no specific address

Was a probable/possible lighting source identified? YES *NO X
If so, what type(s) of light(s) were identified? (please circle)
parking lot street light condominium (interior)
dune crossover single family home (interior) condominium (exterior)
restaurant/bar single family home (exterior) sky glow/urban glow
pier other:
*If not, why?: (please circle) Too many lights present to determine No possible lights observed

Describe lighting source(s); include number & type of lights observed:
HATCHLINGS TRAVELLED S. BUT NOT TO A SPECIFIC ADDRESS.

Incident was documented during (circle one): morning survey night survey
Was this a caged nest? YES NO X If yes, what type of cage?
Was a temporary light barrier used (i.e. Silt screen)? YES NO X
Was this a relocated nest? YES NO X
Was the incident photographed? YES NO X
Was the nest located? YES X NO
Was the nest excavated? YES NO X
If yes, how many hours after emergence?



Sketch

	LOGGERHEAD	GREEN	LEATHERBACK	UNIDENTIFIED
No. OF HATCHLINGS DISORIENTED	5			
No. OF HATCHLINGS FOUND DEAD	0			
No. OF HATCHLINGS FOUND ALIVE	0			
No. OF DISORIENTED HATCHLINGS REACHING WATER	1			

Additional comments (please elaborate and use back if necessary):
MINOR DISORIENTATION - 5 TRACKS PARALLEL TO SHORE FOR 70+M TO THE SOUTH OF 850 BEN FRANKLIN DR.

Was local authority provided a copy of this report? YES X NO
If yes, please indicate person and city/county/state department report was copied to:
KENYA LEONARD 861-6267
MEGHAN CONTI 561-743-6228

Signature of Observer: Jen Beggs
DNR-FMRI 33-714 Revised 6/29/92, 11/12/96, 9/97, 1/99, 3/01, 11/01

Date: 8/9/06 JS.

PMIC 06 08 22 01 SAR

Permit Holder: Initials Year Month Day Dis. # by Day County Code

FWC MARINE TURTLE HATCHLING DISORIENTATION INCIDENT REPORT FORM

If you have any questions please contact FWC at the Tequesta Field
Laboratory (561) 575-5407 or in Tallahassee (850) 922-4330

Turtle Permit #: 054 Date of Incident: 8/21/06
Observer's Name: JENNIFER BEGGS
Telephone (include area code): 388 4441 x308
Location of incident (address of source, beach name and/or nearest landmark):
905' S of R31 North Lido Park
City and County: LIDO KEY SARASOTA
Local nest ID# &/or zone nest was located in: W/25 905S R31SS
Address/landmark hatchlings disoriented towards: North toward R31

Was a probable/possible lighting source identified? YES *NO X
If so, what type(s) of light(s) were identified? (please circle)
parking lot street light condominium (interior)
dune crossover single family home (interior) condominium (exterior)
restaurant/bar single family home (exterior) sky glow/urban glow
pier other:
*If not, why?: (please circle) Too many lights present to determine No possible lights observed

Describe lighting source(s); include number & type of lights observed:
may have been a glow from buildings to north, but
unsure what caused misorientation

Incident was documented during (circle one): morning survey night survey
Was this a caged nest? YES NO X If yes, what type of cage?

Was a temporary light barrier used (i.e. Silt screen)? YES NO X
Was this a relocated nest? YES NO X
Was the incident photographed? YES NO X
Was the nest located? YES X NO
Was the nest excavated? YES X NO
If yes, how many hours after emergence?



Sketch

	LOGGERHEAD	GREEN	LEATHERBACK	UNIDENTIFIED
No. OF HATCHLINGS DISORIENTED	20+			
No. OF HATCHLINGS FOUND DEAD	0			
No. OF HATCHLINGS FOUND ALIVE	1			
No. OF DISORIENTED HATCHLINGS REACHING WATER	9			

Additional comments (please elaborate and use back if necessary): 20+ traveled behind
dune into vegetation & traveled north along dirt / sand
road. 9 tracks gone back over dune to sea -
others lost in vegetation. Some traveled 30+ m
along road.

Was local authority provided a copy of this report? YES ✓ NO

If yes, please indicate person and city/county/state department report was copied to:

Kenna Leonard - 861-6267
Meghan Conti - 561-743-6228

Signature of Observer: Jenny Beggs

Date: 8/22/06

FW
VSAR

FWC 00 08 23 02 SAR

Permit Holder Initials Year Month Day Dis. # by Day County Code

FWC MARINE TURTLE HATCHLING DISORIENTATION INCIDENT REPORT FORM

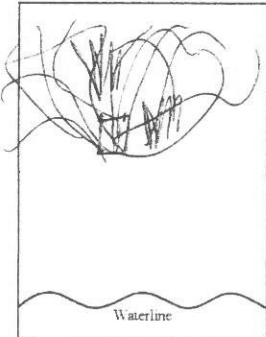
If you have any questions please contact FWC at the Tequesta Field Laboratory (561) 575-5407 or in Tallahassee (850) 922-4330

Turtle Permit #: 054 Date of Incident: 8/23/06
Observer's Name: P. Clark
Telephone (include area code): 941-388-4331
Location of incident (address of source, beach name and/or nearest landmark):
1212 Ben Franklin Drive, Lido Beach
City and County: Tallahassee, FL
Local nest ID# &/or zone nest was located in: 7/B 1212C-MDPC
Address/landmark hatchlings disoriented towards:
Due east at same property

Was a probable/possible lighting source identified? YES ☒ *NO ☐
If so, what type(s) of light(s) were identified? (please circle)
parking lot street light condominium (interior)
dune crossover single family home (interior) condominium (exterior)
restaurant/bar single family home (exterior) sky glow/urban glow
pier other: possible pool light
*If not, why?: (please circle) Too many lights present to determine No possible lights observed

Describe lighting source(s); include number & type of lights observed:
low light by pool

Incident was documented during (circle one): morning survey night survey
Was this a caged nest? YES ☐ NO ☒ If yes, what type of cage?
Was a temporary light barrier used (i.e. Silt screen)? YES ☐ NO ☒
Was this a relocated nest? YES ☐ NO ☒
Was the incident photographed? YES ☐ NO ☒
Was the nest located? YES ☒ NO ☐
Was the nest excavated? YES ☒ NO ☐
If yes, how many hours after emergence? 4



Sketch

	LOGGERHEAD	GREEN	LEATHERBACK	UNIDENTIFIED
No. OF HATCHLINGS DISORIENTED	74			
No. OF HATCHLINGS FOUND DEAD	1			
No. OF HATCHLINGS FOUND ALIVE	2			
No. OF DISORIENTED HATCHLINGS REACHING WATER	~70			

Additional comments (please elaborate and use back if necessary): Possible interior condo light or light by the pool drew hatchlings east & displaced them. Hatchlings were light up then turned off as most hatchlings turned toward water.

Was local authority provided a copy of this report? YES ☒ NO ☐
If yes, please indicate person and city/county/state department report was copied to:

Michael Conti, FWC
Rebecca Leonard, SAR

Signature of Observer: Paul Clark Date: 8/23/06

AW

PMC 06 08 28 01 SAR

Permit Holder Initials Year Month Day Dis. # by Day County Code

FWC MARINE TURTLE HATCHLING DISORIENTATION
INCIDENT REPORT FORMIf you have any questions please contact FWC at the Tequesta Field
Laboratory (561) 575-5407 or in Tallahassee (850) 922-4330

Turtle Permit #: 054 Date of Incident: 8/28/06
 Observer's Name: P. Clark
 Telephone (include area code): 941 388-4331
 Location of incident (address of source, beach name and/or nearest landmark):
R-33, Lido Beach
 City and County: Sarasota, Sarasota
 Local nest ID# &/or zone nest was located in: 0124 R-33 PC
 Address/landmark hatchlings disoriented towards: R-30

Was a probable/possible lighting source identified? YES X *NO
 If so, what type(s) of light(s) were identified? (please circle)
 parking lot street light condominium (interior)
 dune crossover single family home (interior) condominium (exterior)
 restaurant/bar single family home (exterior) sky glow/urban glow
 pier other:

*If not, why?: (please circle) Too many lights present to determine No possible lights observed

Describe lighting source(s): include number & type of lights observed:

possible exterior light on private homes @ R-30
also possible condo light @ 1 BFD (Ben Franklin Drive)

Incident was documented during (circle one): morning survey night survey also dog prints on
 Was this a caged nest? YES NO X If yes, what type of cage? hatchlings tracks go
 Was a temporary light barrier used (i.e. Silt screen)? YES NO X to water



Was this a relocated nest? YES NO X
 Was the incident photographed? YES NO X
 Was the nest located? YES X NO
 Was the nest excavated? YES X NO X
 If yes, how many hours after emergence? 4

	LOGGERHEAD	GREEN	LEATHERBACK	UNIDENTIFIED
No OF HATCHLINGS DISORIENTED	<u>~5</u>			
No OF HATCHLINGS FOUND DEAD	<u>0</u>			
No OF HATCHLINGS FOUND ALIVE	<u>0</u>			
No OF DISORIENTED HATCHLINGS REACHING WATER	<u>0</u>			

Additional comments (please elaborate and use back if necessary): Obvious light source
from southeast also dog tracks around the
hatchlings that were heading to water causing
those hatchlings to wander before entering water.

Was local authority provided a copy of this report? YES ✓ NO
 If yes, please indicate person and city/county/state department report was copied to:

Meghan Clark, FWC
Kerisa K. Conrad, SAR
P. Clark

Signature of Observer
 DNR FMRJ 33-714 Revised 6/29/92, 11/12/96, 9/97, 1/99, 3/01, 11/01

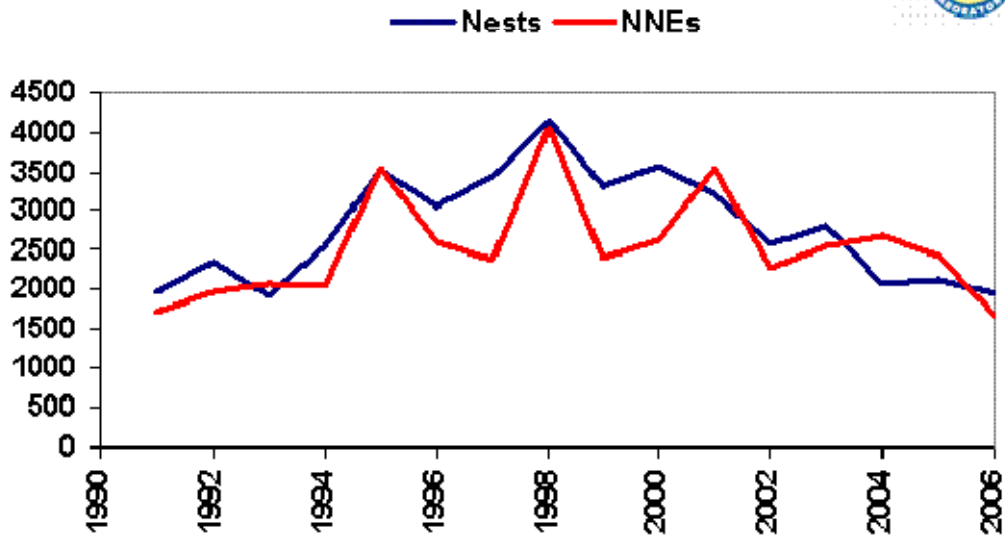
Date

8/28/06

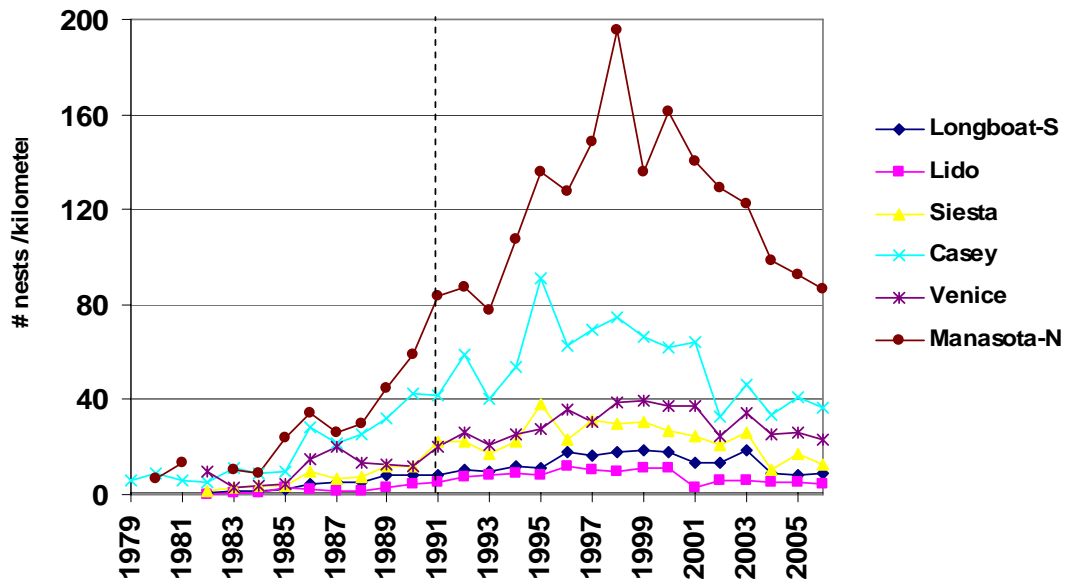
APPENDIX C

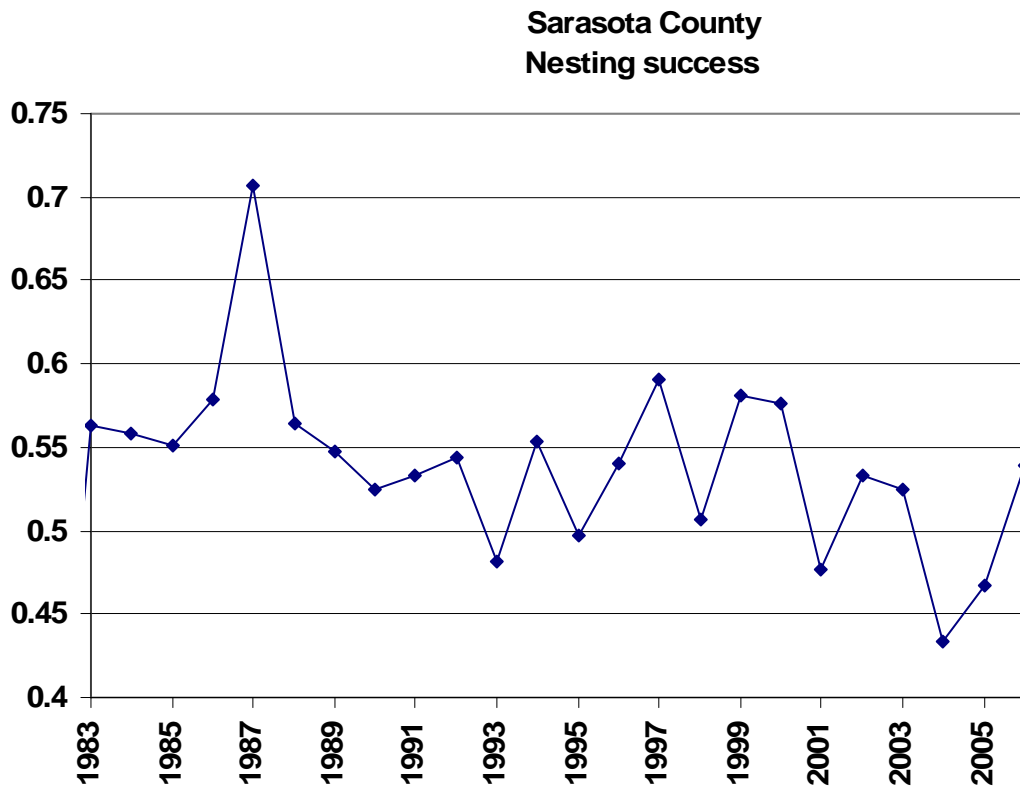
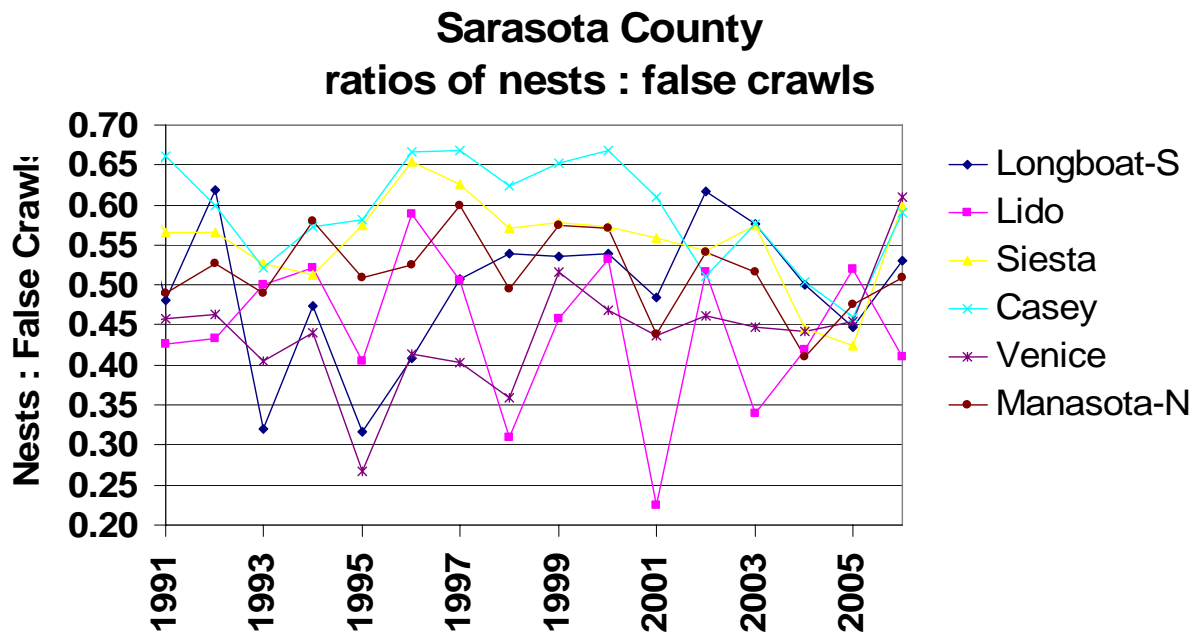
SARASOTA COUNTY TRENDS 2006

Sarasota County- loggerhead nesting trends



Sarasota County - loggerhead nesting
(monitoring standardized in 1991)

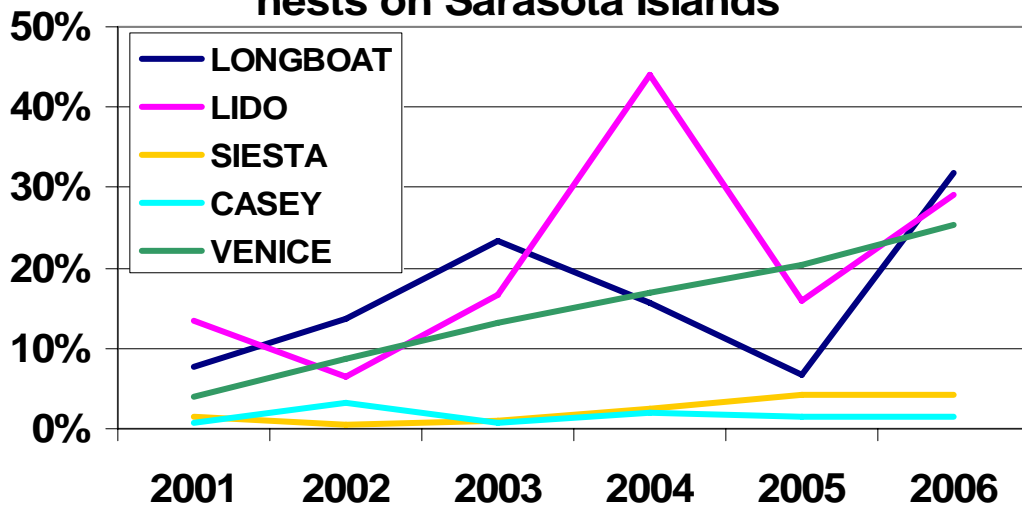




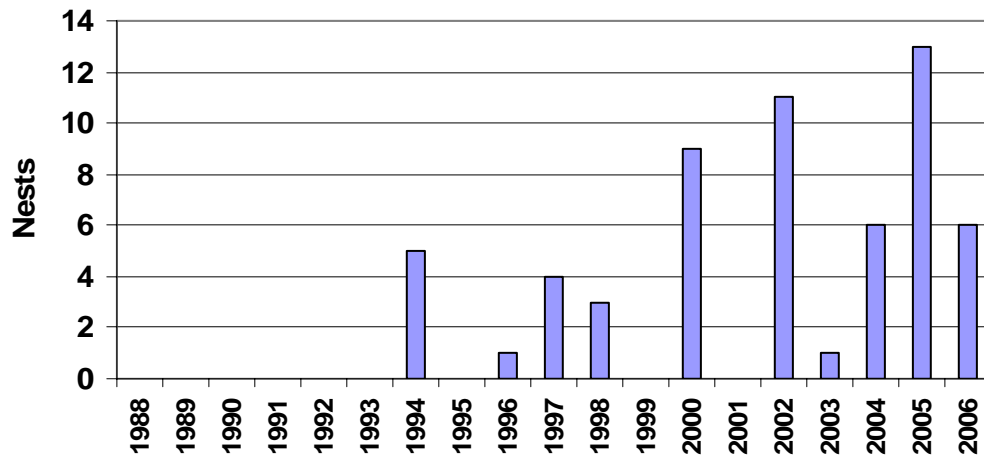
MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

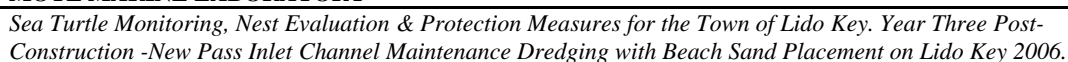
Disorientations as percentages of all nests on Sarasota Islands



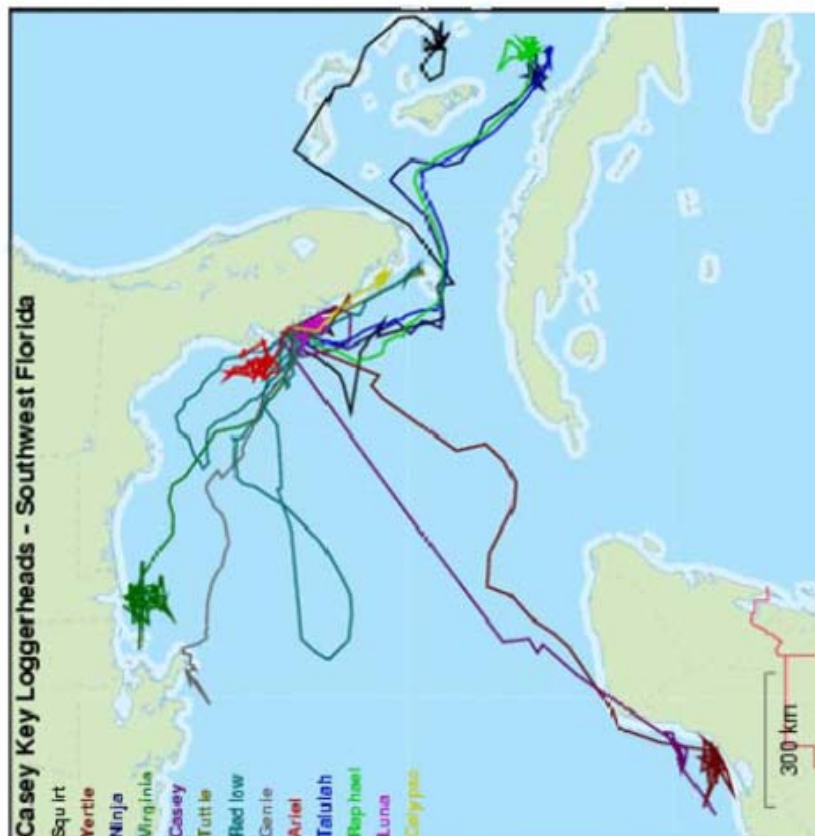
Sarasota County - green turtle nests



Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.



These results have a number of policy implications and need to be taken into account by the relevant stakeholders. The first is that the results suggest that the current regulatory framework is not sufficient to ensure that the public is adequately informed of the benefits and risks of GM crops. This is particularly true for the case of GM crops that are not currently marketed in the EU. The second is that the results suggest that the current regulatory framework is not sufficient to ensure that the public is adequately informed of the benefits and risks of GM crops. This is particularly true for the case of GM crops that are not currently marketed in the EU. The third is that the results suggest that the current regulatory framework is not sufficient to ensure that the public is adequately informed of the benefits and risks of GM crops. This is particularly true for the case of GM crops that are not currently marketed in the EU.



BEACH NOURISHMENT AND ITS EFFECTS ON NESTING SEA TURTLES

Alli Hays, Tony Tucker, Jan Beggs, and Ryan Welsh



WHAT IS BEACH NOURISHMENT?

Beach nourishment is sand pumped onto a narrow stretch of beach to offset erosion.

WHY NOURISH BEACHES?

Beaches are nourished to better protect against extreme weather conditions (such as hurricanes) and to provide more beach area for recreational and aesthetic appeal.

HOW ARE BEACHES NOURISHED?

Sand is dredged from an offshore borrow site and pumped through a pipeline onto the beach.



HOW DOES BEACH NOURISHMENT AFFECT SEA TURTLES?

Beach nourishment affects the nesting activity and the hatch and emergence success of sea turtles.

Sea turtles are selective when nesting and are affected by factors such as beach slope, resistance, beach shape, sand density, and grain size and shape – all of which influence where and how much energy is required for a turtle to nest.

Differences in sand density, moisture content, grain color, grain size and shape, temperature, and moisture content can all affect the hatch and emergence success of nests laid in new sand.

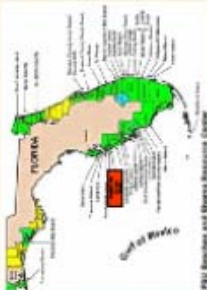


Beach nourishment can affect the nesting activity and the hatch and emergence success of sea turtles. Beach nourishment can also affect the nesting activity and the hatch and emergence success of sea turtles.



BEACH NOURISHMENT IN FLORIDA

The left map indicates Florida beaches that have undergone nourishment as of 2005, including three Sarasota County beaches. The right map shows the location of the beach nourishment project in Lido Key, Florida. The map shows the location of the beach nourishment project in Lido Key, Florida. The map shows the location of the beach nourishment project in Lido Key, Florida.

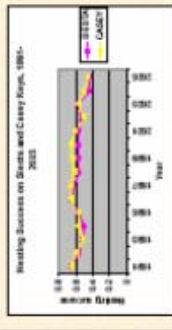


SARASOTA COUNTY

Native Beaches: Santa Key and Casey Key

Nourished Beaches: Longboat Key, Lido Key, and Venice Beach

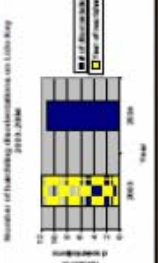
On native beaches, the nesting success is mainly affected by natural factors. The following graph shows the nesting success of Sarasota County's native beaches (Santa Key and Casey Key) from 1991-2005.



Nesting Successes

The creation of a higher and wider beach profile, which is more stable (left photo), which contributes to more hatching. Hatching success on native beaches. On Lido Key, the number of hatchlings in 2004, one year post nourishment, represents a 120% increase over the number of hatchlings in 2003 (see graph on right).

Number of hatchlings on Lido Key 2003-2004



CONCLUSIONS

Beach nourishment is regularly occurring throughout the state of Florida to widen narrow beaches. 2005 was a record year with 17-20 projects occurring.



Nourishment projects may impact the ability of the sea turtle population to recover because of its effects on nesting activity.



Made it continuing to document the full extent of nourishment events on nesting sea turtles and emerging hatchlings. If the current beach design is not conducive for sea turtles, perhaps the design can be modified to better accommodate nesting turtles and still provide a new and wider beach.





SEA TURTLE DISORIENTATIONS IN SARASOTA COUNTY, FLORIDA

Jan Beggs, Ryan Welch, Tony Tucker, All Hays, Jim Gilmore, Mario Mola, Paula Clark, and Sarah Condon



HATCHLING FACTS:



• Sea turtle hatchlings orient themselves to the sea by finding the brightest horizon. The brightest natural horizon should be that of the sea.

• Artificial lights alter the brightest horizon and cause hatchlings to travel inland.



• It is estimated that only 1 in over 1,000 hatchlings makes it to maturity in order to breed.

IF HATCHLINGS TRAVEL INLAND:

• They are far less likely to find the sea. They may die from dehydration, predation by crabs or birds, fall into pools, or become lost in parking lots and gardens.



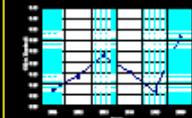
IF ADULT FEMALES TRAVEL INLAND:

• They can travel inland, become lost, dehydrate and die. The same lights that affect hatchlings can also affect adults.

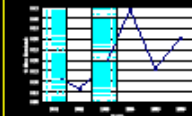


PROPORTION OF LOGGERHEAD NESTS DISORIENTED BETWEEN 2001-2006 BY KEY

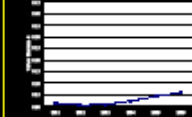
Indicate years of nonorientation. Previous studies done by Mote Marine Laboratory indicate that there is typically an increase in hatchling disorientation events in the year following a reevaluation project.



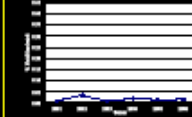
• Longboat Key
- highly developed, primarily hotels and condominiums
- low density nesting beach



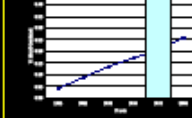
• Lido Key
- highly developed, primarily hotels and condominiums
- very low density nesting beach



• Siesta Key
- less developed, primarily residential/ single family homes
- medium density nesting beach



• Casey Key
- less developed, primarily residential/ single family homes
- high density nesting beach



• Venice
- highly developed, primarily hotels and condominiums
- high density nesting beach

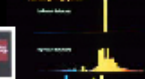
"KEEP IT LOW, KEEP IT LONG, KEEP IT SHIELDED"

Turtle-friendly lighting includes all of the following:

✓ Keep it LOW: LOW mounting height and LOW wattage



✓ Keep it LONG: Light bulbs using LONG wavelengths (monochromatic in reds & yellows) are seen less by turtles



✓ Keep it SHIELDED: Shield lights so that they are not visible from the beach.

Lights can be shielded by natural vegetation, existing structures, or by metal shielding.

Lights should focus downward to provide light where needed, but retain darkness elsewhere.



MOTE MARINE LABORATORY

Sea Turtle Monitoring, Nest Evaluation & Protection Measures for the Town of Lido Key. Year Three Post-Construction -New Pass Inlet Channel Maintenance Dredging with Beach Sand Placement on Lido Key 2006.

¹⁰Florida Dept. of Env. Protection

[illegible]

These loggers (Figure 4) were used to record temperatures. These are relatively small, battery-powered devices that can be used for continuous recording of a microcomputer and a temperature logger. The loggers were programmed to record temperatures at 1-min intervals. The loggers can accurately record temperatures to approximately $\pm 0.1^\circ\text{C}$. Colson, HCBOS, Cyclic thermoses, HCBOS, and 1-Billion were used to record temperatures. The loggers were programmed in the laboratory at the University of Missouri at St. Louis and at John Muir Research Station. The loggers were used to record temperatures every 1 to 3 years. They were mounted in plastic bags with conditions of treatment. The loggers were placed on longitudinal sealing benches that were representative of most log-shear benches used in the field. The loggers were indicated by collaborators familiar with such a bench.

[illegible]

Each data logger was placed at a depth to approximate the center of a logribhead nest (60 cm). The data logger was retrieved at the end of the nesting season. The data were downloaded to a computer and then exported to Microsoft for analysis. The maximum temperature, minimum temperature, and average temperature during the nesting season were calculated for each location.

Like all sea turtles, the loggerhead (Figure 1) possesses temperature-dependent sex determination. The sex of the hatchling is determined by the incubation temperature of the egg, with temperatures of approximately 27.5°C and below producing males, and temperatures of approximately 29°C and above producing females (Baskin and Baskin 1998, and Schwenk et al. 1999). SIO can produce a variety of sex ratios as a function of incubation temperature (Witzgall, 2000).

In the current study, eight bench sites were examined during the 2004 seedling season during the 2005 seedling season (Figure 2). The purpose of the current study was to determine whether the use of larger-bread seedling benches throughout Florida in order to provide a continuous supply of seedlings to the transplant stream throughout the range of fingerbread seedling. This study only examined the effect of seedling bench type on the production of seedlings from January to April. The study found that the production of seedlings from January to April was higher for the larger-bread seedling benches than for the smaller-bread seedling benches. The study found that the production of seedlings from January to April was higher for the larger-bread seedling benches than for the smaller-bread seedling benches. The study found that the production of seedlings from January to April was higher for the larger-bread seedling benches than for the smaller-bread seedling benches.

1

Methods

Figure 1. Four photographs showing people participating in various outdoor activities: a person on a beach, a person on a beach, a person on a beach, and a person on a beach.

Two layers are shown in each of the representative water droplets (scale would be 10 μ m).

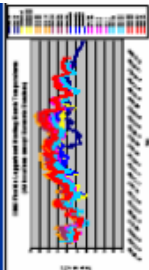
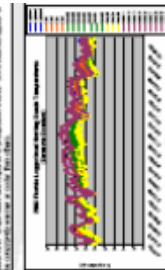
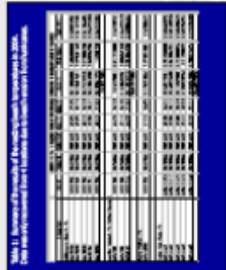
RESULTS AND DISCUSSION

A total of 38 data loggers were deployed in 2002 and 14 were recovered. This temperature data can be seen in Table 1 and Figure 6. A total of 56 data loggers were deployed for 2003 study in 2005 and 56 were recovered (see Table 2 and Figures 7-8). The 2004-2005 hurricane season was particularly destructive and resulted in data logger losses. Although data loggers were lost in several of the aging basins due to the erodence of

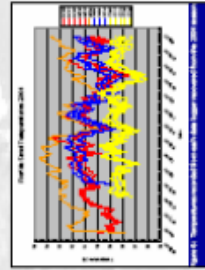
In general, beach temperatures during the nesting season varied according to weather and, in particular, to precipitation. The range of temperatures recorded in the current study adequately reflected the temperature range of temperatures previously documented for the region (e.g. 10–30°C) (Barnard 1992). The mean air and sand temperatures were within a range of 24–23°C, with an average of 26.0°C. The overall average temperature of 26°C. The overall average temperature of all beaches in 2005 was 26.05°C, which is slightly above the average ground temperature for the longhorn cow lizards. In general, the temperature variation within a beach was less than the temperature variation among beaches.

The results also indicate that some beaches may be consistently warmer or cooler than others, for example Boca Raton and Jupiter Beach on the Atlantic coast were the warmest beaches, whereas some of the cooler beaches such as South Island and Cape Sable were in the Gulf of Mexico. These results indicate that ocean beaches may be important for the production of females and that ocean beaches may be important for the production of males.

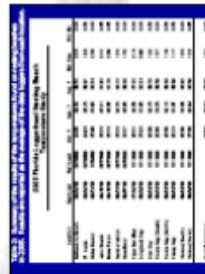
The findings of this study facilitate the identification of nesting beaches which may be of conservation and management interest due to their thermal characteristics. This sort of information can have significant implications for the management of loggerhead rookeries in the northeastern United States.

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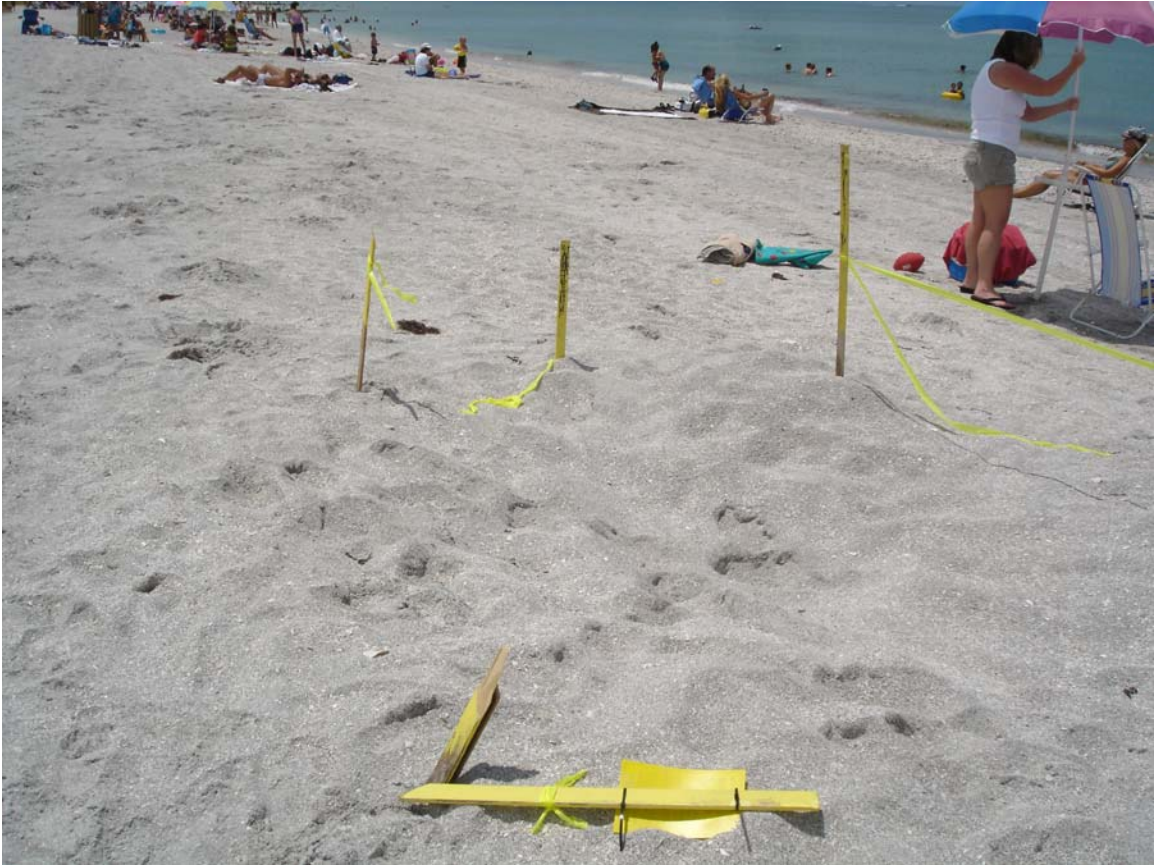
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This research was made possible through support by the Mississippi-Alabama Sea Grant Consortium, the University of Alabama at Birmingham, GAANS Fellowship, NSF GK-12 Fellowship, and the Florida Fish and Wildlife Conservation Commission (Sea Turtle License 1905).

APPENDIX E

LIDO KEY PHOTOGRAPHS 2006



Nest 6/24 333BFDDL on Lido Key that had stakes removed and broken for use as soccer goals.