SEA TURTLE PROTECTION MEASURES INCLUDING NEST/HATCH AND SAND COMPACTNESS MONITORING

FOR THE

LONGBOAT KEY BEACH RESTORATION PROJECT
SARASOTA COUNTY
1993 ACTIVITIES SUMMARY

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INTRODUCTION

BACKGROUND

On October 1, 1992, with the concurrence of the U.S. Fish and Wildlife Service (USFWS), the Florida Department of Environmental Protection (FDEP) (formerly Florida Department of Natural Resources) approved Permit Number DBS 910279 ST, for the Town of Longboat Key (permittee) Beach Nourishment Project. This permit allowed the nourishment of 9.8 miles of Longboat Key beach and imposed several special permit conditions. One of the special conditions seeks to prevent adverse impacts to marine turtles. Longboat Key beaches host a significant nesting population of *Caretta caretta* (the loggerhead turtle). *Caretta caretta* is listed as a threatened species under the U.S. Endangered Species Act, 1973 and Chapter 370, F.S. This report summarizes measures taken to address Special Permit Condition Number 7 which stipulates:

1) Monitoring for marine turtle nesting must commence 65 days prior to construction or on April 15 whichever is later.
2) Relocation of endangered nests must occur between sunrise and 9 A.M. daily.
3) Nest survey, nest relocation, screening or caging activities, and nest success evaluations shall be conducted by persons with prior experience and authorized to conduct such activities through a current and valid FDEP Marine Turtle Permit.
4) Immediately after completion of construction activities and prior to March 15 of the next two nesting seasons monitoring of sand compactness shall be performed following FDEP sand compactness protocol. Areas where compactness exceeds 500 Cone Penetrometer Units (CPU) shall be plowed to a depth of 36 inches.
5) Surveys for escarpment of beach berm shall be made in March of the two years following the project completion. Escarpments interfering with marine turtle nesting or which exceed 18 inches in height for a distance of 100 feet shall be leveled to the natural beach contour prior to April 15 of the two nesting seasons following initial construction. Escarpments that occur during the nesting season shall be leveled immediately while protecting both *in situ* and relocated nests.
6) Reports of nesting activity, protection measures and nest success shall be provided for the initial nesting season and for a minimum of two additional nesting seasons. Monitoring of nesting activity for the two seasons following construction shall include but not be limited to daily surveys enumerating nesting activity and evaluation of hatch success for *in situ* and relocated nests.

This report documents the marine turtle protection measures, nesting activity, and nest success for the Sarasota County portion, and the results of sand compactness monitoring for the entire Sarasota/Manatee County length of Longboat Key for the initial post-project nesting season.

PROJECT LOCATION AND DESCRIPTION

The beach restoration project resulted in sand being placed along slightly more than nine miles of the Longboat Key shoreline. This required a total volume of sand in excess of two and a half million cubic yards. The target berm elevation for most of the length was +7 feet (NGVD) and the overall average volumetric increase was about 50 cubic yards per linear foot of shoreline. However, because of large variations in the shape of the native beaches and the presence of armoring structures, the range of volumetric change along the beach is large. Similarly, the initial increase in the width of beach (the seaward displacement of the waterline by the fill) varied from as little as 30 feet to more than 200 feet. The typical or average constructed width was 140 to 150 feet.

Constructed fill slopes are far steeper than native beaches and, as a result, the profile undergoes a period of initial adjustment which is an expected and predicted part of the project design. During this adjustment, the constructed beach width decreases and vertical escarpments often form in the fill near the waterline. When such escarpments were observed during monitoring, they were reported and the contractor or the Town took action to grade or smooth the profile flat again.

As a result of the rapid initial profile adjustment, the net increase in beach width available for most of the nesting season (July and August) was in the range of 65 to 75 feet. The fundamental difference between the pre- and post-project beach geometry, however, is not the width, but the continuity. The native beaches were comprised of a combination of many small "pocket" beaches and a few longer but still intermittent stretches with approximately 30 percent of the shoreline length armored. This difference in availability of a continuous surface area for nesting makes comparisons about grouping or nest density difficult.

MARINE TURTLE MONITORING

BACKGROUND

Marine turtle nest hatch monitoring was conducted by two separate FDEP permitted agencies. The northern Manatee County portion of Longboat Key from approximately FDEP Monument R-48 south to approximately 350 feet south of R-67 was monitored by the Longboat Key Turtle Watch. The southern Sarasota County area begins at the Manatee/Sarasota County line at approximately 200 feet north of FDEP Monument T-1 and proceeds south to New Pass at approximately 700 feet south of FDEP Monument R-29 and was monitored by Mote Marine Laboratory Sea Turtle Program personnel. Only the monitoring activity for the Sarasota County portion is included in this report.

Beginning on April 15, 1993, daily monitoring of the construction site (the Sarasota County beach portion of Longboat Key) was begun to fulfill the Florida Department of Environmental Protection guidelines for sea turtle protection and to fulfill the scope of work contracted by Mote Marine Laboratory with Applied

Technology and Management, Inc. and the Town of Longboat Key. Mote Marine personnel are permitted through the Florida Department of Environmental Protection (formerly the Florida Department of Natural Resources) under the 1993 marine turtle permit #054 (Appendix A).

PROCEDURES

The entire 5.3 miles of Sarasota County beach was monitored daily between the hours of 6:00 and 9:00 a.m. during the nesting season (April 15 through September 15). All marine turtle activity resulting in either successful nesting or false crawls (non-nesting emergences) were recorded.

For the purposes of this report, each identified sea turtle emergence was classified as resulting in either a "false crawl" or "nest." A false crawl was defined as an emergence which did not result in egg deposition. The following are examples of false crawls: 1) a turtle that moved onto the beach but did not excavate a nest and returned to the water or 2) a turtle that moved up the beach, excavated a nest cavity but for unknown reasons did not deposit any eggs in the nest (usually these aborted nest excavations are left uncovered by the turtle). A nest was defined as a turtle emergence which resulted in the turtle successfully depositing eggs. Where an emergence resulted in what "appeared" to the experienced patrol personnel to be a successful nest but the eggs were not verified, the "possible nest" was monitored along with the nests to observe for hatching. These possible nests were reclassified as either nests or false crawls depending on the outcome.

From April 15 throughout June patrol personnel walked the beach beginning at the immediate area of construction and bicycled or drove by automobile to any individual native pocket beach areas. During the initial pass down the beach false crawls were recorded and nests were marked with a wooden stake both waterward and landward of the nest. Florescent flagging tape was tied from one stake to the other making the site visible to the contractor. At the end of the pass the patrol personnel drove back to an address near the marked nest. If the nest was in an area to be impacted by construction activity it was carefully hand excavated. The eggs were placed in a bucket lined with sand and were transported by automobile to the hatchery location. After the bulk of construction activity was completed making it possible to travel the full length of the beach an all terrain vehicle was utilized enabling patrol personnel to mark, record, and if necessary to transport nests in a more efficient manner. The following two criteria were assessed to determine if a nest was in danger from adverse impacts: 1) If a nest was located below or within 20 feet above the approximate mean high water line it was moved landward on the beach at the same location, or 2) if a nest was located within the beach nourishment construction area it was relocated to the preselected open beach hatchery/relocation area in front of The Pierre Condominium, 455 Longboat Club Drive, at approximately 400 feet south of FDEP Monument R-26.

Nests located in the completed fill section were staked with a red or orange painted stake and florescent flagging tape and left in place on the beach. Each nest was marked with an individual wooden stake identifying the site as a protected sea turtle nest, the date the nest was laid and the location of the nest. Nest location was documented by two methods. In the field, monitoring

personnel located nests by relative position to the nearest street address, building, or other landmark. These descriptions were checked in our offices against annotated aerial photographs to associate the locations to FDEP profile survey monuments. All hatching and compactness data in this report data are summarized and presented by 1,000-foot long sections of shoreline, 500 feet on each side of each profile survey monument. Data regarding each nest and false crawl were recorded on a NEST/HATCH data sheet (Appendix B).

After fifty days incubation, nests were monitored in the early morning and again in the evening. Ants invaded numerous nests at hatching in the nest relocation area (455 Longboat Club Dr., Pierre Condominium) necessitating an additional check of the area in mid-afternoon. Because ants will kill the remaining hatchlings, nests exhibiting ant infestation at initial hatching were excavated immediately. No other animal predation occurred, so protective screening or nest cages were not utilized on any of the nests for the season. In all other cases, hatch success was determined by nest excavation 72 hours after the first emergence or after 75 days of incubation, whichever came first.

RESULTS AND DISCUSSION

The above procedures resulted in the documentation of 84 nests and 179 false crawls for the 5.3 mile length of beach in Sarasota County. The total number of nests for 1993 is comparable to past data (Figure 1) and is only seven nests fewer than in 1992. However the ratio of false crawls to nests is significantly higher than in any previous season since daily monitoring began in 1986. The overall ratio of false crawls to nests for both portions of the Sarasota County beach combined (north and south) was 2.1 to 1. This compares to a 0.6 false crawl to nest ratio for the 1992 season (56 false crawls to 91 nests). Overall, the emergence activity was greater in the southern section where the beach had been completed prior to the beginning of nesting.

The expected post-project profile adjustments resulted in intermittent escarpments ranging from one to seven feet throughout June, July and August. These were found particularly in the area between approximately 400 feet south of Monument T-1 south to R-14. Twenty-two false crawls were observed and recorded abutting the escarpments.

The seasonal pattern of *Caretta caretta* emergence is shown in Figure 2. The first nest was made on May 20 and the last nest on August 22. The period of peak nesting occurred in the four weeks from June 19 to July 17 when almost half of the total nests were created.

The ratio of false crawls to nests was further analyzed by shoreline section and compared to the overall average. Figure 3 shows the alongshore distribution of turtle emergence relative to FDEP monument numbers (1 to 29). The left side of Figure 3 corresponds to the northern Sarasota County area from Monument T-1 south through Monument R-12. This section of shoreline was impacted throughout the entire nesting season by the beach fill construction activity. The ratio of false crawls to nests in this area was 3.4 to 1. The number of false crawls was equal to, or greater, than nests at each station throughout this area with the exception of Monument 1 where nests exceeded false crawls.

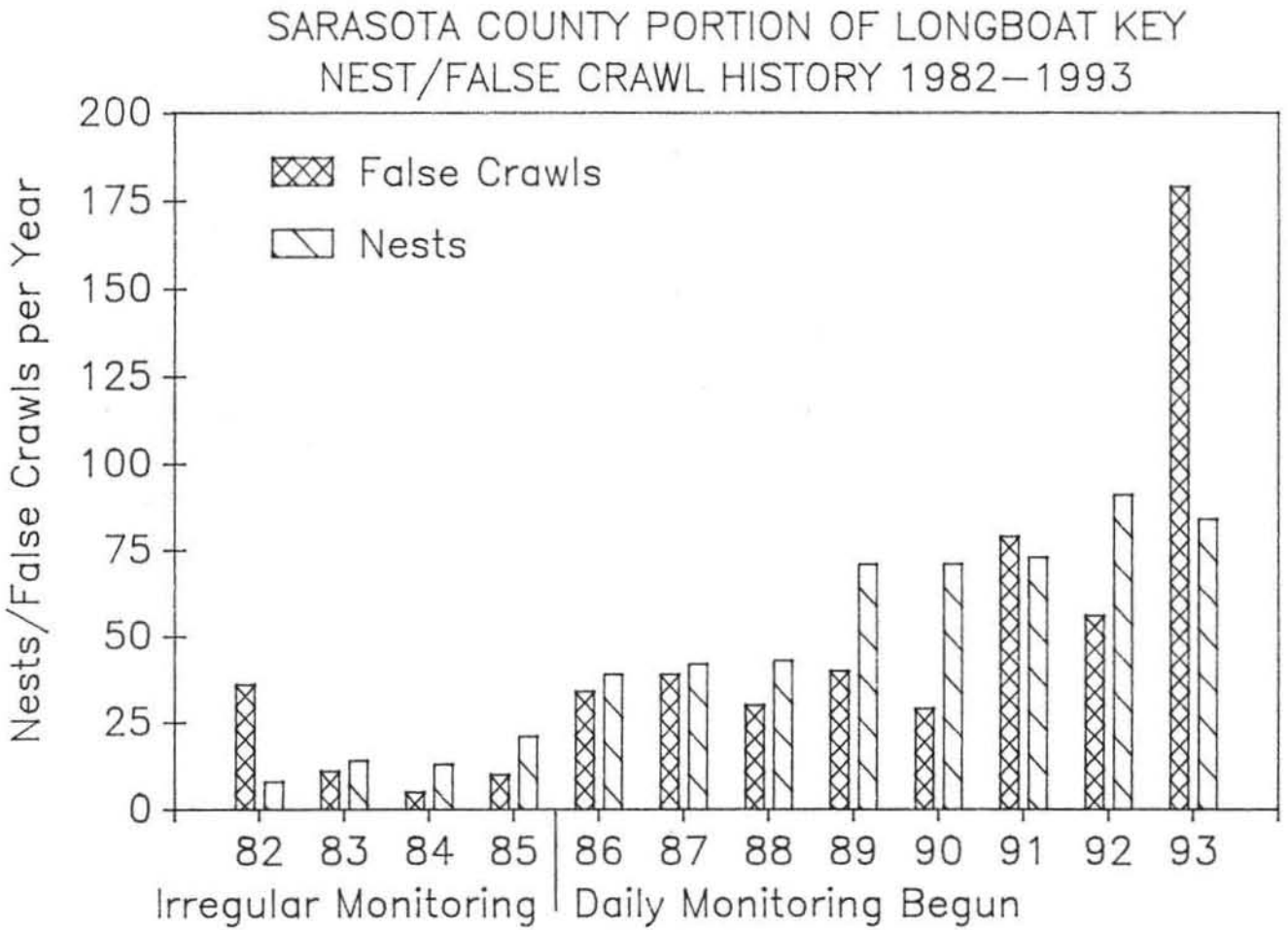

Figure 1. The historical pattern of marine turtle emergences on Longboat Key, Sarasota County.

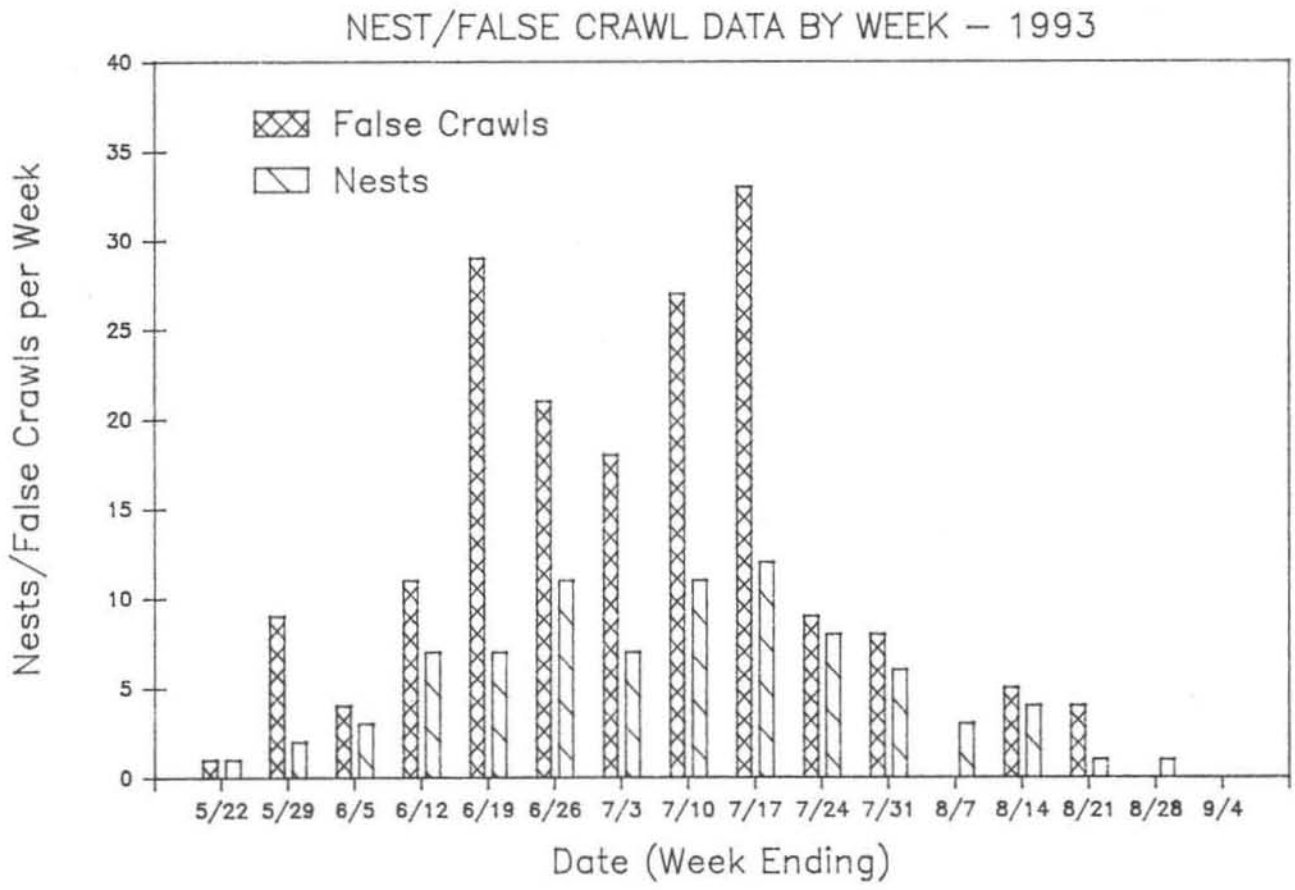

Figure 2. The 1993 seasonal pattern of daily *Caretta caretta* emergences for Longboat Key, Sarasota County.

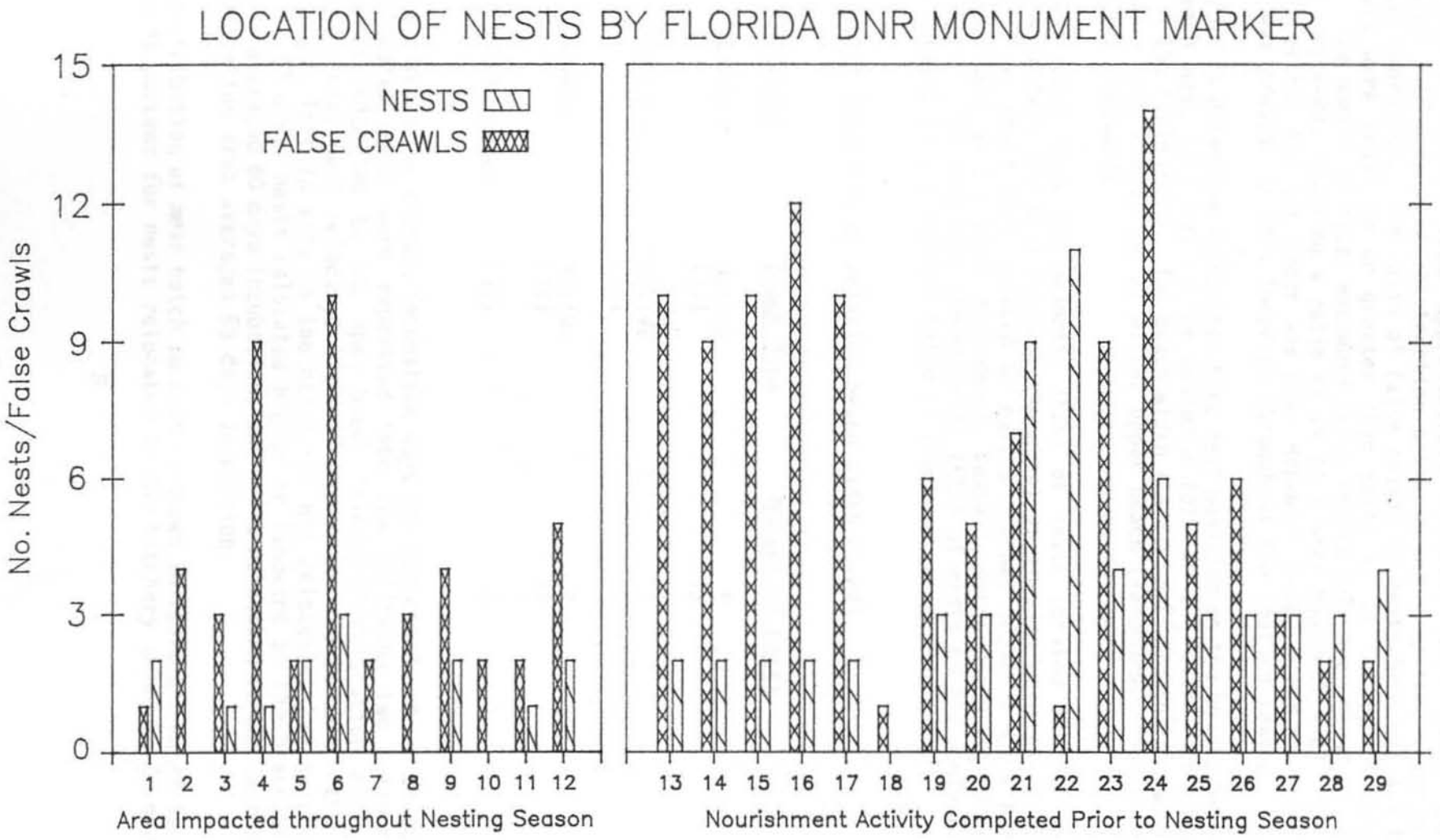

Figure 3. Locations of *Caretta caretta* emergences on Longboat Key, Sarasota County. (Listed in reference to Florida DNR Monument Number [1-29].)

The right side of Figure 3 corresponds to the southern portion of the Sarasota County section from approximately Monument R-13 south through Monument R-29. In this area construction activity was completed prior to the first turtle emergence. The ratio of false crawls to nests here was 1.8 to 1. False crawls were equal to or greater than nests at 13 out of 17 monument locations. The number of nests exceeded false crawls only near Monuments R-21, T-22, R-28 and R-29, reaching a ratio of 14 to 1 near Monument T-22. The only area where nesting did not occur was near Monument R-18. A one to four foot escarpment was present in this location throughout the nesting season.

In order to determine the cross-shore nest position on the beach, the beach width at each nest site was either measured (82% of the sites) or visually estimated in the field (18%). The beach width was divided into thirds, and nest locations were then classified as either upper beach (landward), middle beach, or lower beach (seaward).

Table 1 shows that the majority (83%) of nests located on sections of native beach (before the fill reached the area) in the landward third of the width. All five nests were located on narrow beaches adjacent to a barrier comprised of either an erosional escarpment, seawall, dense woody vegetation or beach furniture. In contrast, the majority (58%) of nests on the newly filled beach were located on the seaward third of the beach width.

Table 1. Nest locations by relative beach width (n=84).

Location	Beach Type	Number of Nests
Landward	Native	5
	Fill	13
Midbeach	Native	1
	Fill	18
Seaward	Native	0
	Fill	43
Not Recorded	Fill	4

Figure 4 shows the average incubation days for relocated and not relocated nests. Relocated nests were separated into the following two categories: 1) those nests relocated to the open beach "hatchery"/relocation area, and 2) those nests that were relocated higher/landward on the beach at the same location. Nests left *in situ* on the beach, or not relocated, had an average incubation of 62 days; nests relocated higher or landward on the beach at the same location averaged 60 days incubation, and nests relocated to the open beach hatchery/relocation area averaged 59 days incubation.

The distribution of mean hatch success is shown in Table 2. Hatch success ranged from 91 percent for nests relocated to the hatchery area, to 88 percent

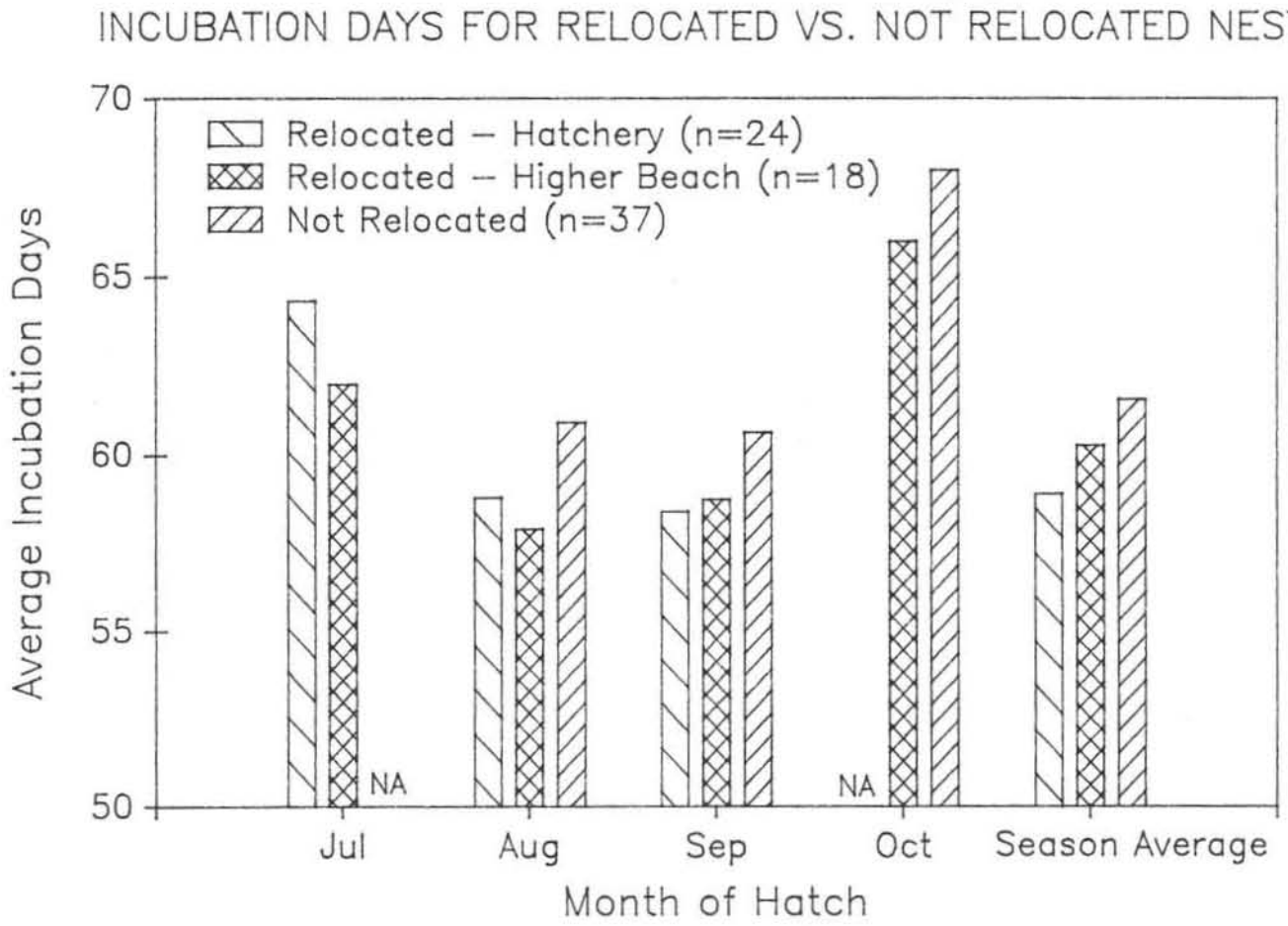

Figure 4. Comparison of incubation periods for nests 1) relocated to the open beach hatchery 2) relocated higher/landward at the same location, and 3) nests not relocated.

for nests left *in situ*. The overall hatch success rate was 89 percent. This compares favorably to the following 1993 mean hatch success rates for adjacent county beaches: Lido Key = 77%, Siesta Key = 83%, Casey Key = 84%, and Venice = 66%.

Table 2. Hatch success for three conditions.

	RELOCATED TO HATCHERY	RELOCATED HIGHER BEACH	NOT RELOCATED	TOTAL
TOTAL EGGS	2500	1765	3667	7932
EGGS DESTROYED	27	2	0	29
EGGS HATCHED	2268	1588	3227	7083
EGGS UNHATCHED	205	175	440	820
DEAD IN NEST	29	18	82	129
DEAD ON SURFACE	5	0	5	10
LIVE RELEASED	713	153	834	1700
HATCH SUCCESS	**91%**	**90%**	**88%**	**89%**

Conditions:

1) nests relocated to the open beach hatchery/relocation area (n=24),
2) nests relocated higher/landward on the beach at the same location (n=18)
3) nests left *in situ*/not relocated (n=37).

No data were available for five nests and thus were not included in the above. Two of the nests were located on a pocket beach on the north shore of New Pass approximately 500 feet south of Monument R-29. Two nests were located seaward on the beach, one near Monument R-28, and one approximately 850' south of R-16. One nest was located midbeach at approximately 775 feet south of R-18. All five nests either: 1) washed away, or 2) were inundated and the marking stake was washed away making the exact nest site impossible to locate. The above occurrences were due to low pressure systems present in the Gulf of Mexico and the associated high tides and wave activity which removed from one to ten feet of beach sand overnight (8/16-8/17 and 10/16-10/17). The five nests were included in the total nest count but were not included in the hatch success data.

A total of forty hatchling disorientation incidents was recorded for the season (Table 3). After emerging from the nest, hatchlings typically move away from shadows (e.g., dune vegetation, tree silhouettes, and unlighted structures) and move toward the lighter, open horizon of the water (Salmon et al., 1992). Hatchlings are attracted to artificial lighting (Witherington, 1991; 1992) and instead of heading toward the water will travel great distances to artificially lighted areas. This activity of looping around or traveling in a direction other than to the water is termed a disorientation. Disorientations often lead to death of the hatchling from dehydration, predation or being run over.

Disorientations may involve from one hatchling to an entire nest. The tabulated data document eight incidents in which more than 75 percent of the total hatch disoriented. Twenty incidents involved twenty or fewer hatchlings. The number of disorientation incidents this year is much greater than in previous seasons. There may be several contributing reasons for this situation, but a more detailed discussion is beyond the scope of this report.

Table 3. Summary of 1993 marine turtle hatchling disorientations (n=40).

INCIDENT DATE	NEST LOCATION	# HATCHLINGS DISORIENTING	% OF HATCH DISORIENTING	DIRECTION TRAVELLED
09/18/93	R-14	5	6	S
09/06/93	R-14	20	23	S,W,S
08/08/93	R-14 600'S	58	74	E
09/09/93	T-15	96	98	E,NE,SE
08/05/93	T-15 575'S	105	100	N/A
09/04/93	R-16 200'S	78	95	N/A
09/05/93	R-18 575'S	101	96	E,N,S
07/22/93	R-20 100'S	4	4	N
07/24/93	R-20 100'S	12	12	N
10/12/93	R-20 200'S	15	23	S,NW
09/04/93	R-21	11	16	N,NE
10/10/93	R-21	N/A	N/A	LOOPS
10/14/93	R-21 200'S	30	31	S
09/13/93	R-21 300'S	23	N/A	S,N,E
08/19/93	R-21 800'S	30	33	N,S
10/17/93	T-22 300'S	65	60	N,S,W
09/03/93	T-22 400'S	5	14	S,N
08/19/93	T-23	75	81	E,S
09/03/93	T-23	1	1	S
09/06/93	T-23	97	92	E,S
10/04/93	R-24 300'S	79	N/A	E,S,N
09/14/93	R-25 600'S	10	19	E,S
08/11/93	R-26	6	5	E,S
09/01/93	R-26	10	11	SE
10/11/93	R-26	49	N/A	SE
07/25/93	R-26 400'S	15	15	N,S
08/12/93	R-26 400'S	1	0.9	SW
08/13/93	R-26 400'S	25	31	SE,S
08/15/93	R-26 400'S	3	N/A	N,E
08/15/93	R-26 400'S	35	41	E,S
08/19/93	R-26 400'S	50	45	N,SE,S
09/16/93	R-26 400'S	65	89	N,SE,S
09/27/93	R-26 400'S	1	1	S
09/05/93	R-26 400'S	30	27	N,S,E
09/08/93	R-26 400'S	5	7	E
09/20/93	R-27	75	95	N,S,E
09/27/93	R-27	5	5	E
09/27/93	R-27	5	5	E
08/13/93	R-28 400'S	30	33	E,S
08/19/93	R-28 650'S	4	4	SE,S

Figure 5 documents the approximate location of the disorientation incidents. Although the incidents are shown only on the southern half of the Sarasota County project area, this is because all nests originally located north of this area were relocated to the hatchery site. The hatchery site is approximately 400 feet south of Monument R-26 and the apparent greater incidence of disorientation at that location is a result of a higher concentration of nests associated with the hatchery. Randy Fowler, the Code Enforcement Officer for the Town, and Barbara Schroeder and Allen Foley of the Florida Department of Environmental Protection Marine Research Institute were notified of hatchling disorientations.

Two sea turtle strandings were documented within the project area during the monitoring (Appendices C and D). A critically endangered juvenile Kemp's Ridley turtle stranded May 4 on the beach approximately 700 feet south of Monument R-18. An adult male loggerhead turtle stranded May 16 on the beach approximately 450 feet south of R-19. Neither turtle exhibited evidence of trauma. Cause of death was not determined.

BEACH COMPACTNESS

BACKGROUND

Several writers have discussed sand compactness as a concern about restoring eroding beaches with dredged borrow material and that background will not be repeated here (see, for example, Nelson et al., 1987; Nelson and Dickerson, 1989; Parkinson and Ryder, 1992; Hodgin et al., 1993). Threshold penetrometer values have been tentatively adopted by regulatory agencies and are used to determine a need for post-project scarifying the beach to reduce compactness. The criterion of "tilling" all areas exceeding a value of 500 Cone Penetrometer (Index) Units is included as a permit condition requirement in the Town's FDEP coastal construction permit. The compactness data presented and discussed below were collected to address that requirement. In addition, baseline compactness information was collected during the summer and fall of 1992, prior to the restoration, to allow for a more complete analysis (Truitt and Foote, 1992).

SCOPE AND MEASUREMENT PROCEDURES

Mote Marine Laboratory (MML) investigators measured compactness along the entire length of the Key following completion of the fill project. Measurement procedures recommended for restored beaches call for the testing stations to be randomly spaced along the beach length in a "zig-zag" pattern. However, because this is a very long project and for better control and subsequent comparison, an alternative procedure was used. The alongshore measuring points were selected to be each FDEP Coastal Construction Control Line survey profile (approximately every 1,000 ft along the shoreline). At each profile line, however, measurements were still made randomly in the cross-shore direction over the dry, sandy beach from below the dune line to near the waterline or escarpment, if present. In

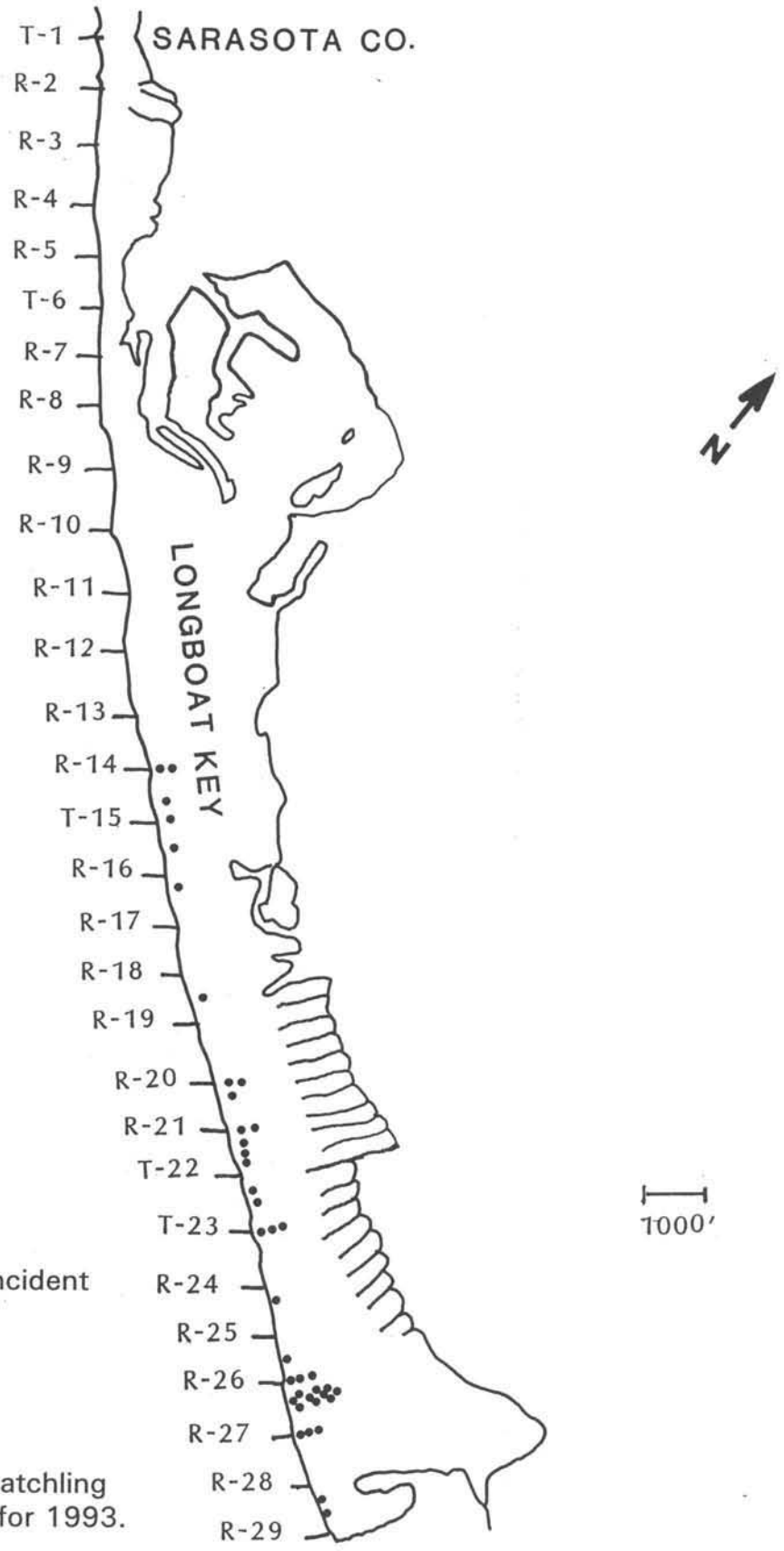

Figure 5. Locations of hatchling disorientation for 1993.

addition to the stations at each profile, measurements were made adjacent to the locations of a number of turtle nests made during the summer.

The methodology and equipment used was the same as described by Nelson et al. (1987). A hand-held cone penetrometer is pushed into the sand and the resistance is indicated by a dial which measures the deflection of an integral proving ring. At each of the test stations, compactness was measured in a vertical series at three depths: 0-6 inches, 6-12 inches, and 12-18 inches. Measurements are recorded in Cone Index Units (termed CIU or CPU) up to the dial maximum.

The field measurements of compactness were evaluated and analyzed for any trends with depth or with beach type. These analyses form the basis for a general characterization of post-project beach compactness on the Key.

RESULTS AND DISCUSSION

The above procedures resulted in a total of 711 individual measurements at 237 test stations. Approximately 56 percent of the measurements (402) were made near actual nest locations. Appendix D tabulates a summary of the processed data showing the averages of all compactness measurements (both nests and profile stations) within 500 ft on each side of each profile survey monument, but without further grouping or analysis. The following paragraphs briefly discuss the results, progressing from the most general averages to more detailed trends.

The overall average compactness for all stations, depths and areas was 669 CIU, which is a statistically significant higher value than the regulatory criterion of 500 CIU. Overall averages for all areas at each different test depth (6, 12 and 18 inches) are 361 CIU, 732 CIU, and 913 CIU, respectively.

Note that the overall average value to a depth of 6 inches (361) is lower than the regulatory criterion of 500 CIU. Of the 237 stations tested, 193 had readings below 500 CIU down to a depth of 6 inches. Fifty-seven stations had values less than 500 at 12 inches and only 12 readings fell below 500 at 18 inches. Similar trends were noted in the native soils during last year's baseline study and a similar conclusion can be made about the fill: for this study area, compactness of the surface layer is a poor indicator of sand conditions immediately below, at the depths where nests are typically excavated.

The results were also analyzed by separating the general background measurements at survey profiles from the values at actual nest sites. The average for all depths at nests sites was 614 CIU and the average at the profile stations was 756 CIU. **No further conclusions about cause and effect can be made about this trend at this time.** None of the many other factors which might result in nest grouping such as grain size, mineral content, coloration, drainage, lighting, type of upland development, or human interference have been evaluated. In addition, in at least 20 cases nests were made on, or sufficiently close to a profile line, so as to make the nest measurement indistinguishable from a background value.

Lastly, the post-project results were compared to the native condition measured last year. The same caution stated above should be noted for these

comparisons because many other factors may overshadow any compactness influence. Also, as noted in the Introduction, the pre-project "native" beach condition was not at all geometrically similar to the fill. Finally, relatively small differences within a data set where the stations are randomly selected and natural variability is great should not be considered significant.

The pre-project overall compactness for all depths and soils was 697 CIU compared to 669 after the project. In order to understand the significance of this difference better, the changes in measurements from last year to this year at each profile line were examined. Of the 47 alongshore stations, average values for 20 lines (42 percent) clearly showed the post-project condition was more compact, but 19 stations (41 percent) were clearly less compact than last year. The average values at 8 lines (17 percent) were not judged to be significantly changed. Based on these overall averages, the differences did not seem significant.

However, looking further at the changes by depth provides a somewhat different result. Overall average values from the surface to 6 inches were somewhat less compact last year, 318 CIU versus 361 in the fill, but the deeper readings in the native beach were considerably higher than in the fill, 827 versus 732 at 12 inches, and 946 versus 913 at 18 inches. The compactness of the fill certainly increases with depth and the deeper measurements exceed regulatory criterion, but the rate of the increase and the overall average compactness is less in the fill than in last year's native beach.

A final interesting result can be seen from comparing the alongshore variation in average compactness (profile to profile). In most cases, where there had been a definite trend in the compactness of the native beach over a length covering three or four profiles, the same trend was observed in the fill. Even if the average values at each profile changed between native and fill, those changes were usually less than the variation from profile to profile in an area of trend.

SUMMARY

This report has presented the results of marine turtle monitoring for the Sarasota County portion of the Longboat Key beach nourishment project. A total of 84 actual nests were documented this season, or 7 fewer than the 1992 total of 91. The data show a clear increase in the average ratio of false crawls to nests from 0.6 to 1 in 1992 to 2.1 to 1 in 1993. The difference was even more pronounced in the northern Sarasota County area where construction occurred throughout the nesting season. The ratio of false crawl to nest for the north project area was 3.4 to 1, while the same ratio was 1.8 to 1 in areas where construction was completed prior to the first turtle emergence. .

Field measurements of sand compactness were made along the Sarasota and Manatee County sections of beach. The overall average compactness for all stations, depths, and areas was 669 CIU, which compares to the overall pre-project compactness of 697 CIU. The analysis presents additional variations and trends in the data with depth and alongshore location. However, both

measurements represent a statistically significant higher value than the regulatory criterion of 500 CIU.

Further comparisons or conclusions about interseasonal nesting patterns and sand compactness are difficult to make because of the direct influence of the construction process. Also, the geometry of the restored beach itself varied dramatically from previous seasons making further extensions or conclusions speculative.

A better understanding may result from comparing next year's data, after the project has adjusted and with no construction activity, to previous seasons. Measurements of sand compactness are required prior to the turtle nesting season for two more years (1994 and 1995). Monitoring for sea turtle activity, including documentation of nesting activity, and hatch success is also necessary during the two nesting seasons.

ACKNOWLEDGMENTS

We would like to thank the Town, Len Smally, P.E., Director of Public Works and the Police Department for allowing us to utilize an all terrain vehicle for nest and hatch monitoring. Thank you to Randy Fowler, Code Enforcement Officer for the Town for his time and effort working with getting LIGHTS OUT. Thank you to the management, staff and owners of Seaplace Condominium, The Pierre Condominium, The Beaches Condominium, The Privateer Condominium, The Inn on the Beach, Sea Gate Condominium, Beachplace Condominium, and Silver Beach Resort for permitting us to park and for giving us beach access through their properties. Also, we would especially thank Jim Quinn and the owners, and staff at Seaplace Condominium for giving us storage space for our all terrain vehicle and for allowing us to access the beach at all hours of the day and night!

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