

CAPE LOOKOUT NATIONAL SEASHORE
2011 SEA TURTLE MONITORING AND MANAGEMENT REPORT



November hatchlings heading for the ocean.

NPS Photo 2011

National Park Service
Cape Lookout National Seashore
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INTRODUCTION

Cape Lookout National Seashore (CALO) began monitoring marine turtles in 1976. Baseline data was collected for a portion of South Core Banks during an extensive six-year study from 1978 - 1983. Nesting turtles were tagged and nests marked during nightly patrols. Since 1984 Cape Lookout has conducted daytime monitoring to document strandings, protect nest sites, relocate nests in danger of being flooded and protect hatchlings. Cape Lookout is a significant northern nesting beach and supports among the highest number of loggerhead sea turtle (*Caretta caretta*) nests in North Carolina. The seashore also provides nesting habitat for leatherback (*Dermochelys coriacea*) and green (*Chelonia mydas*) sea turtles. Each year data have been collected, analyzed, and presented to management in hopes of better protecting our marine turtle population. This report will summarize the 2011 project, consolidate many years of data and make recommendations for management of these federally protected species. In addition to providing CALO with management data, the information gathered on CALO beaches continues to be an important link for many state, federal, and private Atlantic coast sea turtle managers.

COOPERATING AGENCIES

Cape Lookout National Seashore cooperates with numerous agencies, including the North Carolina Wildlife Resources Commission (NCWRC), the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) on sea turtle protection. The North Carolina Sea Turtle Program Coordinator receives all original stranding reports and annual nesting activity reports. NCWRC also issues Cape Lookout National Seashore an Endangered Species permit for possession and disposition of stranded marine turtles and relocation of nests.

SITE DESCRIPTION

Cape Lookout National Seashore is located in the southern Outer Banks of North Carolina between Beaufort and Ocracoke Inlets. The seashore consisted of three barrier islands during the nesting season. The northernmost island, North Core Banks (NCB) was approximately 23 miles long, extending from Ocracoke Inlet to Ophelia Inlet. South Core Banks (SCB) extends southward from Ophelia Inlet almost 24 miles to Barden Inlet. The Core Banks have a northeast to southwest orientation and exhibit a low profile landscape. The third island, Shackleford Banks (SB) is 9 miles long and has an east-west orientation with a higher dune system and larger areas of vegetation. Hurricane Irene fragmented NCB into three islands on August 27. All islands in the park are subject to constant and dramatic change by the actions of wind and waves.

METHODS

All three of the islands comprising the Seashore were monitored daily for turtle nesting activity. Student Conservation Association interns and NPS staff patrolled NCB and SCB daily in the early morning searching for nesting activity from May 1st to September 15th. Each patrol began early in the morning so that the island was checked for turtle activity by 12:00 PM. Shackleford Banks was monitored three times a week. For detailed information on procedures used in the 2011 Sea Turtle Program refer to Appendix III. In addition to these program procedures the seashore participated in a genetic mark-recapture study of nesting female loggerheads using DNA derived from eggs. The study was coordinated by the NCWRC for North Carolina and the included the other Northern Recovery Unit states of Georgia and South Carolina. One egg from each nest was collected and preserved so DNA could be sampled at the University of Georgia genetic laboratory. As part of this study sea turtle crawl and nest activity was entered onto an online database at www.seaturtle.org.

Nest losses to tidal flooding and predation are the primary threats to nesting success at CALO. Nests laid in the tidal wash zone, primary berm, and back swale are considered in danger of erosion or tidal flooding. Nests laid in locations likely to repeated flooding were relocated to a higher elevation on the primary dune. Relocated nests were moved into designated areas and vehicles were detoured to the back road around these areas when nests neared hatching. Smaller vehicle detours were erected around those nests that were not relocated and were outside other vehicle closures. Vehicle closures provide a rut-free corridor from the nest site to the ocean, preventing hatchlings from being run over or becoming entrapped in tire ruts and dying from predation or desiccation. Camping and campfires were not permitted in the closures to prevent disturbance of hatchlings by artificial lights.

Nests relocated onto the primary dunes and into beach closures may introduce factors that increase egg and hatchling mortality. Sea oats (*Uniola paniculata*) are dominant on the primary dunes and their roots invade the nest. Hatchlings that emerge from nests located high on the primary dunes may be exposed to mainland lights and may travel toward the lights away from the ocean. Records were therefore kept of hatchlings entangled in roots and eggs destroyed by roots in the egg chamber. Hatchling tracks that were observed to go away from the ocean were also noted. Finally, relocating nests into a single beach closure increases the risk of a large loss due to storms, pathogens, or predation. Any sign of predation was noted and the approximate numbers of eggs or hatchlings destroyed were recorded. To discourage raccoon (*Procyon lotor*) predation, wire screens anchored

by rebar were placed over all nests. Wire cages were used, if needed, on nests between the lighthouse and Power Squadron Spit, the area with the most problems from raccoons in the past. Nests and digs were monitored for hatching activity through November. Nests were excavated after hatching to determine nest success. Digs were treated as nests through the nesting and hatching time frame. If the dig hatched it was added to the nest category and if it failed to show hatching activity after 75-80 days the site was excavated. It then was classified as a nest if eggs were found or as a crawl if no eggs were found.

RESULTS

The monitoring procedures used at CALO prior to 1990 were significantly different than those used after that year. Records from those years will not be included in this report. 1990 marked the beginning of monitoring procedures following the USFWS Index Nesting Beach program

NESTING RESULTS

The first recorded nesting activity in 2011 was on May 17 and the last on August 19, for a 94 day nesting season. A total of 318 activities were documented of which there were 157 nests and 161 false crawls, (Table 1.). All sea turtle nests were loggerheads. Individual nest data are in Appendix 1 and mapped nest locations are in Appendix 2.

Table 1. 2011 ACTIVITIES BY STUDY AREA

	North Core Banks	South Core Banks	Shackleford Banks	CALO Total
NESTS	54	76	27	157
CRAWLS	83	60	18	161

The number of nests found in 2011 (157 nests) was above the annual average for CALO (130 nests) (Fig. 1 and 2). South Core Banks continued to have more nests than the other islands in 2011. Nesting on SCB was spread out; however, there was a higher occurrence of nests south of the lighthouse between mile 41 and 46, 27 nests (Fig. 3). Another concentration of nests on SCB occurred between mile 24 and mile 26, 13 nests. The greatest nesting density on NCB occurred mid-island between mile 9 and mile 18, 29 nests. Shackleford Banks had 27 nests.

Figure 1. Cape Lookout Turtle Activities 1990-2011

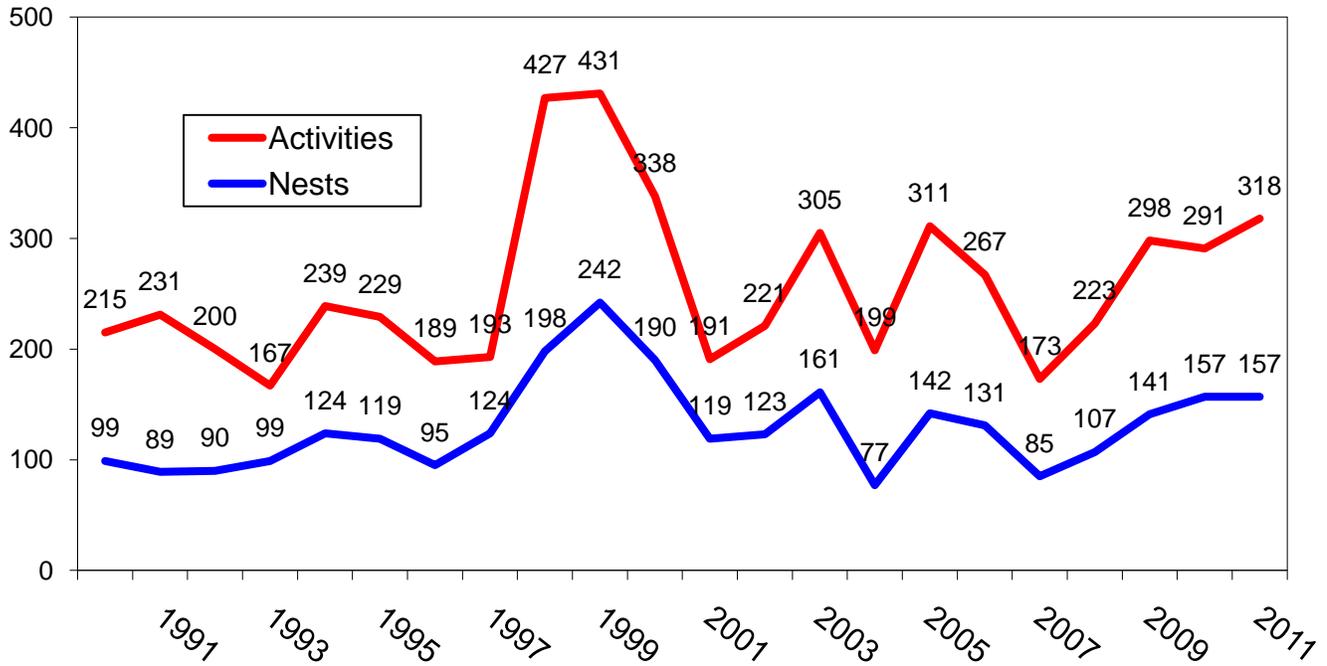


Figure 2. Turtle Nests 1990-2011

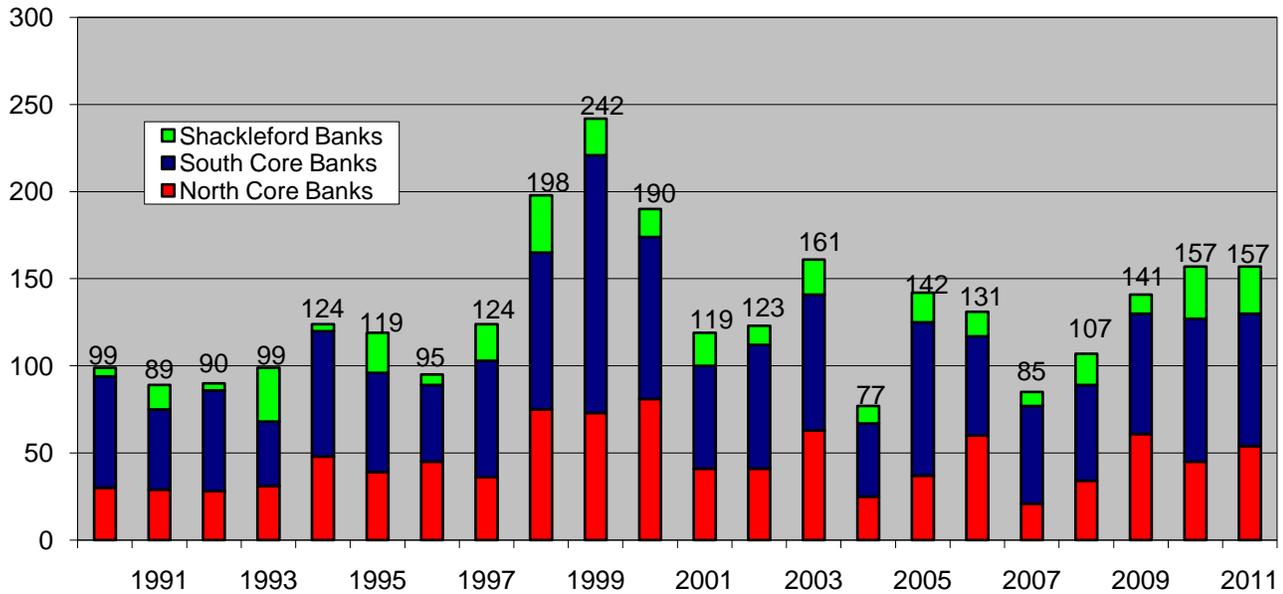
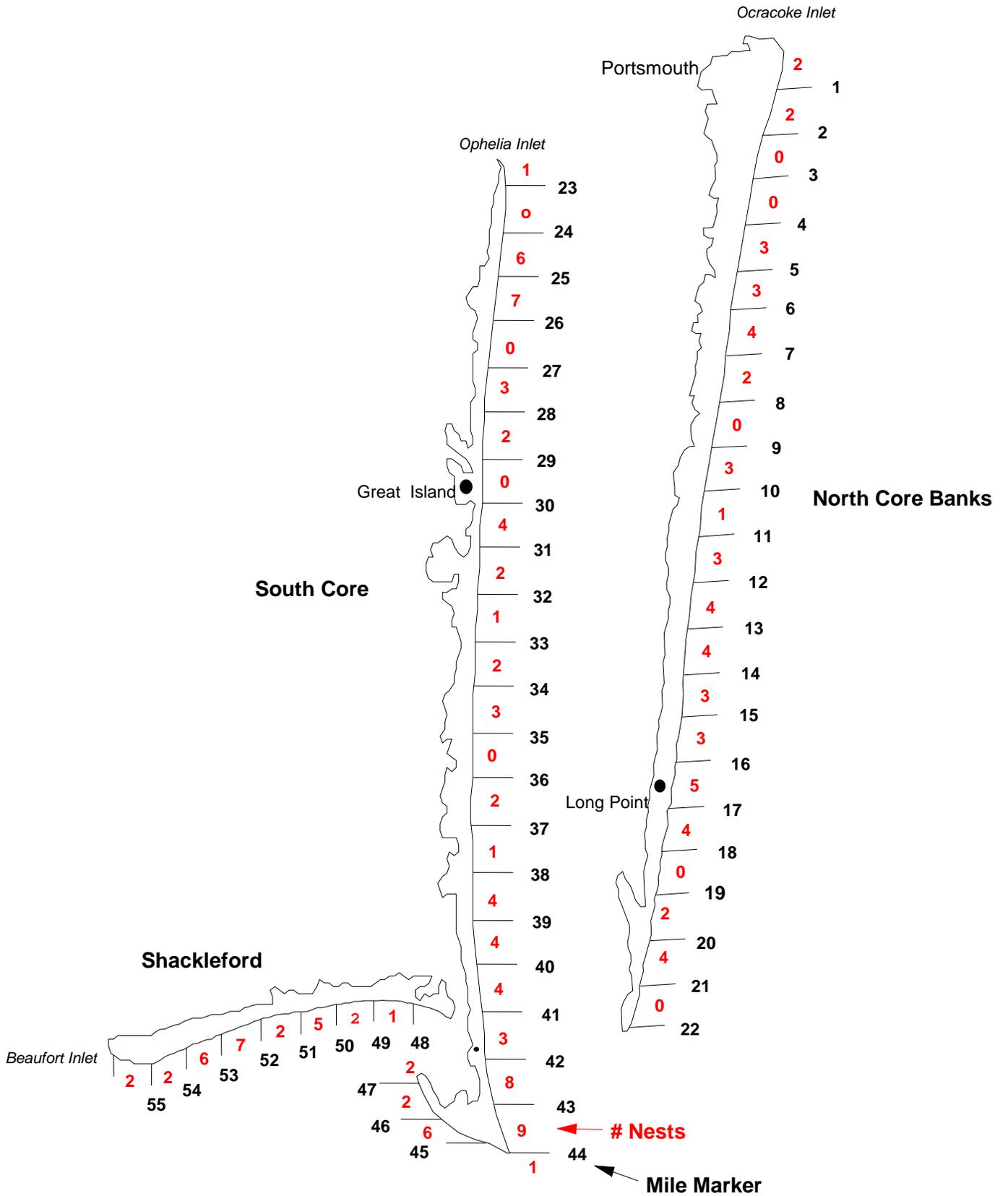


Figure 3. 2011 Turtle Nests by Mile Section



HATCHING RESULTS

Follow-up of nesting activity involved observing nest and dig sites for signs of hatching, recording relevant data, and excavating the site. By collecting hatch information, it can often be determined if predators, human disturbance or environmental occurrences have adversely affected a nest.

Nest hatching began on July 15th and ended on November 7th, for a 113 day nest hatching period. The last nest was excavated on November 10th at day 89 of incubation. A known total of 12,910 eggs, 8,343 hatchlings, and 157 hatched dead were counted. The total hatch success, number of total eggs divided by number of total hatchlings, was 65%. The total emergence success of 63% (8186 emerged) was calculated by subtracting the total hatched dead from the total hatchlings and dividing by the total of eggs (Table 2). This is the same calculation for each individual nest emergence success (Appendix III, Attachment 3). The emergence success reported on www.seaturtle.org for Cape Lookout is 43%, which subtracts live hatchlings that were still in the nest. The seashore has not traditionally subtracted the live hatchlings in the nest which receive emergence assistance and to remain consistent with 22 years of data will report emergence success based on the calculation in Appendix III, Attachment 3. The emergence success range was from 0% to 99%. The average clutch size was 114 eggs. It took an average of 56 days for nests to incubate. 58 nests were washed away by Hurricane Irene with the numbers of eggs unknown. There were 4 raccoon encounters at nest documented; two superficial diggings, one nest with tracks around it, and one after emergence predation of 68 hatchlings on the beach. One nest suffered raccoon predation that destroyed the nest of all eggs on NCB and another had raccoon tracks at the nest the same night it boiled. There were no signs of raccoon presence or predation at nests on SB.

Seven nests suffered some ghost crab predation on SCB and one nests had ghost crab predation on NCB. A total of 30 nests were over-washed by the ocean, 21 nests from one to three days and 9 nests four times or more. Twenty two of these 30 nests hatched. The emergence success for these 30 flooded nests was 49%.

Table 2. SEA TURTLE HATCH SUMMARY 1990-2011

Year	Nests	Avg. Clutch	Flooded	Avg. Incu	Eggs	Emerged	EMR % *	Est.Total EMR%**
1990	99	115	1	57	10,376	7,369	71%	69%
1991	89	115	6	62	8,393	5,197	62%	61%
1992	90	114	4	63	9,419	6,791	73%	71%
1993	99	115	9	59	10,365	7,544	74%	74%
1994	124	120	3	62	14,459	11,296	79%	79%
1995	119	115	38	57	12,357	6,157	51%	47%
1996	95	115	16	65	10,091	5,602	57%	53%
1997	124	122	3	63	14,824	10,740	73%	73%
1998	198	114	39	62	19,672	13,315	69%	61%
1999	242	116	90	62	23,224	11,751	53%	44%
2000	190	111	2	67	19,527	13,471	69%	65%
2001	119	113	5	65	12,358	9,555	79%	75%
2002	123	119	7	61	13,657	10,758	79%	75%
2003	161	119	45	65	16,440	10,067	61%	53%
2004	77	104	36	64	7,309	3,139	43%	40%
2005	142	111	54	60	12,423	6,569	53%	42%
2006	131	125	19	61	14,808	10,843	73%	66%
2007	85	109	19	60	8,759	6326	72%	68%
2008	107	111	60	60	11063	6868	62%	57%
2009	141	116	77	64	15130	7574	50%	46%
2010	157	105	80	57	14666	7956	54%	49%
2011	157	114	30	56	12910	8186	63%	42%

*emergence success for nests with known egg and hatch totals

**includes an estimate of egg totals for nests lost and not excavated

Calculating a true emergence success for the year always proves to be difficult. Raccoons may dig into a nest at hatching making it impossible to know how many turtles escaped from the nest. A nest may be washed away, thus an emergence success of zero is known but the original number of eggs laid is not known. The emergence success reported is for those nests in which the number of eggs laid and the number of emerged turtles is known.

In order to account for the 59 nests lost with unknown egg counts we have calculated an estimated emergence success of 42 % in 2011 (Table 2). The average clutch size for each island was given to those nests as the number of eggs, allowing them to be calculated into the estimated emergence success. The seashore total of 59 lost nests at an average clutch of 114 eggs equals 6726 eggs with 0% emergence success (Table 3).

Table 3. 2011 ACTIVITY SUMMARY BY STUDY AREA

	NCB	SCB	SH	TOTALS
NESTS	54	76	27	157
# KNOWN EGGS	4067	6926	1917	12910
# EMERGED	2351	4502	1333	8186
AVERAGE CLUTCH	113 eggs	115 eggs	113 eggs	114 eggs
EMERGE SUCCESS	58%	65%	70%	63%
# ESTIMATED EGGS	6666	9916	3047	19636
ESTIMATED TOTAL EMERGENCE SUCCESS (including nests with unknown /averaged egg totals)	35 %	45%	44 %	42 %
AVERAGE INCUBATION	57 days	56 days	56 days	56 days
# LOST TO FLOODING	22	26	10	58
# LOST TO PREDATORS	1	0	0	1

In 2011, 27% of the nests were relocated. The emergence rate for relocated nests was 36% and the emergence rate for non-relocated nests was 78% (Table 4). The estimated emergence success for non-relocated nests was 49% which accounts for the 44 in suti nests lost to erosion. Fifteen relocated nests were lost to Hurricane Irene.

Table 4. EMERGENCE SUCCESS OF RELOCATED VS. NON-RELOCATED NESTS BY STUDY AREA IN 2011

<i>RELOCATED</i>	NCB	SCB	SH	CALO Total
Nests	20	21	1	42 (27%)
Eggs	2161	2377	110	4648
Hatchlings	720	915	80	1715
# Hatch Dead	6	8	7	21
Emergence Rate	33%	38%	66%	36%
<i>NON-RELOCATED</i>				
Nests	34	55	26	115 (73%)
Eggs	1906	4549	1807	8262
Hatchlings	1673	3673	1282	6628
# Hatch Dead	36	78	22	136
Emergence Rate	86%	79%	70%	78%
Estimated Total Emergence Rate	42%	56%	43%	49%

Since 1990 the twenty two year average emergence success is equal (65%) for relocated nests and non-relocated nests (65%) (Table 5). However the estimated emergence rate of non-relocated nests, which accounts for erosion and predation lost nests, is 56%.

Predation

In 2011, one nest was completely lost to raccoon predation on NCB. On SCB 68 hatchlings that emerged from the nest were predated by raccoon and three nests had superficial digging and/or tracks at the nests. Eight nests suffered minor ghost crab predation in the seashore in 2011.

Table 5. 1990-2011 EMERGENCE SUCCESS FOR RELOCATED vs. NON-RELOCATED NESTS

YEAR	PERCENT OF NESTS RELOCATED	EMERGENCE RATE-RELOCATED	EMERGENCE RATE-NON RELOCATED*	PERCENT OF NESTS EXCAVATED
1990	69	71%	74% (67%)	94
1991	63	57%	76% (72%)	97
1992	43	71%	76% (74%)	97
1993	54	74%	73% (73%)	90
1994	79	80%	73% (73%)	96
1995	55	61%	38% (31%)	86
1996	73	56%	64% (48%)	89
1997	74	69%	86% (86%)	95
1998	59	77%	55% (41%)	85
1999	51	49%	59% (40%)	79
2000	63	66%	74% (61%)	93
2001	50	81%	76% (68%)	89
2002	45	73%	84% (77%)	93
2003	41	47%	75% (58%)	86
2004	44	63%	23% (20%)	97
2005	34	42%	61% (42%)	79
2006	39	85%	64% (54%)	90
2007	24	79%	70% (65%)	95
2008	30	57%	64% (57%)	92
2009	25	61%	46% (41%)	92
2010	13	75%	51% (45%)	89
2011	27	36%	78% (49%)	62
<i>AVERAGES</i>	48	65%	65% (56%)	89

* Number in parentheses is an estimate including nests with unknown egg totals

Three nests had roots in the egg chamber that destroyed eggs or trapped hatchlings. Sand deposition partially buried eight nests and along with flooding may have prevented hatching. Hatchlings from six nests appeared disorientated and crawled outside the closures. There were 5 hatchlings stuck in the metal predator screens from three different nests. There was one missed nests discovered after it hatched.

Human Disturbance

Off-road vehicles disregarding beach closures threaten the survival of hatchlings. Hatchlings are at risk of being directly crushed and/or becoming trapped in tire ruts. At night vehicle lights could disorientate hatchlings. In 2011, park law enforcement staff issued two written warnings for sea turtle closure violations. These vehicles drove between posts and the ocean at low tides or drove through posts and rope.

DISCUSSION

Nest relocation is the primary management tool used to enhance hatching success in the park. In 2011, park staff relocated 42 nests that were threatened with repeated flooding or erosion. The remaining 115 nests were above the high tide line on the beach or on the dunes. The nesting and hatching season spanned from May 17th to November 10th, 177 days. Hurricane Irene on August 27th had a major impact on both relocated and non-relocated nests. Flooding and erosion destroyed 58 nests throughout the seashore. These nests were completely washed away. Hurricane Irene struck in the middle of the hatching period before many nests could finish incubation and hatch. The storm was the single most negative influence on the emergence success. In addition to destroying

nests the storm re-opened Old Drum Inlet and New Drum Inlet isolating Middle Core Banks again. Four nests did manage to hatch after Hurricane Irene, including the last nest to hatch on November 7th. This nest received overwash and 1.5 feet of sand deposition from Hurricane Irene. There have been six sea turtle nests that have hatched in the month of November from 1986 to 2011.

The seashore continues to participate in the genetic mark-recapture study of the northern recover unit of loggerhead sea turtles. Results can be viewed at www.seaturtle.org.

US Fish and Wildlife Service Biological Opinion and Performance Measures

The USFWS provided CALO a biological opinion that included two performance measures on sea turtles for the Interim Protected Species Management Plan. The first performance measure requires that the sea turtle false crawl to nest ratio is less than or equal to 1:1 (annually). In 2011, there were 161 false crawls and 157 nests for a ratio of 1.02:1. The second performance measure states we should have 20 percent or greater of the state's total sea turtle nests for the last five years. There was an average of 790 nests for the previous five years in North Carolina. In 2011 CALO had 20% of the state's total sea turtle nests for the last five years.

STRANDINGS

Collecting information from stranded turtles is also an important phase of the CALO Sea Turtle Monitoring Program. CALO documents strandings, collects data for the N.C. Sea Turtle Project Coordinator and the National Marine Fisheries Service (NMFS) and assists in the transportation of live strandings to rehabilitation facilities.

Eighty eight strandings occurred at CALO in 2011. All strandings were reported to the NCWRC and were documented with a “Sea Turtle Stranding and Salvage Network” stranding report. Green turtles accounted for the majority of the strandings (44). There were also 26 Kemp’s Ridleys, and 18 loggerheads. Fifty six turtles stranded on the ocean shore and 32 turtles stranded on the inshore soundside. There were four live strandings. The live stranded turtles were transported out of the park and sent to the Topsail Turtle Hospital or the Pine Knolls Shore NC Aquarium. Turtles were scanned for Passive Integrated Transponder (PIT) tags. No PIT tagged turtles were found in 2011. Tables 6 and 7 provide stranding data by island and species from 1994 to 2011.

Table 6. CALO SEA TURTLE STRANDINGS 1994 – 2011

YEAR	NCB	SCB	SHACK	OTHER	TOTAL
1994	22	27	12	1	62
1995	11	23	9		43
1996	29	33	29		91
1997	21	18	17	1	57
1998	20	21	20	2	63
1999	21	58	14	1	94
2000	28	47	24	2	102
2001	30	24	10		64
2002	13	38	19	1	71
2003	13	30	21		64
2004	20	39	18	1	78
2005	15	35	21		71
2006	14	26	20	1	61
2007	14	34	14	2	64
2008	22	110	16	2	149
2009	48	55	12	2	117
2010	130	122	19	4	275
2011	32	26	30	0	88

Table 7. CALO TURTLE STRANDINGS BY SPECIES 1994-2011

YEAR	LOGGERHEAD	GREEN	KEMP'S RIDLEY	LEATHERBACK	HAWKSBILL	UNKNOWN
1994	30	24	5	2	0	1
1995	27	7	6	1	0	2
1996	63	21	4	3	0	0
1997	49	1	7	0	0	0
1998	43	8	12	0	0	0
1999	36	41	15	2	0	0
2000	46	40	11	4	0	1
2001	38	15	9	2	0	0
2002	33	26	5	7	0	0
2003	44	9	7	2	1	1
2004	45	28	4	1	0	0
2005	37	21	6	0	2	5
2006	35	16	8	0	0	2
2007	19	38	1	0	0	6
2008	29	116	2	0	0	3
2009	36	66	14	0	0	1
2010	131	116	27	0	0	0
2011	18	44	26	0	0	0

MANAGEMENT RECOMMENDATIONS

1. CALO will continue to use the Interim Protected Species Management Plan as adopted in 2006 for protection, monitoring and management of sea turtles.
2. The park should continue their relocation standards of moving nests that the monitoring staff believes are likely to be flooded repeatedly.
3. A detailed guide to nest relocation identifying specific areas of beach susceptible to erosion and repeated flooding will be developed for the seashore for monitoring staff in 2012.
4. Evaluate established nest relocation areas before nesting season in April to determine suitability and nest relocation options.
5. All park staff and volunteers involved with turtle monitoring will be given complete training in current monitoring procedures.
6. Educational efforts should continue to be directed toward park visitors to prevent inadvertent disturbance to nesting females, eggs, and hatchlings. This should include posted signs, site bulletins, and interpretive programs to include nest excavations. The park should to continue to cooperate with the North Carolina Maritime Museum to educate visitors about sea turtles.
7. CALO should continue with the DNA study of nesting females of the Northern Recovery Unit in 2012.

APPENDIX I
2011 INDIVIDUAL NEST DATA

Table 9. North Core Banks Sea Turtle Nesting Data-2011

#	Date	Mile	Relocated Mile	Hatch Date	Incubation days	Total # Eggs, (TC)	# Hatchlings, (H)	# hatch dead, (HD)	% Emerge, (H-HD/TC)	Comments
NCB 002	5/23/2011	14.81		7/28/2011	66	158	140	5	85	
NCB 003	5/23/2011	5.23							0	Entire nest was predated, raccoon
NCB 005	5/30/2011	1.19	4.9	8/2/2011	64	142	120	0	85	
NCB 006	6/1/2011	22.92	15.75	7/31/2011	60	124	119	5	88	
NCB 009	6/3/2011	14.42				103	96	0	93	
NCB 012	6/5/2011	16.35		8/3/2011	59	59	44	0	75	
NCB 016	6/6/2011	9.34				107	97	2	89	
NCB 017	6/8/2011	13.91		8/5/2011	58	145	139	0	95	
NCB 021	6/9/2011	12.8		8/5/2011	57	123	109	3	86	
NCB 023	6/12/2011	16.16		8/11/2011	60	113	102	0	89	
NCB 024	6/12/2011	9.07		8/9/2011	58	130	116	5	84	
NCB 025	6/14/2011	6.27		8/9/2011	56	122	119	1	97	

NCB 027	6/17/2011	Mile 17.45		8/19/2011	63	121	117	0	97	
NCB 038	6/19/2011	Mile 11.80	11.2 3	8/11/2011	53	91	79	1	84	
NCB 040	6/21/2011	Mile 5.30	5.29	8/12/2011	52	82	64	0	75	
NCB 042	6/22/2011	Mile 16.57		8/23/2011	62	102	99	0	92	Excavated early due to hurricane Irene
NCB 052	6/27/2011	Mile 17.12		8/21/2011	55	134	128	15	83	
NCB 053	6/28/2011	Mile 20.81							0	confirmed lost on 11/3/2011, Hurricane Irene
NCB 059	6/30/2011	Mile 13.34		8/20/2011	51	155	147	3	92	
NCB 060	6/30/2011	Mile 10.03	11.2 4	8/21/2011	52	88	75	0	87	Excavated early due to hurricane Irene
NCB 061	7/1/2011	Mile 9.02	11.2 5	8/22/2011	52	107	89	0	83	Excavated early due to Hurricane Irene
NCB 063	7/4/2011	Mile 13.54	15.1 7	8/22/2011	49	100	90	0	83	Excavated early due to hurricane Irene
NCB 064	7/4/2011	Mile 6.53							0	Hurricane Irene Loss
NCB 065	7/5/2011	Mile 6.81							0	Hurricane Irene Loss
NCB 068	7/6/2011	Mile 15.00	15.1 6			114			0	Hurricane Irene Loss
NCB 069	7/6/2011	Mile 4.12							0	Hurricane Irene Loss
NCB 073	7/8/2011	Mile 20.59							0	confirmed lost due to Hurricane Irene

NCB 081	7/12/2011	Mile 11.47	11.4 7			95	0	0	0	8/27 sand deposition from Hurricane Irene.
NCB 083	7/12/2011	Mile 11.30	11.3 1			129	1	0	1	8/27 sand deposition from Hurricane Irene
NCB 085	7/13/2011	Mile 12.15	11.9 3			102	0	0	0	sand deposition on 8/27 from Hurricane Irene.
NCB 086	7/13/2011	Mile .45							0	Hurricane Irene Loss
NCB 087	7/14/2011	Mile 14.31		9/4/2011	52	99	91	0	92	hatchling tracks toward soundside, no tracks to ocean, many predator tracks,
NCB 088	7/15/2011	Mile 17.48							0	Hurricane Irene Loss
NCB 092	7/19/2011	Mile 15.81							0	Hurricane Irene Loss
NCB 095	7/19/2011	Mile 5.40	5.34			113	0	0	0	sand deposition on 9/10. partial development of embryos.
NCB 097	7/20/2011	Mile 19.55	15.7 5			95			0	Hurricane Irene Loss
NCB 098	7/20/2011	Mile 16.51							0	Hurricane Irene Loss
NCB 099	7/21/2011	Mile 7.02	5.31			121	0	0	0	sand deposition from hurricane Irene. Partial development of embryos.
NCB 100	7/22/2011	Mile 13.57	1.94			88	0	0	0	sand deposition from Hurricane Irene.
NCB 103	7/27/2011	Mile 12.33							0	Hurricane Irene Loss
NCB 105	7/28/2011	Mile 4.59	5.17			110	83	0	73	roots in nest
NCB 107	7/29/2011	Mile 1.49	5.1			131	0	0	0	sand deposition on 8/27 by Hurricane Irene.

NCB 108	7/30/2011	Mile 19.27							0	Hurricane Irene Loss
NCB 109	7/30/2011	Mile 22.39	15.8			103			0	Hurricane Irene Loss
NCB 110	7/30/2011	Mile 15.79							0	Hurricane Irene Loss
NCB 111	8/1/2011	Mile 7.32							0	Hurricane Irene Loss
NCB 116	8/3/2011	Mile 6.28							0	Hurricane Irene Loss
NCB 122	8/4/2011	Mile .03							0	Hurricane Irene Loss
NCB 125	8/9/2011	Mile 20.15	15.8 1			128			0	Hurricane Irene Loss
NCB 126	8/12/2011	Mile 17.68							0	Hurricane Irene Loss
NCB 128	8/14/2011	Mile 4.32							0	Hurricane Irene Loss
NCB 131	8/15/2011	Mile 16.10				99	0	0	0	no development
NCB 135	8/15/2011	Mile 20.27	15.8			98			0	Hurricane Irene Loss
NCB 136	2011-00-00	Mile 12.88		8/21/2011		136	129	2	85	Was a missed nest, excavated before hurricane Irene

Table 10. South Core Banks Sea Turtle Nesting Data-2011

#	Date	Mile	Relocated Mile	Hatch Date	Incubation days	Total # Eggs, (TC)	# Hatchlings, (H)	# hatch dead, (HD)	% Emerge, (H-HD/TC)	Comments
SCB 002	5/17/2011	42.49	41.74	7/15/2011	59	110	100	1	90	Excavated 5 days after major hatching event. root entanglement
SCB 003	5/23/2011	38.61		7/21/2011	59	62	57	0	92	Excavated 5 days after major hatching event. 2 hatchlings caught in screen 7/21/2011. Ants in nest chamber
SCB 007	5/24/2011	43.09				160	157	3	96	Excavated 10 days after depression.
SCB 009	5/25/2011	42.53				113	84	0	74	Excavated 10 days after depression. Overwashed 7/17, 7/18 and 7/19.
SCB 010	5/27/2011	36.97		7/30/2011	64	138	59	0	43	Excavated 5 days after major hatch date. Hatchlings- 15-20 sets of tracts to dunes or N on beach for ~300ft.
SCB 011	5/28/2011	25.87		7/25/2011	58	92	62	0	67	Excavated 5 days after major hatching event.
SCB 012	5/29/2011	41.34				122	115	1	93	Excavated 11 days after depression. 7/27 and 7/31 superficial digging on screen by raccoon.
SCB 016	6/2/2011	41.59		7/31/2011	59	111	106	0	96	Excavated 8 days after major hatch event. 7/31 68 hatchlings were predated by a raccoon on emergence.
SCB	6/3/2011	25.15	41.64	7/28/2011	55	111	95	0	83	Excavated 5 days after major hatching

017										event.
SCB 019	6/5/2011	45.86	41.65	7/30/2011	55	119	111	3	91	Excavated 5 days after major hatching event. 1 hatchling was disoriented on 8/2; circling event
SCB 020	6/6/2011	43.9		7/29/2011	53	100	94	0	91	Excavated 5 days after major hatching event.
SCB 021	6/7/2011	27.31		8/8/2011	62	140	100	0	71	Nest excavated five days after nesting event. All unhatched eggs were undeveloped.
SCB 026	6/9/2011	43.24	41.65	8/3/2011	55	146	142	3	95	Excavated 5 days after major hatching event.
SCB 027	6/10/2011	38.77		8/2/2011	53	128	112	0	88	Excavated 5 days after major hatching event.
SCB 028	6/10/2011	40.82		8/6/2011	57	141	75	1	52	Excavated 5 days after hatching event. 1 UH late stage development; 64 UH undeveloped
SCB 029	6/11/2011	45.31		8/8/2011	58	105	100	2	93	Excavated 5 days after major hatch event. 2 hatchlings caught in screen 8/8/2011 4
SCB 030	6/12/2011	25.3	42.21	8/3/2011	52	110	105	0	95	Excavated 5 days after major hatching event.
SCB 031	6/12/2011	45.01		8/9/2011	58	116	97	2	88	Excavated 5 days after hatching event. 7 unhatched eggs undeveloped.
SCB 032	6/13/2011	30.19		8/9/2011	57	131	120	17	75	Excavated 5 days after first hatching event.
SCB 035	6/16/2011	42.57		8/15/2011	60	131	128	1	96	Excavated 5 days after first hatching event. -roots in nest -many ants in nest
SCB 036	6/16/2011	38.58		8/7/2011	52	140	133	1	94	Excavated 5 days after first emergence. All 6 UH undeveloped
SCB	6/19/2011	25.48		8/10/2011	52	139	119	0	86	Excavated 5 days after first hatching

039										event. 8-10-11 one hatchling stuck in screen
SCB 040	6/19/2011	34.98		8/13/2011	55	106	100	0	94	Excavated 5 days after first emergence.
SCB 041	6/19/2011	40.81		8/12/2011	54	130	83	0	64	Excavated 5 days after first emergence. 45 UH eggs undeveloped
SCB 042	6/20/2011	30.21		8/17/2011	58	95	80	0	84	Excavated 5 days after first emergence 14 UH undeveloped
SCB 043	6/20/2011	34.8		8/25/2011	66	119	79	0	66	Excavated early due to Hurricane Irene
SCB 044	6/20/2011	39.81		8/15/2011	56	115	112	1	92	8/15-17/2011 - Root entanglement - 4 hatchlings, 1 dead 8/18/2011
SCB 045	6/21/2011	40.54		8/13/2011	53	109	98	0	84	Excavated 5 days after first emergence. 8/18 1 hatchlings went out of closure for 50 ft before going into water.
SCB 047	6/22/2011	43.24	42.24	8/18/2011	57	116	105	6	84	Excavated 5 days after first hatching event. 10 UH undeveloped
SCB 048	6/22/2011	43.8		8/11/2011	50	156	138	1	82	Excavated 5 days after major hatching event. -5 dead pipped -
SCB 050	6/23/2011	25.24		8/17/2011	55	106	72	1	67	Excavated 5 days after first emergence
SCB 051	6/23/2011	31.85		8/17/2011	55	104	94	0	90	Excavated 5 days after first emergence 9 UH undeveloped
SCB 052	6/23/2011	43.15		8/11/2011	49	149	145	21	82	Excavated 5 days after major hatching
SCB 057	6/23/2011	45.88		8/18/2011	56	96	58	1	58	Excavated 5 days after first emergence. 8/21-Vehicle drove over barricade sign and into closure, turned around
SCB 058	6/24/2011	45.71	46.51	8/21/2011	58	130	102	1	72	Excavated 3 days after emergence (Hurricane Irene) 8/20 Ghost crab dug

										into nest but no evidence of predation seen
SCB 062	6/26/2011	47.55		8/25/2011	60	120	0	0	0	Laid near a creek, water coming up from underneath soundside, relocated 7/6
SCB 063	6/27/2011	25.51	26.79	8/21/2011	55	87	78	0	90	
SCB 065	6/27/2011	24.45		8/25/2011	59	120	75	1	64	Excavated same day due to hurricane Irene
SCB 067	6/27/2011	41.53		8/22/2011	56	112	101	3	88	Excavated 2 days after first emergence (Hurricane Irene) 8/24
SCB 068	6/27/2011	46.48		8/25/2011	59	90	44	5	43	Excavated same day as hatch due to hurricane Irene
SCB 073	6/30/2011	39.29		8/20/2011	51	106	93	7	80	Excavated 3 days after first emergence (Hurricane Irene) Roots in nest
SCB 074	7/1/2011	32.23		8/23/2011	53	113	111	0	96	Excavated early due to hurricane Irene
SCB 075	7/2/2011	27.65		8/25/2011	54	75	67	1	81	Excavated early due to hurricane Irene
SCB 077	7/3/2011	30.05	35.17						0	Hurricane Irene Loss
SCB 078	7/3/2011	33.34		8/25/2011	53	86	78	0	91	Excavated early due to Hurricane Irene
SCB 080	7/3/2011	40.78		8/25/2011	53	85	29	0	32	Excavated same day as hatch due to Hurricane Irene
SCB 084	7/4/2011	24.26	35.76						0	Hurricane Irene Loss
SCB 086	7/5/2011	36.3		8/24/2011	50	133	60	0	45	Excavated early due to Hurricane Irene, released 60 hatchlings after inventory

SCB 087	7/5/2011	43.23		8/24/2011	50	142	136	0	95	Excavated same of hatching event because of Hurricane Irene 1 UH dead pipped
SCB 088	7/5/2011	43.46							0	Hurricane Irene Loss
SCB 089	7/6/2011	42.35	42.22						0	Hurricane Irene Loss
SCB 090	7/6/2011	45.89		8/25/2011	50	99	93	1	88	Inventory done early due to hurricane Irene
SCB 091	7/8/2011	30.67							0	Hurricane Irene Loss
SCB 092	7/8/2011	39.51							0	Hurricane Irene Loss
SCB 097	7/10/2011	25.15	35.74						0	Hurricane Irene Loss
SCB 098	7/11/2011	38.49				125			0	Hurricane Irene Loss
SCB 099	7/12/2011	37.45							0	Hurricane Irene Loss
SCB 102	7/15/2011	28.98	27.54						0	Hurricane Irene Loss
SCB 104	7/16/2011	27.8	26.72			105			0	Hurricane Irene Loss
SCB 108	7/18/2011	24.34				127			0	Hurricane Irene Loss
SCB 113	7/19/2011	42.69	26.75						0	Hurricane Irene Loss
SCB 116	7/20/2011	24.57	42.2			80			0	Hurricane Irene Loss
SCB	7/21/2011	44.18				121			0	Hurricane Irene Loss

118										
SCB 120	7/24/2011	34.9							0	Hurricane Irene Loss
SCB 121	7/24/2011	39.11							0	Hurricane Irene Loss
SCB 124	7/24/2011	47.73	35.19			104	0	0	0	soundside nest in Cape Lookout Bight
SCB 125	7/31/2011	33.76	27.49			87			0	Hurricane Irene Loss
SCB 127	8/1/2011	28.49				116			0	Hurricane Irene Loss
SCB 128	8/1/2011	42.78	26.84						0	Hurricane Irene Loss
SCB 129	8/2/2011	24.81	26.91			127			0	Hurricane Irene Loss
SCB 130	8/4/2011	24.46	42.21			124			0	Hurricane Irene Loss
SCB 131	8/5/2011	42.27				126			0	Hurricane Irene Loss
SCB 132	8/7/2011	43.17							0	Hurricane Irene Loss
SCB 133	8/8/2011	31.88							0	Hurricane Irene Loss
SCB 134	8/11/2011	46.59				120	86	1	71	hatched post Irene
SCB 136	8/19/2011	42.18	41.74						0	Hurricane Irene Loss

Table 11. Shackleford Banks Sea Turtle Nesting Data-2011

#	Date	Mile	Relocated Mile	Hatch Date	Incubation days	Total # Eggs, (TC)	# Hatchlings, (H)	# hatch dead, (HD)	% Emerge, (H-HD/TC)	Comments
SB 003	5/29/2011	mile 54.43		7/21/2011	53	150	126	1	83	7/21 ghost crab hole in nest
SB 005	5/27/2011	mile 53.53				136	63	0	46	
SB 007	6/1/2011	mile 50.36		8/4/2011	64	117	86	0	73	hatched by 8/3/2011
SB 008	6/2/2011	mile 52.68				102	67	1	65	7/28-depression/hatch, erosion scarp 1 foot away
SB 009	6/9/2011	mile 56		8/12/2011	64	120	116	1	88	soundside nest within Beaufort Inlet
SB 010	6/5/2011	mile 52.60				78	66	1	83	Tropical Storm Emily swell/tide is at nest
SB 011	6/11/2011	mile 53.27		8/4/2011	54	127	70	1	54	nest chamber was wet on 8/4, unhatched eggs were undeveloped
SB 012	6/11/2011	mile 54.66		8/4/2011	54	115	60	2	50	
SB 014	6/22/2011	mile 53.33		8/13/2011	52	139	93	0	66	
SB 017	6/22/2011	mile 50.08		8/13/2011	52	94	90	2	93	
SB 018	6/23/2011	mile 49.24		8/12/2011	50	117	116	4	96	
SB 019	6/25/2011	mile 52.81		8/18/2011	54	114	71	1	61	
SB 020	6/29/2011	mile 52.04		8/18/2011	50	110	98	0	88	
SB 022	7/5/2011	mile 55.20							0	Hurricane Irene loss
SB 023	7/6/2011	mile 50.40		8/25/2011	50	85	80	0	0	Excavated early due to hurricane Irene. Hatchlings released.
SB 024	7/6/2011	mile 49.57							0	Hurricane Irene loss
SB 027	7/7/2011	mile 53.27		8/25/2011	49	95	79	8	74	Excavated early due to hurricane Irene, hatchlings released

SB 029	7/7/2011	mile 50.53								0	Hurricane Irene loss
SB 030	7/10/2011	mile 51.73								0	Hurricane Irene loss
SB 031	7/13/2011	mile 50.06								0	Hurricane Irene loss
SB 033	7/16/2011	mile 52.08				108	1	0		1	2 feet of sand deposition from Hurricane Irene.
SB 034	7/18/2011	mile 53.70								0	Hurricane Irene loss
SB 035	7/20/2011	mile 52.78								0	Hurricane Irene loss
SB 037	7/20/2011	mile 48.54								0	Hurricane Irene loss
SB 042	8/4/2011	mile 52.91								0	Hurricane Irene loss
SB 043	8/7/2011	mile 51.42								0	Hurricane Irene loss
SB 044	8/18/2011	mile 53.99	52.03	11/7/2011		110	80	7	66		sand deposition on 8/27 of 1.5 feet from Hurricane Irene. Hatchlings released at inventory.

APPENDIX II
2011 GIS SEA TURTLE ACTIVITY MAPS

Figure 4. 2011 North Core Banks Sea Turtle Activities

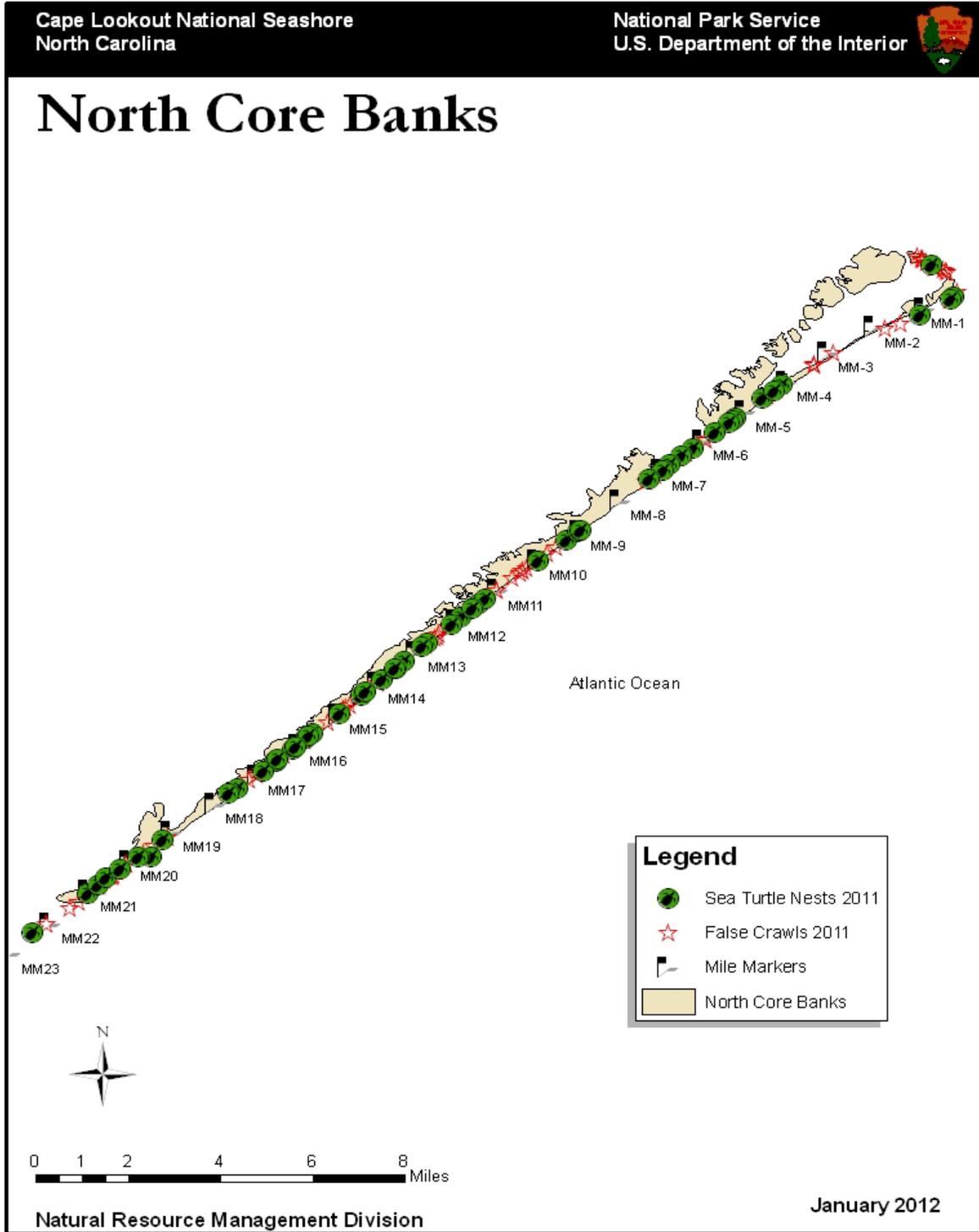


Figure 5. 2011 South Core Banks Sea Turtle Activities.

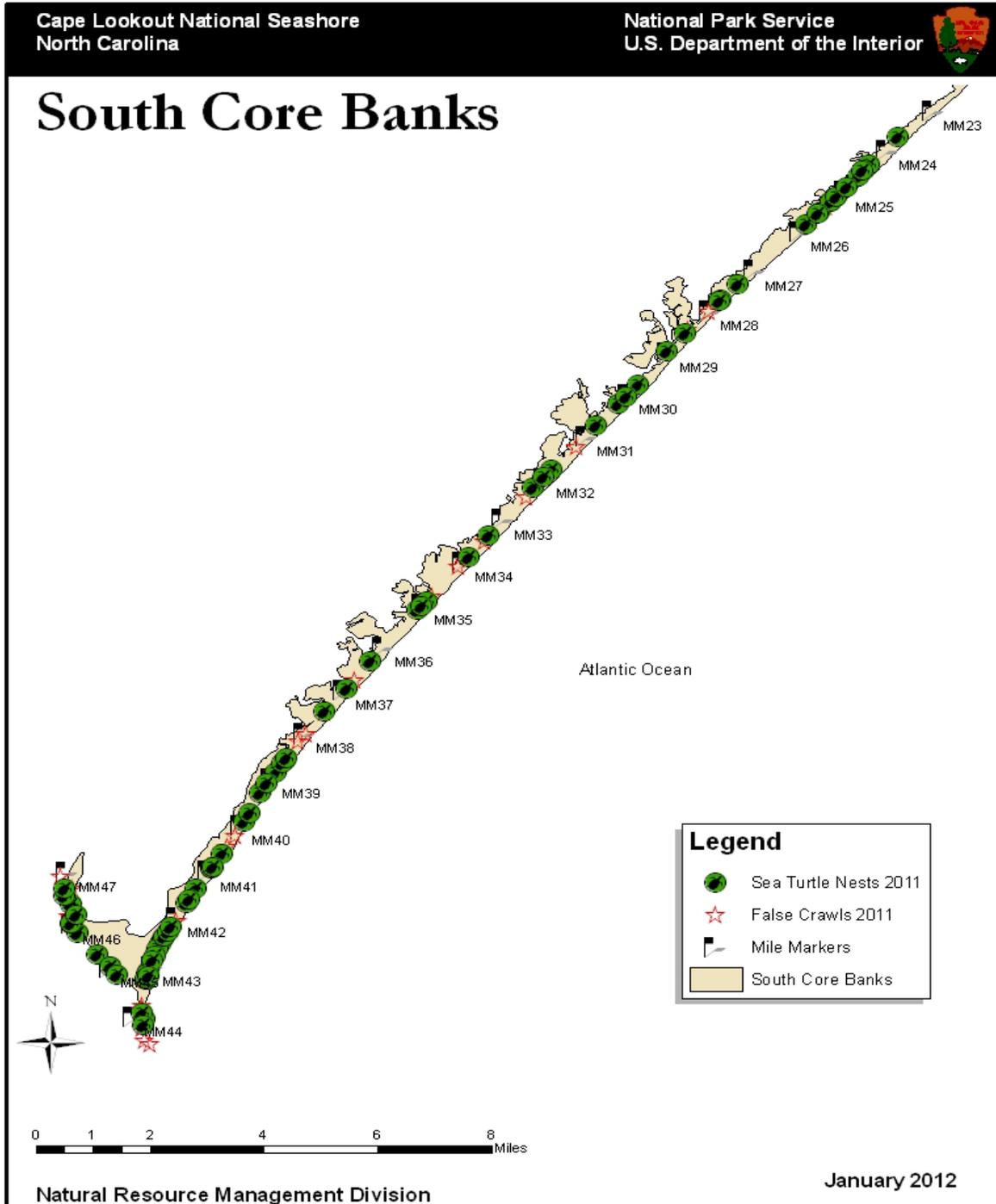
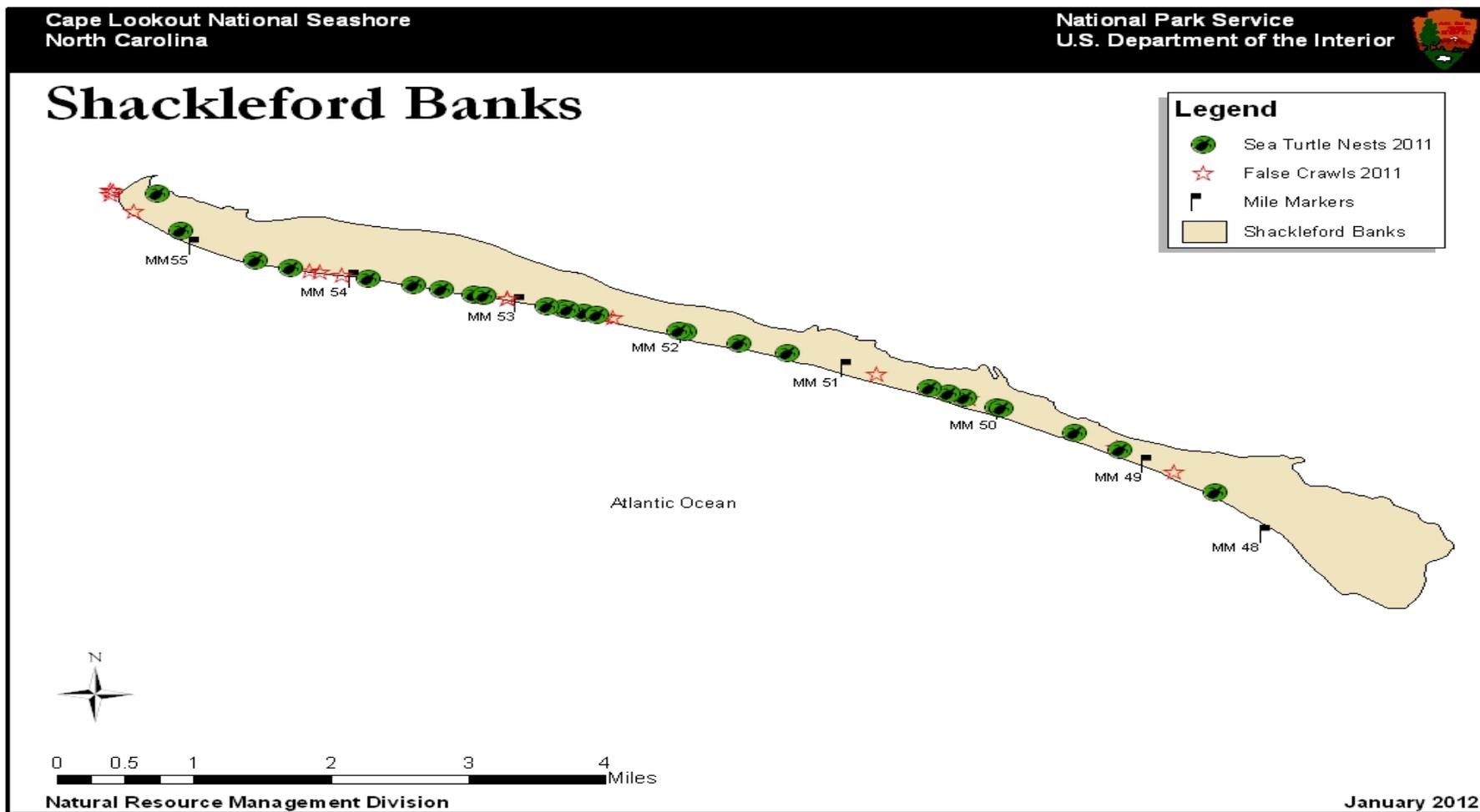


Figure 6. 2011 Shackleford Banks Sea Turtle Activities.



Appendix III

2011 SEA TURTLE PROGRAM PROCEDURES

2011 SEA TURTLE PROGRAM PROCEDURES

The basic procedures for the 2011 sea turtle program are outlined below. The monitoring program encompasses both turtle nesting activity and turtle strandings. The primary goal of the program is to ensure continued survival of sea turtles. This is done by:

- collecting data that can be used by the NPS and other organizations in developing sea turtle conservation programs
- protecting sea turtle nests and hatchlings

These procedures outline the basic organization of monitoring staff, describe field identification of nesting activities, and provide instructions on the monitoring system. In order to standardize data collection methodology and provide year to year consistency of data collection Cape Lookout will adopt the U.S. Fish and Wildlife's "Index Nesting Beach Survey Protocol". This protocol is given in Attachment 7.

ORGANIZATION OF MONITORING PROGRAM STAFF

The organization of the sea turtle monitoring staff is as follows:

Resource Management Specialist (RMS)

- Oversees the total program and assures all permits are current
- Acts a liaison with other agencies
- Represents CALO at public hearings regarding sea turtles
- Reviews and routes turtle related reports to appropriate authorities

Field Coordinator

- Reviews turtle activity reports
- Checks nest sites for proper marking
- Provides field guidance on locating nests, relocations, marking and follow-up
- Assures turtle monitoring staff are carrying out the program as described in the procedures
- Purchases related supplies and equipment
- Schedules staffing requirements
- Ensures follow-up checks are conducted on all nests and digs
- Completes the annual turtle program summary report

TYPES OF NESTING ACTIVITIES AND FIELD IDENTIFICATION TECHNIQUES

Nesting activity is defined as any terrestrial activity by sea turtles possibly related to nesting. These techniques were developed for loggerhead sea turtles, the majority of activities. See additional notes for other species. There are three types of nesting activities. Determining the type of nest activity is the initial step in field observations. The types of nesting activities and field techniques for identifying them are:

Nest: Nesting occurs when eggs have actually been laid. Usually, there is a body pit associated with a nest. A body pit is a large shallow depression or disturbance made in the beach from the turtle's initial digging activities; loggerhead body pits are about 2.5' in diameter and 6" deep. There are tracks associated with nesting activity. Loggerhead tracks are approximately 2' wide.

Choose the most likely spot(s) in the body pit and carefully dig down 10 to 15 inches by hand to locate the nest. You may determine the most likely spot by determining the direction of the turtle crawl and digging on the trailing edge of the body pit. The actual nest may be anywhere in or at the edge of the body pit. A methodical approach may be the easiest and most effective way of locating nests. Place surveyor flags in a circle around the area in which the nest is most likely to be found. Such a circle should encompass an area larger than the typical body pit. Divide the circle into quarters and excavate one quarter at a time. Do not refill any portion of the circle until either the nest is found or the entire circle has been checked. Nests are often difficult to find; you may have to dig several times to locate the nest. If eggs are found, do not disturb them unless the nest is to be relocated, refill the nesting area with sand. Pack the sand tightly; this is important for proper incubation.

Dig: A dig occurs when the turtle excavates a body pit or disturbs a large amount of sand but an egg chamber is unconfirmed. A nest is occasionally misidentified as a dig because an egg chamber is difficult to find, often because the body pit is indistinct or obscured by the turtle's activities. For this reason, every "dig" will be accurately marked, recorded, and monitored just as if it is a confirmed nest, except that the screening will not be installed

Crawl: Crawls are defined as turtle tracks that are not associated with any type of digging activity by the turtle. Crawls will only be counted if they extend above the most recent high tide line. Also referred to as a false crawl.

TURTLE NESTING ACTIVITY MONITORING SYSTEM

A uniform system to locate, mark, and record turtle nesting activity is necessary for coordinating staff efforts in collecting related data. This will enhance the long-term value of the data collected by making it easier to analyze and retrieve data. Equipment and materials needed for the monitoring program are listed in attachment 1.

Mile Markers: Mile markers are the primary means of recording locations of sea turtle nesting

activity. It facilitates determining concentrations of nesting activity and relocating nests for follow-up. Beach areas are marked at one-mile intervals. Attachment 2 shows the "mile marker locations." More information on using the markers is contained in the instructions for completing the "Turtle Nest Data Sheets" (Attachment 3A).

Marking Nesting Activity Sites: Techniques for marking each activity are given below.

Nest Marking: Each nest is marked with four stakes. Stake #4 is placed two feet from the seaward side of the egg chamber. Stake #3 is placed three feet from the dune side of the egg chamber. Stake #1 is placed at the primary dune line and perpendicular to the shoreline (See attachments 4 and 4A). Stake #2 is placed three feet from the seaward side of stake #1 and in line with stakes #1, 3 and 4.

If the nest is laid behind the dune line, also place an extra stake at least 25' seaward of stake #4 so that it may be seen from the beach but not be below the high tide line.

The nest number will be written in waterproof ink on stakes number 1 and 3. This will facilitate identifying nests at a later time. This number is assigned from the "Activity No." column of the "Master Log of Sea Turtle Nesting Activity" (Attachment 5 and 5A). When marking a nest or dig measure 12" up from the surface of the sand at stakes #3 and 4 and mark the stakes at this height with a line completely around the stake using a permanent marker. Observe the mark daily for drastic sand deposition or erosion. Around the time of hatch, level sand over the nest to the original 12" mark.

Dig Marking: Digs will be marked the same as nests. Since the location/existence of any associated nest is in doubt, use the center of the body pit for the nest as a reference in setting stakes. This will require that you carefully excavate the stake locations by hand to check for presence of eggs prior to setting stakes.

Crawl Marking: Simply flag the highest point of the crawl. The flag should be removed when the tracks are no longer visible.

Recording Nesting Activity: Records of sea turtle nesting activity are kept on "Turtle Nest Data Sheets" (Attachment 3) and the "Master Log of Sea Turtle Nesting Activities" (Attachment 5 and 5A). Individual data sheets are used for each nest and dig. The log is used to summarize and keep track of turtle activities. Attachment 3A provides instructions on completing data sheets.

GPS Locations: The latitude and longitude of all activities will be recorded using a Garmin GPS unit. To mark a position press "mark" and "enter." The waypoint number should be the same as the activity number on the Master Log.

Relocating Nests: Nests laid at or below the high tide line or in areas where they are likely to be washed away will be relocated. Three areas on each island will be designated as closed to vehicles and nests will be relocated into the closed area closest to the original nest site. Attachment 8 indicates which areas will be closed to vehicles for relocation purposes. Nests on Shackleford Banks

will be relocated to the nearest suitable area.

Nests should be relocated within 12 hours after the eggs were laid. The following procedures should be followed for relocating nests.

1. When relocating a nest, be careful not to rotate the eggs.
2. Gently move the eggs from the nest into the pail.
3. Measure the dimensions of the nest chamber, depth to top of eggs, width of chamber, and depth to bottom of nest chamber. Use these dimensions to recreate the new nest chamber.
5. Fill in the original excavation and mark with a surveyor flag. After wind, rain, or tide has erased the tracks, remove the surveyor flag.
6. Transport the eggs preferably by foot to the new nest site. If the eggs must be moved by vehicle to the nearest relocation area, do so slowly and try to minimize jarring.
7. The eggs should be placed in the new nest site in the same layered fashion as the original nest.
8. Cover the eggs with sand.

This process should be completed quickly so that the temperature of the eggs will not change drastically.

PROTECTING NESTS

Nest protection will start as soon as the nest is discovered. "Digs" will be treated as "nests." Each nest will be staked/marked as described in attachments 4 and 4A. The main purpose of the stakes is to warn ORV Drivers away from nests and facilitate relocating nests later.

Place a 3' by 3' (2"x 4" mesh) screen over each nest. The 4" side of the wire opening should be parallel with the waterline. Anchor the four sides down with steel rebar and cover with 1" to 2" of sand. The screen is designed to protect the nest from raccoon predation. Some nests on SCB will be covered with a 3'x3'x2' wire cage to prevent raccoons from digging through the screen. Bury the edges of the cage about 6" and anchor it with rebar. Digs do not receive screening since rebar anchors could puncture unlocated eggs.

After 50 days have passed the turtle monitoring staff will erect a funnel-shaped barricade around those nests/digs not in protected areas (i.e. single nest) from the nest to a point at least 15 feet below the high tide line and smooth any ORV tracks in the enclosure. (The barricade should extend down to a point where the sand is usually hard enough to prevent formation of tire ruts). Attachment 6 diagrams the closure. This action provides a natural beach surface for the hatchlings to crawl to the ocean, protecting them from becoming trapped in ORV tracks. This barricade is removed after the nest is excavated. Barricade stakes will also be wrapped in orange or red reflector tape.

FOLLOW-UP ON NESTS AND DIGS

Follow-up of nesting activity involves excavating nests, looking for signs of turtle hatching, retrieving temperature HOBOS, and recording related data.

Follow-up of nesting activity begins fifty days after the nest was laid. Smooth the sand over and around the nest to a height equal to the original sand level indicated by the 12" line on stakes #3 and 4. This facilitates observing the small (2" to 4" inch) depression usually formed in the sand above the nests when hatching begins. Smoothing the sand also facilitates observing hatchling tracks. Excavate the nest on the fifth day after a major hatch (indicated by distinctive hatchling tracks), 10 days after the depression forms, or excavate the nest 75 days after the date laid if there has been no sign of hatching. Digs will be excavated after 75 days to determine if the activity was a nests or a crawl. If many live hatchlings are found in the nest, simply refill the nest with sand and continue to check until hatching occurs. Check the condition of the hatchlings prior to placing them back in the nest. If the egg yoke sack has not been fully absorbed by the hatchlings, then place them back in the nest, cover lightly with sand and allow them to complete this process. If the hatchlings are weak and or dehydrated (plastrons concave) they should be released as soon as possible. If there are hatchlings with fully absorbed egg yokes found in the nest after the main hatch, release them in the evening hours, preferably after dark. Such hatchlings should be allowed to crawl at least a short distance of beach and enter the ocean under their own power. Create/maintain a clear path to the ocean for the hatchlings; visitors should be kept back from the hatchlings to avoid stressing them. *It is a violation of our permit to dig into nests prior to hatch.*

When motionless hatchlings (apparently drowned) are located in a recently flooded nest, the following resuscitation efforts should be attempted.

1. Remove the hatchling from the water.
2. Invert hatchlings (head lower than tail).
3. Stimulate hatchlings by slight compressions of the plastron.
4. Raise the head to provide an open airway.
5. Continue stimulating for approximately 15 minutes.

If the hatchlings regain consciousness, monitor their progress and assist them in reaching the surf.

During late fall excavations, if sluggish turtles are located well after the 75-day normal incubation period, these measures may be taken.

1. Remove the turtles from the nests.
2. Allow them to warm on the sand or in a warm tidal pool until they become more active.
3. Assist the turtles to hard packed sand near the surf. If the turtles do not respond, the N.C. Aquarium may be telephoned for possible long-term care.

Digs are monitored daily beginning 10 days prior to estimated hatch date and ending at hatch or 75 days from date of lay, whichever occurs first. Look for signs of a depression or hatchling tracks within a 15-foot radius of the nest stakes. If no hatching is observed after day 75 dig out area with a shovel to determine if eggs are present or not. Make changes to datasheets to record nest or false crawl.

Complete the "Hatching Data" section of the Turtle Nest Data Sheet. Remove the turtle nest stakes.

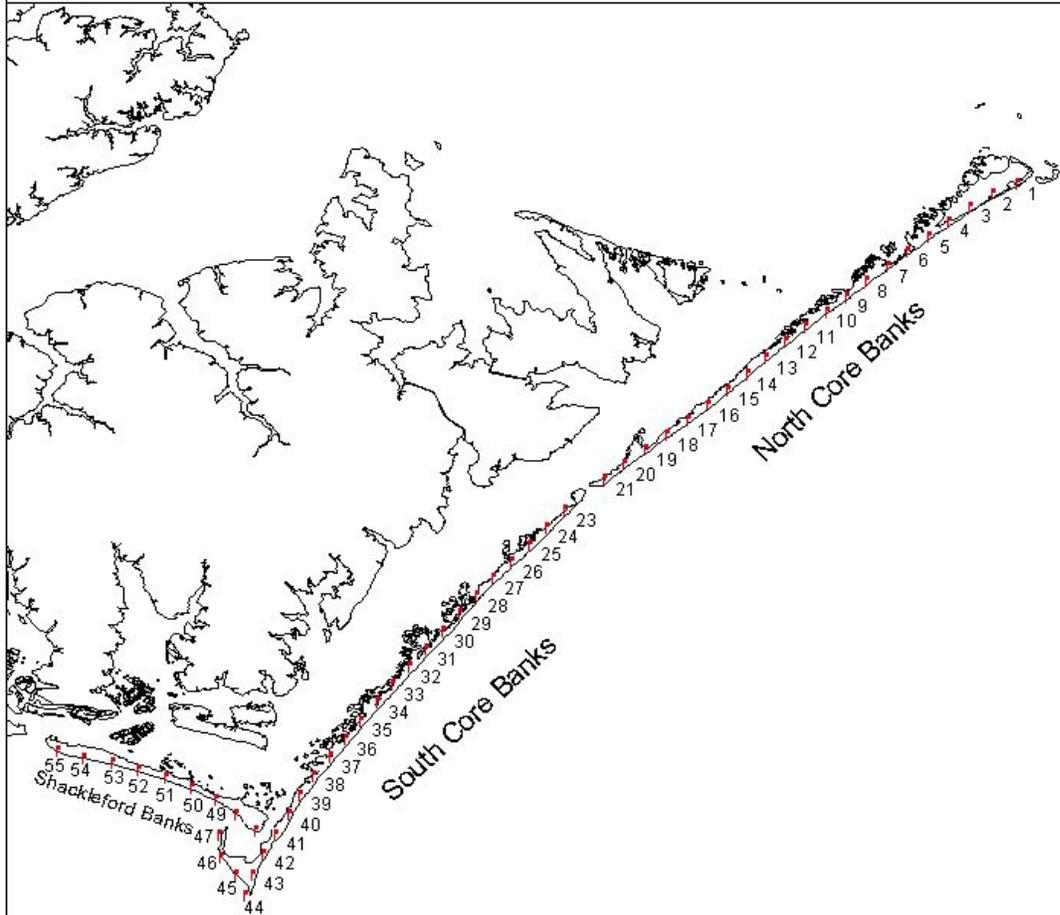
NOTES ON GREEN AND LEATHERBACK SEA TURTLES

While 99% of the sea turtle nests at Cape Lookout are loggerhead nests, we do provide nesting habitat for green and leatherback sea turtles. We may have green turtle nests every year in low numbers and can occur throughout the summer. Leatherback nests occur less frequently, about every other year and typically occur in late spring and early summer. In 2007 there was a leatherback activity on April 30. In general these turtles are treated the same as the loggerheads except for some important differences. Both the green and leatherback nest are laid deeper in the sand, leatherback eggs can be up to a meter deep. The green eggs are slightly bigger than loggerheads and the leatherback eggs are at least double the size of loggerheads. Leatherback eggs often go unconfirmed due to their depth and the body pit size. Incubation for leatherback eggs is longer from 60 to 110 days. Incubation for green nests is also longer from 64 to 69 days.

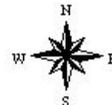
ATTACHMENT 1
EQUIPMENT AND MATERIALS
FOR
SEA TURTLE NEST MONITORING PROGRAM

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
Marker stakes	PVC 1 1/4" x 5' post and Wood 2"x2"x5' post	2 per nest 2 per nest
Post hole diggers		
Turtle monitoring kit	in pack, with contents as described below	1 for each island
Orange reflective tape	2" wide	
Tape measure	100'	
Marker	waterproof (permanent ink or paint)	
Pens		
Clip board	standard size	
Binder	for data sheets	

Attachment 2- Mile Marker System Cape Lookout National Seashore



National Park Service
Cape Lookout National Seashore
Resource Management



Plot date: December 1, 2000 c:\my documents\gis\base maps.apr

ATTACHMENT 3

TURTLE NEST DATA SHEET

CAPE LOOKOUT NATIONAL SEASHORE

NAME _____

_____ North Core Banks _____ South Core Banks _____ Shackleford Banks

Activity _____ (check one)
Number _____ Date _____ Nest _____ Dig _____ Turtle Observed? Y/N Species _____

Original Nest _____

Relocated Nest _____

Location (tenths of mile): _____

Location (tenths of mile): _____

Site Desc. _____

Site Desc. _____

Dist. above high tide _____

Dist. above high tide _____

Distance below high tide _____

Date and Time Relocated _____

Dist. dune stake to nest _____

Dist. dune stake to nest _____

of Eggs Relocated _____

Latitude _____ N

Longitude _____ W

Nest Damage/Predation (prior to hatchling emergence)

Date eroded/washed away _____

Date(s) flooded by tide _____, _____, _____, _____, _____, _____.

Human disturbances (circle one): ORV, Dug-up, Other _____

Ghost crab predation (date)? _____, _____, _____.

Raccoon predation (date)? _____, _____, _____.

HATCHING DATA

Dates nest hatched: _____ (circle major hatch date)

Excavated by _____ Date nest excavated _____

Hatched eggs, from which hatchlings escaped from egg H = _____

Hatched dead,
hatched from egg but dead in nest HD = _____

Unhatched eggs, includes turtles pipped dead..... UH = _____

Total eggs in Clutch (H+UH) TC = _____

Emergence success (H-HD/TC) ES = _____ %

Live Hatchlings released from nest LH = _____

ATTACHMENT 3A

INSTRUCTIONS FOR COMPLETING "TURTLE NEST DATA SHEET"

Activity Number - This number is assigned on the chronological order that the nesting activity (nest, dig, crawl) occurred in the area being monitored (South Core Banks, North Core Banks, or Shackleford Banks). For example, the number one would be entered for the first nest laid on North Core Banks (NCB); a three would be entered if it was the third nest laid on NCB.

Mileage - Mile Markers are the primary tools used in determining location. Mileage is obtained by using the mile markers and the ATV's odometer. For example, mileage of a nest that is .2 mile south of mile marker 40 on SCB is entered as 40.2. Refer to Attachment 2 for a diagram of the marker system.

Site Desc. - Descriptions such as "nested in grass", "nested among dunes", or "nest relocated to front of primary dune", etc. may be entered here.

Dist. above/below high tide - Give the distance in feet from the estimated high tide line.

Dist. dune stake to nest - This is the distance from the base of the stake farthest from the nest (stake #1), to the center of the egg chamber. This distance is measured following the natural grade between the stake and nest.

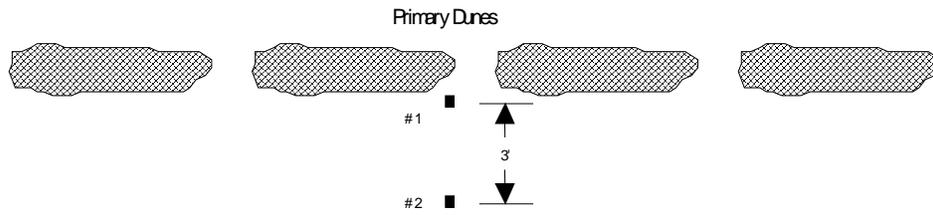
Latitude/ Longitude- If the nest is relocated, record the latitude and longitude of the new nest location using the GPS unit.

Predation- Record ghost crab predation if eggshells are found on the surface.

Emergence success - Percent of the eggs that hatched and produced turtles that emerged or were released from the nest.

ATTACHMENT 4

TURTLE NEST MARKER SYSTEM

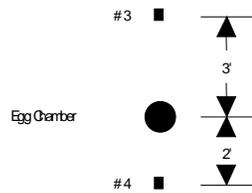


NOTES

- 1) Nest stakes are PVC, range stakes may be wooden or PVC
- 2) Stakes 1 through 4 must be on a straight line.
- 3) Stakes 3 and 4 should have orange reflector tape on top.

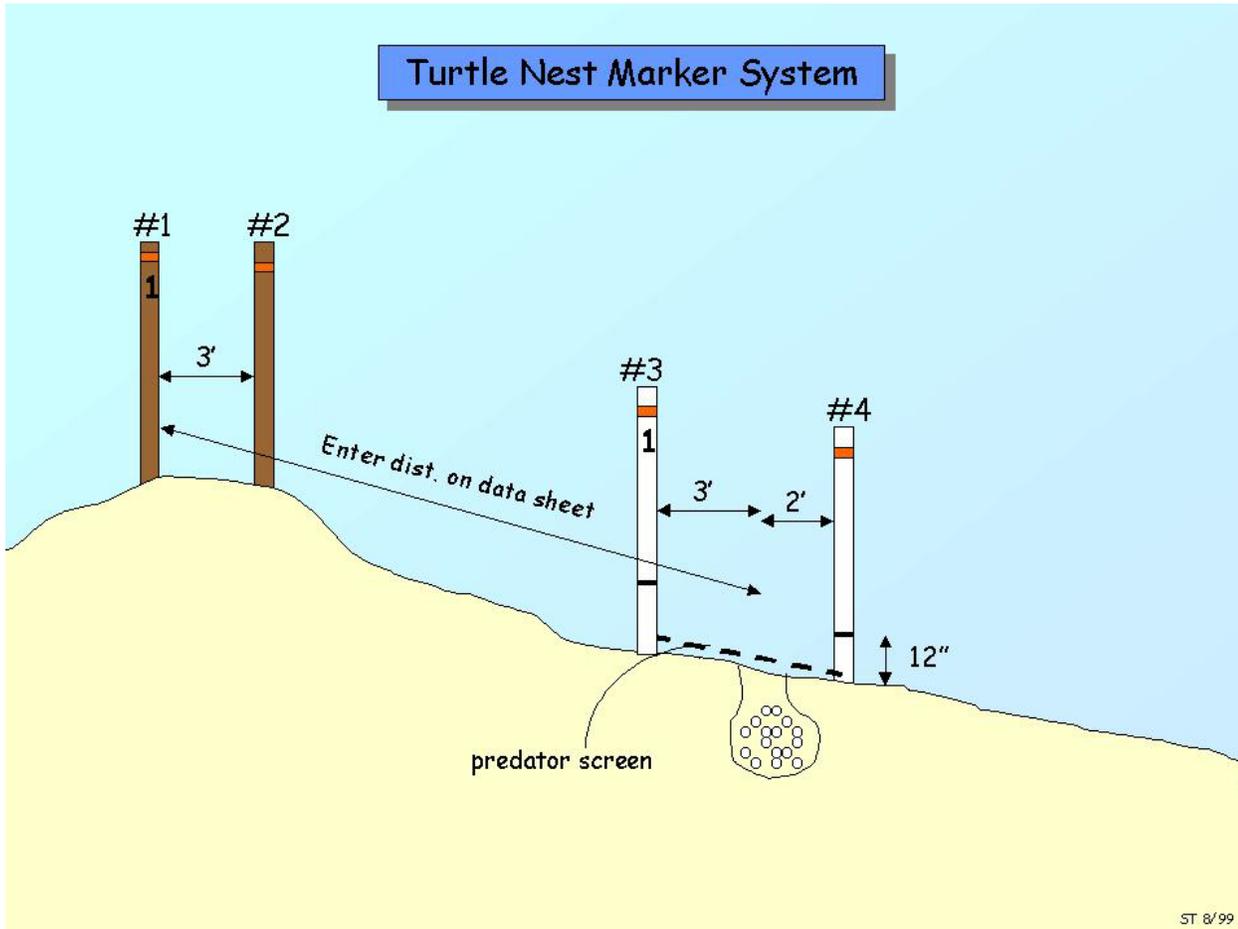
Legend

■ - Stake



ATTACHMENT 4A

TURTLE NEST MARKER SYSTEM



ATTACHMENT 5A

Instructions for Master Log of Sea Turtle Nesting Activities

Activity Number. This number is assigned sequentially and entered as the "Activity Number" on the turtle nest data sheet completed for each nest, dig, or crawl (N, D, or C) observed.

Location. Enter "mile" to the nearest tenth as entered on "Turtle Nest Data Sheet" in the "location" block for the original nest site and the relocated nest site.

Latitude and Longitude. Use a GPS unit to obtain the location. Record the location in DD.MMMMM format. Mark and save activity sequentially in GPS unit. This is the original nest location.

Date Occur. This is the date the activity is discovered.

Barricade Date. Add 50 days to the "Date Occurred" date to get this date. Smooth/level the sand over the egg chamber to facilitate observing formation of a "depression", an indication of hatching.

Estimated Hatch Date. This date is obtained by adding 60 days to the "Date Occurred." Start looking for a "nest depression" ten days before this date; continue watching the nest until either evidence of hatching occurs or 75 days have passed.

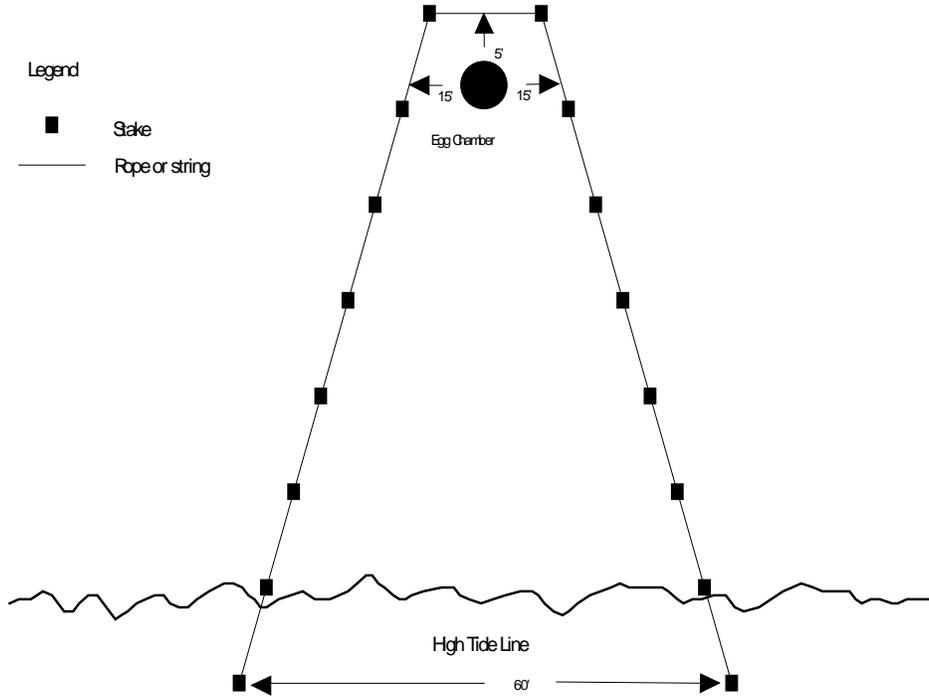
Depression Date. This date is taken by direct observation.

Actual Hatch Date. The day most hatchling tracks were observed or the day of the main emergence of hatchlings from the nest. If no sign of hatching was observed, excavate 75 days after the "Date Occurred".

Date Excavated. This is the date the nest was excavated by CALO personnel. Excavate five days after nest hatches.

ATTACHMENT 6 NEST BARRICADE

Primary Dunes



NOTES

- Approx 15' between posts
- Nest markers not shown

ATTACHMENT 7

U.S. FISH AND WILDLIFE SERVICE INDEX NESTING BEACH PROTOCOL

1. **Survey Consistency:** Standardization of data collection methodology and year to year consistency of data collection efforts are crucial to the long term success of the project. Adherence to the protocol outlined herein is necessary to eliminate survey bias. Deviations from this protocol must be relayed to project leaders in order to accurately interpret the data base.
2. **Survey Period:** All index beaches (east and west coast) south of and including Cape Canaveral National Seashore will be surveyed 15 May - 31 August of each year. All index beaches north of Canaveral National Seashore will be surveyed 1 June - 15 August of each year. Additional requirements for Cape Lookout National Seashore include monitoring from 1 May- September 15.
3. **Survey Time:** Surveys should be conducted in the early morning hours, preferably beginning at dawn.
4. **Survey Frequency:** There are several options, but one option must be selected and adhered to. Options are:
 - a. Seven (7) days per week. All crawls are marked daily to avoid duplicate counts on subsequent survey days. This is Cape Lookout National Seashore's option.
 - b. Six (6) days per week with randomized non-survey day and no "marking" of crawls on the non-survey day. Randomized non-survey days have been generated and will be provided by USFWS. Data is not reported from the non-survey day or from the survey immediately following the non-survey day. In other words, six (6) survey days without "marking" on the non-survey day result in 5 daily reported counts per week.
 - c. Six (6) days per week with randomized non-survey day and "marking" of crawls on the non-survey day. Randomized non-survey days have been generated and will be provided by USFWS. All crawls present on the non-survey day are "marked" prior to sundown. Data is reported from the survey day immediately following the non-survey day. Six (6) survey days with "marking" on the non-survey day result in 6 daily reported counts per week.
5. **Unplanned Missed Survey Days:** For projects surveying six days per week, an unplanned missed survey day may be substituted for a scheduled random non-survey day within the same week, provided the non-survey day has not already occurred. For all other situations follow

the procedures above in 4(b) and 4(c) as appropriate. Explain in remarks section of data report form for the affected week.

6. **Crawl Identification:** Surveyors will identify and record all "new" crawls by species and as nests or false crawls. False crawls will only be counted if they extend above the most recent high tide line. Crawl data will be reported by beach sector. The preferred length of beach sector is 1 km or 1/2 mile. Sectors must be identified with a unique numbering or lettering system.
7. **Crawl Verification:** Nest and false crawl determinations should be based on observable crawl characteristics. Digging for verification should not be routinely carried out. Probing for verification purposes is strongly discouraged.
8. **Data Reporting:** Data will be recorded on CALO Turtle Nest Data Sheets. Annual Sea Turtle Nesting Reports will be submitted to: NC Sea Turtle Program Coordinator

Attachment 8

Relocation Areas for Sea Turtle Nests

