

1989 MARINE TURTLE NEST
SCREENING PROGRAM AT
CANAVERAL NATIONAL SEASHORE,
FLORIDA

JOHN C. STINER
NATIONAL PARK SERVICE
CANAVERAL NATIONAL SEASHORE
TITUSVILLE, FLORIDA

JANUARY 1990

ABSTRACT

In 1989, Canaveral National Seashore completed the sixth year of its marine turtle nest screening program. A total of 1113 nests were deposited on the northern 11.25 miles of beach, 1095 loggerhead Caretta caretta and 18 green turtle (Chelonia mydas) nests. Ninety-three percent (1030) of the 1113 nests were screened to prevent raccoons (Procyon lotor) from depredating the nests.

Eighty-eight percent (903) of the screened nests hatched. Three percent (35) were depredated by raccoons. An average of 84 eggs (80 percent) hatched in each loggerhead nest and 96.5 (72 percent) in each green turtle nest. This yielded an estimated 74,424 loggerhead and 1,640 green turtle hatchlings.

Eighty-one percent (903) of the total nests (screened and unscreened) hatched. Ten percent were destroyed by raccoons, 5 percent were inundated with saltwater and 4 percent were washed away or not relocated.

No screening was done on the southern 12 miles of Canaveral National Seashore's beaches. Instead the U. S. Fish and Wildlife Service conducted a predator control program. Raccoons and a few armadillos (Dasypus novemcinctus) were live trapped and removed.

When U. S. Fish and Wildlife results become available, the cost and success of the two methods will be compared to guide future management actions.

INTRODUCTION

Canaveral National Seashore (CANA) is an important nesting beach for several species of threatened and endangered sea turtles. Its 23.25 miles of shoreline is one of the critical remaining stretches of undeveloped beach on the east coast of Florida. Over 2000 loggerhead turtle (Caretta caretta) nests are deposited in the park each year. A small but important number of green turtles (Chelonia mydas) and occasional leatherback (Dermochelys coriacea) and hawksbill (Ertmochelys imbricata) turtles nest at Canaveral as well.

Raccoons (Procyon lotor) present a major threat to the marine turtles at CANA. In the past they have depredated up to 99 percent of the nests (McMurtray, 1986). In 1984 the National Park Service implemented a nest screening program to aid the turtles. Wire screens were placed over the nests to deter raccoons from digging up the eggs. Over the next five years as the hours of coverage and number of personnel varied the percentage of nests that successfully hatched fluctuated. The number of successful nests rose from 30 percent in 1984 to 46 percent in 1986 and then declined to 40 percent in 1987 and 30 percent in 1988.

On the advice of the U. S. Fish and Wildlife Service, the lead agency on threatened and endangered species, assistance was sought from the Merritt Island National Wildlife Refuge. The refuge operates a turtle management program on the 6 miles of beach just south of CANA. It had reduced the predation rate to less than 5 percent by removing predators, chiefly raccoons, from the beach and dune area.

Because National Park Service policy has traditionally discouraged the removal or destruction of one native species to aid another (single species management) a comparative study was initiated to determine the desirability of utilizing predator removal at CANA. In 1989 the National Park Service would continue screening along the northern 11.25 miles of Canaveral's shoreline. In the southern 12 miles the U. S. Fish and Wildlife Service would remove raccoons. At the end of the season the two methods would be compared for nesting success, cost effectiveness and documented public reaction.

STUDY SITE AND METHODS

Canaveral National Seashore lies along the east-central coast of Florida with Bethune Beach to the north and Kennedy Space Center to the south. The northern 11.25 miles of beach is situated in Volusia County, the southern 12 miles in Brevard County.

The beach is essentially undeveloped with only a few artificial lights and number of boardwalks to protect the dune vegetation. The dune is well developed along most of the beach and is stabilized by a thick growth of sea oats (Uniola paniculata), sea grape (Coccoloba uvifera), saw palmetto (Serenoa repens) and other dune species. The beach is closed to the public between sunset and sunrise except for occasional guided turtle walks. These walks are limited in size to minimize disturbance to the nesting turtles.

From May 15 to September 30, two to three rangers and volunteers patrolled the beach each night on four-wheeled all-terrain vehicles (ATV's). They worked from 10:00 p.m. to 6:00 a.m. screening turtle nests and collecting data. Screening consisted of placing a 4 feet X 4 feet wire mesh screen over the nest and staking down the corners with three foot sections of #3 rebar. The rebar was bent over near one end to form a 70 degree angle. The 2 inches X 4 inches mesh size was large enough to allow hatchlings to emerge while discouraging raccoon attempts to reach the eggs. All nests undepredated at the time of discovery were screened. Any depredated nests that had less than 20 percent of the eggs destroyed were cleaned up and screened as well.

Data collection for each nest included: date, observer, nest number, species, location (the beach was divided into 44 quarter mile sections) and extent of depredation or tampering, if any. The date and grid location of each false crawl were also recorded.

Each nest was followed throughout the season to determine its outcome. Categories included hatched, destroyed by predators, inundated, eroded away and fate unknown. Hatching and emergence was determined by the presence of hatchling tracks and nest excavation. Emergences were observed for any evidence of disorientation caused by artificial lighting.

The normal incubation period for the loggerhead turtle is about 60 days and the green turtle from 48 to 70 days. After 65 days or evidence of hatching the screen was pulled from each nest. Every nest was at least partially excavated to verify hatching or non-hatching. For 10 percent of the nests a total excavation was

performed. Each unhatched egg and empty shell (hatched egg) was counted to calculate an average hatching success for the entire beach.

Night patrols ceased on September 5. The final observed nest was screened on September 11. Daytime monitoring continued through mid-November to determine the fate of the remaining screened nests.

RESULTS

Nesting

A total of 1113 nests were deposited on CANA'S northern 11.25 miles of beach in 1989. Of those, 1095 were loggerhead and 18 were green (Table 1). The overall nest density was 98.9 per mile or 61.8 per kilometer. This corresponded closely to the 1988 nesting density of 96.8 per mile or 60.1 per kilometer (Bryant, 1988). The total number of false crawls was 720, a 1:1.55 false crawl to nest ratio (Table 1). This was down slightly from the 1:1.06 false crawl ratio for 1988 (Bryant, 1988).

TABLE 1. Turtle Nest and False Crawls. 1989.
Canaveral National Seashore

<u>Species</u>	<u>Nests</u>	<u>False Crawls</u>
Loggerhead	1095	714
Green	<u>18</u>	<u>6</u>
Total	1113	720

Predators

Raccoons continue to be the primary predator of marine turtles at CANA. Ghost crabs (Ocypode quadrata) entered some nest mounds but did no observable damage. Ants and armadillos depredated several nests on the portion of CANA managed by the U. S. Fish and Wildlife Service, but were not observed to disturb any nests on the NPS-managed section of beach. Hogs, a major predator of turtle nests at Patrick Air Force Base, approximately 30 miles south of CANA, were not seen on CANA'S beach. However, hogs are present within the park's boundaries and could become a serious problem in the future.

Nest Depredation

Most nest depredation occurred within the first hour after deposition. On occasion, raccoons even removed eggs from beneath the turtle as the eggs were being laid. With a concerted effort to cover the beach as rapidly as possible, rangers and volunteers managed to reach 86 percent or 953 of the nests before the raccoons had destroyed any eggs.

The other 14 percent (160) of the nests were at least partially damaged. However of these, 77 (7 percent of the total) were only lightly depredated, the raccoons having been interrupted before they could destroy more than 20 percent of the eggs. In these cases the broken egg shells and yolk were cleaned out and the nest reburied and screened. The remaining seven percent (83) of the 1113 nests were completely destroyed by raccoons before they were located by park personnel.

Nest Screening

Ninety-three percent (1030) of the 1113 nests deposited on the northern 11.25 miles of CANA were screened; 953 were undepredated at the time of screening, 77 were partly predated (Table 2). Seven percent (83) of the nests were heavily depredated and not screened.

TABLE 2 Turtle Nest Action Upon Initial Encounter. 1989
 Canaveral National Seashore

<u>Action</u>	<u>Loggerhead</u>	<u>Green</u>	<u>Total</u>
Not Depredated/Screened	936	17	953
Partially Depredated/Screened	76	1	77
Totally Depredated/Not Screened	<u>83</u>	<u>0</u>	<u>83</u>
TOTAL	1095	18	1113

Depredation of Screened Nests

Three percent (35) of the 1030 screened nests were depredated, a sharp decline from the 19 percent recorded in 1988 (Bryant, 1988). Raccoons circumvented the eggs in one of two ways. They either tunneled under the screen to reach the egg cavity or, where the nest was shallow, reached down through the screen to grab the uppermost eggs in a clutch. In 23 of the 35 cases the nest was totally destroyed. In 12 others the majority of the eggs were still untouched and the nest was cleaned out and rescreened.

Outcome of Screened Nests

In 1989, 903 of the 1030 nests screened at CANA hatched, 886 loggerhead and 17 green. This represents an overall success rate of 88 percent. Two percent were destroyed by raccoons, six percent were inundated with saltwater and four percent were either washed away or never relocated (Table 3).

TABLE 3. Outcome of Screened Nests. 1989.
Canaveral National Seashore

<u>Outcome</u>	<u>Loggerhead</u>		<u>Green</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Hatched	886	88	17	94
Destroyed by Raccoons	23	02	0	0
Inundated	57	06	1	6
Washed Away/Not Located	<u>46</u>	<u>04</u>	<u>0</u>	<u>0</u>
TOTAL	1012	100	18	100

Outcome of Unscreened Nests

In 1988 an estimated 88 percent of the unscreened nests at CANA were depredated (Bryant, 1988). In 1986 and 1987 the figure was estimated at 95 percent (Bryant, 1986b and 1987). Because of these extremely high figures an attempt was made to screen every possible nest at CANA in 1989. Thus, the only nests that were not screened in 1989 were those nests destroyed by raccoons before park personnel could reach the nest. Eighty-three loggerhead nests fell into this category. None of the 18 green turtle nests were destroyed by predators.

Hatching Success

The overall hatching success for all nests (screened and unscreened) of both species was 81 percent. The same figure, 81 percent of the loggerhead nests hatched, 10 percent were destroyed by raccoons, five percent were inundated with saltwater and four percent were washed away or never relocated.

All Green nests were screened. Ninety-four percent hatched and six percent (one nest) were inundated with saltwater.

Disorientation

A concern of the park was disorientation of hatchlings due to artificial lighting. Just to the north of the park are residences with outdoor pole lights. To the south lies Kennedy Space Center. A launch pad, very heavily lit for security reasons, can be seen at least 15 miles up the beach. However, none of these lights shine directly on the beach. Several night time emergences were observed in 1989. No cases of disorientation were noted.

Excavation of Nests

Ten percent of the nests were completely excavated to determine mean clutch size and mean nest success. A total of 100 loggerhead and eight green turtle nests were sampled. Excavations were distributed throughout the season and done randomly. All the hatched (empty eggshells) and unhatched eggs in each clutch were counted.

The mean clutch size for loggerhead nests was 105 eggs. This compares to a mean clutch size of 108 in 1988 and 111 in 1986 (Bryant, 1988 and 1986b). The mean number of hatched eggs was 84 or 80 percent. Multiplying the mean number of hatched eggs (84) by the number of successful nests (886) equals an estimated 74,424 loggerhead hatchlings produced on the northern half of CANA in 1989.

Of the 18 green turtle nests at CANA, eight were excavated. The mean clutch size was 134 and the mean number of hatched eggs 96.5 or 72 percent. The number of green nests was small making averages less meaningful than for the loggerhead. However, multiplying the mean number of hatched eggs (96.5) by the number of successful nests (17) yields an estimated 1,640 hatchlings for 1989.

The number of hatchlings that reached the water for either species is not known. No attempt was made to quantify the predation of hatchlings. Predation on nine emergences was observed with a total of 108 dead hatchlings counted.

Relocated Nests

Twenty-one loggerhead nests were relocated. The nests were moved for three reasons: 1) they had been deposited near the surf line and were in danger of being inundated or washed away; 2) the nest was located at the base of a heavily travelled boardwalk; 3) the nest had been partially depredated and required major clean up of broken egg shells and yolk.

Pits approximating the natural nest cavity were dug near the base of the dune. The eggs were then carefully transferred, buried and the nest screened in the usual manner.

More nests would have been relocated, however the amount of time involved in careful transfer of the eggs (up to 45 minutes) and the need to reach other nests quickly limited such activity.

SUMMARY AND DISCUSSION

Yearly Nesting Totals

In 1989 approximately 3000 marine turtle nests were deposited at CANA, the highest total since 1986 (Table 4) (Bryant 1986a, 1986b, 1987, 1988). The new Florida Index Nesting Beach Survey, which CANA participated in this year, will allow future comparison of yearly fluctuations with other portions of the Florida coast.

TABLE 4. Total Number of Marine Turtle Nests
Canaveral National Seashore 1984-1989

<u>Year</u>	<u>Number of Nests</u>	<u>12 hours Depredation Rate</u>
1984	2125	65 percent
1985	2508	42
1986	3374	46
1987	1776	56
1988	2250	58
1989	3063*	07

*This includes the 1113 nests for the northern half of CANA and an USFWS estimate of 1950 nests for the southern half of CANA.

Depredation Rates

Canaveral initiated a nest screening program in 1984 to alter the foraging habits of raccoons and cause them to feed on items other than turtle eggs. Table 4 shows the percentage of nests hit during the first 12 hours after deposition for the six years of the nest screening program. From 65 percent in 1984 the depredation rate dropped to 42 percent in 1985. This raised initial hopes that the program was working. However in 1986 the depredation rate rose to 46 percent and by 1988 was approaching 60 percent.

In 1987 and 1988 the raccoons become noticeably more aggressive in tunnelling under the screens (Table 5). McMurtray (1986) predicted that raccoons would eventually learn to reach the eggs despite the screens.

TABLE 5. Percent of Screened Nests Depredated by Raccoons
 Canaveral National Seashore, 1985-1989

<u>Year</u>	<u>Percent Depredated</u>
1984	---
1985	5.0
1986	3.7
1987	7.2
1988	18.7
1989	3.4

However in 1989 the overall predation rate dropped to seven percent (Table 4) and the depredation of screened nests to 3.4 percent (Table 5). Several factors are responsible for the reversal in trend.

The hours of ranger operation were changed from the 4:00 a.m.-12:00 noon shift the previous year to 10:00 p.m.- 6:00 a.m. in 1989. Most predation will occur within the first hour after laying. Many turtles emerge an hour or so after dark with the peak time of laying being between 10:00 p.m. and 3:00 a.m. The new shift gave the rangers a better chance to reach nests before the raccoons did or to interrupt them before they had totally destroyed a clutch.

Partially depredated nests were salvaged if the majority of eggs were still intact. Often raccoons were frightened away before they had opportunity to eat all the eggs. The initial scene might look bleak to the observer with dozens of eggshells scattered about. However closer examination often revealed that the majority of eggs were unharmed. In such cases the nests were cleaned up, reburied and screened. If yolk had gotten on the remaining eggs they were wiped off and relocated to another pit. This prevented fungus from growing on the eggs that could ruin the clutch.

Extra rebar was used to fasten down the sides of the screen whenever a nest was partially depredated or raccoons were sighted in the area. This made it more difficult for raccoons to get underneath the edge of the screen and tunnel to the nest.

In 1987 and 1988 screening was discontinued after July 25 and August 7 respectively because of budgetary restraints. In 1989 nest screening was extended until September 11. Between August 8 and September 11, 120 additional nests were screened, 94 of which hatched.

Ninty-three percent of the nests were screened in 1989 compared to the previous high of 45 percent in 1986. A major reason for the dramatic increase was the role of two important groups--volunteers and the park maintenance staff.

An experienced and committed volunteer staff worked with the rangers on weekends from mid-May to September. When the ranger staff was unexpectedly reduced in early July, the volunteers covered weekends alone until the end of August. This allowed a minimum of two people, often three, to patrol the beach every night of the week. The importance of the volunteer staff to the success of this project cannot be overestimated.

The park maintenance staff also played a critical role. They assumed a variety of duties formerly handled by the turtle personnel. This enabled the latter to spend significantly more time on the beach screening nests. Maintenance personnel moved materials, cut screen, sanded stakes and ensured that adequate screening materials were on hand for each night's shift. They also kept the fleet of all terrain vehicles in operation, a difficult and time consuming task since the ATV's were run a minimum of 25 miles a night seven nights a week. In previous years much of the turtle personnel's time was tied up in these support activities.

There are other possible factors in the reduction of nest depredation. The removal of raccoons from the adjacent beach to the south had an unknown effect on raccoon density in the northern half of CANA. Individuals may have emigrated to the newly opened territories in the south reducing predation in the north. Also the importance of turtle eggs in the raccoon's diet may fluctuate from year to year as alternate food sources such as fruits or other prey species vary in abundance.

Both of these factors need further study before definitive statements can be made.

CONCLUSION

The results of the 1989 nest screening program were encouraging. Ninety-three percent of the nests were screened. Eighty-eight percent of the screened nests hatched, 81 percent of the nests overall (screened and unscreened). This exceeds the 50 percent nesting success recommended by the U.S. Fish and Wildlife Service Marine Turtle Recovery Plan (Hopkins and Richardson, 1984).

Whether the funding and support is available to repeat such an effort in future years remains unclear. The trapping program conducted by the U.S. Fish and Wildlife Service consistently yields a high level of nesting success. The answer to which method is best for Canaveral National Seashore will be left for the experts to decide.

LITERATURE CITED

- Bryant, R. M. (1986a) 1985 marine turtle nest screening program at Canaveral National Seashore, Florida. CPSU Technical Report 21. University of Georgia, Athens. 17 pp.
- Bryant, R. M. (1986b) Evaluation of the marine turtle nests screening program at Canaveral National Seashore, Florida in 1986. National Park Service, Titusville, Florida. 30 pp.
- Bryant, R. M. (1987) Marine turtle nests screening program at Canaveral National Seashore, Florida in 1987. National Park Service, Titusville, Florida. 11 pp.
- Bryant, R. M. (1988) 1988 Marine turtle nests screening project at Canaveral National Seashore, Florida. National Park Service, Titusville, Florida. 15 pp.
- Hopkins, S. R. and J. I. Richardson. (1984) Recovery Plan for marine turtles. National Marine Fisheries Service. 355 pp.
- McMurtray, J. D. (1986) Reduction of raccoon predation on sea turtle nests at Canaveral National Seashore, Florida. CPSU Technical Report 20. University of Georgia, Athens. 52 pp.

ACKNOWLEDGEMENTS

Many dedicated people contributed to this year's successful screening program. Richard Bryant, the former sea turtle coordinator, provided valuable advice and insight throughout the summer. Though stationed thousands of miles away, he still remains deeply committed to sea turtle protection and continues to aid their cause. Evelyn Reilly, another former turtler, also provided useful comments.

Enough thanks cannot be given to the dedicated group of volunteers who sacrificed sleep and braved multitudes of mosquitoes to help the turtle's cause. When the park lost one of its paid positions, Mark Hempe, Kathryn Hempe, Mike Sherris and Diana Sherris offered to single handedly cover Friday and Saturday nights. This allowed coverage of the beach 7 nights a week and greatly enhanced the final results. Although they must have been exhausted, I never once heard a complaint or saw the slightest waiver of resolve.

Other volunteers who worked almost every weekend were Bob Buckendorf, Murray Hempe, Janet Hempe and John Palmer. A special acknowledgement goes to Arnie Dumsha who somehow kept the ATV's running night after night. Finally to the seasonals, John Broward, Billy Griffy and Richard Edwards, who hung tough through thick and thin: thanks for a job well done.

Every individual above was a source of inspiration and a privilege to work with. As long as there are people like these, hope remains for the beleaguered sea turtles.

1989 EXPENDITURES - MARINE TURTLE SCREENING PROGRAM

Resource Management

Personnel	\$20,644.71
Supplies*	1,988.01
ATV's (3)	<u>7,300.00</u>
Total	\$29,932.72

*Includes ATV parts, screens, rebar, stakes, flashlights, interpretive signs, reflective tape, mosquito jackets, etc.

Maintenance Support

Logistical 140 hrs.	\$2,000.00
ATV Repair 122 hrs.	<u>1,500.00</u>
Total	\$3,500.00

Resource Management	\$29,932.72
Maintenance Support	<u>3,500.00</u>
Total	\$33,432.72

Items purchased in 1989 that would not need purchasing in 1990:

3 ATV's	\$7,300
Screen (partial)	750
Interpretive Signs	103
Reflective Tape	<u>108</u>
	\$ 8,261

Anticipated Costs for 1990	\$33,432
Less Major Items on Hand	- <u>8,261</u>
Total	\$25,171