

**From:** [Britta Muiznieks](#)  
**To:** [Mike Murray](#)  
**Cc:** [Michelle Baker](#); [Thayer Broili](#)  
**Subject:** Re: Please review Sea Turtle information  
**Date:** 11/25/2008 09:35 AM  
**Attachments:** [CAHA Sea Turtle Data.11.24.08.ppt](#)  
[Sea Turtle Data.2007.doc](#)  
[USGS Adaptive Mgt Rec for Sea Turtles.doc](#)

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Mike-

Following are Michelle and my comments on the PPT and email.

**Slide #1:** We recommend that the graphs only go back to 2000. Last year we went back through the data to verify the databases by comparing what we had in our database and what the state had and compared it to the annual reports. None of the numbers matched up. We did the best we could with the data we had from 2000-2007. We don't have any confidence in the numbers prior to 2000.

**Slide #2:** We recommend this slide be removed. There is no way for us to tell if false crawls were located inside of or outside of resource closures prior to 2008. The datasheets reflected the locations of nests and false crawls in relation to villages, day use areas, and ORV areas. If a nest was located within a resource closure that would otherwise have been open to ORVs it would have been designated as falling within an ORV area. This information was used to determine size of the expanded closure after day 50. It was not intended to show whether or not the area was open or closed to ORVs at the date of discovery. Because we felt this information was misleading, especially with the current emphasis on ORV management, it was not included in the 2007 report. Other than 2008 we do not recommend using this data for anything other than its original purpose (e.g. to determine the size of the closure installed). When Abra entered the data this year, she denoted whether or not the nest/false crawl was located in a pedestrian, village, ORV or resource closure at the time of the activity.

Another factor that is not reflected in this graph is that ORV driving within ORV areas can cause lighting issues inside resource, safety and village closures thereby increasing the number of false crawls within these areas. For example, vehicles at Cape Point at night may still affect nesting turtles well within the South Beach bird closure. Also patrols are less likely to find false crawls and/or nests in areas where there is ORV activity. Nests that are missed in ORV areas are not likely to be found at a later date, as the likelihood of them hatching is very low.

**Slide #3:** Please make a note that the first nests of the year is most likely the first **FOUND** nest of the year. Prior to 2007 nesting surveys did not begin until late May. Any nests found prior to the start date were found entirely by chance. As a result of the Biological Opinion we are required to begin nesting surveys on May 1. USFWS felt it was prudent to start surveys earlier as they felt we were missing early nests. Even though we are currently starting patrols on May 1, we are still at risk of missing leatherback nests that could be laid as early as February.

We are a little more confident in the last nest of the year. Prior to the Biological Opinion the nest patrols stopped on September 1. As a result of the BO we continue patrols until Sept 15th. Regardless of when patrols ended, staff were still on the beach every day checking known nests for hatchling emergence. It is therefore probable that any nesting activity that occurred after patrols ended were still found.

According to Abra's GIS records the first nest in 2005 was on June 3rd and the last nest was on Aug 29th. In 2008 the first nest was on May 18th and the last nest was on August 24th. It would be important also to note that the first activity (i.e. false crawl) in 2008 was on May 10th.

"If the subcommittee cannot reach an agreement about hours of night driving, I am also thinking of suggesting that the subcommittee explore the idea of an adaptive management approach to night driving restrictions. For areas that are open to ORV, it might make sense for the subcommittee to identify some areas that would have more restrictive night driving hours (e.g., 1/2 hr past ~~sunrise~~ **sunset** until 1/2 hr ~~before~~ **after** sunrise) along with some areas that are less restrictive (e.g., 10 p.m. to 6 a.m. with night fishing allowed at a few keys spots). The subcommittee could then "negotiate" a few locations and we could monitor false crawls in the respective locations over time to see if the hours of operation make a difference. See attached summary out of the USGS protocols, which has some recommendations along that line (as well as a bunch of other recommendations, some which are pretty complicated or labor intensive) and let me know which, if any, aspects of them are realistic to try."

For safety reasons morning patrols should only start when it is light enough to safely operate an ATV/UTV on the beach. (~sunrise). Patrols that begin earlier than sunrise are much more likely to miss nesting activity because the crawls are often cryptic to begin with and are difficult to detect in low light conditions.

In regard to the USGS protocols, these studies could not be conducted with our current staffing levels. They would have to be contracted out.

Call if you have any questions or want to discuss.

Britta and Michelle

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**Mike  
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11/24/2008 04:39 PM

To Thayer Broili/CAHA/NPS@NPS  
cc Britta Muiznieks/CAHA/NPS@NPS, Michelle Baker/CAHA/NPS@NPS  
Subject Please review Sea Turtle information

To try to get some data to the Natural Resources subcommittee about sea turtles before their call at 0930 on Wednesday, I did a quick review of the annual reports from 1998-2007 and produced the attached Powerpoint slides. Also, used a copy-and-paste program (Snag-It) to copy several data tables from the 2007 annual report.

**Please review and provide feedback by noon on Tuesday, if you have any suggestions for improvements.**

Note: We did not do an official 2005 annual report, so the only data I could find for 2005 was in the 2006 and 2007 annual reports. I did not find 2005 data for:

- Slide # 2: the % of false crawls in ORV areas vs. busy pedestrian beaches/villages/near piers vs. other (less busy) non-ORV areas (no 2007 data either)
- Slide # 3: Date of first and last nest of the season for 2005

**If either of the data items for 2005 is readily available, please provide it and I can quickly update those slides.** Beyond that information, we should wait to hear the discussion on Wed to see if there is any other information the subcommittee thinks is necessary to help them get the job done.



CAHA Sea Turtle Data.11.24.08.ppt



Sea Turtle Data.2007.doc

If the subcommittee cannot reach an agreement about hours of night driving, I am also thinking of suggesting that the subcommittee explore the idea of an adaptive management approach to night driving restrictions. For areas that are open to ORV, it might make sense for the subcommittee to identify some areas that would have more restrictive night driving hours (e.g., 1/2 hr past sunrise until 1/2 hr before sunrise) along with some areas that are less restrictive (e.g., 10 p.m. to 6 a.m. with night fishing allowed at a few keys spots). The subcommittee could then "negotiate" a few locations and we could monitor false crawls in the respective locations over time to see if the hours of operation make a difference. See attached summary out of the USGS protocols, which has some recommendations along that line (as well as a bunch of other recommendations, some which are pretty complicated or labor intensive) and let me know which, if any, aspects of them are realistic to try.



USGS Adaptive Mgt Rec for Sea Turtles.doc

Thanks,

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## CAHA Sea Turtle Data from 2007 annual report

Table 3. Sea Turtle Hatch Summary 2001-2007

Year	Nests	Avg. Clutch	Ave. Incub. (days)	Eggs	Emerged	EMR %
2001	75	111.7	64.5	6257	3402	54%
2002	99	108.7	58.6	10108	7201	71%
2003	87	115.7	69.1	4627	2708	58%
2004	43	103.4	58.5	2999	1609	53%
2005	73	114.6	58	6072	4142	68%
2006	76	114.8	62.9	7059	4444	63%
2007	82	112.1	60.7	9078	6075	58%

7 Year Average: Nests = 76.4; Avg. Clutch = 111.6 eggs; Eggs = 6,600; Emerged = 4,226; EMR = 64.0%

Figure 4. Nest to False Crawls by Year for CAHA (2000-2007).

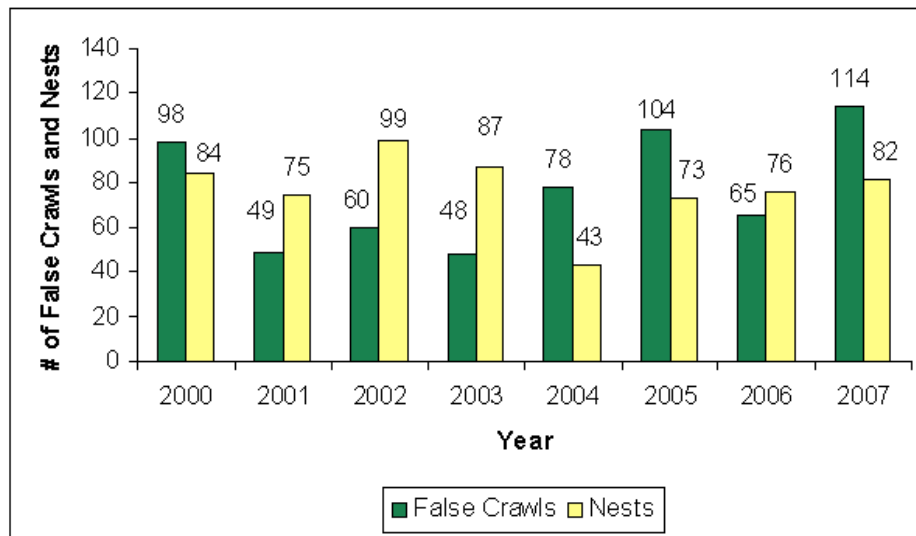


Table 5. False Crawl to Nest Ratios for CAHA (2000-2007)

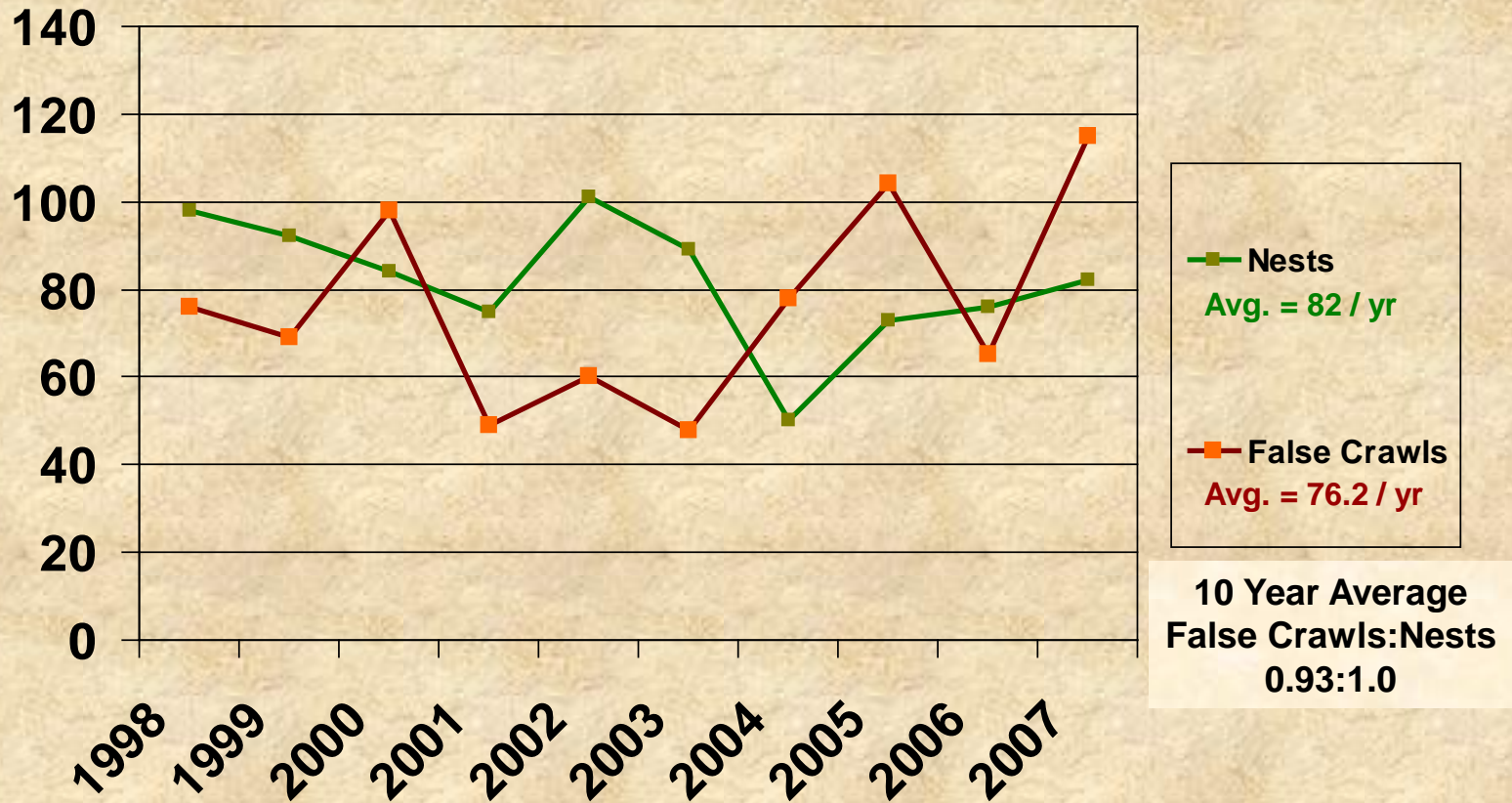
Year	False Crawls	Nests	Ratio (FC:N)
2000	98	84	1.17 : 1
2001	49	75	0.65 : 1
2002	60	99	0.61 : 1
2003	48	87	0.55 : 1
2004	78	43	1.81 : 1
2005	104	73	1.42 : 1
2006	65	76	0.86 : 1
2007	114	82	1.34 : 1

8 Year Average: False Crawls:Nests = 1.005:1.0



# National Park Service

## CAHA Sea Turtle Nests and False Crawls 1998 - 2007

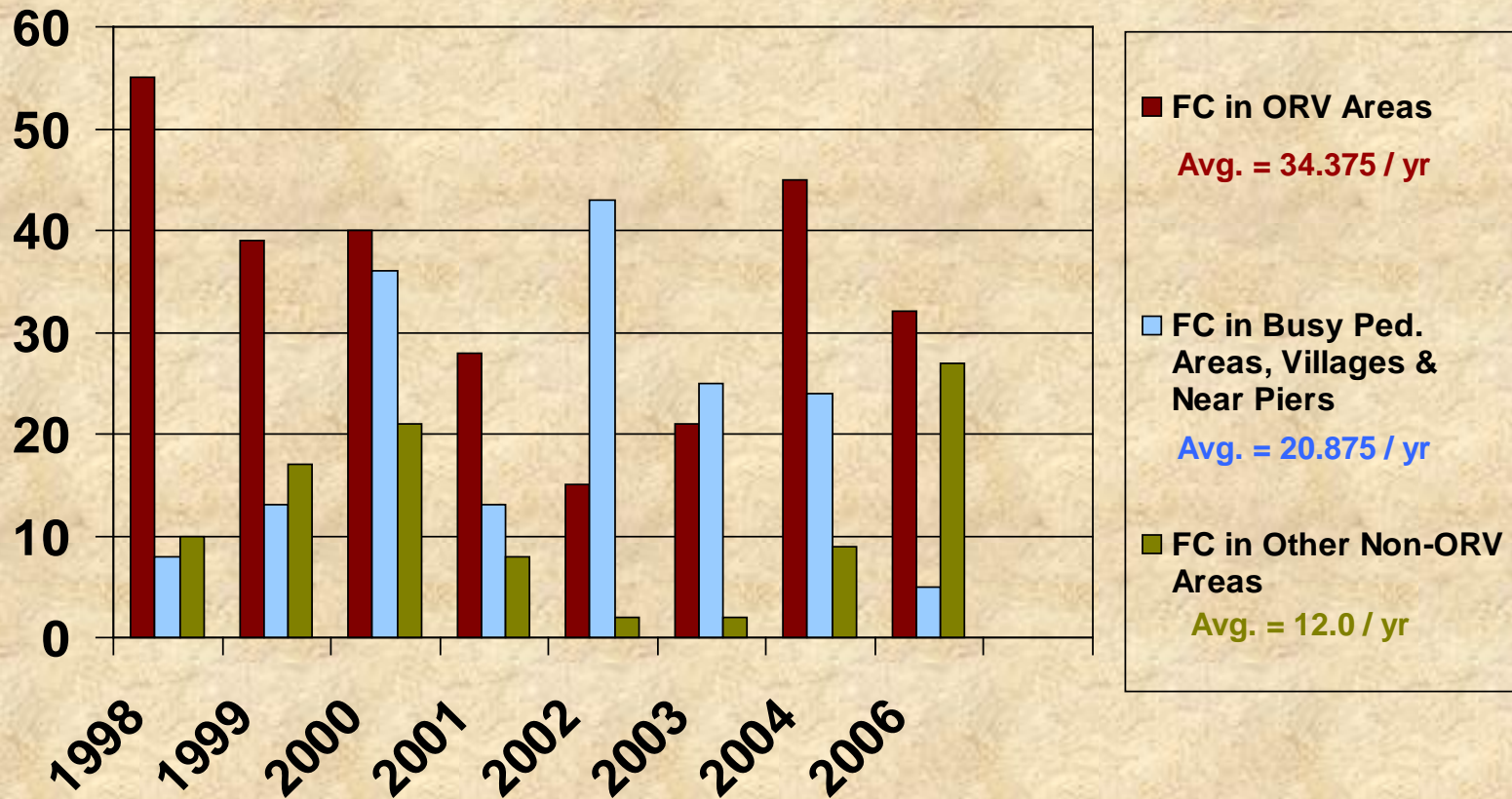




# National Park Service

## CAHA False Crawls (FC) 1998-2004 & 2006\*

\*Did not have data for 2005 and 2007



# National Park Service



## CAHA First and Last Sea Turtle Nest of the Season

Year	First nest of season	Last nest of season
1998	May 26	October 12
1999	mid-May	August 27
2000	April 16*	August 24
2001	May 28	August 26
2002	May 12	August 7
2003	May 21	August 21
2004	May 22	August 17
2006	May 18	September 11
2007	April 18*	August 22

\* Leatherback



## Sea Turtle

### Adaptive Resource Management

Monitoring of floral and fauna over large landscapes should always include three components: a research question(s) aimed at a desired goal, a management approach or experiment to try to determine causality, and a monitoring component to determine the resultant magnitude, duration, and latency of changes associated with the management action or experiment. As monitoring results are revealed, a feedback loop allows the manager to either continue the current management practice or technique, or modify it until the desired trajectory is achieved.

CAHA is at or near the northern limit of the breeding range for all three species of sea turtle that nest there. As such, it may be difficult to manage the current populations for increased nesting density, especially for the green and leatherback turtles. For the latter two species, the primary management goals should be to accurately assess the number of nesting females and their reproductive success so that the current contribution of CAHA to regional population dynamics can be better understood, and to continue to protect adults and nests wherever they are found. Some have suggested, however, that as populations of green and leatherback turtles increase in the western Atlantic, they are expanding their range, and thus populations in North Carolina could increase in the future (M. Godfrey, NC Wildlife Resources Commission, per. comm.). For the more numerous loggerhead, factors affecting distribution and abundance, and especially the effectiveness of recreation management, can be studied and the results used to enhance management. Data collected to that end should still be collected for green and leatherback turtles, in the event that numbers of those species increase. The baseline level of recreational use of sea turtle habitat has not been quantified, and should be studied if management to reduce recreational impact is desired.

### Questions to Be Addressed

- 1) How many nests of each species are found per year and what is their location?
- 2) What is the hatching success for each species?
- 3) What is the sea-finding success rate for hatchlings of each species?
- 4) What is the fate of nests that are relocated?

### Adaptive Management Protocols

Objective 1: To determine the effect of management of human recreation on nesting rate, hatching success, sea-finding by hatchlings (prevalence of misorientation and trapping by obstacles), proportion of false crawls, presence of potential predators and their tracks or burrows (mammalian, avian, and ghost crabs), and nest site characteristics (intertidal zone slope, backshore slope, % vegetation in the backshore, distance from nests to tide line, distance from nest to dune, sand grain size in ITZ and backshore).

Proposal: Closure of 20 2-km beach segments to ORVs and pedestrians from April 1 (to allow the beach to return to more natural conditions before the nesting season) to November 15. Compare aforementioned variables between the treatment segments and 39 control segments that are managed according to Option B or Option C below. All segments in the experiment should be chosen in areas where turtles have nested in the last 10 years (i.e., exclude northern portions of CAHA where turtles rarely or never nest). The experiment should be replicated for several years, at least until nesting rate in the control segments equals the 10 year average of 0.7 nest/km. Improving the power of the test to detect an effect at a lower baseline nesting rate would require greatly increasing the number of beach segments that are closed to ORVs, which would likely entail collaboration with other nearby parks where ORVs are typically permitted (e.g., Cape Lookout National Seashore). Alternatively, with an increased number of beach segments (either within CAHA or with the addition of other parks), several management options could be tested simultaneously. We recommend at least 20 2-km beach segments per management option tested, with at least 39 control segments.

If a significant effect of recreation is found, recreational restrictions in the experimental and control segments can be varied systematically to distinguish the effects of pedestrians from ORVs and the effect of time of day when recreation occurs. As an example, under management Option B with no nighttime pedestrian recreation as a sub-option, this experiment will be testing the combined effect of daytime ORV and pedestrian recreation. If an effect is detected, in the next round of experiments the specific effect of ORVs can be examined by allowing pedestrians into the treatment segments during the day. On the other hand, if no effect is detected then the next round of experiments could entail switching to Option C in the control areas, to determine the combined effect of 24 hour ORV and pedestrian recreation. Decrease in sea turtle protection in any portion of CAHA for purposes of management experiments should not occur without the permission of the USFWS and the North Carolina Wildlife Resources Commission (NCWRC), on a case by case basis.

Objective 2: To determine the effect of artificial light management on nesting rate and hatchling orientation.

Proposal: Compare proportion of false crawls and hatchling misorientation incidents within 500 m and 1000 m of artificial light sources on human structures before and after turtle-friendly lighting regulations or initiatives are enacted.

### **Additional Research to Address Management Goals**

Question 1: How is the detectability of turtle nests by monitors affected by changes in observers, species, presence of vehicles, environmental conditions, and time of day?

Proposal: Lay down artificial tracks for each species from May 15 to September 1 at a rate and density similar to the nesting rate of each species at CAHA (for loggerheads, 1 nest/1.2 days spaced at 1 nest/1.4 km, perhaps varying the rate somewhat to mimic peak nesting). Lay the artificial tracks at randomly selected times between sunset and sunrise. Record species mimicked, sunset and sunrise time, time tracks are laid, whether there is ORV access, wind speed and direction, and indicators of precipitation (yes or no, heavy or light, proportion of the

night that it rained). Record the locations of each artificial crawl with a GPS unit so they can be reliably distinguished from true nest attempts or crawls. Compare detection rates of artificial crawls on morning surveys, between ORV and no ORV areas, including the effect of hours after sunset that an artificial crawl was made, species, weather variables, and observer.

Question 2: What proportion of closure violations by pedestrians and ORVs occurs between sundown and sunrise?

Proposal: In 25 randomly chosen nest closures in the ORV areas, smooth over the sand at dawn. Survey these closures just before sundown for the presence of human, ORV, and predator tracks, and vandalism of fencing and signs. Smooth the sand again and repeat the survey during the dawn monitoring on the following day. Replicate the survey 10 times during the nesting season, including Memorial Day and July 4th weekend. Estimate the proportion of violation events that occur at night.

Question 3: How much ORV and pedestrian traffic occurs in turtle nesting habitat at CAHA, and how does this differ between day and night?

Proposal: Once/3 hrs for 10 minutes, count the number of ORVs driving through and stopping in the 59 1-km beach segments designated in the protocol for adaptive management objective 1, and the number of people seen in each segment, recording the time of day, length of stay of each ORV and whether ORVs were seen in intertidal, backshore, or dune zones, so that the “total ORV hours” can be calculated for both driving and stationary vehicles in major beach habitat types. Perform these surveys one weekday and one weekend day/month from May 15 to September 1, plus once on each major holiday. If possible, perform the survey a second time each month, such that one fair weather day and one foul weather day is surveyed each month.

Question 4: How does nest relocation affect hatching success and sex ratio, and how do the results vary by location and crew member?

Proposal: Compare hatching success and incubation time between relocated nests and natural nests that were laid at the same time. Incubation time, like sex ratio, is directly related to nest temperature (Godfrey and Mrosovsky 1997). Therefore, sex ratio is correlated with incubation time. Record the identity of all staff involved in disturbing and relocating each nest, and the geographic coordinates of the original and new nest location.