



United States Department of the Interior

FISH AND WILDLIFE SERVICE

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U.S. Fish and Wildlife Service

Sea Turtle Nest Survey Protocol in Mississippi

Surveys are often done in conjunction with nest marking, which facilitates nest protection (e.g., caging, screening), and allows assessment of nest productivity, i.e., how many hatchlings were produced.

Nesting beach surveys are the daily survey of a specific beach area to identify, enumerate, and evaluate nesting activities. The specific beach area surveys will be specified on the U.S. Fish and Wildlife Service (USFWS) permit. Nest surveyors must have at least one full nesting season of experience (within the last five years) conducting nesting surveys experience (i.e. identifying sea turtle crawls, locating a nest by hand, marking and inventorying nests). Surveys are conducted by foot or by ATVs/UTVs. In nesting surveys, surveyors count and identify “crawls,” which are the marks left in the sand by sea turtles that have attempted to nest. In order to count the majority of loggerhead nests laid on a specific beach in Mississippi, daily-nesting surveys should start on May 1st and end on August 31.

For best viewing of crawls, nesting surveys should begin shortly after sunrise but never earlier than ½ hour before local published sunrise. Because of potential disturbances to nesting females and the difficulty of locating and interpreting crawls in the dark, nesting surveys may not be conducted at night unless such surveys are required for a beach nourishment project and authorized by the USFWS.

Surveyors should traverse the beach along (and seaward of, if possible) the most recent high tide line. This is important not only for ensuring that turtle crawls are not obscured before they can be evaluated, but also for avoiding impacts to nesting shorebirds and chicks. Other key points about ATV use include:

- avoid the wrack (where shorebirds might be taking cover),
- minimize ruts by using a light-weight vehicle with low tire pressure (10 psi or less),
- drive slowly (less than 10 mph),
- survey in daylight only,
- respect areas posted for shorebird nesting,
- access the beach through existing pathways, not through the dunes or vegetated areas, and
- be observant for shorebird eggs and chicks.

Upon discovery of a crawl, surveyors should identify which is the incoming and which is the outgoing track. The next step is to determine which species of turtle made the crawl. Using this information, surveyors should then make a visual determination as to whether the crawl was a nesting emergence (i.e., resulting in eggs being laid) or non-nesting emergence (often called a “false crawl”). In most cases, the eggs will not be seen—their presence is inferred by the

evidence visible on the beach. All crawls should be recorded on a data sheet. If a crawl is identifiable as a nest and the nest does not have to be screened, caged, precisely marked, or relocated, the surveyor should not dig into the nest simply to verify the presence of eggs. After each crawl is evaluated and documented, the tracks should be crossed out to avoid duplicate reporting. To accomplish this, a surveyor may obliterate a section of the upper track (not the nest site) by sweeping his/her feet across the track or by crossing over the track (well above the high tide mark but not over the clutch) with a survey vehicle.

The decision as to whether a crawl represents a nest or a non-nesting emergence should be made at the time of the survey (not at a later date), and it should be based only on the visual characteristics of the crawl (not the verified presence of eggs). The visible evidence for this assessment will deteriorate, and there is the danger that the crawl might be erased before a decision is made. Do not confirm the presence of eggs before calling a crawl a nest. Likewise, it is not necessary to observe signs of hatching in order to call a crawl a nest.

Nesting surveys may only be conducted within the boundaries specified on the permit. It is imperative that survey areas do not overlap. GPS coordinates of the nest and non-nesting emergence must be taken.

Nest Protection Protocol in Mississippi

Sea turtle nests shall remain to incubate where the nest was originally laid. Protective measures should be taken to ensure the incubating nest is undisturbed. If a sea turtle nest or crawl is found in Mississippi, contact the U.S. Fish and Wildlife Service:

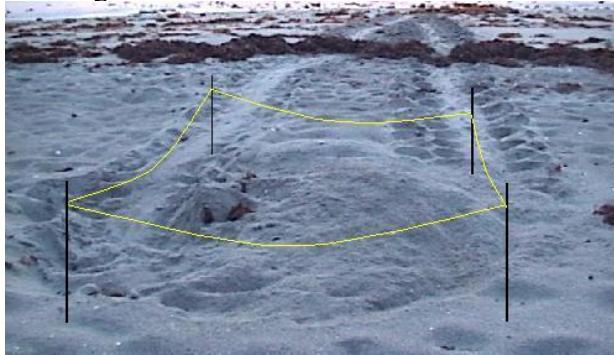
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Marking nest sites to protect buried eggs

The goal of this marking method is to clearly identify the nest area and protect it from human activities such as high recreational use. First, visually inspect the site to determine whether a nest exists. Nests should not be dug into simply to verify the presence of eggs. The entire disturbed

area (where digging has occurred) should be delineated with stakes (preferably four). The stakes should extend about 36" above the sand. To further identify the nest site, surveyor's ribbon can be tied from the top of one stake to another to create a perimeter around the nest site. A nest-identifying number should be indicated on at least one of the nest perimeter stakes. If marking nests with stakes will lead to increased disturbance, contact FWS to discuss other options for marking the nest.



On beaches with high recreational use:

In situations where nests are incubating on beaches with high recreational use, the nests must be marked with adequate buffer zones to avoid incidental crushing. Each nest should be marked such that a 10-25 foot buffer zone is allowed on all sides of the nest during incubation, depending on the amount of recreational beach use.

Equipment Needs

Nest marker stakes:

- i. 4 stakes per nests for 20 nests. Dimensions 1" x 2", 4 feet long.
- ii. 1 roll of 3/16" fluorescent orange flagging tape.

USE OF GPS

It is useful to take GPS coordinates of the location of each nest. Depending on the level of accuracy of the GPS unit, these coordinates may help find the general nest area or the clutch itself at the time of inventory.

Protecting Nests From Mammalian Predators

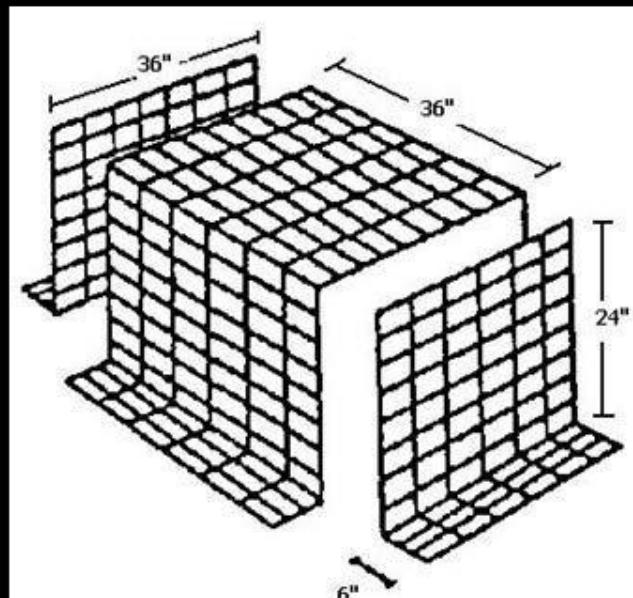
Although raccoons are the most common predators of sea turtle nests, raccoons, dogs, and hogs may also destroy nests in some areas. They generally target nests either within the first few days after egg deposition or as the embryos pip out of their shells.

The most effective method for controlling mammalian predation without killing the predators is to place a self-releasing screen or cage over threatened nests.

Screens used for this purpose are typically 4' x 4' pieces of 2" x 4" mesh -welded wire (do not use a smaller mesh size as it is likely to trap emerging hatchlings). This size is large enough to keep mammalian predators out while allowing hatchlings to escape from the nest unaided. The screen or cage should be placed over the entire nest mound or area of sand disturbance for mammalian predators to burrow to the eggs from the side, and to ensure that any anchoring stakes will not contact the egg chamber.

While the exact construction of cages may vary (see example of a self-releasing cage in Figure 2-22), the 2" x 4" mesh of all self-releasing cages must be oriented so that the 4" opening is parallel to the surface of the sand. If self-releasing cages are not constructed of a material with a mesh size that is 2" x 4" or greater, then the cage must have an opening on the seaward face that allows hatchlings to escape. The bottom edge of the opening should not extend above the sand's surface, the top edge of the opening should be at least 2" above the sand's surface, and the opening should extend along the entire seaward side of the cage.

Figure 2-22. Example of a self-releasing cage. The cage is constructed of 2" x 4" welded utility wire. Hatchlings are able to escape through the mesh of the wire. Cage design courtesy of The Conservancy of Southwest Florida.



To install a self-releasing screen, level the surface of the sand (2'x4' or 4'x4') centered on the nest. If the screen is to be buried, remove 2" of surface sand from the square. Place the screen on the smoothed sand. Using hooked stakes, secure the four corners of the screen. Use tent stakes or

make your own stakes of rebar or some other durable material. Even though the corners of the screen should be well away from the egg chamber, do not drive the stakes at an angle in the direction of the egg chamber. If the screen was placed 2" below the normal sand surface, place the removed sand back on top of the screen after anchoring so that the egg chamber is at its original depth. In some areas, predators are very persistent and may dislodge screens with only four stakes. In this case, use eight stakes and place the four additional stakes midway between the corners. If stakes are easily dislodged, longer stakes may be used.

Most cages are anchored by burying the outward pointing flanges about one foot under the sand's surface. To install a self-releasing cage, center the cage over the egg chamber and trace the edges of the cage in the sand. The cage should be oriented so that the opposing sides of the cage are either parallel or perpendicular to the shoreline. Remove the cage and the temporary egg chamber marker and carefully dig a one-foot deep trench along the tracing of the edges of the cage. Place the cage into the trench and fill the trench with sand. When completed, the sand around the cage and over the egg chamber should be at the original level. If stakes are used to secure a cage, drive the stakes at an angle away from the egg chamber.

Depending on the local situation, you may or may not want to mark screened/caged nests. In some situations, if screened/caged nests are not marked with an appropriate sign, a beach user is likely to discover the screen, think that it should not be on the beach, and pull it up. Marking screened/caged nests may also be necessary to prevent people from inadvertently injuring themselves on the screen or cage or on any stakes.

Because stakes, screens, and cages may become partially or completely dislodged, they should be checked daily (if remote, check regularly). During the period of anticipated hatching, screens and cages should be checked each morning just in case hatchlings become trapped by them. Please remove all screens and cages from the beach after hatchling emergence is complete.

Assessing Anthropogenic Threats to Emerging Hatchlings

Coordinate with the FWS' Sea Turtle Recovery Lead to assess any lights visible from the nesting beach or driving where the nest is located. We will take steps to minimize the anthropogenic threat while protecting the nest in situ and to allow the hatchlings to emerge undisturbed.

Hatching Success Evaluations (Nest Inventories) including late season nests

Hatching success evaluations may only be conducted by person(s) authorized by the FWS to conduct this activity. A nest inventory can be conducted either 120 hours (5 days) after the first sign of emergence or 70 days after the eggs were deposited (75 days for leatherbacks), whichever occurs first. Digging into a nest before some hatchlings have emerged may adversely affect these hatchlings. Because cooler temperatures sometimes delay hatching and emergence, a nest that has been subjected to inundation, excessive rainfall, shading, or cool fronts, should not be excavated until 90 days after egg deposition or as long as one week after the first emergence. It is important to allow all hatchlings to emerge naturally before excavating the nest.

HATCHING SUCCESS EVALUATIONS (NEST INVENTORIES)

Hatching success may be conducted on all nests or on a sample of nests on the beach. A hatching success evaluation involves the excavation and inventory of a post-emergent nest to determine the fate of each egg. Because sea turtle eggs are subjected to a variety of incubation environments, including many that are affected by human activities, we encourage you to conduct nest inventories for hatching success on a representative sample of the nests in your survey area each year.

Nest Inventory

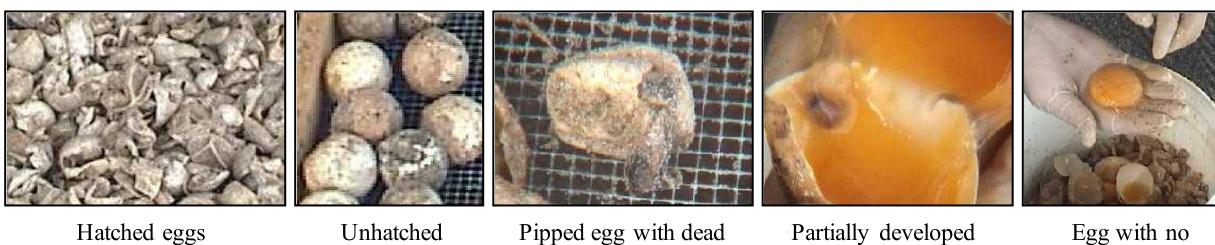
To conduct a nest inventory, begin by excavating the nest. While wearing nitrile gloves, carefully dig down into the nest chamber with your hands until you reach eggs or eggshells. Do not use shovels or other tools. If you encounter live hatchlings before reaching any eggs or eggshells, the hatchlings have probably not finished emerging. Quickly cover the egg chamber with moist sand and return the site to its original condition. Wait at least 24 hours before excavating again.

Carefully remove the contents of the nest and place them in a pile on the sand or in a tray for easier sorting (Figure 1). Separate the contents into the following categories: hatched eggs (empty eggshells), live hatchlings, dead hatchlings, pipped eggs with live hatchlings, pipped eggs with dead hatchlings, and unhatched eggs (Figure 1). In pipped eggs, the turtle has broken through the egg but the hatchling is not completely free of its eggshell. Pipped eggs range from those with just a small hole to those with large tears.

Figure 1. Excavation of a post-emergent nest.



Figure 2. Categories of the contents of a nest.



Determine and record the number of eggs that hatched by carefully counting the eggshells (Table 1). Count each eggshell that is more than 50% complete as one hatched egg and disregard the smaller pieces. Be sure that all the eggshells are completely separated from each other. Record the number of live and dead hatchlings. These will account for some of the hatched eggs. The rest of the hatched eggs represent hatchlings that emerged from the nest. To determine the number of hatchlings that emerged from the nest, subtract the sum of live and dead hatchlings from the total number of hatched eggs. The sum of the live, dead, and emerged hatchlings should equal the number of hatched eggs. Next, determine and separately record the number of pipped eggs with live hatchlings, the number of pipped eggs with dead hatchlings, and the number of unhatched eggs. Pipped eggs are those in which some part of the hatchling has broken through the egg but is not completely free of its eggshell. Pipped eggs range from those with just a small hole to those with large tears. Finally, determine the number of eggs originally present in the nest by adding together the hatched eggs, the pipped eggs, and the unhatched eggs. After completing the nest inventory, the nest contents can be reburied within the original egg chamber.

Table 1. Contents of a Post-Emergent Nest

Hatched eggs	=	98
Live in nest	=	3
Dead in nest	=	1
Live pipped	=	0
Dead pipped	=	1
Unhatched eggs	=	5
No discernable embryo	=	3
Partially developed embryo	=	1
Fully developed embryo	=	1
TOTAL # EGGS		104

During nest inventories, some live hatchlings or pipped eggs with live hatchlings may be encountered. If this happens often, try waiting a day or two longer before conducting the inventory. Pipped eggs with live hatchlings or live hatchlings that have prominent yolk sacs may be carefully re-buried at the top of the egg chamber or held on moist sand (not in water) until ready for release. If pipped eggs or hatchlings are held on moist sand, they are to be kept in a darkened, quiet, temperature-controlled area. If the nest contains live pipped eggs, or live hatchlings with prominent yolk sacs perform these steps. Rebury the contents of the nest at the bottom of the egg chamber. Add a 3 - 4 inch layer of clean moist sand. Place the viable pipped eggs and live hatchlings with visible yolk sacs on this layer of sand and add more clean, moist sand over them. Cover the area with dry sand and keep the nest location marked. Wait one week before excavating again to complete the nest analysis. If you encounter this scenario when

ambient temperatures and/or nearshore water temperatures are below 50 degrees F, call the FWS or State contact immediately for further instructions on what to do with the turtles. When ready, these hatchlings are to be released on the beach at night and allowed to crawl to the water.

Media: On the occasions where there is a sea turtle nest, there is media interest. Our goal of educating the public on sea turtles follows our Recovery Plans. The FWS' emphasis of sea turtle nest management is to be far less manipulative with nests and hatchlings and allow the incubation and hatching processes to occur undisturbed (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991, 2008). Sea turtles have developed a strategy to offset the effects of natural erosion on nesting beaches by laying large numbers of eggs and by distributing their nests both spatially and temporally. The USFWS Recovery Actions focus on minimizing the anthropogenic threats to sea turtles, which include habitat protection and reduction of fisheries bycatch. Contact the FWS to coordinate and develop talking points as needed.