TOWN OF Kiawah Island

KIAWAH ISLAND TURTLE PATROL

NESTING PATROL

VOLUNTEER GUIDE

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WELCOME

Welcome to the Kiawah Island Turtle Patrol







Sea turtle nest protection on Kiawah has been actively helping and monitoring nests since 1972. The residents of Kiawah formed the Kiawah Turtle Patrol in 1989. We are one of the largest turtle patrol volunteer programs in South Carolina, and we are thrilled to have you join us!

Loggerhead sea turtles are the most common species to nest on Kiawah Island, and have been protected under the Endangered Species Act of 1973 (ESA) since 1978. Nests laid on beaches without a nest protection project have extremely low hatch rates, typically under 10%. With intervention from trained volunteers like you, that number jumps to over 70%. One person can make all the difference, and with your help, we can improve the odds of survival even more. We appreciate your time as part of this effort; know that your work has an observable, positive impact.

This manual provides insight on the tools we use and practices we follow for this patrol, and will help you become a turtle expert before setting foot on the beach. We recognize that your time here is valuable, and we are excited to have you be a part of the patrol!

On behalf of South Carolina's Department of Natural Resources, the Kiawah Island Turtle Patrol, and the turtles who make the journey to and from Kiawah every year, thank you for volunteering with us. We can't do it without you!

Nesting Patrol Overview

Sea turtle activity, which includes nesting and hatching, takes place from the beginning of May through the end of October. From May 1st to August 31st, mother turtles make the journey from the ocean to their nesting grounds, and through the end of October, hatchlings will emerge from their nests and make for the ocean. While turtles do not always return to the exact beach where they hatched, they do return to the same general area.

Kiawah Island serves as a vital nesting ground and consists of over 10,000 acres of land and 10 miles of beach. For patrol purposes, Kiawah's beach is divided into eight separate zones, which are defined by marker numbers, typically placed 1/10 mile apart. Each morning, Hatching Patrol teams survey individual zones on foot, while the Nesting Patrol team surveys the entire beach, moving eastward from marker **#40**. We use marker numbers to help indicate nest locations, as well as to determine which zone the nest is in. This process establishes which Hatching Patrol team is responsible for the nest.

Nesting Patrol is responsible for locating and marking new turtle nests, recording their locations, and providing anti-predator protection. Once Nesting Patrol identifies and marks the nest in one of the eight zones, the Hatching Patrol for that zone will take over the care of the nest.

Nesting Patrol is our first patrol phase and begins in early May. The patrol surveys the beach every morning to look for turtle tracks, or "crawls." In most cases, turtle crawls lead to nests. However, in some cases, a turtle will make a "false crawl" if she decides not to lay a nest; this can happen if she is scared off by people or predators or if the area is not right for laying a nest.

The goal for both Nesting and Hatching Patrols is to keep everything as natural as possible; for example, when Nesting Patrol deems it necessary to relocate a nest, the patrol makes sure to dig out a new nest in the same shape as the original nest and to replace the eggs in the general order they were originally laid.

GENERAL GUIDELINES

All aspects of turtle nest handling require South Carolina Department of Natural Resources (SCDNR) permission. The Project Coordinator holds the permit with a list of authorized activities. All volunteers are required to read the procedures and guidelines and sign a consent form to receive a Letter of Authorization (LOA). Unauthorized disturbing of sea turtles, eggs, nests, or hatchlings is unlawful.

All the procedures in this guide are compliant with SCDNR regulations and should be followed as outlined. Refer to the information below to learn more about some the guidelines you should keep in mind when performing your patrol.

Patrol Procedure

- You must wear your volunteer T-shirt while performing patrol activities to identify yourself as a member of the patrol.
- When you sign the volunteer consent form, you will receive your LOA. You must carry the LOA with you when performing your patrol.
- Only SCDNR-trained volunteers and team members may probe a nest. Unauthorized personnel (including children) are not permitted to undertake any of the turtle nest handling activities.

Patrol Times

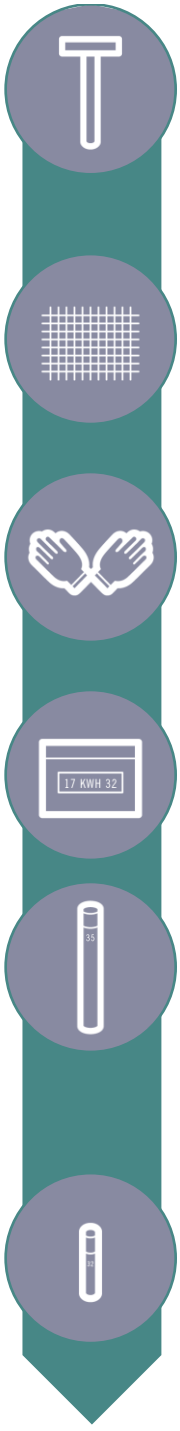
- Nesting surveys are conducted daily, May through August, at first light to identify fresh crawls and protect nests before they are disturbed by predators or washed away by the tide.
- In case of inclement weather, make every effort to start the patrol as soon as possible. However, do not risk your safety or well-being to perform any patrol-related duties—stay off the beach during a storm event and comply with any evacuation orders.

Nest Relocation

- Nest relocation should only be performed for nests that are seaward of the debris line marking the **normal** spring high tide (not King tides), laid in vehicle access roads, or partially depredated. Lighting is not a valid reason to move a nest—lights can and should be turned off.
- Every effort should be made to get eggs moved before 9:00 a.m. to reduce the potential of embryo death.

EQUIPMENT

In performing the tasks associated with your patrol, you will use the equipment defined below. In the procedures outlined later in this manual, equipment icons will appear next to the tasks they are related to.



Probe

- After identifying the egg chamber's approximate location, use the probe to examine the area. When probing, place the tip of the probe between your feet and push the probe down into the sand. The probe will sink quickly into softer sand and the nest cavity compared to the surrounding sand.

Screens

- Mesh screens are used to protect identified nests from predators while allowing hatchlings to crawl through the mesh openings.
- The center of the screen must be placed directly above the egg chamber, and screens are secured in the sand using tent pegs.

Protective Gloves

- Protective nitrile, latex, or vinyl gloves are required by SCDNR regulations when excavating a nest or handling hatchlings, any part of a turtle, and eggs/egg shells.
- **<u>There are no exceptions for using protective gloves.</u>**

Specimen Bags

- When a nest has been identified, a specimen (i.e., an intact egg or an egg shell fragment) must be retrieved for genetic testing. Specimens are stored in numbered bags that correspond to the identified nest number.

Long Stakes

- Numbered long stakes are used to mark identified nests in the order in which they are found.
- These stakes are used when you have found the eggs and screened the nest.
- Use the post digger to dig a hole for these stakes to the right of the mesh screens, and the numbers on the stakes should face towards the beach.

Short Stakes

- Numbered short stakes are used to mark possible nests in the order in which they are found.
- These stakes are used when all signs point to a nest (e.g., body pit, thrown sand, loose vegetation), but the eggs cannot be found.
- Use your hands to dig a hole for these stakes, and the numbers on the stakes should face towards the beach.

Red Flag

- Numbered red flags are used to mark identified and suspected nests in addition to long and short stakes—in case the stake is lost, the nest number can still be identified by the flag.
- The flag must be placed at a 90-degree angle uphill from the stake, and the number on the red flag must correspond to the number on the stake.

PVC Elbow

- When posting a long or short stake, use the PVC elbow to place a red flag at a 90-degree angle uphill from the nest marking post to help identify the center of the nest opening—the point of the elbow needs to be centered over the nest opening.

GPS

- Documenting an identified possible nest's and false crawl's locations includes recording its latitude and longitude with a GPS device—this ensures that if the nest's physical markers are somehow lost, the patrol can still locate the nest.
- GPS location details are required for data recording on the nest identification cards.

Nest Identification Cards

- Nest identification cards are used to record the nest location, species, nest number, relocation data (in the event the nest needs to be moved), and any other details or comments related to the nest.
- Abbreviated versions of nest identification cards are also used to record non-nesting emergences (false crawls).

Rakes

- Rakes are used to clear turtle tracks that have already been documented; this ensures that other patrols do not duplicate nests or crawls that have already been surveyed.

Measuring Tape

- If you need to relocate a nest, use the measuring tape to measure the depth of the original nest—the new nest you dig needs to be the same depth, and should be at least 18 inches deep.
- If you encounter a nesting turtle with a metal tag on her front or rear flippers, record the tag number and, if **safely** possible, measure and record the length and width of her shell at the center line.

Buckets

- Buckets are used only when relocating nests—buckets must have sand from the nest in the bottom to ensure that the first eggs don't roll around.

REQUIRED PAPERWORK

Nest Identification Cards

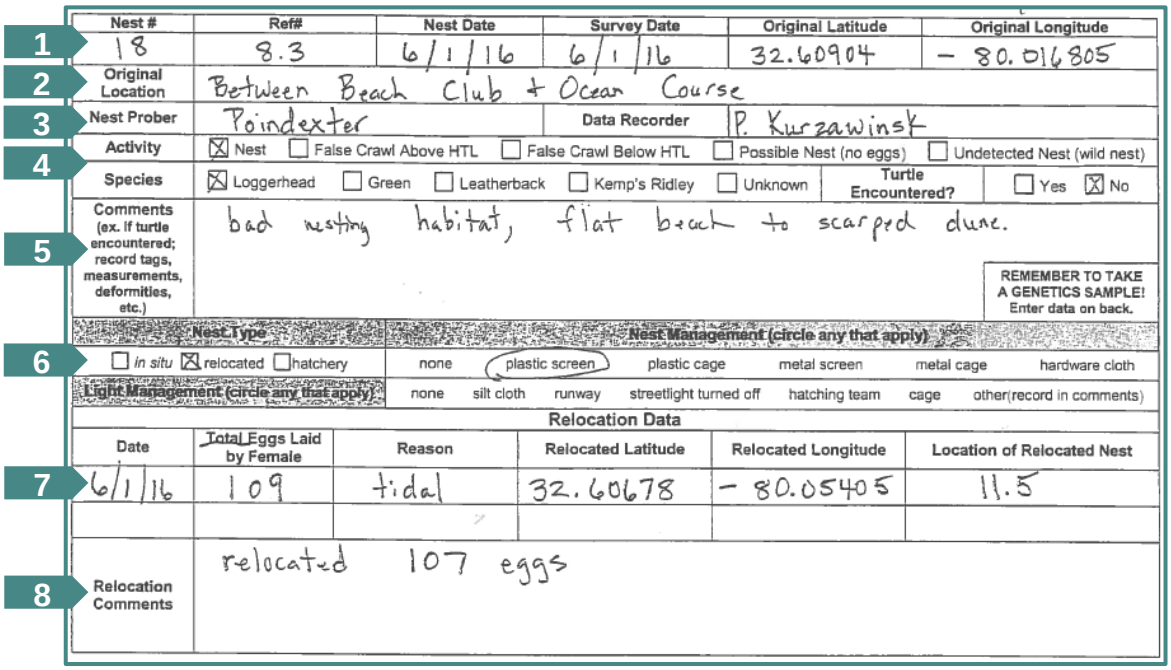
Nesting Patrol uses nest identification cards to record information on all turtle activity, including nests, false crawls, and possible nests. For each instance of activity, there must be a designated data recorder who logs all the relevant information.

- For an *in situ* nest, record the nest number, dates, turtle species, GPS coordinates, location information, nest prober name, data recorder name, nest management method, any losses, genetic sample information, and any relevant comments.
- If a nest must be relocated, you need to additionally record the total egg count, the reason the nest was relocated, and the relocated nest's new location information in addition to where the turtle laid the nest.
- If it's a false crawl, only record the dates, GPS coordinates, location information, type of activity, data recorder name, and any relevant comments.

Refer to the card (front and back) below for an example of how to fill out the paperwork.

Front

All the information fields on the front of the nest identification card must be filled when recording data for Nesting Patrol.



	Nest #	Ref#	Nest Date	Survey Date	Original Latitude	Original Longitude
1	18	8.3	6/1/16	6/1/16	32.60904	−80.016805
2	Original Location	Between Beach Club & Ocean Course				
3	Nest Prober	Poindexter	Data Recorder	P. Kurzawinsk		
4	Activity	☒ Nest ☐ False Crawl Above HTL ☐ False Crawl Below HTL ☐ Possible Nest (no eggs) ☐ Undetected Nest (wild nest)				
	Species	☒ Loggerhead ☐ Green ☐ Leatherback ☐ Kemp's Ridley ☐ Unknown	Turtle Encountered?	☐ Yes ☒ No		
5	Comments (ex. If turtle encountered; record tags, measurements, deformities, etc.)	bad nesting habitat, flat beach to scarped dune.	REMEMBER TO TAKE A GENETICS SAMPLE! Enter data on back.			
6	Nest Type: ☐ in situ ☒ relocated ☐ hatchery	Nest Management (circle any that apply): none, (plastic screen), plastic cage, metal screen, metal cage, hardware cloth				
	Light Management (circle any that apply):	none, silt cloth, runway, streetlight turned off, hatching team, cage, other(record in comments)				

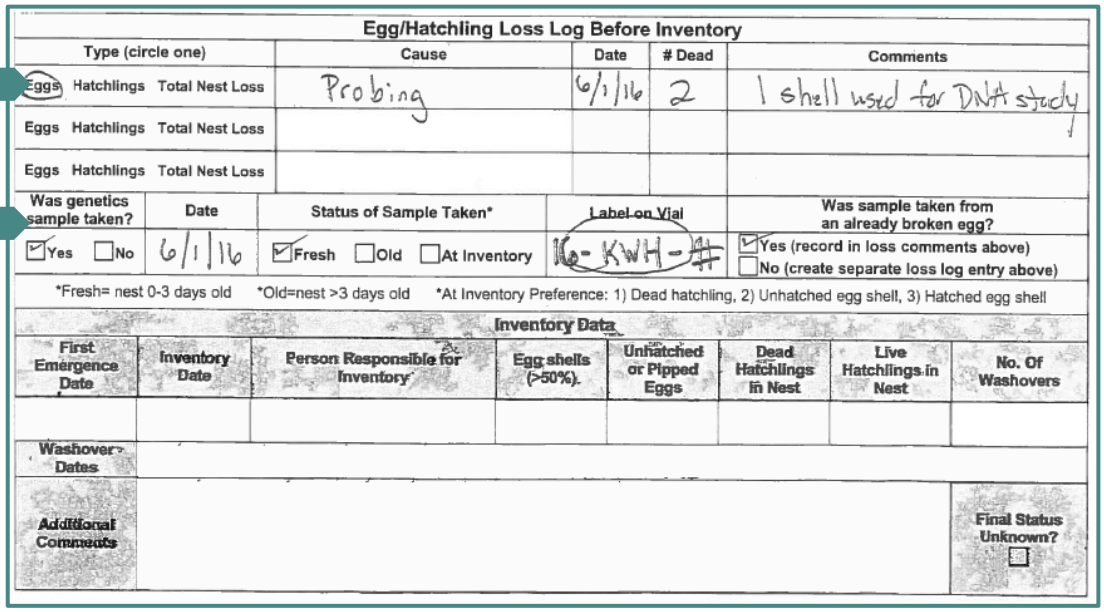
Relocation Data

	Date	Total Eggs Laid by Female	Reason	Relocated Latitude	Relocated Longitude	Location of Relocated Nest
7	6/1/16	109	tidal	32.60678	−80.05405	11.5
8	Relocation Comments	relocated 107 eggs				

1. Nest information, including number, date, beach location using beach markers, and GPS coordinates
2. General nest location on the beach
3. Nest prober and data recorder information
4. Turtle activity and species
5. Nest comments
6. Nest type (*note: in situ means "left as is"*) and management method
7. Nest relocation information
8. Nest relocation comments

Back

The upper half of the back of the nest identification card is used by Nesting Patrol to record information on egg or hatchling loss before the nest inventory. Nest inventory is conducted by Hatching Patrol, which uses the Inventory Data section on the lower half of the card to record information when evaluating the hatch success rate of a nest. When recording data during Nesting Patrol, all the information fields on the upper half of the back of the nest identification card need to be filled.



Egg/Hatchling Loss Log Before Inventory

Type (circle one)	Cause	Date	# Dead	Comments
1 (Eggs) Hatchlings Total Nest Loss	Probing	6/1/16	2	1 shell used for DNA study
Eggs Hatchlings Total Nest Loss				
Eggs Hatchlings Total Nest Loss				

Was genetics sample taken?	Date	Status of Sample Taken*	Label on Vial	Was sample taken from an already broken egg?
2 ☑Yes ☐No	6/1/16	☑Fresh ☐Old ☐At Inventory	16-KWH-#	☑Yes (record in loss comments above) ☐No (create separate loss log entry above)

*Fresh= nest 0-3 days old *Old=nest >3 days old *At Inventory Preference: 1) Dead hatchling, 2) Unhatched egg shell, 3) Hatched egg shell

Inventory Data

First Emergence Date	Inventory Date	Person Responsible for Inventory	Egg shells (>50%)	Unhatched or Pipped Eggs	Dead Hatchlings in Nest	Live Hatchlings in Nest	No. Of Washovers

Washover Dates		
Additional Comments		Final Status Unknown? ☐

1. Type of loss (there are 36 choices) before the nest inventory, cause, recorded date, number of eggs/hatchlings lost, and additional comments
   - Causes for hatchling or egg loss can include:
     - Probing
     - Fox, Coyote, Raccoon or other predator
     - Research
     - Eggs punctured by finger
2. Genetic sample information
   - Make sure to fill the fields accurately, as SCDNR uses this information for lab testing and turtle tracking.
   - The vials/specimen bags are pre-labeled, and they are formatted as Year-Island Code-Corresponding Nest Number. For example, if you are collecting a genetic sample for nest number 18 on Kiawah for 2016, the label for the vial/specimen bag you will use will be labeled as 16-KWH-18.

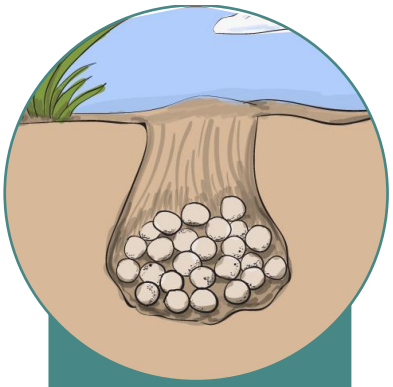
At the end of each patrol, the driver should review and confirm the information logged for each nest. The information on the nest identification cards must be accurate, as it is entered online using seaturtle.org by the Kiawah data entry person(s). The data is organized to link the nest number to the IDed female who laid the nest.

Once the nest data is entered, the original nest card goes to the zone leader of each Hatching Patrol so volunteers can estimate when nests are ready to hatch and perform nest inventories. Volunteers with Hatching Patrol fill out the rest of the nest information, including losses during incubation, number of washovers and the inventory data. The Kiawah data entry person(s) will enter the additional data and keep the cards for future reference.

ABOUT TURTLES

Lifecycle

Nesting



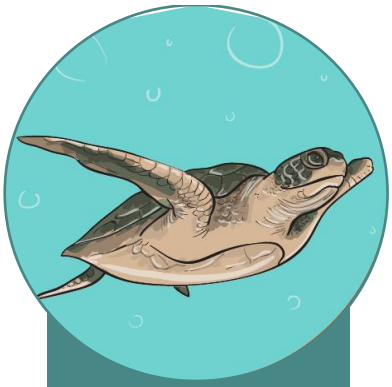
- The lifecycle begins when female turtles come ashore at night through the early morning, using the natural light of the moon and stars to navigate on the beach. Nesting on Kiawah typically lasts from early May to late August.
- After the female has selected a site, she digs her nest with her back flippers until she reaches the maximum depth, about 20 inches beneath the surface. She then deposits her eggs one at a time. A turtle nest can contain anywhere from 100 – 150 eggs.
- Once the mother has finished laying her eggs, she'll cover the nest with all four flippers and return to the sea. Loggerhead turtles are the most common species to nest at Kiawah, and they can lay 4- 7 nests per season, typically about 14 days apart. This entire process takes about 75 minutes.

Hatching

- Turtle eggs typically incubate for 50 – 60 days, depending on the ambient temperature and rainfall. When an egg hatches, the hatchling stays underground for roughly three days until their shell straightens out and the orifice where the yolk sac was attached is closes. Hatchlings emerge as a group. When this happens, the sand covering the nest looks like it is bubbling and boiling, which is why an emergence of dozens of hatchlings is called a "boil."
- Hatchlings usually make their way to the surface at night and use natural light reflected off the ocean surf to find their way to the water—artificial lights on the beach or along the shore can confuse hatchlings and lead them in the wrong direction, which is why it is so important to observe "Lights Out for Sea Turtles!"
- The hatchlings must travel across the beach on their own; according to scientific research, this journey helps them orient better to the oncoming waves and imprint on the magnetic field of the Earth, which gives them a sense of direction and allows them to return to their natal region when they mature in 25 – 30 years.

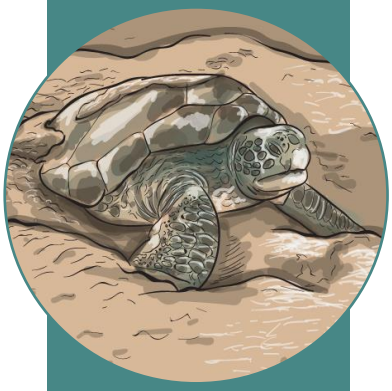
Growth & Migration

- Once in the ocean, hatchlings swim continuously to reach the Gulf Stream, which they use to drift with the current in the sargassum weed. Here they are protected from predators and have plenty of food to grow as they travel the North Atlantic.
- This period of time is often referred to as the "lost years," as following sea turtle movements during this phase is difficult. However, towards the end of this period, the survivors will return to the southeast US coast at about six years old to feed and grow for the next 20 years.



Mating & Return

- As adults, turtles gather to mate off the coast in spring when the water warms on the continental shelf. Mating usually does not take place near the nesting beach, but rather along the migration routes between feeding and breeding grounds.
- After the mating period, the males depart and the females remain offshore while their fertilized eggs develop, after which they will come ashore to lay their nests.
- Tagging studies have shown that females. Recent genetics research and tagging studies have shown that the majority of females return to nest at a preferred beach—the beach where they were hatched—on a two or three-year cycle. Possibly as few as 1 out of 1,000 hatchlings will return to shore as adults to lay their eggs.

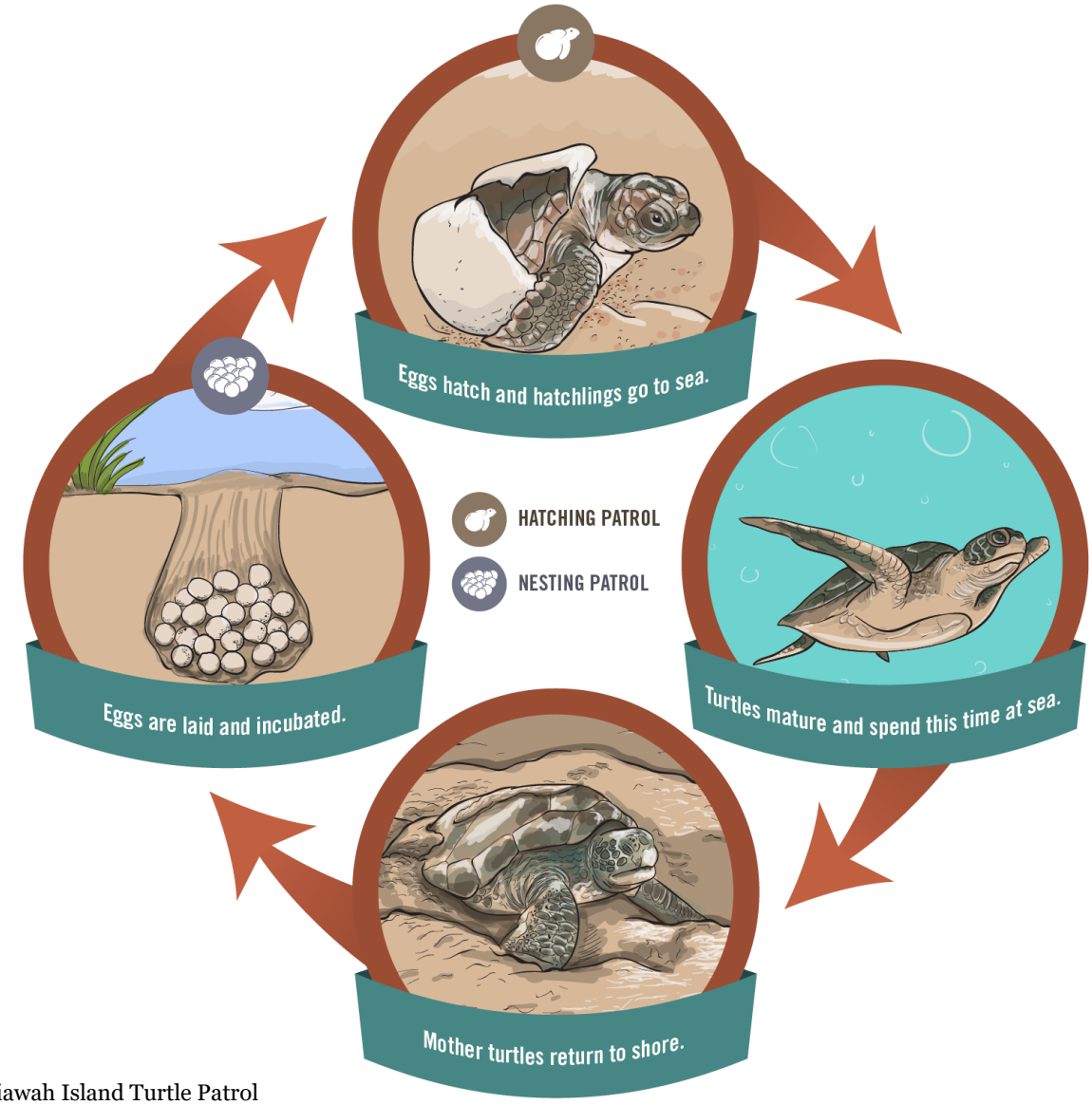


Where This Patrol Fits In

Within the turtle lifecycle, Nesting Patrol fits in immediately after the nesting stage. It is our job to identify nests, record their locations, provide anti-predator protection, and mark them in order to (1) easily locate the nests on the beach and (2) make the public aware of the nests.

Sea turtles spend their entire lives in the ocean except when they come ashore to nest and when they leave land upon hatching; on land, sea turtles are vulnerable to human interference and predators such as raccoons, crabs, and even coyotes. While we can't protect nests from all of these dangers—for example, ghost crabs are too small to defend against and are notorious for digging into turtle nests to feast on incubating eggs—we can provide deterrents against some of the larger dangers; the mesh netting we place over nests prevent predators like coyotes and raccoons from digging up nests. Furthermore, it is against the law for humans to disturb nests and harass hatchlings unless they are part of a protection program, such as the Kiawah Island Turtle Patrol. Each beach marker has an DNR sign on it that states this.

In 2016, Kiawah was home to over 390 nests, and our efforts contributed to an average hatch rate of 78.3%; providing protection and marking nests makes a difference.



Turtle Tracks

Each turtle species leaves distinct tracks in the sand when they come ashore to nest. Loggerheads are the most common turtles that come to Kiawah, although there are three other species that may rarely come ashore here: green, leatherback, and Kemp's ridley. The driver on duty will be able to confirm if the nest is not a loggerhead's.

Loggerhead

- Loggerheads are the most common turtles to nest in the Southeast US region, and are by far the most typical species you'll encounter during your patrol.
- Loggerheads leave staggered tracks in the sand, and you can determine their direction by the direction the sand was pushed back by the flippers.

Green

- While green turtles and loggerheads are roughly the same size, green turtle tracks are symmetrical, and you can determine their direction by the direction of the tail drag and "poke" in the center of their tracks. Their body pits are deeper and much more sand is mounded up.

Leatherback

- Like green turtles, leatherback tracks are symmetrical, but they are easy to distinguish due to their large size, which can range from five to seven feet in width. Their egg chambers are deeper.

Kemp's ridley

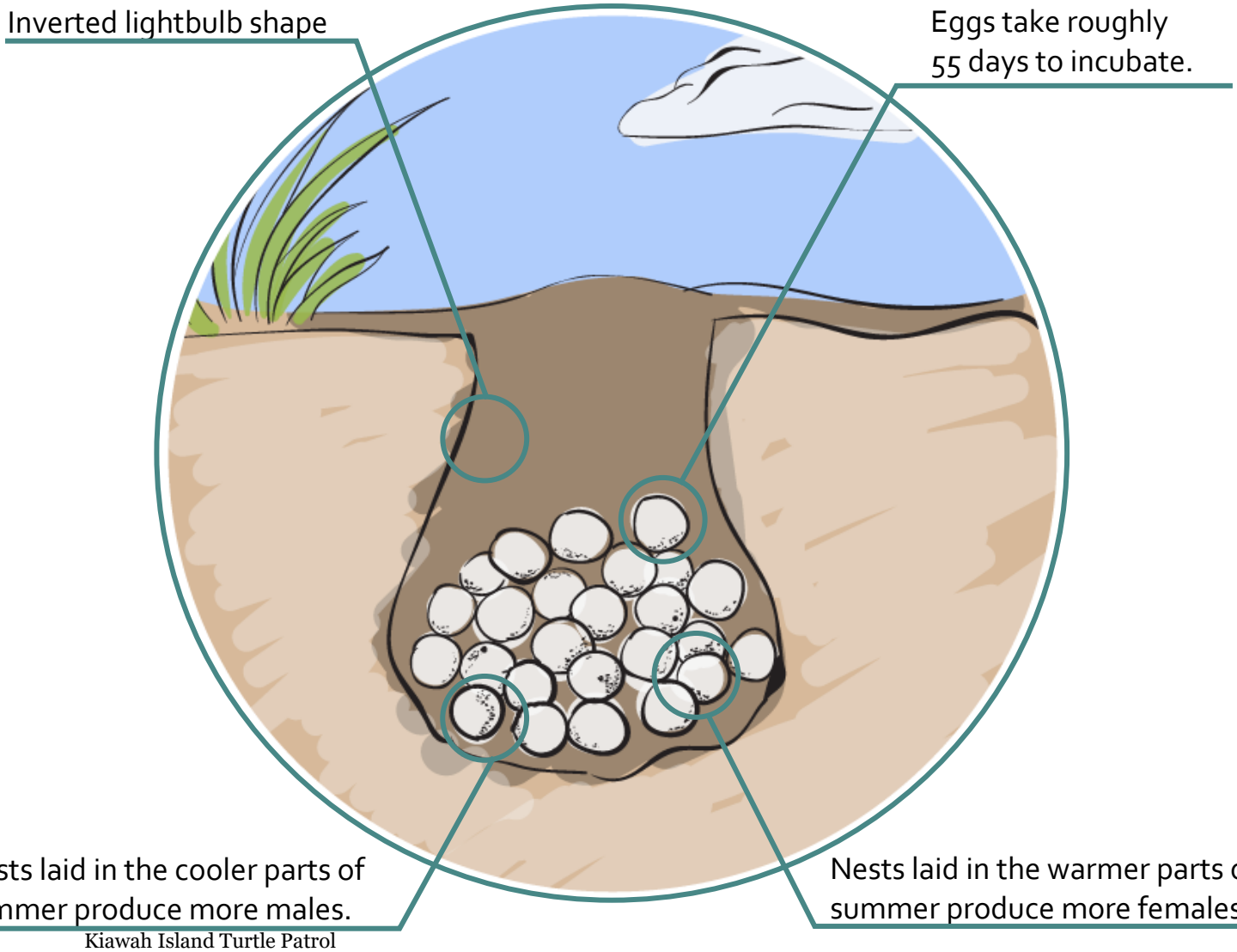
- Kemp's ridley turtles are extremely rare, and while they leave staggered tracks like loggerheads, their tracks are much smaller and more spaced out.

Turtle Nests

While different turtle species make distinct tracks in the sand, the nest cavities that they leave behind are fairly similar in shape: each egg chamber looks like an inverted lightbulb, with a narrow opening that leads to a larger and more bulbous cavern.

Turtle eggs usually take about 55 days to incubate, although the incubation period is dependent on the species and ambient temperature. Like many reptiles, turtle sex determination is also dependent on temperature; typically, nests laid in early May and August will incubate during cooler nights and are more likely to produce males. Nests laid between late May and July will have shorter and warmer incubation periods and produce females. A good way to remember temperature-dependent sex determination is the phrase "Hot chicks and cool dudes."

In the event a nest needs to be relocated, it is critical to dig the new nest in the same kind of inverted lightbulb shape in order to mimic the natural way that the mother digs her nest, as the shape of the nest helps regulate egg temperature.



ANALYZING CRAWLS

We begin our patrol each morning by looking for a crawl—that is, the tracks left behind by the female turtle as she emerged from the ocean to lay her eggs. Examining crawls enables us to determine if a nest was laid, locate that nest, and determine the species of the turtle who came ashore. Remember, if the high tide peaked during the early hours of the morning, you may not see a crawl at all, so be on the lookout for just a body pit on the other side of the high tide line.

Step 1: Identifying the Type of Crawl

In some instances during your patrol, you may come across a false crawl, or a non-nesting emergence. If a crawl is an obvious "turn around" (i.e., there are continuous flipper marks in the sand and there is no evidence of a nest at all), simply use an abbreviated version of the nest identification card. Under "Activity," circle "False Crawl" and record the following information:

- Survey date
- Original location and crawl coordinates
- Species
- Indicate if you probed or dug even if you do not assign a short stake
- Data recorder

However, if the crawl does not appear to be an obvious turn around, you will need to perform a thorough analysis to identify the incoming and outgoing crawl. Use the following criteria to determine the most likely nest site:

- Differential length of incoming and outgoing tracks (only if the tide is dropping throughout the night)
- Uprooted vegetation
- Thrown sand (usually darker than the surrounding sand) stuck to adjacent plants
- A turning arc
- A body pit marked by fluffy sand without flipper marks

Use the rake to cover over the tracks after you find the eggs.

Equipment You Will Need:

Step 2: Identifying the Species

As a part of identifying and analyzing turtle crawls, you will need to be able to identify the species of turtle. While extremely rare, it is possible that green, leatherback or Kemp's ridley turtles could nest on Kiawah. Remember:

- **Loggerhead**—staggered flipper marks, points in sand indicate inbound or outbound direction
- **Green**—symmetrical flipper marks, distinct, funnel-shaped body pits
- **Leatherback**—extremely large, symmetrical flipper marks
- **Kemp's ridley**—staggered, small, spaced out flipper marks

If you identify a crawl as anything other than loggerhead, do not disturb the crawl or potential nest. First, call the SCDNR for instructions on proceeding. If possible, take pictures of them before, during, and after the survey and nest marking.

If the SCDNR contact cannot be reached, proceed as normal to identify and relocate the nest (if necessary). Note that leatherback nests are very difficult to find and relocate because of their extreme depth.

Equipment You Will Need:

Step 3: Observing Any Metal Tags

If a nesting turtle is present, look during her exit for metal ID tags on her front or rear flippers. Tags are usually found on the trailing (back) edge of a front flipper.

Record the tag number and, if safely possible, measure and record the length and width of her shell at the center line.

Equipment You Will Need:

LOCATING NESTS

After analyzing the crawl, you need to look for evidence of a nest, which includes a body pit, flipper marks disappearing under soft, fluffy sand then reappearing, thrown dark sand, and uprooted vegetation that suggests digging. Once you've determined that the female laid a nest nearby, the next step is to locate the eggs, usually found in the body pit.

In some cases, after you find a nest, you may need to relocate it. The criteria in the *Relocating Nests* process section will help you determine if the nest needs to be relocated. If it does not, proceed to the *Screening and Marking Nests* procedure section.

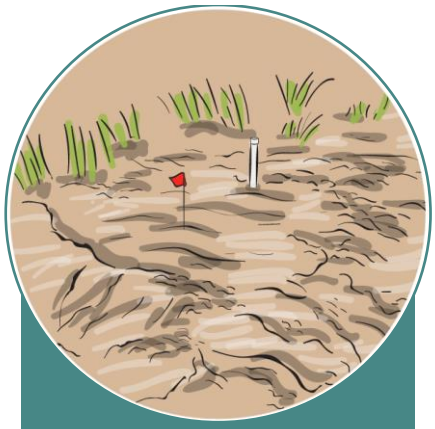
Step 1: Probing the Nest

Before probing within the body pit, probe outside the body pit to get a feel for the sand and determine how far your probe goes down in sand that has not been dug previously. After you determine the area of the body pit where you should probe:

- Insert the probe into the sand directly between your feet and always keep your weight on your legs. Push the probe down using your arms and back strength—if you find the nest, the probe will sink into the ground faster than it would for sand that has not been dug previously.
- When probing, do not lean forward or to the side; keep the probe vertical with the point between your feet and move your feet each time you probe in a different spot.
- Only one person is to probe at a time.

Equipment You Will Need:

Step 2: No Indication of a Nest



If there is evidence of a nest but probing does not reveal one, mark the site with a numbered short stake and corresponding red flag. Dig the hole for the short stake by hand—make sure you do not drive the stake into any eggs.

On the nest identification card, circle "Possible Nest" and record the following information:

- Survey date
- Short stake number
- Location and coordinates

Equipment You Will Need:

Step 3: Indication of a Nest

If probing indicates a nest, complete the following steps:

1. Carefully excavate the surface of the nest by hand to verify there are eggs.
    - You **must** wear protective gloves for this.
2. If a nest is completely predated, give it the next number on the nest identification card, but do not mark it with a stake. Record the number of egg shells and use one of these shells for your DNA sample.
3. Record the following data on the nest ID card:
    - Nest number and location reference number
    - Nest date and survey date
    - Nest coordinates and location notes
    - Nest prober and data recorder
    - Turtle activity and species
    - Nest comments
    - Nest type (i.e., in situ, relocated, etc.)
    - Genetic info

Equipment You Will Need:

RELOCATING NESTS

In some cases, it is necessary to relocate a nest; for instance, the turtle may have laid it too close to vehicular traffic and the nest could be crushed Relocation is called for if the nest is:

- Seaward of beach marker posts (placed during high tide)
- West of marker 40
- In a heavily trafficked area, such as:
    - At the end of a public boardwalk without a roped off area that people can walk around
    - In an area used by beach vehicles, like at trash receptacles or emergency vehicle access roads

If the nest does need to be relocated, use the following steps in this section. If the nest does not need to be relocated, proceed to the next section, which outlines how to mark and protect a nest. If a nest does not meet these criteria, proceed to the *Screening and Marking Nests* procedure section.

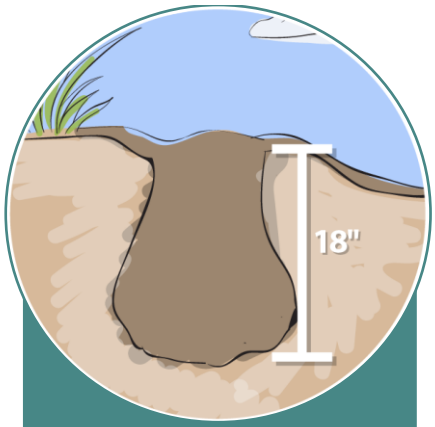
Step 1: Finding a Relocation Site

If a nest needs to be relocated, you will first need to determine a suitable relocation site. The site should be landward of the high tide markers on a gentle slope and as free as possible of vegetation. You can go to another zone if necessary if you do not have suitable habitat.

Step 2: Excavating the New Nest

After determining a suitable relocation site, you will need to dig the new hole first so the eggs do not stay exposed to the sun and air. The new nest must mimic the original nest left behind by the turtle. You can use a post digger to dig out the initial hole, then use your hands or a digging cup to enlarge the bottom of the nest to replicate the inverted lightbulb shape of the nest.

- The opening for the relocated nest should be slightly larger than the original nest, as you will not be able to pack the eggs in as tightly as the mother turtle did.
- Measure the empty chamber and note the size of the original egg chamber—the new nest must be at least 18 inches deep, but it should be the same depth as the original nest. Do not make the nest deeper than 24 inches unless it is a green or leatherback nest.

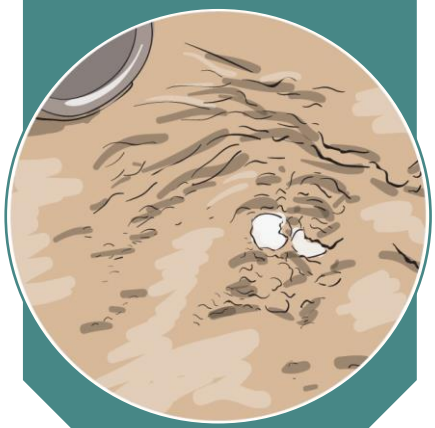


Equipment You Will Need:

Step 3: Excavating the Original Nest

To relocate the eggs, you must excavate the original nest by hand. This must be done gently to avoid harming the eggs.

- Move away sand until you open the nest cavity enough for a patrol member to reach the eggs.
- Protective gloves **must** be worn at all times when excavating the original nest.



Equipment You Will Need:

Step 4: Handling the Eggs

To relocate the eggs, a designated patrol member will remove them from the original nest and place them in a bucket with moist sand in the bottom that was dug out from the original nest; this sand is firmer than the surface sand and will help keep the eggs from rolling during the move.

- The patrol member will also count the eggs, including any broken eggs, as he or she is removing them.
- A second patrol member needs to stay with the patrol member who is removing the eggs to ensure a correct egg count, including any broken eggs.
- Bury any broken eggs away from the new nest location. Make sure to enter the number of broken eggs in the "Loss Log" area and keep one shell for the genetic study.

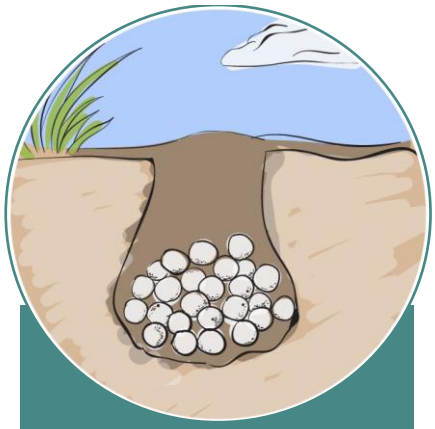
When handling the eggs, move them as little as possible. Remember to:

- Lift only one egg at a time.
- Keep the egg vertically oriented (i.e., hold the egg the same way it was originally positioned in the nest).
- Maintain "smooth motion" from the nest to the container and from the container to the nest.
- Protective gloves **must** be worn at all times when handling the eggs.

As part of removing the eggs from the original nest, measure the nest depth and have the new nest excavator make adjustments to the new nest before the eggs are relocated.

Equipment You Will Need:

Step 5: Moving the Eggs



Relocated or not, remove all traces of damaged eggs before refilling the original nest.

To move the eggs into the new nest, place the eggs carefully into the nest one at a time, ensuring that they do not roll.

- When placing the eggs, keep them vertically oriented, with the North pole always on top—hold the egg the same way it was positioned in the bucket, which should be the same way it was positioned in the original nest.
- The general principle for moving the eggs is that the last one out of the original nest should be the first one into the new nest; this ensures that the eggs deeper in the original nest are at roughly the same depth and temperature in the new nest.
- As you place the eggs in the new nest, count them to verify the number of eggs relocated.
- Protective gloves **must** be worn at all times when handling the eggs.

On the nest identification card, the designated data recorder will need to record the following information:

- Relocation date
- Total egg count (including any broken eggs)
- Nest type (in this case, relocated)
- Reason for relocation
- Relocated nest coordinates and location reference
- Number of eggs relocated
- Number of eggs broken
- Nest depth

Once a nest has been properly relocated, it can be screened and marked.

Equipment You Will Need:

SCREENING AND MARKING NESTS

All nests, whether they are left in situ or relocated, need to be screened and marked. Proper nest screening provides protection from predation for each nest. The center of the screen is used to accurately identify the center of the nest opening, and the screen establishes the original surface of the nest—this is important information for Hatching Patrol, as their responsibilities include clearing sand that accumulates from the original nest surface and raising the screen.

Marking nests is a critical step, as our physical markers help us pinpoint the nest's location, in addition to GPS coordinates, location reference numbers, and beach zones.

Step 1: Removing a Genetic Sample

Before we screen and mark the nest, we need to remove a sample for genetic testing; genetic sampling tells us what the current state of the turtle population is and whether the same mother turtles are returning to the same area. To do this, we test the egg shell, which contains genetic material solely from the mother.

- If the nest can be left in situ, you can simply remove the first egg you see after partially excavating the nest.
- If the nest needs to be relocated, you should remove a broken egg shell—if there are no broken egg shells by the time relocation is complete, you can remove an intact egg instead.
- Use the specimen bag or vial that corresponds to the nest number to store the sample.
- Make sure to store the specimen in a place where it is safe from seagulls or crows, as they have been known to steal specimens.

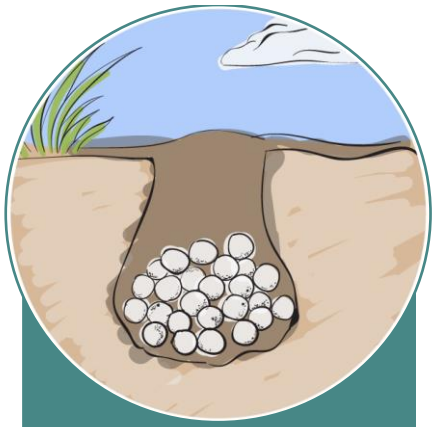
When you remove a genetic sample, the data recorder will need to log the type of sample taken on the nest identification card.

Equipment You Will Need:

Step 2: Reburying the Nest

Once a genetic sample has been removed, the nest needs to be reburied to the same depth as it was when the mother turtle originally buried her nest.

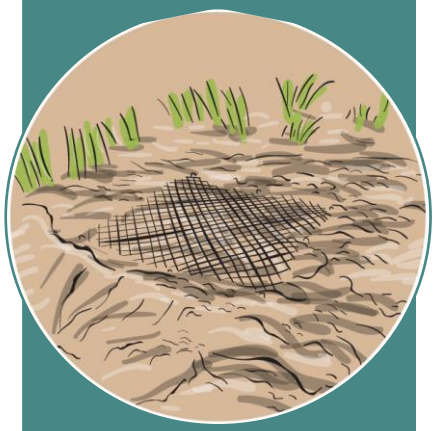
As you rebury the nest and smooth out the sand, place a temporary marker (such as a stick) over the center of the nest opening. This will help you position the center of the screen over the nest opening.



Step 3: Placing the Screen

After the nest has been reburied and the sand over the nest has been smoothed, you will need to place the screen.

The screens we use for Nesting Patrol should be large enough to keep mammalian predators out, yet they allow hatchlings to escape from the nest without assistance. These screens are typically 4'x4' pieces of 2-inch mesh plastic.

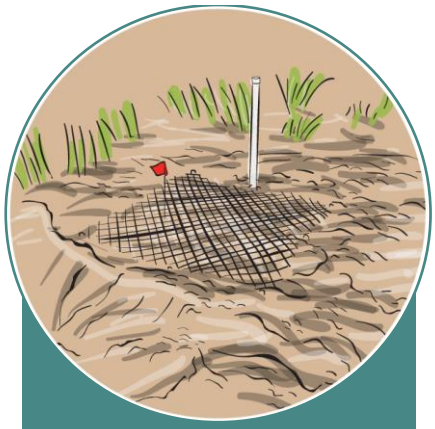


- Place the screen so that the center of the screen is directly on top of the center of the nest opening—use the temporary marker you placed as a guide.
- The lower edge of the screen needs to be parallel to the beach.
- Once the screen has been secured with stakes, you can remove the temporary marker.

The designated data recorder will need to record the nest management method on the nest identification card.

Equipment You Will Need:

Step 4: Placing the Nest Markers



When a nest has been identified, it will need to be marked with both a numbered long stake and a corresponding numbered red flag.

- Marking screened nests is necessary to prevent people from inadvertently injuring themselves or the incubating eggs.
- The numbered long stake must be posted to the east of the center of the nest, on the edge of the screen.
    - Use a post digger to dig the hole for the stake; be careful not to cut the screen while digging.
    - The hole for the stake should be deep enough for the stake to be secure and firmly in the ground.
- The numbered red flag needs to be placed landward directly behind the screen, at a 90-degree angle to the numbered long stake.
    - Use a PVC elbow to measure the angle and correctly place the flag.
    - The point of the angle must be at the center of the nest opening.

The red flag is used to identify the position of the nest if the marker and screen are removed (e.g., stolen or washed away).

The same flag will also be used to mark the hatched nest by Hatching Patrol. To help identify the nest location if screens are lost, be sure to get accurate GPS coordinates for the center of the nest.

When recording data on the nest identification cards throughout the entire process, ensure that your information is accurate, as this information is used by other patrol teams and the SCDNR.

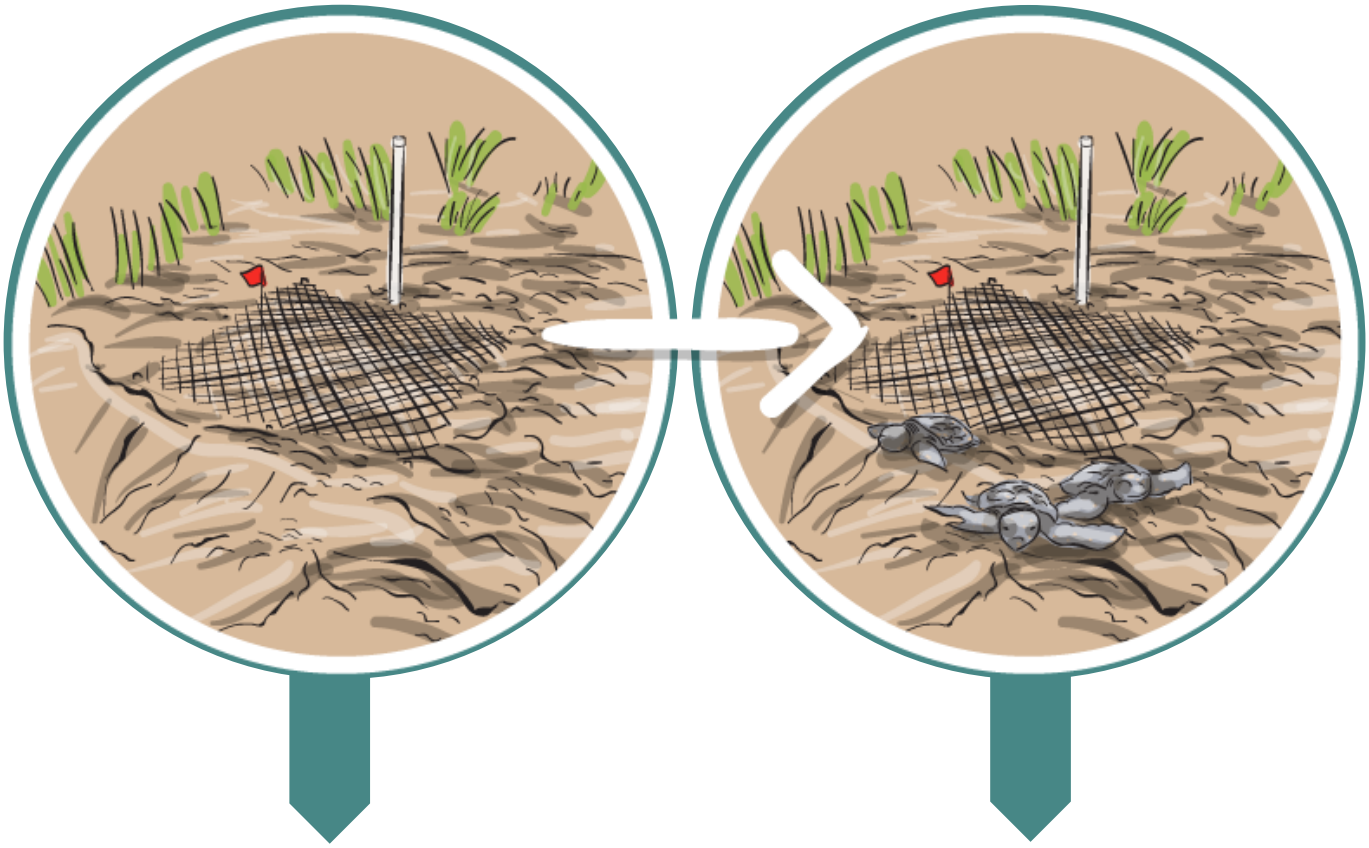
Equipment You Will Need:

NEXT STEPS

Once you complete the Nesting Patrol steps for each nest your team identifies, those nests will come under the care of Hatching Patrol for each beach zone. While the eggs will be incubating for roughly 55 days once they are laid, there is still a lot to do in the meantime to ensure the young turtles have the best chances for survival. You took the first step in helping the next generation of turtles this season: you laid out anti-predator protection measures, you marked nests so we know where the nests are and no one puts a beach umbrella through the clutch, and you relocated nests that were left in any unsafe areas. What happens next during Hatching Patrol is the result of your hard work!

Over the course of the turtles' incubation period, Hatching Patrol will:

- Record data for nests that are depredated, disrupted, washed over, or destroyed.
- Remove accumulating sand or raising the screen to the surface, as sand buildup on top of the screen can prevent the turtles from reaching the surface.
- Soften sand when needed to provide hatchlings a better chance of reaching the surface.
- Excavate hatched nests and determine the fate of each egg.
- Assist disoriented hatchlings and safely release live hatchlings.



Nests will incubate safely and be monitored by Hatching Patrol.

Hatchlings will emerge and make the journey to the ocean.

THANK YOU

We're looking forward to having you join us on the beach and be a part of our team of enthusiastic and devoted volunteers. Kiawah Island is a busy place for turtles once the season starts; in 2016, we recorded nearly 400 nests alone! It's all hands on deck for the turtles, and we can't do our work without the help of dedicated volunteers like you. Your time is your most precious resource, and we sincerely appreciate you using it to help the Kiawah Island Turtle Patrol!

While out on the beach with us, we encourage you to have fun, and we're glad you recognize the importance of protecting turtle nests and ensuring that every new hatchling has a greater chance of making it to the water. If you'd like to learn more about sea turtle conservation and see what kind of impact your efforts have on sea turtles, take a look at seaturtle.org.

From all of us on Kiawah Island, human and turtle alike, thank you.

NESTING PATROL CHECKLIST

Nesting Patrol is the first patrol of the season to go out on the beach to look for new turtle nests. Our tasks include analyzing crawls, locating, screening, and marking nests, and relocating eggs from potentially dangerous areas.

When we get on the beach to perform our patrol duties, we need to make sure that we perform our tasks according to SCDNR regulations and Kiawah Island Turtle Patrol practices.

Refer to the following checklist to help keep track of what you need to do as you complete your patrol.

Thoroughly analyze the crawl before probing for a nest.

- Determine the inbound and outbound crawl, identify the species, and look for evidence that it is a nesting crawl to help you determine where you should probe.

Rake over crawls that have already been surveyed.

- Rake over crawls that have already been surveyed to ensure there are no duplicate reports for the same crawl.

Wear protective gloves when excavating nests and handling eggs.

- Protective gloves must be worn when digging out a nest and handling eggs, hatchlings, and genetic samples—no exceptions

Remove a genetic sample.

- A genetic sample must be removed from each nest.

Use sand from the original nest to transport the eggs when relocating them.

- Relocating eggs in buckets with sand from the original nest lining the bottoms helps prevent the eggs for rolling.

Place the center of the nest screen on top of the opening of the egg chamber

- The center of the screen, as well as the GPS and placement of the long stake and red flag, help us determine the exact location of the nest opening.

Plant the correctly numbered long stakes, short stakes, and red flags.

- The numbered physical markers we use must correspond to the nest number and face toward the beach.

Record all the relevant information on the nest identification cards.

- All the fields on the front of the nest identification card need to be filled, as do the fields on the upper half of the back of the card.

Confirm that all the information you record is correct.

- Hatching Patrol will use the information you record to determine when a nest is about to hatch and to conduct a nest inventory.