

ENVIRONMENTAL ASSESSMENT

for the

SEA TURTLE NEST PREDATOR CONTROL PLAN

for the

TEN THOUSAND ISLANDS NATIONAL WILDLIFE REFUGE

Collier County, Florida

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SECTION 1.0 PURPOSE AND NEED FOR PROPOSED ACTION

SECTION 1.1 INTRODUCTION

The 1988 Arizona-Florida Land Exchange Act authorized the conveyance of approximately 35,000 acres of lands owned by the Collier family to the U.S. Fish and Wildlife Service (USFWS). The title was conveyed on December 18, 1996, establishing the Ten Thousand Islands National Wildlife Refuge (TTINWR). The refuge is located south of Marco Island in Collier County, on the southwest coast of Florida. The refuge is part of the larger Ten Thousand Islands estuarine area that stretches from Cape Romano to Cape Sable. The Refuge was established to develop, advance, manage, conserve, and protect the unique subtropical estuarine ecosystem and its fish and wildlife resources (Fish and Wildlife Act of 1956). In 2003, the USFWS acquired management authority from the State of Florida for approximately 13,500 acres of tidal open water. This area is co-managed with the Florida Department of Environmental Protection (DEP), Rookery Bay National Estuarine Research Reserve (RBNERR). Total refuge acreage is approximately 35,000 acres.

Five species of sea turtles, the loggerhead (*Caretta caretta*), the green (*Chelonia mydas*), the Kemp's ridley (*Lepidochelys kempi*), the leatherback (*Dermochelys coriacea*) and the hawksbill (*Eretmochelys imbricata*), inhabit the Atlantic and Gulf Coasts of the United States. All five species are protected by the Endangered Species Act (ESA), international agreement, and state laws. Two species of sea turtles are known to nest in the TTINWR and adjacent lands owned by RBNERR (Figure 1). The predominant nester is the threatened loggerhead sea turtle, whereas the endangered green sea turtle is an infrequent nester. The Kemp's Ridley feeds in the waters surrounding TTINWR, but has not been known to nest there.

As the primary federal agency responsible for administering the Endangered Species Act (ESA) of 1973, the USFWS is obligated to promote the recovery of species listed under the act. The TTINWR is charged under the ESA to protect and conserve listed sea turtle species. The refuge's goals and objectives have been more clearly identified to protect and conserve federally-listed species in the TTINWR Comprehensive Conservation Plan (CCP; 2002). Our objective is to reduce depredation on loggerhead nests to 10 percent or less of all nests (USFWS 2008). Additionally, the Loggerhead Sea Turtle Recovery Plan (2008) lists 13 recovery objectives, one of which is to minimize nest predation. Controlling mammalian predator populations has proven an effective means of increasing nesting success of sea turtles (USFWS, 2000).

SECTION 1.2 NEED AND PURPOSE OF THE PROPOSED ACTION

The National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd et seq.) provides authority for the Service to manage the Refuge and its wildlife populations.

Heavy predation and nest destruction by predators throughout the state of Florida have significantly decreased the breeding success of sea turtles and presents an important limiting factor in sea turtle reproduction. Raccoons may depredate up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk *et al.* 1980). Raccoons (*Procyon lotor*), ghost crabs (*Ocypode quadrata*) and red fire ants (*Solenopsis invicta*) are the only known nest and hatchling predators that occur on TTINWR (Doyle and Magerowski 2002). Raccoons are significant predators, whereas these other species currently exert an insignificant impact. In 2009, 59 percent of all sea turtle nests were partially or completely depredated by raccoons. Previous work has shown that raccoon control on Ten Thousand Islands significantly increases sea turtle nest success. Between 1991 and 1994 raccoon depredation affected between 76 percent and 100 percent of the nests laid on Panther Key. Fourteen raccoons were captured on Panther Key in 1995, and two were captured in 1996. In 1995 and 1996, 0 percent of the nests were depredated on Panther Key. It is believed that this decrease in depredation was the result of predator control. (Garmestrani, 1997) Additional nest predators on Florida beaches include feral hogs (*Sus scrofa*), foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes, (*Canis latrans*), and armadillos (*Dasypus novemcinctus*), but are not known to occur on TTINWR. Within peninsular Florida annual nest totals averaged 64,513 nest from 1989-2007. Index beach data in this same period indicate a 26 percent decrease over the 20-year period (1989-2008), and a 41percent decrease since 1998. However, these statistics do not reflect the impact of predators alone. Habitat loss, unrestricted harvesting, and other factors have resulted in serious declines in sea turtle populations throughout their range. Entirely dependent on very limited and dwindling coastal habitat for their survival, sea turtles worldwide are either listed as endangered or threatened and continue to face the possibility of extinction. As available nesting habitat dwindles along the southwest coast of Florida due to development, sea level rise, and climate change, maximizing nest production in the remaining areas, especially on conservation lands, becomes imperative. An active predator control program can aid in facilitating this objective.

SECTION 1.3 PROPOSED ACTION

The proposed action includes implementation of the Sea Turtle Nest Predator Control Plan for the Ten Thousand Islands National Wildlife Refuge, Collier County, Florida (Predator Control Plan; Appendix A). This plan consists of the humane management of sea turtle nest predator populations on barrier islands within the Ten Thousand Islands National Wildlife Refuge and adjacent lands. Implementing the predator control plan will help the refuge meet goals and objectives identified in the CCP and recovery objectives identified under approved species recovery plans.

SECTION 1.4 COORDINATION AND CONSULTATION

The National Environmental Policy Act of 1969 (NEPA), 42 USC § 4321-4347, and its implementing regulations at 40 CFR Parts 1500-1508, require early and continuous

communication with the public, early consideration of significant environmental consequences, considerations of all reasonable alternatives, and the use of all practicable means to avoid or minimize any possible adverse effect of the action on the quality of the human environment (40 CFR § 1500.2[f]). Section 1506.6 of the regulations requires Federal agencies to make diligent efforts to involve the public in preparing and implementing NEPA procedures.

This environmental assessment has received input from refuge staff and has been coordinated with personnel of the RBNERR. A 30-day public comment period will be announced by legal notice in local newspapers and posted at the refuge and at RBNERR. The EA and trapping plan will be posted on the refuge website (<http://www.fws.gov/floridapanther/tenthousandislands/>) for interested parties to download. Copies will be mailed to interested parties upon request.

SECTION 1.5 RELATIONSHIP TO EXISTING LAWS AND STATUTES

The FWS prepared this EA in accordance with NEPA, which requires assessments to be conducted which describe the environmental consequences of proposed actions and various alternatives.

Other statutes and regulations related to this EA are described below:

1. Endangered Species Act of 1973 (16 USC 1531-1544)– ESA’s implementing regulations at 50 CFR, Subpart C, administers prohibitions on taking endangered wildlife and exemptions therein (§17.21(c) *Take*) through harassment, killing, injuring or other means in defense of human lives or in response to a threat to human safety. This is consistent with the requirements of NEPA and the Council of Environmental Quality NEPA regulations.
2. Florida Administrative Code (FAC) 68A-9.010 - FAC 68A-9.010 provides for landowners and public land managers and their designees to take nuisance wildlife.
3. Florida Administrative Code 68A-27 - FAC 68A-27 establishes rules relating to threatened and endangered species under Florida law.
4. Florida Administrative Code 68A-4.001 - FAC 68A-4.001 provides prohibitions to intentionally feeding black bears, foxes, raccoons, or sandhill cranes and thereby creating a public nuisance.
5. National Wildlife Refuge System Act (USC 460k, 664, 668dd) - This act governs the general administration of national wildlife refuges. All national wildlife refuges are maintained for the primary purpose of wildlife and ecological conservation and, where appropriate, restoration.

SECTION 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

In accordance with mandates established under NEPA, the USFWS is required to consider a full range of reasonable alternatives for addressing and responding to major public issues, management concerns, and resource conservation opportunities associated with issues arising from predator control measures to protect sea turtle nesting. In determining whether these alternatives provided a satisfactory range of options, the USFWS evaluated the following information:

- Biological requirements of sea turtles, other protected fauna and flora, and identified predators potentially affected by administration of the plan;
- Social, economic, environmental, and other relevant issues and concerns identified during both internal and public review of the proposed plan; and
- Legal mandates of the USFWS under NEPA and the ESA.

Four alternatives were analyzed using these criteria for predator control to protect sea turtle nests on TTINWR and adjacent lands. All of these alternatives have been used by the USFWS in managing predatory issues regarding sea turtle nesting. Alternative A (No Action) would allow uncontrolled nest predation. Alternative B would also allow uncontrolled nest predation, but nesting information and the effects of predation would be collected. Alternative C is currently in place on TTINWR and utilizes predator excluder devices and monitors sea turtle nests through the entire nesting season. This method is based on techniques used elsewhere in the state of Florida. Alternative D would actively remove predators from Ten Thousand Islands.

SECTION 2.1 ALTERNATIVE A-NO ACTION

With this alternative, no nest monitoring or predator reductions would take place. Raccoons would continue to negatively affect the nesting sea turtle population on Ten Thousand Islands National Wildlife Refuge.

SECTION 2.2 ALTERNATIVE B-NEST MONITORING

This alternative monitors sea turtle nesting and false crawls daily between the beginning of May and the end of September. Nests and false crawls are identified, enumerated and evaluated. Clutches are found, marked with stakes as described in the FWC's Marine Turtle Conservation Guidelines (2007), and the position is recorded on a GPS. Depredation is recorded and nesting success is measured. Nests are excavated by hand with hatched eggs, live hatchlings, dead hatchlings, pipped eggs with live hatchlings, pipped eggs with dead hatchlings, and unhatched eggs inventoried. A nest inventory is conducted 72 hours after the first signs of emergence, or 70 days after the eggs are deposited (80 days for green sea turtles), whichever occurs first. If the nest has been subjected to inundation, excessive rainfall, shading or cool fronts, the nest is not

excavated until after 80 days after eggs were deposited or 96 hours after the first signs of emergence.

SECTION 2.3 ALTERNATIVE C-PREDATOR EXCLUDING DEVICES AND MONITORING

This alternative is the same as ALTERNATIVE B with the installation of a self-releasing screen or cage over nests to deter predators from digging up eggs or hatchlings. Predators generally target nests within a few days of egg deposition or as the embryos pip out of their shells, releasing odors attractive to predators. As in ALTERNATIVE B, nests and false crawls would be identified, enumerated, and evaluated. Nests would be identified, clutches found, marked and the location recorded with a GPS. Nest inventories would take place after emergence.

- a. Screens: The screens typically used for mammalian exclusion are 4' x 4', with 2" x 4" mesh welded wire. This type of screen is large enough to keep predators out but allow hatchlings to escape from the nest unaided. The screen is centered over the clutch to prevent predation from the sides, and anchors are placed at the corners of the screen so that they do not come in contact with the eggs. If the screen is to be buried, 2" of sand can be removed and leveled. The screen is then placed and anchored, and the removed sand is returned to top of the screen so that the burial chamber is at its original depth. Predators can be very persistent, so additional stakes may be utilized at the midpoints between the corners if necessary. Three days before and three days following anticipated hatching, screens will be checked regularly to be sure hatchlings are not trapped by the screens. The screens are removed after hatchling emergence is complete and a nest inventory is conducted.
- b. Cages: The eggs and pre-emergent hatchlings can be protected by placing a self-releasing cage over the nest. Construction of self-releasing cages may vary, but all are designed to allow enough space to allow hatchlings to completely emerge from the sand. Generally the self-releasing cages are made of 4" X 2" wire mesh, and the cage is oriented so that the 4" opening is parallel to the surface of the sand. Cages are centered over the nest to minimize predation by burrowing from the sides and the possibility that the anchors will make contact with the egg chamber. These cages are sunk into the sand to a foot below the surface around the perimeter. Cages are checked on a regular basis in order to reposition if they become dislodged. Cages are removed from the beach after hatchling emergence and a nest inventory is conducted

SECTION 2.4 ALTERNATIVE D- PREDATOR CONTROL PLAN (PREFERRED ALTERNATIVE)

The proposed action includes the use and implementation of the Sea Turtle Nest Predator Control Plan for the Ten Thousand Islands National Wildlife Refuge, Collier County, Florida (Appendix A), which seeks to humanely manage sea turtle nest predators to reduce raccoon depredation to less than 10% of all nests on the six main nesting islands in Ten Thousand Island National Wildlife Refuge. A maximum of one survey per week during the nesting season will be conducted to assess depredation of nests. Daily nest monitoring, as described in ALTERNATIVE B, will be done every five years to assess the nesting turtle population status and trends. This alternative would include the removal of sea turtle nest predators. Trapped animals would be euthanized humanely by shooting. Deceased animals would be buried to a minimum depth of three feet to deter unearthing by scavenging animals. Non-target animals would be released.

All control measures would be implemented in accordance with applicable federal and state laws and USFWS policy. All field equipment would be checked daily by personnel visiting each island via watercraft to inspect all traps. Efforts would be made to check the traps early in the day to reduce exposing trapped animals to adverse weather conditions.

- a. Walk-in Live Traps - This method would be the first option used to capture animals. Traps would be set in areas of high predator activity and pathways. Animal trails are readily visible along all of the surveyed turtle nesting beaches, with raccoon tracks easily identifiable. Trails are characteristically landward, above the exposed beach where travel by mammals is more concealed. Occasionally, raccoons can be observed hunting along the surf line, fully exposed on the beachfront. To minimize exposure to the visiting public and their pets, all traps will be located among vegetated areas for enhanced concealment and further camouflaged with appropriate cut vegetation to disguise traps and provide shade to any trapped animals. Traps will be checked early in the day to reduce exposure to animals from adverse weather conditions (heat and direct sunlight) and minimize confinement time.
- b. Leghold Traps - This method would be used in cases where raccoons have learned to avoid live traps, precluding their successful use. Number 1½ or 2 Victor Soft Catch® leghold traps or Egg traps would be used to capture and restrain animals. No leghold traps will be set in or near high visitor use areas. Leghold traps would generally be set near partially depredated nests in order to target raccoons visiting or re-visiting nest. However, they will not be used on predated nests close to hatching to avoid impacts to hatchlings.
- c. Shooting - This method would be used to remove nest predators. Shooting would be done utilizing shotguns or rifles. Opportunistic shooting of target species would not occur during public use hours. This alternative would only be used in select areas.

To maximize success, trapping operations may begin as early as March of each year, prior to commencement of sea turtle nesting, and continue throughout the nesting season. Turtle nesting typically begins in south Florida by the first or second week of May and the last hatchlings emerge in October.

Fire ants and ghost crabs are currently not known to prey on sea turtle eggs or hatchlings in the Ten Thousands Islands NWR although they are known to do so, on other Florida beaches. If ghost crabs begin to prey on sea turtle eggs and impact nest success, they will be trapped and exterminated. If fire ants predate sea turtle eggs, they will be managed using an approved commercial ant bait. Bait will be applied by hand directly to the ant mound, in accordance with State and Federal regulations, in order to avoid adverse impacts to turtles.

SECTION 3.0 AFFECTED ENVIRONMENT

This section of the EA describes the portions of the human environment potentially affected by the proposed and alternative actions. In reviewing a proposed activity for NEPA compliance, the Council on Environmental Quality generally considers the following elements of the human environment:

- Physical Environment (topography, wetlands, floodplains, coastal zones, subsurface conditions, hydrology, soils, energy and mineral resources, toxic substances, and air);
- Land Use (zoning, existing land uses, proposed long-range plans, farmland, and timberland);
- Biological Environment (vegetation, fisheries, wildlife, and threatened/endangered species);
- Cultural Resources (historical sites and standing structures, architectural issues, archaeological sites, and Native American issues)
- Social Interests (human population, human health/safety, and public services);
- Economy (employment, income sources, and economic uses of affected environment);
- Aesthetics (scenic value, noise and odor).

From the list of requisite elements, the Biological Environment, and Social and Economic Interests, apply to the proposed action because actions relating to one element will have a consequential effect on the others, and vice versa. The proposed action will not adversely or beneficially affect the remaining requisite elements; therefore, no further discussion of these elements is required.

SECTION 3.1 BIOLOGICAL ENVIRONMENT

This section presents a general description of the biological environment that could be affected by the three alternatives. Management of sea turtle nest predators will primarily affect raccoons, ghost crabs, or red fire ants.

A. Habitat

Tidal areas in the southern two-thirds of the refuge consist of open water habitats such as saltwater bays, interconnected embayments, lagoons, and creeks. The most prominent habitat type in this area is the mangrove forest which dominates the tidal fringes and the numerous islands (or keys). Three species of mangrove occur in the refuge: red, black, and white. The red mangroves generally dominate the middle and lower portions of the intertidal and upper subtidal zone, while the black predominates in the upper intertidal zone and the irregularly flooded tidal areas. White mangroves are few and patchy in their distribution and are the least salt tolerant of the three mangrove species. The refuge's barrier islands are situated along the Gulf of Mexico and characterized by narrow beaches and West Indian tropical hardwood hammock vegetation. The presence of Indian shell middens on several of the islands influences local vegetative diversity. Sea grasses are sparsely distributed in the refuge tidal waters: the dominant species being shoal grass, while manatee and turtle grasses are less common.

B. Sea Turtles

The loggerhead is the most common sea turtle in Florida, and is named for its massive, block-like head. Loggerheads are among the larger sea turtles; adults weigh an average of 275 pounds and have a shell length of about 3 feet. Its carapace, which is a ruddy brown on top and creamy yellow underneath, is very broad near the front of the turtle and tapers toward the rear. Each of its flippers has two claws. As is true for all sea turtles, the adult male has a long tail, whereas the female's tail is short.

The powerful jaws of the loggerhead allow it to easily crush the clams, crabs, and other armored animals it eats. A slow swimmer compared to other sea turtles, the loggerhead occasionally falls prey to sharks, and individuals missing flippers or chunks of their shell are not uncommon. However, the loggerhead compensates for its lack of speed with stamina.

In the United States, 90 percent of all loggerhead nesting occurs in Florida. The majority of this nesting takes place on the east coast of Florida. Loggerheads typically nest in Florida from April through September. Females return to their nesting beach every two or more years to lay about four to seven nests, one about every 14 days. Each nest contains on average 100 to 126 eggs that incubate about 60 days.

Green turtles, named for their green body fat, were valued by European settlers in the New World for their meat, hide, eggs, and "calipee" (the fat attached to the lower shell that formed the basis of the popular green turtle soup). A more streamlined-looking turtle

than the bulky loggerhead, the green turtle weighs an average of 350 pounds and has a small head for its body size. Its oval-shaped upper shell averages 3.3 feet in length and is olive-brown with darker streaks running through it; its lower shell, or plastron, is yellow.

Green turtles are found during the day in shallow flats and sea grass meadows and return every evening to their usual sleeping quarters—scattered rock ledges, oyster bars, and coral reefs. Adult green turtles are unique among sea turtles in that they are largely vegetarians, consuming primarily sea grasses and algae.

Approximately 100 to 1,000 green turtles nest on Florida's beaches each year from June through late September. Every two or three years, a female will return to her nesting beach and lay an average of three to five egg clutches in a season. They can lay as many as 10 clutches, with about 12 days between each nesting. The average number of eggs in a clutch is about 115. Although nesting activity has been recorded in almost every coastal county in Florida, most green turtle nesting is concentrated along the southeast coast of Florida.

C. Birds

Piping plovers (*Charadrius melodus*) are small shorebirds approximately seven inches long with sand-colored plumage on their backs and crown and white underparts. Breeding birds have a single black breastband, a black bar across the forehead, bright orange legs and bill, and a black tip on the bill. During winter, the birds lose the black bands, the legs fade to pale yellow, and the bill becomes mostly black.

Piping plovers breed only in North America. Piping plovers from all breeding populations winter along South Atlantic, Gulf Coast, and Caribbean beaches and barrier islands, primarily on intertidal beaches with sand and/or mud flats with no or very sparse vegetation.

Piping plover populations were federally listed as threatened and endangered in 1986. Piping plovers are considered threatened throughout their wintering range. The highest concentration of birds reported in winter censuses are found in Texas, Louisiana, and Florida. However, only 63 percent of the breeding birds counted in 1991 were reported during the winter census, suggesting that important wintering areas are still unknown.

Plovers are found in the wintering grounds from mid-July through late October. Breeding and wintering plovers feed on exposed wet sand in wash zones; intertidal ocean beach; wrack lines; wash over passes; mud-, sand-, and algal flats; and shorelines of streams, ephemeral ponds, lagoons, and salt marshes by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening. Small sand dunes, debris, and sparse vegetation within adjacent beaches provide shelter from wind and extreme temperatures.

Critical habitat has been designated for wintering piping plovers in south Florida. However, no designated critical habitat occurs within TTINWR or surrounding lands.

Piping plovers are known to migrate through and winter in the vicinity of the refuge and have been observed loafing or feeding at Santana Bay, Shell Key Flats, Hog Key, and Round Key during low tide. Santana Bay and Shell Key Flats are in the backwaters where sea turtles do not nest. Thus, these areas would not be affected by predator control. Trappers will keep away from shorebird concentration areas, including Hog and round Keys, during low tide when traveling to and from trapping sites to avoid disturbance to plovers and other shorebirds (Figure 2).

The Red knot (*Calidris canutus rufus*) is a sturdy, medium-sized shorebird with a short, straight bill and olive-yellow legs. In breeding plumage, red knots are bright rufous below and mottled gray and black above. The adult in non-breeding plumage is gray overall. The juvenile has white-tipped feathers on its wings, giving the wings a scalloped look.

Red knots breed in the far north, mostly above the Arctic Circle in both North America and Eurasia. Breeding grounds are often inland from the coast, and usually near a pond or stream. Red Knots migrate through and winter along shorelines around the world. Large sandy estuaries and tidal flats are most preferred.

Red knots form enormous flocks during migration and in winter. They are often found in flocks with Black-bellied Plovers and Short-billed Dowitchers. In the tundra, they feed by sight, picking food from the surface. On their breeding grounds, Red Knots eat insects (especially flies) as well as plant matter, especially early in the season before many insects are out. On tidal flats, they probe for food with their bills--probing a few times and then running to a new spot. Small invertebrates including mollusks, crustaceans, and marine worms are part of the diet during migration and winter. Eastern populations eat numerous horseshoe crabs during migration.

Red knots are candidates for listing under the ESA. They winter from August to April in southwest Florida. Knots have been observed loafing and feeding in fairly low numbers on Hog Key, North Coon Key, Santana Bay, and Shell Key Flats during low tide. North Coon Key, Santana Bay and Shell Key Flats are not near the turtle nesting islands and therefore, would not be affected in any way by predator control. Trappers will keep away from shorebird concentration areas, including Hog Key, during low tide when traveling to and from trapping sites to avoid disturbance to red knots and other shorebirds (Figure 2).

D. Predators

The raccoon (*Procyon lotor*) is a medium-sized mammal native to North America. Their original habitats were deciduous and mixed forests. Due to their adaptability, they have extended their range to mountainous areas, coastal marshes, and urban areas, and are present on most of the islands of TTINWR. Raccoons are omnivorous, usually nocturnal, and their diet consists of about 40 percent invertebrates, 33 percent plant foods and 27 percent vertebrates. Raccoons are known to prey on the eggs of numerous species (Garmestani 1997). The impacts of raccoons on sea turtles eggs and hatchlings are well known, particularly in areas where continuous studies have been conducted. The TTI are

inhabited by the Ten Thousand Islands raccoon (*Procyon lotor marinus*), which are commonly found throughout southern Florida. The Ten Thousand Islands raccoon has proven to be the single greatest threat to sea turtle hatch success in the mangrove forests of Southwest Florida (Garmestani 1997). Additional mammalian predators on Florida beaches include bobcats, feral hogs, foxes, coyotes, opossums and armadillos. Only bobcats are known to occur on the TTINWR and adjacent lands and they have not been documented to prey on sea turtle eggs or hatchlings locally. Traps of an appropriate size to capture raccoons will be used. Bobcats are larger than raccoons and would be less likely to enter the smaller traps. Any non-target species captured would be released unharmed. Thus, other mammalian predators will likely be unaffected by any predator control method employed.

Ghost crabs, also called *sand crabs*, are common shore crabs of the genus *Ocypode*. In the south eastern United States, ghost crabs are frequently seen scurrying along beaches between sunset and dawn. They tunnel down several feet into the ground at a 45° angle, creating 1 to 2 inch wide holes, which speckle the beach. There is evidence that ghost crabs are effective scavengers of organic matter and it's believed that this may include eggs and nestlings of the loggerhead sea turtle (Dodd 1988). The actual impact of predation on sea turtles by ghost crabs has not been adequately assessed and there is recent evidence that this level of predation is insignificant (Thompson 1995; Von Harten et al. 2002). Ghost crabs occur within the refuge and adjacent lands. However, they have not been documented to prey on sea turtle nests.

The imported red fire ant was introduced from South America in the 1930s. They attack *en masse*, often inflicting death on smaller animals by overloading their immune systems. Red fire ants are extremely resilient and have adapted to contend with both flooding and drought conditions. The occurrence of red fire ants in green sea turtle and loggerhead sea turtle nests have been documented, however few researchers have documented observations of hatchling mortality due to fire ants.

SECTION 3.2 SOCIO-ECONOMIC

Collier County is very urbanized along the western coastal edge but becomes increasingly rural nearer the Refuge in east Collier. The economy is based on tourism, agriculture, and light industry. Agriculture is dominated by vegetable and citrus farming and cattle production. Clean air, a subtropical climate, extensive natural resource amenities and diverse recreational opportunities make the south Florida area extremely attractive to tourists, retirees, and year-round residents. A 2002 survey found that 66 percent of visitors from other mainland states were likely to participate in a nature-based activity during their vacation (Visit Florida.org 2005). Saltwater-based recreation has been a traditional form of outdoor recreation for many people in Collier County, with fishing, boating, island camping, and wildlife observation being popular within the TTINWR. Over 100,000 visitors utilize TTINWR each year. The barrier islands are heavily utilized during the cooler months by boaters, paddlers and campers. During the summer, hordes of mosquitoes keep human use of the islands at a minimum.

SECTION 4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the foreseeable environmental consequences of implementing the four management alternatives in section 2. When detailed information is available, a scientific and analytic comparison between alternatives and their anticipated consequences are presented, which are described as “impacts” or “effects.” When detailed information is not available, those comparisons are based on the professional judgment and experience of Refuge staff.

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income community’s access to public information and participation in matters relating to human health or the environment. This assessment has not identified any adverse or beneficial effects for any alternative unique to minority or low-income populations in the South Florida area. None of the alternatives will disproportionately place any adverse environmental, economic, social, nor health impacts on minority or low-income populations.

SECTION 4.1 ALTERNATIVE A- NO ACTION

The no action alternative would lead to the continued depredation of sea turtle nests at the TTINWR resulting in long-term negative impacts to the nesting population of sea turtles that utilize the refuge and adjacent lands. The refuge could be held liable for failing to act in accordance with USFWS policies and the Endangered Species Act.

SECTION 4.2 ALTERNATIVE B- NEST MONITORING

The monitoring alternative would also lead to the continued depredation of sea turtle nests at the TTINWR resulting in long-term negative impacts to the nesting population of sea turtles that utilize the refuge and adjacent lands. The refuge could be held liable for failing to act in accordance with USFWS policies and the Endangered Species Act.

SECTION 4.3 ALTERNATIVE C- PREDATOR EXCLUDER DEVICES

Excluder devices are only efficient at controlling predation when they are placed before the predator can destroy a nest. The raccoon pressure is so great in TTINWR and adjacent lands that predation occurs the evening of, or subsequent morning after, the nest is laid. The only way that exclusion devices would be effective is if they were placed immediately after the eggs were laid. This would require nightly monitoring on all of the islands every night during the summer months; which is not feasible due to extremely harsh environmental conditions and jeopardizes safety of refuge staff on the remote islands. In 2009, when ALTERNATIVE C was in place, 61 Loggerhead Turtle nests and 5 Green Turtle nests were laid on the TTINWR and adjacent lands and 39 of these were negatively affected by raccoons. Even though predator excluder devices were being used, 59% of the nests were negatively affected. Predation within the Ten Thousand Islands often occurs the night that the nest is laid before surveyors get there in the morning to place the exclusion devices. Though predator exclusion has worked on other beaches in Florida, it is not an effective way to deal with raccoon depredation within the Ten Thousand Islands. The objective of reducing raccoon depredation to 10 percent or less of all sea turtle nests cannot be met with this method alone.

SECTION 4.4 ALTERNATIVE D- PROPOSED ACTION

This alternative includes implementation of the predator control plan which involves trapping and humanely eradicating sea turtle nest predators. This action promotes the maximum protection of sea turtle nests from predation. Lethal methods of wildlife control are often very effective when used properly. Problem animals can be targeted and their numbers reduced without negatively affecting the overall faunal community. Most control of problem animals would occur in the spring months prior to the turtle nesting season so as to maximize control of raccoons before the start of sea turtle nesting season. With this alternative, risk to non-target species is minimal. The traps are checked each morning to reduce the exposure of the animals to inclement weather conditions. Trapped raccoons are shot at very close range (approx. 20cm) utilizing a .22 caliber round discharged into the cranium. The carcass is then buried behind the beach vegetation, away from turtle nesting areas and visitor use areas. Burial would not be done in areas with identified archeological sites.

Human safety hazards associated with the use of live traps are minimal. Risk of human injury by live traps is generally limited to FWS, cooperators or designated contract employees. Additionally, traps are placed away from the public use areas in order to minimize perceived risks to the general public. Risk to domestic animals would be negligible because pets must be leashed and controlled at all times while on the refuge.

Direct, Indirect and Cumulative Impacts:

Implementation of this alternative would aid in achieving the primary objective of decreasing sea turtle nest depredation to less than or equal to 10% as identified in the loggerhead turtle recovery plan(USFWS 2008); minimizing nest predation and assuring

efficiency and safety to the staff and the public. By concentrating trapping on beach sections with high raccoon predation rates, the capture of non-target raccoons and other animals will be minimized. The determination of high raccoon predation will be based on data collected on depredated nests by island. Islands that experience the highest rates of depredation would then be targeted. Trapping efforts will be suspended once target raccoons are removed and depredation rates are reduced to acceptable levels (i.e., 10 % or less of nests/year). Trapping will resume when predation rates exceed 10%.

This alternative will have no effect on the raccoon population. The raccoons on the six islands where predator control will take place are part of a much larger metapopulation. Individuals removed from the islands are only a small fraction of the metapopulation. Loss of these individuals will not affect the population as a whole.

Concerns have been raised before that by reducing the population of a predator, secondary effects may result. For example, because raccoons feed on ghost crabs, reducing the population of raccoons may result in higher numbers of ghost crabs and thereby, predation of sea turtle nests might increase from ghost crabs (Ratnaswamy, 1995). However, this potential has not been substantiated. Because shorebirds are also predators of ghost crabs and are present on the islands, the reduction of raccoon numbers in an area will not guarantee an increase in crab numbers.

The goal on TTINWR is to reduce the predation of sea turtle nests in problem areas, not to eliminate the population of raccoons. By selectively trapping in problem areas, impacts should be minimized and localized.

Because bobcats prey on raccoons, trapping may have some effect on the local bobcat populations. However, bobcats have large territories and a varied diet. Since raccoon trapping would be localized, the reduction of raccoons as prey for bobcats would not likely have an adverse impact on the bobcat population.

No significant or cumulative adverse environmental consequences resulting from the proposed action are anticipated. Beneficial impacts expected include increased annual nesting success of the loggerhead and green sea turtles at TTINWR and adjacent lands. No threatened or endangered species or critical habitat would be adversely impacted by the proposed action (see Section 9.0 Appendix: Intra-service Section 7 biological evaluation).

Social and Economic Impacts:

Because the refuge is used by the visiting public, the Service must be considerate of these users when implementing management actions. Refuge visitors frequent the barrier islands for recreational fishing, wildlife observation, beachcombing, and photography. Refuge visitation is approximately 120,000 per year with greater than 60 percent of this visitation occurring in the fall and winter months when mosquitoes and other nuisance insects are less abundant. Fortunately, in the summer months when the sea turtles are nesting and raccoon trapping would occur, the beaches in the refuge are rarely used by the public. This would minimize the possible effects of trapping on the public.

Trapping could have a negative social impact on the visitors to TTINWR if observed. The sight of the traps, especially if they are holding animals, could potentially have an emotional impact on the public. On the other hand, people may have the opportunity to witness nestlings emerging from successfully protected nests. Again, it must be stated that the public is generally not using the beaches within the refuge during the period when trapping will take place. Also, the traps will be placed away from the beaches and well camouflaged so as to minimize public exposure. If members of the public have a negative reaction to the traps, they may no longer choose to utilize the refuge; which would likely have a negative impact on the local economy, proportional to the number of individuals who choose not to return to the area.

A cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonable foreseeable future actions (40 CFR § 1508.7).

The refuge is ideal nesting habitat because there is limited human encroachment on the islands. The predation of the sea turtle nests is one of the only limiting factors to hatchling success in TTINWR. Predator control on TTINWR has the potential to impact overall loggerhead populations by increasing the number of successful sea turtle nests in South Florida.

Raccoon removal will dramatically improve the success of sea turtle nesting efforts in TTINWR.

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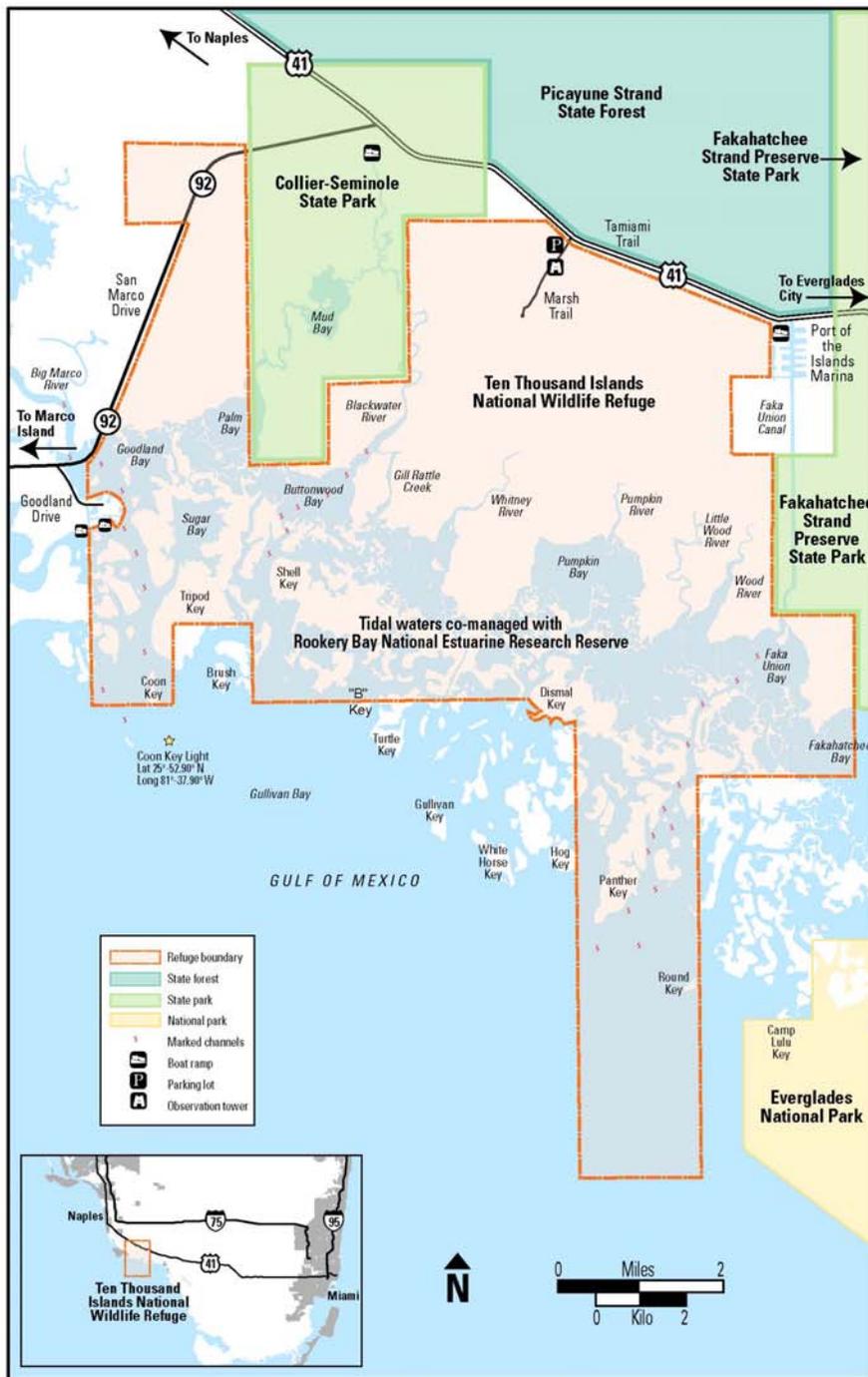


Figure 1. Ten Thousand Islands National Wildlife Refuge and surrounding area.

