DRAFT ENVIRONMENTAL ASSESSMENT

Florida Keys National Wildlife Refuges Complex
Integrated Predator Management Plan

January 2011

U.S. Fish and Wildlife Service
28950 Watson Blvd.
Big Pine Key, FL 33043

Note to Reviewers:

This Draft Integrated Predator Management Plan/Environmental Assessment has been provided to you for your review and comments for a 30-day period beginning on January 3, 2011. All reviewers are encouraged to provide written comments regarding the following (but not limited to):

- any oversights, omissions, or inconsistencies;
- additional data, literature, or other relevant information;
- support and/or opposition for all or portions of any of the alternative management strategies;
- need for clarification or further explanation; and
- strengths and limitations of the overall proposal.

Submit your comments in writing either through e-mail to keydeer@fws.gov, fax to 305-872-3675, or send through regular mail to:

Anne Morkill
Florida Keys National Wildlife Refuges
28950 Watson Blvd.
Big Pine Key, FL 33043

All comments must be postmarked no later than **February 3, 2011**. The FWS will consider all comments received and revise the text accordingly within the context of laws and policies for managing National Wildlife Refuges, compliance with the Endangered Species Act, workload priorities, fiscal constraints, best available scientific data, professional expertise, and uncertainties in management outcomes of different strategies in order to determine the most effective and efficient management approach. An official version of the Final Integrated Predator Management Plan will be available upon request.

Thank you for your interest and support of our fish and wildlife conservation efforts in the Florida Keys National Wildlife Refuges.

Anne Morkill
Wildlife Refuge Manager

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Introduction

The U.S. Fish and Wildlife Service's (USFWS) Florida Keys National Wildlife Refuges Complex includes four units of the National Wildlife Refuge System – National Key Deer Refuge, and the Key West, Great White Heron, and Crocodile Lake National Wildlife Refuges (Figure 1). These refuges provide a diversity of habitats for more than 30 threatened and endangered species, some of which are found nowhere else, including the Key deer (*Odocoileus virginianus clavium*), Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*), and Key Largo woodrat (*Neotoma floridana smalli*).

Predation by the domestic cat (*Felis catus*) and other exotic species that have invaded the Florida Keys has impacted populations of several native species and threatens their long-term viability. Native raccoons (*Procyon lotor*) have also been known to prey on endangered species when raccoon abundance is inflated by human-subsidized food sources; thus it is incumbent upon the FKNWRC to ensure that similar impacts are prevented from occurring. This draft environmental assessment (EA) evaluates the environmental impacts of alternative management actions for reducing predation on imperiled species of the Florida Keys National Wildlife Refuges Complex.

1.0 Purpose and Need for Action

1.1 Purpose

The purpose of this draft Integrated Pest Predator Management Plan/Environmental Assessment (Plan/EA) is to conserve and restore federally-listed species and protect all native fauna and flora on the Florida Keys National Wildlife Refuges Complex (FKNWRC) from population decline and potential extirpation or extinction due to predation by non-native species and human-subsidized populations of native predators.

The U.S. Fish and Wildlife Service's (USFWS) prepared an EA to describe the environmental consequences of managing predators given various alternatives to ensure compliance with the National Environmental Policy Act of 1969 (NEPA), the Endangered Species Act (ESA), and other federal laws and regulations (see also Section 1.4, Legal Authorities and Policy Directives). NEPA (42 USC § 4321-4347) and its implementing regulations (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.

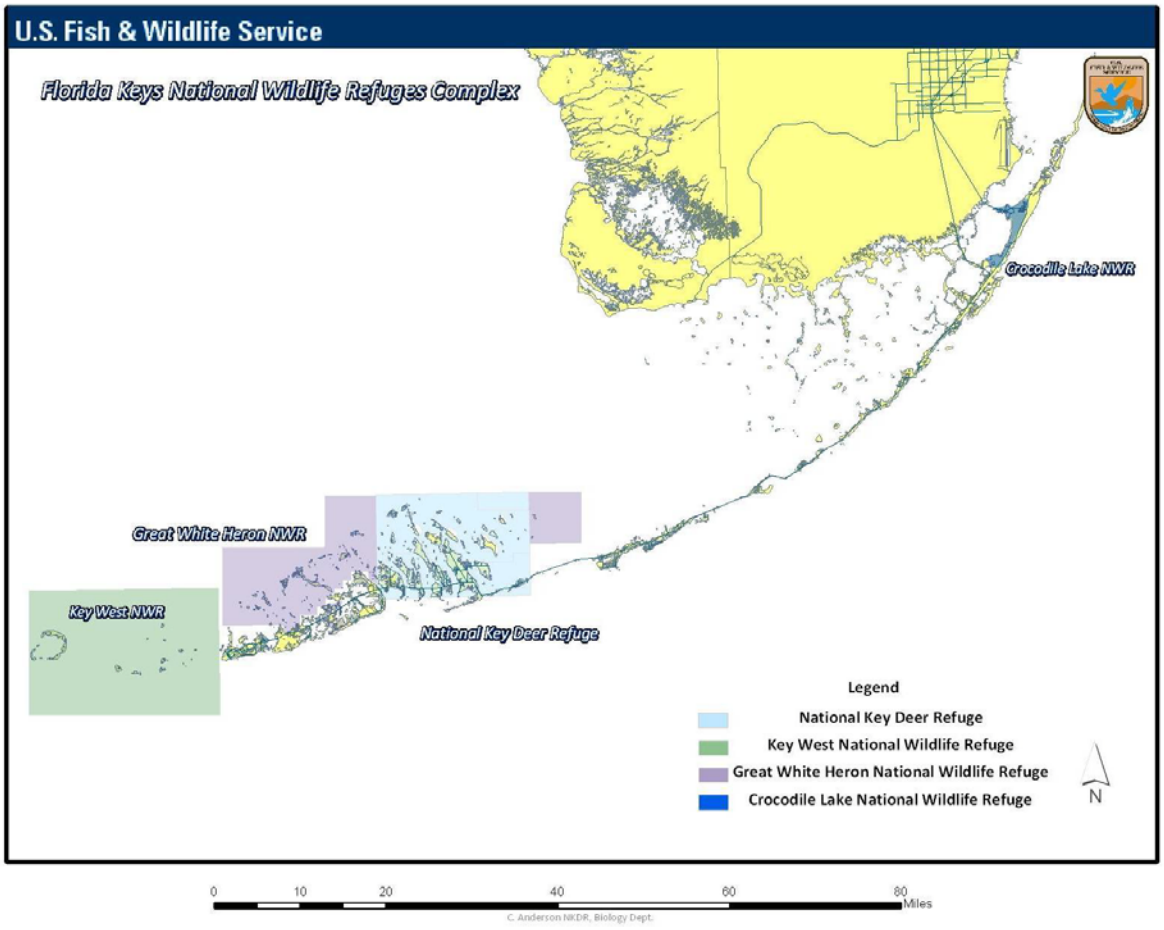


Figure 1. General location of the Florida Keys National Wildlife Refuges

1.2 Need for Action

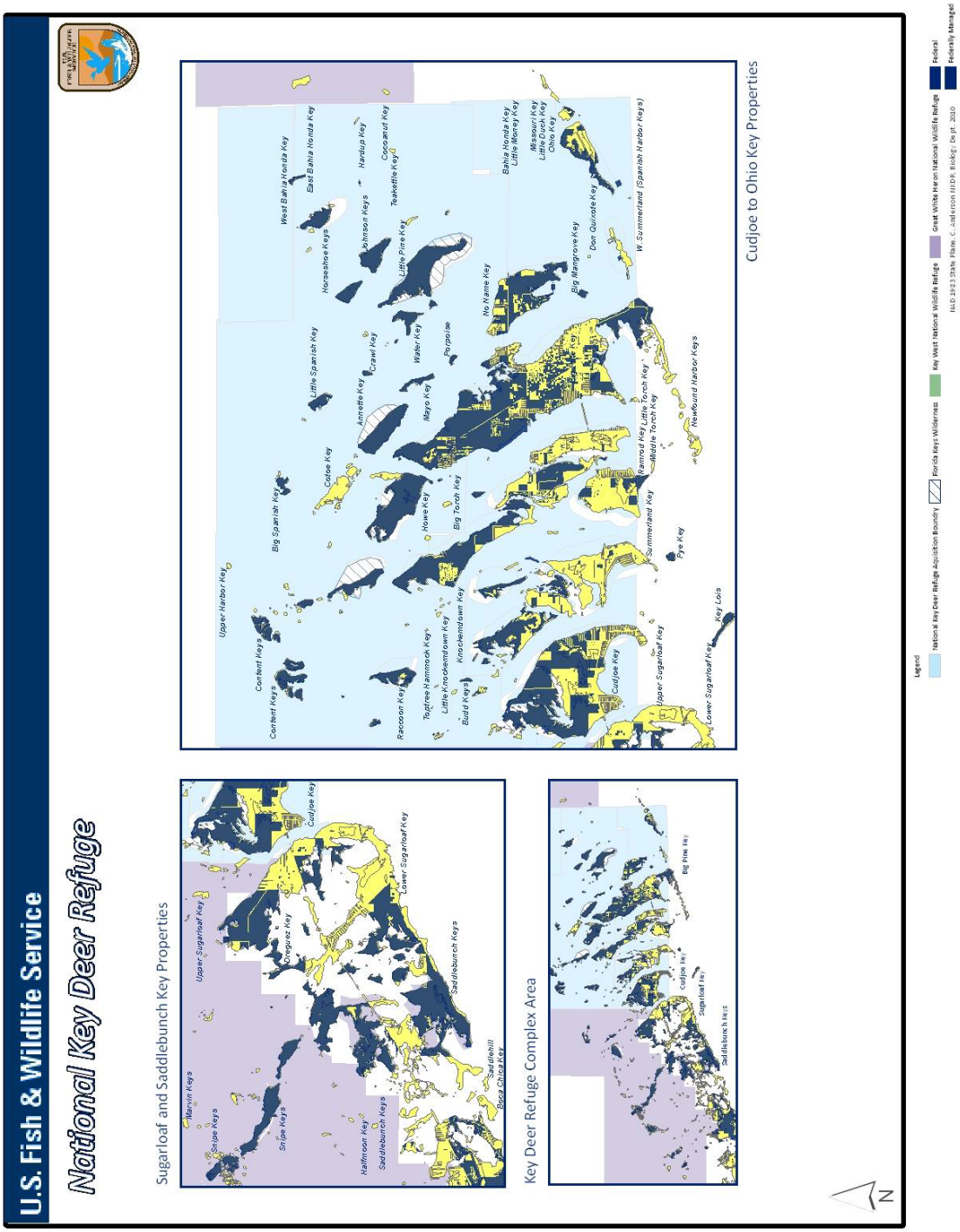
This Plan/EA supports an adaptive decision-making process for implementing an integrated predator management program on the FKNWRC, consistent with the goals and objectives published in the Final Comprehensive Conservation Plans (CCP) for Crocodile Lake National Wildlife Refuge (USFWS 2006) and Lower Florida Keys National Wildlife Refuges (USFWS 2009a). Exotic non-native and human-subsidized native predators pose a grave threat to native species (Wilcove et al. 1998, Crooks & Soul'e 1999). The urgent need for reducing predation on federally listed species in the Florida Keys has been well documented and addressed in several species recovery plans (USFWS 1999) (Appendix 1) and reiterated in their subsequent Five Year Reviews (http://ecos.fws.gov/ecos/indexPublic.do). The most intensive studies have been done on the Lower Keys marsh rabbit; records show that populations have consistently indicated a long-term decline (Lazell 1989, USFWS 1999, Forys and Humphrey 1999, Faulhaber 2003, Faulhaber et al. 2007, USFWS 2007). Free-roaming domestic cat predation

accounted for 50% of adult Lower Keys marsh rabbit mortality during radio telemetry studies and was cited as the largest factor limiting their population viability in the 1990s (Forys and Humphrey 1999). In addition, cats accounted for 77% of the mortality during a recent re-introduction of the Key Largo woodrat (S. Klett, Refuge Manager, personal communication). Due to the extensive literature and well known biology of invasive predators, it is likely that similar primary and secondary sources of mortality are impacting many of the FKNWRC native species, both plant and animal.

The USFWS has conducted periodic predator control on Refuge lands in the Florida Keys over the past decade. Those activities were primarily implemented through contracts with the U.S. Department of Agriculture's Division of Wildlife Services, pursuant to an EA and Finding of No Significant Impact on the Management of Predation Losses to Federally Listed Species in the State of Florida (2004). Due to the needs for both sustaining a long-term program of predator management and responding to local public concerns regarding past predator management activities, the USFWS decided to develop an integrated predator management plan that addresses site-specific conditions and constraints unique to the FKNWRC and Monroe County, Florida. In the National Key Deer Refuge in particular, a comprehensive and coordinated effort will be needed among the USFWS, state, county, and private property owners due to the intermix of public and private lands (Figure 2).

Four public scoping meetings were held in Big Pine Key, Florida on April 3, April 24, May 8, and November 25, 2008, with participants representing the state, county, animal advocate groups, environmental organizations, and local citizens. Meetings were professionally facilitated by the Florida Conflict Resolution Consortium Consensus Center (headquartered at Florida State University, Tallahassee), which serves as an independent public resource for facilitating consensus solutions and supporting collaborative action throughout Florida. Meeting documents (agendas, notes, related reports) are posted online at http://concensus.fsu.edu/LKMR/. The final outcome was a commitment to a common goal of "no homeless cats" through a collaborative public and private effort including education, enforcement, and trapping, neutering and relocating free-roaming cats as well as applying proper waste management practices to control native raccoon populations (Taylor 2008). Several stakeholder groups subsequently formed an innovative partnership called "One Animal Family." This educational effort promotes the humane treatment of all animals, both wild and domestic, while seeking to reduce human-induced pressures on our endangered species (www.oneanimalfamily.org). The proposed action analyzed in this EA is based on those tasks in the final stakeholder report for which the USFWS is responsible for implementing on Refuge lands.

Figure 2. Land status in the National Key Deer Refuge



1.3 Predator Species Accounts and Justification for Action

1.3.1 Non-Native Vertebrate Species

A. Domestic Cats

Domestic cats that roam freely outdoors, both owned pets as well as unsocialized feral cats, disrupt the abundance, diversity, and integrity of native ecosystems (Soul´e et al. 1988, Hawkins 1998, Crooks & Soul´e 1999, Jessup 2004, Nogales et al. 2004). In addition to large numbers of small rodents, amphibians, and reptiles, free-roaming cats kill at least one billion birds every year in the U.S., representing one of the largest single sources of human-influenced mortality for small native wildlife (Stallcup 1991, Gill 1995, Sax and Gaines 2008). Free-roaming cats have been shown to be a major cause of 33 native species extinction globally, mostly on islands (Iverson 1978, Moors 1985, Kirkpatrick and Rauzon 1986, Cruz and Cruz 1987, Churcher and Lawton 1987, Towns et al. 1990, Mellink 1992, Coleman and Temple 1993, Donlan et al. 2000, Veitch 2001, Tershy et al. 2002, Calver et al. 2007). Many of the species impacted by free-roaming cats are federally listed threatened or endangered species and federally protected migratory birds (Kirkpatrick and Rauzon 1986; Konecny 1987, Fitzgerald 1988, Nogales et al. 1998, Jurek 1994, Fitzgerald and Turner 2000, Lepczyk et al. 2003, Nogales et al. 2004). Feral and free-ranging cats have a substantial impact on Florida's wildlife (Miller and Wallace 2006, FFWCC 2003). According to the Centers for Disease Control (CDC), free-roaming cats not only threaten wildlife through direct predation but also serve as vectors for a number of diseases including rabies, cat scratch fever, hookworms, roundworms and toxoplasmosis (www.cdc.gov/healthypets/animals/cats.htm). Some of these diseases can be transmitted to other domestic animals, native wildlife, and in some cases, humans.

In the FKNWRC, free-roaming cats prey upon the Lower Keys marsh rabbit, Key Largo Woodrat, Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*), and likely, the silver rice rat (*Oryzomys palustris natator)* (Brown 1978, Goodyear 1992, Forys 1995, Forys et al. 1996, USFWS 1999, Perry 2006). Recent motion-triggered camera trap images confirm that free-roaming cats are present in the two largest habitat patches occupied by Lower Keys marsh rabbits (USFWS unpublished data 2010).

B. Opossum, Armadillo, and Rats

For the purposes of this Plan/EA, the nine-banded armadillo (*Dasypus novemcinctus*), black rat (*Rattus rattus*), Gambian pouch rat (*Cricetomys gambianus)*, and Virginia opossum (*Didephis virgininanus*) are grouped in the same management category because they are non-native invasive predator

species; therefore population monitoring and control methodologies will be similar. The armadillo and rat species are non-native species that did not historically occur in Florida, and were most likely introduced by humans either intentionally or by accident. Black rats have been widely distributed throughout Florida since the 1800s, likely introduced through cargo and shipwrecks. Several captive Gambian pouch rats released on Grassy Key by a breeder in 2000-2002 quickly multiplied and spread, and although most have since been eradicated by state agents, there have been at least two apparently credible sightings on Key Largo and Marathon. Armadillos are a recent invader of the Florida Keys, with at least two road-killed animals on Big Pine Key documented in 2010. While opossums are native to peninsular Florida, they do not occur naturally in the Florida Keys and are considered invasive in the lower Florida Keys. Opossums reportedly became established on Big Pine Key in the 1980s, previously only rare sightings were reported which were most likely from earlier accidental human transportation (Deisler 1987, Lazell 1989). Due to a higher frequency of road mortalities, it seems apparent that they have become more abundant in recent years (Phillip Hughes, Refuge Ecologist, pers. comm.). Opossums along with rats are some of the most common species recorded on camera trap images (USFWS unpublished data 2010).

Opossums and rat species have the potential to be, or in some cases have been shown to be, predators of native species (Kincaid and Cameron 1982, Wolfe 1982, Jennings et al. 2006), including species of concern in the Florida Keys such as the federally listed endangered Stock Island tree snail (*Orthalacus reses reses),* and other state listed tree snails (*Drymaeus multilineatus* and *Liguus* spp.) (Deisler 1987, Tuskes 1981, Forys et al. 1996, Mitchell 1996, USFWS 1999, Perry 2006). Published research indicates that the diet of armadillos generally consists of insects (including butterflies), gastropods, arthropods, and small vertebrates (i.e., salamanders, lizards, etc.); however, there have been numerous accounts of armadillos feeding on ground nesting bird eggs (Davis and Schmidly 1994, Sikes et. al 1990). Non-native rats are prevalent in residential and commercial areas, and may impact native wildlife particularly in the wildland-urban interface. Additionally, this assemblage of non-native predators is likely a threat to native wildlife of the FKNWRC through direct competition and other non-lethal affects.

C. Reptiles - Iguanas, Lizards, and Large Bodied Snakes

The impact of exotics reptiles on island ecosystems worldwide is well known. Exotic reptiles have been shown to prey on and compete with native wildlife, alter and degrade habitat, and offer the potential to introduce foreign disease into native wildlife populations (Platenburg 2007, Harvey et al. 2008). Exotic large-bodied snakes such as the Burmese python *(Python molurus bivittatus)* and common boa (*Boa constrictor*) have established breeding populations in south Florida (Meshaka 2000, Snow 2007b, Harvey et al. 2008). As both predators and

competitors, these snakes pose a major threat to endangered wildlife in the FKNWRC. Their rapid and widespread invasion has been facilitated by aspects of their natural history such as diverse habitat use, broad dietary preferences, long lifespan, high reproductive output, and ability to move long distances; consequently, all of these advantages may allow pythons to compete with native snakes such as the federally listed endangered Eastern indigo snake (*Drymarchon couperi)* for food, habitat, and space (Reed 2005). Several pythons have been found on Key Largo where they have eaten the Key Largo woodrat (Green et al. 2007). A large boa captured on No Name Key was found to have eaten one or more unidentified mammal, which could have potentially included domestic pets and native wildlife such as the Key deer (USFWS unpublished data 2008). Dietary analysis of pythons and boas in the Florida Everglades shows that they have consumed more than ten native mammal species, including marsh rabbit, white-tailed deer, and rice rat (Snow et al. 2007a), all of which have associated subspecies in the FKNWRC.

There are three large, non-native lizard species of concern found in the Florida Keys, the green iguana (*Iguana iguana)*, Nile monitor (*Varanus niloticus)*, and the black spiny-tailed iguana *(Ctenosaura similis*). The green iguana was the first exotic lizard reported in southern Florida by King and Krakauer (1966). The range of these relatively large lizard species has been increasing over the last 35 years (Townsend et al. 2003). The green iguana is primarily a vegetarian, but the species has been documented preying upon tree snails which are species of special concern in Florida (Townsend et al. 2005). Consequently, green iguanas are also considered a threat to the federally endangered Stock Island tree snail which has established populations in the FKNWRC on north Key Largo and No Name Key. The iguana's voracious appetite for certain native plant species may also result in indirect impacts on native flora and fauna. At Bahia Honda State Park, green iguanas severely impacted grey nickerbean (*Caesalpinia bonduc*) plants which is a host plant of the Miami blue butterfly (*Cyclargus thomasi bethunebakeri*), a state endangered species and a candidate for federal listing (Emmel and Daniels 2009, USFWS 2009b). Larvae of this highly imperiled insect are also likely consumed opportunistically with the tender new shoots on which iguanas feed. Iguana tracks have recently been documented on the remote islands of the Key West NWR, which supports the only other population of Miami blue butterfly (Cannon et al. 2007); consequently, herbivory by iguanas is an emerging important threat to imperiled snail and butterfly species that may warrant immediate attention.

The Nile Monitor and black spinytail iguana are both aggressive non-native reptilian predators that have established breeding populations in the Florida Keys. Both species will prey on small animals, including insects, crabs, rodents, fishes, nestling birds, bird eggs, and hatchling sea turtles (Montanucci 1968, Alverez del Toro 1982, Fitch and Hackforth-Jones 1983, Lee 2000, Krysko et al.

2003, Krysko et al. 2009). Because of the possible ecological impacts of the Nile monitor and spinytail iguana on the native flora and fauna of the Florida Keys, population monitoring and eradication efforts are warranted (Krysko et al. 2003, Enge et al. 2004). The giant black and white tegu (*Tupinambus merianae*) has recently become established in extreme south Florida and has been documented crossing underpasses under the 18-mile stretch of US-1 leading into Key Largo (Ronald Rozar, U.S. Geological Survey Biologist, pers. comm). Due to its carnivorous diet, tegus could also threaten the Key Largo woodrat and Key Largo cottonmouse populations found on Crocodile Lake NWR.

1.3.2 Non-Native Invertebrate Species

A. Ants

Imported red fire ants (*Solenopsis invicta*) have invaded natural areas of the Florida Keys and have been shown to have dramatic consequences when introduced into natural communities (Allen et al. 2004). Fire ants are a possible nest predator for the endangered Lower Keys marsh rabbit, Key Largo woodrat, and Key Largo cottonmouse (USFWS 1999). Fire ants have been shown to prey on the Stock Island tree snail, and reportedly caused its extirpation within the original range. They are also a threat to the endangered Schaus swallowtail butterfly (*Heraclides aristodemus ponceanus)* and may impact a wide variety of invertebrate fauna including many rare butterflies (Tuskes 1981, Forys et al. 2001a, Forys et al. 2001b, Forys et al. 2002). Other non-native ant species, such as the Mexican twig ant (*Pseudomyrmex gracilis)*, have also been the subject of much debate regarding the decline of rare butterfly species (Mark Minno, Lepidologist, pers. comm.).

1.3.3 Native Vertebrates Species

A. Raccoon

Raccoons are found statewide in Florida in ever-increasing numbers. Two subspecies in the Florida Keys are recognized by the USFWS, the Key Vaca raccoon (*Procyon lotor auspicatus*) and Key West raccoon (*P. l. incautus*). Raccoons are omnivorous, feeding on fruits, plant material, turtle and bird eggs, crustaceans, small animals, garbage, and possibly listed tree snails (Carrillo et al. 2001, Gehrt 2003, Lotze and Anderson 1979). Raccoons have been known to kill adult Lower Keys marsh rabbits when the rabbits' movements were restricted, and neonatal and juvenile rabbits are considered highly susceptible to raccoon predation (Forys 1995). In addition, there has been some indication that high densities of raccoons may be one of many limiting factors for marsh rabbit populations (Schmidt et. al 2010). Raccoons are efficient and opportunistic

predators that have relatively few enemies, are extremely adaptable, and have relatively high populations throughout much of their range. Raccoon populations are often inflated due to human-subsidized sources of food, water, and shelter. Consequently, local raccoon populations can, in some cases, increase to the extent that they have a significant impact on other native wildlife such as nesting sea turtles and shorebirds; and consequently, warrant active control measures (Prange et al. 2003, Prange et al. 2004, Engeman et al 2005, Rosatte et al. 2006, Barton and Roth 2006). Given that raccoons are indigenous to the Florida Keys and the removal of raccoons from the local ecosystem has the potential to yield unintended ecological consequences (Ratnaswamy and Warren 1998, Meshaka et al. 2008), more research and evaluation is warranted to determine the most appropriate and effective strategies for managing native raccoon populations on the FKNWRC.

1.3 Legal Authorities and Policy Directives

U.S. Fish and Wildlife Service: The Service is the primary federal agency charged with protecting the nation's native fish and wildlife resources, including migratory birds and candidate, threatened and endangered species, for the enjoyment of current and future generations of Americans. The Service has the responsibility for conserving, protecting and enhancing fish, wildlife, plants and their habitats. The Service administers the National Wildlife Refuge System, and has the lead responsibility in implementing the Endangered Species Act and Migratory Bird Treaty Act.

Endangered Species Act (ESA): The ESA (87 Stat. 884, as amended; 16 U.S.C. § 1531 et seq.) affords federal legal protections to species of plants and animals classified as endangered or threatened. It is federal policy, under Section 7 of the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act to ensure that "any action authorized, funded or carried out by such an agency. . . is not likely to jeopardize the continued existence of any endangered or threatened species. . . Each agency shall use the best scientific and commercial data available" [Sec. 7(a)(2)]. Section 9 makes it illegal for any "person" to "take" any species listed as endangered or threatened, and defines "take" as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm may include significant habitat modification where it actually kills or injures a listed species through impairment of essential behavior (e.g., nesting or reproduction). Section 10 requires private landowners, corporations, state or local governments, or other non-Federal landowners who wish to conduct activities on their land that might "take" threatened and endangered wildlife to first obtain an Incidental Take Permit (ITP; see discussion below for Monroe County). Activities that are considered take under ESA include altering an animal's behavior such as occurs when people intentionally feed or touch Key deer, and if they place food and water out for free-roaming cats that may unintentionally attract

Key deer. The Service traditionally implements outreach and education efforts to inform the public and companies about activities they are practicing that may unintentionally result in the take of species protected by the ESA. Enforcement actions can ultimately be pursued when such acts knowingly or intentionally continue.

Migratory Bird Treaty Act (MBTA): The MBTA (40 Stat.755; 16 U.S.C. § 703-712) implements the U.S. commitment to four separate international conventions with Russia, Japan, Great Britain (for Canada), and Mexico that recognize migratory birds as international resources warranting coordinated federal trust protections across nations. The MBTA affords protection to over 1,000 species of native birds occurring in the U.S. and its territories (50 Code of Federal Regulations (C.F.R.) § 10.13). Prohibited activities include unauthorized taking, killing, possession, transportation or importation of these species, or their parts, nests or eggs. Under the MBTA, "take" is defined as pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt these activities, by any means or any manner (16 U.S.C. § 703; 50 C.F.R. § 10.12). The Service traditionally implements outreach and education efforts to inform the public and companies about activities they are practicing that may unintentionally result in the take of migratory birds. Enforcement actions can ultimately be pursued when such acts knowingly or intentionally continue.

National Wildlife Refuge System: The mission of the National Wildlife Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997 (NWRSIA), is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. The policy of the Service is to engage in animal control management on National Wildlife Refuges to prevent substantial damage to refuge resources and to ensure balanced wildlife and fish populations consistent with the optimum management of refuge habitat. Refuge policy promotes an integrated approach using an appropriate combination of various animal control techniques, including but not limited to: biological control, habitat management, live trapping and transfer, public harvest (prohibited in Monroe County), non-lethal repellants, physical barriers (e.g. exclusion fencing), and lethal reduction (16 U.S.C. 668dd-668ee, National Wildlife Refuge System Administration Act of 1966, as amended; 601 FW 3, Biological Integrity, Diversity and Environmental Health; 50 C.F.R. 27.52 Introduction of Plants and Animals; 50 C.F.R. 28.42 Impounding of Domestic Animals; 50 C.F.R. 28.43 Destruction of Dogs and Cats; 50 C.F.R. 30.11-12, Feral Animal Management; 50 C.F.R. 31.1-2, Surplus Wildlife Management; 50 C.F.R. 31.14, Terms and Conditions of Wildlife Reduction and Disposal; 7 Refuge Manual 14, Pest Control).

Invasive Species Executive Order 13112: This order directs Federal agencies to prevent the introduction of invasive species, to detect and to respond rapidly to control populations of such species in a cost effective and environmentally sound manner, accurately monitor invasive species, provide for restoration of native species and

habitat conditions, conduct research to prevent introductions and to control invasive species, and promote public education on invasive species and the means to address them.

Florida State Law: The State of Florida's statute and administrative code also provide various authorities for protecting native wildlife, prohibiting relocation of wild animals to public lands, controlling the release of non-native species, and prohibiting cruelty to animals and abandonment of domestic animals into the wild (FFWCC 2003). The Service may enforce state laws under the Assimilated Crimes Act (ACA) 18 U.S. Code Sect. 13.

Monroe County: The Monroe County (MOCO) 2010 Comprehensive Plan includes several goals and objectives that address the special environmental protection needs of the Florida Keys, particularly Big Pine and No Name Keys. For example, Objective 207.3 states "Monroe County shall protect native wildlife species, especially state- and federally-designated species, from disturbance and predation by free-roaming domestic pets, particularly cats and dogs." Furthermore, in compliance with Section 10 of the ESA, Monroe County (in partnership with the Florida Department of Transportation and Florida Department of Community Affairs) developed a Habitat Conservation Plan (HCP) for Big Pine and No Name Keys (MOCO 2006). The HCP outlines a conservation strategy to protect the habitat of the Key deer, Lower Keys marsh rabbit, and eastern indigo snake while allowing limited residential, commercial, recreational, and municipal development on Big Pine and No Name Keys. In addition to protecting higher quality habitat, the HCP directs development toward areas that have already been impacted and away from endangered species habitat. The Service subsequently issued an Incidental Take Permit (ITP) associated with this HCP in June 2006. With respect to animal control, the ITP includes measures to ensure that take of covered species is minimized and mitigated, including "implement an animal control education program to educate the public regarding the potential negative effect of domestic predators on the Key deer and Lower Keys marsh rabbit…" and "annually review and evaluate the need and feasibility of additional regulatory measures to control the spread of domestic predators."

2.0 Alternative Management Actions

Three alternative management actions were analyzed for the purposes of evaluating the environmental consequences of managing predators on the FKNWRC: Alternative A – No Action (Status Quo), Alternative B –Integrated Predator Management (Proposed Action), Alternative C – Lethal Control Only. Other possible management actions that were considered but dismissed from further evaluation are also described.

2.1 Alternative A - No Action (Status Quo)

The No Action Alternative is the current situation and maintains status quo. Currently, the USFWS is not implementing a formal predator management program. Free-roaming cats would be allowed to continue occupying Refuge lands unchecked and preying on endangered wildlife and native fauna, and other non-native predators would continue invading and expanding across Refuge lands, thereby jeopardizing threatened and endangered species as well as the biological integrity and natural diversity of the FKNWRC. The USFWS would be a passive supporter of the One Animal Family's "No Pets Left Behind" public outreach campaign to promote the humane treatment of all animals, including native wildlife and domestic pets. The No Action Alternative fails to meet the identified purpose and need for action (Section 1.0).

2.2 Alternative B - Integrated Predator Management (Proposed Action)

Under Alternative B, the Proposed Action is a fully integrated range of nonlethal and lethal predator management strategies that would be available for implementation on the FKNWRC, depending on the status, distribution, and extent of predation by targeted predator species, as described below. This alternative would be implemented using an adaptive management approach as prescribed by the USFWS's Strategic Habitat Conservation program (Appendix 4). Adaptive management is an iterative process of selecting best management strategies, implementing actions, monitoring and evaluating results, determining if objectives have been met, considering other environmental and social factors that may change over time, and refining strategies as necessary. Successfully implementing the proposed action on Refuge lands, particularly in the National Key Deer Refuge which includes a mosaic of public lands intermixed with private residential and commercial areas, will require a collaborative public and private effort on adjacent lands by a diversity of land managers and stakeholders, including Monroe County, Florida Fish and Wildlife Conservation Commission, animal control service providers, animal advocacy groups, wildlife rescuers, environmental organizations, private landowners, and responsible pet owners.

2.2.1 Non-Native Vertebrate Species

A. <u>Domestic Cats</u>

1. The USFWS will remove all free-roaming cats found on Refuge lands through live trapping. Baited walk-in live traps (for example, Have-A-Hart®) will be used. Traps will be set at dusk and closed each morning, reducing exposure of trapped animals to adverse weather (solar heat, humidity) conditions. A variety of baits, visual attractants, and trap design modifications will be used to target cats while trying to avoid attracting non-target species to the greatest extent possible. All non-target native species will be immediately released (see following sections for disposition of other target species).

2. Cats trapped by the USFWS on Refuge lands will be transferred to a Monroe County Animal Control shelter facility as quickly as possible to minimize stress on the animal(s). The Monroe County animal control service provider will have the authority to determine the final disposition of the trapped cats according to county ordinances and standards, which may include returning to owner, adopting out, relocating to a long-term cat care facility on the mainland, or euthanizing.

3. Feral cat colonies and feeding stations on Refuge lands will be identified and removed. The USFWS will also coordinate with county and state agencies to assist in the identification and removal, where feasible and legal, cat colonies and feeding stations on other public properties that are adjacent to or near Refuge lands. Extensive public outreach will be conducted to encourage people who feed free-roaming cats to cease doing so, and to promote trapping and relocating those animals to long-term facilities on the mainland where they will no longer be a threat to Refuge's wildlife. Initial enforcement efforts will be focused on Big Pine and No Name Keys, pursuant to the Big Pine-No Name Key Habitat Conservation Plan and Incidental Take Permit.

4. Promote the One Animal Family's "No Pets Left Behind" campaign (learn more at www.oneanimalfamily.org). This innovative partnership and educational effort promotes the humane treatment of all animals, including native wildlife and domestic pets, and seeks to reduce human-induced pressures on endangered species. With its partners, the USFWS will develop brochures and conduct neighborhood canvassing to distribute educational materials. The One Animal Family campaign could also be used to spread the word about any new ordinances, legislation, free spay/neuter clinics, and other activities or issues that may arise in the future. The initial focus will be on Big Pine and No Name Keys, but the message is relevant throughout the Florida Keys where natural areas and human development interface.

5. Encourage and assist Monroe County in enforcing existing ordinances and promoting new codes that serve to reduce the prevalence of free-ranging domestic pets, including free-roaming cats, dogs, snakes and other predatory species. The Service supports ordinances which require micro-chips, tattoos, or identification tags for all cats owned, sold, adopted, licensed or taken to a vet in order to promote responsible pet ownership. This would also allow for free-roaming pet cats trapped on Refuge lands to be easily identified and returned to owners, and for homeless cats to clearly be identified as such

6. Implement monitoring and conduct further research as needed to determine abundance and distribution of free-roaming cats throughout the Refuge, document effectiveness of management actions taken or not taken on cat populations, and determine the impacts on the ecosystems and native species to aid in the adaptive

management process. The USFWS will implement a passive mark and re-capture study based on auto-triggered camera trap data to evaluate the efficacy of the trap and removal program and help to identify critical areas that require immediate attention.

B. Opossum, Armadillo, and Rats

1. Any non-native opossum, armadillo, or rat caught incidentally in the live traps targeted for cats on Refuge lands will be immediately dispatched in accordance with the American Veterinary Medical Association (AVMA) guidelines for humane euthanasia. All native species will be immediately set free.

2. Prevent, to the extent possible, further invasion of non-native opossums, armadillos, and rats onto Refuge lands and reduce their impacts on native wildlife. Noticeable population increases based on reports, road kill, or other specific or auxiliary data may initiate targeted control and eradication efforts in addition to incidental capture discussed above.

3. The USFWS will work with Monroe County, neighborhood associations, civic organizations, commercial businesses, homeowners and others to distribute wildlife-proof garbage cans and trash dumpsters to homes and businesses located near Refuge lands, and to discourage outdoor pet feeding stations and intentional feeding or watering of wildlife.

C. Iguanas, Lizards, and Large Bodied Snakes

1. Presence of exotic non-native iguanas, lizards, and large-bodied snakes will be detected through reports, incidental sightings, and the community-based interagency “Python Patrol” network. Exotic reptiles will be immediately dispatched in accordance with AVMA guidelines for humane euthanasia. Complete prevention of the establishment of any breeding populations of any non-native reptile species will be the intent of these actions in order to protect vulnerable native species.

2. Dietary studies will be conducted whenever possible through necropsy to determine diet preferences and consumption rates of non-native reptile species to document impacts on native species.

3. Early detection will continue to be the best policy to prevent further establishment of invasive non-native species within the boundaries of the FKNWRC. As workloads and necessity permits, the USFWS may conduct sweeping surveys and eradications of non-native reptiles on Refuge lands in areas with proximity to known problem areas or with potential for new invasions.

2.2.2 Non-Native Invertebrate Species

A. Ants

1. Known exotic ant colonies on Refuge lands will be treated with a USFWS-approved insecticide to prevent, to the extent possible, the impacts of the imported red fire ant upon native wildlife.

2. Early detection will continue to be the best policy to prevent further establishment of invasive non-native ant species within the boundaries of the FKNWRC. As workloads and necessity permits the Service may conduct sweeping surveys and eradications of non-native ant species on Refuge lands.

2.2.3 Native Vertebrate Species

A. Raccoons

1. The USFWS will manage raccoon populations indirectly by working with Monroe County, neighborhood associations, civic organizations, commercial businesses, homeowners and others to distribute wildlife-proof garbage cans and trash dumpsters to homes and businesses located near Refuge lands, and to discourage outdoor pet feeding stations and intentional feeding or watering of wildlife.

2. With partners such as the One Animal Family, the USFWS will develop brochures and conduct neighborhood canvassing to distribute educational materials on the legal and biological ramifications of intentional and unintentional outdoor feeding and watering of animals, including the dangers and nuisance posed to themselves, their pets, their neighbors, and local wildlife such as raccoons.

3. Raccoons trapped incidentally in live traps targeted for cats or other non-native predators will be released alive at the trap location. Incidentally-caught raccoons may be either marked (e.g. ear tag, ear clip, radio collar or other identification) or left unmarked, depending on research needs identified above. Raccoons that exhibit severe disease or other serious health issues will receive appropriate evaluation, which may include care by a state-certified wildlife rehabilitator or euthanasia as recommended by a qualified veterinarian or animal control services provider.

4. The USFWS will work with universities and research partners to conduct field studies on the ecology, distribution, abundance, density, food habits, and

genetic diversity of raccoons in the FKNWRC. Motion-triggered cameras and/or radio telemetry methods will be used to mark-and-recapture and track individual raccoons. A better understanding of the predator-prey relationship between raccoons and marsh rabbits will be essential for measuring the effectiveness of management strategies on Refuge lands. Targeted monitoring will be implemented to evaluate if the raccoon populations are responding to indirect management strategies such as reducing human-subsidized sources of food and shelter.

5. If field studies and monitoring indicate that raccoon populations are having a negative impact on endangered species, the USFWS will reevaluate the need to implement more direct control by removal of raccoons from sensitive habitats. Removal could include, but not be limited to, transfer to a wildlife park or zoo, a state-certified wildlife rehabilitator, or euthanasia. Any decision by the Service to use lethal control measures on raccoons will trigger additional public notification and an amendment to this EA.

2.3 Alternative C – Lethal Control Only

This alternative would allow the lethal removal of all targeted species outlined in Section 1.3 above that pose a predation threat to native species, especially those listed as threatened or endangered. Lethal control methods would be applied in all areas of the FKNWRC. Predators would be euthanized on site in a humane manner utilizing AMVA approved methods. Deceased animals would be disposed in accordance with local and state animal disposal regulations. Non-target species caught incidentally would be released on site.

2.4 Alternatives Considered But Dismissed From Further Evaluation

2.4.1 Trap, neuter, release of free-roaming cats

Trap, neuter, and release (TNR) of free-roaming cats has been widely promoted as a method for reducing feral cat numbers slowly over time. TNR typically involves a colony that is established in which homeless cats are trapped, sterilized, vaccinated, and then released back into the environment, and volunteer caretakers provide food and water to the colony. However, TNR does little to reduce cat predation on native wildlife. Studies have proven that the instinctive hunting and killing behavior of cats is unrelated to their hunger mechanism, so that cats kill impulsively and pose a threat to wildlife even when they are not hungry (Adamec 1976, Fitzgerald and Turner 2000, Liberg 1984). In addition, the TNR method has little valid scientific support for claims that it actually reduces cat colony numbers over time and often has been shown to attract people to release new cats into an area (Foley et al. 2005, Neville 1989, Natoli et al.

2006, Castillo and Clark 2003, Longcore et al. 2009). TNR practices are prohibited on National Wildlife Refuges, and violate the Endangered Species Act (ESA) and the Migratory Bird Treaty Act (MBTA) because they may result in the direct harm of protected species. Some animal advocates therefore often agree that traditional TNR programs are not the most appropriate choice, especially where cats are released near designated wildlife areas and at-risk wildlife populations (see the People for the Ethical Treatment of Animals' Animal Rights Uncompromised fact sheets at www.peta.org/about/why-peta/default.aspx). For these reasons, TNR was considered but dismissed from further evaluation.

2.4.2 Live Capture and Translocation to Other Natural Areas

Live capture and translocation of predators to other natural areas was considered as an alternative to the proposed action. Translocation of exotic species to their respective native habitats is not practical or economically feasible given that they originated in other states or countries, such as the Burmese python. In most cases, exotic animals were once pets that were released, abandoned, or escaped from their homes. Given that cats are domesticated they have no true native range to be relocated to. In the case of native species, moving common animals from one area to another is widely discouraged by wildlife biologists and researchers. Suitable habitat is often fully occupied, and the translocated animal is at a disadvantage when establishing a new territory, and the exchange of disease is always a threat (see the Florida Fish and Wildlife Conservation Commission's fact sheet on Relocating Wildlife at http://myfwc.com/wildlifehabitats/SpeciesInfo_Relocation.htm). For these reasons, live capture and translocation to other natural areas was considered but dismissed from further evaluation.

3.0 Refuge Environment

3.1 Plant Communities

The Florida Keys National Wildlife Refuges are a collection of low-lying, subtropical islands between the Gulf of Mexico and the Atlantic Ocean that protect all the vital habitats representative of the Florida Keys ecosystem, including the globally imperiled pine rockland forests, tropical hardwood hammocks, and mangrove wetlands (Figures 3 and 4). Within the continental United States, these habitat types are found only in extreme south Florida and the Florida Keys. Pine rocklands have the highest plant diversity of all plant communities in the Florida Keys, with a total of 250 species of plants including 14 herbs endemic to south Florida, 5 of which occur only in the Lower Keys settings. The tropical hardwood forests contain more than 120 native trees and shrubs, nearly 80 percent of which are of West Indian origin. Mangrove wetlands are dominated by black mangrove, white mangrove, or red mangrove species ranging from tall, coastal forest to low, dense scrub communities. Other major habitat types in the Florida Keys National Wildlife

Refuges include freshwater wetlands, salt marsh transition, inland salt ponds, beach ridge hammock, coastal rock barren, coastal berm, beach and dune, and marine. Each habitat type and its associated flora and fauna is more fully described in the Crocodile Lake and Lower Florida Keys Comprehensive Conservation Plans (available at http://www.fws.gov/southeast/planning/CCPFinalRefugesDocuments.html).

3.2 Wildlife Populations, Including Federally Listed Species

These ecologically, geologically and climatically distinct islands provide a haven for a diversity of native fish and wildlife. Unfortunately, many habitats, such as hardwood hammock and pine rockland, have been lost or altered due to human development. Other impacts of development include the fragmentation of native habitats due to roads, canals, and mosquito ditches; and the introduction and invasion of non-native exotic plant and animal species that compete with or prey on native species. These impacts have led to considerable population declines in several species which are currently listed as endangered, threatened, or candidate species under the Endangered Species Act (Table 1). "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. "Candidate" species are those for which the Service has enough information to warrant proposing them for listing but is precluded from doing so by higher listing priorities; however, the Service carries out priority conservation actions for these species to prevent further decline and possibly preclude the need to list. The Service's South Florida Multi-Species Recovery Plan provides a full description of all federally listed species that occur within the Florida Keys (available for free download at http://www.fws.gov/verobeach). The following provides a brief overview of the different wildlife species groups found in the Florida Keys.

3.2.1 Birds

The Florida Keys National Wildlife Refuges support more than 250 species of birds, including wading and water birds, shorebirds, waterfowl, raptors, and neotropical migratory songbirds. Priority species include great white heron, reddish egret, brown pelican, piping plover, Wilson's plover, roseate tern, white-crowned pigeon, bald eagle, osprey, and northern harrier.

3.2.2 Mammals

As with many island chains, few land-dwelling species occur in the Florida Keys. Most of the native mammals represent sub-species of those found on mainland Florida, but they became genetically distinct after thousands of years of geographic isolation when the last drop in sea level rise formed the island chain. Raccoons are the most commonly seen native mammals in the Florida Keys and they inhabit most habitat types as well as developed areas. Key deer can be found on up to 26 islands from Big Pine Key to

Sugarloaf Key, with the center of its population on Big Pine and No-Name Keys. Key deer use most habitat types, including developed areas. Lower Keys marsh rabbits are predominantly found in scattered low-density populations in salt marsh transition and freshwater wetland communities in the Lower Keys from Big Pine Key to Boca Chica Key. Silver rice rat habitat includes mangrove wetlands and salt marsh transition on at least 13 islands from Big Pine Key to Lower Sugarloaf Key. The Key Largo woodrat and Key Largo cottonmouse are only found in protected tropical hardwood hammocks on upper Key Largo.

3.2.3 Amphibians

Amphibians require freshwater and therefore only occur in freshwater solution holes, wetland ponds, and man-made mosquito ditches and borrow pits. At least seven native amphibians are known from the Florida Keys, including the southern leopard frog.

3.2.4 Reptiles

The mosaic of habitats throughout the Florida Keys National Wildlife Refuges support a variety of native snake species, including the Big Pine ringneck snake, eastern diamondback rattlesnake, eastern indigo snake, rim rock crowned snake, and the Florida Keys mole skink. Crocodile Lake National Wildlife Refuge supports nearly 25 percent of the existing American crocodile population and is one of only three areas in the United States that provides nesting habitat for the species. The green, loggerhead, and hawksbill sea turtles are nesting species, while leatherback and Kemp's ridley forage in waters surrounding the refuges. The Florida box turtle and Keys mud turtle inhabit upland areas of National Key Deer Refuge, and mangrove terrapin are found on offshore islands of the Key West National Wildlife Refuge and in Florida Bay.

3.2.5 Invertebrates

The National Key Deer Refuge and Crocodile Lake National Wildlife Refuges contain the only known remaining populations of the Stock Island tree snail. There are also a variety of *Liguus* tree snails that inhabit similar tropical hardwood hammock communities that merit attention and conservation. There are more than 200 species of butterflies, moths and dragonflies that have been described in the Florida Keys. The Schaus swallowtail butterfly is found in the hammocks on Key Largo, including Crocodile Lake National Wildlife Refuge. At least eight resident butterflies have disappeared from the Keys since the late 1970s, and another eight species of butterflies found in the lower Keys are highly imperiled, including Bartram's hairstreak, Florida leafwing, and Miami blue.

Table 1. Federally endangered (E), threatened (T), and candidate (C) species found in the Florida Keys National Wildlife Refuges

NKDR	GWH NWR	KW NWR	CLNWR	SPECIES	LATIN NAME	FEDERAL STATUS
MAMMALS	* = occurs at this refuge			(CH) = critical habitat		
*	*			Key deer	*Odocileus virginianus clavium*	E
*	*			Lower Keys marsh rabbit	*Sylvilagus palustris hefneri*	E
*	*			Silver rice rat	*Oryzomys palustris natator*	E (CH)
			*	Key Largo woodrat	*Neotoma floridana smalli*	E
			*	Key Largo cotton mouse	*Permyscus gossypinus allapticola*	E
*	*	*	*	West Indian manatee	*Trichecus manatus*	E (CH)
BIRDS						
possible	possible	possible	possible	Kirtland's warbler	*Dendroica kirtlandii*	E
*	*	* (CH)	possible	Piping plover	*Charadrius melodus*	T (CH)
possible	possible	*	possible	Roseate tern	*Sterna dougallii dougallii*	T
*	*	*	possible	Red knot	*Calidris canutus rufa*	C
REPTILES						
*			*	American crocodile	*Crocodylus acutus*	T (CH)
*			*	Eastern indigo snake	*Dymarchon corais couperi*	T
*	*	*	*	Green sea turtle	*Chelonia mydas*	E (CH)
*	*	*	*	Hawksbill sea turtle	*Eretmochelys imbricata*	E (CH)
*	*	*	*	Kemp's ridley sea turtle	*Lepidochelys kempii*	E
*	*	*	*	Leatherback sea turtle	*Dermochelys coriacea*	E (CH)
*	*	*	*	Loggerhead sea turtle	*Caretta caretta*	T

(continued)

Table 1. (continued)

NKDR	GWH NWR	KW NWR	CLNWR	SPECIES	LATIN NAME	FEDERAL STATUS
INVERTEBRATES						
			*	Schaus swallowtail butterfly	*Heraclides aristodemus ponceanus*	E
*			*	Stock Island tree snail	*Orthalicus reses (not including nesodryas)*	T
*				Bartram's hairstreak butterfly	*Strymon acis bartrami*	C
*				Florida Leafwing	*Anaea troglodyta floridalis*	C
possible	possible	*		Miami blue butterfly	*Cyclargus thomasi bethunebaker*	C
PLANTS						
*				Key tree cactus	*Pilosocereus robinii*	E
*		*		Garber's spurge	*Chamaesyce garberi*	T
*				Blodgett's silverbush	*Argythamnia blodgettii*	C
*				Big Pine partridge pea	*Chamaecrista lineata var. keyensis*	C
*				Wedge spurge	*Chamaesyce deltoidea spp. serpyllum*	C
		*		Cape Sable thoroughwort	*Chromolaena frustrata*	C
*				Sand flax	*Linum arenicola*	C
*				Florida semaphore cactus	*Consolea corallicola*	C

Figure 3. Land cover types in the Lower Florida Keys Refuges, No Name Key to Boca Chica Key, Florida.

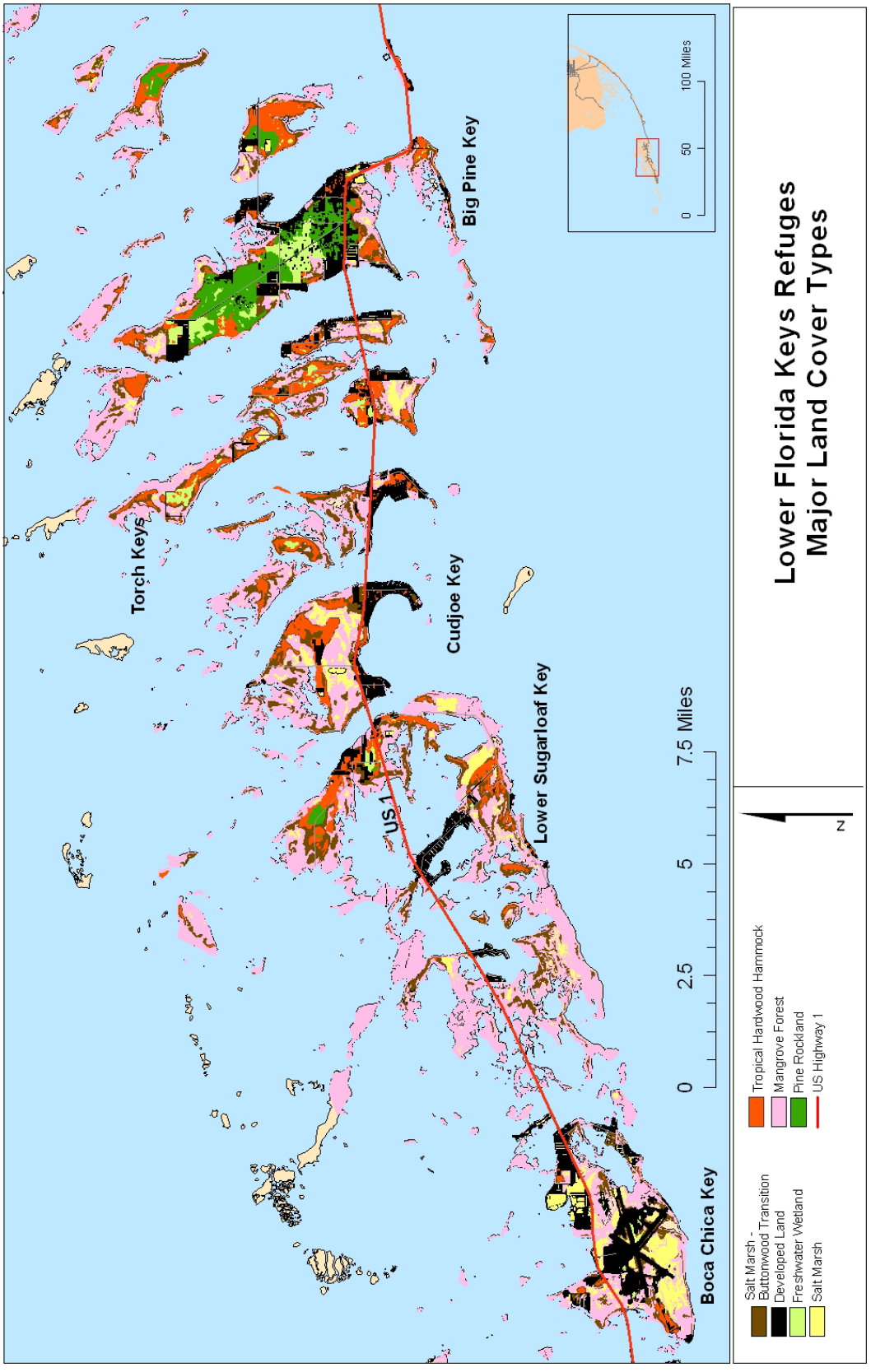
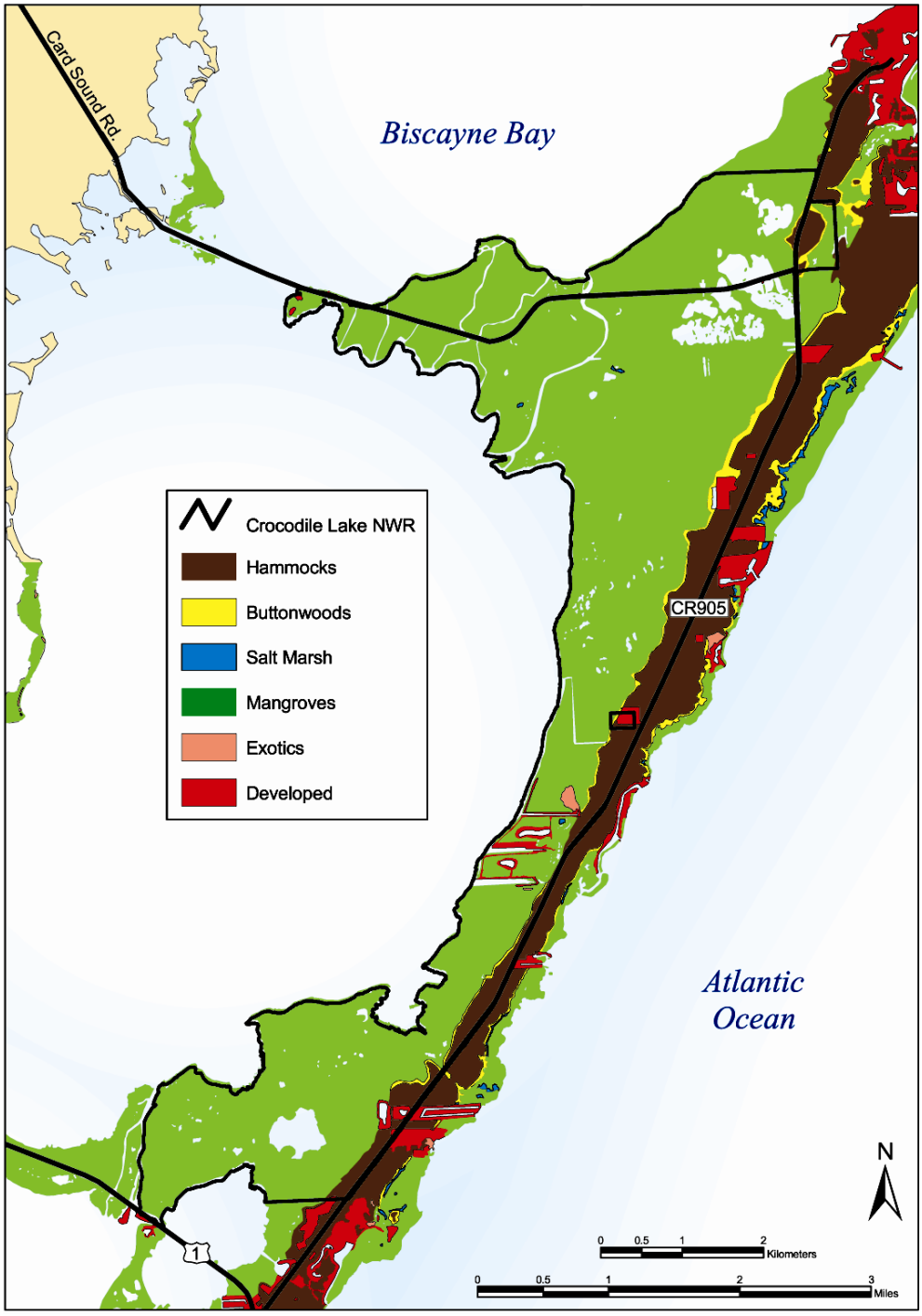


Figure 4. Land cover types in the Crocodile Lake National Wildlife Refuge, Key Largo, Florida.



4.0 Environmental Consequences

4.1 Alternative A - No Action (Status Quo)

Under this alternative, the USFWS would not be involved in any management actions to reduce predation of federally listed species on Refuge lands in the FKNWRC. Many species of native wildlife would continue to incur potentially unsustainable levels of mortality or competition by exotic predators, provided that the USFWS did not implement their own predator management program (Table 2). Birds, small mammals, and reptile species would continue to be impacted by predation from non-native predators (Table 3). This "no action" alternative is likely to result in continued impacts on protected species populations, and impacts upon other native species would continue to occur unabated. The No Action Alternative would not implement the USFWS's responsibilities as agreed to in the stakeholder process (Taylor 2008).

The No Action Alternative would allow for the continued predation of the silver rice rat, Lower Keys marsh rabbit, Key Largo woodrat, Key Largo cottonmouse, migratory birds, and other listed or vulnerable native species. Continued long term and unsustainable biological impacts are likely for the species addressed in this EA. In addition, a continued policy of No Action would not be in compliance with the South Florida Multispecies Recovery Plan (USFWS 1999), which includes recovery actions such as predator control to benefit the silver rice rat, Lower Keys marsh rabbit, Key Largo woodrat, Key largo cotton mouse, and the Stock Island tree snail, as required by the ESA (Appendix I). The No Action Alternative would also not be in compliance with other mandates such as the Migratory Bird Treaty Act, Refuge System policies, Executive Order 13122, or Florida State law which are intended to prevent unacceptable environmental impacts.

4.2 Alternative B - Integrated Predator Management (Proposed Action)

Under this alternative, the USFWS has the greatest potential for effectively reducing predation to listed species because all potential nonlethal and lethal control alternatives and methods would be available for use on Refuge lands in the FKNWRC (Table 2). Additionally, Alternative B would allow for the most efficient protection of other wildlife species such as small mammals, birds, and reptiles by focusing efforts with minimum impact upon non-target species with using passive and active predation reducing efforts. The Integrated Predator Management approach would be comprehensive and proactive by attempting to address the core problem – people abandoning exotic pets and feeding native wildlife - through public outreach, education, and enforcement programs (FFWCC 2003). It also incorporates the points of consensus developed by the stakeholder group to a greater degree than any of the other alternatives (Taylor 2008). This alternative would also allow for the greatest flexibility for adaptive management in the framework of strategic habitat conservation by incorporating an iterative decision-

making process based on targeted monitoring and informed research (Nichols and Williams 2006, Martin et al. 2009) (Appendix II).

Alternative B would be in compliance with the South Florida Multispecies Recovery Plan, which includes recovery actions such as predator control to benefit the silver rice rat, the Lower Keys marsh rabbit, the Key Largo woodrat, Key Largo cotton mouse, and the Stock Island tree snail, as required by the ESA (Appendix I). Alternative B would also be in compliance with other mandates such as the Migratory Bird Treaty Act, Refuge System policies, Executive Order 13122, and Florida State law which are intended to prevent unacceptable environmental impacts.

4.3 Alternative C - Lethal Control Only

Under this alternative, the Service would implement lethal control methods to all exotic species and native raccoons trapped on Refuge lands, without applying or considering nonlethal methods. Efforts would be focused on trapping and removing or exotic species and native raccoons, with minimal monitoring or research. Predation of listed species would likely be reduced or eliminated under this alternative, providing that lethal control methods could be safely and effectively implemented. This alternative would likely be more effective at preventing or reducing predation to listed and non-listed species than Alternatives A or B if some effective level of lethal management could be implemented (Table 1, 2). While lethal control is allowed by Refuge System policy, it is not a socially acceptable approach and is inconsistent with the points of consensus developed by the stakeholder group (Taylor 2008).This alternative would likely not be logistically feasible on a FKNWRC-wide basis and would not allow for adaptive management under a strategic habitat conservation approach (Appendix III).

Alternative C would be in compliance with the South Florida Multispecies Recovery Plan which includes recovery actions such as predator control to benefit the silver rice rat, Lower Keys marsh rabbit, Key Largo woodrat, Key Largo cotton mouse, and the Stock Island tree snail, as required by the ESA (Appendix I). Alternative C would also be in compliance with other mandates such as the Migratory Bird Treaty Act, Refuge System policies, Executive Order 13122, or Florida State law which are intended to prevent unacceptable environmental impacts.

4.4 Comparison of the Alternatives

Table 2: Comparison of the Alternatives

	Predation Pressure on T&E species	***Compatibility with Regulations***
Alternative A – No Action	**High**	**Low**
Alternative B - Proposed Action	**Medium**	**High**
Alternative C – Lethal Only Action	**Low**	**High**

Table 3: Comparison of the Environmental Consequences of Each Alternative

	Lower Keys Marsh Rabbit	***Key Largo Woodrat***	***Other Wildlife***	***Socioeconomics/ Sociopolitical***
Alternative A – No Action	LKMR would persist in isolated populations, but in low numbers, with little chance of re-colonization.	KLWR would likely be extirpated, or could possibly survive in low numbers, with low success in re-introduction leading to genetic depression and possible extinction	No changes from human actions are associated with this alternative. Continued predation of listed and non-listed species.	Increased potential for ESA listing may pose economic threat. Public dissatisfaction with inaction. Not in agreement with stakeholder group consensus.
Alternative B – Integrated Predator Management (Proposed Action)	LKMR pop would increase as predation pressure decreased. Dispersal to formerly occupied patches more likely.	KLWR pop would likely increase as predation pressure decreased. Re-introduction more likely to succeed.	Native Wildlife such as reptiles, birds and small mammals would benefit from decreased predation pressure.	Increased likelihood of ESA delisting and increased stability of local economy. Most socially acceptable, in agreement with stakeholder group consensus.
Alternative C - Lethal Control Only	LKMR would increase as predation pressure decreased. Dispersal to formerly occupied patches more likely.	KLWR pop would likely increase and be protected on lands as predation pressure decreased. Re-introduction more successful	Species associated with protected sites and/or vegetation would benefit.	Increased likelihood of ESA delisting and increased stability of local economies. Not socially acceptable or in agreement with stakeholder group consensus.

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Appendix I
South Florida Multi-Species Recovery Plan (USFWS 1999)

Lower Keys Marsh Rabbit

S2.5.1. Control or eliminate free-roaming cat populations near rabbit habitat. Free-roaming cats are abundant in the Lower Keys and are a major threat to juvenile and adult marsh rabbit survival. Establish a program throughout the Lower Keys to control free roaming cats. Establish a program to license domestic cats, implement leash laws, eliminate cat-feeding stations, implement spay and neuter program, increase awareness through educational material, test diseases, and remove nuisance feral cats.

S2.5.1.1. Continue coordination efforts with NAS, Key West to eliminate free roaming cats from that federal facility.

S2.5.1.2. Reduce impacts by free roaming cats. Develop deed restrictions to prohibit free roaming cats in rabbit sensitive areas. Develop and enforce deed restrictions that minimize the effects of free-roaming cats on Lower Keys marsh rabbits.

S2.5.2. Control raccoon predation. Raccoon populations are unnaturally high in some areas of the Lower Keys. Raccoons are capable of killing both adult and juvenile rabbits. Eliminate supplemental food sources--outdoor cat feeding stations and open dumpsters--to reduce raccoon populations.

S5.2. Develop and implement a free-roaming cat control program. Conduct workshops to inform residents about the necessity of controlling cat predation on marsh rabbits through licensing programs, leash laws, and spay and neuter programs.

S5.3. Continue to inform military and civilian personnel at NAS. Inform personnel about the marsh rabbit's presence, its protection under the ESA, and ways to minimize impacts on it.

H1.2.1. Protect marsh rabbits on private lands. Protect marsh rabbit populations on private land through acquisition, conservation easements or agreements, and education of land owners. Develop agreements or coordinate section 10 permits between the FWS and private land owners to minimize impacts such as feral cats, mowing, and exotics. For example, coordinate with Long Beach Estate Fish Camp to minimize the impact of feral cats and increase exotic control along the nature trail.

H1.2.2. Protect marsh rabbits on public lands. Manage public lands for exotics, off-road vehicles, dumping, feral cats and other predators, and vehicular traffic. Identify and minimize other causes of rabbit injury or mortality on public lands.

H1.2.8. Continue cooperative management at NAS, Key West. NAS has minimized their impacts on the Lower Keys marsh rabbit through management actions. Continue protection efforts such as controlled mowing, exotic removal, habitat restoration, and cat control.

Silver Rice Rat

S2.5. Minimize and eliminate disturbance or mortality to the silver rice rat. Silver rice rats are preyed upon by cats, black rats, raccoons, and fire ants. Predation by these species is increased near areas of urbanization. Eliminate or reduce mortality from these sources.

S2.5.1. Minimize cat predation on silver rice rats. Cats are known predators of silver rice rats. Establish a program to license domestic cats, implement leash laws, eliminate cat-feeding stations, implement spay and neuter programs, increase awareness through educational material, test diseases, and remove nuisance free-roaming cats.

S2.5.2. Minimize competition and predation by black rats. Black rats may be able to out-compete silver rice rats for food and habitat resources and prey on young rice rats. Eliminate black rat food shelters and sources. Enforce proper disposal of refuse around residences and in silver rice rat habitat.

S2.5.3. Minimize raccoon impacts on silver rice rats. Raccoon populations are unnaturally high in some areas of the Lower Keys. Raccoons are capable of killing both adult and juvenile rats. Eliminate supplemental food sources, feeding by humans, outdoor cat-feeding stations, and open dumpsters to reduce raccoon populations.

S5.2. Develop and implement a cat, black rat, and raccoon control program. Conduct workshops to educate residents about the necessity of controlling cat and raccoon predation on silver rice rats as well as minimizing the effects of black rats and fire ants.

H1.3.1. Protect rice rats on public lands. Develop a habitat management plan that outlines priority habitat for acquisition and methods to protect, restore, and minimize impacts on rice rats and their habitat. Manage habitat for exotics, off-road vehicles, dumping, feral cats and other predators, and vehicular traffic.

H1.3.2. Protect rice rats on private lands. Protect rice rat populations on private land through acquisition, conservation easements or agreements, and education of land owners. Develop agreements (*e.g.*, Memorandum of Agreement) between the FWS and private land owners to minimize impacts such as feral cats and exotics.

Key Largo Woodrat

S2.3.1. Remove nuisance predators. Feral dogs and cats, black rats, raccoons, and fire ants can increase woodrats mortality. Eliminate food sources and home sites for raccoons and black rats, control free-roaming feral cats and dogs, and destroy fire ant colonies near and in woodrat habitat. Enforce deed restrictions of cat control in Ocean Reef Club and other areas.

S5. Increase public awareness and stewardship. Develop educational materials and host public workshops to increase awareness about woodrats and instill a sense of stewardship for the protection of this endangered species.

S5.2. Develop and implement a cat, black rat, fire ant, and raccoon control program. Conduct workshops to educate residents about the necessity to control cat and raccoon predation on woodrats and to reduce the effects of black rats and fire ants.

H1.2.2. Protect woodrats on private lands. Protect woodrat populations on private land through acquisition, conservation easements or agreements, and education of landowners. Develop agreements (*e.g.,* Memorandum of Agreement) between the FWS and private landowners to minimize impacts such as feral cats and exotics.

H1.2.3. Coordinate with Federal, State and Monroe County agencies and private entities to develop management actions to protect woodrat habitat. Coordinate with all Federal agencies to ensure Federal actions do not impact woodrat habitat. Coordinate with these entities to ensure proposed construction activities that result in land clearing or alteration do not impact the woodrat and its habitat. Coordinate with the Audubon Society to develop a management plan for Parcel 22. Coordinate with the landowner to protect and manage habitat and minimize impacts to the woodrat (*e.g.*, trash, feral cats, *etc.*).

<u>Key Largo Cotton Mouse</u>

S25. Minimize and eliminate disturbance or mortality to the Key Largo cotton mouse. The level of cotton mouse mortality has not been characterized, although sources of mortality are documented. Implement management actions that reduce mortality.

S2.5.1. Remove nuisance predators. Feral dogs and cats, black rats, raccoons, and fire ants can increase cotton mouse mortality. Eliminate food sources and home sites for raccoons and black rats, control free-roaming feral cats and dogs, and destroy fire ant colonies near and in cotton mouse habitat. Enforce deed restrictions of cat control in Ocean Reef Club and other areas.

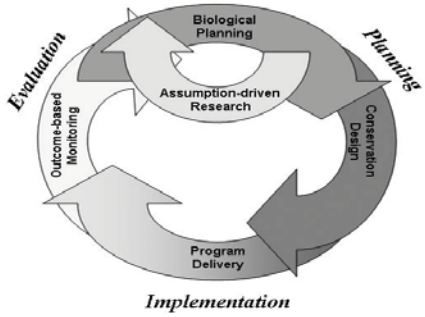
S5.2. Develop and implement a cat, black rat, fire ant, and raccoon control program. Conduct workshops to educate residents about the necessity to control predation on cotton mice as well as to minimize the effects of black rats and fire ants.

H1.2.1. Protect cotton mice on private lands. Protect cotton mouse populations on private land through acquisition, conservation easements or agreements, and informing landowners. Develop agreements (*e.g.*, Memorandum of Agreement) between the FWS and private landowners to minimize impacts such as feral cats and exotics.

H1.2.3. Coordinate with Federal, State and Monroe County agencies and private entities to develop management actions to protect cotton mouse habitat. Coordinate with these entities to ensure proposed construction activities that result in land clearing or alteration do not impact the cotton mouse and its habitat. Coordinate with the Audubon Society to develop a management plan for Parcel 22. Coordinate with private landowners to protect and manage habitat and minimize impacts to the cotton mouse (*e.g.*, trash, feral cats, *etc.*).

Appendix II
Strategic Habitat Conservation

Strategic habitat conservation (SHC) is defined as an iterative process of developing and refining a conservation strategy, making efficient management decisions, and using research and monitoring to assess accomplishments and inform future iterations of the conservation strategy.



The goal of SHC is to make natural resource management agencies more efficient and transparent, thereby making them more credible and wide-reaching in effect. Conservation efficiency may be thought of as the ratio of population impacts to management costs.

A science-based conservation strategy must address five basic questions:

1. Why have long-term average populations declined?

2. What do we want to achieve and how can we achieve it?

    a. What are our objectives for populations?

    b. What factors are acutely limiting populations below objective levels?

    c. What management treatments are available to overcome these limiting factors?

3. Where should we apply these management treatments to effect the greatest change in populations at the lowest possible total monetary and non-monetary costs to management agencies and societies?

4. How much of a particular type of management will be necessary to reach our population objectives (a habitat objective – a minimum estimate, but useful nonetheless).

5. What are the key uncertainties in the answers to questions 1-4 and what assumptions were made in developing the strategy? These will guide our research and monitoring activities.

In the case of federal and state fish and wildlife management agencies it is appropriate to ask and answer these questions in terms of populations; however, these basic questions are equally applicable to other ecosystem functions. Other agencies and organizations with different mandates may focus on the other functions by applying the same basic concepts. This guide discusses a framework for SHC for the conservation of populations limited by loss or deterioration of habitat. For more information, go to http://www.fws.gov/science/shc/index.html.