United States Department of the Interior

FISH AND WILDLIFE SERVICE
1875 Century Boulevard
Atlanta, Georgia 30345

In Reply Refer To:
FWS/R4/AES

April 18, 2003

Mr. Michael D. Brown
Acting Under Secretary of
Emergency, Preparedness, and Response
500 C Street, SW
Washington, D.C. 20472

Dear Mr. Brown:

This provides an amendment to the June 16, 1997, biological opinion on the effects of the Federal Emergency Management Agency's (FEMA) continued administration of the National Flood Insurance Program (NFIP) in Monroe County, Florida on the ten following listed species: Key deer (*Odocoileus virginianus clavium*), Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*), Key Largo woodrat (*Neotoma floridana smalli*), Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*), rice rat (*Oryzomys palustris natator*), eastern indigo snake (*Drymarchon corais couperi*), Garber's spurge (*Chamaesyce garberi*), Key tree-cactus (*Pilosocereus robinii*), Schaus swallowtail butterfly (*Heraclides aristodemus ponceanus*), and Stock Island tree snail (*Orthalicus reses* [not incl. *nesodryas*]). This document was prepared under section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA).

The 1997 biological opinion is being amended as a result of new information gained from implementation of the reasonable and prudent alternative (RPA) provided in the 1997 opinion and because a county-wide Habitat Conservation Plan was not completed within four years of the issuance of the 1997 biological opinion. The new information includes improved knowledge of the distribution of listed species and their habitats in the Keys, improved understanding of the manner in which the NFIP may adversely impact listed species, and the addition of two municipal governments, the City of Marathon and the Village of Islamorada, as participating communities in the FEMA NFIP program. In addition, the American crocodile (*Crocodylus acutus*) has begun to reoccupy portions of the Upper and Lower Keys. Therefore, effects of the action on the crocodile and its critical habitat are included in this amended opinion.

In this amendment, the Service has concluded that full implementation of the NFIP in Monroe County over the next 20 years would jeopardize the continued existence of several species unless site specific assessment of each development in the area where flood insurance is available occurs. The establishment of the RPA, where the Service will review individual Monroe County

building permits within habitats for listed species, removes the likelihood that this action will jeopardize the continued existence of these species. FEMA and Monroe County have agreed to cooperate with the Service in implementation of the RPA whereby the Service will conduct site specific analyses with respect to the potential impact of each development on listed species. Under the process outlined in the RPA, the Service has the opportunity to review individual development projects and to recommend changes to protect the species. If the applicant is not willing to implement these recommended changes, Monroe County's practice has been to deny the issuance of the necessary building permit. Without this RPA, the Service would not have the same opportunity to review private development projects for potential impacts to listed species. Although some development projects requiring permits from Army Corps of Engineers under section 404 of the Clean Water Act might come to the Service for review, the majority of projects do not require these permits. Although a permit under section 10 of the ESA would be required for private individuals whose proposed development may take listed animal species, in many cases the developers are not necessarily aware of the exact location of the threatened or endangered species, nor may they contact the Service for assistance. In addition, the Service may not be made aware of the presence of threatened and endangered species until a site specific review can occur. The RPA ensures that the Service has access to private properties to determine the exact location of species and to modify the development to avoid or minimize take.

The "take" of plants on private property is not a violation of the ESA (unless take is also prohibited by State law.) Therefore, authorization to "take" plants on private property is not granted under section 10 (a)(1)(B) or section 7. However, Federal agencies are required under section 7(a)(2) to ensure that their actions do not jeopardize the continued existence of listed plants and, therefore, the Service recommends reasonable and prudent alternatives for Federal actions that would jeopardize plant species. The RPA outlined in this biological opinion is designed to remove the jeopardy determination we have made for the Key tree-cactus. The process outlined in the RPA removes the likelihood that the NFIP will jeopardize the continued existence of the Key tree-cactus by requiring that participating communities in Monroe County follow any recommendations to avoid or minimize affects that the Service makes after site specific review of permit applications for areas that may contain this species. If the Service determines that the proposed action will jeopardize the continued existence of the species, the Service will forward this recommendation to the participating community. If the participating community issues the permit in opposition to this recommendation, the Service would draw this to FEMA's attention for FEMA to pursue in accordance with the procedures outlined in the RPA.

CONSULTATION HISTORY

(Add this section to the June 16, 1997 opinion on page 1.2.)

On June 16, 1997, the biological opinion on FEMA's administration of the NFIP in Monroe County, Florida was issued by the U.S. Fish and Wildlife Service (Service). The Service concluded that the continued administration of the NFIP was likely to jeopardize the continued existence of nine of the ten species: the Garber's spurge, Key deer, Key Largo cotton mouse, Key Largo woodrat, Key tree-cactus, Lower Keys marsh rabbit, Schaus swallowtail butterfly, rice rat, and Stock Island tree snail. The continued administration of the NFIP was not likely to jeopardize the eastern indigo snake. The Service also concluded that critical habitat for the rice

rat was likely to be destroyed or adversely modified.

The RPA from the 1997 opinion established a procedure whereby Monroe County, with the assistance of the Service and FEMA, developed maps showing the distribution of threatened and endangered species and their habitats in the Florida Keys. These maps identified occupied habitat, unoccupied suitable habitat, and unsuitable habitat. In areas mapped as unsuitable habitat, Monroe County, after making appropriate documentation in the administrative records, issues building permits without further concerns for threatened or endangered species or designated critical habitat. In areas mapped as occupied or unoccupied suitable habitat, issuance of building permits requires further consultation with the Service.

After issuance of the June 16, 1997 biological opinion, the Service and Monroe County met:

1. to discuss actions necessary as a result of the BO. Monroe County would review building permits for impacts to listed species. If the permit would impact a species or its habitat, the Service would determine if the building permit is not likely to adversely affect (NLTAA) listed species or critical habitat, or the building permit may adversely affect listed species or critical habitat. If the Service made a NLTAA determination, a letter would be provided to Monroe County and no further action would be necessary. Monroe County would place that letter in the file for that permit for future review by FEMA during their community assistance visits. If the Service determined the building permit might adversely affect listed species or critical habitat, Monroe County would work with the landowner and the Service to ensure compliance with the ESA either through section 7 or section 10. Either the section 10(a)(1)(B) permit or the section 7 consultation would be retained in the administrative record for the building permit for future review by FEMA during their community assistance visits. As part of this requirement, FEMA must coordinate with the Service every six months to evaluate Monroe County's compliance with the biological opinion.

2. to discuss actions necessary as a result of the BO. The two agencies met with representatives from local governments including Monroe County, the City of Marathon, and the Village of Islamorada. The agencies reviewed a random selection of projects requiring technical assistance/coordination and identified areas to improve implementation of the RPA.

3. to discuss implementing the RPA. FEMA agreed to hire consultants to reconcile the County's parcel mapping process with the listed species maps produced by the Service. A unified system was developed for the County that identifies the list of real estate parcel numbers located within listed species habitat or potential habitat. Individuals requesting permits in those areas are required to consult with the Service.

In July 1998, the Service coordinated with FEMA and Monroe County on the initiation of a

Building Permit Review System.

In an August 5, 1998, letter from the Service to Monroe County, 18 minor activities that do not require coordination with the Service were identified. These activities must be carried out within the footprint of an existing structure and must not modify existing habitat that may be used by listed species. The activities do not include the building of new structures, significant modifications within the original footprint, and increased density of occupancy.

On September 24, 2002, the Service and FEMA met to discuss and evaluate compliance with the 1997 opinion. The consultation parties met to review a set of projects requiring Service technical assistance/coordination. No deficiencies in review content, timeliness, or review consistency were identified. On November 27, 2002, the Service requested FEMA to reinitiate consultation, on the June 16, 1997 biological opinion.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

The project description is the same as that presented in the June 16, 1997 opinion. Therefore, it will not be discussed here.

Action Area

This is the same as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

II. STATUS OF THE SPECIES/CRITICAL HABITAT

(Add this as a new section title instead of "Species Included in this Biological Opinion" in the June 16, 1997 opinion and add the following discussion after the table on page 2.6.)

For species/critical habitat information in addition to that presented below, see the June 16, 1997 FEMA biological opinion.

A. Species/critical habitat description

Table 1a. Listed species and designated critical habitat considered in this opinion:

Common Name	Status	Critical Habitat
Eastern indigo snake	threatened	no
Garber's spurge	threatened	no
Key deer	endangered	no

Common Name	Status	Critical Habitat
Key Largo cotton mouse	endangered	no
Key Largo woodrat	endangered	no
Key tree-cactus	endangered	no
Lower Keys marsh rabbit	endangered	no
Schaus swallowtail butterfly	endangered	no
Rice rat	endangered	yes
Stock Island tree snail	threatened	no
American crocodile	endangered	yes

Unless noted, the information on the species included in this opinion was obtained from the South Florida Multi-Species Recovery Plan (MSRP) (Service, 1999). The biology of each species that was presented in the June 16, 1997 biological opinion is not restated in this amendment.

Eastern indigo snake (Drymarchon corais couperi)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description

(Add this as a new section title instead of the title "Description" in the June 16, 1997 opinion, page 2.7.)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Life history

(Add this as a new section title of the June 16, 1997 opinion, page 2.8 before section titled "Distribution and habitat.")

Distribution and habitat:

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Feeding:

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Reproduction:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends
(Add this as a new section title of the June 16, 1997 opinion, page 2.9 instead of the title "Threats" and add the following discussion as the first paragraph on page 2.10.)
Law enforcement has reduced pressure from the pet trade. However, because of its relatively large home range, this snake is especially vulnerable to habitat loss, degradation, and fragmentation (Lawler, 1977; Moler, 1985b). Extensive tracts of undeveloped land are important for maintaining eastern indigo snakes. In Florida, indigo snake habitat is being lost at a rate of five percent annually (Lawler, 1977).

Information on the populations of eastern indigo snake in the Keys is lacking. Tasks identified in the recovery plan for this species include: habitat management through controlled burning, testing experimental miniature radio transmitters for tracking of juvenile eastern indigo snakes, maintenance of a captive breeding colony at Auburn University, recapture of formerly released snakes to confirm survival in the wild, educational lectures and field trips, and efforts to obtain landowner cooperation in conservation efforts.

Analysis of the species likely to be affected
(Add this as a new section title of the June 16, 1997 opinion on page 2.10, and the following discussion after the above addition.)
In the Keys, the primary threat to the eastern indigo snake is habitat loss due to development. Low density residential housing is also a threat because it increases the likelihood of snakes being killed by property owners and domestic pets. The population on Key Largo is at risk due to extensive habitat loss and fragmentation.

Garber's spurge (Chamaesyce garberi)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description
(Add this as a new section title instead of the section titled "Description" in the June 16, 1997 opinion, page 2.10.)
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Life history
(Add this as a new section title of the June 16, 1997 opinion, page 2.10, before section titled "Distribution and habitat.".)

Distribution and habitat:

(Replace the existing section of the June 16, 1997 opinion, page 2.10, with the following)
Gann et al. (2002) found Garber's spurge on the following conservation areas: Bahia Honda State Park, Big Torch Key (Florida Keys Wildlife and Environmental Area), Crocodile Lake NWR, Everglades National Park, Key West NWR, Lopp tract and main tract of Lignumvitae Key Botanical State Park, Long Key State Park, NKDR, and Deering Estate at Cutler in Miami-Dade. The total population of the spurge has been estimated as less than 1,000 individual plants.

Garber's spurge grows at low elevations (less than three m. (9.8 ft)) in well- to poorly-drained, calcareous sands or directly on exposed limestone in a variety of open to moderately-shaded vegetative communities. In pine rocklands, Garber's spurge grows in crevices in oolitic limestone. On Cape Sable in Everglades National Park, Garber's spurge has been reported from hammock edges, open grassy prairie, and backdune swales. In the Keys, Garber's spurge grows on semi-exposed limestone shores, open calcareous salt flats, pine rocklands, calcareous sands of beach ridges, and along disturbed roadsides. While most populations of the spurge occur in coastal habitats, one population in Dade County is approximately 26 km (16 mi.) inland from Florida Bay. The National Key Deer Refuge (NKDR) on Big Pine Key contains most (83 percent) of the remaining pine rocklands in the Keys (Cox et al., 1994). Pinelands in private ownership receive protection under the Monroe County Comprehensive Plan, and all remaining pinelands are targeted for acquisition by County, State, and Federal land acquisition programs.

The Garber's spurge occurs in vegetative communities that historically are naturally prone to periodic disturbance. Pine rocklands and coastal grasslands experience frequent wildfires, while coastal habitats are prone to periodic submergence at high tide or during storm surges.

Reproduction:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends
(Add this as a new section title of the June 16, 1997 opinion on page 2.11, instead of the title "Threats" and replace the existing discussion in that section with the following.)
Threats to the Garber's spurge include habitat fragmentation, fire suppression, and exotic plant invasion. Habitat fragmentation intensifies the effects of natural events such as strong storms and hurricanes. A small, isolated population of Garber's spurge can be eliminated by erosion or deposition of debris during a storm. The pine rockland communities, which are adapted to fire, have undergone extensive alteration because of fire suppression. Fire suppression in pineland and grassland areas has eliminated sunny openings that are necessary for the species to survive.

To conserve Garber's spurge within the action area, pinelands need fire to maintain adequate habitat conditions and roadside management must include the needs of this species. The NKDR has an active prescribed fire program and the Florida Department of Transportation (FDOT) and Monroe County have programs in place for the detection and protection of Garber's spurge when encountered on road construction projects.

Analysis of the species likely to be affected
(Add this as a new section title of the June 16, 1997 opinion, page 2.11, and add the following after the above addition.)
Information gained from the site visits for permits and other activities since the issuance of the June 16, 1997 biological opinion indicates that Garber's spurge occurs primarily on sites under public ownership and managed for conservation, such as the Service's NKDR. It also occurs on road right-of-ways. **Because these habitats are not subject to residential and commercial development, implementation of the NFIP is not likely to adversely affect the Garber's spurge and this species will not be considered further in this consultation.**

Key deer (Odocoileus virginianum clavium)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description
(Add this as a new section title instead of the title "Description" in the June 16, 1997 opinion, page 2.11.)
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Life History
(Add this as a new section title of the June 16, 1997 opinion, page 2.11 before the section titled "Distribution and habitat.")

Description:
(Replace the first paragraph of this section of the June 16, 1997 opinion, page 2.11, with the following.)
The Key deer's historical range probably extended from Key Vaca to Key West. The current range includes approximately 26 islands from Little Pine Key west to Sugarloaf Key (Lopez, 2001) (Figure 4, 1997 BO). The National Key Deer Refuge (NKDR) and Great White Heron National Wildlife Refuge (NWR) encompass much of this area and are managed by the Service for the Key deer and other wildlife. The principle factor influencing the distribution and movement of Key deer is the location and availability of freshwater. Key deer swim easily between Keys and use all the Keys during the wet season, but only 13 Keys provide water during the dry season. The Big Pine/No Name Key complex provides the most freshwater and forms the center of the Key deer's range, supporting more than 75 percent of the entire population (Lopez, 2001).

Distribution and habitat:
(Replace the last paragraph of this section to the June 16, 1997 opinion, page 2.12, with the following.)
Key deer utilize all habitat types including pine rocklands, hardwood hammocks, buttonwood salt marshes, mangrove wetlands, freshwater wetlands, and disturbed/developed areas (Lopez, 2001). They use these habitats for foraging, cover, shelter, fawning, and bedding. Pine rocklands hold freshwater year-round and are especially important to Key deer conservation. However, only 5 of 26 islands occupied by Key deer have significant pine rocklands. Key deer

also use disturbed/developed areas extensively for foraging, travel, loafing, and socializing.

Behavior:
(Add this section to the June 16, 1997 opinion, page 2.13, as the last two paragraphs of the section.)
Key deer have well defined patterns of activity and habitat use, and trails established from years of daily use are clearly visible in many areas within Key deer habitat. Roadkill hotspots are evident from the Service's long-term mortality database, further illustrating the habitual movement patterns of Key deer.

Feeding:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Reproduction:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends
(Replace the existing "Threats" title in the June 16, 1997 opinion, page 2.13, with the following title: "Status and trends" and replace that discussion with the following.)
By the late 1940s, over-hunting and wanton killing had reduced the Key deer population to an estimated 50-80 individuals, and by the early 1950s only 25 deer remained. In 1970, the Key deer population was estimated at 250-300 individuals. The protection afforded the Key deer through prohibitions on hunting, habitat management, and habitat protection through land acquisition has resulted in significant population increases. The population has most recently been estimated at 700-800 individuals (Lopez, 2001). Based on habitat condition and the presence of density-dependent disease in the population, the Key deer may be at or near ecological carrying capacity (Lopez, 2001).

Despite this increase in population, there has been a contraction in the range of Key deer from 1970 to 1999 (Lopez, 2001). Key deer have become increasingly abundant on Big Pine Key and adjacent islands, but have decreased to near zero on more distant islands such as Cudjoe and Sugarloaf Keys (Lopez, 2001). Although Key deer were never abundant on Cudjoe and Sugarloaf Keys, they now exist at such low numbers that local extirpation is likely in the near future (Lopez, 2001). This contraction in range has decreased the overall viability of the Key deer population by increasing the probability that a stochastic event, such as a severe hurricane or disease epidemic, may have catastrophic impacts to the core population on and around Big Pine Key.

Current threats to the Key deer include habitat loss and degradation resulting from development, fencing, fire suppression, invasive exotic plants, lack of fresh water, density-dependent disease, and road mortality. The main threat to the continued existence of the Key deer is the alteration of habitat caused by residential and commercial construction activities.

Development: Nearly half of the islands in the range of the Key deer are inhabited by people, and eight have large subdivisions and commercial development. Key deer are located in small, isolated, and fragmented habitats within very restricted ranges. Even though large parcels of land are in public ownership and are protected, Key deer utilize private property and require additional areas to maintain viable populations needed for long-term conservation of the species. Human construction activities within pinelands has destroyed and degraded habitat that is used by deer for feeding, resting, and reproduction.

Hammocks comprise the majority of uplands on most Keys. Hammocks serve as critical fawning areas for Key deer and the destruction or degradation of these habitats may have reduced the reproductive potential of the Key deer. Hardwood hammocks that provide drinking water resources, escape cover, food supply, and shelter have been destroyed by construction activities resulting from urbanization. Mangrove wetlands, buttonwood wetlands, and salt marshes provide important food plants and are heavily used by Key deer for feeding. These habitats have experienced substantial habitat loss as a result of development, but are now protected under local, State and Federal wetland regulations.

Land use patterns and disturbance drastically increased from the 1950s to 1990s. Destruction of habitat from construction activities increased over 1,000 percent between 1952 and 1989, with a loss of 500 ha (1,235 ac) of habitat. Much of the pineland, hammock, buttonwood, and saltmarsh was developed between 1955 and 1989. The herbaceous diversity and composition of pinelands changed in those 30 years. An estimated 47 ha per year (116 ac per year) of deer habitat was cleared on Big Pine Key from 1969 to 1973. The human population of Big Pine Key in 1990 was estimated at 4,208 permanent residents, a 77 percent increase since 1980. An additional 2,154 seasonal residents spend winters on Big Pine Key. Development on Big Pine Key is highly regulated due to the 1997 FEMA biological opinion and Monroe County's Rate of Growth Ordinance (ROGO)(State imposed). There are numerous State and local development controls currently limiting urban development throughout the Keys, however, they are not permanent and may be changed.

Human activities, such as fencing interfering with movement, harassment by dogs, death by automobile traffic, dependence upon food and water from humans, and habitat destruction by humans, adversely impact the Key deer. The presence of structures may discourage some deer from using the habitat, but some deer have become habituated to the presence of buildings and may not find it an impediment. Key deer sometimes use lots with buildings present for feeding, loafing, and insect-escape areas.

Fire suppression: Fire suppression has resulted in the deterioration of important pineland habitat, and the ability of land managers to use prescribed fire has been hampered by increasing urbanization. Fire suppression in the pinelands has adversely affected the Key deer by changing or removing important components of its habitat. Fire suppression causes ecological succession in pine rockland communities, resulting in increased hardwood cover, decreased herbaceous cover, reduced light penetration, and a general deterioration of habitat quality for Key deer.

Recently burned areas provide an increased amount of high nutrition browse material.

Fencing: Fencing associated with development may cause direct Key deer habitat loss, alter movement patterns, and prevent access to important resources. Habitat fragmentation from fencing and urbanization has restricted Key deer movements, creating bottlenecks that interfere with their ability to reach permanent water and feeding areas and have often forced them to cross roads in high traffic areas. Although fencing is regulated under the Monroe County Comprehensive Land Use Plan, many areas important to deer have been restricted from deer access because of fencing and some fencing may continue after adoption of this plan. An additional concern is injury or death as a result of attempting to jump these fences.

Invasive exotic plants: Exotic plant species such as Australian pine (*Casuarina* spp.), Brazilian pepper (*Schinus terebinthifolius*), and latherleaf (*Colubrina asiatica*) are invading Key deer habitat, displacing native vegetation and reducing habitat quality.

Freshwater availability: Permanent available freshwater occurs on 13 of the 19 islands Key deer use. Water is available on a semipermanent basis on Little Torch and Little Johnson, and seasonally on Summerland, Annette, and Big Torch Keys. Sources of water are related to rainfall, permanency of collecting sites, amount of freshwater trapped in limestone, relationship to freshwater lenses, and effects of human disturbance. Low rainfall periods, such as the one in late 1988 to early 1990, severely limit the availability of freshwater, particularly on small islands.

Freshwater resources have been lost and degraded by residential and commercial facilities built between 1970 and 1996. Excavation of isolated rock pits on Big Pine, No Name, and Summerland Keys have affected water availability by increasing evaporation and salinity and decreasing groundwater flow. In addition, dredging of tidal canals has lowered water tables and increased drainage from permanent and seasonal lenses. Mosquito ditching has contributed permanent water and may be important during drought on several Keys. However, ditching has resulting in saltwater intrusion, affecting the availability of suitable freshwater and changing the vegetation composition in certain areas.

Road mortality: Road mortality is the most significant source of deer mortality documented by NKDR over the last 30 years. Road mortality contributes to approximately 75-80 percent of all documented mortalities. An average of 54 roadkills per year were recorded from 1990 to 2000, with the majority of those on Big Pine Key, and those on U.S. Highway (Hwy.) 1 accounting for approximately 60 percent of this total (Table 2a). An increasing trend is observed from 1990 to1995 and 1996 to 2000 (Table 2a).

Table 2a. Analysis of Key deer road mortality between 1990 and 2000 estimated by field examination and necropsy of carcasses recovered by NKDR.

Year	U.S. Hwy. 1	Off U.S. Hwy. 1	Combined
1990-1995 Total	155	90	245
1990-1995 Annual Average	31 (63%)	18 (37%)	49
1996-2000 Total	195	151	346
1996-2000 Annual Average	39 (56%)	30 (44%)	69
1990-2000 Total	350	241	591
1990-2000 Annual Average	32 (60%)	22 (40%)	54

Road mortality is easily visible from roads, and dead or injured Key deer are typically reported by the public. Because of the high detection rate of roadkills relative to other mortality causes (especially natural causes), road mortality may be more accurately estimated than other less obvious mortality causes.

Road mortality has increased over the last 30 years, with the greatest increases occurring during the mid-1990s (Lopez, 2001). The increasing trend in Key deer road mortality between 1970 to 2000 is correlated to estimates in Key deer population growth over the same period (Lopez, 2001). This relationship suggests that road mortality estimates may provide a relative indication of population size; as population increases the incidence of road mortality increases. This trend in road mortality may not limit growth of Key deer population, but may decrease the rate at which the population can grow (Lopez, 2001). The Key deer herd on Big Pine and No Name Keys has increased over the 30 year period (1970-2000) that corresponds to a rapid increase in development, road construction, traffic volumes, and documented road mortality of Key deer (Lopez, 2001).

Key deer move more between and over islands to find freshwater and females during dry seasons and breeding season. During cycles when deer numbers are high, road mortalities may have less of a negative impact on the Big Pine Key deer population because the majority of the deer killed are dispersing males. However, catastrophes, such as hurricanes, may reduce Key deer numbers to the extent that road mortalities could adversely affect the population and cause extinction.

In November 2002, FDOT installed two underpasses in the undeveloped eastern portion of Big Pine Key and fences will be built to keep deer off this approximately one-mile long segment of highway. Deer guards will be placed at roads and driveways connecting to U.S. Hwy. 1. It is anticipated that road mortality on the project segment will be reduced from a baseline average of 15-20 deer annually (approximately 25 percent of all road mortality observed on the Big Pine Key segment of U.S. Hwy. 1) to 5 to 7 deer annually. FDOT is also constructing an additional traffic lane on U.S. Hwy. 1 on Big Pine Key. The purpose of this project was to alleviate traffic

congestion on the island and to improve motorist safety. The Service determined that this project would not jeopardize the deer and anticipated incidental take would not increase by more than four individuals annually over the life of the project.

Management: The NKDR was established in 1957 for the purpose of protecting and maintaining habitat for the Key deer and actively managing the Key deer population. The Service has acquired over 3,238 ha (8,000 ac) that will be managed as part of the NKDR. Management of Key deer habitat involves prescribed burning, removal of invasive exotic vegetation, wetland creation and restoration, and land acquisition. To decrease the impacts of road mortality, the Service is cooperating with FDOT and Monroe County to establish and enforce speed zones and maintain warning signs for deer crossings in an effort to reduce the number of road deaths. Service law enforcement is working to minimize human contact with Key deer, especially with public feeding. Other management activities include guzzler (water tank) maintenance, relocation of nuisance and rehabilitated animals, and research and monitoring of Key deer populations.

Educating the public about the conservation needs of Key deer is an integral component of NKDR management, especially in the suburban setting of Big Pine Key. The Key Deer Protection Alliance, a local conservation group formed in 1988, is also working to assist the Service in management of Key deer through public education, sponsoring direct action projects, and supporting preservation of Key deer habitat.

Analysis of the species likely to be affected

(Add this as a new section title to the June 16, 1997 opinion, page 2.14 and the following discussion after the above addition.)

The current range of the Key deer is restricted to the Lower Keys. The deer lives in a complex of native upland and wetland habitats interspersed in a mix of light to dense urban development. The Key deer herd has increased substantially over the past 40 years, due principally to a ban on hunting and from-protection and management of habitat within NKDR. Natural random events and the influence of human development, as indicated by habitat loss, fragmentation, and degradation, continue to negatively affect Key deer conservation. Road mortality represents the largest known source of documented Key deer mortality (Lopez, 2001).

Currently, Monroe County is under a residential building moratorium for the action area as a result of the inadequate traffic capacity for evacuation of the Florida Keys in an emergency on U.S. Hwy. 1. However, should this moratorium be lifted, because of improved traffic flow on U.S. Hwy. 1, Monroe County, under the County Comprehensive Land Use Plan, may issue residential building permits at a rate of eight per year.

Key Largo cotton mouse (Peromyscus gossypinus allapaticola)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description

(Add this as a new section title instead of "Description" in the June 16, 1997 opinion, page 2.14 and replace the existing discussion under "Description" with the following.)

The Key Largo cotton mouse is an island subspecies of the cotton mouse *(P. gossypinus),* a widespread species in the southeastern United States. It is a medium-sized mouse with large ears and bulging eyes, a reddish- to dusky-brown back, and white underparts. Its body length ranges from 170-189 mm (6.6-7.4 in), tail length ranges from 72-87 mm (2.8-3.4 in), and hind foot length ranges from 21-23 mm (0.82-0.90 in).

Life history

(Add this as a new section title of the June 16, 1997 opinion, page 2.14, before section titled "Distribution and habitat.")

Distribution and habitat:

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Behavior

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Feeding:

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Reproduction:

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends

(Add this as a new section title instead of "Threats" in the June 16, 1997 opinion, page 2.15 and add the following discussion.)

The Key Largo cotton mouse is restricted to a fraction of its former range. The majority of high quality hammock habitat available on North Key Largo has been protected through acquisition and management by the Service and State of Florida. As a result of these efforts and current land use regulations in place by Monroe County, the threat of occupied habitat loss from development on North Key Largo is low.

Factors other than habitat loss appear to be impacting the cotton mouse. Frank et al. (1997) failed to document the cotton mouse at the southern end on North Key Largo, an area where only black rats were captured and exotic fire ants (*Solenopsis invicta*) were abundant. Animals caught in traps where exotic fire ants were abundant were either dead or badly injured by the ants and trapping was discontinued in these areas following the initial night. This southern section of North Key Largo is generally disturbed; there are three residential subdivisions partly developed

and commercial development. Much of the undeveloped area in this vicinity is highly disturbed from past land clearing, unfinished developments, and rock mining. The hammock habitat in this area is bisected by old roads and several large abandoned buildings associated with the unfinished Port Bougainville development are present. Feral and domestic cats are abundant in this area.

The domestic cat is the most widespread terrestrial carnivore on earth, and the fact that cats negatively affect a vast array of wildlife species, especially birds and small mammals, is well documented (Churcher and Lawton, 1989). Cats are extremely flexible in food habits and social organization and hunt even when fed daily by humans (Liberg, 1985). Studies of food habits of feral cats have shown that mice often compose a large proportion of the diet (Churcher and Lawton, 1989). The feral and domestic cats on North Key Largo undoubtably impact cotton mouse populations, and in areas of relatively dense human population could be a principal factor in the absence of this species in this area.

The role of exotic fire ants in the ecology of the North Key Largo hammocks is unknown. However, the fire ant has been documented to seriously impact wildlife populations in other areas (Killion and Grant, 1993). Because the cotton mouse is ground nesting and nocturnal, it is likely that it would be vulnerable to fire ant predation while taking refuge in nests during the daytime. In addition, cotton mice bear helpless young which would be extremely vulnerable to fire ant predation.

Analysis of the species likely to be affected

(Add this as a new section title at end of cotton mouse portion of the June 16, 1997 opinion, page 2.15 and add the following discussion.)

The Key Largo cotton mouse was formerly distributed throughout Key Largo, but is now restricted to hardwood hammocks on North Key Largo (Frank et al., 1997). The majority of occupied habitat on North Key Largo is under public ownership and managed for conservation by the Service and the State of Florida. The current status of the cotton mouse appears good; the population is well distributed on North Key Largo and appears to be maintaining viable numbers (Frank et al., 1997). Threats to the cotton mouse include habitat loss resulting from development, predation by feral and domestic cats, predation by exotic fire ants, and stochastic environmental events such as fires and hurricanes.

Key Largo woodrat (Neotoma floridana smalli)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description

(Add this as a new section title instead of the title "Description" in the June 16, 1997 opinion, page 2.14.)

This is the same information as that presented in the June 16, 1997 biological opinion.

Therefore, no discussion will be included here.

Life history
(Add this as a new section title of the June 16, 1997 opinion, page 2.16, before the section titled "Distribution and habitat.")

Distribution and habitat:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Behavior
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Feeding:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Reproduction:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends
(Add this as a new section title instead of the title "Threats" in the June 16, 1997 opinion, page 2.17, and replace the discussion in that section with the following.)
Efforts to monitor the status of the Key Largo woodrat population began in the 1970s and have continued intermittently (Frank et al., 1997). Past studies and monitoring efforts indicate that the Key Largo woodrat population has experienced a substantial decline sometime in the late 1980s and early 1990s (Frank et al., 1997). The following time line documents what is known about the decline in woodrat numbers.

In 1952, the Key Largo woodrat was distributed on Key Largo, but was apparently most abundant on the northern end of the island even at that time. Stick nests were prominent features of the species. For example, one survey of stick nests examined a total of 40 nests in a single location four miles north of U.S. Hwy. 1 on C.R. 905.

In July 1971, 19 woodrats (ten males, nine females) were relocated from North Key Largo to Lignumvitae Key. The introduction was apparently successful based on stick nest presence observed by Hersh (1978) and park rangers until at least 1985-1986.

Hersh (1978) conducted a study of the woodrat in 1976-1977 and found densities of 2.2 animals per ha (0.9 animals per ac) on North Key Largo. Stick nests were common and used as a general indicator of woodrat presence. An index of 5.6 nests per woodrat was developed. Management recommendations from her study suggest old, mature hammock supports the highest Key Largo

woodrat density.

Barbour and Humphrey (1982) conducted a status survey in 1979 and estimated that there were 3,666 Key Largo woodrat stick nests and 645 individual Key Largo woodrats over an area of 90 ha (222 ac). These estimates were based on 40 0.4 ha (one ac) strip transects established along C.R. 905. They found Key Largo woodrats on Lignumvitae Key at comparable densities to North Key Largo, and estimated 85 woodrats occurred on the island at a density of 0.9 per acre (2.25 per ha). They concluded that Key Largo woodrat density was highest in mature forest, and that active stick nests were strong indicators of healthy Key Largo woodrat populations.

Goodyear (1985) used traplines placed in hammock the length of North Key Largo, and concluded that woodrats were found in areas with and without stick nests. She concluded that woodrats are not dependent on stick nests. She suggested that stick nest construction was more a function of habitat conditions. Habitats with abundant natural cover had fewer stick nests. She felt that disturbance could benefit woodrats in habitats with few natural cavities such as recently cleared early successional sites. Older hammocks with increased structural complexity were considered prime habitat.

Humphrey (1988) based his study on grid trapping conducted at six sites on North Key Largo in 1986. Low density Key Largo woodrat sites were found on the north end of North Key Largo and averaged 3.1 per ha (1.3 per ac). Sites further south had higher woodrat densities, averaging 12.2 per ha (4.9 per ac). Humphrey concluded that woodrat densities were seven times the levels reported by Hersh (1978) and three times the levels reported for Eastern woodrats. He also concluded that stick nests were poor estimators of Key Largo woodrat density and tended to underestimate density. Extrapolating average density over acres of habitat available, Humphrey estimated a total of 6,500 individual woodrats were in existence on North Key Largo.

In 1995, Frank et al. (1997) initiated a transect and grid study of Key Largo woodrats on North Key Largo. Prior to this project, the Key Largo woodrat had not been monitored by any agencies or individuals since the 1986 effort by Humphrey. Frank et al. (1997) found that in general, Key Largo woodrat densities had declined significantly since the 1986 project, and that stick nests were virtually absent from the habitat. Frank et al. (1997) expressed concern that low densities coupled with the absence of stick nests could indicate significant declines in the Key Largo woodrat population and suggested that intensive monitoring and management be initiated by State and Federal land managers. Key Largo woodrats were found to be extirpated on Lignumvitae Key as evidenced by both trapping and lack of sign.

In 1996, the University of Miami initiated a project on the Key Largo woodrat that expanded on the Frank et al. (1997) project using the same trapping locations and methods (Sasso, 1999). The study did not document increases in either stick nests or woodrat densities, and concluded that intermediate-aged hammock may provide better habitat conditions than old, mature hammock, and suggested a possible role for natural disturbance (hurricanes) in maintaining good Key Largo woodrat habitat.

Crocodile Lake NWR has continued Key Largo woodrat monitoring using both transect and grid trapping annually since 1998. The most recent survey was conducted in 2000-2001 and included 15 transects and four 1.8 ha (4.4 ac) grids. Total trap nights was 10,400 with an average trap success of 0.004 percent, and an average Key Largo woodrat density of 0.6 individuals per hectare (1.5 per ac).

Trapping initiated in January 2002 by Texas A & M University (TAMU) has documented low numbers of Key Largo woodrats and a high mortality rate of radio-collared individuals. In three months of trapping, TAMU has accumulated a total of 3,342 trap nights with a trap success of 0.004 percent and an average Key Largo woodrat density of 0.3 per hectare (0.7 per ac). In addition, all Key Largo woodrats have been captured in relatively young forest stands with debris present, and two Key Largo woodrats with radio-collars are nesting in garbage heaps.

The majority of high quality hammock habitat available for Key Largo woodrats on North Key Largo has been protected through acquisition and management by the Service and State of Florida. The most important measure to protect the Key Largo woodrat has been to prevent development on the remaining habitat on North Key Largo through the acquisition of nearly all suitable habitat remaining. Approximately $65 million has been spent by both State and Federal governments to acquire 880 ha (2,147 ac) of hammock habitat on North Key Largo. As a result of these efforts and current land use regulations by Monroe County, the threat of future occupied habitat loss from development on North Key Largo is low.

Factors other than habitat loss appear to be impacting the Key Largo woodrat. The past alteration of the hammock on southern North Key Largo has reduced the amount of available hammock habitat and reduced the quality of that habitat remaining. The three residential subdivisions in the southern end of North Key Largo have caused a permanent loss of total hammock area and the resulting disturbance has fragmented the southern portion of the hammock area. There is also an active solid waste transfer station within the occupied range of the Key Largo woodrat; the impact of this facility on the Key Largo woodrat is unknown. In addition to loss and fragmentation of habitat, the man-made disturbances in this area have resulted in enhanced access to the hammocks by exotic species that benefit from disturbance including feral and domestic cats, exotic fire ants, and invasive exotic vegetation. These non-native species adversely impact the woodrat through predation, competition, and habitat alteration.

The current status of the Key Largo woodrat is precarious, and populations are believed to have declined to the point where extinction is a very real possibility. The total population of Key Largo woodrats is believed to be less than 200 individuals distributed over an area of approximately 880 ha (2,147 ac). Because of the severe and proximate threats of extinction to this population and our lack of detailed knowledge regarding the specific mechanism of this decline, the Service initiated a captive propagation project for the Key Largo woodrat in April 2002. This captive propagation project is a short-term solution to prevent the extinction of the Key Largo woodrat while habitat management and other options can be implemented.

Efforts to manage the hammocks on North Key Largo have focused primarily on the maintenance of an intact ecosystem. The restoration of degraded sites through debris removal and invasive plant control are the primary management action on both State and Federal preserves. While the specific mechanisms responsible for the decline of the Key Largo woodrat is not known, factors are being investigated as possible contributors to this decline:

- *Natural habitat changes*: Successional changes towards more mature habitat may have degraded Key Largo woodrat habitat. The recent observation of Key Largo woodrats inhabiting refuse piles may support this idea. In addition, natural predators may be more abundant or forage more efficiently in mature hammock (easier for an owl to forage), or natural runways in the form of fallen logs may be reduced. Hersh (1978) suggested runways are a key habitat component for the Key Largo woodrat.

- *Habitat loss and degradation*: Development in the 1960s and 1970s has degraded habitat conditions. This process has taken several years, notably 1985-1995, to manifest itself into realized population declines.

- *Exotic predators*: The exotic fire ants, feral and domestic cats, and black rats are all relatively recent invaders of North Key Largo and are each potential predators and competitors of Key Largo woodrats.

- *Disease*: There is evidence that disease carried by racoons, infection by the roundworm (*Baylisascaris procyonis*), has impacted Allegheny woodrats *(N. magister)* in the northeast (Logiudice, 2001). There are large numbers of racoons on North Key Largo, but tests for roundworm to date have been negative. It appears, therefore, that disease is not a factor.

Analysis of the species likely to be affected

(Add this as a new section title and discussion at end of woodrat portion in the June 16, 1997 opinion on page 2.17.)

The Key Largo woodrat formerly was distributed throughout Key Largo, but is now restricted to hardwood hammocks on North Key Largo. The majority of occupied habitat on North Key Largo is under public ownership and managed for conservation by the Service and the State of Florida. Despite the protected status of this habitat, the Key Largo woodrat continues to decline, and the outlook for recovery is poor. Threats to the Key Largo woodrat include habitat loss from past development, predation by feral and domestic cats, predation by exotic fire ants, and stochastic environmental events such as fires and hurricanes.

Key tree-cactus (Cereus robinii)

This is the same information as that presented in the June 16, 1997 biological opinion at page 2-17. Therefore, no discussion will be included here.

Species description
(Add this as a new section title instead of the title "Description" in the June 16, 1997 opinion on page 2.17.)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Life history
(Add this as a new section title before "Distribution and habitat" in the June 16, 1997 opinion on page 2.18.)

Distribution and habitat:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Reproduction:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends
(Add this as a new section title instead of the title "Threats" in the June 16, 1997 opinion and add the following discussion to the bottom of page 2.19.)
Hurricanes also have the potential to adversely impact tree-cactus populations. Hurricane Georges hit Big Pine Key in October 1998 and caused severe damage to the tree-cactus population on the NKDR. Many of the larger adult cacti were damaged by high winds and adjacent vegetation. The long-term impacts of hurricanes on tree-cactus are difficult to predict, but because the number of locations where cacti occur has been drastically reduced, the threat of hurricanes is significant.

Development of occupied tree cactus habitat remains the most significant threat to the long-term conservation of this species. Of the remaining seven populations of tree cactus, only three occur on protected public lands: one at the NKDR and two at Long Key State Recreation Area. The other four occur on private lands and could be extirpated through development activities.

Analysis of the species likely to be affected
(Add this as a new section and add the following discussion as the first paragraph on page 2.19.)
The Key tree-cactus occurs at seven locations in the Keys. Only three (two on Long Key and one on Big Pine Key) locations are protected on public lands managed for conservation. The main threat to the continued existence of this cactus is habitat loss from development at the four sites in private ownership.

Lower Keys marsh rabbit (Sylvilagus palustris hefneri)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description

(Add this as a new section title instead of the title "Description" in the June 16, 1997 opinion, page 2.20.)
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Life history

(Add this as a new section title in the June 16, 1997 opinion, page 2.20, before the section titled "Distribution and habitat.")

Distribution and habitat:
(Replace the existing section of the June 16, 1997 opinion, page 2.20 to 2.21, with the following section.)
Marsh rabbits are found throughout southeastern North America. *Sylvilagus p. palustris* is found from southeastern Virginia south to the Georgia/Florida border. *Sylvilagus p. paludicola* is found from the Georgia/Florida border south to the Upper Keys. The Lower Keys marsh rabbit's original range extended from Big Pine Key to Key West, encompassing a linear distance of about 48 km (30 mi). Historically, Lower Keys marsh rabbits probably occurred on all of the Lower Keys that supported suitable habitat but did not occur east of the Seven-mile Bridge where it is replaced by *S. p. paludicola*.

The Lower Keys marsh rabbit is habitat-specific, depending upon a transition zone of grasses and sedges for feeding, shelter, and nesting. This species primarily occurs in the grassy marshes and prairies of the Lower Keys. These wetland communities lie in the middle of the salinity gradient in the Lower Keys. Key vegetative species include grasses and shrubs (shoregrass [*Monanthochloe littoralis*]; saltwort [*Batis maritima*]; Virginia glasswort [*Salicornia virginica*]; marsh fimbry [*Fimbristylis spadicea*]); succulent herbs (bushy seaside oxeye [*Borrichia frutescens*]); sedges (*Cyperus* spp.); and sparse tree cover (buttonwood, catclaw blackbeard).

Lower Keys marsh rabbits also use freshwater marshes, most notably on Big Pine Key. Freshwater marsh areas are dominated by sawgrass (*Cladium jamaicense*), with succulent herbs like seashore dropseed (*Sporobolus virginicus*) and grasses like cordgrass (*Spartina* spp.). Freshwater marshes are found in depressions in the interior of only a few islands, primarily Sugarloaf, Cudjoe, and Big Pine Key. During the wet season these areas can accumulate standing water.

Rabbits also use coastal beach berm habitat, a relatively rare habitat, consisting of a vegetated high ridge of storm-deposited sand and shell. Coastal berms are vegetated with over 84 plant species including beeftree, gumbo-limbo, poisonwood, seagrape (*Coccoloba uvifera*), and Spanish stopper. Significant tracts of coastal berm habitat in the Lower Keys are found on Big Pine, Newfound Harbor, Lower Sugarloaf, Saddlebunch, Boca Chica, and Geiger Keys.

Lower Keys marsh rabbits prefer areas with higher amounts of clump grass, ground cover, and bushy seaside oxeye present, close to other existing rabbit populations and to large bodies of water (Forys, 1995). These rabbits spend most of their time in the mid-marsh (bushy seaside

oxeye) and high-marsh areas (*Spartina* spp. and marsh fimbry), both of which are used for cover and foraging, while most nesting occurs in the high-marsh area (Forys, 1995). Lower Keys marsh rabbits occasionally use low shrub marshes and mangrove communities (red mangrove, black mangrove [*Avicennia germinans*], white mangrove [*Laguncularia racemosa*], buttonwood) for feeding and as a corridor between patches of transitional habitats. Plant species that are most important to the Lower Keys marsh rabbit for cover and nesting include Gulf cordgrass, marsh fimbry, and sawgrass, all of which can form thick cover.

Due to urbanization between 1970 and 1996, Lower Keys marsh rabbit habitat has been lost and the remaining habitat fragmented. Currently, the habitat consists of a mosaic of small native and disturbed habitat patches. In the two years between the 1988-1990 study for the Lower Keys marsh rabbit's listing and the actual listing, four of the 15 original sites used in the listing were destroyed.

In 1995, a comprehensive survey for Lower Keys marsh rabbit habitat located 125 areas, comprising a total of 317 ha (783 ac), that provided suitable habitat (Forys et al., 1996). Lower Keys marsh rabbits have been recorded at 61 of these 125 areas at some point in time. The majority of these areas of suitable habitat are smaller than three ha (7.4 ac) and the total amount of habitat occupied by the rabbit is about 253 ha (625 ac) (Forys et al., 1996). Lower Keys marsh rabbits currently occur on only a few of the larger Lower Keys including Boca Chica, Saddlebunch, Lower Sugarloaf, and Big Pine and small islands near these Keys (Forys et al., 1996) (Figure 8, 1997 BO). There is a large gap in the distribution of rabbits from Cudjoe Key to the Torch Keys. Approximately 23 percent of the total suitable habitat (both occupied and unoccupied by rabbits) is owned by the military, 38 percent is Federal, State, or county owned, and the remaining 39 percent is privately owned. The majority of the sites that remain are isolated from each other by urbanized areas, and population interchange seems unlikely.

This rabbit relies on the recolonization of vacant habitat patches for survival (Forys et al., 1996). Subpopulations in habitat patches are vulnerable to extinction, but vacant habitat patches have the potential to be recolonized by dispersing rabbits. The potential for recolonization has been decreased or eliminated because of loss or fragmentation of its habitat. Since urbanization has affected both occupied and unoccupied sites, not only is survival affected, but the opportunity for natural or managed recolonization has been reduced.

Population structure:

(Add this section to the June 16, 1997 opinion, after the above section on page 2.21)

The Lower Keys marsh rabbit, with its small body size, short life span, high reproductive potential, and high habitat specificity, exhibits classic metapopulation community dynamics (Forys, 1995; Forys and Humphrey, 1999). There are approximately 51 subpopulations of rabbits that occur in small disjunct patches of habitat on four primary keys and adjacent smaller isolated Keys. Rabbits living in these habitat patches are socially isolated from other patches but interact through dispersal (Forys and Humphrey, 1996). Distance among habitat patches is important because the ability of rabbits to recolonize vacant habitat patches depends upon the presence of habitat corridors. These habitat patches occur in a fragmented composite of native and disturbed

habitat, with few contiguous areas of native habitat greater than five ha (12 ac) (Forys, 1995). Random population fluctuation is evident in rabbit populations; several populations were so small and contained so few individuals of the same sex that they eventually became extirpated (Forys, 1995; Forys and Humphrey, 1999). Over two-thirds of the habitat identified in the Lower Keys is currently occupied by rabbits at a density below carrying capacity (Forys et al., 1996).

Behavior:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Feeding:
(Add this as a new section title of the June 16, 1997 opinion, after "Behavior" on page 2.21.)
Rabbits are herbivores, feeding on grasses, succulent plants, and herbaceous shrubs. Lower Keys marsh rabbits show a preference for particular plant species, and the most important food species is bushy seaside oxeye. Lower Keys marsh rabbits feed on at least 19 different plant species, representing 14 families (Forys, 1995). The most abundant species in the rabbit's diet include seashore dropseed, Virginia glasswort, spartina, beeftree, red mangrove, and white mangrove. Dietary habits are not affected by sex or season.

Based on their distribution, Lower Keys marsh rabbits appear to need only a little freshwater to survive. In a study of several mammals from the Lower Florida Keys, the rabbit was found to have one of the highest capacities to concentrate urine. The rabbit may be able to survive solely on dew and brackish water, but probably cannot use seawater.

Reproduction:
(Add the following to this section of the June 16, 1997 opinion, at the end of the existing discussion on page 2.22)
Both sexes begin to mature at about nine months of age. During this time, the majority of the males disperse. Sexually maturing females do not appear to disperse. Lower Keys marsh rabbits are polygamous and breed year round. Higher anestrous (infertile) periods are evident from mid-October through mid-March, although anestrous females are present in every month. During a breeding season, male rabbits become sexually active just prior to females, whose breeding may be induced by male behavior.

Some female marsh rabbits in South Florida could potentially produce ten-12 litters per year, although this high rate of productivity is rare since some females fail to breed each month. Usually, 75 percent of female marsh rabbits in South Florida are pregnant during the height of the breeding season. Although no estimate is available for Lower Keys marsh rabbits, the average gestation period of marsh rabbits from mainland Florida ranges from 30 to 37 days. The average number of litters produced during the wet and dry seasons do not differ significantly. The highest proportion of females with litters occurs in March and September, with the lowest proportion in April and December. In South Florida, other marsh rabbit pregnancy rates are usually lower from September through December and higher from February through June. One to three young (average of 1.77) have been observed per nest for Lower Keys marsh rabbits

(Forys, 1995). An average of 3.7 litters per year has been reported for Lower Keys marsh rabbits (Forys, 1995). Some marsh rabbits experience total litter resorption that can affect their reproductive output. This reproductive loss can be related to maternal physiological changes in response to stressful events like overcrowding. It is not yet known if such stresses cause total litter resorption in Lower Keys marsh rabbits, but with the continual loss of habitat, marsh rabbits may experience similar problems.

Status and Trends

(Add this as a new section title instead of the title "Threats" in the June 16, 1997 opinion and substitute the following to the end of the existing section, page 2.22.)

Although once abundant on many of the Lower Keys including Key West, habitat destruction has limited this rabbit to small populations on a few Keys. Population estimates range between 100 and 300 rabbits in the Lower Florida Keys. In 1991, there was a high of 300 individuals, and by 1993, the population decreased to 100 individuals (Forys and Humphrey, 1999). Forys et al. (1996) report an estimated population size of 275 rabbits.

A population viability analysis (PVA) conducted for the Lower Keys marsh rabbit predicted that this species may become extinct in 20 to 30 years under current conditions (Forys and Humphrey, 1999). Although the PVA did not evaluate the effects of any increases in the threats, we expect that such increases would only accelerate the extinction of the Lower Keys marsh rabbit. When different management scenarios were included in the model, the persistence of the Lower Keys marsh rabbit was extended to 50 years if all predation by cats was removed (Forys and Humphrey, 1999). Persistence was not extended appreciably if all road mortality were removed or reintroductions into vacant patches were conducted. The PVA did not assess whether habitat restoration, introductions into occupied habitats, or a combination of management activities would change persistence rates. Considering the condition of the Lower Keys marsh rabbit, the continued degradation of its habitat and predation by cats are likely to push the rabbit to extinction.

The Lower Keys marsh rabbit is threatened by habitat alteration, contaminants, road mortality, poaching, domestic animal predation, feral hogs, exotic fire ants, and exotic vegetation. These threats have resulted in a decrease in the number of populations, a decline in the size of the populations, the isolation of populations, an increase in road mortalities, increased feral and domestic cat predation, and the loss of foraging, shelter, and nesting habitat.

In the past 20 years, more than half the area of suitable habitat has been destroyed for construction of residential housing, commercial facilities, utility lines, roads, and other infrastructure in the Lower Keys. Much of the remaining suitable habitat has been degraded by exotic plants, repeated mowing, dumping of trash, off-road vehicle use, and feral and domestic cats. Development has fragmented the sites occupied by rabbits and has eliminated many of the corridors that allow rabbits to move among sites. In urbanized areas where the vegetation has been mowed, dispersing rabbits have no cover from predation.

Same-sex adult territories do not overlap; therefore, rabbits may be forced to have smaller

territories if habitat is continually fragmented. If fragmentation continues, habitat will become increasingly isolated and dispersal and migration of rabbits will be hindered. The minimum habitat size considered suitable to support the rabbit is based on the minimum home range size of 0.3 ha (0.7 ac). The destruction and fragmentation of habitat may result in habitat patches that are too small to support the Lower Keys marsh rabbit. For example, five occupied habitat patches located on isolated islands without cat predation were determined not large enough to support viable populations of this species long-term (Forys and Humphrey, 1999).

Mortality from feral and domestic cats may be the greatest current threat to the persistence of the rabbit (Forys and Humphrey, 1999). A detailed study of cat diets in the Keys has not been conducted, but rabbits were the largest component of feral cat diets in several studies conducted elsewhere. The number of cats present in the Lower Keys has increased over the past 20 years with the increase in the human residential population. Rabbits appear to be equally susceptible to cat predation, regardless of gender or age. Feral and domestic cats are present on most of the larger islands that contain some degree of development. Forys et al. (1996b) reported that feral or domestic cats occurred in 14 of 19 newly-located rabbit subpopulations.

Roads can interfere with home range movements and dispersal and may prevent essential interchange between subpopulations (Forys and Humphrey, 1999). Dispersing males are the most vulnerable to road mortality. Dispersal is the means of populating sites where rabbits no longer exist. Since only a portion of the males breed during the year, the loss of these males may lower the likelihood of mating and hence decrease the reproductive potential. Rabbit road mortality totaled four on Naval Air Station (NAS) between 1992 and 1994 (Forys, 1995). This represents only those animals that have been recovered; it is reasonable to assume that others were never recorded (undetected in roadside vegetation or carried off by scavengers). Off-road vehicular activities also affect the rabbit through habitat degradation and direct mortality. At least one radio-collared rabbit was killed by an off-road vehicle on NAS (Forys, 1995). Road mortality on Big Pine Key is poorly documented, but at least three individuals have been recovered since 1990.

Increased nutrients from septic tanks and fertilizers degrade water quality in habitat of the rabbit. Illegal dumping deteriorates habitat and allows the infestation of exotic plants and animals to occur. Poaching has decreased, although it still occurs infrequently. Feral hogs destroy rabbit habitat while foraging, but the extent of impact has not been analyzed. The exotic fire ants have been increasing in marsh habitat and pose a threat to newborn rabbits.

Management:

(Add this as a new section title of the June 16, 1997 opinion, page 2.22 following the above section.)

Management for the rabbit should consist of the maintenance of as many patches of suitable marsh habitat as possible in as near-pristine condition as possible. This includes the elimination of feral and domestic cats, exotic fire ants, and invasive exotic vegetation. In addition, active manipulation of rabbit subpopulations through translocation and captive breeding may also be required in order to maintain populations. Rabbit relocations to Little Pine Key occurred in 2002, establishing another area of rabbit use and providing valuable information on using this

technique.

To decrease negative effects on the rabbit at NAS, the Service consulted with the Navy in 1993 concerning rabbit road mortalities and mowing activities on the base. Several actions have been initiated by the Navy in an attempt to reduce these effects, including the posting of "no mowing" signs in important rabbit habitat, fencing of some rabbit habitat to prevent illegal vehicle traffic, removal of some exotics, and the elimination of the feral and domestic cats on the installation. These cooperative efforts have not only minimized impacts on the rabbit but also provided additional protection. The rabbit and its habitat are also protected on NKDR and Great White Heron NWR.

Analysis of the species likely to be affected

(Add this as a new section title and discussion at end of rabbit discussion in the June 16, 1997 opinion, page 2.22.)

Recovery of the Lower Keys marsh rabbit will be challenging due to the lack of available habitat, road construction causing habitat fragmentation and development, and increased mortality due to cats. This recovery potential will increase if active management of populations and habitats is undertaken (Forys, 1995). Since residential and commercial construction affected both occupied and unoccupied sites over the past three decades, opportunities for conservation of the rabbit have been reduced.

Schaus swallowtail butterfly (*Papilio aristodemus ponceanus*)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description

(Add this as a new section title instead of the title "Description" in the June 16, 1997 opinion, page 2.22)

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Life History

(Add this as a new section title in the June 16, 1997 opinion, page 2.22, before the section titled "Description and habitat.")

Distribution and habitat:

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Behavior:

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Feeding:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Reproduction:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends
(Add this as a new section title instead of "Threats" in the June 16, 1997 opinion and replace the discussion, on page 2.27 with the following.)
Habitat loss, habitat fragmentation, and application of pesticides are the primary factors responsible for the decline of Schaus swallowtail throughout its range. Traffic made possible by paved roads through Schaus swallowtail butterfly habitat, particularly S.R. 905 on northern Key Largo, result in road kill of adults. Aerial application of insecticides for mosquito control throughout the Keys likely adversely affects Schaus swallowtail populations. The pesticides Dibrom, Baytex, and Teknar, used in the Keys for mosquito control, are toxic to the related giant swallowtail butterfly in the laboratory. Threats to the conservation of the Schaus swallowtail are habitat loss due to development, pesticide use, over-collecting, and climatic factors such as hurricanes, freezes, and droughts. The population on Key Largo is at risk due to extensive habitat loss and fragmentation, making preservation of remaining large contiguous forest fragments essential.

The Schaus swallowtail butterfly has always had a very restricted range in southern Florida (Figure 23, 1997 BO). It is most abundant on the Keys of Biscayne National Park, with a reintroduced population on the mainland of the Miami metro area and populations in northern Key Largo, where it exists on State lands, Crocodile Lake NWR, and private lands. The Schaus' range suffered a direct hit from Hurricane Andrew in 1992. The Service sponsored a captive breeding program that helped Schaus populations to recover and expand through the mid-1990s. Census information from the 1990s indicated an increase in numbers, however, results from 2000 and 2001 showed a decline in numbers. This decline was likely due to drought that curtailed food supplies for larvae. Status surveys in 2000 estimated an adult population of 200-250; results from 2001 showed only about 100-120. The estimate for 2002 was about 190-230. Additionally, researchers have recently observed a reduced adult life span for this butterfly.

Analysis of the species likely to be affected
(Add this as a new section title and discussion in the June 16, 1997 opinion after the above discussion on page 2.27.)
The current range of the Schaus swallowtail includes hardwood hammock on the upper Florida Keys from Lower Matecumbe Key north to Elliot Key. Habitat loss from development, pesticide use, and over-collecting are the primary causes for this species decline. Hammock fragments are increasingly rare in the upper Keys as a result of development activities. Therefore, acquisition of the remaining patches for conservation is a high priority.

Silver rice rat *(Oryzomys argentatus)*
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description
(Add this as a new section title instead of the title "Description" in the June 16, 1997 opinion, page 2.27, before the section "Distribution and habitat.")
This is the same as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Life history
(Add this as a new section title of the June 16, 1997 opinion, page 2.28.)
Distribution and habitat:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Behavior:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Feeding:
This is the same as information that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Reproduction:
This is the same as information that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Critical habitat
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends
(Add this as a new section title instead of the title "Threats" in the June 16, 1997 opinion, page 2.29, and replace the discussion under "Threats" with the following.)
The main threat to the rice rat is degradation, fragmentation, and loss of habitat due to urbanization. Rice rats require expanses of high-quality salt marsh habitat. The conservation of the rice rat may be adversely affected by construction activities for residential and commercial development, as well as by mangrove trimming. These activities can cause direct mortality of individuals through land clearing and habitat loss. Fragmentation results in isolated patches of habitat too small to support the rice rat. Additional threats from human encroachment on the viability of the rice rat have been difficult to quantify because of the low population densities of this species throughout the Lower Keys. In some areas, the natural hydrologic cycles of rice rat

habitat has been altered by the construction of fill roads, borrow pits, and mosquito ditches. While the effect of these disturbances on rice rat ecology is unknown, it is most likely adverse. These alterations may encourage growth of exotic vegetation which may reduce the ability of the habitat to support rice rats.

Construction activities also increase the densities of black rats and feral and domestic cats. Cats are predators of rice rats and there is evidence of interspecies competition between rice rats and black rats. Feral and domestic cats are abundant throughout the Lower Keys, and forage in the higher elevation salt marsh habitats used by the rice rat. Because rodents are often the most abundant items in a domestic cat's diet (Churcher and Lawton, 1989), this is a main threat to the rice rat.

Residential areas and solid waste accumulation encourages establishment of black rats. Rice rats and black rats use habitats that overlap, and islands with high densities of black rats support few rice rats. These data suggest that black rats may out compete rice rats for food and habitat resources. In areas of suitable habitat, the occurrence of black rats may preclude the continued existence of rice rats. Pesticides used to control black rats may also threaten the rice rat.

Exotic fire ants may cause direct mortality of rice rats. Exotic fire ants have been documented to cause declines in populations of small mammals in Texas (Killion and Grant, 1993). The ants are attracted to mucous, so newborn rice rats are vulnerable to predation (Forys et al., 1996).

The small, isolated, and widely distributed populations of rice rats are also vulnerable to extinction through random demographic fluctuations, loss of genetic variability caused by small population size, and hurricanes that may affect the entire population.

Analysis of the species/critical habitat likely to be affected

(Add this as a new section title and discussion of the June 16, 1997 opinion, following the above discussion on page 2.29.)

Seven of the nine Keys in critical habitat are within the NKDR boundaries. Although the NKDR is managed for Key deer, the habitat requirements and biological needs of the species and the silver rice rat do not conflict. Both the permitting program of the U.S. Army Corps of Engineers (COE) and the administration of flood insurance by FEMA affect rice rat critical habitat. These COE actions include such activities as the filling of transitional wetlands for residential construction. FEMA provides flood insurance for residential and commercial development activities which in some cases involves structures in rice rat critical habitat. A large portion of the construction of platted subdivisions and single family residences has occurred in rice rat habitat between 1970 and 1996. Many of these are located within critical habitat. The construction of these subdivisions resulted in the loss of rice rat habitat. These construction activities also increased the number of predators and competitors, such as dogs, cats, raccoons, and black rats. However, since the RPA has been in effect, these impacts have been avoided and minimized.

The rice rat occurs in freshwater and tidal wetlands on several islands in the Lower Florida Keys.

This species requires large, intact marsh systems for its conservation. A large amount of occupied rice rat habitat has been protected through public acquisition and management, but significant areas also remain in private ownership. Although the wetlands inhabited by the rice rat are generally protected through wetland regulations, the threat of critical habitat loss still exists because permits to destroy wetlands can be obtained with sufficient mitigation.

***Stock Island tree snail** (Orthalicus reses reses)*

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Species description

(Add this as a new section title instead of the title "Description" in the June 16, 1997 opinion on page 2.30.)
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Life history

(Add this as a new section title in the June 16, 1997 opinion, page 2.30, before section titled "Distribution and habitat.")

Distribution and habitat:

(Add the following discussion to the end of this section of the June 16, 1997 opinion on page)
As a result of unauthorized introduction efforts, the Stock Island tree snail occupies six areas outside its historic range. Sites at John Pennekamp Coral Reef State Park, Key Largo Hammock State Botanical Site, and the Everglades NP/Big Cypress Preserve area are publicly owned and protected. However, the other three areas, located in south Key Largo subdivisions, Calusa Cove Camp Ground, and Monkey Jungle, are in private ownership and subject to human disturbance.

(Replace paragraphs two and three under section "Distribution and Habitat" with the following two paragraphs on page 2.30 in the June 16, 1997 opinion.)
The Stock Island tree snail survives best in higher-elevation hammocks (minimum elevations of 1.5-3.4 m (five-eleven ft)) that support large amounts of lichens and algae. Larger trees support more Stock Island tree snails than smaller trees because they provide the snails with an increased surface area for foraging. There is no evidence that Stock Island tree snails prefer certain tree types or species, although they seem to prefer trees with smooth bark over trees with rough bark. Stock Island tree snails are arboreal except when they move to the forest floor for egg deposition or dispersal.

Hammocks that contain well-developed soils or leaf litter are probably necessary for reproductive activity and dispersal. No data are available on minimal hammock size needed to support a viable population of tree snails. Suitable habitat would have to include an area large enough to provide for foraging and nesting requirements as well as provide for the microclimate (air temperature and humidity) needed by the Stock Island tree snail.

Behavior:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Feeding:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Reproduction:
This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Status and trends

(Add this as a new section title instead of the title "Threats" in the June 16, 1997 opinion and replace the existing discussion with the following on page 2.31.)

Since listing, the snail has been eliminated from its historic range on Stock Island by extensive habitat destruction. The primary threats to the conservation of the snail include loss of habitat from development, application of pesticides, fragmentation of habitat, and predation by black rats and exotic fire ants. Pesticide use near known sites of the Stock Island tree snail has impacted populations either by poisoning animals directly or altering reproduction. Trash and debris piles provide home sites for black rats which prey on the snail. Illegal collecting of the snail has reduced the populations and contributed to the extirpation of the snail from Stock Island. The population on Key Largo is at risk due to development, making preservation of the remaining large contiguous forest fragments essential (Forys et al., 1996).

Recent surveys have confirmed that the Stock Island tree snail is virtually absent from Stock Island and Key West. Four populations on Key Largo exist with two of the Key Largo sites, both privately owned, containing healthy populations.

Populations of Stock Island tree snails were established at six locations outside of the historical range. All areas were known to support Stock Island tree snails in the recent past; however, surveys conducted in 1995 and 1996 indicated a decline in or an absence of snails. The areas are as discussed below.

Approximately 33 snails were placed on John Pennekamp Coral Reef State Park, Key Largo in 1993. By 1995, no snails were found. Additional snails were released here in 1996, but later surveys revealed no snails. The absence of snails may suggest low quality habitat, interference (e.g., relocating, collecting) from snail collectors, or simply dispersion. The status of this population is considered to be low, or possibly extirpated.

Key Largo Subdivisions, Key Largo: Due to the elimination of snails on Stock Island, collectors moved an unknown number of snails to several single family lots in various Key Largo subdivisions. In one subdivision, several lots support snails. In December 1995, one lot was cleared and the adjoining lot is now planned for clearing and requires authorization under the

ESA for compliance with section 9. A Service survey conducted in August 1996 on this lot revealed 72 snails present. Most of these snails were young (one to two years old). Another lot in the same area contains over 50 snails, most of which are older snails (five plus years old). Although other lots have not been surveyed, snails may be present. The snails in these subdivisions face imminent threats from habitat destruction, illegal collecting, biocides, and mosquito spraying. Additional surveys are necessary to determine the population status and determine if the snails can be relocated before development. These surveys will be conducted prior to any construction activities, pursuant to implementation of the RPA.

Crocodile Lake NWR/Key Largo Hammocks State Botanical Site, Key Largo: Several snails have been observed on both the NWR and the State Botanical Site as a result of relocation by collectors. Because thorough surveys have not been conducted, the status of these snails is unknown.

Calusa Cove Campground, Key Largo: Collectors introduced snails here because of the large amount of undisturbed suitable habitat. In past years, this area contained the largest population of snails. Surveys conducted in 1994 and 1995 showed a drastic reduction of live snails, and several dead shells at the base of trees. A brief survey in 1996 reported a few live snails and a few snail shells, but detailed surveys have not been conducted. Monitoring of this population is necessary to track changes in their status. This property is privately owned and currently listed on the Conservation and Recreation Lands list as a priority for purchase. Because recent surveys have reported a decrease in the number of snails, this population is considered to be declining.

Monkey Jungle, Miami: Monkey Jungle is managed as a tourist facility and the owner has no current plans to modify any of the hardwood habitat occupied by tree snails. However, ownership and/or management plans could change. Although snails are known to occur here, the date of their introduction is not known. The habitat is sparse, consisting of only a few small tree islands surrounded by asphalt, resulting in low quality habitat. Researchers from the University of Florida surveyed this site in February 1992 and collected approximately 460 individuals for captive propagation experiments. Of those, only 200 survived, several of which were released in 1993 at Monkey Jungle. Between 180 to 195 eggs were hatched in 1993 at the University of Florida's laboratory, but the majority of them died. Approximately five survivors were found in 1996, four of which were released by researchers on John Pennekamp Coral Reef State Park property. Follow-up monitoring was not conducted, so the fate of those snails is unknown. The one remaining snail was released with other Stock Island tree snails by the Service on public property and is currently being monitored. Although the Monkey Jungle habitat suffered considerable disturbance in 1992 from Hurricane Andrew, the snail population rebounded and continues to persist today. Surveys conducted in 1996 found at least 35 snails present at Monkey Jungle. The combined threat of free roaming monkeys and the disturbance of habitat by exotic vegetation is believed to be partially responsible for the continued decline in the status of these snails.

Everglades National Park and Big Cypress Preserve: Snails were first introduced by collectors to

a small area in Everglades National Park in the late 1980s. Between 1987 to 1994, the presence of snails was reported, but by 1995, surveys revealed the snails were no longer present. The disappearance of the snails from Everglades National Park may be due to a number of causes including over-collecting, hurricanes, exotics, competition, or inability to adapt to the surroundings. A population of snails has recently been reported in Big Cypress, but surveys have not been conducted to confirm their presence. The status of the populations in Everglades National Park and Big Cypress is considered to be declining or extirpated.

Management: Efforts to manage the Stock Island tree snail have been complicated by two problems. First, since Deisler's 1987 study, little or no information has been collected or published about the life history of the Stock Island tree snail. What little information does exist is found in letters, memos, unreleased, or incomplete data from researchers. Second, although the status of a few snail populations has been monitored over the years, the most difficult thing to monitor is how snail collectors and other parties have been moving this species to areas within and outside of its range. Although the relocation of snails to other areas may have protected the snails from extinction, management has been impacted because appropriate biological data, was not obtained, from all sites, before and after the establishment of the new populations .

Analysis of the species likely to be affected

(Add this as a new section title and discussion in the June 16, 1997 opinion after the above discussion on page 2.31.)

The current range of the Stock Island tree snail includes only hardwood hammock fragments where the species has been relocated by collectors and conservationists. The subspecies is believed to be extirpated from its historic range, and the long-term conservation of the species is doubtful. Hammock fragments are increasingly rare in the upper Keys as a result of development activities and conservation of the remaining patches is a high priority.

Loss of habitat from development was a primary factor responsible for the decline of the Stock Island tree snail within its historic range. However, the species is now only found outside of its historic range due to introduction by collectors and researchers. Outside of the historic range, when surveys indicate that tree snails are not present on the site in question, development may proceed. When surveys indicate that tree snails are present on the site in question, development may still occur with the appropriate avoidance of take of the snails. Within the historic range, attempts continue to rehabilitate habitat on a portion of Stock Island so that the species can be reintroduced.

American Crocodile (Crocodylus acutus)

(Add all the crocodile discussion and section titles to the June 16, 1997 opinion on page 2.31.)

The Florida population of the American crocodile was listed as endangered on September 25, 1975, listing (40 FR 44149). The primary threats cited included development pressures, lack of

adequate protection of crocodiles and their habitat, and the risk of extinction inherent to a small, isolated population. Critical habitat for the American crocodile was designated on September 24, 1976 (41 FR 41914). On December 18, 1979, the American crocodile, with the exception of the previously-listed population in Florida, and the saltwater crocodile throughout its range, with the exception of the Papua New Guinea population, were listed as endangered (44 FR 75074). This provided protection to these crocodilians worldwide.

Species description

The American crocodile is a large, greenish-gray reptile. At hatching, crocodiles are yellowish-tan to gray in color with vivid dark bands on the body and tail. As they grow older, their overall coloration becomes paler and uniform without dark bands. Adult crocodiles have a hump above the eye, and tough, irregular armor-like scutes (scale-like boney-plates) on their backs. The American crocodile is distinguished from the American alligator by a relatively narrow, more pointed snout and by an indentation in the upper jaw that leaves the fourth tooth of the lower jaw exposed when the mouth is closed. In Florida, the crocodile ranges in size from 26.0 cm (10.3 in) at hatching, to an upper length of 3.8 m (12.5 ft) (Moler, 1991a). Larger specimens in Florida were reported in the 1800s (Moler, 1991a), and individuals as large as six to seven m (19.7 to 23.0 ft) have been reported outside the United States (Thorbjarnarson, 1989).

Life history

Distribution and habitat: The American crocodile is limited in distribution in Florida to the southern tip, with the upper Florida Keys (Kushlan and Mazzotti, 1989a) (Figures 26 and 27) being the northern extent of its range. The American crocodile occurs in coastal regions of both the Atlantic and Pacific coasts, in southern Mexico, Central America, and northern South America, as well as the Caribbean islands (Thorbjarnarson, 1989). The species occurs within the jurisdictional boundaries of many different governments in the western hemisphere, including Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, Mexico, Panama, Peru, and Venezuela.

The first documented occurrence of a crocodile in the United States resulted from the collection of a crocodile in 1869 in the Miami River off Biscayne Bay, though crocodiles were earlier suspected to occur there (Kushlan and Mazzotti, 1989a). Within the United States, the historic core geographic range of crocodiles includes Miami-Dade, Broward, and Monroe Counties in Florida, but reports indicate that they occupied areas as far north as Palm Beach County on the east coast. Crocodiles were probably never common on the west coast, but credible reports suggest that they occurred at least periodically as far north as Sanibel Island and Sarasota County (Kushlan and Mazzotti, 1989a). The primary historic nesting area was on the mainland shore of Florida and Biscayne Bays, including many of the small islands near shore, in what is today Everglades National Park (Kushlan and Mazzotti, 1989a). Nesting was also historically well-documented in the upper Keys from Key Largo south to Lower Matecumbe Key (Kushlan and Mazzotti, 1989a). Reports of crocodile nests on Little Pine Key (Ogden, 1978), and occurrences on Key West (Ogden, 1978) suggest that crocodiles were once more common in the Keys than

they are today.

Crocodiles live primarily in the sheltered, fresh or brackish waters of mangrove-lined bays, mangrove swamps, creeks, and inland swamps. Prolonged exposure to salinities similar to that of seawater (35 parts per thousand of sodium) may lead to reduced growth rates, particularly for young crocodiles. Availability of fresh water is a primary factor affecting growth and survival in young crocodiles (Dunson and Mazzotti, 1989).

American crocodiles are shy and secretive, and remain solitary for most of the year; however, they are usually tolerant of other crocodiles in the same general area. Individuals may travel widely throughout their range, but they are generally concentrated around the major nesting areas. Prior to nesting season, males become more territorial, and dominant males may mate with several females.

Feeding: At all ages crocodiles forage opportunistically. Fish, crabs, snakes, turtles, and a variety of other small prey compose the majority of their diet. Crocodiles are usually active at night, which is the primary feeding time.

Reproduction: Females do not become reproductively active until they reach a total length of approximately 2.3 m (7.4 ft) (Mazzotti, 1983), and this generally corresponds to an age of ten to 13 years (LeBuff, 1957; Moler, 1991a). Females construct earthen nests (mounds or holes) on elevated, well-drained sites near the water, such as ditch-banks and beaches. Nests have been reported in sand, marl, and organic peat soils. Female crocodiles will only nest one time per year and may not nest every year after they reach sexual maturity. They lay an average of 38 eggs (Kushlan and Mazzotti, 1989b), which will hatch after an incubation period of approximately 90 days (Mazzotti, 1989). Flooding, over-drying, and raccoon predation all pose threats to nests and developing eggs (Mazzotti et al., 1988; Mazzotti, 1999), which limits suitable nest. The reported percent of nests that successfully hatch in any one year range from 33 to 78 (Ogden 1978; Kushlan and Mazzotti, 1989b; Moler, 1991b, Mazzotti et al., 2000; Mazzotti and Cherkiss, 2001).

Female crocodiles do not defend nest sites. However, females remain near their nest sites and must excavate young from the nest after hatching. Kushlan (1988) reported that females may be very sensitive to disturbance at the nest site; most females that were disturbed near their nests did not return to excavate their young after hatching. Female crocodiles show little parental care, and young are generally independent shortly after hatching.

Critical habitat

Critical habitat for the crocodile includes all land and water within following boundary: Beginning at the easternmost tip of Turkey Point, Dade County, on the coast of Biscayne Bay; from there southeastward along a straight line to Christmas Point at the southernmost tip of Elliott Key; thence southwestward along a line following the shores of the Atlantic Ocean side of Old Rhodes Key, Palo Alto Key, Anglefish Key, Key Largo, Plantation Key, Windley Key,

Upper Matecumbe Key, Lower Matecumbe Key, and Long Key, to the westernmost tip of Long Key; then northwestward along a straight line to the westernmost tip of Middle Cape: then northward along the shore of the Gulf of Mexico to the north side of the mouth of Little Sable Creek; then eastward along a straight line to the northernmost point of Nine-Mile Pond; then northeastward along a straight line to the point of beginning.

Status and trends

Prior to listing in 1975, crocodiles were frequently collected for museums and zoos, and at least occasionally shot for sport. At the time listing was proposed, an estimated ten to 20 breeding females remained in Florida, mostly concentrated in northern Florida Bay. The crocodile population in Florida has grown to 500 to 1,000 individuals, not including hatchlings (P. Moler, , personal communication, 2001; F. Mazzotti, personal communication, 2001). The nesting range has also expanded on both the east and west coasts of the State, and crocodiles are frequently being seen throughout most of their historical range. Nesting has extended into Biscayne Bay on Florida's east coast, and now commonly occurs at the Turkey Point Nuclear Plant (Brandt et al., 1995; Gaby et al., 1985). During 2001, 55 crocodile nests were found in South Florida (S. Klett, personal communication, 2001; Mazzotti et al., 2001; J. Wasilewski, personal communication, 2002). The actual number of nesting females may be higher than the 55 nests recorded. Researchers detect approximately 80 to 90 percent of nests (F. Mazzotti, personal communication, 2001; J. Wasilewski, personal communication, 2002) and are generally unable to distinguish those nests that contain more than one clutch of eggs from different females without researchers excavating the nests. The breeding range of the crocodile is still restricted relative to their reported historic range (Kushlan and Mazzotti, 1989a), with most breeding occurring on the mainland shore of Florida Bay between Cape Sable and Key Largo (Mazzotti et al., 2002).

Since listing, much of the nesting habitat in Florida for crocodiles remains and has been afforded some form of protection. The habitat in Everglades National Park has been maintained and has consistently supported the largest number of nests and the largest population of American crocodiles in Florida. The acquisition of Crocodile Lake NWR in 1980 provided protection for nearly 2,025 ha (5,000 ac) of the remaining crocodile nesting and nursery habitat on Key Largo. All of the nesting on Key Largo occurs within Crocodile Lake NWR on artificial substrates composed of spoil taken from adjacent ditches, that was dredged prior to acquisition of the property. These sites and the surrounding high-quality nursery habitat consistently support five to eight successful crocodile nests each year.

The Turkey Point Nuclear Power Plant site, owned and operated by Florida Power and Light (FPL), contains an extensive network of cooling canals (built in 1974) that appear to provide good crocodile habitat in Biscayne Bay. The site is approximately 1,214 ha (3,000 ac) and the majority is considered crocodile habitat. The number of nests at this site has risen from one to two between 1978 and 1980 (Gaby et al., 1985) to ten to 15 nests per year in the late 1990s (Brandt et al., 1995; Cherkiss, 1999; J. Wasilewski personal communication, 2002). FPL personnel maintain the canals and crocodile habitat. They also have supported an extensive

crocodile monitoring program since 1976. FPL has also developed the Everglades Mitigation Bank along the western shore of Biscayne Bay and immediately adjacent to the Turkey Point Nuclear Plant, which may help bolster the crocodile population in Biscayne Bay in coming years. This site is a wetlands mitigation bank, approximately 5,665 ha (14,000 ac) in size, of which about 5,050 ha (10,000 ac) is crocodile habitat.

Outside of these areas that comprise the core of nesting habitat for crocodiles in Florida, land acquisitions have also provided protection to many other areas of potential habitat for crocodiles. A total of 44 public properties, owned and managed by Federal, State, or county governments, as well as two privately owned properties are managed at least partially or wholly for conservation purposes contain potential habitat for crocodiles in Florida. The 44 public properties contain about 28,330 ha (70,000 ac) of potential crocodile habitat, whereas together Everglades National Park and Crocodile Lake NWR contain about 131,120 ha (324,000 ac). Approximately 166,000 ha (410,000 ac) of mangrove-dominated vegetation communities are currently present in South Florida on public and private lands that are managed at least partially for conservation purposes. Approximately 10,117 ha (25,000 ac) of mangrove habitat occurs in South Florida outside of public or privately-owned conservation lands. Construction and development within coastal areas continues and poses a threat to remaining crocodile habitat that is not protected. However each year, only a few nests may occur on privately-owned, unprotected sites.

As the crocodile population and the human population in South Florida both grow, the number of human-crocodile interactions has increased but monitoring has not shown that these interactions have a negative threat to the crocodile. Managing potential human-crocodile conflicts effectively and protecting existing estuarine habitats remain important factors in providing adequate protection for crocodiles.

Hurricanes or other natural disasters have the potential to threaten the historically restricted nesting distribution of the crocodile in South Florida. However, increased nesting activity in western Florida Bay, Cape Sable, and Turkey Point Nuclear Plant have broadened the nesting range. Nesting now occurs on the eastern, southern, and southwestern portions of the Florida peninsula. While a single storm could affect all portions of the population, it is unlikely that the impact to all population segments would be severe.

Ongoing efforts to restore the Everglades ecosystem and restore a natural hydroperiod to South Florida will affect the amount of freshwater entering the estuarine systems. Because growth rates of hatchling crocodiles are closely tied to the salinity in the estuaries, restoration efforts will affect both quality and availability of suitable nursery habitat. Hydrological restoration may also affect crocodile habitat in Biscayne Bay. Current projections indicate increased and extended freshwater discharges into central and southern Biscayne Bay, where the American crocodile population is currently concentrated. Reductions in freshwater discharge will occur in the Miami River, Snake Creek, and northern Biscayne Bay (simulation D13R4; COE and South Florida Water Management District, 1999). These projected changes would appear to improve a portion of the crocodile population in Biscayne Bay, and detrimentally affect other areas of potential

habitat. Consequently, the net effect of the proposed hydrological modifications on the crocodile population in Biscayne Bay is difficult to evaluate.

Vehicle strikes have consistently been the primary source of adult mortality, and this trend has not changed. Roadkills have occurred throughout the crocodile's range in Florida, but most have occurred around Card and Barnes Sounds. It is difficult to accurately estimate the magnitude of this source of mortality or its effect on the population. However, all segments of the crocodile population in Florida, have continued to grow despite this continuous mortality factor.

Several studies have shown that contaminants occur in crocodiles in South Florida (Hall et al., 1979; Stoneburger and Kushlan, 1984; Mazzotti unpublished data). A variety of organochlorine pesticide residues (DDT, DDE, and Dieldrin, among others), and PCBs have been documented in crocodile eggs collected from South Florida (Hall et al., 1979). Acute exposure to pesticides and heavy metals may result in death, while prolonged exposure to lower concentrations of organochlorines include liver damage, reproductive failure, behavioral abnormalities, or deformities. Despite the fact contaminants have been documented in crocodile eggs, the crocodile population and nesting are apparently increasing.

Analysis of the species/critical habitat likely to be affected

Humans and vehicles pose the greatest threat to adult American crocodiles. Several crocodiles are killed each year on roadways, primarily on Key Largo and around Florida Bay. Hurricanes and freezing temperatures may also kill some adult crocodiles (Moler, 1991a), but the susceptibility to mortality from extreme weather is poorly documented.

Land acquisition efforts by many agencies have continued to provide protection for crocodile habitat in South Florida. A total of 44 public properties, owned and managed by Federal, State, or county governments, as well as two privately-owned properties managed at least partially or wholly for conservation purposes contain potential crocodile habitat within the coastal mangrove communities in South Florida. Approximately 95 percent of nesting habitat for crocodiles in Florida is under public ownership (F. Mazzotti, personal communication, 2001).

(Insert the following on page 3.12 in the June 16, 1997 biological opinion)

Changes in the size of the human population in Monroe County

At the time we prepared the original biological opinion, the most current census data available was from the 1990 census. Since that time, we have reviewed the census data from the 2000 census. The population growth has slowed significantly. From1980 to 1990, the population of Monroe County increased by 32.8 percent. We had projected a similar rate of increase for the period 1990 to 2000. However, based upon the 2000 census, the actual population growth was only two percent, with an actual population of 79,589 rather than the 91,300 that was previously projected.

(Insert the following on page 3.44 in the June 16, 1997 biological opinion.)

Actions implemented from the 1997 reasonable and prudent measures

To assist in implementation of the 1997 RPA, the Service stationed a biologist in the Florida Keys, and the coordination between Monroe County and the Service for the review of building permits was in place by December 1998. Table 3a summarizes the informal consultations conducted in the Keys that resulted in an initial determination of NLTAA listed species or critical habitat. The consultations began in July 1998 and the data are current through September 30, 2002.

Table 3a. NLTAA determinations in Monroe County per year by geographic region.

Year	*Upper Keys	*Middle Keys	*Lower Keys	Totals
1998	157	43	113	313
1999	419	110	261	790
2000	343	80	242	665
2001	250	71	199	520
2002 (through 9/30/02)	156	36	126	318
Totals	1325	340	941	2,606

* Lower Keys - Key West to Seven Mile bridge
* Middle Keys - East Bahia Honda through Channel 5 bridge
* Upper Keys - Channel 5 bridge through Soldier Key.

In addition to the 2,606 informal consultations that resulted in a determination of NLTAA, the Service also informally consulted on an additional 30 projects that resulted in a NLTAA determination after the applicant modified the project in response to concerns for threatened and endangered species. The modifications generally involved a change in the location or a reduction in the footprint of development that avoided adverse impacts. Examples of project modifications have included a landowner with four lots reducing the project footprint to one lot and putting a conservation easement on the remaining three lots; reducing the amount of area proposed to be fenced to leave a travel corridor for Key deer; and shifting the location of a driveway to protect the Keys tree-cactus. All recommendations that the Service has made to date to modify building permits to avoid or minimize adverse effects to listed species, have been implemented by the county.

The Service consulted on an additional 12 projects (Table 4a) determined to have adverse impacts to one or more threatened or endangered species. In these cases, the Service recommended the landowner apply for a section 10(a)(1)(B) permit for incidental take of listed species (including Key deer, American crocodile, Key Largo cotton mouse, Lower Keys marsh rabbit, silver rice rat,

Key Largo woodrat, Schaus swallowtail butterfly, and eastern indigo snake). To date, none of the landowners have applied for a section 10(a)(1)(B) permit and none of these proposed projects have been initiated.

Table 4a. HCPs recommended under the 1997 FEMA BO as of 9/30/02

Year	Upper, Middle or Lower Keys	Specie(s) Involved
2000	Upper Keys	None recommended
2000	Lower Keys	3 involving Key deer
1999	Upper Keys	1 involving Key Largo woodrat; Key Largo cotton mouse; Schaus swallowtail butterfly; Eastern indigo snake; Stock Island tree snail 1 involving American crocodile
1999	Lower Keys	5 involving Key deer
1998	Lower Keys	1 involving Key deer; Eastern indigo snake; Schaus swallowtail butterfly; Key tree-cactus 1 involving Key deer

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III. ENVIRONMENTAL BASELINE

(Replace the existing first paragraph of the June 16, 1997 opinion on page 3.2, with the following paragraph.)

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area; the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation; and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline describes the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Status of the species within the action area

(Add this as a new section title instead of "Changes in the Status of Threatened and Endangered Species in Monroe County" in the June 16, 1997 opinion on page 3.17 and add the following to the bottom of page 3.17.)

The entire range of the Key deer, Key Largo cotton mouse, Key Largo woodrat, Key tree-cactus, Lower Keys marsh rabbit, and rice rat are contained within the action area. Therefore, the information presented in the preceding Status of the Species/Critical Habitat section is the same as what would be discussed in this section of the "Environmental Baseline." However, the American crocodile, eastern indigo snake, Schaus swallowtail butterfly,

and Stock Island tree snail have ranges extending beyond the action area, and therefore information regarding the status of the species within the action area will be presented here.

Eastern indigo snake

This is the same information as that presented in the June 16, 1997 biological opinion. Therefore, no discussion will be included here.

Schaus swallowtail butterfly
(Add this section to the June 16, 1997 opinion at the bottom of page 3.39.)

The Service has current information on the butterfly's population in Miami-Dade County (where it is currently present only in Biscayne National Park) and in Monroe County (Key Largo). We believe that the discussion on pages 26-27 of this amendment accurately represents the species' distribution. Census results, in Miami-Dade and Monroe counties, from 2000 and 2001 showed a serious decline in numbers, almost certainly due to drought that curtailed food supplies for larvae. Status surveys in 2000 estimated an adult population of 200-250 (30-50 in Monroe); results from 2001 showed only about 100-120 adults (not more than 20 in Monroe). The estimate for 2002 is about 190-230 adults, with only one adult sighted in Monroe County. Researchers have recently observed a reduced adult life span for this butterfly, apparently due to drought.

Stock Island tree snail
(Replace the first three paragraphs on page 3.42 in the June 16, 1997 opinion with the following four paragraphs.)

The Stock Island tree snail population was once found only on Key West and Stock Island; Stock Island formerly had the largest and most stable population, but now does not support the snail. If it were not for the population found in Key West, which is presumably a direct transplantation from Stock Island, the snail would be considered extirpated from its entire historic range. The stability and protection of those populations outside of its historic range are extremely important and will be necessary for the persistence of this species.

The population discovered in Key West in 1997 was located in a residential subdivision, along a small street near the center of Key West. Over 65 snails were counted in two large royal poinciana trees (*Delonix regia*) and approximately 30 were found on other vegetation including *Aralia* bushes and mango trees. Most of the snails were one to two years old. The fate of these snails is not certain because the trees are frequently trimmed by the City of Key West and there are reports of heavy collecting. The Service is coordinating with the City of Key West to establish management procedures to protect these snails.

The greatest threat to the Stock Island tree snail is the loss and modification of its habitat,

although natural disasters, such as hurricanes and drought, can have a significant effect. Increased urbanization in the Keys has led to the destruction, fragmentation, and reduction in quality of habitat throughout the historic and present range. Residential and commercial construction destroys snail habitat. The areas that currently harbor populations of tree snails are small isolated tracts of land, which makes them highly susceptible to habitat loss, and reduction in habitat quality. Habitat fragmentation may destroy the microclimate (air temperature and humidity) important for feeding, shelter, and reproduction. Because of its limited range, the Stock Island tree snail faces a risk of extinction from habitat loss or a single, natural disaster.

Other threats include pesticide use, and predation by black rats, birds, raccoons, and exotic fire ants (*Solenopsis invicta*). The exotic fire ants are becoming more abundant in the Keys and hence an increasing threat to the Stock Island tree snail as well as other species. The exotic fire ants have been observed killing *Liguus* snails, despite the snails' ability to ward off other ant species. The use of pesticides on or near snail habitat can kill snails directly or alter behavior associated with feeding and reproduction. These effects decrease the likelihood of conservation of the Stock Island tree snail in the wild.

American crocodile

(Add this entire discussion on the crocodile as a new section title and discussion in the June 16, 1997 opinion before the section "Integration and Synthesis" on page 3.43.)

Crocodiles no longer regularly occur in the Keys south of Key Largo (P. Moler, personal communication, 2002; Jacobsen, 1983), though individuals have occasionally been observed in the lower Keys in recent years. A crocodile was also observed for the first time near Fort Jefferson in the Dry Tortugas in May 2002 (O. Bass, personal communication, 2002). These occasional observations may indicate that crocodiles are returning to more of the Keys, but Key Largo is the only nesting area known in the Florida Keys.

IV. EFFECTS OF THE ACTION

(Add the following discussion to the June 16, 1997 opinion at the end of the discussion under "Effects of the National Flood Insurance Program on Listed Species in the Keys" on page 4.7.)

In implementing the 1997 opinion, the Service conducted field visits on hundreds of proposed projects and ground-truthed existing habitat conditions throughout the Florida Keys. In addition to field observations, the availability of high-resolution digital mapping products such as one-m (3.28 ft.) resolution digital ortho-quad maps has allowed us to better determine the distribution of listed species habitats throughout the Keys.

This information allowed us to construct updated species distribution maps based on both the verified distribution of a species and the presence of suitable habitat. These maps represent suitable (occupied and unoccupied) habitat for each species considered in this document. The amount of habitat for each species that occurs in areas where flood insurance can be issued is listed in Table 5a.

To generate the numbers in Table 5a, we identified the amount of habitat that is not within a public or private conservation area. Then we determined how much of that unprotected habitat occurs in areas where flood insurance can be issued. The percentages represent the amount of habitat in which flood insurance is available as a percentage of the total unprotected lands.

Table 5a. Unprotected habitat affected by NFIP for listed species in the Keys

Species	Total unprotected habitat (ha)	Unprotected habitat subject to NFIP (ha)	Percent of total unprotected habitat subject to NFIP
Eastern indigo snake	3,462 (8,554 ac)	1,108 (2,738 ac)	32
Key deer	5,257 (12,990 ac)	2,944 (7,275 ac)	56
Key Largo cotton mouse	440 (1,087 ac)	22 (54 ac)	5
Key Largo woodrat	440 (1,087 ac)	22 (54 ac)	5
Key tree-cactus	1,510 (3,731 ac)	151 (373 ac)	10
Lower Keys marsh rabbit	433 (1.070 ac)	243 (600 ac)	56
Schaus swallowtail butterfly	1,140 (2,816 ac)	570 (1,408 ac)	50
Rice rat	732 (1,808 ac)	745 (1,841 (ac)	28
Stock Island tree snail	221 (546 ac)	443 (1,095 ac)	50

To determine which specific real estate parcels could impact listed species and critical habitat in the Keys, we overlaid each species map on the Monroe County real estate parcel map obtained from the Monroe County Growth Management Division. Parcels that were within the potential habitat boundaries of any of the listed species considered in this document were identified as such in the GIS. These data were then used to generate the list of real estate parcels used to analyze the effects of the proposed action.

Eastern indigo snake

(Replace the last paragraph of discussion on page 4.9 in the June 16, 1997 opinion with the following two paragraphs.)

Eastern indigo snakes require a mosaic of different habitat throughout their life cycle for such activities as feeding and breeding. Indigo snakes have large home ranges (five to 224 ha) (12 to 554 ac) and are susceptible to construction activities that fragment existing habitat types. The loss of habitat decreases the food base available, increases the risk of direct mortality from property owners and domestic animals, causes a greater probability of direct mortality from automobiles, and secondary exposure to rodenticides used to control black rats.

The proposed action could result in the loss of 1,108 ha (2,738 ac) of habitat. Considering the low number of individuals thought to occur in the Keys, additional impacts from FEMA may eliminate this population from the Keys, resulting in a reduction in the range of the snake. However, this would not constitute a significant loss of genetic viability of the species and therefore the conservation of the species would not be appreciably reduced.

Key deer

(Replace paragraphs four and five on page 4.10 in the June 16, 1997 opinion with the following three paragraphs.)

Habitat maps for Key deer were generated based on the present range of the deer which includes Bahia Honda Key west through the Saddlebunch Keys (Figure 4, 1997 BO). All native plant communities were considered Key deer habitat, and lots largely devoid of vegetation and existing developments were not considered habitat. However, parcels with native vegetation and acreage to support Key deer were considered habitat even if some development was present.

A female-based, random pattern model was developed (RAMAS Metapop) for Key deer to assess population response to various residential, commercial, recreational, and infrastructure development alternatives on Big Pine and No Name Keys. The model was run 10,000 times over a 50-year (approximately five generations) modeling period. The average of model runs for each alternative generated a possibility of apparent extinction (likelihood of the Key deer herd falling below 50 females). Apparent extinction risks ranged from 0.23 percent with no development to 14.7 percent with loss of about 150 ha (371 ac) of habitat (the equivalent of 1,000 residential homes). A statistically significant risk of apparent extinction (odds greater then or equal to five percent) was reached when development consumed about 82.2 ha (203 ac) of Key deer habitat or the equivalent of about 550 residential homes. Apparent extinction risks were not calculated for loss of all Key deer habitat, but the probability of apparent extinction under this scenario would likely be much higher than the 14.7 percent generated by the model with the loss of 150 ha (371 ac) of habitat.

Continued implementation of the NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in the loss and fragmentation of Key deer habitat on private land. Loss of habitat constitutes a permanent reduction in the land available for this Key deer to live. In addition, the proposed action will increase the number of residents in the Keys which will result in increases in road mortality, negative effects related to urbanization (i.e., illegal feeding, dogs, decrease in water quality), and increases the Key deer's susceptibility to natural catastrophes. Even though numbers of Key deer have increased substantially, implementation of the action, as proposed, will appreciably reduce the likelihood of the Key deer's conservation in the wild.

Key Largo cotton mouse

(Add the following discussion to the June 16, 1997 opinion at the end of the mouse discussion at the top of page 4.12.)

Habitat maps for the Key Largo cotton mouse were generated based on the present known range of the mouse which includes all hardwood hammock habitats on North Key Largo from the intersection of U.S. Hwy. 1 and C.R. 905 north to the Ocean Reef Club (Figure 5, 1997 BO). Hammocks south of North Key Largo were not considered to be viable Key Largo cotton mouse habitat due to their isolation from the source population, their fragmented nature, the presence of large numbers of feral and domestic cats, and the generally poor habitat conditions.

Continued implementation of the NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in the loss and fragmentation of Key Largo cotton mouse habitat on private lands. Any habitat loss will constitute a permanent reduction in the number of cotton mice in the Florida Keys and reduce the long-term conservation of Key Largo cotton mice. In addition, the proposed action will increase the human population in the Keys which will result in increases in feral and domestic cats, a primary threat to this species. Implementation of the action, as proposed, will appreciably reduce the likelihood of the Key Largo cotton mouse's conservation in the wild.

Key Largo woodrat

(Add the following discussion to the June 16, 1997 opinion at the end of the woodrat discussion on page 4.13.)

Habitat maps for the Key Largo woodrat were generated based on the present known range of the mouse which includes all hardwood hammock habitats on North Key Largo from the intersection of U.S. Hwy. 1 and C.R. 905 north to the Ocean Reef Club (Figure 5, 1997 BO). Hammocks south of North Key Largo were not considered to be viable Key Largo woodrat habitat due to their isolation from the source population, their fragmented nature, the presence of large numbers of feral and domestic cats, and the poor habitat quality.

Continued implementation of the NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in the loss and fragmentation of the remaining Key Largo woodrat habitat on private lands. Any habitat loss will constitute a permanent reduction in the land available in the Florida Keys for Key Largo woodrats, and generally reduce the long term conservation for the remaining population. In addition, the proposed action will increase the human population in the Keys which will result in increases in feral and domestic cats, a threat to this species. Implementation of the action, as proposed, will appreciably reduce the likelihood of the Key Largo woodrat's conservation in the wild.

Key tree-cactus

(Add the following discussion to the June 16, 1997 opinion at the end of the tree-cactus discussion on page 4.13.)

Habitat maps for the Key tree-cactus were based on the present known range of the Key tree-cactus which includes hardwood hammock habitats on Big Pine Key, Long Key, and Upper and Lower Matecumbe Keys. In addition, unoccupied suitable habitat consisting of larger tracts of

hammock throughout the Keys was also mapped as potential habitat (Figures 6 and 7, 1997 BO). Very small hammock fragments were not included as potential habitat because of isolation from the source population, fragmentation, the presence of exotic plants, and poor habitat conditions for supporting a viable Key tree-cactus population.

Implementation of the NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in the loss and fragmentation of the remaining populations of Key tree-cactus that occurs on private lands. In addition, suitable unoccupied Key tree-cactus habitat throughout the Keys is vulnerable to development allowable under the NFIP because Key tree-cacti may not be present and, if they were, no prohibition against their destruction exists under the ESA unless such destruction constitutes a violation of State laws. By far, the major threat to the continued existence of this cactus in Florida is habitat loss for the construction of commercial facilities and residential housing on the upland areas in the Keys. Any loss of the remaining Key tree-cactus populations or suitable unoccupied habitat will constitute a further, permanent reduction in the long-term viability of this species in the Florida Keys.

The conservation of the Key tree-cactus depends on protecting the remaining tropical hardwood hammock areas throughout the Keys. The Service believes that protection, conservation, and management of these areas are critical to the conservation of the Key tree-cactus. The proposed action will result in habitat loss and associated impacts that will impair the ability of this species to survive and preclude its recovery. Implementation of the action, as proposed, will appreciably reduce the likelihood of the Key tree-cactus' conservation in the wild.

Lower Keys marsh rabbit

(Add the following discussion to the June 16, 1997 opinion at the end of the rabbit discussion on page 4.14.)

Habitat maps for the Lower Keys marsh rabbit were generated based on detailed information on the present known range which includes specific areas of salt marsh, transitional buttonwood habitat, freshwater wetlands, and mangrove habitats in the Lower Keys from Big Pine Key through Boca Chica Key (Figure 8, 1997 BO). Suitable but unoccupied habitat within the present range of the Lower Keys marsh rabbit was also mapped. Fragments of suitable habitat, isolated from a source population, were not considered to be viable Lower Keys marsh rabbit habitat due to their size , the presence of large numbers of feral and domestic cats, and the generally low biological quality in terms of supporting a viable Lower Keys marsh rabbit population.

The Lower Keys marsh rabbit occurs in small, disjunct populations, and continued existence depends on the immigration and dispersal of individuals. This subspecies is thought to be less productive than others, making it more susceptible to demographic and random events (Forys, 1995). In addition to natural threats, several of the threats resulting from urbanization have reduced reproductive potential, including direct mortality and disruption of dispersal. With the lower potential for interchange between subpopulations, the probability of continued existence has been decreased. Those sites that are not occupied are important to the marsh rabbit for future dispersal and recovery to offset the loss of occupied habitat.

The NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in the loss and fragmentation of the remaining Lower Keys marsh rabbit habitat that occurs on private lands. Any occupied habitat lost will generally reduce the viability for the remaining population. In addition, the proposed action will increase the human population in the Keys which will result in increases in feral and domestic cats, a primary threat to this species. Implementation of the action, as proposed, will appreciably diminish the likelihood of the Lower Keys marsh rabbit's conservation in the wild.

Schaus swallowtail butterfly

(Add the following discussion to the June 16, 1997 opinion at the end of the butterfly discussion on page 4.16.)

Habitat maps for the Schaus swallowtail butterfly were based on information about its use of hardwood hammocks in the Upper Keys from Lower Matecumbe Key north through North Key Largo. Because this species moves around and is wide ranging, no attempt was made to distinguish occupied habitat from unoccupied potential habitat. All areas of hardwood hammock within the range of the Schaus swallowtail butterfly were considered potential habitat capable of supporting this species. Fragments of suitable habitat were not considered to be viable Schaus swallowtail butterfly habitat due to: isolation from a source population; a high chance of pesticide exposure mosquito control chemicals; and a low habitat quality (absent some necessary habitat requirements) to support a viable butterfly population.

Development of the remaining hardwood hammocks will adversely affect the Schaus swallowtail butterfly through direct and indirect impacts. The direct effects include the destruction of the hardwood hammocks. The indirect effects include: degradation of adjacent habitat with moisture and temperature changes; increased edge effects; and introduction of exotic species such as exotic fire ants.

The NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in the loss and fragmentation of the remaining Schaus swallowtail butterfly habitat that occurs on private lands. Any habitat loss will constitute a further, permanent reduction in the number of this species, and generally reduce the overall viability for the remaining population. Implementation of the action, as proposed, will appreciably reduce the likelihood of the Schaus swallowtail butterfly's conservation in the wild.

Silver Rice rat

(Add the following discussion to the June 16, 1997 opinion at the end of the rice rat discussion on page 4.17.)

The adverse modification of critical habitat determination remains unchanged from the June 16, 1997 biological opinion. Since that opinion, no additional habitat has been created for the rice rat to eliminate the critical habitat loss from this action. Habitat maps for the rice rat were based on detailed information on the present range which includes specific areas of salt marsh, transitional buttonwood, freshwater wetlands, and mangrove habitats in the Lower Keys, from Howe Key

through the Saddlebunch Keys (Figure 10, 1997 BO). Suitable but unoccupied habitat was also mapped based on vegetation and being adjacent and contiguous to known populations of the rice rat. Fragments of some apparently suitable habitat were not considered due to their isolation from a source population, the presence of large numbers of feral and domestic cats, and the lack of habitat requirements for supporting a viable rice rat population.

Threats to the rice rat include habitat loss from development, feral and domestic cats, exotic fire ants, and alteration of surface and atmospheric water conditions. The NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in the loss and fragmentation of the remaining rice rat habitat that occurs on private lands. Any habitat loss will constitute a permanent reduction in the population of this species, and reduce the viability of the remaining population. Because of the low density of rice rat populations in the Florida Keys and the limited distribution of this species, reducing the quantity and quality of its remaining habitat and the size of its remaining populations increases its risk of extinction. Implementation of the action, as proposed, will appreciably reduce the likelihood of the rice rat's conservation in the wild.

Stock Island tree snail

(Add the following discussion to the June 16, 1997 opinion at the end of the snail discussion on page 4.18.)

As a result of relocations by snail collectors, the Stock Island tree snail presently occupies several areas outside its historic range. Three sites on public lands on North Key Largo and No Name Key are not affected by the proposed action. However, two areas located on Key Largo, Twin Lakes Subdivision and the Caloosa Cove Camp Ground hammock, are under private ownership and vulnerable to development.

Habitat maps for the Stock Island tree snail in the Florida Keys were generated based on detailed information on the distribution of this species and the fact that this species uses hardwood hammocks on Key Largo outside its historic range. Because this species is wide ranging and difficult to detect, no attempt was made to distinguish occupied habitat from potentially suitable but unoccupied habitat on Key Largo. All areas of hardwood hammock within the probable range of the Stock Island tree snail were considered potential habitat capable of supporting this species (Figure 25, 1997 BO). Very small fragments of apparently suitable habitat were not considered to be viable Stock Island tree snail habitat due to their isolation from source populations, their fragmented nature, the high probability of pesticide exposure from mosquito control, and the generally poor condition in terms of supporting a viable Stock Island tree snail population.

Development will adversely impact Stock Island tree snails through direct habitat loss, and through the degradation of the remaining habitat on-site from secondary effects including pesticide application, microhabitat alteration, increased edge effects, and exotic species such as exotic fire ants. Implementation of the NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in the loss and fragmentation of the remaining Stock Island tree snail habitat that occurs on private lands. In addition, the secretive nature of this

species makes detecting adverse impacts of habitat loss and direct mortality from development activities extremely difficult. Any habitat loss will constitute a permanent reduction in the carrying capacity of the Florida Keys for this species, and generally reduce the overall viability for the remaining population of the Stock Island tree snail.

Reducing remaining, suitable habitat for the tree snail will increase the risk of extinction to this imperilled species in the Keys. The proposed action will also preclude efforts to reintroduce Stock Island tree snails into their historic range, which is essential to the recovery of this species. Implementation of the action, as proposed, will appreciably reduce the likelihood of the Stock Island tree snail's conservation in the wild.

American crocodile

(Add the following crocodile discussion to the June 16, 1997 opinion after the snail discussion on page 4.18.)

The implementation of the NFIP, without implementing the RPA proposed in Section VII of this amended biological opinion, will result in degradation of habitat for the American crocodile in the Florida Keys. Though American crocodiles have not regularly occurred in the Keys south of Key Largo, in recent years they appear to be expanding their range and re-occupying portions of the Upper and Lower Keys (Figures 26 and 27). The NFIP will result in degradation, loss, and fragmentation of the remaining brackish mangrove wetlands and adjacent uplands on which crocodiles rely. Degradation will result from clearing of mangroves and adjacent uplands, filling of wetlands, alteration of salinity and water chemistry, introduction of non-native vegetation, and increases in populations of predators such as raccoons and feral cats that may prey upon young crocodiles. Additionally, the increased human population will result in the harassment of crocodiles as they expand beyond their current area.

By assisting increases in the human population in the Keys, the NFIP also increases risk to American crocodiles. Road mortality is currently the largest known source of mortality for adult American crocodiles, and the majority of roadkills occur on U.S. Hwy. 1 between the mainland and the Keys. Increased traffic volume will incrementally increase risk to the crocodiles that occur in that vicinity. Additionally, crocodiles are by nature shy and wary, and prefer sheltered, undisturbed habitats. Increases in development will increase human activity, which degrades habitat quality for crocodiles, and increases the likelihood of negative interactions between crocodiles and humans.

Critical habitat: Because the majority of the designated crocodile critical habitat is within public ownership, the NFIP is only likely to result in limited development in critical habitat. Approximately 95 percent of the nesting habitat for crocodiles in Florida is under public ownership, the population has doubled since listing in 1975, and the population has expanded on both coasts of the state. Only a few nests occur on privately-owned, unprotected sites each year and crocodiles are being observed throughout most of their historic range. While the NFIP may lead to some degree of development in areas that provide crocodile habitat, the magnitude of the resulting habitat degradation will be minor. We do not believe that the NFIP will diminish the

quality of the critical habitat to the extent that their value for recovery of the species will be appreciably reduced.

V. CUMULATIVE EFFECTS

((Add the following discussion to the June 16, 1997 opinion at the end of the discussion on page 4.21.)

The Service is aware of only one project, an electrical substation being proposed by the Florida Keys Electric Cooperative that would impact Key Largo woodrat.

VI. CONCLUSION

(Replace the existing discussion of the June 16, 1997 opinion with the following discussion on page 5.1.)

In summary, the clearing of native vegetation and construction of homes and other structures in listed species habitat results in a permanent reduction in the amount of habitat available and further fragments undeveloped habitat. The increased number of people in the Keys increases the demand for new roads and other infrastructure and improvements in community facilities resulting in additional habitat degradation, fragmentation, and permanent loss.

The administration of the NFIP and the incentives created by the NFIP will continue to result in the destruction of the ecosystems that provide habitat for these listed species, without implementing the RPA proposed in Section VII of this amended biological opinion. Tables 6a identifies the amount of habitat, for each species that is subject to the NFIP action. Table 7a identifies the conservation goals that must be accomplished before action may change to alter the listing status of the species. The Service will review all development actions based on these conservation goals. We believe that continued implementation of the NFIP in the Keys, without implementation of the RPA, will further reduce the carrying capacity of the Florida Keys for these listed species and, consequently, decrease the likelihood that these species will survive or recover in the wild.

Table 6a. Summary of acres, population, and protected lands for each species discussed in this biological opinion.

SPECIES	HABITAT IN THE KEYS					POP. IN THE KEYS	
	TOTAL UNPROTECTED HABITAT (ha)	TOTAL HABITAT SUBJECT TO NFIP (%)	UNPROTECTED HABITAT SUBJECT TO NFIP (ha)	HABITAT STATUS	HABITAT IN PUBLIC OWNERSHIP (ha)	CURRENT	STATUS
Indigo Snake	3,462 (8,554 ac)	32	1,108 (2,738 ac)	declining		rare	declining
Key deer	5,257 (12,990 ac)	56	2,944 (7,275 ac)	declining	3,400 (8,200 ac)	700-800	increasing
KL cotton mouse	440 (1,087 ac)	5	22 (54 ac)	declining	880 (1,011 ac)	18,000 in 1984 (most recent survey) but four-fold decrease in trapping success in 2001	declining
KL woodrat	440 (1,087 ac)	5	22 (54 ac)	declining	880 (1,011 ac)	Less than 200	declining (High in 1984 about 6,500)
Key tree-cactus	1,510 (3,731 ac)	10	151 (373 ac)	declining	851 (2,100 ac)	624	stable
LK marsh rabbit	433 (1.070 ac)	56	243 (600 ac)	declining	851 (2,100 ac)	200-300	declining
Schaus' SW butterfly	1,140 (2,816 ac)	50	570 (1,408 ac)	declining	unknown	190-230	declining
Silver rice rat	2,660 (6,571 ac)	28	745 (1,841 ac)	declining	50 areas	150-400	stable
Stock Isl. snail	884 (2,190 ac)	50	443 (1,095 ac)	declining	50 areas	180-230	declining
Am. crocodile				stable		50-100	increasing

Table 7a. Summary of recovery needs for each species discussed in this biological opinion.

SPECIES	HABITAT CONSERVATION GOALS	POPULATION CONSERVATION GOALS
Indigo Snake	Protect loss or fragmentation of suitable habitat, and determine an appropriate amount of habitat protection to maintain the population.	Stabilize and increase numbers of snakes. Determine delisting criteria and protection necessary to maintain at least a 95 percent probability of survival for 100 years (approximately 10 generations).
Key deer	Prevent further loss, fragmentation, or degradation of suitable, occupied habitat, reduce native and non-native nuisance species by 80 percent, acquire or protect all occupied habitat on priority acquisition lists, and manage, restore, or rehabilitate habitat on protected lands	Stable populations of deer distributed throughout historic range, and two more, populations established along the edge of the historic deer range. Populations will be stable when they exhibit a stable age structure and have a rate of increase (r) equal to or greater than 0.0 as a seven-year running average for 14 years.
Key Largo cotton mouse	Prevent further loss, fragmentation, or degradation of suitable, occupied habitat, reduce domestic predators and competitors by 80 percent, and acquire all suitable, occupied habitat on priority acquisition lists, and manage and restore protected lands, including trash and exotic plant removal.	Establish stable populations of cotton mice throughout North Key Largo, and three additional populations elsewhere within its historic range. Populations will be stable when they exhibit a stable age structure and have a rate of increase (r) equal to or greater than 0.0 as a three-year running average for six years.
Key Largo woodrat	Prevent further loss, fragmentation, or degradation of suitable, occupied habitat, reduce domestic predators and competitors by 80 percent, and acquire all suitable, occupied habitat on priority acquisition lists, and manage and restore protected lands, including trash and exotic plant removal.	Establish stable populations of woodrats throughout North Key Largo, and three additional populations elsewhere within its historic range. Populations will be stable when they exhibit a stable age structure and have a rate of increase (r) equal to or greater than 0.0 as a three-year running average for six years.

SPECIES	HABITAT CONSERVATION GOALS	POPULATION CONSERVATION GOALS
Key tree-cactus	Prevent loss, fragmentation, or degradation of occupied or suitable habitat; reduce native and non-native nuisance species by 80 percent; purchase or gain conservation easements for all suitable, occupied habitat on priority acquisition lists; restore habitat on protected lands	Need secure populations (newly established ones, if necessary) on Upper Matecumbe Key (two populations), Long Key (three populations), Windley Key, Boca Chica Key, and/or Key West.
Lower Keys marsh rabbit	Prevent loss, fragmentation, or degradation of occupied or suitable habitat; reduce native and non-native nuisance species by 80 percent; purchase or gain conservation easements for all suitable, occupied habitat on priority acquisition lists; restore or rehabilitate habitat on protected lands	Stable populations of marsh rabbit are distributed on at least five Keys connected to U.S. Highway 1 and three back country islands in the lower Keys. These populations will be considered stable when they exhibit a stable age structure and have a rate of increase (r) equal to 0.0 as a three-year running average for six years.
Schaus' swallowtail butterfly	Prevent further loss, fragmentation, or degradation of suitable occupied habitat within the butterfly's historic range in the Upper Keys and Miami-Dade County, protect breeding sites from mosquito spraying and reduce spraying in other areas used by the butterfly by 90 percent; acquire or protect all suitable, occupied habitat on priority acquisition lists; and manage, restore, or rehabilitate hardwood hammocks on protected lands.	Establish stable populations of butterfly distributed throughout its historic range. These populations will be considered stable when they exhibit a rate of increase (r) equal to or greater than 0.0 as a three-year running average for six years.
Silver rice rat	Prevent loss, fragmentation, or degradation of occupied or suitable habitat; reduce native and non-native nuisance species by 80 percent; purchase or gain conservation easements for all suitable, occupied habitat on priority acquisition lists; restore or rehabilitate habitat on protected lands	Establish stable populations of the rat distributed throughout its historic range, and establish three additional populations along the edge of the historic range; Populations will be considered stable when they exhibit a stable age structure and have a rate of increase (r) equal to or greater than 0.0 as a three-year running average for six years.

SPECIES	HABITAT CONSERVATION GOALS	POPULATION CONSERVATION GOALS
Stock Island snail	Prevent further loss, fragmentation, or degradation of occupied habitat; acquire or gain conservation easements for all occupied habitat on priority acquisition lists; manage, restore or rehabilitate habitat on protected lands	Establish four stable populations of snails throughout the Lower Keys. Populations will be considered stable when they exhibit a stable age structure, have a rate of increase (r) equal to or greater than 0.0 for as a three-years running average for 14 years, and have at least a 95 percent probability of persistence for 100 years. (About 17 generations)
American crocodile	Prevent habitat alteration and maintain adequate nesting habitat to support or increase nesting effort.	Stable population exists and meets requirements for reclassification providing existing levels of protection continue to be afforded to crocodiles and their habitat.

After reviewing the current status of the Key deer, Key Largo cotton mouse, Key Largo woodrat, Lower Keys marsh rabbit, rice rat, American crocodile, eastern indigo snake, Key tree-cactus, Schaus swallowtail butterfly, Stock Island tree snail, and critical habitat for the rice rat and American crocodile; the environmental baseline for the action area; the effects of the proposed action; and cumulative effects, it is the Service's biological opinion that continued administration of FEMA's NFIP (without the continued implementation of the RPA) would likely result in the changes to species status or their critical habitat as identified in Table 8a below.

Table 8a. Service determinations of "jeopardy" or "adverse modification" for the 10 species considered in this amendment to the June 16, 1997 FEMA biological opinion.

SPECIES	JEOPARDY	ADVERSE MODIFICATION
Eastern indigo snake	NO	NOT APPLICABLE
Key deer	YES	NOT APPLICABLE
Key Largo cotton mouse	YES	NOT APPLICABLE
Key Largo woodrat	YES	NOT APPLICABLE
Key tree-cactus	YES	NOT APPLICABLE
Lower Keys marsh rabbit	YES	NOT APPLICABLE
Schaus swallowtail butterfly	YES	NOT APPLICABLE
Rice rat	YES	YES
Stock Island tree snail	YES	NOT APPLICABLE
American crocodile	NO	NO

VII. REASONABLE AND PRUDENT ALTERNATIVES

(Replace the discussion on pages 5.2 to 5.4 under this section of the June 16, 1997 opinion with the following discussion.)

Regulations (50 CFR §402.02) implementing section 7 of the ESA define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

Our jeopardy determinations were generally based on habitat loss and conversion expected to occur over a 5 to 20-year period of implementation of the NFIP, although the continued existence

of the Lower Keys marsh rabbit would be jeopardized by the proposed action in less than five years. The RPA is intended to prevent further declines of the eight species that we concluded were likely to be jeopardized by the proposed action. One of the main reasons for the decline of the species discussed in this amendment to the June 16, 1997 FEMA biological opinion is habitat loss and fragmentation. Through the reasonable and prudent alternative process described below, the Service alleviates the likelihood that the implementation of the NFIP in Monroe County will appreciably reduce the likelihood of survival and recovery of the listed species, because it requires a process whereby the Service reviews and provides recommendations on proposed development projects that would otherwise cause these impacts and which may not otherwise be reviewed by the Service.

Without the process implemented by the RPA, the Service would not have the opportunity to review all development projects for potential impacts to listed species. Although some development projects requiring permits from Army Corps of Engineers under section 404 of the Clean Water Act might come to the Service for review, the majority of projects do not require 404 or other Federal permits. Although a permit under section 10 of the ESA would be required for private individuals whose proposed development may take listed animal species, in many cases the developers are not necessarily aware of the exact locations of species within habitat that appears suitable nor may they contact the Service for assistance. In addition, the Service may not be aware of the presence of threatened and endangered species until a site-specific review occurs. Therefore, many would not necessarily approach the Service for incidental take authorization under the ESA absent this process. The RPA results in the Service working directly with each applicant to analyze direct, indirect, and cumulative effects of the development and to provide measures to avoid, minimize and/or compensate for impacts to listed species, with the result that the implementation of the NFIP will no longer appreciably reduce their likelihood of survival and recovery.

Reasonable and Prudent Alternative:

FEMA currently requires participating communities to comply with applicable Federal environmental laws. FEMA should modify their guidance on implementation of 43 CFR §60.1-60.5 to establish specific requirements for compliance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1351 et seq.). In the case of Monroe County, Florida, that guidance should establish the following process:

1. The Service will update the distribution and habitat maps, originally developed in 1998, of threatened and endangered species habitat, both known and potential, in the Florida Keys and provide them to FEMA for distribution to all participating communities in Monroe County. The participating communities in Monroe County, with the assistance of the Service and FEMA will also develop from these maps an updated real estate parcel list that will be used to direct projects in areas of known or potential habitat. The updated real estate parcel list will be completed within 60 days of the Service providing the maps to FEMA.

2. In areas mapped as containing unsuitable habitat, participating communities in Monroe County, will place a form letter in the permit file that indicates: 1) the individual that made the determination, 2), the date of the determination, and 3) the date of the habitat map used for the documentation. After this form letter is finished, participating communities in Monroe County may take action on the proposed building permits without further concerns for threatened and endangered species (or their critical habitat).

3. In areas mapped as containing occupied or unoccupied suitable habitat, issuance of building permits will require further consultation with the U. S. Fish and Wildlife Service. The Service would determine that the building permit:

   a. would not adversely affect threatened or endangered species or designated critical habitat. The Service would notify the participating community in Monroe County by letter of the "not likely to adversely affect" determination. The participating communities in Monroe County would place the letter in the permit file for future community assistance reviews by FEMA; or

   b. may adversely affect threatened and endangered species or designated critical habitat. The Service would notify participating communities in Monroe County by letter of the "may affect" determination and the possible need for authorization under the section 7 or section 10 of the ESA. Participating communities in Monroe County would work with the landowner and the Service to ensure compliance with the ESA through either section 7 or section 10. A copy of the section 10(a)(1)(B) permit or the section 7 consultation would be retained in the building permit file for future community assistance reviews by FEMA.

      For those actions that may result in adverse effects to listed plants, the Service will provide recommendations to the participating community in Monroe County and the landowner to avoid or minimize the affects. If the Service determines that the proposed action will jeopardize the continued existence of the species, the Service will forward this recommendation to the participating community. If the participating community issues the permit in opposition to this recommendation, the Service would draw this to FEMA's attention for FEMA to pursue in accordance with the procedures outlined in number 4 below.

4. FEMA will consult with the Service every six months to evaluate the extent of ESA compliance for proposed construction or other development in Monroe County. In addition, during community assistance visits to participating communities in Monroe County, FEMA will evaluate the administrative records maintained by the participating community in Monroe County on permits issued for all proposed construction or other development in the county to ensure compliance with the requirement. FEMA shall use information provided by the Service or other Federal, State, or local agencies to achieve this purpose. FEMA should treat any violation of the spirit and letter of this reasonable

and prudent alternative as a substantive deficiency under 44 CFR 60.3, 60.4, and 60.5. Within 30 days of determining non-compliance with the spirit and letter of this reasonable and prudent alternative, FEMA should notify the participating community in writing that substantial progress must be made in correcting the deficiency within 60 days or FEMA will initiate the procedures outlined in 44 CFR 59.24, which allows FEMA to place participating communities on probation or suspend them from the NFIP. Unless the participating community corrects the deficiencies identified in FEMA's notification letter, FEMA should initiate and complete the probation or suspension procedures according to the schedules identified in 44 CFR 59.24.

This biological opinion has found that the continued administration of the NFIP, as proposed in the original project description, through its indirect impacts on habitat destruction and modification in the Keys, is likely to jeopardize the continued existence of the endangered Key deer, endangered Key Largo cotton mouse, endangered Key Largo woodrat, endangered Key tree-cactus, endangered Lower Keys marsh rabbit, endangered Schaus' swallowtail butterfly, endangered silver rice rat, threatened Stock Island tree-snail; and adversely modify designated critical habitat for the silver rice rat. Consequently, FEMA is required to notify the Service of its final decision on implementation of the reasonable and prudent alternative identified in this biological opinion.

INCIDENTAL TAKE STATEMENT

There are no changes to this section from what was included in the June 16, 1997 biological opinion.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

(Add this as a new section title and discussion to the June 16, 1997 opinion after the end of the above discussion on page 5.4.)

The Service anticipates incidental take of the American crocodile as a result of the proposed action. Incidental take of this species will be identified and addressed through the process established in the RPA. Therefore, the Service is not exempting incidental take for the crocodile in this biological opinion.

EFFECT OF THE TAKE

(Add this as a new section title and discussion to the June 16, 1997 opinion after the end of the above discussion on page 5.4.)

No incidental take is exempted under this amendment to the June 16, 1997, biological opinion. Therefore, there would be no adverse impacts to the species.

REASONABLE AND PRUDENT MEASURES

(Add this as a new section title and discussion to the June 16, 1997 opinion after the end of the above discussion on page 5.4.)

There is no incidental take exempted under this amendment to the June 16, 1997 biological opinion. Therefore, there are no reasonable and prudent measures that would be applicable to this biological opinion.

TERMS AND CONDITIONS

(Add this as a new section title and discussion to the June 16, 1997 opinion after the end of the above discussion

on page 5.4.)
There are no reasonable and prudent measures in this amendment to the June 16, 1997 biological opinion. Therefore, there are no terms and conditions for their implementation.

CONSERVATION RECOMMENDATIONS

(Replace the discussion in the June 16, 1997 opinion on page 5.5, with the following discussion.)
Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. In furtherance of the purposes of the ESA, and consistent with FEMA's obligation under 7(a)(1) of the ESA, we recommend implementing the following discretionary action:

1. FEMA should continue to implement and monitor their modified Community Rating System (CRS) associated with the NFIP to benefit communities that have implemented community-wide, multi-species conservation planning under section 10(a)(1)(B) of the ESA. FEMA already provides credit in the CRS for protection of areas that provide natural and beneficial functions, such as wetlands, riparian areas, sensitive areas and habitat for rare or endangered species. Since 2002, FEMA has implemented a two tiered system to encourage communities to develop habitat conservation plans which protect rare, threatened, or endangered species. Communities receive credit if they have adopted and implemented a habitat conservation plan, even if the plan has not yet been submitted to or received approval from the Service. Additional credit is awarded to communities which have a Service approved habitat conservation plan under section 10(a)(1)(B) of the ESA. The two tiered system encourages communities to develop community-wide, multi-species conservation plans and rewards efforts by providing credit prior to Service approval. Any credits provided to Monroe County, should they again become eligible for CRS, will be in accordanee with FEMA CRS criteria.

2. The Service recommends that FEMA nominate a member of its staff to be appointed to the Multi-species/Ecosystem Recovery Implementation Team (MERIT). MERIT was formed to implement the Multi-species Recovery Plan for 68 federally threatened and endangered species found in the South Florida ecosystem and the habitats upon which they depend, including those species found in the Florida Keys. The role of MERIT is to help guide the Service in identifying and prioritizing those actions necessary for the recovery of the species. As participants in the recovery planning and implementation process FEMA would be in a position to identify those actions that are within their authorities to implement and thereby contribute to the successful recovery of those species.

REINITIATION NOTICE

(Replace the discussion in the June 16, 1997 opinion on page 5.5, with the following discussion.)
This concludes formal consultation on FEMA's administration of the NFIP in the Florida Keys. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary

Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, in this case any incidental take without separate approval under section 7 or 10 of the ESA; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; (4) a new species is listed or critical habitat designated that may be affected by the action; or (5) Monroe County is in non-compliance with this biological opinion and FEMA fails to initiate enforcement actions as described in the reasonable and prudent alternative, part 4. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation of consultation.

The June 16, 1997 biological opinion included a reinitiation clause that indicated reinitiation was necessary if a completed county wide habitat conservation plan was not received by the Service within four years. The Service included that clause in the original biological opinion because we were aware of county efforts to begin such a conservation plan, and we realized that implementation of such a plan might make the implementation of the RPA unnecessary. However, we have found that the inclusion of the clause in the original BO misled some readers to infer that the completion of such a county wide plan was necessary in order for the stated RPA to perform as intended (that is, to avoid the likelihood of jeopardy to the species). We have not included that clause in this reinitiation notice in order to clarify that the RPA identified here is sufficient to avoid the likelihood that the NFIP in Monroe County will reduce appreciably the survival and recovery of the species (which is the definition of jeopardy). Comprehensive planning action on the part of the county may also benefit the species and we encourage the county to complete the process they are engaged in.

If you have any questions about this consultation, please contact Jay Slack, Supervisor, South Florida Field Office at 772-562-3909.

Sincerely yours,

for Sam D. Hamilton
Regional Director

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