United States Department of the Interior

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Applicant:	John Pennekamp Coral Reef State Park
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County:	Monroe

Dear Mr. Wells:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) for the Florida Department of Environmental Protection's (DEP) proposed North Key Largo Restoration Project (Project) to benefit the endangered Key Largo woodrat (*Neotoma floridana smalli*; KLWR) and the endangered Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*; KLCM) in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The Project is located within the Dagny Johnson Key Largo Hammock Botanical State Park (Park) in Key Largo, Monroe County, Florida.

The Service is consulting with DEP on this project under section 7 of the Act because a Federal nexus involves the expenditure of compensation funds ($713,634.64) from the federally funded Key Largo Wastewater Treatment Plant. The funds were transferred to Monroe County as compensation resulting from the Service's June 11, 2001, BO (Service Code: 41420-2000-T-0736) and October 10, 2006, Technical Assistance (TA) (Service Code: 41420-2006-FA-1604) evaluation of the construction and expansion of the Key Largo Wastewater Treatment Plant. According to the terms of the Service's October 2006 TA letter to the Key Largo Wastewater Treatment District, the Service agreed the funds may be used cooperatively with the DEP to restore tropical hardwood hammock (hammock) on the island of Key Largo. A minimum of 4.2 acres of hammock was specified to be restored in accordance with the terms of the BO and TA. DEP's proposed Project will restore a total of 13.16 acres of hammock in North Key Largo; therefore, the Service approves the use of the $713,634.64 for the Project. The use of the funds for this restoration activity will fulfill the requirements for restoration in the referenced BO and TA.

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This BO is based on information provided in the Park's October 21, 2010, information package, email messages, telephone conversations, site visits, and other sources of information. A complete administrative record of this consultation is on file at the South Florida Ecological Services Office, Vero Beach, Florida.

Consultation History

On October 21, 2010, the Service received the DEP's request for consultation on the proposed Project.

As of June 23, 2011, we have received all the information necessary for initiation of formal consultation on the KLWR and the KLCM as required in the regulations governing interagency consultations (50 CFR § 402.14). The Service is providing this Biological Opinion in conclusion of formal consultation.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Project purpose is to restore historic natural elevations and vegetation on 19.07 acres at three previously developed, and now abandoned, sites in the Dagny Johnson Botanical State Park in North Key Largo (Table 1, Figure 1). The three sites proposed for restoration are: the Port Bougainville Site (Figure 2), the Old Roads site (Figure 3) and the Nike Radar Site (Figure 4). Previous development includes roads, structures, fill and excavations.

The sites are located within the Park in North Key Largo, which encompasses the area north of the intersection of US Highway 1 and County Road (CR) 905. The majority of North Key Largo is in public ownership and preserved as conservation lands. The Service's Crocodile Lake National Wildlife Refuge (CLNWR) is located west of CR 905, while the Park is located east of CR 905. A few private parcels are scattered on either side of CR905. The dominant natural communities are hammock, salt marsh, and mangrove wetland. The majority of the areas to be restored are within hammock. There are sections of transitional zone habitat located at both the Port Bougainville site and the Old Roads site.

DEP proposes to:

- Restore 13.31 acres of disturbed hammock, 5.12 acres of disturbed wetlands to hammock and 0.64 acre of wetland transition zone habitat, totaling 19.07 acres.
- Break up and remove all structures (except one historic radar tower), roads, sidewalks, parking areas, game courts and other previous development and scrape down to a natural grade, matching the elevations of surrounding natural communities.
- Remove fill and transport all clean fill* from the demolition to either the entrance channel at Port Bougainville or Carysfort Marina, both of which are currently under restoration and are permitted to receive clean fill material. Other material including wood, metal, asphalt, etc. will be removed from the site and disposed of at a permitted waste facility.

- Plant the "Restaurant & Tunnel" location, within the Port Bougainville Site, with native vegetation stock grown in the Park's native plant nursery. Natural recruitment is expected to occur rapidly in the other areas.
- Remove and maintain control of invasive exotic vegetation.
- Monitor restoration and revegetation of the proposed sites.
- Conduct small mammal trapping on all Project areas in accordance with Service trapping protocols (Enclosure) and, in consultation with the Service, modify Project guidelines if necessary where KLWRs or KLCMs are found.

**Clean fill is defined as clean (free of contaminants) lime-rock fill, concrete rubble [(smaller than 4 feet, no rebar protruding more than 6 inches, no paint or coating not approved by the Florida Keys Environmental Restoration Fund (KERF)], brick, crushed glass, PVC (chipped to smaller than 6 inches), clay roof or floor tiles and ceramic floor tiles free of sealants.*

Table 1. Proposed habitat restoration.

Site	Hammock Acres	Transitional Zone Acres	Disturbed Wetlands	Total
Port Bougainville	6.16	0.15	5.12	11.43
Old Roads	4.86	0.49	0	5.35
Nike Radar	2.29	0	0	2.29
Total	**13.31**	**0.64**	**5.12**	**19.07**

Action Area

In determining the action area for the KLWR and KLCM for this BO, the Service evaluated the extent that these species may be affected. About 19.07 acres of hammock and transitional wetlands at three previously disturbed sites will be restored (Figure 1). No measureable impacts outside this area were identified. Therefore, the Service's defines the action area for the KLWR and KLCM as the combined footprints of the 19.07-acre Project.

STATUS OF THE SPECIES/CRITICAL HABITAT

The sections that follow summarize the status of KLWR and KLCM across their entire range and the status of critical habitat, where applicable. These summaries provide biological and ecological information relevant to the analyses in the Effects of the Action section that follows.

Key Largo woodrat

Species/critical habitat description

The KLWR is a subspecies of the eastern woodrat (*N. floridana*), a species widely distributed in the eastern United States. The KLWR is gray-brown with white underparts, and has large ears, protuberant eyes, and a hairy tail. The body length ranges from 4.7 to 9.0 inches, the tail length ranges from 5.1 inches to 7.4 inches, and the hind foot length ranges from 1.3 inches to 1.5 inches (Service 1999).

Critical habitat has not been designated for this species. Therefore, no regulatory description is provided here.

Life history

Distribution and Habitat: The KLWR is endemic to the hammocks of Key Largo (Service 2008). Historically, the KLWR occurred throughout Key Largo south to near Tavernier, but the species' present range includes only the northern portion of Key Largo (Frank et al. 1997). About 2,498 acres of suitable woodrat habitat occur within this range, and a total of 2,188 acres (88 percent) are currently protected for conservation purposes. Woodrats are active climbers, and often climb along fallen trees to move across the forest floor. Moreover, woodrats appear to establish and use trails within their home range (Service 1999).

The KLWR, like other members of the genus *Neotoma,* builds large structures as nests and shelters. The structures are comprised of sticks, twigs, and various other objects and assembled into mounds that can reach 4 feet high and 6 to 7 feet in diameter. Woodrats frequently locate these structures adjacent to tree stumps, fallen trees, or boulders and may use old sheds, abandoned cars, rock piles, and machinery as shelter and nest sites. Structures generally consist of a central chamber and may have several entrances. Normally, only one adult woodrat inhabits a structure, and a single woodrat may build and use several structures over its lifetime. Goodyear (1985) found that KLWRs occurring within some areas of North Key Largo did not build structures, although she noted nest and shelter sites located within rock crevices contained at least a few sticks placed at the nest entrance. In the late 1990s, Frank et al. (1997) reported that stick structures were no longer observed on North Key Largo.

Miscellaneous Life History Information: The KLWR is herbivorous; its diet consists of a variety of leaves, buds, seeds, and fruits. Woodrats can reproduce year round, although, reproductive activity has been observed to be greatest during the summer. The KLWR usually gives birth to two young per litter, but litter size can range from one to four young. Female woodrats may produce two litters per year. Both sexes of the KLWR reach sexual maturity in about 5 months. The KLWR is believed to have a short life span. Based on the known life spans of other subspecies of *N. floridana*, the life expectancy of the KLWR is likely 1 to 3 years (Service 1999).

Habitat management

Historically, the management of KLWR habitat on North Key Largo was limited to the maintenance of mature hammock vegetation. However, more recent management efforts have included the installation of artificial cover and nesting structures. For example, the Service enhanced woodrat habitat at the abandoned "Nike Missile" site within the CLNWR in 2004. Concrete buildings at the site were demolished, and piles of rubble and large rocks were constructed to provide cover and nest sites for the KLWR. In 2005, refuge volunteers began experimenting with the placement of artificial structures (comprised of rocks, sticks, artificial materials, etc.) to provide additional nesting sites and shelter for the KLWR within the CLNWR. In 2008, more than 150 artificial structures had been installed within the CLNWR. Potts (2008) reported that about 33 percent of these structures were being used by woodrats. As of January 2010, more than 300 artificial nesting and shelter structures have been installed within the CLNWR (S. Klett, personal communication).

Population dynamics

Past studies to monitor the population size of the KLWR vary greatly with respect to methods and trapping effort. Therefore these studies should not be considered as replicate samples of the KLWR population. However, since each monitoring study provides information on the relative abundance of the KLWR, the studies can be used collectively to roughly assess the population trends of the KLWR. Based on the monitoring data, it does appear that the size of the KLWR population may have declined from levels observed 20 to 30 years ago (McCleery et al. 2006; Winchester 2007), and may currently be precariously small. Frank et al. (1997) suggests the substantial decline in KLWR population occurred sometime in the late 1980s and early 1990s. The following discussion summarizes the information available from past monitoring efforts and studies of the KLWR.

In 1952, anecdotal evidence suggested the KLWR occurred on Key Largo, but was most abundant on the northern end of the island. As discussed above, the KLWR builds nesting and sheltering structures out of sticks, and the presence of these structures can be used as an index of KLWR abundance in an area. A survey of a site in North Key Largo documented 40 stick nests within a site located adjacent to CR 905 approximately 4 miles north of its intersection with U.S. Highway 1 (Service 2003).

In 1970, an effort was made to reestablish the KLWR within Lignumvitae Key Botanical State Park by relocating a total of 19 KLWRs (10 males and 9 females) from North Key Largo (Brown and Williams 1971). The introduction was apparently successful based on the stick nests observed in the area by Hersh (1978) and park rangers. Park rangers reported observing stick nests on Lignumvitae Key until about 1986.

Hersh (1978) studied the KLWR in North Key Largo during 1976 and 1977. Hersh (1978) reported a density of 0.9 woodrat per acre, and reported stick nests were common and could be used as a general indicator of woodrat presence. Hersh (1978) developed an index of 5.6 stick nests per woodrat, and observed mature hammocks supported the highest densities of the KLWR.

In 1979, Barbour and Humphrey (1982) surveyed the KLWR in Key Largo and estimated there were 3,666 KLWR stick nests and 645 individual KLWRs within a 222-acre study area. These estimates were based on live trapping using 40 strip transects established within habitat adjacent to CR 905. Barbour and Humphrey (1982) also found KLWRs on Lignumvitae Key at comparable densities to those on North Key Largo, and estimated 85 KLWRs occurred on the island at a density of 0.9 per acre. Barbour and Humphrey (1982) concluded KLWR density was highest in mature forests, and active stick nests were strong indicators of healthy KLWR populations.

In May and June of 1985, Goodyear (1985) conducted live trapping for the KLWR at 15 sites within hammock habitat in North Key Largo. A total of 59 individual KLWRs were captured during the survey. Goodyear (1985) observed the KLWR was found in areas with and without stick nests. Goodyear (1985) also concluded the following: 1) woodrats are not dependent on stick nests as shelters; 2) stick nest construction is based on habitat conditions, and habitats with abundant natural cover were observed to contain fewer stick nests; 3) disturbance could benefit woodrats in habitats with few natural cavities such as recently cleared early successional sites; and 4) older hammocks with increased structural complexity appear to be optimal woodrat habitat.

From March through May in 1986, Humphrey (1988) surveyed six sites in Key Largo for the KLWR. A total of 129 individual KLWRs were captured during the study. Humphrey (1988) reported a mean density of 1.3 KLWR per acre for sites in the north end of Key Largo, and a higher density of 4.9 KLWR per acre for sites farther south, but still in north Key Largo. Humphrey's (1988) woodrat densities were 7 times greater than densities reported by Hersh (1978) and 3 times greater than the densities previously reported for other subspecies of the eastern woodrat (Finch and Rainey 1956). Humphrey (1988) also concluded that stick nests were poor estimators of KLWR density and tended to underestimate density. Extrapolating average density over acres of habitat available, Humphrey (1988) estimated a population of 6,500 KLWRs in North Key Largo.

Frank et al. (1997) conducted a live trapping survey of the KLWR within North Key Largo during January through May of 1995. Live traps were places within 48 transects (each 250 meters in length), and 4 165-meter by 165-meter trapping grids. Frank et al. (1997) found densities of the KLWR had declined significantly from those reported by Humphrey (1988). A total of only 42 individual KLWRs were captured during the study. Moreover, stick nests were virtually absent from the areas surveyed. Frank et al. (1997) expressed concern that low densities coupled with the absence of stick nests could indicate significant declines in the KLWR population, and suggested that intensive monitoring and management be initiated by State and Federal land managers. Since 1997, the KLWR has been absent on Lignumvitae Key as evidenced by both trapping and lack of sign (Greene 2007).

Sasso (1999) monitored the KLWR from July 1996 through April 1998, using the same trapping locations and methods used by Frank et al. (1997). Sasso (1999) observed woodrat densities and stick nest numbers similar to those reported by Frank et al. (1997). Sasso (1999) concluded intermediate-aged hammock may provide better habitat conditions for woodrats than old, mature hammock, and suggested a possible role for natural disturbance (*e.g.*, hurricanes) in maintaining optimal woodrat habitat.

From 1998 to the present, monitoring of the KLWR has been conducted at the CLNWR by CLNWR staff and others, using live traps arranged in both grids and transects. In April 2002, the Service estimated a population size for the KLWR of 200 individuals (Service 2003).

Trapping initiated in January 2002 by McCleery (2003) documented low numbers of KLWRs and a high mortality rate of radio-collared individuals. McCleery (2003) trapped 60 randomly-established plots on North Key Largo, and captured 10 individual KLWRs, a capture success rate of 17 percent. In October 2002, McCleery estimated a population size for the KLWR of less than 90 individuals (Service 2003).

In 2005, Winchester (2007) conducted live trapping for the KLWR within the CLNWR and the Dagny Johnson State Botanical Park. Winchester (2007) captured a total of 7 KLWRs on 7 of 40 randomly placed grids, a capture rate of 18 percent.

Potts (2008) also conducted live trapping for the KLWR in North Key Largo. A total of 16 individual KLWR were captured at 137 trapping stations within the CLNWR. Potts (2008)

also captured 42 individual KLWR from 152 artificial nest structures located throughout the CLNWR. In addition, Potts (2008) caught 31 KLWR at the "Nike Missile" site within the CLNWR, and 13 KLWRs at the Dagny Johnson State Botanical Park. A total of 102 individual KLWRs were captured during Potts 2008 survey effort. Based on her survey work, Potts estimated the KLWR population in North Key Largo to be about 300 animals (S. Sneckenberger, personal communication).

In 2009, Potts (2009) conducted live trapping for the KLWR in North Key Largo. A total of 6 individual KLWRs were captured at 136 trapping stations established within the CLNWR and Dagny Johnson State Botanical Park. Potts (2009) also captured 42 individual KLWRs from 157 artificial nest structures located throughout the CLNWR. In addition, Potts caught 15 individual KLWRs at the "car dump" and "Harrison Tract" sites within the CLNWR, and 5 individual KLWRs at the "Ocean Forest" and "PP212" sites within the Dagny Johnson State Botanical Park. A total of 68 individual KLWR were captured during Potts 2009 survey effort. Potts noted a substantial drop in detectability of male woodrats during her 2009 survey effort and could not estimate the KLWR population size (S. Sneckenberger, personal communication).

In 2010, Potts conducted additional live trapping for the KLWR in North Key Largo. A total of 2 individual KLWRs were captured at 136 trapping stations established within the CLNWR and Dagny Johnson State Botanical Park. Potts also captured 6 individual KLWRs from artificial nest structures located and 13 individuals during opportunistic sampling throughout the CLNWR (S. Sneckenberger, personal communication). A total of 21 individual KLWRs were captured during Potts' 2010 survey effort.

Status and distribution

Reasons for Listing: From the early 1950's to the present, the KLWR has lost much of its hammock habitat due to land clearing for commercial and residential development. The KLWR was first listed as a threatened species in 1969 under the Endangered Species Conservation Act of 1969. However, this listing only afforded the woodrat protection on Service lands. The KLWR was listed as endangered on September 21, 1983, through an emergency listing action (Service 1983). The emergency listing was necessary to provide full consideration of the welfare of this species during a Service consultation with the Rural Electrification Administration. The proposed action was a construction project that would result in habitat loss. The Key Largo woodrat was proposed for listing as an endangered species with critical habitat on February 9, 1984 (Service 1984a) and was officially listed as endangered under the Act on August 31, 1984 (Service 1984b). The proposed critical habitat designation was withdrawn on February 18, 1986 (Service 1986).

Rangewide trend: As discussed above, evidence suggests the population of the KLWR has decreased significantly over the last 20 to 30 years. Based on the most recent survey information (Potts 2008, 2009), the current small population size of the KLWR makes the possibility of extinction of this species more likely.

Due to the threat of extinction of the KLWR, and our lack of understanding on the specific mechanisms of the observed population decline in the KLWR, the Service began a captive

propagation project for the KLWR in April 2002 to augment the wild KLWR population (Service 2003). The first captive raised KLWRs from the program were introduced into the wild in February 2010. Specifically, 14 captive-bred KLWRs were released into their native habitat at CLNWR. The survival rate of these animals has been low. By July 2010, only one of these animals was known to be alive. Many of the introduced KLWRs were believed to be killed by feral cats (C. Alligood, personal communication), and one KLWR was found dead near CR 905 and may have been hit by a motor vehicle (B. Powell, personal communication). One introduced KLWR was known to successfully give birth after it was released (C. Alligood, personal communication).

Threats: Habitat loss and degradation have adversely affected the KLWR. Significant commercial and residential development in the Keys during the 1960s and 1970s has reduced the extent of habitat available to the KLWR, and degraded the condition of remaining habitat. However, the Federal government and State of Florida have protected the majority of the remaining high quality hammock available for KLWRs on North Key Largo through acquisition and management. A total of about $65 million has been spent to acquire 2,147 acres of habitat on North Key Largo. Moreover, the threat of loss and degradation of remaining KLWR habitat has been significantly diminished with the establishment of the Monroe County's *Rate of Growth Ordinance* in the 1990s. Due to these efforts, the threat of significant loss of remaining KLWR habitat is low.

The presence of exotic animal species on Key Largo also may represent a threat to the KLWR. Feral and free-roaming domestic cats (*Felis catus*) are known to occur within the CLNWR and the Key Largo Hammocks State Botanical Site. Densities of domestic cats appear to be greater near the residential areas of North Key Largo such as the Ocean Reef, Garden Cove, and the Ocean Shores developments. Cats are known to prey upon a variety of wildlife species, and studies indicate that small mammals often compose a large proportion of the diet (Churcher and Lawton 1989). As indicated above, cats are implicated in the death of introduced KLWRs. Moreover, domestic cats may hunt even when fed daily by humans (Liberg 1985). In addition to direct mortality, predators may also have indirect effects on prey species. The risk of predation may alter the behavior of prey species resulting in reduced growth rates and reproductive output (Arthur et al. 2004). Consequently, it is likely feral and free-roaming domestic cats are affecting the KLWR population, but in the absence of specific studies their effects are difficult to quantify. The Service is attempting to address the problem of cats on North Key Largo and contracted the U.S. Department of Agriculture's Wildlife Services in 2005 to remove the cats from the CLNWR. However, because humans continue to release cats in this area, ongoing efforts to remove cats will be necessary.

Other non-native species occurring on Key Largo that may pose a threat to the KLWR include the fire ant (*Solenopsis invicta*), the Burmese python (*Python molurus bivittatus*), and the black rat (*Rattus rattus*) (Service 2008). The role of fire ants in the ecology of the North Key Largo hammocks is not specifically known, but predation by fire ants has substantially affected wildlife populations in other areas (Killion and Grant 1993). Because the KLWR is a ground nester, it may be vulnerable to predation by fire ants. The Service has funded a project currently being conducted by the U.S. Geological Survey (USGS) to detect and control Burmese pythons on Key Largo using visual surveys and experimental traps (Service 2008). Seven Burmese pythons have

been captured in Key Largo since April 2007, and predation of Key Largo woodrats by Burmese pythons was documented in 2007 (Snow 2008). Finally, black rats have also been established on Key Largo, and competition from this species may adversely affect the KLWR. The full extent of the threat from these exotic species is not yet known.

Parasites represent another potential threat to the KLWR because they are known to transmit viruses, bacteria, and protozoa that result in disease and mortality. These pathogens may also be carried by other species of mammals and ultimately transmitted to the KLWR. For example, the roundworm (*Baylisascaris procyonis*), carried by the raccoon (*Procyon lotor*), is known to transmit pathogens to Allegheny woodrats *(N. magister*) (LoGiudice 2001). Raccoons are abundant on North Key Largo. However, to date this species of roundworm has not been detected in raccoons occurring in this area.

The successional stage of woodrat habitat may affect the abundance of the KLWR. The habitat preferences of the KLWR are unclear. Mature hammocks were once thought to provide optimal habitat for the KLWR (Service 2008). However, recent observations documenting KLWRs inhabiting refuse piles have challenged this assumption. Therefore, it is possible woodrats may prefer earlier successional habitats more than originally believed (McCleery, 2003).

Climate change is also an important threat to the KLWR. Sternberg et al. (2007) and Su Yean Teh et al. (2008) in their assessment of the middle and upper Keys susceptibility to sea level rise concluded that hammocks characteristic of the upper Florida Keys will ultimately be replaced by mangrove communities. Worst-case models by Bergh (2009) forecast an 88 percent loss in hammock vegetation within Key Largo by 2100. Consequently, survival of the KLWR will likely require resource management intervention or translocation to suitable habitat outside of North Key Largo.

Analysis of the species/critical habitat likely to be affected

The proposed action has the potential to have temporary adverse effects on the KLWR within the action area. Potential effects include injury, mortality, disturbance, and habitat loss or degradation from demolition and restoration of natural grade. However, the long term effects of the proposed restoration are anticipated to be beneficial.

Critical habitat has not been designated for the KLWR, and will not be affected.

Key Largo cotton mouse

Species/critical habitat description

The KLCM is an island subspecies of the cotton mouse (*P. gossypinus*), a widespread species in the southeastern United States. Schwartz (1952) described the KLCM as a medium-sized mouse with large ears and protuberant eyes. The KLCM has a reddish to dusky brown back and a white underside. The body length ranges from 6.6 inches to 7.4 inches, the tail length ranges from 2.8 inches to 3.4 inches, and the hind-foot length ranges from 0.82 inch to 0.90 inch (Service 1999).

Critical habitat has not been designated for this species. Therefore, no regulatory description is provided here.

Life history

Distribution: The KLCM historically inhabited all of the hammock forests from the northern end of Key Largo southward to Tavernier in Plantation Key. The distribution of the KLCM is now restricted to Key Largo north of the intersection of U.S. Highway 1 and CR 905, known locally as North Key Largo (Frank et al. 1997). The Service introduced the KLCM to Lignumvitae Key in 1970. However, the last recorded sighting was in 1977 (Service 2009). The KLCM was not observed during a trapping study on Lignumvitae Key in 2007 (Greene 2007) and it appears that this population no longer exists.

Habitat: The KLCM occurs within a variety of habitats including early successional, and mature hammocks, and *Salicornia* coastal strands (Humphrey 1992). The species is also known to use recently burned areas where bracken fern *(Pteridium aquilinum)* dominates the ground cover (Goodyear 1985). The KLCM builds leaf-lined shelters in logs, tree hollows, rock crevices, or within or near woodrat nests. The shelter entrances measures 1.2 inches to 3.5 inches in diameter, and is often partially covered with leaves or bark.

Miscellaneous Life History Information: The KLCM is an herbivore, its diet consisting of leaves, buds, seeds, and fruits. Cotton mice breed throughout the year, and produce two to three litters annually with a mean litter size of four. The KLCM's life expectancy ranges from about 5 months to 3 years (Service 2009).

Population dynamics

Because efforts to monitor the KLCM population over the last 30 years have been meager, trends in the population are difficult to ascertain. Barbour and Humphrey (1982) reported a density of 11.5 KLCM per hectare (4.7 KLCM per acre), Humphrey (1988) reported a density of 21.2 KLCM per hectare (8.6 KLCM per acre), and Frank et al. (1997) reported a density of 6.2 KLCM per hectare (2.5 KLCM per acre). Castleberry et al. (2008) conducted the most current monitoring efforts of the KLCM population in North Key Largo in 2007 and estimated a KLCM population of about 17,000 individuals with an increasing trend in the population based on live trapping conducted from November to December.

Status and distribution

Reasons for Listing: From the early 1950s to the present, the KLCM has lost much of its hammock habitat due to land clearing for commercial and residential development. Consequently, the KLCM was listed as endangered for 240 days on September 21, 1983, through an emergency listing action (Service 1983). The emergency listing was necessary to provide full consideration of the welfare of this species during Service consultation on a Federal action undertaken by the Rural Electrification Administration. The action consisted of a loan to the Florida Keys Electric Cooperative for construction of a project that would accelerate loss of

KLCM habitat. The KLCM was proposed as endangered with critical habitat on February 9, 1984 (Service 1984a) and was listed as endangered on August 31, 1984 (Service 1984b). The proposed critical habitat was withdrawn on February 18, 1986 (Service 1986, Service 1999).

Rangewide trend: The KLCM was formerly distributed throughout Key Largo, but is now restricted to hammocks on North Key Largo. However, the majority of high quality hammock habitat available on North Key Largo has been protected through acquisition and is being managed for conservation by the Service and State of Florida. Because 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. A total of 2,498 acres of suitable KLCM habitat currently occurs in North Key Largo. About 88 percent of this acreage (2,188 acres) is protected under public ownership.

Threats: A potential serious threat to the KLCM is feral and free-roaming domestic cats. Cats are known to occur within the CLNWR and the Key Largo Hammocks State Botanical Site. Densities of domestic cats appear to be greater near the residential areas of North Key Largo such as Ocean Reef, Garden Cove, and the Ocean Shores developments. Cats are known to prey upon a variety of wildlife species, and studies indicate that mice often compose a large proportion of the diet (Churcher and Lawton 1989). Moreover, cats may hunt even when fed daily by humans (Liberg 1985). In addition to direct mortality, predators such as cats may also have indirect effects on prey species. The risk of predation may alter the behavior of prey species resulting in reduced growth rates and reproductive output (Arthur et al. 2004). Consequently, it is likely that cat predation is affecting the KLCM population. However, in the absence of specific studies, the effects of cat predation on the KLCM population are difficult to quantify. The Service is attempting to address the problem of free roaming cats on North Key Largo and contracted the U.S. Department of Agriculture's Wildlife Services in 2005 to remove the cats from the CLNWR. However, because humans continue to release cats in this area, future efforts to remove cats from the area will be necessary.

Other non-native predators, such as fire ants and exotic snakes, also pose a threat to the KLCM (Service 2009). The role of fire ants in the ecology of the North Key Largo hammocks is not specifically known. However, fire ants have substantially affected wildlife populations in other areas (Killion and Grant 1993). Because the KLCM is a ground nester, it may be vulnerable to predation by fire ants. The exotic Burmese python may also be a significant predator of the KLCM. The Service has funded a project currently being conducted by the USGS to detect and control Burmese pythons on Key Largo using visual surveys and experimental traps (Service 2008). Seven Burmese pythons have been captured in Key Largo since April 2007 (Snow 2008). Finally, black rats have also been established on Key Largo, and competition from this species may adversely affect the KLCM. The full extent of the threat from these exotic species is not yet known.

In addition to predators, past commercial and residential development in the Keys has reduced the extent of habitat available to the KLCM, and degraded the condition of remaining habitat. Brown (1978) and Hersh (1981) attributed the apparent extirpation of this species from Key Largo south of the U.S. Highway 1/CR 905 intersection to land clearing followed by residential and commercial development. Habitat fragmentation, combined with a decreased range, makes

the KLCM more vulnerable to natural catastrophes such as hurricanes and fire (Service 1993). However, the Federal government and State of Florida have protected the majority of the remaining high quality hammock habitat available for KLCMs on North Key Largo through acquisition and management. A total of about $65 million has been spent to acquire 2,147 acres of hammock habitat on North Key Largo. Moreover, the threat of loss and degradation of remaining woodrat habitat has been significantly diminished with the establishment of the Monroe County's *Rate of Growth Ordinance* in the 1990s. Due to these efforts, the threat of significant loss of remaining KLCM habitat is low.

Climate change is also considered an important threat to the KLCM. Sternberg et al. (2007) and Su Yean Teh et al. (2008) in their assessment of the middle and upper keys susceptibility to sea level rise concluded that hammocks characteristic of the upper Florida Keys will ultimately be replaced by mangrove communities. Worst-case models by Bergh (2009) forecast an 88 percent loss in hammock vegetation within Key Largo by 2100. Consequently, in order to survive, the KLCM will likely require resource management intervention or translocation to suitable habitat outside of North Key Largo.

Analysis of the species/critical habitat likely to be affected

Although ultimately considered to be beneficial, the proposed restoration action has the potential to adversely affect the KLCM. The effects on the KLCM will be considered further in the remaining sections of this BO. Potential effects include injury, mortality, disturbance, and habitat loss or degradation from demolition and restoration activities.

Critical habitat has not been designated for the KLCM, and, therefore, none will be affected.

Other species in the Action Area

The following species also occur within the Project's Action Area: the endangered Schaus swallowtail butterfly (*Heraclides aristodemus ponceanus*), the threatened Stock Island tree snail (*Orthalicus reses reses*), the endangered American crocodile (*Crocodylus acutus*), and the threatened eastern indigo snake (*Drymarchon corais couperi*).

The Service notes suitable nesting habitat for the American crocodile will not be affected. Furthermore, the Schaus swallowtail butterfly and the Stock Island tree snail are not known to occur in the disturbed areas to be restored. Stock Island tree snails and Schaus swallowtail butterflies were not documented at the Port Bougainville site during pedestrian surveys conducted by the DEP's environmental consultant (Service 2010). There has not been a reported observation of the eastern indigo snake in north Key Largo within the past 10 years (Steve Klett, personal communication). Therefore, it is unlikely the eastern indigo snake currently uses the restoration sites.

As discussed below in the section entitled "Reasonable and Prudent Measures," procedures used to clear and grub the project sites and demolish existing buildings will be designed to minimize the potential for harm to federally listed species. Therefore, the Service finds the Project is likely to

have long term beneficial effects on the American crocodile, eastern indigo snake, Schaus swallowtail butterfly, and Stock Island tree snail. We concur with the DEP's determination that this project is not likely to adversely affect these species.

ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, and private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions, which are contemporaneous with the consultation in progress.

Status of the Species within the Action Area

Key Largo woodrat and Key Largo cotton mouse

Although the Project sites are disturbed, the Service finds they provide some potential habitat for the KLWR and the KLCM. Moreover, trapping studies have documented the KLWR and the KLCM in or near all of the Project sites (Service Geographical Information System (GIS) data 2011).

Factors Affecting the Species' Environment within the Action Area

The action area is located within the geographic range of the KLWR and KLCM. The Project sites (*i.e.*, the action area) are within a State-owned botanical park that is managed for conservation. The restoration sites were previously disturbed by development and are largely cleared of existing vegetation and were previously developed (roads, buildings, etc.).

Climate Change

According to the Intergovernmental Panel on Climate Change Report (IPCC 2007), warming of the earth's climate is "unequivocal," as is now evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level. The IPCC Report (2007) describes changes in natural ecosystems with potential wide-spread effects on many organisms, including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Based on these findings and other similar studies, the Department of the Interior (DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007).

Global climate changes will intuitively affect regional weather, which is also strongly affected by season and by local effects (*e.g.*, elevation, topography, latitude, proximity to the ocean). Temperatures are predicted to rise from 2°C to 5°C for North America by the end of this century (IPCC 2007), affecting rainfall (amount, seasonal timing and distribution), storms (frequency and intensity), and sea level rise. However, the exact magnitude, direction and distribution of these changes at the regional level are not well understood or easy to predict. Seasonal change and

local geography make prediction of the effects of climate change at any location variable. Climatic changes in south Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management (Pearlstine 2008).

Air Temperature

Current models predict changes in mean global temperature in the range 2 to 4°C (4 to 8°F) by 2100, but how this manifests at the regional and local scale is uncertain. A change of just 2 degrees can have profound effects, particularly at temperature extremes. For example, in Florida, winter frost, a 2-degree transition from 33°F to 31°F, greatly affects vegetation. While predicted changes in average annual temperature appear small, local and seasonal temperature variation may be greater. It is also important to consider that an increase in global atmospheric temperature may manifest as an increase or a decrease in local means and extremes. We do not yet know either the direction or anticipated size of temperature change in Florida, but the following possibilities should be considered:

- Changes (likely small) in mean annual temperature.
- Greater extremes of temperature in summer (average highs) and winter (average lows).
- More prolonged and seasonally extended frosts.
- Shifts in the distribution of temperature regimes (isotherms, growing zones).
- Changes in the seasonal onset of temperature changes (*e.g.*, earlier spring).
- Changes in the duration of temperature regimes (*e.g.*, longer hot summers).
- Changes in both air and water (lake, river, ocean) temperature.

Most organisms have preferred ranges of temperature and lethal temperature limits they cannot survive. Many organisms require temperature signals or suitable temperature regimes to successfully complete life cycle activities such as nesting and winter dormancy. Some organisms are sensitive to temperature for incubation, sex determination (*i.e.*, reptiles such as sea turtles and alligators) or seed germination. The dissolved oxygen content of water (affecting fish) and the water content of vegetation (affecting fire combustion) are temperature-dependent. Some noxious or undesirable organisms may proliferate under different temperature regimes (*e.g.*, blue green algae in lakes, exotic species). Changes in temperature will likely affect fish and wildlife resources in many ways depending on the direction, amount, timing and duration of the changes.

Rainfall

Florida is already very sensitive to variation in rainfall. Well-drained soils, rapid runoff and high plant transpiration quickly redistribute water available to organisms. Despite a high average rainfall, much of Florida experiences seasonal drought that profoundly affects fish and wildlife resources. Florida's rain depends on both global and regional climate factors (jet stream, El Nino, frontal progression, storms and hurricanes) and local weather (thunder storms, sea breezes, lake effects and local circulation) that are likely affected by climate change. The following factors at the local level should be considered:

- Average annual rainfall (higher or lower).
- Seasonal distribution of rainfall (when rain falls).

- Regional distribution of rainfall (where rain falls).
- Intensity (*e.g.*, more severe storm rain, or dispersed "misty" rain).

Rainfall is affected by temperature (changes in evaporation). Rainfall change will likely be mediated through responses by vegetation and surface water availability (lakes, ponds, rivers, swamps, wet prairies) on which many organisms depend. In the longer term, changes in deposition (recharge) to surficial and deep aquifers may affect spring flow. Florida has an unusually large area of wetland habitats supporting wildlife. If climate change reduces rainfall, then desertification of much of Florida is possible and it may come to resemble "desert islands" such as much of the Bahamas that occur at the same latitude. Rainfall changes could profoundly affect Florida's fish and wildlife resources.

Storms

One predicted effect of climate change is to increase the frequency and intensity of severe storms, particularly tropical cyclones (hurricanes). Higher sea temperatures and high atmosphere conditions generate energy and conditions suitable for storms. There is some controversy on whether this effect is already discernible against the background of natural variation and cycles of hurricane occurrence. Hurricanes are generally detrimental to human interests and cause plant and animal mortality. However, their effect in natural systems is generally transient. Plants and animals recover rapidly. Hurricanes have significant secondary effects, which are not necessarily negative for wildlife, *i.e.*, remodeling coastal habitat structure (barrier islands, beaches, salt/freshwater intrusion to marshes and estuaries), renewing plant succession and replenishing water bodies and aquifers. Hurricane effects will interact with rainfall and sea level changes, possibly exacerbating coastal flooding. Hurricanes also redistribute organisms, particularly plants, by spreading seeds and other propagules. The following possibilities at the local level should be considered:

- Increased storm intensity and frequency.
- More concentrated storm tracks leading to more frequent storm landfall.
- Interaction of surge and sea level affecting coasts and adjacent inlands.
- Distribution of invasive species.

Sea Level Rise

All current predictions suggest sea level will rise due to melting of continental and glacial ice and thermal expansion of the oceans. Florida, with its extensive coastline and low topography is vulnerable to sea level rise. The magnitude of the predicted rise is currently unknown and estimates vary from a few centimeters to meters. Modeled predictions using median consensus sea level rise estimates indicate that significant portions of Florida's coastline will be inundated and a major redistribution of coastal habitats is likely. However, to put this in context, Florida's coast currently experiences sea level fluctuations (tides) of 1 to 2 meters (3 to 6 feet) twice daily and is exposed to storm surges of 3 to 5 meters (9 to 15 feet) during hurricanes. Sea level changes will be superimposed on these current fluctuations. While these changes would be disastrous to human structures and activities, the effect on wildlife and its habitat may be less damaging. In essence, coastal habitats will migrate inland and Florida's flat coastal topography (a result of previous sea level changes) actually mitigates the effect. Current coastal forests,

dunes and beaches will migrate inland and be displaced by marsh, current marsh will become sea grass, barrier islands will become sandbars and new barrier islands will form. The primary effect on wildlife will be redistribution, and possibly an increase in some habitats at the expense of others. Temperature and rainfall effects may redistribute mangroves and coral reefs into an expanded coastal zone. The hazard to wildlife will arise from efforts to protect human structures from these changes by dikes, sea walls, dredging, beach nourishment and similar engineering responses. Changes in temperature regimes in the ocean may cause shifts in distribution of marine species, and profound, but entirely unpredictable effects may be generated if climate changes causes large scale change in ocean circulation such as the Florida Current. The following possibilities at the local level should be considered:

- Transient, but damaging effects on vulnerable coastal species (*e.g.*, beach nesting shorebirds, sea turtles).
- Redistribution of coastal habitats with disruptions of productivity.
- Sedimentation effects during the transition.
- Interactive synergy with other climate effects (*e.g.*, temperature, storm frequency) to generate unanticipated second order effects.
- Disruption of coastal migration patterns, particularly "passive" migrations of larvae driven by local water movement effects.
- Secondary effects of protection of human structures.
- Migration zones and corridors available to allow changes in distribution.

To summarize, effects of climate change on wildlife in Florida are likely to be widespread and profound, and occur over a variety of dimensions and variables. As these effects cannot be prevented or delayed, a practical response is to identify key areas, species and habitats that are vulnerable to change and develop strategies to avoid or minimize effects.

Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006).

EFFECTS OF THE ACTION

This section analyzes the direct and indirect effects of the Project on the KLWR and the KLCM, and their habitat.

Factors to be Considered

This restoration project will occur within habitat suitable for the KLWR and the KLCM. Critical Habitat has not been designated for these species. The timing of the restoration, relative to sensitive periods of the KLWR's and KLCM's life cycles, is unknown. The KLWR and the KLCM may be found within and adjacent to the proposed restoration footprints year-round. The Project will result in the restoration of 19.07 acres of KLWR and the KLCM habitat. The time

required to complete the restoration is not known, but it is likely the removal of existing development will be completed within a few months. It will take several years for complete natural revegetation to occur. The initial disturbance associated with the Project will be temporary.

Analyses for effects of the action

Beneficial Effects - Beneficial effects are those effects of the proposed action that are wholly positive, without any adverse effects to the listed species or its critical habitat. The Project will result in the restoration of 19.07 acres of KLWR and the KLCM habitat.

Direct Effects - Direct effects are those effects that are caused by the proposed action, at the time of construction, and are reasonably certain to occur. The direct effects that this project will have on the KLWR and KLCM within the action area are discussed below.

The restoration activities and temporary habitat loss during clearing and removal of structures, fill, and roads may result in take of the KLWR and the KLCM. The probability of incidental take is dependent upon the number of KLWRs and KLCMs in the area, their dispersal abilities, and the amount and distribution of available, suitable habitat. With proper safeguards in place during construction, the probability of direct mortality of the KLWR and the KLCM as a result of construction activities is low. However, the proposed action will directly result in the temporary loss of 19.07 acres of potentially suitable habitat, some of which may provide limited foraging and breeding habitat for KLWRs and KLCMs. As indicated above, a total of 2,498 acres of suitable KLWR and KLCM habitat currently occurs in North Key Largo. Therefore, the Project will result in temporary impacts to less than 0.5 percent of the geographic range of these species, and much of that 0.5 percent is currently concrete, asphalt or road beds.

The restoration will result in increased human activity (*e.g.*, equipment, construction personnel, surveys, replanting, etc.). The increase in human activity could cause the KLWR and the KLCM to avoid using existing adjacent habitat, resulting in additional temporary habitat loss. However, KLWRs and KLCMs present adjacent to the restoration activities could acclimate to the human activities and not abandon adjacent habitat.

Interrelated and Interdependent Actions - An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that does not have independent utility apart from the action under consultation. Interrelated or interdependent actions are not expected to result from the Project.

Indirect Effects - Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside the area directly affected by the action. Indirect effects may include other Federal actions that have not undergone section 7 consultation, but will result from the action under consideration.

The indirect effects of the restoration are expected to be beneficial, resulting in restoration of 19.07 acres of hammock to its natural condition. Additional high quality habitat will be created and existing access to the sites will be more restricted following restoration. Invasive, exotic plant removal will continue after initial clearing and is beneficial.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Future restoration projects are anticipated to occur in or near the action area and their long term effects should be beneficial. These restoration projects are likely to be consulted on by the Service; and, therefore, are not considered as cumulative effects.

CONCLUSION

After reviewing the current status of the KLWR and KLCM, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Project, as proposed, is not likely to jeopardize the continued existence of the KLWR or the KLCM.

The Project will result in the restoration of 19.07 acres of KLWR and KLCM habitat. The restoration is expected to benefit the overall survival and recovery of the KLWR and KLCM. Critical habitat has not been designated for the KLWR and KLCM. Therefore, critical habitat will not be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of the agency action, is not considered to be prohibited taking under the Act provided such taking is in compliance with the terms and conditions of this incidental take statement.

The terms and conditions described below are nondiscretionary and must be undertaken by the DEP so they become binding conditions of any grant or permit issued to the DEP, as appropriate, for the exemption in section 7(o)(2) to apply. The DEP has a continuing duty to regulate the activity covered by this incidental take statement. If the DEP (1) fails to assume and implement the terms and conditions or (2) fails to require DEP to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant

document, the protection coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the DEP, must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service has reviewed the biological information for the KLWR and KLCM, information presented by the applicant's consultant, and other available information relevant to this action.

The Service anticipates incidental take of one KLWR and one KLCM that could be killed during debris removal, or during trapping. Incidental take of three KLWRs and KLCMs in the form of harm and harassment is also anticipated from the action. Temporary harm (*i.e.,* habitat loss) to the KLWR and KLCM will result from the construction activities to restore 19.07 acres of habitat. Harassment of the KLWR and KLCM is anticipated in the form of disturbance resulting from the removal of debris, restoring natural grade, and trapping.

The Service has determined this level of anticipated take is not likely to result in jeopardy to these species. If, during the course of this action, this level of take is exceeded, such take would represent new information requiring review of the reasonable and prudent measures provided. All work should stop and the reasonable and prudent measures must be modified immediately.

EFFECT OF THE TAKE

In this Biological Opinion, the Service determined this level of anticipated take is not likely to result in jeopardy to the KLWR or KLCM. No critical habitat has been designated for either of these species; therefore, none will be destroyed or adversely modified.

REASONABLE AND PRUDENT MEASURES

When providing an incidental take statement, the Service is required to give reasonable and prudent measures it considers necessary or appropriate to minimize the take along with terms and conditions that must be complied with to implement the reasonable and prudent measures. Furthermore, the Service must also specify procedures to be used to handle or dispose of any individuals taken. The Service believes the following reasonable and prudent measures are necessary and appropriate to reduce take and to minimize the direct and indirect effects of the Project on the KLWR and KLCM:

1. Further minimize the adverse effects of the action to the KLWR and KLCM and other species through avoidance of certain areas (as described in the Terms and Conditions, below), use of appropriate land clearing techniques and planting appropriate native species.
2. Evaluate the success of the restoration plan through appropriate monitoring.
3. Minimize the adverse effects of feral animal predation on the KLWR and KLCM.

TERMS AND CONDITIONS

To implement the above reasonable and prudent measures, the Service has outlined the following terms and conditions. In accordance with the Interagency Cooperation Regulation (50 CFR 402), these terms and conditions must be complied with to implement the reasonable and prudent measures:

1a. DEP will not restore 0.15 acre of emerging hammock at the Port Bougainville Site marked as "Fill Area" in Figure 2.

1b. Land clearing, removal of abandoned buildings and construction activities will not commence until trapping for presence of KLWR and KLCM has been completed at each restoration site. If presence is documented, the Service will be contacted to delineate areas that will be avoided.

1c. Procedures used to clear and grub the proposed sites will be designed to minimize the potential for harm to the KLWR and KLCM. Stands of existing hammock vegetation will be avoided if possible. The sites will be cleared of vegetation by workers using chain saws. All cut vegetation will be removed daily, and piles or other accumulations of vegetation will not be allowed to remain overnight. Following site clearing, existing abandoned buildings, sheds, roads, courts, etc. will be demolished using a hand-held or equipment-mounted pneumatic or hydraulic jackhammer where feasible. The gradual demolition of concrete structures will allow any KLWRs and KLCMs hiding in or under the existing structures to leave the project site, while minimizing potential injuries. Once the buildings and sheds have been demolished, the debris will be removed from the site immediately. Storage of demolition debris will not occur on the project site. A qualified biologist with documented experience identifying and handling the KLWR and the KLCM (as described in Term and Condition 2b) will be on site during the debris removal, vegetation clearing and building demolition. If a living KLWR or KLCM is encountered during land clearing or demolition, all work will immediately stop and the animal will be allowed to leave the area under its own volition. Land clearing and demolition work will not resume until the animal has left the project site. If a dead KLWR or KLCM is encountered during land clearing or demolition, all work will immediately stop, the animal will be left *in situ*. The original material surrounding it will be immediately returned to its original configuration to the maximum extent practicable. The Service will then be contacted (see 4, below) for further instructions. Demolition or debris removal will not resume until authorized by the Service. All KLCMs or KLWRs observed will be recorded and this information will be provided to the Service within 10 business days of completion of land clearing and demolition.

1d. DEP will consult with the Service on the removal of any existing debris piles that are not removed by hand.

1e. DEP will avoid disturbance of any stick or other pile nests, and contact the Service if any are encountered.

1f. Native hammock species planted at the "Restaurant & Tunnel" location will include pigeon plum (*Coccoloba diversifolia*), wild coffee (*Psychotria nervosa*), torchwood (*Amyris elemifera*) and wild lime (*Zanthoxylum fagara*).

2a. Live trapping for KLWR and KLCM will be conducted, at a minimum, at the sites at 5 and 10 years after the restoration is completed to evaluate the success of the restoration. All trapping procedures will follow the Service's protocol for small mammal surveys. The following information will be recorded for each KLWR or KLCM captured during the trapping: GPS location; the species of the each animal captured; the date each animal was captured; the location of each animal captured; the sex, approximate age, and mass (in grams) of each animal captured; and any other noteworthy observations. All KLWRs and KLCMs captured will immediately be released unharmed at the trap site following the recording of data. Any other threatened and endangered species encountered within the project footprint will be recorded. Black rats captured during the live-trapping event will be euthanized humanely. The date and GPS location of each black rat captured as well as standard biological data will be recorded. A summary report will be provided to Service within 30 days of completion of the initial live trapping activities.

2b. Experienced biologists are necessary to minimize take during the live-trapping and monitoring of the KLWR and the KLCM specified in Term and Conditions 1b, 1c, 1d, 1e and 2a. Qualifications include education, experience with required techniques, and knowledge of the specific species being evaluated. The Service will provide an email to the individual(s) conducting these actions that provides their name, the location and date(s) of the action, methodology, and any special conditions associated with the event. The recipient, when conducting the authorizations, shall carry a copy of the email at all times.

The Service authorizes the following qualified individuals to safely capture and handle the KLWR and KLCM to implement the Reasonable Prudent Measures and Terms and Conditions of this BO:

Dr. Philip Frank, Terramar Environmental Services Incorporated, Sugarloaf Key, Florida 33042

Ms. Nadia Spencer, Post Office Box 726, Key Largo Florida, 33037

This action is in accordance with the exemptions afforded under the Biological Opinion's Incidental Take Statement as a requirement to minimize the anticipated take to listed species. Other qualified individuals and/or species may be considered by the Service if deemed appropriate.

3a. Control feral and free-ranging domestic cats on the project sites in perpetuity, and educate the public about the harm to the KLWR, KLCM, and other native wildlife species that results when domestic cats are allowed to roam freely or are released into the wild.

Upon locating a dead KLWR or KLCM specimen, initial immediate notification must be made to the nearest Service Law Enforcement Office (10426 NW 31st Terrace, Miami, Florida 33172;

305-526-2610; 305-526-2610). Secondary notification should be made to the FWC (South Region, 8535 Northlake Boulevard West Palm Beach, Florida 33412; 561-625-5122). Care must be taken in handling any dead specimens of proposed or listed species found in the project area to preserve the specimen or its remains in the best possible condition. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the Act. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure the terms and conditions are appropriate and effective.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service is not proposing any conservation recommendations at this time.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the Project. As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required when discretionary Federal agency involvement or control over the action has been retained and if: (1) the amount or extent of incidental take is exceeded; (2) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat not considered in this opinion; (3) 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; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation in the effort to conserve fish and wildlife resources. If you have any questions regarding this project, please contact Winston Hobgood at 772-469-4306.

Sincerely yours,

Donald R. Progulske
Acting Field Supervisor
South Florida Ecological Services Office

Enclosure

cc: electronic only
Corps, Miami, Florida (Paul Kruger)
EPA, West Palm Beach, Florida (Richard Harvey)
DEP, Tallahassee, Florida (Samantha Browne)
FWC, Tallahassee, Florida (FWC-CPS, Maryann Poole, Traci Wallace)
FWC, West Palm Beach, Florida (Ricardo Zambrano)
Service, Atlanta, Georgia (Dave Flemming)
Service, Big Pine Key, Florida (Anne Morkill)
Service, Key Largo, Florida (Steve Klett)
Service, Vero Beach, Florida (Sandra Sneckenberger)

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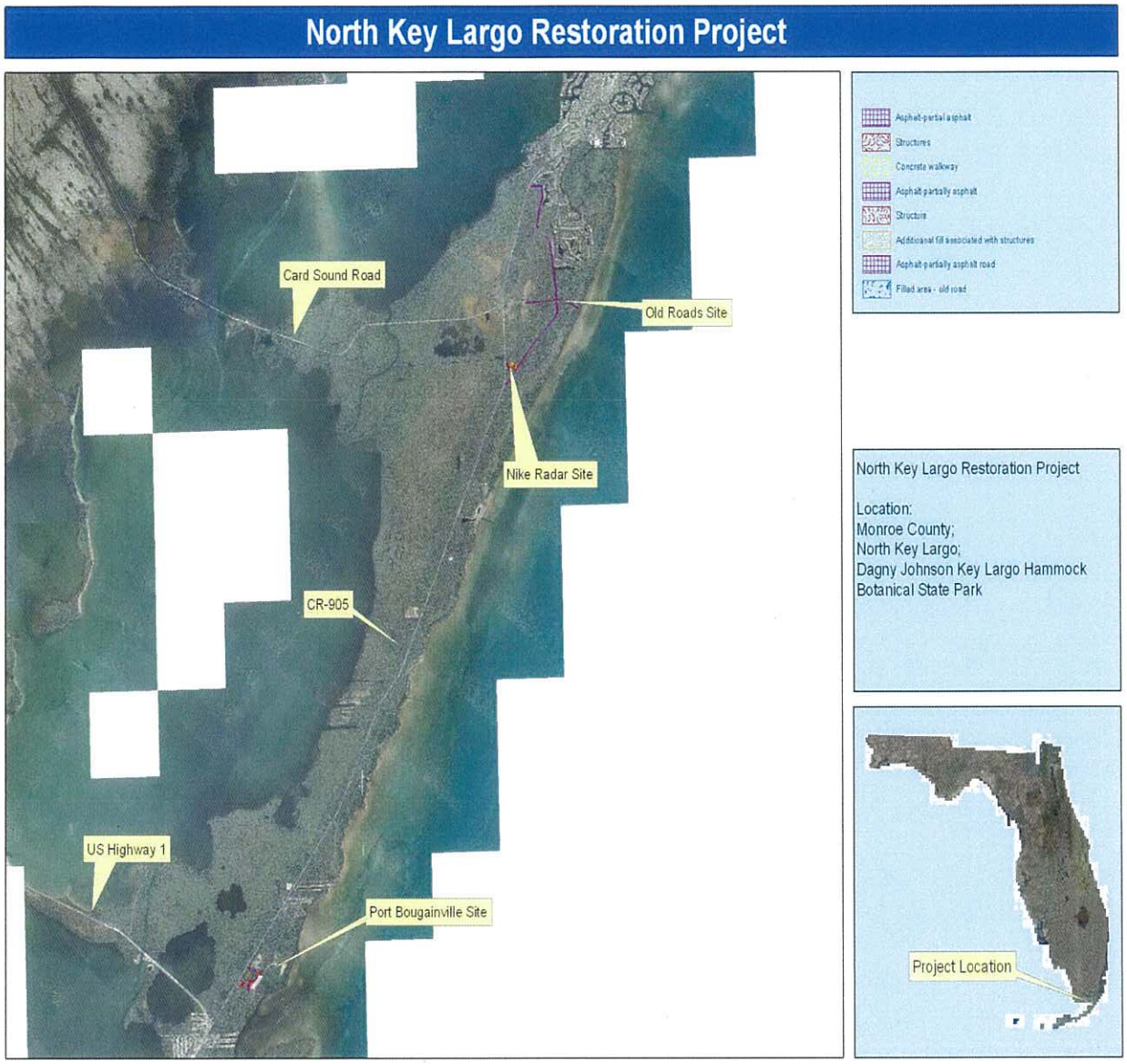
Figure 1: Location of the three proposed restoration sites on North Key Largo.



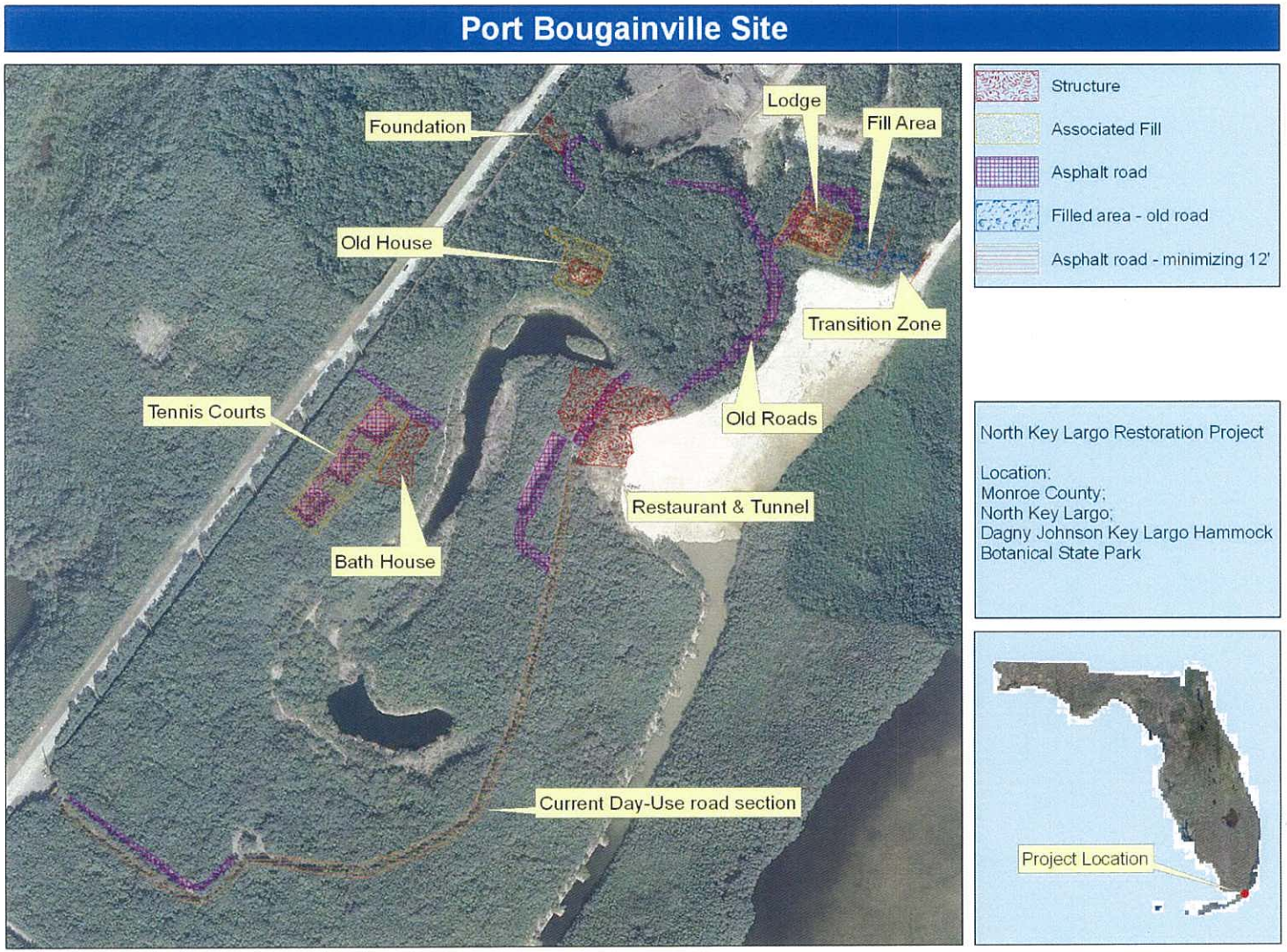
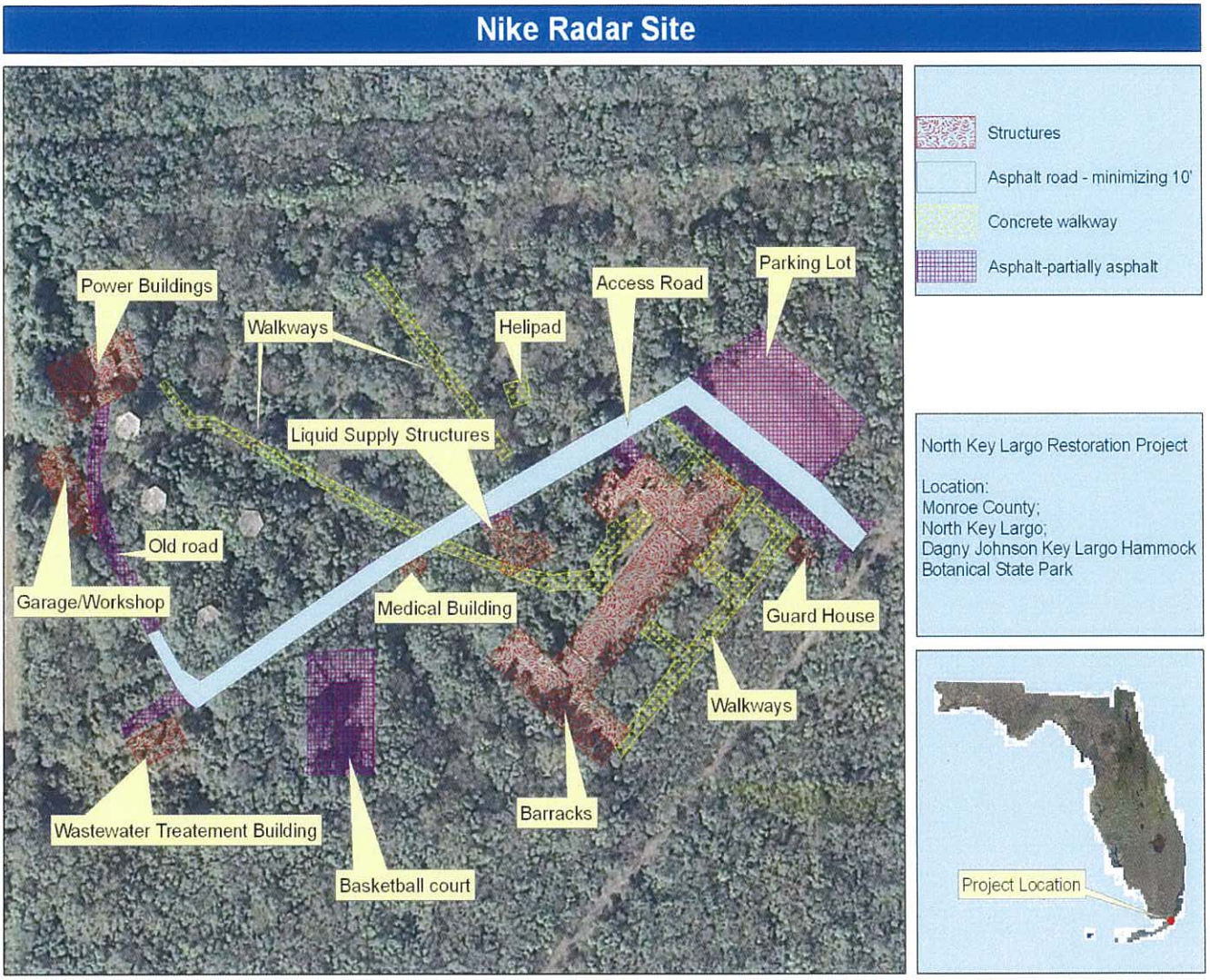


Figure 2: Aerial of the Port Bougainville Site showing areas to be restored.

Figure 3: Aerial of the Old Roads Site showing areas to be restored.

Figure 4: Aerial of the Nike Radar Site showing areas to be restored.



Enclosure

Key Largo woodrat and Key Largo cotton mouse
Trapping Protocol

U.S. FISH AND WILDLIFE SERVICE

TRAPPING PROTOCOL TO DETERMINE PRESENCE OF
THE KEY LARGO WOODRAT (*Neotoma floridana smalli*) AND THE KEY LARGO
COTTON MOUSE (*Peromyscus gossypinus allapaticola*)
5/9/2005

This protocol is to be used when trapping to determine presence/absence of the Key Largo woodrat (KLWR) and Key Largo cotton mouse (KLCM) in a given area.

1. Individuals conducting the trapping should have a permit and previous experience in live trapping small mammals (or be trained by an experienced person). They must also be able to identify any species that may be captured during the trapping event.

2. Surveys should include all potential KLWR/KLCM habitats within the area and, if landowner permission can be obtained, adjacent lands with potential KLWR/KLCM habitat.

3. Trapping should be conducted over the entire project area using a grid system of Sherman live-traps spaced at 10-15 meter intervals.

4. Traps should be set for four consecutive nights per trapping season or until an individual of each species is caught. Unexpected drops in temperature may cause a disruption in consecutive trapping nights.

5. Trapping will not be conducted when nighttime temperatures are forecast to be <60° F. If temperatures are forecast to be in the mid to low 60's, cotton balls (4-5) will be placed in the trap along with the bait.

6. Bait should consist of crimped oats and any combination of the following ingredients: peanut butter, grapes, apples and/or sunflower seeds.

7. In areas where fire ants are present, 10% Carbaryl (Sevin) dust will be placed immediately under the traps so that KLWRs/KLCM will not come in immediate contact with it. Other approved methods will be considered.

8. Traps should be checked and all KLWRs/KLCM released no later than 3 hours after official sunrise.

9. Upon capture of a KLWR or KLCM, authorized personnel identified by the Service will be contacted immediately.

10. All captured individuals shall be handled for as briefly as possible in a humane manner during the time it takes to tag, examine, identify, and collect necessary biological samples. OPTIONAL: All KLWRs captured in the wild will have blood samples taken by authorized personnel for genetic analysis. PIT (passive-induced transponder) tags in conjunction with ear tags will be used for individual woodrat

identification and such identification will be applied by authorized personnel. All KLWRs/KLCM shall be released at their point of capture, if possible.

11. Any black rats (*Rattus rattus)* captured during woodrat trapping will be euthanized humanely. If raccoons are disturbing traps (determined by missing bait or closed traps), the Service will be contacted and an appropriate method for minimizing trap disturbance will be implemented. If raccoon trapping is deemed necessary, the raccoons will be trapped using appropriately sized traps (*e.g.*, Tomahawk). Domestic cats are to be released on the perimeter of the study area near residences and any feral cats captured in the traps will be brought to the local animal shelter.

12. Presence of KLWRs/KLCM can be documented in a single trapping period. To determine absence, traps shall be operated seasonally (fall, winter, spring, summer) for 2 years.

13. Site description and trapping data should be recorded. Site description should include GPS location and property Real Estate number, habitat on the project area and adjacent lands, and trapping design relative to habitat distribution. Daily trapping data should include number of KLWRs/KLCM trapped per day, non-target species, and lost or missing traps. Sex, age, and reproductive status of Key Largo cotton mice will also be reported. Digital photographs of trap setups and captured animals should be included with the final report. All data, including all verified data, GIS files, metadata, photographs, reports and final reports will be delivered via CD- or DVD-ROM. All trapping information should be submitted to the following offices:

    Winston Hobgood
    U.S. Fish and Wildlife Service
    1339 20th Street
    Vero Beach, Florida 32960

    Jeffery A. Gore, Ph.D.
    Fish and Wildlife Research Institute
    Florida Fish and Wildlife Conservation Commission
    3911 Highway 2321
    Panama City, Florida 32409

    Pat Wells
    Pennekamp State Park
    Post Office Box 487
    Key Largo, Florida 33037

    Ernest M. Cowan
    Florida Park Service
    13798 S.E. Federal Highway
    Hobe Sound, Florida 33455

Steve Klett
Crocodile Lake National Wildlife Refuge
Post Office Box 370
Key Largo, Florida 33037

Dana Hartley
U.S. Fish and Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960-3559