



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
South Florida Ecological Services Office  
1339 20<sup>th</sup> Street  
Vero Beach, Florida 32960



June 11, 2008

Colonel Paul L. Grosskruger  
District Commander  
U.S. Army Corps of Engineers  
701 San Marco Boulevard, Room 372  
Jacksonville, Florida 32207-8175

|                                |  |
|--------------------------------|--|
| Service Federal Activity Code: | 41420-2008-FA-0642   |
| Service Consultation Code:     | 41420-2008-F-0381  |
| Corps Application No.:         | SAJ-1994-2783 (IP-KBH)   |
| Project:                       | Improvements to U.S. Highway 1<br>From Key Largo to Florida City |
| Applicant:                     | Florida Department of Transportation                             |
| County:                        | Monroe   |

Dear Colonel Grosskruger:

This letter serves to amend the February 20, 2004, Biological Opinion for improvements to U.S. Highway 1 (U.S. 1) from Key Largo to Florida City in Monroe County, Florida formally assigned under (Service Log Number 4-1-04-F-5233). This Biological Opinion addressed the potential effects of the project on the Miami-Dade County segment of the Atlantic Subpopulation of the West Indian (= Florida) manatee (*Trichechus manatus*), 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 Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1461 *et seq.*), and the provisions of the Fish and Wildlife Coordination Act of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*).

The project includes the removal of fill material that comprises the Lake Surprise Causeway. The U.S. Fish and Wildlife Service (Service) has received additional information regarding the deposition and storage of material taken from the proposed removal of the causeway. The Florida Department of Transportation (FDOT) has informed us that they propose to deposit the causeway material within approximately 5.7 acres of the Port Bougainville area of the Florida Department of Environmental Protection's (DEP) Dagny Johnson Key Largo Hammock Botanical State Park site located at Section 32, Township 60 South, Range 40 East. The Port Bougainville site was previously cleared and scrapped for several proposed developments in the late 1970s and the early 1980s. The development projects were subsequently abandoned and the area was acquired by the DEP. The DEP has been working to restore the Port Bougainville site to native plant communities. The placement of material from the Lake Surprise Causeway will assist the DEP in the restoration of the currently disturbed lands at the site to tropical hardwood



hammock. The Port Bougainville material deposition site is located within the geographic range of the endangered Key Largo wood rat (*Neotoma floridana smalli*) (KLWR), the endangered Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*) (KLCM), and the endangered Schaus swallowtail butterfly (*Heraclides aristodemus ponceanus*) (SSBF), and currently provides habitat for these species.

The Service believes that the deposition of material at the Port Bougainville site has the potential to result in take of the KLWR, the KLCM, and the SSBF in the form of harm or harassment due to the loss of 5.7 acres of habitat resulting from the material deposition operations. As provided in 50 CFR 402.15, reinitiation of formal consultation is required where 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) 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 Biological Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was 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.

Therefore, the Service has modified the February 20, 2004, Biological Opinion to include the KLWR, KLCM, and the SSBF, and the information listed below.

## **Consultation History**

### **Action area**

The original action area listed in the Service's February 20, 2004, Biological Opinion was defined as the waters of Barnes Sound, Lake Surprise, Jewfish Creek, and Blackwater Sound. These waters closely correspond to the area defined as Reach 1 and Reach 25 by the U.S. Army Corps of Engineers' (Corps) Reach Characterization for Florida waters (Corps and DEP 2001). The Service defined the original action area for the Biological Opinion as all waters within Reach 1 and Reach 25. With respect to the proposed permit modification, the action area is modified to include approximately 5.7 acres of previously disturbed land in the Port Bougainville area of the DEP's Dagny Johnson Key Largo Hammock Botanical State Park site located at Section 32, Township 60 South, Range 40 East (Figure 1).

## **STATUS OF THE SPECIES/CRITICAL HABITAT**

### *Key Largo woodrat*

#### **Species description**

The KLWR is a subspecies of the eastern woodrat (*N. floridana*) which occurs widely in the eastern United States. The KLWR is gray-brown with white underparts, large ears, protuberant

eyes, and a hairy tail. The head and body length ranges from 4.7 to 9.0 inches, the tail length ranges from 5.1 to 7.4 inches, and the hind foot length ranges from 1.3 to 1.5 inches.

### **Listing status and critical habitat description**

The KLWR was first listed as a threatened species in 1969 under the Endangered Species Conservation Act of 1969. This listing afforded the KLWR protection on Service lands only. The KLWR was recognized as a candidate for listing in a notice of review on July 28, 1980, and 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 a Service consultation with the Rural Electrification Administration. The proposed action was construction of a project that would result in accelerated habitat loss. The KLWR was proposed for listing as an endangered species with critical habitat on February 9, 1984, (Service 1984a, 1984 b) and was finally listed endangered on August 31, 1984, (Service 1984a, 1984b). The proposed critical habitat was withdrawn on February 18, 1986, (Service 1986).

### **Life history**

**Distribution and Habitat:** The KLWR is endemic to the tropical hardwood hammocks of Key Largo, Florida. Historically, it occurred over the length of Key Largo south to near Tavernier, but the present range of the KLWR includes only the northern portion of Key Largo (Frank et al. 1997). Currently, 2,103 acres of suitable woodrat habitat occurs in Key Largo. Approximately, 1,872 acres of woodrat habitat (89 percent) is protected in public ownership.

The KLWR is an active climber, but use trails and fallen trees to move over the forest floor. The KLWR, like other members of the genus *Neotoma*, builds nests of sticks, twigs, and various other objects that they assemble into mounds up to 4 feet (ft) high and 6 to 7 ft in diameter. Woodrats frequently build their nests against a stump, fallen tree, or boulder and may use old sheds, abandoned cars, rock piles, and machinery as nest sites. A woodrat nest has several entrances and a single, central nest chamber. Normally, only one adult woodrat inhabits a nest and one animal may use several nests. Goodyear (1985) found that KLWRs occupied some areas on North Key Largo without obvious stick nests, although she noted that the animals had at least a few sticks placed at the entrance to rock crevices they used for their nests. In the late 1990s, stick nests were no longer present on North Key Largo (Frank et al. 1997). In 2006, stick nests have been infrequently observed on North Key Largo by Service biologists.

**Food Habits:** The KLWR is a nocturnal omnivore, but feed primarily on a variety of leaves, buds, seeds, and fruits (Brown 1978b), and is dependent upon the diversity of tropical hardwood fruits. Other woodrat species cache foods such as seeds and acorns (Post and Reichman 1991), but it is not known if the KLWR caches food items.

**Reproduction:** The KLWR is capable of reproducing all year, although seasonal peaks in reproduction during summer are evident (Hersh 1981). Both sexes reach sexual maturity at about

5 months of age (Hersh 1981). Litter sizes range from one to four young, with two most common. Female woodrats can produce up to two litters a year (Brown 1978b), but likely average less than 1 liter a year (Fitch and Rainey 1956; Goertz 1970). Approximately 1.2 males are produced for each female produced (Hersh 1981). An alteration in food availability can result in a higher mortality and reduced growth rate of nestlings and may produce a sexual bias in growth and mortality that favors female nestlings. McClure (1981) found this brood reduction strategy for eastern woodrats was an adaptive response to limited food resources, where Sikes (1995) did not find any sex bias behaviors, but instead found a reduction in fitness of large litters whose mothers experience limited food availability.

## **Population dynamics**

Population Size: The effort to monitor the KLWR population began in the 1970s and continues intermittently (Frank et al. 1997). Past monitoring efforts indicate the KLWR population substantially declined 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 KLWR occurred 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 40 nests in a single location 4 miles north of U.S. 1 on County Road (CR) 905.

In July 1971, 19 woodrats (10 males and 9 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) studied woodrats on North Key Largo in 1976-1977 and found 0.9 animals per acre. Stick nests were common and used as a general indicator of woodrat presence. Management recommendations from Hersh's study suggested that old, mature hammock support the highest densities of the KLWR.

Barbour and Humphrey (1982) surveyed the KLWR in 1979 and estimated 3,666 KLWR stick nests and 645 individuals within a 222-acre site. These estimates were based on 40 strip transects of 1 acre established along CR 905. The KLWR was found to occur on Lignumvitae Key at comparable densities to North Key Largo (85 woodrats, 0.9 animals per acre). Barbour and Humphrey (1982) concluded that the density of KLWR was highest in mature forest, and active stick nests were strong indicators of healthy wood rat populations.

Goodyear (1985) used traplines placed in hammock sites in North Key Largo, and concluded that woodrats were found in areas with and without stick nests. Goodyear (1985) concluded that woodrats are not dependent on stick nests and suggested that stick nest construction was more a function of habitat condition. Habitats with abundant natural cover had fewer stick nests.

Goodyear believed 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) trapped six sites on North Key Largo in 1986. Low-density KLWR sites were found on the north end of North Key Largo and averaged 1.3 per acre. Sites further south had higher woodrat densities, averaging 4.9 per acre. Humphrey concluded that the density of woodrats was 7 times greater than the density reported by Hersh (1978), and 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 6,500 woodrats in North Key Largo.

In 1995, Frank et al. (1997) initiated a transect and grid study of KLWRs on North Key Largo. Prior to this project, Humphrey monitored the KLWR in 1986. Frank et al. (1997) found that in general, KLWR 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 woodrat population, and suggested that intensive monitoring and management be initiated by State and Federal land managers. The KLWR is now absent on Lignumvitae Key as evidenced by both trapping and lack of sign.

In 1996, the University of Miami initiated a project on the KLWR 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, concluded that intermediate-aged hammock may provide better habitat conditions than old, mature hammock, and suggested a possible role for natural disturbance (*e.g.*, hurricanes) in maintaining good KLWR habitat.

Staff at Crocodile Lake National Wildlife Refuge has monitored the KLWR on Key Largo using both transect and grid trapping annually since 1998. A density of 1.5 woodrats per acre was observed in 2000-2001.

Trapping studies initiated in Key Largo during January 2002 by Texas A&M University (TAMU) documented low numbers of KLWRs and a high mortality rate of radio-collared individuals. In 3 months of trapping (3,342 trap nights) found a density of 0.7 KLWRs per acre. The results of a population viability analysis projected a high risk of extinction for the KLWR within the next 10 years.

The apparent decline in the woodrat population has been dramatic, and there is no evidence that the population is recovering. During the period of greatest decline, there was almost no loss of tropical hardwood hammock habitat on upper Key Largo. To date, the cause or causes of the decline remain poorly understood.

## **Status and threats**

### **Status**

The status of the KLWR is precarious, and populations are believed to have declined to the point where extinction is a possibility. We believe the total population of KLWRs number less than 200 individuals distributed over an area of about 2,147 acres. Because of the threat of extinction of this species and our lack of understanding on the specific mechanisms of this decline, the Service initiated a captive propagation project for the KLWR in April 2002. This captive propagation project is a short-term solution to prevent the extinction of the KLWR while habitat management and other options can be implemented.

Live-trapping surveys were conducted at the Port Bougainville site from 2002 to 2005 to determine the status of the KLWR. Woodrats were not observed during the surveys, however, a small number of KLCM were captured, (Hughes personal communication 2008). Further details regarding this trapping effort are not available.

### **Threats**

The Service and State of Florida have protected the majority of high quality hammock habitat available for KLWRs on North Key Largo through acquisition and management. The most important measure to protect the KLWR has been to prevent development on the remaining habitat on North Key Largo through the acquisition of nearly all suitable habitats remaining. Both State and Federal governments have spent about \$65 million to acquire 2,147 acres of hammock habitat on North Key Largo. Because 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 affecting the KLWR. The past alteration of the hammock in southern North Key Largo fragmented available hammock habitat and reduced the quality of that habitat remaining. There is also an active solid waste transfer station within the occupied range of the KLWR. The impact of this facility on the KLWR is unknown. Other threats to the KLWR include predation by feral and domestic cats, predation by other exotic animals such as the imported fire ant (*Solenopsis invicta*) and the Burmese python (*Python molurus* - a species recently documented in Key Largo), invasive exotic vegetation, and stochastic environmental events such as fires and hurricanes

Efforts to manage the hammocks on North Key Largo have focused primarily on the maintaining an intact ecosystem. The refuge has taken a proactive approach to enhancing woodrat habitat. Concrete buildings at the old NIKE missile sight were demolished in 2004 and rubble piles were left as potential woodrat habitat. By 2005 the piles were already occupied by woodrats. Large rock piles have also been trucked into the area to provide additional structure as it reverts to hardwood hammock. In 2005 refuge volunteers began experimenting with the placement of

artificial nest structures in the hammock near occupied habitat to provide additional nesting substrate in anticipation of hammock regeneration. Some of these structures have been visited by woodrats, and a radio-collar woodrat has nested in one of the structures.

While the specific mechanisms responsible for the decline of the Key Largo woodrat are not known, several hypotheses have been proposed:

1. *Natural habitat changes*: Successional changes towards more mature habitat may have degraded KLWR habitat. The recent observation of KLWR inhabiting refuse piles may support this idea. In addition, predators of the KLWR may be more abundant or able to forage more efficiently in mature hammock. Moreover, natural woodrat runways (in the form of fallen logs) may be reduced in mature forests. Hersh (1978) suggested runways are a key habitat component for the KLWR.
2. *Habitat loss and degradation*: Development in the 1960s and 1970s has degraded habitat conditions.
3. *Exotic predators*: Fire ants, feral and domestic cats, black rats, and Burmese pythons are all relatively recent invaders of North Key Largo, and each are potential predators and/or competitors of the KLWR.
4. *Disease*: There is evidence that the roundworm (*Baylisascaris procyonis*) has affected Allegheny woodrats (*N. magister*) in the northeast (LoGiudice 2001) and this parasite may affect the KLWR. The raccoon (*Procyon lotor*) is abundant on North Key Largo, but have not been found to contain roundworms to date.

#### *Key Largo cotton mouse*

#### **Species description**

The KLCM is an subspecies of the cotton mouse (*P. gossypinus*). The KLCM was first described by Schwartz (1952) as a medium-sized mouse with large ears, protuberant eyes, a reddish to dusky brown back, and white under parts. The body length of the KLCM ranges from 170 millimeters (mm) to 189 mm, the tail ranges from 72 mm to 87 mm, and hind-foot length ranges from 21 mm to 23 mm.

#### **Listing status and critical habitat description**

The KLCM was recognized by the Service in a notice of review on July 28, 1980, and 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 loan from the Rural Electrification Administration to the Florida Keys Electric Cooperative. The loan was for construction of a project that would result in accelerated habitat loss. The KLCM was proposed as endangered

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

## **Life history**

Distribution: The KLCM formerly inhabited all of the hardwood hammock forests of Key Largo. At present, evidence suggests that the KLCM is restricted to Key Largo north of the U.S. 1 and CR 905 intersection, known locally as North Key Largo (Frank et al. 1997). This species also occurred historically at the south end of Key Largo, at Plantation Key, near Tavernier. Attempts to collect this species in southern Key Largo have been unsuccessful in recent years (Service 1999; Frank et al. 1997). The KLCM was introduced to Lignumvitae Key in 1970, although it has not been documented there since 1977, when a park ranger observed one individual.

Habitat: The KLCM builds leaf-lined nests in logs, tree hollows, and rock crevices. The holes occupied by these mice measure 1.2 to 3.5 inches in diameter and are often partially covered by leaves or bark. The nest of the KLCM is usually located at the base of trees, or near or in a woodrat nest, although the KLCM also uses recently burned areas where bracken fern (*Pteridium aquilinum*) dominates the ground vegetation.

Food Habits: The KLCM is omnivorous and feeds on a wide variety of plant and animal materials (Calhoun 1941; Pournelle 1950; Brown 1978a). Over 70 percent of tropical hardwood hammock trees and shrubs produce fruits and berries that may provide important food items for this species.

Reproduction: The KLCM breeds throughout the year. Two to three litters are produced annually, averaging four young per litter (Brown 1978a).

## **Population dynamics**

In 1997, the KLCM occurred throughout North Key Largo and the population was apparently viable (Frank et al. 1997), although no precise survey data exist. There is no new survey information or other data since that time, and therefore no updated information on the condition of the species is available.

## **Status and threats**

### **Status**

The KLCM was formerly distributed throughout Key Largo, but is now restricted to hardwood hammocks on North Key Largo (Frank et al. 1997). 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. Currently, 2,103 acres of suitable KLCM habitat occurs in Key Largo, and approximately 1,872 acres of this habitat (89 percent) is protected in public ownership. Frank et al. (1997) failed to document the cotton mouse at the southern end of North Key Largo. Live-trapping surveys were conducted at the Port Bougainville site from 2002 to 2005 to determine the status of the KLWR. Woodrats were not observed during the surveys, however, a few KLCM were captured (Hughes personal communication 2008). Cotton mouse abundance within this area was difficult to determine because raccoons disturbed many of the traps during the trapping sessions. Further details regarding this trapping effort are not available.

### Threats

Factors other than habitat loss appear to be the greatest threat to the KLCM. Without active management, it will be difficult for cotton mice to maintain stable populations in areas adjacent to developed lands. Although much of the land currently occupied by the cotton mouse is protected, the secondary impacts from development, perhaps most notably domestic and feral cats, may represent the greatest long-term threat to the persistence of the cotton mouse.

The negative effects of domestic and feral cat predation on bird and small mammal populations, is well-documented (Churcher and Lawton 1989). Domestic cats are catholic in food habits 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 free-roaming domestic cats on North Key Largo undoubtedly impact cotton mouse populations. The direct and indirect impacts of cats on the cotton mouse population are difficult to quantify. Not only will the cats prey on the cotton mice but also they may cause changes in cotton mouse behavior. Behavioral changes in prey species such as cotton mice in response to an increase in predation risk can result in significant effects on prey-body growth rate and reproductive output (Arthur et al. 2004).

Feral and free-roaming domestic cats are a threat to the KLCM throughout the Crocodile Lake National Wildlife Refuge and Key Largo Hammocks State Botanical Site. Cats have been removed from all areas of North Key Largo by the United States Department of Agriculture's Animal and Plant Health Inspection Service regardless of the proximity of the nearest inhabited dwelling. Concentrations of cats appear to be higher near the developed areas especially near Ocean Reef, Garden Cove, and the Ocean Shores development.

Recolonization of the KLCM in the Port Bougainville area may have been impeded by the establishment of a feral cat colony on State property near the Garden Cove Marina. The date that this cat colony was established is not known. However, the U.S. Department of Agriculture's Wildlife Services was contracted in 2005 to remove the cats from the area. Although the colony was removed, free-roaming domestic cats and the abandonment of new cats into the area will be a continuing problem.

In addition to threats posed by cats, the apparent extirpation of the KLCM from Key Largo south of the U.S. 1 and CR 905 intersection has been generally attributed to land clearing followed by residential and commercial development (Brown 1978b; Hersh 1981). Habitat fragmentation, combined with a decreased range, makes the KLCM more vulnerable to natural catastrophes such as hurricanes and fire (Service 1993). Natural catastrophes have altered significant portions of north Key Largo hammocks.

The affect of fire ants on the KLCM 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 vulnerable to fire ant predation.

#### *Schaus swallowtail butterfly*

#### **Species description**

Doctor William Schaus described the SSBF in 1911 from specimens collected in the south Miami area during May 1898. The SSBF is a large blackish-brown swallowtail butterfly with contrasting markings that are mostly dull yellow (Klots 1951; Pyle 1981; Opler and Krizek 1984). The antennae are black with a black-tipped yellow knob. The wingspan of the SSBF is 2.9 to 4 inches. The forewings have a dull yellow median band from the apex to about midpoint of the inner wing margin, with a short side branch to costa about 1/3 distance from the apex. The subterminal and terminal lines of the forewings contain lunular yellow spots from the apex to anal angle. The hindwings of the SSBF have a yellow median band and a submarginal row of large yellow lunular spots. The underside of the wings are yellow with black shading. The concavities of the hindwings contain a deeply scalloped outermargin with yellow edging. The straight-edged tail is blackish and bordered with yellow, and has a hollow red spot with bluish scaling along the anal margin just above the anal angle. A small, inconspicuous red dash is sometimes present basad of the second yellow lunule from the anal angle (between vein M2 and Cu1) (Klots 1951; Pyle 1981; Covell personal communication 1985).

The SSBF can be mistaken for the giant swallowtail (*Papilio cresphontes*), which is widespread in eastern North America and occurs in habitat occupied by the SSBF. The giant swallowtail is larger than the SSBF and is more nearly coal-black with brighter yellow lines. Moreover, the giant swallowtail butterfly has a broader median forewing band that is more broken into spots and less separated from the submarginal band toward the apex. The giant swallowtail butterfly's antennae are solid black, and its tail is teardrop-shaped and yellow inside bordered with black edging. The reddish markings on the underside of its wings are less brownish and much less extensive than on the SSBF (Opler and Krizek 1984).

## **Listing and critical habitat description**

The SSBF was listed as a threatened species on April 28, 1976, because of population declines resulting from the destruction of tropical hardwood hammocks, mosquito control practices, and over-harvesting by collectors (Service 1976). The SSBF was reclassified to an endangered species on August 31, 1984, because its numbers and range had declined dramatically since its first listing. Critical habitat has not been designated for this species.

## **Life history**

Distribution: The present distribution of the SSBF is limited to undisturbed tropical hardwood hammocks in insular portions of Miami-Dade and Monroe Counties, from Elliott Key in Biscayne National Park (BNP) to northern Key Largo (Service 1982; Emmel 1985). The SSBF is also known to occur on the larger islands within BNP including Adams, Elliott, Old Rhodes, Swan, and Totten Keys (Brown 1973; Covell and Rawson 1973; Emmel 1995). Individuals have also been seen in and adjacent to the Crocodile Lakes National Wildlife Refuge. Captive bred butterflies have been released on six sites in North Key Largo. Historically, the last known mainland specimen of the SSBF was collected at Coconut Grove, Miami-Dade County in May 1924 (Service 1982). A specimen of the SSBF was reportedly collected at Key West prior to 1924 (Service 1982), and a colony flourished from 1935 to 1946 on Lower Matecumbe Key (Service 1982; Grimshawe 1940) (although only one specimen was observed during a survey in 1964) (Service 1982).

Habitat: The SSBF occurs exclusively in mature subtropical dry forest (hardwood hammocks) that is now extensive only in the Upper Keys in Miami-Dade and Monroe Counties (Service 1982). Habitats for the SSBF are located at elevations of 10 to 15 feet above mean sea level and away from tidal waters. The tree species that comprise the SSBF's tropical hardwood hammock habitat include gumbo-limbo (*Bursera simaruba*), pigeon plum (*Coccoloba diversifolia*), black ironwood (*Krugiodendron ferreum*), West Indian mahogany (*Swietenia mahagoni*), and wild tamarind (*Lysiloma latisiliquum*) (Covell 1976). The SSBF is restricted to areas where its primary food plant, torchwood (*Amyris elemifera*), grows abundantly (Service 1982). Tropical hardwood hammock plants grow on a substrate of Key Largo limestone, which characterizes the Upper Keys.

Behavior: Adult SSBFs may fly in clearings and along roads and trails, or even out over the ocean for short distances (Rutkowski 1971; Brown 1973), but they typically remain in the hammocks proper (Rutkowski 1971). Nectaring activity usually occurs on blossoms of wild coffee (*Psychotria nervosa*), guava (*Psidium guajava*), or cheese shrub (*Morinda royoc*), along the hammock margins. Although the SSBF rarely feeds in areas open to direct sunlight (Service 1982; Rutkowski 1971).

The SSBF is territorial to the extent that males have been observed to investigate other males entering their territories within hardwood hammocks (Emmel 1985). Male butterflies have also been reported as they "patrolled the treetops at a height of 10 feet or more" during the "hot

afternoon” on “bright days,” sometimes “descending into open spaces to investigate any other *Ponceanus*” (Rutkowski 1971). Emmel (1985) also notes that male SSBF are remarkably adapted to flight within hardwood hammocks and are able to pick their way among branches and around spider webs.

Courtship of the SSBF has been observed along narrow trails cut through the hammock (Rutkowski 1971; Covell personal communication). Open areas such as trails or clearings within or near the dense hammock are requisite for courtship activity and nectaring.

The SSBF appears to be strictly diurnal. Rutkowski (1971) observed two female butterflies on different days visiting cheese shrub blossoms just before 9:00 am his earliest observation, another female hovering over cheese shrub at 5:00 pm comprised his last observation during a day (Rutkowski 1971). He found both sexes “within the hammocks, fluttering in diffused light about a foot above the ground at blossoms of Guava during the hottest part of the day (from 1:00 to 2:00 pm).

Mass migration of the SSBF has not been reported. However, an individual butterfly was observed to cross a 0.5 mile expanse of Biscayne Bay between two islands (Brown 1973). In 1986, a SSBF was observed crossing a 1,200-foot expanse of open water from Old Rhodes Key to Swan Key (Emmel 1986a). These observations suggest that these butterflies can travel across open water for a considerable distance among the Upper Keys and may be able to travel to and from the mainland.

Adult SSBF are active primarily in May and June, with most sightings recorded between mid-April and mid-July (Service 1982). A few August and September records suggest either delayed-emergence during a year, or a facultative second brood (Service 1982; Brown 1976).

The SSBF has a short lifespan with one-generation occurring per year (Emmel 1985). There is some evidence from laboratory rearings that diapause may extend for at least 2 years (Grimshawe 1940). If this occurs in natural populations, the SSBF could survive extreme droughts in the season following its larval development by delaying emergence, perhaps until July-September or later (Rutkowski 1971). Some adults are active during July-September as well as during the normal flight period of late April through early July (Brown 1976).

Feeding: Young caterpillars feed on tender, young leaves of plants such as wild lime (*Zanthoxylum fagara*) and will avoid tougher, older leaves. Although fifth (final) instar larvae have been observed eating tougher older leaves of torchwood (Service 1982) and prickly-ash (*Zanthoxylum americanum*) (Rutkowski 1971). Adults were observed taking nectar from blossoms of guava, cheese shrub, and wild coffee (Service 1982; Rutkowski 1971). Guava seemed to be the nectar source preferred by individuals observed by Rutkowski (1971) and he suggested that the SSBF will fly some distance from their hammock haunts to find blooming guava flowers. On Elliot Key, Emmel (1986a) observed frequent nectaring at cheese shrub,

blue porterweed (*Stachytarpheta jamaicensis*); sea grape (*Coccoloba uvifera*); dog's tail (*Heliotropium angiospermum*); lantana (*Lantana involucrata*); salt-and-pepper (*Melanthera nivea*); and wild coffee.

Population Size: The SSBF appeared to be widespread in BNP and on northern Key Largo and the population was apparently expanding in 2004. However, in 2005 numbers appeared lower and localized (Salvato personal communication 2006). Emergence of adults is highly dependent on rain and timing is often of major significance in survey results. The poor results in 2005 were likely the result of dry conditions (Salvato personal communication 2006), and do not represent a general decline of the species.

Reproduction: The courtship of SSBF has been partially described in the following observation: “*At 10:15 am in a dimly lit trail through brushy hammock, I saw a female and two male ponceanus visiting flowers at opposite ends of a Guava tangle. The fresher of the two males eventually approached this slightly worn female while she was still feeding. He hovered over her. She then settled on the ground with wings flattened and vibrating, raising her abdomen. The male fluttered on the ground behind and then rose over her before flying away*” (Rutkowski 1971). Three courting pairs of SSBFs were observed in 1982 on Elliott Key (Covell, personal communication, 1985) and photographed; details were not recorded. During part of the flight, the males were flying behind the females from 3 to 10 ft in the air.

Oviposition in the wild has also been described. The SSBF deposits its eggs on torchwood and wild lime (Grimshawe 1940; Rutkowski 1971; Brown 1973; Loftus and Kushlan 1984). These food plants are usually located at the edge of hammocks along trails impartially sheltered by the canopy or within or a large opening in the canopy. Females deposit single eggs on the Upper surface of the tips of the leaves. However, there is one record of two eggs on a leaf (Service 1982). Eggs and larvae are not found on plants in open sunlight; however, in contrast, the giant swallowtail, *Heraclides cresphontes*, has been observed ovipositing on wild lime growing in the open (Service 1982). Egg survival rate of 29.7 percent (11 of 37) was cited in one case for a group of eggs collected in the wild. Further mortality of hatching larvae resulted in a survival rate of only 5 percent in the group studied (Emmel personal communication 1985).

Grimshawe (1940) and Rutkowski (1971) described development from egg to adult. Eggs take 3 to 5 days to hatch. Grimshawe also describes pupation:

“*When ready to transform, the larva seeks a place of seclusion, each for itself, fastens its anal extremity with a button of silk, and throws a heavy girdle around the thorax, supporting the body in an upright, or vertical, position for the long sleep. The encased segments of the body of some of the chrysalides are rusty-brown color; others are gray, etched with moss-green and conforming generally with that of their supporting object. They take on a rigid cast and show no signs of life throughout the entire period of their sleep. Unlike the double and triple-brooded related species of Neotropical Florida, our butterflies remained in the chrysalis stage either one or two years. As an example, half the caterpillars transforming into the chrysalis stage July 7, 1935, emerged May 8, 1936; the other half remained, hatching May 13, 1937.*”

Rutkowski (1971) also noted the white osmeteria on the larvae, and drinking of water droplets by fifth-instar caterpillars.

### **Status and threats**

#### **Status**

Previous attempts to establish SSBF populations outside their current range have failed (Salvato personal communication 2006). The most recent investigations of SSBF populations were made in Elliot Key in BNP and other areas in 2003 (Emmel and Daniels 2004). The range-wide population in 2003 was about 360 to 400 adults, including 255 on Elliott Key. Elliot Key contains the largest of all extant SSBF populations. Abundance estimates for Elliott Key in 1999-2003 were 212, 253, 115, 264, and 255, respectively, based on mark and recapture efforts. \* Emmel and Daniels (2004) indicated that this period was characterized by drought conditions and late onset of summer rains. Population numbers appeared to be widespread in BNP and on northern Key Largo and apparently expanding in 2004, but in 2005 numbers appeared less common and localized (Salvato personal communication 2006). Emergence of adults is highly dependent on rain and timing is often of major significance in survey results. The poor results in 2005 were likely the result of dry conditions (Salvato personal communication 2006).

The SSBF was formerly distributed throughout Key Largo, but is now restricted to hardwood hammocks on North Key Largo. 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 and mosquito spraying on North Key Largo is low. The status of the SSBF appears stable (Salvato personal communication 2006). The population is distributed throughout North Key Largo and is apparently viable.

#### **Threats**

Clearing of habitat for urban and agricultural purposes in and around Miami, Homestead, and Lower Matecumbe Key were likely instrumental in eliminating the SSBF from much of its historic range. Food plants were probably either eliminated or reduced to small stands incapable of sustaining SSBF populations (Service 1982). Similar clearing has occurred within its known North Key Largo habitat, but now most of that habitat is protected.

Slight alterations of habitat, such as dirt roads and trails through hammocks may allow easy access to butterfly collectors, however, small clearings and trail edges seem to promote a proliferation of torchwood plants. Denudation of hammock habitats following hurricanes and fires may account for population increases in the SSBF and its food plants (Baggett 1985). In addition, efforts to limit clearing of native vegetation by the county and municipalities have helped curtail the loss of suitable habitat. Furthermore, local government requirements to plant native species have provided additional habitat for the species.

As part of a recovery action for the SSBF, 760 pupae were released in 1995 on seven protected sites (Emmel personal communication 1996). Depredation by birds accounted for an estimated 85-90 percent mortality rate. In 1996, this effort involved the release of 248 female and 155 male adult SSBF on those same seven sites. All females were mated prior to release. Apparently, none of the seven reintroductions was successful in establishing a population outside the current known range of this species (Emmel and Daniels 2002; Salvato personal communication 2006).

Habitat loss and deterioration due to development and invasion by exotic plants, and the application of pesticides to control mosquitoes, have historically been the likely causes for the decline of SSBF throughout its range. Hardwood hammocks have been increasingly fragmented in the upper Keys because of roads and development activities. Traffic associated with paved roads through SSBF habitat, particularly CR 905 on northern Key Largo, results in road-kills of adults.

The current aerial application of insecticides for mosquito control may be a key limiting factor on the distribution of SSBF. Although most of North Key Largo is not sprayed for mosquitoes, pesticide application for mosquito control to the remainder of Key Largo and throughout the southern range of this species is widely believed to be a major factor in the decline of populations south of North Key Largo (Emmel 1986b). The Florida Keys Mosquito Control District applies insecticides to control adult and larval mosquitoes. The pesticides Dibrom, Baytex, and Teknar, used in the Keys for mosquito control, are toxic to the related giant swallowtail butterfly in the laboratory. The insecticides applied annually in Monroe County could adversely affect the SSBF, including where adulticide drifts over otherwise protected butterfly habitat. Future advances in insecticide technology, coupled with existing effects to minimize habitat loss and plant native vegetation, could allow the species to repopulate parts of its historic range.

Collecting of immature stages as well as adults may have reduced numbers on Key Largo during the period 1969 to 1974; but the long-term effects on the SSBF' population cannot be gauged (Covell 1976). Commercial exploitation has existed, but its extent cannot be assessed due to secrecy on the part of dealers.

Little is known about predation by spiders, lizards, birds, or other predators. Damage to wings and beak marks on some individuals suggest that SSBFs are frequently attacked by birds (Emmel 1985). The Flight behavior of the SSBF indicates that the butterflies can fly slowly and painstakingly to avoid the many large orb spider webs located in the hammock (Emmel 1985). Emmel also states that butterflies are able to remember flight paths through hammocks and follow them repeatedly. Larval predation is likely minimized by oviposition behavior (one egg per leaf and few per foodplant), bird-dropping appearance of the larvae (as in other *Papilio* larvae), secretive behavior of larvae, and bad-smelling scents from the osmeteria when larvae are disturbed (Grimshawe 1940; Rutkowski 1971). Crypsis of the pupa (Grimshawe 1940) (as observed in species of swallowtails) helps avoid predation. Nothing is known about parasites of this species. Information on diseases of the SSBF is also not available. However, high egg mortality has been observed (Service 1982; Rutkowski 1971).

Periodic climatic factors such as hurricanes, freezes, and droughts pose additional threats to the SSBF. The butterfly's could lose a significant portion of its remaining populations from hurricanes or frost. The SSBF is near the limits of its cold-tolerance in south Florida, and a single freeze could greatly reduce the population.

## **ENVIRONMENTAL BASELINE**

The environmental baseline includes the effects of past and ongoing human and natural factors leading to the current status of the species and their habitats.

### Action area

As indicated above, the action area for this project includes approximately 5.7 acres in the Port Bougainville area of the DEP's Dagny Johnson Key Largo Hammock Botanical State Park site located at Section 32, Township 60 South, Range 40 East (Figure 1). Deposition of material will occur within previously disturbed land that was historically cleared for a development project that was subsequently abandoned.

### Status of the species within the action area

Live-trapping surveys for small mammals were last conducted in the Port Bougainville area during 2002 through 2005. A small number of the KLCM was caught during the trapping, but KLWR were not captured (Hughes personal communication 2008). However, three KLWRs were captured approximately 3.5 miles northeast of the Port Bougainville area during live-trapping surveys conducted in 2004 (Klett personal communication 2008). Potts (personal communication 2008) reports that she captured the KLWR approximately 100 meters from the project site, although no further information is available. Current surveys for the SSBF have not been conducted at the Port Bougainville site

The current status of the KLWR, KLCM, and the SSBF at the Port Bougainville site is currently unknown, although the Service believes that these species may occur on the project site. The proposed 5.7 acre material deposition site currently provides poor-quality habitat for these species. However, high-quality, tropical hardwood habitat is located immediately adjacent to the deposition site.

## **EFFECTS OF THE ACTION**

### Factors to be considered

The Port Bougainville site contains habitat suitable for the KLWR, the KLCM, and the SSBF. However, the site has been disturbed by past development and land clearing activities. Critical habitat has not been designated for this species. The timing of material deposition for this project, relative to sensitive periods of the KLWR, the KLCM, and the SSBF lifecycles, are

unknown. The KLWR, KLCM, and the SSBF may be found within and adjacent to the proposed material deposition area year-round. The project will occur in a single, disruptive event and result in temporary loss and alteration of the native upland vegetation within the project site. However, over time, the addition of the fill material in association with the supplemental planting of native plant species is expected to restore the area to native tropical hardwood habitat suitable for the KLWR, the KLCM, and the SSBF. The time required to complete the project is not known, but it is likely that the deposition of material associated with the project will be completed in a few months. The disturbance associated with the project will be temporary and result in a temporary loss of habitat currently available to the KLWR, the KLCM, and the SSBF.

Beneficial Effects - The beneficial effects of the project to the KLWR, the KLCM, and the SSBF include the restoration of approximately 5.7 acres of potential habitat at the Port Bougainville site. The Service believes that the proposed project will result in the restoration of tropical hardwood hammock habitat at the site that provides better quality habitat for the KLWR, the KLCM, and the SSBF than currently exists at the site.

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, the KLCM, and the SSBF within the action area are discussed below.

The deposition of material at the Port Bougainville site may result in the harassment or harm of the KLWR, the KLCM, and the SSBF as a result of habitat loss during the deposition of material taken from the Lake Surprise Causeway. The probability of direct incidental take is dependent upon the number of KLWRs, KLCMs, and the SSBF in the area, their dispersal abilities, and the amount and distribution of available, suitable habitat. The probability of direct mortality of KLWR, KLCM, and the SSBF as a result of material deposition activities is low with proper safeguards to protect these species.

The proposed action will directly result in the temporary loss of approximately 5.7 acres of uplands that provide habitat for the KLWR, the KLCM, and the SSBF. In addition, the project will result in a temporary reduction of the geographic range of the species. The deposition of the material, and supplemental planting proposed, is expected to result in the establishment of high-quality tropical hardwood hammock habitat for the KLWR, the KLCM, and the SSBF at the Port Bougainville site.

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 Service has not identified any indirect effects to the KLWR, the KLCM, and the SSBF that will result from the proposed deposition of material.

## **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 biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Because nearly all of the remaining potential habitat for the KLWR, the KLCM, and the SSBF occur within publicly-owned land, actions resulting in adverse cumulative effects are unlikely. The Service is not aware of any State, local, or private activities that are reasonably certain to occur within the action area that would adversely affect the KLWR, the KLCM, or the SSBF.

## **CONCLUSION**

After reviewing the current status of the KLWR, the KLCM, and the SSBF, 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, the KLCM, and the SSBF. Critical habitat for the KLWR, the KLCM, and the SSBF has not been designated. Therefore, critical habitat will not be affected.

Construction of the project will result in the temporary loss of 5.7 acres of habitat for the KLWR, the KLCM, and the SSBF. However, the loss of this habitat is not expected to appreciably affect the overall survival and recovery of the KLWR, the KLCM, or the SSBF.

## **INCIDENTAL TAKE STATEMENT**

Sections 4(d) and 9 of the Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct) of Act listed species of fish or wildlife without a special exemption. "Harm" and "harass" are further defined in Service regulations (50 CFR 17.3). "Harm" is defined to include significant habitat modification or degradation that results in death or injury to ESA listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. "Harass" is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering.

Under the terms of sections 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement. The measures described below are nondiscretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply.

The Federal agency has a continuing responsibility to regulate the activity that is covered by this incidental take statement. If the agency (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

### **AMOUNT OR EXTENT OF TAKE ANTICIPATED**

The Service has reviewed the biological information for the KLWR, the KLCM, and the SSBF, and other available information relevant to this action. Based on our review, the Service anticipates incidental take of 1 KLWR and 1 KLCM. The incidental take is expected to be in the form of accidental direct mortality resulting from the proposed material deposition and the live-trapping surveys. The Service also anticipates incidental take of the KLWR, KLCM, and SSBF in the form of harm and harassment associated with the loss of 5.7 acres of habitat due to the deposition of spoil materials at the project site. The Service has determined that 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. The Federal agency must immediately provide modification of the reasonable and prudent measures.

### **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 proposed project on the KLWR, the KLCM, and the SSBF:

1. Minimize the adverse effects of the material deposition activities on the KLWR and the KLCM by (a) hand grubbing and removal of vegetation at the interface of the material deposition site prior to deposition of material; and (b) disassembly and inspection of on-site trash pile(s) prior to removal for presence of the KLWR, the KLCM, and their nests.
2. Minimize the adverse effects of the material deposition activities on the SSBF by inspecting all appropriate vegetation within the material deposition site and appropriate vegetation located in the adjacent hardwood hammock within 25 ft of material deposition site. Any eggs or larvae observed should be either avoided or removed and relocated outside of the deposition area within the adjacent hardwood hammock.
3. Notify the Service of any unauthorized take of KLWR, the KLCM, or the SSBF.

## **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:

1. The applicant will conduct live-trapping surveys at the Port Bougainville project site for the KLWR and the KLCM prior to the clearing of the site and commencement of material deposition. Live trapping shall occur for 7 consecutive days. Sherman live-traps will be used. A single transect of live traps will be established at 10-15 meter intervals within the adjacent hardwood hammock along the periphery of the deposition area (no farther than 15 meters away from the edge of the deposition area). Within the 5.7-acre deposition area, traps will be placed in a grid at 10-15 meter intervals and in areas that contain vegetation and around any debris piles. Traps should be situated to increase the likelihood of trapping success (immediately adjacent to vegetation, large rocks, etc.).
2. Traps will be baited with rolled oats and any combination of peanut butter, grapes, apples and/or sunflower seeds.
3. 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 60s, cotton balls (4-5) will be placed in the trap along with the bait.
4. In areas where fire ants are present, 10 percent Carbaryl (Sevin) dust will be placed immediately under the traps so that the dust will not come in contact with KLWRs and KLCMs. Other approved methods to control fire ants at each trapping station will be considered by the Service.
5. Traps must be checked at least once each day no later than 3 hours after official sunrise.
6. 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 weight (in grams) of each animal captured; and any other noteworthy observations.
7. All KLWRs and KLCMs captured during the trapping effort will be immediately relocated to tropical hardwood habitat adjacent to the material deposition area and released no later than 3 hours after official sunrise.
8. All black rats (*Rattus rattus*) captured during trapping will be euthanized humanely. The date and GPS location of each black rat captured will be recorded.

9. As soon as possible following the completion of the last day of trapping, the applicant's consultant will report the results of the live-trapping surveys to the Service. This will be accomplished by contacting John Wrublik at the South Florida Ecological Services Office; U.S. Fish and Wildlife Service; 1339 20th Street, Vero Beach, Florida 32960; 772-562-3909, extension 282; or by email [John\\_Wrublik@fws.gov](mailto:John_Wrublik@fws.gov)). Clearing of vegetation and deposition of spoil material will not commence until authorization (verbally by telephone or by email) is given to the FDOT by the Service. After contacting the Service, a detailed electronic report of the trapping results shall be sent to the Service
10. Prior to the clearing of the site and the commencement of material deposition, the entire deposition area and the adjacent hardwood hammock within 7 meters of the deposition area will be searched for wild lime and torchwood, and all wild lime and torchwood observed will be marked with flagging.
11. All marked trees will be searched for the presence of SSBF eggs and larvae. Searches will be conducted prior to clearing of the site and the commencement of the material deposition activities (in conjunction with the live-trapping for KLWR and KLCM) each day for 7 consecutive days.
12. Marked trees containing SSBF eggs or larvae will either be avoided during clearing and deposition activities, or (prior to the clearing of the site and the commencement of material deposition) the eggs or larvae will be relocated in the adjacent tropical hardwood hammock. Eggs and larvae will be relocated at least 10 meters from the material deposition area to a suitable living tree of the same species. If possible, each cluster of eggs or larvae relocated will be attached to a different recipient tree.
13. Relocation of SSBF eggs will be accomplished by removing the leaf containing eggs at the base of the petiole and attaching the leaf to a living leaf on the recipient tree with glue or thread.
14. Relocation of SSBF larvae will be accomplished by removing the branch of the tree containing the larvae and attaching the excised branch to a recipient tree of the same species with tie wraps.
15. Within 5 business days of completion of the SSBF work outlined above, the applicant's consultant will report the results to the Service via a detailed electronic report.
16. Experienced biologists are necessary to minimize take during surveys and relocations of the KLWR, the KLCM and the SSBF. Qualifications include education, experience with required techniques, and knowledge of the specific species being evaluated. The Service believes surveys and follow-up actions are necessary to protect listed species impacted by this project. The Service will provide a letter 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 the provided letter at all times.

The Service recognizes the following individuals as being qualified to implement the Reasonable Prudent Measures and Terms and Conditions of this Biological Opinion and may, as authorized by the Service, capture and handle the KLWR, KLCM, and SSBF:

- a. Dr. Philip Frank, Consulting Engineering and Science, Incorporated;  
8925 Southwest 148th Street, Suite 100, Miami, Florida 33176
- b. 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 will be considered as appropriate. An updated list will be maintained in the project file at the South Florida Ecological Services Office; Vero Beach, Florida.

17. Following the small mammal trapping/searches for SSBF' eggs and larvae and prior to the clearing of vegetation and deposition of material, each debris pile within the material deposition area will be disassembled by hand. A back hoe (or similar type of equipment) will be used only to remove items too large to be removed by hand. The applicant's consultant will be onsite during the disassembly of the debris pile(s) to inspect each pile for the presence of the KLWR and KLCM. All motile animals shall be allowed to leave the area under their own volition. Any KLWRs or KLCM not able to leave the area shall be left *in situ* and the original material surrounding them will be immediately returned to its original configuration to the maximum extent practicable. The Service should be immediately notified for further instructions by contacting John Wrublik at the South Florida Ecological Services Office, U.S. Fish and Wildlife Service; 1339 20th Street, Vero Beach, Florida 32960; 772-562-3909, extension 282; or by email [John\\_Wrublik@fws.gov](mailto:John_Wrublik@fws.gov)). All further removal of that debris pile will cease until removal is authorized by the Service. All KLCM and KLWRs observed will be recorded and this information will be provided to the Service within 5 business days of completion of all debris removal.
18. Following the small mammal trapping, debris pile disassembly, and searches for SSBF' eggs and larvae, and prior to the deposition of material within the deposition area, all vegetation along the entire boundary of the deposition site (defined as a 10 foot-wide swath of land that begins at the edge of existing non-disturbed soil and extends 10 ft inward into the proposed material deposition site) will be cleared and grubbed by hand. Clearing of vegetation within the remainder of the deposition site will not begin until the boundary of the deposition area is cleared. Vegetation within the remainder of the material deposition area will also be cleared and grubbed by hand. The placement of fill material within the deposition site will commence no earlier than 1 week (7 days) and no later than 2 weeks (14 days) following the

clearing of the site (the intent of the waiting period is to provide sufficient time for any KLWR and KLCM within the deposition site to vacate the site).

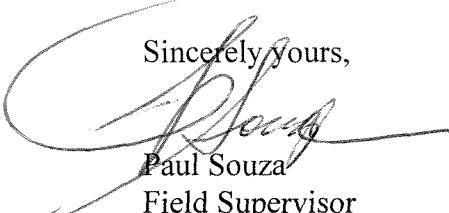
19. The 5.7-acre deposition site will be enhanced as habitat for the KLWR through the construction and placement of shelter/nest sites (approximately 10 ft in length by 3 ft in width by 2 to 3 ft in height) at a density of 4 per acre. Each shelter/nest site will be comprised of a combination of natural rock, sticks and logs, or other materials acceptable to the Service's South Florida Field Office. The Service should be consulted for guidance on location and construction of the nesting sites by contacting John Wrublik at the South Florida Ecological Services Office, U.S. Fish and Wildlife Service; 1339 20th Street, Vero Beach, Florida 32960; 772-562-3909, extension 282; or by email [John\\_Wrublik@fws.gov](mailto:John_Wrublik@fws.gov)).
20. Following placement of material at the site, supplemental planting of the deposition site will be conducted with native plant species. Native canopy trees will be planted, and consist of nursery stock in 5 to 7 gallon containers obtained from native plant nurseries in Monroe County or Miami-Dade County. The tree species planted will include West Indian mahogany, Jamaica dogwood (*Piscidia piscipula*), gumbo limbo, short-leave fig (*Ficus citrifolia*), pigeon plum, torchwood, and wild lime. Trees will be planted in a clumped dispersal pattern to the greatest extent practicable in order to provide vegetated islands of habitat for KLWRs and KLCMs. Wetland plant species will be planted on the slope that forms the transition between the upland area and the adjacent disturbed wetlands (an area of approximately 1000 feet by 15 feet). The transitional zone will be planted with a mix of salt-tolerant hardwood and scrub species including buttonwood (*Conocarpus erectus*), blackbead (*Pithecellobium guadalupense*), blolly, (*Guapira discolor*) and sea oxeye daisy (*Borrachia frutescens*). Nursery stock used in the planting of the transition zone will consist of trees in 5 to 7 gallon containers and shrubs in 1 gallon containers. The supplemental planting of the deposition site should be completed within 6 months following completion of the spoil material deposition. If circumstances dictate that the supplemental planting cannot be completed within this time period, then the Service should be contacted to determine if an extension is warranted.
21. The project site shall be monitored to determine the presence of KLWR and KLCM approximately 1 year, 3 years, and 5 years following the completion of supplemental planting of the project site. The monitoring will consist of 4 live-trapping events per year and each event consist of 4 nights of trapping. The monitoring will follow the Service's KLWR and KLCM trapping protocol dated March 19, 2007, (Appendix A). When both a KLWR and KLCM are captured, no further trapping during that year is necessary (*i.e.*, if only one species is documented, trapping must continue until both species have been captured or that year's trapping has been completed). Within 30 calendar days of the completion of each trapping event, a detailed electronic report of the trapping results shall be sent to the Service.
22. Approximately 3 years after the supplemental planting of the site is completed, torchwood will be planted to benefit the SSBF. Recommended spacing is every 4 meters.

## CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the ESA 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 Act 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.

This concludes the amendment to the Biological Opinion discussed above. Thank you for your cooperation and effort in protecting threatened and endangered species. If you have any questions regarding this project, please contact John Wrublik at 772-562-3909, extension 282.

Sincerely yours,



Paul Souza

Field Supervisor

South Florida Ecological Services Office

cc:

Service, Atlanta, Georgia (Cynthia Dohner)

Corps, Stuart, Florida (Alisa Zarbo)

FDOT, Miami, Florida (John Palenchar) electronic copy only

FWC, Tallahassee, Florida (Mary Ann Poole) electronic copy only

## LITERATURE CITED

- Arthur, A.D., R.P. Pech and C.R. Dickman. 2004. Habitat structure mediates the non-lethal effects of predation on enclosed populations of house mice. *Journal of Animal Ecology* 73, 867-877.
- Baggett, H.D. 1985. Personal communication. Department of Geology, University of South Florida; Tampa.
- Barbour, D.B. and S.R. Humphrey. 1982. Status and habitat of the Key Largo woodrat and cotton mouse (*Neotoma floridana smalli* and *Peromyscus gossypinus allapaticola*). *Journal of Mammalogy* 63(1):144-148.
- Brown, L.N. 1973. Populations of *Papilio andraemon bonhotei* Sharpe and *Papilio aristodemus ponceanus* Schaus in Biscayne National Monument Florida. *Journal of the Lepidopterists' Society* 27(2):136-140.
- Brown, C.H. 1976. A colony of *Papilio aristodemus ponceanus* (Lepidoptera: Papilionidae), in the upper Florida Keys. *Journal of Georgia Entomological Society* 11(2):117-118.
- Brown, L.N. 1978a. Key Largo woodrat. Pages 11-12 in J.N. Layne, editor. Rare and endangered biota of Florida. Mammals. University Press; Gainesville, Florida.
- Brown, L.N. 1978b. Key Largo cotton mouse. Pages 10-11 in J.N. Layne, editor. Rare and endangered biota of Florida. Mammals. University Press; Gainesville, Florida.
- Calhoun, J.B. 1941. Distribution and food habits of mammals in the vicinity of Reelfoot Biological Station, III. Discussion of the mammals recorded from the area. *Journal Tennessee Academy of Science*. 16: 207-255.
- Churcher, P.B. and J.H. Lawton. 1989. Beware of well-fed felines. *Natural History* 7:40-46.
- Covell, C.V., Jr. 1976. The Schaus swallowtail: a threatened subspecies? *Insect World Digest* 3(59):21-26.
- Covell, C.V., Jr. and G.W. Rawson 1973. Project ponceanus: a report of first efforts to survey and preserve the Schaus swallowtail (Papilionidae) in southern Florida. *Journal of the Lepidopterists' Society* 27(3):206-210.
- Emmel, T. C. 1985. Status survey of the Schaus swallowtail in Florida in 1984. Technical Report No. 145, Florida Cooperative Fish and Wildlife Research Unit, University of Florida, Gainesville.

- Emmel, T.C. 1986a. Status survey and habitat requirements of Florida's endemic Schaus swallowtail butterfly. Florida Game and Fresh Water Fish Commission. Final Report GFC-84-028. Tallahassee, Florida.
- Emmel, T.C. 1986b. Pesticide effects on the survival of the Schaus swallowtail butterfly. Final report to Elizabeth Ordway Dunn Foundation.
- Emmel, T. C. 1995. Captive propagation and experimental reintroduction of the Schaus swallowtail in the Florida Keys. Interim Status Report submitted to the U.S. Fish and Wildlife Service, Vero Beach, Florida, and Jacksonville, Florida. Research Work Order No. 153.
- Emmel, T.C. and J.C. Daniels. 2002. Status Survey for the Endangered Schaus Swallowtail. Report to the Fish and Wildlife Service, Vero Beach, Florida
- Emmel, T.C. and J.C. Daniels. 2004. Status monitoring of the endangered Schaus swallowtail butterfly (*Papilio aristodemus ponceanus*) in South Florida. Unpublished report to U.S. Fish and Wildlife Service.
- Fitch, H.S. and D.G. Rainey. 1956. Ecological observations of the woodrat, *Neotoma floridana*. University of Kansas publications, Museum of Natural History 8:499-533.
- Frank, P.F., F. Percival, and B. Keith. 1997. A Status Survey for the Key Largo woodrat (*Neotoma floridana smalli*) and Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*) on North Key Largo, Monroe County, Florida. Final Report to the U.S. Fish and Wildlife Service.
- Goertz, J.W. 1970. An ecological study of *Neotoma floridana* in Oklahoma. Journal of Mammalogy 51:94-104.
- Goodyear, N.C. 1985. Results of a study of Key Largo woodrats and cotton mice: Phase I, spring and summer 1985. Unpublished report to the North Key Largo Study Committee.
- Grimshawe, F.M. 1940. Place of sorrow: The world's rarest butterfly and Matecumbe Key. Nature Magazine 33:565-567, 611.
- Hersh, S.L. 1978. Ecology of the Key Largo woodrat. M.S. thesis. University of Miami; Coral Gables, Florida.
- Hersh, S.L. 1981. Ecology of the Key Largo woodrat (*Neotoma floridana smalli*). Journal of Mammalogy 62(1):201-206.

- Humphrey, S.R. 1988. Density estimates of the endangered Key Largo woodrat and cotton mouse (*Neotoma floridana smalli* and *Peromyscus gossypinus allapaticola*), using the nested grid approach. *Journal of Mammalogy* 69(3):524-531.
- Killion, M.J. and W.E. Grant. 1993. Scale effects in assessing the impact of fire ants on small mammals. *Southwest Naturalist* 38:393-396.
- Liberg, O. 1985. Food habits and prey impact by feral and house-based domestic cats in a rural area in southern Sweden. *Journal of Mammalogy* 65:424-432.
- Loftus, W.F. and J.A. Kushlan. 1984. Population fluctuations of the Schaus swallowtail (Lepidoptera: Papilionidae) on the islands of Biscayne Bay, Florida, with comments on the Bahaman swallowtail. *Florida Entomologist* 67(2):977-287.
- LoGiudice, K. 2001. Latrine foraging strategies of two small mammals: implications for the transmission of *Baylisascaris procyonis*. *American Midlands Naturalist* 146: 369-378.
- McClure, P.A. 1981. Sex-biased litter reduction in food-restricted woodrats (*Neotoma floridana*). *Science* 211(4486):1058-1060.
- Opler, P.A. and G.N. Krizek. 1984. Butterflies east of the Great Plains. Johns Hopkins University Press, Baltimore, MD.
- Post, D. and O.J. Reichman. 1991. Effect of food perishability, distance, and competitors on caching behavior by Eastern woodrats. *Journal of Mammalogy* 72(5): 513-517.
- Pournelle, G.H. 1950. Mammals of a North Florida swamp. *Journal of Mammalogy* 31(5): 310-319.
- Pyle, R. 1981. The Audubon Society field guide to North American butterflies. Chanticleer; New York, New York.
- Rutkowski, F. 1971. Observations on *Papilio aristodemus ponceanus* (Papilionidae). *Journal of the Lepidopterists' Society*. 25(2):126-136.
- Sasso, C.R. 1999. Population dynamics, microhabitat use, and competition in the small mammal community of Key Largo. Ph.D. dissertation. University of Miami; Coral Gables, Florida.
- Schwartz, A. 1952. The land mammals of southern Florida and the upper Florida Keys. Ph.D. dissertation. University of Michigan; Ann Arbor, Michigan.
- Sikes, R.S. 1995. Maternal response to resource limitations in eastern woodrats. *Animal Behavior* 49(6):1551-1558.

U.S. Army Corps of Engineers and Florida Department of Environmental Protection. 2001.

The U.S. Corps of Engineers, Jacksonville District, and the Florida Department of Environmental Protection effect determination key for the manatee in Florida, January 2, 2001. U.S. Army Corps of Engineers; Jacksonville, Florida.

U.S. Fish and Wildlife Service. 1976. To the List of Endangered and Threatened Species, Fish and Wildlife Service Added the Gray Bat, Mexican Wolf, and Two Butterfly Species. Federal Register 41(83):17736-17740

U.S. Fish and Wildlife Service. 1982. Schaus Swallowtail Butterfly Recovery Plan. Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1983. Emergency Determination of Endangered Status for Key Largo Woodrat and Key Largo Cotton Mouse; Emergency Rule; Federal Register 48:43040-43043

U.S. Fish and Wildlife Service. 1984a. Endangered and threatened wildlife and plants; determination of endangered status for the Key Largo woodrat and Key Largo cotton mouse. Federal Register 49:4951-4956.

U.S. Fish and Wildlife Service. 1984b. Endangered and threatened wildlife and plants; determination of endangered status for the Key Largo woodrat and Key Largo cotton mouse. Federal Register 49(171):34504-34510.

U.S. Fish and Wildlife Service. 1986. Withdrawal of Critical Habitat Proposals for Key Largo Woodrat and Cotton Mouse; Federal Register 51:5746-5747

U.S. Fish and Wildlife Service. 1993. Technical/agency draft recovery plan for the Key Largo woodrat and the Key Largo cotton mouse. Fish and Wildlife Service; Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. U.S. Fish and Wildlife Service; Atlanta, Georgia.



**Figure 1.** Location map of the Port Bougainville restoration site within the DEP's Dagny Johnson Key Largo Hammock Botanical State Park.

## APPENDIX A

U.S. FISH AND WILDLIFE SERVICE'S  
SOUTH FLORIDA ECOLOGICAL SERVICES OFFICE  
TRAPPING PROTOCOL TO DETERMINE PRESENCE/ABSENCE OF  
KEY LARGO WOODRAT (*Neotoma floridana smalli*) AND  
KEY LARGO COTTON MOUSE (*Peromyscus gossypinus allapaticola*) 3/19/2007

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 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 and KLCM habitat within the area and, if landowner permission can be obtained, adjacent lands with potential KLWR and KLCM habitat.
3. Trapping should be conducted over the entire project area using a grid system of Sherman live-traps spaced at 10 to 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 60s, 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. If raccoons are disturbing traps (determined by missing bait or closed traps), the U.S. Fish and Wildlife Service will be contacted and an appropriate method for minimizing trap disturbance will be implemented. If raccoon trapping is deemed necessary, raccoons will be trapped using appropriately sized traps (e.g., Tomahawk) and any free-roaming cats incidentally captured in the traps will be brought to the local animal shelter.
7. In areas where fire ants are present, 10 percent Carbaryl (Sevin) dust will be placed immediately under the traps so that KLWRs and KLCM will not come in immediate contact with it. Other approved methods will be considered, but must be approved by the U.S. Fish and Wildlife Service.

8. Traps should be checked and all KLWRs and KLCM released no later than 3 hours after official sunrise.
9. All captured individuals shall be handled as briefly as possible in a humane manner during the time it takes to tag, examine, identify, and collect necessary biological samples. 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 KLWR identification and such identification will be applied by authorized personnel. All KLWRs and KLCM shall be released at the point of capture.
10. Any black rats (*Rattus rattus*) captured during trapping will be humanely euthanized.
11. KLWR and KLCM presence can be documented in a single trapping period. If KLWR or KLCM presence is confirmed, cease trapping efforts and contact the U.S. Fish and Wildlife Service regarding how to proceed. To determine absence, traps shall be operated seasonally (fall, winter, spring, summer) for 2 years.
12. Site description and trapping data should be recorded. Site description should include project location, habitat on the project area and adjacent lands, and trapping design relative to habitat distribution. Daily trapping data should include number of KLWR and /KLCM trapped, number of non-target species trapped, and lost or missing traps. Complete and verified data will be delivered via CD-ROM (preferred) and/or by software compressed (zipped) file. All digital and hardcopy information that is part of the project must be included in the final report (e.g., GIS data, reports, metadata, photos, other supporting materials). Sex, age, and reproductive status of each KLWR and KLCM will be reported. All trapping information should be submitted to the following offices:

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

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

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

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

Cindy Schulz  
Endangered Species Supervisor  
U.S. Fish and Wildlife Service  
South Florida Ecological Services Office  
1339 20th Street  
Vero Beach, FL 32960