October 12, 2007

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:	41420-2007-FA-0385
Service Consultation Code:	41420-2007-F-1035
Corps Application No.:	SAJ-2004-3931 (AEK)
Date Received:	February 3, 2006
Project:	Big Cypress Regional General Permit-83
Applicant:	Seminole Tribe of Florida
Counties:	Hendry, Broward

Dear Colonel Grosskruger:

This document transmits the Fish and Wildlife Service's (Service) biological opinion (BO) based on our review of the letter dated February 3, 2006, and other information submitted by the U.S. Army Corps of Engineers (Corps) and the Seminole Tribe of Florida (Tribe) for the application referenced above. Based on the "Florida Panther Effect Determination Key", the Corps determined this project "may affect" the Florida panther (*Puma concolor coryi*). This BO is provided 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*.) 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 Service concurs with the Corps' "may affect" determination. A complete administrative record of this consultation is on file in the South Florida Ecological Services Office, Vero Beach, Florida.

AREA HISTORY

The Seminole Tribe of Florida (Tribe) is a federally recognized tribe with several reservations in Florida. In 1845, most of the Native Indians living in Florida were relocated to the western states. Some of the Miccosukee and Seminole Indians remained in Florida and reside in the western Everglades. By 1938, more than 80,000 acres of land had been set aside for the Seminoles in the Big Cypress, Hollywood, and Brighton areas.

The largest reservation is the Big Cypress Seminole Indian Reservation (BCSIR), which encompasses approximately 52,000 acres (Figure 1). Approximately 30,600 acres of the BCSIR are jurisdictional wetlands. Primary economic-related activities for the tribal members residing in the BCSIR are farming, ranching, eco-tourism and other recreational activities for visitors. Portions of the reservation has been impacted in the past by ditching and diking activities associated with permitted water control activities undertaken by the Tribe and the Corps, as well as activities associated with the Central and Southern Florida Flood Control Project.

PROJECT DESCRIPTION

The Corps is proposing the development and use of a Regional General Permit (RGP) for 10 designated development activities within specific area of the BCSIR (Figure 2). The BCSIR is located in waters of the United States, south of Lake Okeechobee, and about 45 miles west of Fort Lauderdale, in Hendry and Broward Counties, Florida. In Hendry County, the BCSIR is located in Sections 23 through 26, 35, and 36, Township 48 South, Range 32 East; Sections 2 through 36, Township 48 South, Range 33 East; and Sections 7, and 12 through 36, Township 48 South, Range 34 East. In Broward County, the BCSIR is located in Sections 7, 8, 9, and 16 through 21, Township 48 South, Range 35 East.

The RGP is applicable within specified areas of BCSIR (Figure 2) for 10 designated development activities (Table 1) that include a maximum threshold impact of 1.5 acres of wetlands for each project, with the exception of ditch maintenance, which has no maximum designated wetland threshold due to the nature of the activity. The proposed RGP would be used for minor activities involving the placement of fill material, not to exceed a total of 100 acres of jurisdictional wetlands within the BCSIR over the life of the RGP. The RGP would be valid for 5 years with a maximum of 20 acres of wetland impacts authorized per year. There are additional areas on the BCSIR that are currently excluded from the RGP, but may be included with appropriate agency coordination and are also depicted on the attached drawing (Figure 2). The Corps may consider delegating the administration of the RGP to the Tribe at a later date. Given these criteria, the Corps has determined that the discharge of fill material is not anticipated to cause significant adverse cumulative impacts to jurisdictional wetlands on BCSIR.

The Tribe proposes to mitigate for adverse jurisdictional wetland impacts, which may occur through the use of the RGP, on a no-net loss of wetland functional value basis that may be completed either in advance of any impacts or concurrent with the activity. An Advance Mitigation Program (AMP) was submitted to the Corps with this RGP. The AMP involves the enhancement of existing wetlands within 6 compartments totaling 4,144 acres within the boundaries of the BCSIR Native Area (Figure 3). The BCSIR Native Area is a 14,724-acre natural area within the boundaries of the BCSIR and is located adjacent to the Big Cypress National Preserve (BCNP) (Figure 3).

The AMP has been prepared in cooperation with the Corps, the Service, the U.S. Environmental Protection Agency (EPA) and the South Florida Water Management District. Compensatory wetland mitigation will occur through:

1. ENHANCEMENT of wetland areas in the BCSIR Native Area through the removal of exotic vegetation;
2. RESTORATION of wetland areas on the BCSIR Native Area by restoring a more natural hydrological regime;
3. CREATION of wetlands on the BCSIR Native Area through the establishment of a suitable hydrological regime and planting of native vegetation; and
4. PROTECTION of resource significant wetland areas and upland buffers located in the BCSIR Native Area.

The BCSIR Native Area is a part of the historic Big Cypress wetland system and is located north of Big Cypress National Preserve. The mosaic of wetlands in this area can be described as freshwater marsh, cypress swamp, mixed wetland hardwoods, wet shrub, sawgrass marsh, and wet prairie with patches of hydric pine flatwoods. The wetland vegetation consists of bald cypress, red maple, Carolina willow, sweet bay, popash, pond apple, duck potato, pickerelweed, fireflag, panic grasses, and sawgrass (among many others). The wetlands have been degraded by hydrologic alterations, principally caused by the construction of the North and West Feeder Canals as part of the Central and South Florida Flood Control Project. These projects disrupted sheetflow to the region and contributed to the spread of invasive exotic plant species such as Brazilian pepper, melaleuca, and Old World Climbing Fern.

THREATENED AND ENDANGERED SPECIES

Based on the "Florida Panther Effect Determination Key", the Corps determined this project "may affect" the Florida panther (*Puma concolor coryi*). The project area of the proposed RGP lies within the primary zone of the Florida panther (Kautz et al., 2006). In evaluating the proposed action's affects to the Florida panther, the Service has identified adverse effects to the Florida panther to primarily include:

1. Loss of suitable foraging and dispersal habitat;
2. Loss of suitable foraging and dispersal habitat for prey species;
3. Adverse effects associated with intraspecific aggression from habitat changes;
4. Adverse effects associated with increases in traffic related to changes in intensity of land use, and
5. Adverse effects from habitat fragmentation.

The applicant is proposing to compensate for habitat foraging and dispersal losses to panther and panther prey species through the enhancement, restoration, creation, and protection of suitable habitat in the 6 wetland enhancement areas (WEA) within the BCSIR Native Area (Figure 3). Compensation needs and habitat values of the lands within the WEAs in the BCSIR Native Area and the lands associated with individual

projects applicable to this GP will be determined as provided in the Service's habitat assessment methodology as discussed in this biological opinion. Based on this methodology, the 4,144 acres within the 6 WEAs will provide about 35,352 panther habitat units (PHUs). The cumulative PHU values for adverse effects associated with habitat losses for all projects applicable to this GP cannot exceed the maximum PHUs identified within the 6 WEAs (35,352). Following this assessment, the average PHU value of the lands within the limits of the GP is 6 PHUs per acre (Table 11). Considering a base multiplier of 2.5 and the average value of affected lands, the estimated amount of lands that can be affected with adequate compensation provided by the 6 WEA is 2,337 acres (35,352/2.5=14,141/6=2,357).

Adverse effects associated with intraspecific aggression from habitat changes, increases in traffic, and habitat fragmentation are project specific assessments and are determined through the use of the following effects key.

Definition of Terms in Key:

Traffic Increase: A traffic increase is defined as an increase in the number of trips per day averaged over a week of new traffic coming onto the BCSIR related to a specific project. A change in traffic associated with day-to-day local traffic movement (intra-Reservation) is not considered an increase in traffic.

Other Identifiable Effects: Other identifiable effects include habitat fragmentation and land use intensity changes associated with the project footprint including affected wetlands and adjacent uplands. Table 2 in the Service's habitat assessment methodology provides habitat values to various habitats based on the importance and degree of usage by panthers. An identifiable impact to a panther would be a project that results in a decrease of habitat value and would be considered an adverse intensity change. For example clearing of cypress swamp ranked as a habitat value of 9 and converting to residential homes with a habitat value of 0 would be an identifiable effect.

Habitat Fragmentation: Mac et al. (1998) define habitat fragmentation as: "The breaking up of a habitat into unconnected patches interspersed with other habitat which may not be inhabitable by species occupying the habitat that was broken up. The breaking up is usually by human action, as, for example, the clearing of forest or grassland for agriculture, residential development, or mine excavation.

In our evaluation of habitat fragmentation, we consider a habitat change from a higher habitat value to a lower habitat value to represent fragmentation (see Table 2 habitat values). For example, if a project changes land use from pasture, habitat value of 7, to cropland, habitat value of 4, this change would be considered habitat fragmentation. However, a change from cropland, habitat value of 4 to orchard, habitat

value of 4, is not considered by the Service to represent habitat fragmentation.

Another example of habitat fragmentation is the widening or construction of a new road or canal through native habitat or the widening of an existing road in a non-urban area. For example clearing a canal of dense vegetation in an existing pasture or agriculture lands to facilitate drainage and maintain existing land use practices is not considered habitat fragmentation. However the construction of a new road or widening of an existing road in a non-urban area or deepening an existing canal or construction of a new canal to provide improved drainage to facilitate a different land use would be considered habitat fragmentation.

Habitat fragmentation would also be considered parceling or dividing high quality habitat by constructing projects with lower habitat value within the high quality habitat.

Community Development Area (CDA): An area within the boundaries of the BCSIR designated due to previously existing land use intensity and the current presence of degraded habitat as an area of proposed future development. This designation helps to focus future development and infrastructure improvements into areas of lower habitat value to the Florida panther and other wildlife species (Figure 4).

A. Total project footprint, including wetlands and uplands is less than 5 acre ……*May affect, not likely to adversely affect, GP applies.*

Total project footprint, including wetlands and uplands is greater than 5 acre ……..…… ……*B*

B Project is within the boundaries of the CDA and will have no increase and/or change in vehicle traffic patterns or other identifiable impacts to the Florida panther....…… .....*May affect, not likely to adversely affect, GP applies.*

Project will have a net increase or change in vehicle traffic patterns and/or the project will have other identifiable impacts to the Florida panther..... C

C. Project has no other identifiable impacts, yet shows a net increase in traffic, and the increase in traffic is restricted to daylight hours only..... .....*May affect, not likely to adversely affect, GP applies.*

Project has other identifiable impacts and/or traffic projections not as above .....

.....D

D. Project action results a reduction in land use intensity and/or restore native habitat..... .....*May affect, not likely to adversely affect, GP applies.*

Project action results in an increase in land use intensity and/or removes native habitat.....*May affect*
Additional coordination with the Service is requested.

Project action results in an increase in traffic into the BCSIR.....May affect
Additional coordination with the Service is requested.

Projects Less than Five Acres

On an individual basis land use changes on sites no larger than five acres will generally not have a measurable effect on panthers. Panthers are a wide ranging species, and individually, a five acre habitat change is not likely to adversely affect panthers. However, collectively they may have an effect and therefore regular monitoring and reporting of these effects are important.

Monitoring and Reporting Effects

For the Service to monitor effects, it is important for the Corps/Tribe to monitor the number of projects the GP is applied to and provide information to the Service regarding the number of permits issued under the GP. It is requested that information on date, Corps identification number, total project acreage, project wetland acreage, latitude and longitude in decimal degrees, and PHU values per project, per year, and GP total be sent to the Service annually.

A determination of "may affect" in the key may be concluded in either a "may affect, not likely to adversely affect, GP applies" or "may adversely affect" and formal consultation with the Service is requested.

CONSULTATION HISTORY

June 24, 2005 - Multi-agency meeting at BCIR to visit the AMP area. Participants included the Tribe, Corp, Service and EPA.

June 28, 2005 - A meeting was held to discuss the RGP. Participants included the Tribe, Corp, Service and EPA.

February 3, 2006 - By letter, the Corps requested initiation of formal consultation on the Florida panther based on a "may affect" determination associated with proposed RGP activities. In addition, the Corps determined the project "may affect" Audubon's crested caracara (*Polyborus plancus audubonii*) and wood stork (*Mycteria americana*).

April 17, 2006 – The Service responded with a letter stating the loss of wetland habitat under the RGP is not likely to adversely affect the wood stork; therefore, formal consultation for wood stork was not required. Additionally, if use of the caracara decision key resulted in a determination of "no effect" or "may affect, but is not likely to adversely affect," no formal correspondence would be necessary. The Service concurred with the Corps determination for Florida panther and requested additional information in order to initiate consultation.

August 31, 2006 – The Tribe provided an email response to the Service's request for additional information.

December 29, 2006 – The Tribe provided a written response to the Service's request for additional information.

May 9, 2007 – Representatives from the Corps and Tribe met with the Service at the South Florida Field Office and provided additional information.

June 18, 2007 – Additional information from the Corps via email was provided to the Service.

July 16, 2007 – Additional information from the Tribe via email was provided to the Service.

July 21, 2007 – Additional information from the Tribe via email was provided to the Service.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Corps is proposing the development and use of a Regional General Permit (RGP) for 10 designated development activities (Table 1) within specific area of the BCSIR (Figure 2). The BCSIR is located in waters of the United States, south of Lake Okeechobee, and about 45 miles west of Fort Lauderdale, in Hendry and Broward Counties, Florida.

The proposed RGP would be used for minor activities involving the placement of fill material, not to exceed a total of 100 acres of jurisdictional wetlands within the BCSIR over the life of the RGP. The RGP would be valid for 5 years with a maximum of 20 acres of wetland impacts authorized per year. There are additional areas on the BCSIR that are currently excluded from the RGP, but may be included with appropriate agency coordination and are also depicted on the attached drawing (Figure 2). The Corps has determined that the discharge of fill material is not anticipated to cause significant adverse cumulative impacts to jurisdictional wetlands on BCSIR.

The Tribe proposes to mitigate for adverse jurisdictional wetland impacts, which may occur through the use of the RGP, through an Advance Mitigation Program (AMP) that was submitted to the Corps with this RGP. The AMP involves the enhancement of existing wetlands within 6 compartments totaling 4,144 acres within the boundaries of the BCSIR Native Area (Figure 3).

The Tribe is proposing to compensate for habitat foraging and dispersal losses to panther and panther prey species through the enhancement, restoration, creation, and protection of suitable habitat in the 6 wetland enhancement areas (WEA) within the BCSIR Native Area (Figure 3). The 4,144 acres within the 6 WEAs will provide about 35,352 panther habitat units (PHUs).

Action Area

The Service's Panther Focus Area for the Florida panther includes lands in Charlotte, Glades, Hendry, Lee, Collier, Palm Beach, Broward, Miami-Dade, and Monroe Counties, as well as the southern portion of Highlands County (Figure 5). Developed urban coastal areas in eastern Palm Beach, Broward, and Miami-Dade Counties, and in western Charlotte, Lee, and Collier Counties were excluded because they contain little or no panther habitat and it is unlikely that panthers would use such areas.

Movements of Florida panthers are much larger than the project site and, therefore, the Service's action area is larger than the proposed action area identified by the Corps' public notice. The action area, which is a subset of the current panther range, includes those lands where the Service believes panthers may experience direct and indirect effects from the proposed development. Maehr et al. (1990a) monitored five solitary panthers continuously for 130-hour periods seasonally from 1986 to 1989, rarely observing measurable shifts in location during the day, but nocturnal shifts in location exceeding 20.0 kilometers (km) (12.4 miles) were not unusual. Maehr et al. (2002a) in a later report documented a "mean maximum dispersal distance" of 68.1 km (42.3 miles) for subadult males and 20.3 km (12.6 miles) for subadult females. In the same report Maehr et al. (2002a) documented a "mean dispersal distance" of 37.3 km (23.1 miles) for subadult males. Comiskey et al. (2002) documented a "mean dispersal distance" for subadult male panthers as an average distance of 40.1 km (24.9 miles) from their natal range, which is similar to the dispersal distance referenced by Maehr et al. (2002a).

Therefore, for both direct and indirect effects, the Service defined the action area (Figure 1) as all lands within a 25-mile radius of the BCSIR, which is slightly greater than the mean dispersal distance for subadult males. This action area includes areas anticipated to sustain direct and indirect effects, such as roadways experiencing increased traffic, areas with increased human disturbance (project area and periphery of project), and areas in which habitat fragmentation and intraspecific aggression may be felt.

STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

Florida panther

Status - Panther Biology/Ecology

The Florida panther, is the last subspecies of *Puma* (also known as mountain lion, cougar, painter, or catamount) still surviving in the eastern United States. Historically occurring throughout the southeastern United States (Young and Goldman 1946), today the panther is restricted to less than 5 percent of its historic range in one breeding population of less than
100 animals, located in south Florida.

When Europeans first came to this country, pumas roamed most all of North, Central, and South America. Early settlers attempted to eradicate pumas by every means possible. By 1899, it was felt that Florida panthers had been restricted to peninsular Florida (Bangs 1899). By the late 1920s to mid 1930s it was thought by many that the Florida panther had been completely eliminated (Tinsley 1970). In 1935, Dave Newell, a Florida sportsman, hired Vince and Ernest Lee, Arizona houndsmen, to hunt for panthers in Florida. They killed eight in the Big Cypress Swamp (Newell 1935). Every survey conducted since then has confirmed that a panther population occurs in southern Florida south of the Caloosahatchee River, and no survey since then has been able to confirm a panther population outside of southern Florida.

Attempts to eradicate panthers and a decline in panther prey (primarily white-tailed deer) resulted in a panther population threatened with extinction. Prior to 1949, panthers could be killed in Florida at any time of the year. In 1950, the Florida Game and Freshwater Fish Commission (now the Florida Fish and Wildlife Conservation Commission [FWC]) declared the panther a regulated game species due to concerns over declining numbers. The FWC removed panthers from the game animal list in 1958 and gave them complete legal protection. On March 11, 1967, the Service listed the panther as endangered (32 FR 4001) throughout its historic range, and these animals received Federal protection under the passage of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act). Also, the Florida Panther Act (State Statute 372.671), a 1978 Florida State law, made killing a panther a felony. The Florida panther is listed as endangered by the States of Florida, Georgia, Louisiana, and Mississippi.

Since the panther was designated as an endangered species prior to enactment of the Act, there was no formal listing package identifying threats to the species as required by section 4(a)(1) of the Act. However, the technical/agency draft of the Florida Panther Recovery Plan, third revision, addressed the five factor threats analysis (Service 2006). No critical habitat has been designated for the panther.

Taxonomy

The Florida panther was first described by Charles B. Cory in 1896 as *Felis concolor floridana* (Cory 1896). The type specimen was collected in Sebastian, Florida. Bangs (1899), however, believed that the Florida panther was restricted to peninsular Florida and could not intergrade with other *Felis* spp. Therefore, he assigned it full specific

status and named it *Felis coryi* since *Felis floridana* had been used previously for a bobcat (*Lynx rufus*).

The taxonomic classification of the *Felis concolor* group was revised and described by Nelson and Goldman (1929) and Young and Goldman (1946). These authors differentiated 30 subspecies using geographic and morphometric (measurement of forms) criteria and reassigned the Florida panther to subspecific status as *Felis concolor coryi.* This designation also incorporated *F. arundivaga* which had been classified by Hollister (1911) from specimens collected in Louisiana into *F. c. coryi*. Nowell and Jackson (1996) reviewed the genus *Felis* and placed mountain lions, including the Florida panther, in the genus *Puma*.

Culver et al. (2000) examined genetic diversity within and among the described subspecies of *Puma concolor* using three groups of genetic markers and proposed a revision of the genus to include only six subspecies, one of which encompassed all puma in North America including the Florida panther. However, Culver et al. (2000) determined that the Florida panther was one of several smaller populations that had unique features, the number of polymorphic microsatellite loci and amount of variation were lower, and it was highly inbred (eight fixed loci). The degree to which the scientific community has accepted the results of Culver et al. (2000) and the proposed change in taxonomy is not resolved at this time. The Florida panther remains listed as a subspecies and continues to receive protection pursuant to the Act.

Species Description

An adult Florida panther is unspotted and typically rusty reddish-brown on the back, tawny on the sides, and pale gray underneath. There has never been a melanistic (black) puma documented in North America (Tinsley 1970, 1987). Adult males can reach a length of seven feet (ft) (2.1 meters [m]) from their nose to the tip of their tail and may exceed 161 pounds (lbs) (73 kilograms [kg]) in weight; but, typically adult males average around 116 lbs (52.6 kg) and stand about 24-28 inches (in) (60-70 centimeters [cm]) at the shoulder (Roelke 1990). Female panthers are smaller with an average weight of 75 lbs (34 kg) and length of 6 ft (1.8 m) (Roelke 1990). The skull of the Florida panther is unique in that it has a broad, flat, frontal region, and broad, high-arched or upward-expanded nasal bones (Young and Goldman 1946).

Florida panther kittens are gray with dark brown or blackish spots and five bands around the tail. The spots gradually fade as the kittens grow older and are almost unnoticeable by the time they are six months old. At this age, their bright blue eyes slowly turn to the light-brown straw color of the adult (Belden 1988).

Three external characters—a right angle crook at the terminal end of the tail, a whorl of hair or cowlick in the middle of the back, and irregular, white flecking on the head, nape, and shoulders—not found in combination in other subspecies of *Puma* (Belden 1986), were commonly observed in Florida panthers through the mid-1990s. The kinked tail and cowlicks were considered manifestations of inbreeding (Seal 1994); whereas the white

flecking was thought to be a result of scarring from tick bites (Maehr 1992, Wilkins et al. 1997). Four other abnormalities prevalent in the panther population prior to the mid-1990s included cryptorchidism (one or two undescended testicles), low sperm quality, atrial septal defects (the opening between two atria in the heart fails to close normally during fetal development), and immune deficiencies and were also suspected to be the result of low genetic variability (Roelke et al. 1993a).

A plan for genetic restoration and management of the Florida panther was developed in September 1994 (Seal 1994) and eight non-pregnant adult female Texas panthers (*Puma concolor stanleyana*) were released in five areas of south Florida from March to July 1995. Since this introgression, rates of genetic defects, including crooked tails and cowlicks, have dramatically decreased (Land et al. 2004). In addition, to date neither atrial septal defects nor cryptorchidism have been found in introgressed panthers (M. Cunningham, FWC, pers. comm. 2005). As of January 27, 2003, none of the eight female Texas panthers introduced in 1995 remain in the wild.

Population Trends and Distribution

The Florida panther once ranged throughout the southeastern United States from Arkansas and Louisiana eastward across Mississippi, Alabama, Georgia, Florida, and parts of South Carolina and Tennessee (Young and Goldman 1946). Historically, the panther intergraded to the north with *P. c. cougar*, to the west with *P. c. stanleyana*, and to the northwest with *P. c. hippolestes* (Young and Goldman 1946).

Although, generally considered unreliable, sightings of panthers regularly occur throughout the Southeast. However, no populations of panthers have been found outside of south Florida for at least 30 years despite intensive searches (Belden et al. 1991, McBride et al. 1993, Clark et al. 2002). Survey reports and more than 70,000 locations of radio-collared panthers recorded between 1981 and 2004 clearly define the panther's current range. Reproduction is known only in the Big Cypress Swamp/Everglades physiographic region in Collier, Lee, Hendry, Miami-Dade, and Monroe Counties south of the Caloosahatchee River (Belden et al. 1991). Although, the breeding segment of the panther population occurs only in south Florida, panthers have been documented north of the Caloosahatchee River over 125 times since February 1972. This has been confirmed through field sign (e.g., tracks, urine markers, scats), camera-trap photographs, seven highway mortalities, four radio-collared animals, two captured animals (one of which was radiocollared), and one skeleton. From 1972 through 2004, panthers have been confirmed in
11 counties (Flagler, Glades, Highlands, Hillsborough, Indian River, Okeechobee, Orange, Osceola, Polk, Sarasota, and Volusia) north of the river (Belden et al. 1991, Belden and McBride 2005). However, no evidence of a female or reproduction has been documented north of the Caloosahatchee River since 1973 (Nowak and McBride 1974, Belden et al. 1991, Land and Taylor 1998, Land et al. 1999, Shindle et al. 2000, McBride 2002, Belden and McBride 2005).

Puma are wide ranging, secretive, and occur at low densities. However, their tracks, urine markers, and scats are readily found by trained observers, and resident populations are easily located. Van Dyke (1986a) determined that all resident puma, 78 percent of

transient puma, and 57 percent of kittens could be detected by track searches in Utah. In south Florida, the Florida panther's limited range and low densities may make the population count derived from track searches more accurate than in Utah. During two month-long investigations – one late in 1972 and early 1973 and another in 1974 – funded by the World Wildlife Fund to determine if panthers still existed in Florida, McBride searched for signs of panthers in portions of south Florida. In 1972, McBride authenticated a road-killed male panther in Glades County and a female captured and released from a bobcat trap in Collier County (R. McBride, Livestock Protection Company, pers. comm. 2005). In 1973, McBride captured one female in Glades County (Nowak and McBride 1974). Based on this preliminary evidence, Nowak and McBride (1974) estimated the "population from the Lake Okeechobee area southward to be about 20 or
30 individuals." In 1974, McBride found evidence of only two additional panthers in the Fakahatchee Strand and suggested that "there could be as few as ten individuals panthers in the area around Lake Okeechobee and southward in the state" (Nowak and McBride 1975). This initial survey, while brief in nature, proved that panthers still existed in Florida and delineated areas where a more exhaustive search was warranted. After this initial investigation, more comprehensive surveys on both public and private lands were completed (Reeves 1978; Belden and McBride 1983a, b; Belden et al. 1991). Thirty individual panthers were identified during a wide-ranging survey in 1985 in south Florida (McBride 1985).

Maehr et al. (1991) provides the only published estimate of population density based on a substantial body of field data (Beier et al. 2003). Maehr et al. (1991) estimated a density of 1 panther/27,520 acres [11,137 hectares (ha)] based on 17 concurrently radiocollared and four uncollared panthers. They extrapolated this density to the area occupied (1,245,435 acres [504,012 ha]) by radio-collared panthers during the period 1985-1990 to achieve a population estimate of 46 adult panthers for southwest Florida (excluding Everglades National Park [ENP], eastern Big Cypress National Preserve [BCNP], and Glades and Highlands Counties). Beier et al. (2003), however, argued that this estimate of density, although "reasonably rigorous," could not be extrapolated to other areas because it was not known whether densities were comparable in those areas.

More recently, McBride (2000, 2001, 2002, 2003) reported minimum population counts (*i.e.*, number known alive) based on panthers treed with hounds, physical evidence (*e.g.*, tracks where radio-collared panthers were not known to occur), documentation by trail-camera photos, and sightings of uncollared panthers by a biologist or pilot from a monitoring plane or via ground telemetry. He counted adults and subadult panthers but not kittens at the den). The population estimate in 2000 was 62 panthers (McBride 2000), with estimates of 78 in 2001 (McBride 2001), 80 in 2002 (FWC 2002), 87 in 2003 (FWC 2003), 78 in 2004 (R. McBride, Personal Communication, 2006), 82 in 2005 (R. McBride, Personal Communication, 2006), and 97 in 2006 (R. McBride, Personal Communication, 2006). The 3-year running average of the verified panther population shows an annual increase in the population over the reported years.

Life History

Reproduction: Male Florida panthers are polygynous, maintaining large, overlapping home ranges containing several adult females and their dependent offspring. The first sexual encounters for males normally occur at about 3 years based on 26 radio-collared panthers of both sexes (Maehr et al. 1991). Based on genetics work, some males may become breeders as early as 17 months (W. Johnson, National Cancer Institute, pers. comm. 2005). Breeding activity peaks from December to March (Shindle et al. 2003). Litters (n = 82) are produced throughout the year, with 56-60 percent of births occurring between March and June (Jansen et al. 2005, Lotz et al. 2005). The greatest number of births occurs in May and June (Jansen et al. 2005, Lotz et al. 2005). Female panthers have bred as young as 18 months (Maehr et al. 1989) and successful reproduction has occurred up to 11 years old. Mean age of denning females is
4.6 ± 2.1 (standard deviation [sd]) years (Lotz et al. 2005). Age at first reproduction for 19 known-aged female panthers averaged 2.2 ± 0.246 (sd) years and ranged from 1.8-3.2 years. Average litter size is 2.4 ± 0.91 (sd) kittens. Seventy percent of litters are comprised of either two or three kittens. Mean birth intervals (elapsed time between successive litters) are
19.8 ± 9.0 (sd) months for female panthers (n = 56) (range 4.1-36.5 months) (Lotz et al. 2005). Females that lose their litters generally produce another more quickly; five of seven females whose kittens were brought into captivity successfully produced another litter an average of
10.4 months after the removal of the initial litter (Land 1994).

Den sites are usually located in dense, understory vegetation, typically saw palmetto (*Serenoa repens*) (Maehr 1990, Shindle et al. 2003). Den sites are used for up to two months by female panthers and their litters from birth to weaning. Independence and dispersal of young typically occurs at 18 months, but may occur as early as one year (Maehr 1992).

Survivorship and Causes of Mortality: Mortality records for uncollared panthers have been kept since February 13, 1972, and for radio-collared panthers since February 10, 1981. One-hundred eighty-nine mortalities have been documented through October 30, 2006, with
86 (46 percent) of known deaths occurring in the past 5 years (FWC 2006a, FWC unpublished data). Overall, documented mortality averaged 3.6 per year through June 2001, and 16.0 per year from July 2001 through June 2006. Of the 189 total mortalities, 100 were radio-collared panthers that have died since 1981 (FWC 2006a, FWC unpublished data). From 1990-2004, mean annual survivorship of radio-collared adult panthers was greater for females (0.894 ± 0.099 sd) than males (0.779 ± 0.125 sd) (Lotz et al. 2005). Except for intraspecific aggression, the causes of mortality were found to be independent of gender (Lotz et al. 2005).

Intraspecific aggression was the leading cause of death for radio-collared panthers, accounting for 42 percent (Jansen et al. 2005, Lotz et al. 2005). Most intraspecific aggression occurs between male panthers; but, aggressive encounters between males and

females, resulting in the death of the female, have occurred. Defense of kittens and\or a kill is suspected in half (5 of 10) of the known instances through 2003 (Shindle et al. 2003).

Unknown causes and collisions with vehicles accounted for 24 and 19 percent of radio-collared panther mortalities, respectively. From February 13, 1972, through June 30, 2006, Florida panther vehicular trauma (n=96), averaged 2.8 per year for radio-collared and uncollared panthers (FWC 2006a). Ten of the collisions were not fatal. Nineteen additional panthers were killed by vehicles from July 1, 2006, through August 21, 2007 (FWC, unpublished data), bringing the total to 115 panthers killed or injured by vehicles.

Female panthers are considered adult residents if they are older than 18 months, have established home ranges and bred (Maehr et al. 1991). Land et al. (2004) reported that 23 of 24 female panthers first captured as kittens survived to become residents and 18 (78.3 percent) produced litters; one female was too young to determine residency. Male panthers are considered adult residents if they are older than three years and have established a home range that overlaps with females. Thirty-one male panthers were captured as kittens and 12 (38.7 percent) of these cats survived to become residents (Jansen et al. 2005, Lotz et al. 2005). "Successful male recruitment appears to depend on the death or home-range shift of a resident adult male" (Maehr et al. 1991). Turnover in the breeding population is low with documented mortality in radio-collared panthers being greatest in subadults and non-resident males (Maehr et al. 1991, Shindle et al. 2003).

Den sites of female panthers have been visited since 1992 and the number of kittens that survived to 6 months for 38 of these litters has been documented. Florida and introgressed panther kitten survival to 6 months were estimated to be 52 and 72 percent, respectively, but were not significantly different (P = 0.2776) (Lotz et al. 2005). Survival of kittens greater than
6 months old was determined by following the fates of 55 radio-collared dependent-aged kittens, including 17 introgressed panthers from 1985 - 2004. Only one of these 55 kittens died before reaching independence, resulting in a 98.2 percent survival rate (Lotz et al. 2005). The FWC and NPS are continuing to compile and analyze existing reproductive and kitten data.

Dispersal: Panther dispersal begins after a juvenile becomes independent from its mother and continues until it establishes a home range. Dispersal distances are greater for males (n = 18) than females (n = 9) (42.5 mi [68.4 km] vs. 12.6 mi [20.3 km], respectively) and the maximum dispersal distance recorded for a young male was 139.2 mi (224.1 km) over a seven-month period followed by a secondary dispersal of 145 mi (233 km) (Maehr et al. 2002a). Males disperse an average distance of 25 mi (40 km); females typically remain in or disperse short distances from their natal ranges (Comiskey et al. 2002). Female dispersers are considered philopatric because they usually establish home ranges less than one average home range width from their natal range (Maehr et al. 2002a). Maehr et al. (2002a) reported that all female dispersers (n = 9) were successful at establishing a home range whereas only 63 percent of males (n = 18) were successful.

Young panthers become independent at 14 months on average for both sexes, but male dispersals are longer in duration than for females (9.6 months and 7.0 months, respectively) (Maehr et al. 2002a). Dispersing males usually go through a period as transient (non-resident) subadults, moving through the fringes of the resident population and often occupying suboptimal habitat until an established range becomes vacant (Maehr 1997).

Most panther dispersal occurs south of the Caloosahatchee River with only four radio-collared panthers crossing the river and continuing north since 1981 (Land and Taylor 1998, Land et al. 1999, Shindle et al. 2000, Maehr et al. 2002a, Belden and McBride 2005). Western subspecies of *Puma* have been documented crossing wide, swift-flowing rivers up to a mile in width (Seidensticker et al. 1973, Anderson 1983). The Caloosahatchee River, a narrow (295-328 ft [90-100 m]), channelized river, probably is not a significant barrier to panther movements, but the combination of the river, State Route (SR) 80, and land uses along the river seems to have restricted panther dispersal northward (Maehr et al. 2002a). Documented physical evidence of at least 15 other uncollared male panthers have been confirmed north of the river since 1972, but no female panthers nor reproduction have been documented in this area since 1973 (Belden and McBride 2005).

Home Range Dynamics and Movements: Panthers require large areas to meet their needs. Numerous factors influence panther home range size including habitat quality, prey density,
and landscape configuration (Belden 1988, Comiskey et al. 2002). Home range sizes of 26 radio-collared panthers monitored between 1985 and 1990 averaged 128,000 acres (51,800 ha) for resident adult males and 48,000 acres (19,425 ha) for resident adult females; transient males had a home range of 153,599 acres (62,160 ha) (Maehr et al. 1991). Comiskey et al. (2002) examined the home range size for 50 adult panthers (residents greater than 1.5 years old) monitored in south Florida from 1981-2000 and found resident males had a mean home range of 160,639 acres (65,009 ha) and females had a mean home range of 97,920 acres
(39,627 ha). Beier et al. (2003) found home range size estimates for panthers reported by Maehr et al. (1991) and Comiskey et al. (2002) to be reliable. Annual minimum convex polygon home range sizes of 52 adult radio-collared panthers monitored between 1998 and 2002 ranged from 15,360 – 293,759 acres (6,216 – 118,880 ha), averaging 89,600 acres (36,260 ha) for 20 resident adult males and 44,160 acres (17,871 ha) for 32 resident adult females (Land et al. 1999, Shindle et al. 2000, Shindle et al. 2001, Land et al. 2002). The most current estimate of home-range sizes (minimum convex polygon method) for established, non-dispersing, adult, radio-collared panthers averaged 29,056 acres (11,759 ha) for females (n = 11) and 62,528 acres (25,304 ha)
for males (n = 11) (Lotz et al. 2005). The average home range was 35,089 acres (14,200 ha)
for resident females (n = 6) and 137,143 acres (55,500 ha) (n = 5) for males located at BCNP (Jansen et al. 2005). Home ranges of resident adults tend to be stable unless influenced by the death of other residents; however, several males have shown significant home range shifts

that may be related to aging (D. Jansen, National Park Service [NPS], pers. comm. 2005). Home-range overlap is extensive among resident females and limited among resident males (Maehr et al. 1991).

Activity levels for Florida panthers are greatest at night with peaks around sunrise and after sunset (Maehr et al. 1990a). The lowest activity levels occur during the middle of the day. Female panthers at natal dens follow a similar pattern with less difference between high and
low activity periods.

Telemetry data indicate panthers typically do not return to the same resting site day after day, with the exception of females with dens or panthers remaining near kill sites for several days. The presence of physical evidence such as tracks, scats, and urine markers confirm that panthers move extensively within home ranges, visiting all parts of the range regularly in the course of hunting, breeding, and other activities (Maehr 1997, Comiskey et al. 2002). Males travel widely throughout their home ranges to maintain exclusive breeding rights to females. Females without kittens also move extensively within their ranges (Maehr 1997). Panthers are capable of moving large distances in short periods of time. Nightly panther movements of
12 mi (20 km) are not uncommon (Maehr et al. 1990a).

Intraspecific Interactions: Interactions between panthers occur indirectly through urine markers or directly through contact. Urine markers are made by piling ground litter using a backwards-pushing motion with the hind feet. This pile is then scent-marked with urine and occasionally feces. Both sexes make urine markers. Apparently males use them as a way to mark their territory and announce presence while females advertise their reproductive condition.

Adult females and their kittens interact more frequently than any other group of panthers. Interactions between adult male and female panthers last from one to seven days and usually result in pregnancy (Maehr et al. 1991). Aggressive interactions between males often result in serious injury or death. Independent subadult males have been known to associate with each other for several days and these interactions do not appear to be aggressive in nature. Aggression between males is the most common cause of male mortality and an important determinant of male spatial and recruitment patterns based on radio-collared panthers (Maehr et al. 1991, Shindle et al. 2003). Aggressive encounters between radio-collared males and females also have been documented (Shindle et al. 2003, Jansen et al. 2005).

Food Habits: Primary panther preys are white-tailed deer (*Odocoileus virginianus*) and feral hog (*Sus scrofa*) (Maehr et al. 1990b, Dalrymple and Bass 1996). Generally, feral hogs constitute the greatest biomass consumed by panthers north of the Alligator Alley section of
I-75, while white-tailed deer are the greatest biomass consumed to the south (Maehr et al. 1990b). Secondary prey includes raccoons (*Procyon lotor*), nine-banded armadillos (*Dasypus novemcinctus*), marsh rabbits (*Sylvilagus palustris*) (Maehr et al. 1990b) and

alligators (*Alligator mississippiensis*) (Dalrymple and Bass 1996). No seasonal variation in diet has been detected.
A resident adult male puma generally consumes one deer-sized prey every 8-11 days; this frequency would be 14-17 days for a resident female; and 3.3 days for a female with three
13-month-old kittens (Ackerman et al. 1986). Maehr et al. (1990b) documented domestic livestock infrequently in scats or kills, although cattle were readily available on their study area.

Infectious Diseases, Parasites, and Environmental Contaminants: *Viral Diseases*--
Feline leukemia virus (FeLV) is common in domestic cats (*Felis catus*), but is quite rare in non-domestic felids. Routine testing for FeLV antigen (indicating active infection) in captured and necropsied panthers has been negative since testing began in 1978 to the fall of 2002. Between November 2002 and February 2003, however, two panthers tested FeLV antigen positive (Cunningham 2005). The following year, three more cases were diagnosed. All infected panthers had overlapping home ranges in the Okaloacoochee Slough ecosystem. Three panthers died due to suspected FeLV-related diseases (opportunistic bacterial infections and anemia) and the two others died from intraspecific aggression. Testing of serum samples collected from 1990-2005 for antibodies (indicating exposure) to FeLV indicated increasing exposure to FeLV beginning in the late 1990s and concentrated north of I-75. There was apparently minimal exposure to FeLV during this period south of I-75. Positive antibody titers in different areas at different times may indicate that multiple introductions of the virus into the panther population may have occurred. These smaller epizootics were apparently self-limiting and did not result in any known mortalities. Positive antibody titers, in the absence of an active infection (antigen positive), indicate that panthers can be exposed and overcome the infection (Cunningham 2005). Management of the disease includes vaccination as well as removal of infected panthers to captivity for quarantine and supportive care. As of June 1, 2005, about one-third of the population had received at least one vaccination against FeLV (FWC and NPS, unpublished data). No new positive cases have been diagnosed since July 2004.

Pseudorabies virus (PRV) (Aujeszky's disease) causes respiratory and reproductive disorders in adult hogs and mortality in neonates, but is a rapidly fatal neurologic disease in carnivores. At least one panther died from PRV infection presumably through consumption of an infected feral hog (Glass et al. 1994). At least one panther has also died of rabies (Taylor et al. 2002). This panther was radiocollared but not vaccinated against the disease.

Feline immunodeficiency virus (FIV) is a retrovirus of felids that is endemic in the panther population. About 28 percent of Florida panthers were positive for antibodies to the puma lentivirus strain of FIV (Olmstead et al. 1992); however, the prevalence may be increasing. Between November 2004 and April 2005, 13 of 17 (76 percent) were positive (M.Cunningham, FWC, unpublished data). The cause of this increase is unknown but warrants continued monitoring and investigation. There is also evidence of exposure to Feline panleukopenia virus (PLV) in adult panthers (Roelke et al. 1993b) although no PLV-related mortalities are known to have occurred.

Serological evidence of other viral diseases in the panther population includes feline calicivirus, feline herpes virus, and West Nile virus (WNV). However these diseases are not believed to cause significant morbidity or mortality in the population. All panthers found dead due to unknown causes are tested for alphaviruses, flaviviruses (including WNV), and canine distemper virus. These viruses have not been detected in panthers by viral culture or polymerase chain reaction (FWC, unpublished data).

Other Infectious Diseases - Bacteria have played a role in free-ranging panther morbidity and mortality as opportunistic pathogens, taking advantage of pre-existing trauma or FeLV infections (FWC, unpublished data). Dermatophytosis (ringworm infection) has been diagnosed in several panthers and resulted in severe generalized infection in at least one (Rotstein et al. 1999). Severe infections may reflect an underlying immunocompromise, possibly resulting from inbreeding depression or immunosuppressive viral infections.

Parasites - The hookworm, *Ancylostoma pluridentatum,* is found in a high prevalence in the panther population. Other parasites identified from live-captured or necropsied panthers include eight arthropod species, eight nematode species, three cestode species, two trematode species, and three protozoa species (Forrester et al. 1985, Forrester 1992, Wehinger et al. 1995, Rotstein et al. 1999, Land et al. 2002). Of these only an arthropod, *Notoedres felis,* caused significant morbidity in at least one panther (Maehr et al. 1995).

Environmental Contaminants - Overall, mercury in south Florida biota has decreased over the last several years (Frederick et al. 2002). However, high mercury concentrations are still found in some panthers. At least one panther is thought to have died of mercury toxicosis and mercury has been implicated in the death of two other panthers in ENP (Roelke 1991). One individual panther had concentrations of 150 parts per million (ppm) mercury in its hair (Land et al. 2004). Elevated levels of p, p'– DDE were also detected in fat from that panther. The role of mercury and/or p, p'– DDE in this panther's death is unknown and no cause of death was determined despite extensive diagnostic testing. Elevated mercury concentrations have also been found in panthers from Florida Panther National Wildlife Refuge (FPNWR). Two sibling neonatal kittens from this area had hair mercury concentrations of 35 and 40 ppm. Although other factors were believed to have been responsible, these kittens did not survive to leave their natal den. Consistently high hair mercury values in ENP and FPNWR and the finding of elevated values in some portions of BCNP warrant continued monitoring (Land et al. 2004). Other environmental contaminants found in panthers include polychlorinated biphenyls (Arochlor 1260) and organochlorines (p, p'–DDE) (Dunbar 1995, Land et al. 2004).

Habitat Characteristics/Ecosystem

Landscape Composition: Noss and Cooperrider (1994) considered the landscape implications of maintaining viable panther populations. Assuming a male home range size of 137,599 acres (55,685 ha) (Maehr 1990), an adult sex ratio of 50:50 (Anderson 1983), and some margin of safety, they determined that a reserve network as large as 15,625–23,438 mi^2

(40,469-60,703 km^2) would be needed to support an effective population size of 50 individuals (equating to an actual adult population of 100-200 panthers [Ballou et al. 1989]). However, to provide for long-term persistence based on an effective population size of 500 individuals (equating to 1,000 - 2,000 adult panthers [Ballou et al. 1989]), could require as much as
156,251-234,376 mi^2 (404,687-607,031 km^2). This latter acreage corresponds too roughly
60 - 70 percent of the Florida panther's historical range. Although it is uncertain whether this much land is needed for panther recovery, it does provide some qualitative insight into the importance of habitat conservation across large landscapes for achieving a viable panther population (Noss and Cooperrider 1994).

Between 1981 and 2003, more than 55,000 locations on more than 100 radio-collared panthers were collected. Belden et al. (1988), Maehr et al. (1991), Maehr (1997), Kerkoff et al. (2000), and Comiskey et al. (2002) provide information on habitat use based on various subsets of these data. Since almost all data from radio-collars have been collected during daytime hours (generally 0700-1100), and because panthers are most active at night (Maehr et al. 1990a), daytime radio locations are insufficient to describe the full range of panther habitat use
(Beyer and Haufler 1994, Comiskey et al. 2002, Beier et al. 2003, Dickson et al. 2005, Beier et al. 2006).

A landscape-level strategy for the conservation of the panther population in south Florida was developed using a Florida panther potential habitat model based on the following criteria:
(1) forest patches greater than 4.95 acres (2 ha); (2) non-urban cover types within 656 ft (200m) of forest patches; and (3) exclusion of lands within 984 ft (300m) of urban areas (Kautz et al. 2006). In developing the model, data from radio-collared panthers collected from 1981 through 2000 were used to evaluate the relative importance of various land cover types as panther habitat, thus identifying landscape components important for panther habitat conservation. Those components were then combined with a least cost path analysis to delineate three panther habitat conservation zones for south Florida: (1) Primary Zone – lands essential to the long-term viability and persistence of the panther in the wild; (2) Secondary Zone - lands which few panthers use contiguous with the Primary Zone, but given sufficient habitat restoration could accommodate expansion of the panther population south of the Caloosahatchee River; and
(3) Dispersal Zone - the area which may facilitate future panther expansion north of the Caloosahatchee River (Kautz et al. 2006) (Figure 7). The Primary Zone is currently occupied and supports the breeding population of panthers. Although panthers move through the Secondary and Dispersal Zones, they are not permanently occupied. The Secondary Zone could support panthers with sufficient restoration.

These zones vary in size, ownership, and land cover composition. The Primary Zone is 2,270,711 acres (918,928 ha) in size, 73 percent of which is publicly owned (R. Kautz, Dennis, Breedlove, and Associates, pers. comm. 2005), and includes portions of the BCNP, ENP, Fakahatchee Strand Preserve State Park (FSPSP), FPNWR, Okaloacoochee

Slough State
Forest, and Picayune Strand State Forest. This zone's composition is 45 percent forest, 41 percent freshwater marsh, 7.6 percent agriculture lands, 2.6 percent prairie and shrub lands, and 0.52 percent urban lands (Kautz et al. 2006). The Secondary Zone is 812,157 acres
(328,670 ha) in size, 38 percent of which is public land (R. Kautz, pers. comm. 2005). This zone's composition is 43 percent freshwater marsh, 36 percent agriculture, 11 percent forest,
6.1 percent prairie and shrub lands, and 2.3 percent low-density residential areas and open urban lands (Kautz et al. 2006). The Dispersal Zone is 28,160 acres (11,396 ha) in size, 12 percent of which is either publicly owned or in conservation easement. This zone's composition is
49 percent agriculture (primarily improved pasture and citrus groves), 29 percent forest (wetland and upland), 8.8 percent prairie and shrub land, 7.5 percent freshwater marsh, and
5.1 percent barren and urban lands (Kautz et al. 2006).

As part of their evaluation of occupied panther habitat, in addition to the average density estimate of one panther per 27,181 acres (11,000 ha) developed by Maehr et al. (1991), Kautz et al. (2006) estimated the present average density during the timeframe of the study, based on telemetry and other occurrence data, to average 1 panther per 31,923 acres (12,919 ha). In the following discussions of the number of panthers that a particular zone may support, the lower number is based on the 31,923 acres (12,919 ha) value (Kautz et al. 2006) and the higher number is based on the 27,181 acres (11,000 ha) value (Maehr et al. 1991).

Based on these average densities, the Primary Zone could support 71 to 84 panthers; the Secondary Zone 8 to 10 panthers without habitat restoration and 25 to 30 panthers with habitat restoration (existing high quality panther habitat currently present in the Secondary Zone is estimated at 32 percent of the available Secondary Zone lands); and the Dispersal Zone,
0 panthers. Taken together, the three zones in their current condition apparently have the capacity to support about 79 to 94 Florida panthers.

Kautz et al.'s (2006) assessment of available habitat south of the Caloosahatchee River determined that non-urban lands in the Primary, Secondary, and Dispersal Zones were not sufficient to sustain a population of 240 individuals south of the Caloosahatchee River. However, Kautz et al. (2006) determined sufficient lands were available south of the Caloosahatchee River to support a population of 79 to 94 individuals (although not all lands
are managed and protected).

Even though some suitable panther habitat remains in south-central Florida, it is widely scattered and fragmented (Belden and McBride 2005). Thatcher et al. (2006) used a statistical model in combination with a geographic information system to develop a multivariate landscape-scale habitat model based on the Mahalanobis distance statistic

(D^2) to evaluate habitats in south central Florida for potential expansion of the Florida panther population. They identified
4 potential habitat patches: the Avon Park Bombing Range area, Fisheating Creek/Babcock-Webb Wildlife Management Area, eastern Fisheating Creek, and the Duette Park/Manatee County area. These habitat patches are smaller and more isolated compared with the current Florida panther range, and the landscape matrix where these habitat patches exist provides relatively poor habitat connectivity among the patches (Thatcher et al. 2006). Major highways and urban or agricultural development isolate these habitat patches, and they are rapidly being lost to the same development that threatens southern Florida (Belden and McBride 2005).

Diurnal Habitat Use: Diurnal panther locations appear to be within or closer to forested cover types, particularly cypress swamp, pinelands, hardwood swamp, and upland hardwood forests (Belden 1986, Belden et al. 1988, Maehr 1990, Maehr et al. 1991, Maehr 1992, Smith and
Bass 1994, Kerkhoff et al. 2000, Comiskey et al. 2002). Dense understory vegetation comprised of saw palmetto provides some of the most important resting and denning cover for panthers (Maehr 1990). Shindle et al. (2003) show that 73 percent of panther dens were in palmetto thickets.

Radio-collar data and ground tracking indicate that panthers use the mosaic of habitats available to them as resting and denning sites, hunting grounds, and travel routes. These habitats include cypress swamps, hardwood hammocks, pine flatwoods, seasonally flooded prairies, freshwater marshes, and some agricultural lands. Although radio-collar monitoring indicates that forest is a preferred cover type, panthers also utilize non-forest cover types (Belden et al. 1988, Maehr et al. 1991, Comiskey et al. 2002). Compositional analyses by Kautz et al. (2006) confirmed previous findings that forest patches comprise an important component of panther habitat in south Florida, but that other natural and disturbed cover types are also present in the large landscapes that support panthers (Belden et al. 1988, Maehr et al. 1991, Comiskey et al. 2002). Kautz et al. (2006) found that the smallest class of forest patches (i.e., 9-26 acres [3.6-10.4 ha]) were the highest ranked forest patch sizes within panther home ranges; this indicates that forest patches of all sizes appear to be important components of the landscapes inhabited by panthers, not just the larger forest patches.

Nocturnal Habitat Use: Maehr et al. (1990a) provide the only descriptions of panther nocturnal activities and represent the available radiocollar data collected during night time hours. However, this paper does not provide analyses of nocturnal habitat use. Dickson et al. (2005) examined the movements of 10 female and seven male puma at 15-minute intervals during
44 nocturnal periods of hunting or traveling in southern California. They found that traveling puma monitored over nocturnal periods used a broader range of habitats than what they appeared to use based on diurnal locations alone. The use of Global Positioning System (GPS) radiocollars is now being investigated to determine if this technology will be suitable to answer questions regarding Florida panther nocturnal habitat use.

Prey Habitat Use: Panther habitat selection is related to prey availability (Janis and Clark 1999, Dees et al. 2001) and, consequently, prey habitat use. Adequate cover and the size, distribution, and abundance of available prey species are critical factors to the persistence of panthers in south Florida and often determine the extent of panther use of an area. Duever et al. (1986)
calculated a deer population of 1,760 in BCNP, based on Harlow (1959) deer density estimates of 1/210 acres (85 ha) in pine forest, 1/299 acres (121 ha) in swamps, 1/1,280 acres (518 ha) in prairie, 1/250 acres (101 ha) in marshes, and 1/111 acres (45 ha) in hammocks. Schortemeyer et al (1991) estimated deer densities at 1/49-247 acres (20-100 ha) in three management units of BCNP based on track counts and aerial surveys. Labisky et al. (1995) reported 1/49 acres
(20 ha) in southeastern BCNP. Using track counts alone, McCown (1994) estimated 1/183-225 acres (74-91 ha) on the FPNWR and 1/133-200 acres (54-81 ha) in the FSPSP.

Hardwood hammocks and other forest cover types are important habitat for white-tailed deer and other panther prey (Harlow and Jones 1965, Belden et al. 1988, Maehr 1990, Maehr et al. 1991, Maehr 1992, Comiskey et al. 1994, Dees et al. 2001). Periodic understory brushfires (Dees et al. 2001) as well as increased amounts of edge (Miller 1993) may enhance deer use of hardwood hammocks, pine, and other forest cover types. However, wetland and other vegetation types can support high deer densities. In the Everglades, for example, deer appear to be adapted to a mosaic of intergrading patches comprised of wet prairie, hardwood tree islands, and peripheral wetland habitat (Fleming et al. 1994, Labisky et al. 2003). High-nutrient deer forage, especially preferred by females, includes hydrophytic marsh plants, white waterlily (*Nymphaea odorata*), and swamp lily (*Crinum americana*) (Loveless 1959, Labisky et al. 2003). Wetland willow (*Salix spp.*) thickets provide nutritious browse for deer (Loveless 1959, Labisky et al. 2003).

Marshes, rangeland, and low-intensity agricultural areas support prey populations of deer and hogs. The importance of these habitat types to panthers cannot be dismissed based solely on use or lack of use when daytime telemetry are the only data available (Comiskey et al. 2002, Beier et al. 2003, Comiskey et al. 2004, Beier et al. 2006).

Travel and Dispersal Corridors: In the absence of direct field observations/measurements, Harrison (1992) suggested that landscape corridors for wide-ranging predators should be half the width of an average home range size. Following Harrison's (1992) suggestion, corridor widths for Florida panthers would range 6.1-10.9 mi (9.8-17.6 km) depending on whether the target animal was an adult female or a transient male. Beier (1995) suggested that corridor widths for transient male puma in California could be as small as 30 percent of the average home range size of an adult. For Florida panthers, this would translate to a corridor width of 5.5 mi (8.8 km). Without supporting empirical evidence, Noss (1992) suggests that regional corridors connecting larger hubs of habitat should be at least 1.0 mi (1.6 km) wide. Beier (1995) makes specific recommendations for very narrow corridor widths based on short corridor lengths in a California setting of wild lands completely surrounded by urban areas; he recommended that corridors with a length less than 0.5 mi (0.8 km) should be more than 328 ft (100 m) wide, and corridors extending 0.6-4 mi (1-7 km) should be more than 1,312 ft (400 m) wide. The Dispersal Zone encompasses 44 mi^2 (113 km^2) with a mean

width of 3.4 mi (5.4 km). Although it is not adequate to support even one panther, the Dispersal Zone is strategically located and expected to function as a critical landscape linkage to south-central Florida (Kautz et al. 2006). Transient male panthers currently utilize this Zone as they disperse northward into south-central Florida.

Panther Recovery Objectives

The recovery objectives identified in the draft third revision of the Florida Panther Recovery Plan (Service 2006) are to (1) maintain, restore, and expand the Florida panther population and its habitat in south Florida and, if feasible, expand the known occurrence of Florida panthers north of the Caloosahatchee River to maximize the probability of the long-term persistence of this metapopulation; (2) identify, secure, maintain, and restore habitat in potential reintroduction areas within the panther's historic range, and to establish viable populations of the panther outside south and south-central Florida; and (3) facilitate panther conservation and recovery through public awareness and education.

Panther Management and Conservation

Habitat Conservation and Protection

Panthers, because of their wide-ranging movements and extensive spatial requirements, are particularly sensitive to habitat fragmentation (Harris 1984). Mac et al. (1998) defines habitat fragmentation as: "The breaking up of a habitat into unconnected patches interspersed with other habitat which may not be inhabitable by species occupying the habitat that was broken up. The breaking up is usually by human action, as, for example, the clearing of forest or grassland for agriculture, residential development, or overland electrical lines." The reference to "unconnected patches" is a central underpinning of the definition. For panther conservation, this definition underscores the need to maintain contiguous habitat and protected habitat corridors in key locations in south Florida and throughout the panther's historic range. Habitat fragmentation can result from road construction, urban development, and agricultural land conversions.

Habitat protection has been identified as being one of the most important elements to achieving panther recovery. While efforts have been made to secure habitat (Figure 8 and Table 3), continued action is needed to obtain additions to and inholdings for public lands, assure linkages are maintained, restore degraded and fragmented habitat, and obtain the support of private landowners for maintaining property in a manner that is compatible with panther use. Conservation lands used by panthers are held and managed by a variety of entities including FWS, NPS, Seminole Tribe of Florida, Miccosukee Tribe of Indians of Florida, FWC, Florida Department of Environmental Protection (FDEP), Florida Division of Forestry (FDOF), Water Management Districts (WMD), non-governmental organizations (NGO), counties, and private landowners.

Public Lands: Public lands in south Florida that benefit the panther are listed below and shown in Figure 8:

1. In 1947, ENP was established with 1,507,834 acres (610,201 ha) and in 1989 was expanded with the addition of 104,320 acres (42,217 ha).

2. In 1974, Congress approved the purchase and formation of BCNP, protecting 570,238 acres (230,768 ha), later 145,919 acres (59052 ha) were added.

3. In 1974, the State of Florida began acquiring land for the FSPSP, which encompasses over 80,000 acres (32,375 ha). Efforts are underway to acquire about 16,640 acres (6,734 ha).

4. In 1985, acquisition of Picayune Strand State Forest and Wildlife Management Area (WMA) began with the complex Golden Gate Estates subdivision buyouts and now comprises over 76,160 acres (30,821 ha). The Southern Golden Gate Estates buyout through State and Federal funds is complete. The South Belle Meade portion of Picayune Strand is about
   90 percent purchased and although the State is no longer purchasing in South Belle Meade,
   Collier County's Transfer of Development Rights program is helping to secure the in-holdings.

5. In 1989, FPNWR was established and now protects 26,240 acres (10,619 ha).

6. In 1989, the Corkscrew Regional Ecosystem Watershed Land and Water Trust, a public/private partnership, was established and to date has coordinated the purchase of
   42 26,880 acres (10,878 ha).

7. In 1996, the South Florida WMD, purchased the 32,000 acres (12,950 ha) Okaloacoochee Slough State Forest.

8. In 2002 Spirit of the Wild WMA, consisting of over 7,040 acres (2,849 ha), was taken into public ownership by the State of Florida and is managed by FDOF.

9. In 2003, Dinner Island Ranch WMA consisting of 21,760 acres (8,806 ha) in southern Hendry County was taken into public ownership by the State of Florida and is managed by FDOF.

Tribal Lands: Lands of the Seminole Tribes of Florida and Miccosukee Tribe of Indians of Florida encompass over 350,079 acres (141,673 ha) in south Florida. Of these, 115,840 acres (46,879 ha) are used by panthers, and comprise 5 percent of the Primary Zone (R. Kautz, pers. comm. 2005). The Seminole Tribe of Florida has identified an area on the BCSIR as a wildlife management area for the benefit and preservation of native wildlife species. This area is referred to as the BCSIR Native Area and encompasses about 14,724 acres. Within this area about 4,144 acres have been specifically designated for management to benefit the Florida panther. The remaining lands on the reservations are not specifically managed for the panther and are largely in cultivation.

Private Lands: A variety of Federal, State, and private incentives programs are available to assist private landowners and other individuals to protect and manage wildlife habitat. Voluntary agreements, estate planning, conservation easements, land

exchanges, and mitigation banks are methods that hold untapped potential for conserving private lands. In 1954, the National Audubon Society established the nearly 10,880 acres (4,403 ha) Corkscrew Swamp Sanctuary. From March 2001 through September 2007, 33,263 acres of additional private land has been protected south of the Caloosahatchee River for panther conservation through Service reviews associated with land development proposals. A number of properties identified by the State Acquisition and Restoration Council (ARC) for purchase by the Florida Forever Program are used by panthers (*e.g.*, Devil's Garden, Half Circle F Ranch, Pal Mal, and Panther Glades). North of the Caloosahatchee River, Fisheating Creek Conservation Easement, 41,600 acres (16,835 ha) in Glades County is a private holding used by dispersing male panthers. Also, 73,235 acres of the 90,845 acres Babcock Ranch were purchased in 2006 by the State of Florida and Lee County for conservation and agriculture. An additional 2,000 acres of this ranch were put into a conservation easement.

Habitat and Prey Management

Land management agencies in south Florida are implementing fire programs that mimic a natural fire regime through the suppression of human-caused wildfires and the application of prescribed natural fires. No studies have been conducted to determine the effects of invasive plant management on panthers. However invasive vegetation may reduce the panther's prey base by disrupting natural processes such as water flow and fire and by significantly reducing available forage for prey (Fleming et al. 1994). All public lands in south Florida have active invasive plant treatment programs. Management for panther prey consists of a variety of approaches such as habitat management and regulation of hunting and off-road vehicle (ORV) use.

Response to Management Activities

Few studies have examined the response of panthers to various land/habitat management activities. Dees et al. (2001) investigated panther habitat use in response to prescribed fire and found that panther use of pine habitats was greatest for the first year after the area had been burned and declined thereafter. Prescribed burning is believed to be important to panthers because prey species (e.g., deer and hogs) are attracted to burned habitats to take advantage of changes in vegetation structure and composition, including exploiting hard mast that is exposed and increased quality or quantity of forage (Dees et al. 2001). Responses of puma to logging activities (Van Dyke et al. 1986b) indicate that they generally avoid areas within their home range with intensification of disturbance.

There is the potential for disturbance to panthers from recreational uses on public lands. Maehr (1990) reported that indirect human disturbance of panthers may include activities associated with hunting and that panther use of Bear Island (part of BCNP) is significantly less during the hunting season. Schortemeyer et al. (1991) examined the effects of deer hunting on panthers at BCNP between 1983 and 1990. They concluded that, based on telemetry data, panthers may be altering their use patterns as a result of hunting.

Janis and Clark (2002) compared the behavior of panthers before, during, and after the recreational deer and hog hunting season (October through December) on areas open (BCNP) and closed (FPNWR, FSPSP) to hunting. Variables examined were: (1) activity rates,
(2) movement rates, (3) predation success, (4) home range size, (5) home range shifts, (6) proximity to ORV trails, (7) use of areas with concentrated human activity, and (8) habitat selection. Responses to hunting for variables most directly related to panther energy intake or expenditure (i.e., activity rates, movement rates, predation success of females) were not detected (Janis and Clark 2002). However, panthers reduced their use of Bear Island, an area of concentrated human activity, and were found farther from ORV trails during the hunting season, indicative of a reaction to human disturbance (Janis and Clark 2002). Whereas the reaction to trails was probably minor and could be related to prey behavior, decreased use of Bear Island most likely reflects a direct reaction to human activity and resulted in increased use of adjacent private lands (Janis and Clark 2002).

Transportation Planning and Improvements

Construction of highways in wildlife habitat typically results in loss and fragmentation of habitat, traffic related mortality, and avoidance of associated human development. Roads can also result in habitat fragmentation, especially for females who are less likely to cross them (Maehr 1990).

There are presently 28 wildlife underpasses with associated fencing suitable for panther use along I-75 (Figure 6). The Florida Department of Transportation identified the location of and constructed six wildlife crossings on SR 29 (Figure 6). Crossings A and B, completed in 2007, were constructed in an area of 10 documented collisions from 1980 to 2004. Crossings C and D, north of I-75, were installed in 1995. There were two recorded collisions in the vicinity of crossing D from 1979 to 1990, but none at either C or D since crossing installation.
Crossing E was installed in 1997. There has been one collision about 1 mile to the north in 2002. Crossing F was installed in 1999. There was one documented collision in the immediate vicinity in 1981, two collisions about 1.5 miles to the north since crossing installation, and one collision about 0.5 mile to the south in December 2005. No panther-vehicle collisions have been recorded in the immediate vicinity of wildlife crossings, with the exception of one collision in December 2005 on SR 29. There was also one panther/vehicle collision mortality on east-west I-75 1.5 miles east of the Hwy 29 interchange. Prior to this occurrence no collision mortalities have occurred on I-75 in the vicinity of crossings since installation in 1991. Prior to 1991, there were five recorded deaths from collisions.

More recent studies have been conducted to identify locations for needed wildlife crossings in Collier County to benefit the Florida panther and other wildlife. Swanson et al. (2005) used a least cost path (LCP) modeling approach to identify the most likely travel routes for panthers among six major use areas in southwest Florida. LCP modeling considers elements in the landscape that permit or impede panther movement when

traveling. Swanson et al. (2005) identified 20 key highway segments where LCPs intersected improved roadways. Within Collier County LCPs intersected the following major highways: SR 29, CR 846 and CR 858 (Oil Well Road). Smith et al. (2006) studied the movements of the Florida panther, the Florida black bear, and other wildlife species along SR 29, CR 846 and CR 858 in Collier County. Data analyzed in the study were obtained from roadkill and track surveys, infra-red camera monitoring stations, existing data provided by the FWC (Florida panther radio telemetry and vehicle mortality reports), and other studies. Smith et al. (2006) recommended that new wildlife crossings be considered at various sites along these roadways to reduce road-related mortality of panthers and other wildlife species, and increase connectivity among wildlife populations.

In an effort to help reduce the potential for roadway-related panther and wildlife mortality, Collier County in cooperation with both public and private interest has committed to construct two additional wildlife crossings and associated fencing. These crossings will be located at Oil Well Road (CR 858) in the Camp Keais Strand, and Immokalee Road (CR 846). The locations of both crossings have been identified as travel corridors for panthers and other wildlife.

Agriculture, Development, and Mining

The Service developed a draft Panther Habitat Assessment methodology and refugia design in 2003 to help guide the agency in evaluating permit applications for projects that could affect panther habitat (see discussion below). This draft methodology was a way to assess the level of impacts to panthers expected from a given project, and to evaluate the effect of any proposed compensation offered by the project applicant. Prior to development of the methodology, the Service from March 1984 through July 2003 concluded consultation on 41 projects involving the panther and habitat preservation (Table 4). The minimum expected result of these projects is impacts to 71,650 acres and the preservation of 14,677 acres of panther habitat. Of the 71,650 acres of impacts, 38,932 acres are due to agricultural conversion and 32,718 acres to development and mining. Portions (10,370 acres) of the largest agricultural conversion project, the 28,700 acres by U.S. Sugar Corporation, were re-acquired by the Federal Government as a component of the Talisman Land Acquisition (Section 390 of the Federal Agricultural Improvement and Reform Act of 1996 [Public Law 104-127] Farm Bill Cooperative Agreement, FB4) for use in the Comprehensive Everglades Restoration Project. The non-agriculture impacts are permanent land losses, whereas the agricultural conversions may continue to provide some habitat functional value to panthers, depending on the type of conversion.

From August 2003 to October 2007, the Service concluded consultations on 69 projects affecting 20,087 acres with preservation of 22,730 acres (Table 4). Following our refugia design assessment approach, the projects affected 9,682 acres in the Primary Zone, 6,295 acres in the Secondary Zone, and 4,090 acres in the Other Zone. Compensation provided included
20,663 acres in the Primary Zone, 652 acres in the Dispersal Zone, 2 acres in the

Secondary Zone, and 1,410 acres in the Other Zone. The project affected lands were primarily agricultural fields consisting of row crops and citrus groves and natural lands with varying degrees of exotic vegetation. Functional habitat value of these lands to the Florida panther, following our Panther Habitat Assessment methodology provided a PHU loss from development of 90,892 PHUs, with a corresponding PHU preservation and enhancement complement of 182,403 PHUs. The preservation lands were generally native habitat lands or disturbed lands that included restoration components. Restoration components included exotic species removal, fire management, wetland hydrology improvement, improved forest management practices, and full habitat restoration from agriculture uses to native habitats.

Panther Habitat Evaluation and Compensation

Population Viability Analysis

Population Viability Analysis (PVA) has emerged as a key component of endangered species conservation. This process is designed to incorporate demographic information into models that predict if a population is likely to persist in the future. PVAs incorporate deterministic and stochastic events including demographic and environmental variation, and natural catastrophes. PVAs have also been criticized as being overly optimistic about future population levels
(Brook et al. 1997) and should be viewed with caution; however, they are and have been shown to be surprisingly accurate for managing endangered taxa and evaluating different management practices (Brook 2000). They are also useful in conducting sensitivity analyses to determine where more precise information is needed (Hamilton and Moller 1995, Beissinger and Westphal 1998, Reed et al. 1998, Fieberg and Ellner 2000).

As originally defined by Shaffer (1981), "a minimum viable population for any given species in any given habitat is the smallest isolated population having a 99 percent chance of remaining extant for 1,000 years despite the foreseeable effects of demographic, environmental and genetic stochasticity, and natural catastrophes." However, the goal of 95 percent probability of persistence for 100 years is the standard recommended by population biologists and is used in management strategies and conservation planning, particularly for situations where it is difficult to accurately predict long-term effects (Shaffer 1978, 1981, 1987, Sarkar 2004).

Since 1981, 139 Florida panthers have been radio-collared and monitored on public and private lands throughout south Florida (Lotz et al. 2005). These data were used by researchers to estimate survival rates and fecundity and were incorporated into PVA models previously developed for the Florida panther (Seal et al. 1989, 1992, Cox et al. 1994, Kautz and Cox 2001, Maehr et al. 2002b). These models incorporated a range of different model parameters such as general sex ratios, kitten survival rates, age distributions, and various levels of habitat losses, density dependence, and intermittent catastrophes or epidemics. The outputs of these models predicted a variety of survival scenarios for the Florida panther and predicted population levels needed to ensure the survival of the species.

Root (2004) developed an updated set of PVA models for the Florida panther based on RAMAS GIS software (Akçakaya 2002). These models were used to perform a set of spatially explicit PVAs. Three general single-sex (i.e., females only) models were constructed using demographic variables from Maehr et al. (2002b) and other sources. A conservative model was based on Seal and Lacy (1989), a moderate model was based on Seal and Lacy (1992), and an optimistic
model was based on the 1999 consensus model of Maehr et al. (2002b). In each model, first-year kitten survival was set at 62 percent based on recent information from routine panther
population monitoring (Shindle et al. 2001). All models assumed a 1:1 sex ratio, a stable age distribution, 50 percent of females breeding in any year, and an initial population of 41 females (82 individuals including males), the approximate population size in 2001-2002 (McBride 2001, 2002).

Basic Versions: The basic versions of each model incorporated no catastrophes or epidemics, no change in habitat quality or amount, and a ceiling type of density dependence. The basic versions of the models incorporated a carrying capacity of 53 females (106 panthers - 50/50 sex ratio). Variants of the models were run with differing values for density dependence, various levels of habitat loss, and intermittent catastrophes or epidemics. Each simulation was run with 10,000 replications for a 100-year period. The minimum number of panthers needed to ensure a 95 percent probability of persistence for 100 years was estimated in a series of simulations in which initial abundance was increased until probability of extinction at 100 years was no greater than 5 percent. More detailed information concerning the PVA model parameters appears in Root (2004).

The results of these model runs predicted a probability of extinction for the conservative model of 78.5 percent in 100 years with a mean final total abundance of 3.5 females. Also, the probability of a large decline in abundance (50 percent) was 94.1 percent. The moderate model resulted in a 5 percent probability of extinction and mean final abundance of 42.3 females in
100 years. The probability of panther abundance declining by half the initial amount was 20 percent in 100 years under the moderate model. The optimistic model resulted in a 2 percent probability of extinction and mean final abundance of 51.2 females in 100 years. The probability of panther abundance declining by half the initial amount was only 9 percent in
100 years under the optimistic model. These models also provide a probability of persistence (100 percent minus probability of extinction) over a 100-year period of 95 percent for the moderate model and 98 percent for the optimistic model.

One Percent Habitat Loss: Model results were also provided by Root (2004) for probability of extinctions for 1 percent loss of habitat, within the first 25 years of the model run. The 1 percent loss of habitat equates to essentially all remaining non-urban privately owned lands in the Primary Zone and corresponds to the estimated rate of habitat loss (Root 2004) from 1986 to 1996 for the five southwest counties based on land

use changes. For the moderate model, the model runs predict a probability of extinction increase of about one percent, from a probability
of extinction of about 5 percent with no loss of habitat to 6 percent with 1.0 percent habitat loss per year, for the first 25 years. For the optimistic model, probability of extinction increased from about 2 percent with no loss of habitat to 3 percent with 1.0 percent habitat loss per year, for
the first 25 years. These models also predicted the mean final abundance of females would
decrease from 41 to 31 females, a 24.3 percent reduction for the moderate model and from
41 to 38 females, a 7.3 percent reduction for the optimistic model.

The model runs also predict a probability of persistence (100 percent minus the probability of extinction) over a 100-year period of about 94 percent for the moderate model and 97 percent
for the optimistic model. The model runs, predict a mean final abundance of 62 individuals
(31 females and 31 males) for the moderate model and 76 individuals (38 females and 38 males) for the optimistic model.

Population Guidelines: Kautz et al. (2006), following review of the output of Root's PVA models and those of other previous PVAs for the Florida panther, suggested a set of population guidelines for use in management and recovery of the Florida panther. These guidelines are:
(1) populations of less than 50 individuals are likely to become extinct in less than 100 years;
(2) populations of 60 to 70 are barely viable and expected to decline by 25 percent over 100 years; (3) populations of 80 to 100 are likely stable but would still be subject to genetic problems (i.e., heterozygosity would slowly decline); and (4) populations greater than 240 have a high probability of persistence for 100 years and are demographically stable and large enough to retain 90 percent of original genetic diversity.

Population guidelines for populations of panthers between 50 and 60 individuals and between
70 and 80 individuals were not specifically provided in Kautz et al. (2006). However, the Service views the guidelines in Kautz et al. (2006) as a continuum. Therefore, we consider populations of 50 to 60 individuals to be less than barely viable or not viable with declines in population and heterozygosity. Similarly, we consider populations of 70 to 80 to be more than barely viable or somewhat viable with some declines in population and heterozygosity. Like other population guidelines presented in Kautz et al. (2006), these assume no habitat loss or catastrophes.

PVA Summaries and Population Guidelines: Root's (2004) moderate model runs, which have a carrying capacity 53 females (106 individuals), show final populations of 42.3 females
(84 total) and 31.2 females (62 total) with extinction rates of 5 percent and 6 percent,

respectively, for the basic and 1 percent habitat loss scenarios. The predicted final populations in Root (2004) are 84 and 62 panthers for no loss of habitat and 1 percent loss of habitat, respectively, over a 100-year period.

Kautz et al.'s (2006) population guidelines applied to the Root (2004) moderate models for a population of 62 to 84 panthers, with or without habitat loss, respectively, describe the "with habitat loss" population as barely viable and expected to decline by 25 percent over a 100-year period. The "without habitat loss" is likely stable but would still be subject to genetic problems.

The Service believes, as discussed in the section on "Population Trends and Distribution", that the 3-year average verified panther population estimate has shown an increase in the number
of panthers reported yearly beginning in 2000; and that McBride's verified population of 82 panthers in 2005 and 97 panthers in 2006 is within Kautz et al.'s (2006) population guidelines that represents a population that is likely stable but would still be subject to genetic problems.

The Service also believes the model runs show that lands in the Primary Zone are important to the survival and recovery of the Florida panther and that sufficient lands need to be managed and protected in south Florida to provide for a population of 80 to 100 panthers, the range defined as likely stable over 100 years, but subject to genetic problems. As discussed in the following section, the Service has developed a south Florida panther conservation goal that, through regulatory reviews and coordinated conservation efforts with land owners and resource management partners, provides a mechanism to achieve this goal.

Model Violations: The actual likelihood of population declines and extinctions may be different than the guidelines and models suggest, depending upon the number of and severity
of assumptions violated. The Service realizes that habitat loss is occurring at an estimated
0.8 percent loss of habitat per year (R. Kautz, FWC, personal communication, 2003). The Service has accounted for some habitat loss and changes in habitat quality within its regulatory program, and specifically through its habitat assessment methodology (discussed below). For example, we have increased the base ratio used within this methodology to account for unexpected increases in habitat loss. Similarly, we consider changes in habitat quality and encourage habitat restoration wherever possible.

With regard to the assumption of no catastrophes, the Service has considered the recent outbreak of feline leukemia in the panther population at Okaloacoochee Slough as a potential catastrophe. The FWC is carefully monitoring the situation and it appears to be under control at this time due to a successful vaccination program. However, if the outbreak spreads into the population, the Service will consider this as a catastrophe and factor this into our decisions.

We acknowledge uncertainties exist, assumptions can be violated, and catastrophes can occur. The Service and the FWC, along with our partners, will continue to monitor the panther population and the south Florida landscape and incorporate any new information and changes into our decision-making process.

South Florida Panther Population Goal

The Service's goal for Florida panther conservation in south Florida is to locate, preserve, and restore sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of a population of 80 to 100 individuals (adults and subadults) south of the Caloosahatchee River. The Service proposes to achieve this goal through land management partnerships with private landowners, through coordination with private landowners during review of development proposals, and through land management and acquisition programs with Federal, State, local, private, and Tribal partners. The acreages of lands necessary to achieve this goal, based on Kautz et al. (2006) average density of 31,923 acres (12,919 ha) per panther is 2,551,851 acres (1,032,720 ha) for 80 panthers or 3,189,813 acres (1,290,900 ha) for 100 panthers.

The principle regulatory mechanism that allows the Service to work directly with private land owners during review of development and land alteration projects is section 10 of the Act. The Service coordinates with Federal agencies pursuant to section 7 of the Act. In August 2000, the Service, to assist the Corps in assessing project effects to the Florida panther, developed the Florida panther final interim Standard Local Operating Procedures for Endangered Species (SLOPES) (Service 2000). The Florida panther SLOPES provide guidance to the Corps for assessing project effects to the Florida panther and recommends actions to minimize these effects. The Florida panther SLOPES also included a consultation area map that identified an action area where the Service believed land alteration projects may affect the Florida panther.

In the original SLOPES, the consultation area map (MAP) was generated by the Service by overlaying existing and historical panther telemetry data on a profile of Florida and providing a connecting boundary surrounding most of these points. Since the development of the MAP, we have received more accurate and up-to-date information on Florida panther habitat usage. Specifically we have received two documents that the Service believes reflects the most likely panther habitat usage profiles although documentation clearly shows panther use of areas outside these locations. These documents are the publications by Kautz et al. (2006) and Thatcher et al. (2006). Based on the information in these documents, we have clarified the boundaries of the MAP to better reflect areas where Florida panthers predominate (Figure 5) and refer to these areas cumulatively as the Panther Focus Area.

The Panther Focus Area was determined from the results of recent panther habitat models south of the Caloosahatchee River (Kautz et al. 2006) and north of the Caloosahatchee River (Thatcher et al. 2006). Kautz et al. (2006) model of landscape components important to Florida panther habitat conservation was based on an analysis of panther

habitat use and forest patch size. This model was used in combination with radio-telemetry records, home range overlaps, land use/land cover data, and satellite imagery to delineate primary and secondary areas that would be most important and comprise a landscape mosaic of cover types important to help support of the current panther breeding population south of the Caloosahatchee River.

Thatcher et al. (2006) developed a habitat model using Florida panther home ranges in south Florida to identified landscape conditions (land-cover types, habitat patch size and configuration, road density and other human development activities, and other similar metrics) north of the Caloosahatchee River that were similar to those associated with the current panther breeding population.

The Panther Focus Area MAP, south of the Caloosahatchee River is divided into Primary, Secondary, and Dispersal Zones; and north of the Caloosahatchee River into the Primary Dispersal/Expansion Area.

Primary Zone is currently occupied and supports the only known breeding population of Florida panthers in the world. These lands are important to the long-term viability and persistence of the panther in the wild.

Secondary Zone lands are contiguous with the Primary Zone and although these lands are used to a lesser extent by panthers, they are important to the long-term viability and persistence of the panther in the wild. Panthers use these lands in a much lower density than in the Primary Zone.

Dispersal Zone is a known corridor between the Panther Focus Area south of the Caloosahatchee River to the Panther Focus Area north of the Caloosahatchee River. This Zone is necessary to facilitate the dispersal of panthers and future panther population expansion to areas north of the Caloosahatchee River. Marked panthers have been known to use this zone.

Primary Dispersal/Expansion Area is the Fisheating Creek/Babcock-Webb Wildlife Management Area region. These are lands identified by Thatcher et al. (2006) as potential panther habitat with the shortest habitat connection to the Panther Focus Area in south Florida. Several collared and uncollared male panthers have been documented in this area since 1973, and the last female documented north of the Caloosahatchee River was found in this area.

Landscape Preservation Need and Compensation Recommendations

Land Preservation Needs: To further refine the land preservation needs of the Florida panther and to specifically develop a landscape-level program for the conservation of the Florida panther population in south Florida, the Service as previously discussed, in February 2000, appointed a Florida Panther Subteam. The Subteam in addition to the assignments discussed previously, was also charged with developing a landscape-level strategy for the conservation of the Florida panther population in south Florida. The results of this collaborative effort are partially presented in Kautz et al. (2006). One of

the primary goals of this effort was to identify a strategically located set of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the south population of the Florida panther. Kautz et al. (2006) focused their efforts on the area south of the Caloosahatchee River, where the reproducing panther population currently exists.

Kautz et al. (2006) created an updated Florida panther potential habitat model based on the following criteria: (1) forest patches greater than 4.95 acres (2 ha); (2) non-urban cover types within 656 ft (200 m) of forest patches; and (3) exclusion of lands within 984 ft (300 m) of urban areas. The potential habitat map was reviewed in relation to telemetry data, recent satellite imagery (where available), and panther home range polygons. Boundaries were drawn around lands defined as the Primary Zone (Figure 7), defined as the most important area needed to support a self-sustaining panther population. Kautz et al. (2006) referred to these lands as essential; however, as observed in the two previous plans (Logan et al. 1993; Cox et al. 1994), lands within the boundaries of the Primary Zone included some urban areas and other lands not considered to be truly panther habitat (*i.e.*, active rock and sand mines). The landscape context of areas surrounding the Primary Zone was modeled and results were used to draw boundaries of the Secondary Zone (Figure 7), defined as the area capable of supporting the panther population in the Primary Zone, but where habitat restoration may be needed (Kautz et al. 2006).

Kautz et al. (2006) also identified, through a least cost path model, the route most likely to be used by panthers dispersing out of south Florida, crossing the Caloosahatchee River, and dispersing into south-central Florida. Kautz et al. (2006) used ArcView GIS© version 3.3 and ArcView Spatial Analyst© version 2 (Environmental Systems Research, Incorporated, Redlands, California) to construct the least-cost path models and identify optimum panther dispersal corridor(s). The least-cost path models operated on a cost surface that ranked suitability of the landscape for use by dispersing panthers with lower scores indicating higher likelihood of use by dispersing panthers. The lands within the boundaries of the least cost model prediction were defined as the Dispersal Zone (Figure 7). The preservation of lands within this zone is important for the survival and recovery of the Florida panther, as these lands are the dispersal pathways for expansion of the south Florida panther population. The Primary Zone covers 2,270,590 acres (918,895 ha); the Secondary Zone covers 812,104 acres (328,654 ha); and the Dispersal Zone covers 27,883 acres (11,284 ha); providing a total of 3,110,578 acres (1,258,833 ha) (Kautz et al. 2006).

As part of their evaluation of occupied panther habitat, in addition to the average density estimate of one panther per 27,181 acres (11,000 ha) developed by Maehr et al. (1991), Kautz et al. (2006) estimated the present average density during the timeframe of the study, based on telemetry and other occurrence data, to average 1 panther per 31,923 acres (12,919 ha). In the following discussions of the number of panthers that a particular zone may support, the lower number is based on the 31,923 acres (12,919 ha) value (Kautz et al. 2006) and the higher number is based on the 27,181 acres (11,000 ha) value (Maehr et al. 1991).

Based on these average densities, the Primary Zone could support 71 to 84 panthers; the Secondary Zone 8 to 10 panthers without habitat restoration and 25 to 30 panthers with habitat restoration (existing high quality panther habitat currently present in the Secondary Zone is estimated at 32 percent of the available Secondary Zone lands); and the Dispersal Zone,
0 panthers. Taken together, the three zones in their current condition apparently have the capacity to support about 79 to 94 Florida panthers.

Kautz et al.'s (2006) assessment of available habitat south of the Caloosahatchee River determined that non-urban lands in the Primary, Secondary, and Dispersal Zones were not sufficient to sustain a population of 240 individuals south of the Caloosahatchee River. However, Kautz et al. (2006) determined sufficient lands were available south of the Caloosahatchee River to support a population of 79 to 94 individuals (although not all lands
are managed and protected).

Compensation Recommendations: To achieve our goal to locate, preserve, and restore sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of a population of Florida panthers south of the Caloosahatchee River, the Service chose the mid point (90 panthers) in Kautz et al.'s (2006) population guidelines that a population of 80 to 100 panthers is likely to be stable, although subject to genetic problems, through 100 years. In addition, a population of 90 individuals is eight individuals greater
than a population of 82 individuals, which according to the best available PVA (Root 2004) is 95 percent likely to persist over 100 years (assuming a 50:50 male to female ratio). These eight individuals provide a buffer for some of the assumptions in Root's (2004) PVA. Our process to determine compensation recommendations for project affects that cannot be avoided in both our section 7 and section 10 consultations is based on the amount and quality of habitat that we believe is necessary to support a population of 90 panthers in south Florida.

The Service, based on Kautz et al.'s (2006) average panther population density of 31,923 acres per panther determined 2,873,070 acres of Primary Zone "equivalent" lands need to be protected and managed. This equivalency factor is needed, since Secondary Zone lands are of less value than Primary Zone lands to the panther, to assure that additional acreage (special consideration) is required in the Secondary Zone to compensate for its lower quality panther habitat. In other words, more than 31,923 acres per panther would be needed, hypothetically, if this acreage were all in the Secondary Zone (see discussion of Primary Zone equivalent lands in the following section). The combined acreage of lands within the Primary, Dispersal, and Secondary Zones is 3,110,577 acres (1,258,833 ha) (Kautz et al. 2006). Currently, 2,073,865 acres of Primary Zone equivalent lands are preserved (Table 6), so 799,205 additional acres need to be preserved to support a population of 90 panthers in south Florida (2,873,070 minus 2,073,865 equals 799,205).

The Service also consults on lands outside of the Primary, Secondary, and Dispersal zones that may effect panthers such as agricultural lands that are adjacent to the Panther Focus Area and proposals in urbanized areas that could generate traffic in or adjacent to the Panther Focus Area or have other identifiable impacts.

Primary Zone Equivalent Lands: Kautz et al. (2006), through their habitat evaluation of lands important to the Florida panther, identified three sets of lands, *i.e.*, Primary Zone, Secondary Zone, and Dispersal Zone, and documented the relative importance of these lands to the Florida panther. These lands generally referred to as Kautz et al.'s panther core lands (Figure 7), include the majority of the home ranges of the current population of the Florida panther. The Service, in our evaluation of habitat needs for the Florida panther expanded the boundaries of the Kautz et al. (2006) lands to include those lands south of the Caloosahatchee River where additional telemetry points historically were recorded. These additional lands (about 819,995 acres), referred to as the "Other" Zone, are added to the lands in Kautz et al.'s (2006) panther core lands (Figure 7) and represent the lands within the Service's 2000 consultation area boundary south of the Caloosahatchee River as shown in Figure 5. These lands (core lands and other zone lands) together are referred to by the Service as the Service's Panther Core Area (labeled on Figure 5 as "Original Panther Consultation Area South of the Caloosahatchee River"). The "Other" Zone lands, as well as the lands within the Secondary Zone, provide less landscape benefit to the Florida panther than the Primary and Dispersal Zones, but are important as a component of our goal to preserve sufficient lands to support a population of 90 panthers in South Florida.

To account for the lower landscape importance of these lands in our preservation goals and in our habitat assessment methodology, we assigned lands in the Other Zone a value of 0.33 and lands in the Secondary Zone a value of 0.69 to convert these lands to Primary Zone value, *i.e.*, Primary Zone equivalents (Table 3). Kautz et al. (2006) identifies the need for restoration in the Secondary Zone to achieve maximum benefits. To estimate the Primary Zone equivalent of Secondary Zone lands, we derived a relative habitat value (average PHU value) for each by comparing the habitat ranks estimated in Kautz et al. (2006 – Table 1) for each habitat type per zone. The average PHU value for the Primary Zone is 6.94 and for the Secondary Zone 4.79. Based on this analysis, the habitat value of the Secondary Zone is roughly 69 percent of the Primary Zone, and restoration is needed to achieve landscape function (4.79/6.94=0.69). Using this assessment, the 503,481 acres of Secondary Zone lands equate to 347,402 acres of Primary Zone equivalent lands. Dispersal Zone lands are considered equivalent to Primary Zones lands with a 1/1 value. At-risk lands in the Other Zone total 819,995 acres. Actions on some of the Other Zone lands such as some actions in areas that have already been urbanized will not have an impact on panthers or their habitat, and these case-specific determinations will be made based on a review of the specific proposals. We estimate 80 percent of these actions will have an impact on achieving the panther population goal, and will monitor this carefully as we review proposed actions (819,995 times 0.8 equals 655,996 acres). Multiply this acreage (655,996 acres) by 0.33 to determine the acres of Primary Zone equivalent lands the Other Zone can provide (655,996 times 0.33 equals 216,479 acres of Primary Zone equivalent lands). These equivalent values, 0.33 and 0.69, for Other and Secondary Zones, respectively, and 1/1 for Dispersal Zone, are important components in

our assessment of compensation needs for a project in the panther consultation area and are components of our habitat assessment methodology as discussed below.

Habitat Assessment Methodology

To evaluate project effects to the Florida panther, the Service considers the contributions the project lands provide to the Florida panther, recognizing not all habitats provide the same functional value. Kautz et al. (2006) also recognized not all habitats provide the same habitat value to the Florida panther and developed cost surface values for various habitat types, based on use by and presence in home ranges of panthers. The FWC (2006b), using a similar concept, assigned likely use values of habitats to dispersing panthers. The FWC's habitats were assigned habitat suitability rank between 0 and 10, with higher values indicating higher likely use by dispersing panthers.

The Service chose to evaluate project effects to the Florida panther through a similar process. We incorporated many of the same habitat types referenced in Kautz et al. (2006) and FWC (2006b) with several adjustments to the assigned habitat use values reflecting consolidation of similar types of habitats and the inclusion of Everglades Restoration water treatment and retention areas. We used these values as the basis for habitat evaluations and the recommended compensation values to minimize project effects to the Florida panther (Table 2), as discussed below.

Base Ratio: To develop a base ratio that will provide for the protection of sufficient acreage of Primary Zone equivalent lands for a population of 90 panthers from the acreage of Primary Zone equivalent non-urban lands at risk, we developed the following approach.

The available Primary Zone equivalent lands are estimated at 3,276,563 acres (actual acreage is 4,376,444 acres [the "actual acreage" value includes acres of lands in each category in the Secondary and Other Zones as well as the lands in the Primary Zone]) (see Table 5). Currently 2,073,865 acres of Primary Zone equivalent lands (actual acreage is 2,578,152 acres) of non-urban lands are preserved (Table 6). The remaining non-urban at-risk private lands are estimated at 1,202,698 acres of Primary Zone equivalent lands (actual acreage is 1,798,295 acres). To meet the protected and managed lands goal for a population of 90 panthers, an additional 799,205 acres of Primary Zone equivalent lands are needed. The base ratio is determined by dividing the primary equivalents of at-risk habitat to be secured (799,205 acres) by the result of the acres of at-risk habitat in the Primary Zone (610,935 acres) times the value of the Primary Zone (1); plus the at-risk acres in the Dispersal Zone (27,883 acres) times the value of the Dispersal Zone (1); plus the at-risk acres in the Secondary Zone (503,481 acres) times the value of the Secondary Zone (0.69); plus the at-risk acres in the Other Zone (655,996 acres) times the value of the Other Zone (0.33); minus the at-risk acres of habitat to be protected (799,205 acres). The results of this formula provide a base value of 1.98.

$$799{,}205 / ((610{,}935 \times 1.0) + (27{,}883 \times 1) + (503{,}481 \times 0.69) + (655{,}996 \times 0.33)) - 799{,}205 = 1.98$$

In evaluating habitat losses in the consultation area, we used an estimate of 0.8 percent loss of habitat per year (R. Kautz , FWC, personal communication, 2004) to predict the amount of habitat loss anticipated in south Florida during the next 5 years (*i.e.*, 6,000 ha/year;
14,820 acres/year). We conservatively assumed that we would be aware of half of these projects. We assumed that half of the projects would occur in the Primary Zone and half would occur in the Secondary Zone. We estimated that over a 5-year period that about 37,000 acres would be developed without Federal review. We adjusted the base value from 1.98 to 2.23.

We also realize that collectively habitat losses from individual single-family residential developments will compromise the Service's goal to secure sufficient lands for a population of 90 panthers. We believe that, on an individual basis, single-family residential developments by individual lot owners on lots no larger than 2.0 ha (5.0 acres) will not result in take of panthers on a lot-by-lot basis; however, collectively these losses may impact the panther. Panthers are a wide ranging species, and individually, a 2.0 ha (5.0 acre) habitat change will not have a measurable impact. Compensation for such small-scale losses on a lot-by-lot basis is unlikely to result in meaningful conservation benefits for the panther versus the more holistic landscape level conservation strategy used in our habitat assessment methodology. To account for these losses, we estimated that about another 12,950 acres over a 5-year period (2,590 acres per year) would be developed through this avenue. We adjusted the base value from 2.23 to 2.48.

We also realize there is a need for road crossings in strategic locations and we believe there are projects that may not have habitat loss factors but will have traffic generation factors. The Service considers increases in traffic as an indirect effect from a project and can contribute to panther mortality. Therefore, we have added another 0.02 to the base ratio to address traffic impacts, which could provide an incentive to implement crossings in key locations. Following the same approached shown above, we adjusted the base ratio from 2.48 to the 2.5. The Service intends to re-evaluate this base ratio periodically and adjust as needed to make sure all adverse effects are adequately ameliorated and offset as required under section 7 of the Act and to achieve the Service's conservation goal for the Florida panther.

Landscape Multiplier: As discussed previously in the above section on Primary Zone Equivalent Lands, the location of a project in the landscape of the core area of the Florida panther is important. As we have previously discussed, lands in the Primary and Dispersal Zones are of the most importance in a landscape context to the Florida panther, with lands in the Secondary Zone of less importance, and lands in the Other Zone of lower importance. These zones affect the level of compensation the Service believes is necessary to minimize a project's effects to Florida panther habitat. Table 7 provides the landscape compensation multipliers for various compensation scenarios. As an example, if a project is in the Other Zone and compensation is proposed in the Primary Zone, a Primary Zone equivalent multiplier of 0.33 is applied to the PHUs (see discussion below) developed for the project. If the project is in the Secondary Zone and compensation is in

the Primary Zone, then a Primary Zone equivalent multiplier of 0.69 is applied to the PHUs developed for the project.

Panther Habitat Units – Habitat Functional Value: Prior to applying the base ratio and landscape multipliers discussed above, we evaluate the project site and assign functional values to the habitats present. This is done by assigning each habitat type on-site a habitat suitability value from the habitats shown in Table 2. The habitat suitability value for each habitat type is then multiplied by the acreage of that habitat type resulting in a number representing PHUs. These PHUs are summed for a site total, which is used as a measurement of the functional value the habitat provides to the Florida panthers. This process is also followed for the compensation-sites.

Exotic Species Assessment: Since many habitat types in south Florida are infested with exotic plant species, which affects the functional value a habitat type provides to foraging wildlife species (*i.e.*, primarily deer and hog), we believe the presence of these species and the value these species provide to foraging wildlife needs to be considered in the habitat assessment methodology. As shown in Table 2, we have a habitat type and functional value shown for exotic species. This category includes not only the total acres of pure exotic species habitats present but also the percent-value acreages of the exotic species present in other habitat types.

For example, a site with 100 acres of pine flatwoods with 10 percent exotics would be treated in our habitat assessment methodology as 90 acres of pine flatwoods and 10 acres of exotics. Adding another 100 acres of cypress swamp with 10 percent exotics would change our site from 90 acres of pine flatwoods and 10 acres of exotics to 90 acres of pine flatwoods, 90 acres of cypress swamp, and 20 acres of exotics.

Habitat Assessment Methodology Application – Example: To illustrate the use of our habitat assessment methodology, we provide the following example. A 100-acre project site is proposed for a residential development. Plans call for the entire site to be cleared. The project site contains 90 acres of pine flatwoods and 10 acres of exotic vegetation, and is located in the "Secondary Zone." The applicant has offered habitat compensation in the "Primary Zone" to minimize the impacts of the project to the Florida panther. To calculate the PHUs provided by the site, we multiply the habitat acreage by the "habitat suitability value" for each habitat
type and add those values to obtain a value of 840 PHUs ((90 acres of pine flatwoods x 9 [the habitat suitability value for pine flatwoods] = 810 PHUs) + (10 acres of exotic vegetation
x 3 [the habitat suitability value for exotics] = 30 PHUs) = 840 PHUs). The value of 840 PHUs is then multiplied by the 2.5 (the base ratio) and 0.69 (the landscape multiplier) resulting in a value of 1,149 PHUs for the project site. In this example, the acquisition of lands in the Primary Zone containing at least 1,149 PHUs are recommended to compensate for the loss of habitat to the Florida panther resulting from this project.

Analysis of the species likely to be affected

The Florida panther is an endangered animal restricted to two to three million acres of land
(6 to 9 percent of the total land area of Florida) in south Florida. The panther is a wide-ranging species that requires a biotically diverse landscape to survive. Dispersing subadult males wander widely through unforested and disturbed habitat. Human population in south Florida has dramatically increased, from one million in 1950 to six million in 1990, resulting in secondary disturbances such as increased human presence and noise, light, air, and water pollution. Increasing human population has resulted in increasing impacts on native habitat and flora and fauna. Resulting threats to panthers include road mortality, habitat loss, habitat fragmentation, and human disturbance.

ENVIRONMENTAL BASELINE – Florida Panther

The environmental baseline includes the past and present impacts of all Federal, state, or 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 occur simultaneously with the consultation in progress.

Status of the Species within the Action Area

As stated previously, for the purposes of this consultation, the action area includes the Corps' project area and surrounding lands frequently visited by panthers (Figure1). The action area is a subset of the current geographic range of the panther and includes those lands that the Service believes may experience direct and indirect effects from the proposed development. Therefore, for both direct and indirect effects, the action area is defined as all lands within a 25-mile radius of the project. The proposed action may have direct and indirect effects on the ability of panthers to breed, feed, and find shelter, and to disperse within the population.

The Service used current and historical radio-telemetry data, information on habitat quality, prey base, and evidence of uncollared panthers to evaluate panther use in the action area. Panther telemetry data are collected 3 days per-week from fixed-wing aircraft, usually in early to midmorning. However, researchers have shown panthers are most active between dusk and dawn (Maehr et al. 1990a, Beier 1995) and are typically at rest in dense ground cover during daytime monitoring flights (Land 1994). Therefore, telemetry locations may present an incomplete picture of panther activity patterns and habitat use (Comiskey et al. 2002). In addition, telemetry data alone may be misleading since less than half of the panther population is currently collared.

Although telemetry data may not provide a complete picture of panther activity patterns, telemetry locations are a good indicator, due to the extensive data set, of the approximate boundaries of home ranges, panther travel corridors, and the range of Florida panthers south of the Caloosahatchee River. The FWC also uses observational data collected during telemetry flights to assess the yearly breeding activity of radio-collared panthers. Female panthers accompanied by kittens or male panthers within close proximity of an

adult female were assumed to have engaged in breeding activity during that year. Documentation by McBride (FWC 2003) shows that between July 2002 and June 2003 5-collared panthers (3 males, 2 females), 5-uncollared females, 2-uncollared males, 6 yearlings, and 1 panther of unknown sex had home ranges in or home ranges that overlapped, or were immediately adjacent to the same survey unit as the BCSIR General Permit boundary limits. In addition, during this time period, 8 other panthers that used this same survey unit previously died or are no longer present (FWC 2003). This unit, designated as Unit 6, includes portions of the Big Cypress National Preserve and the Big Cypress Seminole Indian Reservation.

Within the action area, the 25-mile radius, 35 living radio-collared panthers currently have telemetry locations with a total of 11,177 points (Figure 9). In addition, McBride (2003) notes previous use of the action area by other panthers prior to their mortality. According to telemetry data, 129 radio-collared panthers have been recorded within the action area, with a total of 39,057 telemetry points.

The BCSIR is located within the eastern portion of the geographic range of the panther in Florida. Within a 5-mile range of the BCSIR, there have been a total of 64 individual panthers with radio telemetry collars with a total of 14,390 points. Currently there are 21 living collared panther within a 5-mile radius of BCSIR, represented by 3,489 telemetry points. According to telemetry data, 15 living radio-collared panthers have been recorded on BCSIR, with a total of 1,800 telemetry points. The Service believes BCSIR is continuously used by panthers because it contains habitat types used by panthers and their prey and BCSIR has been used historically by panthers as indicated by telemetry locations.

Past and ongoing Federal and State actions affecting panther habitat in the action area include the issuance of Corps permits and State of Florida Environmental Resource Permits authorizing the filling of wetlands for development projects and other purposes. Since 1982, the Corps and the State have had a joint wetland permit application process, where all permit applications submitted to the State are copied to the Corps and vice versa. Within the 25-mile action area, the Service, since January 14, 1992, has formally consulted on 5 projects regarding the panther that were a result of Federal actions (database entries for formal consultations prior to 1992 are incomplete for projects in the action area) (Table 4). These projects have impacted or are expected to impact about 2,162 acres of panther habitat (226 direct and 1,936 indirect [Off-road Vehicle Use]). These projects have also incorporated a total of 220 acres of preservation and restoration of panther habitat. The Service determined in the biological opinions issued for these 5 Federal actions requiring formal consultation, that individually and cumulatively these projects do not jeopardize the survival and recovery of the Florida panther.

Although out of the project action area, from July 2000 through September 2006, the Service also engaged in informal consultation for projects under 5 acres with the Corps for about 757 projects affecting about 764.1 acres in Collier County (primarily Northern Golden Gate Estates) and about 202.8 acres in Lee County (primarily Lehigh Acres) (database entries for informal consultations prior to 2000 are incomplete for projects in the

consultation area). Almost all of these projects involved the construction of single-family residences in partially developed areas, each in most cases involving less than an acre of direct impact. Although panthers have been known to cross these areas to other parts of their range, prey base and denning utilization of these areas have been affected by the level of development and the additions of these residences is not expected to significantly further impact these habitat functions. For these actions, the Service concurred with the Corps' determination of "may affect, but is not likely to adversely affect" for these individual projects.

We have received information that the Corps, between March 2004, and September 2006, has issued no non-jurisdictional wetland determinations (isolated wetlands) for projects within the action area,. These determinations are issued per jurisdictional guidance provided recently in the Supreme Court decision, *Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers,* 531 U.S. 159 (2001) and, therefore, they will not require a Federal Clean Water Act 404 wetland permit.

There have been 39 documented panther-vehicle collisions within the 25-mile action area (see Table 8 and Figure 6). The panther-vehicle collision closest to the project site is UCFP 38 [Female], occurred in 2001, on CR 833, about 1 mile north of BCSIR. Another panther, FP 80 (female), was killed in 2000 about 200 feet west of the BCSIR Swamp Safari. Two additional panther-vehicle collisions have occurred in the action area in 2006. One occurred 21.6 miles west of the project on CR 846 and one occurred 20 miles west of the project on County Line Road. One panther-vehicle collision occurred 23.6 miles west of the project in 2007 on I-75 about 1.5 miles east of its intersection with SR 29.

Activities within the action area have also benefited panthers. The issuance of Corps and State of Florida Environmental Resource Permits has preserved 220 acres of panther habitat for permitted impacts to 2,162 acres(226 direct and 1,936 indirect [Off-road Vehicle Use]) (1992 to present). Installation of wildlife crossings under SR 29 and I-75 within the action area has also benefited the panther by protecting habitat connectivity and reducing panther-vehicle collision mortalities. Additional benefits have resulted from the acquisition of 24,286 acres of high quality habitat through acquisition programs by the other Federal, State, and County resource agencies. Table 9 provides a summary of the State and County acquisitions within the last 5 years.

Moreover, the management of public lands, including prescribed fire and eradication of exotic vegetation in the Picayune Strand State Forest, Fakahatchee Strand State Preserve, Florida Panther NWR, ENP, and other conservation areas, is intended to improve habitat for panther prey species, which benefits panthers within these areas.

Factors Affecting Species Environment within the Action Area

Factors that affect the species environment (positively and negatively) within the action area include, but are not limited to, the presence and construction of highways and urban development, agriculture, resource extraction, public lands management (prescribed fire,

public use, exotic eradication, etc.), hydrological restoration projects, public and private land protection efforts, effects of genetic inbreeding, and genetic restoration.

Development activities may result in avoidance or limited use of remaining suitable habitat by panthers as well as habitat loss, habitat fragmentation, habitat degradation, and also an increase in risk of vehicular collision (*e.g.*, injury or death).

Public and private land management practices can have a positive, neutral, or negative effect, depending on the management goals. Land protection efforts will help to stabilize the extant population. Hunting of the panther is no longer sanctioned, although there still may be instances of intentional or unintentional shooting of individuals for various reasons.

Wildlife Value and Habitat Quality: As discussed previously in the status of the species, the Service believes the existing habitat conditions present on a site and the foraging value that a site provides to the Florida panther and panther prey species are an important parameter in assessing the importance of the project site to the Florida panther and other wildlife species. In order to assess this importance, the Service requires wildlife surveys and plant species compositions as part of the applicant's biological assessment prepared for the project.

***Wildlife Value*:** Surveys for white-tailed deer (*Odocoileus virginianus*), feral hog (S*us scrofa*) and other potential panther prey species were conducted on the approximately 53,000 acre BCSIR in December 2006 (Turrell 2006). The Reservation contains a mosaic of habitats and ongoing activities including cattle grazing, row crop farming, citrus farming, aggregate mining, hunting activities, as well as swamp buggy and airboat rides. There is also a residential /town center area with residences, schools, shops, and other urban services. Several roads, both paved and unpaved criss-cross the property as well as several water control structures and canals. These canals can create barriers that limit free wildlife movement across the site. Fences around the Billie Swamp Safari and Big Cypress Hunting Adventures also create barriers difficult for some animals to cross.

Spotlight surveying methodologies were followed in the pasture and row crop areas where visibility was unobstructed and existing roads facilitated this survey type. Track count methodologies were used in the forested areas where spotlighting would have been ineffective and where existing roads provided good substrate for this type of survey. High water levels at the beginning of the survey period made track counting ineffective in some areas so the heavily forested natural area was also sampled remotely with motion and infra-red sensing cameras. The cameras provide an overview of the type of animals in an area and their frequency of use or passage through the areas. Aerial counts were made over the sawgrass and marsh areas that could not be adequately surveyed under the previously mentioned methodologies. It was believed that these four survey activities would give a good overview of the property and allow for a estimation of the deer population. Survey boundaries followed the general land/habitat boundaries shown in Figure 10 and included: The Billie Swamp Safari, Big Cypress Hunting Adventures, Sawgrass Marsh, Pasture, Agriculture, Native Area, and Residential.

Billie Swamp Safari: This area is approximately 1,500 acres in size and is the center of operations for the swamp buggy and airboat ride tourist attraction. High fencing prevents easy passage of wildlife across this barrier and the managers of this attraction have an estimated count of game at approximately 40 white-tailed deer and approximately 150 feral hogs within the enclosure, for an average of one deer per 38 acres and one hog per 10 acres.

Big Cypress Hunting Adventure: This portion of the property is approximately 2,800 acres in size. Like the Swamp Safari, the managers have an estimated count of game within the fence. They estimate up to 50 white-tail deer and as many as 500 wild hogs for an average of one deer per 56 acres and one hog per 6 acres.

Sawgrass Marsh and Prairie: This area is about 10,800 acres in size which equates to a population of approximately 1 deer per 270 acres and one hog per 216 acres. While no hogs were seen from the airplane, ground surveys did show that hogs are present. The estimate, based on track and rooting evidence, shows approximately 30 to 50 hogs were using this area during the survey period but that their utilization is seasonal as high water levels during the rainy season would make their use of this area difficult.

Pasture: This area represents about 13,000 acres in size and is predominately open pasture with tree islands and hammocks scattered throughout. Spotlighting and aerial counts were used to estimate the deer population within this expanse of the property. There is also a small area of native forested growth in the southwestern portion where track count surveys were used to supplement the spotlighting. Based on these survey methodologies, the average density for this area is one deer per 240 acres. No hogs were seen in this area during the survey periods.

Agriculture: This area represents about 8,700 acres in size and consists of a mosaic of row crops, pasture, citrus groves, and wetlands. This area also has widely scattered residences throughout. Spotlight surveys were the major means of estimating the population within this area though a couple of cameras were also placed to try and capture movement through the area by deer and hogs. A considerable number of turkeys and small mammals were observed during the daytime and evening spotlight surveys within this area, which also showed more utilization by wild hogs than the other surveyed areas. This equates to a deerpopulation density estimate of about 1 deer per 171 acres.

Native Area: The native area located in the southwestern portion of the property. This area is approximately 12,200 acres in size and includes a mosaic of native habitats. The population of deer within this zone of the property is approximately 1 deer per 187.

Residential: The remaining area, about 4,000 acres of the property is mainly residential, airport, and urban services with more traffic and human activity. Based on anecdotal evidence gathered from residents in the area, there is a small population of deer that are occasionally seen in this area. Residents estimate the numbers at 5 to 10 animals which would equate to a maximum population of approximately 1 deer per 250 acres to 1 deer per 500 acres.

The Big Cypress Seminole Indian Reservation habitat supports a white-tailed deer density varying between 1 deer per 38 acres to 1 deer per 500 acres. Excluding the populations within the Billie Swamp Safari, the Big Cypress Hunting Adventure, and the Residential Area, areas either controlled or strongly affected by human activities, the deer population for the BCSIR varies from one deer per 171 acres to one deer per 270 acres, with an average of one deer per 217 acres. These deer densities are similar to numbers reported by McCown (1994) in FPNWR of
1 deer per 183-225 acres (74-91 ha) and in FSPSP of 1 deer per 133-200 acres

Habitat/Use Type	Acres	Acres per Deer
Billie Swamp Safari	1,500	38
Big Cypress Hunting Adventure	2,800	56
Sawgrass Marsh and Prairie	10,800	270
Pasture**:**	13,000	240
Agriculture:	8,700	171
Native Area	12,200	187
Residential	4,000	500
Average		**217**

Habitat Quality: As discussed previously, white-tailed deer densities and other prey species are influenced by the quality of the foraging habitat present in an area. The lands generally applicable to the proposed action includes residential and agriculture lands. These lands either support a mixture of exotic or nursery species developed for residential use or generally include monotypic stands of foraging plant species primarily consisting of either row crops or citrus groves. The adjacent on-site compensation sites support a mixture of native species with varying amounts of exotic plant species ranging from less than 10 percent coverage to greater than 50 percent coverage. The proposed enhancements will include the removal of these exotic plant species, providing an improvement in foraging value to resident deer and other wildlife species.

Habitat Assessment Methodology Application: The application of the habitat assessment methodology to specific projects including the base ratio, landscape multiplier, PHU determinations, and compensation recommendations has been discussed previously in the "Landscape Preservation Need and Compensation Recommendations" section in the "Status of the Species.**"**

The proposed action is the use of a General Permit for 10 specific types of wetland impacts and associated upland habitat alterations related to a specific project. Since the actual footprint of a proposed project cannot be determined and the project's direct and indirect effects cannot be accurately assessed, the Service developed an effects key specific to the BCSIR. This key identifies thresholds that determine when a proposed project exceeds a "not likely to adversely affect" determination for direct and indirect effects and when further consultation with the Service is appropriate.

In all applications covered by the General Permit, the potential take associated with loss of functional foraging value of suitable habitat for the Florida panther and panther prey species from a proposed project is assessed through the habitat improvements and land preservations associated with the 6 WPA. The Service in coordination with the Tribe have determined that the 4,144 acres within the 6 WEAs will provide about 35,352 panther habitat units (PHUs) (Table 10). The cumulative PHU values for adverse effects associated with habitat losses for all projects applicable to this GP cannot exceed the maximum PHUs identified within the 6 WEAs (35,352). Following this assessment, the average PHU value of the lands within the limits of the GP is 6 PHUs per acre (Table 11). Considering a base multiplier of 2.5 and the average value of affected lands, the estimated amount of lands that can be affected with adequate compensation provided by the 6 WEA is 2,337 acres (35,352/2.5=14,141/6=2,357).

The expected project actions applicable to the GP are generally associated with either the residential area or associated with lands within the Community Development Area. These lands are either in agriculture use (row crops and citrus groves) or support residential land uses. The lands proposed for preservation are in the Primary Zone, adjacent to other natural lands, and are consistent with the Service's panther goal to strategically locate, preserve, and restore sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Florida panther population south of the Caloosahatchee River.

Conservation Measures: The beneficial effects of the project include preservation of 4,144 acres of Primary Zone panther habitat. Though the project will result in a net loss in number of acres of habitat available to the panther, the habitat quality provided to the Florida panther through restoration and preservation will be of higher functional value to that of the areas to be impacted, and the habitat will be protected in perpetuity. The WEA sites will be managed to prevent infestation by exotic vegetation in perpetuity. The WEA lands and the surrounding BCSIR Native Area show significant panther usage, and contain habitats valuable for breeding, foraging, and dispersal by the Florida panther.

EFFECTS OF THE ACTION – Florida Panther

This section analyzes the direct and indirect effects of the proposed action and interrelated and independent actions on the Florida panther and Florida panther habitat.

Factors to be Considered

Residential, commercial, and industrial development projects may have a number of direct and indirect effects on the Florida panther and panther habitat. Direct impacts, which are primarily habitat based, may include: (1) the permanent loss and fragmentation of panther habitat; (2) the permanent loss and fragmentation of habitat that supports panther prey; (3) roadway improvements: (4) the loss of available habitat for foraging, breeding, and dispersing panthers; (5) a reduction in the geographic distribution of habitat for the species; (6) harassment by construction activities; and (7) habitat compensation. Indirect effects may include: (1) an increased risk of roadway mortality to panthers traversing the area due to the increase in vehicular traffic; (2) increased

disturbance to panthers and panther prey in the project vicinity due to human activities (human/panther interactions); (3) the reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and (4) a potential increase of intraspecific aggression between panthers due to reduction of the geographic distribution of habitat of the panther. These indirect effects are habitat based, with the exception of vehicular mortality, which could result in lethal "take." Intraspecific aggression, though habitat based, could also result in lethal "take."

This project site contains panther habitat and is located within the western portion of the geographic range of the Florida panther. The timing of construction for project authorized by the GP, relative to sensitive periods of the panther's lifecycle, is unknown. Panthers may be found on and adjacent to the proposed construction footprints year-round. The GP projects will generally be constructed as a single, disruptive event, and result in permanent loss and alteration of a portion of the existing ground cover on the project site. The time required to complete construction of the projects is not known. The disturbance associated with the project will be permanent and result in a loss of habitat currently available to the panther.

Analyses for Effects of the Action

The GP project area currently provides habitat of various quality for the Florida panther. The project site is located in the Primary Zone (Kautz et al. 2006), and is inside of the Panther Focus Area as defined by the Service. The GP project area is located in the core area of occupied habitat, is adjacent to preserved lands, agriculture lands, and an area of urban development to the east of the project area. The Community Development Area, the area most likely to be affected by projects authorized by the GP is not located within known dispersal corridors (FWC 2006b) or between larger publicly owned managed lands. Compensation for the loss of functional habitat value of lands affected by the GP will be through the protection and restoration of 4,144 acres of Primary Zone habitat (Kautz et al. 2006) in the WEAs. The WEA sites will be managed to prevent infestation by exotic vegetation in perpetuity. The WEA lands and the surrounding BCSIR Nativel Area show significant panther usage, and contain habitats valuable for breeding, foraging, and dispersal by the Florida panther.

Direct Effects

Direct effects are those effects that are caused by the proposed action, at the time of construction, are primarily habitat based, are reasonably certain to occur and include: (1) the permanent loss and fragmentation of panther habitat; (2) the permanent loss and fragmentation of habitat that supports panther prey; (3) roadway improvements: (4) the loss of available habitat for foraging, breeding, and dispersing panthers; (5) a reduction in the geographic distribution of habitat for the species; (6) harassment by construction activities; and (7) habitat compensation. The direct effects this project will have on the Florida panther within the action area are discussed below.

Permanent Loss and Fragmentation of Panther Habitat: The project will result in the loss of panther habitat located within the Primary Zone, primarily within the Community

Development Area. These lands will be converted to support and improve current land use practices including agriculture canal vegetation clearing, residential housing units, various infrastructure improvements, recreational facilities, and other projects identified in the 10 activity types referenced in Table 10. The habitat value of these lands to the Florida panther has been affected by the surrounding residential, agriculture, and urban development and although providing some habitat value for occasional prey base foraging and dispersal travel of panthers, use of these habitats is expected to be infrequent although the habitat loss may adversely affect the panther by decreasing the spatial extent of lands available to the panther. Compensation for the loss of functional habitat value of lands affected by the GP will be through the protection and restoration of 4,144 acres of Primary Zone habitat in the WEAs. The cumulative PHU values for adverse effects associated with habitat losses for all projects applicable to this GP cannot exceed the maximum PHUs identified within the 6 WEAs (35,352). Following this assessment, the average PHU value of the lands within the limits of the GP is 6 PHUs per acre (Table 11). Considering a base multiplier of 2.5 and the average value of affected lands, the estimated amount of lands that can be affected with adequate compensation provided by the 6 WEA is 2,337 acres (35,352/2.5=14,141/6=2,357).

Panthers, because of their wide-ranging movements and extensive spatial requirements, are also particularly sensitive to habitat fragmentation (Harris 1984). Mac et al. (1998) defines habitat fragmentation as: "The breaking up of a habitat into unconnected patches interspersed with other habitat, which may not be inhabitable by species occupying the habitat that was broken up. The breaking up is usually by human action, as, for example, the clearing of forest or grassland for agriculture, residential development, or overland electrical lines." The reference to "unconnected patches" is a central underpinning of the definition. For panther conservation, this definition underscores the need to maintain contiguous habitat and protected habitat corridors in key locations in south Florida. Habitat fragmentation can result from road construction, urban development, and agricultural land conversions within migratory patterns of panther prey species and affect the ability of panthers to move freely throughout their home ranges. Construction of highways in wildlife habitat typically results in loss and fragmentation of habitat, traffic related mortality, and avoidance of associated human development. Roads can also result in habitat fragmentation, especially for females who are less likely to cross them (Maehr 1990).

As discussed previously, the BCSIR Effects Key provides guidance in determining the threshold of habitat alterations and the types of habitat alterations that could directly or indirectly influence habitat fragmentation. For projects authorized by the GP, that do not exceed these guidance thresholds, habitat fragmentation is not expected to be an important component in determining adverse effects to the Florida panther. For projects that exceed the guidance thresholds, additional coordination with the Service is required. The primary project area, the Community Development Area is not located within known dispersal or connection corridors (FWC 2006b) to larger publicly owned managed lands. As a result of our analysis, we believe that fragmentation of panther habitat is not expected to result from the GP implementation.

Permanent Loss and Fragmentation of Habitat that Supports Panther Prey: Prey surveys documented use of the BCSIR by white-tailed deer and hogs, which are primary panther prey species. White-tailed deer populations within the more rural portions of the Reservation vary from one deer per 171 acres to one deer per 270 acres, with an average of one deer per 217 acres. These population estimates are similar to the population estimates in the surrounding wildlife preserve lands. However, within the boundaries of the residential areas, prey base populations are estimated at 1 deer per 500 acres and in the agricultural areas, estimates are 1 deer per 171 acres. Although the native habitats in these areas have been degraded or converted to agricultural uses, foraging value to panther prey species still persist and use of these lands by prey species and companion use of these lands occasionally by panther will still occur. The habitat loss of these lands may adversely affect panther prey species by decreasing the spatial extent of lands available to these species. Compensation for the loss of functional habitat value to these species will be through the protection and restoration of 4,144 acres of Primary Zone habitat in the WEAs.

As discussed previously, the BCSIR Effects Key provides guidance in determining the threshold of habitat alterations and the types of habitat alterations that could directly or indirectly influence habitat fragmentation. For projects authorized by the GP, that do not exceed these guidance thresholds, habitat fragmentation is not expected to be an important component in determining adverse effects to the Florida panther pre species. For projects that exceed the guidance thresholds, additional coordination with the Service is required. The primary project area, the Community Development Area is not located within known dispersal or connection corridors (FWC 2006b) to larger publicly owned managed lands. As a result of our analysis, we believe that fragmentation of panther prey habitat is not expected to result from the GP implementation.

Road Way Improvements: The major transportation corridor within the boundaries of the BCSIR is Snake Road (Figure 11). The Federal Highway Transportation, in corporation with the Florida Department of Transportation recently completed an environmental study and evaluation of proposed improvement to this corridor through the BCSIR and the adjoining Miccosukee Reservation (FDOT 2007). Preliminary analysis have noted that the proposed road improvements will provide transportation speeds of 50 miles per hour for portions of the road improvements within the rural areas of BCSIR and all of the Miccosukee Reservation, and a 35 mile per hour speed limit within the more urban portions of BCSIR.

The Bureau of Indian Affairs (BIA) identifies Snake Road (BIA 1281) as a facility in need of safety improvements. In the period from January 1997 to July 2001, 74 accidents, including six fatalities, were reported for the portion of Snake Road within BCSIR. The proposed improvements consist of widening the existing lanes to meet safety standards, adding paved shoulders, replacing a substandard bridge and straightening non-standard curve geometry throughout the project area. Additional safety improvements include site distance corrections and guard rail. The straightening of S-curves found in the southern portion of the corridor will require shifting outside of the

current alignment. The project will not increase vehicle capacity and has been developed to minimize environmental impacts where practical.

Re-initiation of consultation with the U.S. Fish and Wildlife Service (USFWS) for the Florida panther (pursuant to Section 7 of the Act, as described in 50 CFR § 402.14) will be done during the design phase and prior to permitting. This is applicable to both the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida.

The BCSIR Effects Key provides guidance in determining the threshold for when a proposed action may have an adverse effect on the Florida panther associated with traffic and roadway improvements. The BCSIR Effects Key recommends a determination of may affect, not likely to adversely affect for projects that may change traffic patterns associated with local day-to-day traffic within the Community Development Area and a may affect for projects that provide an increase in traffic associated with a specific project or is outside the Community Development Area. The BCSIR Effects Key provides further guidance on traffic generation with a recommended determination of may affect, not likely to adversely affect for projects with an increase in traffic or change in traffic patterns when the time of day use is restricted to daylight hours only. As a result of our analysis and the guidance recommendations in the BCSIR Effects Key, we believe that traffic effects associated with the projects receiving authorization under the GP will not have an adverse effect to panthers or to panther prey species.

Loss of Available Habitat for Foraging, Breeding, and Dispersing Panthers:
According to the FWC, telemetry records show that 12 living panther associated with 1,139 telemetry points, have territories that overlap the BCSIR or occasionally cross these lands. Panther FP 73 (female) accounted for 519 points, and FP 56 (female) accounted for 232 points. Both of these animals collars have failed and their current locations are unknown, although their territories historically have overlapped portions of the BCSIR. Panther dens have been reported within and adjacent to BCSIR continuously over the past 5 years. References to den distances are from the center point of the east-west leg of Snake Road through the Reservation. FP 77 denned in BCNP in 2001, about 5.6 miles west-southwest of the center point; FP 73 also denned in BCNP in 2002, about 5.9 miles south-southwest of the Snake Road center point; FP 121 denned in BCSIR in both 2004 and 2006, about 7.7 miles west of the reference point; and FP 128 denned in 2005 in BSCIR about 6.5 miles southwest of the reference point. All den locations are either in the western part of the BCSIR Natural Area or in the adjacent BCNP.

The project will result in the loss of panther habitat available for foraging, breeding, and dispersal. The cumulative PHU values for adverse effects associated with habitat losses for all projects applicable to this GP cannot exceed the maximum PHUs identified within the 6 WEAs (35,352). Considering a base multiplier of 2.5 and the average value of affected lands of 6 PHUs per acre (Table 11), the estimated amount of lands that can be affected with adequate compensation provided by the 6 WEA is 2,337 acres (35,352/2.5=14,141/6=2,357). These lands are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. These uses have affected the habitat value of these lands for both the Florida panther and panther prey. Review of

telemetry data for panther occurrence shows that these lands have occasional use but the most use by panthers, based on telemetry points, is within the BCSIR natural area (Figure 12). Although these lands include a mixture of residential, agriculture, and urban development and provide some habitat value for occasional prey base foraging and dispersal travel of panthers, use of these habitats is expected to be infrequent although the habitat loss may adversely affect the panther by decreasing the spatial extent of lands available to the panther for foraging, breeding, and dispersing.

Reduction in the Geographic Distribution of Habitat for the Species: The project will result in loss of habitat suitable for foraging, breeding and dispersal. These lands are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. For assessment purposes the lands within the limits of the GP boundaries are estimated to represent about 25,163 acres with an average PHU per acre value of 6 PHUs (Table 11). Based on an estimated PHU value for the 4,144 acres within the 6 WEAs of about 35,352 PHUs (Table 10), habitat loss is estimated to be 2,357 acres (35,352/2.5=14,141/6=2,357). This loss represents only 0.12 percent of the 1,962,294 acres of available non-urban private lands in south Florida in the Service's panther core area of the Florida panther (Table 3). The Service believes the habitat value that may be lost by the application of the GP will be minimized by the preservation and restoration actions proposed by the applicant. The lands applicable to the GP are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. The lands proposed for preservation are consistent with the Service's panther conservation strategy to locate, preserve, and restore sets of lands containing sufficient area, access, and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River.

Harassment by Construction Activities: The timing of construction for projects applicable to the GP, relative to sensitive periods of the panther's lifecycle, is unknown. . There are no known den sites within the GP project boundaries and telemetry data shows limited but occasional use of the GP area by panthers (Figure 12). Therefore, we believe panther usage of the property is occasional and we do not believe project construction will result in direct panther mortality, but may result in temporary disturbance to resident or dispersing panthers.

Compensation: The applicant's proposed preservation acreage is estimated at 4,144 acres. The lands proposed for development are hydrologically disturbed and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. The lands proposed for preservation are connected to other larger tracts of preserved lands and are consistent with the Service's panther goal to locate and preserve sets of lands containing sufficient area and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River.

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 has no independent utility apart from the action under consultation. No interrelated or interdependent actions are expected to result from the project.

Indirect Effects

Indirect effects are those effects that result from the proposed action and are reasonably certain to occur. The indirect effects this project will have on the Florida panther within the action area are discussed below and in the assessment of functional habitat values previously discussed. They include: (1) an increased risk of roadway mortality to panthers traversing the area due to the increase in vehicular traffic; (2) increased disturbance to panthers and panther prey in the project vicinity due to human activities (human/panther interactions); (3) the reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and (4) a potential increase of intraspecific aggression between panthers due to reduction of the geographic distribution of habitat of the panther.

Increased Risk of Roadway Mortality: In evaluating a project's potential to increase roadway mortality to the Florida panther, we consider the location of the project in relation to surrounding native habitats, preserved lands, and wildlife corridors that are frequently used by the Florida panther. We also consider the current configuration and traffic patterns of surrounding roadways and the projected increase and traffic patterns expected to result from the proposed action. We evaluate the habitats present on-site, their importance in providing foraging needs for the Florida panther and panther prey species, and if the site development would further restrict access to surrounding lands important to the Florida panther and panther prey species.

Vehicular mortality and injury data (see Table 8 and Figure 6) provided by the FWC indicate collisions with motor vehicles show an increase from 2000 through 2003, with an average of 4 mortalities per year (17/4=4.25) and a decrease from 2004 through 2006, with an average of 2 per year (7/3=2.3) in the 25-mile radius project action area. However, on Snake Road, the main travel corridor into and out of the Reservation, 4 road-related mortalities have been recorded (UCFP 38- 2001; FP 80 – 2000; UCFP 33 – 1999; and UCFP 19 – 1990). Only one of the mortalities, FP 80 was within the boundaries of BCSIR and occurred on a secondary road not generally accessible to vehicular traffic. Of the 39 documented collisions, 35 (90 percent) have occurred more than 10 miles away from the project site.

The BCSIR Effects Key recommends a determination of may affect, not likely to adversely affect for projects that may change traffic patterns associated with local day-to-day traffic within the Community Development Area and a may affect for projects that provide an increase in traffic associated with a specific project or is outside the Community Development Area. The BCSIR Effects Key provides further guidance on traffic generation with a recommended determination of may affect, not likely to adversely affect for projects with an increase in traffic or change in traffic patterns when the time of day use is restricted to daylight hours only. As a result of our analysis and the

guidance recommendations in the BCSIR Effects Key, we believe that traffic effects associated with the projects receiving authorization under the GP will not have an adverse effect to panthers or to panther prey species.

Panther and Prey Disturbance (Panther/Human Interactions): Potential increases in disturbance to the Florida panther and panther prey were evaluated. As discussed previously in our assessment of fragmentation, we considered habitat quality related factors and occurrence data for the Florida panther and panther prey species. This information is also the basis of our evaluation of disturbance to the Florida panther and to panther prey species.

The habitat value of the lands within the limits of the GP to the Florida panther has been affected by the surrounding residential, agriculture, and urban development and although providing some habitat value for occasional prey base foraging and dispersal travel of panthers, use of these habitats has been affected by these land alterations. White-tailed deer populations within the more rural portions of the Reservation vary from one deer per 171 acres to one deer per 270 acres, with an average of one deer per 217 acres. These population estimates are similar to the population estimates in the surrounding wildlife preserve lands. However, within the boundaries of the residential areas, prey base populations are estimated at 1 deer per 500 acres and in the agricultural areas, estimates are 1 deer per 171 acres.

Although the native habitats in these areas have been degraded or converted to agricultural uses, foraging value to panther prey species still persist and use of these lands by prey species and companion use of these lands occasionally by panther will still occur. The habitat loss of these lands may adversely affect the panther and panther prey species through disturbance by decreasing the spatial extent of lands available to the panther and panther prey. Compensation for the loss of functional habitat value of lands affected by the GP will be through the protection and restoration of 4,144 acres of Primary Zone habitat in the WEAs.

As a result of our analysis, we believe that panther/human interactions and panther prey disturbance is not expected to result from the GP implementation. Though panthers and panther prey may occasionally use the habitats within the GP project area, we believe projects authorized by the GP will not result in a significant increase in panther/human interactions and prey disturbance.

Habitat Fragmentation: The BCSIR Effects Key provides guidance in determining the threshold of habitat alterations and the types of habitat alterations that could directly or indirectly influence habitat fragmentation. For projects authorized by the GP, that do not exceed these guidance thresholds, habitat fragmentation is not expected to be an important component in determining adverse effects to the Florida panther. For projects that exceed the guidance thresholds, additional coordination with the Service is required. Considering our discussion of fragmentation under Direct Effects and the guidance provided in the BCSIR Effects Key, fragmentation of panther habitat and fragmentation of panther prey habitat is not expected to result from project implementation.

Intraspecific Aggression: Potential increases in intraspecific aggression and disturbance to the Florida panther were evaluated. As discussed previously in our assessment of fragmentation and habitat for panther and panther prey, we considered habitat quality related factors and occurrence data for the Florida panther and panther prey species as factors affecting intraspecific aggression. The lands applicable to the GP are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities and these lands are not located within known dispersal corridors to larger publicly owned managed lands important to the panther.

Within the 25-mile action area, there have been no reported mortalities attributed to intraspecific aggression. However, the reduction in the geographic range of habitat for dispersal and/or escape cover may contribute to a potential increased risk of harm and harassment of panthers in the action area due to intraspecific aggression.

Species Response to the Proposed Action

The proposed action will result in increased human activity and noise in the project area during construction of the project. However, since panthers and panther prey species are not commonly associated with the lands applicable to authorization by the GP, activities associated with construction authorized by the GP are not anticipated to significantly increase risk of disturbance to panthers, though some temporary disturbance may occur.

The projects authorized by the GP, based on an average PHU value of 6, with a 2.5 base multiplier cannot exceed the proposed compensation PHU value of the 6 WEAs, with an acreage loss estimated to be 2,357 acres (35,352/2.5=14,141/6=2,357). According to the most current home range estimates of the Florida panther (Lotz et al. 2005), this loss represents 8.1 percent of a female panther's average home range (29,059 acres) and 3.8 percent of a male panther's average home range (62,542 acres). The lands applicable to the GP are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. Although panthers and panther prey species are occasionally known to use the habitats within the GP action area, these lands are not located within known dispersal corridors to larger publicly owned managed lands important to the panther. However, the loss of habitat may contribute to increases in intraspecific aggression through decreasing the spatial extent of lands available to the panther for foraging, breeding, and dispersing. We anticipate any resident panthers with home ranges overlapping or in the vicinity of the projects authorized by the GP will adjust the size and location of their ranges to account for this loss and that adjustment is anticipated to occur in concert with project construction.

Panthers are sensitive to habitat fragmentation. However, the GP project lands are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities, and are not located within known dispersal corridors (FWC 2006b) between

larger publicly owned managed lands. Therefore, fragmentation of panther habitat is not expected to result from project implementation.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions reasonably certain to occur in the action area considered in this biological opinion. To identify future private actions that would affect panthers and that may reasonably be certain to occur in the action area, the Service first identified the types of land alteration actions that could occur in the action area, then developed a mechanism to distinguish between those that will require future federal review and those that are not likely to be a future federal action, and thus meet the cumulative effects definition. To estimate future non-federal actions, the Service chose to identify and tabulate recent past non-federal actions and project this level of development as representative of future non-federal actions.

Within the action area, past and ongoing state and county actions affecting panther habitat include: (1) State of Florida DRI Orders (2001 to 2004); (2) Comprehensive Plan Amendments (2003 to 2004); (3) Lee and Collier County Zoning Amendments (2003 to 2004); (3) Collier County's PUDs (2001 to 2004); (4) Lee County's PUDs (2003 to April 2004); and (5) South Florida Water Management District's Environmental Resource Permits (2003 to 2004). To evaluate these effects, the Service incorporated the Florida Land Use, Cover and
Forms Classification System (FLUCCS) mapping to determine properties that may be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps. To determine which of these projects would likely be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps, we identified the percentage of the project site that was classified as wetland habitat, based on the FLUCCS mapping units. The mapping units relied on by the Service included the 600 series (wetland classifications) and the 411 and
419 pine flatwood classifications (hydric pine systems). For listing purposes, properties with less than 5 percent wetlands were considered by the Service to be generally exempt from regulatory review as these quantities of wetlands could be avoided by project design.

Within the action area, based on FLUCCS mapping, or lack there of, about 24 projects totaling 3,266 acres could be expected to be subject to development without Federal permit involvement through the Clean Water Act section 404 (Table 12). Since FLUCCS mapping was not provided for these listed projects, we consider all projects to be exempt for Federal permit review. This level of development represents 11.2 percent of a female panther's average home range (29,059 acres) and 5.2 percent of a male panther's average home range (62,542 acres).

State and county land alteration permits in southwest Florida not part of those actions listed above, generally included single-family residential developments within Northern Golden Gate Estates and Lehigh Acres. Vacant lands within the area of Northern Golden

Gate Estates (north of I-75), also within the action area, totaled about 34,028 acres as of September 2004 (Figure 13). To evaluate these effects, the Service overlaid the plat boundaries on 2004 aerials, queried the parcel data from Collier County's Property Appraisers Office, noted lots with developments, compared those to 2003 aerials, and noted the changes. Vacant lands within the area of Northern Golden Gate Estates (north of I-75) totaled about 35,768 acres as of August 2003. The breakdown of acres for August 2003 is: (1) wetlands, about 17,572 acres; (2) uplands, about 17,990 acres; and (3) water, about 210 acres. These changes were overlain on the National Wetlands Inventory (NWI) maps for presence of wetlands. This evaluation was used to estimate the acreage of properties that may be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps. A comparison of the 2003 and 2004 data for Northern Golden Gate Estates indicates about 1,740 acres of land were converted from vacant to developed with the breakdown as: (1) wetlands, about 696 acres; and (2) uplands, about 1,740 acres.

The evaluation process provided an estimate of 417 lots totaling 1,740 acres for Northern Golden Gate Estates. Therefore, using NWI mapping for the Northern Golden Gate Estates, a total of about 1,740 acres could be expected to be subject to development in a year in these areas without Federal permit involvement. Based on historical records for wetland permits issued by the Corps for these areas, most of these projects will involve the construction of single-family residences in partially developed areas and will involve less than an acre of impact. This level of development represents 3.59 percent of a female panther's average home range (29,059 acres) and 1.67 percent of a male panther's average home range (62,542 acres).

Vacant lands within the area of Lehigh Acres, also within the action area, totaled about 34,852 acres as of April 2003 (Figure 14). The breakdown of acres is: (1) wetlands, about 1,057 acres; (2) uplands, about 33,592 acres; and (3) water, about 202 acres. A review of aerial photography and Lee County building permit data for Lehigh Acres from the 1-year period prior to April 2003 indicates about 441 acres of land was converted from vacant to occupied, during the 1-year period. The breakdown of converted acres is estimated as: (1) wetlands, 66 acres; (2) uplands, 375 acres; and (3) water, 0 acres. Therefore, using NWI mapping, about 375 acres could be expected to be subject to development in a year in this area without Federal permit involvement.

In conclusion, the Service's cumulative effects analysis has identified about 5,381 acres within the action area that could be developed without Federal wetland permit involvement. This level of development, which the Service believes is representative of future non-Federal actions, is reasonably certain to occur and, therefore, meets the definition of cumulative effect. This level of projected future development represents 19 percent of a female panther's average home range (29,059 acres) and 8.6 percent of a male panther's average home range (62,542 acres), though the impacts will be scattered and generally located on the fringes of occupied panther habitat, supported primarily with disturbed vegetative communities, in row crops, or in partially developed areas. These lands represent 0.27 percent of the non-urban private lands at risk in the Service's panther core area (1,962,294 acres) (Table 3). Based on the above analysis, we believe

the loss of the habitat associated with these lands, though insignificant in the short term, may adversely impact the panther as development continues to occur in the future in the action area. The Service has accounted for some habitat loss and changes in habitat quality through its habitat assessment methodology and is encouraging state and county environmental staff to pursue section 10 (HCP) process to account for and compensate for adverse effects to the Florida panther.

SUMMARY OF EFFECTS

Panther Usage: The timing of construction for projects authorized by the GP, relative to sensitive periods of the panther's lifecycle, is unknown. There are no known den sites within the GP project boundaries, although dens are present or have been historically present in the BCSIR Native Area and the adjacent BCNP. Though panthers likely use the habitats within the GP project area, we believe panther usage of the project site is infrequent and we do not believe project construction authorized by the GP will result in direct panther mortality, but may result in temporary disturbance to resident or dispersing panthers.

Traffic: As discussed above and in previous sections, the lands within the GP project boundaries provide various levels of resource value to the Florida panther and panther prey species. The lands applicable to the GP are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. There may be traffic increases with specific project developments authorized by the GP. However, the BCSIR Effects Key recommends determinations on how to address traffic changes and when increases in traffic may require further coordination. Although the risk to the panther from collisions with vehicles as a result of GP authorized projects is difficult to quantify, we believe that for projects that comply with the BCSIR Effects Key, traffic effects associated with the projects receiving authorization under the GP will not have an adverse effect to panthers or to panther prey species.

Habitat Loss: The Service, based on the habitat evaluations discussed previously, believes GP authorized projects could potentially result in an acreage loss estimated to be 2,357 acres. The lands applicable to the GP are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. Although panthers and panther prey species are occasionally known to use the habitats within the GP action area, these lands are not located within known dispersal corridors to larger publicly owned managed lands important to the panther. However, the loss of habitat may contribute to increases in intraspecific aggression through decreasing the spatial extent of lands available to the panther for foraging, breeding, and dispersing. This loss represents about 0.12 percent of the 1,962,294 acres of available non-urban private lands in south Florida in the Service's panther core area of the Florida panther (Table 3). This small loss (0.12 percent) of non-urban private lands will not adversely affect the Service's land conservation and preservation goals.

Compensation: The applicant's proposed preservation acreage is estimated at 4,144 acres. The lands proposed for development are hydrologically disturbed and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. The lands proposed for preservation are connected to other larger tracts of preserved lands and are consistent with the Service's panther goal to locate and preserve sets of lands containing sufficient area and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River. The proposed compensation plan, which provides habitat preservation and restoration inside the project action area, benefits the survival and recovery of the Florida panther as referenced in the draft Panther Recovery Plan (Service 2006) goal 1.1.1.2.3. This goal recommends that habitat preservation and restoration within the Primary Zone be provided in situations where land use intensification can not be avoided. The applicant has proposed equivalent habitat protection and restoration, to compensate for both the quantity and functional value of the lost habitat.

Fragmentation: The BCSIR Effects Key provides guidance in determining the threshold of habitat alterations and the types of habitat alterations that could directly or indirectly influence habitat fragmentation. For projects authorized by the GP, that do not exceed these guidance thresholds, habitat fragmentation is not expected to be an important component in determining adverse effects to the Florida panther. For projects that exceed the guidance thresholds, additional coordination with the Service is required. Considering our discussion of fragmentation under Direct Effects and the guidance provided in the BCSIR Effects Key, fragmentation of panther habitat and fragmentation of panther prey habitat is not expected to result from project implementation.

Intraspecific Aggression: Potential increases in intraspecific aggression and disturbance to the Florida panther were evaluated. As discussed previously in our assessment of fragmentation and habitat for panther and panther prey, we considered habitat quality related factors and occurrence data for the Florida panther and panther prey species as factors affecting intraspecific aggression. The lands applicable to the GP are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities and these lands are not located within known dispersal corridors to larger publicly owned managed lands important to the panther.

However, the reduction in the geographic range of habitat for dispersal and/or escape cover may contribute to a potential increased risk of harm and harassment of panthers in the action area due to intraspecific aggression.

Cumulative Analysis: In the cumulative analysis, the Service identified the potential loss of about 5,381 acres within the action area that could be developed without Federal wetland permit involvement and we believe this level of development represents future non-Federal actions expected to occur in the action area. This level of development represents a small percentage (0.27 percent of the 1,962,294 acres) of available non-urban private lands in the core area. Although this small percentage of lands may be lost from the core area of private lands available for panther conservation, the Service believes the loss of these lands will not adversely affect the Service's land conservation and preservation goals.

Conservation Land Acquisitions: The State and County land acquisition programs acquired about 24,286 acres of lands within the action area from 2000 to 2005 (Table 9), which represents 3.04 percent of the 799,205 acres of private lands still needed for the population of 90 individuals. These lands are generally located within the core lands of the Florida panther and are intended to be actively managed for the benefit of many wildlife species including the Florida panther. The preservation of these lands in the panther core lands will have a beneficial effect on the panther and further the Service's goal in panther conservation.

CONCLUSION

In conclusion, the Service believes there will be no direct take in the form of mortality or injury of the Florida panther resulting from this project. However, the increase in traffic and potential increase in intraspecific aggression in the action area as a result of the proposed action may potentially contribute to an increase in harm and harassment to the Florida panther. This indirect take is difficult to quantify due to the wide-ranging habit of the species and the challenge of linking the death or injury of a single panther to increases in panther interactions (intraspecific aggression) or traffic generated as a result of projects a. The adverse affects of project-generated traffic and intraspecific aggression potential, however, is not anticipated to appreciably diminish or preclude the survival and recover of the panther.

The loss of habitat from implementing the project, estimated at 2,357, taking into consideration the status of the species, remaining habitat, and other factors considered in this biological opinion; such as the overall recovery objectives and other cumulative effects from actions in the action area; will be minimized by the conservation of other, more functionally valuable habitat, which for this project is the restoration and preservation of about 4,144 acres of Primary Zone habitat in Hendry County. Taking all of the above into consideration, the Service believes the proposed implementation of the GP is not likely to jeopardize the continued existence of the Florida panther. Critical habitat has not been designated for this species; therefore, none will 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 "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 that

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 Corps so they become binding conditions of any grant or permit issued to BCSIR., as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require BCSIR, 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 Corps or BCSIR, 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

Florida Panther

The Service anticipates that incidental take of the Florida panther will be difficult to detect for the following reasons: (1) the Florida panther is wide-ranging, and (2) the lands within the boundaries of the GP project site provide various levels of habitat value to the Florida panther and panther prey species. The lands applicable to the GP are primarily within the Community Development Area and currently support agriculture uses, residential housing units, various infrastructure improvements, and recreational facilities. These lands are not located within known dispersal corridors to larger publicly owned managed lands important to the panther. Therefore, the Service does not anticipate the implementation of the GP with its associated Panther Effects Key will result in the direct mortality or injury of any Florida panthers.

However, the Service anticipates indirect take of the panther in the form of harm and harassment because of potential increases in traffic and interspecific aggression within the 25-mile radius action area. This level of incidental take may be monitored through the loss of an estimate of about 2,357 acres with an equivalent loss of 14,141 PHUs. This PHU habitat value, after applying the 2.5 base multiplier, provides a recommended compensation value of 35,352 PHU, which is the panther habitat value of the 6 WEA within the BCSIR Natural Area offered as compensation to minimize project adverse effects to the Florida panther.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined this level of anticipated take is not likely to result in jeopardy to listed species or destruction or adverse modification of critical habitat to either species.

REASONABLE AND PRUDENT MEASURES

The Service believes the Corps and the applicant have developed a project that has conservation measures necessary and appropriate to minimize the effect of incidental take of the Florida panther. In summary, to compensate for impacts for projects authorized by the GP, the BCSIR proposes to enhance and preserve 4,144 acres of habitat suitable for panthers.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply
with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline reporting/monitoring requirements. The terms and conditions described below are non-discretionary, and must be undertaken by the Corps so they become binding conditions of any grant or permit issued to BCSIR., as appropriate, for the exemption in section 7(o)(2) to apply.

The Corps has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require BCSIR 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 Corps or BCSIR 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)). Although we have not identified any specific Reasonable and Prudent Measures not incorporated in the project, we are providing the following for clarification:

1. The preservation-sites will be managed in perpetuity for the control of invasive exotic vegetation as defined by the Florida Exotic Pest Plant Council's Pest Plant List Committee's 2001 List of Invasive Species (Category 1)(2005) and managed for the benefit of the Florida panther in accordance to the management and monitoring plans provided as part of this action;

2. The Corps will provide a copy of the final permit to the Service upon issuance. The Corps will monitor the permit conditions regarding conservation measures to minimize incidental take of panthers by providing the Service a report on implementation and compliance with the conservation measure within 1 year of the issuance date of the permit;

3. For the Service to monitor effects, it is important for the Corps/Tribe to monitor the number of projects the GP is applied to and provide information to the Service regarding the number of permits issued under the GP. It is requested that information on date, Corps identification number, total project acreage, project wetland acreage, latitude and longitude in decimal degrees, and PHU values per project, per year, and GP total be sent to the Service annually.

4. Upon locating a dead, injured, or sick threatened or endangered species, initial notification must be made to the nearest Service Law Enforcement Office; Fish and Wildlife Service; 9549 Koger Boulevard, Suite 111; St. Petersburg, Florida 33702; 727-570-5398. Secondary notification should be made to the FWC; South Region; 3900 Drane Field Road; Lakeland, Florida; 33811-1299; 1-800-282-8002; and

5. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or in the handling of dead specimens to preserve biological material in the best possible state for later analysis as to the cause of death. In conjunction with the care of sick or injured panthers or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

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 NOTICE

This concludes formal consultation on the Big Cypress Regional General Permit-83. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) 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 the 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 and effort in protecting fish and wildlife resources. If you have any questions regarding this project, please contact Allen Webb at 772-562-3909, extension 246.

Sincerely yours,

Paul Souza
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Table 1
BIG CYPRESS SEMINOLE INDIAN RESERVATION (BCSIR)
Proposed Regional General Permit #83
10/17/05

PROPOSED ACTIVITY	ACRE LIMIT	DESCRIPTION OF ACTIVITIES & CONDITIONS FOR USE OF RGP
1.SINGLE FAMILY HOME SITES	1.0	Discharges of dredged or fill material in non-tidal waters of the U.S. including non-tidal wetlands, for the construction or expansion of traditional home sites that would include houses, access roads, driveways, chickees for various practices (sewing, cooking, religious practices, and other similar practices), bathhouses, and septic systems with drain fields with applicable set-backs. COMMENTS/CONSIDERATIONS: The applicant must have taken all practicable actions to minimize the on-site impacts. The discharge is part of a single and complete project; the discharges authorized under this RGP may not exceed an aggregate total loss of waters of the U.S. of 1.0 acre. This authorization is valid only for a single-family home for a personal residence.
2.UTILITY LINES	1.0	The construction, maintenance or repair of utility lines, including intake/outfall structures, and the associated excavation, backfilling or bedding, utility line substations, foundations for overhead utility line towers, cell towers, poles, and anchors; Access roads for the construction and maintenance of utility lines, including overhead power lines and utility line substations. COMMENTS/CONSIDERATIONS: The term “utility line” is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for the purpose of electrical energy, telephone, data communication, and telegraph messages, and computer, radio and television communication. The term “utility line” does not include activities which drain a water of the U.S. such as drainage tile, or □rench drains; however it does apply to pipes conveying drainage from another area. Temporary impacts from filling, flooding, excavation, or drainage, where the project area is restored to pre-construction contours and elevation, are not included in the calculation of permanent loss of waters of the U.S. This includes temporary construction mats (e.g., timber, steel, geotextile) used during construction and removed upon completion of the work. Where certain functions and values of waters of the U.S. are permanently adversely affected, such as the conversion of a forested wetland to a herbaceous wetland in the permanently maintained utility line right-of-way these will be captured as permanent impacts. The applicant must have taken all practicable actions to minimize the onsite impacts.
3.RECREATIONAL FACILITIES	1.5	Discharges of dredged or fill material in non-tidal waters of the U.S. including non-tidal wetlands for both passive and non-passive recreation use to include, but not limited to, campgrounds, swimming pools, playing fields (baseball, soccer or football), basketball and tennis courts. Also authorized are small support facilities, such as maintenance and storage buildings, restrooms and associated parking areas that are directly related to the recreational activity. COMMENTS/CONSIDERATIONS: Hotels, motels, restaurants, and other similar facilities are not authorized under this RGP. The applicant must have taken all practicable actions to minimize the onsite impacts.
4.BOATING	0.25	Noncommercial boat launching facility (ramps), parking for vehicles/trailers, associated structures-bulkheads, rub-rails, tie-up piers, and walkways. COMMENTS/CONSIDERATIONS: All practicable actions to minimize the on-site impacts must be taken. The acreage limitation includes the filled area and excavated area plus special aquatic sites and surface waters that are adversely affected.

U.S. Army Corps of Engineers
Permit # SAJ-2004-03931 (PGP-JSC)
Date: 3/5/2015
Drawing
Attachment 6 of 10

PROPOSED ACTIVITY	ACRE LIMIT	DESCRIPTION OF ACTIVITIES & CONDITIONS FOR USE OF RGP
5.AGRICULTURAL USE	1.0	Land clearing, building pads, new ditches and/or dikes, side casting from ditch construction, associated with agricultural uses. Ditches will be constructed to control both surface and ground water. Any direct, cumulative or secondary impacts will not exceed the 1.0-acre threshold. COMMENTS/CONSIDERATIONS: All practicable actions to minimize the on-site impacts must be taken.
6.COMMERCIAL USE	1.5	Small business development. However, when associated with an existing single-family homesite both the existing and proposed fill impacts will not exceed 1.5 acres. Authorization will include buildings, parking areas, septic systems with drain fields and access roads. COMMENTS/CONSIDERATIONS: All practicable actions to minimize the on-site impacts must be taken. The acreage limitation includes the filled area and excavated area plus special aquatic sites that are adversely affected.
7.GOVERNMENT FACILITIES	1.5	Includes new or additions to existing facilities such as schools, government buildings, medical facilities for associated parking areas, public works infrastructure, and other similar facilities. COMMENTS/CONSIDERATIONS: Existing facilities are those that were existing and/or under construction when this RGP is issued. All practicable actions to minimize the onsite impacts must be taken.
8. WATER CONTROL ACTIVITIES	1.0	For the construction of stormwater management facilities including excavation of stormwater ponds, the installation and maintenance of water control structures, outfall structures, and emergency spillways, including secondary impacts associated with the excavation of stormwater ponds. Also for the construction and maintenance of ditches, which includes re-shaping of existing ditches and modification of the cross-sectional configuration of currently serviceable ditches. COMMENTS/CONSIDERATIONS: None of these activities will result in an increase of the designed drainage capacity or in the designed drainage area. Any direct, cumulative or secondary impacts will not exceed the 1.0-acre threshold. If a design is not available aerial and/or historic photos will be used.
9.DITCH MAINTENANCE	None	Maintenance of existing functional ditches, limited to pre-existing ditch design and/or historic design. This applies to ditches located on existing farm fields or on existing agriculture lands. COMMENTS/CONSIDERATIONS: All practicable actions to minimize the on-site impacts must be taken. Best Management Practices will be used. Impacts associated with the maintenance activities described have no acreage or linear restrictions. If a design is not available aerial and/or historic photos will be used.
10. ROADS	1.5	Construction, expansion, modification, or improvement of existing linear transportation crossings (roadways) for safety purposes. Includes the widening of existing road shoulders or construction of new shoulders along existing roadways, using only pervious material. COMMENTS/CONSIDERATIONS: Existing roadways are those that were existing or under construction when this RGP is issued. All practicable actions to minimize the on-site impacts must be taken.

Table 2. Habitat suitability values for use in assessing habitat value to the Florida panther and land use intensity change.

Land Cover Type	Value	Land Cover Type	Value	Land Cover Type	Value
Water	0	STA	4.5	Cypress swamp	9
Urban	0	Shrub swamp	5	Sand pine scrub	9
Coastal strand	1	Shrub and brush	5	Sandhill	9
Reservoir	1.5	Dry prairie	6	Hardwood-Pine	9
Mangrove swamp	2	Grassland/pasture	7	Pine forest	9
Salt marsh	2	Freshwater marsh	9	Xeric oak scrub	10
Exotic plants	3	Bottomland hardwood	9	Hardwood forest	10
Cropland	4	Bay swamp	9		
Orchards/groves	4	Hardwood swamp	9		

Table 3.* Targeted and Acquired Acreage Totals of Conservation Lands in South Florida Directly Affecting the Panther within the Panther Focus Area.

Name	Targeted[1] Acreage	Acquired Acreage	Indian Reservation
Federal Conservation Lands			
Everglades National Park	1,508,537	1,508,537	--
Big Cypress National Preserve	720,000	720,000	--
Florida Panther National Wildlife Refuge	26,400	26,400	--
Subtotal	**2,254,937**	**2,254,937**	--
State of Florida: Florida Forever Program			
Belle Meade	28,505	19,107	--
Corkscrew Regional Ecosystem Watershed	69,500	24,028	--
Twelvemile Slough	15,653	7,530	--
Panther Glades	57,604	22,536	--
Devil's Garden	82,508	0	--
Caloosahatchee Ecoscape	18,497	2,994	--
Babcock Ranch	91,361	0	--
Fisheating Creek	176,760	59,910	--
Subtotal	**540,388**	**136,105**	--
State of Florida: Other State Acquisitions			
Water Conservation Area Number 3	491,506	491,506	--
Holey Land Wildlife Management Area	33,350	33,350	--
Rotenberger Wildlife Management Area	25,019	20,659	--
Fakahatchee Strand State Preserve	74,374	58,373	--
Picayune Strand State Forest	55,200	55,200	--
Okaloacoochee Slough State Forest and WMA	34,962	34,962	--
Babcock-Webb Wildlife Management Area	79,013	79,013	--
Subtotal	**793,424**	**773,063**	--
Indian Reservations[2]			
Miccosukee Indian Reservation	--	--	81,874
Big Cypress Seminole Indian Reservation	--	--	68,205

Name	Targeted[1] Acreage	Acquired Acreage	Indian Reservation
Brighton Seminole Indian Reservation	--	--	37,447
Subtotal	**--**	**--**	**187,526**
GRAND TOTALS	**3,588,749**	**3,164,105**	**187,526**

1 Targeted acres not available for all lands. In Such cases, targeted equals acquired acreage.

2 Indian lands are included due to their mention in the MSRP. Acreages taken from GIS data.

* Table 1was excerpted from the Brief of Amicus (2003). However, the lands shown as acquired in this table may include some private in-holdings and may include lands currently under sales negotiations or condemnation actions.

Table 4. Habitat preservation efforts resulting from formal and informal consultations with the Service for projects affecting Florida panther habitat from March 1984 through September 2007.

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
03/29/84	4-1-83-195	83M-1317	Ford Test Track	Collier	530	0	0	0
02/21/85	4-1-85-018	unknown	I-75	Broward Collier	1,517	0	0	0
10/17/86	4-1-87-016 4-1-87-017	unknown	Exxon Master Plan	Collier	9	0	0	0
01/07/87	4-1-86-303	86IPM-20130	Citrus Grove	Collier	11,178	0	0	0
01/11/88	4-1-88-029	unknown	NERCO – Clements Energy	Collier	3	0	0	0
02/23/88	4-1-88-055	unknown	Shell Western E&P	Collier Dade Monroe	0	0	0	0
02/10/89	4-1-89-001	FAP IR-75-4(88)81	SR 29/I-75 Interchange	Collier	350	0	0	0
08/15/90	4-1-90-289	unknown	I-75 Recreational Access	Collier	150	0	0	0
09/24/90	4-1-90-212	89IPD-20207	U.S. Sugar Corporation	Hendry	28,740	700	0	700
03/12/91	4-1-91-229	90IPO-02507	Lourdes Cereceda	Dade	97	0	0	0
01/14/92	4-1-91-325	199101279	Dooner Gulf Coast Citrus	Collier	40	40	0	40
09/25/92	4-1-92-340	unknown	STOF, BCSIR Citrus Grove	Hendry	1,995	0	0	0
06/18/93	4-1-93-217	199200393	Corkscrew Road	Lee	107	0	0	0
02/25/94	4-1-94-209	199301131	Daniels Road Extension	Lee	65	0	0	0
05/09/94	4-1-93-251	199202019	Corkscrew Enterprises	Lee	900	100	100	200
10/27/94	4-1-94-430	199302371 199400807 199400808	Florida Gulf Coast University Treeline Boulevard	Lee	1,088	526	0	526
05/24/95	4-1-95-230	199302130	Turner River Access	Collier	1,936	0	0	0

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
08/07/95	4-1-95-274	199405501	Bonita Bay Properties	Collier	509	491	0	491
08/15/95	4-1-94-214	199301495	SW Florida Airport Access Road	Lee	14	0	0	0
09/19/96	4-1-95-F-230	199302052 199301404	I-75 Access Points	Broward	116	0	0	0
03/10/98	4-1-98-F-3	L30 (BICY)	Calumet Florida	Collier Broward Dade	0	0	0	0
03/27/98	4-1-97-F-635	199604158	Willow Run Quarry	Collier	359	190	0	190
06/11/99	4-1-98-F-398	199800622	STOF Water Conservation Plan	Hendry	1,091	0	0	0
09/27/99	4-1-98-F-310	199130802	Daniels Parkway	Lee	2,093	0	94	94
12/08/99	4-1-98-F-517	199607574	Cypress Creek Farms	Collier	239	0	24	24
04/17/00	4-1-98-F-428	199507483	Miromar	Lee	1,323	0	194	194
06/09/00	4-1-99-F-553	199900619	Naples Reserve	Collier	833	0	320	320
02/21/01	4-1-00-F-135	199803037	Corkscrew Ranch	Lee	106	0	0	0
04/17/01	4-1-00-F-584	200001436	Sun City	Lee	1,183	0	408	408
07/30/01	4-1-94-357	199003460	Naples Golf Estates	Collier	439	175	0	175
08/31/01	4-1-00-F-183	199900411	Colonial Golf Club	Lee	1,083	0	640	640
12/14/01	4-1-00-F-585	199301156	SW Florida Airport	Lee	8,058	0	6,986	6,986
03/07/02	4-1-00-F-178	199901251	Southern Marsh Golf	Collier	121	75	80	155
04/24/02	4-1-01-F-148	199901378	Hawk's Haven	Lee	1,531	267	0	267
09/24/02	4-1-01-F-135	200001574	Verandah	Lee	1,456	0	320	320
10/08/02	4-1-02-F-014	199602945	Winding Cypress	Collier	1,088	840	1,030	1,870
05/19/03	4-1-02-F-1741	200200970	Apex Center	Lee	95	10	18	28
06/10/03	4-1-01-F-1955	200003795	Walnut Lakes	Collier	157	21	145	166
06/18/03	4-1-01-F-136	199701947	Twin Eagles Phase II	Collier	593	57	98	155
06/23/03	4-1-01-F-143	199905571	Airport Technology	Lee	116	55	175	230
07/02/03	4-1-98-F-428	199507483	Miromar Lakes	Lee	342	158	340	498
09/04/03	4-1-02-F-1486	200206725	State Road 80	Lee	33	2	12	14
10/06/03	4-1-02-F-0027	200102043	Bonita Beach Road	Lee	1,117	145	640	785
12/29/03	4-1-02-F-1743	200202926	The Forum	Lee	650	0	310	310
01/18/05	4-1-04-F-4259	199702228	Bonita Springs Utilities	Lee	79	0	108	108

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
03/31/05	4-1-04-F-5656	200306759	Gateway Shoppes II	Collier	82	0	122	122
04/08/05	4-1-04-F-8176	2004-5312	Seminole Mine	Broward	110	0	220	220
04/29/05	4-1-04-F-5780 4-1-04-F-5982	2003-5331 2003-6965	Arborwood and Treeline Avenue	Lee	2,329	0	1,700	1,700
06/06/05	4-1-03-F-7855	2003-11156	Collier Regional Medical	Collier	44	0	64	64
02/22/05 03/16/05 06/29/05 04/04/06	4-1-04-F-6866	200309416	Ava Maria DRI	Collier	5,027	0	6,114	6,114
06/29/05	4-1-03-F-3915	199806220	Wenthworth Estates	Collier	917	0	458	458
07/15/05	4-1-04-F-5786	199405829	Land's End Preserve	Collier	231	0	61	61
09/08/05	4-1-04-F-5260	200106580	Parklands Collier	Collier	489	157	434	591
09/23/05 10/26/05	4-1-04-F-9348	200101122	Super Target-Tarpon Bay Plaza	Collier	34	0	20	20
11/23/05	4-1-04-F-6043	20034914	Summit Place	Collier	108	0	61	61
11/29/05	4-1-04-F-8847	20048995	STOF Administrative Complex	Collier	6	0	8	8
12/06/05	4-1-03-F-3483	200302409	SW Florida Commerce Center	Lee	207	0	305	305
12/06/05	4-1-04-F-6691	200310689	Rattlesnake Hammock Road Widening	Collier	23	0	23	23
01/04/06	4-1-04-F-8388	2004554	Immokalee Regional Airport – Phase I	Collier	67	0	43	43
01/04/06	4-1-04-F-9777	20048577	Logan Boulevard Extension	Collier	30	0	10	10
1/13/06	4-1-04-F-6707	20042404	Journey's End	Collier	66	0	34	34
01/26/06	4-1-04-F-8940	20047053	The Orchard	Lee	93	0	81	81
02/19/06	4-1-05-F-11724	2005834	Firano at Naples	Collier	24	0	19	19
02/22/06	4-1-04-F-6504	200491	Corkscrew Road	Lee	20	0	47	47
02/23/06	4-1-04-F-5244	200312276	Summit Church	Lee	10	0	13	13
03/31/06	4-1-05-F-11343	20051909	Coral Keys Homes	Miami-Dade	41	0	61	61
05/05/06	41420-2006-I-0274	20056176	Santa Barbera , Davis to Radio Road, Widening	Collier	6	0	3	3
05/9/06	41420-2006-I-0263	20056298	Santa Barbara and Radio Road Widening	Collier	29	0	20	20
05/9/06	41420-2006-F-0089	20043248	Collier Boulevard, Immokalee Rd. to Goldengate Blvd.	Collier	14	0	16	16

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
05/16/06	4-1-05-F-10309	19971924	Sabal Bay	Collier	1,017	1,313	223	1,536
06/05/06	4-1-05-I-8486	20041688	Seacrest School	Collier	31	0	16	16
06/09/06	4-1-05-I-10965	200303733	HHJ Development	Dade	3	0	4	4
06/14/06	4-1-05-F-11855	200411010	Keysgate School	Dade	39	0	62	62
06/15/06	41420-2006-FA-0811 and I-0362	20056149	Collier County Wellfield	Collier	29	0	36	36
07/12/06	41420-2006-F-0282	200311150	Cypress Shadows	Lee	244	0	160	160
07/28/06	4-1-04-F-12330	20047920	Hamilton Place	Dade	10	0	50	50
07/28/06	4-1-04-F-7279	20041695	Raffia Preserve	Collier	131	0	119	119
08/15/06	41420-2006-I-0151	20031963	Naples Custom Homes	Collier	10	0	9	9
08/21/06	4-1-03-F-3127	19956797	Atlantic Civil Agriculture Expansion	Dade	981	0	1553	1553
08/21/06	4-1-03-I-0540	20041813	ASGM Business Park	Collier	41	0	25	25
9/12/06	41420-2006-FA-0589 and F-0554	20037414	Miccosukee Government Complex	Dade	17	0	37	37
9/22/06	41420-2006-I-0355	20040047	Immokalee Seminole Reservation Road Improvements	Collier	17	0	35	35
10/16/06	41420-2006-FA-1488 and F-0442	199507483	Miromar Lakes Addition	Lee	366	0	390	390
10/05/06	41420-2006-I-0616	20065295	New Curve on Corkscrew Road	Lee	12	0	18	18
10/18/06	41420-2007-FA-0029 and F-0787	2004777	Treeline Preserve	Lee	97	0	95	95
10/25/06	41420-2006-FA-1129 and F-0442	20047046	Koreshan Boulevard Extension	Lee	14	0	31	31
10/26/06	41420-2006-FA-1636 and F-0787	200306755	Jetway Tradeport	Lee	38	0	51.5	52

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
10/26/06	41420-2006-I-0849	20055702	Marina Del Lago	Lee	49	0	36	36
10/27/06	41420-2006-I-0203	20057180	Living Word Family Church	Collier	18	0	35	35
10/30/06	41420-2006-I-0607	200604878	SeminoleTribe Access Road	Hendry	2	0	5	5
11/15/06	41420-2006-TA-0727	N/A	Liberty Landing	Collier	27	0	19	19
11/15/06	41420-2007-FA-0222	200412415	5th Avenue Estates	Dade	15	0	18	18
11/16/06	41420-2006-TA-0060	N/A	Collier County Elementary School K	Collier	26	0	17	17
12/5/06	41420-2006-I-0883	20057179	Roberts Group	Lee	46	0	18	18
12/7/06	41420-2006-I-0327	20041689	Cypress Landing	Collier	59	0	29	29
1/19/07	41420-2006-I-0871	20061359	Brighton Veteran's Center	Glades	9	0	8.1	8.1
03/09/07	41420-2006-F-0850	200312445	Airport Interstate Commerce Park	Lee	323	0	371	371
03/09/07	4-1-04-F-6112	20021683	Alico Airpark (Haul Ventures)	Collier	241	75	315	390
04/13/07	41520-2007-TA-0618	NA	Collier County School Site J-Everglades Blvd.	Collier	39	0	56	56
05/01/07	41420-2006-FA-0756	2004-5223	Seminole Motocross	Hendry	58	5	19	23
02/21/03 03/09/05 03/02/07 05/03/07	4-1-01-F-607 41420-2007-F-0674	200001926	Mirasol	Collier	773	940	182	1,122
05/04/07	41420-2007-TA-0623	NA	Abercia North	Collier	25	0	31	31
05/07/07	41420-2007-I-0581	1999-4313	Savanna Lakes	Lee	124	0	140	140
06/19/07	41420-2007-I-0997	2006-2583	Caloosa Reserve	Collier	111	0	139	139
07/03/07	41420-2007-TA-0818	NA	Woodcrest	Collier	11	0	15	15
07/17/07	41420-2007-I-0330	2006-6377	Faith Landing	Collier	35	0	18	18
07/31/07	41420-2007-I-0866	2006-7022	Collier County School Site L	Collier	32	0	21	21
06/14/04 03/21/05 08/24/07	4-1-04-F-5744 41420-2007-F-0677	199603501	Terafina	Collier	438	210	252	462
9/5/07	41420-2006-I-0051	2005-4186	FL Gulf Coast Landfill	Lee	123	0	65	65
10/31/07	41420-2007-F-1035	2004-3931	Seminole Tribe – BCSIR GP	Hendry	2337	4144	0	4144
				Totals	91,737	10,6961	26,711	37,407

Table 5: Undeveloped Privately Owned Land within Florida Panther Core Area

	Acres	Primary Equivalent Factor	Primary Equivalent Acres
Primary	610,935	1.00	610,935
Dispersal	27,883	1.00	27,883
Secondary	503,481	0.69	347,402
Other	655,996*	0.33	216,479

- About 819,995 acres are at risk in the other zone with about 80 percent with resource value

Table 6: Land Held for Conservation within the Florida Panther Core Area

	Acres	Primary Equivalent Factor	Primary Equivalent Acres
Primary	1,659,657	1.00	1,659,657
Dispersal	0	1.00	0
Secondary	308,623	0.69	212,950
Other	609,872	0.33	201,258

Table 7. Landscape Compensation Multipliers

Zone of Impacted Lands	Zone of Compensation Lands	Multiplier
Primary	Secondary	1.45
Secondary	Primary	0.69
Other	Secondary	0.48
Other	Primary	0.33

Table 8. Panther-Vehicle Collisions within the BCSIR Action Area as of September 26, 2007.

Year	Panther No	SEX	LOCATION	Distance from Project Miles	DIRECTION	Result
2/7/1980	UCFP05-(G80-15)	M	SR 29 NEAR SUNNILAND	23.1	W	DEATH
6/17/1987	FP20	M	CR 858 .8 M E SR 29	21.8	W	INJURY
12/14/1987	FP13	M	SR 29 SUNNILAND	23.2	W	DEATH
6/18/1990	UCFP19-(RK-846)	M	CR 835 (846) 1 M E CR 833	9.8	N	DEATH
2/4/1991	UCFP20-(FP11'S)	F	SR 29 PISTOL POND BRIDGE	23.3	W	DEATH
11/9/1992	UCFP21-(FP19'S)	F	SR 29 SUNNILAND	23.2	W	DEATH
12/6/1993	FP50	M	CR 846 5 M E OF IMMOKALEE	23.4	W	DEATH
2/28/1994	UCFP23-(FP52'S)	M	3 M N ON COUNTY LINE ROAD	19.4	W	DEATH
3/3/1994	FP31	F	SR 29 SUNNILAND	23.2	W	DEATH
9/21/1995	TX102	F	CR 833 JUST N CR 835 (846)	10.4	N	DEATH
7/13/1997	UCFP31	U	CR 846 1.5 M W CR 858	23.0	W	DEATH
6/13/1998	UCFP25	F	CR 846 3 M E CR 858	16.7	NW	DEATH
7/17/1998	FP51	M	SR 29 @ BEAR ISLAND GRADE	23.9	W	DEATH
7/8/1999	UCFP27	F	FARM ROAD E HENDRY PRISON	13.4	W	DEATH
10/29/1999	UCFP33	M	CR 833 2 MI N BCSIR	6.4	NW	DEATH
2/10/2000	FP80	F	200 FT. W SWAMP SAFARI, BCSIR	5.6	W	DEATH
2/28/2000	K76-(FP66)	M	1 MI W SR 29, ON CR 858	24.5	W	DEATH
3/23/2000	UCFP34	M	CR846 2 MILES E COUNTY LINE	17.7	NW	DEATH

Year	Panther No	SEX	LOCATION	Distance from Project Miles	DIRECTION	Result
8/13/2000	UCFP36	F	CR 846 E IMMOK. NEAR POWERLINE	18.7	NW	DEATH
12/29/2000	UCFP37	F	4.5 MI E SR29 ON CR846	24.3	W	DEATH
4/14/2001	UCFP38	F	CR 833 1 MI N BCSIR, HENDRY CO	4.8	NW	DEATH
5/22/2001	UCFP41	M	SR 29 SUNNILAND, NEAR MINE RD	23.2	W	DEATH
6/14/2001	UCFP42	F	CR846, 1 MILE EAST POWERLINE	17.3	NW	DEATH
8/17/2001	UCFP43	M	CR846 1 MILE EAST OF POWERLINE	17.1	NW	DEATH
7/1/2002	FP98	M	1 KM N PISTOL POND, SR 29	23.2	W	DEATH
11/10/2002	UCFP48	F	CR846 5-6 MI E IMMOKALEE	23.1	W	DEATH
2/20/2003	FP106	F	SR29 AT SUNNILAND MINE ENTRANCE	23.2	W	DEATH
3/20/2003	UCFP52	M	CR833, 2MI S CR832, HENDRY CO.	21.5	NW	DEATH
5/25/2003	UCFP53	F	SR29, 1.4 MI N CR858, COLLIER	23.3	W	DEATH
6/3/2003	UCFP54	M	SR29, 1.7 MI N CR858, COLLIER	23.3	W	DEATH
11/2/2003	UCFP59	F	CR 858, 1.2 miles west of SR 29	24.3	W	DEATH
12/25/2003	UCFP61	F	CR833, 1.7 MI N CR846 INTERSECTION	16.4	NW	DEATH
4/6/2004	UCFP65	M	SR29, 200 YD N BEAR ISLAND GRADE	23.8	W	DEATH
10/25/2004	UCFP69	F	SR 29 2.5 miles N of CR 858	23.4	W	DEATH
12/1/2004	UCFP70	F	SR 29 at Owl Hammock Curve	23.8	W	DEATH
6/19/2005	UCFP75	M	SR 29 at Owl Hammock Curve	23.7	W	DEATH
1/25/2006	UCFP78	M	CR846 1 mi W of CR858	21.6	W	DEATH
12/12/2006	UCFP89	M	County Line Road, Collier/Hendry	20.0	W	DEATH
9/12/2007	UCFP102	M	I-75, 1.5 miles east of SR29	23.6	W	DEATH

Table 9. County and State Acquisitions within the Action Area (Acres)

Year	County and State
2000	0
2001	0
2002	0
2003	21,724
2004	2000
2005	562
Totals	24,286

Table 10 – Panther Functional Units
6 Wetland Enhancement Areas within the
BCSIR Native Area

Habitat Type	*Assigned value*	*WEA 1*	*WEA 2*	*WEA 3*	*WEA 4*	*WEA 5*	*WEA 6*	*PHUs Pre*	*PHUs Post*
Xeric oak scrub	10							0	0
Hardwood forest	10							0	0
Freshwater marsh	9	15	16	25	84	42	20	1,810	1,810
Bottomland hardwood	9							0	0
Bay swamp	9							0	0
Hardwood swamp	9	5	358	5	29	8	0	3,652	3,652
Cypress swamp	9	56		362	897	814	11	19,260	19,260
Sand pine scrub	9							0	0
Sandhill	9							0	0
Hardwood-pine forest	9	36	36	114	173	135	17	4,604	4,604
Pine forest	9		122	61	127			2,789	2,789
Grassland/pasture	7			35	26	20	3	592	592
Dry prairie	6							0	0
Shrub swamp	5							0	0
Shrub and brush	5							0	0
STA	4.5							0	0
Crop land	4							0	0
Orchards/groves	4							0	0
Exotic plants*	3	36	12	154	120	98	61	1,442	2,644
Mangrove swamp	2							0	0
Salt marsh	2							0	0
Reservoir	1.5							0	0
Coastal strand	1							0	0
Water	0				0	0	0	0	0
Urban	0				3	2	4	0	0
	Sum	148	544	756	1,459	1,119	117	34,150	35,352
	Total Acres	**4,144**				**Total PHU's**	**35,352**		

Table 11

FLUCCS Codes and PHU Values for Lands within GP Boundaries

COVER_TYPE	Habitat Values	ACRES	PHUs
Crop Land	4	482	1,929
Cypress Swamp	9	1,275	11,477
Dry Prairie	6	488	2,926
Freshwater Marsh	9	2,668	24,008
Grassland/Pasture	7	9,166	64,164
Hardwood Forest	10	113	1,130
Hardwood Swamp	9	3,250	29,249
Hardwood-Pine Forest	9	11	102
Orchards/Groves	4	1,858	7,431
Pine Forest	9	959	8,633
Shrub Swamp	5	723	3,614
Shrub and Brush	5	31	157
Urban	0	4,090	0
Water	0	48	0
TOTAL		**25,163**	**154,820**
	PHU Average Value		6

Table 12. GP Consultation Area Project List – Panthers

PROJECT NAME	ACREAGE
SEMINOLE TRACKS	0
SEMINOLE TRACKS	396
GOLDEN OX	1,285
FISH BRANCH CREEK	0
ARROWHEAD RESERVE	106
FARM WORKERS VILLAGE ACCESS RD	0
PRIDE CITRUS DEVELOPMENT	0
SUMMER GLEN APARTMENTS	7
IMMOKOLEE SENIOR HOUSING	8
DAVENPORT	31
FAITH LANDING RPUD	35
GARDEN LAKE APARTMENTS	7
TIMBER RIDGE	11
R. ROBERTS ESTATE	45
COLLIER VILLAGE	40
GARDEN WALK VILLAGE	17
ARROWHEAD	301
LAKE TRAFFORD MARINA	5
PRICE	18
FORD TEST CENTER	554
SANDERS PINES	5
CYPRESS GREEN APTS. (Willowbrook)	5
HARVEST FOR HUMANITY	38
HERITAGE (Heritage PUD)	351
Total	**3,266**

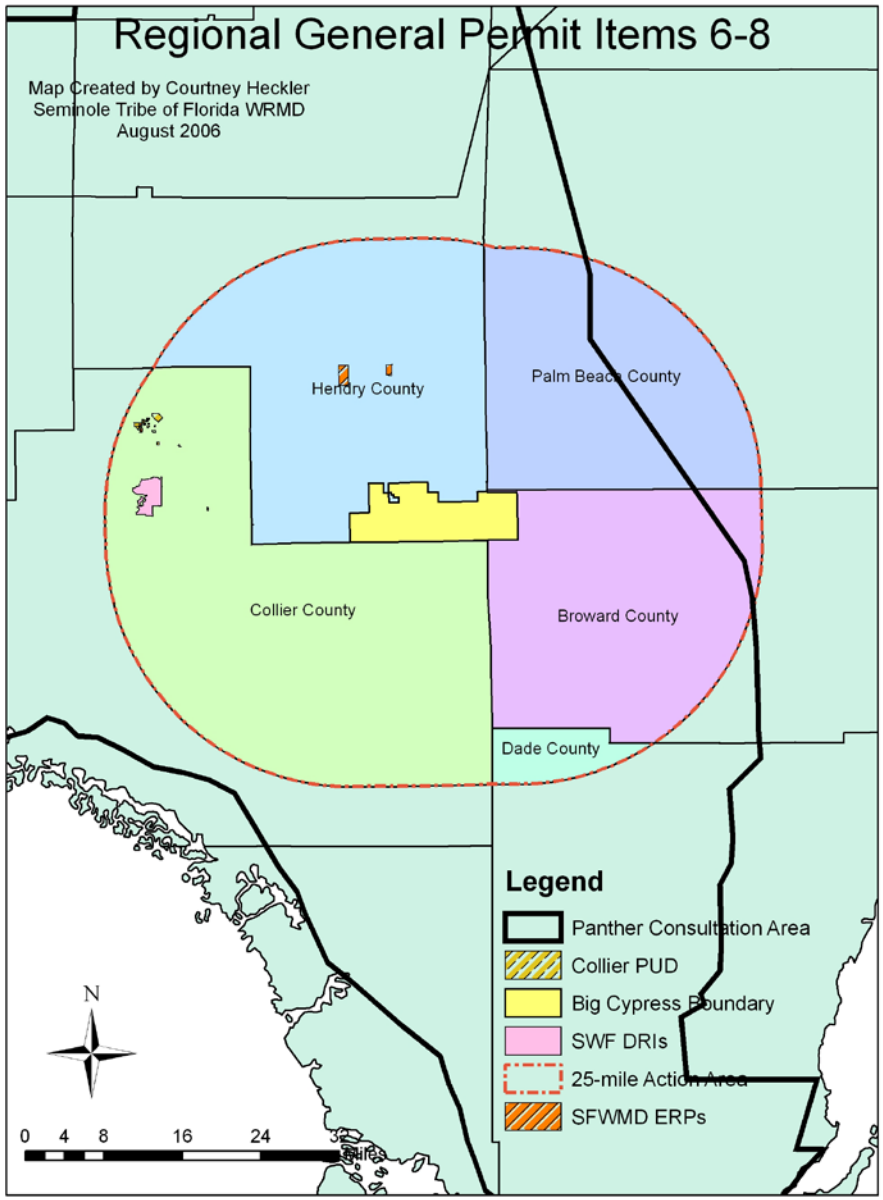

Regional General Permit Items 6-8
Map Created by Courtney Heckler
Seminole Tribe of Florida WRMD
August 2006
Hendry County
Palm Beach County
Collier County
Broward County
Dade County
Legend
Panther Consultation Area
Collier PUD
Big Cypress Boundary
SWF DRIs
25-mile Action Area
SFWMD ERPs
N
0 4 8 16 24

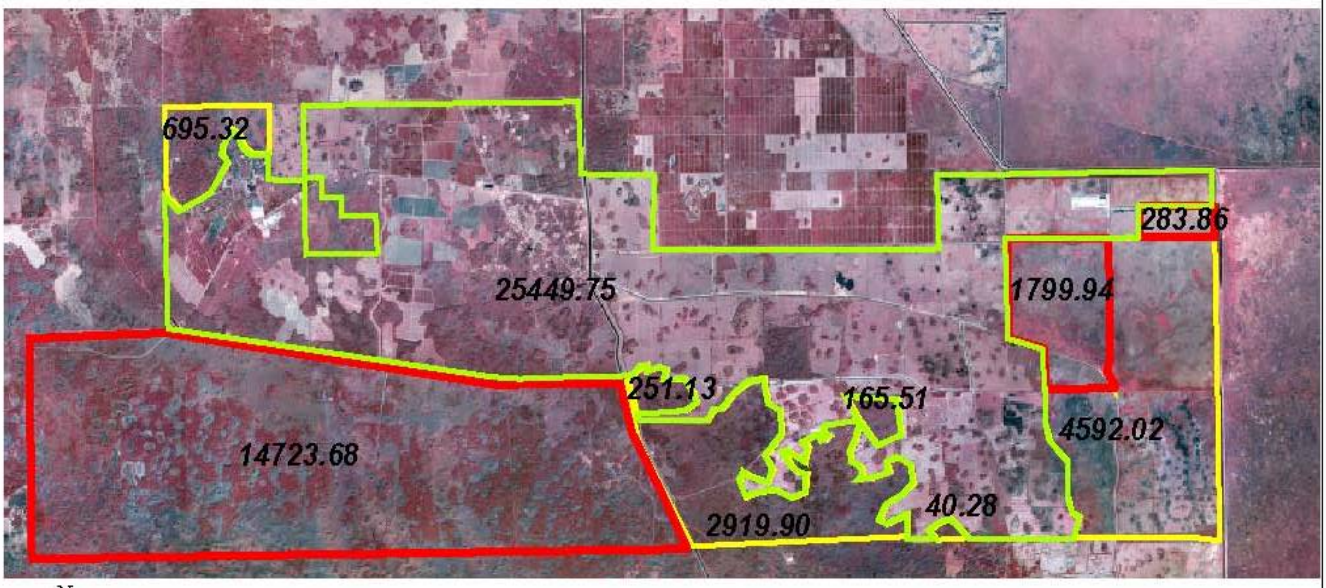
Figure 1

General Location

Big Cypress Seminole Indian Reservation

Attachment A

Seminole Regional General Permit



N
W E
S

0 0.5 1 2 3 4 Miles

Legend

- Included in GP
- Excluded from GP
- GP with Coordination

Numbers in polygons are in acres. Acreage is approximate.

Figure 2

Regional General Permit Site Locations

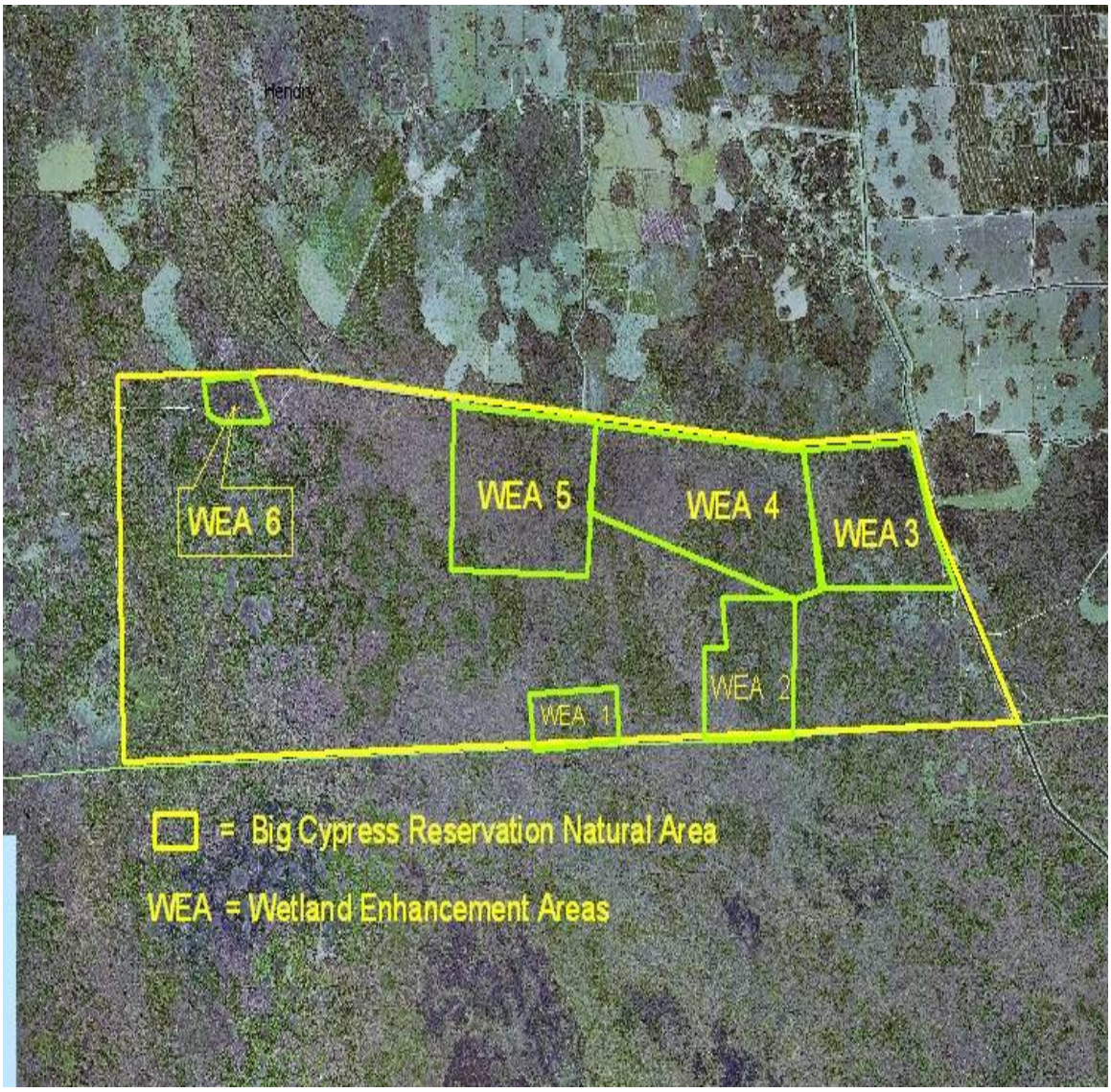
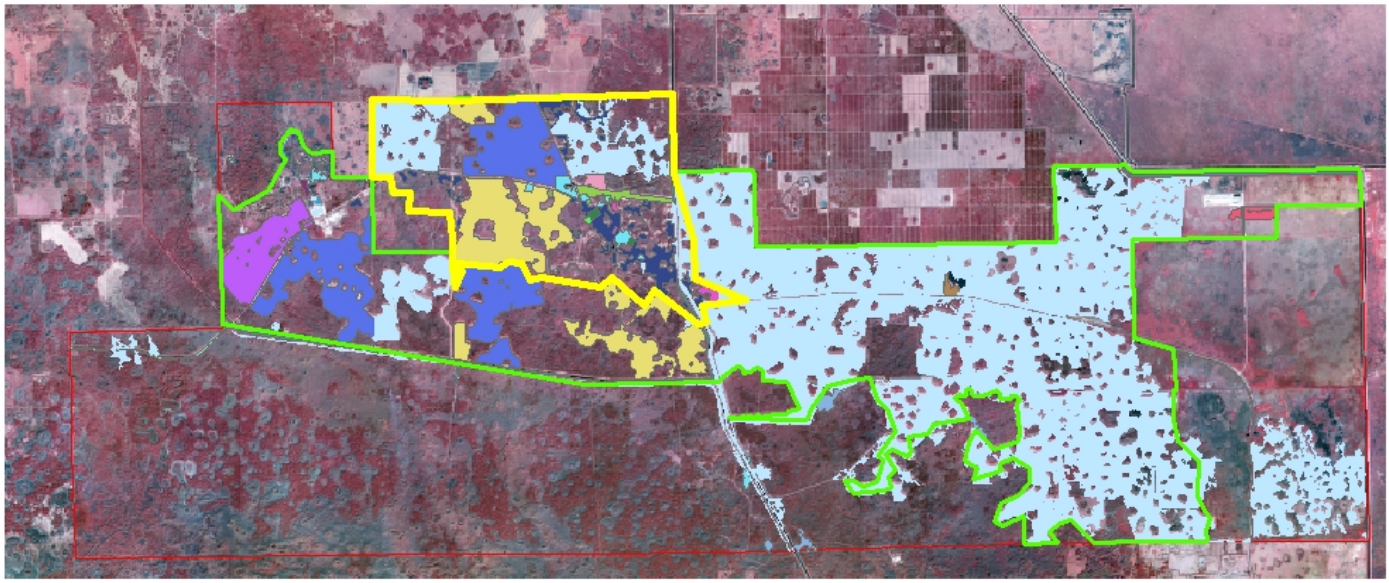

Hendry
WEA 6
WEA 5
WEA 4
WEA 3
WEA 2
WEA 1
= Big Cypress Reservation Natural Area
WEA = Wetland Enhancement Areas

Figure 3

Big Cypress Seminole Indian Reservation Native Area

Advance Mitigation Parcel

Seminole Regional General Permit
Proposed "Community Development Area"



Airports
Cemeteries
Citrus
Commercial & Services
Communications
Community Recreational Facilities
Cultural and Entertainment
Disturbed Lands
Educational Facilities
Extractive (surface and subsurface mining)
Improved Pasture
Recreational
Religious
Residential
Roads
Row Crops
Sand and Gravel Pits
Sewage Treatment
Spoil Areas
Tourist Services
Tree Crops
Unimproved Pasture

Legend

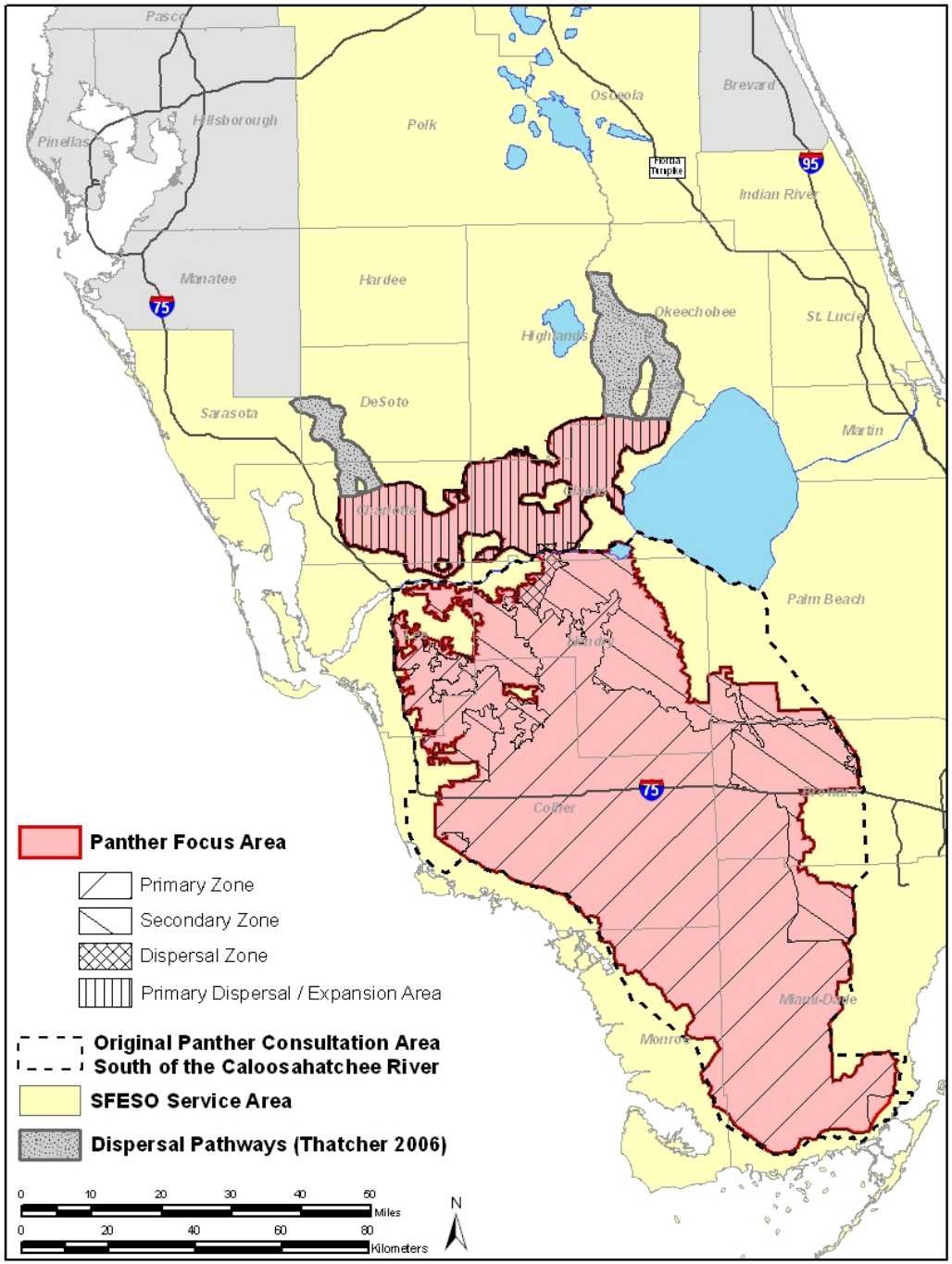
GP Applicable
Community Development Area

N
W
E
S

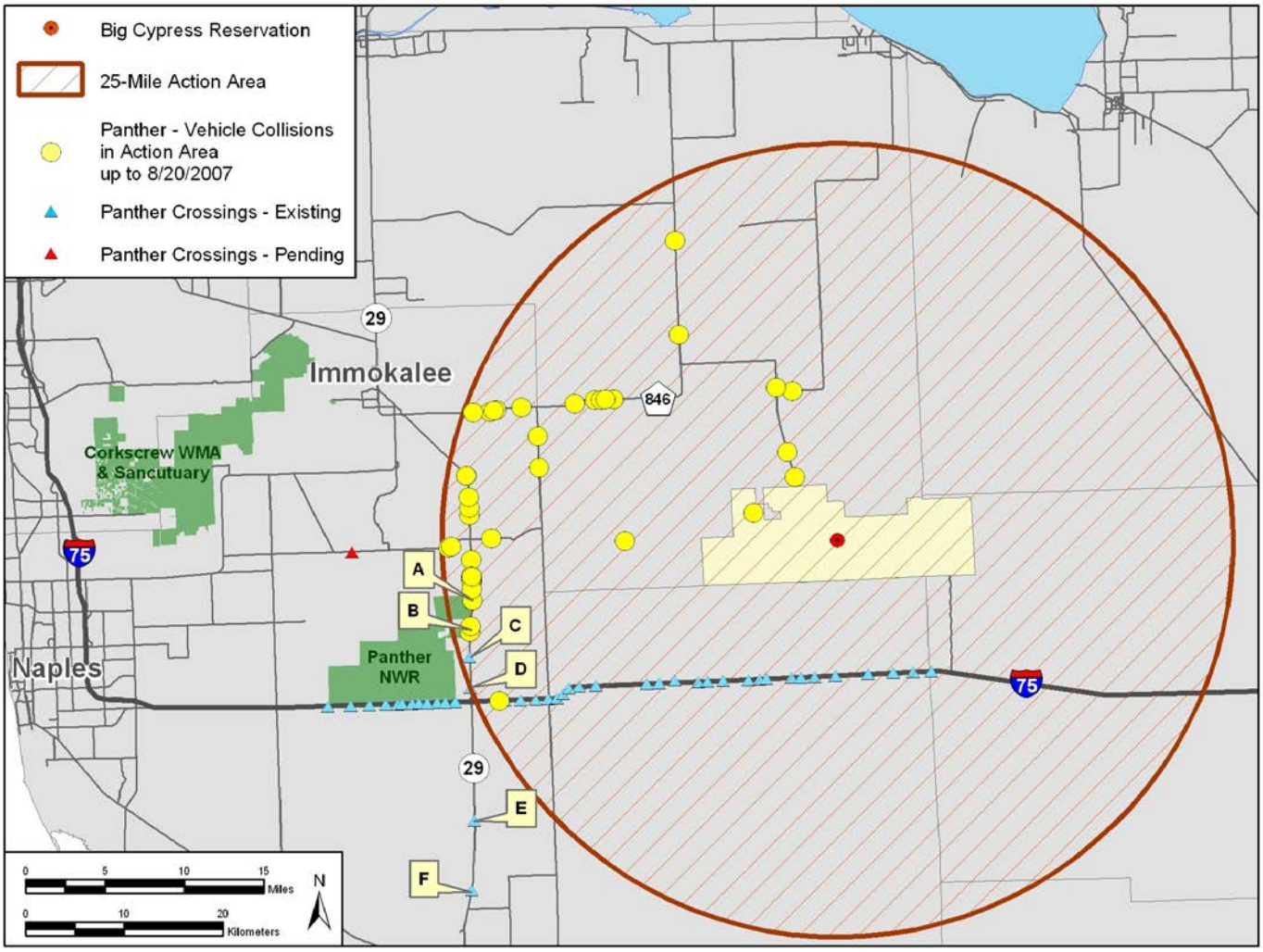
0 0.375 0.75 1.5 2.25 3 Miles

Big Cypress Seminole Indian Reservation

Community Development Area


Pasco
Hillsborough
Pinellas
Polk
Osceola
Brevard
Florida Turnpike
95
Indian River
Manatee
Hardee
75
Okeechobee
St. Lucie
Highlands
Sarasota
DeSoto
Martin
Charlotte
Glades
Palm Beach
Hendry
Collier
Miami-Dade
Monroe
Panther Focus Area
Primary Zone
Secondary Zone
Dispersal Zone
Primary Dispersal / Expansion Area
Original Panther Consultation Area South of the Caloosahatchee River
SFESO Service Area
Dispersal Pathways (Thatcher 2006)
0 10 20 30 40 50
Miles
0 20 40 60 80
Kilometers
N

Panther Focus Area


Big Cypress Reservation
25-Mile Action Area
Panther - Vehicle Collisions in Action Area up to 8/20/2007
Panther Crossings - Existing
Panther Crossings - Pending
Immokalee
Corkscrew WMA & Sancutuary
Naples
Panther NWR
29
846
75
A
B
C
D
E
F
0 5 10 15 Miles
0 10 20 Kilometers
N

Panther – Vehicle Collisions within 25-mile Action Area
And
Proposed and Installed Road Crossings

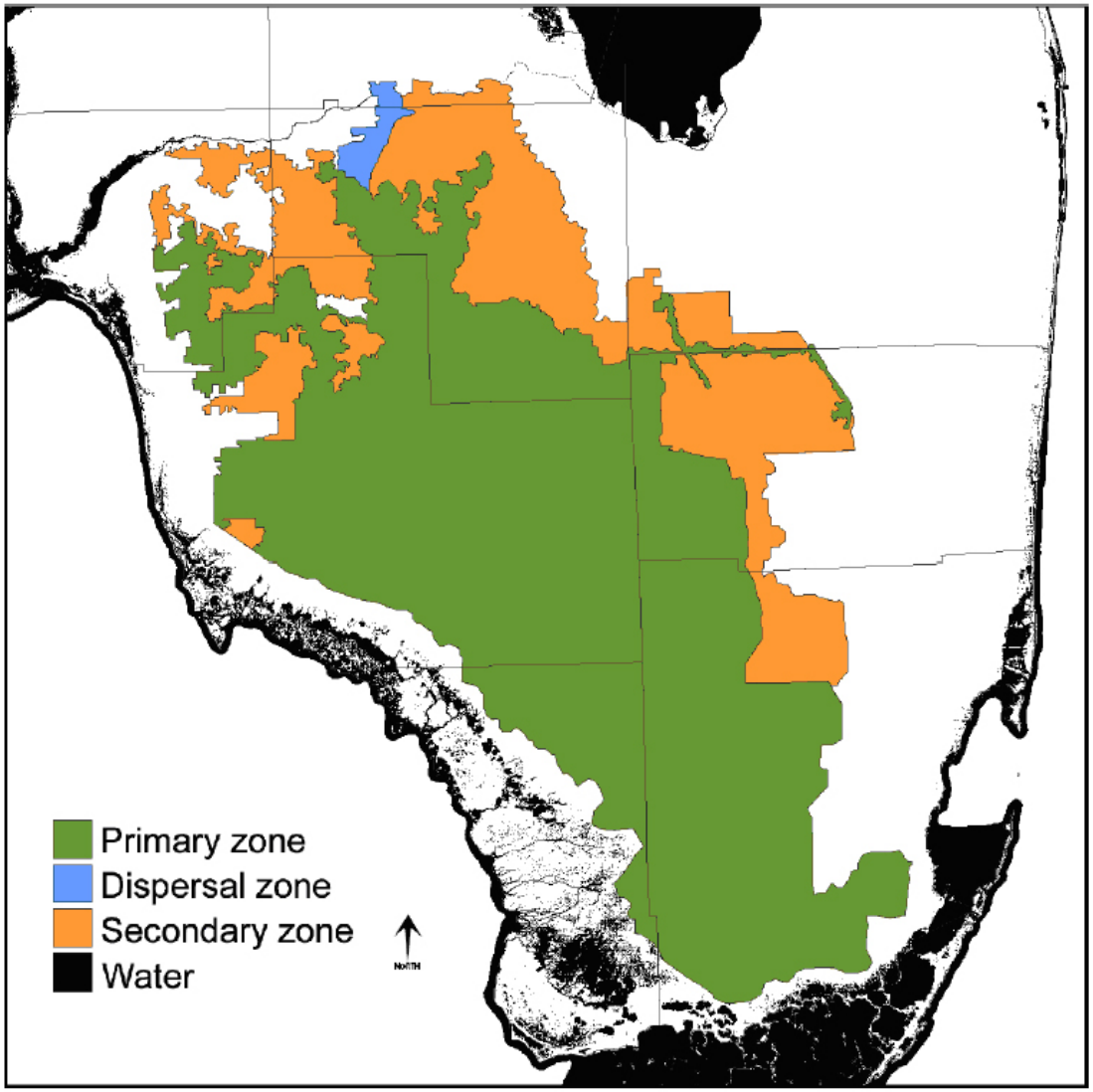
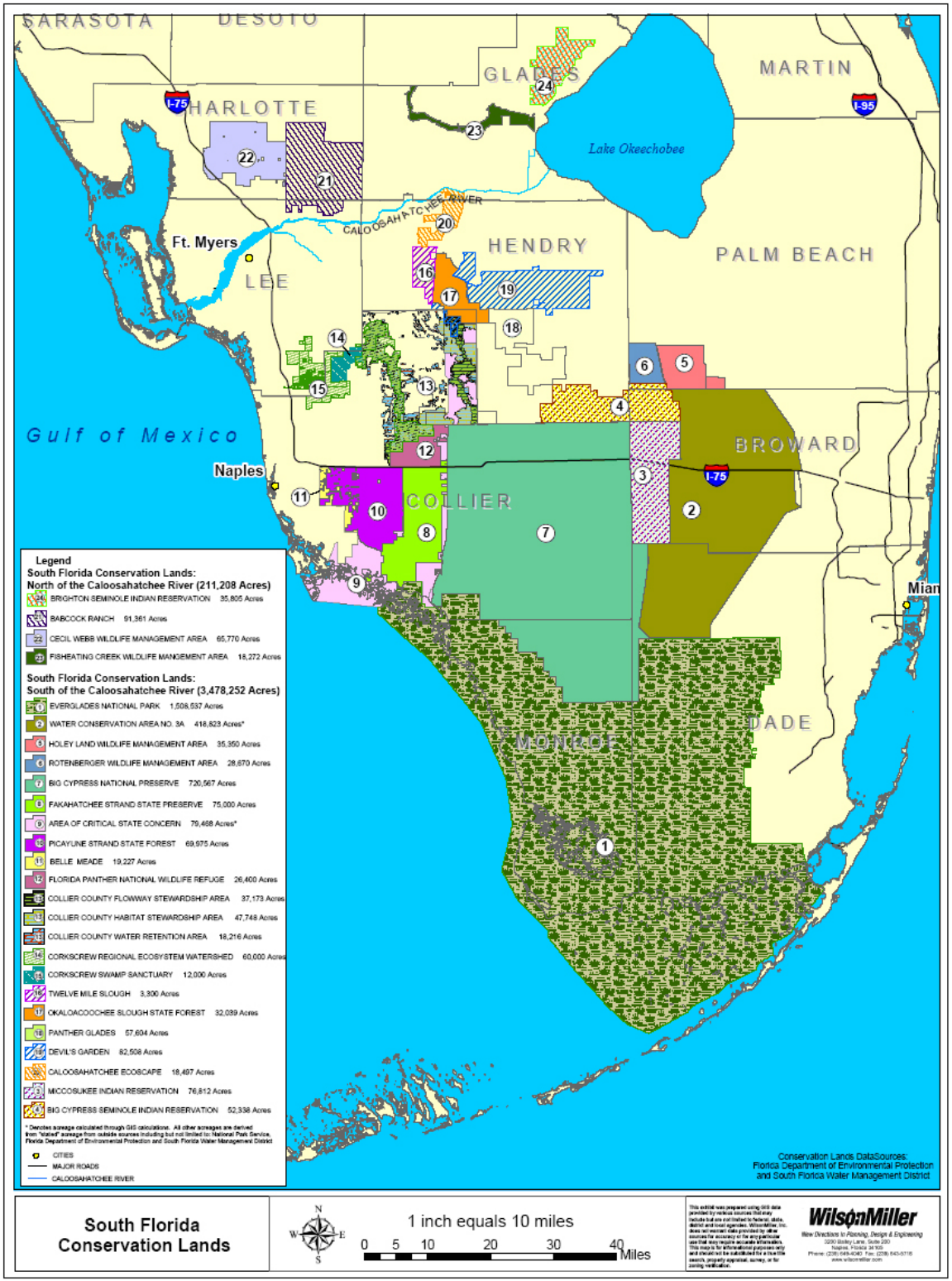


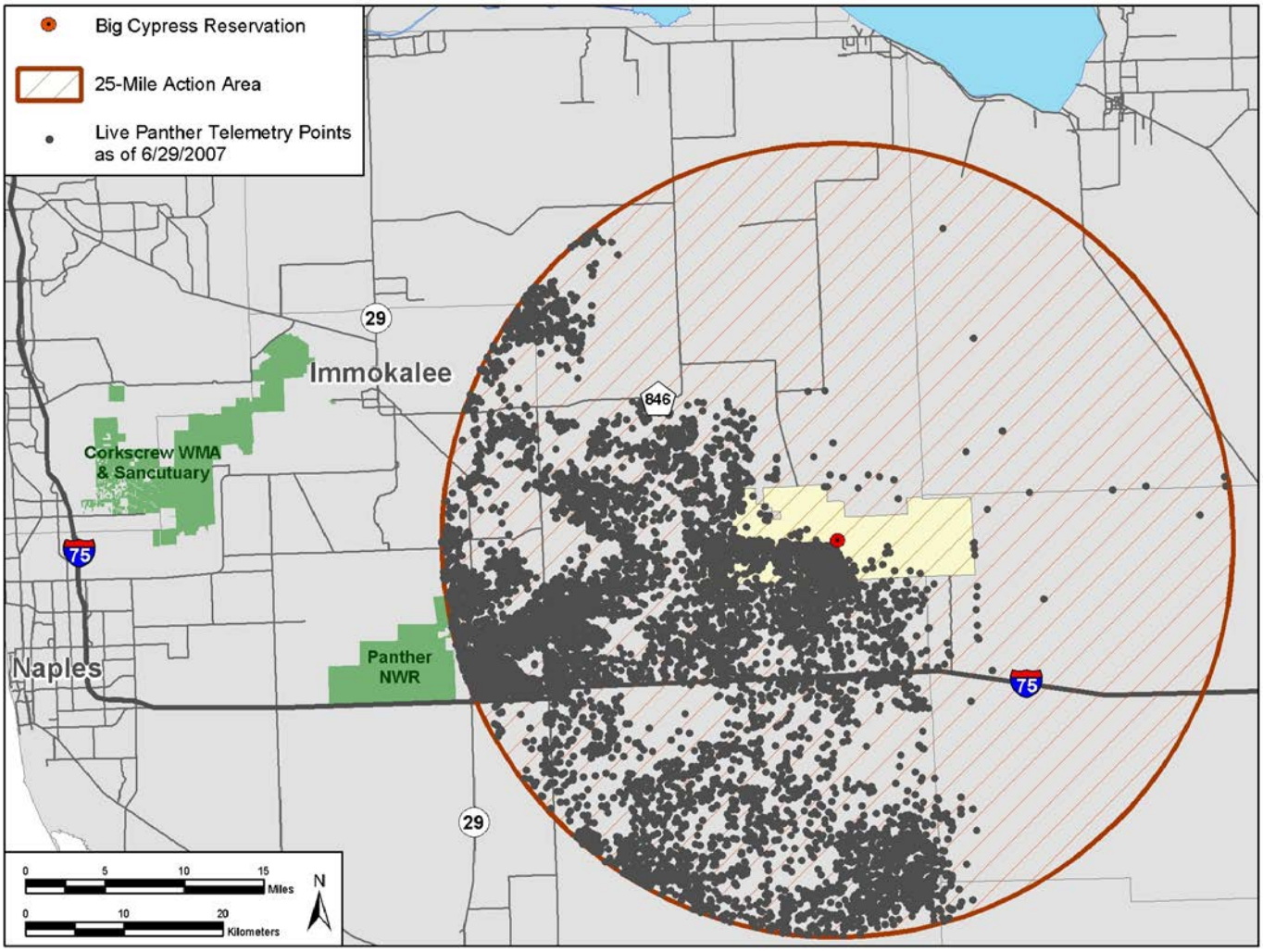
Figure 7

Kautz et al 2006

Primary Secondary and Dispersal Zones

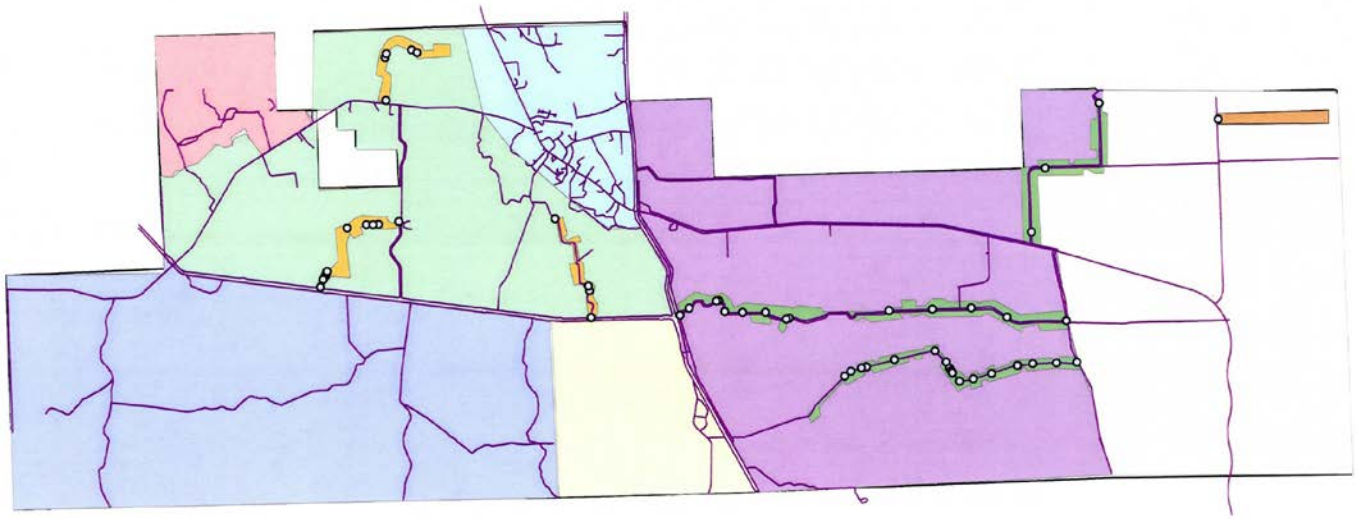

SARASOTA
DESOTO
GLADES
MARTIN
CHARLOTTE
I-75
I-95
Lake Okeechobee
CALOOSAHATCHEE RIVER
Ft. Myers
LEE
HENDRY
PALM BEACH
Gulf of Mexico
Naples
BROWARD
COLLIER
MONROE
DADE
Legend
South Florida Conservation Lands:
North of the Caloosahatchee River (211,208 Acres)
BRIGHTON SEMINOLE INDIAN RESERVATION 35,805 Acres
BABCOCK RANCH 91,361 Acres
CECIL WEBB WILDLIFE MANAGEMENT AREA 65,770 Acres
FISHEATING CREEK WILDLIFE MANGEMENT AREA 18,272 Acres
South Florida Conservation Lands:
South of the Caloosahatchee River (3,478,252 Acres)
EVERGLADES NATIONAL PARK 1,508,537 Acres
WATER CONSERVATION AREA NO. 3A 418,823 Acres*
HOLEY LAND WILDLIFE MANAGEMENT AREA 35,350 Acres
ROTENBERGER WILDLIFE MANAGEMENT AREA 28,670 Acres
BIG CYPRESS NATIONAL PRESERVE 720,567 Acres
FAKAHATCHEE STRAND STATE PRESERVE 75,000 Acres
AREA OF CRITICAL STATE CONCERN 79,468 Acres*
PICAYUNE STRAND STATE FOREST 69,975 Acres
BELLE MEADE 19,227 Acres
FLORIDA PANTHER NATIONAL WILDLIFE REFUGE 26,400 Acres
COLLIER COUNTY FLOWWAY STEWARDSHIP AREA 37,173 Acres
COLLIER COUNTY HABITAT STEWARDSHIP AREA 47,748 Acres
COLLIER COUNTY WATER RETENTION AREA 18,216 Acres
CORKSCREW REGIONAL ECOSYSTEM WATERSHED 60,000 Acres
CORKSCREW SWAMP SANCTUARY 12,000 Acres
TWELVE MILE SLOUGH 3,300 Acres
OKALOACOOCHEE SLOUGH STATE FOREST 32,039 Acres
PANTHER GLADES 57,604 Acres
DEVIL'S GARDEN 82,508 Acres
CALOOSAHATCHEE ECOSCAPE 18,497 Acres
MICCOSUKEE INDIAN RESERVATION 76,812 Acres
BIG CYPRESS SEMINOLE INDIAN RESERVATION 52,338 Acres
* Denotes acreage calculated through GIS calculations. All other acreages are derived from "stated" acreage from outside sources including but not limited to: National Park Service, Florida Department of Environmental Protection and South Florida Water Management District
CITIES
MAJOR ROADS
CALOOSAHATCHEE RIVER
Conservation Lands DataSources:
Florida Department of Environmental Protection
and South Florida Water Management District
South Florida
Conservation Lands
N
W
E
S
1 inch equals 10 miles
0 5 10 20 30 40 Miles
WilsonMiller
New Directions in Planning, Design & Engineering

Florida Conservation Lands


Big Cypress Reservation
25-Mile Action Area
Live Panther Telemetry Points as of 6/29/2007
Immokalee
Corkscrew WMA & Sancutuary
Naples
Panther NWR
29
846
75
0 5 10 15 Miles
0 10 20 Kilometers
N

Live Panther Telemetry Points
Within a 25-mile Radius

BC Reservation Spotlight Survey Map



Legend

BC_Streets

Property Areas

- 1 - Swamp Safari
- 2 - Hunting Adventures
- 3 - Sawgrass Marsh
- 4 - Pasture
- 5 - Agriculture
- 6 - Native Area
- 7 - Residential Area

Spotlight View Corridors

- Area 3
- Area 4
- Area 5
- Spotlight Sightings

N
W E
S

0 0.5 1 2 3 4 Miles

The spotlight surveys were conducted starting approximately 1 hour after nightfall. The indicated view corridors are based on the distance out from the road that the spotlight beam effectively lit up and allowed for observations to be made. Narrow areas were blocked by either vegetation or spoil mounds along the canals.

Figure 10

Deer and Hog Survey Areas

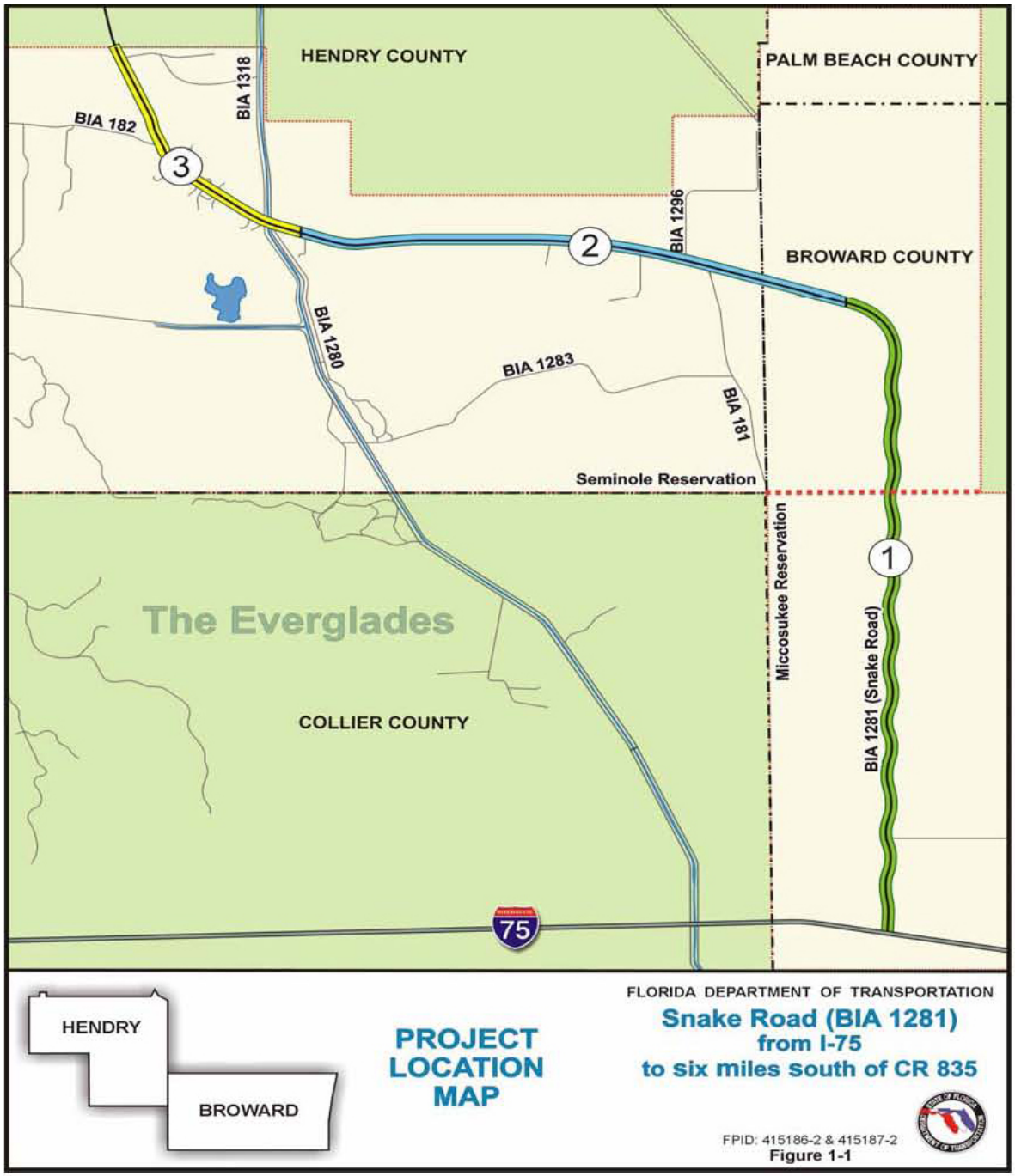

HENDRY COUNTY
PALM BEACH COUNTY
BROWARD COUNTY
COLLIER COUNTY
Seminole Reservation
Miccosukee Reservation
The Everglades
BIA 182
BIA 1318
BIA 1296
BIA 1280
BIA 1283
BIA 181
BIA 1281 (Snake Road)
1
2
3
75
HENDRY
BROWARD
PROJECT LOCATION MAP
FLORIDA DEPARTMENT OF TRANSPORTATION
Snake Road (BIA 1281)
from I-75
to six miles south of CR 835
FPID: 415186-2 & 415187-2
Figure 1-1

Figure 11

Major Roadways within the BCSIR

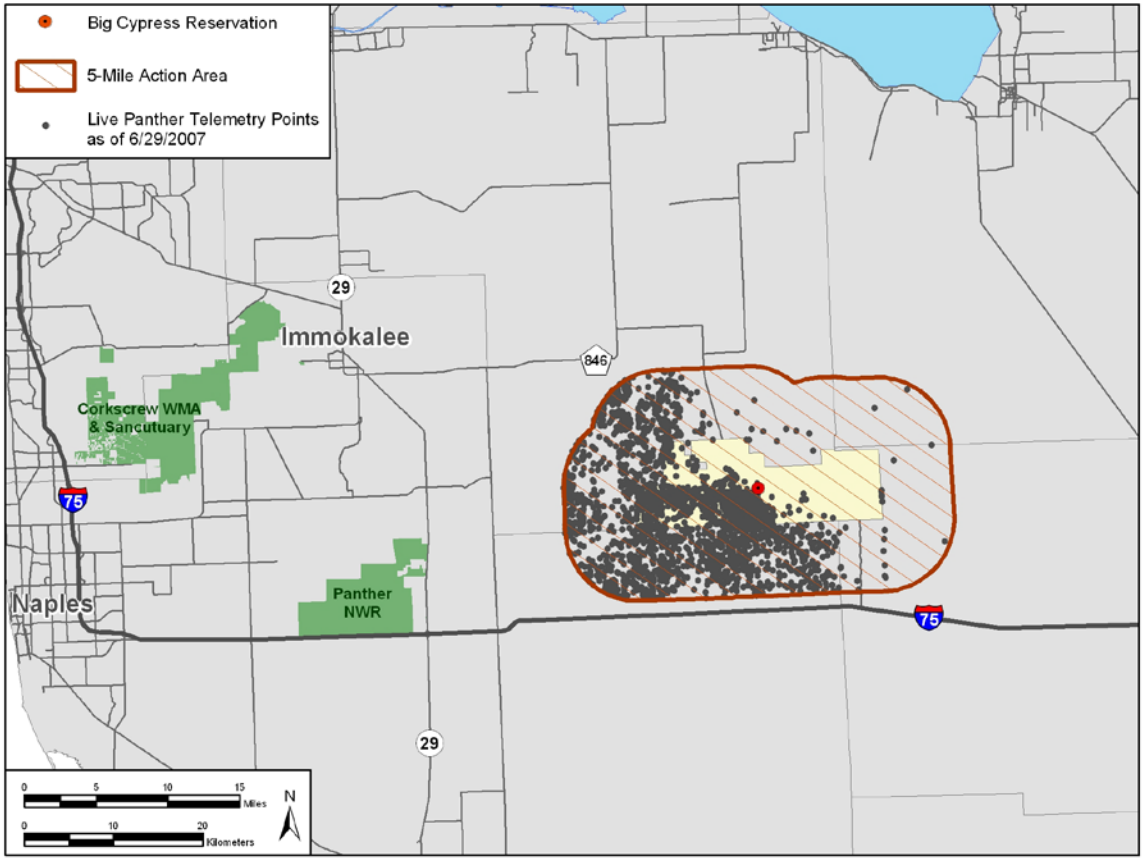
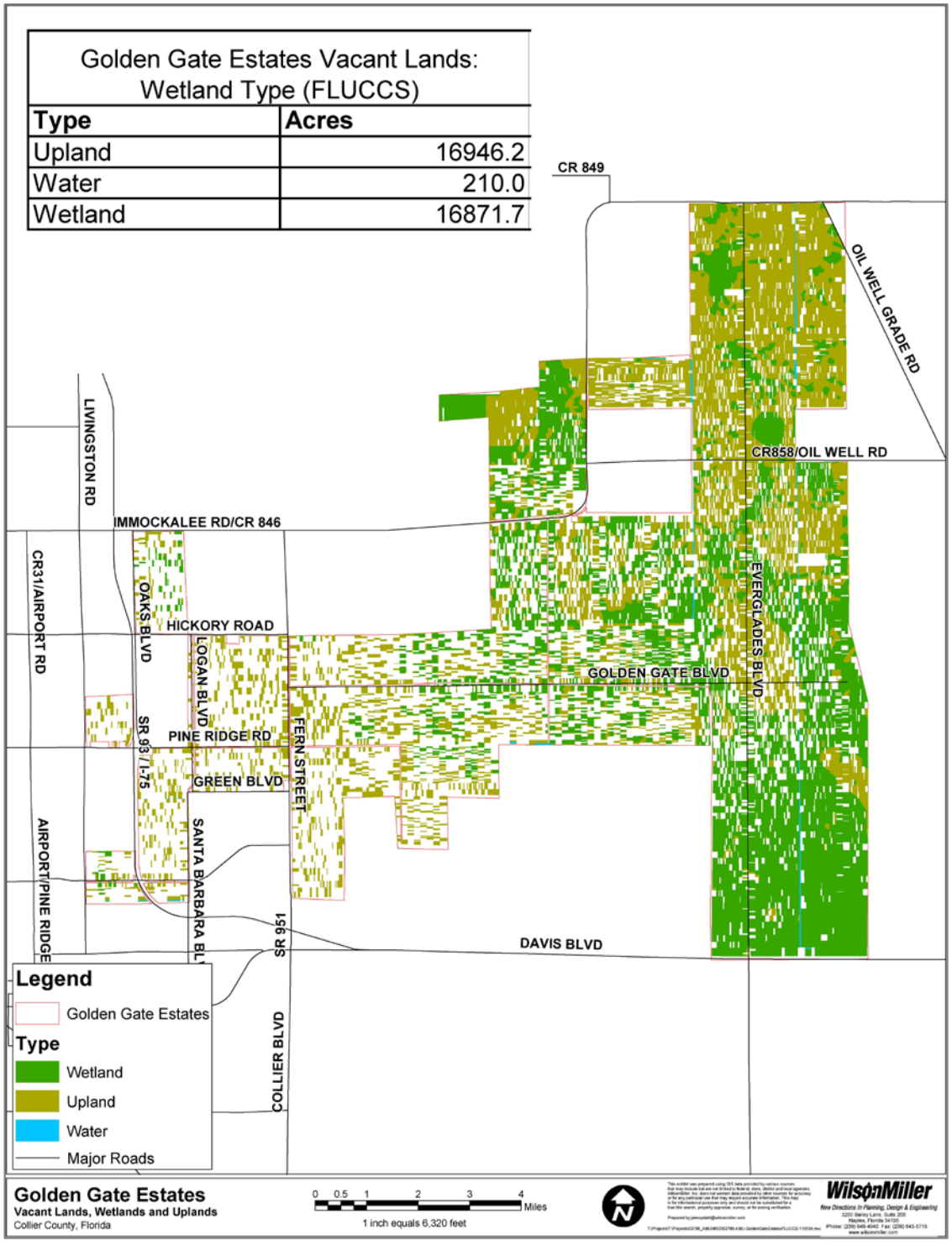


Figure **12**

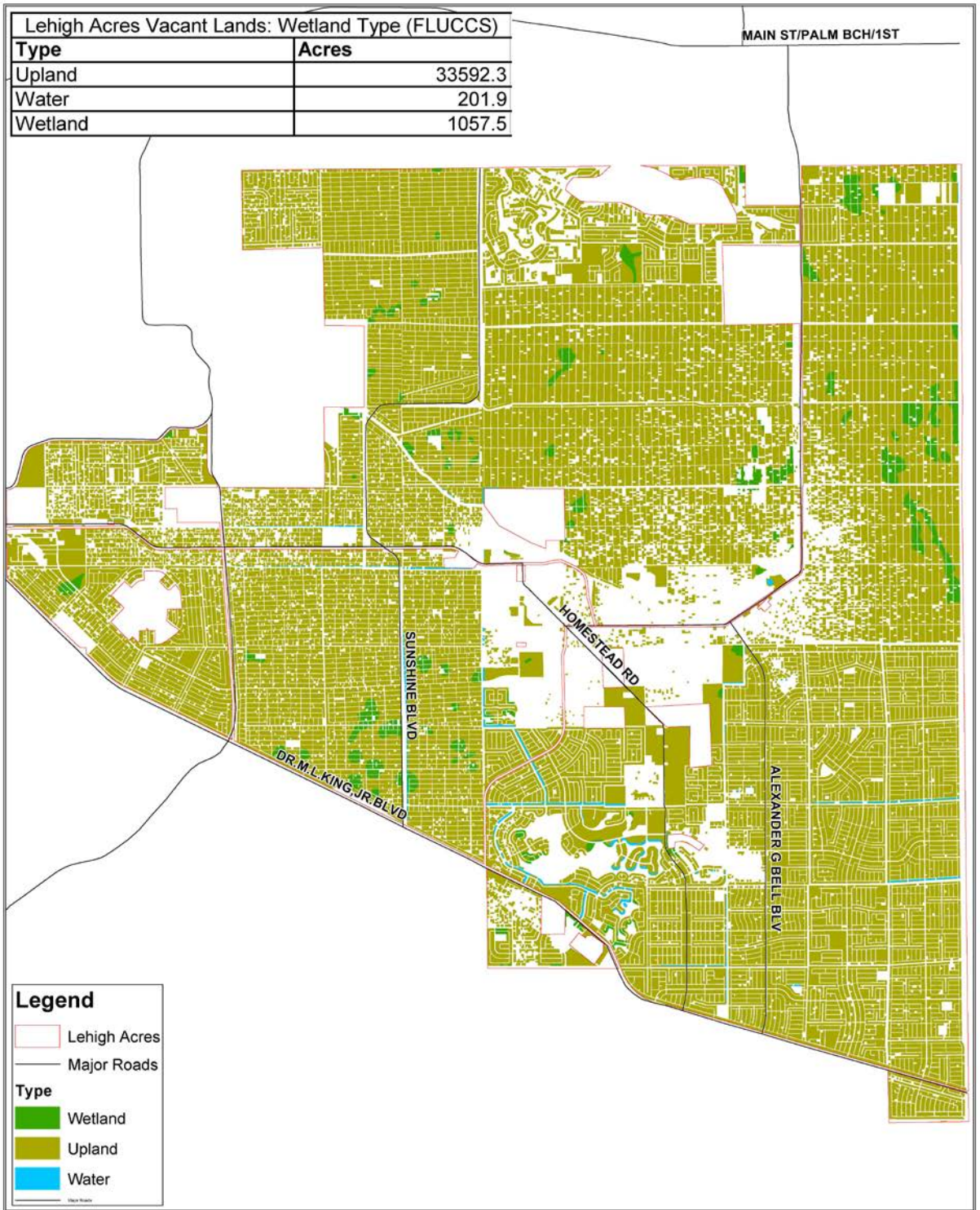
Live Panthers within a 5-mile radius of BCSIR

Golden Gate Estates Vacant Lands: Wetland Type (FLUCCS)	
Type	**Acres**
Upland	16946.2
Water	210.0
Wetland	16871.7



Golden Gate Estates

Lehigh Acres Vacant Lands: Wetland Type (FLUCCS)	
Type	**Acres**
Upland	33592.3
Water	201.9
Wetland	1057.5



Lehigh Acres
Vacant Lands, Wetlands and Uplands
Lee County, Florida

0 0.375 0.75 1.5 2.25 3 Miles

1 inch equals 3,955 feet

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