

# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

South Florida Ecological Services Office

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Vero Beach, Florida 32960

January 18, 2005

Colonel Robert M. Carpenter  
District Engineer  
U.S. Army Corps of Engineers  
701 San Marco Boulevard, Room 372  
Jacksonville, Florida 32207-8175

Service Log No.: 4-1-04-PL-4259  
Corps Application No.: 199702228 (IP-TWM)  
Date: June 5, 2001  
Applicant: Bonita Springs Utilities, Incorporated  
County: Lee

Dear Colonel Carpenter:

This document transmits the Fish and Wildlife Service's (Service) biological opinion for the construction and operation of the Bonita Springs Utilities Wastewater Treatment Plant and its effects on the endangered Florida panther (*Puma concolor coryi*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA) (87 Stat. 884;16 U.S.C. 1531 *et seq.*). The facility site is located in Section 24, Township 47 South, Range 25 East, Lee County, Florida (Figure 1).

This biological opinion is based on information provided in the June 5, 2001, U.S. Army Corps of Engineers' (Corps) Public Notice; information provided by Johnson Engineering on July 13, 2001, December 26, 2003, and May 7, 2004; the Corps' September 25, 2003, letter to the Service, which transmitted project information prepared by Johnson Engineering; information provided by Panther Island Mitigation Bank (PIMB); information provided by Turrell and Associates, Incorporated; information provided by WilsonMiller; and meetings, telephone conversations, email, and other sources of information. A complete administrative record of this consultation is on file at the Service's South Florida Ecological Services Office, Vero Beach, Florida.

The Corps has received an application for fill and excavation in 68.98 acres of wetlands and other surface waters and to alter 9.94 acres of uplands on a 176.39-acre site. The purpose of the project is to construct a new wastewater treatment facility (Figure 2). The 176.39-acre project site is comprised of 124.31 acres of jurisdictional wetlands, 12.05 acres of other surface waters, and 40 acres of uplands. Land use and habitat cover types include 124.31 acres of hydric pasture and cropland, 35.30 acres of pasture and cropland, a 9.25-acre borrow pit, 3.06 acres of land previously cleared and disturbed, 2.8 acres of ditches, 1.29 acres of roads and highways, and

0.38 acre of berms. The property is bounded on the north by a borrow pit and natural area, on the east by agricultural land and natural area, and on the south and west by Interstate 75 (I-75) (Figure 1).

In the Public Notice dated June 5, 2001, the Corps determined that the Bonita Springs Utilities project “may affect” the endangered wood stork (*Mycteria americana*). The Corps provided a determination by email dated August 27, 2001, that the project would have “no effect” on the Florida panther. In a letter to the Corps dated September 20, 2001, the Service did not concur with these determinations and requested additional information on both the wood stork and Florida panther. After reviewing information received from the Corps and the applicant’s agent, Johnson Engineering, the Service provided the Corps with a letter dated March 9, 2004, concurring with the Corps’ revised determination of “may affect, but is not likely to adversely affect” for the wood stork and not concurring with the Corps’ revised determination of “may affect, but not likely to adversely affect” for the Florida panther. Pursuant to an email from the Corps on March 16, 2004, revising their determination for the Florida panther to “may affect” and requesting formal consultation, the Service concurred by letter of April 9, 2004, and initiated formal consultation and stated that a biological opinion would be provided to the Corps.

As compensation for wood stork and wetland impacts, the applicant proposes to create and enhance 10.17 acres of wading bird habitat surrounding a borrow pit onsite and to purchase 10.37 credits from PIMB, which equates to 108 acres. Total impacts, including both wetlands and uplands, will be 78.92 acres on the Bonita Springs Utilities site. Although the project is not within the boundaries of the Primary or Secondary zones as designated in the Landscape Conservation Strategy for the Florida Panther in south Florida (Conservation Strategy) developed by the Florida Panther Subteam of the Multi-species Ecosystem Recovery Implementation Team (MERIT) (Florida Panther Subteam 2002) (Figure 3), the project is within the Service’s consultation area for the Florida panther (Figure 4) and provides habitat suitable for occasional use for foraging and dispersal. The applicant has proposed to provide compensation for project effects to panther habitat through the purchase of wetland mitigation bank credits from the PIMB. The bank credit purchase provides compensation for the loss of 78.92 acres of habitat suitable for occasional use for foraging and dispersal by the Florida panther through the protection and restoration of 108 acres of higher quality panther habitat in an area surrounded by high quality panther habitat.

The proposed PIMB compensation site is in northern Collier County and is located in the Primary zone (Florida Panther Subteam 2002) (Figure 3). This 2,778-acre wetlands mitigation bank is currently a mixture of agricultural fields, hydric and mesic pine (*Pinus elliottii*) flatwoods, and cypress (*Taxodium distichum*) domes and sloughs, with various levels of infestation of the invasive exotics melaleuca (*Melaleuca quinquenervia*) and Brazilian pepper (*Schinus terebinthifolius*). It is situated on the northern and western borders of the National Audubon Society Corkscrew Swamp Sanctuary. Compensation for panther habitat will be in Phase VI of PIMB, which consists primarily of cypress swamp and pine forest. Restoration of wetlands and uplands in this phase will consist of the removal of exotic vegetation, ranging from 0 to 25 percent coverage, averaging 14 percent.

## The Use of Best Scientific and Commercial Information by the Service

The Service will use the most current and up-to-date scientific and commercial information available. The nature of the scientific process dictates that information is constantly changing and improving as new studies are completed. The scientific method is an iterative process that builds on previous information. As the Service becomes aware of new information, we will ensure that it is fully considered in our decisions, evaluations, reviews, and analyses as it relates to the base of scientific knowledge and any publications that are cited in our documents.

Specifically, there are two such documents cited in the biological opinion that the Services acknowledge that have been affected in their cited form by new scientific information. The Service has taken these new sources of information into account when using these documents to help guide our analysis and decisions. These two documents are the Multi-Species Recovery Plan (MSRP) of 1999 and the draft Landscape Conservation Strategy of 2002.

### *South Florida Multi-Species Recovery Plan*

The MSRP was designed to be a living document and it was designed to be flexible to accommodate the change identified through ongoing and planned research and that it will be compatible with adaptive management strategies. These principals are set forth in both the transmittal letter from the Secretary on the Interior and in the document itself. As predicted, this is what indeed occurred in the intervening years since the MSRP was published. The Service uses the MSRP in the context that it still presents useful information when taken in conjunction with all of the new scientific information that has been developed subsequent to its publication.

### *Landscape Conservation Strategy for the Florida Panther*

In February 2000, the Service appointed a Florida Panther Subteam of the Multi-species/Ecosystem Recovery Implementation Team to develop a landscape conservation strategy for panthers in south Florida using an open and collaborative venue. The Panther Subteam was comprised of 11 highly qualified individuals knowledgeable in panther biology and landscape ecology representing academia, government agencies, and other interests. The primary goal of the Panther Subteam was to identify a strategically located set of lands in south Florida containing sufficient area and appropriate land cover types to ensure a viable panther population in south Florida. The Conservation Strategy identifies lands for the continued conservation of panthers in south Florida, as well as a landscape linkage to provide for population expansion north of the Caloosahatchee River to aid in the recovery of the species. Since the draft Conservation Strategy is a product of a highly qualified team of panther biologists and landscape ecologists, the Service believes that it was based upon the best available scientific information.

The Panther Subteam submitted a draft Landscape Conservation Strategy for the Florida Panther (Conservation Strategy) to the Service in December 2002. The methodology and results of this draft document were scientifically peer reviewed, and comments from two of three peer reviewers were incorporated. Comments from the third reviewer, Paul Beier (received substantially after the comment deadline), largely involving the need for reanalyses of telemetry

data, have not yet been incorporated into a revised draft. The Service acknowledges the need for this reanalyses, based upon Beier's review of the Conservation Strategy and findings and recommendations provided by the Scientific Review Team in their report entitled "An analysis of scientific literature related to the Florida panther" (Beier et al. 2003). Consistent with the scientific process, reanalyses were performed by a member of the Panther Subteam. The results of these reanalyses did not negate or invalidate the draft Conservation Strategy for the purposes in which it is used (R. Kautz, Florida Fish and Wildlife Conservation Commission [FWC], Personal Communication, 2004). In fact, they did not substantially change any of the findings, including the maps and recommendations. The Service plans to update and revise the draft Conservation Strategy to reflect the new analyses and Beier's comments and notice it in the Federal Register to obtain the widest array of review possible. Although the current draft of the Conservation Strategy does not yet reflect these changes, we will consider the findings of the reanalyses in our decisions, evaluations, reviews, and analyses regarding the panther. Therefore, the Service will continue to use the information in the draft Conservation Strategy, along with all other best scientific and commercial information available, in our daily work regarding the panther until the revised final product is completed.

## CONSULTATION HISTORY

On May 25, 2001, the Corps issued a Public Notice for permit application 199702228 (IP-DY). The proposed Bonita Springs Utilities project would consist of a new wastewater treatment facility, access road, and influent/effluent lines encompassing development on 79 acres of wetlands and uplands on a 176-acre parcel. As mitigation for wetland impacts, the applicant initially proposed to purchase 10.62 units of freshwater herbaceous credits from the Little Pine Island Mitigation Bank. The Corps determined that the project "may affect" the wood stork.

On July 13, 2001, the applicant's agent, Johnson Engineering, provided the Service with responses to the Corps' request for additional information, a mitigation and monitoring plan, a protected species survey, a wetland functional assessment, and drawings identifying impact/mitigation areas.

By email dated August 22, 2001, the Service suggested that the Corps provide a project effect determination for the Florida panther.

By email dated August 27, 2001, the Corps determined that the project would have "no effect" on the Florida panther.

On September 20, 2001, the Service provided a letter to the Corps in which we did not concur with the Corps' determinations for the wood stork and Florida panther and requested additional information on both species in accordance with 50 CFR 402.14.

On September 25, 2003, the Corps provided the Service with a letter: (1) stating that the applicant now proposes to create 10.17 acres of freshwater marsh onsite and purchase

7.37 credits at PIMB as compensation for project impacts to wood stork habitat; and (2) revising effect determinations to “may affect, but is not likely to adversely affect” for both the wood stork and Florida panther.

By email dated December 12, 2003, the Service requested additional habitat characterizations and wetland functional assessment details from Johnson Engineering.

On December 20, 2003, the Service received information requested from Johnson Engineering.

On March 9, 2004, the Service provided the Corps with a letter concurring with the revised determination of “may affect, but is not likely to adversely affect” for the wood stork and not concurring with the Corps’ revised determination of “may affect, but is not likely to adversely affect” for the Florida panther.

By email dated March 16, 2004, the Corps revised their determination for the Florida panther to “may affect” and requested formal consultation.

On April 9, 2004, the Service provided concurrence by letter and initiated formal consultation, stating that a biological opinion would be provided to the Corps on or before August 5, 2004.

On April 27, 2004, the Service requested additional details and map figures from Johnson Engineering by email.

On May 7, 2004, Johnson Engineering provided the information requested.

On June 17, 2004, the Corps informed the Service by telephone that 10.37 credits will be purchased for preservation and restoration in PIMB as compensation for the onsite wetland impacts.

On June 24, 2004, WilsonMiller provided the Service with documentation that 108 acres in Phase VI of PIMB will be preserved and restored through the purchase of 10.37 credits.

On August 10, 2004, the Service issued the Biological Opinion, Service Log Number 4-1-01-F-4259, for the proposed Bonita Springs Utilities project, Corps Application Number SAJ-199702228, for project effects on the Florida panther.

On September 15, 2004, the Service received a request from the Corps to reinitiate consultation on the reference project, based on the remanding of the Florida Rock Biological Opinion dated January 30, 2002; Service Log Number 4-1-98-F-372, Corps Application Number SAJ-1994-2492 in National Wildlife Federation v. Norton, 332 F. Supp.2d 170 (D.D.C. 2004).

On October 19, 2004, the Service requested additional information and map figures from the Corps.

On October 7, 2004, and October 25, 2004, the Service received additional information from Johnson Engineering.

## BIOLOGICAL OPINION

### DESCRIPTION OF PROPOSED ACTION

#### Proposed Action

The applicant proposes to construct a wastewater treatment facility. The 176.39-acre project site is comprised of 124.31 acres of jurisdictional wetlands, 12.05 acres of other surface waters, and 40 acres of uplands. Land use and habitat cover types include 124.31 acres of hydric pasture and cropland, 35.30 acres of pasture and cropland, a 9.25-acre borrow pit, 3.06 acres of land previously cleared and disturbed, 2.8 acres of ditches, 1.29 acres of roads and highways, and 0.38 acre of berms.

The project will involve impacts to 68.98 acres of wetlands that may be utilized by the wood stork. The project will also impact an additional 9.94 acres of uplands, for a total of 78.92 acres of habitat suitable for utilization by the Florida panther. Wetlands consist primarily of improved wet pasture. Uplands consist primarily of improved pasture and cropland. Melaleuca and Brazilian pepper coverage is approximately 18 percent of the area to be impacted by development according to a land cover analysis provided by Johnson Engineering. The applicant is proposing conservation measures to minimize the direct and indirect effects of the project to the Florida panther and the wood stork. To compensate for impacts to wood stork habitat, the applicant proposes to create and enhance 10.17 acres of wading bird habitat within a 19.18-acre onsite preserve and to purchase 10.37 credits from PIMB, located approximately 6 miles to the northeast of the project site. In a letter dated March 9, 2004, the Service concurred with the Corps' determination of "may affect, but is not likely to adversely affect" for the wood stork. Credits purchased from PIMB will also provide compensation for the loss of 78.92 acres of poor quality panther habitat on the project site through the protection and restoration of 108 acres of higher quality panther habitat (10.37 credits from PIMB) in an area surrounded by high quality habitat. Restoration of wetlands and uplands in Phase VI of PIMB will consist of the removal of exotic vegetation, ranging from 0 to 25 percent coverage, averaging 14 percent.

The Bonita Springs Utilities site is bounded on the north by a borrow pit and natural areas, on the east by agricultural land and natural areas, and on the south and west by I-75. The site is located in Section 24, Township 47 South, Range 25 East, Lee County, Florida. The project site is not within the boundaries of the Primary or Secondary zones as designated by the Florida Panther Subteam of the MERIT (Florida Panther Subteam 2002).

PIMB, in northern Collier County, is located in the Primary zone. This 2,778-acre wetlands mitigation bank is currently a mixture of agricultural fields, hydric and mesic pine flatwoods, and cypress domes and sloughs, with various infestations of the invasive exotics melaleuca and Brazilian pepper. It is situated on the northern and western borders of the National Audubon

Society Corkscrew Swamp Sanctuary. Compensation for panther habitat will be in Phase VI of PIMB, which consists primarily of cypress swamp and pine forest.

#### Action Area

The consultation 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 4). 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.

For the purposes of this consultation, the action area includes the Corps' project area and surrounding lands used by panthers with home ranges near the project area (Figure 5).

Movements of Florida panthers are much larger than the project site, and therefore, the action area is larger than the proposed action identified by the Corps' public notice. The action area, which is a subset of the current panther range, includes those lands that the Service believes 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 1986-1989, rarely observing measurable shifts in location during the day, but nocturnal shifts in location exceeding 20 kilometers (km)(12.4 miles) were not unusual. Maehr et al. (2002) in a latter report also states that dispersal distances average 42.8 miles (68.4 km) for subadult males and 12.6 miles (20.3 km) for adult females, and dispersal patterns tend to be circular, and of insufficient length to ameliorate inbreeding. However, Comiskey et al. (2002) in a more recent assessment states that male panthers disperse an average distance of 40 km (24.8 miles) from their natal range and, as the most current data analysis, is the basis of the Service's action area determination. Therefore, for both direct and indirect effects, the action area is defined as all lands within a 25-mile radius of the project. This action area does not include urban lands, lands west of I-75, and lands that are outside of the Service's panther consultation area.

#### STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

The State of Florida declared the panther a game species in 1950 and an endangered species in 1958. The Federal government listed the panther as endangered in 1967 (32 FR 4001). Heavy hunting and trapping, an inability to adapt to changes in the environment, and land development were cited as reasons for the species decline. Critical habitat has not been designated for the Florida panther; therefore, none will be affected.

#### Species Description

The Florida panther was first described by Charles B. Cory in 1896 as *Felis concolor floridana* based on a specimen he collected in Sebastian, Florida (Hall and Kelson 1959). Bangs (1899), however, noted that *Felis floridana* had previously been used for a bobcat and, believing that the panther was restricted to peninsular Florida and could not breed with any other form, assigned it full specific status as *Felis coryi*. The taxonomic classification of the *Felis concolor* group was

revised by Nelson and Goldman (1929), and the panther was assigned subspecific status as *Felis concolor coryi*. This designation also incorporated *Felis arundivaga*, which had been classified by Hollister (1911) from specimens collected in Louisiana. Detailed descriptions of each of the subspecies are provided in Young and Goldman (1946) [30 subspecies] and Hall (1981) [27 subspecies]. The genus *Felis* was recently revised so all mountain lions, including the Florida panther, were placed in the genus *Puma* (Nowell and Jackson 1996).

The Florida panther is a medium-sized mammal described as dark tawny in color, with short, stiff hair (Bangs 1899), and having longer legs and smaller feet (Cory 1896) than other *puma* subspecies. Adult males reach a length of 2.15 meters (m) (7 feet) from their nose to the tip of their tail and may reach or exceed 68 kilograms (kg) (150 pounds) in weight, but typically average around 54.5 kg (120 pounds). They stand approximately 60 to 70 centimeters (23 to 27 inches) at the shoulder. Adult females are smaller with an average weight of 34 kg (75 pounds) and length of 1.85 m (6 feet). The skull of the Florida panther has been described as having a broad, flat, frontal region, and broad, high-arched or upward-expanded nasals (Young and Goldman 1946).

The coat of an adult Florida panther is unspotted and typically rusty reddish-brown on the back, tawny on the sides, and pale gray underneath. The long cylindrical tail is slender compared to some of the other subspecies of *Puma concolor* (Belden et al. 1988). Florida panther kittens are gray with dark brown or blackish spots and have five bands around the tail. The spots fade as the kittens grow older and are almost unnoticeable by the time they are 6 months old. At this age, their bright blue eyes turn to the light-brown straw color of the adult (Belden et al. 1988).

Three external characters are often observed in Florida panthers, which are not found in combination in other subspecies of *Puma concolor*. These characters are 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, light flecking on the head, nape, and shoulders (Belden 1986). The light flecking may be a result of scarring from tick bites (Maehr 1992a, Wilkins 1994). The kinked tail and cowlicks are considered manifestations of inbreeding (Seal et al. 1994).

## Life History

Panthers are essentially solitary. Interactions between adult females and their kittens are most frequent. Interactions between adult male and female panthers are second in frequency, last from 1 to 7 days, and usually result in pregnancy. Conflicts between males are common and often result in serious injury or death to some individuals. Between October 1984 and June 2004, there were 36 known deaths attributed to intraspecific aggression (FWC 2004). While most of those were between males, one-third occurred between male and female panthers resulting in 12 deaths of females (FWC 2004). Overall, the amount of mortality from intraspecific aggression appears to be increasing with a total of 13 mortalities during the first 10 years of study and nearly double that in the second 10 years (FWC 2004). In addition, the extent of mortality in female panthers from intraspecific aggression appears to be increasing. Since 1995, 10 of the 23 known deaths from intraspecific aggression were female panthers, whereas in previous years only 2 of 13 such deaths were females (FWC 2004). Densities of Florida panthers have increased in the

last decade. Higher densities may lead to increases in panther interactions and aggressive conflicts between male panthers, and male and female panthers. However, aggressive encounters between females have not been documented (Maehr et al. 1991a).

Panther activity levels peak around sunrise and sunset. The lowest activity levels occur during the middle of the day. Females at natal dens follow a similar pattern with less difference between high and low activity periods. Although some travel occurs during the day, panthers are mostly crepuscular (Maehr et al. 2004). There are no known differences in seasonal movements, wet and dry season habitat use, seasonal variation in diet, or effects of season on road crossings. Responses to fluctuations in water levels are believed to be insignificant (Maehr et al. 1989; Maehr et al. 1990b, 1991a).

**Habitat:** Maehr (1990a) estimated the occupied range of the panther in 1990 to be 2.2 million acres (880,000 hectares) in south Florida. Logan et al. (1993) estimated the range to be 3.1 million acres (1,254,500 hectares), which is roughly 5 percent of its historic range. The area of most consistent panther occupancy was estimated by the Florida Panther Subteam (2002) to be 2 million acres (800,951 hectares). Native landscapes within the Big Cypress Swamp region of south Florida, within occupied panther range, are dominated by slash pine, cypress, and freshwater marshes, interspersed with mixed-swamp forests, hammock forests, and prairies. Private lands represent about 29 percent of panther range in south Florida (Florida Panther Subteam 2002). The largest contiguous tract of panther habitat is the Big Cypress/Everglades ecosystem in Collier, Monroe, and Miami-Dade Counties. Suitable habitat also extends into Lee, Hendry, Charlotte, Glades, Broward, Palm Beach, Highlands, Sarasota, Polk, Osceola, Hardee, and Desoto Counties. Some researchers are of the belief that the low nutrient, frequently saturated soils prevalent south of I-75 in south Florida do not produce the quality or quantity of forage required to support large herds of white-tailed deer (*Odocoileus virginianus*), a dominant prey species for panthers (see below) and believe it is unlikely that habitat in Big Cypress National Preserve (BCNP) and Everglades National Park (ENP) is as productive as habitat on private lands in northern and western Collier County in terms of panther health, reproduction, and density (Maehr 1992a). However, more recent reports provide contradictory information (McBride 2002 and 2003). In addition, according to Beier et al. (2003), the conclusion that ENP and BCNP are poor habitats for panthers is not scientifically supported.

Forests provide important diurnal habitat for panthers. Belden et al. (1988) reported that Florida panthers use hardwood forests and mixed swamps more than would be expected based on their occurrence in the landscape. While panthers may seek upland forests for daytime resting, as indicated by telemetry data, more recent data indicate that panthers also utilize non-forest cover types interspersed in landscapes dominated by forests, including freshwater marsh, prairie and shrub lands, agricultural lands, and urban and barren lands (Florida Panther Subteam 2002).

Telemetry data are the best available information about daytime panther habitat use. However, there are limitations and assumptions that should be stated about any conclusions that are based on telemetry data. Beier et al. (2003) points out several biases in research by Maehr and colleagues in relating the importance of forests as panther habitat. These biases are stated to result from the use of daytime telemetry locations to describe habitat use, the selective use of

telemetry data, and using location of telemetry versus panthers as a sampling unit. First, the panther telemetry data is collected in the morning, which creates a disjuncture between the time of data collection (beginning shortly after 7:00 AM) and the times of peak panther activity (dawn and dusk). Habitat selection by panthers may be considerably broader at dawn and dusk (Beyer and Haufler 1994, Rettie and McLoughlin 1999). Second, the majority of panthers that have been radio-collared were on public lands. Telemetry research began in the Fakahatchee Strand State Preserve in 1981 and gradually expanded to include BCNP, ENP, Florida Panther National Wildlife Refuge (NWR), Picayune Strand State Forest, Okaloacoochee Slough State Forest, and Corkscrew Regional Ecosystem Watershed (CREW), and has also expanded to include some telemetry data research on private lands in Collier, Hendry, Glades and Lee Counties (Belden et al. 1988). Lastly, tests of the accuracy of some of the telemetry locations used in Maehr and Deeson (2002) revealed that the difference between the actual location of the transmitter and the recorded location averaged 77 m (Dees et al. 2001) and can be as large as 230 m (Belden et al. 1988). These results were obtained by placing test transmitters in known locations in the field, plotting transmitter locations from the air, and then determining the error of actual versus observed locations.

A more recent analysis (Maehr et al. 2004) suggests some likelihood that daytime telemetry locations are not dissimilar to areas used by panthers at night. However, 24-hour telemetry has not returned enough data to fully address this question. Maehr et al. (1990b) found that panthers were very active around sunrise, a time of day that is well represented by aerial telemetry data, but that Comiskey et al. (2002) claim is missing from previous analyses of panther habitat use. Although it is not known exactly what behavior each animal was engaged in at the time these data were collected, it likely included a variety of activities, *e.g.*, walking, hunting, feeding, grooming, and resting. However, Maehr (2004) believes that daytime telemetry data include periods during which panthers are quite active.

The Florida panther Scientific Review Team (SRT), commissioned by the Service and the FWC to do an independent critical review of literature related to ecology and management of the panther, published their findings in Beier et al. 2003. Included in these findings, the SRT (1) encourages the acquisition and analysis of nighttime telemetry data to provide a more complete picture of Florida panther habitat use; (2) urges researchers to fully disclose and explain reasoning for selective use of data; (3) believes that panthers rather than panther locations should be the sampling unit for determining habitat use; (4) believes that vegetation maps used in habitat use analysis be validated and ground-truth if necessary; and (5) recommends that, due in part to telemetry error, the use of ideas that panthers do not travel more than 90 m from forest cover or that habitat patches farther than 90 m from forest cover are unlikely to be used by panthers should be discontinued.

Maehr and Cox (1995) studied 10 female and 13 male panthers and found that the home ranges included 6 percent freshwater marsh, 5 percent grass and agriculture, 3 percent dry prairie, 3 percent shrub swamp, 1 percent barren land, and concluded that panthers can remain part of the native fauna in areas where agricultural activities exist. The above cover types, which represent open habitat, totaled 18 percent of the panther's home range. Maehr et al. (1991a) states that panthers may travel through agricultural areas at night. Panthers currently in ENP have home

ranges that are less than 10 percent forest cover (Comiskey et al. 2002). Maehr et al. (2002) found that the three panthers that crossed the Caloosahatchee River all went through areas with limited forest cover, and that dispersing males wander widely through unforested and disturbed areas (Maehr 1992a). In addition cougars outside of Florida have been described as habitat generalists (Tinsley 1970) and have not been described as forest specialists. Beier et.al. (2003) found that the relationship between panther home range size and amount of forest and non-forest habitat within the home range is shown to be weak (Comiskey et al. 2002). However, since the issue is currently unresolved, the Service is accepting the most conservative approach, which is the findings by Comiskey et al. (2002) and the Florida Panther Subteam (2002) that Florida panthers use a broad range of habitats as the best available science on the mosaics of habitats used by panthers.

Reproduction and Demography: Male panthers are polygynous and maintain large home ranges mutually exclusive of other males but overlapping that of several females. Breeding peaks in fall and winter (Maehr 1992a). Gestation lasts 90 to 96 days. Parturition is distributed throughout the year with the majority of births occurring between March and July. Prenatal litters range from three to four. Postnatal litters range from one to four kittens (FWC 2001). Litters surviving to 6 months of age average 2.2 kittens. Female panthers losing their litters generally produce replacement litters within the same breeding season. Intervals between litters range from 16 to 37 months (Maehr et al. 1991a, Maehr 1992a) to 19 to 22 months (FWC 2004). Den sites are usually located in dense, understory vegetation, typically saw palmetto (*Serenoa repens*) (Maehr 1990a). Den sites are used for up to 2 months and may be used again in subsequent years.

Historical records of den sites and birth rates for the past 5 years for the Florida panther, based on data provided by the FWC (2004) were: 7 dens, 18 kittens in 2003/2004; 6 dens, 17 kittens in 2002/2003; 12 dens, 26 kittens in 2001/2002; 8 dens, 21 kittens in 2000/2001; and 6 dens, 17 kittens in 1999/2000. Based on the above data and an understanding that a female panther will generally produce kittens every other year (16 to 37 months [Maehr et al. 1991a, Maehr 1992a] to 19 to 22 months [FWC 2004]), the female population is estimated to include an average of 14 to 16 females producing kittens with 7 to 8 females-per-year producing a total of 18 to 20 kittens-per-year.

Early estimates of infant mortality varied and were in conflict. For example, Roelke et al. (1993) characterized infant mortality as relatively high with fewer than half of all births resulting in offspring that survive beyond 6 months of age (Roelke et al. 1993). Land (1994) estimated the kitten survival rate between age 6 months and 1 year at 0.895, based on a sample of 15 radio-instrumented kittens monitored from 6 months to 1 year of age. More recently, however, the FWC has been visiting dens sites of female Florida panthers and Texas puma females since 1992 and has documented the number of kittens that survived to 6 months-of-age for 38 of these litters (FWC 2004). Florida panther and Texas puma kitten survival to 6months-of-age were estimated to be 52 and 72 percent, respectively, but were not significantly different ( $P = 0.2776$ ) (FWC 2004). Average kitten survival, therefore, was 62 percent from birth to 6 months-of-age (FWC 2004). The FWC (2004) determined the survival of kittens greater than 6 months-of-age by following the fates of 55 radio-collared dependent-aged kittens, including 17 Texas puma

descendants from 1985-2004. They found that only 1 of these 55 kittens died before reaching independence from a 98.2 percent survival rate (FWC 2004). Twenty-three of 24 female panthers, first captured as kittens, became residents and 18 (78.3 percent) produced litters; 1 female was too young to determine residence (FWC 2004). Female panthers were considered as adult residents if they were older than 18 months-of-age and established home ranges and bred or if they were older than 3 years-of-age and established a home range (Maehr et al. 1991b). Twenty-eight residents; three males were too young to determine residency status (FWC 2004). Male panthers were considered residents if they were older than 3 years-of-age and established a home range that overlapped with females (FWC 2004).

Females are readily recruited into the population as soon as they are able to breed (Maehr et al. 1991a). Age at first reproduction has been documented at 18 months for females (Maehr et al. 1989). However, 50 percent of known panther dens were initiated by females aged 2 to 4 years. The remaining 50 percent were initiated by females aged 5 to 11 years.

The first sexual encounters for males have occurred at about 3 years of age (Maehr et al. 1991a). Dispersing females are quickly assimilated into the resident population, typically establishing home ranges that are less than one home range width from their natal ranges (Maehr et al. 2002), while 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 1997a). Maehr (1990a) believes that there is a lack of unoccupied suitable habitat for dispersing subadult Florida panthers, which may increase fighting among males, and that successful male recruitment appears to depend on the death or home range shift of a resident adult male (Maehr et al. 1991a). Turnover in the breeding population is low and documented mortality in radio-collared panthers is greatest in subadult and non-resident males (Maehr et al. 1991b).

Natural genetic exchange with other panther populations ceased when the Florida panther became geographically isolated over a century ago (Seal et al. 1994). Isolation, reduced population size, and inbreeding resulted in loss of genetic variability and diminished health. Data on polymorphism and heterozygosity, along with records of multiple physiological abnormalities, suggest that the panther population has experienced inbreeding depression (Roelke et al. 1993; Barone et al. 1994). Inbreeding depression has been related to decreased semen quality, lowered fertility, reduced neonatal survival, and congenital heart defects in a variety of domesticated and wild species (Lasley 1978; Ralls and Ballou 1982; Wildt et al. 1982; O'Brien et al. 1985; Roelke 1991). Congenital heart defects have been shown to be related to diminished panther survival and reproduction (Roelke 1991; Dunbar 1993; Barone et al. 1994). The Florida panther exhibits diminished male reproductive characteristics compared to other populations of *Puma concolor* in North and Latin America (Barone et al. 1994). In a comparison of 16 male Florida panthers and 51 males from *Puma concolor* populations in Texas, Colorado, Latin America, and North American zoos, Wildt (1994) found a much higher rate of unilateral cryptorchidism (43.8 versus 3.9 percent), lower testicular and semen volumes, diminished sperm motility, and a greater percentage of morphologically abnormal sperm in the Florida panther samples.

Measured heterozygosity levels indicate that the Florida panther has lost 60 to 90 percent of its genetic diversity (Culver et al. 2000). Measured levels of mDNA variation are the lowest reported for any similarly studied feline population, including leopards, cheetahs, and other *Puma concolor* subspecies. Electrophoretic analyses also indicated that the Florida panther has less genetic variation than any other *Puma concolor* subspecies. Panther DNA fingerprint variation is nearly as low as in the small, isolated population of Asiatic lions of the Gir Forest Sanctuary in India (Roelke et al. 1993).

A genetic restoration program was initiated for the Florida panther in 1995. FWC (2001, 2003, 2004) indicated that representation of Texas cougar genes in the south Florida population is probably close to the goal of 20 percent (Seal et al. 1994), although 2 of the 8 Texas females are over-represented. The occurrence of kinked tails and cowlicks has been reduced in intercross progeny. Information on other morphological traits associated with genetic isolation and inbreeding such as cryptorchidism, sperm deformities, atrial septal heart defects, and skull morphology cannot be collected until the intercross progeny mature or pass away. However, the fecundity of the intercross progeny would seem to indicate that sperm deformities have been reduced. For example, one first-generation male captured and examined in the field by Smithsonian theriogenologist Dr. Jo Gayle Howard had a sperm count 3 times that of a Florida panther, a sperm motility rate that was twice as high, a percentage of normal sperm that was 4 times greater, and a sperm concentration that was 10 times higher (McBride 2001). Since the genetic restoration program was initiated in 1995, the number of panthers monitored annually has increased, highway mortality has increased, and panthers have moved into formerly unoccupied niches on public land in south Florida (McBride 2002). This may indicate a more robust population that varies dramatically from population parameters prior to 1995. However, Maehr and Lacy (2002) recommended caution in claiming success through genetic management. They state that it is likely that local prey populations cannot support the increased number of panthers over the long term, and that as long as the panthers are restricted to south Florida, the problems of inbreeding and genetic variation that led to the genetic restoration program will return. Still, McBride (2002) states that panther recovery continues to benefit from genetic restoration and an existing State land acquisition program (for large tracts of land) north of BCNP will provide additional benefits.

Food Habits: Florida panther food habit studies indicate that commonly consumed prey include feral hog, white-tailed deer, raccoon (*Procyon lotor*), nine-banded armadillo (*Dasypus novemcinctus*), and alligator (Maehr 1990a, Dalrymple and Bass 1996). Adult panthers generally consume one deer or hog per-week, supplemented by opportunistic kills of smaller prey (Maehr 1997). A female with kittens may need the equivalent of two such kills per-week. The high caloric intake needed to sustain successful reproduction and rearing of kittens is best achieved when a dependable supply of large prey is available (Florida Panther Subteam 2002). Deer and hogs accounted for 85.7 percent of consumed biomass north of I-75 and 66.1 percent south of I-75 in southwest Florida (Maehr 1990a). In ENP, where feral hogs are absent, the diet of the panther is dominated by white-tailed deer (78.4 percent of biomass consumed (Dalrymple and Bass 1996). Differences in prey abundance and availability were indicated by an eight-fold greater deer abundance north of I-75 versus south of I-75, although the estimated number of deer consumed did not differ between the north and south portions of the study area. Hog numbers

were lower south of I-75. Hogs dominated the diet of panthers in the north in terms of both estimated biomass and numbers. In the south, deer accounted for the greatest estimated biomass consumed, whereas raccoons were the highest estimated number of prey items consumed. Domestic livestock were found infrequently in scats or kills, although cattle were readily available north of I-75 (Maehr et al. 1990a). There appears to be a consensus among land managers and Federal biologists that white-tailed deer and wild hogs are the dominant prey for panther; while rabbits, raccoon, and armadillos are of secondary importance (Beier et al. 2003).

Movements and Dispersal: Adult Florida panthers occupy available habitat in a pattern similar to that of western cougars (Land 1994). More than 7,000 telemetry locations on 26 radio-collared panthers between 1985 and 1990 indicated that home-range size varied from 21 to 461 square-miles (53 to 1,183 square km), averaging 200 square-miles (519 square km) for resident males and 75 square-miles (193 square km) for resident females. Beier et al. (2003) found estimates of panther home ranges varying from 74 to 153 square-miles (193 to 396 square km or 47,359 to 97,920 acres) for females and 168 to 251 square-miles (435 to 650 square km or 107,520 to 160,639 acres) for males to be reliable. The most current estimate of home-range sizes (minimum convex polygon method) for established, non-dispersing adult panthers, based on radio-collared panthers monitored during the 2003-2004 genetic restoration and management annual monitoring report ( $n = 37$ ), averaged 60.3 square-miles (156.1 square km or 38,572 acres) for females ( $n = 22$ ) and 160.6 square-miles (416 square km or 102,794 acres) for males ( $n = 10$ ) (FWC 2004). Home ranges of resident adults were stable unless influenced by the death of other residents and home-range overlap was extensive among resident females and limited among resident males (Maehr et al. 1991a).

Young and Goldman (1946) report western pumas traveled distances of 25 miles in 1 night. Maehr et al (2002) note that dispersal distances average 42.8 miles (68.4 km) for subadult males and 12.6 miles (20.3 km) for adult females, and dispersal patterns tend to be circular, and of insufficient length to ameliorate inbreeding. However, Comiskey et al. (2002) in a more recent assessment states that male panthers disperse an average distance of 40 km (24.8 miles) from their natal range and, as the most current data analysis, is the basis of the Service's action area determination. Subadult dispersal typically occurs around 1.5 to 2 years of age, but may occur as early as 1 year of age. Dispersing males wander widely through unforested and disturbed areas (Maehr 1992a).

### Status and Distribution

Of the 27 recognized subspecies of *P. concolor* described by Hall (1981), the Florida panther is the sole remaining subspecies in the eastern United States. Historically, the panther was distributed from eastern Texas or western Louisiana and the lower Mississippi River Valley East through the southeastern States in general, intergrading to the north with *P. c. cougar*, and to the west and northwest with *P. c. stanleyana* and *P. c. hippolestes* (Young and Goldman 1946). The Florida panther had been eliminated from most of the historic range by 1950. Occasional sightings and signs were reported throughout the rural southeast between 1950 and 1980 (Anderson 1983). The only confirmed panther population was found in south Florida (Anderson 1983).

Distribution: A variety of human activities contributed to the decline of the Florida panther. The first bounty on Florida panthers was passed in 1832. An 1887 Florida law authorized a payment of \$5.00 for scalps (Tinsley 1970). Agricultural land clearing in the southeastern United States between 1850 and 1909 totaled 31.6 million acres (12.8 million hectares). Lumbering reduced the original southern forest nearly 40 percent from 300 million acres (121.4 million hectares) to 178 million acres (72.0 million hectares) by 1919 (Williams 1990). Meanwhile the white-tailed deer, primary prey of the panther, was reduced from a range-wide population of about 13 million in 1850, to under 1 million by 1900 (Halls 1984). Over a 100-year period, bounty hunting, land clearing, lumbering, and market hunting of deer contributed to the range-wide decline of the panther.

At the beginning of the 20th century, the Florida panther population may have numbered as many as 500 (Seal et al. 1989). The State of Florida declared the panther a game species in 1950 and an endangered species in 1958. The population was estimated at 100 to 300 statewide in 1966 (Smith 1970, Schemnitz 1972). The Federal government listed panthers as endangered in 1967 (32 FR 4001). The Big Cypress population was estimated at 125 in 1969 (U.S. Department of the Interior [DOI] 1969), and a south Florida population at 92 in 1972 (Schemnitz 1972). In the 1970s, the Florida Game and Fresh Water Fish Commission (the predecessor of the FWC) established a Florida Panther Record Clearinghouse to ascertain the status of the panther. The first field searches were made in 1972. The Florida Panther Act, a State law enacted in 1978, made killing the panther a felony. Telemetry investigations began in 1981, primarily on public lands in southwest Florida. Maehr et al. (1991a) estimated the average density of panthers in southwest Florida between February and July 1990 to be 1 panther per 42.9 square-miles (110 square km or 27,456 acres). When extrapolated over a 1,965.6 square-mile (5,040 square-km or 1,257,979-acre) area thought to be occupied by radio-collared panthers in southwest Florida, the estimated population of the area was 46 adults (9 resident males, 28 resident females, and 9 transient males) between December 1985 and October 1990. This population estimate assumed homogeneous density and similar age and sex composition over time and space. Maehr et al. (1991a) considered the actual population to be higher because the estimation technique excluded panthers in ENP, eastern BCNP, and areas north of the Caloosahatchee River. The Florida Panther Interagency Committee, comprised of the Service, National Park Service, Florida Department of Environmental Protection, and the FWC, estimated the population in 1993 at 30 to 50 adults (Logan et al. 1993). More recent estimates show a panther population (adults and subadults) of 62 in 2000 (McBride 2000), 78 in 2001 (McBride 2001), 80 in 2002 (McBride 2002), and 87 in 2003 (FWC 2003). No documented population number has been provided by FWC for 2004 to date. However, D. Land (personal communication, November 2004) estimates the population to be between 70 and 100 panthers.

In September 2003 the documented panther population was 87 adults and subadults, not including kittens at the den (FWC 2003). It is not clear because of the differences in reporting methods in defining adult panthers whether the documented population of 87 (adults and subadults) represents an increase from the 30 to 50 adults referenced in Logan et al. (1993) or the 30 to 80 individuals referenced by the Service (1999). However the documented population in 2003 does represent a decrease from the 125 for the Big Cypress population (DOI 1969), and is

well below a population estimate of 500 at the beginning of the 20th century (Seal et al. 1989). These early estimates did not specify whether the population consisted of adults, subadults, or kittens.

**Habitat Threats:** Over a 100-year period, bounty hunting, land clearing, lumbering, and market hunting of deer resulted in a range-wide decline of the panther and as a result panthers now occupy just 5 percent of their former range (Maehr 1997a), although much of the historic range supports habitat suitable for panther occupation. The remaining core breeding population is in southwest Florida and is generally considered to be south of the Caloosahatchee River, although dispersing males migrate north and have been observed in rural habitats of south-central Florida.

In the southwest Florida breeding population, habitat loss, habitat fragmentation, habitat degradation, and increased human disturbance resulting from agricultural and residential development are now considered among the primary threats to long-term panther persistence. Continued development associated with the expansion of Florida's urbanized east coast, urban development on the west coast, and the spread of agricultural development in the south Florida interior, have placed increasing pressure on panthers and panther habitat (Maehr 1990b, Maehr et al. 1991a, Maehr 1992b). Past land use activity, hydrologic alterations, road construction, and lack of fire management (Dees et al. 1999) have also affected the quality and quantity of panther habitat. Because of their wide-ranging movements and extensive spatial requirements, panthers are also sensitive to habitat fragmentation (Harris 1985).

In southwest Florida, agriculture development between 1986 and 1990 resulted in a row crop acreage increase of 8,990 acres (3,640 hectares) or 21 percent; a sugarcane increase of 16,000 acres (6,475 hectares) or 21 percent; and a citrus increase of 54,000 acres (21,850 hectares) or 75 percent. The acreage of rangeland, much of it suitable for panther occupation, decreased by 160,000 acres (64,750 hectares) or 10 percent. In a more current analysis, B. Stys (FWC, unpublished data 2002) performed a change detection analysis for Collier, Lee, Hendry, Charlotte, and Glades Counties, and found that the area of disturbed lands in these 5 counties increased 31 percent between 1986 and 1996. Most (66 percent) of the land use change over the 10-year period was due to conversion to agricultural. Forest cover types accounted for 42 percent of land use conversions, dry prairies accounted for 37 percent, freshwater marsh accounted for 9 percent, and shrub/brush lands accounted for 8 percent.

Not all of the conversions in this region have resulted in a loss of panther habitat. In an effort to estimate loss of panther habitat in the region, a panther potential habitat model (Cox et al. 1994) was overlaid with land cover data from 1986 and 1996. Results indicate that 28,621 hectares of natural cover types mapped as potential panther habitat in these 5 counties were converted to agricultural and urban uses between 1986 and 1996 (Florida Panther Subteam 2002). Most (75 percent – 21,466 acres) of the habitat alteration were due to conversions to agricultural uses; while 25 percent (7,155 acres) was converted to urban uses. The estimated conversion rate was 0.82 percent per-year (Florida Panther Subteam 2002). 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. However, these land conversions provide less functional value than natural habitats.

Residential, commercial, and industrial development projects may have an adverse direct effect on the Florida panther through: (1) the permanent loss and fragmentation of panther habitat; (2) the permanent loss and fragmentation of habitat that supports panther prey; (3) the loss of available habitat for foraging, breeding, and dispersing panthers; and (4) a reduction in the geographic distribution of the species. 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 in the project vicinity due to human activities; (3) the reduction in panther prey; (4) the reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and (5) a potential increase in intraspecific aggression between panthers (and an increase in mortality of subadult male panthers) due to reduction of the geographic range of the panther.

Panther prey density, especially deer, is an important factor in evaluating the panther habitat. The type and number of prey available to the panther affects the health and distribution of the panther, as well as its ability to breed and support young. Environmental factors, specifically the availability of high quality forage, affect the prey density and influence the carrying capacity and population dynamics of the prey species, especially deer herds (Fleming et al. 1993). In the Everglades region, deer inhabit a variety of landscape types, including pinelands, high ridges, and adjacent periphery wetlands, which include the mosaic of sawgrass and wet prairie savannahs and sloughs that comprise the interior freshwater marshes and coastal mangrove forest.

Deer are ruminants, with small stomach capacities, and are selective for high quality forage to meet their nutritional needs. To meet these high quality forage needs, deer selectively move through the mosaic of habitat types taking advantage of the seasonal forage that provides the most benefit to the deer. Water management practices have reduced habitat heterogeneity and the sequence of seasonal and successional patterns of plant growth and appear to have affected deer abundance (Fleming et al. 1993).

Other adverse changes in habitat characteristics that affect deer density include the invasion of exotics into native uplands, over drainage of marshes, and the establishment of monotypic stands of unpalatable plant species, generally resulting from nutrient enrichment related to agricultural and urban runoff. The replacement of these native plant communities reduces important habitat heterogeneity and the ability of deer to meet their critical dietary needs. For example, deer densities on over-drained, exotic species infested private lands being developed in northwest Lee County averaged 1 deer-per 591 acres (Turrell and Associates, Incorporated 2001) to 1 deer-per 534 acres (Passarella and Associates, Incorporated 2004). As another example, in monotypic stands of cattail (*Typha* spp.) communities in the Everglades Wildlife Management Areas, historical deer densities in the mid-to-late 1950s averaged 1 deer-per 100 acres (40 hectares) when the vegetative community was a mosaic of native species, whereas more recent surveys (1993) showed a 67 to 76 percent decrease (1 per 300 to 1 per 415 acres) of the 1959 population estimate (Fleming et al. 1993).

As a comparison to higher quality habitat communities, deer densities in wildlife management areas in the BCNP's Corn Dance Unit were predicted to be between 1 deer-per 165 acres and 1 deer-per 250 acres (Steelman et al.1999). Predictions of deer density in Fakahatchee Strand were estimated to be higher than 1 deer-per 18.2 acres (McCown 1991). Deer densities in the Mullet Slough area of BCNP yielded an estimated density range of 1 deer-per 93 acres and 1 deer-per 250 acres. The Stairsteps Unit of BCNP supports densities of 1 deer-per 190 acres to 1 deer-per 218 acres from track count estimates. Aerial surveys for the same units used after 1982 estimated deer densities between 1 deer-per 60 acres and 1 deer-per 2,643 acres (Steelman et. al.1999). Harlow (1959) predicted deer density in wet prairie habitat in Florida to be 1 deer-per 115 acres.

To counteract the threat of exotic species invasion and monotypic stands of unpalatable plant species, all public land and most private land managers pursue exotic and invasive species management and habitat improvement through fire management and eradication programs. However, these actions are restricted by available funds to implement these programs (Florida Panther Subteam 2002).

Panthers, because of their wide-ranging movements and extensive spatial requirements are also particularly sensitive to habitat fragmentation (Harris 1985). Habitat fragmentation can result from road construction, urban development, and agricultural land conversions within rural landscapes that provide habitat value to the Florida panther. Fragmentation may disrupt 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 are a significant cause of panther mortality. Roads can also result in habitat fragmentation, especially for females that are less likely to cross them.

The Florida Panther Subteam (2002) estimated that approximately 29 percent of panther habitat within Primary, Secondary, and Dispersal zones identified by the Florida Panther Subteam is on private land. Maehr (1990a) indicated that development of private lands may limit panther habitat to landscapes under public stewardship. From March 1984 through July 2004 the Service concluded formal consultation on 48 projects involving the panther. The minimum expected result of these projects is impacts to 79,715 acres of panther habitat and the preservation of 18,191 acres (Table 1). Of the 79,715 acres of impacts, 39,918 are due to agricultural conversion and 39,797 acres to development and mining. 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. However, these land conversions provide less functional value than native habitats. The 39,797 acres of expected impacts from development and mining included a mixture of agricultural fields consisting of row crops and citrus groves and natural lands with varying degrees of exotic vegetation. Management actions on the lands preserved include exotic species removal, fire management, wetland hydrology improvement, improved forest management practices, and recreational benefit improvements.

Habitat Management: Prescribed burning is probably the single most important habitat management tool available to public land stewards. Dees et al. (1999) examined panther use of

habitat in response to prescribed burning at Florida Panther NWR and BCNP between 1989 and 1998. A positive temporal response to prescribed burns occurred in the year following the burn and is likely due to the rapid regrowth of vegetation, which in turn attracted white-tailed deer. Panther use of the burned area gradually declined after the first year and ended after 4 years. The prescribed burn rotation on both study sites is 4 years. Dees et al. (1999) concluded that resource managers could improve panther habitat by reducing the proportion of area comprised of burns older than 4 years but cautioned that shorter burn rotations could alter vegetative patterns and have a negative impact at the landscape level.

Land conservation trends: The 1.4 million-acre ENP was established in 1947 more than 2 decades before the Florida panther was listed as endangered. The 577,000-acre BCNP was established in 1974, just 1 year after passage of the ESA. Additional State and Federal acquisitions since the establishment of ENP and BCNP include Fakahatchee Strand Preserve State Park (58,373 acres), Florida Panther NWR (26,400 acres), Picayune Strand State Forest (55,200 acres), Collier-Seminole State Park (7,271 acres), Okaloacoochee Slough State Forest (34,962 acres), and CREW (24,028 acres). As of October 2001 non-profit organizations, local governments, State and Federal agencies, and Tribes have protected approximately 2.21 million acres of panther habitat south of the Caloosahatchee River (Florida Panther Subteam 2002). These protected lands are the cornerstones for the Service's continuing effort to work in tandem with the private sector, and State and County governments, to preserve and manage panther habitat. In addition, as seen in Table 1, since 1984 there has been an increasing trend in the amount of land preserved in proportion to land impacted for individual projects subject to Service biological opinions. These lands are protected by conservation easements or transferred by title to public entities to manage. From March 1984 through the implementation of the Bonita Springs Utilities project, approximately 18,299 acres will have been protected for conservation through the issuance of Corps' permits, compared to 79,715 acres adversely affected.

Mortality, Trauma, and Disturbance: Records of mortality on uncollared panthers have been kept since February 13, 1972, and records of mortality on radio-collared panthers have been kept since February 10, 1981. A total of 143 panther mortalities have been documented through June 2004, with 59 (41 percent) known deaths occurring in the past 4 years (FWC 2001, 2002, 2003, 2004). Overall, documented mortality ( $n = 99$ ) of radio-collared and uncollared panthers averaged 3.4 per-year through June 2001. However, from July 2001 through June 2004, documented mortality ( $n = 48$ ) increased with an average of 16.0 per-year during these years (FWC 2002, 2003, 2004). Eighty-four free roaming radio-collared panthers have died since 1981, and intraspecific aggression was the leading cause accounting for 41 percent of these mortalities (FWC 2004). Unknown causes and collisions with vehicles accounted for 24 percent and 19 percent of mortalities, respectively. Other factors (7 percent), infections (5 percent), and diseases (4 percent) caused the remaining mortalities (FWC 2004). The causes of mortality were found to be independent of gender (FWC 2004). It is likely that some causes, such as road mortality, are more likely to be found, and therefore are over represented in the above totals.

Overall, Florida panther vehicular trauma ( $n = 73$ ) between February 13, 1972, and June 30, 2004, averaged 2.3 panthers per-year (FWC 2004). However, 34 incidents of trauma (47 percent) have occurred in the past 5 years (average 6.8 panthers per-year during 2001-2004).

Table 8 shows vehicular trauma in southern Florida from June 1998 through June 2004. Mortalities have increased in recent years with yearly road mortalities increasing from a total of less than 3 per-year from 1972-1999 (average of 1.14 per-year), to an average of 6.67 per-year from 2000-2002. From June 30, 2003, through October 2004, we are aware of seven additional vehicular mortalities, including several near CREW, 1 on Interstate 4 (I-4) near Tampa, 1 just east of the intersection of I-75 and Alligator Alley, 1 on I-75 at mile marker 93, 1 on I-75 near mile marker 98, and 1 several miles north of County Road 858 on State Road 29. Although the relative significance of vehicular trauma to other sources of mortality is not entirely known, it has been the most often documented source of mortality (Maehr 1989, Maehr et al. 1991b) because the death of uncollared panthers due to other causes (*e.g.*, intraspecific aggression, old age, disease, etc.) will often go undetected.

There are presently 34 wildlife underpasses with associated fencing suitable for panther use along I-75 and to date, no panthers have been killed by vehicles in areas protected with wildlife underpasses (FWC 2003). There are two underpasses suitable for panther use currently existing, and two additional underpasses presently proposed by the Florida Department of Transportation along U.S. Highway 29 (Department of the Army public notice SAJ-2004-778). However, vehicular trauma still occurs on outlying rural roads and the FWC is conducting a study to determine the impacts of vehicular collisions to panthers and studying ways to minimize panther-vehicle collisions. Several additional panther/wildlife crossings are proposed along roadways in rural Lee and Collier Counties in addition to the proposals along U.S. Highway 29 (FWC 2001).

Florida panthers were hunted for bounty during the 1800s and for sport up until the 1950s (Tinsley 1970). Seven panther shootings, six fatal, and one non-fatal, occurred between 1978 and 1986. A female Texas *puma* introduced for genetic restoration was shot in 1998 (FWC 1999). Education, self-policing among hunters and regulation are the tools by which shootings are minimized. All free-ranging *puma* in the Florida are protected by a “similarity of appearance” provision in the ESA (56 FR 40265-40267; August 14, 1991).

Janis and Clark (1999) 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 (Florida Panther NWR, Fakahatchee Strand State Preserve) to hunting. The variables examined were: (1) morning activity rates; (2) movement rates; (3) predation success; (4) home range size; (5) home range shifts; (6) habitat selection; (7) distance from panther locations to trails; and (8) frequency of panther use in the Bear Island Unit of BCNP. The authors failed to detect any relationship between hunting and the first 6 variables. Of the last 2 variables they determined that the distance of panther locations from trails increased an average of 0.31 mile (180 m) and that the frequency of panther use in the Bear Island Unit decreased from 30 up to 40 percent during the hunting season. An analysis of movement rates, a measure of energy expenditure, and predation success, a measure of energy intake, do not indicate any direct, negative energetic responses to increased human activity during the hunting season. However, the increase in average distance from trails and decrease in panther use of the Bear Island Unit are indicative of a behavioral change. Janis and Clark (1999) surmise that the increase in the distance of panther locations from trails is “biologically minor” and probably related to prey behavior (*i.e.*, white-tailed deer moving deeper into the forest to avoid hunters). The decrease in

panther use of the Bear Island Unit is balanced by an increase in use of private lands north of BCNP as “refugia.” However, Beier et al (2003) finds this and other studies of hunting impacts to panthers to be inconclusive.

### Population Dynamics

Population Viability Analyses (PVA) have 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, p.132), “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 biologist used in management strategies and conservation planning, particularly for situations where it is difficult to accurately predict long-term effects.

We believe that the spatially-explicit model, based on probability of persistence for 100 years, developed by the Florida Panther Subteam (2002) represents the best insight into population viability for the panther at this time. The Florida Panther Subteam (2002) built their own spatially-explicit or habitat-based models using RAMAS Geographic Information System (GIS) database and based them on long-term mark-recapture survey data, detailed habitat data, and estimates of vital rates. The basic versions of these models assumed no catastrophes or epidemics, no change in habitat quality or amount, no difficulty in finding mates, no additional human-induced mortality, and a ceiling type of density dependence (Florida Panther Subteam 2002). Variations of these models had different density dependence or none, various levels of habitat loss, intermittent catastrophes or epidemics, or scheduled translocation (Florida Panther Subteam 2002).

Based upon a review of the literature and the results of the basic versions of their own models, the Florida Panther Subteam (2002) suggested a set of population guidelines for use in management and recovery of the Florida panther: (1) populations of less than 50 individuals at least 1 year old 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 and be subject to inbreeding depression; (3) populations of 80 to 100 are likely stable but would still be subject to genetic problems (*i.e.*, the population is expected to remain stable through 100 years, but 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. Although the Florida Panther Subteam's population guidelines did not address populations between 50 and 60 individuals and 70 and 80 individuals, the Service believes these two missing populations are subsets of the Florida Panther Subteam's (2002) population set of 60 to 70 individuals.

In September 2003, the documented south Florida panther population was 87 adults and subadults, not including kittens at the den (FWC 2003). The south Florida panther population has shown an increase in the survivability of young and juveniles (McBride 2003) and an increase in the population estimates from 62 in 2000 (McBride 2000), to 78 in 2001 (McBride 2001), to 80 in 2002 (Florida Panther Subteam 2002), to 87 in 2003 (FWC 2003). No documented population number has been provided by FWC for 2004; however, D. Land (personal communication, November 2004) estimates the population to be between 70 and 100 panthers. McBride (personal communication, November 2004) plans to provide a verified population count in early 2005 and expects due to the extent of mortalities this year that the population estimate may be lower than last year.

Based on the model prediction of the Florida Panther Subteam (2002), a population of 80 to 100 panthers are needed for stability over a 100-year period and is the basis of the Service's conservation strategy to identify and protect sufficient lands for this size population. However, minor fluctuations in the number of panthers within any given year are expected and are not the determining factors in the jeopardy analysis for biological opinions in which all take would be due to habitat loss.

Panther conservation strategy: Previous recovery plans for the Florida panther have called for the establishment of additional populations within the historic range of the Florida panther (Service 1987, 1995). The PVA models discussed in the previous section and in detail in the Conservation Strategy (Florida Panther Subteam 2002) support this goal and predict that a population of 80 to 100 individuals is needed for stability over a 100-year period and a population greater than 240 is needed to retain 90 percent of original genetic diversity. The Florida Panther Subteam assessed the available habitat south of the Caloosahatchee River and determined that sufficient lands were not available to sustain a population of 240 individuals south of the Caloosahatchee River. However, the Florida Panther Subteam determined that sufficient lands were available south of the Caloosahatchee River to support a population of 80 to 100 individuals (although all lands are not protected), and that the highest priority for recovery and conservation of the Florida panther is to ensure the survival of the existing breeding population south of the Caloosahatchee River. The Service's South Florida panther conservation strategy is to achieve this priority goal and concurrently identify lands north of the Caloosahatchee River that can be the recipient area for the expansion of the South Florida panther population from south of the Caloosahatchee River to other parts of its historic range. We believe that sufficient lands may be found north of the Caloosahatchee River to, in conjunction with the lands conserved south of the river, support a population of greater than 240 individuals.

In the early 1990s, two plans for the protection of Florida panther habitat in south Florida were developed (refer to Logan et al. 1993 and Cox et al. 1994). Both of these plans identified privately owned lands that contained habitats important to the long-term conservation of the Florida panther. Logan et al. (1993) identified specific parcels of land by section, township, and range as Priority 1 and 2 preservation areas. However, this plan has been criticized as being too general (*i.e.*, targeted lands perceived as including too many areas that were not truly panther habitat) and for not having been available for public review and comment prior to publication. Cox et al. (1994) identified specific lands based on their habitat features and the likelihood that they could support a minimally viable population of panthers for the next 200 years.

The lands identified in each of these planning studies, although referred to in the studies as essential to the survival and recovery of the Florida panther, were intended to be guides for land acquisition planning purposes, because of their inclusion of lands containing urban developments and other lands not considered truly panther habitat (*i.e.*, rock and sand mines). These land preservation recommendations have been used by Federal, State, and County resource agencies as guides for public land acquisition programs, local land-use planning, and, in a few cases, compensation for land-use conversion projects proposed for lands identified by the plans.

Figure 6 provides a representative view of the land preservation efforts within the southwest Florida landscape that not only benefit the Florida panther, but also provide benefits to the mosaic of other species that are important to the south Florida ecosystem. Table 2 provides a summary of the targeted and acquired acreages of the Conservation Lands in southwest Florida. Based on the table, total lands targeted for acquisition to date are 3,164,672 acres.

To further refine the land preservation needs of the Florida panther and to specifically develop a landscape-level strategy for the conservation of the Florida panther population in south Florida, the Service, in February 2000, appointed a Florida Panther Subteam. This Subteam is part of the overarching MERIT for south Florida. MERIT includes 36 members representing Federal, State and local governmental agencies, the Seminole Tribe of Florida, the Miccosukee Tribe of Indians of Florida, academia, industry, and the private sector, and was created with the purpose of overseeing the implementation of the recovery and restoration tasks identified in the MSRP.

The Florida Panther Subteam was charged with developing a landscape-level strategy for the conservation of the Florida panther population in south Florida (Conservation Strategy). 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 Florida panther (Figure 7). The Florida Panther Subteam focused its efforts on the area south of the Caloosahatchee River, where the reproducing panther population currently exists.

The Florida Panther Subteam created an updated Florida panther potential habitat model that was based on the following criteria: (1) forest patches greater than 4.95 acres (2 hectares); non-urban cover types less than 656 feet (200 m) from forest patches; and (2) exclusion of lands less than 984 feet (300 m) from 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.

The Conservation Strategy (Florida Panther Subteam 2002) referred to these lands as essential; however, as observed in the two previous plans (Logan et al. 1993 and 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.*, 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. This area is also important as foraging habitat and areas for expansion of the Primary zone resident population.

The Florida Panther Subteam 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. 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 pathway for expansion of the south Florida panther population.

The Primary zone covers 2,270,590 acres (918,895 hectares); the Secondary zone covers 812,104 acres (328,654 hectares); and the Dispersal zone covers 27,883 acres (11,284 hectares); providing a total of 3,110,578 acres (1,258,833 hectares) (Florida Panther Subteam 2002). The Florida Panther Subteam also estimated the present average density, based on telemetry and other occurrence data to average 1 panther per 31,923 acres (12,919 hectares). Based on this average density, the Primary zone could support 71 (71.1) panthers; the Secondary zone 6 to 10 panthers without habitat restoration and 25 (25.4) panthers with habitat restoration; and the Dispersal zone 1 (0.87) panther, for a maximum total of 97 (97.4) individuals, provided that sufficient lands within the Secondary zone are restored. This maximum total is within the range of the Florida

Panther Subteam's PVA model that suggests that a population of 80 to 100 individuals is likely to be stable, and although subject to genetic problems, is likely to survive through 100 years provided the model assumptions are met (Florida Panther Subteam 2002).

To evaluate the effects of a project such as this one, which takes habitat rather than direct taking through killing, on the Florida panther, the Service considers the contribution that the project lands provide to the Florida panther, recognizing that not all habitats provide the same functional value. The Florida Panther Subteam (2002) also recognized that not all habitats provide the same functional value to the Florida panther and developed habitat suitability scores for various habitat types, based on the likelihood of use by dispersing panthers. Habitat types were assigned a score from zero (0) to ten (10), with 0 representing no value to the Florida panther and 10 representing the highest value. As an interim process, the Service has accepted these values, with several adjustments to the assigned habitat values reflecting consolidation of similar types

of habitats and the inclusion of Everglades Restoration water treatment and retention areas, as the basis for habitat evaluations and the recommended compensation values to minimize project effects to the Florida panther (Table 3).

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 (SLOPES) for endangered species (Service 2000). The Florida panther SLOPES provide guidance to the Corps in assessing project effects to the Florida panther, and recommends actions to minimize these effects. The Florida panther SLOPES also include a consultation area map (Figure 4) that identifies an action area where the Service believes land alteration projects may affect the Florida panther. The acreage in the consultation area map (Figure 4) (4,717,152 acres [1,909,031 hectares]) includes lands north of the Caloosahatchee, lands within the three zones and “other” lands. The lands in the “other” classification include a mixture of lands, both north and south of the Caloosahatchee River (1,606,640 acres [650,198 hectares]), including urban lands. During project reviews, habitat values for these lands are developed. These habitat values are incorporated into the overall evaluation of the project effects to the Florida panther and assist the Service in our recommendations to applicants of actions that may minimize adverse project effects to the Florida panther.

As stated previously, the Service’s conservation strategy for south Florida is to locate and preserve 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 strategy through land management partnerships with private landowners, through coordination with private landowners during review of development proposals, and through sensitive land management and acquisition programs with Federal, State, local, private, and tribal partners. The acreages of lands necessary to achieve this strategy, based on the average density of 31,923 acres (12,923 hectares) (Florida Panther Subteam 2002) per panther is 2,551,851 acres (1,032,720 hectares) for 80 panthers or 3,189,813 acres (1,290,900 hectares) for 100 panthers.

The acreage of lands within the panther consultation area as defined in the Florida panther SLOPES (Service 2000) (Figure 4) is 4,717,152 acres (1,909,031 hectares), understanding that all of these lands do not provide the same value to the Florida panther. The combined acreage of lands within the Primary, Dispersal, and Secondary zones is 3,110,577 acres (1,258,833 hectares) (Florida Panther Subteam 2002). With the premise that the Service’s strategy is to focus habitat conservation in the Primary, Secondary, and Dispersal zones, the Service believes that lands are available within the consultation area to meet the Service’s conservation strategy for the Florida panther in southwest Florida, provided that panther habitat fragmentation is discouraged.

Additionally, a separable element of panther recovery is the establishment of panther populations elsewhere in its historic range, with northward dispersal (female migration) through the Dispersal zone, cross the Caloosahatchee River, and into south-central Florida, where dispersing males are already present.

## 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 (Figure 5). 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. This action area does not include urban lands, lands west of I-75, and lands that are outside of the Service's panther consultation area. 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 that 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 monitored.

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, 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, 12-collared panthers, 4-uncollared females, and 3-uncollared males had home ranges in or home ranges that overlapped the same survey unit as the Bonita Springs Utilities project. In addition, 8 other panthers that used this same survey unit previously died during this time period (FWC 2003). This unit, designated as Unit 5, includes the Florida Panther NWR, Corkscrew Swamp Sanctuary, and CREW.

Within the action area, the 25-mile radius, 8 radio-collared panthers have overlapping known home ranges. Home range coverage of radio-collared panthers in the action area totals

337,952 acres (Figure 8). These panthers are FP 59 (male), FP 60 (male), FP 65 (male), FP 75 (female), FP 83 (female), FP 107 (female), FP 113 (female), and FP 131 (male). Panther FP 66, a female, was documented within 5 miles of the project site between December 1997 and February 2001; however, its radio-collar failed and no recent data is available. In addition, McBride (2003) notes previous use of the action area by other panthers prior to their mortality. According to telemetry data, no radio-collared panthers have been recorded on the project site.

The project site is located within the western portion of the geographic range of the panther in Florida. There have been a total of 4 male panthers recorded within 5 miles of the project site on 87 occasions from 1989 through 2002. The Service believes the project site may occasionally be used by panthers because it contains habitat types used by panthers and their prey and the project vicinity has been used historically by panthers as indicated by telemetry locations over a 14-year period.

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 25 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). These projects have impacted or are expected to impact approximately 25,496 acres of panther habitat. These projects have also incorporated a total of 15,141 acres of preservation and restoration of panther habitat. The impacted lands generally are: (1) on the western fringe of occupied panther habitat; (2) vegetated with dense stands of exotic species, which may adversely affect the density of the panther prey base; and/or (3) support agricultural enterprises, *i.e.*, row crops, citrus, etc., which provide a lower quality habitat value to the Florida panther. The preserved lands, which are generally proximate to larger tracts of Federal, State, and other preserves, provide a higher quality habitat value for the Florida panther. The Service has determined in the biological opinions issued for these Federal actions, that individually and cumulatively these projects do not jeopardize the survival and recovery of the Florida panther.

From July 2000 through September 2004, the Service also engaged in informal consultation within the Florida panther consultation area with the Corps for approximately 314 projects affecting approximately 420 acres in Collier County (primarily Northern Golden Gate Estates) and 26 acres in Lee County (primarily Lehigh Acres) (database entries for informal consultations prior to 1992 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 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. These projects have been incorporated into the Service's environmental baseline for the Florida

panther and the Service has determined that individually and cumulatively these projects do not jeopardize the survival and recovery of the Florida panther.

We have recently received information that within the action area, that the Corps has, between April 1, 2004, and September 30, 2004, issued non-jurisdictional wetland determinations (isolated wetlands) for 3 projects, totaling 1,039.6 acres in Collier County, and for 4 projects, totaling 226 acres in Lee County. These additional determinations were 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 require no Federal Clean Water Act 404 wetland permit. These projects have been incorporated in the Service's environmental baseline for the Florida panther in this biological opinion and the Service has determined, based on the location of these projects (generally in the western fringe of the panther's geographic range), the quality of the habitat present on these project sites, and the overall status of the Florida panther that these projects individually and cumulatively do not jeopardize the survival and recovery of the Florida panther. However, since loss of panther foraging habitat may occur from construction of these projects and no Corps' wetland permit is required, the Service is requesting that the applicants pursue Habitat Conservation Plans in cooperation with the Service.

Panther mortality related to traffic within the 25-mile action area from 1985 through August 2004 totals 15 documented panther-vehicle collisions (see Table 4 and Figure 12). Two recent road mortalities are east of the project area on County Road 846, the location of which is being evaluated for construction of a panther crossing (FWC 2003).

Activities within the action area have also benefited panthers. The issuance of Corps and State of Florida Environmental Resource Permits has preserved 15,141 acres of high quality panther habitat for permitted impacts to 25,496 acres of poor quality panther habitat. Additional benefits have resulted from the acquisition of high quality habitat through acquisition programs by the other Federal, State, and County resource agencies. Table 5 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, has improved 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 (positive and negative) within the action area include, but are not limited to, highway, urban, 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.

## EFFECTS OF THE ACTION – FLORIDA PANTHER

This section analyzes the direct and indirect effects of the project 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) the loss of available habitat for foraging, breeding, and dispersing panthers; and (4) a reduction in the geographic distribution of the species. 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 in the project vicinity due to human activities; (3) the reduction in panther prey; (4) the reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and (5) a potential increase in intraspecific aggression between panthers (and an increase in mortality of subadult male panthers) due to reduction of the geographic range 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”. However, based on our analysis (see below), neither vehicular mortality nor mortality through intraspecific aggression are likely to occur as a result of this project.

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 this project, relative to sensitive periods of the panther’s lifecycle, is unknown. Panthers may be found on and adjacent to the proposed construction footprint year-round. The project will be constructed in 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 project is not known, but it is likely that all land clearing associated with the development will be completed in a few months. The disturbance associated with the project will be permanent and result in a loss of habitat currently available to the panther; however, fragmentation of habitat will not occur due to the proposed wastewater treatment facility’s position in the landscape of existing development.

### Analyses for Effects of the Action

The 176-acre Bonita Springs Utilities project site currently provides habitat of various quality for the Florida panther. The project site is not located in either the “Primary” or “Secondary” zone as designated by the Florida Panther Subteam (2002), but is located inside of the Panther consultation area as defined by the Service (2000). The project site is located on the western

fringe of occupied habitat, is adjacent to urban development, and is not located within known dispersal or connection corridors to larger publicly owned managed lands. The project will result in the conversion of 78.92 acres of marginal panther habitat onsite into a wastewater treatment complex. Compensation for the loss of 78.92 acres of this marginal panther habitat will be through the protection and restoration of 108 acres of high quality panther habitat in PIMB. PIMB is in Primary zone habitat designated by the Florida Panther Subteam (2002). High quality panther habitat borders this mitigation bank to the west, east, and south.

Restoration of wetlands and uplands in Phase VI of PIMB will consist of the removal of exotic vegetation, ranging from 0 to 25 percent coverage, averaging 14 percent. The bank will be protected by a conservation easement granted to the State of Florida and maintained in perpetuity.

### Habitat Assessment

To assess the project's effects to the Florida panther, the Service in coordination with the applicant agreed to evaluate the project's effects through application of habitat suitability scores from the Conservation Strategy (Florida Panther Subteam 2002) as adjusted by the Service as a direct calculation per-acre with a base ratio (2.5) to compensate for unavoidable project effects to the Florida panther.

The base ratio is determined from the habitat acreage needs of a population of 90 panthers, which is the mid-point in the Florida Panther Subteam's (2002) PVA model predictions that a population of 80 to 100 panthers is likely to be stable, although subject to genetic problems, through 100 years. The Service, based on the average panther home range size of 31,910 acres (Florida Panther Subteam 2002) determined that 2,871,894 acres of Primary zone equivalent lands need to be protected and managed. The available non-urban Primary zone equivalent lands in the core area (Figure 13) are estimated at 3,272,493 acres (actual acreage is 4,486,364 acres), with 2,094,988 acres of Primary zone equivalent lands (actual acreage is 2,605,046 acres) of non-urban lands preserved. The remaining non-urban private lands are estimated at 1,177,506 acres of Primary zone equivalent lands (actual acreage is 1,881,318 acres). To meet the protected and managed lands goal, an additional 776,906 acres of Primary zone equivalent lands need to be secured, leaving approximately 400,600 acres of Primary zone equivalent non-urban lands at risk (1,177,506 minus 776,906 equals 400,600). A base ratio of 1.94 (rounded to 2) is necessary to achieve this goal. However, not all lands provide the same functional value to the Florida panther and not all lands will be subject to Service consultation reviews. Therefore, to provide a margin of conservatism in the Service's assessment goal to protect and manage lands for the Florida panther, an additional 0.5 was added to the ratio of 2.0, providing a base ratio of 2.5. The Service intends to re-evaluate this base ratio periodically (every 2 to 3 years) and adjust as needed to achieve the Service's conservation goal for the Florida panther.

The Service also believes that a landscape multiplier is necessary to compensate for landscape location and importance of project lands in the consultation area to the Florida panther. For example, as discussed previously, lands in the "other" classification provide less functional value to the Florida panther than lands in the "Primary" classification. The Service is applying

landscape multipliers of 0.33 where the loss of “other” is being compensated for in “Primary,” 0.5 for loss in “other” when compensation is in “Secondary”, 0.67 for loss in “Secondary” when compensation is in “Primary,” 1.5 for loss in “Primary” when compensation is in “Secondary”, and 3.0 for loss in “Primary” when compensation is in “other.”

For the Bonita Springs Utilities project, which is in “other”, with compensation in “Primary,” the habitat functional value for the project site is 478 functional units, which is based on the acres of each type of habitat multiplied by the habitat value (Table 6). To determine the compensation needs for the project, the habitat value is multiplied by the base ratio of 2.5, then by the landscape multiplier of 0.33 (project in “other,” compensation in “Primary”) resulting in a compensation need of 394 functional units ( $478 \times 2.5 \times 0.33 = 394$ ). The functional value of the compensation site is determined in the same manner, *i.e.*, the acres of each type of habitat multiplied by the habitat value. In this instance, the PIMB site, based on 108 acres offered by the applicant, provides 876 functional units, without enhancement and 972 functional units with enhancement, a lift of 96 functional units. However, since enhancement actions generally require a period of time to achieve full functional value of the enhanced habitat value (temporal lag); the Service credits this value at one-half the difference between pre and post functional values. For example, the PIMB site has an existing functional value of 876 units, once enhancement actions meet their full potential habitat value, the PIMB will have a functional value of 972 units. However, because of the temporal lag in achieving full habitat values, the Service credits the compensation site with one-half of the difference (lift), which for the PIMB site is 48 units ( $[972-876]/2 = 48$ ). This lift credit is added to the existing habitat value of 876 units, providing a compensation site functional value of 924 functional units.

Based on these functional comparisons, the Service believes the habitat values lost by the proposed 79-acre development will be more than offset by the preservation and compensation actions proposed by the applicant. The lands proposed for development are in the “other” zone, are primarily improved pasture and cropland, are on the fringe of the currently occupied range of the Florida panther, and are adjacent to I-75 and existing urban areas. The lands proposed for preservation are in the “Primary” zone, are adjacent to other larger tracts of preserved lands, including the National Audubon Society’s Corkscrew Swamp Sanctuary, and are consistent with the Service’s panther conservation strategy to strategically locate and preserve 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.

**Wildlife Assessment:** A protected species survey was conducted by Boylan Environmental Consultants, Incorporated in 1997 utilizing belt transects. More recent observations have been provided by ecologists with Johnson Engineering. During these assessments, wood storks were observed onsite, along with other State-listed wading birds. Evidence of feral hogs and raccoons was observed during fall surveys. Other small mammals also constituting panther prey may utilize the site. No observations of deer have been recorded; however it is possible that deer forage in the open fields.

As discussed previously, white-tailed deer densities and other prey species are influenced by the quality of the foraging habitat present in an area. Monotypic stands of poor quality foraging

plant species and the invasion of a site by exotic plants provide lower habitat foraging values and affect the utilization by and density of foraging species. The habitats in the project area have also experienced similar vegetation changes. Historical vegetation on the property included a mosaic of upland and wetland habitats that provided a seasonal pattern of plant growth. However, past agricultural practices and the invasion of the habitats by the exotics, melaleuca and Brazilian pepper, have resulted in the growth of dense stands of monotypic, unpalatable plant species that provide poor quality foraging needs for resident deer populations. While the compensation site, with its growth of invasive exotic plant species and altered hydrology also displays similar foraging restrictions, the proposed enhancements will result in a more diverse mosaic of plant species, which will provide an increased foraging value to resident deer populations.

Conservation Measures: The beneficial effects of the project include the preservation and enhancement of 108 acres of “Primary” zone panther habitat in PIMB, located approximately 6 miles to the northeast of the project site. Although the project will result in a net loss in the number of acres of habitat, the habitat quality provided to the Florida panther through preservation and enhancement in Phase VI of PIMB is superior to that of the areas to be impacted. Enhancement in PIMB consists of eradication of exotic vegetation, primarily melaleuca, and to a lesser degree, Brazilian pepper. In Phase VI of PIMB, exotic infestation ranges up to 25 percent with an average of 14 percent. However, the eradication of exotics will improve suitability for the panther primarily through the resultant improvement in panther prey base. Lands preserved and improved in PIMB will be protected by conservation easement granted to the State of Florida. There were 7 telemetry locations of panthers recorded within PIMB from 1989 to 2002, involving 2 panthers; 25 telemetry locations within 1 mile of PIMB, involving 4 panthers, and 246 telemetry locations of panthers within 5 miles of PIMB, involving an estimated 6 panthers. The compensation site is a valuable area for breeding, foraging, and dispersal habitat that is important to panthers. In comparison, no radio-collared panthers have been recorded within the project site. Although the amount of use of PIMB and the project site by uncollared panthers is unknown.

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) the loss of available habitat for foraging, breeding, and dispersing panthers; and (4) a reduction in the geographic distribution of the species. Panthers may also be subject to harassment by construction activities. The direct effects include that this project will have on the Florida panther within the action area are discussed below.

Permanent Loss of Habitat: The project will result in the loss of 78.92 acres of panther habitat located outside of the “Primary” and “Secondary” zones. The land will be converted to support a wastewater treatment facility. Habitat quality is generally poor, as it is primarily improved pasture and cropland supporting an average of 18 percent exotics. Prey surveys did not document site usage by white-tailed deer, a primary panther prey species. Therefore, we believe the loss of the habitat associated with these lands is insignificant and this action is not expected to result in jeopardy to or a reduction in the geographic distribution of the Florida panther.

Fragmentation of Habitat: The project site is located on the western fringe of occupied habitat, is adjacent to urban development, and is not located within known dispersal or connection corridors to larger publicly owned managed lands; therefore, fragmentation of panther habitat is not expected to result from project implementation. The project site is also bordered on the west, north, and south by disturbed and/or other urban lands, which provide marginal quality foraging habitat for prey species; therefore fragmentation of panther prey species habitat is not expected.

Construction: The timing of construction for this project, relative to sensitive periods of the panther's lifecycle, is unknown. However, it is likely that all land clearing associated with the development will be completed in a few months. There are no known den sites within the project boundaries and the quality and quantity of the foraging prey base is low. Therefore, we believe panther usage of the property is limited and we do not believe project construction will result in direct panther mortality.

Compensation: The Service believes the habitat values lost by the development will be offset by the preservation and compensation actions proposed by the applicant. The lands proposed for development are primarily improved pasture and cropland on the fringe of the currently occupied range of the Florida panther, and are adjacent to I-75 and existing urban areas. The lands proposed for preservation are adjacent to other larger tracts of preserved lands and are consistent with the Service's panther conservation strategy 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 that 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 in the project vicinity due to human activities; (3) the reduction in panther prey; (4) the reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and (5) a potential increase in intraspecific aggression between panthers due to reduction of the geographic range of the panther.

The project will result in minor increased vehicular traffic in the project vicinity during construction and operation. However, vehicular mortality data (see Table 5 and Figure 12) provided by the FWC indicate that collisions with motor vehicles are not an important source of panther mortality in the project vicinity. According to traffic studies provided by Bonita Springs Utilities, Incorporated, construction traffic will be coming from East Terry Street which is south of the project, up Morton Avenue into the site. The access is through areas that are already

developed. Traffic trips-per-day will average 30 to 50 trips including cars, pickup trucks, and tractor trailer delivery trucks. Once construction is completed, estimated at 2 years, additional vehicular traffic in the area as a result of plant operations will consist primarily of several daily shifts of 8 to 10 employees, supervisory visits, and chemical deliveries. Although there may be some traffic increase east of the project site, the traffic flow pattern to and from the proposed wastewater treatment plant will be generally to the north, south, and west into urban areas and not into the more rural lands of Lee or Collier County. Considering this information, distances from the project site to documented collisions, and the small number of vehicles to be associated with plant construction and operation, it is unlikely that the traffic generated by this project will significantly increase the risk of roadway mortality to panthers.

The project site is located on the western fringe of occupied habitat, is adjacent to urban development, and is not located within known dispersal or connection corridors to larger publicly owned managed lands; therefore fragmentation of panther habitat is not expected to result from project implementation.

The project may increase intraspecific aggression and disturbance to the Florida panther. However, the Service believes, that as previously discussed, the habitats on the property provide marginal quality foraging for prey species, which directly affects the frequency and duration of use of the property by panthers. Therefore, the Service believes it is unlikely that the loss of this limited use of the site by panthers will significantly increase the risk of mortality from intraspecific aggression between panthers and increase disturbance to panthers in the project action area due to human activities.

#### CUMULATIVE EFFECTS – FLORIDA PANTHER

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action but located in the action area are not considered in this section because they require separate consultations pursuant to section 7 of the ESA. As discussed in the environmental baseline, the Service identified a variety of actions that may have a beneficial and/or an adverse effect on the Florida panther and has developed a mechanism to distinguish between those actions that are likely to be future Federal actions and those that are not, and thus meet the cumulative effects definition.

Within the action area past and ongoing State and County actions affecting panther habitat include the issuance of Development of Regional Impact Orders (2001 – 2004), Comprehensive Plan Amendments (2003 – 2004), Zoning Amendments (2003 – 2004), Planned Unit Developments (2001 – 2004), and Environmental Resource Permits (2003 – 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. 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. The Service cross-referenced the boundaries and approximate locations of the listed projects on

recent aerial photographs (Figure 11). Table 7 provides a list of those projects, size in acres, year approved, and designation if wetlands are present. According to FLUCCS mapping, approximately 2,627.3 acres could be expected to be subject to development in the action area without Federal permit involvement through the Clean Water Act section 404. According to the most current home range estimates of the Florida panther (FWC 2004), this level of development represents 9.8 percent of a female panther home range and 2.7 percent of a male panther home range.

State and County land alteration permits 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) total approximately 34,028 acres as of September 2004 (Figure 9). To evaluate these effects, the Service has overlain the plat boundaries on 2002 aerials, 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) total approximately 35,768 acres as of August of 2003. The breakdown of acres for August 2003 is: (2) wetlands, approximately 17,572 acres; uplands, approximately 17,990 acres; and (2) water, approximately 210 acres. These changes were overlain on the National Wetlands Inventory (NWI) maps for presence of wetlands. This evaluation was used to estimate the percentage of properties that may be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps (Figure 9). A comparison of the 2003 and 2004 data for Northern Golden Gate Estates indicates approximately 1,740 acres of land were converted from vacant to occupied with the breakdown as: (1) wetlands, approximately 696 acres; and (2) uplands, approximately 1,044 acres. Therefore, using NWI mapping, approximately 1,050 acres could be expected to be subject to development each year in this area without Federal permit involvement.

Vacant lands within the area of Lehigh Acres total approximately 34,852 acres as of April 2003 (Figure 10). The breakdown of acres is: (1) wetlands, approximately 1,057 acres; (2) uplands, approximately 33,592 acres; and (3) water, approximately 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 approximately 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. For the non-exempt projects, where permits were required by the Corps, the Service concurred with the Corps' determination of "may affect, but is not likely to adversely affect" for these individual projects. Therefore, using NWI mapping, approximately 375 acres could be expected to be subject to development each year in this area without Federal permit involvement.

The evaluation process discussed previously for both of these subdivisions provided an estimate of 417 lots totaling 1,044 acres for Northern Golden Gate Estates and 1764 lots totaling 375 acres for Lehigh Acres. Therefore, using NWI mapping for the Northern Golden Gate Estates and Lehigh areas, a total of approximately 1,419 acres could be expected to be subject to development each 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 3.7 percent of a female panther home range and 1.4 percent of a male panther home range.

In summary, the Service's cumulative effect analysis has identified approximately 4,046.3 acres within the action area that could be developed without Federal wetland permit involvement. This level of development is reasonably certain to occur, will not involve a Federal action, and therefore, meets the definition of a cumulative effect. This level of development represents 14.3 percent of a female panther home range, 5.4 percent of a male panther home range, and 0.22 percent of the private non-urban lands at risk in the core area. As previously discussed, these lands are generally on the fringes of occupied panther habitat, vegetated with exotics or in row crops, are in partially developed area, and represent less than 1 percent of the private lands at risk in the core area. Therefore, we believe the loss of the habitat associated with these lands is insignificant.

#### SUMMARY OF EFFECTS – FLORIDA PANTHER

The timing of construction for this project, relative to sensitive periods of the panther's lifecycle, is unknown. However, it is likely that all land clearing associated with the development will be completed in a few months. There are no known den sites within the project boundaries and the quality and quantity of the foraging prey base is low. Therefore, we believe panther usage of the property is limited and we do not believe project construction will result in direct panther mortality.

Although there may be some traffic increase east of the project site, the traffic flow pattern to and from the proposed wastewater treatment plant will be generally to the north, south, and west into urban areas and traffic is not directed into the more rural lands of Lee or Collier County. Considering this information, distances from the project site to documented collisions, and the small number of vehicles to be associated with plant operation, we believe it is unlikely that the traffic generated by this project will result in direct road mortality of panthers.

The Service, based on the habitat evaluations discussed previously, believes that the project will result in the loss of 78.92 acres of mostly poor quality panther habitat outside of the "Primary" and "Secondary" zones. Habitat types are primarily improved pasture and cropland with average exotic vegetation coverage of 18 percent. Wildlife utilization of the property shows limited foraging values to panther prey species. The loss of these 78.92 acres of poor quality habitat represents 0.0043 percent of the 1,881,318 acres of available non-urban private lands in the core area. The Service believes that this small loss of poor quality habitat on the western fringe of the panther's range will not adversely affect the Service's recovery strategy and land conservation/preservation goals.

On the other hand, the project will also provide for the preservation and enhancement of 108 acres of "Primary" zone habitat in PIMB. Enhancement will be in the form of removing exotics from all habitat types, and fostering growth of native species in replacement. The preservation of these lands in the panther core preservation area represents 0.024 percent of the 443,399 acres of private lands still needed for the population of 80 individuals and 0.01 percent

of the 1,086,361 acres of private lands still needed for 100 individuals. Therefore, we believe that the preservation of the 108 acres of panther habitat in the panther core preservation area will have a beneficial effect on the panther, will more than offset the habitat lost, and further the Service's goal in panther conservation. The lands protected by this preservation action, based on the Service's functional value assessment, provides a net benefit value (value lost 478 units; value gained 924 units) of 446 functional units.

The project site is also located on the western fringe of occupied habitat, is adjacent to urban development, and is not located within known dispersal or connection corridors to larger publicly owned managed lands; therefore, fragmentation of panther habitat is not expected to result from project implementation.

The project may increase intraspecific aggression and disturbance to the Florida panther. However, the Service believes, that as previously discussed, the habitats on the property provide marginal quality foraging for prey species, which directly affects the frequency and duration of use of the property by panthers. Therefore, the Service believes it is unlikely that the loss of this limited use of the site by panthers will significantly increase the risk of mortality from intraspecific aggression between panthers and increase disturbance to panthers in the project action area due to human activities.

In the cumulative analysis, the Service identified the potential loss of approximately 4,046.3 acres within the action area that could be developed without Federal wetland permit involvement. The 4,046.3 acres represent a small percentage (0.22 percent of the 1,881,318 acres) of available non-urban private lands in the core area. In general, these lands are primarily within previously impacted areas or are in the western more urbanized portion of the Florida panther's consultation area. Although this small percentage of lands will be lost from the core area of private lands available for panther conservation, the Service believes that sufficient lands are available to meet the needs of the Service's recovery strategy and land conservation/preservation goals.

Conversely, the State and County have acquired within the last year 2,351 acres of lands, which represent 0.53 percent of the 443,399 acres of private lands still needed for the population of 80 individuals and 0.22 percent of the 1,086,361 acres of private lands still needed for 100 individuals. These lands are generally located within the core preservation area of the Florida panther and are actively managed for the benefit of many wildlife species including the Florida panther. The preservation of these lands in the panther core preservation area will have a beneficial effect on the panther and further the Service's goal in panther conservation.

## CONCLUSION – FLORIDA PANTHER

In summary, the Service believes that there will be no direct take of the Florida panther resulting from this project. The loss of habitat from implementing the project, taking into consideration the status of the species, remaining habitat, and other factors considered by this biological opinion such as the overall recovery objectives and other cumulative effects from actions in the action area will be offset by the conservation of other, superior habitat. Therefore, the proposed construction of the wastewater treatment plant by Bonita Springs Utilities, Incorporated is not

likely to jeopardize the continued existence of the Florida panther. No critical habitat has been designated for this species; therefore, none will be affected.

#### INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA 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 ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

#### AMOUNT OR EXTENT OF TAKE

Although there may be some minor traffic increase from the project, the traffic flow pattern to and from the proposed wastewater treatment plant will be generally to the north, south, and west into urban areas. Considering this information, distances from the project site to documented collisions, and the small number of vehicles to be associated with plant operation, the Service believes that no direct mortality of Florida panthers is expected from the proposed action. Accordingly, the Service is not authorizing any direct take or mortality.

However, the Service anticipates incidental take of panthers in the form of harm and harassment associated with the loss of 78.92 acres of panther habitat outside of the “Primary” and “Secondary” zones.

#### Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species. The amount of panther habitat affected by the proposed action is approximately 0.004 percent of an estimated 2 million acres (Florida Panther Subteam 2002) of habitat occupied by the panther. It would represent approximately 0.08 percent of the average home range of a male panther (FWC 2004) and 0.21 percent of the average home range of a female panther (FWC 2004).

The proposed action will result in the preservation and enhancement of 108 acres of panther habitat off-site in PIMB. The proposed action will increase the preservation and enhancement acreage of panther habitat through permitted Federal actions by about 0.6 percent, from

18,191 acres to 18,299 acres (see Table 1). The cumulative increase in the preservation and enhancement of panther habitat to permitted Federal actions will be from 700 acres in 1990 to 18,299 acres following issuance of a permit, if issued, by the Corps.

The proposed action will result in the loss of 78.92 acres of mostly poor quality panther habitat. The proposed action will increase the impacts from direct and indirect effects to panther habitat from residential and commercial developments, mining, and agriculture by about 0.1 percent, from 79,636 acres to 79,715 acres. Of the 79,715 acres of impacts, 39,918 acres are due to agricultural conversion and 39,797 acres to development and mining. The 39,797 acres impacted by development and mining included a mixture of agricultural fields consisting of row crops and citrus groves, and natural lands with varying degrees of exotic vegetation. The non-agricultural impacts are permanent land losses, whereas the agricultural conversions may continue to provide some habitat functional value to panthers although of less value than native habitats.

The lands proposed for compensation/preservation from the proposed take of panther habitat are lands adjacent to other larger tracts of preserved lands and are consistent with the Service's panther conservation strategy to locate and preserve sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River. Therefore, based on the evaluations provided above for project's direct, indirect and cumulative effects, the status of the species, and the compensation proposed by the applicant, the Service believes that the proposed construction and operation of the Bonita Springs Utilities Wastewater Treatment Plant will not jeopardize the survival and recovery of the Florida panther.

#### REASONABLE AND PRUDENT MEASURES

The Service believes the Corps and the applicant have incorporated all reasonable and prudent measures necessary and appropriate to minimize impacts of incidental take of Florida panthers into the design of the proposed action. In summary, the Corps and the applicant will ensure that no more than 78.92 acres of panther habitat will be lost as a result of implementation of the proposed action and that 108 acres off-site in PIMB will be preserved and managed to benefit the Florida panther and its prey.

#### TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, 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 that they become binding conditions of any grant or permit issued to Bonita Springs Utilities, Incorporated 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 Bonita Springs Utilities, Incorporated 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 Bonita Springs Utilities, Incorporated 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)].

- (1) The Corps will include, as special conditions to the permit instrument, the conservation measures listed below and in the description of the proposed action that commits the applicant to purchase, preserve, and manage high quality panther habitat, which is necessary and appropriate to minimize incidental take of panthers by the proposed action. Specifically, to compensate for impacts to 78.92 acres of Florida panther habitat, the applicant proposes to preserve and enhance 108 acres of panther habitat off-site in PIMB. Habitat to be preserved and restored is within the Florida Panther Subteam (2002) Primary zone designation.
- (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) The Corps will provide documentation to the Service for completion of the proposed off-site restoration and verification of the execution and terms of the conservation easement in PIMB.
- (4) Upon locating a dead, injured, or sick panther specimen, 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.
- (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 ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

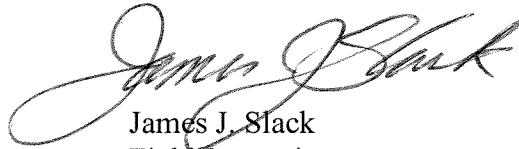
The Service is not proposing any conservation recommendations at this time.

#### REINITIATION NOTICE

This concludes formal consultation on the Bonita Springs Utilities Wastewater Treatment Plant project. 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,



James J. Slack  
Field Supervisor  
South Florida Ecological Services Office

cc:

Corps, Fort Myers, Florida (Skip Bergman)  
District, Fort Myers, Florida  
EPA, West Palm Beach, Florida (Richard Harvey)  
FWC, Punta Gorda, Florida (Jim Beever)  
FWC, Naples, Florida (Darrell Land)  
FWC, Tallahassee, Florida  
Service, Florida Panther NWR, Naples, Florida (Layne Hamilton)  
Service, Vero Beach, Florida (Cindy Schulz)

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**Table 1.** Biological opinions prepared by the Service for projects affecting Florida panther habitat from March 1984 through July 2004.

Biological Opinion Date	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved Onsite (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
03/29/84	83M-1317	Ford Test Track	Collier	530	0	0	0
02/21/85	Unknown	I-75	Collier/Broward	1,517	0	0	0
10/17/86	Unknown	Exxon Master Plan	Collier	9	0	0	0
1/07/86	861PM-20130	Collier Enterprises (Citrus Grove)	Collier	11,178	0	0	0
01/11/88	Unknown	NERCO - Clements Energy	Collier	3	0	0	0
02/23/88	Unknown	Shell Western E&P	Collier/Monroe	0	0	0	0
02/10/89	FAP IR-75-4(88)81	SR 29/I-75 Interchange	Collier	350	0	0	0
08/15/90	Unknown	I-75 Recreational Access	Collier	150	0	0	0
09/24/90	89IPD-20207	U.S. Sugar Corporation	Hendry	28,740	700	0	700
03/12/91	90IPD-02507	Lourdes Cereceda	Miami-Dade	97	0	0	0
01/14/92	199191279	Dooner Gulf Citrus	Collier	40	40	0	40
09/25/92	Unknown	BIA, STOF, BCSIR	Hendry	1,995	0	0	0
06/18/93	199300393	Corkscrew Road	Lee	107	0	0	0
02/25/94	199301131	Daniels Road Extension	Lee	65	0	0	0
05/09/94	199202019	Corkscrew Enterprises	Lee	563	437	0	437
10/27/94	199302371 199400807 199400808	Florida Gulf Coast University Treeline Boulevard	Lee	1,088	526	0	526
05/24/95	199302130	Turner River Access	Collier	1,936	0	0	0
08/07/95	199405501	Bonita Bay Properties	Collier	509	491	0	491
08/15/95	199301495	SW Florida Airport Access Road	Lee	14	0	0	0
09/19/96	199302052 199301404	I-75 Access Points	Broward	116	0	0	0
03/10/98	L30(BICY)	Calumet Florida	Collier/Broward/Miami-Dade	0	0	0	0
03/27/98	199604158	Willow Run Quarry	Collier	359	190	0	190

**Table 1.** (continued)

Biological Opinion Date	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved Onsite (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
09/27/99	199130802	Daniels Parkway	Lee	2,093	0	94	94
06/11/99	199800622	STOF	Hendry	1,091	0	0	0
12/08/99	199607574	Cypress Creek Farms	Collier	239	0	24	24
04/17/00	199507483	Miromar	Lee	1,323		194	194
06/09/00	199900619	Naples Reserve	Collier	833	0	320	320
02/21/01	199803037	Wortzel and Landl	Lee	106	0	0	0
04/17/01	200001436	WCI	Lee	1,183	0	408	408
07/30/01	199003460	Naples Golf Estates	Collier	439	175	0	175
08/31/01	199900411	Colonial Golf Club	Lee	1,083	0	640	640
12/14/01	199301156	Southwest Florida Airport	Lee	8,058	0	6,986	6,986
01/30/02	199402492	Florida Rock	Lee	5,269	802	0	802
03/07/02	199901251	Southern Marsh Golf	Collier	121	75	80	155
04/24/02	199901378	Hawk's Haven	Lee	1,531	267	0	267
09/24/02	200001574	Verandah	Lee	1,456	0	320	320
10/08/02	199602945	Winding Cypress	Collier	1,088	840	1,030	1,870
01/27/03	200003795	Walnut Lakes	Collier	157	21	145	166
02/21/03	200001926	Mirasol	Collier	818	895	0	895
05/19/03	200200970	Apex Center	Lee	95	10	18	28
06/18/03	199701947	Twin Eagles Phase II	Collier	593	57	98	155
06/23/03	199905571	Airport Technology	Lee	116	55	175	230
07/02/03	199507483	Miromar	Lee	342	158	340	498
10/06/03	200102043	Bonita Beach Road	Lee	1,117	145	640	785
09/01/03	200206725	SR 80	Lee	33	2	12	14
12/29/03	200202926	The Forum	Lee	650	0	310	310
06/14/04	199603501	Terafina	Collier	436	210	261	471
Pending	199702288	Bonita Springs Utilities	Lee	79	0	108	108
		<b>Totals</b>		79,715	6,096	12,203	18,299

**Table 2.\*** Targeted and Acquired Acreage Totals of Conservation Lands in South Florida Directly Affecting the Panther

Name	Targeted <sup>1</sup> Acreage	Acquired Acreage	Indian Reservation
<b>Federal Conservation Lands</b>			
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	--
<b>Subtotal</b>	<b>2,255,504</b>	<b>2,255,504</b>	--
<b>State of Florida: Florida Forever Program</b>			
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	--
<b>Subtotal</b>	<b>540,389</b>	<b>136,105</b>	--
<b>State of Florida: Other State Acquisitions</b>			
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	--
<b>Subtotal</b>	<b>793,424</b>	<b>793,424</b>	--
<b>Indian Reservations<sup>2</sup></b>			
Miccosukee Indian Reservation	--	--	81,874
Big Cypress Seminole Indian Reservation	--	--	68,205
Brighton Seminole Indian Reservation	--	--	37,447
<b>Subtotal</b>	<b>--</b>	<b>--</b>	<b>187,526</b>
<b>GRAND TOTALS</b>	<b>3,589,317</b>	<b>3,164,672</b>	<b>187,526</b>

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

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

\* Table 2 was 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 3.** Habitat suitability scores from the Florida Panther Subteam (2002) as adjusted by the Service for use in assessing habitat value to the Florida panther.

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

**Table 4.** Panther-Vehicle Collisions

<b>Distance from Project</b>	<b>Roadway</b>	<b>Date</b>	<b>Result</b>
19.5 miles south	County Road 951	1985	Injury
12.5 miles north	Near Daniels Road	1988	Injury
16.5 miles northeast	County Road 850	1989	Death
8.5 miles north	Alico Road	1992	Injury
12.5 miles north	Daniels Road	1993	Death
24 miles east	County Road 846	2000	Death
25 miles east	County Road 858	2000	Death
25 miles east	County Road 846	2002	Death
10.5 miles southeast	County Road 846	2002	Death
16.5 miles east	County Road 846	2003	Death
17.5 miles east	County Road 847	2003	Death
25 miles east	County Road 858	2003	Death
16.5 miles southeast	I-75, MM 99	2004	Death
20 miles southeast	I-75, MM 93	2004	Death
17 miles southeast	I-75, MM98	2004	Death

**Table 5.** County and State Acquisitions within the Action Area (Acres)

<b>Year</b>	<b>County</b>	<b>State</b>
1998	1,723	*
1999	315	*
2000	1,237	*
2001	700	*
2002	369	767
2003	2,291	60
<b>Totals</b>	<b>6,635</b>	<b>827</b>

\* Acreages per-year data are under request from the State of Florida.

**Table 6.** Florida Panther Habitat Matrix.

<b>Land Cover Types</b>	<b>Habitat Values</b>	<b>Project Development 79 acres</b>			<b>Off-site Preserve with Enhancement 108 acres</b>		
		<b>Functional Units Needed</b>		<b>Functional Units Provided</b>			
		<b>Pre</b>	<b>Post</b>	<b>Pre</b>	<b>Post</b>		
		<b>Acres - FUV</b>	<b>Acres - FUV</b>	<b>Acres - FUV</b>	<b>Acres - FUV</b>		
Water/Urban	0	0	0	79	0		
Exotic Plants	3	15	45		16	48	
Cropland	4	5	20				
Grassland/Pasture	7	59	413				
Cypress Swamp	9				46	414	54 486
Pine Forest	9				46	414	54 486
<b>Subtotal</b>		<b>79</b>	<b>478</b>		<b>108</b>	<b>876</b>	<b>108 972</b>

\* Functional Units provided is one-half of the difference between pre and post enhancement values added to the pre value ( $[972-876]/2 + 876 = 924$ ).

**Table 7.** Bonita Springs Utilities, Incorporated – Florida Panther Consultation Area Project List

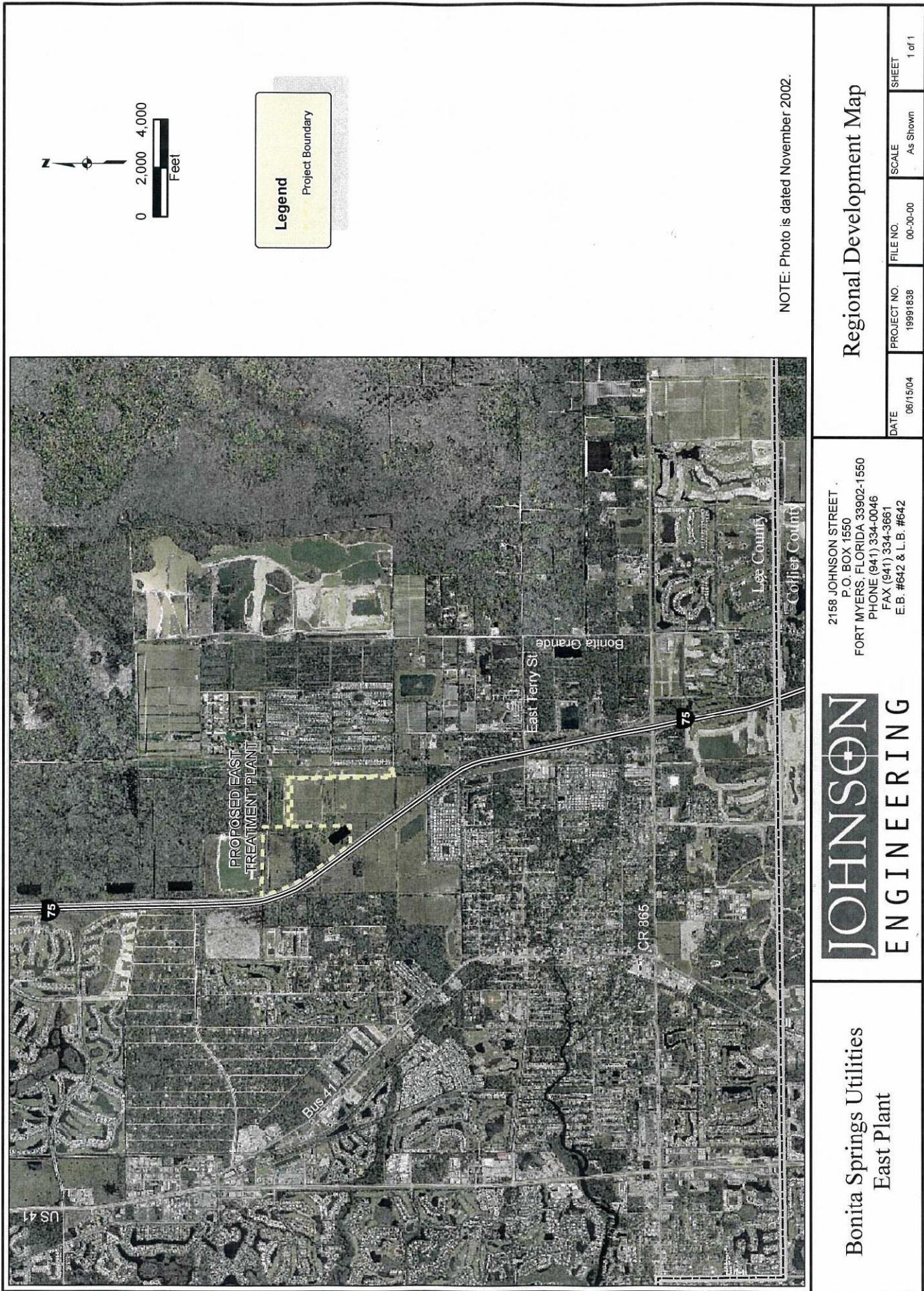
Less than 5 percent Wetland Acres		Permits Issued								
Project Name		Total Acres	Wetland Acres	% Wetland Acres	City	Comp Plan	DRI	PUD	Rezoning	District
Schuman Insurance		0.25	0.00	0.00%					2003	
Gunnery Road Commercial		0.26	0.00	0.00%					2003	
HMB Rezoning		0.47	0.00	0.00%					2004	
Sellstate Associates R		0.50	0.00	0.00%					2004	
Il Rezoning		0.52	0.00	0.00%					2004	
Sunbelt Realty Sales C		0.56	0.00	0.00%					2003	
Djans Embroidery Design		0.75	0.00	0.00%					2003	
707 Canterbury Circle		0.81	0.00	0.00%					2004	
Gunnery Rd Residential		1.24	0.00	0.00%					2003	
Wanda Hall Rezone		1.30	0.00	0.00%					2003	
Florida Landmark Community		1.93	0.00	0.00%					2004	
Coffey Discount Furniture		4.88	0.00	0.00%					2004	
Charter School		5.82	0.00	0.00%		2003				
Colonades at Santa Barbara		6.82	0.00	0.00%				0		
Immokalee Senior Housing		7.39	0.00	0.00%				0		
Summer Glen Apartments		7.58	0.00	0.00%				0		
GGFD		9.08	0.00	0.00%				0		
Egret Isles		9.99	0.00	0.00%				0		
Talavera Estates		10.12	0.00	0.00%					2004	
Bonus Density Woodward		16.34	0.00	0.00%					2003	
Bristol Pines		17.67	0.00	0.00%					2003	
Delacruz 19 Acre		18.98	0.00	0.00%					2003	
Dominion Video Satellite		21.81	0.00	0.00%						2004
Veterans Park Rezoning		36.04	0.00	0.00%					2003	
New Hope Ministries		39.99	0.00	0.00%				0		
ASGM Business Center of Naples		40.77	0.00	0.00%					2001	
Santa Barbara Landings		42.61	0.00	0.00%				0		
Collier County Gov't Center		59.78	0.00	0.00%		2004	2004			
ASGM Business Park		128.12	0.00	0.00%						2004
Glen Eagle Golf & Cntry Club/Bretonne Park		300.91	0.00	0.00%		2001				
Parklands West		304.04	0.00	0.00%		2001	2001			
Orange Blossom Ranch		641.84	0.00	0.00%				0		2004
Serengeti Subdivision		29.60	0.02	0.07%						2003
Airside Plaza		121.81	0.15	0.12%		2003	2004			
Village Walk at Bonita Springs		649.40	0.87	0.13%						2004
The Brooks of Bonita Springs		18.60	0.06	0.32%		2002	1997			
Eastwood Professional Center		158.09	2.81	1.78%						2004
River Pointe		38.75	0.74	1.91%						2004
<b>TOTALS:</b>		2,627.3	4.65							

**Table 8.** Summary of Florida panther vehicular mortality in southern Florida from 13 June 1998 through 30 June 2004.

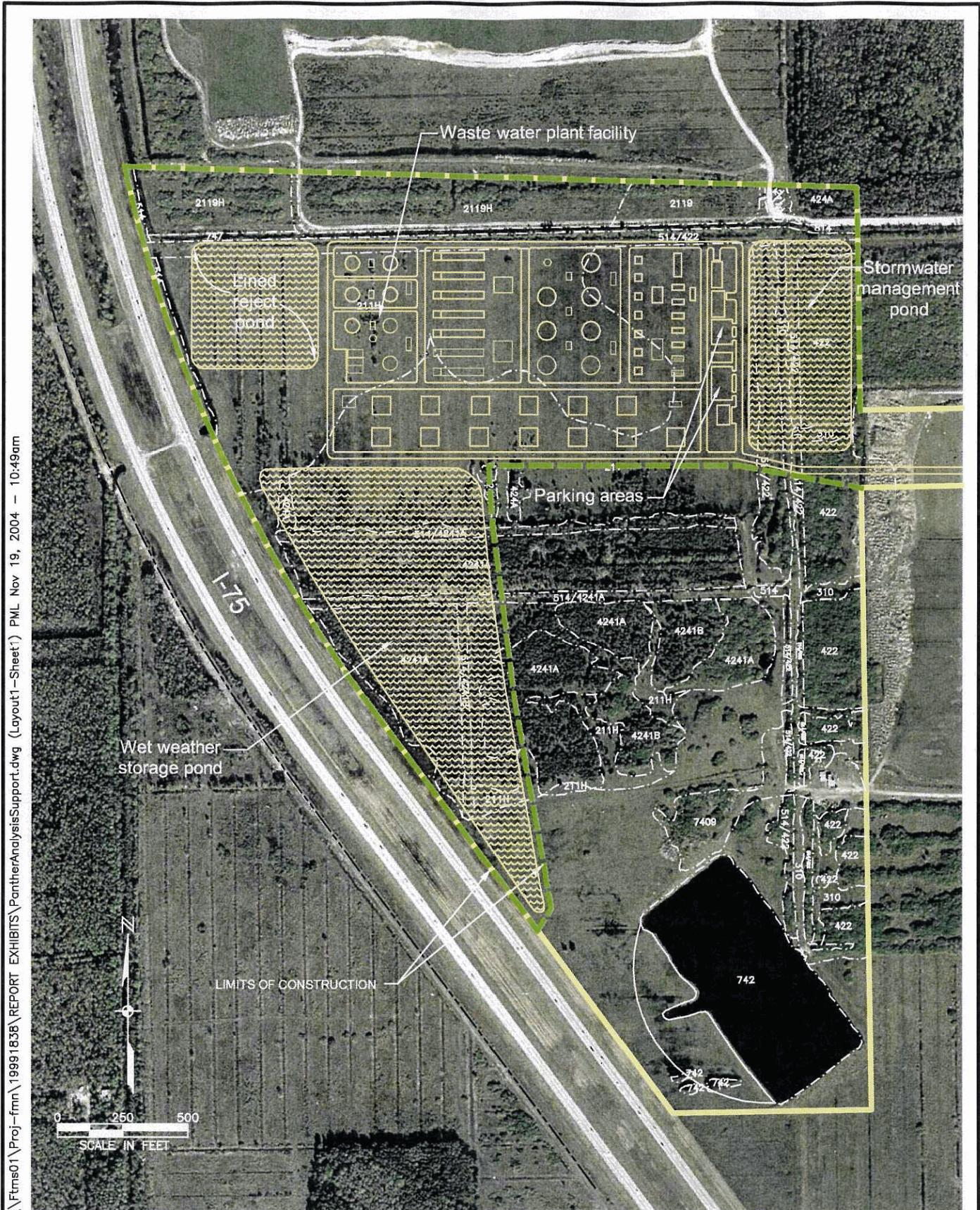
Cat ID	Date	Sex	Age	Location
UFP25	13 Jun 1998	F	2	County Road 846
FP51	17 Jul 1998	M	9	State Road 29
UFP26	17 Sep 1998	M	3-5	U.S. Highway 41
UFP27	08 Jul 1999	F	2	Hendry County Farm Road
FP74	08 Sep 1999	M	2-2.5	U.S. Highway 27
UFP33	29 Oct 1999	M	10 months	County Road 833
FP63	15 Jan 2000	M	4.5	State Road 29
FP80	10 Feb 2000	F	4	BCSIR Road
K76	28 Feb 2000	M	3 months	County Road 858
UFP34	23 Mar 2000	M	1.5-2	County Road 846
UFP35	23 Jun 2000	M	2	County Road 846
UCFP36	13 Jul 2000	F	2	County Road 846
UCFP37	29 Dec 2000	F	5	County Road 846
UCFP38	14 Apr 2001	F	2	County Road 833
FP90	26 Apr 2001	M	1.1	U.S. Highway 27
UCFP39	07 May 2001	F	10 months	State Road 29
UCFP40	07 May 2001	M	10 months	State Road 29
UCFP41	22 May 2001	M	2	State Road 29
UCFP42	14 Jun 2001	F	3-4	County Road 846
UCFP43	17 Aug 2001	M	2-3	County Road 846
UCFP45	05 Apr 2002	M	3	U.S. Highway 27
UCFP46	10 Apr 2002	M	6 months	State Road 29
UCFP48	10 Nov 2002	F	8 months	County Road 846
UCFP49	25 Nov 2002	F	19 months	County Road 846
FP99	28 Nov 2002	M	2.5	County Road 846
UCFP50	26 Jan 2003	M	6.5	County Road 846
FP106	20 Feb 2003	F	3	State Road 29
UCFP51	10 Mar 2003	M	2	Interstate 4
UCFP52	20 Mar 2003	M	1.5	County Road 833
UCFP53	25 May 2003	F?	2-3	State Road 29
UCFP54	3 Jun 2003	M	8-10 months	State Road 29
UCFP58	30 Jun 2003	F	1	County Road 846
UCFP59	2 Nov 2003	F	3-4 months	County Road 858
UCFP60	9 Dec 2003	M	2-3	US Highway 41
UCFP61	25 Dec 2003	F	2-3	County Road 833
UCFP62	11 Jan 2004	F	7-8 months	US Highway 41
UCFP63	26 Feb 2004	M	3-5	I-75, MM99
UCFP65	6 April 2004	M	2	State Road 29
UCFP66	27 June 2004	M	3	I-75, MM93

**Figure 1**

Regional development map with location of proposed wastewater treatment facility



**Figure 2**  
Project site: Wastewater treatment facility



**JOHNSON**  
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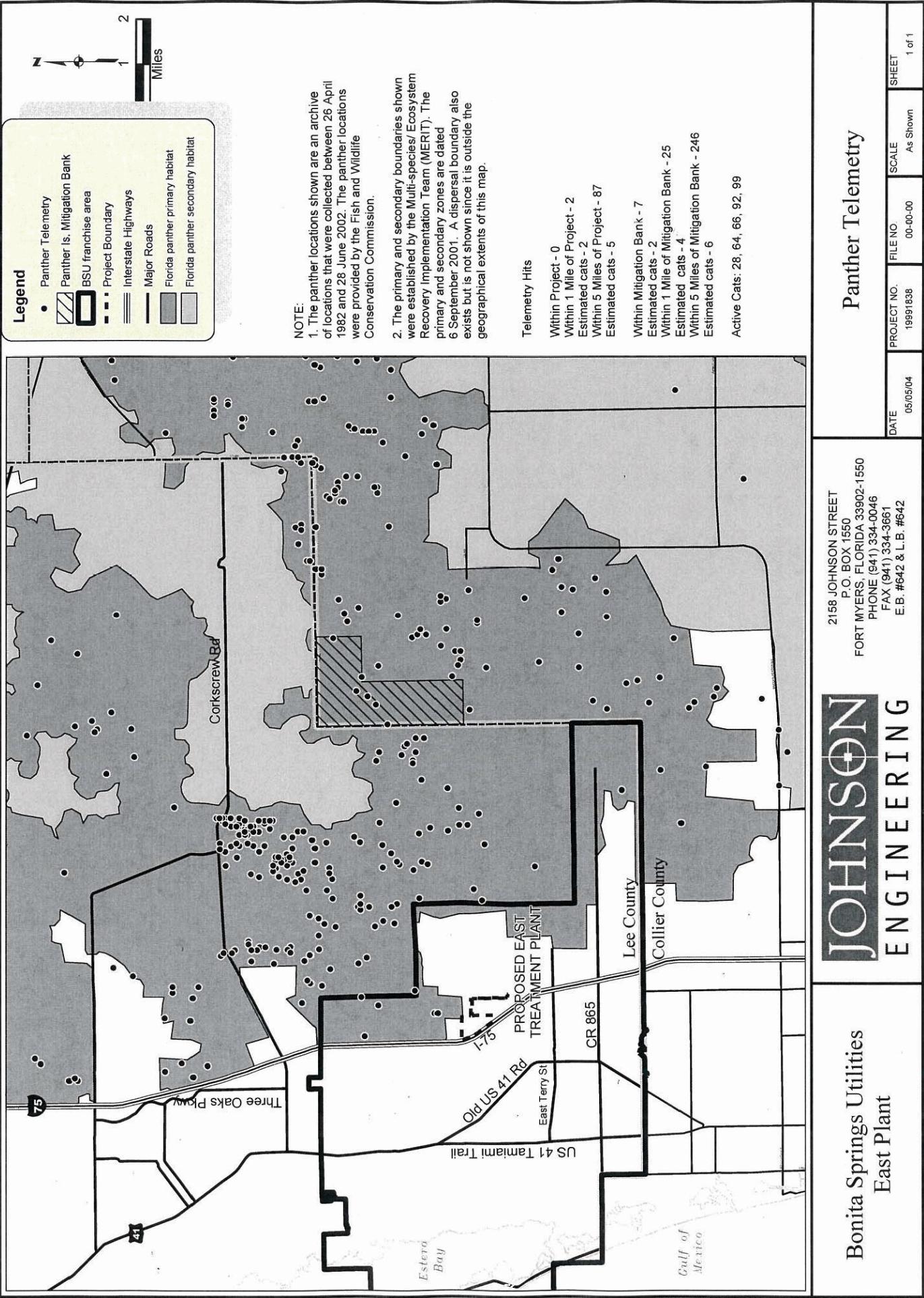
2158 JOHNSON STREET  
P.O. BOX 1550  
FORT MYERS, FLORIDA 33902-1550  
PHONE (239) 334-0046  
FAX (239) 334-3661  
E.B. #642 & L.B. #642

**BSU East Treatment Plant**  
**Panther Analysis Support Map**

DATE	PROJECT NO.	FILE NO.	SCALE	SHEET
July 2004	19991838	24-47-25	As shown	1

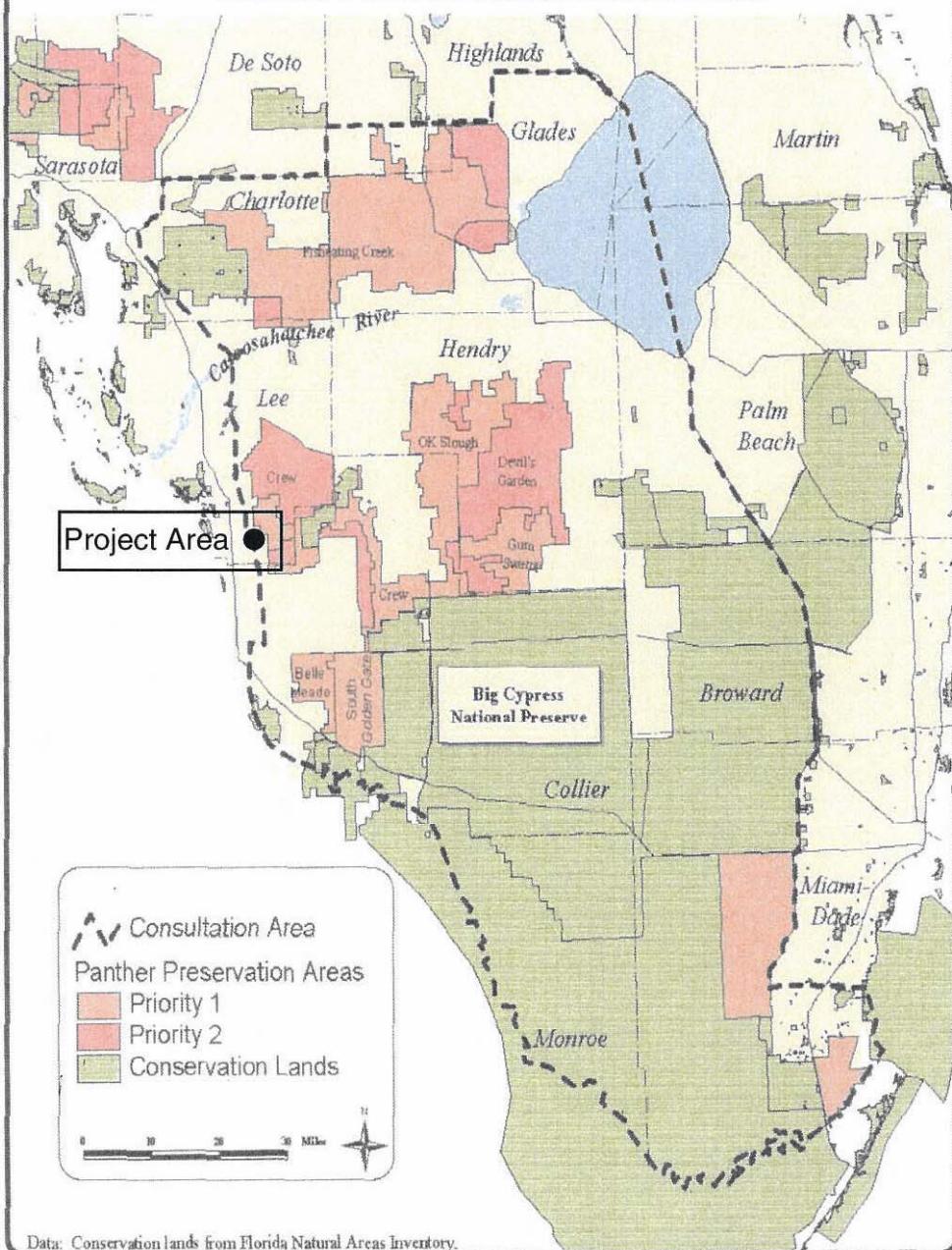
**Figure 3**

Wastewater treatment facility in relation to panther Primary and Secondary zones and telemetry

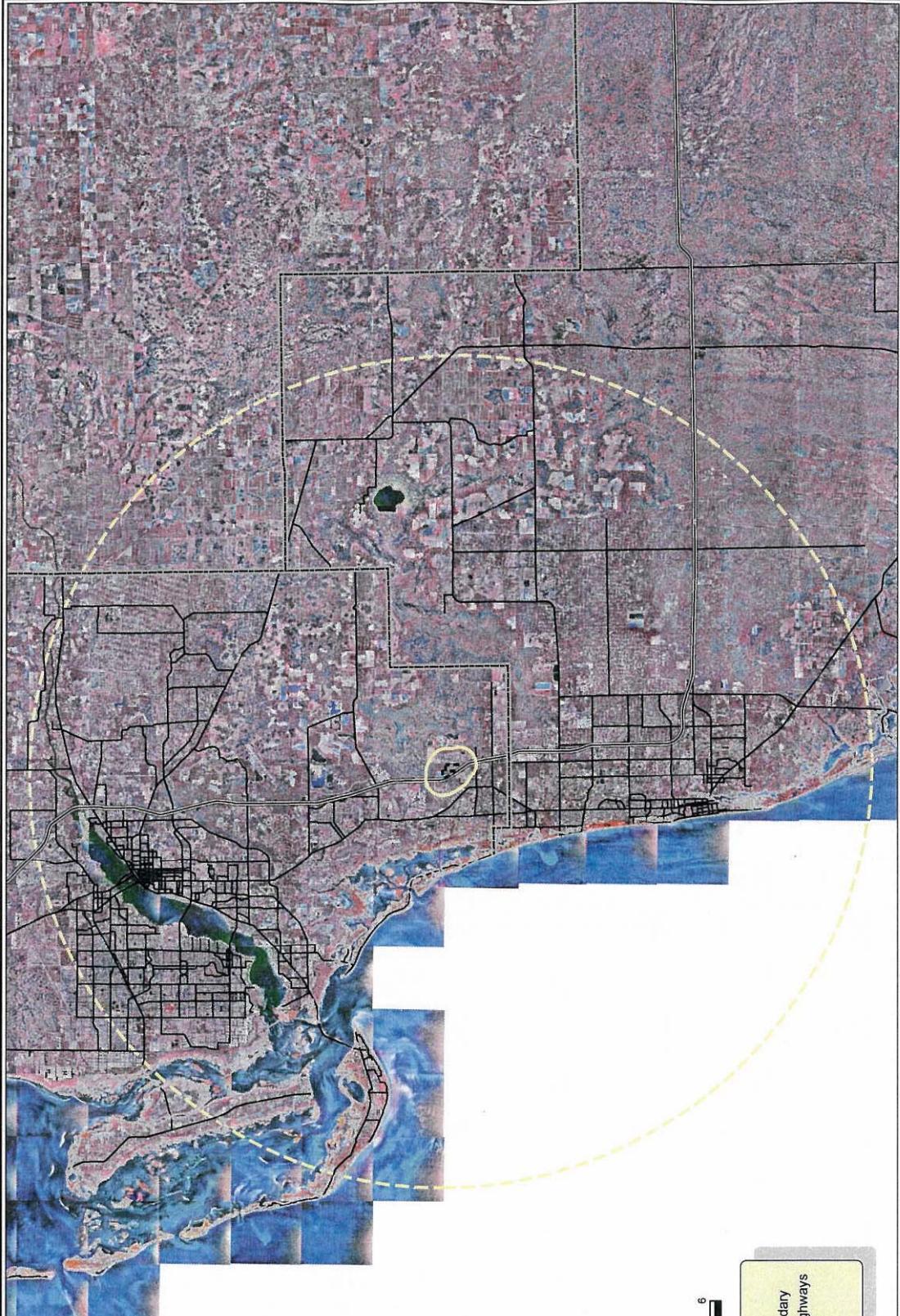


**Figure 4**  
Florida panther consultation area

## Florida Panther Consultation Area



**Figure 5**  
Regional aerial map showing 25-mile action area



**Legend**

- - - Project Boundary
- Interstate Highways
- Major Roads
- Yellow Area Action area

0 3 6  
Miles

## JOHNSON ENGINEERING

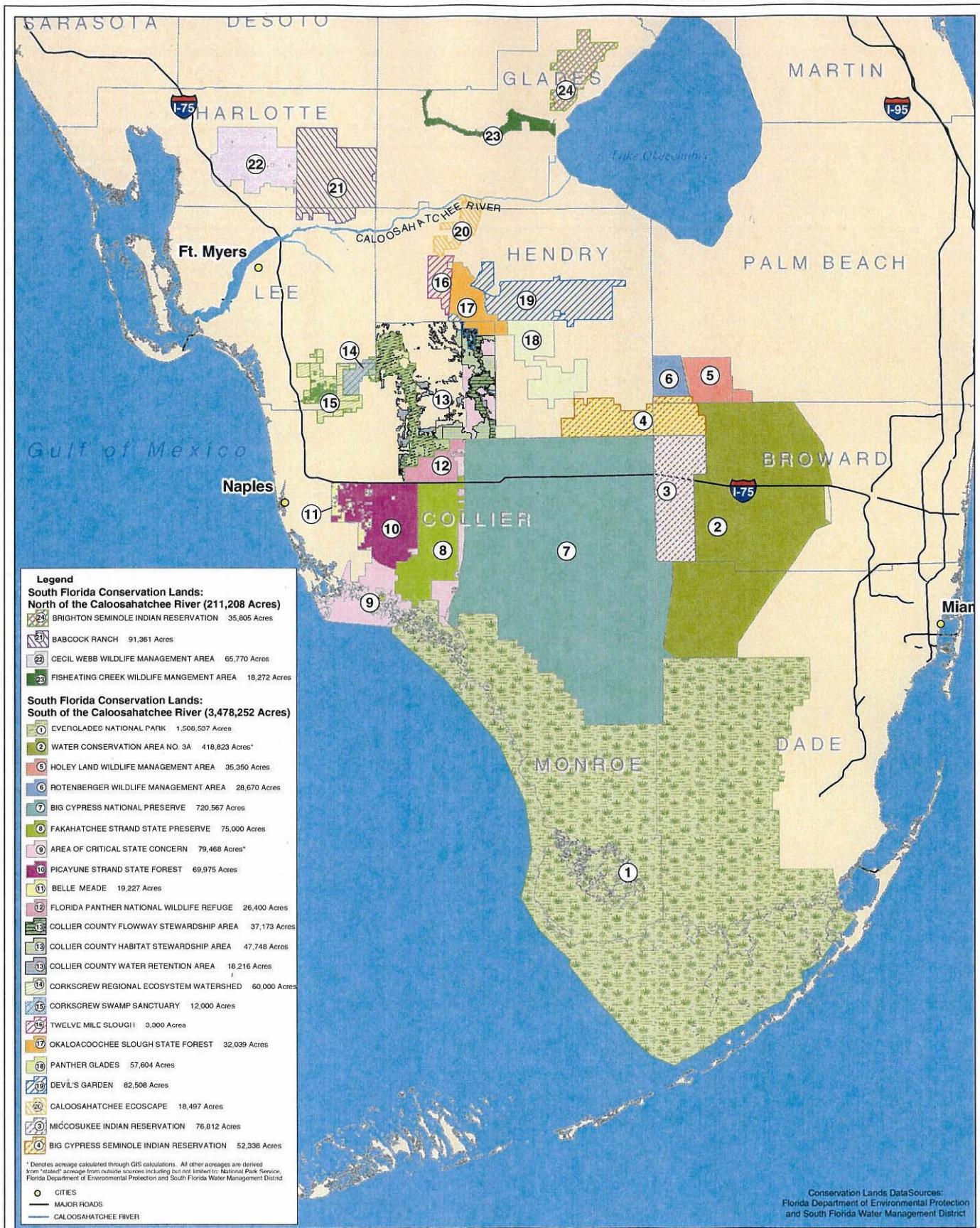
Bonita Springs Utilities  
East Plant

### Regional Development Map

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DATE	PROJECT NO.	FILE NO.	SCALE	SHEET
July 2004	18991838		As Shown	1

**Figure 6**  
Southwest Florida conservation lands



## South Florida Conservation Lands



1 inch equals 10 miles

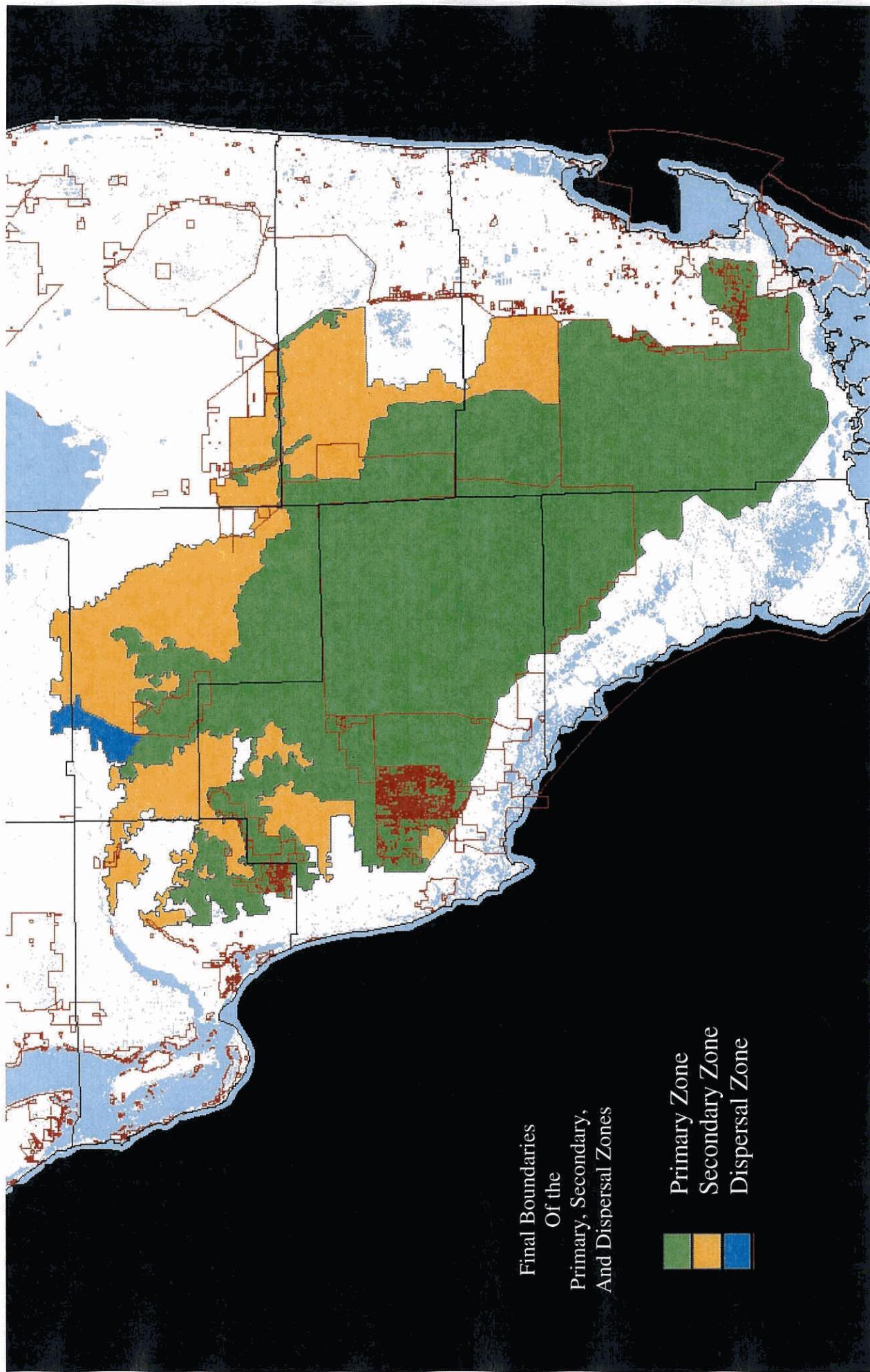
0 5 10 20 30 40 Miles

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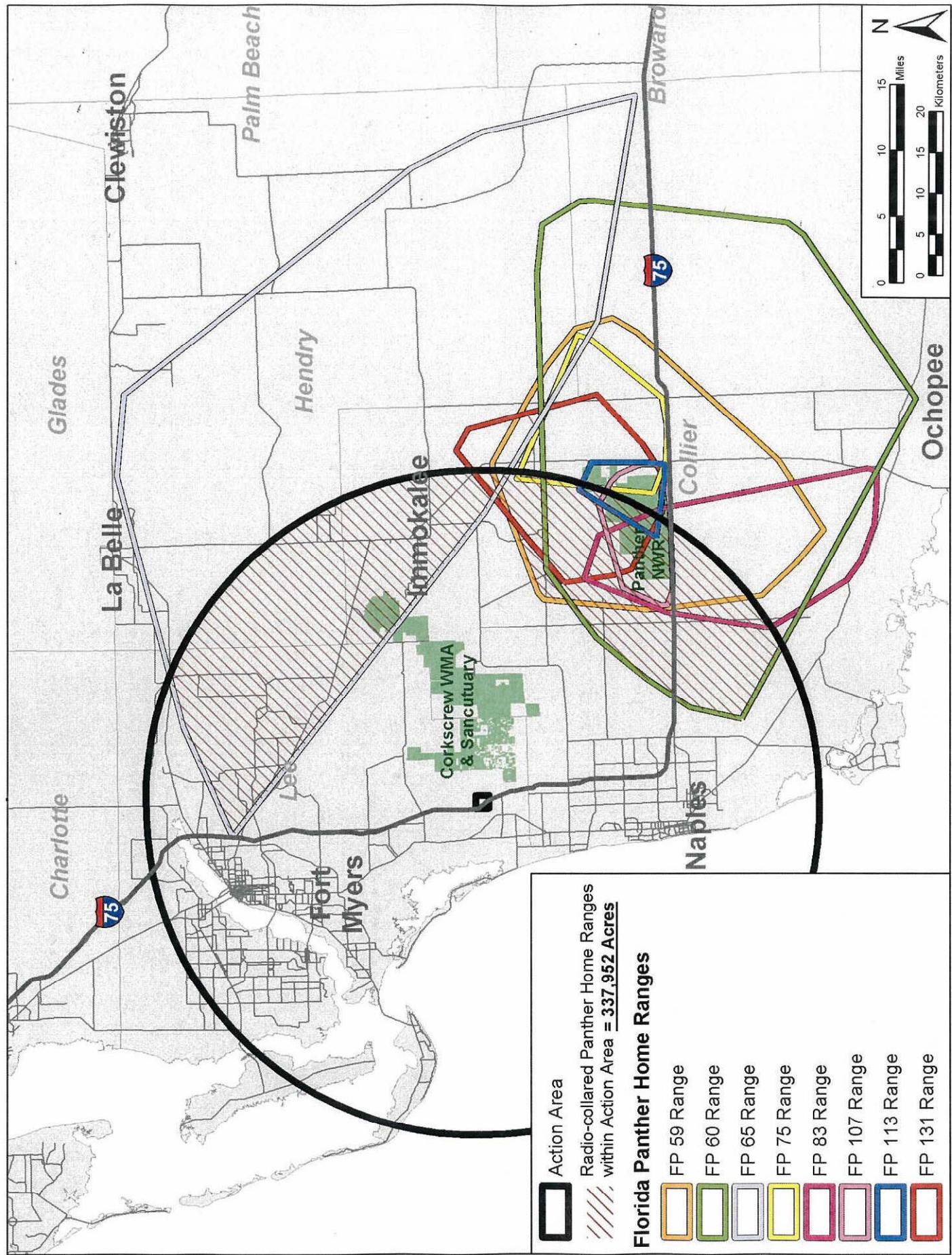
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**Figure 7**  
Florida panther zones: Primary, Secondary, and Dispersal



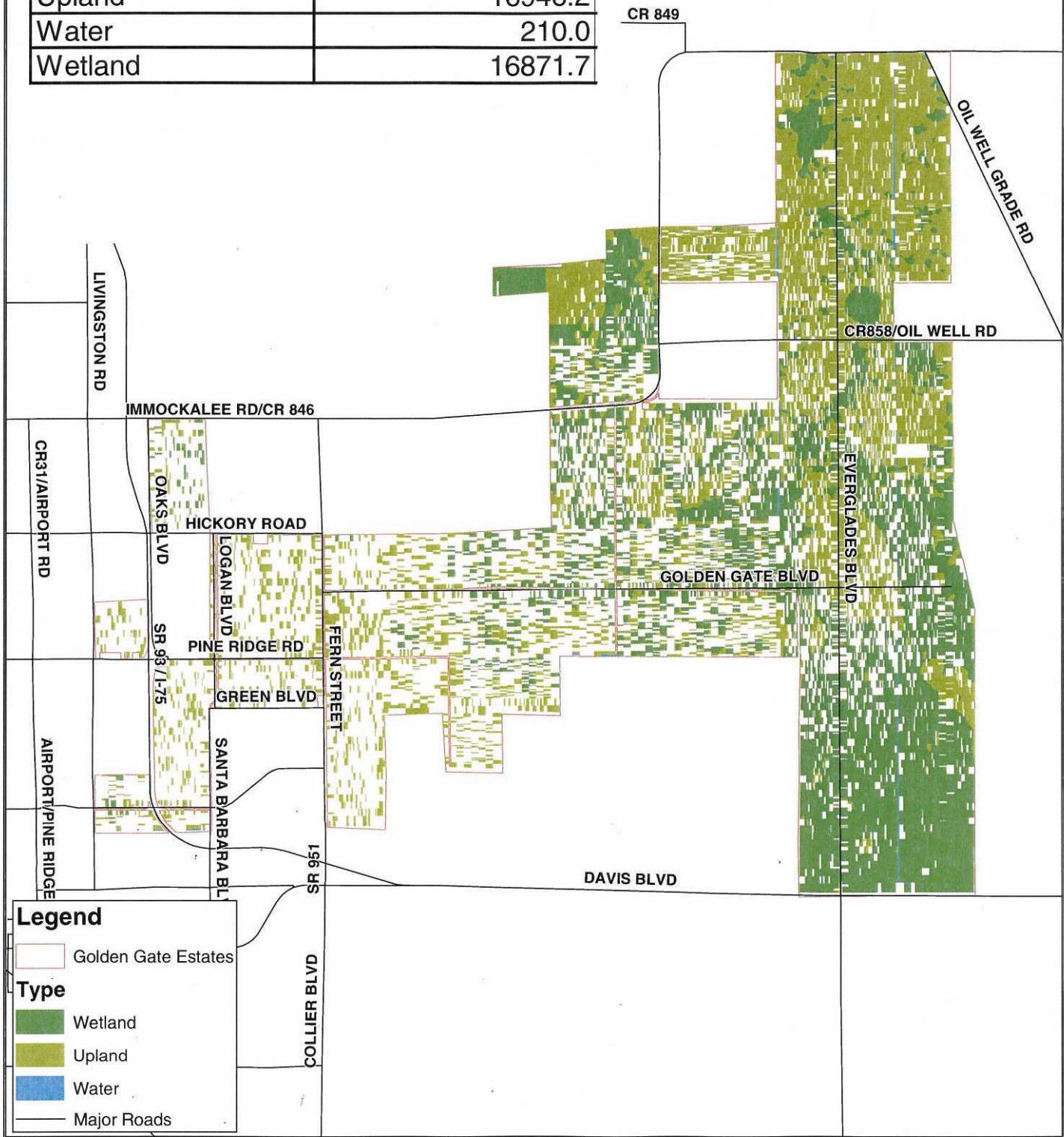
**Figure 8**  
Florida panther home ranges within action area



**Figure 9**  
Northern Golden Gate Estates vacant lands

**Golden Gate Estates Vacant Lands:  
Wetland Type (FLUCCS)**

Type	Acres
Upland	16946.2
Water	210.0
Wetland	16871.7



**Golden Gate Estates**  
Vacant Lands, Wetlands and Uplands  
Collier County, Florida

0 0.5 1 2 3 4 Miles  
1 inch equals 6,320 feet



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Prepared by jake.peddy@wilsonmiller.com

T-Project#T-Projects-05706\_AM/AM/D05706-AM/G-GatedCommunityFLUCCS-110154.mxd

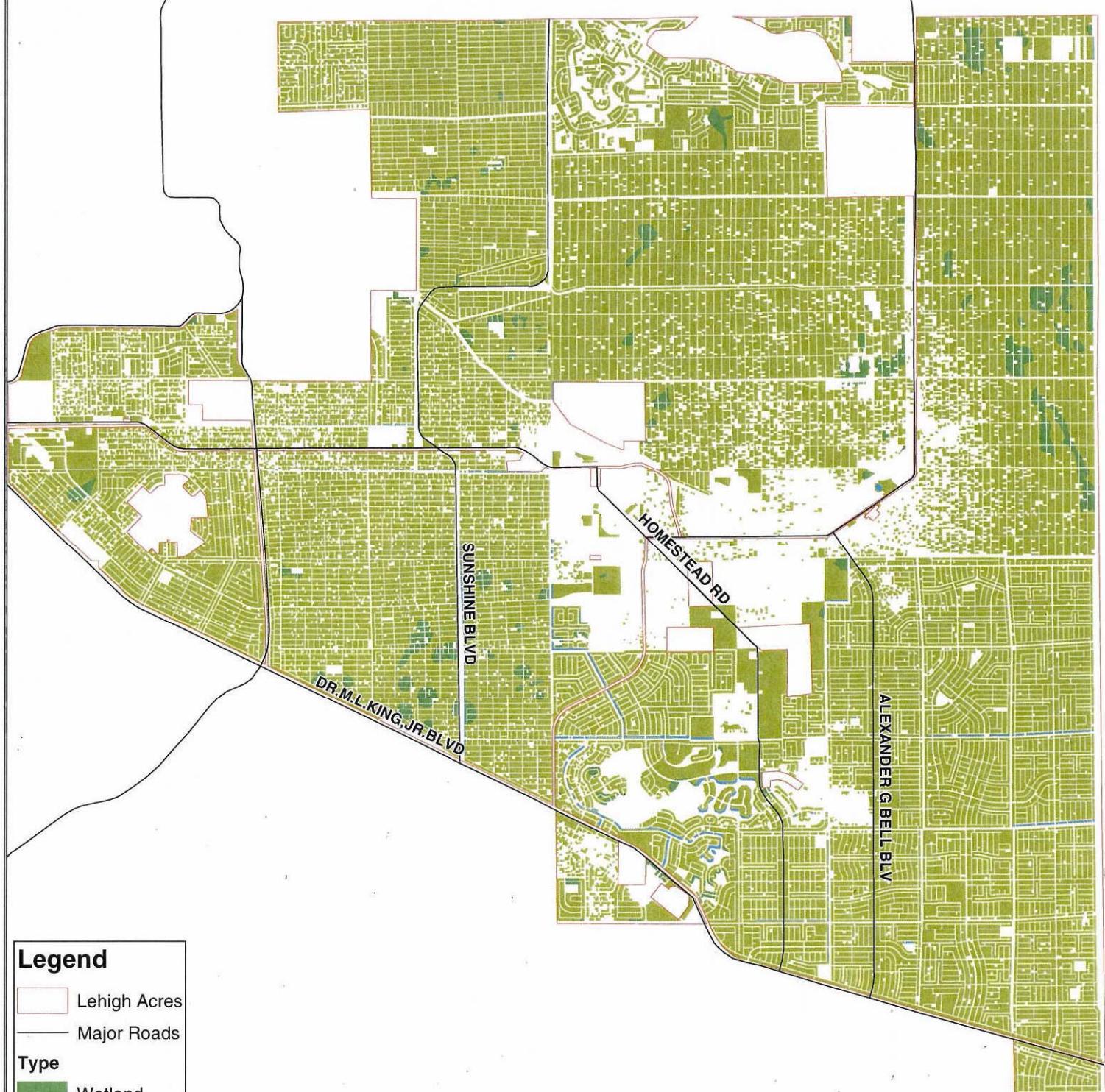
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**Figure 10**  
Lehigh Acres vacant lands

## Lehigh Acres Vacant Lands: Wetland Type (FLUCCS)

MAIN ST/PALM BCH/1ST

Type	Acres
Upland	33592.3
Water	201.9
Wetland	1057.5



### Legend

Lehigh Acres
Major Roads
Type
Wetland
Upland
Water
Major Roads

**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

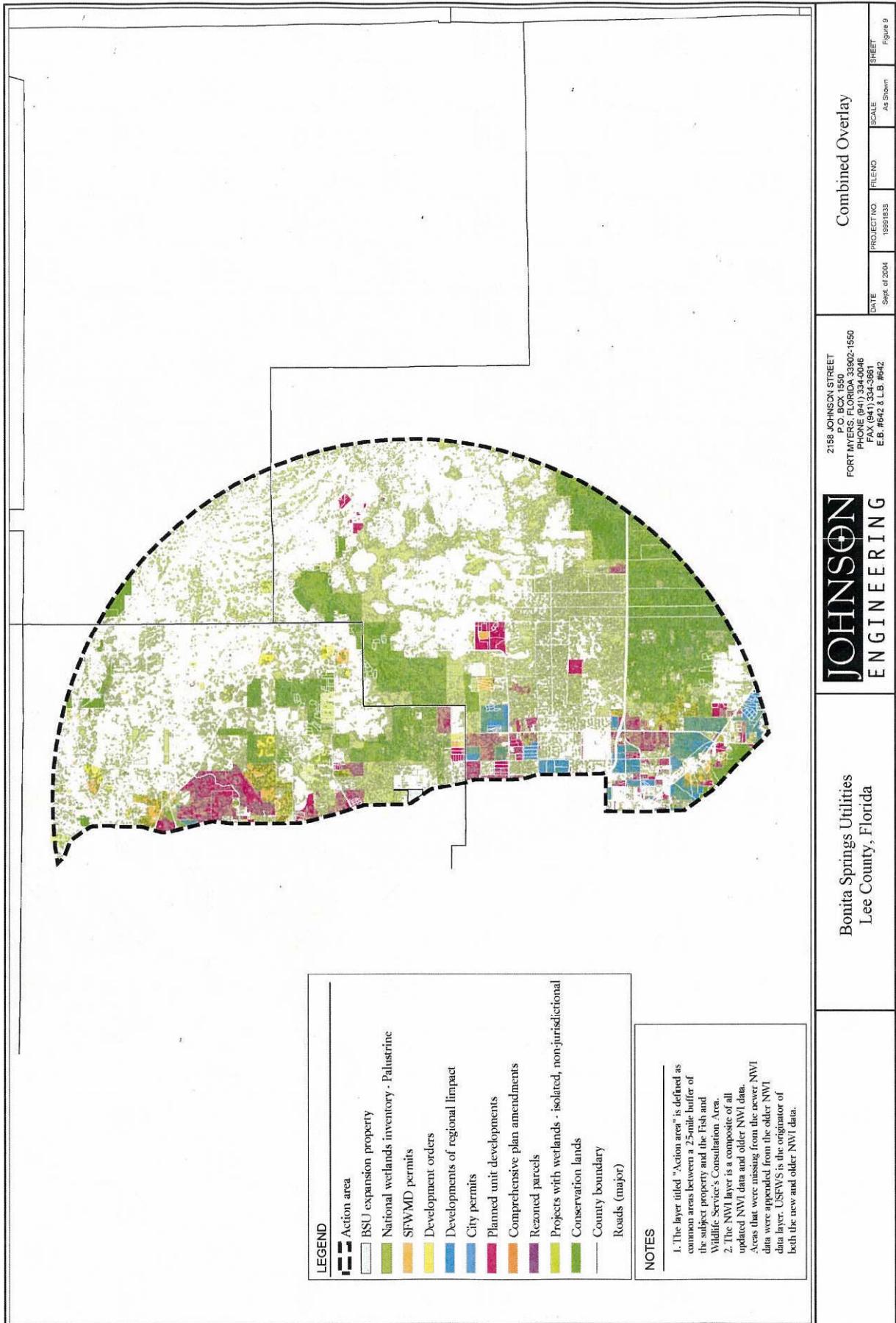


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Prepared by jakepedell@wilsonmiller.com

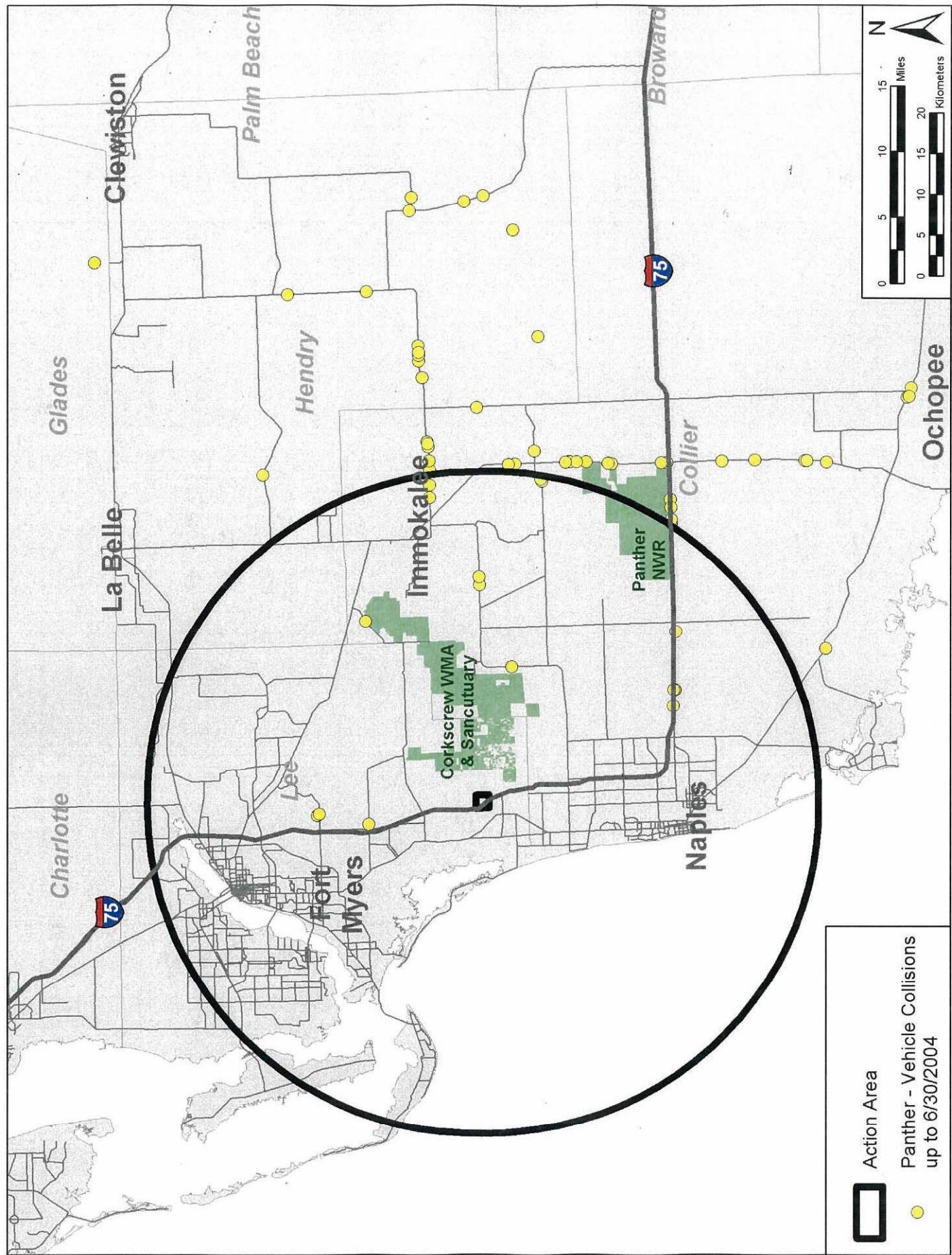
T-Projects T-Project#03794 AMU-MX03-03794-AMU-LehiAcresFLUCCS-110194.mxd

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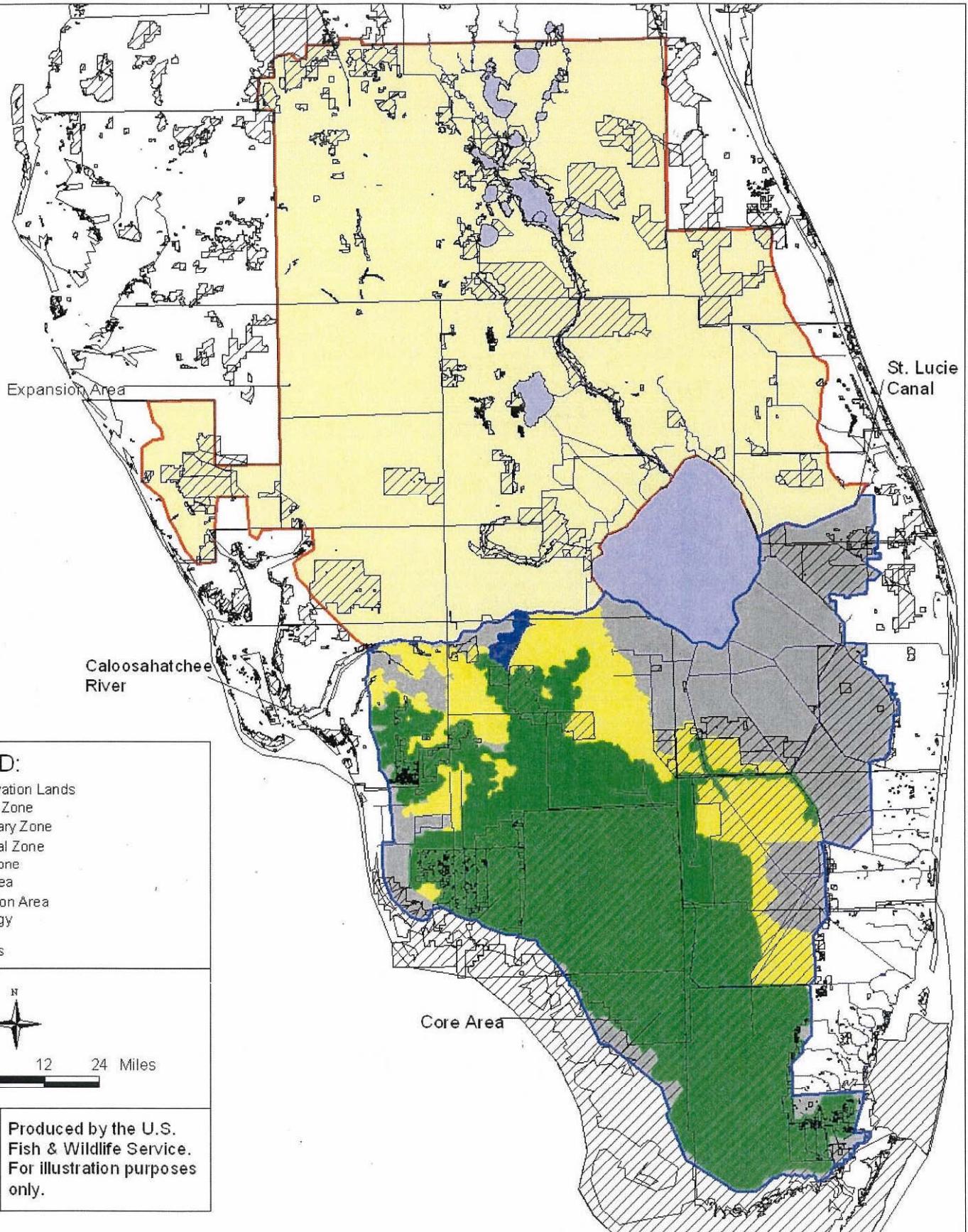
**Figure 11**  
Combined project overlay with NWI map



**Figure 12**  
Panther – vehicle collisions within action area.



**Figure 13**  
Florida panther core area



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