United States Department of the Interior

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

March 26, 2007

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

Service Federal Activity Code:	41420-2006-FA-0417
Service Consultation Code:	41420-2006-F-0872
Corps Application No.:	2002-1683 (IP-TWM)
Date Received:	February 6, 2004
Formal Consultation Initiation Date:	March 30, 2006
Applicant:	Haul Ventures, LLC
Project:	Alico Airpark Center
County:	Lee

Dear Colonel Grosskruger:

This document transmits the Fish and Wildlife Service's (Service) biological opinion for the construction and operation of the Alico Airpark Center project 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 (Act) (87 Stat. 884;16 U.S.C. 1531 *et seq.*). The site is located in Sections 6 and 7, Township 46 South, Range 26 East, Lee County, Florida (Figure 1).

This biological opinion is based on information provided in the U.S. Army Corps of Engineers' (Corps) Public Notice dated February 6, 2004, information prepared by Passarella and Associates, Incorporated (PAI) submitted to the Service 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 45.8 ± acres of wetlands, and impacts on 98.59± acres of uplands totaling 165.5 acres within a 240.96-acre property. The applicant is proposing preservation on-site of 75.46 acres of mixed wetlands and uplands. The 240.96± acre Alico Airpark Center project site is comprised of 135.29± acres of jurisdictional wetlands, 0.26± acre of waters of the United States, and 105.41± acres of uplands. The property is bounded on the east by Airport Haul Road, on the north by Southwest Florida International Airport (SWFIA), and on the south and west by limerock mines in Sections 6 and 7, Township 46 South, Range 26 East, Lee County, Florida (Figures 1 and 2).

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Land use and habitat cover types include 5.53± acres of pine (*Pinus elliottii*) flatwoods (0 to 24 percent exotics), 80.49± acres of pine flatwoods (25 to 49 percent exotics), 14.84± acres of pine flatwoods (50 to 75 percent exotics), 2.80± acres of pine flatwoods (76 to 100 percent exotics), 21.40± acres of hydric melaleuca (*Melaleuca quinquenervia*), 0.24± acre of hydric wax-myrtle (*Myrica cerifera*)/willow (*Salix caroliniana*) (0 to 24 percent exotics), 5.58± acres of hydric wax-myrtle/willow (25 to 49 percent exotics), 2.92± acres of hardwood/conifer (25 to 49 percent exotics), 0.26± acre of ditch, 4.81 acres of cypress (*Taxodium distichum*) (0 to 24 percent exotics), 1.46± acres of cypress (25 to 49 percent exotics), 0.51± acre of cypress (50 to 75 percent exotics), 5.41± acres of pine-cypress (25 to 49 percent exotics), 1.14± acres of pine-cypress (50 to 75 percent exotics), 20.65± acres of hydric pine flatwoods (25 to 49 percent exotics), 33.85± acres of hydric pine flatwoods (50 to 75 percent exotics), 0.71± acre of freshwater marsh (0 to 24 percent exotics), 1.35± acres of freshwater marsh (25 to 49 percent exotics), 8.84± acres of wet prairie (0 to 24 percent exotics), 26.16± acres of wet prairie (25 to 49 percent exotics), 0.26± acre of hydric disturbed land, and 1.75± acres of road.

In the Public Notice dated February 3, 2004, the Corps determined that the Alico Airpark Center project "may affect" the endangered red-cockaded woodpecker (*Picoides borealis*) and the endangered Florida Panther. The Corps determined that the project "may affect, but is not likely to adversely affect" the endangered wood stork (*Mycteria americana*). In a letter to the Corps dated February 24, 2005, the Service concurred with the determination for the Florida panther, but could not concur with the determinations for the red-cockaded woodpecker and wood stork. The Service requested additional information on all three species.

The project will result in direct loss of 165.5 acres of habitat marginally suitable for use by the Florida panther (see discussion under Wildlife Assessment). The project is located in the Florida Panther Primary Zone (Kautz et al. 2006) (Figure 3). The habitat loss equates to approximately 1,111.24 panther habitat units (PHU) with a recommended compensation need of 2,778.09 PHUs (see definition under Habitat Assessment Methodology). The applicant has proposed to provide compensation for project effects to panther habitat through the preservation and purchase of 414 acres of Primary Zone habitat with associated enhancement, which equates to 2,857.49 PHUs. The compensation proposal will provide approximately 2,857.49 PHUs of higher quality panther habitat in areas abutting higher quality panther habitat. These lands which currently include about 255 acres of croplands, 54 acres of grasslands, 40 acres of freshwater marsh, 14 acres of cypress swamp, and 51 acres of mixed upland uses, will be restored to 217 acres of cypress swamp, 143 acres of hardwood swamp, 40 acres of freshwater marsh, and 14 acres of mixed upland habitats. The applicant also proposes to preserve 75.46 acres of wetlands and uplands on-site. The habitat preserved on-site will provide limited resources value to the Florida panther because of the adjacent surrounding urban development.

The proposed compensation plan provides habitat preservation and restoration in Collier County, and benefits the survival and recovery of the Florida panther as referenced in the draft Panther Recovery Plan (Service 2006) goal 1.1.1.2.3. This goal recommends that habitat preservation and restoration within the Primary Zone be provided in situations where land use intensification can not be avoided. The applicant has proposed equivalent habitat protection and restoration, to compensate for both the quantity and functional value of the lost habitat.

This document also represents the Service's view of the effects of the proposed action on the endangered wood stork, and red-cockaded woodpecker in accordance with section 7 of the Act.

Wood Stork

By Public Notice dated February 3, 2004, the Corps determined this project "may affect, but is not likely to adversely affect" the endangered wood stork. By correspondence dated February 24, 2005, the Service informed the Corps about the need for additional information to complete the review of this project and its effect on the wood stork.

The proposed project is located about 8 miles north and west of the National Audubon Society's Corkscrew Swamp Sanctuary, the largest wood stork rookery in the continental United States. The number of nesting pairs at the Corkscrew Swamp Sanctuary has declined from 6,000 in 1961 to 450 in 1998. The annual number of nesting pair between 1989 and 1998 ranged from a low of zero to a high of 1,200. Nesting pairs in Corkscrew Swamp Sanctuary were 462 in 2003, 600 in 2004, and 338 in 2005. The decline of nesting productivity in this rookery has been generally attributed to changes in wetland hydrology in surrounding wetlands and wetland losses. Changes in hydrology may affect productivity and seasonal concentration of fish populations and vegetative profiles. Vegetative profile changes may include open-water emergent systems converting to denser shrub/scrub and forested systems and the invasion of these systems by aggressive exotic plant species producing dense monotypic communities with reduced foraging opportunities provided to wood storks. Wetland losses result in an increase in competition for the remaining foraging base available to the rookery.

Researchers have shown that wood storks forage most efficiently and effectively in habitats where prey densities are high, and the water shallow and open enough to hunt successfully (Ogden et al. 1978, Browder 1984, Coulter 1987). Calm water, about 5 to 40 cm (2 to 16 in) in depth, and free of dense aquatic vegetation is ideal (Coulter and Bryan 1993). Coulter and Bryan's (1993) study also suggested that wood storks preferred ponds and marshes, visited areas with little or no canopy more frequently, and even in foraging sites in swamps, the canopy tended to be sparse. They suggested that open canopies may have contributed to detection of the sites and more importantly may have allowed the storks to negotiate landings at the sites more easily than at closed-canopy sites. In their study the median amount of canopy cover where wood stork foraging was observed was 32 percent. Other researchers, (Service 2006) also confirm that wood stork will forage in woodlands, though the woodlands have to be fairly open, with vegetation not very dense, and with canopies where there is room to walk quickly to the edge for flight. In south Florida wetlands, they agree that wood storks will forage in exotic dominated wetlands, when the exotics are noncontinuous, in broken stands (blow-downs), in small islands, or in sparsely distributed landscapes. They also agree that wood storks will not forage in melaleuca where the stem density is high and the canopy closed (Service 2006). Typical foraging sites include freshwater marshes and stock ponds, shallow seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, depressions in cypress heads, and swamp sloughs.

Prey densities can also be affected by the stem density and types of vegetation present in a wetland, which also correlates to the availability of the prey to foraging by wood storks. Many areas in south Florida are moderately to heavily infested with melaleuca, an exotic plant species. Melaleuca is a dense-stand growth plant species, effectively producing a closed canopy and dense understory growth pattern that generally limits a site's accessibility to foraging by wading birds. However, O'Hare and Dalrymple (1997) suggest that moderate infestations of melaleuca may have little effect on some species' productivity as long as critical abiotic factors such as hydrology remain. They also note that as the levels of infestation increase, wildlife usage decreases proportionally. Their studies also show that the number of fish species present in a wetland system remain stable as melaleuca overruns the area (O'Hare and Dalrymple 1997). However, the availability of the prey base for the wood storks and other foraging wading birds is reduced proportionally to the restriction of access by dense and thick exotic vegetation, although, wood storks and other wading birds do forage in these systems in open area pockets (*i.e.*, wind blow-downs).

The wetland communities within the project area proposed to be affected by the action include a mixture of shrub swamp, shrub/brush, freshwater marsh, hardwood swamp, cypress swamp, and hydric pine forest. Within the project footprint wetlands, exotic coverage averages greater than 75 percent in many of the on-site wetlands, with about 21 acres consisting of 100 percent melaleuca. In our analysis of wood stork suitable foraging habitat (Service 2006), we consider exotic species densities of greater than 75 percent to provide minimal to no foraging value to wood storks. The proposed project is expected to impact about 45.8 acres of wetlands. As compensation for wetland and upland impacts, the applicant proposes to preserve and manage 75.46 acres of wetlands and buffer uplands on-site.

Also, as part of the proposed compensation proposed for the project the applicant is proposing the enhancement and preservation of an additional 414 acres off-site in Collier County. These lands which currently include about 255 acres of croplands, 54 acres of grasslands, 40 acres of freshwater marsh, 14 acres of cypress swamp, and 51 acres of mixed upland uses, will be restored to 217 acres of cypress swamp, 143 acres of hardwood swamp, 40 acres of freshwater marsh, and 14 acres of mixed upland habitats.

The loss of the foraging value of the 45.8 acres of disturbed wetlands on-site will be compensated for by the enhancement and preservation of about 389.6 acres of wetlands and 24.4 acres uplands off-site and the enhancement and preservation of 75.46 acres on-site, resulting in a net increase in foraging value to the wood stork. The Corps determined the Alico Airpark Center "may affect, but is not likely to adversely affect" the wood stork. Based on the information received and the compensation measures proposed, the Service concurs with this determination.

Red-cockaded Woodpecker

The red-cockaded woodpecker probably once occurred in all 67 Florida counties, with exception of the Florida Keys in Monroe County (Hovis and Labisky 1996). This species is still widely distributed in the state, but substantial populations now occur only in the Panhandle; elsewhere,

populations are relatively small and disjunct. The estimated breeding population of the red-cockaded woodpecker in Florida is 1,500 pairs, with about 75 percent of that total occurring in the Panhandle (Cox et al. 1995). However, it is likely current numbers are lower especially in south Florida.

Pine stands, or pine-dominated pine/hardwood stands, with a low or sparse understory and ample old-growth pines, constitute primary red-cockaded woodpecker nesting and roosting habitat. In southwest Florida (Charlotte, Collier, and Lee Counties), the hydric slash pine (*Pinus elliottii* var. *densa*) flatwoods provide the preferred critical nesting and foraging habitat for this species (Beever and Dryden 1992).

The spatial extent needed to sustain red-cockaded woodpeckers depends primarily on habitat quality. Home ranges in optimal habitat average 173 to 222 acres. In most of Florida, however, habitat quality is considerably lower than the optimal conditions. Home ranges for red-cockaded woodpeckers in northern Florida average 297 to 346 acres (Porter and Labisky 1986). Habitat quality in southern and central Florida is particularly marginal in that respect; home ranges average 346 to 395 acres, but can exceed 494 acres (Patterson and Robertson 1981, Nesbitt et al. 1983, DeLotelle et al. 1987, Wood 1996). Territory sizes for red-cockaded woodpeckers in south Florida have been reported as large as 740 to 990 acres in Big Cypress National Preserve, because the pinelands are not contiguous.

Most female red-cockaded woodpeckers disperse within 1 year after fledging. They may attain breeding status in another territory or become floaters that are not definitively associated with a particular group of birds or cluster of cavity trees (Hovis and Labisky 1996). Some fledgling males also disperse to become breeders or floaters, or to establish and defend a territory, while others remain on their natal territory as helpers until a breeding opportunity arises (Walters et al. 1988). There is little information on dispersal distances for birds in south Florida.

The project site is located about 13 miles west of an active red-cockaded woodpecker colony in Lee County. Based on the presence of 10 acres of potentially suitable red-cockaded woodpecker habitat within the project site, the Corps, by Public Notice dated February 3, 2004, determined the project "may affect" the endangered red-cockaded woodpecker. Taking into consideration the distance between the project site and the existing red-cockaded woodpeckers active colonies, the extensive home ranges of red-cockaded woodpeckers in southwest Florida, and suitable habitat on and adjacent to the project site, the Service analyzed the likelihood of red-cockaded woodpeckers occurring on the project parcel. As part of our analysis, the Service reviewed the foraging, and nesting cavity surveys of the project site submitted by the applicant. Suitable habitat surrounding the project site appears largely unmanaged and fragmented by development and sand mining activities. The red-cockaded woodpecker was not recorded during the foraging and cavity nesting surveys of the project parcel.

By correspondence dated November 6, 2006 the Corps revised its determination for red-cockaded woodpecker from a may affect to may affect not likely to adversely affect the

red-cockaded woodpecker. Based on the review of the status of the species on the project site and information provided by the applicant, the Service concurs with Corps determination for the red-cockaded woodpecker.

The Use of Best Scientific and Commercial Information by the Service

The Service uses 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 it is fully considered in our decisions, evaluations, reviews, and analyses as it relates to the base of scientific knowledge and any publications cited in our documents.

Specifically, there is one such document cited in this biological opinion the Service acknowledges has been affected in its cited form by new scientific information. The Service has taken these new sources of information into account when using this document to help guide our analysis and decisions. This document is the South Florida Multi-Species Recovery Plan (MSRP) of 1999 (Service 1999). In addition, the Service has examined Kautz et al. (2006) for its scientific validity, specifically with regards to comments and recommendations by other reviewers.

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 would be compatible with adaptive management strategies. These principals are set forth in both the transmittal letter from the Secretary of 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 it still presents useful information when taken in conjunction with all the new scientific information developed subsequent to its publication.

Kautz et al. (2006)

The Florida Panther Subteam was charged with developing a landscape-level strategy for the conservation of the Florida panther population in south Florida. The Subteam produced the draft Landscape Conservation Strategy for the Florida Panther in south Florida in December 2002 and provided it to the Service. Upon receipt, the Service began to use the information in the draft Landscape Conservation Strategy in its decision making processes and documents since it was part of the best scientific information available to the Service at the time. Since then some portions of the science and findings in the draft Landscape Conservation Strategy have been challenged. Many, but not all, of the Subteam members have refined the methodology, further analyzed the data, and better defined the results of the Landscape Conservation Strategy into the publication, referred to here as Kautz et al. (2006). Therefore, Kautz et al. (2006) and the

analyses contained therein, along with all other best scientific and commercial data available, is referred to in this document and will be used in our decision making process until or unless new information suggests revisions are necessary.

Consultation History

On February 3, 2004, the Corps issued a Public Notice for permit application SAJ-2002-1683 (IP-TWM) which requested authorization to discharge 182,726 cubic yards of fill material into 56.63± acres of jurisdictional wetlands and 0.26± acre of Corps waters and excavate 84,410 cubic yards from 6.54± acres of jurisdictional wetlands. As mitigation for wetland impacts, the applicant proposed to preserve and enhance 72.12± acres of wetlands, 1.81± acres of uplands, and 1.53± acres of upland buffer on-site. The Corps provided a determination of "may affect, but is not likely to adversely affect" for the wood stork. The Corps provided a determination of "may affect" for the red-cockaded woodpecker and the Florida panther.

On March 9, 2004, the Corps requested a concurrence letter for the "may affect, but is not likely to adversely affect" determination and a confirmation letter from the Service that formal consultation has commenced for the Florida panther.

On February 6, 2005, the Service responded to the public notice with a letter to the Corps requesting additional information on the Florida panther, red-cockaded woodpecker, wood stork, and fish and wildlife resources (wetlands).

On April 26, 2005, Hopping Green & Sams (HGS) responded to the Public Notice comments on behalf of the applicant with a letter to the Corps and the Service requesting informal consultation for Florida panther based on the SWFIA Biological Opinion. The applicant stated that compensation for habitat impacts on Florida panther habitat by the Alico Airpark Center project was not warranted because the SWFIA project had already compensated for habitat impacts on the parcel proposed for the construction of the Alico Airpark Center.

On July 18, 2005, the Service responded to the applicant with a letter to the Corps which explained that the Alico Airpark Center was an independent project from the SWFIA project and the direct and indirect effects on listed species would need to be addressed independently.

On October 28, 2005, PAI responded to the Public Notice comments on behalf of the applicant with a letter to the Corps which included the Biological Assessment.

On March 28, 2006, PAI provided a letter to the Corps which included supplemental information for the red-cockaded wood-pecker, the wood stork, and Florida panther.

As of March 30, 2006, we received all the information necessary for initiation of formal consultation on the Florida panther for this project as required in the regulations governing interagency consultations (50 CFR § 402.14). The Service is providing this biological opinion in conclusion of formal consultation.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

Proposed Action

The Corps has received an application for fill and excavation in 45.8 ± acres of wetlands, 0.26 acre of Corps waters, and impacts on 98.59± acres of uplands. The applicant is proposing to impact 165.5 acres and preserve 75.46 acres on-site. The 240.96± acre Alico Airpark Center project site is comprised of 135.29± acres of jurisdictional wetlands, 0.26± acre of waters of the United States, and 105.41± acres of uplands. The property is bounded on the east by Airport Haul Road, on the north by SWFIA, and on the south and west by limerock mines.

Land use and habitat cover types include 5.53± acres of pine (*Pinus elliottii*) flatwoods (0 to 24 percent exotics), 80.49± acres of pine flatwoods (25 to 49 percent exotics), 14.84± acres of pine flatwoods (50 to 75 percent exotics), 2.80± acres of pine flatwoods (76 to 100 percent exotics), 21.40± acres of hydric melaleuca (*Melaleuca quinquenervia*), 0.24± acre of hydric wax-myrtle (*Myrica cerifera*)/willow (*Salix caroliniana*) (0 to 24 percent exotics), 5.58± acres of hydric wax-myrtle/willow (25 to 49 percent exotics), 2.92± acres of hardwood/conifer (25 to 49 percent exotics), 0.26± acre of ditch, 4.81 acres of cypress (*Taxodium distichum*) (0 to 24 percent exotics), 1.46± acres of cypress (25 to 49 percent exotics), 0.51± acre of cypress (50 to 75 percent exotics), 5.41± acres of pine-cypress (25 to 49 percent exotics), 1.14± acres of pine-cypress (50 to 75 percent exotics), 20.65± acres of hydric pine flatwoods (25 to 49 percent exotics), 33.85± acres of hydric pine flatwoods (50 to 75 percent exotics), 0.71± acre of freshwater marsh (0 to 24 percent exotics), 1.35± acres of freshwater marsh (25 to 49 percent exotics), 8.84± acres of wet prairie (0 to 24 percent exotics), 26.16± acres of wet prairie (25 to 49 percent exotics), 0.26± acre of hydric disturbed land, and 1.75± acres of road.

The project will result in direct loss of 165.5 acres of habitat marginally suitable for use by the Florida panther (see discussion under Wildlife Assessment). The project is located in the Florida Panther Primary Zone (Kautz et al. 2006) (Figure 3). The habitat loss equates to approximately 1,111.24 PHU with a recommended compensation need of 2,778.09 PHUs (see definition under Habitat Assessment Methodology). The applicant has proposed to provide compensation for project effects to panther habitat through the preservation and purchase of 414 acres of Primary Zone habitat with associated enhancement, which equates to 2,857.49 PHUs. The compensation proposal will provide approximately 2,857.49 PHUs of higher quality panther habitat in areas abutting higher quality panther habitat. These lands which currently include about 255 acres of croplands, 54 acres of grasslands, 40 acres of freshwater marsh, 14 acres of cypress swamp, and 51 acres of mixed upland uses, will be restored to 217 acres of cypress swamp, 143 acres of hardwood swamp, 40 acres of freshwater marsh, and 14 acres of mixed upland habitats. The applicant also proposes to preserve 75.46 acres of wetlands and uplands on-site. The habitat preserved on-site will provide limited resources value to the Florida panther because of the adjacent surrounding urban development.

The proposed compensation plan provides habitat preservation and restoration in Collier County, and benefits the survival and recovery of the Florida panther as referenced in the draft Panther Recovery Plan (Service 2006) goal 1.1.1.2.3. This goal recommends that habitat preservation and restoration within the Primary Zone be provided in situations where land use intensification can not be avoided. The applicant has proposed equivalent habitat protection and restoration, to compensate for both the quantity and functional value of the lost habitat.

Action Area

The Service's Panther Focus Area for the Florida panther includes lands in Charlotte, Glades, Hendry, Lee, Collier, Palm Beach, Broward, Miami-Dade, and Monroe Counties, as well as the southern portion of Highlands County (Figure 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.

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

Therefore, for both direct and indirect effects, the Service defined the action area (Figure 7) as all lands within a 25-mile radius of the Alico Airpark Center development, which is slightly greater than the mean dispersal distance for sub-adult males. This action area does not include urban lands, lands west of Interstate 75 (I-75). This action area includes areas anticipated to sustain direct and indirect effects, such as roadways experiencing increased traffic, areas with increased human disturbance (project area and periphery of project), and areas in which habitat fragmentation and intraspecific aggression may be felt.

STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

PANTHER BIOLOGY/ECOLOGY

Status

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

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

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

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

Taxonomy

The Florida panther was first described by Charles B. Cory in 1896 as *Felis concolor floridana* (Cory 1896). The type specimen was collected in Sebastian, Florida. Bangs (1899), however,

believed that the Florida panther was restricted to peninsular Florida and could not intergrade with other *Felis* spp. Therefore, he assigned it full specific status and named it *Felis coryi* since *Felis floridana* had been used previously for a bobcat (*Lynx rufus*).

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

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

Species Description

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

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

Three external characters—a right angle crook at the terminal end of the tail, a whorl of hair or cowlick in the middle of the back, and irregular, white flecking on the head, nape, and shoulders—not found in combination in other subspecies of *Puma* (Belden 1986), were commonly observed in Florida panthers through the mid-1990s. The kinked tail and cowlicks were considered manifestations of inbreeding (Seal 1994); whereas the white flecking was thought to be a result of scarring from tick bites (Maehr 1992, Wilkins et al. 1997). Four other

abnormalities prevalent in the panther population prior to the mid-1990s included cryptorchidism (one or two undescended testicles), low sperm quality, atrial septal defects (the opening between two atria in the heart fails to close normally during fetal development), and immune deficiencies and were also suspected to be the result of low genetic variability (Roelke et al. 1993b).

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

Population Trends and Distribution

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

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

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

and 57 percent of kittens could be detected by track searches in Utah. In south Florida, the Florida panther's limited range and low densities may make the population count derived from track searches more accurate than in Utah. During two month-long investigations – one late in 1972 and early 1973 and another in 1974 – funded by the World Wildlife Fund to determine if panthers still existed in Florida, McBride searched for signs of panthers in portions of south Florida. In 1972, McBride authenticated a road-killed male panther in Glades County and a female captured and released from a bobcat trap in Collier County (R. McBride, Livestock Protection Company, personal communication 2005). In 1973, McBride captured one female in Glades County (Nowak and McBride 1974). Based on this preliminary evidence, Nowak and McBride (1974) estimated the "population from the Lake Okeechobee area southward to be about 20 or 30 individuals." In 1974, McBride found evidence of only two additional panthers in the Fakahatchee Strand and suggested that "there could be not more than ten individual panthers in the area around Lake Okeechobee and southward in the state" (Nowak and McBride 1975). This initial survey, while brief in nature, proved that panthers still existed in Florida and delineated areas where a more exhaustive search was warranted. After this initial investigation, more comprehensive surveys on both public and private lands were completed (Reeves 1978; Belden and McBride 1983a, b; Belden et al. 1991). Thirty individual panthers were identified during a wide-ranging survey in 1985 in south Florida (McBride 1985).

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

More recently, McBride (2000, 2001, 2002, 2003) obtained minimum population counts (*i.e.*, number known alive) based on panthers treed with hounds, physical evidence (*e.g.*, tracks where radio-collared panthers were not known to occur), documentation by trail-camera photos, and sightings of uncollared panthers by a biologist or pilot from a monitoring plane or via ground telemetry. He counted adults and subadult panthers but not kittens at the den). The population estimate in 2000 was 62 panthers (McBride 2000), with estimates of 78 in 2001 (McBride 2001), 80 in 2002 (FWC 2002), 87 in 2003 (FWC 2003), 78 in 2004 (R. McBride, Personal Communication, 2006), 82 in 2005 (R. McBride, Personal Communication, 2006), and 96 in 2006 (R. McBride, Personal Communication, 2006).

Life History

Reproduction: Male Florida panthers are polygynous, maintaining large, overlapping home ranges containing several adult females and their dependent offspring. The first sexual encounters for males normally occur at about three years based on 26 radio-collared panthers of both sexes (Maehr et al. 1991). Based on genetics work, some males may become breeders as

early as 17 months (W. Johnson, National Cancer Institute, personal commuication 2005). Breeding activity peaks from December to March (Shindle et al. 2003). Litters (n = 82) are produced throughout the year, with 56-60 percent of births occurring between March and June (Jansen et al. 2005, Lotz et al. 2005). The greatest number of births occurs in May and June (Jansen et al. 2005, Lotz et al. 2005). Female panthers have bred as young as 18 months (Maehr et al. 1989) and successful reproduction has occurred up to 11 years old. Mean age of denning females is 4.6 ± 2.1 (standard deviation [sd]) years (Lotz et al. 2005). Age at first reproduction for 19 known-aged female panthers averaged 2.2 ± 0.246 (sd) years and ranged from 1.8-3.2 years. Average litter size is 2.4 ± 0.91 (sd) kittens. Seventy percent of litters are comprised of either two or three kittens. Mean birth intervals (elapsed time between successive litters) are 19.8 ± 9.0 (sd) months for female panthers (n = 56) (range 4.1-36.5 months) (Lotz et al. 2005). Females that lose their litters generally produce another more quickly; five of seven females whose kittens were brought into captivity successfully produced another litter an average of 10.4 months after the removal of the initial litter (Land 1994).

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

Survivorship and Causes of Mortality: Mortality records for un-collared panthers have been kept since February 13, 1972, and for radio-collared panthers since February 10, 1981. One-hundred eighty-nine mortalities have been documented through June 6, 2006, with 86 (46 percent) of known deaths occurring in the past 5 years (FWC 2006a, FWC unpublished data). Overall, documented mortality averaged 3.6 per year through June 2001, and 16.0 per year from July 2001 through June 2006. Of the 189 total mortalities, 100 were radio-collared panthers that have died since 1981 (FWC 2006a). From 1990-2004, mean annual survivorship of radio-collared adult panthers was greater for females (0.894 ± 0.099 sd) than males (0.779 ± 0.125 sd) (Lotz et al. 2005). Except for intraspecific aggression, the causes of mortality were found to be independent of gender (Lotz et al. 2005).

Intraspecific aggression was the leading cause of death for radio-collared panthers, accounting for 42 percent (Jansen et al. 2005, Lotz et al. 2005). Most intraspecific aggression occurs between male panthers; but, aggressive encounters between males and females, resulting in the death of the female, have occurred. Defense of kittens and\or a kill is suspected in half (5 of 10) of the known instances through 2003 (Shindle et al. 2003).

Unknown causes and collisions with vehicles accounted for 24 and 19 percent of radio-collared panther mortalities, respectively. From February 13, 1972, through June 30, 2006, Florida panther vehicular trauma (n=96), averaged 2.8 per year for radio-collared and un-collared panthers (FWC 2006a). Ten of the collisions were not fatal. Three additional panthers were killed by vehicles from July 1, 2005, through November 30, 2006 (FWC Unpublished data), bringing the total to 99 panthers killed by vehicles.

Female panthers are considered adult residents if they are older than 18 months, have established home ranges and bred (Maehr et al. 1991). Land et al. (2005) reported that all 24 female panthers first captured as kittens survived to become residents and 19 (79.2 percent) produced litters. Male panthers are considered adult residents if they are older than three years and have established a home range that overlaps with females. Thirty-one male panthers were captured as kittens and 12 (38.7 percent) of these cats survived to become residents (Jansen et al. 2005, Lotz et al. 2005). "Successful male recruitment appears to depend on the death or home-range shift of a resident adult male" (Maehr et al. 1991). Turnover in the breeding population is low with documented mortality in radio-collared panthers being greatest in subadults and non-resident males (Maehr et al. 1991, Shindle et al. 2003).

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

Dispersal: Panther dispersal begins after a juvenile becomes independent from its mother and continues until it establishes a home range. Dispersal distances are greater for males (n = 18) than females (n = 9) (42.5 mi [68.4 km] vs. 12.6 mi [20.3 km], respectively) and the maximum dispersal distance recorded for a young male was 139.2 mi (224.1 km) over a seven-month period followed by a secondary dispersal of 145 mi (233 km) (Maehr et al. 2002a). Males disperse an average distance of 25 mi (40 km); females typically remain in or disperse short distances from their natal ranges (Comiskey et al. 2002). Female dispersers are considered philopatric because they usually establish home ranges less than one average home range width from their natal range (Maehr et al. 2002a). Maehr et al. (2002a) reported that all female dispersers (n = 9) were successful at establishing a home range whereas only 63 percent of males (n = 18) were successful. Young panthers become independent at 14 months on average for both sexes, but male dispersals are longer in duration than for females (9.6 months and 7.0 months, respectively) (Maehr et al. 2002a). Dispersing males usually go through a period as transient (non-resident) subadults, moving through the fringes of the resident population and often occupying suboptimal habitat until an established range becomes vacant (Maehr 1997).

Most panther dispersal occurs south of the Caloosahatchee River with only four radio-collared panthers crossing the river and continuing north since 1981 (Land and Taylor 1998, Land et al. 1999, Shindle et al. 2000, Maehr et al. 2002a, Belden and McBride 2005). Western subspecies of *Puma* have been documented crossing wide, swift-flowing rivers up to a mile in width (Seidensticker et al. 1973, Anderson 1983). The Caloosahatchee River, a narrow (295-328 ft [90-100 m]), channelized river, probably is not a significant barrier to panther movements, but the combination of the river, State Route (SR) 80, and land uses along the river seems to have restricted panther dispersal northward (Maehr et al. 2002a). Documented physical evidence of at

least 15 other un-collared male panthers have been confirmed north of the river since 1972, but no female panthers nor reproduction have been documented in this area since 1973 (Belden and McBride 2005).

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

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

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

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

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

Food Habits: Primary panther preys are white-tailed deer (*Odocoileus virginianus*) and feral hog (*Sus scrofa*) (Maehr et al. 1990, Dalrymple and Bass 1996). Generally, feral hogs constitute the greatest biomass consumed by panthers north of the Alligator Alley section of I-75 while white-tailed deer are the greatest biomass consumed to the south (Maehr et al. 1990b). Secondary prey includes raccoons (*Procyon lotor*), nine-banded armadillos (*Dasypus novemcinctus*), marsh rabbits (*Sylvilagus palustris*) (Maehr et al. 1990b) and alligators (*Alligator mississippiensis*) (Dalrymple and Bass 1996). No seasonal variation in diet has been detected. A resident adult male puma generally consumes one deer-sized prey every 8-11 days; this frequency would be 14-17 days for a resident female; and 3.3 days for a female with three 13-month-old kittens (Ackerman et al. 1986). Maehr et al. (1990b) documented domestic livestock infrequently in scats or kills, although cattle were readily available in their study area.

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

Pseudorabies virus (PRV) (Aujeszky's disease) causes respiratory and reproductive disorders in adult hogs and mortality in neonates, but is a rapidly fatal neurologic disease in carnivores. At

least one panther died from PRV infection presumably through consumption of an infected feral hog (Glass et al. 1994). At least one panther has also died of rabies (Taylor et al. 2002). This panther was radiocollared but not vaccinated against the disease.

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

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

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

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

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

Consistently high hair mercury values in ENP and FPNWR and the finding of elevated values in some portions of BCNP warrant continued monitoring (Land et al. 2004). Other environmental contaminants found in panthers include polychlorinated biphenyls (Arochlor 1260) and organochlorines (p, p'–DDE) (Dunbar 1995, Land et al. 2004).

Habitat Characteristics/Ecosystem

Landscape Composition: Noss and Cooperrider (1994) considered the landscape implications of maintaining viable panther populations. Assuming a male home range size of 137,599 acres (55,685 ha) (Maehr 1990), an adult sex ratio of 50:50 (Anderson 1983), and some margin of safety, they determined that a reserve network as large as 15,625–23,438 mi^2 (40,469-60,703 km^2) would be needed to support an effective population size of 50 individuals (equating to an actual adult population of 100-200 panthers [Ballou et al. 1989]). However, to provide for long-term persistence based on an effective population size of 500 individuals (equating to 1,000 - 2,000 adult panthers [Ballou et al. 1989]), could require as much as 156,251-234,376 mi^2 (404,687-607,031 km^2). This latter acreage corresponds to roughly 60-70 percent of the Florida panther's historical range. Although it is uncertain whether this much land is needed for panther recovery, it does provide some qualitative insight into the importance of habitat conservation across large landscapes for achieving a viable panther population (Noss and Cooperrider 1994).

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

A landscape-level strategy for the conservation of the panther population in south Florida was developed using a Florida panther potential habitat model based on the following criteria: (1) forest patches greater than 4.95 acres (2 ha); (2) non-urban cover types within 656 ft (200m) of forest patches; and (3) exclusion of lands within 984 ft (300m) of urban areas (Kautz et al. 2006). In developing the model, data from radio-collared panthers collected from 1981 through 2000 were used to evaluate the relative importance of various land cover types as panther habitat, thus identifying landscape components important for panther habitat conservation. Those components were then combined with a least cost path analysis to delineate three panther habitat conservation zones for south Florida: (1) Primary Zone – lands essential to the long-term viability and persistence of the panther in the wild; (2) Secondary Zone - lands which few panthers use contiguous with the Primary Zone, but given sufficient habitat restoration could accommodate expansion of the panther population south of the Caloosahatchee River; and (3) Dispersal Zone - the area which may facilitate future panther expansion north of the Caloosahatchee River (Kautz et al. 2006) (Figure 7). The Primary Zone is currently occupied

and supports the breeding population of panthers. Although panthers move through the Secondary and Dispersal Zones, they are not permanently occupied. The Secondary Zone could support panthers with sufficient restoration.

These zones vary in size, ownership, and land cover composition. The Primary Zone is 2,270,711 acres (918,928 ha) in size, 73 percent of which is publicly owned (R. Kautz, Dennis, Breedlove, and Associates, personal communication 2005), and includes portions of the BCNP, ENP, Fakahatchee Strand Preserve State Park (FSPSP), FPNWR, Okaloacoochee Slough State Forest, and Picayune Strand State Forest. This zone's composition is 45 percent forest, 41 percent freshwater marsh, 7.6 percent agriculture lands, 2.6 percent prairie and shrub lands, and 0.52 percent urban lands (Kautz et al. 2006). The Secondary Zone is 812,157 acres (328,670 ha) in size, 38 percent of which is public land (R. Kautz, personal communication 2005). This zone's composition is 43 percent freshwater marsh, 36 percent agriculture, 11 percent forest, 6.1 percent prairie and shrub lands, and 2.3 percent low-density residential areas and open urban lands (Kautz et al. 2006). The Dispersal Zone is 28,160 acres (11,396 ha) in size, 12 percent of which is either publicly owned or in conservation easement. This zone's composition is 49 percent agriculture (primarily improved pasture and citrus groves), 29 percent forest (wetland and upland), 8.8 percent prairie and shrub land, 7.5 percent freshwater marsh, and 5.1 percent barren and urban lands (Kautz et al. 2006).

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

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

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

Even though some suitable panther habitat remains in south-central Florida, it is widely scattered and fragmented (Belden and McBride 2005). Thatcher et al. (2006) used a statistical model in

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

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

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

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

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

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

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

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

encompasses 44 mi^2 (113 km^2) with a mean width of 3.4 mi (5.4 km). Although it is not adequate to support even one panther, the Dispersal Zone is strategically located and expected to function as a critical landscape linkage to south-central Florida (Kautz et al. 2006). Transient male panthers currently utilize this Zone as they disperse northward into south-central Florida.

PANTHER RECOVERY OBJECTIVES

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

PANTHER MANAGEMENT AND CONSERVATION

Habitat Conservation and Protection

Panthers, because of their wide-ranging movements and extensive spatial requirements, are particularly sensitive to habitat fragmentation (Harris 1985). Mac et al. (1998) defines habitat fragmentation as: "The breaking up of a habitat into unconnected patches interspersed with other habitat which may not be inhabitable by species occupying the habitat that was broken up. The breaking up is usually by human action, as, for example, the clearing of forest or grassland for agriculture, residential development, or overland electrical lines." The reference to "unconnected patches" is a central underpinning of the definition. For panther conservation, this definition underscores the need to maintain contiguous habitat and protected habitat corridors in key locations in south Florida and throughout the panther's historic range. Habitat fragmentation can result from road construction, urban development, and agricultural land conversions.

Habitat protection has been identified as being one of the most important elements to achieving panther recovery. While efforts have been made to secure habitat (Figure 7 and Table 1), continued action is needed to obtain additions to and inholdings for public lands, assure linkages are maintained, restore degraded and fragmented habitat, and obtain the support of private landowners for maintaining property in a manner that is compatible with panther use. Conservation lands used by panthers are held and managed by a variety of entities including FWS, NPS, Seminole Tribes of Florida, Miccosukee Tribe of Indians of Florida, FWC, Florida Department of Environmental Protection (DEP), Florida Division of Forestry (FDOF), Water Management Districts (WMD), non-governmental organizations (NGO), counties, and private landowners.

Public Lands: Public lands in south Florida that benefit the panther are listed below and shown in Figure 7:

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

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

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

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

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

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

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

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

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

Tribal Lands: Lands of the Seminole Tribes of Florida and Miccosukee Tribe of Indians of Florida encompass over 350,079 acres (141,673 ha) in south Florida. Of these, 115,840 acres (46,879 ha) are used by panthers, and comprise 5 percent of the Primary Zone (R. Kautz, personal communication 2005). These lands are not specifically managed for the panther and are largely in cultivation.

Private Lands: A variety of Federal, State, and private incentives programs are available to assist private landowners and other individuals to protect and manage wildlife habitat. Voluntary agreements, estate planning, conservation easements, land exchanges, and mitigation banks are methods that hold untapped potential for conserving private lands. In 1954, the National Audubon Society established the nearly 10,880 acres (4,403 ha) Corkscrew Swamp Sanctuary.

However, little additional private land has been protected south of the Caloosahatchee River for panther conservation. A number of properties identified by the State Acquisition and Restoration Council (ARC) for purchase by the Florida Forever Program are used by panthers (*e.g.*, Devil's Garden, Half Circle F Ranch, Pal Mal, Panther Glades). North of the Caloosahatchee River, Fisheating Creek Conservation Easement, 41,600 acres (16,835 ha) in Glades County is a private holding used by dispersing male panthers. Also, 73,235 acres of the 90,845 acres Babcock Ranch were purchased in 2006 by the State of Florida and Lee County for conservation and agriculture. An additional 2,000 acres of this ranch were put into a conservation easement.

Habitat and Prey Management

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

Response to Management Activities

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

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

Janis and Clark (2002) compared the behavior of panthers before, during, and after the recreational deer and hog hunting season (October through December) on areas open (BCNP) and closed (FPNWR, FSPSP) to hunting. Variables examined were: (1) activity rates, (2) movement rates, (3) predation success, (4) home range size, (5) home range shifts, (6) proximity to ORV trails, (7) use of areas with concentrated human activity, and (8) habitat selection. Responses to hunting for variables most directly related to panther energy intake

or expenditure (*i.e.*, activity rates, movement rates, predation success of females) were not detected (Janis and Clark 2002). However, panthers reduced their use of Bear Island, an area of concentrated human activity, and were found farther from ORV trails during the hunting season, indicative of a reaction to human disturbance (Janis and Clark 2002). Whereas the reaction to trails was probably minor and could be related to prey behavior, decreased use of Bear Island most likely reflects a direct reaction to human activity and resulted in increased use of adjacent private lands (Janis and Clark 2002).

Transportation Planning and Improvements

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

There are presently 28 wildlife underpasses with associated fencing suitable for panther use along I-75 (Figure 7). There are four underpasses suitable for panther use currently existing, and two additional underpasses presently proposed by the Florida Department of Transportation (FDOT) along State Road 29 (SR 29) (Corps' Public Notice SAJ-2004-778) (Figure 7). Several additional panther/wildlife crossings are proposed along roadways in rural Lee and Collier Counties (Shindle 2001). In addition, Collier County, in cooperation with the National Wildlife Federation and the Florida Wildlife Federation, is coordinating a study of the segment of County Road (CR) 846 east of Immokalee and the section of Oil Well Road where the road crosses Camp Kies Strand to determine the optimum location for wildlife crossing construction (WilsonMiller 2005). An additional crossing of Camp Kies Strand on CR 846 west of Immokalee is also being evaluated. 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 (Swanson et al. 2006).

No panther-vehicle collisions have been recorded in the immediate vicinity of wildlife crossings, with the exception of one collision in December 2005 on SR 29. There have been no collisions on east-west I-75 in the vicinity of crossings since installation in 1991. Prior to 1991, there were five recorded deaths from collisions. FDOT has also identified the location of and constructed wildlife crossings on SR 29. Proposed crossings A and B (Figure 7) will be in an area of 10 documented collisions from 1980 to 2004. Crossings C and D, north of I-75, were installed in 1995. There were two recorded collisions in the vicinity of crossing D from 1979 to 1990, but none at either C or D since crossing installation. Crossing E was installed in 1997. There has been one collision about 1 mile to the north in 2002. Crossing F was installed in 1999. There was one documented collision in the immediate vicinity in 1981, two collisions about 1.5 miles to the north since crossing installation, and one collision about 0.5 mile to the south in December 2005.

Agriculture, Development, and Mining

The Service developed a draft Panther Habitat Assessment (PHA) methodology and refugia design in 2003 to help guide the agency in evaluating permit applications for projects that could

affect panther habitat (see discussion below). This draft methodology was a way to assess the level of impacts to panthers expected from a given project, and to evaluate the effect of any proposed compensation offered by the project applicant. Prior to development of the methodology, the Service from March 1984 through July 2003 concluded consultation on 42 projects involving the panther and habitat preservation (Table 2). The minimum expected result of these projects is impacts to 76,919 acres and the preservation of 15,479 acres of panther habitat. Of the 76,919 acres of impacts, 38,932 acres are due to agricultural conversion and 37,982 acres to development and mining. Portions (10,370 acres) of the largest agricultural conversion project, the 28,700 acres by U.S. Sugar Corporation, were re-acquired by the Federal Government as a component of the Talisman Land Acquisition (Section 390 of the Federal Agricultural Improvement and Reform Act of 1996 [Public Law 104-127] Farm Bill Cooperative Agreement, FB4) for use in the Comprehensive Everglades Restoration Project. The non-agriculture impacts are permanent land losses, whereas the agricultural conversions may continue to provide some habitat functional value to panthers, depending on the type of conversion.

From August 2003 to November 2006, the Service concluded consultations on 56 projects affecting 17,059 acres with preservation of 18,135 acres (Table 2). Following our refugia design assessment approach, the projects affected 7,287 acres in the Primary Zone, 5,911 acres in the Secondary Zone, and 3,861 acres in the Other Zone. Compensation provided included 16,071 acres in the Primary Zone, 652 acres in the Dispersal Zone, 2 acres in the Secondary Zone, and 1,410 acres in the Other Zone. The project affected lands were primarily agricultural fields consisting of row crops and citrus groves and natural lands with varying degrees of exotic vegetation. Functional habitat value of these lands to the Florida panther, following our PHA methodology provided a PHU loss from development of 74,036 PHUs, with a corresponding PHU preservation and enhancement complement of 142,742 PHUs. The preservation lands were generally native habitat lands or disturbed lands that included restoration components. Restoration components included exotic species removal, fire management, wetland hydrology improvement, improved forest management practices, and full habitat restoration from agriculture uses to native habitats.

PANTHER HABITAT EVALUATION AND COMPENSATION

Population Viability Analysis

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

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

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

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

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

The results of these model runs predicted a probability of extinction for the conservative model of 78.5 percent in 100 years with a mean final total abundance of 3.5 females. Also, the probability of a large decline in abundance (50 percent) was 94.1 percent. The moderate model resulted in a 5 percent probability of extinction and mean final abundance of 42.3 females in

100 years. The probability of panther abundance declining by half the initial amount was 20 percent in 100 years under the moderate model. The optimistic model resulted in a 2 percent probability of extinction and mean final abundance of 51.2 females in 100 years. The probability of panther abundance declining by half the initial amount was only 9 percent in 100 years under the optimistic model. These models also provide a probability of persistence (100 percent minus probability of extinction) over a 100-year period of 95 percent for the moderate model and 98 percent for the optimistic model.

One Percent Habitat Loss: Model results were also provided by Root (2004) for probability of extinctions for 1 percent loss of habitat, within the first 25 years of the model run. The 1 percent loss of habitat equates to essentially all remaining non-urban privately owned lands in the Primary Zone and corresponds to the estimated rate of habitat loss (Root 2004) from 1986 to 1996 for the five southwest counties based on land use changes. For the moderate model, the model runs predict a probability of extinction increase of about one percent, from a probability of extinction of about 5 percent with no loss of habitat to 6 percent with 1.0 percent habitat loss per year, for the first 25 years. For the optimistic model, probability of extinction increased from about 2 percent with no loss of habitat to 3 percent with 1.0 percent habitat loss per year, for the first 25 years. These models also predicted the mean final abundance of females would decrease from 41 to 31 females, a 24.3 percent reduction for the moderate model and from 41 to 38 females, a 7.3 percent reduction for the optimistic model.

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

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

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

PVA Summaries and Population Guidelines: Root's (2004) moderate model runs, which have a carrying capacity 53 females (106 individuals), show final populations of 42.3 females (84 total) and 31.2 females (62 total) with extinction rates of 5 percent and 6 percent, respectively, for the basic and 1 percent habitat loss scenarios. The predicted final populations in Root (2004) are 84 and 62 panthers for no loss of habitat and 1 percent loss of habitat, respectively, over a 100-year period.

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

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

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

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

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

South Florida Panther Population Goal

The Service's goal for Florida panther conservation in south Florida is to locate, preserve, and restore sets of lands containing sufficient area and appropriate land cover types to ensure the

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

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

In the original SLOPES the consultation area map (MAP) was generated by the Service by overlaying existing and historical panther telemetry data on a profile of Florida and providing a connecting boundary surrounding most of these points. Since the development of the MAP, we have received more accurate and up-to-date information on Florida panther habitat usage. Specifically we have received two documents the Service believes reflects the most likely panther habitat usage profiles although documentation clearly shows panther use of areas outside these locations. These documents are the publications by Kautz et al. (2006) and Thatcher et al. (2006). Based on the information in these documents, we have clarified the boundaries of the MAP to better reflect areas where Florida panthers predominate (Figure 4) and refer to these areas cumulatively as the Panther Focus Area.

The Panther Focus Area was determined from the results of recent panther habitat models south of the Caloosahatchee River (Kautz et al. 2006) and north of the Caloosahatchee River (Thatcher et al. 2006). Kautz et al. (2006) model of landscape components important to Florida panther habitat conservation was based on an analysis of panther habitat use and forest patch size. This model was used in combination with radio-telemetry records, home range overlaps, land use/land cover data, and satellite imagery to delineate primary and secondary areas that would be most important and comprise a landscape mosaic of cover types important to help support of the current panther breeding population south of the Caloosahatchee River.

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

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

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

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

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

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

Landscape Preservation Need and Compensation Recommendations

Land Preservation Needs: To further refine the land preservation needs of the Florida panther and to specifically develop a landscape-level program for the conservation of the Florida panther population in south Florida, the Service as previously discussed, in February 2000, appointed a Florida Panther Subteam. The Subteam in addition to the assignments discussed previously, was also charged with developing a landscape-level strategy for the conservation of the Florida panther population in south Florida. The results of this collaborative effort are partially presented in Kautz et al. (2006). One of the primary goals of this effort was to identify a strategically located set of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the south population of the Florida panther. Kautz et al. (2006) focused their efforts on the area south of the Caloosahatchee River, where the reproducing panther population currently exists.

Kautz et al. (2006) created an updated Florida panther potential habitat model based on the following criteria: (1) forest patches greater than 4.95 acres (2 ha); (2) non-urban cover types within 656 ft (200 m) of forest patches; and (3) exclusion of lands within 984 ft (300 m) of urban areas. The potential habitat map was reviewed in relation to telemetry data, recent satellite imagery (where available), and panther home range polygons. Boundaries were drawn around

lands defined as the Primary Zone (Figure 8), defined as the most important area needed to support a self-sustaining panther population. Kautz et al. (2006) referred to these lands as essential; however, as observed in the two previous plans (Logan et al. 1993; Cox et al. 1994), lands within the boundaries of the Primary Zone included some urban areas and other lands not considered to be truly panther habitat (*i.e.*, active rock and sand mines). The landscape context of areas surrounding the Primary Zone was modeled and results were used to draw boundaries of the Secondary Zone (Figure 8), defined as the area capable of supporting the panther population in the Primary Zone, but where habitat restoration may be needed (Kautz et al. 2006).

Kautz et al. (2006) also identified, through a least cost path model, the route most likely to be used by panthers dispersing out of south Florida, crossing the Caloosahatchee River, and dispersing into south-central Florida. Kautz et al. (2006) used ArcView GIS© version 3.3 and ArcView Spatial Analyst© version 2 (Environmental Systems Research, Incorporated, Redlands, California) to construct the least-cost path models and identify optimum panther dispersal corridor(s). The least-cost path models operated on a cost surface that ranked suitability of the landscape for use by dispersing panthers with lower scores indicating higher likelihood of use by dispersing panthers. The lands within the boundaries of the least cost model prediction were defined as the Dispersal Zone (Figure 8). The preservation of lands within this zone is important for the survival and recovery of the Florida panther, as these lands are the dispersal pathways for expansion of the south Florida panther population. The Primary Zone covers 2,270,590 acres (918,895 ha); the Secondary Zone covers 812,104 acres (328,654 ha); and the Dispersal Zone covers 27,883 acres (11,284 ha); providing a total of 3,110,578 acres (1,258,833 ha) (Kautz et al. 2006).

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

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

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

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

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

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

Primary Zone Equivalent Lands: Kautz et al. (2006), through their habitat evaluation of lands important to the Florida panther, identified three sets of lands, *i.e.*, Primary Zone, Secondary Zone, and Dispersal Zone, and documented the relative importance of these lands to the Florida panther. These lands are generally referred to as Kautz et al.'s (2006) panther core lands (Figure 8) and include the majority of the home ranges of the current population of the Florida panther. The Service, in our evaluation of habitat needs for the Florida panther expanded the boundaries of the Kautz et al.'s (2006) panther core lands to include those lands south of the Caloosahatchee River where additional telemetry points historically were recorded. These additional lands (about 819,995 acres), referred to as the "Other" Zone, are added to the lands in Kautz et al.'s (2006) panther core lands (Figure 8) and represent the lands within the Service's 2000 consultation area boundary south of the Caloosahatchee River as shown in Figure 4. These lands (core lands and other zone lands) together are referred to as the Service's panther core area. The "Other" Zone lands, as well as the lands within the Secondary Zone, provide less landscape benefit to the Florida panther than the Primary and Dispersal Zones, but are important as a component of our goal to preserve sufficient lands to support a population of 90 panthers in south Florida.

To account for the lower landscape importance of these lands in our preservation goals and in our habitat assessment methodology, we assigned lands in the Other Zone a value of 0.33 and lands in the Secondary Zone a value of 0.69 to convert these lands to Primary Zone value, *i.e.*, Primary Zone equivalents (Table 3 - 4). Kautz et al. (2006) identifies the need for restoration in the Secondary Zone to achieve maximum benefits. To estimate the Primary Zone equivalent of Secondary Zone lands, we derived a relative habitat value (average PHU value) for each by comparing the habitat ranks estimated in Kautz et al. (2006 – Table 1) for each habitat type per zone. The average PHU value for the Primary Zone is 6.94 and for the Secondary Zone 4.79. Based on this analysis, the habitat value of the Secondary Zone is roughly 69 percent of the Primary Zone, and restoration is needed to achieve landscape function (4.79/6.94=0.69). Dispersal Zone lands are considered equivalent to Primary Zones lands with a 1/1 value. At-risk lands in the Other Zone total 819,995 acres. Actions on some of the Other Zone lands such as some actions in areas that have already been urbanized will not have an impact on panthers or their habitat, and these case-specific determinations will be made based on a review of the specific proposals. We estimate 80 percent of these actions will have an impact on achieving the panther population goal, and will monitor this carefully as we review proposed actions (819,995 times 0.8 equals 655,996 acres). Multiply this acreage (655,996 acres) by 0.33 to determine the acres of Primary Zone equivalent lands the Other Zone can provide (655,996 times 0.33 equals 216,479 acres of Primary Zone equivalent lands) (Table 4). Using this assessment, the 503,481 acres of Secondary Zone lands equate to 347,402 acres of Primary Zone equivalent lands (Table 4). These equivalent values, 0.33 and 0.69, for Other and Secondary Zones, respectively, and 1/1 for Dispersal Zone, are important components in our assessment of compensation needs for a project in the Service's panther core area and are components of our habitat assessment methodology as discussed below.

Habitat Assessment Methodology

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

The Service chose to evaluate project effects to the Florida panther through a similar process. We incorporated many of the same habitat types referenced in Kautz et al. (2006) and FWC (2006b) with several adjustments to the assigned habitat use values reflecting consolidation of similar types of habitats and the inclusion of Everglades Restoration water treatment and retention areas. We used these values as the basis for habitat evaluations and the recommended compensation values to minimize project effects to the Florida panther (Table 5), as discussed below.

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

The available Primary Zone equivalent lands are estimated at 3,276,564 acres (actual acreage is 4,376,447 acres [the "actual acreage" value includes acres of lands in each category in the Secondary and Other Zones as well as the lands in the Primary Zone]) (see Tables 3 and 4). Currently 2,073,865 acres of Primary Zone equivalent lands (actual acreage is 2,578,152 acres) of non-urban lands are preserved (Table 3) The remaining non-urban at-risk private lands are estimated at 1,202,698 acres of Primary Zone equivalent lands (actual acreage is 1,798,295 acres) (Table 4). To meet the protected and managed lands goal for a population of 90 panthers, an additional 799,205 acres of Primary Zone equivalent lands are needed. The base ratio is determined by dividing the primary equivalents of at-risk habitat to be secured (799,205 acres) by the result of the acres of at-risk habitat in the Primary Zone (610,935 acres) times the value of the Primary Zone (1); plus the at-risk acres in the Dispersal Zone (27,883 acres) times the value of the Dispersal Zone (1); plus the at-risk acres in the Secondary Zone (503,481 acres) times the value of the Secondary Zone (0.69); plus the at-risk acres in the Other Zone (655,996 acres) times the value of the Other Zone (0.33); minus the at-risk acres of habitat to be protected (799,205 acres). The results of this formula provide a base value of 1.98.

799,205 / ((610,935 x 1.0) + (27,883 x 1) + (503,481 x 0.69) + (655,996 x 0.33)) – 799,205 = 1.98

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

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

We also realize there is a need for road crossings in strategic locations and we believe there are projects that may not have habitat loss factors but will have traffic generation factors. The Service considers increases in traffic as an indirect effect from a project and can contribute to panther mortality. Therefore, we have added another 0.02 to the base ratio to address traffic impacts, which could provide an incentive to implement crossings in key locations. Following the same approached shown above, we adjusted the base ratio from 2.48 to the 2.5. The Service

intends to re-evaluate this base ratio periodically and adjust as needed to make sure all adverse effects are adequately ameliorated and offset as required under section 7 of the Act and to achieve the Service's conservation goal for the Florida panther.

Landscape Multiplier: As discussed previously in the above section on Primary Zone Equivalent Lands, the location of a project in the landscape of the Service's panther core area is important. As we have previously discussed, lands in the Primary and Dispersal Zones are of the most importance in a landscape context to the Florida panther, with lands in the Secondary Zone of less importance, and lands in the Other Zone of lower importance. These zones affect the level of compensation the Service believes is necessary to minimize a project's effects to Florida panther habitat. Table 5 provides the landscape compensation multipliers for various compensation scenarios. As an example, if a project is in the Other Zone and compensation is proposed in the Primary Zone, a Primary Zone equivalent multiplier of 0.33 is applied to the PHUs (see discussion below) developed for the project. If the project is in the Secondary Zone and compensation is in the Primary Zone, then a Primary Zone equivalent multiplier of 0.69 is applied to the PHUs developed for the project.

Panther Habitat Units – Habitat Functional Value: Prior to applying the base ratio and landscape multipliers discussed above, we evaluate the project site and assign functional values to the habitats present. This is done by assigning each habitat type on-site a habitat suitability value from the habitats shown in Table 6. The habitat suitability value for each habitat type is then multiplied by the acreage of that habitat type resulting in a number representing PHUs. These PHUs are summed for a site total, which is used as a measurement of the functional value the habitat provides to the Florida panthers. This process is also followed for the compensation-sites.

Exotic Species Assessment: Since many habitat types in south Florida are infested with exotic plant species, which affects the functional value a habitat type provides to foraging wildlife species (*i.e.*, primarily deer and hog), we believe the presence of these species and the value these species provide to foraging wildlife needs to be considered in the habitat assessment methodology. As shown in Table 6, we have a habitat type and functional value shown for exotic species. This category includes not only the total acres of pure exotic species habitats present but also the percent-value acreages of the exotic species present in other habitat types.

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

Habitat Assessment Methodology Application – Example: To illustrate the use of our habitat assessment methodology, we provide the following example. A 100-acre project site is proposed for a residential development. Plans call for the entire site to be cleared. The project site contains 90 acres of pine flatwoods and 10 acres of exotic vegetation, and is located in the "Secondary Zone." The applicant has offered habitat compensation in the "Primary Zone" to minimize the impacts of the project to the Florida panther. To calculate the PHUs provided by

the site, we multiply the habitat acreage by the "habitat suitability value" for each habitat type and add those values to obtain a value of 840 PHUs (90 acres of pine flatwoods x 9 [the habitat suitability value for pine flatwoods] = 810 PHUs + 10 acres of exotic vegetation x 3 [the habitat suitability value for exotics] = 30 PHUs = 840 PHUs). The value of 840 PHUs is then multiplied by the 2.5 (the base ratio) and 0.69 (the landscape multiplier) resulting in a value of 1,149 PHUs for the project site. In this example, the acquisition of lands in the Primary Zone containing at least 1,149 PHUs are recommended to compensate for the loss of habitat to the Florida panther resulting from this project.

A**nalysis of the Species Likely to be Affected**

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

ENVIRONMENTAL BASELINE

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 7). 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 and lands west of I-75. 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 un-collared panthers to evaluate panther use in the action area. Currently (FWC 2006) 42 of the estimated 80 to 100 panthers have active telemetry collars. 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 collared.

Although telemetry data may not provide a complete picture of panther activity patterns, telemetry locations are a good indicator, due to the extensive data set, of the approximate boundaries of home ranges, panther travel corridors, and the range of Florida panthers south of the Caloosahatchee River. The FWC also uses observational data collected during telemetry flights to assess the yearly breeding activity of radio-collared panthers. Female panthers accompanied by kittens or male panthers within close proximity of an adult female were assumed to have engaged in breeding activity during that year. Documentation by McBride (Shindle et al. 2003) shows that between July 2002 and June 2003, 12-collared panthers, 4-uncollared females, and 3-un-collared males had home ranges in or home ranges that overlapped or were immediately adjacent to the same survey unit as the Alico Airpark Center. In addition, 8 other panthers that used this same survey unit previously died during this time period (Shindle et al. 2003). This unit, designated as Unit 5, includes the FPNWR, Corkscrew Swamp Sanctuary, and CREW.

Within the 25-mile radius action area, based on telemetry data as of 2006, at least 18 living panthers have overlapping home ranges (Figure 10). These panthers are FP 48 (female), FP 57 (female), FP 60 (male), FP 65 (male), FP 66 (female), FP 83 (female), FP 107 (female), FP 110 (female), FP 119 (male), FP 131 (male), FP 135 (male), FP 137 (male), FP 139 (male), FP 146 (male), FP 148 (female) and TX 106 (female). Two panthers, FP 62 (male) and FP 130 (male) have been documented within the 25-mile action area, but are considered to be transient males. FP 62 was last documented within the action area in 2000, the year that his radio-collar failed. FP 130 was last documented within the action area in April 2004 and has been living north of the Caloosahatchee River since August 2004. No living radio-collared panther has been documented within 10 miles of the site since November 2002 (Figure 6). The status and activities of uncollared Florida panthers within the action area are unknown.

The project site is located within the western portion of the geographic range of the panther in Florida. Historically, there have been a total of four male panthers recorded within 5 miles of the project site on 185 occasions using telemetry data from February 1981 through June 2005 (Figure 6). No radio-collared panthers have been documented within 10 miles of the project site since November 2002. This translates to an average of 7.7 occurrences per year, which translates to an average of one occurrence every 47 days. All four panther were documented to have died as follows: FP 28 (male) and FP 64 (male) died from intraspecific aggression on September 25, 1992 and March 26, 1999 respectively. Panther FP 92 (male) died from unknown causes in September 2001 and FP 99 from vehicle collision on November 28, 2002.

No other radio-collared panthers have been documented within 10 miles of the project site since November 2002; however, an un-collared panther, UCFP 83-male, which died as a result of intraspecific aggression, was found approximately 2.5 miles southeast of the project site in

March 2006. Another un-collared panther, UCFP 87-male was killed by a car on Corkscrew Road about 4.40 miles southeast of the project site in August 2006. The Service believes the project site may occasionally be used by other non-collared panthers because it contains habitat types used by panthers and their prey and at least two uncollared panthers were within 2.5 miles of the site in March 2006 and one was killed within 4.40 miles of the site in August 2006. The project vicinity has been used historically by panthers as indicated by telemetry locations over a 24-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 52 projects and informally consulted on 4 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 40,838 acres of panther habitat. These projects have also incorporated a total of 28,227 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 the 52 Federal actions requiring formal consultation, that individually and cumulatively these projects do not jeopardize the survival and recovery of the Florida panther.

From July 2000 through September 2006, the Service also engaged in informal consultation for projects under five acres with the Corps for approximately 735 projects affecting approximately 764.1 acres in Collier County (primarily Northern Golden Gate Estates) and approximately 202.8 acres in Lee County (primarily Lehigh Acres) (database entries for informal consultations prior to 2000 are incomplete). Almost all of these projects involved the construction of single-family residences in partially developed areas, each in most cases involving less than an acre of direct impact. Although panthers have been known to cross these areas to other parts of their range, prey base and denning utilization of these areas have been affected by the level of development and the additions of these residences is not expected to significantly further impact these habitat functions. For these actions, the Service concurred with the Corps' determination of "may affect, but is not likely to adversely affect" for these individual projects. 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 received information that within the action area, the Corps has, between March 16, 2004, and August 8, 2005, issued non-jurisdictional wetland determinations (isolated wetlands) for 8 projects, totaling 4,389 acres in Collier County, for 16 projects totaling

1,244 acres in Lee County, and for 1 project totaling 975 acres in Charlotte County. These 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 not require a 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, 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 the applicants pursue Habitat Conservation Plans in cooperation with the Service.

There have been 19 documented panther-vehicle collisions within the 25-mile action area from 1988 through February 27, 2006 (see Table 7 and Figure 7). The panther-vehicle collision closest to the project site occurred on August 24, 2006, about 4.4 southeast of the project site on Corkscrew Road. This collision resulted in the death of panther number UCFP 87.

Activities within the action area have also benefited panthers. The issuance of Corps and State of Florida Environmental Resource Permits has preserved 28,616 acres of high quality panther habitat for permitted impacts to 41,402 acres of mostly poor quality panther habitat (1992 to present). Installation of wildlife crossings under SR 29 and I-75 within the action area has also benefited the panther by protecting habitat connectivity and eliminating panther-vehicle collision mortalities within the vicinity of the crossing areas. Additional benefits have resulted from the acquisition of high quality habitat through acquisition programs by the other Federal, State, and County resource agencies. Table 8 provides a summary of the State and County acquisitions within the last 5 years.

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

Factors Affecting Species Environment within the Action Area

Factors that affect the species environment (positively and negatively) within the action area include, but are not limited to, the presence and construction of highways and urban development, agriculture, resource extraction, public lands management (prescribed fire, public use, exotic eradication, etc.), hydrological restoration projects, public and private land protection efforts, effects of genetic inbreeding, and genetic restoration.

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

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

EFFECTS OF THE ACTION

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 habitat that supports panthers and panther prey; (2) the fragmentation of habitat that supports panthers and panther prey; (3) roadway improvements; (4) construction; and (5) compensation. Indirect effects may include: (1) an increased risk of roadway mortality to panthers traversing the area due to the increase in vehicular traffic; (2) the reduction in value of panther habitat and panther prey habitat adjacent to the project due to habitat fragmentation; (3) increased disturbance to panthers in the project vicinity due to human activities (human/panther interactions); and (4) a potential increase of intraspecific aggression between panthers due to reduction of the geographic distribution of habitat for the Florida panther. These indirect effects are habitat based, with the exception of vehicular mortality, which could result in lethal "take." Intraspecific aggression, though habitat based, could also result in lethal "take."

This project site contains low quality panther habitat (see discussion under Wildlife Assessment) 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 have the potential to 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 land clearing associated with development will be undertaken in the next two years. The disturbance associated with the project will be permanent and result in a loss of habitat currently available to the panther.

Analyses for Effects of the Action

The 240.9-acre project site is located on the extreme western edge of the Florida panther Primary Zone as designated by Kautz et al. (2006). The site currently provides habitat of mostly low quality for the Florida panther (see discussion under Wildlife Assessment). The project site is located on the western fringe of occupied habitat, is adjacent to urban development, and is not located within known dispersal corridors (FWC 2006b) between larger publicly owned managed lands. The project will result in the conversion of 165.5 acres of poor quality panther habitat

on-site into commercial development. The on-site preservation and enhancement of 75.46 acres provide limited resource value due to its proximity to urban development, but does provide benefits to other wildlife species; wood storks and other wading birds.

Compensation for the loss of 165.5 acres of mostly poor quality panther habitat will be through the protection and restoration of about 414 acres off-site in the panther Primary Zone (Kautz et al. 2006) at Collier County Mitigation Parcel (Figure 5). Lands preserved are in the Primary Zone of the panther core lands (Kautz et al. 2006) of the Florida panther. Restoration of wetlands at the Collier County Mitigation Parcel will be primarily through the removal of non-native and nuisance vegetation with some hydrological enhancement. The compensation will provide 2,857.5 PHUs as replacement for the loss of 1,111.24 PHUs (Table 9).

Habitat Assessment Methodology Application: The application of the habitat assessment methodology including the base ratio, landscape multiplier, PHU determinations, and compensation recommendations, are presented below for the Alico Airpark Center project and compensation area.

Table 9 illustrates the PHU calculations for the Alico Airpark Center project with impacts to 165.5 acres of land in the Primary Zone with compensation provided by preservation and enhancement of approximately 414 acres in the Primary Zone. Table 9 shows the 165.5-acre on-site impact area to presently support 1,111.24 PHUs. This value is multiplied by 2.5 to provide the base ratio compensation need, which is 2,778.09 PHUs. Since the project is located in the Primary Zone compensation is in the Primary Zone, the base ratio PHUs are adjusted by the landscape compensation multiplier of 1.0 (1,111.24 x 2.5 x 1.0), to provide a combined recommended compensation need of 2,778.09 PHUs.

The 414-acre off-site mitigation area provides for 1,997.06 PHUs without restoration (existing condition) and 3,717.92 PHUs following restoration. In the assessment methodology discussed previously, the Service generally accepts compensation credit at half the difference between pre- and post-restoration, which equates to [(3,717.92 – 1,997.06)/2 + 1,997.06] = 2,857.49. The total compensation will provide approximately 414 acres or the equivalent of 2,857.49 PHUs of high quality panther habitat. Therefore, the Service believes the habitat values lost by the proposed development will be offset by the compensation actions proposed by the applicant. The lands proposed for development are on the western limits of the panther's range and panther habitat value has been diminished by exotic infestation and adjacent development. Lands proposed for preservation are in the Primary Zone, adjacent to other natural lands, and will be consistent with the Service's panther goal to strategically locate, preserve, and restore sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Florida panther population south of the Caloosahatchee River.

Wildlife Assessment: As discussed previously in the status of the species and in the environmental baseline, the Service believes the existing habitat conditions present on a site and the foraging value that a site provides to the Florida panther and panther prey species are an important parameter in assessing the importance of the project site to the Florida panther and other wildlife species. In order to assess this importance, the Service requires wildlife surveys

and plant species compositions as part of the applicant's biological assessment prepared for the project. To provide the Service with this information, plant species compositions and wildlife surveys were conducted by PAI in January 2003.

Approximately 91 percent of the project is comprised of native communities with an exotic coverage varying from 10 to 100 percent, with an average of 25 percent. The habitats on-site have been invaded by exotics, particularly melaleuca and Brazilian pepper. PAI also performed tracking surveys for white-tailed deer and feral hog in November 2004. Wildlife tracks observed during surveys included white-tailed deer (*Odocoileus virginianus*), feral hog (*Sus scrofa*), snake, raccoon (*Procyon lotor*), armadillo (*Dasypus novemcinctus*), rabbit, bobcat (*Felis rufus*), and domestic dog (*Canis familiaris*). Twenty-four sets of white-tailed deer tracks were observed during the five day survey period. No listed species were observed during the wildlife survey.

The Service believes the habitats on the property provide various levels of foraging quality for prey species which directly affects value of the habitat to panthers, and specifically, the frequency and duration of use of the property by panthers. As discussed previously, white-tailed deer densities and other prey species are influenced by the quality of the foraging habitat present in an area. The monotypic stands of poor quality foraging plant species (melaleuca) and the invasion of a site by exotic plants (10 to 100 percent, with an average of 25 percent) affect habitat foraging values and affect the utilization by and density of foraging species. 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 provide the most benefit to the deer.

Based on track surveys (Tyson 1952), deer densities on exotic-infested private lands in Lee County have been estimated at one deer per 591 acres (Turrell 2000) and one deer per 534 acres (PAI 2004). In comparison, deer densities on wildlife management areas average one deer per 165 acres to one deer per 250 acres (Steelman et al. 1999). Twenty-four sets of white-tailed deer tracks were observed during the five day survey period. Based on this survey, the average deer population index was calculated at 7.86, which translates to an estimated deer population of one deer per 30.66 acres. However, density estimates from deer tracks should be viewed with caution. Property internal access, protocol, and observer interpretation can skew results and diminish consistency between survey areas, which is the case in this project.

Track estimates are most appropriately used as long-term indicators (McCown 1991) and several factors can influence counts including weather, food abundance, season, and availability of water (O'Connell et al. 1999).

The habitats on the Alico Airpark Center site that have been invaded by exotics, primarily melaleuca and Brazilian pepper, provide lower quality foraging needs for resident deer populations, hog, and other prey species than non-exotic native habitats. The on-site preservation lands will provide limited resource value to the Florida panther, primarily due to the proximity of urban development, although these lands will provide benefit to other wildlife species.

The 414 acre compensation-site is comprised presently of approximately 62 percent hydric fallow cropland; and will need to be restored through the removal of exotics, the backfilling of ditches, and the replanting with native wetland plants. The lands will be maintained free of exotic species, indefinitely. The habitats within the off-site compensation area will contain a diverse mosaic of plant species that yield quality forage to panther prey species, especially resident deer populations. Although deer densities at the proposed compensation-site were not determined, coverage of exotics after removal and native plantings will be minimal.

Conservation Measures: The beneficial effects of the project include the preservation of approximately 414 acres of Primary Zone panther habitat. The project will result in a net gain in number of acres of preserved habitat in the primary zone and an improvement in habitat quality provided to the Florida panther through restoration of these habitats. The Collier County preservation-site is within an area of high known use by the Florida panther. The mitigation area is in the panther Primary Zone and contains habitat valuable for breeding, foraging, and dispersal by the Florida panther. The restoration and preservation of this area will increase the overall quality of these habitats to panthers and should result in increased use by panthers. The amount of use of preservation area by un-collared 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 habitat that supports panthers and panther prey; (2) the fragmentation of habitat that supports panthers and panther prey; (3) roadway improvements; (4) construction; and (5) compensation. The direct effects 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 165.5 acres available for occasional use by panthers and panther prey within the western bounds of the Primary Zone. The land will be converted to support a residential and commercial development. Habitat quality has been affected by infestations of melaleuca. The project site is located near I-75, and is bound by existing development and sand mining operations along the majority of the project perimeter. Telemetry data shows that radio-collared panthers have not been documented on the site since September 2002 (Figure 10). Habitat quality is generally poor, as it is primarily exotic-infested native communities. Based on the above analysis, the loss of the habitat associated with these lands is not significant.

Fragmentation of Habitat: Panthers, because of their wide-ranging movements and extensive spatial requirements, are also particularly sensitive to habitat fragmentation (Harris 1985). Mac et al. (1998) defines habitat fragmentation as: "The breaking up of a habitat into unconnected patches interspersed with other habitat which may not be inhabitable by species occupying the habitat that was broken up. The breaking up is usually by human action, as, for example, the clearing of forest or grassland for agriculture, residential development, or overland electrical lines." The reference to "unconnected patches" is a central underpinning of the definition. For panther conservation, this definition underscores the need to maintain

contiguous habitat and protected habitat corridors in key locations in south Florida. Habitat fragmentation can result from road construction, urban development, and agricultural land conversions within migratory patterns of panther prey species and affect the ability of panthers to move freely throughout their home ranges. Construction of highways in wildlife habitat typically results in loss and fragmentation of habitat, traffic related mortality, and avoidance of associated human development. Roads can also result in habitat fragmentation, especially for females who are less likely to cross them (Maehr 1990).

The project site is located on the western fringe of the panther primary zone, is adjacent to existing or permitted urban development, and is not located within known dispersal or connection corridors (FWC 2006b) to larger publicly owned managed lands; therefore, fragmentation of panther habitat is not expected to result from project implementation. The property is bounded on the east by Airport Haul Road, on the north by SWFIA, and on the south and west by limerock mines thus, fragmentation of panther habitat and panther prey species habitat is not expected.

Road Way Improvements: There are significant improvements in progress or planned for the project vicinity, however these expansions were designed before the Alico Airpark Center project was approved as a PUD. According to the most recent Lee County Capital Improvement Plan, some roadway improvements are proposed within a two-mile radius of the project site. Daniels Parkway between Chamberlain Parkway and Gateway Boulevard will be widened to six-lanes by Fiscal Year 2010/2011. Additionally, Three Oaks Parkway will be four-lanes and extend north of Alico Road to Daniels Parkway. Estero Parkway will be extended east to Ben Hill Griffin Parkway with an overpass being constructed over I-75. Corkscrew Road will be widened four-lanes starting from Ben Hill Griffin Parkway to Wildcat Run. According to FDOT, I-75 is slated for six-laning within the five year window as well. The lands proposed for the road expansions are in urban settings and not suitable habitat for use by the Florida panther.

Construction: The timing of construction for this project, relative to sensitive periods of the panther's lifecycle, is unknown. However, it is possible that land clearing associated with the development could be completed in several months. There are no known den sites within the project boundaries and the quality and quantity of the habitat foraging base for prey species is low. Therefore, 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 restoration actions proposed by the applicant. The lands proposed for development are primarily exotic-infested native communities on the western fringe of the occupied range of the Florida panther and are adjacent to existing roads, urban areas, and industry to the south and west. The lands proposed for preservation are consistent with the Service's panther conservation strategy to locate, preserve, and restore sets of lands containing sufficient area, access, and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River.

Interrelated and Interdependent Actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. No interrelated or interdependent actions are expected to result from the project.

Indirect Effects

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

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

Major traffic travel routes in the vicinity of the project site include Alico Road to the south, Treeline Avenue/Ben Hill Griffin Parkway and I-75 to the west; and Corkscrew Road to the southeast. Alico Road is a two-lane roadway adjacent to the subject site. To the west, Alico Road widens to six lanes near I-75. Treeline Avenue is a four-lane divided roadway to the north of Alico Road. Ben Hill Griffin Parkway is a six-lane divided roadway to the south of Alico Road, and it narrows down to four-lanes to the south of the Gulf Coast Town Center. I-75 is a four-lane divided highway with access generally restricted to major intersections only. Corkscrew Road is a two-lane roadway. According to traffic studies by TR Transportation Consultants, Incorporated (f.k.a. Metro Transportation Group, Incorporated) construction traffic will be coming from the west on Alico Road via I-75 and other principal arterials west of I-75. Daily construction traffic will average 70 to 100 trips per day including cars, pickup trucks, and semi-trailer combination delivery trucks. Once construction is completed, additional vehicular traffic will operate in the area as a result of the development of the project.

At build-out, the project is estimated to generate 5,710 two-way weekday daily trips. Although traffic increases are projected on the adjacent street network, the traffic flow will be generally toward the west (99 percent) into existing urbanized areas and will generally not flow into the more rural lands of Lee and Collier Counties.

Although the Service expects traffic in the project corridor to increase, we note that data provided by the FWC, suggest that collisions with vehicles are not an important source of panther mortality in the project vicinity (see Table 7 and Figure 7). Of the 19 documented collisions, 15 (79 percent) have occurred more than 10 miles away from the project site in the more rural lands of Lee and Collier Counties.

The Service believes, based on the current habitat conditions on the site, the level of existing and proposed development in the surrounding area, the level of documented historical and current use of the site by the Florida panther, distances from the site to documented collisions, and number and direction of vehicle traffic associated with project construction and build-out, that the traffic generated by the Alico Airpark Center project will not significantly increase the risk of roadway mortality to panthers.

Habitat Fragmentation: Considering our discussion of fragmentation under Direct Effects, the project site is located on the western fringe of occupied habitat, is adjacent to existing and proposed urban development, and is not located within known dispersal corridors to larger publicly owned managed lands important to the panther; therefore, fragmentation of panther habitat is not expected to result from project implementation. The project site is surrounded by existing and approved development; therefore, fragmentation of panther prey species habitat is not expected.

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

Furthermore, the Service believes, as previously discussed, the habitats on the property provide lower quality foraging for prey species than non-exotic native habitats, which directly affects the frequency and duration of use of the property by panthers. Therefore, since we do not believe that panther prey species and/or Florida panthers utilize the property on a frequent basis, the loss of the limited use of the site by panthers and panther prey species will not significantly increase the risk of disturbance to panthers in the project action area due to human activities and will not significantly increase disturbance to panther prey species in the project action area.

Potential Increase in Intraspecific Aggression: Potential increases in intraspecific aggression to the Florida panther were evaluated. From June 1994 to the present there has been only one panther mortality related to intraspecific aggression documented within 10 miles of the project site. An un-collared panther, UCFP 83-male, died as a result of intraspecific aggression about 2.5 miles southeast of the project site and in March 2006. This cat was found on the

edge of the developed area within a larger tract of undeveloped land about 1.5 miles south of Corkscrew Road and 3 miles east of I-75. The property is bounded on the east by Airport Haul Road, on the north by SWFIA, and on the south and west by limerock mines, which have been previously fragmented by roads and land conversions. Since we do not believe that Florida panthers utilize the property on a frequent basis, the loss of the limited use of the site by panthers will not significantly increase the risk of disturbance to panthers in the project action area and will not significantly increase intraspecific aggression between panthers in the project action area.

Species Response to the Proposed Action

The proposed action will result in increased human activity and noise in the project area during construction of the project. However, since panthers are not commonly known to use lands within and adjacent to the project site, activities associated with construction of the Alico Airpark Center project are not anticipated to increase risk of disturbance to panthers.

The project will result in the loss of a relatively small area (165.5 acres) of potential panther habitat according to the most current home range estimates of the Florida panther (Lotz et al. 2005). This represents 0.6 percent of a female panther's average home range (29,059 acres) and 0.03 percent of a male panther's average home range (62,542 acres). Because the project area provides mostly poor quality panther habitat and panthers are not known to commonly use the project area, we do not expect that the project will significantly affect use of the area by the panther.

Panthers are sensitive to habitat fragmentation. However, the project site is located on the western fringe of occupied habitat, is adjacent to urban development, and is not located within known dispersal corridors (FWC 2006b) between larger publicly owned managed lands. Therefore, fragmentation of panther habitat is not expected to result from project implementation.

CUMULATIVE EFFECTS

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

Within the action area, past and ongoing State and County actions affecting panther habitat include: (1) State of Florida DRI Orders (2001 to 2004); (2) Collier County's PUDs 2001 to 2004); (3) Lee County's PUDs (2001 to April 2004); and (4) South Florida Water Management District's (District) Environmental Resource Permits (2003 to 2004) (Figure 11). To evaluate these effects, the Service incorporated the Florida Land Use, Cover and Forms Classification System (FLUCFCS) mapping to determine properties that may be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps. To determine which of these projects would likely be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps, we identified the percentage of the project site that was classified as wetland habitat, based on the FLUCFCS mapping units. The mapping units relied on by the Service included the 600 series (wetland classifications) and the 411 and 419 pine flatwood classifications (hydric pine systems). For listing purposes, properties with less than 5 percent wetlands were considered by the Service to be generally exempt from regulatory review as these quantities of wetlands could be avoided by project design.

Within the action area, based on FLUCCS mapping, 32 projects affecting approximately 2,370.4 acres could be expected to be subject to development without Federal permit involvement through the Clean Water Act section 404 (Table 10). This level of development represents 8.2 percent of a female panther's average home range (29,059 acres) and 3.8 percent of a male panther's average home range (62,542 acres).

State and county land alteration permits in south Florida not part of those actions listed above generally included single-family residential developments within Northern Golden Gate Estates and Lehigh Acres. Vacant lands within the area of Northern Golden Gate Estates (north of I-75), also within the action area, totaled approximately 34,028 acres as of September 2004 (Figure 12). To evaluate these effects, the Service overlaid the plat boundaries on 2004 aerials, queried the parcel data from Collier County's Property Appraisers Office, noted lots with developments, compared those to 2003 aerials, and noted the changes. Vacant lands within the area of Northern Golden Gate Estates (north of I-75) totaled approximately 35,768 acres as of August 2003. The breakdown of acres for August 2003 is: (1) wetlands, approximately 17,572 acres; (2) uplands, approximately 17,990 acres; and (3) 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 acreage of properties that may be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps (Figure 12).

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 developed with the breakdown as: (1) wetlands, approximately 696 acres; and (2) uplands, approximately 1,044 acres.

The evaluation process provided an estimate of 417 lots totaling 1,044 acres for Northern Golden Gate Estates. Therefore, using NWI mapping for the Northern Golden Gate Estates, a total of approximately 1,044 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 3.59 percent of a female panther home range (29,059 acres) and 1.67 percent of a male panther home range (62,542 acres).

Vacant lands within the area of Lehigh Acres, also within the action area, totaled approximately 34,852 acres as of April 2003 (Figure 13). 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, zero acres. Therefore, using NWI mapping, approximately 375 acres could be expected to be subject to development each year in this area without Federal permit involvement.

In conclusion, the Service's cumulative effects analysis has identified approximately 3,789 acres within the action area that could be developed without Federal wetland permit involvement. This level of development, which the Service believes is representative of future non-Federal actions, is reasonably certain to occur and will not involve a Federal action and, therefore, meets the definition of cumulative effect. This level of projected future development represents 13.0 percent of a female panther's average home range (29,059 acres), 6.1 percent of a male panther's average home range (62,542 acres), and 0.20 percent of the private non-urban lands at risk in the core panther area (1,962,294 acres) (Table 3). As previously discussed, these lands are generally located on the fringes of occupied panther habitat, supported primarily with disturbed vegetative communities; are in row crops; or are in partially developed areas. These lands represent 0.20 percent of the non-urban private lands at risk in the Service's panther core area. Based on the above analysis, the loss of the habitat associated with these lands is insignificant. The Service has accounted for some habitat loss and changes in habitat quality through its habitat assessment methodology and is encouraging State and county environmental staff to pursue section 10 (Act) HCP process to account for and compensate for adverse effects to the panther.

SUMMARY OF EFFECTS

Panther Usage: 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 within 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. According to telemetry data, no radio-collared panthers have been documented on the project site since October 2002. Although the amount of use of project site by un-collared panthers is unknown, at least two un-collared panthers are known to have been within 4 miles of the project site in March of 2006 and 11 additional un-collared panthers have been documented within the project action area since 2002 (known panther deaths). The status and activities of other un-collared Florida panthers within the action area is unknown. Panthers likely use the habitats within the project's action area. However, panther usage of the property is relatively infrequent and the project construction will not result in indirect panther mortality.

Traffic: Although there will be some traffic increases with project development, as discussed above and in previous sections, the lands on the project site provide limited value to the Florida panther and panther prey species; the site is adjacent to existing sand mines and proposed urban development; and the proposed action will further restrict suitability of the site for use by either resident or dispersing panthers. The traffic flow pattern to and from the proposed residential development will be generally to the west and north into urban areas and the Alico Airport. Based on the current habitat conditions on the site, the level of development in the adjacent areas, and the location relative to documented collisions, the increase in traffic generated by the proposed development on the surrounding roads is likely to maintain the current levels of risk of roadway mortality or injury to panthers in the action area.

Habitat Loss: The Service, based on the habitat evaluations discussed previously, believes the project will result in the direct loss of 165.5 acres of mostly low quality panther habitat within the Primary Zone (see discussion under Wildlife Assessment). Habitat types are primarily exotic-infested wetlands and other natural communities. The prevalence of exotics within the project area provides limited foraging value to panther prey species. This loss of 165.5 acres of panther habitat represents 0.001 percent of the 1,962,294 acres of available non-urban private lands in the Service's panther core area. The small loss (0.001 percent) of non-urban private lands on the western edge of the panther's range will not adversely affect the Service's land conservation and preservation goals.

Compensation: The project will provide for the preservation of about 414 acres of Primary Zone habitat in Collier County. This acreage will be maintained long-term through the removal of exotic vegetation. The preservation of these lands in the panther Service's panther core area represents 0.005 percent of the 799,205 acres of private lands still needed for the population of 90 individuals. Therefore, the preservation of about 414 acres of panther habitat in the Primary Zone will have a beneficial effect on the panther and will offset the loss of this low quality habitat and further the Service's goal in panther conservation.

The proposed compensation plan, which provides habitat preservation and restoration in the action area, benefits the survival and recovery of the Florida panther as referenced in the draft Panther Recovery Plan (Service 2006) goal 1.1.1.2.3. This goal recommends that habitat preservation and restoration within the Primary Zone be provided in situations where land use intensification can not be avoided. The applicant has proposed equivalent habitat protection and restoration, to compensate for both the quantity and functional value of the lost habitat.

Fragmentation: The project site is also located on the western edge of occupied habitat, is adjacent to other existing and proposed development, and is not located within known dispersal corridors to larger publicly owned managed lands important to the panther. Therefore, fragmentation of panther habitat is not expected to result from project implementation.

Intraspecific Aggression: Potential increase in intraspecific aggression and disturbance to the Florida panther was evaluated. However, as previously discussed, the habitat on the property provides low quality foraging for prey species, which directly affects the frequency and duration

of use of the property by panthers. Therefore, it is unlikely 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 Analysis: In the cumulative analysis, the Service identified the potential loss of approximately 3,789 acres within the action area that could be developed without Federal wetland permit involvement and this level of development represents future non-Federal actions expected to occur in the action area. This level of development represents a small percentage (0.2 percent of the 1,962,294 acres) of available non-urban private lands in the Service's panther core area. In general, these lands are primarily within previously impacted areas or are in the western more urbanized portion of the Service's panther core area. Although this small percentage of lands may be lost from the Service's panther core area of private lands available for panther conservation, the loss of these lands will not adversely affect the Service's land conservation and preservation goals.

Conservation Land Acquisitions: The State and county land acquisition programs acquired approximately 15,251 acres of lands within the action area from 1999 to 2003 (Table 8), which represents 0.95 percent of the 799,205 acres of private lands still needed for the population of 90 individuals. These lands are generally located within the Service's panther core area of the Florida panther and are intended to be actively managed for the benefit of many wildlife species including the Florida panther. The preservation of these lands in the Service's panther core area will have a beneficial effect on the panther and further the Service's goal in panther conservation.

CONCLUSION

In conclusion, there will be no direct take in the form of mortality or injury of the Florida panther resulting from this project. However, the increase in traffic and potential increase in intraspecific aggression in the action area as a result of the project may potentially contribute to indirect take of panthers in the form of death or injury. This indirect take is difficult to quantify due to the wide-ranging habit of the species and the challenge of linking the death or injury of a single panther to increases in panther interactions (intraspecific aggression) or traffic generated as a result of the Alico Airpark Center project. The adverse affects of project-generated traffic and intraspecific aggression potential, however, is not anticipated to appreciably diminish or preclude the survival and recover of the panther. The loss of habitat from implementing the project, 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 minimized by the conservation of other, more functionally valuable habitat. Taking all of the above into consideration, the proposed construction and operation of the Alico Airpark Center project is not likely to jeopardize the continued existence of the Florida panther. Critical habitat has not been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

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

The terms and conditions described below are nondiscretionary and must be undertaken by the Corps so they become binding conditions of any grant or permit issued to Haul Ventures, LLC 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 Haul Ventures, LLC 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 Haul Ventures, LLC must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The Service anticipates that incidental take of the Florida panther will be difficult to detect for the following reasons: the Florida panther is wide-ranging, the lands on the project site provide limited value to the Florida panther and panther prey species, and lands adjacent to the project site consists of existing and proposed urban development that reduce their suitability for use by either resident or dispersing panthers. Therefore, the Service does not anticipate the project will result in the direct mortality or injury of any Florida panthers. However, the Service anticipates incidental take of panthers because of traffic and intraspecific aggression in the form of harm and harassment through the loss of 165.5 acres of panther habitat within the Primary Zone.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined this level of anticipated take is not likely to result in jeopardy to the species. The amount of panther habitat affected by the proposed action is about 0.002 percent of an estimated 2 million acres of habitat occupied by the panther.

The proposed action will result in the restoration and preservation of about 414 acres of panther habitat in the Florida panther Primary Zone in Collier County. The proposed action will increase the preservation and enhancement acreage of panther habitat through permitted Federal actions by about 0.01 percent from about 33,353 acres to about 33,842 acres (Table 2). The cumulative increase in the preservation and enhancement of panther habitat to permitted Federal actions will be from 700 acres in 1990 to 33,842 acres following issuance of a permit for this project, if issued by the Corps.

The proposed action will result in the loss of 165.5 acres of mostly lower quality panther habitat (see discussion under Wildlife Assessment). 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 0.01 percent from 93,677 acres to 93,918 acres. Of the 93,918 acres of impacts, 39,918 acres are due to agricultural conversion and 54,000 acres to development and mining. Portions (10,370 acres) of the largest agricultural conversion project, the 28,700 acres by U.S. Sugar Corporation, were re-acquired by the Federal Government as a component of the Talisman Land Acquisition (Section 390 of the Federal Agricultural Improvement and Reform Act of 1996 [Public Law 104-127] Farm Bill Cooperative Agreement, FB4) for use in the Comprehensive Everglades Restoration Project. The 54,000 acres impacted by development and mining include 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 natural and preserved lands and are consistent with the Service's panther goal to locate, preserve, and restore sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Florida panther 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 proposed construction and operation of the Alico Airpark Center project will not jeopardize the survival and recovery of the Florida panther.

REASONABLE AND PRUDENT MEASURES

The Corps and the applicant have developed a project that has conservation measures necessary and appropriate to minimize impacts of incidental take of Florida panthers built into the design of the proposed action. In summary, the Corps and the applicant will ensure that no more than 165.5 acres of panther habitat will be lost as a result of implementation of the proposed action and that about 414 acres in the panther Primary Zone will be restored and preserved to benefit the Florida panther and its prey.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures,

described above and outline reporting/monitoring requirements. The terms and conditions described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to Haul Ventures, LLC, 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 Haul Ventures, LLC, 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 Haul Ventures, LLC, must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement (50 CFR § 402.14(i)(3)). Although we have not identified any specific Reasonable and Prudent Measures not incorporated in the project, we are providing the following for clarification:

1. The 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 165.5 acres of Florida panther habitat, the applicant proposes to preserve 414 acres at a Collier County mitigation-site, for a minimum of 2,857.49 PHUs.

2. The method of preservation for the 414-acre site shall be a conservation easement. The conservation easement shall contain the following language: "U.S. Fish and Wildlife Service (Service) approval in writing is necessary for any intensification of land use beyond that needed for wildlife and natural area conservation and for the removal of the conservation easement from the land. It is the Service's intent that these lands under easement remain in preservation for perpetuity." The Service should be provided a copy of the agreement for review and approval within 60 days of start of project construction.

3. The preservation-sites will be managed in perpetuity for the control of invasive exotic vegetation as defined by the Florida Exotic Pest Plant Council's Pest Plant List Committee's 2001 List of Invasive Species (Category 1) (2005).

4. 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.

5. The Corps will provide documentation to the Service for completion of any proposed on-site restoration and verification of the execution and terms of the conservation easement or deed, if applicable;

6. 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.

7. 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.

No more than 165.5 acres of Florida panther habitat will be incidentally taken as result of the proposed action. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of the incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

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

REINITIATION NOTICE

This concludes formal consultation on the Alico Airpark Center 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 as monitored by the lost of 165.5 acres of habitat; (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 Al Begazo at 772-562-3909, extension 246.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc:
Corps, Fort Myers, Florida (Skip Bergman)
EPA, West Palm Beach, Florida (Richard Harvey)
FWC, Punta Gorda, Florida
FWC, Naples, Florida (Darrell Land) (electronic copy only)
FWC, Tallahassee, Florida (Kipp Frohlich)
Service, Atlanta, Georgia (David Flemming) (electronic copy only)
Service, Florida Panther NWR, Naples, Florida (Layne Hamilton)
Service, Vero Beach, Florida (Chris Belden) (electronic copy only)

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Table 1. *Targeted and Acquired Acreage Totals of Conservation Lands in South Florida Directly Affecting the Panther within the Panther Focus Area.

Name	Targeted[1] Acreage	Acquired Acreage	Indian Reservation
Federal Conservation Lands			
Everglades National Park	1,508,537	1,508,537	--
Big Cypress National Preserve	720,000	720,000	--
Florida Panther National Wildlife Refuge	26,400	26,400	--
Subtotal	**2,254,937**	**2,254,937**	--
State of Florida: Florida Forever Program			
Belle Meade	28,505	19,107	--
Corkscrew Regional Ecosystem Watershed	69,500	24,028	--
Twelvemile Slough	15,653	7,530	--
Panther Glades	57,604	22,536	--
Devil's Garden	82,508	0	--
Caloosahatchee Ecoscape	18,497	2,994	--
Babcock Ranch	91,361	0	--
Fisheating Creek	176,760	59,910	--
Subtotal	**540,388**	**136,105**	--
State of Florida: Other State Acquisitions			
Water Conservation Area Number 3	491,506	491,506	--
Holey Land Wildlife Management Area	33,350	33,350	--
Rotenberger Wildlife Management Area	25,019	20,659	--
Fakahatchee Strand State Preserve	74,374	58,373	--
Picayune Strand State Forest	55,200	55,200	--
Okaloacoochee Slough State Forest and WMA	34,962	34,962	--
Babcock-Webb Wildlife Management Area	79,013	79,013	--
Subtotal	**793,424**	**773,063**	--
Indian Reservations[2]			
Miccosukee Indian Reservation	--	--	81,874
Big Cypress Seminole Indian Reservation	--	--	68,205
Brighton Seminole Indian Reservation	--	--	37,447
Subtotal	--	--	**187,526**
GRAND TOTALS	**3,588,749**	**3,164,105**	**187,526**

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

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

* Table 1 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 2. Habitat preservation efforts resulting from formal and informal consultations with the Service for projects affecting Florida panther habitat from March 1984 to October 2006.

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
03/29/84	4-1-83-195	83M-1317	Ford Test Track	Collier	530	0	0	0
02/21/85	4-1-85-018	unknown	I-75	Broward Collier	1,517	0	0	0
10/17/86	4-1-87-016 4-1-87-017	unknown	Exxon Master Plan	Collier	9	0	0	0
01/07/87	4-1-86-303	86IPM-20130	Citrus Grove	Collier	11,178	0	0	0
01/11/88	4-1-88-029	unknown	NERCO - Clements Energy	Collier	3	0	0	0
02/23/88	4-1-88-055	unknown	Shell Western E&P	Collier Dade Monroe	0	0	0	0
02/10/89	4-1-89-001	FAP IR-75-4(88)81	SR 29/I-75 Interchange	Collier	350	0	0	0
08/15/90	4-1-90-289	unknown	I-75 Recreational Access	Collier	150	0	0	0
09/24/90	4-1-90-212	89IPD-20207	U.S. Sugar Corporation	Hendry	28,740	700	0	700
03/12/91	4-1-91-229	90IPO-02507	Lourdes Cereceda	Dade	97	0	0	0
01/14/92	4-1-91-325	199101279	Dooner Gulf Coast Citrus	Collier	40	40	0	40
09/25/92	4-1-92-340	unknown	STOF, BCSIR Citrus Grove	Hendry	1,995	0	0	0
06/18/93	4-1-93-217	199200393	Corkscrew Road	Lee	107	0	0	0
02/25/94	4-1-94-209	199301131	Daniels Road Extension	Lee	65	0	0	0
05/09/94	4-1-93-251	199202019	Corkscrew Enterprises	Lee	900	100	100	200
10/27/94	4-1-94-430	199302371 199400807 199400808	Florida Gulf Coast University Treeline Boulevard	Lee	1,088	526	0	526
05/24/95	4-1-95-230	199302130	Turner River Access	Collier	1,936	0	0	0
08/07/95	4-1-95-274	199405501	Bonita Bay Properties	Collier	509	491	0	491
08/15/95	4-1-94-214	199301495	SW Florida Airport Access Road	Lee	14	0	0	0
09/19/96	4-1-95-F-230	199302052 199301404	I-75 Access Points	Broward	116	0	0	0
03/10/98	4-1-98-F-3	L30 (BICY)	Calumet Florida	Collier Broward Dade	0	0	0	0
03/27/98	4-1-97-F-635	199604158	Willow Run Quarry	Collier	359	190	0	190
06/11/99	4-1-98-F-398	199800622	STOF Water Conservation Plan	Hendry	1,091	0	0	0

Table 2. Continued.

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
09/27/99	4-1-98-F-310	199130802	Daniels Parkway	Lee	2,093	0	94	94
12/08/99	4-1-98-F-517	199607574	Cypress Creek Farms	Collier	239	0	24	24
04/17/00	4-1-98-F-428	199507483	Miromar	Lee	1,323	0	194	194
06/09/00	4-1-99-F-553	199900619	Naples Reserve	Collier	833	0	320	320
02/21/01	4-1-00-F-135	199803037	Corkscrew Ranch	Lee	106	0	0	0
04/17/01	4-1-00-F-584	200001436	Sun City	Lee	1,183	0	408	408
07/30/01	4-1-94-357	199003460	Naples Golf Estates	Collier	439	175	0	175
08/31/01	4-1-00-F-183	199900411	Colonial Golf Club	Lee	1,083	0	640	640
12/14/01	4-1-00-F-585	199301156	SW Florida Airport	Lee	8,058	0	6,986	6,986
01/30/02	4-1-98-F-372	199402492	Florida Rock	Lee	5,269	802	0	802
03/07/02	4-1-00-F-178	199901251	Southern Marsh Golf	Collier	121	75	80	155
04/24/02	4-1-01-F-148	199901378	Hawk's Haven	Lee	1,531	267	0	267
09/24/02	4-1-01-F-135	200001574	Verandah	Lee	1,456	0	320	320
10/08/02	4-1-02-F-014	199602945	Winding Cypress	Collier	1,088	840	1,030	1,870
05/19/03	4-1-02-F-1741	200200970	Apex Center	Lee	95	10	18	28
06/10/03	4-1-01-F-1955	200003795	Walnut Lakes	Collier	157	21	145	166
06/18/03	4-1-01-F-136	199701947	Twin Eagles Phase II	Collier	593	57	98	155
06/23/03	4-1-01-F-143	199905571	Airport Technology	Lee	116	55	175	230
07/02/03	4-1-98-F-428	199507483	Miromar	Lee	342	158	340	498
09/04/03	4-1-02-F-1486	200206725	State Road 80	Lee	33	2	12	14
10/06/03	4-1-02-F-0027	200102043	Bonita Beach Road	Lee	1,117	145	640	785
12/29/03	4-1-02-F-1743	200202926	The Forum	Lee	650	0	310	310
01/18/05	4-1-04-F-4259	199702228	Bonita Springs Utilities	Lee	79	0	108	108
02/21/03 03/09/05	4-1-01-F-607	200001926	Mirasol	Collier	800	914	145	1,059
03/31/05	4-1-04-F-5656	200306759	Gateway Shoppes II	Collier	82	0	122	122
04/08/05	4-1-04-F-8176	2004-5312	Seminole Mine	Broward	110	0	220	220
04/29/05	4-1-04-F-5780 4-1-04-F-5982	2003-5331 2003-6965	Arborwood and Treeline Avenue	Lee	2,329	0	1,700	1,700

Table 2. Continued.

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
06/06/05	4-1-03-F-7855	2003-11156	Collier Regional Medical	Collier	44	0	64	64
06/14/04 03/21/05	4-1-04-F-5744	199603501	Terafina	Collier	437	210	261	471
02/22/05 03/16/05 06/29/05 04/04/06	4-1-04-F-6866	200309416	Ava Maria DRI	Collier	5,027	0	6,114	6,114
06/29/05	4-1-03-F-3915	199806220	Wenthworth Estates	Collier	917	0	458	458
07/15/05	4-1-04-F-5786	199405829	Land's End Preserve	Collier	231	0	61	61
09/08/05	4-1-04-F-5260	200106580	Parklands Collier	Collier	489	157	434	591
09/23/05 10/26/05	4-1-04-F-9348	200101122	Super Target-Tarpon Bay Plaza	Collier	34	0	20	20
11/23/05	4-1-04-F-6043	20034914	Summit Place	Collier	108	0	61	61
11/29/05	4-1-04-F-8847	20048995	STOF Administrative Complex	Collier	6	0	8	8
12/06/05	4-1-03-F-3483	200302409	SW Florida Commerce Center	Lee	207	0	305	305
12/06/05	4-1-04-F-6691	200310689	Rattlesnake Hammock Road Widening	Collier	23	0	23	23
01/04/06	4-1-04-F-8388	2004554	Immokalee Regional Airport - Phase I	Collier	67	0	43	43
01/04/06	4-1-04-F-9777	20048577	Logan Boulevard Extension	Collier	30	0	10	10
1/13/06	4-1-04-F-6707	20042404	Journey's End	Collier	66	0	34	34
01/26/06	4-1-04-F-8940	20047053	The Orchard	Lee	93	0	81	81
02/19/06	4-1-05-F-11724	2005834	Firano at Naples	Collier	24	0	19	19
02/22/06	4-1-04-F-6504	200491	Corkscrew Road	Lee	20	0	47	47
02/23/06	4-1-04-F-5244	200312276	Summit Church	Lee	10	0	13	13
03/31/06	4-1-05-F-11343	20051909	Coral Keys Homes	Miami-Dade	41	0	61	61
05/05/06	41420-2006-I-0274	2005-6176	Santa Barbara , Davis to Radio Road, Widening	Collier	6	0	3	3
05/9/06	41420-2006-I-0263	20056298	Santa Barbara and Radio Road Widening	Collier	29	0	20	20
05/9/06	41420-2006-F-0089	20043248	Collier Boulevard, Immokalee Rd. to Goldengate Blvd.	Collier	14	0	16	16

Table 2. Continued.

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
05/16/06	4-1-05-F-10309	19971924	Sabal Bay	Collier	1,017	1,313	223	1,536
06/05/06	4-1-05-I-8486	20041688	Seacrest School	Collier	31	0	16	16
06/09/06	4-1-05-I-10965	200303733	HHJ Development	Dade	3	0	4	4
06/14/06	4-1-05-F-11855	200411010	Keysgate School	Dade	39	0	62	62
06/15/06	41420-2006-FA-0811 and I-0362	20056149	Collier County Wellfield	Collier	29	0	36	36
07/12/06	41420-2006-F-0282	200311150	Cypress Shadows	Lee	244	0	326	326
07/28/06	4-1-04-F-12330	20047920	Hamilton Place	Dade	10	0	50	50
07/28/06	4-1-04-F-7279	20041695	Raffia Preserve	Collier	131	0	119	119
08/15/06	41420-2006-I-0151	20031963	Naples Custom Homes	Collier	10	0	9	9
08/21/06	4-1-03-F-3127	19956797	Atlantic Civil Agriculture Expansion	Dade	981	0	1553	1553
08/21/06	4-1-03-I-0540	20041813	ASGM Business Park	Collier	41	0	25	25
9/12/06	41420-2006-FA-0589 and F-0554	20037414	Miccosukee Government Complex	Dade	17	0	37	37
9/22/06	41420-2006-I-0355	20040047	Immokalee Seminole Reservation Road Improvements	Collier	17	0	35	35
10/16/06	41420-2006-FA-1488 and F-0442	199507483	Miromar Lakes Addition	Lee	366	0	390	390
10/05/06	41420-2006-I-0616	20065295	New Curve on Corkscrew Road	Lee	12	0	18	18
10/18/06	41420-2007-FA-0029 and F-0787	2004777	Treeline Preserve	Lee	97	0	95	95
10/25/06	41420-2006-FA-1129 and F-0442	20047046	Koreshan Boulevard Extension	Lee	14	0	31	31
10/26/06	41420-2006-FA-1636 and F-0787	200306755	Jetway Tradeport	Lee	38	0	51.5	52
10/26/06	41420-2006-I-0849	20055702	Marina Del Lago	Lee	49	0	36	36
10/27/06	41420-2006-I-0203	20057180	Living Word Family Church	Collier	18	0	35	35

Date	Service Log Number	Corps Application Number	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
10/30/06	41420-2006-I-0607	200604878	SeminoleTribe Access Road	Hendry	2	0	5	5
11/15/06	41420-2006-TA-0727	N/A	Liberty Landing	Collier	27	0	19	19
02/21/03 03/09/05 03/01/07	4-1-01-F-607	200001926	Mirasol	Collier	773	940	182	1,122
03/09/07	41420-2006-F-0850	200312445	Airport Interstate Commerce Park	Lee	323	0	371	371
03/26/07	4-1-04-F-6112	20021683	Alico Airpark (Haul Ventures)	Collier	241	75	414	489
				Totals	93,918	7,349	26,493	33,842

Table 3. Land Held for Conservation within the Florida Panther Core Area.

	Acres	Primary Equivalent Factor	Primary Equivalent Acres
Primary	1,659,657	1.00	1,659,657
Dispersal	0	1.00	0
Secondary	308,623	0.69	212,950
Other	609,872	0.33	201,258
TOTAL	2,578,152	**TOTAL**	2,073,865

Table 4. Undeveloped Privately Owned Land within Florida Panther Core Area.

	Acres	Primary Equivalent Factor	Primary Equivalent Acres
Primary	610,935	1.00	610,935
Dispersal	27,883	1.00	27,883
Secondary	503,481	0.69	347,402
Other	655,996*	0.33	216,479
TOTAL	1,798,295	**TOTAL**	1,202,699

* About 819,995 acres are at risk in the other zone with about 80 percent with resource value. Total acres of at-risk privately owned lands are 1,962,294 acres.

Table 5. Landscape Compensation Multipliers

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

Table 6. Habitat suitability values for use in assessing habitat value to the Florida panther.

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

Table 7. Panther-Vehicle Collisions within the Alico Airparck Center Action Area as of September 2006.

Cat No.	Location	Distance From Project	Result	Date
UCFP79	CR846 2 mi N of CR858 - near Collier fairgrounds	14.5 Mi. Southeast	DEATH	1/26/2006
K153	CR951, 1.	24.79 Mi. South	DEATH	8/29/2005
FP28	NEAR DANIELS RD. RSW	4..30 Mi. North	INJURY	11/29/1988
UCFP18-(RK-850)	CR 850 1.5 M S SR 80	13.5 Mi. East	DEATH	1/25/1989
NONE	ALICO RD. 1	2.20 Mi. West	INJURY	4/7/1992
UCFP22	DANIELS RD 1 M E I-75	4.09 Mi. North	DEATH	8/9/1993
UCFP35	CR846 2 MILES E IMMOKALEE	23.5 Mi. East	DEATH	6/23/2000
UCFP49 (K98)	CR846 3-4 MI E IMMOKALEE	24.39 Mi. East	DEATH	11/25/2002
FP99	CR846 1/4 MI N COLLIER FAIRGRN	14.69 Mi. Southeast	DEATH	11/28/2002
UCFP50 (K33)	CR846 3.4 MI E EVERGLADES BLVD	18.29 Mi. Southeast	DEATH	1/26/2003
UCFP58	CR846 3/4 MILES E OF EVERGLADS B.	18.89 Mi. Southeast	DEATH	6/30/2003
UCFP63	I-75, MM99 EASTBOUND LANE	24.10 Mi. South	DEATH	2/26/2004
K156	US41 @ TURNER RIVER	24.60 Mi. South	DEATH	8/2/2004
K94	I-75, NEAR MM98 EASTBOUND LANE	24.5 Mi. South	DEATH	8/17/2004
UCFP81	I-75 Ft. Myers, between exits 137-138	10.89 Mi. North	DEATH	2/27/2006
UCFP87	Corkscrew Road, Lee County, near the intersection with Alico Road	4.40 Mi. Southeast	DEATH	8/24/2006

Table 8. County and State Acquisitions within the Action Area (Acres).

Year	County	State
1999	0.0	4918.10
2000	705.1	409.65
2001	590.9	256.95
2002	59.8	8100.34
2003	0.0	210.63
Totals	1,355.8	13,895.67

Table 9. Panther Habitat Units

Land Cover Types	Habitat Values	Project Development 188.75 acres				Off-Site Preserve 414.12 acres			
		Functional Units Needed				Functional Units Provided*			
Land Cover Type	**Score**	**Pre-**		**Post-**		**Pre-**		**Post-**	
		Acres	PHU	Acres	PHU	Acres	PHU	Acres	PHU
Urban	0	2.3	0	165.5	0	14.06	0	0	0
Water	0	0.3	0			19.96	0	0	0
Exotic Plants	3	59.4	178			6.32	18.96	0	0
Cropland	4					255.42	1,021.68	0	0
Shrub Swamp	5	5.7	28	5.7	28.5	0.36	1.80	0.47	2.35
Grassland/Pasture	7					53.69	375.83	3.64	25.48
Freshwater marsh	9	33.9	305	53.2	478.5	39.52	355.68	39.68	357.12
Cypress Swamp	9	6.7	60	6.3	56.7	14.07	126.63	217.00	1,953.00
Hardwood Swamp	7	6.4	45	6	42	2.68	24.12	143.39	1,290.51
Hardwood-pine Forest	9	2.9	26	2.8	25.2	8.04	72.36	9.94	89.46
Pine Forest	9	123.7	1,113	1.5	13.5				
Subtotal		240.9	1,755.6*	240.9	644.4	414.12	1,997.06	414.12	3,717.92**

*PHUs needed – 1,755.6 times base multiplier of 2.5 equals 2,778.1 PHUs. Project is in the Primary Zone with compensation in the Primary Zone.

**Incorporating ½ credit for restoration, Primary Zone Compensation PHUs are calculated thus: [(3,717.92 – 1,997.06)/2 + 1,997.06] = 2,857.49

Total compensation provided by the applicant = 2,857.49 PHUs

Table 10. Alico Airpark Center Action 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**
Colonades at Santa Barbara	6.82	0.00	0.00%				2004		
Da Vinci Estates in Olde Cypress	40.44	0.00	0.00%				2001		
Salvation Army	5.63	0.00	0.00%				2001		
Sandpiper Village	2.94	0.00	0.00%				2002		
21st Century Oncology	1.03	0.00	0.00%						2004
AmSouth Bank-Hammock Bay	0.23	0.00	0.00%						2003
ASGM Business Park	40.36	0.00	0.00%						2004
Bonita Beach Rd./Bonita Grande Intersection	0.17	0.00	0.00%						2004
Bonita Beach Rd./Bonita Grande Intersection	0.38	0.00	0.00%						2004
Bonita Beach Rd./Bonita Grande Intersection	0.40	0.00	0.00%						2004
Botanical Place PUD	0.23	0.00	0.00%						2003
City Gate Commerce Center	10.83	0.00	0.00%						2003
Collier County EMS-19	18.06	0.00	0.00%						2003
Heritage Bay	0.02	0.00	0.00%						2004
Immokalee Road 6-Lane Widening	0.04	0.00	0.00%						2004
Lee Parkland Golf/Country Club	0.11	0.00	0.00%						2004
Lee Parkland Golf/Country Club	0.44	0.00	0.00%						2004
Oak Ridge Subdivision	1.02	0.00	0.00%						2003
Quarry Lake Estates	41.23	0.00	0.00%						2004
Rookery Bay Pedestrian Bridge Crossing	0.23	0.00	0.00%						2003
Tierra Bay	66.26	0.00	0.00%						2004
Tuscany Reserve-Phase 2	0.23	0.00	0.00%						2003
Van Roekel and Van Roekel DVM PH1	0.72	0.00	0.00%						2003
Village Walk-Bonita Springs	631.33	0.04	0.01%						2003
Seacrest Upper School Campus	9.97	0.01	0.05%						2004
Corkscrew Growers Sec 3 RPD/CPD	652.91	3.60	0.55%				2002		
Orange Blossom Ranch	350.31	2.21	0.63%						2004
Lee Parklands-NW Modifications	316.71	3.53	1.11%						2003
Orange Blossom Ranch	94.97	1.17	1.23%						2004
Magnolia Square Phase 3	42.83	0.57	1.33%						2004
Collier County (US Outfall Swale No. 1)	24.09	0.37	1.56%						2003
1st National Bank of Florida/Naples Lake	8.96	0.41	4.57%						2003
TOTALS:	2,370.41								

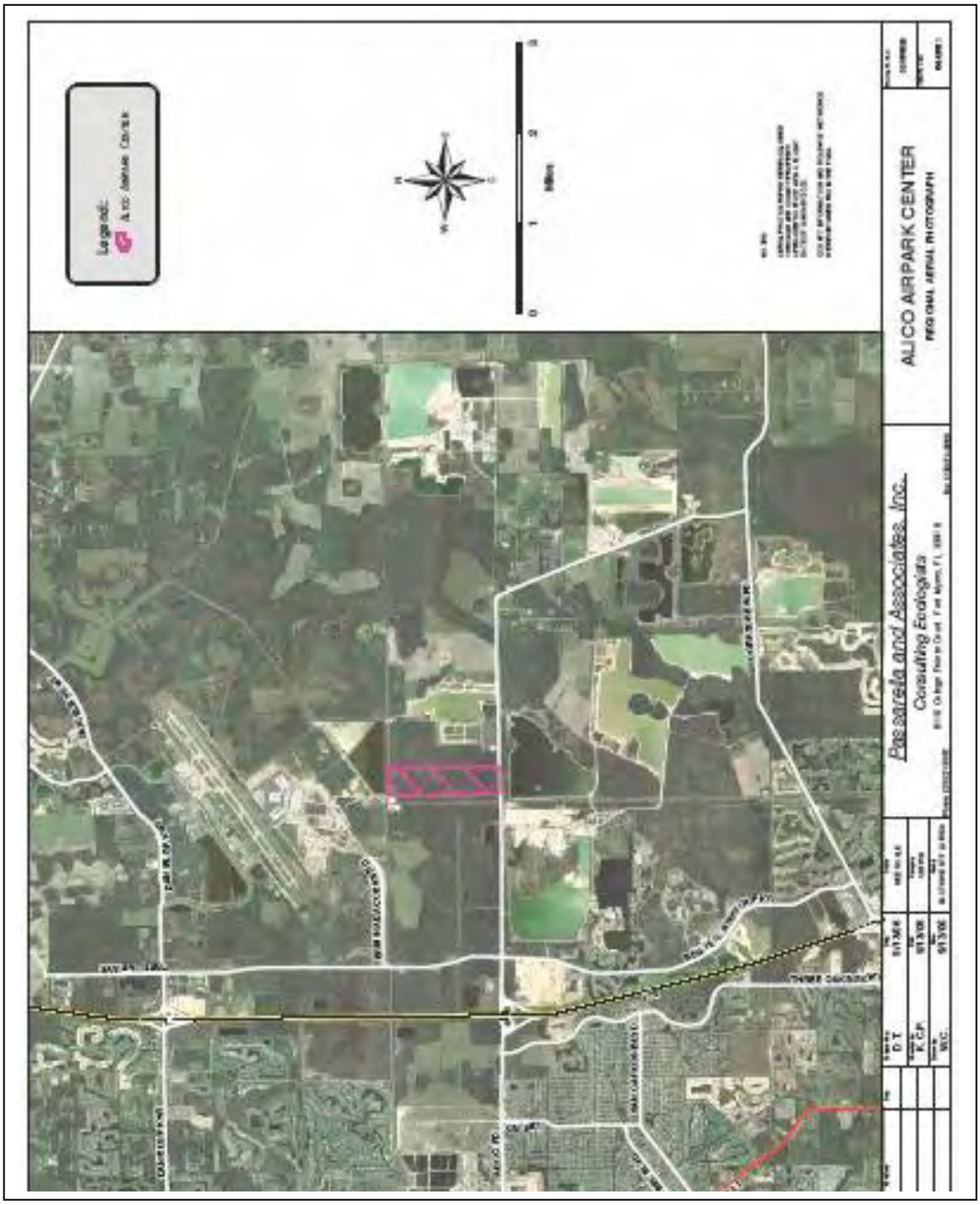

Figure 1. Location map of proposed Alico Airpark Center Project Site in Lee County, Florida.

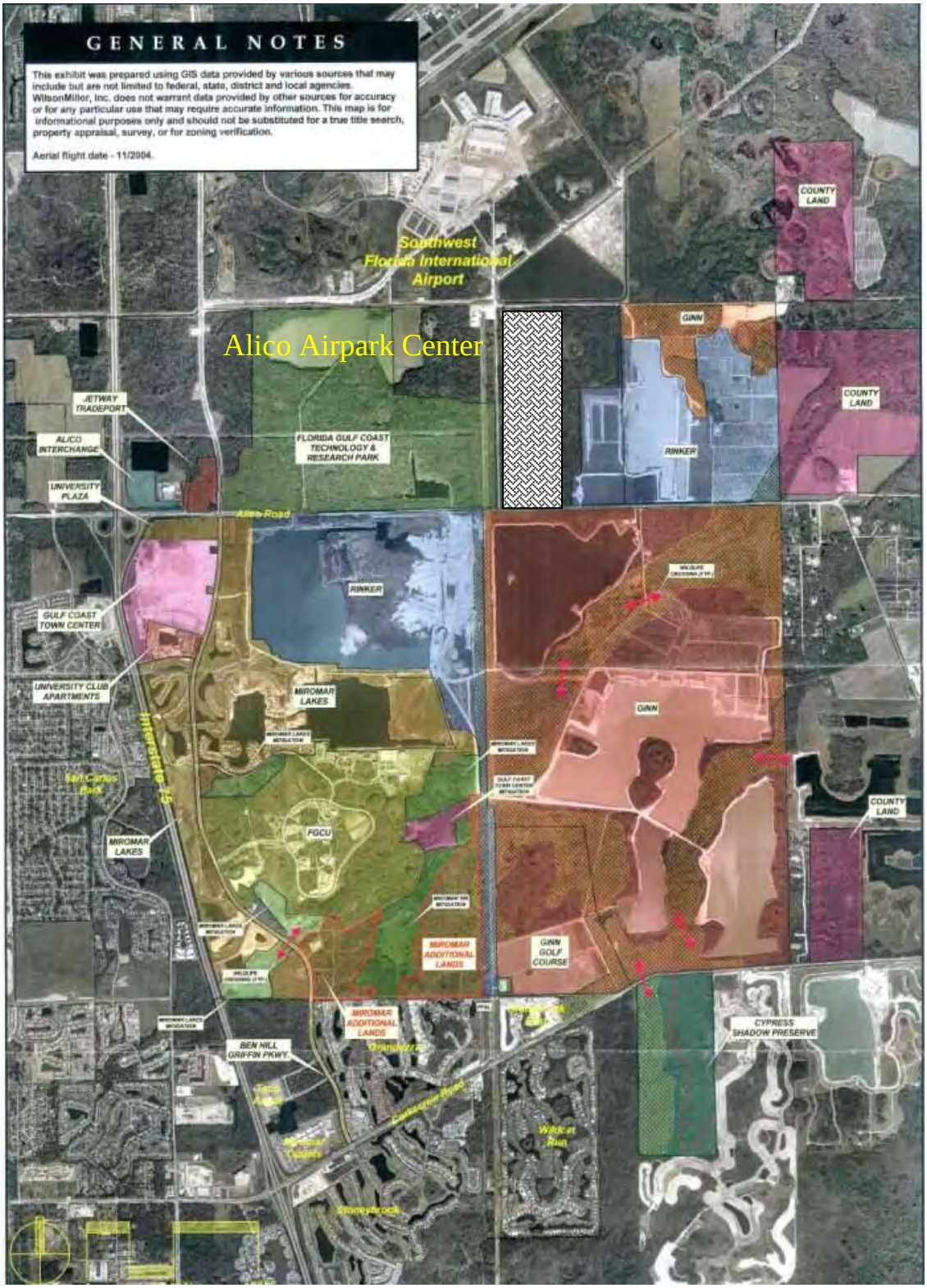

Figure 2. Map of proposed Alico Airpark Center Project Site and adjacent existing and approved development

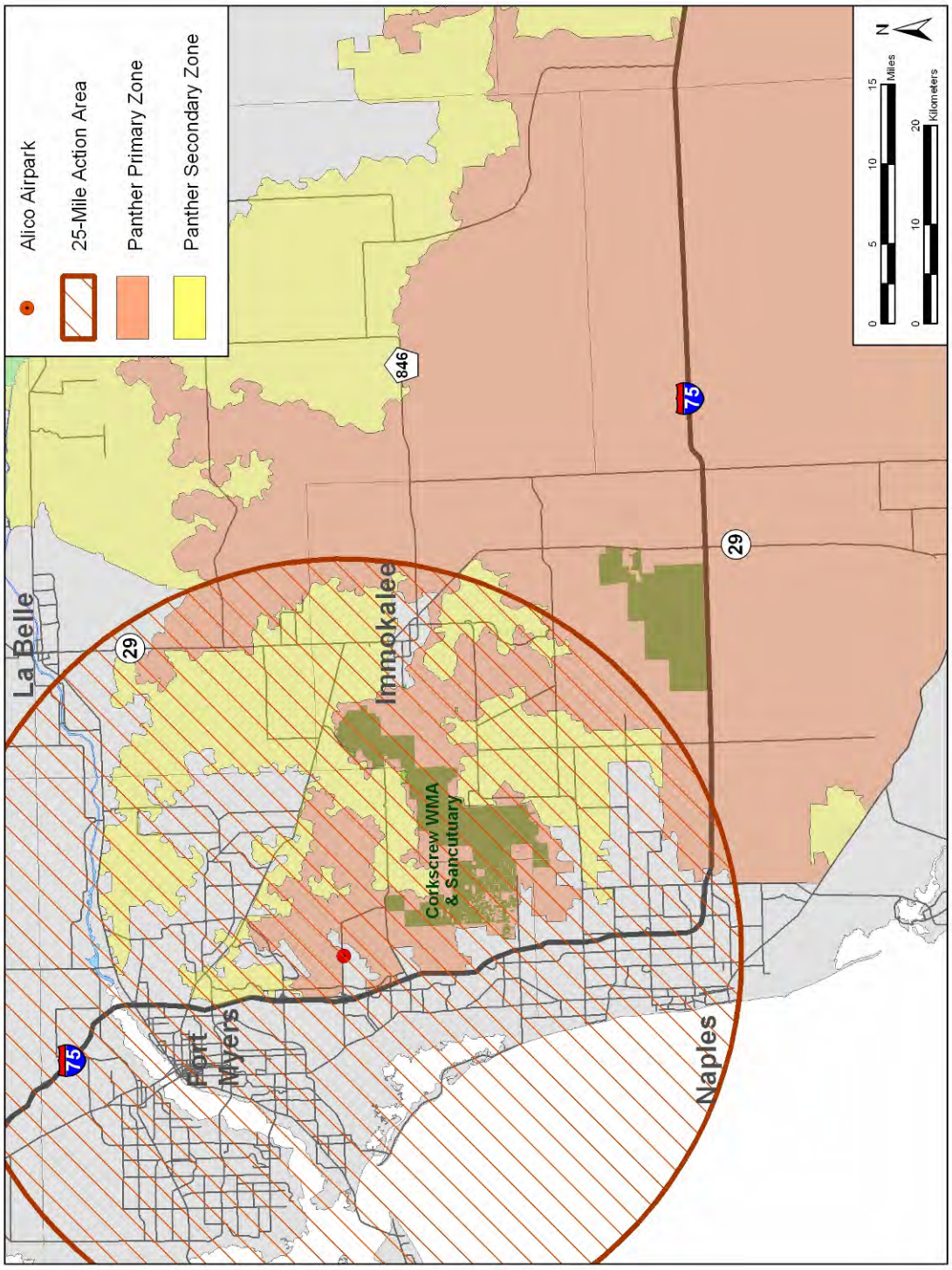

Figure 3. Alico Airpark Center project site in relation to panther Primary and Secondary Zones.

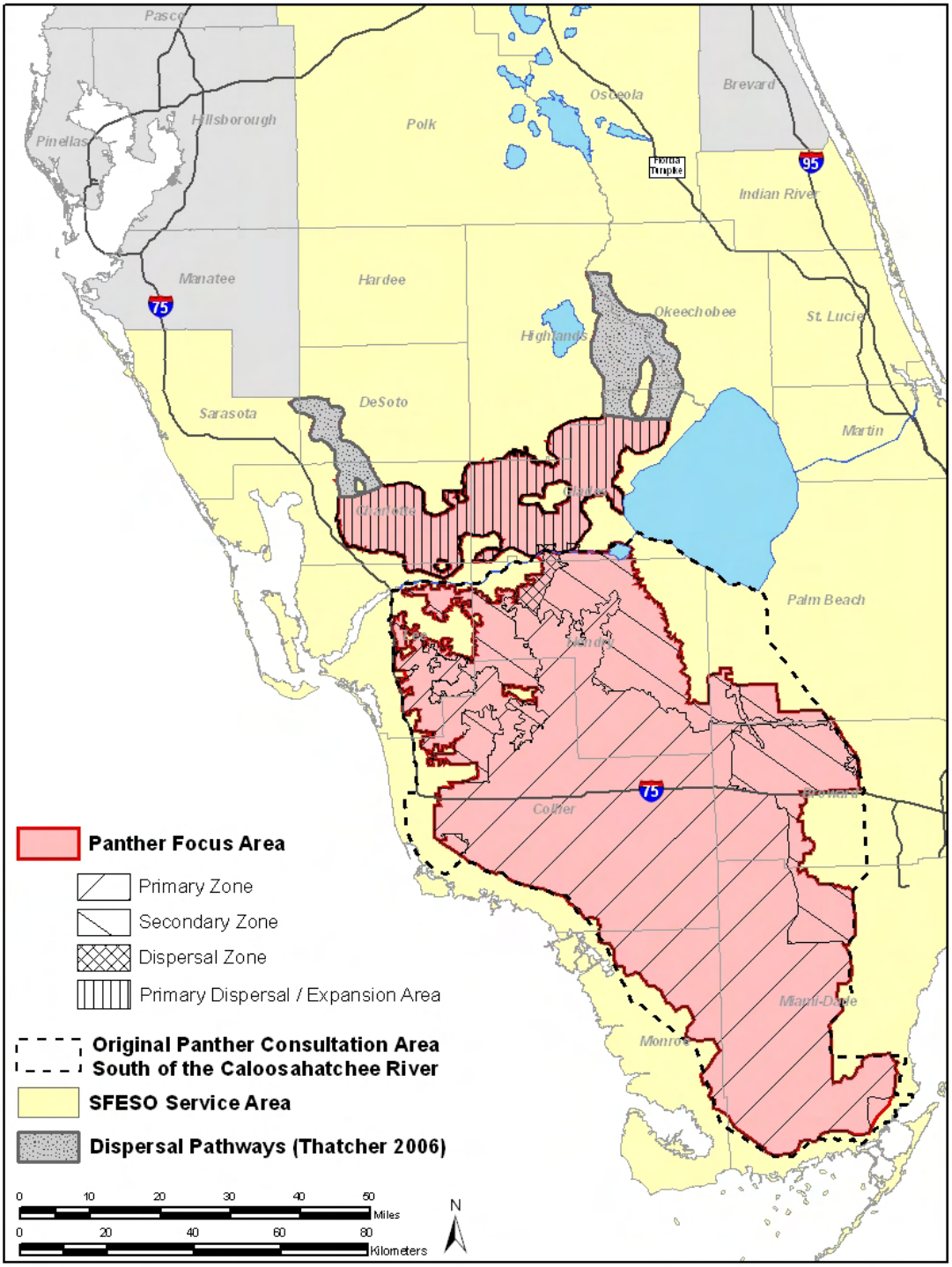

Figure 4. Panther Focus Area

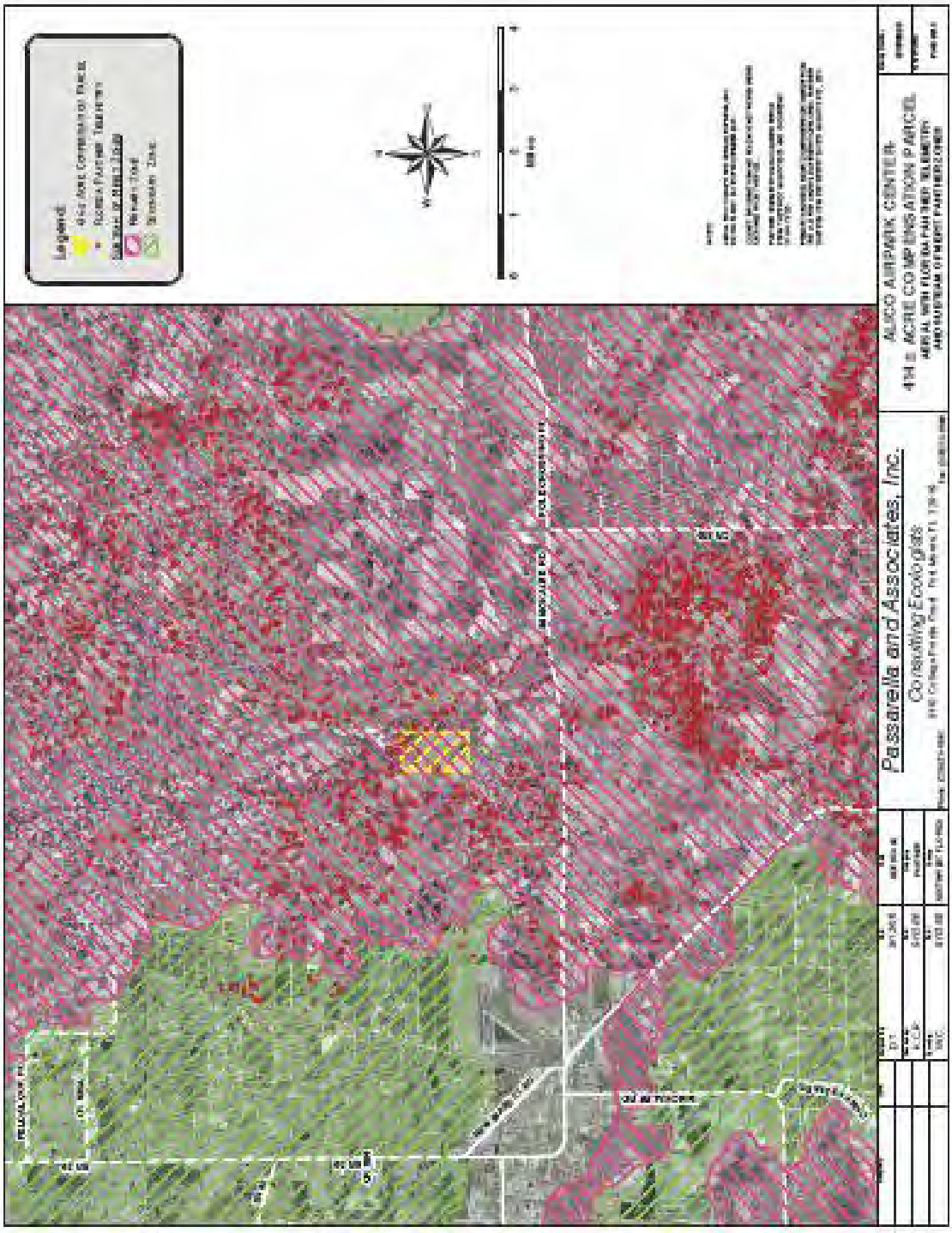

Figure 5. Map showing the location of the Collier County Mitigation Parcel located in Section 28, Township 48 South, Range 30 East.

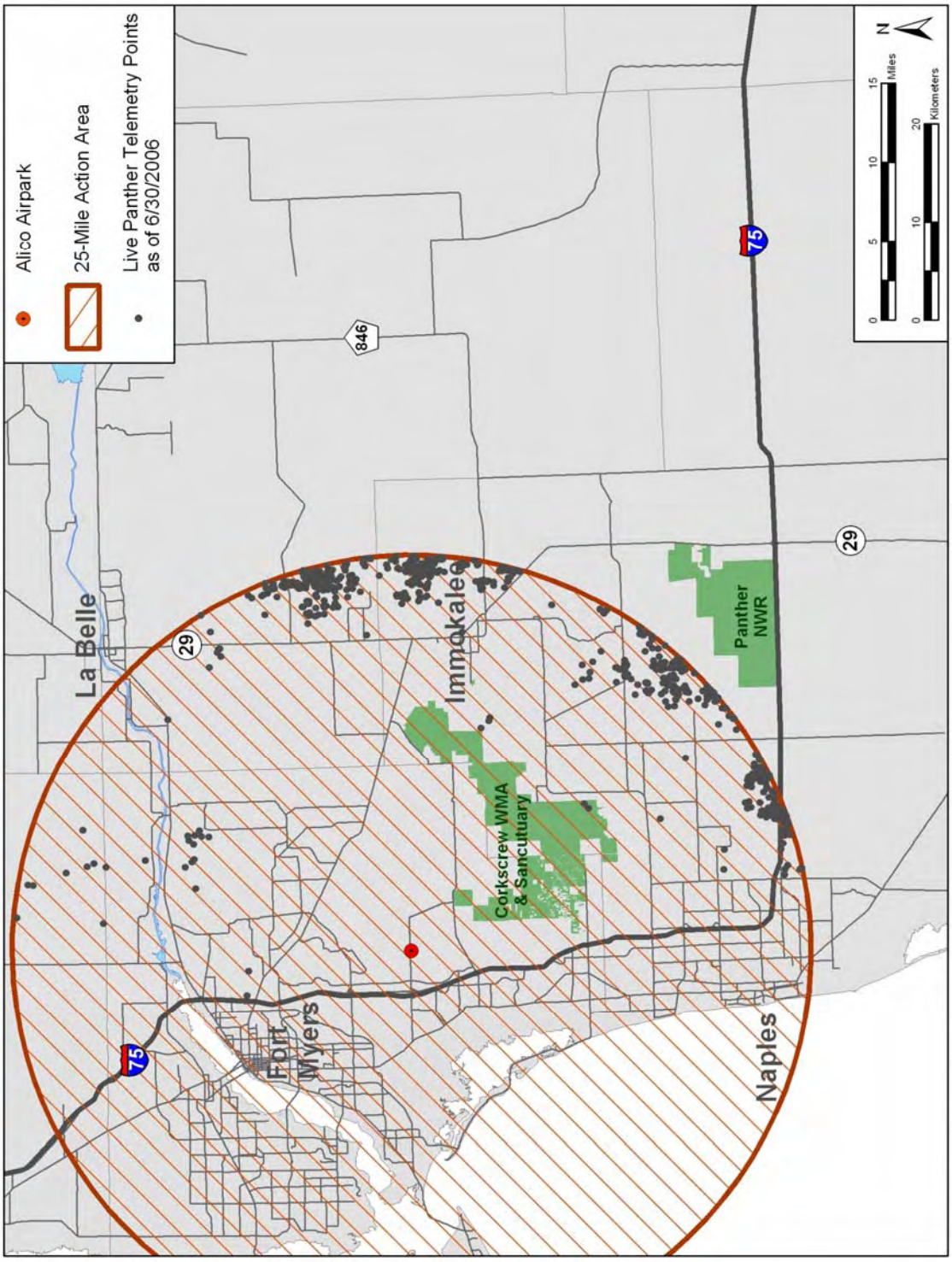

Figure 6. Map showing Action Area for the Alico Airpark Center Project in relation to locations of radio-collared panthers determined by radio-telemetry.

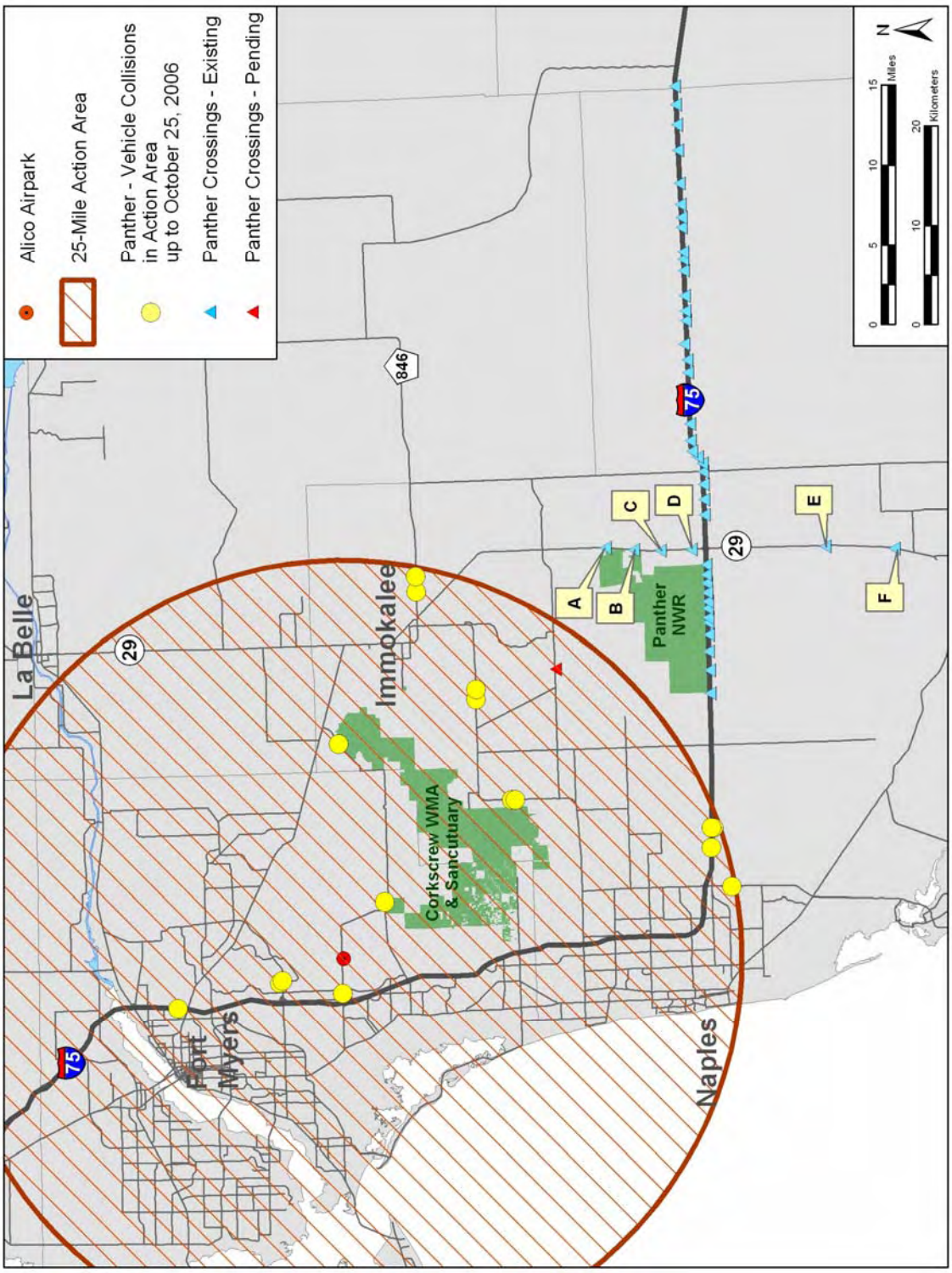

Figure 7. Panther-vehicle collisions and wildlife crossings within action area as of August 24, 2006.

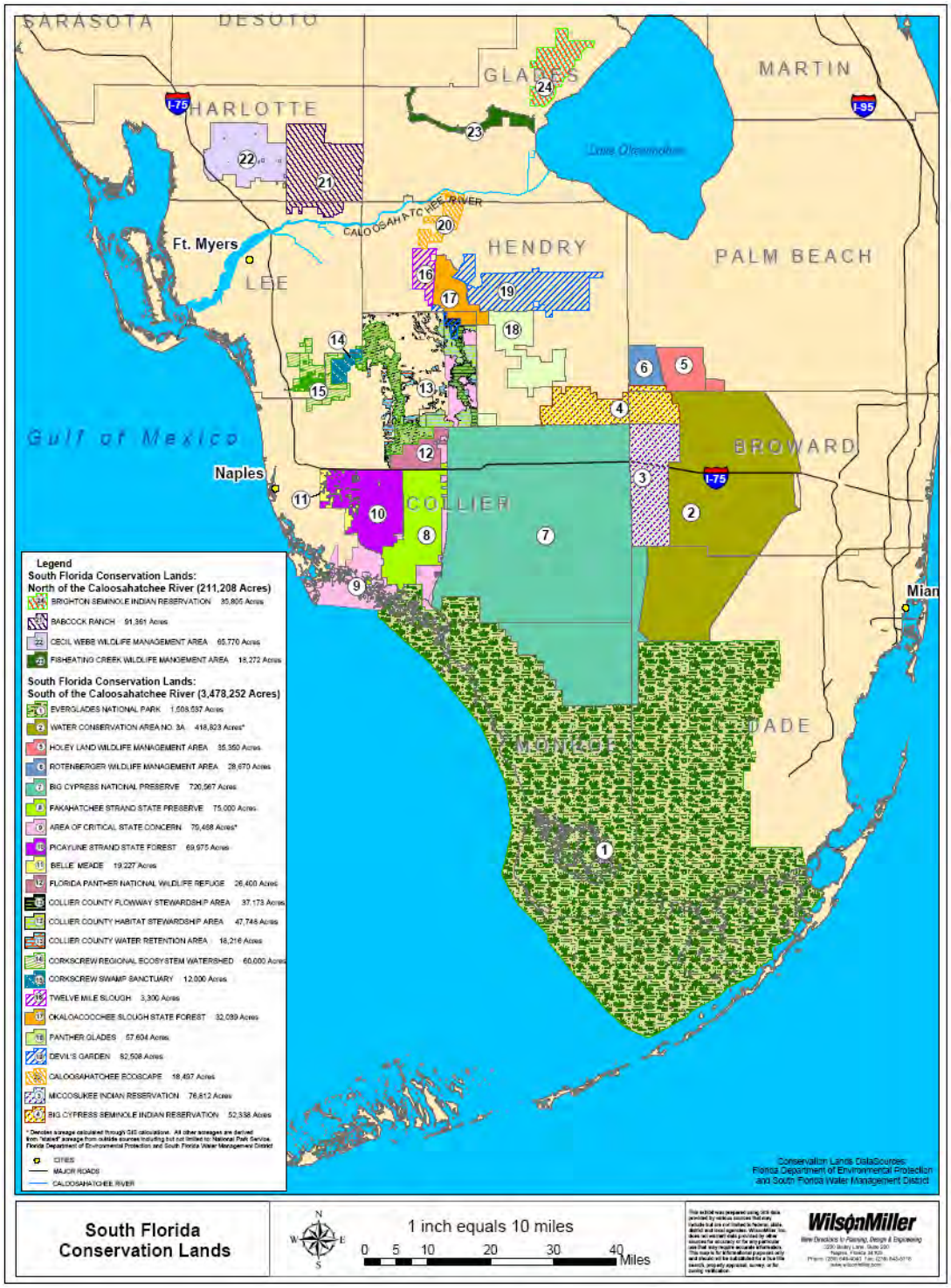

Figure 8. South Florida conservation lands.

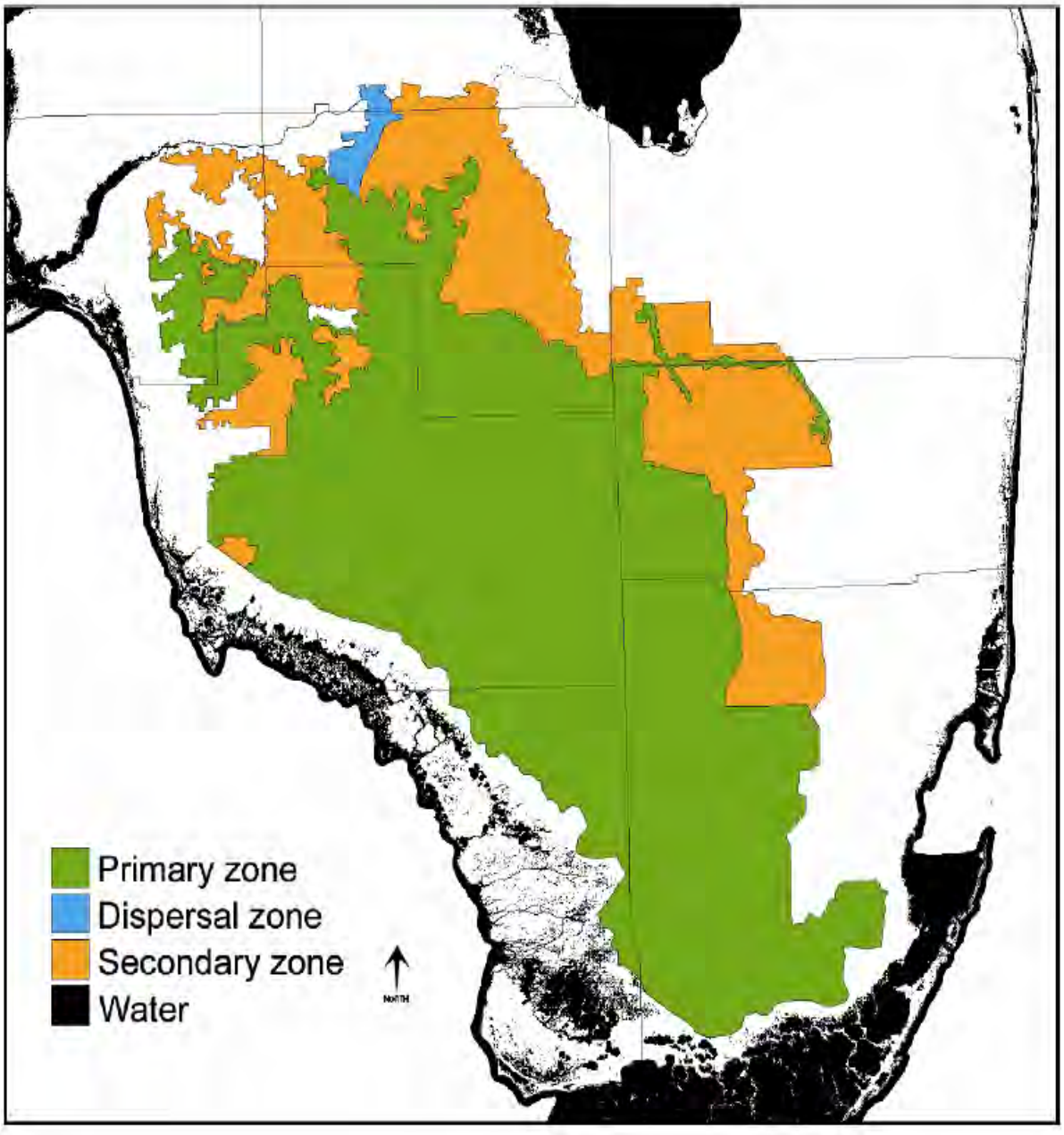

Figure 9. Florida panther core lands: Primary, Secondary, and Dispersal Zones (Kautz et al, 2006).

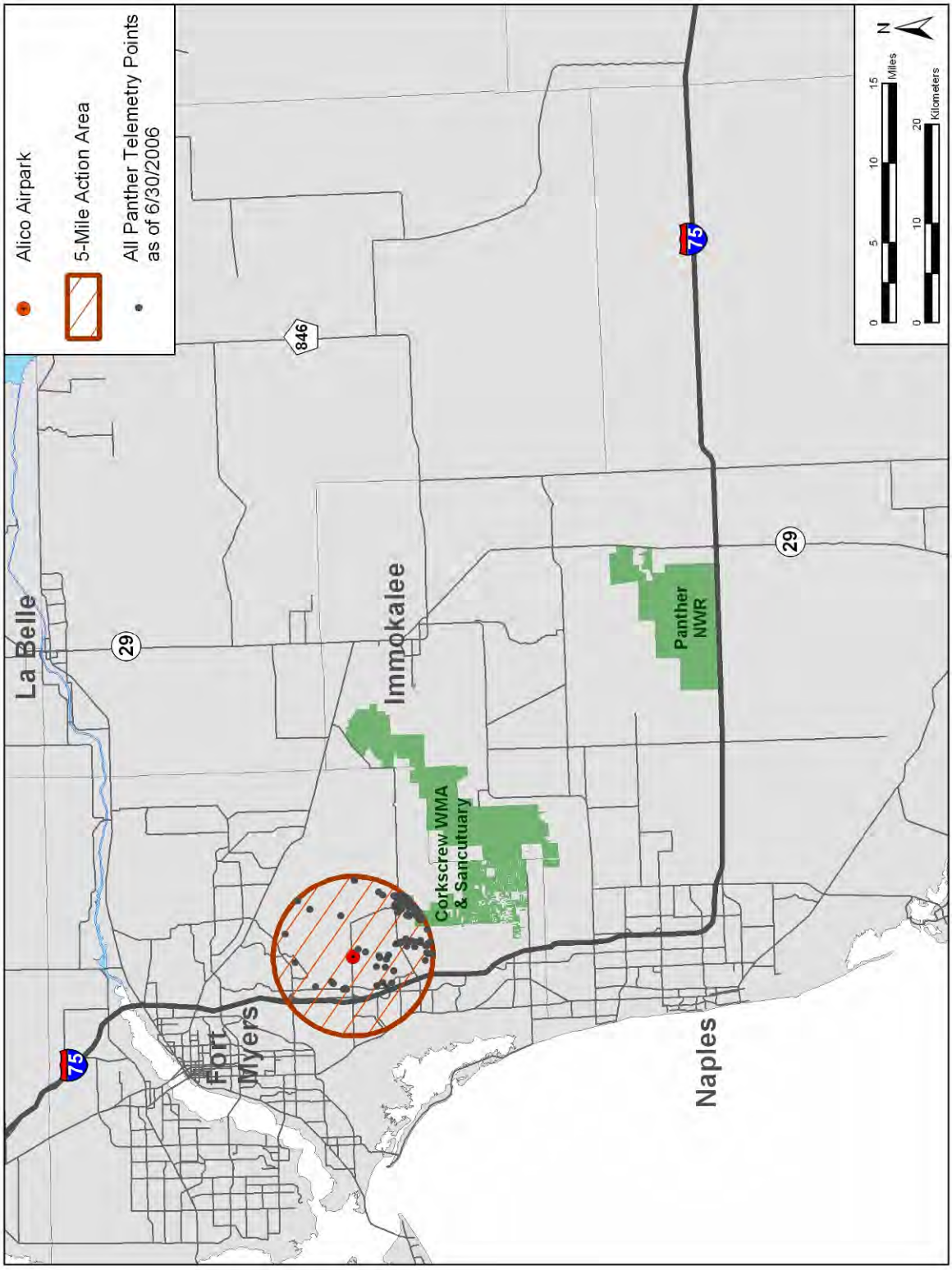

Figure 10. Telemetry within 5-mile radius of project.

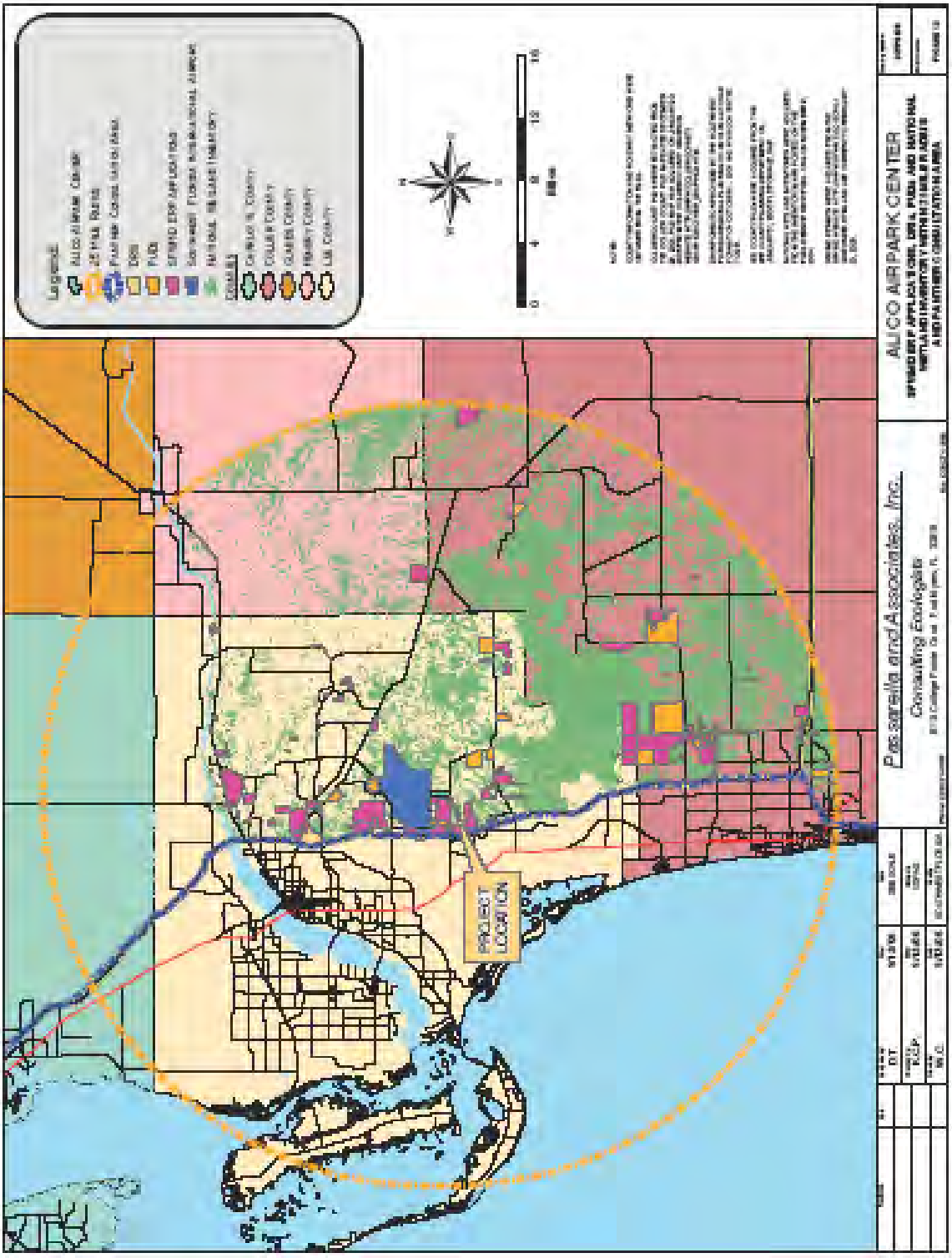

Figure 11. Projects in cumulative impact analysis.

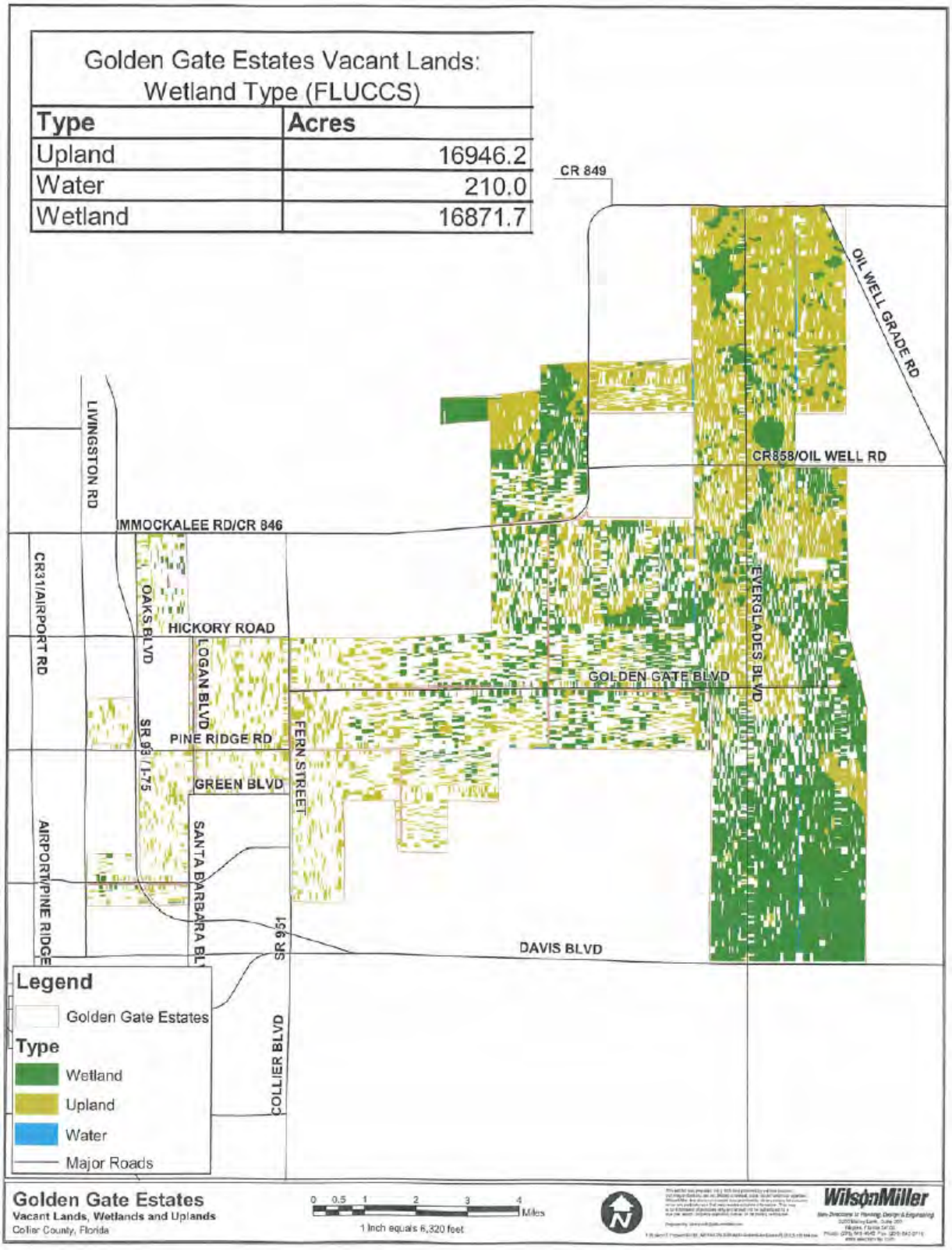

Figure 12. Northern Golden Gate Estates vacant lands.

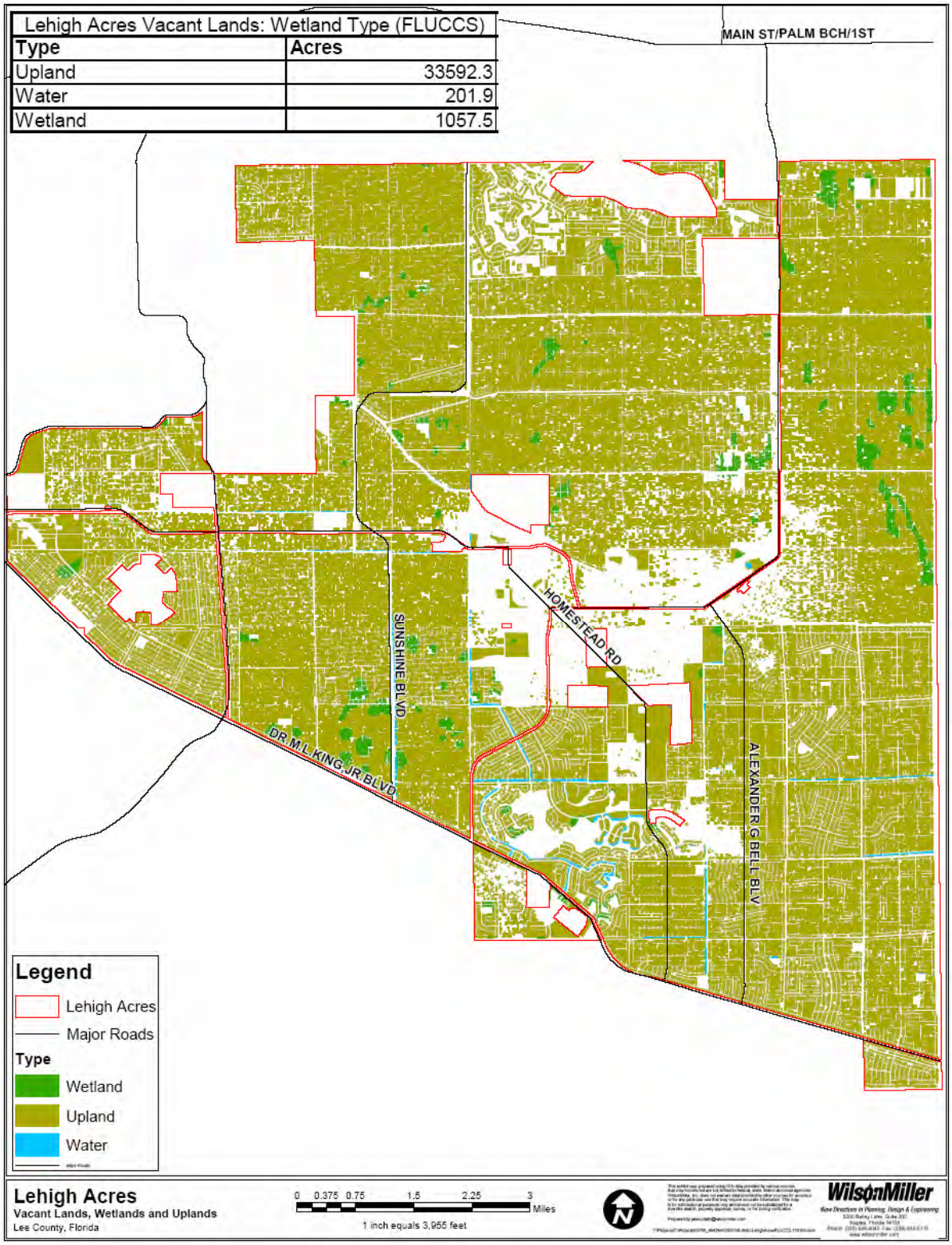

Figure 13. Lehigh Acres vacant lands.