United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecosystem Office
P.O. Box 2676
Vero Beach, Florida 32961-2676

June 9, 2000

Colonel Joe R. Miller
District Engineer
Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Log No.: 4-1-99-F-553
Application No.: 199900619 (IP-SB)
Dated: August 4, 1999
Applicant: Naples Reserve Golf Club
County: Collier

Dear Colonel Miller:

This document transmits the Fish and Wildlife Service's (Service) biological opinion for the proposed Naples Reserve Golf Club located in Collier County, Florida, and the effects on the endangered Florida panther (*Puma concolor coryi*) (panther), endangered wood stork (*Mycteria americana*), and endangered red-cockaded woodpecker (*Picoides borealis*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA). With regards to the Army Corps of Engineers (Corps) permitting program and Florida panther habitat, the Service encourages the Corps to meet with our agency to discuss potential panther conservation opportunities under section 7(a)(1) of the ESA.

This biological opinion is based on information provided in the public notice for the project, field investigations, meetings, and phone conversations with the Corps; the applicant - Vineyards Development Corporation represented by Mr. Michael Procacci, owner; Mr. Michel Saadeh, President and CEO, and Mr. Thomas Masters, P.E., Director of Engineering; the applicant's consultants - Mr. George Hermanson, P.E., Senior Vice President, Hole, Montes & Associates, Inc.; Mr. Geza Wass de Czega, president, Southern Biomes, Inc., and Ms. Karen Bishop, president, PMS, Inc.; the applicant's attorney - Mr. Lawrence Curtin, Holland & Knight LLP; National Marine Fisheries Service (NMFS); Environmental Protection Agency (EPA); Florida Department of Environmental Protection (FDEP), Rookery Bay National Estuarine Research Reserve; South Florida Water Management District (SFWMD); Southwest Florida Regional Planning Council (SWFRPC); Service staff, and other sources of information. A complete administrative record of this consultation is on file at the Service's Southwest Florida Suboffice in Naples, Florida.

Consultation History

On August 9, 1999, the Service received the Corps public notice for the project. By letter dated August 25, 1999, the Service requested a 30-day extension to the comment period, pursuant to the 1992 Memorandum of Agreement (MOA) between the Department of the Interior and the Department of the Army, Part II (5). On August 25, 1999, the Corps extended the comment period until October 3, 1999.

On September 22, 1999, the Service participated in a site visit with the applicant and the applicant's consultant. Conversation focused on golf course and entrance road impacts to on-site wetlands; the location of project infrastructure relative to preserve areas on the proposed Winding Cypress Development of Regional Impact (DRI) and the Picayune Strand State Forest, and potential contamination of Rookery Bay from chemicals released from farm soils disturbed during project construction. The importance of Picayune Strand State Forest to the panther; the indirect effects of noise, light, pollution, "nuisance" animal conflicts, and potential restrictions on use of prescribed fire for forest habitat management were also discussed.

On October 1, 1999, the Service provided comments to the Corps regarding the potential effects of the project on the endangered panther, endangered wood stork, endangered red-cockaded woodpecker, and fish and wildlife resources. The Service requested additional information to complete the formal consultation initiation package (50 CFR 402.14) and stated that formal consultation would not begin until the information had been received. In accordance with the procedural requirements of the 1992 404 (q) Memorandum of Agreement, Part IV, 3(a) the Service advised the Corps that the proposed work may affect aquatic resources of national importance. The Service recommended denial of the project as proposed.

In an October 8, 1999 letter to the Corps, the EPA stated that the proposed action did not conform with the Section 404(b)(1) guidelines nor the sequence of "avoidance, minimization, and compensatory mitigation" described in the Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines (February 7, 1990). The EPA recommended denial of the project as proposed.

On October 25, 1999, the Service notified the Corps that the project would have substantial and unacceptable impacts on aquatic resources of national importance pursuant to part IV.3(b) of the 1992 Memorandum of Agreement (MOA) between the Corps and the Service.

On November 19, 1999, the Corps transmitted a compilation of public comments on the proposed project from NMFS, EPA, the Service, and Mr. Thomas Reese, Attorney at Law on behalf of the Florida Wildlife Federation and Collier County Audubon Society, to the applicant's engineering consultant.

On November 30, 1999, the applicant's biological consultant submitted to the Corps a response to the public comment package. The response included information on wood storks, red-cockaded woodpeckers, the pre- and post-development distribution and condition of native and modified habitats, prey densities, human activities, human population densities, a plan to prevent negative human/puma interactions; the direct, indirect, and cumulative effects of the proposed action on the panther, and conservation measures to minimize adverse affects to the panther. The applicant's biological consultant stated that there would be no direct impacts to the panther and that indirect impacts could be minimized by replacing houses on the north and west boundary with lakes and fairways. Cumulative affects to the panther were not addressed. The project design remained unchanged with regard to wetland impacts proposed in the Corps public notice.

On January 26, 2000, the Corps transmitted to the Service information from the applicant needed to complete the formal consultation initiation package (50 CFR 402.14). The Corps requested that the Service provide a letter of initiation for formal consultation on the panther, wood stork, red-cockaded woodpecker and a projected consultation completion date.

On February 8, 2000 the applicant's biological consultant submitted an aerial photograph of a 262-acre proposed wetland mitigation site, overlaid with vegetation types, to the Service.

On February 24, 2000, the applicant's biological consultant submitted to the Corps a pre- and post-deforestation analysis of the proposed mitigation site in-lieu of a standard Wetland Rapid Assessment Procedure (WRAP).

On February 28, 2000 the Service, the applicant, and the applicant's biological consultant visited the site of the proposed action and the proposed wetland mitigation site. All parties later met with the Corps to discuss the proposed project and potential impacts to listed species and wetlands.

On March 13, 2000 the Service met with the applicant, the applicant's biological and engineering consultants, and the Corps to discuss the proposed project and potential impacts to listed species and wetlands.

On March 23, 2000, the applicant's biological consultant submitted notes to the Service for the March 13, 2000 meeting.

On March 27, 2000 the Service met with the applicant's biological consultant to discuss the project. The Service; (1) requested additional avoidance and minimization of wetland impacts by reducing the number of holes from 36 to 18; (2) stated that use of a Panther Habitat Evaluation Model developed by Dr. David Maehr for section 7 consultation was inappropriate (Service letter dated April 24, 2000 attached); and (3) requested a 3:1 off-set for impacts to forested panther habitat onsite. Site plan design changes to reduce indirect impacts to the panther were discussed.

On March 28, 2000, the applicant's biological consultant submitted notes on the March 27, 2000 meeting to the Service.

On April 10, 2000 the Service advised the Corps that formal consultation had been initiated and that the projected date of completion would be on, or before, June 9, 2000.

On April 10, 2000, the applicant's biological consultant submitted a revised wetland mitigation plan to the Corps. In addition to the 262 acres previously offered the applicant would restore a 58-acre wetland pasture bringing the total size of the mitigation site to 320 acres.

On April 11, 2000 the Service met with the Corps to discuss the proposed project and potential impacts to listed species and wetlands.

On April 21, 2000 the Service met with the Corps and the applicant's biological consultant to discuss project revisions and potential impacts to listed species and wetlands. Only one of five site plan modifications recommended by the Service October 1, 1999 had been incorporated. Replacing the houses along the north and west boundary of the project would reduce the indirect impacts to the panther but would not reduce the wetland impacts. An attempt was made to develop a procedure for assessing direct and indirect impacts to panther habitat.

On May 1, 2000, the Corps requested written concurrence from the Service that the proposed project is not likely to adversely affect the endangered wood stork and the endangered red-cockaded woodpecker. The Service stated that written concurrence would be provided in the biological opinion.

On May 8, 2000 the Service met with the Corps and the applicant's biological consultant to discuss the project. The applicant's consultant presented a letter dated May 6, 2000 with six maps attached and claimed that the maps indicated agricultural lands at the site of the proposed action did not constitute panther habitat. The Service noted that the maps, produced by the Florida Fish and Wildlife Conservation Commission (FWC) for scientists recently empaneled by the Service to produce a spatially explicit population viability analysis, were a draft product subject to change based on the outcome of panel discussions, peer review, and public input.

On May 17, 2000, the Service met with the Corps, the applicant, the applicant' lawyer, and the applicant's biological and engineering consultants to try and bring closure to the consultation. All aspects of the proposed action were discussed with an emphasis on conservation measures for the panther and adherence to section 404(b)(1) guidelines.

On May 19, 2000 the Service informed the applicant by phone that the revised Panther Habitat Evaluation Model presented after the May 17, 2000 meeting would not be acceptable for use in section 7 consultation and that Service concerns have still not been addressed.

State (FWC) Project Coordination

The project is subject to water quality certification by the SFWMD with technical assistance offered to the SFWMD by the FWC. The FWC also offers comments and recommendations to the Corps under the Fish and Wildlife Coordination Act of 1958 (48 Stat. 40, as amended;16 U.S.C. 661 *et seq.*). The FWC has not yet provided comments to the SFWMD or the Corps on the proposed project (Jim Beever, FWC, personal communication, May 2000).

On May 17, 1999, the Service received a copy of a May 4, 1999, letter from the SWFRPC to the SFWMD requesting additional information on the proposed project. The SWFRPC has not yet provided comments on the proposed project (Glen Heath, SWFRPC, personal communication, May 2000).

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The applicant proposes to construct a 550-unit residential subdivision and 36-hole golf course to be known as "Naples Reserve Golf Club." The 688-acre tract includes 181 acres of jurisdictional wetlands, and 507 acres of uplands. Project construction will require impacts to 114 acres of jurisdictional wetlands including the excavation of 24 acres and filling of 90 acres. A new access road from U.S. 41 north to the site would require impacts to four acres of berm and adjacent drainage ditches vegetated by Brazilian pepper (*Schinus terebinthifolius*). The site of the proposed action is located in the headwaters of Henderson Creek adjacent to Picayune Strand State Forest about 0.38 mile north of U.S. 41 in section 1, Township 51 South, Range 26 East, Collier County, Florida (Figure 1).

The applicant proposes to mitigate wetland impacts by creating 11 acres of wetlands onsite, preserving and enhancing 59 acres of onsite wetlands and five acres of onsite uplands. Wetland enhancement includes the removal of exotic and nuisance vegetation. In wetland areas where the density of exotic vegetation is greater than 50 percent, the land will be mechanically cleared, re-graded where feasible, and re-vegetated. The 75 acre onsite mitigation area would be maintained in perpetuity to control exotic and nuisance vegetation and would be placed under a conservation easement granted to the SFWMD. The applicant also proposes to mitigate wetland impacts by restoring 58 acres of wetland pasture offsite and preserving and enhancing 262 acres of cypress and pine wetland habitat offsite. A wetland functional analysis has not been provided and the proposed wetland mitigation plan has not been finalized or approved.

In order to minimize direct and indirect effects to the panther and panther habitat Vineyards Development Corporation proposes to: (1) deed 320 acres of Priority 1 panther habitat (Logan *et al.* 1993) located within the Picayune Strand State Forest boundary to the State of Florida, (2) develop a restoration plan for 58 acres, (3) develop a management plan for the 320-acre mitigation site, and (4) provide an endowment fund for perpetual management of the 320-acre mitigation site by the Division of Forestry.

Action area

For the purposes of this consultation, the action area includes the current occupied range of the panther in south Florida (Figure 2). The Service reviewed panther radio-telemetry data, known den sites, and other information to delineate an action area that 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. 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 to no panther habitat and it is unlikely that panthers would use such areas. The Florida Keys, in Monroe County, were excluded for the same reason.

The action area is larger than the proposed action identified by the Corps public notice. Development of the proposed project may have adverse direct and indirect effects on the ability of the remaining panther population to breed, feed, shelter, and disperse. The current range of the panther in south Florida is about one percent of a historic range which extended from eastern Texas eastward through Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, and parts of Tennessee and South Carolina. The current small panther population size has not precluded the ability of panthers to move over large distances in relatively short periods of time. Therefore, potential adverse effects to individual panthers in proximity to the proposed action may effect the remaining small panther population.

STATUS OF THE SPECIES

The following discussion is summarized from the *South Florida Multi-Species Recovery Plan* (MSRP) (Service 1999). A complete panther life history discussion can be found in the MSRP. No critical habitat has been designated for the panther, therefore, none will be affected.

Species description

The panther is a medium-sized subspecies of puma or mountain lion, that is characterized as being relatively dark tawny in color, with short, stiff hair (Bangs 1899), and relatively longer legs and smaller feet (Cory 1896) than other subspecies. Skulls of the panther have been described as having a broad, flat, frontal region, and broad, high-arched or upward-expanded nasals (Young and Goldman 1946).

The coat of adult panthers is unspotted and typically rusty reddish-brown on the back, tawny on the sides, and pale gray underneath. The long cylindrical tail is relatively slender compared to some of the other subspecies (Belden 1988). Panther kittens are gray with dark brown or blackish spots and have 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 are often observed in panthers remaining in southwest Florida which are not found in combination in other subspecies of *P. concolor*. These characters are: (1) a right angle crook at the terminal end of the tail, (2) a whorl of hair or "cowlick" in the middle of the back, and (3) irregular, light flecking on the head, nape, and shoulders (Belden 1986). The light flecking may be a result of scarring from tick bites (Maehr 1992a).

Adult male panthers reach a length of around 2.15 meters (seven feet) from the nose to the tip of their tail and have reached or exceeded 68 kilograms (150 pounds) in weight, but typically average around 54.5 kilograms (120 pounds). They stand approximately 60 to 70 centimeters (23 to 27 inches) at the shoulder. Female panthers are considerably smaller with an average weight of around 34 kilograms (75 pounds) and average length of about 1.85 meters (six feet).

Habitat

Maehr (1990a) estimated the current occupied range of the panther to be 2.2 million acres (880,000 hectares) in south Florida. Later estimates by Logan *et al.* (1993) indicated the current occupied range to be at least 3.1 million acres (1.2 million hectares). Native landscapes within the Big Cypress Swamp region of south Florida, within occupied panther range, are dominated by slash pine (*Pinus elliottii*), cypress, and freshwater marshes, interspersed with mixed-swamp forests, hammock forests, and prairies (Duever *et al.* 1979). Private lands represent about 50 percent of occupied panther range in south Florida. The largest contiguous tract of panther habitat is the Big Cypress National Preserve/Everglades ecosystem in Collier, Monroe, and Miami-Dade counties. Suitable habitat extends into Lee, Hendry, Charlotte, Glades, Broward, Palm Beach, and southern Highlands counties. Poorer-quality (low nutrient, frequently saturated) soils prevalent south of Interstate 75 (I-75) in south Florida do not produce the quality or quantity of forage required to support large herds of deer and other panther prey items. The influence of soils on primary productivity makes it unlikely that habitat in Big Cypress National Preserve and Everglades National Park is as productive as habitat on private lands in northern and western Collier County in terms of panther health, reproduction, and density. Better soils and drainage also make private lands north of I-75 more suitable for intensive agriculture and urban growth (Maehr 1992a).

Native upland forests are preferred by panthers in southwest Florida (Maehr 1990a). Highly preferred habitat types are relatively limited in availability but are sought by panthers as daytime resting cover (Maehr *et al.* 1991a). Understory thickets of saw palmetto have been identified as the most important resting and denning cover for panthers (Maehr 1990a). Early telemetry investigations (n=6) indicate that panther use of mixed swamp forests and hammock forests was greater than expected relative to their availability within the panthers' home range (Belden *et al.* 1988). As investigations expanded onto private lands between 1985 and 1990, it was determined that panthers preferred native upland forests, especially hardwood hammocks and pine flatwoods, over wetlands and disturbed habitats (n=26) (Maehr *et al.* 1991a). Hardwood hammocks were consistently preferred by panthers, followed by pine flatwoods (Maehr *et al.* 1991a). This may be related to the fact that, among major vegetation types in Florida, hardwood hammocks had the

greatest potential for producing white-tailed deer, an important panther prey species (Harlow 1959, Belden *et al.* 1988, Maehr 1990a, Maehr 1992a, Maehr *et al.* 1991a).

Male panthers use more cover types and have larger home ranges than females. The home range size of male panthers is influenced by the percentage of hardwood hammock, hardwood swamp, water, grass, agricultural land, barren land, scrub, and brush in the landscape. Smaller male home ranges have greater percentages of hardwood hammocks and hardwood swamp, while larger home ranges have greater percentages of water, grass and agricultural land, barren land, shrub, and brush. Larger female home range size has been positively correlated with higher percentages of dry prairie, shrub swamp, and shrub and brush (Maehr 1992b). Similar to male home range size, female panther home range size is inversely related to habitat quality, which may also influence reproductive success (Maehr 1992b, Maehr *et al.* 1989b).

Dispersing males may wander widely through unforested and disturbed areas. Agricultural and other disturbed habitats, freshwater marsh, thicket swamp, and mixed swamp are not preferred, and are either used in proportion to their availability or are avoided (Maehr 1990a). Habitats avoided by panthers include agriculture, barren land, shrub and brush, and dry prairie. Panthers have not been found in pastures during daytime telemetry location flights but may travel through them at night (Maehr *et al.* 1991a, Maehr 1992a).

Telemetry research is biased toward heavily forested public lands where a majority of panthers have been captured and radio-collared. Telemetry data are collected just after sunrise and at a time when panthers are bedding down for the day. Other panther activities must be interpreted from the location of the telemetry reading in the landscape and from field investigations. Consequently the value of habitats characterized as "not preferred" or "avoided" is understated. These habitats provide food and cover for panther prey, provide a buffer against more intensive land uses such as urban development, have a capacity to be restored to a native condition more conducive to panther use, and are part of the rural landscape matrix that has allowed the panther to persist in south Florida.

Life history

Panthers are essentially solitary. Interactions between panthers were infrequent during a 1985-1990 study (Maehr *et al.* 1991a). Most interactions occurred between adult females and their kittens. Interactions between adult male and female panthers were second in frequency. Interactions between males and females lasted from one to seven days and usually resulted in pregnancy. Documented interactions between males were not uncommon and resulted in serious injury or death to some individuals. David Maehr (University of Kentucky, personal communication, 1998) indicates that intraspecific aggression is the number one cause of mortality in panthers. Aggressive encounters between females have not been documented (Maehr *et al.* 1991a).

Reproduction and demography

The pattern of Florida panther distribution involves several males maintaining large, mutually exclusive home ranges containing several adult females and their dependent offspring. This spatial arrangement seems to be a prerequisite for successful reproduction (Maehr 1993).

Male panthers are polygamous. Breeding activity peaks in fall and winter (Maehr 1992a). Parturition is distributed throughout the year with 81 percent of births occurring between March and July. Litter sizes range from one to four kittens, with a mean of 2.2 kittens per successful litter[1] (Maehr *et al.* 1991a). Intervals between litters range from 16 to 37 months.

Den sites are usually located in dense, understory vegetation, typically saw palmetto (*Serenoa repens*) (Maehr 1990a). Den sites are used for up to two months by female panthers and their litters from parturition to weaning and are also used in subsequent years. Female panthers losing their litters generally produce replacement litters. Five of seven females whose kittens were brought into the captive breeding program successfully reproduced an average of 10.4 months after the removal of the litter (Land 1994).

Age at first reproduction has been documented at 18 months for females (Maehr *et al.* 1989a). The first sexual encounters for males has occurred at approximately three years of age (Maehr *et al.* 1991a). Dispersal of young typically occurs around 1.5 to two years of age, but may occur as early as one year of age (Maehr 1992a).

Infant mortality is characterized as relatively high with fewer than half of all births resulting in offspring that survive beyond six months of age (Roelke *et al.* 1993). The kitten survival rate between age six months and one year has been estimated at 0.895, based on a sample of 15 radio-instrumented kittens monitored from six months to one year of age (Land 1994). Young panthers are considered recruited into the population when they have successfully reproduced (Dennis Jordan, Service, personal communication, 1997).

Females are readily recruited into the population as soon as they are capable of breeding (Maehr *et al.* 1991a). Males appear to have more difficulty being recruited. Sub-adult male recruitment is complicated by the lack of dispersal habitat and competition with adult male panthers for territories. Without large areas of suitable habitat to accommodate dispersal, young males have few opportunities for recruitment as residents. As a result, the panther's ability to increase and outbreed has been severely restricted. Successful male recruitment appears to depend on the death or home range shift of a resident adult male (Maehr *et al.* 1991a). Turnover in the breeding population is low; documented mortality in radio-collared Florida panthers is greatest in sub-adult and non-resident males (Maehr *et al.* 1991b).

Land and Taylor (1998) documented that panther mortality (n=67) averaged 3.5 deaths per year from 1978 through June 30, 1998. Male panthers accounted for 57.6 percent of mortality. Sub-adult panthers (up to three years of age) of both sexes accounted for 45.5 percent of mortality.

---

[1] A successful litter is one in which the kittens have survived to an age of at least six months.

Specific causes of documented panther mortality include road kill (37.9 percent), intraspecific aggression (21.2 percent), disease and old age (18.2 percent), causes unknown (12.1 percent), shootings (9.1 percent), and research-related (1.5 percent). These mortality figures only include panthers endemic to south Florida, not introduced Texas cougars.

Foraging

Food habit studies of panthers in southwest Florida indicate that the feral hog (*Sus scrofa*) is the most commonly taken prey followed by white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), and nine-banded armadillo (*Dasypus novemcinctus*). Deer and hogs accounted for 85.7 percent of consumed biomass north of I-75 and 66.1 percent south of I-75 (Maehr 1990a). No seasonal variation in diet was detected; however, panthers inhabiting an area of better soils consumed more large prey. Differences in prey abundance and availability were indicated by an eight-fold deer abundance north of I-75 versus south of I-75, although the estimated number of deer consumed did not differ between the north and south portions of the study area. Hog numbers were lower south of I-75. Fewer large prey may, in part, explain the poorer physical condition, larger home ranges, and lower reproductive output of panthers south of I-75. Hogs dominated the diet of panthers in the north in terms of both estimated biomass and numbers. In the south, deer accounted for the greatest estimated biomass consumed, whereas raccoons were the highest estimated number of prey items consumed. Domestic livestock were found infrequently in scats or kills, although cattle were readily available north of I-75 (Maehr *et al.* 1990a).

Movements and dispersal

Adult panthers occupy available habitat in southwest Florida in a pattern similar to that of western cougars (Land 1994). Over 7,000 telemetry locations on 26 radio-collared panthers between 1985 and 1990 indicated that home-range size varied from 53 to 1,183 km^2, averaging 519 km^2 for resident males and 193 km^2 for resident females. Home ranges of resident adults were stable unless influenced by the death of other residents. Home-range overlap was extensive among resident females and limited among resident males (Maehr *et al.* 1991a).

There are no known differences in seasonal movements, wet and dry season habitat use, seasonal variation in diet, or effects of season on road crossings. There may be a response to fluctuations in water levels; however, the response is believed to be unmeasurable (Maehr 1989; Maehr *et al.* 1990b, 1991a).

Prior to and during the early construction converting State Road (SR) 84 (Alligator Alley) to I-75 and installation of wildlife crossings, only male panthers were detected successfully crossing this roadway. A female panther was killed on SR 84 in 1986. The highway may have been a deterrent to female movements (Maehr *et al.* 1991a). Since the completion of I-75 and the associated wildlife underpasses, male panthers and a female panther have regularly used the wildlife crossings (Lotz *et al.* 1996).

Dispersal distances average 58.7 km for sub-adult males and 16 km for an adult female. Mean dispersal age was 17.9 months. Dispersing males wander widely through unforested and disturbed areas (Maehr 1992a). The limited dispersal opportunities for sub-adult males may encourage fighting among males (Maehr *et al.* 1991a).

Activity levels for panthers peak around sunrise and sunset. The lowest activity levels occur during the middle of the day. Females at natal dens follow a similar pattern with less difference between high and low activity periods. Although some travel occurs during the day, panthers are mostly nocturnal (Maehr *et al.* 1990b).

Relationship to other species

The panther requires extensive, biotically diverse landscapes to survive. Large carnivores are considered critical in maintaining ecological integrity in many large forested systems (Terborgh 1988). Landscapes through which the panther ranges support a vast array of south Florida's faunal and floral diversity.

The panther's most important species association is with its prey species. Deer, hog, and raccoon are the most important prey species taken in term of biomass and numbers (Maehr *et al.* 1990a).

The panther is also influenced by man. Human activities, including road construction, residential/commercial development, and agricultural development have had impacts on the distribution, abundance, mortality, and dispersal and colonization opportunities of the panther.

Comparisons of food habits, habitat use, and movements revealed a low probability for competitive interactions among the panther, bobcat (*Lynx rufus*), and Florida black bear (*Ursus americanus floridanus*). All three species preferred upland forests but consumed different foods and utilized the landscape in ways that resulted in ecological separation (Maehr 1997).

Status and distribution

A small population of panthers in south Florida, estimated to number between 30 and 50 adults (30 to 80 total individuals) (Service 1999), represents the only known remaining wild population of an animal that once ranged throughout most of the southeastern United States from eastern Texas, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, and parts of South Carolina and Tennessee. The panther presently occupies a contiguous system of native forests, agricultural lands including rangeland, and rural areas totaling from two to three million acres (800,000 to 1,200,000 hectares) on public and private lands in Charlotte, Glades, Lee, Hendry, Collier, Miami-Dade, Broward, Palm Beach, Monroe, and Highlands counties in south Florida.

Of the 27 recognized subspecies of *P. concolor* described in Hall (1981), the Florida panther is the sole remaining subspecies that occurs in the eastern United States. The population of this large cat may have numbered as many as 500 at the turn of the century (Seal *et al.* 1989).

Historically, the panther was distributed from eastern Texas or western Louisiana and the lower Mississippi River valley east through the southeastern States in general, intergrading to the north with *P. c. cougar*, and to the west and northwest with *P. c. stanleyana* and *P. c. hippolestes* (Young and Goldman 1946) (Figure 3). Hunting, habitat loss from residential and agricultural development, and the loss of the panther's prey base have led to the decline of this species since that time (Belden *et al.* 1988, Maehr 1992a). In 1950, the panther was declared a game species in the State of Florida. This action resulted in the first regulation of panther harvest. By 1958 the panther was listed under Florida state law as an endangered species. The population was estimated at 100 to 300 statewide in 1966 (Smith 1970, Schemnitz 1972). The Federal government listed panthers as endangered in 1967. The Service cited heavy hunting and trapping pressures, the inability of the species to adapt to changes in the environment, and developmental pressures as the reasons for the decline of the panther (Service 1967).

In the 1970's, the FWC established a Florida Panther Record Clearinghouse to ascertain the status of the panther. The first field searches were made in 1972. Telemetry investigations began in 1981, primarily on public lands in southwest Florida. At the end of February 1997, 20 panthers were radio-collared in an area encompassing Everglades National Park, Big Cypress National Preserve, Florida Panther National Wildlife Refuge, Fakahatchee Strand State Preserve, and private lands in Collier, Lee, and Hendry counties. Maehr *et al.* (1991a) estimated the density of panthers in southwest Florida between February and July 1990 to be one panther/110 km^2. When extrapolated over a 5,040 km^2 area thought to be occupied by radio-instrumented panthers in southwest Florida, the estimated population of the area was 46 adults (nine resident males, 28 resident females, and nine transient males) between December 1985 and October 1990. This population estimate assumed homogeneous density and similar age and sex composition over time and space. The total population in south Florida was likely higher, because the estimation technique excluded panthers in Everglades National Park, eastern Big Cypress National Preserve, and areas north of the Caloosahatchee River (Maehr *et al.* 1991a). Logan *et al.* (1993) reports that based on road kills, tracks, scat, and a decade of radio telemetry data, the only reproducing panther population occurs in Collier, Miami-Dade, Hendry, and Lee counties in south Florida.

Natural gene exchange between the Florida panther and three other subspecies ceased when the panther became geographically isolated, probably over a century ago (Seal *et al.* 1994). Isolation from *P. c. cougar*, *P. c. stanleyana*, and *P. c. hippolestes*; habitat loss; reduced population size; and inbreeding have resulted in loss of genetic variability and diminished health (Service 1999). Data on polymorphism and heterozygosity, when combined with multiple physiological abnormalities, suggest that the panther is experiencing inbreeding depression (Roelke *et al.* 1993, Barone *et al.* 1994). Inbreeding depression has been related to decreased semen quality, lower fertility, lower neonatal survival, and congenital heart defects in a variety of domesticated and wild species (Lasley 1978, Rails and Ballou 1982, Wildt *et al.* 1982, O'Brien *et al.* 1985, Roelke 1991).

Population viability analysis data indicate that a minimum of 50 adult panthers are needed to ensure demographic and/or genetic health (Seal *et al.* 1989). The present population is estimated

to be at or below this level. Maehr (1990a) indicates that there is no unoccupied habitat suitable for dispersal by sub-adult panthers. Inbreeding increases when dispersing individuals can no longer immigrate into the fragmented population, resulting in inbreeding depression, loss of genetic variation, declining health, reduced survivability, lower numbers, and eventual extinction. Continued loss of panther habitat results in less dispersal opportunity, thus adding to inbreeding problems.

Geographic isolation, habitat loss, small population size, and associated inbreeding have resulted in the loss of approximately half of the panther's genetic diversity (Roelke 1990). Natural gene exchange between the panther and other subspecies of *Puma concolor* stopped when the panther became geographically isolated from other populations. Early population viability analyses projected extinction of the panther in 25 to 40 years under existing demographic and genetic conditions (Seal *et al.* 1989, 1992). To restore genetic health and genetic viability, a genetic management program was implemented with the release of eight female Texas cougars (*P. c. stanleyana*) into south Florida through the spring and summer of 1995. This program should restore the depressed panther genetic pool through the replacement of material from this formerly contiguous subspecies, without significant alteration in the basic genetic makeup of the panther or swamping the existing gene pool which may be adapted to local environmental conditions (Service 1994b).

A recent population viability analysis using a non-spatially explicit model known as VORTEX indicates a high probability of persistence for 100 years (Maehr *et al.* 1999). The Service has convened a panel of scientists tasked with completing a population viability analysis using a spatially-explicit model known as RAMAS and updated demographic parameters. The results will then be used to better guide recovery decisions. The panther persists as a small, isolated population and a catastrophic natural event, such as disease, could accelerate extinction significantly.

Disease is a threat to small inbred populations (Roelke 1991, Barone *et al.* 1994, Seal *et al.* 1989). Panthers have tested positive for feline immunodeficiency virus (FIV) (Barr *et al.* 1989, Roelke and Glass 1992, Taylor 1997). FIV has a long incubation period but leads to non-specific immunosuppression and death in domestic cats (Roelke 1991). Its significance to the panther is unknown. Other diseases, such as feline infectious peritonitis (FIP), feline leukemia virus (FeLv), *Cytauxzoon felis*, and *Bartonella henselae*, are present in varying degrees (Roelke 1991, Roelke and Glass 1992, Dunbar 1993). Parasites found on 12 panthers examined between 1978 and 1983 included one protozoan, two trematodes, three cestodes, seven nematodes, six ticks, and one flea. The trematode *Alaria marcianae* and a hookworm *Ancylostom pluridentatum* were the most prevalent and abundant (Forrester *et al.* 1985).

Other recovery efforts include the establishment of two additional populations within the historic range of the panther (Service 1987, 1995). Between 1988 and 1995, twenty-six Texas cougars were released near Okeefenokee National Wildlife Refuge and Osceola National Forest. Studies have concluded that Florida panther reintroduction is biologically feasible (Belden and Hagedorn

1993, Belden and McCown 1996) based on available habitat in north Florida and south Georgia. However, complex social issues must be addressed prior to population reestablishment (Belden and McCown 1996).

Twenty years of radio-telemetry data suggest that the south Florida population may be at or near carrying capacity for existing habitat conditions. Demographic and genetic health depend on maintaining suitable habitat to support a viable population. Therefore maintaining sufficient habitat for resident adults and recruitment of dispersing sub-adults is essential to facilitate gene exchange and to prevent problems associated with inbreeding. Continued deterioration, fragmentation, loss of habitat, and further reductions in the current extent of the occupied range will likely reduce the south Florida population below the level necessary for demographic and genetic health.

Analysis of the species likely to be affected

The endangered panther occupies two to three million acres (800,000 to 1,200,000 million hectares) of land in south Florida, six to nine percent of Florida's total land area, and about one percent of a historic range that included all of six, and part of two, southeastern states. Geographic isolation, small population size, and associated inbreeding have compromised the genetic health and viability of the panther. The panther is a wide-ranging species that requires extensive, biotically-diverse landscapes to survive. Sub-adult males wander widely through unforested and disturbed habitat and limitations on recruitment into the breeding population result in intraspecific aggression and mortality. Approximately 50 percent of occupied panther range in south Florida is on private lands: these lands include preferred panther habitat such as native upland forests. The habitat productivity on some public lands may be reduced as a result of low nutrient, frequently saturated soils which limit the quality and quantity of forage required to support panther prey species. Private lands in south Florida are subject to increasing and intensifying agricultural and urban development, including associated infrastructure such as drainage canals and roads.

The pine flatwoods onsite are too young to provide nest trees for the red-cockaded woodpecker. The low density of south Florida slash pine trees and thick mid-story canopy of Brazilian pepper indicate that foraging habitat onsite is of moderate quality. One-half to two-thirds of the pine habitat onsite will be preserved and enhanced by exotic removal. Approximately 68 acres of wetland pine forest mixed with cypress, 48 acres of upland pine forest, 11 acres of wetland pine forest, one active cavity tree, one inactive cavity tree, and one tree with a start hole will be protected by deeding 320 acres of land to Picayune Strand State Forest. The Corps provided a determination in a meeting April 21, 2000 that the project may effect but is not likely to adversely affect the red-cockaded woodpecker. The Service concurs with this determination.

The herbaceous wetlands, forested wetlands, agricultural ditches, and flooded fallow fields all provide wood stork foraging habitat as water levels recede. The nearest nesting colony of wood storks is at the Audubon Corkscrew Swamp Sanctuary about 22 miles north. About 59 acres of

wetland habitat will be preserved onsite, enhanced by exotic removal and placed under a conservation easement held by the SFWMD. The 320-acre mitigation site will protect 53 acres of uplands, 209 acres of forested wetlands, and 58 acres of forested wetlands restored from pasture. The Corps provided a determination in a meeting April 21, 2000 that the project may effect but is not likely to adversely affect the red-cockaded woodpecker. The Service concurs with this determination.

Road mortality

Florida panther road mortality (n=24) between 1978 and June 30, 1998, averaged 1.2 panthers per year and was almost evenly divided between males (n=13) and females (n=11). Although the relative significance of highway deaths to other sources of mortality is not entirely known, it has been the most often documented source of mortality (Maehr 1989, Maehr *et al.* 1991b). Vehicle collisions resulting in the death of sub-adult panthers of both sexes exceeds sub-adult mortality due to intraspecific aggression (23.4 versus 10.9 percent) and equals all other forms of sub-adult mortality combined (Land and Taylor 1998). Total mortality figures may be biased toward road mortality because the only documented deaths of non-instrumented panthers are the results of vehicle collision.

Habitat loss and fragmentation

Although road mortality is a concern, habitat loss, habitat fragmentation, and increased human access resulting from agricultural and residential development in south Florida are greater threats to the panther. Between 1936 and 1987, statewide cropland and rangeland increased 1.72 million hectares (4.23 million acres) or 30 percent, urban areas increased by 1.60 million hectares (3.95 million acres) or 538 percent, while herbaceous wetlands declined by 1.57 million hectares (3.88 million acres) or 56 percent and forests declined by 1.74 million hectares (4.30 million acres) or 21 percent (Kautz 1993, Kautz 1994). Continued development associated with the expansion of Florida's urbanized east coast, increasing growth on the west coast, and the spread of agricultural development in the south Florida interior have placed increasing pressure on panthers and panther habitat (Maehr 1990b, Maehr *et al.* 1991a, Maehr 1992b). Rapid development in southwest Florida is compromising the ability of natural habitats to support a self-sustaining panther population (Maehr 1990b, 1992b). Maehr (1990a) reports that there are approximately 2.2 million acres (880,000 hectares) of occupied panther range in south Florida and that approximately 50 percent of the known breeding distribution is comprised of landscapes under private ownership. Agricultural and urban development continues to replace and fragment panther habitat. Over 83 percent of the 648,000 hectares (1.6 million acres) of agricultural land in southwest Florida; (Charlotte, Collier, Glades, Hendry, Lee and Sarasota counties) is categorized as rangeland. Between 1986 and 1990, row crop acreage increased by 3,640 hectares (8,990 acres) or 21 percent, sugarcane increased by 6,475 hectares (16,000 acres) or 21 percent, citrus increased by 21,850 hectares (54,000 acres) or 75 percent, and rangeland, much of it suitable for panther occupation, decreased by 64,750 hectares (160,000 acres) or ten percent. Rangeland losses were about evenly divided between agricultural and urban development

(Townsend 1991). Maehr (1990a) indicates that unchecked development of private lands will limit panther habitat to landscapes under public stewardship and result in extinction of the panther. Maehr (1990b) also reports a lack of unoccupied, suitable habitat for sub-adult dispersal. This suggests that available landscapes are at or near carrying capacity under existing habitat conditions.

Panthers consistently use large areas with few major highways (Maehr and Cox 1995). Belden and Hagedorn (1993) observed that Texas cougars used in a population reintroduction study established home ranges in an area with one-half the road density of the region in which the study was conducted. In particular, the study animals tended to avoid crossing more heavily traveled roads in favor of more lightly traveled roads. Female panthers rarely establish home ranges bisected by highways and maternal dens are located at distances one kilometer or greater away from highways (Maehr 1997).

Because of their wide-ranging movements and extensive spatial requirements, panthers are particularly sensitive to habitat fragmentation (Harris 1985). Past land use activity, hydrologic alterations, road construction, invasion of exotic plants, and lack of fire management have affected the quality and quantity of panther habitat. The effect of invasive plants on panther habitat utilization, particularly such species as melaleuca (*Melaleuca quinquenervia*) is unknown. Panthers may have increased their use of suboptimal wetland habitat, because forested uplands have been developed. As the remaining forested uplands are lost, sloughs containing cypress, marsh, and shrub wetlands comprise a greater percentage of the remaining habitat available to panthers, relative to habitat historically available to the species.

Panther/human interactions

Florida panthers were hunted for bounty during the 1800s and for sport up until the 1950s. Three studies of western puma indicate that there are short- and long-term responses to habitat alteration, road density, and human population density. Two recent studies have attempted to quantify the response of Florida panthers to hunting and prescribed fire. Prescribed fire is probably the single-most important habitat management tool available to public land stewards. Current information on panther and human interactions is summarized below.

Seven panther shootings, six fatal and one non-fatal, occurred between 1978 and 1986. A female Texas puma introduced for genetic restoration was shot twelve years later in 1998 (Land *et al.* 1999). Education, self-policing among hunters, and regulation are the tools by which shootings are minimized. All free-ranging puma in the southeastern U.S. are protected by a "similarity of appearance" provision in the ESA.

Reactions of *Puma concolor* to logging and other human activities were studied in northern Arizona from 1976 to 1980 and in south-central Utah from 1979 to 1982. Resident puma were rarely found within one km of sites logged within the past six years. Puma two to three years old were found in logged areas more often than older puma, but four of five young puma that visited

logged areas did not maintain residence there (Van Dyke *et al.* 1986). Puma in undisturbed areas tend to be inactive at mid-day, more active at mid-evening and sunset, and most active at sunrise (Ackerman 1982, Van Dyke 1983). Puma in areas disturbed by humans shifted activity peaks to after sunset, concentrated other activity during evening hours, and were inactive rather than active at sunrise. Dispersing juvenile puma encountered human disturbances more frequently than resident puma. Residents, and transients that became residents, selected home ranges with road densities lower than the study area average, no recent timber sales, and few or no sites of human residence (Van Dyke *et al.* 1986).

Janis and Clark (1999) compared the behavior of panthers before, during, and after the recreational deer and hog hunting season (October through December) on areas open (Big Cypress National Preserve) and closed (Florida Panther National Wildlife Refuge, Fakahatchee Strand State Preserve) to hunting. The variables examined were; (1) morning activity rates, (2) movement rates, (3) predation success, (4) home range size, (5) home range shifts, (6) habitat selection, (7) distance from panther locations to trails, and (8) frequency of panther use in the Bear Island Unit of Big Cypress National Preserve. The authors failed to detect any relationship between hunting and the first six variables. Of the last two variables they determined that the distance of panther locations from trails increased an average of 180 meters (0.31 mile) and that the frequency of panther use in the Bear Island Unit decreased from 30 up to 40 percent during the hunting season. An analysis of movement rates, a measure of energy expenditure, and predation success, a measure of energy intake, do not indicate any direct, negative energetic responses to increased human activity during the hunting season. However, the increase in average distance from trails and decrease in panther use of the Bear Island Unit are indicative of a behavioral change.

Janis and Clark (1999) surmise that the increase in the distance of panther locations from trails is biologically minor" and probably related to prey behavior; *i.e.*, white-tailed deer moving deeper into the forest to avoid hunters. The decrease in panther use of the Bear Island Unit is balanced by an increase in use of private lands north of Big Cypress National Preserve as "refugia". The authors assert that this pattern would be of serious concern if panther habitat on these private lands were lost.

Dees *et al.* (1999) examined panther use of habitat in response to prescribed fire at Florida Panther National Wildlife Refuge and Big Cypress National Preserve between 1989 and 1998. A positive temporal response to prescribed fire occurred in the year following the burn and is likely due to the rapid regrowth of vegetation which in turn attracted white-tailed deer. Panther use of the burn area gradually declined after the first year and ended after four years. Prescribed fire rotations on both study sites is four years but unfavorable weather conditions and logistics may sometimes extend the rotation.

Spatial responses to fire depended on scale. Panthers positioned their home ranges in areas more likely to be burned, whereas use of burned areas within the home range was less than non-burned areas. Although burnable habitats (pine) were not preferred within panther home ranges, they

were used, with about 36 percent of the locations occurring in previously burned areas. Dees *et al.* (1999) concluded that resource managers could improve panther habitat by reducing the proportion of area comprised of burns older than four years but cautioned that shorter burn rotations could alter vegetative patterns and have a negative impact at the landscape level.

ENVIRONMENTAL BASELINE

The first bounty on Florida panthers was passed in 1832. Another Florida law passed in 1887 authorized a payment of $5.00 for panther scalps (Tinsley 1970). Agricultural land clearing in the southeast between 1850 and 1909 totaled 12.8 million ha. Lumbering reduced the original southern forest nearly 40 percent from 121.4 million hectares to 72.0 million hectares (300.0 million to 177.8 million acres) by 1919. Some 36.4 million hectares (89.9 million acres) of pine forests were considered cut-over by 1920 with one-third classified as restocked with saw timber, one-third restocked with cordwood only, while one-third remained barren (Williams 1990). Meanwhile the white-tailed deer, primary prey of the panther, was reduced from a range-wide population of about 13 million in 1850, to under one million by 1900 (Halls 1984). Over a 100-year period, bounty hunting, land clearing, lumbering, and market hunting of deer contributed to the range-wide decline of the panther leaving only a remnant population in the impenetrable Everglades and Big Cypress swamps of south Florida.

Of the 27 *Puma concolor* subspecies described in Hall (1981), the Florida panther is the only one remaining in the eastern U.S. The population in Florida numbered about 500 at the turn of the century (Seal et al. 1989). Kautz (1994) estimated that a loss of 1.74 million hectares (4.3 million acres) of forests in Florida between 1936 and 1987 was the equivalent of 35 to 70 male panther home ranges and 100 to 200 female panther home ranges. The Big Cypress population was estimated at 125 in 1969 (DOI 1969) and a south Florida population at 92 in 1972 (Schemnitz 1972). The State of Florida declared the panther a game species in 1950 and an endangered species in 1958. The Florida Panther Act, a State law enacted in 1978, made killing the panther a felony.

The Service listed the panther as endangered in 1967 (32 FR 4001). Although there were prior consultations, the records on file in the Southwest Florida Suboffice contain only those consultations completed after 1980. Between June 3, 1980, and December 21, 1999, the Service has provided technical assistance on 32 projects; concluded informal consultation on 23 projects and concluded formal consultation on 40 projects affecting the panther and panther habitat in the action area. Five proposed actions, including the subject of this biological opinion, are currently being reviewed by the Service. Thirteen percent of these actions occurred between 1980 and 1989 (average 1.3 per year) while 87 percent occurred between 1990 and 1999 (average 8.7 per year). The highest number of actions reviewed was 22 in 1999. Several important consultations are summarized below.

On March 29, 1984, the Service provided a biological opinion to the Corps of Engineers on the proposed construction of an automobile test track, maintenance and office buildings on a 530-

acre tract located 11 miles northeast of the proposed action in sections 22, 27, and 34, T49S, R28E, Collier County, Florida. A ten-foot high chain-link fence, whether for product development security or to minimize the risk of panther/vehicle collisions, resulted in a loss of 530 acres of habitat. Habitat loss from the project footprint included three acres of hammock, 87 acres of pine flatwoods, and 40 acres of wetlands. Indirect impacts from disturbance and cumulative habitat losses were discussed but not quantified. The Service noted that "the loss of habitat has been and continues to be the greatest threat to the Florida panther" and concluded that the proposed action would not jeopardize the panther.

On February 21, 1985, the Service provided a biological opinion to the Federal Highway Administration on the conversion of two-lane State Road 84 to four-lane Interstate 75. The opinion covered I-75 from County Road 951 in Collier County to US 27 in Broward County, through 40 miles of known panther habitat, for a total distance of 76 miles. Habitat lost to the project footprint was not addressed. The opinion focused instead on a 1,000 percent increased risk of panther mortality from vehicle collisions. Proposals to construct an interchange at State Road 29 and recreational access points in Big Cypress National Preserve were tabled for future consultation. The Service noted that the Broward County segment would not adversely affect the panther and construction could proceed immediately, but the Collier County segment, without the recommended 25 crossings, 13 bridge extensions, and proper fencing, would jeopardize the panther.

On February 10, 1989, the Service provided a biological opinion to the Federal Highway Administration on the proposed interchange at State Road 29 and Interstate 75 in Collier County, Florida about 20 miles northeast of the proposed action. The project footprint would impact 85 acres of habitat. Indirect impacts included an increased potential for development of 25,600 acres of panther habitat along State Road 29 and an increased potential for injury and mortality of panthers from vehicle collisions (as of the date of consultation 38 percent of the road kills had occurred on State Road 29). The threat of development was reduced when the Collier County Board of Commissioners passed a resolution giving State and Federal agencies 60 days to review zoning variances requested of the board. The Florida Department of Transportation (FDOT) committed to provide wide, grassy shoulders on State Road 29 that would allow motorists a better chance to avoid collisions with panthers and they committed to posting panther warning signs with reduced nighttime speed limits. As a conservation recommendation the Service suggested that FDOT turn management authority of four square miles, the intersection lands, over to the appropriate State or Federal agency. The Service concluded that the project would not jeopardize the panther.

On December 31, 1991, the Service provided a draft jeopardy biological opinion to the Corps on the proposed improvement of Miller Boulevard Extension in sections 25 and 36, T51S, R27E in Collier County, Florida about seven miles southeast of the proposed action. Improvement of the one mile long dirt road would not result in direct impacts to the panther or panther habitat. Improvement of the extension, connecting Miller Blvd. proper with Highway 41, would have indirectly increased the potential for development of 50,000 acres in South Golden Gate Estates

by reducing travel time from Naples about 55 percent. The proposed action would also have increased the potential for injury and mortality of panthers from vehicle collisions. The Service was unable to provide any Reasonable and Prudent Alternatives. The County eventually withdrew the permit but continues to make, and table, improvement proposals.

On January 14, 1992, the Service provided a biological opinion to the Corps for a 32-acre citrus grove (Dooner Gulf Coast Citrus) and a water retention area on 40 acres within an 80-acre parcel located south of Immokalee Road (section 36) in Collier County, Florida about 12 miles north of the proposed action. The opinion stated that the project would "fall just short of the jeopardy threshold for the panther," noting the potential cumulative impact of conversion of native habitat to citrus and other agricultural land. The Service recommended that the applicant acquire and place under conservation easement and perpetual management, approximately 40 acres of land identified as high priority for panther protection. The Service also recommended that the grove detention pond not discharge into pine habitat on the remaining undeveloped 40 acres of the tract to avoid upland habitat impacts from flooding.

On February 23, 1993, the Service issued a jeopardy biological opinion on panther impacts associated with a permit application by Lee County Department of Transportation (DOT) to upgrade Corkscrew Road in southern Lee County, located 26 miles north of the proposed action. The Service in issuing its jeopardy opinion identified a wildlife crossing as reasonable and prudent alternative (RPA) to allow the applicant to proceed with the project while avoiding jeopardy to the panther. On June 18, 1993, the applicant agreed to implement the RPA and the Service determined that the modified action was not likely to jeopardize the panther. The dirt road was then paved by the county. No known vehicle/panther collisions have been reported.

On October 5, 1993, a jeopardy opinion was drafted for a proposed 1,000-acre housing development (The Habitat DRI), located 26 miles northwest of the proposed action, because of traffic and cumulative development impacts to the panther. As a result of modifications to the project proposal, including reduction in habitat impacts, site design changes, and proposed applicant funding of panther habitat acquisition, a jeopardy opinion for the panther was avoided.

On October 27, 1994, the Service provided biological opinions for the 760-acre Florida Gulf Coast University, the 787-acre Timberland & Tiburon DRI, and 60-acre Treeline Boulevard. The opinions determined that the projects would adversely affect but not jeopardize the panther and recommended speed zones on Corkscrew and Alico Roads, traffic management strategies to encourage speed zone compliance, posting wildlife crossing signs in panther habitat on Alico Road, Corkscrew Road, and Treeline Boulevard, day and night speed zones on Treeline Boulevard, initiation of a traffic compliance study, a local educational program under the leadership of the University, and a region-wide analysis of the cumulative impacts of growth on the environment and the panther. The Corps permit subsequently provided 560 acres of habitat purchase, habitat restoration, and management for the University and Treeline Boulevard (a $2 million commitment from Lee County). Approximately 400 acres of habitat acquisition to

minimize adverse effects to the panther was provided by the Corps permit issued for the Timberland & Tiburon DRI.

On August 7, 1995, the Service provided a biological opinion to the Corps for a proposed 36-hole golf course (Bonita Bay East Golf Course) on 1,000 acres located in sections 18, 19, and 20, T48S, R27E, Collier County, Florida about 14 miles north of the proposed action. The project footprint would impact about 129 acres of native habitat and 380 acres of improved pasture. The proposed action included preservation of 464 acres of native habitat (78 percent of 593 acres) and restrictions on night-time golf. The proposed action did not include housing. Based on this information, the Service concluded that the proposed action was not likely to adversely affect the panther.

On March 27, 1998, the Service provided a biological opinion to the Corps on the proposed expansion of Willow Run quarry in sections 11 through 14, T50S, R26E, Collier County, Florida about four miles north of the proposed action. The site of the proposed action, 549 acres, included 162 acres of existing mine, 288 acres of jurisdictional wetlands, and 99 acres of uplands. The proposed action would involve temporary impacts to 17 acres of wetlands and excavation of 104 acres of wetlands, including 36 acres of Priority 1 panther habitat. Wetland mitigation included restoration, enhancement, and preservation of 136 acres of wetlands and 54 acres of uplands. This land, about 190 acres of Priority 1 panther habitat, would be placed under easement to FDEP. The Service concluded that the proposed action would not jeopardize the panther. Suggested conservation recommendations included a panther education program for truck drivers at the quarry and reduced speed limits on the entrance road.

On November 9, 1998, the Service issued a biological opinion for the Daniels Parkway extension, 33 miles north of the proposed action, which would connect existing Daniels Parkway at Southwest Florida International Airport to Gunnery Road in southern Lehigh Acres. On September 3, 1999, the Service reinitiated consultation with the Corps in response to the Corp's July 30, 1999, request to amend the original biological opinion based on further project analysis by the applicant, Lee County DOT. The amended biological opinion, dated September 17, 1999, indicated that the effects to the panther resulting from the roadway would be minimized by a final plan to purchase and manage 94.4 acres of habitat in the CREW Ecological Unit to satisfy the 50.5 functional units of minimizing credits set forth in the November 1998 opinion.

On December 8, 1999, the Service issued a non-jeopardy biological opinion to the Corps for the proposed development, by Kaufmann Holdings, Inc., of a 47-lot rural subdivision on 239 acres in section 32, T48S, R27E, Collier County, Florida about 13 miles north of the proposed action. Effects to the panther were minimized by a plan to purchase, preserve, and manage at least 24 acres of forested land in, or adjacent to, the Corkscrew Regional Ecosystem Watershed project.

On April 17, 2000, the Service issued a non-jeopardy biological opinion to the Corps for the proposed development of a 1,323-acre mixed use residential golf course community by Miromar Development, Inc. in sections 11 through 14, 23, and 24, T46S, R25E, and sections 18 and 19,

T46S, R26E, Lee County, Florida about 28 miles northwest of the proposed action. Effects to the panther were minimized by a plan to purchase, preserve, and manage, in perpetuity, the functional equivalent of 194 acres of Priority I panther habitat adjacent to existing public lands.

Status of the species within the action area

The uncertain status of the panther led to the establishment of a GFC Florida Panther Record Clearinghouse in the 1970s. Records were compiled prior to extensive field surveys and radiotelemetry research of remaining animals (Belden 1977). The first field surveys began in 1972. Radiotelemetry research began in 1981 and through 1983 was limited to Fakahatchee Strand State Preserve and Big Cypress National Preserve (Belden et al. 1988). The research program gradually expanded to include Everglades NP, Florida Panther NWR, Picayune Strand State Forest, Okaloacoochee Slough State Forest, the Corkscrew Regional Ecosystem Watershed, and private lands in Collier, Hendry, and Lee counties. A total of 79 panthers (44 male, 35 female) have been radio-collared since telemetry research began in 1981. As of June 30, 1999, there were 27 panthers (14 male, 13 female) being monitored (Land *et al.* 1999).

Ten Florida panther kittens, five male and five female, were removed from the wild between February 1991 and August 1992 for captive breeding purposes. The kittens ranged in age from ten days to eight months and represented progeny of 11 different adult panthers. Two females died in captivity in 1992. One died after heart surgery in an attempt to correct an atrial septal heart defect and one died of unknown causes. Two captive males died of severe respiratory distress after being released to the wild in southern Big Cypress National Preserve in 1997. Six panthers remain in permanent captivity, one male and one female each, at White Oak Conservation Center in Yulee, FL, Lowry Park Zoo in Tampa, and at the Jacksonville Zoo (Land and Taylor 1998).

The Picayune Strand State Forest, Fakahatchee Strand State Preserve, Florida Panther National Wildlife Refuge, Big Cypress National Preserve, Big Cypress Seminole Indian Reservation, and ranches located in southern Hendry County and northeastern Collier County provide a contiguous landscape that supports the only extant breeding puma population east of the Mississippi River.

The Belle Meade and South Golden Gate Estates Ecological Units represent three percent, or 82,846 acres, of the occupied range of the panther and together they support 11 percent, or seven of 61, panthers known to the Service. The proposed action is located approximately 11 miles southwest of the Florida Panther National Wildlife Refuge, a 26,000-acre tract acquired in 1989 for panther recovery.

Factors affecting species environment within the action area

Several factors that affect the species environment within the action area include but are not limited to highway, urban, agriculture, resource extraction, and land management (prescribed

fire, water) projects. These activities often result in habitat loss, habitat fragmentation, and habitat degradation.

EFFECTS OF THE ACTION

Factors to be considered

The disturbance intensity, or amount of panther habitat affected by the proposed action, at the population level is 688 acres, or less than three one-hundredths of one percent, of an estimated 2.2 million acres occupied by the panther (Land *et al.* 1999). The disturbance intensity at the local level is nine-tenths of one percent of the 75,000-acre Picayune Strand State Forest. The disturbance intensity at the individual level is 0.5 percent and 1.5 percent of the average home range of a male and female panther respectively. Transferring title of 320 acres of Priority 1 panther habitat (Logan *et al.* 1993) to the State of Florida will minimize adverse effects to the panther by protecting that land from future development. The disturbance severity, or effect of the project as a function of the rate of recovery, is negligible if genetic restoration of the panther is successful and sufficient lands are protected from development and managed in perpetuity for the panther. Multiple actions of lesser, equal, or greater disturbance intensity and severity in the vicinity of the proposed action, and throughout the action area, may result in adverse effects to the panther population.

The proposed action is located adjacent to the 75,000-acre Picayune Strand State Forest which is part of a contiguous system of south Florida public lands that includes Fakahatchee Strand State Preserve, Florida Panther National Wildlife Refuge and Big Cypress National Preserve. Picayune Strand State Forest and surrounding lands, including the site of the proposed action, are located on the rapidly developing urban fringe of Collier County about 25 miles from the geographic center of the panther population.

Picayune Strand State Forest has been used by 18 radio-collared panthers, 13 male and five female, since 1981. The number using the area has ranged from a low of one in 1981, when telemetry research first began, to a high of nine in 1997 and 1998. As of now there are at least seven radio-collared panthers using Picayune Strand State Forest. Telemetry data represent the annual range and movements of radio-collared panthers and not that of uncollared panthers which may have been, or could be, present in the vicinity of the proposed action. Telemetry data are gathered three times per week, or on 43 percent of the days during which the animal may be wearing a functional radio-collar. Telemetry data are collected between sunrise and mid-day and primarily reflect a panther's choice of day rest sites, or maternal den sites. Mating and denning behavior, aggressive encounters between males, movements and home range shifts, dispersal, survival, recruitment, displacements and replacements of individuals, and other social and ecological interactions are interpreted from telemetry data and field investigations (Land *et al.* 1999). Panthers are crepuscular, wide-ranging and, based on the frequency and proximity of telemetry data, the likelihood is high that they have used the site of the proposed action which

has 168 acres of forested habitat and 444 acres of farm fields which may support white-tailed deer and hogs (especially when the fields lie fallow).

Human activity is currently limited to the seasonal planting and harvesting of row crops. During years when the fields lie fallow, human activity is greatly reduced to non-existent. Trespass by humans is intermittent. The proposed action will result in a permanent human population of 1,300 to 1,400 persons at 2.5 persons per housing unit.

There are about 11,840 acres between the Belle Meade Ecological Unit, County Road 951 on the west, and U.S. Highway 41 on the south (Figure 4) that provide panther forage and dispersal habitat. Forty-three percent of this land is designated *urban residential fringe* and zoned for development at 1.5 units per acre or a total of 7,600 units. The remaining 57 percent is designated *agriculture* and zoned for development at one housing unit per five acres or a total of 1,350 units. Denser urban development in the vicinity of the proposed action is contingent on a zoning variance. Based on information provided by the applicant the proposed action will have 500 to 550 units. The site of the proposed action is zoned 50 percent *urban residential fringe* and 50 percent *agriculture*. Based on the Collier County Land Development Code the proposed action has a maximum allowable density of 300 units.

Eleven percent of the 11,840 acres has been developed for urban uses. Eighteen percent has been developed for small scale agriculture and low density urban uses mixed with native habitats. Forty-three percent has been converted to farm fields interspersed with native habitats (forested and herbaceous wetlands that were incorporated as water detention systems for the crops). These native habitats have been used by the panther. The remaining 28 percent of the 11,840 acre area is comprised of native upland and wetland habitats that have also been used by the panther.

Occupied panther habitat is about evenly divided between public and private lands. If private land habitats are lost the existing public lands in south Florida are judged capable of supporting only nine to 22 (Maehr 1990b) of the minimum 50 adult panthers needed to sustain a genetically viable population (Seal *et al.* 1989). Soils on public lands are lower in quality than soils on private lands. Current and historic rates of private land conversion to agricultural and urban development continue a trend of habitat loss, degradation, and fragmentation. Studies have concluded that panther reintroduction in north Florida is biologically feasible but that complex social issues must first be addressed (Belden and Hagedorn 1993, Belden and McCown 1996).

Analyses for effects of the action

The proposed action will (1) contribute to the permanent loss and fragmentation of panther habitat, (2) contribute to the permanent loss and fragmentation of habitat that supports panther prey, (3) limit the available habitat for dispersing sub-adult panthers, potentially contributing to an increase in intraspecific aggression between, and an increase in mortality of, sub-adult male panthers, and (4) restrict the geographic distribution and reproductive success of the species.

The Belle Meade Ecological Unit comprises 40,846 acres or 1.4 percent of the occupied range of the panther. The proposed action, located on the southwestern edge of occupied panther range, will directly affect 688 acres of habitat at the urban-wildland interface and indirectly affect 145 acres of adjacent habitat on the west, north, east, and south sides of the proposed action. The indirect effects to adjacent habitat include avoidance or reduced use of 300 feet surrounding the site of the proposed action by panther prey and the panther due to lights and noise. The extent of avoidance due to free-ranging dogs has not been measured.

Loss of forage habitat will reduce the carrying capacity of occupied panther range. Loss of dispersal habitat will decrease the likelihood that a dispersing sub-adult male panther can survive long enough to be assimilated into the breeding population. Four sub-adult male panthers using Picayune Strand State Forest between 1986 and 1993 perished before they could be recruited into the breeding population. Anthropogenic disturbances may deter use of adjacent habitat by panthers. Panther activity increases from the site of the proposed action northeast toward the geographic center of the population.

Panther habitat impact analysis

The 688-acre site of the proposed action is comprised of about 168 acres of forests, 444 acres of farm fields with the balance in herbaceous wetlands, ditches, etc. Fifty percent of the occupied range of the panther is found on private land in eastern Collier County and southern Hendry County where native habitats are interspersed with agricultural land uses such as row crops, citrus, sugar cane, and pasture. Telemetry data is concentrated in large areas of contiguous forest, less concentrated in areas where forest and agricultural land uses are mixed, and almost non-existent in areas where the human population density exceeds ten persons per square mile (Service, unpublished data). Although used less than many native habitat types, agricultural lands are part of a regional landscape that supports the panther. Agricultural lands may provide habitat for panther prey, buffer panther habitat from urban uses, and under certain conditions may revert to native habitats preferred by the panther. In an agricultural state, they retain an ability to be restored should restoration be required for the survival and recovery of the panther. Once developed for urban uses the potential for restoration, capacity to buffer, and capacity to support prey and the panther is lost. In addition, the proposed action will indirectly affect adjacent suitable habitat.

Species response to the proposed action

The proposed action will reduce the panther's ability to feed, breed, and shelter on 688 acres of forested and agricultural land. The proposed action will reduce the abundance of panther prey and the ability of the panther to forage on an additional 145 acres due to the indirect effects of noise and lighting associated with the development. Loss of 688 acres of habitat and degradation of 145 acres of habitat may decrease the likelihood that a dispersing sub-adult male panther can survive long enough to be assimilated into the breeding population, thus potentially reducing the reproductive success and genetic health of the population.

Transferring 320 acres of Priority 1 panther habitat (Logan *et al.* 1993) within the boundary of the Picayune Strand State Forest to the State of Florida will protect that site from future development. Adverse effects to the panther will be minimized by providing a contiguous landscape for the panther to feed, breed, and find shelter, and by providing opportunities for recovery-oriented research and management activities on public-owned lands.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Anticipated future actions in the action area that will degrade, fragment, or directly eliminate panther habitat include:

1. Population Growth - The human population of Florida has doubled every 20 years since 1830 and has now reached 13 million, with over 50 percent residing in south Florida. Florida's population, fourth largest in the United States, is expected to reach 17.8 million (127 persons per km^2) by 2010 (Floyd 1997). The population of south Florida exceeded one million (130 persons per km^2) in 1950, three million (391 persons per km^2) in 1970, and six million (780 persons per km^2) in 1990. The population growth rate of south Florida has exceeded the statewide average since 1960. South Florida's population is projected to reach 8.2 million (1,070 persons per km^2) by 2010 (Floyd 1997). One example illustrating the connection between human population growth, habitat loss, fragmentation, and degradation can be seen in a 5,986 square mile area of southwest Florida, *i.e.* Charlotte, Collier, Glades, Hendry, Lee and Sarasota counties. Between 1975 and 1993 the amount of urban land and transitional land cleared and prepared for development increased from 641 square miles or 11 percent to 1,372 square miles or 23 percent (SWFRPC 1995).

2. Land Clearing - Clearing or timbering of upland habitat for grazing, vegetable crop production (primarily tomatoes, peppers, squash, watermelon), citrus production, and nurseries is common in the action area. These uses require only a Notice of Clearing or clearing permit from Collier County and may be exempt from stringent wetland regulation or only require a surface water management or water use permit from the SFWMD. Lands on, and adjacent, to the site of the proposed action include uplands that have been cleared for agricultural uses. Panther activity is lower on agricultural lands than native lands however agricultural lands can, and may need to, be restored to a native condition to achieve panther recovery goals. Conversion of agricultural lands to urban uses precludes this opportunity.

3. SFWMD Permits - The SFWMD is responsible for permitting the construction, alteration, operation, maintenance, removal and abandonment of surface water management systems within its jurisdictional boundaries (SFWMD 1996). The SFWMD has issued 382 surface water management permits or ground water use permits covering 384,000 hectares (948,480

acres) or 64 percent of the Immokalee Rise Physiographic Region (Mazzotti *et al.* 1992), *i.e.* approximately 64 percent of the occupied panther range in private ownership.

4. Subsequent intensification of uses on lands where initial habitat clearing occurred under agricultural uses. Most single-family home construction and some low-density "ranchette" style subdivisions do not trigger re-zoning thresholds or more intensive local development regulation instituted under local growth management provisions. Other than local building permits, no additional permits from, or notification to, State or Federal permitting agencies is required.

5. Mining - Eighty-five percent of 17,500 acres zoned and approved, as of December 1992, for commercial excavation in eastern Lee County is Priority 2 panther habitat. Similar figures are not available for Collier County but commercial excavation is permitted as a conditional use in the rural agriculture district (Land Development Code 2.2.2.3.1). Small mines proposed on previously cleared land with no wetlands are a harbinger of future urban development in the rural agriculture district.

6. Golf Courses - Lee County Commissioners approved a county growth plan amendment in June 1999 that would allow golf course development on 22,000 acres of Priority 2 panther habitat in the CREW ecological unit. In Collier County golf course development is permitted in the rural agriculture district (Land Development Code 2.2.2.2.2.10). Growth management critics see this as a loophole that permits urban development outside the designated urban boundary. Five of twenty golf courses constructed in Collier County since 1995 are located in the rural agriculture district; Bonita Bay East, 36 holes, 1,000 acres; Forest Glen, 18 holes, 640 acres; and Twin Eagles, 36 holes, 1,115 acres. As the number of vacant tracts 300 acres or larger within the urban boundary diminishes the likelihood of golf course development on rural lands inhabited by the panther increases. A strong local and regional housing market and low land prices favor development in the rural agriculture district. Land already converted to agricultural uses, and with minimal or no wetlands, are prime candidates for development.

7. State and County Road Projects - New roads and road extensions create development opportunities. Road improvements, from dirt to pavement and from 2-lanes to 4-lanes, may increase the potential profit, and therefore the likelihood, of roadside development. A 33 meter (108 foot) and 100 meter (328 foot) cleared right-of-way would consume, respectively, 1.9 and 5.7 percent of each section of land through which it passes (Ruediger 1998). Highways stimulate more land development than is generally recognized. Change occurs as far away as 3.2 km on either side of the highway. Thus for each kilometer a highway is extended, 644 hectares (1,590 acres) are opened to new development (Wolf 1981). Concurrent with road and land development motor vehicle registrations have increased 374, 267, and 371 percent in Collier, Hendry, and Lee counties respectively between 1974 and 1992 (SWFRPC 1995). Proposed road projects of concern include the proposed improvement of Miller Boulevard Extension and Sabal Palm Road from dirt to pavement in

the Belle Meade Ecological Unit and the proposed extension of County Road 951 from it's terminus at Immokalee Road in Collier County to Corkscrew Road in Lee County. State Road 80 in Hendry County will eventually require the addition of two lanes to handle increased cross-state traffic. Increased development along an improved State Road 80 could restrict panther dispersal into central Florida.

8. An increase in disturbances related to increased human presence and development in the action area. Noise, lighting, pollution, pet and human disturbance may contribute to behavioral changes, such as habitat avoidance, for the panther in the action area.

CONCLUSION

The disturbance intensity, or amount of panther habitat affected by the proposed action, at the population level is 688 acres, or less than three one-hundredths of one percent, of an estimated 2.2 million acres occupied by the panther (Land *et al.* 1999). The disturbance intensity at the local level is nine-tenths of one percent of the 75,000-acre Picayune Strand State Forest. The disturbance intensity at the individual level is 0.5 percent and 1.5 percent of the average home range of a male and female panther respectively.

After reviewing the current status of the panther, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the development of Naples Reserve Golf Club, as proposed, is not likely to jeopardize the continued existence of the panther. No critical habitat has been designated for this species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

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

The measures 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 Vineyards Development Corporation, 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 Vineyards Development Corporation 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 Vineyards Development Corporation must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

Amount or extent of take anticipated

The Service anticipates incidental take of panthers associated with the direct loss of 688 acres of panther habitat and the degradation, or indirect loss, of 145 acres of habitat surrounding the site of the proposed action. Incidental take should be minimized by implementation of the following reasonable and prudent measures. The incidental take is expected to be in the form of harm and harassment.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of 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.

Reasonable and prudent measures

The Service believes the Corps and the applicant have incorporated all reasonable and prudent measures necessary and appropriate to minimize impacts of incidental take of panthers into the design of the proposed action. In summary, the Corps and the applicant will ensure that no more than 688 acres of panther habitat will be lost and that no more than 145 acres will be degraded as a result of implementation of the proposed action.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measure described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The Corps will include as special conditions to the DA permit the conservation measures listed in the description of the proposed action (page 5) to preserve and manage high quality panther habitat which are necessary and appropriate to minimize incidental take of panthers by the proposed action.

2. The Corps will provide a copy of the final DA permit to the Service upon issuance. The Corps will monitor the DA 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 one year of the date of the DA permit.

3. Upon locating a dead, injured, or sick panther specimen, initial notification must be made to the nearest Service Law Enforcement Office (Mr. Vance M. Eaddy; Fish and Wildlife Service; 9549 Koger Blvd., Suite 111; St. Petersburg, Florida 33702; 727-570-5398). Secondary notification should be made to the Florida Fish and Wildlife Conservation Commission; South Region, 3900 Drane Field Road, Lakeland, Florida, 33811-1299; 1-800-282-8002. 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.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that panthers associated with the loss off 688 acres of habitat and the degradation of 145 acres of habitat will be incidentally taken. 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 ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Develop and provide homeowners with an information pamphlet on the Picayune Strand State Forest and pertinent State law regarding forest management at the urban-wildland interface.

2. Develop and provide homeowners with an information pamphlet on the Florida panther and the Florida Panther Habitat Preservation Plan, in cooperation with the FWC and the Service.

3. The Corps is encouraged to meet with the Service to discuss potential panther conservation opportunities regarding the Corps permitting program and Florida panther habitat.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects of benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the Vineyards Development Corporation (Naples Reserve Golf Club) project. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) 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; (3) 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; 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.

If you have questions regarding this biological opinion, please contact Andrew C. Eller, Jr. of our Southwest Florida Suboffice in Naples, Florida, at (941) 353-2814 or me at (561) 562-3909 extension 234.

Sincerely yours,

James J. Slack

James J. Slack
Field Supervisor
South Florida Ecological Services Office

cc:
Corps, Jacksonville, FL (Ron Silver)
Corps, Ft. Myers, FL (Skip Bergman)
Development Review Services, Naples, FL (Barbara Bergerson)
DOF, Naples, FL (Sonja Durrwachter)
EPA, West Palm Beach, FL (Beth Burger)
FWC, Naples, FL (Darrell Land)
FWC, Punta Gorda, FL (Jim Beever)
FWC, Tallahassee, FL (Brad Hartman)
SFWMD, Ft. Myers, FL (Karen Johnson)
Service, Ecological Services-Naples, FL (Jim Krakowski)
Service, Ecological Services-Naples, FL (Andrew C. Eller, Jr.)
Service, Ecological Services-Jacksonville, FL
Service, Ecological Services-Atlanta, GA (Noreen Walsh)
Service, Florida State Supervisor-Ecological Services, Vero Beach, FL
Vineyards Development Corporation

LITERATURE CITED

Ackerman, B.B. 1982. Cougar predation and ecological energetics in southern Utah. M.S. Thesis, Utah State University, Logan, Utah *in* F.G. Van Dyke, R.H. Brocke, H.G. Shaw, B.B. Ackerman, T.P. Hemker, F.G. Lindzey. 1986. Reactions of mountain lions to logging and human activity. J. Wildlife Management 50(1):95-102.

Bangs, O. 1899. The Florida Puma. Proceedings of the Biological Society of Washington. 13:15-17.

Barone, M.A., M.E. Roelke, J. Howard, J.L. Brown, A.E. Anderson, and D.E. Wildt. 1994. Reproductive characteristics of male Florida panthers: comparative studies from Florida, Texas, Colorado, Latin America, and North American zoos. Journal of Mammalogy 75(1):150-172.

Barr, M.C., P.P. Calle, M.E. Roelke, and F.W. Scott. 1989. Feline immunodeficiency virus infection in nondomestic felids. Journal of Zoo and Wildlife Medicine 20 (3):265-272.

Belden, R.C. 1977. If you see a panther. Florida Wildlife. September-October 1977.

Belden, R.C. 1986. "Florida Panther Recovery Plan Implementation - A 1983 Progress Report", pp. 159-172 in S.D. Miller and D.D. Everett (eds.), Cats of the world: Biology, Conservation and Management, Proceedings of the Second International Cat Symposium. Caesare Kleberg Wildlife Reserarch Institute. Kingsville, Texas.

Belden, R.C. 1988. "The Florida Panther" in Audubon Wildlife Report. 1988/1989. National Audubon Society, New York, NY. 515-532.

Belden, R.C., W.B. Frankenberger, R.T. McBride, and S.T. Schwikert. 1988. Panther habitat use in southern Florida. Journal of Wildlife Management 52(4):660-663.

Belden, R.C., and B.W. Hagedorn. 1993. Feasibility of translocating panthers into northeast Florida. Journal of Wildlife Management 57(2):338-397.

Belden, R.C., and J.W. McCown. 1996. Florida panther reintroduction feasibility study. Final report, July 1, 1992 to June 30, 1995. Study Number 7507, Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Cory, C.B. 1896. Hunting and fishing in Florida. Estes and Lauriat: Boston, Massachusetts.

Dees, C.S., J.D. Clark and F. T. van Manen. 1999. Florida panther habitat use in response to prescribed fire at Florida Panther National Wildlife Refuge and Big Cypress National Preserve. Final Report. University of Tennessee, Knoxville, Tennessee.

Duever, M.J., J.E. Carlson, J.F. Meeder, L.C. Duever, L.H. Gunderson, L.A. Riopelle, T.R. Alexander, R.F. Myers, and D.P. Spangler. 1979. Resource inventory and analysis of the Big Cypress National Preserve. Final Report to the National Park Service, University of Florida, Gainesville, and National Audubon Society Ecosystem Research Unit, Naples, Florida. 2 volumes.

Dunbar, M.R. 1993. Florida panther biomedical investigation. Annual Performance Report, July 1, 1992-June 30, 1993. Study No. 7506. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Floyd, S.S., Editor. 1997. Florida Statistical Abstract. Bureau of Economic and Business Research, Warrington College of Business Administration, University of Florida, Gainesville, Florida.

Forrester, D.J., J.A. Conti, and R.C. Belden. 1985. Parasites of the florida panther (Felis concolor coryi). Proceedings Helminthological Society, Washington, D.C. 52(1):95-97

Hall, E.R. 1981. The mammals of North America Volume II. The Ronald Press Company; New York, New York.

Halls, Lowell K., ed. 1984. White-tailed deer, ecology and management. The Wildlife Management Institute; Washington, D.C.

Harlow, R.F. 1959. An evaluation of white-tailed deer habitat in Florida. Florida Game and Fresh Water Fish Commission. Tech. Bull. 5:1-64.

Harris, L.D. 1985. The fragmented forest. University of Chicago Press; Chicago, Illinois.

Janis, M.W. and J.D. Clark. 1999. The effects of public use on the behavior of Florida panthers at Big Cypress National Preserve. University of Tennessee, Knoxville, Tennessee.

Jordan, D.B. 1997. Telephone communication. January 9, 1997.

Kautz, R.S. 1993. Trends in Florida wildlife habitat 1936-1987. Florida Scientist 56(1):7-24.

Kautz, R.S. 1994. Historical Trends Within the Range of the Florida Panther *in* Proceedings of the Florida Panther Conference, Dennis B. Jordan, Editor. Florida Panther Interagency Committee, November 1-3, 1994.

Land, E.D. 1994. Response of the wild Florida panther population to removals for captive breeding. Final Report, Study Number 7571. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Land, E.D. and S.K. Taylor. 1998. Florida panther genetic restoration and management. Annual report, Study Number 7508. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Land, E.D., M. Lotz, D. Shindle, and S.K. Taylor. 1999. Florida panther genetic restoration and management. Annual report, Study Number 7508. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Lasley, M.F.W. 1978. Genetics of livestock improvement. Third ed. Prentice-Hall, Englewood Cliffs, New Jersey.

Logan, T.J., A.C. Eller, Jr., R. Morrell, D. Ruffner, and J. Sewell. 1993. Florida panther habitat preservation plan - south Florida population. Prepared for the Florida Panther Interagency Committee.

Lotz, M.A., E.D. Land, and K.G. Johnson. 1996. Evaluation of State Road 29 wildlife crossings. Final Report, Study No. 7853. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Maehr, D.S. 1989. Florida panther road mortality prevention. Final Performance Report, Study No. 7502. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Maehr, D.S. 1990a. Florida panther movements, social organization, and habitat utilization. Final Performance Report, Study No. 7502. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Maehr, D.S. 1990b. The Florida panther and private lands. Conservation Biology 4 (2):167-170.

Maehr, D.S. 1992a. Florida panther. *In* Rare and Endangered Biota of Florida. Volume I: Mammals. S. R. Humphrey, (ed.). University Press of Florida, Gainesville, Florida.

Maehr, D.S. 1992b. Florida panther distribution and conservation strategy. Final Report, Study No. 7572. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Maehr, D.S. 1993. Response to the wild Florida panther population to removals for captive breeding. Final Report, Study No. 7571. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Maehr, D.S. 1997. The comparative ecology of bobcat, black bear, and Florida panther in south Florida. Bulletin of the Florida Museum of Natural History. University of Florida, Gainesville, Florida.

Maehr, D.S. 1998. University of Kentucky. Letter dated August 25, 1998.

Maehr, D.S., J.C. Roof, E.D. Land, and J.W. McCown. 1989a. First reproduction of a panther (*Felis concolor coryi*) in Southwest Florida. U.S.A. Mammalia 25:37-38.

Maehr, D.S., E.D. Land, J.C. Roof, and J.W. McCown. 1989b. Early maternal behavior in the Florida panther (*Felis concolor coryi*). Am. Midl. Nat. 122:34-43.

Maehr, D.S., R.C. Belden, E.D. Land, and L. Wilkins. 1990a. Food habits of panthers in southwest Florida. Journal of Wildlife Management 54:420-423.

Maehr, D.S., E.D. Land, J.C. Roof, and J.W. McCown. 1990b. Day beds, natal dens, and activity of Florida panthers. Proceedings of the Annual Conference of Southeast Fish and Wildlife Agencies 44:000-000.

Maehr, D.S., E.D. Land, and J.C. Roof. 1991a. Social ecology of Florida panthers. National Geographic Research & Exploration 7 (4):414-431.

Maehr, D.S., E.D. Land, and M.E. Roelke. 1991b. Mortality patterns of panthers in southwest Florida. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 45:201-207.

Maehr, D.S. and Cox, J.A. Oct. 1995. Landscape Features and Panthers in Florida. Conservation Biology 9(5):1008-1019.

Maehr, D.S., R.C. Lacey, E.D. Lande, O.L. Bass, and T.S. Hoctor. 1999. A reassessment of Florida panther population viability analysis and recovery efforts from multiple perspectives. Paper presented at Population Viability Analysis: Assessing Models for Recovering Endangered Species. University of California, Berkeley and The Wildlife Society. San Diego, California. March 15-16, 1999.

Mazzotti, F.J., L.A. Brandt, L.G. Pearlstine, W.M. Kitchens, T.A. Obreza, F.C. Depkin, N.E. Morris, and C.E. Arnold. 1992. An evaluation of the regional effects of new citrus development on the ecological integrity of wildlife resources in southwest Florida. Final report. South Florida Water Management District; West Palm Beach, Florida.

O'Brien, S.J., M.E. Roelke, L. Marker, A. Newman, C.A. Winkler, D. Meltzer, L. Colly, J.F. Evermann, M. Bush, and D.E. Wildt. 1985. Genetic basis for species vulnerability in the cheetah. Science 227:1428-1434.

Rails, K., and J. Ballou. 1982. Effects of inbreeding on infant mortality in captive primates. International Journal of Primatology 3:491-505.

Roelke, M.E. 1990. Florida panther biomedical investigations. Final Performance Report, July 1, 1986 - June 30, 1990. Study No. 7506. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Roelke, M.E. 1991. Florida panther biomedical investigation. Annual Performance Report, July 1, 1990-June 30, 1991. Study No. 7506. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Roelke, M.E. and C.M. Glass. 1992. Florida panther biomedical investigation. Annual Performance Report, Endangered Species, Project E-I 11-E-7 7506. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Roelke, M.E., J.S. Martenson, and S.J. O'Brien. 1993. The consequences of demographic reduction and genetic depletion in the endangered Florida panther. Current Biology 3:340-350.

Ruediger, B. 1998. Rare carnivores and highways moving into the 21 st century. Pages 10-16 in Evink, G.L., P. Garrett, and J. Berry, eds. Proceedings of the international conference on wildlife ecology and transportation. FL-ER-69-98, Florida Department of Transportation, Tallahassee, Florida.

Schemnitz, S.D. 1972. Distribution and abundance of alligator, bear, deer, and panther in the Everglades Region of Florida. Report to the Florida Game and Fresh Water Fish Commission, Ft. Lauderdale, Florida in fulfillment of contract No. 14-16-0004-308.

Seal, U.S., R.C. Lacy, and Workshop Participants. 1989. Florida panther viability analysis and species survival plan. Report to the U.S. Fish and Wildlife Service, by the Conservation Breeding Specialist Group, Species Survival Commission, IUCN; Apple Valley, Minnesota.

Seal, U.S., R.C. Lacy, and Workshop Participants. 1992. Genetic management strategies and population viability of the Florid panther. Report to the U.S. Fish and Wildlife Service, by the Conservation Breeding Specialist Group, Species Survival Commission, IUCN; Apple Valley, Minnesota.

Seal, U.S. and Workshop Participants. 1994. A plan for genetic restoration and management of the Florida panther (*Felis concolor coryi*). Report to the Florida Game and Fresh Water Fish Commission, by the Conservation Breeding Specialist Group, Species Survival Commission, IUCN; Apple Valley, Minnesota.

Service (U.S. Fish and Wildlife Service). 1967. Endangered and threatened wildlife. *Federal Register* Vol. 32: 4001. March 11, 1967.

Service (U.S. Fish and Wildlife Service). 1987. Florida Panther (*Felis concolor coryi*) recovery plan. Prepared by the Florida panther interagency committee for the U. S. Fish and Wildlife Service; Atlanta, Georgia.

Service (U.S. Fish and Wildlife Service). 1994b. Final Environmental Assessment - Genetic restoration of the Florida panther. Atlanta, Georgia.

Service (U.S. Fish and Wildlife Service). 1995. Second revision Florida panther recovery plan; Atlanta, Georgia.

Service (U.S. Fish and Wildlife Service). 1999. Multi-species recovery plan for south Florida. U.S. Fish and Wildlife Service, Vero Beach, Florida.

South Florida Water Management District (SFWMD). 1996. Basis of Review for Environmental Resource Permit Applications Within the South Florida Water Management District. West Palm Beach, Florida.

Southwest Florida Regional Planning Council (SWFRPC). 1995. Strategic Regional Policy Plan of the Southwest Florida Regional Planning Council. North Fort Myers, Florida.

Smith, G. 1970. Mystery cat. Florida Wildlife 24 (3):4-6.

Taylor, Sharon. 1997. Florida panther biomedical investigations. Annual report, Study Number 7506. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Terborgh, J. 1988. The big things that run the world - a sequel to E. O. Wilson. Conservation Biology 2:402-403.

Tinsley, J.B. 1970. The Florida panther. Great Outdoors Publishing Company; St. Petersburg, Florida.

Townsend, D. 1991. An economic overview of the agricultural expansion in southwest Florida. Unpublished report on file at South Florida Field Office, U.S. Fish and Wildlife Service, Vero Beach, Florida.

U.S. Department of the Interior [DOI]. 1969. Environmental impact statement of the Big Cypress Swamp jetport. Washington, D.C.

Van Dyke, F.G. 1983. A western study of cougar track surveys and environmental disturbances affecting cougars related to the status of the eastern cougar *Felis concolor couguar*. Ph.D. Thesis, State University, New York, Syracuse *in* F.G. Van Dyke, R.H. Brocke, H.G. Shaw, B.B. Ackerman, T.P. Hemker, F.G. Lindzey. 1986. Reactions of mountain lions to logging and human activity. J. Wildlife Management 50(1):95-102.

Van Dyke, F.G., R.H. Brocke, H.G. Shaw, B.B. Ackerman, T.P. Hemker, F.G. Lindzey. 1986. Reactions of mountain lions to logging and human activity. J. Wildlife Management 50(1):95-102.

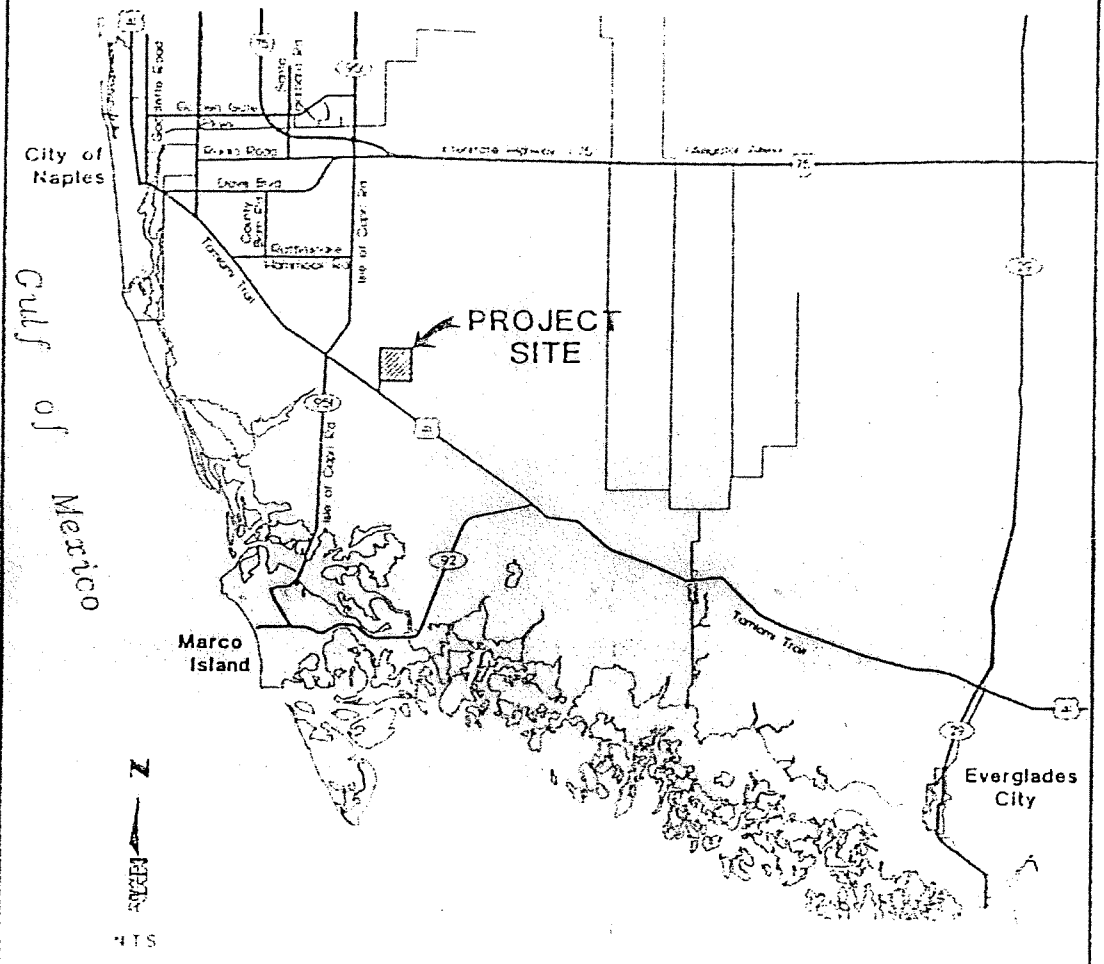
Wildt, D.E., E.J. Baas, P.K. Chakraborty, T.L. Wolfle, and A.P. Stewart. 1982. Influence of inbreeding on reproductive performance, ejaculate quality and testicular volume in the dog. Theriogenology 17:445-452.

Williams, M. 1990. Americans & their forests, a historical geography. Cambridge University Press; New York, New York.

Wolf, P. 1981. Land in America: its value, use and control. Pantheon Books; New York.

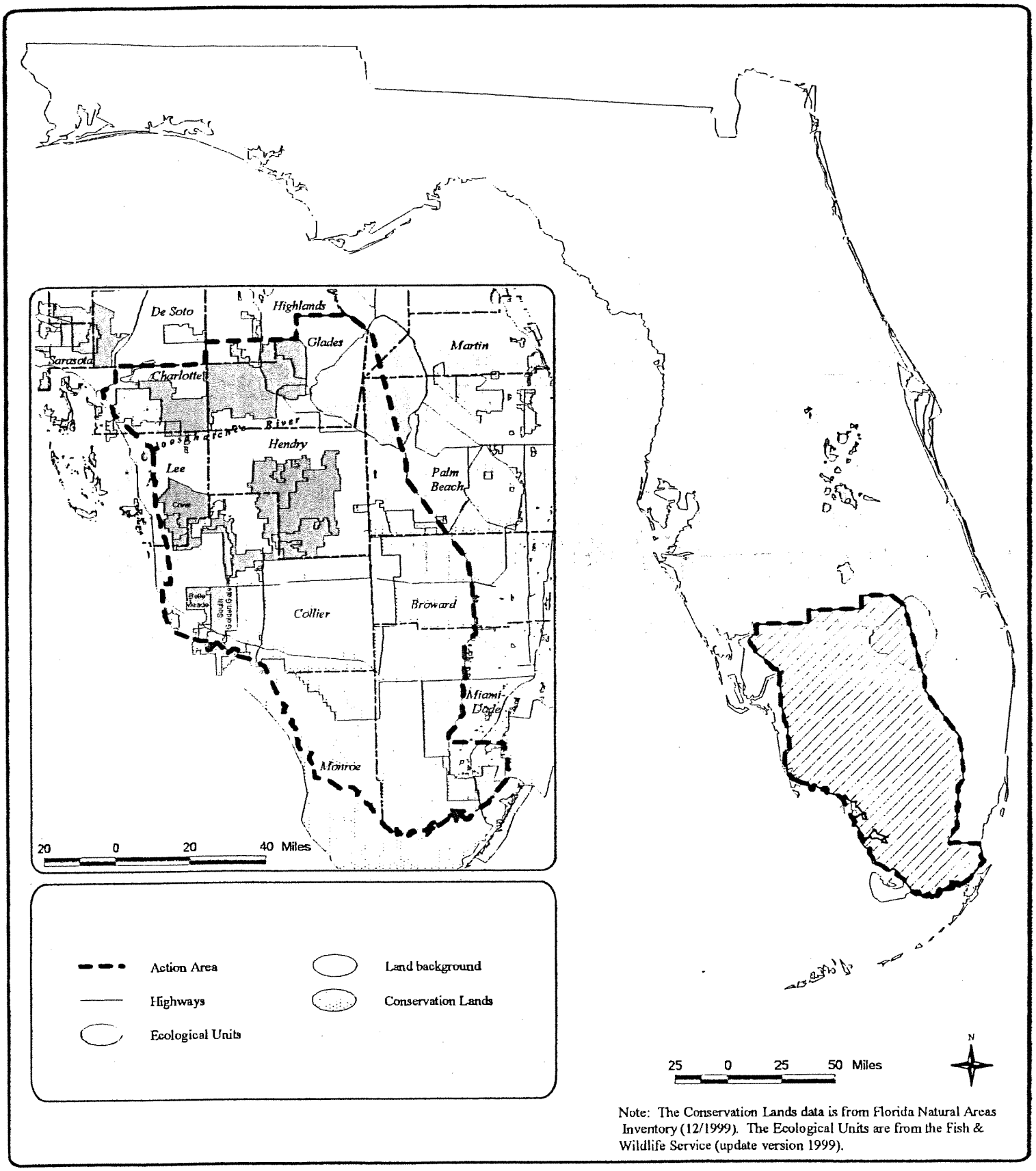
Young, S.P. and E.A. Goldman. 1946. The Puma - Mysterious American Cat. Dover Publications, Inc.. New York, New York.

Figure 1. The location of the proposed action.



19990619(IP-SB) Naples Reserve July 28, 1999 1 of 10	Naples Reserve Golf Club	PURPOSE: VICINITY MAP WATER BODY: COUNTY: COLLIER	CHECKED BY: CHN DRAWN BY: LMF DATE: 4/99

Figure 2
Naples Reserve Golf Club,
Biological Opinion
Action Area



Note: The Conservation Lands data is from Florida Natural Areas Inventory (12/1999). The Ecological Units are from the Fish & Wildlife Service (update version 1999).

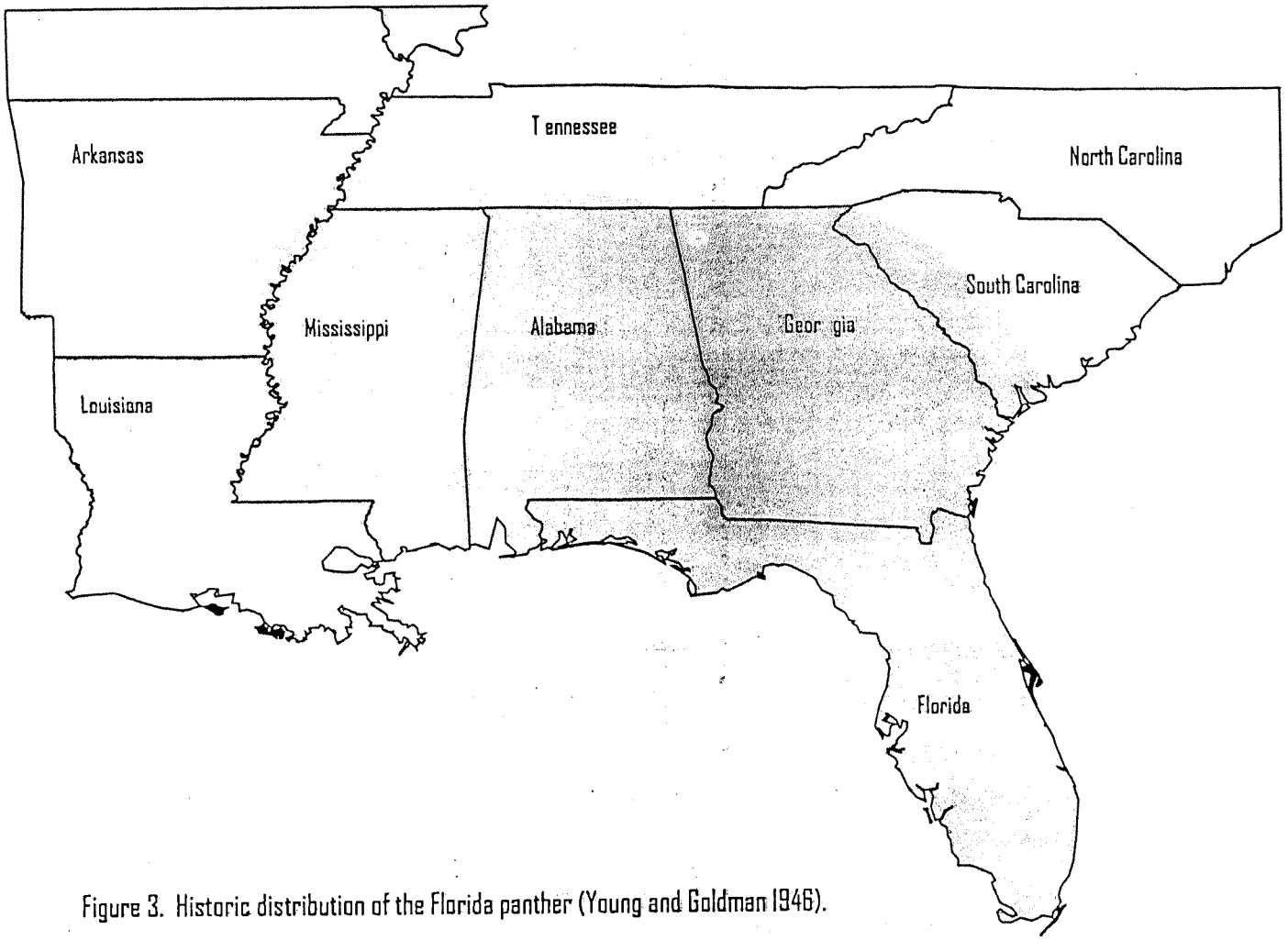


Figure 3. Historic distribution of the Florida panther (Young and Goldman 1946).

Figure 4. Location of the proposed action, Belle Meade Ecological Unit, and adjacent 11,840 acre area