# United States Department of the Interior

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

April 1, 2003

Memorandum

To: Superintendent, Everglades National Park

From: James J. Slack, Field Supervisor, South Florida Ecological Services Office

Subject: Everglades National Park 2003-2005 Prescribed Burn Plan Section 7 Consultation for Pinelands, Miccosukee, Shark Valley, and East Ever

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of the 2003-2005 Pinelands, Miccosukee Reserved Area (MRA), Shark Valley, and East Ever prescribed burn plans and associated resource management treatments in the National Park Service's (NPS) Everglades National Park (ENP), Miami-Dade County, Florida, and its effects on the threatened eastern indigo snake (*Drymarchon corais couperi*), endangered Florida panther (*Puma concolor coryi*), threatened Garber's spurge (*Chamaesyce garberi*), endangered Cape Sable seaside sparrow (CSSS) (*Ammodramus maritimus mirabilis*), and endangered Everglade snail kite (*Rostrhamus sociabilis plumbeus*), and critical habitat for the CSSS and snail kite in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). Your February 27, 2003, request for consultation was received on February 27, 2003.

This biological opinion is based on information provided in the February 27, 2003, ENP fire management package; March 21, 2003, burn plans for Pinelands, MRA, Shark Valley, and East Ever; telephone conversations; field investigations; and other sources of information. A complete administrative record of this consultation is on file in this office.

The ENP made a determination of "may affect, not likely to adversely affect" for the bald eagle and wood stork. Bald eagles occur in south Florida year-round and utilize a variety of habitats including high pine, scrubby high pine, maritime hammock, temperate hammock, scrubby flatwoods, pine flatwoods, prairie, freshwater marsh, and swamp. Bald eagles have been observed foraging onsite, however there are no known bald eagle nests on or adjacent to the proposed burn areas. No impacts to foraging or roosting sites are anticipated. Therefore, the Service concurs with ENP's determination.

Wood storks utilize wetlands for foraging year-round. The Service has identified a core foraging area of 18.6 miles around known wood stork rookeries. The four burn units are within 18.6 miles of eight wood stork rookeries. Typical foraging sites for the wood stork include freshwater marshes, stock ponds, shallow and seasonally flooded roadside or agricultural ditches, narrow

tidal creeks, shallow tidal pools, managed impoundments, and depressions in cypress heads, swamps, and sloughs. Because of their specialized feeding behavior, wood storks forage most effectively in shallow water areas with highly concentrated prey. Administration of the proposed burn plans will not impact wetlands important to wood stork foraging. Wetland impacts will be temporary in nature, ranging from days to weeks. No hydrological changes will occur, and fish and macroinvertebrate communities will not be adversely affected. The prescribed fires will reduce plant biomass within wetlands and open up wetland communities for wood stork foraging. In a telephone conversation on March 27, 2003, ENP agreed that no water will be extracted by helicopter dipping from Paurotis Pond during the wood stork nesting season (November through May). Based on the avoidance of rookeries during the nesting season, the temporary nature of the prescribed burns, and the avoidance of any loss of wetland function, the Service concurs with ENP's determination.

## I. CONSULTATION HISTORY

On April 25, 1991, the NPS forwarded a copy of the revised Fire Management Plan to the Service and requested section 7 consultation.

On July 19, 1991, the Service issued a biological opinion on the NPS's revised Fire Management Plan.

On February 19, 1999, the Service issued a biological opinion on three Everglades restoration projects affecting the CSSS. The biological opinion required an annual Fire Management Symposium be held to design an adaptive management plan incorporating prescribed burning within CSSS habitat within ENP.

On November 19-20, 2002, the CSSS Fire Management Strategy Working Group subcommittee of the Fire Management Symposium group held their annual meeting in Homestead, Florida. A working definition of CSSS "occupied" habitat was developed to facilitate ecosystem management decision-making for evaluating and further strategizing the adaptive fire management practices of ENP. The CSSS Fire Management Working Group agreed to define "occupied" sparrow habitat as that area consisting of a 1-kilometer (km) diameter circle centered on each CSSS survey point in which a sparrow was present within the three most recent yearly surveys (J. Lockwood, University of California, Santa Barbara, personal communication 2002). The maps of these survey points will be updated after the completion of each new, annual survey (D. LaPuma, ENP, personal communication 2002).

On February 27, 2003, ENP submitted the 2003 Pinelands Burn Plan to the Service.

On March 14, 2003, the Service discussed the initial project area maps with ENP via telephone. The Service outlined concerns over the proximity of the project area boundary to occupied CSSS habitat. The Service requested that additional geospatial layers be added to maps depicting the vegetative changes from suitable to unsuitable nesting and foraging habitat, and additional characterization of these areas.

On March 17, 2003, new maps including Arcview layers clarifying the vegetation structure described as unsuitable were received by the Service. These maps supported the CSSS survey biologists' habitat observations and determination that the vegetative structure constituted unsuitable CSSS habitat in the Pinelands project area, such as where portions of the 1-km circle includes pine savanna at point of project area boundary intersection, as in the case of the Southwest Burn Unit 3 (S. Bass, ENP, personal communication 2003).

On March 20, 2003, NPS and the Service agreed on the need for formal consultation on the initial Pinelands burn plan.

On March 21, 2003, during a conference call between the Service and ENP Fire Management, it was agreed to expand the scope of formal consultation to four ENP burn plans proposed for 2003, including follow-up treatment components extending through the 2005 fire season.

On March 21, 2003, the MRA, Shark Valley, and East Ever project area burn plans were received by the Service.

On March 27, 2003, ENP provided a determination of "may affect, not likely to adversely affect" for the bald eagle and wood stork via telephone.

On March 27, 2003, ENP modified their proposed action to exclude use of Paurotis Pond as a helicopter water source during the wood stork nesting season.

On March 28, 2003, the Service provided, via e-mail, a preliminary draft of the biological opinion to Nate Benson, ENP, for review.

## II. BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

### Proposed Action

The NPS, Fire and Aviation Management Division, proposes to conduct a series of prescribed burns within four fire management areas of ENP. The proposed burn areas are the Pinelands, MRA, Shark Valley, and East Ever. Each burn area is discussed individually below.

Pinelands Prescribed Burn Plan

The project area encompasses 44,000 acres of pinelands, seasonally flooded prairies, and tropical hardwood hammocks (Figure 1). The majority of the project area is comprised of Fire Management Unit (FMU) 3, except for the western and northern edges, which are located in FMU 2. The project area is bound to the north, northwest, and northeast by Main Park Road and by Old Ingraham Highway to the south. Target area D extends north of Main Park Road , and is bound to the north by a dirt road. The project area is bound to the east and southeast by Royal

Palm Visitor Center Road and is separated from CSSS critical habitat in the southwest by a tree line. The project area is located in Sections 4-16, and 21-28, Township 58 South, and Range 37 East.

Approximately 9,575 acres within the 44,000-acre project area have been identified as primary target areas. These high priority areas are overgrown with vegetation (5 to 11 year rough), where the natural fire interval of 1 to 4 years was historically maintained by dry-wet transitional season ignitions. Over the next two years no more than 50 percent of the 44,000-acre area will be burned in any one year. The goals of this burn plan are (1) to restore or maintain the existing natural range of fuel loads within the pine rockland community; (2) to restore, maintain, and preserve existing prairies in natural condition; and (3) to apply prescribed fire in areas previously or currently dominated by Brazilian pepper (*Schinus terebinthifolius*) to assist with restoration. To achieve these goals, most areas will be burned in the transition from dry to wet season and early wet season (April-July).

The ignition of the proposed burns will be based on appropriate weather conditions and availability of personnel and may occur at any time of the year. However, the preferred ignition dates are April through July to mimic the natural conditions. The proposed burns will occur before the end of 2005. The projected burn duration for each unit is 1-3 days.

Miccosukee Reserved Area (MRA) Prescribed Burn Plan

The project area encompasses 2,000 acres in FMU 2 and is comprised of sawgrass prairie and brush with willow heads surrounding hardwood hammocks (Figure 2). The unit is bound to the east by Shark Valley Tram Road, to the north by U.S. Highway 41 and MRA homes and businesses, and to the west by existing air-boat trails originating from Loop Road. Holding lines will be established by amphibious rollagon (vehicle with large rubber tires that holds about 500 gallons of water; used to mash down grass to create a fire line) to the south and north to contain fire spread north towards the MRA and south into sparrow habitat, as necessary. The project area is in Sections 19-24, Township 54 South, and Range 35 East.

The goal of this burn plan is to create a buffer area of reduced fuels between the MRA and CSSS subpopulation A. The buffer area will limit wildland fire spread into MRA and CSSS habitat. The result of the prescribed fires will be a 100- to 500-yard strip with at least 50 percent reduction in post burn fuel loading.

The ignition of the proposed burns will be based on appropriate weather conditions and availability of personnel, and may occur at any time year-round. The proposed burns will occur before the end of 2005. The projected burn duration for each unit is 1-2 weeks.

Shark Valley Prescribed Burn Plan

The project area encompasses approximately 1,300 acres within the western portion of the Shark Valley River Slough (Figure 2). The project area consists primarily of sawgrass, with numerous bayheads hardwood hammocks dispersed throughout. The area is in FMU 2, south of Highway 41 (Tamiami Trail) adjacent to the Shark Valley Information Center and Observation Tower. The entire project area is contained within the 10-foot wide Shark Valley Tram Loop Road. The project is also bound to the north by the visitor's center, and to the south by the observation tower. The width of the project area varies from 0.25 to 0.50 mile with overall length being approximately 7 miles. The project area is in Sections 19, 30, and 31, Township 54 South, Range 36 East, and Sections 6, 7, 18, 19, 30, Township 55 South, and Range 36 East. The goal of this burn is to burn >20 percent of the project area to: (1) perpetuate natural processes; (2) provide a buffer of protection for CSSS subpopulation A and the Miccosukee strip; and (3) to reduce hazard fuels in an area of moderately high risk for human caused fires.

The ignition of the proposed burns will be based on appropriate weather conditions and availability of personnel, and may occur year-round. However, the preferred ignition dates are April through July in order to mimic natural conditions. The proposed burns will occur before the end of 2005. The projected burn duration for each unit is 1-2 weeks.

East Ever Prescribed Burn Plan

The project area encompasses approximately 6,000 acres within a 12,000 acre area that is currently being targeted for exotic plant eradication and control (Figure 3). The habitat types represented in this project area are short hydro-period prairies interspersed with pockets of native woody vegetation and exotic pest plants including Australian pine (*Casuarina sp.*) and/or Melaleuca (*Melaleuca quinquenervia*). The prescribed 6,000 acre burn area is intended to follow-up on herbicide treatments of exotic plants in the area. The boundary for the project area coincides with the planned treatment area within FMU 4. Prescribed fire treatment in East Ever is along ENP's eastern urban interface boundary. For safe fire management, this project area may be divided into smaller, manageable units and ignited several times depending on weather and vegetation conditions.

The project area is bounded by theoretical 120$^{th}$ Street on the north, 216$^{th}$ Street to the south, theoretical 232$^{nd}$ Avenue to the east, and a north-south line passing just beyond the western-most extent of the "U-Road". Removal of the exotic species will allow soil nutrients and open canopy for native vegetation to recover and return to a more diverse community.

Within the project area, secondary target areas have also been identified. Secondary target areas are burn units that are less of a priority than the primary areas and will be completed as feasible. The implementation of prescribed burning for all target areas will follow the burn plan. An Incident Action Plan will be written to guide burning operations before the implementation of any prescribed fire. The burn boss will determine appropriate management strategy based on current and expected weather, potential threat to values within the project area, potential threat to

the project area boundary, and the ability to manage additional fire within the project area using on-site resources. Human-made and natural barriers confine many of the primary and secondary target areas and, in most situations fire managers can use these barriers to effectively manage fire growth. Prescribed burns conducted in 2002 north of the project area will help personnel contain the fire within the designated unit boundary.

The proposed ignition dates for the single operational units within the project area are April through September in 2003, and year-round after 2003 given appropriate weather conditions and availability of personnel. The projected burn duration for each unit is 1-2 weeks of multiple single operational unit periods.

Herbicide treatments will be followed by prescribed fire in an attempt to eradicate or control invasive species. Prescribed fire in this wildland-urban interface (WUI) fire management area dually serves as a protective buffer by reducing fuel loadings in areas at high risk of anthropogenic ignitions that may cause adverse impacts to CSSS habitat. In 2001, the human-caused Lopez wildfire consumed 8,427 acres running into CSSS subpopulations F and then E where 30 to 40 percent of occupied habitat was consumed and approximately 50 percent of the consumed acres were in CSSS critical habitat.

Ignition and Holding

Fires will be ignited using a combination of aerial ignition from a helicopter, ground personnel with drip torches, ATVs equipped with drip torches, and other ground-based vehicles. A combination of backing fires, flanking fires, strip-heading fires, and spot fires will be employed within burn units. Firing patterns and directions can change during a burn, and the appropriate ignition method and pattern will be determined based on wind direction and other parameters.

Prescribed fires will be contained within burn units using a variety of methods. Whenever possible, existing roads, airboat trails, and other features will be used to contain fires. In cases where these features do no occur, fire lines will be established in a manner that minimizes permanent impact to vegetation or soils. In the Pinelands burn unit, a tractor-mounted mower will be used to install control lines, and equipment will use specific entry and exit points to reduce impacts to land and resources. Under wet conditions in marsh and prairie vegetation, containment lines may be established by using aerial ignition within an hour of sunset, when increasing relative humidity will limit the spread of fire. During dry periods, a cut or smashed line may be established, followed by black-lining using ground-based personnel and vehicles equipped for firefighting. Hand-cut vegetation may also be used to establish containment lines in some areas.

The risk of escaped fire will be minimized using combinations of the following precautions:

- Prescriptions will identify environmental conditions that will minimize risk of escaped fire.
- Staff will be briefed prior to initiating burn.
- A test burn will be ignited and evaluated to see if fire behavior will meet objectives.
- A helicopter will be available for use within an hour or will be stationed at a nearby helibase, and equipped with a bucket to aid in controlling spots and slop-overs as necessary. Water sources will be identified prior to ignition to facilitate expeditious control of spots and slop-over.
- Aerial reconnaissance of target area will occur before any interior ignition.
- Initial interior ignition of target areas will focus on improving and widening black line.
- Sufficient equipment and personnel will be dedicated to holding activities to minimize the risk of escape.

### Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The Service has determined that the action area for the proposed burns is ENP (Figure 4).

## STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

### Eastern Indigo Snake

The eastern indigo snake was listed as threatened on January 31, 1978 (43 FR 4028) due to population declines caused by habitat loss, over-collecting for the domestic and international pet trade, and mortality caused by rattlesnake collectors who gas gopher tortoise (*Gopherus polyphemus*) burrows to collect snakes.

### Species Description

The eastern indigo is the largest non-venomous snake in North America, obtaining lengths of up to 2.6 m (102 inches [in]). Its color is uniformly lustrous-black, dorsally and ventrally, except for a red or cream-colored suffusion of the chin, throat, and sometimes the cheeks. Its scales are large and smooth (the central 3-5 scale rows are lightly keeled in adult males) in 17 scale rows at mid- body. Its anal plate is undivided. In the Keys, adult eastern indigo snakes seem to have less red on their faces or throats compared to most mainland specimens. Several researchers have informally suggested that lower Keys eastern indigo snakes may differ from mainland snakes in ways other than color.

**Critical Habitat** - none designated.

## Life History

Reproduction and Demographics: Eastern indigo snakes breed between November and April, with females depositing 4-12 eggs during May or June (Moler 1992). Young hatch in approximately 3 months. There is no evidence of parental care. The snakes take 3-4 years to reach sexual maturity. Female eastern indigo snakes can store sperm and delay fertilization of eggs. There is a single record of a captive snake laying five eggs (at least one of which was fertile) after being isolated for more than 4 years. There is no information on eastern indigo snake lifespan in the wild, although one captive individual lived 25 years, 11 months (Shaw 1959).

Food Habits: The eastern indigo snake is a generalized predator and will eat any vertebrate small enough to be overpowered. Food items include fish, frogs, toads, snakes (venomous as well as nonvenomous), lizards, turtles, turtle eggs, small alligators, birds, and small mammals (Keegan 1944, Babis 1949, Kochman 1978, Steiner *et al.* 1983).

Habitat: Eastern indigo snakes require a mosaic of habitats. Interspersion of tortoise-inhabited sandhills and wetlands improves habitat quality for the eastern indigo. Eastern indigos require sheltered retreats from winter cold and desiccating conditions, and often use burrows of the gopher tortoise when available. In habitats lacking gopher tortoises, eastern indigos may take shelter in hollowed root channels, hollow logs, or the burrows of rodents, armadillo, or crabs. Over most of its range in Florida, the eastern indigo frequents diverse habitats such as pine flatwoods, scrubby flatwoods, floodplain edges, sand ridges, dry glades, tropical hammocks, edges of freshwater marshes, muckland fields, coastal dunes, and xeric sandhill communities. Eastern indigos also use agricultural lands and various types of wetlands, with higher population concentrations occurring in the sandhill and pineland regions of northern and central Florida. In extreme south Florida (*e.g.*, the Everglades and Florida Keys), eastern indigos are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats (Steiner *et al.* 1983). It is thought that they prefer hammocks and pine forests since most observations occur there and use of these areas is disproportionate compared to the relatively small total area of these habitats (Steiner *et al.* 1983).

Movements and Dispersal: In Georgia, the average range of the eastern indigo snake is 4.8 hectares (ha) (12 acres) during the winter (December-April), 42.9 ha during late spring/early summer (May-July), and 97.4 ha (241 acres) during late summer and fall (August-November) (Speake *et al.* 1978). Adult male eastern indigos have larger home ranges than adult females and juveniles; their ranges average 224 ha (554 acres), reducing to 158 ha (390 acres) in the summer (Moler 1985a). In contrast, a gravid female may use from 1.4-42.9 ha (3.5-106 acres) (Smith 1987).

## Status and Distribution

Law enforcement has reduced pressure from the pet trade. However, because of its relatively large home range, this snake is especially vulnerable to habitat loss, degradation, and fragmentation (Lawler 1977, Moler 1985b). Extensive tracts of undeveloped land are important for maintaining eastern indigo snakes. In Florida, eastern indigo habitat is being lost at a rate of 5 percent annually (Lawler 1977).

Information on the status of populations of eastern indigo snakes in ENP is lacking, and most information has resulted from incidental observations within ENP. Tasks identified in the recovery plan for this species include: habitat management through controlled burning, testing experimental miniature radio transmitters for tracking of juveniles, maintenance of a captive breeding colony at Auburn University, recapture of formerly released snakes to confirm survival in the wild, educational lectures and field trips, and efforts to obtain landowner cooperation in conservation efforts.

Distribution: The eastern indigo ranges from the southeastern United States to northern Argentina. This species has eight recognized subspecies, two of which occur in the United States: the eastern indigo and the Texas indigo *(D. c. erebennus)*. In the United States, the eastern indigo historically occurred throughout Florida and in the coastal plains of Georgia and has been recorded in Alabama and Mississippi. It may have occurred in southern South Carolina, but its occurrence there cannot be confirmed. Georgia and Florida currently support the remaining, endemic populations of the eastern indigo. The eastern indigo occurs throughout most of Florida and is absent only from the Dry Tortugas and Marquesas Keys, and regions of north Florida where cold temperatures and deeper clay soils exist (Cox and Kautz 2000).

Threats: The primary threat to the eastern indigo is habitat loss primarily due to commercial and residential development, and agriculture. In urban and residential, and areas heavily used for recreation, contact with humans and pets may increase the likelihood of snakes being killed.

Habitat Management: To protect and manage this species for recovery, large expanses of land must be protected. Management of these lands must be directed towards maintaining and enhancing the diversity of plant and animal assemblages within these properties. Where these goals are achieved, eastern indigos will directly benefit because of improved habitat conditions.

## Florida Panther

The State of Florida declared the panther a game species in 1950 and an endangered species in 1958. The Federal government listed the panther as endangered in 1967 (32 FR 4001). Heavy hunting and trapping, an inability to adapt to changes in the environment, and land development were cited as reasons for the species decline (Service 1967).

## Species Description

The Florida panther was first described by Charles B. Cory in 1896 as *Felis concolor floridana* based on a specimen he collected in Sebastian, Florida (Hall and Kelson 1959). Bangs (1899), however, noted that *Felis floridana* had previously been used for a bobcat and, believing that the panther was restricted to peninsular Florida and could not breed with any other form, assigned it full specific status as *Felis coryi*. The taxonomic classification of the *Felis concolor* group was revised by Nelson and Goldman (1929), and the panther was assigned subspecific status as *Felis concolor coryi*. This designation also incorporated *Felis arundivaga*, which had been classified by Hollister (1911) from specimens collected in Louisiana. Detailed descriptions of each of the subspecies are provided in Young and Goldman (1946) [30 subspecies], and Hall (1981) [27 subspecies]. The genus *Felis* was revised so all mountain lions, including the Florida panther, were placed in the genus *Puma* (Nowell and Jackson 1996).

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

The coat of an adult Florida panther is unspotted and typically rusty reddish-brown on the back, tawny on the sides, and pale gray underneath. The long cylindrical tail is slender compared to some of the other subspecies of *Puma concolor* (Belden 1988). Florida panther kittens are gray with dark brown or blackish spots and five bands around the tail. The spots 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 turn to the light-brown straw color of the adult eye (Belden 1988).

Three external characters are often observed in Florida panthers that are not found in combination in other subspecies of *Puma concolor*. These characters are: a right angle crook at the terminal end of the tail; a whorl of hair or "cowlick" in the middle of the back; and irregular, light flecking on the head, nape, and shoulders (Belden 1986). The light flecking may be a result of scarring from tick bites (Maehr 1992a, Wilkins 1994). The kinked tail and cowlicks are considered manifestations of inbreeding (Seal *et al.* 1994).

**Critical Habitat** - none designated.

## Life History

Panthers are essentially solitary. Interactions between adult females and their kittens are most frequent. Interactions between adult male and female panthers are second in frequency, last from one to seven days, and usually result in pregnancy. Conflicts between males are common and often result in serious injury or death to some individuals. Aggressive encounters between females have not been documented (Maehr *et al.* 1991a).

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

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

Reproduction and Demography: Male panthers are polygamous and maintain large home ranges mutually exclusive of other males but overlapping that of several females. Breeding peaks in fall and winter. Gestation lasts 90 to 96 days. Parturition is distributed throughout the year with the majority of births occurring between March and July. Prenatal litters range from three to four. Postnatal litters range from one to four kittens. Litters surviving to six months of age average 2.2 kittens. Female panthers losing their litters generally produce replacement litters. Intervals between litters range from 16 to 37 months (Maehr 1992a, Maehr *et al.* 1991a).

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 and may be used again in subsequent years.

Early estimates of infant mortality varied and were in conflict. For example, Roelke *et al.* (1993) characterized infant mortality as relatively high with fewer than half of all births resulting in offspring that survive beyond six months of age (Roelke *et al.* 1993). Land (1994) estimated the kitten survival rate between age six months and one year at 0.895, based on a sample of 15 radio-instrumented kittens monitored from six months to one year of age.

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

The first sexual encounters for males have occurred at about three years of age (Maehr *et al.* 1991a). Recruitment of males into the breeding population is complicated by the lack of dispersal habitat and competition for territories. Successful male recruitment appears to depend

on the death or home range shift of a resident adult male (Maehr *et al.* 1991a). Turnover in the breeding population is low and documented mortality in radio-collared panthers is greatest in sub-adult and non-resident males (Maehr *et al.* 1991b).

Food Habits: Food habit studies of panthers in southwest Florida indicate that the feral hog is the most commonly taken prey followed by white-tailed deer (*Odeocoilus virginianus*), raccoon (*Procyon lotor*), and nine-banded armadillo (*Dasypus novemcinctus*). Deer and hogs accounted for 85.7 percent of consumed biomass north of Interstate 75 and 66.1 percent south of Interstate 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 greater deer abundance north of Interstate 75 versus south of Interstate 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 Interstate 75. Fewer large prey may, in part, explain the poorer physical condition, larger home ranges, and lower reproductive output of panthers south of Interstate 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 Interstate 75 (Maehr *et al.* 1990a).

Movements and Dispersal: Adult Florida panthers occupy available habitat in a pattern similar to that of western cougars (Land 1994). More than 7,000 telemetry locations on 26 radio-collared panthers between 1985 and 1990 indicated that home-range size varied from 21 to 461 $mi^2$ (53 to 1,183 $km^2$), averaging 200 $mi^2$ (519 $km^2$) for resident males and 75 $mi^2$ (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).

Dispersal distances average 36.4 mi (58.7 km) for sub-adult males and 9.9 mi (16 km) for an adult female. Sub-adult dispersal typically occurs around 1.5 to two years of age, but may occur as early as one year of age (Maehr 1992a). 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).

**Status and Distribution**

Of the 27 recognized subspecies of *P. concolor* described by Hall (1981), the Florida panther is the sole remaining subspecies in the eastern United States. Historically, the panther was distributed from eastern Texas or western Louisiana and the lower Mississippi River valley east through the southeastern States in general, intergrading to the north with *P. c. cougar*, and to the west and northwest with *P. c. stanleyana* and *P. c. hippolestes* (Young and Goldman 1946). The Florida panther had been eliminated from most of the historic range by 1950 (Figure 5).

Occasional sightings and signs were reported throughout the rural southeast between 1950 and 1980 (Anderson 1983). The only confirmed panther population was found in south Florida (Belden 1982, cited in Anderson 1983).

A variety of human activities contributed to the decline of the panther. The first bounty on Florida panthers was passed in 1832. An 1887 Florida law authorized a payment of $5.00 for scalps (Tinsley 1970). Agricultural land clearing in the southeastern United States between 1850 and 1909 totaled 12.8 million ha. Lumbering reduced the original southern forest nearly 40 percent from 121.4 million ha to 72.0 million ha by 1919 (Williams 1990). Meanwhile, the white-tailed deer, primary prey of the panther, was reduced from a range-wide population of about 13 million in 1850, to under 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.

At the beginning of the 20th century, the Florida population may have numbered as many as 500 (Seal *et al.* 1989). The population was estimated at 100 to 300 statewide in 1966 (Smith 1970, Schemnitz 1972). The Big Cypress population was estimated at 125 in 1969 (DOI 1969), and a south Florida population at 92 in 1972 (Schemnitz 1972). In the 1970s, the Florida Game and Fresh Water Fish Commission (predecessor of the FWC) established a Florida Panther Record Clearinghouse to ascertain the status of the panther. The first field searches were made in 1972. The Florida Panther Act, a State law enacted in 1978, made killing the panther a felony. Telemetry investigations began in 1981, primarily on public lands in southwest Florida. The Florida Panther Interagency Committee, based on telemetry data collected between 1981 and 1991 estimated the population at 30 to 50 adult panthers (Logan *et al.* 1993). The State of Florida declared the panther a game species in 1950 and an endangered species in 1958.

Maehr *et al.* (1991a) estimated the density of panthers in southwest Florida between February and July 1990 to be one panther per 42.9 $mi^2$ (110 $km^2$). When extrapolated over a 1,965.6 $mi^2$ (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 (9 resident males, 28 resident females, and 9 transient males) between December 1985 and October 1990. This population estimate assumed homogeneous density and similar age and sex composition over time and space. Maehr *et al.* (1991a) considered the population to be higher because the estimation technique excluded panthers in ENP, eastern Big Cypress National Preserve, and areas north of the Caloosahatchee River. The Florida Panther Interagency Committee, comprised of the Service, NPS, Florida Department of Environmental Protection, and the former Florida Game and Freshwater Fish Commission, estimated the population at 30 to 50 adults (Logan *et al.* 1993).

The present population is estimated at 80 panthers (McBride 2002) and is comprised of 46 females, 22 males, and 12 whose sex is unknown. Forty-six of the panthers are collared and 34 are uncollared. Based on information in Land *et al.* (2001) and McBride (2002) it appears that 43 panthers have home ranges entirely on public lands, 31 have home ranges partially on public lands, and 4 have home ranges entirely on private lands.

Habitat loss, habitat fragmentation, habitat degradation, and increased human disturbance resulting from agricultural and residential development are considered among the primary threats to long-term panther persistence. Continued development associated with the expansion of Florida's urbanized east coast, urban sprawl 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). Over 83 percent of the 1.6 million acres (648,000 ha) of agricultural land in southwest Florida is categorized as rangeland. Between 1986 and 1990, row crop acreage increased by 8,990 acres (3,640 ha) or 21 percent; sugarcane increased by 16,000 acres (6,475 ha) or 21 percent; citrus increased by 54,000 acres (21,850 ha) or 75 percent; and rangeland, much of it suitable for panther occupation, decreased by 160,000 acres (64,750 ha) or 10 percent. Rangeland losses were about evenly divided between agricultural and urban development (Townsend 1991). The most recent information currently available from this area indicates that the amount of urban land and transitional land cleared and prepared for urban development between 1975 and 1993 increased from 641 $mi^2$ to 1,372 $mi^2$; or 23 percent of Charlotte, Collier, Glades, Hendry, Lee, and Sarasota Counties combined (Southwest Florida Regional Planning Council 1995).

Rapid development in southwest Florida has compromised the ability of landscapes to support a self-sustaining panther population (Maehr 1990b). Maehr (1990a) reports that there are approximately 2.2 million acres (880,000 ha) of occupied panther range in south Florida and that approximately 50 percent of the known breeding distribution is comprised of landscapes under private ownership. Maehr (1990a) indicated that development of private lands may limit panther habitat to landscapes under public stewardship.

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 and favored crossing more lightly traveled roads. Female panthers rarely establish home ranges bisected by highways (Maehr 1997).

Because of their wide-ranging movements and extensive spatial requirements, panthers are sensitive to habitat fragmentation. Past land use activity, hydrologic alterations, road construction, and lack of fire management (Dees *et al.* 1999) have affected the quality and quantity of panther habitat.

Habitat Management: Protection and enhancement of remaining natural lands and habitat has been the focus of management efforts. Prescribed burning is probably the single most important habitat management tool available to public land stewards. Dees *et al.* (1999) examined panther use of habitat in response to prescribed burning at Florida Panther National Wildlife Refuge (NWR) and Big Cypress National Preserve between 1989 and 1998. A positive temporal response to prescribed burns occurred in the year following the burn and is likely due to the rapid regrowth of vegetation, which in turn attracted white-tailed deer. Panther use of the burned area

gradually declined after the first year and ended after four years. Prescribed burn 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.

## Garber's Spurge

The Garber's spurge was listed as a threatened species on July 18, 1985 (50 FR 29349) due to habitat destruction and degradation, and competition from exotic pest plants. The Garber's spurge occurs in vegetative communities that historically are naturally prone to periodic disturbance. Pine rocklands and coastal grasslands experience frequent wildfires, while coastal habitats are prone to periodic submergence at high tide or during storm surges.

### Species Description

Garber's spurge is a perennial herb belonging to the spurge family (Euphorbiaceae). The Garber's spurge grows either prostrate or erect and has pubescent stems. The leaves are ovate, 4- 9 millimeters (mm) (0.2-0.4 in) long and are entire or obscurely serrate. The cyathia is about 1.5 mm long (0.06 in) and is solitary at the nodes; appendages are minute or absent. Capsules are 1.5 mm wide and pubescent with seeds that are smooth or with transverse ridges, but not wrinkled.

**Critical Habitat** - none designated.

### Life History

Habitat: Garber's spurge grows at low elevations (<3.0 m [9.8 ft]) in well- to poorly-drained, calcareous sands or directly on exposed limestone in a variety of open to moderately-shaded vegetative communities. In pine rocklands, Garber's spurge grows in crevices in oolitic limestone. On Cape Sable in ENP, Garber's spurge has been reported from hammock edges, open grassy prairie, and backdune swales. In the Keys, Garber's spurge grows on semi-exposed limestone shores, open calcareous salt flats, pine rocklands, calcareous sands of beach ridges, and along disturbed roadsides. While most populations of the spurge occur in coastal habitats, one population in Dade County is approximately 16 miles inland from Florida Bay.

Reproduction: Reproductive ecology of spurges has been poorly studied but it is known to be highly variable. Garber's spurge reproduces sexually by seed. Some spurges are completely reliant on insects for pollination and seed production while others are self-pollinating. Pollinators may include bees, flies, ants, and wasps. Seed capsules of many Euphorbiaceae are explosively dehiscent, ejecting seeds a short distance from the parent plant. The seeds of some species are dispersed by ants. The reproduction mechanisms (*e.g.*, pollination, seed dispersal) in Garber's spurge are not known.

**Status and Distribution**

Gann *et al.* (2002) found Garber's spurge on the following conservation areas: Bahia Honda State Park, Big Torch Key (Florida Keys Wildlife and Environmental Area), Crocodile Lake NWR, ENP, Key West NWR, Lopp tract and main tract of Lignumvitae Key Botanical State Park, Long Key State Park, National Key Deer Refuge (NKDR), and Deering Estate at Cutler in Miami-Dade. The total population of the spurge has been estimated as less than 1,000 individual plants.

The NKDR on Big Pine Key contains most (83 percent) of the remaining pine rocklands in the Keys (Cox *et al.* 1994). Pinelands in private ownership receive protection under the Monroe County Comprehensive Plan, and all remaining pinelands are targeted for acquisition by County, State, and Federal land acquisition programs.

Threats to the Garber's spurge include habitat fragmentation, fire suppression, and exotic plant invasion. Habitat fragmentation intensifies the effects of natural events such as strong storms and hurricanes. A small, isolated population of Garber's spurge can be eliminated by erosion or deposition of debris during a storm. The pine rockland communities, which are adapted to fire, have undergone extensive alteration because of fire suppression. Fire suppression in pineland and grassland areas has eliminated sunny openings that are necessary for the species to survive.

Habitat Management: Prescribed fire is the primary means of habitat management for Garber's spurge in pine rockland communities. Prescribed fire maintains openings and bare soil conditions that may benefit Garber's spurge. The ENP has an active prescribed fire program. Control of exotic plants will also likely benefit Garber's spurge by eliminating competition and shading.

## Cape Sable Seaside Sparrow

The CSSS was listed as an endangered species on March 11, 1967, pursuant to the Endangered Species Preservation Act of 1966 (32 FR 4001). That protection was continued under the Endangered Species Conservation Act of 1969 and the ESA. The CSSS was listed because of its limited distribution and threats to its habitat posed by large-scale conversion of land in southern Florida to agricultural uses. For more information on this species see the Multi-Species Recovery Plan (MSRP) (Service 1999).

## Critical Habitat

Critical habitat for the CSSS was designated on August 11, 1977 (50 CFR §17.95), before the full distribution of the subspecies was known. The critical habitat, as designated, does not adequately account for the distribution of the present-day core subpopulations, or the areas necessary for continued survival and recovery. The Service has recently concluded that re-designation of critical habitat is warranted, and will be completed as funding and priorities allow. An important area west of Shark River Slough, which until 1993 supported one of two core subpopulations (nearly half of the entire population), is not included within the original designation, and has been undergoing detrimental changes in habitat structure as a result of water management practices. Additionally, other parts of the originally designated critical habitat have been converted to agriculture, and are no longer occupied by sparrows. Constituent elements were not included within the original designation of critical habitat. A key constituent element for the CSSS should be a hydroperiod pattern that maintains the preferred vegetative communities for successful breeding. During the breeding season, surface water levels should be at or below the surface within the short hydroperiod prairies, and should be achieved through adherence to a rainfall-driven operational schedule. Adherence to such a regulation schedule will provide for restoration of hydropatterns that best support CSSSs, in addition to other native Everglades species. Other constituent elements should include vegetative structure necessary to support successful breeding.

## Species Description

The CSSS is a medium-sized sparrow, 5 to 5.5 in (13 to 14 cm) in length (Werner 1975). Of all the seaside sparrows, it is the lightest in color (Curnutt 1996). The dorsal surface is dark olive-grey and the tail and wings are olive-brown (Werner 1975). Adult birds are light grey to white ventrally, with dark olive grey streaks on the breast and sides. The throat is white with a dark olive-grey or black whisker on each side. Above the whisker is a white line along the lower jaw. A grey ear patch outlined by a dark line sits behind each eye. The lores of the head are yellow. The leading edge of each wing has a small yellow patch near the alula. The legs and bill are grey (Curnutt 1996). There are no noticeable differences in markings between the sexes. However, there are significant differences in the sizes of specific body parts between the sexes (Werner 1975). Young birds differ from adults in that they do not have whisker marks, lack the yellow lores, and have brown streaking on the back and chest.

## Life History

Habitat: In the 1930s, Cape Sable was the only known breeding range for the sparrow (Nicholson 1928); areas on Cape Sable that were occupied by CSSSs in the 1930s have experienced a shift in vegetative communities from freshwater vegetation to mangroves, bare mud flats, and salt-tolerant plants such as *Batis maritima* and *Borrichia frutescens* (Kushlan and Bass 1983). The hurricane of 1935 is believed to have initiated the succession of the plant community on Cape Sable from one dominated by freshwater plants to one dominated by salt-

tolerant plants. Sea level rise, reduced freshwater flows to the area resulting from upstream water management practices, and another hurricane in 1960 were also likely factors in this habitat change. As a result, CSSSs no longer use this area.

The currently preferred nesting habitat of CSSSs appears to be a mixed marl prairie community that often includes muhly grass (*Muhlenbergia filipes*) (Stevenson and Anderson 1994). These short-hydroperiod, mixed marl prairies contain moderately dense, clumped grasses, with open space permitting ground movements by the sparrow. Sparrows tend to avoid tall, dense, sawgrass-dominated communities, spike rush (*Eleocharis*) marshes, extensive cattail (*Typha*) monocultures, long-hydroperiod wetlands with tall, dense vegetative cover, and sites supporting woody vegetation (Werner 1975, Bass and Kushlan 1982). The CSSS avoids sites with permanent water cover (Curnutt and Pimm 1993).

The suitability of short-hydroperiod, mixed marl prairie communities for the sparrow is driven by a combination of hydroperiod and periodic fires (Kushlan and Bass 1983). Fires prevent hardwood species from invading these communities and prevent the accretion of dead plant material, both of which decrease the suitability of the habitat for CSSSs. In the Taylor Slough area, Werner (1975) found that sparrow numbers increased annually in areas that had been burned up to three years previously. Taylor (1983) suggested that the response of sparrow population following fire is dependent on the rate of vegetation recovery, the soil depth, and the amount of exposed pinnacle rock. Taylor (1983) found that on sites where soil depth was 15.7 in (40 cm) or greater, or on soils without pinnacle rock, vegetation recovery is rapid and the birds recovered more quickly following fire. At sites where soil depths are less than 7.9 in (20 cm) and where considerable pinnacle rock occurs, the birds begin to reoccupy sites four years post fire (Taylor 1983). However, recent analysis suggests that a four-year fire return frequency reduces habitat suitability and causes decline in resident sparrow populations (Curnutt *et al.* 1998). This recent study observed increased sparrow numbers up to at least 10 years post fire (Curnutt *et al.* 1998).

Reproduction and Demographics: Nesting has been observed from late February through early August (Service 1983). The majority of nesting occurs in the spring when large areas of the marl prairies are dry. Sparrows build new nests for each successive brood. The average height of the nests (i.e., from soil surface to bottom of the nest structure) increases after the onset of summer rains in early June (Lockwood *et al.* 2001). Nests that hatch young before June 1$^{st}$ sit an average of 6.7 in (17 cm) off the ground, whereas nests that hatch young after June 1$^{st}$ sit an average of 8.3 in (21 cm) off the ground (Lockwood *et al.* 2001). Similarly, average nest height varies from year to year. Lockwood *et al.* (2001) determined that during the 1996 and 1997 breeding seasons, CSSSs built nests closer to the ground (6.3 in and 5.9 in respectively) than during the 1998 and 1999 breeding season (8.3 in and 7.5 in respectively). Sparrows construct their nests with materials that are locally common and sometimes place taller grasses over the nest to conceal it. Nests are placed in clumps of grasses composed primarily of *Muhlenbergia* and *Spartina* (Pimm *et al.* 1996).

Pimm (University of Tennessee, personal communication 1996) suggests that nesting will not be initiated if water levels are at a depth greater than 3.9 in (10 cm) during the breeding season. The end of the breeding season appears to be triggered by the onset of the summer rains. When water levels rise above the mean height of the nests off the ground, sparrows cease breeding (Lockwood *et al.* 1997).

The CSSS usually raises one or two broods in a season, although they may raise a third brood if weather conditions allow (Kushlan *et al.* 1982, Service 1983). Recent information indicates sparrows can produce up to four broods if conditions allow (Lockwood *et al.* 2001).

Foraging and Movement: The CSSS typically forages by gleaning items from low vegetation or from the substrate (Ehrlich *et al.* 1992). The sparrow is a dietary generalist (Pimm *et al.* 1996). They commonly feed on soft-bodied insects such as grasshoppers, spiders, moths, caterpillars, beetles, dragonflies, wasps, marine worms, shrimp, grass and sedge seeds (Stevenson and Anderson 1994). Significant differences were detected in nestling diet between years and sites (Lockwood *et al.* 1997), which reflects the patchy distribution of insects and opportunistic nature of the sparrow (Post and Greenlaw 1994). The sparrow appears to shift the importance of prey items in its diet in response to their availability (Pimm *et al.* 1996).

The CSSS is nonmigratory. The fidelity of breeding male sparrows to their territories is high; many male seaside sparrows will defend the same area for two to three years (Werner 1975). Lockwood *et al.* (2001) followed banded individuals from one breeding season to the next and found that adult sparrows move an average of 695.5 ft (212 m) from the location where they were banded the previous year (or in some cases, two or more years previously). An average movement of 695.5 ft (212 m) means that many birds probably do not move their territories from one year to the next and the majority only adjust their positions (Lockwood *et al.* 2001).

Dean and Morrison (1998) utilized radio-transmitters to document sparrow movements over the non-breeding season within the western population (subpopulation B). Of the 17 individuals for which they recorded over 20 locations, all but two made movements >1,214 ft (>370 m) (Dean and Morrison 1998). Longer-range movements were recorded, sometimes up to 4.3 mi (7 km). These movements were rare, however, and these individuals returned to their breeding territories by the end of the non-breeding season (Dean and Morrison 1998). Collectively, these observations indicate that adult sparrows are quite sedentary throughout the year. Adult immigration and emigration rates are low.

Lockwood *et al.* (2001) re-sighted or recaptured juveniles an average of 1,893 ft (577 m) from their place of hatching. This value is significantly different from that observed for equivalent time frames in adults and is in contrast to adult dispersal distances (Lockwood *et al.* 2001). Juvenile birds are more apt to move longer distances with a maximum recorded natal dispersal distance of over 3,281 ft (1 km) (Lockwood *et al.* 2001).

## Status and Distribution

The results of several studies suggest that CSSSs exist as several subpopulations whose distribution, size, and importance to the persistence of the species changes with time. Bass and Kushlan (1982) described two core subpopulations of the sparrow, one northwest of Shark River Slough in the southeast portion of the Big Cypress National Preserve (subpopulation A), and a second one in the Taylor Slough area southeast of Shark River Slough (subpopulation B). Curnutt and Pimm (1993) recognized six subpopulations (A-F) that roughly correspond to the groupings recognized by Bass and Kushlan in 1982. Pimm (1998) suggested that three breeding subpopulations are critical to the long-term survival of the CSSS.

In 1981, Bass and Kushlan (1982) estimated a total of 6,656 birds in the six subpopulations; two core subpopulations (A and B) that held most of the sparrows, and four peripheral subpopulations (C-F). Core subpopulation A inhabited the marl prairies west of Shark River Slough extending into Big Cypress National Preserve and held an estimated 2,688 individuals. Core subpopulation B held approximately 2,352 birds inhabiting the marl prairies southeast of Shark River Slough near the center of ENP. Peripheral subpopulation E, north of subpopulation B, held about 672 sparrows, while subpopulation C, located along the eastern boundary of ENP, and subpopulation D, just to the southeast of subpopulation C, held about 400 birds each. Peripheral subpopulation F, the northernmost peripheral subpopulation located on the western edge of the Atlantic coastal ridge, was the smallest subpopulation with an estimated 112 birds. Bass repeated the survey in 1992, with population estimates similar to those in 1981.

Table 1. Results of the last 12 censuses of the CSSS. The actual number of birds observed is corrected to give an estimate for the total population using the methods developed by Bass and Kushlan (1982). Logistical problems resulted in incomplete surveys in 1994.

| CSSS sub-population | 1981 | 1992 | 1993 | 1994* | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 1st** | 2000 2nd** | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 2688 | 2608 | 432 | 80 | 240 | 384 | 272 | 192 | 400 | 448 | 400 | 128 | 96 |
| B | 2352 | 3184 | 2464 | 2224 | 2128 | 1888 | 2832 | 1808 | 2048 | 1824 | 2448 | 2128 | 1904 |
| C | 432 | 48 | 0 | - | 0 | 48 | 48 | 80 | 144 | 112 | 64 | 96 | 112 |
| D | 400 | 112 | 96 | - | 0 | 80 | 48 | 48 | 176 | 64 | 16 | 32 | 0 |
| E | 672 | 592 | 320 | 112 | 352 | 208 | 832 | 912 | 768 | 1040 | 704 | 848 | 576 |
| F | 112 | 32 | 0 | - | 0 | 16 | 16 | 16 | 16 | 0 | 112 | 32 | 16 |
| Total | 6656 | 6576 | 3312 | 2416* | 2720 | 2624 | 4048 | 3056 | 3552 | 3488 | 3744 | 3264 | 2704 |

* 1994 surveys were incomplete due to logistical problems.

** In response to peer review recommendations, two separate surveys were done in 2000.

In 1981 and 1992, the area west of Shark River Slough (subpopulation A) supported nearly half of the total CSSS. Starting in 1993, the number of individuals declined precipitously in this area. By 1994 and 1995, the birds were absent from this area except for a few locations and the number of individuals had dropped to less than 10 percent of 1992 numbers. Population estimates improved slightly during the 1996 breeding season as the numbers of sparrows found west of Shark River Slough increased from approximately 240 in 1995 to 384 birds in 1996. The 1997 and 1998 estimates indicate a continued decline of individuals within subpopulation A (272 and 192 birds respectively). In 1999 and 2000, the number of individuals more than doubled compared to the 1998 survey results. However, in 2001, the total number of birds west of Shark River Slough declined once again to approximately 128 individuals. Subpopulation A estimates for 2001 and 2002 are less than 5 percent of what they were in 1992.

Core subpopulation B increased by more than 800 birds from 1981 to 1992, declined slightly from 1992 to 1995, remained relatively stable from 1995 to 1997, and decreased by approximately 1,000 individuals in 1998. Interestingly, from 1999 to 2001 population estimates have remained stable in this core subpopulation although exhibiting decreasing numbers from 2000 to 2002. Subpopulation B remains one of the most abundant populations, with numbers changing only slightly from previous years.

Subpopulation C declined to 11 percent of its 1981 value by 1992. After three years of no birds, 48 birds were estimated in this area in 1996 and 1997 and 80 birds were estimated in 1998. Since 1998, this population has remained stable while increasing through the 2002 surveys (approximately 64, 96 to 112 birds respectively).

Subpopulation D declined from 1981 to 1993 (400 to 93 birds respectively), and was not counted in 1994. No birds were found in 1995, but 80 birds were estimated in this area in 1996, and 48 in 1997 and 1998. In 1999, the population grew to an estimated 176 birds. Unfortunately, numbers have been decreasing since 1999 with 32 birds estimated in 2001. The 2002 survey recorded no individuals in this subpopulation.

Subpopulation E decreased little between 1981 and 1992, fluctuated in the mid 1990s and increased to an estimated 912 birds in 1998. Numbers have remained stable since 1998 with the 2001 survey estimating 848 birds and then decreasing in 2002 to 576 birds after the Lopez fire of May 2001.

By 1992, subpopulation F declined to 29 percent of the 1981 estimation. No sparrows were observed in 1993 and no counts occurred in 1994. Surveys resumed in 1995, but no sparrows were observed. From 1996 to 1999, only 16 birds were estimated for each year. The next year (2000) the population increased to an estimated 112 birds; but in 2001and 2002, the numbers decreased to 32 estimated birds and further decreased to 16 as impacted by the 2001 Lopez fire.

The most recent survey (2002) indicates that CSSSs have declined almost 50 percent range-wide since 1992. However, the range-wide population estimates have remained relatively stable since 1993, with the greatest abundance estimate occurring in 1997 (4,048 estimated birds).

### Recovery Plan Objective

Pursuant to the MSRP (Service 1999), to achieve downlisting the following criteria must be met: if the loss of functional CSSS habitat, as a result of current and past water management practices, and the invasion of woody and exotic plant species, is eliminated; if CSSS habitat west of Shark River Slough and in Taylor Slough, which has been degraded by current and past water management practices, is restored; when demographic information on the CSSS supports, for a minimum of five years, a probability of persistence [$T_{(N)}$] that is equal to or greater than 80 percent (+/- 0.05), for a minimum of 100 years; when the rate of increase (r) for the total population is equal to or greater than 0.0 as a three year running average for at least 10 years; when a minimum of three stable, self-sustaining core breeding areas are secured; when a stable age structure is achieved in the core populations; and, when a minimum population of 6,600 birds is sustained for an average of five years, with all fluctuations occurring above this level.

## Everglade Snail Kite

The snail kite was federally listed as endangered in 1967 (FR 42 40685-40688) because of its limited population size and distribution, and threats to its habitat posed by over-draining and large-scale conversion of land in southern Florida to agricultural uses. Much of the following discussion is summarized from the MSRP (Service 1999). Other sources are referenced.

### Critical Habitat

Critical habitat was designated for the snail kite in 1977 (50 CFR §17.95) and has not been revised. Critical habitat includes portions of the Water Conservation Areas (WCA), portions of ENP, western portions of Lake Okeechobee, the Strazzulla and Cloud Lake reservoirs in St. Lucie County, and portions of the St. Johns Marsh in Indian River County. Although critical habitat for the snail kite did not include constituent elements, water-level management as discussed below is required to maintain favorable habitat conditions that are considered necessary to ensure the species survival.

### Species Description

The snail kite is a medium-sized raptor, with a total body length for adult birds of 14 to 15.5 in (36 to 39.5 cm) and a wingspan of 42.5 to 45 in (109 to 116 cm) (Sykes *et al.* 1995). In both sexes, the tail is square-tipped with a distinctive white base, and the wings are broad and paddle-shaped. Adults of both sexes have red eyes, while juveniles have brown eyes (Brown and

Amadon 1976, Clark and Wheeler 1987). The slender decurved bill is an adaption for extracting the kite's primary prey, the apple snail; the bill is a distinguished character for field identification in both adults and juveniles.

Sexual dimorphism is exhibited in this species, with adult males uniformly slate gray and adult females brown with cream streaking in the face, throat, and breast. Most adult females have a cream superciliary line and cream chin and throat (Sykes *et al.* 1995). Females are slightly larger than males. Immature snail kites are similar to adult females but are more cinnamon-colored, with tawny or buff-colored streaking rather than cream streaking. The legs and cere of females and juveniles are yellow to orange; those of adult males are orange, turning more reddish during breeding (Sykes *et al.* 1995).

In the field, the snail kite could be confused with the northern harrier (*Circus cyaneus*), a similarly sized hawk with a white rump. The northern harrier has a longer and narrower tail, with longer narrower wings held in a dihedral. The snail kite's flight is slower and characterized by more wing flapping, with the head tilting down to look for snails; the northern harrier has a gliding, tilting flight. At a closer distance, the long, curved beak of the snail kite allows it to be easily distinguished from the northern harrier (Sykes *et al.* 1995).

**Life History**

Habitat: Snail kite habitat consists of freshwater marshes and the shallow vegetated edges of lakes (natural and man-made) where apple snails (*Pomacea pallidosa*) can be found. Suitable foraging habitat for the snail kite is typically a combination of low-profile (<10 ft ) marsh with a matrix of shallow (0.65 - 4.25 ft deep) open water that is relatively clear and calm. Low trees and shrubs are also often interspersed with the marsh and open water. Snail kites require foraging areas to be relatively clear and open in order to visually search for apple snails; therefore, dense growth of herbaceous or woody vegetation is not conducive to efficient foraging. Nearly continuous flooding of wetlands for >1 year is needed to support apple snail populations that in turn provide forage for the snail kite (Beissinger 1988).

Nesting and roosting sites almost always occur over water, which deters predation. Nesting substrates include small trees (usually < 32.8 ft in height), but can also occur in herbaceous vegetation, such as sawgrass, cattail, bulrush, and reed (Service 1999). It is important to note that suitable nesting substrate must be close to suitable foraging habitat, so extensive areas of contiguous woody vegetation are generally unsuitable for nesting.

Reproduction: Copulation can occur from early stages of nest construction, through egg laying, and during early incubation if the clutch is not complete. Egg laying begins soon after completion of the nest or is delayed a week or more. In Florida, the incubation period lasts from 24 to 30 days (Sykes 1987a). Hatching success is variable from year to year and between areas. In nests where more than one egg hatched, hatching success averaged 2.3 chicks per nest. The

most successful months for hatching are February (19 percent), March (31 percent), and April (23 percent) (Sykes 1987a). The breeding season varies widely from year to year in relation to rainfall and water levels. Ninety-eight percent of the nesting attempts are initiated from December through July, while 89 percent are initiated from January through June (Sykes 1987a, Beissinger 1988).

Foraging: The snail kite feeds almost exclusively on apple snails in Florida (Sykes 1987b). Snail kites spend between 25 to 50 percent of the time foraging while nesting, and 31 to 68 percent of the time foraging during pre- and post-nest desertion periods (Service 1999). Feeding perches include living and dead woody-stemmed plants, blades of sawgrass and cattails, and fence posts.

Movements: Snail kites in Florida are not migratory in the strict sense; they are restricted to southern and central Florida. Snail kites are nomadic in response to water depths, hydroperiod, food availability, nutrient loads, and other habitat changes (Bennetts *et al.* 1994). Radio-tracking and sighting of marked individuals have revealed that nonbreeding individuals disperse widely on a frequent basis (Bennetts *et al.* 1994). Shifts in distribution can be short term, seasonal, or longterm; and can take place between areas among years (Rodgers *et al.* 1988), between areas within a given nesting season (Beissinger 1986), within areas in a given nesting season, and within or between areas for several days to a few weeks (Bennetts and Kitchens 1997). Sykes (1983b) noted that during colder winters, snail kites will shift their distribution more to the southern part of their range.

**Status and Distribution**

Several authors (Nicholson 1926, Howell, 1932, Bent 1937) indicated that the snail kite was numerous in central and south Florida marshes during the early 1900s, with groups of up to 100 birds. Sprunt (1945) estimated the population to be 50 to 100 individuals. The snail kite apparently plummeted to its lowest population between 1950 and 1965. By 1954, the population was estimated at no more than 50 to 75 birds (Sprunt 1954). Stieglitz and Thompson (1967) reported 8 birds in 1963 at the Loxahatchee NWR, 17 on the NWR and 2 at Lake Okeechobee in 1964, 8 in WCA-2A and 2 on Lake Okeechobee in 1965, and 21 in WCA-2A in 1966. On the other hand, no snail kites have been observed nesting within the Lake Okeechobee littoral zone over the past few years, due to loss of nesting substrate (Steve Gornak, FWC, personal communication 2001).

The snail kite has apparently experienced population fluctuations associated with hydrologic influences, both man-induced and natural (Sykes 1983b, Beissinger 1986), but the amount of fluctuation is debated. While acknowledging the problems associated with making year-to-year comparisons in the count data, some general conclusions are apparent. Lake Okeechobee apparently can retain some suitable snail kite habitat throughout both wet and dry years, as long as water levels do not compromise nesting substrate. In contrast, kite use of WCA-3A fluctuates

greatly, with low use during drought years, such as 1991, and high use in wet years, such as 1994. Although sharp declines have occurred in the counts since 1969 (for example, 1981, 1985, 1987), it is unknown to what extent this reflects actual changes in the population. Rodgers *et al.*(1988) point out that it is unknown whether decreases in snail kite numbers in the annual count are due to mortality, dispersal (into areas not counted), decreased productivity, or a combination of these factors. Despite these problems in interpreting the annual counts, the data since 1969 have indicated a generally increasing trend (Rodgers *et al.* 1988, Bennetts *et al.* 1994). The annual counts since 1995 confirm a continued increasing trend. Most recently, use of telemetry and mark-recapture methods has improved the precision of population estimates and produced significant increases in population estimates (R. Bennetts, University of Florida, personal communication 2001).

The current distribution of the snail kite in Florida is limited to central and southern portions of Florida. Six large freshwater systems (the Upper St. Johns drainage, Kissimmee Valley, Lake Okeechobee, Loxahatchee Slough, the Everglades, and the Big Cypress basin) generally encompasses the current range of the species, although radio tracking of snail kites has revealed that the network of habitats used by the species also includes many other smaller widely dispersed wetlands within this overall range (Bennetts and Kitchens 1997). Continuing radiotracking work underscores the importance of these smaller, peripheral habitats that support large numbers of snail kites, particularly in years when the larger wetland areas are drier than average (R. Bennetts, personal communication 2001).

**Recovery Plan Objective**

Pursuant to the MSRP (Service 1999), to achieve downlisting the following criteria must be met: the 10-year average for the total population size is estimated as greater than or equal to 650, with a coefficient of variation less than 20 percent for the pooled data over the 10-year period; no annual population estimate is less than 500 in the 10-year period; the rate of increase of the population to be estimated annually or biannually, and over the 10-year period, will be greater than or equal to 1.0, sustained as a 3-year running average over 10 years; the feeding range of snail kites will not decrease from its current extent, including as a minimum, the St. Johns Marsh, the Kissimmee Chain of Lakes, Lake Okeechobee, Loxahatchee Slough, A.R.M. Loxahatchee NWR, all of the WCAs, ENP, Big Cypress National Preserve, Fakahatchee Strand, Okaloacoochee Slough, and marshes surrounding the Corkscrew Regional Ecosystem Watershed (CREW) Land and Water Trust Corkscrew Swamp; and snail kite nestings regularly occurs over the 10-year period in the St. Johns Marsh, Kissimmee Chain of Lakes, Lake Okeechobee, and at least one of the present compartments of the WCAs. The Service recognizes that the snail kite is a resilient species in a highly changeable environment and, that to some degree, a "boom and bust" population fluctuation is characteristic of the species. The above criteria for reclassification to threatened are flexible enough to allow substantial declines in population within a given year, while setting goals over a 10-year period.

ENVIRONMENTAL BASELINE

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

**Status of the species and critical habitat within the action area**

Eastern Indigo Snake: Information on the status of the eastern indigo snake in ENP is lacking, and most information has resulted from incidental observations. The eastern indigo is most commonly observed in hardwood hammocks and pinelands where it can easily find sheltered retreat. Because the project areas include these habitat types, it is assumed that this species occurs in the action area.

Florida Panther: Florida panthers are captured, radio-collared, and regularly monitored by the FWC. According to Shindle *et al.* (2002), collared panthers (two females and four males), are utilizing parts of the project areas for foraging and resting. Neither of the collared females has denned or produced kittens in these areas. Un-collared panthers are utilizing the Pinelands and East Ever project areas where kittens and dens were sighted by ENP wildlife biologist and other staff members (J. Kitchens, ENP, personal communication 2003).

Garber's Spurge: On Cape Sable in ENP, Garber's spurge has been reported from hammock edges, open grassy prairie, and backdune swales. A Miami-Dade County Department of Environmental Resource Management (1994) survey identified a Garber's spurge population of approximately 150 plants on Long Pine Key in the east central area of ENP. Because pine rocklands, similar to those of Long Pine Key, are dispersed throughout the Pinelands project area, the Service assumes that this species is likely to be present in similar habitat elsewhere in ENP. Garber's spurge requires open areas and periodic fires to maintain habitat suitability. Habitat for the spurge has been lost due to fire suppression. Lack of fire to promote and maintain the habitat needs of Garber's spurge is contributing to the degradation of its habitat and delaying recovery efforts.

Cape Sable Seaside Sparrow: The majority of the CSSS population is within the action area, and the status of the species within the action area closely follows the status of the species rangewide, as discussed above. The only portions of the CSSS population that occur outside of the action area are sparrow subpopulation D, and the western portion of subpopulation A. The action area contains approximately 71 percent of the historic habitat of the CSSS, but contains a larger percentage of the current population. In 2002, the action area contained 2,640 of the estimated 2,704 CSSSs (approximately 97 percent).

Designated CSSS critical habitat within the action area includes most of the areas that currently support the CSSS. Approximately 98 percent of the designated critical habitat is within the

action area. Hydrologic modifications have altered the condition of critical habitat within the Taylor Slough area, and recent efforts to re-establish more natural hydropatterns within that system have improved conditions. Northern portions of critical habitat had been overly dry due to blockage of natural flows into northeastern Shark River Slough. Efforts are underway to rehydrate these portions. The frequency of fire within over-dried portions of critical habitat has increased, and once hydrologic restoration has improved, the vegetation may require additional time to recover.

Everglade Snail Kite: Everglade snail kites primarily use the action area for foraging, though nesting does normally occur within some portion of the action area. The action area represents a small portion (< 10 percent) of the total range of the species, and also represents a small percentage of the known breeding range. No regular nesting activity has been identified in the four areas proposed for prescribed burning. Snail kite activity within the action area has been monitored annually for several years (Kitchens *et al.* 2002). The mobility of snail kites allows them to utilize areas with suitable hydrologic conditions, and the amount of use, both for foraging and nesting within the action area, depends largely on the local hydrologic conditions.

Designated critical habitat for the snail kite includes most of Shark Slough and the wetter freshwater areas within central ENP. Approximately 18 percent of snail kite critical habitat occurs within the action area. Hydrologic conditions appropriate for snail kites are maintained within the action area. The northeastern portion of the action area is artificially dry as a result of blockage of hydrologic flows into northeastern shark slough, and the northwestern portions of the critical habitat are wetter than normal, due to the westerly diversion of water. Native vegetation is maintained within the action area, including shrubs that may provide substrate for nesting.

**Factors affecting the species' environments within the action area**

Most of the vegetation types on the ENP depend on periodic fire for their continued existence. Fire has been excluded from much of ENP for a number of years allowing changes in both the structure and species composition of some vegetative communities.

Historically, frequent, low-intensity surface fires characterized the Pineland's slash pine savanna and prairie habitat types. Ongoing research sites, investigating CSSS habitat use and habitat characterization, are located within this project area. This area is used for road travel and over-night camping.

The MRA and Shark Valley project areas' consist of a mix of prairie grasses and sawgrass and hardwood hammock/brush and willow heads. The historical fire regime in Shark River Slough is characterized by seasonally flooded wet prairies. According to ENP fire history records, this habitat has burned every 3-15 years. Portions of the project area were prescription burned in 1990 and 1982. Much of the fuels in the project area have not burned since the 1980s. This long period of fire exclusion has resulted in high fuel loads and brush encroachment into the prairies.

Just north of the MRA project area, there are over 100 residences and numerous buildings and secondary structures. These buildings are constructed on platforms a few feet higher than the adjacent vegetation. Tall sawgrass fuels dominate both of these project areas.

The East Ever project area historically comprised of short hydro-period prairies and interspersed scrub habitat. The natural fire interval for this project area was one to five years maintaining a landscape mosaic of varying growth stages. Presently, the area has an increasing problem with exotic pest plant establishment and spreading, particularly in this urban interface area of ENP. Invasion by these pest plant species is displacing native vegetation and degrading habitat quality for species in these areas. This area has been directly disturbed by human use; disturbance has generally been limited to man made changes in hydrology causing excessive drying in recent years.

Eastern Indigo Snake: Information on the status of eastern indigos in ENP is lacking. To protect and manage this species for recovery, large expanses of land must be protected, such as those at ENP. Management of these lands must be directed towards maintaining and enhancing the diversity of plant and animal assemblages within these properties. Where these goals are achieved, eastern indigos will directly benefit because improved habitat conditions.

Florida Panther: Habitat management throughout ENP affects the panther. Management of human activities, prey species, hydrology, exotic invasives, and fire affect the ability of the panther to feed, breed, and shelter in and adjacent to ENP.

Garber's Spurge: Garber's spurge requires open areas and periodic fires to maintain habitat suitability. Habitat for the Garber's spurge has been lost due to fire suppression. Lack of fire to promote and maintain the habitat needs of Garber's spurge is contributing to the degradation of its habitat and delaying recovery efforts.

Cape Sable seaside sparrow: Hydrologic management is the primary factor affecting the CSSS within the action area. Previous consultations have been conducted that address hydrologic management operations, modifications to existing water control structures, and restoration actions including establishing seepage reservoirs adjacent to critical habitat on the eastern boundary of ENP, and the restoration of canals *(e.g.*, lower reaches of the L-67E canal were restored in 2002). Water management affects the suitability of sparrow habitat for nesting by increasing the risk of nest flooding and increasing predation risk when water levels are high (> 10 cm). Long-term inundation of CSSS habitat and designated critical habitat may also result in shifts in vegetation composition that will reduce the quality of habitat for sparrows.

Wildfires within ENP have affected sparrow populations and habitat, including designated critical habitat. Wildfires that result from both natural ignitions and anthropogenic causes have resulted in vegetation conditions that will not support sparrow breeding for one to three years.

Repeated fires, and fires occurring during unnaturally dry conditions also result in consumption of organic material in soils that may have longer-term effects on vegetation recovery. The ENP has an active prescribed burning program, and this program also has conducted prescribed burns within CSSS habitat and designated critical habitat. The effects of prescribed fires on CSSSs are generally not as severe as those resulting from wildfires because managers work to minimize detrimental impacts to CSSS and other species, but these fires still may result in habitat conditions that are unsuitable for CSSS nesting for one to three years following fire.

Everglade snail kite: Factors affecting the snail kite are similar to those affecting the CSSS. Hydrologic modification has altered hydropatterns within the action area, and these alterations have resulted in changes in the distribution and abundance of apple snails, which the kites prey on. In addition, long-term changes in hydrologic conditions can cause changes in vegetation composition and structure, which affects availability of nesting substrate, and the kites' ability to capture prey, as well as the suitability of designated critical habitat.

Fire management within the action area affects snail kite habitat. Both prescribed fires and wildfires may result in short-term changes in habitat structure. Because snail kite habitat is generally wetter than CSSS habitat, the impacts of fire are generally less severe, except when fires occur during extremely dry periods. The effect of fire on foraging habitat depends on the specific conditions of the site and the fire. Fires may be detrimental to kite nesting by reducing shrubs and other potential nesting substrate.

## EFFECTS OF THE ACTION

The Pineland's project area consists of slash pine savannas (Fuel Model 7) and prairie (Fuel Model 3) habitat types. Most of the area, excluding areas dominated by the exotic-pest plant *Schinus*, has a rough (burnable plant matter) between one to four years old. Less than 20 percent of the project area has a rough between five and eleven years old. Fuels within the primary target areas have roughs of five-years or greater due to lack of fire.

The MRA and Shark Valley project areas' consist of a mix of prairie grasses and sawgrass (Fuel Model 3) and hardwood hammock/brush and willow heads (Fuel Model 6). Tall sawgrass fuels dominate both project areas. Fuel Model 3 characterizes fire behavior in these fuels. Fires in this fuel type are the most intense of the grass types and display high rates of spread under the influence of wind. Wind may drive the fire into the upper heights of the grass and across standing water. Often, one-third or more of the prairie is considered dead and cured and maintains the fire. With wind-speeds of 5 mph and fuel moistures of 8 percent, flame lengths of 12 feet and rates of spread in excess of 104 chains per hour are possible. Hardwood bay heads and hammocks will only carry fire when soil moisture is low. In general, the fire will creep and smolder through these area unless a head fire originating from the prairie hits them. Then, the bay heads and hammocks will support a ground fire with torching of the shrubby vegetation and trees.

The East Ever project area has an increasing problem with establishment and spreading of exotic pest plants. Invasion by these pest plant species is displacing native vegetation and degrading habitat quality. Fire management follows the herbicide treatments.

Because of fire suppression efforts over recent decades, overgrown vegetative communities left unburned/unmanaged, stand as a potential threat with fuel loads able to carry catastrophic wildfire regardless of ignition source. This has already resulted in adverse effects to habitat and species.

**Adverse Effects**

Eastern Indigo Snake: Mechanical preparation of fire lines can crush or injure individual snakes and their nests and destroy or degrade occupied and potential den sites. The use of vehicles and low flying helicopters to conduct and suppress the prescribed fire may result in short-term disturbance and disruption of foraging and sheltering activities. The prescribed fires may adversely affect the eastern indigo by causing snakes to leave the area, abandon den sites, and possibly miss foraging and mating opportunities. In southern Florida, snakes may den in above-ground refugia, such as hollowed tree stumps. Above ground refugia may be lost during the prescribed burn events. Individual snakes fleeing the fire are more vulnerable to predation.

Some snakes may seek underground refugia, if available. Eastern indigo snakes can remain in underground refugia throughout fire events, emerging within days of extinguishment (Becky Smith, Dynamac, pers. comm 2003). The four burn areas have not been assessed for availability of underground refugia.

Drier areas with high fuel loads, are expected to burn quickly. The prescription burn ignition technique is unknown for the East Ever, MRA, and Shark Valley burns. The ignition technique will be determined before the fire event and will be suited to the weather conditions at the time of the prescribed burn. Aerial ignition is the most disruptive to terrestrial wildlife, as the fire will be ignited at multiple locations along a grid and individual fires may form a ring entrapping an individual. The Pinelands burn plan calls for aerial ignition, and aerial ignition techniques may be used for all of the proposed burns. The use of aerial ignition increases risk of harm, harassment, and death to individual snakes, in areas without underground refugia. Although snakes can move across the landscape quickly (B. Smith, personal communication 2003), some snakes may become caught in the fires. Snakes caught in the fire may be injured or killed. Snakes able to escape the fire may be forced into marginal habitat or occupied territories resulting in an increase likelihood of predation, difficulty foraging, and difficulty in finding shelter and mates.

The preparation, prescribed burn, and subsequent suppression, will all occur over a period of days to weeks, and impacts will be temporary in nature. While prescribed burning will result in short-term reductions in habitat suitability for the eastern indigo snake, it will not result in

permanent detrimental impacts to habitat and may have beneficial effects on some habitat components. Florida's landscape has evolved with fire and many of the habitats within the action area depend on fire for long-term maintenance. It is expected that there will be a rapid regrowth of vegetation following the prescribed burns, particularly by grass species, fire tolerant ground cover, and species which depend on fire for germination. Eastern indigo snakes are known to utilize disturbed areas, and have quickly recolonized habitats following burns (B. Smith, pers. comm 2003). Small prey species will move back into burnt areas immediately following fire, and it is expected that eastern indigo snakes will quickly move back into burnt areas following their prey base.

The extent of the Pinelands (44,000 acres) and East Ever (6,000 acres) burn areas increase risk to the eastern indigo snake. If underground refugia are not present in these areas, aerial ignition is used, and there are no unburnt patches within the landscape, multiple snakes could be injured or killed during these burns. If a significant number of snakes are lost, recolonization efforts by this species would be greatly hindered.

Florida Panther: Adult panthers are not likely to be injured or killed as a result of the proposed action. The mechanical preparation of fire lines, including mowing used to prepare lines and installation of smash lines, and vehicles and helicopters used to conduct the prescribed fire may result in short-term disturbance and disruption of foraging and sheltering activities. Adult panthers maintain large home ranges, averaging 200 square miles for males and 75 square miles for females (Maehr *et al.* 1991a). Adult panthers can move across large expanses of habitat in a short period of time; males have been known to move 9 miles in one day; females have been known to move 6 miles in one day. Panthers have evolved within fire-adapted communities and are accustomed to running from wildfires. Adult panthers have a strong sense of smell and will detect nearby fires when initiated. Adult panthers can escape prescribed burns by outrunning the fire, or by finding shelter in a tree if the fire is not intense and are likely capable of escaping prescription fires. The prescription burn ignition technique is unknown for the East Ever, MRA, and Shark Valley burns. The ignition technique will be determined before the fire event and will be suited to the weather conditions at the time of the prescribed burn. Aerial ignition is the most disruptive to terrestrial wildlife, as the fire will be ignited at multiple locations along a grid and individual fires may be ignited in all cardinal directions from an individual. The Pinelands burn plan calls for aerial ignition. Aerial ignition techniques may be used for all of the proposed burns within the action area. The use of aerial ignition increases risk of harassment to individual panthers, particularly un-collared individuals whose locations are unknown.

There may also be adverse affects to panther den sites associated with the prescribed fires. Den sites are usually located in dense, understory vegetation, typically saw palmetto (Maehr 1990a). Den sites are used for up to two months and may be used again in subsequent years. The vegetative communities in the Pinelands and East Ever Burn Plan project areas are particularly suitable for panther denning. Panther dens and kittens have been observed in both areas (S. Bass, ENP , personal communication 2003). These project areas have been managed by prescribed fire during the years when these habitat use observations occurred.

Panthers may be adversely affected by the proposed burns by leaving the area while the fires are taking place. Of serious concern is the possibility that a fire could impact kittens at a den site. The information ENP has through weekly telemetry data and incidental observations reported via ENP's wildlife observation reports make it unlikely that an active den site will be affected by the prescribed burns. If a prescribed fire threatens panthers, the fire will not take place (S. Bass, personal communication 2003).

Garber's Spurge: Individual Garber's spurge plants are likely to be damaged or destroyed by mowing used to prepare lines and the installation of smash lines. Vehicles used to conduct and suppress the prescribed fire may also damage and destroy plants. The prescribed burn may result in loss of biomass, however, no individual plants should be lost. Garber's spurge is not considered fire dependant, however, the Garber's spurge occurs in vegetative communities that historically are naturally prone to periodic disturbance. Prescribed fire is the primary means of habitat management for Garber's spurge in pine rockland communities. Prescribed fire maintains openings and bare soil conditions that may benefit the spurge. Control of exotic plants will also likely benefit Garber's spurge by eliminating competition and shading.

Cape Sable Seaside Sparrow: The CSSS will be adversely affected by the fires in the short term. The CSSS does not nest within prairies that have burned within the previous 1-3 years, presumably due to lack of sufficient vegetation density or structural complexity (Pimm *et al.* 2002). Taylor (1983) reported that sparrows occupy burned prairies as quickly as the second breeding season following fire, but they may not return until 2-3 years after a fire. Fires conducted during the CSSS breeding season (April to August) may result in the destruction of nests and any eggs or young within the nests. Mortality of adult sparrows is unlikely to occur as a direct result of fire. Pre-burn surveys will aid in avoiding sites where sparrows are nesting, but surveys may fail to detect sparrows when they are actually present (Pimm 2002).

In addition, the proposed action may result in the disruption of normal behaviors including feeding, nesting, and care of young. Vehicles and helicopters used to conduct and suppress the prescribed fire may result in short-term disturbance. Mowing used to prepare lines, and the installation of smash lines may also disrupt foraging, sheltering, and breeding activities, possibly destroying nests and nest contents.

Both the Pinelands and the southern half of the East Ever burn areas occur within designated CSSS critical habitat. The MRA and Shark Valley burn areas occur within close proximity to occupied breeding habitat that was not included in CSSS critical habitat. Key elements for CSSS habitat include: short hydroperiods, where surface water levels are maintained at or below the surface and the hydroperiod adheres to a rainfall-driven schedule; and mainainence of vegetative structure necessary to support successful breeding. The prescribed burns will not impact the hydroperiod of any of the burn areas. The burns will result in short-term reductions in habitat structure suitability for CSSS, however, they will not result in permanent detrimental impacts to critical habitat or occupied habitat, and may have beneficial effects on some habitat components.

Fire may stimulate flowering in vegetation species that comprise CSSS habitat, and this may be essential to ensure the long-term persistence of the vegetation type.

Everglade Snail Kite: Adult snail kites are not likely to be injured or killed as a result of the proposed action. The mechanical preparation of fire lines, including mowing used to prepare lines and installation of smash lines, and vehicles and helicopters used to conduct the prescribed fire may result in short-term disturbance and disruption of foraging, breeding, and sheltering activities. Adult kites are capable of escaping prescribed burns through flight, regardless of ignition technique.

Prescribed fire may result in direct impacts to kite foraging, nesting habitat, and kite nests. Snail kite nests and their contents within a burn unit may be destroyed by fire. The prescribed fires may reduce the quality of foraging habitat through changes in vegetation structure and loss of suitable perches used during foraging and roosting. Additionally, the use of a helicopter in the vicinity of snail kite nests may damage nests and result in nest failure, as a result of air turbulence from a low-flying or hovering helicopter. Collision with a helicopter, while unlikely, is also possible.

Short-term disturbance to foraging may result from the fire, or from equipment, personnel, and vehicles involved in conducting the prescribed fire. These effects will be temporary, but may reduce provisioning of nestling kites if nests are located in the vicinity.

Both the MRA and Shark Valley burn areas occur within designated snail kite critical habitat. Active snail kite breeding habitat was identified in 1994 in and adjacent to the East Ever burn area. This breeding habitat was not included in the original designation of snail kite critical habitat. Snail kites rely on long hydroperiod wetlands, including low-profile marsh and shallow open water that is relatively clear and calm. The kites feed almost exclusively on apple snails, and rely on habitats which promote high densities of apple snails. Another key element to snail kite success is suitable nesting substrate close to the foraging habitat. The prescribed burns will not impact the hydroperiod of any of the burn areas. The burns will result in short-term reductions in nesting structure suitability for snail kites, however, they will not result in permanent detrimental impacts to designated critical habitat or occupied habitat, and may have beneficial effects on some habitat components.

**Beneficial Effects**

Species addressed in this opinion are dependent on periodic fire for feeding, breeding, and/or sheltering. Although the proposed fires may result in adverse affects to individuals of these species, the fires will maintain the ecological functions and values of the native pineland and prairie vegetative communities. We expect that the proposed fire management will result in significant habitat benefits to these listed species by restoring and maintaining suitable habitat

conditions over the long term. The following beneficial effects will result from the proposed action:

- A reduction in the hazardous fuel loads that contribute to the potential for catastrophic wildfire. Without prescribed fire, fuels will continue to accumulate, increasing the risk of catastrophic wildfire which is a threat to listed species and their habitats as such fires may occur during the time of year when a given species is vulnerable and may burn in such a way that significant, adverse habitat alteration or degradation could occur.

- Improved forage base for the panther, indigo snake, and CSSS.

- Improved soil and groundcover conditions for the Garber's spurge.

- Improved habitat quality for listed species.

- Eradication of exotic pest plants. Without prescribed fire, exotic pest plants will continue to invade and displace native, plant communities. Loss of native plant communities degrades the habitat required by these listed species, thereby reducing their potential for survival and recovery in the wild.

- Restoration and maintenance of historical habitat succession conditions.

- Enhancement of the diversity of plant and animal assemblages.

Prescribed fire is a natural component of the disturbance regime in south Florida, and most communities are either fire-dependent or fire-adapted. Prescribed burning is probably the single most important habitat management tool available to public land stewards. Dees *et al.* (1999) examined panther use of habitat in response to prescribed burning at Florida Panther NWR and Big Cypress National Preserve between 1989 and 1998. A positive temporal response to prescribed burns occurred in the year following the burn, likely due to the rapid regrowth of vegetation, which in turn attracted white-tailed deer. Panther use of the burned area gradually declined after the first year and ended after four years. 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 (Dees *et al.* 1999). 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. Prescribed burn rotations on both sites are four years, but unfavorable weather conditions and logistics may sometimes extend the rotation.

The short-hydroperiod marshes and the marl prairies of ENP are also fire-adapted, and contain many plant species that flower primarily following growing-season fire, such as muhly grass, which has been reported as an important component of CSSS habitat. Fire may also control encroaching woody vegetation in some areas of sparrow habitat. Prescribed fire, when conducted in limited areas within CSSS populations, will help reduce the possibility of a catastrophic fire by reducing fuels. While vegetation responds quickly and will achieve sufficient density to carry fire within only 1-2 years, fires within these previously burned areas will travel more slowly, be easier to suppress, and will be less severe. Reducing the fuels along roads, public access points, and within strips through potential habitat may allow wildfire managers to effectively suppress fires that would otherwise devastate sparrow habitat and the sparrow population.

Taylor (1983) reported that sparrows re-occupied burned areas during the second breeding season following a fire, and then increased in number in each of the subsequent years, and burned sites supported greater densities of sparrows than unburned sites for several years after re-occupancy of burned sites. Subsequent analyses of the effects of fire on population density have failed to detect increased density of sparrows on burned sites (Pimm *et al.*2002). In some cases, burned sites may be able to support greater population densities. Additional studies are needed on this subject. Fires may also lead to temporary increases in invertebrate abundance, and this may improve CSSS foraging.

## 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.

The ENP, which comprises the action area, is wholly owned by the NPS. Any future actions outside the scope of this opinion will require a separate consultation.

## CONCLUSION

The Service has evaluated and balanced the long term benefits of the fuels treatments proposed within the project areas. ENP proposes using fuels treatment projects to reach goals stated in the National Fire Plan (2001); to treat hazardous fuels, using appropriate tools, to reduce risk to communities and the environment caused by unplanned and unwanted wildfire. Fuels treatment projects are being used to reach the goal of restoring fire-adapted ecosystems which will ultimately benefit many listed and sensitive species and their habitat.

After reviewing the status of the eastern indigo snake, Florida panther, Garber's spurge, CSSS, and Everglade snail kite, and CSSS and Everglade snail kite critical habitat, 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 action, as proposed, is not likely to jeopardize the continued existence of these species and is not likely to destroy or adversely modify designated critical habitat.

## III. 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 a 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 if that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by NPS so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in action 7(o)(2) to apply. The NPS has a continuing duty to regulate the activity covered by this incidental take statement. If the NPS (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the NPS must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

Sections 7(b)(4) and 7(o)(2) of the ESA generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the ESA prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on areas under federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law. Since the taking of plants associated with the proposed action does not meet the above criteria, we have determined that incidental take for the Garber's spurge does not apply.

AMOUNT OR EXTENT OF TAKE

Eastern indigo snake: We anticipate that incidental take of the indigo snake will be difficult to detect for the following reasons: (1) wide-ranging distribution, (2) unpredictably clumped in their distribution in suitable habitat, and (3) apparently suitable habitat may not be occupied. However, the Service anticipates incidental take of eastern indigo snakes associated with the prescribed burning of as much as 53,300 acres in the four burn areas. The incidental take is expected to be in the form of harm, harassment, and direct mortality. Take of eastern indigo snakes is anticipated to be 1 individual per 741 acres burned.

Florida Panther: The amount of panther habitat affected by the proposed action at the population level is 2.42 percent of an estimated 2.2 million acres of habitat occupied by the panther (Maehr 1990a). Incidental take is expected to be in the form of harassment. The Service anticipates incidental take of panthers associated with the prescribed burning of as much as 53,300 acres in the four burn areas. No direct mortality of panthers is expected from the proposed action.

Cape Sable Seaside Sparrow: The Service anticipates incidental take of CSSS will be difficult to detect for the following reasons: (1) small body size makes it unlikely that dead or impaired specimens will be found, (2) nests are well hidden in vegetation, and (3) the reproductive output for each pair is unknown. Approximately 2,400 acres of the 53,300 acres proposed to be burned can be reasonably expected to support CSSS. The incidental take of the CSSS is expected to be in the form of harm or injury due to habitat loss, harassment, disturbance, and destruction of nests. The Service anticipates that 10 nests will be destroyed, 40 adults will be harassed, and 2,400 acres of habitat will be unable to support sparrow nesting for 1-2 years post-burn.

Everglade Snail Kite: Incidental take is expected to be in the form of harm or injury due to habitat loss, harassment, disturbance, and destruction of nests. The Service anticipates that no more than 40 individual kites will be harassed. No mortality of flighted birds is expected. No regular nesting has been detected in the four areas proposed for burning. However, if nesting occurs in the 53,300 acres proposed for burning, all nests may be destroyed.

The Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 7 03-712), or the Bald Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of eastern indigo snake, Florida panther, CSSS, and Everglade

snail kite:

1. Minimize adverse affects to breeding/rearing young by avoiding prescribed burns during the breeding season in areas in which reproductive efforts were identified.

2. Minimize adverse affects by monitoring the long-term response of species and habitats to prescribed fire to improve protection efforts during subsequent fires.

**Terms and Conditions**

In order to be exempt from the prohibitions of Section 9 of the ESA, the NPS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. Conduct preburn surveys for nesting kites if burns are proposed during the nesting season of December 1 through June 30. If nests area detected, do not burn the area within 1,000 feet of any nest during the nesting season.

2. Conduct preburn surveys for nesting CSSS if burns are proposed during the nesting season of March 1 through August 15. If nests area detected, do not burn suitable habitat within 500 feet of any nest during the nesting season. Forested areas within 500 feet of CSSS nests may be burned, including a 50-foot buffer from the treeline.

3. Conduct preburn surveys for panther dens. If any dens are detected, do not burn within 100 meters of the den.

4. Prepare a monitoring plan to document effects to listed species and their habitats within burned areas. A draft monitoring plan will be submitted to the Service for review and approval within 60 days after the date of this biological opinion. Monitoring will be designed to document the amount and extent of take of listed species and their response to the prescribed burns. A monitoring report that complies with the requirements of 50 CFR part 402.14(i)(3) will be submitted to the Service annually for 10 years.

5. Submit an Annual Burn Report of ENP past year's burn season results to the Service each year following the proposed burns.

6. 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. If, during the course of the action, this level of incidental take is exceeded, such incidental take would represent new information requiring reinitiation of consultation and review of the reasonable and prudent measure 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 that helps improve the status of endangered or threatened species. The Service recommends that the NPS implement the following:

- In the Pinelands burn unit avoid impacts to *Digitaria pauciflora*, a federal candidate for listing, that occurs on the margins of pines and prairies likely to be affected by the proposed mowing.

- Continue studies on the effects of interactions between prescribed fire and hydrological management on vegetation.

- Implement the MSRP to the maximum extent practicable.

- Conduct a Garber's spurge survey within appropriate habitat in ENP.

## V. REINITIATION NOTICE

This concludes formal consultation on the action described in the ENP's proposed prescribed burns. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, as defined by the action area measures provided in this project description; (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 any questions, please contact Holly Hoier at 772-562-3909, extension 266.

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Figure 1. Pinelands burn plan project area, 2003-2005, Everglades National Park

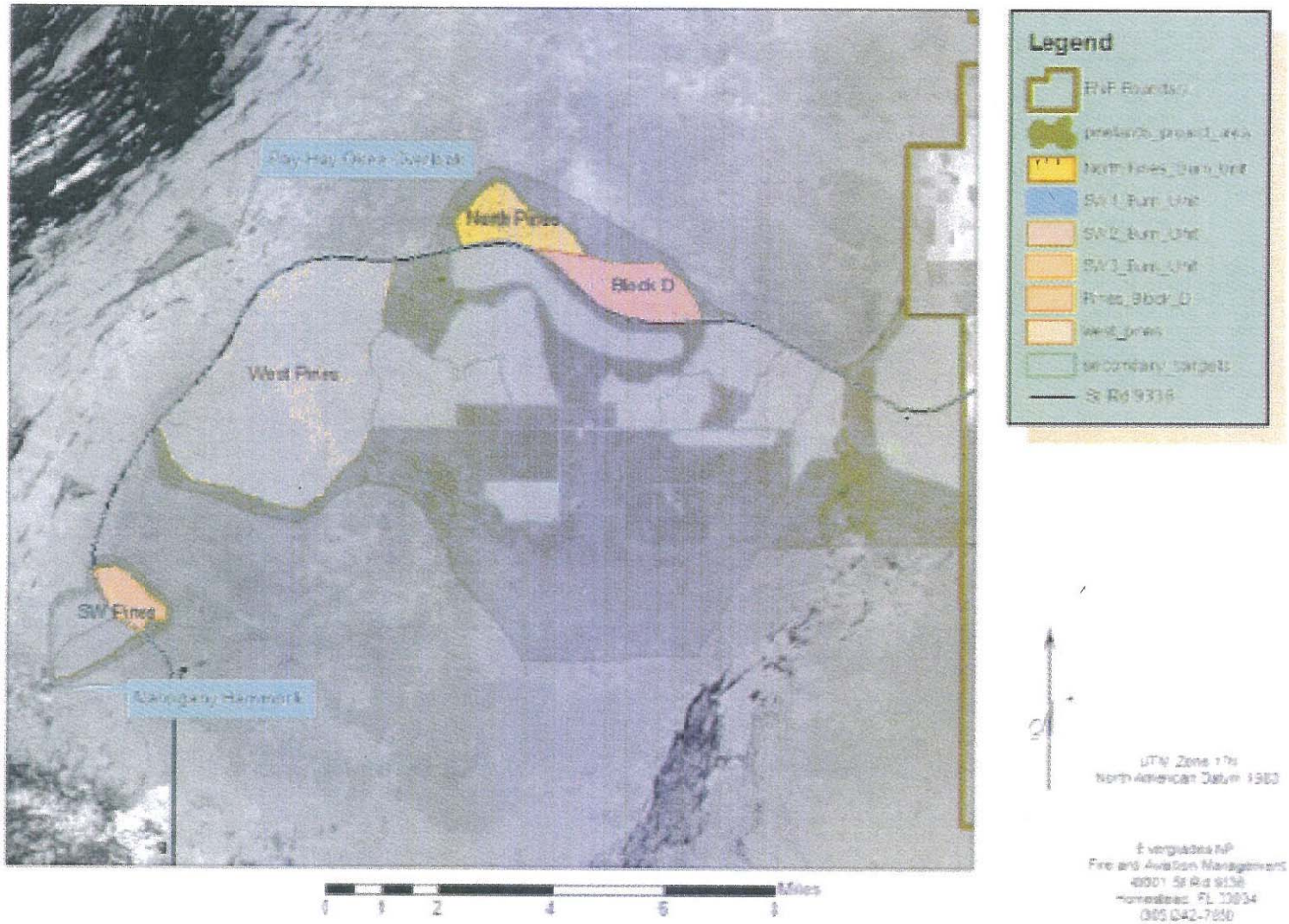


Figure 2. Miccosukee Reserved Area (MRA) and Shark Valley Burn plan project areas, 2003-2005, Everglades National Park

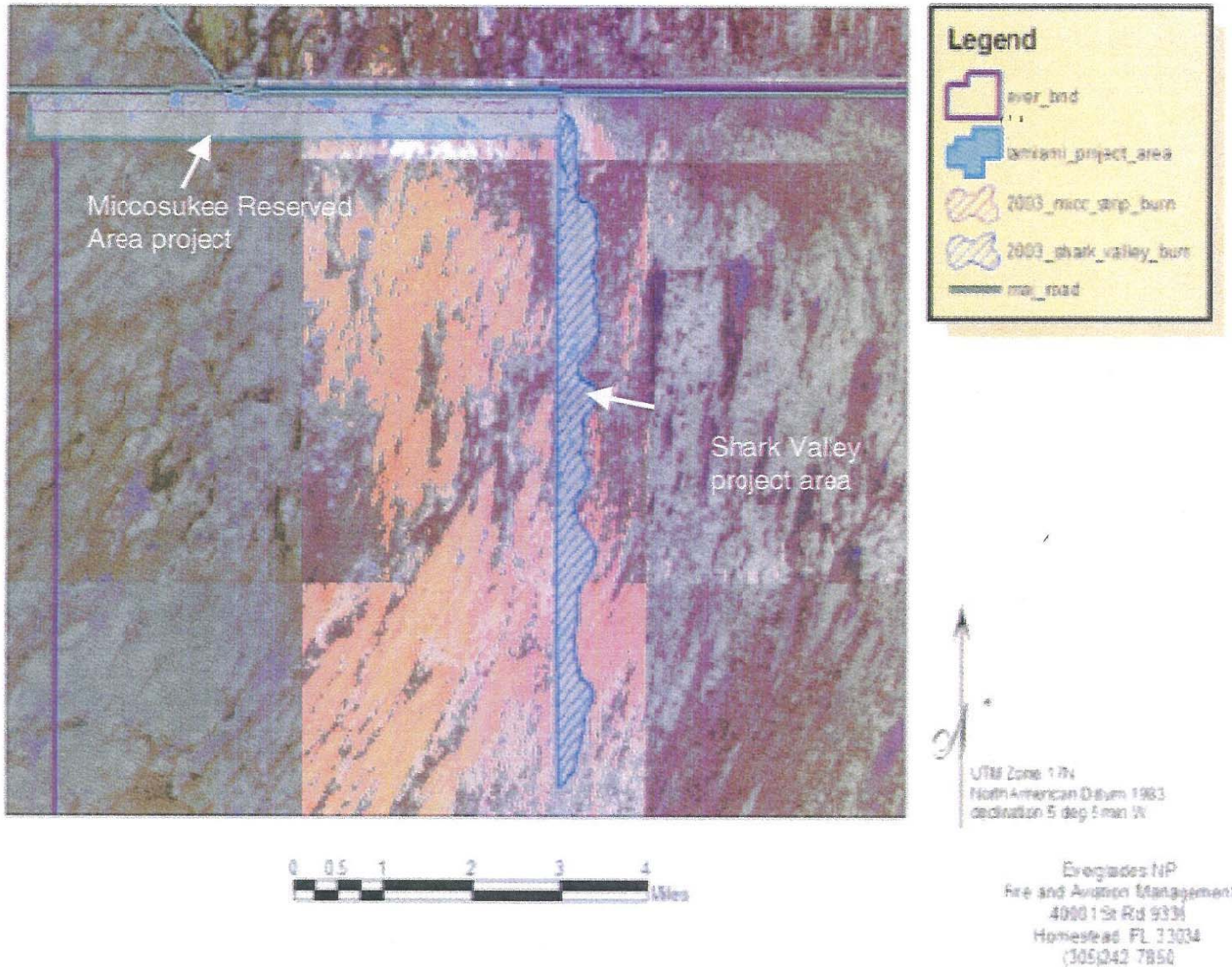
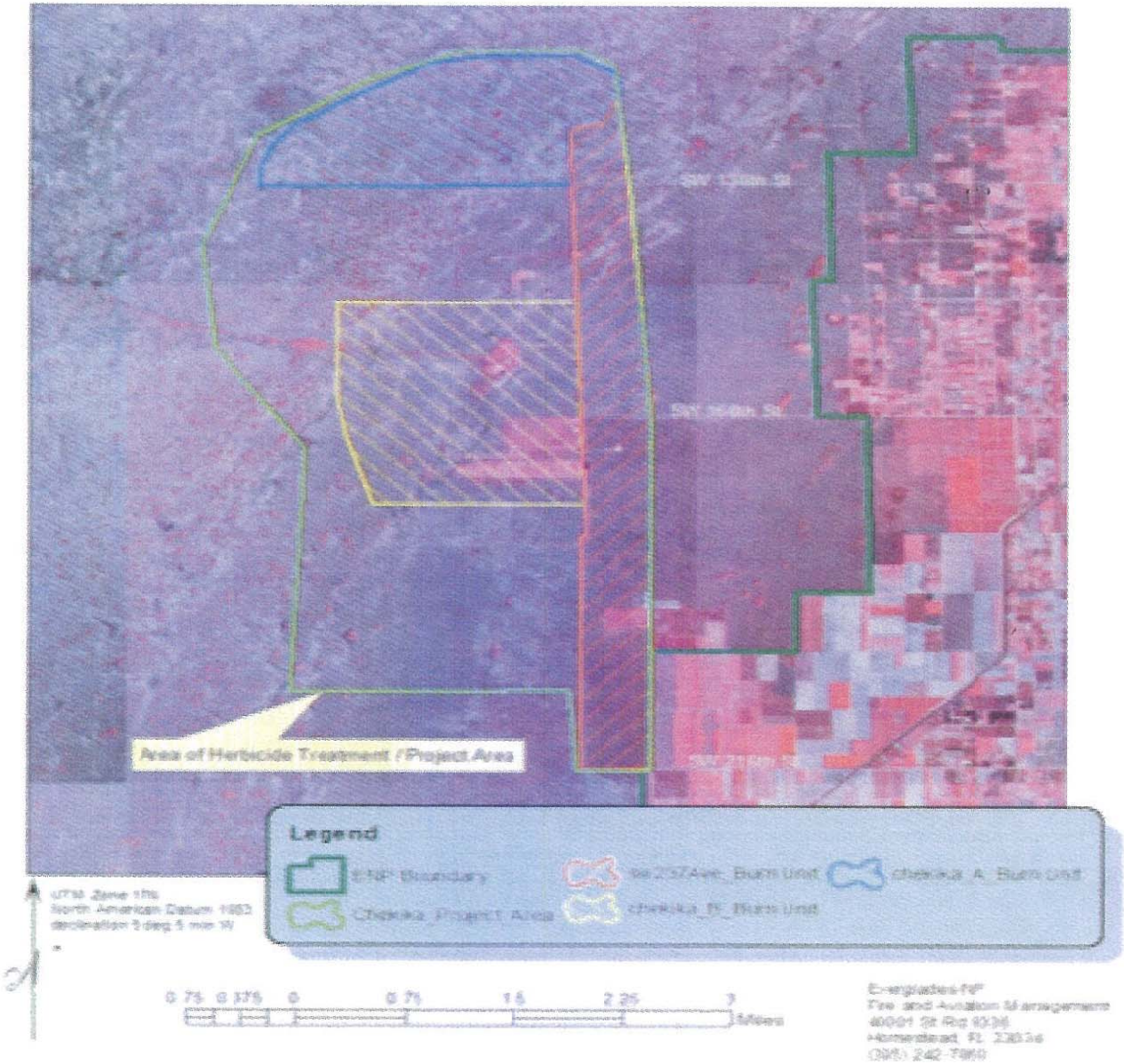


Figure 3. East Ever burn plan project area, 2003-2005, Everglades National Park



# Figure 4. Action area for Everglades National Park's 2003-2005 Pinelands, Miccosukee, Shark Valley, and East Ever burn plans.

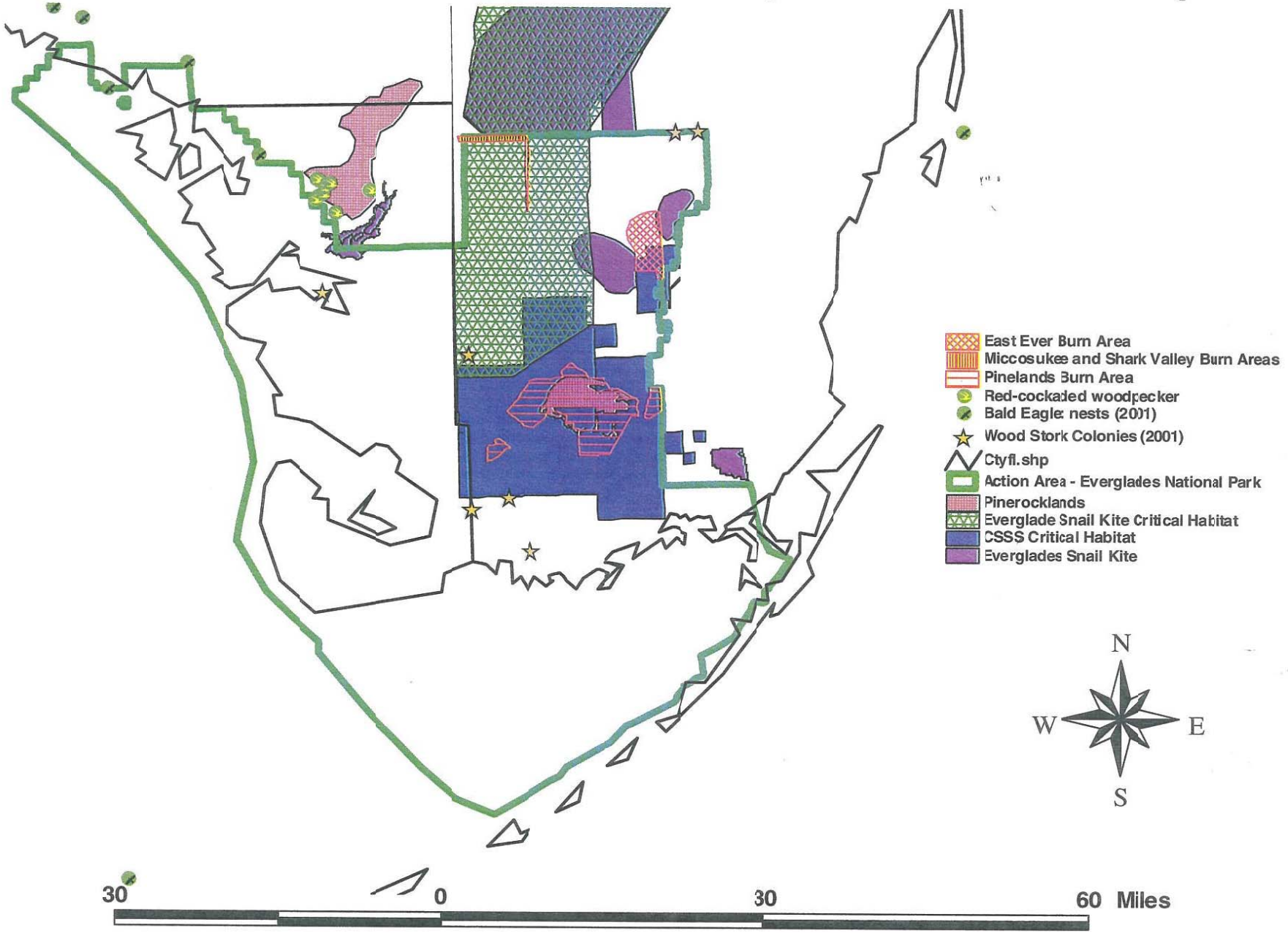


Figure 5. Historic distribution of the Florida panther (Young and Goldman, 1946)