



**FLORIDA PANTHER (*Puma concolor coryi*)
RESEARCH AND MONITORING
IN BIG CYPRESS NATIONAL PRESERVE
2007-2008 ANNUAL REPORT**

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photo of FP153 by Ralph Arwood

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Abstract

The goals of this project are to provide demographic, biomedical, and genetic information on Florida panthers (*Puma concolor coryi*) in the 217,409-ha study area in Big Cypress National Preserve (SBICY) with which to guide management actions, assess responses to natural events and human-caused impacts, and enhance panther recovery. The reporting period is 1 July 2007 to 30 June 2008. During 27 hunting days between 3 February and 3 March, we captured and handled 9 panthers. Four were previously uncollared and 5 had their collars replaced. Two other females, slated for collar replacement, were not handled because each was raising kittens less than 12 months of age. We monitored 13 panthers, 5 males and 8 females, for at least a portion of the reporting period. The average home range (95% MCP) of the 7 resident females and 4 resident males located more than 50 times in the reporting period was 127 km² and 678 km², respectively. The presence of a minimum of 4 uncollared adult males, 6 uncollared (or failed collar) adult females and 8 uncollared juveniles was verified in the study area. The minimum population count of 31 panthers for SBICY is comparable to Rancher's Supply, Inc. synoptic survey results of 29 panthers in SBICY during the 2008 calendar year.

Six adult and 4 kitten mortalities were documented. Four collared panthers were lost from the sample through mortality and 2 due to collar failure. One uncollared male panther was killed on I-75 and 1 uncollared female was killed on SR29, the western boundary of the study area. Four neonates were found dead in their dens. In addition, the 5-month-old kittens of FP103 would not have survived after her death in August of 2007.

Three of the 8 monitored females denned 4 times, producing 10 kittens, 4 males, 5 females, and 1 of unknown gender. The remains of 4 of the 10 kittens, 2 males, 1 female, and 1 of unknown gender, were found at 2 dens. Six kittens, therefore, were marked with transponders and sampled for biomedical information. One female kitten, apparently abandoned in the den, was removed from SBICY and placed in captivity.

Report Background

This is the sixth annual report on National Park Service (NPS) panther work in Big Cypress National Preserve (Big Cypress). It covers capture and monitoring efforts between 1 July 2007 and 30 June 2008 in the study area (SBICY), which consists of all lands (217,410 ha) within the Preserve boundary south of Interstate 75 (I-75). The Florida Fish and Wildlife Conservation Commission (FWC) monitors panthers in the remaining 75,340 ha of Big Cypress north of I-75. The SBICY study area also includes lands used by our monitored panthers that are not in the FWC or Everglades National Park (EVER) study areas.

Examples of these areas are the Miccosukee tribal lands south of I-75 and east of the L-28 canal and EVER north and west of Shark Valley Slough.

Information on all the panthers known to inhabit SBICY between 1981 and 2003 can be found in the 2003 Big Cypress Annual Report (Jansen et al 2003). The 2004, 2005, 2006, and 2007 annual reports covered capture and monitoring work in SBICY between 1 July to 30 June of those years to coincide with the fiscal year reporting requirements of FWC (Jansen et al. 2004, Jansen et al. 2005, Jansen et al. 2006, Jansen et al. 2007).

Statement of Purpose

The overall purpose of this ongoing project is to monitor the status of the panther population in Big Cypress, to provide information to management so their decisions will support and enhance panther recovery, and to determine the panthers' behavioral and/or demographic responses to natural events, management actions, and human impacts in south Florida.

Project Goals

The proposal to renew the Federal permit to capture and handle Florida panthers included the following goals (Jansen 2006):

Goal 1. To provide the necessary information to make sound management decisions, evaluate the effects of restoration projects and management strategies, and meet the

recommendations and stipulations of the Environmental Impact Assessments and Biological Opinions related to the management of Big Cypress.

Goal 2. To assess the potential of the habitat in Big Cypress to support panthers.

Goal 3. To assess the potential of the expanding population of panthers in Big Cypress to link with the subpopulation of panthers in EVER and to provide baseline information on panther use in areas that may be affected by the Comprehensive Everglades Restoration Plan (CERP).

Goal 4. To provide the samples necessary to assess of the impacts of the Genetic Restoration Project on the panthers in Big Cypress south of Interstate-75.

Goal 5. To monitor the prevalence of feline leukemia and other potentially harmful diseases through biomedical sample collection.

Goal 6. To determine the nighttime movements and habitat use of panthers through GPS technology.

Goal 7. To identify crossing and mortality sites with which to recommend highway enhancements that resolve panther-vehicle collisions.

Goal 8. To provide timely response to panther-human interactions that occur within Big Cypress through monitoring of radio-collared panthers and, when warranted, through marking of panthers involved in these interactions.

Study Area

The study area, SBICY, represents 74% (217,409 ha) of Big Cypress, a 292,750-ha unit of the National Park Service (NPS), situated in south Florida in Collier, Monroe, and Miami-Dade Counties. The enabling legislation of Big Cypress allows for recreational and commercial uses, such as hunting, off-road vehicle operation, and oil extraction. Most of Big

Cypress is also designated a state wildlife management area for recreational hunting, and, as such, has been divided into 6 “units” to allow flexibility in management and regulatory decision-making (Figure 1). Big Cypress encompasses almost half of a unique water-dependent ecosystem called Big Cypress Swamp. Unlike the Everglades, it is still a relatively pristine wetland system. Nearly 80% of the rain normally falls during the 6-month wet season of May through October and averages 135 cm per year (Schneider et al. 1996). The vegetative types described by Welch et al (1999) have been consolidated into 7 general categories. Using these, the study area consists of 50% cypress, 16% prairie, 13% marsh, 13% pineland, 4% mixed hardwood swamp, 3% hardwood hammock, and 1% mangroves (Figure 2). Disturbed habitat, including exotic plants and areas of human influence such as roads, is found in 0.4% of SBICY.

Only 285 km of roads exist in SBICY. Two paved roads, I-75 (formerly Alligator Alley) and Highway 41 (Hwy. 41), run east-west through the northern and southern portions respectively from State Road 29 (S R 29) to Conservation Area 3A. Four unpaved county roads, Birdon (C R 841), Wagonwheel (C R 837), Turner River (C R 839), and Loop (C R 94) (now partially under NPS jurisdiction), cover 97 kms. State Road 29 is a paved road that borders Big Cypress on the west. The southern boundary of Big Cypress joins EVER and the eastern boundary is partially separated from Water Conservation Area 3A by a levee (L-28) (Figure 1). The northern boundary adjoins tribal and private lands, some of which have been converted into agricultural production.

A deer and hog hunting season takes place from September through December. The 5-year (2003-2007) average for hunter pressure was 12,998 man-days, with a mean harvest of 190 deer (bucks only) and 9 hogs (FWC 2003-2007 annual harvest reports). The agencies also monitor deer population trends through aerial surveys, track counts, and spotlight counts since deer and hogs are the main prey species of the Florida panther.

Off-road vehicles (ORVs) are the only practical way to access the interior of Big Cypress for recreational purposes. The extent of ORV trails has increased since first quantified from 1953 maps (Duever et al. 1986). They mapped 250 km of ORV trails from 1953 maps and

over 1,100 km from 1973 maps. Welch et al (1999) delineated over 46,774 km of trails or trail remnants that were visible on aerial photos. Janis and Clark (2002) determined that panthers showed some avoidance of these trails during periods of increased vehicle activity. Aesthetic concerns and the probable impacts on soils, vegetation, and wildlife have prompted the development of an ORV management plan that restricts ORV travel to designated trails (National Park Service 2000). This designated trail system is still in the development and construction phase.

Methods

Study Area Sampling

We used the 6 designated “game management units” of Big Cypress, i.e., Bear Island, Deep Lake, Turner River, Corn Dance, Loop, and Stairsteps, to partition Big Cypress for descriptive purposes. We called the area added to Big Cypress in 1988 the Addlands North and Addlands South (Figure 1). We incorporated the 1-mile strip of acquired land along SR 29 into the existing management units for the purpose of this report. Because the Turner River, Corn Dance, and Stairsteps Units are so large, we further divided SBICY into 12 survey “blocks”, based on roads and recognizable geographic features, to aid in quantifying our survey and capture efforts (Figure 3). The size of the blocks ranges from 14,184 ha to 28,698 ha and averages 20,747 ha. Although our objective is to randomly sample all areas for the presence of panthers, targeted goals identified annually may take precedent.

2008 Capture Season Plans

In the SBICY 2008 Capture Season Plan presented at the 2 October 2007 Panther Capture Season Planning meeting in Naples, Florida, we identified 6 panthers, #s 124, 138, 150, 151, 152, and 153, whose collars needed replacement. Since FWC stated that they were not planning to recollar FP133 whose home range includes both study areas, we added him to our capture seasons goals. We planned to target blocks 3, 4, 9, 10, and 11 where the sample of monitored females continues to be small. Collar replacement on 3 panthers with non-GPS failed collars, #s 102, 127, and 145, was an additional goal.

We placed Generation III GPS collars (Telonics, Inc.), programmed to obtain 5 evening-to-morning locations on panthers in areas where this data has not yet been obtained. This information should complement the existing dataset of daytime locations and assess nighttime habitat use. For other panthers, we placed MK9 collars (Telonics, Inc.) with VHF capability and programmed to duty-cycle in order to extend their life in the field.

Survey and Capture Protocols

Documentation of panthers was recorded during the capture work and augmented by the annual synoptic survey efforts by Rancher's Supply, Inc. using the protocol they developed to determine the presence of uncollared panthers (McBride et al. 2008, Rancher's Supply, Inc. 2008). We conducted our capture work following the protocols outlined in Endangered Species Permit TE146761-0 from USFWS and the Special Purpose Permit #WX02384c from the FWC. Drug protocols and panther handling modifications were updated as new information became available. Biomedical procedures were similar to those outlined in Cunningham (2004) and Florida Fish and Wildlife Conservation Commission (2008). For consistency in our capture effort analysis, we defined a hunt day as one having suitable environmental conditions and the availability of all team members to conduct a capture.

Population Monitoring

We located each panther with a functioning collar 3 times a week between 0900-1200 hrs, using telemetry from a fixed-wing aircraft. Our methodology differed to some extent from the EVER and FWC monitoring protocol. We determined the general location of each panther at 150 m above the ground, and then made 1 or more passes at 60 m to further define the location. Flights conducted by other panther monitoring agencies do not descend below 150 m (Darrell Land and Sonny Bass, pers. comm.) We found, however, that low-level passes were necessary in most instances to confirm habitat use due to the complexity and intermingling of vegetative types in SBICY.

We recorded the date, time, Universal Transverse Mercator (UTM) coordinates, habitat type, and unique situations, such as 2 panthers in the same location or panther sightings. We mapped the general location by air, and in the office used a Geographic Information System

with aerial photos geo-referenced in North American datum 83 to obtain accurate UTM's. We shared with FWC, on a flight-by-flight basis, the locations of several males that used both the FWC and SBICY study areas. The combined dataset on these individuals was incorporated into this report. We also incorporated location data from FWC and EVER to generate a map showing SBICY locations in relation to the entire monitored population.

We displayed the home ranges of resident radio-collared panthers located in SBICY between 1 July 2007 and 30 June 2008 (Figures 9-21) by 2 methods:

- 1) as minimum convex polygons (MCP) (Mohr 1947) with a 5% harmonic mean outlier removal for the entire time the individual was monitored via telemetry as an adult, and
- 2) as fixed kernels (Worton 1989), using the least squares cross validation (LSCV) "smoothing parameter" to show the home range during the reporting period (Seaman and Powell 1996). We generated home range maps using the ArcView 3.2 Spatial Analyst (Environmental Systems Research Institute, Inc.).

Reproduction

Inspection of Florida panther dens by FWC began in April 1992 and by Big Cypress in April 1995. When an adult female panther was found in the same location for more than 3 consecutive flights, we conducted a ground check to further delineate the site and install a remote monitoring device (Land et al 1998) if denning was suspected. We determined the female's routine of den attendance by 24-hour remote monitoring, and handled the kittens when she was away from the den during the daytime. We processed the kittens following the protocol established by FWC (Cunningham, M. 2002). Appendix II in Florida Fish and Wildlife Conservation Commission (2008) lists all panther kittens handled at dens from 7 April 1992 through 30 June 2008 and Appendix III lists all known dens of radio-collared female panthers from June 1985 to 30 June 2008.

Mortality

If a panther's collar emitted a mortality signal, we notified FWC that we were in the process of confirming whether or not the panther was dead. On rare occasions, a panther may remain motionless for 2 hours, the time it takes to activate the mortality mode on the collar.

Following the protocol established by FWC (Land 1999), a law enforcement officer either accompanied us to inspect the site for sign of human involvement in the death. We submitted the carcass to FWC immediately and, within 24 hours, submitted the standardized form “*Panther Mortality Investigations and Carcass Retrieval*” to FWC and USFWS.

If Big Cypress personnel received a report that a panther had been injured or killed on a road in SBICY, we notified FWC and responded to the site to secure the evidence and obtain detailed information. We submitted the carcass to FWC. Some aspects of necropsy results are incorporated into this report. Appendix IV in Florida Fish and Wildlife Conservation Commission (2008) lists known panther injuries and mortalities from 13 February 1972 to 30 June 2008.

Reporting

We used the reporting period of 1 July 2007 to 30 June 2008 to correspond with FWC reports that coincide with their fiscal year. The compiled telemetry flight dataset was submitted to FWC at the end of the reporting period. We submitted all data obtained on panther dens and mortality as well as biomedical samples from kittens and adults to FWC and designated labs within 24 hours of collection.

Definitions

We defined **Home range** as the area where a panther restricts the majority of its movements. We determined home range for **resident** panthers, i.e., those that had more than 5% of their locations in SBICY, had more than 50 locations during the reporting period (approximately one-third of all flight locations), and were considered to be adults. Those not meeting these criteria had **areas of use**. We chose 2 years as the average age to classify female panthers as **adults**, based on a sample of 7 known age females in SBICY who had their first litter at an average of 23 months. We also chose 2 years as the average age to classify male panthers as adults, although some may be still dispersing or have not had a breeding opportunity until older, whereas others, i.e. FP79, have successfully bred at 15 months (Warren Johnson, pers. comm.) We described **Dispersers** as those panthers that made large random movements and typically inhabited SBICY for less than 6 months before they either left or settled into a

home range. **Immigrants** dispersed into SBICY from some other locality. **Emigrants** were panthers born in SBICY but dispersed completely outside the study area.

Results

Survey and Capture Efforts

We hunted for 27 days between 3 February and 3 March 2008 in 10 of the 12 survey blocks. We captured and collared 4 new panthers, FP161, 162, 163, and 164. We replaced the failed collar on FP127 and changed the working collars on 4 panthers, FP124, 133, 152, and 153 (Table 1). We did not handle females FP150 and FP151 because they each were raising kittens less than 12 months-of-age. On February 13th, Big Cypress got an average of 3.25 inches of rain which hindered our hunting efforts and searches for panther sign. Figure 4 shows our capture effort per block for the past 6 years.

2008 Capture Season Summary:

- 27 total hunt days
- 4 newly collared panthers (FP161, FP162, FP163, and FP164)
- 1 failed collar replacement (FP127)
- 4 working collar replacement (FP124, FP133, FP152, and FP153)
- 2 not handled because had kittens less than 12 months-of-age (FP150 and FP151)
- 2 treed but not handled due to environmental conditions (uncollared male, FP152)
- 1 treed but not needing handling (FP133)
- 2 juveniles treed/not handled because had another panther treed (FP124's juvenile male; FP93's juvenile male)

Documentation of Uncollared Panthers

Within the study area, 4 uncollared adult males, 6 uncollared (or failed collar) adult females and 8 dependent juveniles were documented either during our capture season or by Rancher's Supply during their synoptic survey work (Rancher's Supply, Inc. 2008) (Figure 5).

Synopsis of our hunt effort and findings during the capture season:

Block 1: Hunted 2 days. On 19 February, recollared FP133. On 3 March, recollared FP153.

Block 2: Hunted 3 days. On 24 February, collared FP164 (new panther). On 29 February, treed FP133 and photographed the wound on his nose.

Block 3: No hunting in this area.

Block 4: Hunted 1 day. Found old sign of a male panther.

Block 5: Hunted 2 days. On 10 February, collared FP161 (new panther).

Block 6: Hunted 7 days. On 18 February, collared FP162 (new panther). On 21 February, treed 2 juvenile males of FP93 and collared 1 (FP163). We documented sign of a female and 2 kittens north of Burns Lake, which could have been FP102 with a failed collar, and sign of a female with kittens on Concho Billie Trail which could have been FP93 with a failed collar.

Block 7: Hunted 4 days. On 6 February, found sign of an uncollared female and treed an uncollared male but didn't handle him due to environmental conditions. On 23 February, treed FP127 but didn't handle him due to environmental conditions.

Block 8: Hunted 4 days. On 5 February, recollared FP127 whose collar had failed. On 15 February, found fresh sign of an uncollared female on the Pipeline Road at Raccoon Point.

Block 9: Hunted 2 days. On 28 February, recollared FP152. Found old sign of an uncollared female, which could have been FP88 with a failed collar.

Block 10: No hunting in this area.

Block 11: Hunted 1 day. Area was very wet.

Block 12: Hunted 1 day. On 27 February, treed FP124 and her juvenile male and recollared FP124.

Synopsis on Monitored Panthers

We monitored 13 resident adult panthers between 1 July 2007 and 30 June 2008. Figure 6 shows the geographical distribution of this year's SBICY panthers in relation to the entire monitored population, and consists of 41% of all locations. Panther locations within Big

Cypress boundaries represent 46% of the monitoring efforts, whereas 3% were obtained in EVER, and 51% occur outside the National Park units. Figures 7 and 8 show the home range overlaps among the 4 resident males and 7 resident females inhabiting SBICY.

Synopsis of monitored (and those with recently failed collars) panthers' background, home range, reproductive activity, and status:

FP93

This female was born to Tx107 on 22 February 1999 in the Turner River Unit. She was first captured on 10 April 2000 at 14 months of age. She did not reunite with her mother post-capture, but was seen on 1 May with an uncollared panther, likely one of her 2 siblings.

When FP93's malfunctioning collar was replaced on 28 February 2002, her progesterone levels indicated she was pregnant. She gave birth to her first litter on 6 April 2002, consisting of 3 females and 1 male. She was observed from the monitoring plane with 3 kittens on 11 October 2002 and the tracks of 3 offspring, 2 females and 1 male, were observed with hers on 31 March 2003. Her male offspring, K115, was captured on 2 April 2003. The status of the 2 females is unknown. FP93 next denned on 16 July 2003. On 5 August, 3 kittens, 2 males and 1 female, were marked. One of these males, K153, was killed on CR 951 in Naples on 29 August 2005. FP93's collar malfunctioned on 30 August 2003, and she was not caught again until 11 February 2006. She was in good condition and weighed 35 kg.

FP93 denned in late June in the Turner River Unit and on 1 July 2006, we handled 3 female kittens at 18 days of age. Based on FP93's associations with radio-collared male panthers, it is likely that these kittens did not survive to 6 months. We treed FP93 on 11 February and because she appeared to be pregnant we did not handle her. She did initiate denning later that month and we marked 3 kittens on 8 March 2007. In keeping with the protocol of not handling female panthers with dependent kittens less than 12 month of age, we were not able to change her collar which failed on 10 December 2007. Her home range during the

reporting period was 98 km² (Figure 9). We treed her 2 juvenile male offspring on 21 February and documented her tracks at the time. Although we collared 1 offspring, he slipped his collar 2 days post-capture.

FP102

This female was born to FP55 on 8 February 1998 in the Turner River Unit. She was first captured on 20 February 2001 at 3 years of age. At least 2 kittens were with her, one of which, FP103, was captured a month later at an estimated 10 months of age. FP102 denned again on 25 June 2001 and 2 males were marked 3 weeks later. FP102 next denned on 5 July 2002, only a year after her previous den. One male and 1 female were marked at this den and their tracks were documented with hers on 11 April 2003. FP102 was recollared on 24 March 2004. She weighed 39 kg and was in late term pregnancy. She apparently lost the fetuses but was bred a month later and gave birth on 22 July 2004. We marked 3 kittens, 2 females and 1 male, at her den on 4 August. She denned again 2 years later, in June 2006, and we marked 2 male kittens on 12 July. On 15 February 2007 we recollared her. This collar failed in late June of 2007 and we have not recollared her. Her collar, however, is scheduled to function again in June of 2009.

FP103

This female, an offspring of FP102, was first captured in the Turner River Unit on 13 March 2001 at an estimated 10 months of age. She was with FP102 through April, except for several days when FP102 was in the company of FP79, the territorial male. When FP103 dispersed at an estimated 11 months of age, she moved east into the Corn Dance Unit. Her collar failed prematurely on 23 December 2003, however, we recollared her on 27 February 2004. She weighed 32 kg, was in very good condition, and was not pregnant. FP103 initiated denning in March of 2007 and 3 kittens, 1 male and 2 females, were marked at her den on 4 April. At 7 years of age, this was FP103's first den. The fact that the territorial male, FP104, was sterile may have been the reason for her not getting pregnant. When he died in March of 2006, another male filled this vacancy. During the first week of August, FP103 remained at the same location and her remains were retrieved on 8 August 2007.

Necropsy indicated that she died of intraspecific aggression. No sign of her 5-month-old kittens was found. FP103's lifetime home range was 357 km² (Figure 10).

FP124

On 13 February 2004, we captured and collared female FP124 and her 2 juvenile males, FP125 and FP126 in the Loop Unit. FP124 weighed 32 kg and was estimated to be 3 to 4 years old. FP126 was removed from Big Cypress on 28 May 2004 and died from intraspecific aggression on 1 January 2005. FP125 dispersed naturally in July 2004 and his collar was found on a road in Miami-Dade County 2 months later on 27 September. FP124 next denned in the Stairsteps Unit and, on 29 September 2004, we marked 1 male kitten. It survived to only 3 to 4 weeks of age. FP124 denned again in February 2005 in the Stairsteps Unit. On 10 February, we marked 3 kittens, 2 males and 1 female. Subsequent sightings up to 26 December 2005 indicated that she successfully raised 2 of the 3 offspring to 11 months of age. She was seen with 1 juvenile during the 19 April 2006 routine monitoring flight. She was recollared on 17 February 2007 and two 9-day-old male kittens were found and marked at the site. On 27 February, FP124 was recollared. One of her 2 male offspring was also treed but not collared. Several observations of FP124 with 1 offspring were made during routine fixed-wing flights during the reporting year. FP124's collar failed prematurely on 25 August 2008. One unconfirmed sighting of her in Pinecrest was reported. Her home range during the reporting period was 270 km² (Figure 11).

FP127

We captured male FP127 in the Turner River Unit on 16 February 2004. He was in good condition, weighed 45 kg, and was estimated to be 2 years of age. He initially inhabited the Turner River Unit, but then moved to the eastern side of Big Cypress, using both private lands and the Addlands North and South. On 29 March 2005 we recollared him. He was in excellent physical condition and weighed 55 kg. With the death of FP104 in March of 2006, FP127 shifted his home range to the south. His collar failed in late June of 2007, but he was recollared on 5 February 2008. FP127 died on 14 March of intraspecific aggression. During

necropsy, bullet fragments confirmed that he had been previously shot but survived those injuries. FP127's monitoring lifetime home range was 833 km² (Figure 12).

FP133

The FWC capture team caught this male panther, estimated at 4 to 5 years-of-age, on 18 November 2004 in the Bear Island Unit. We recollared him on 19 Feb 2008. His 305-km² home range during the reporting period encompassed Bear Island, Deep Lake, and Turner River Units of Big Cypress, with 73% of the locations in SBICY (Figure 13).

FP138

We captured adult male FP138 on 31 January 2005 in the Turner River Unit. He was in very good condition, weighing 61 kg and estimated at 4 years of age. He bore obvious signs of intraspecific aggression, i.e., a deep nasal scar and a portion of the right ear missing, and had a comparatively heavy tick infestation. He was recollared on 27 February 2007, was in excellent condition, weighing 63 kg. He died in early May, but the collar's mortality mode was not detected until 12 May, at which time his remains were retrieved. During necropsy, bullet fragments and fractured ribs confirmed that he had previously been shot but survived those injuries. The cause of his death is unknown. FP138 spent 80% of his 1,940-km² monitoring lifetime home range in SBICY (Figure 14).

FP145

The female was captured on 16 February 2006 in the Deep Lake Unit. She was in good condition, weighed 29 kg, and was estimated at 1.5 to 2 years of age. She had not been handled as a kitten at a den, so her lineage was unknown. On 23 June 2006, we marked 3 female kittens at her den. This was the first panther den documented in the Deep Lake Unit. We recollared her on 25 February 2007. She was in excellent condition, weighing 32 kg. She denned in April of 2006, indicating that the kittens from her June 2006 den did not survive. We marked 3 kittens on 26 April 2007. FP145's collar failed in mid-June and she was not handled during the reporting period. Her collar is programmed to function again in June of 2009.

FP150 and K255

On 8 February 2007, female FP150 was first collared in the Turner River Unit. Her transponder confirmed that she was the offspring of FP93, born in July of 2003. She had a juvenile female with her, estimated at 1 year of age, which we didn't handle. FP150 weighed 32 kg and was in average condition. She denned in July 2007 and we marked 4 18-day-old kittens, 1 male and 3 females, on 20 July. On August 3, we returned to the den site to change the battery on the den monitoring device and check the original den for kitten sign. We found K255 in very poor condition, dehydrated and with an open wound on the top of her head. FP150 was still attending to kittens that she had moved a short distance from the original den site. After consultation with FWC DVM Mark Cunningham, we removed K255 from the field and turned her care temporarily over to DVM John Lanier. We then transported K255 to the Lowry Park Zoo for further care. She now resides in an enclosure of native habitat and is on display to the public. She has adapted to captivity where she will remain.

Movements of FP150 during the reporting period indicate that she was raising kittens, therefore, we did not handle her to change her collar during the 2008 capture season. Her collar failed on 7 June 2008. Her home range during the reporting period was 177 km² (Figure 15).

FP151

On 10 February 2007 we collared FP151 in the Turner River Unit. Her transponder confirmed that she was the offspring of FP93, born in April of 2002. She weighed 41 kg and was in excellent condition. In April of 2007 she denned, and on 21 April we marked 3 kittens, 1 male and 2 females. They evidently did not survive because in August of 2007 she denned again. We went to mark the kittens on 27 August and found the remains of a male and a kitten of unknown sex. The kittens had been killed within the past few hours and partially eaten. Fresh bear scat found within 5 meters of the den suggested that a bear had killed them. FP151 denned again in late February. We marked 2 kittens, 1 male and 1 female, on 4 March 2008. FP151's collar failed on 7 June 2008. Her home range during reporting period was 69 km² (Figure 16).

FP152

On 16 February 2007 we collared FP152 in the Stairsteps Unit. He did not have a transponder and so was estimated to be between 4 and 5 years of age. He was assessed to be in good condition and weighed 61 kg. He was recollared on 28 February 2008, in excellent condition at 60 kg. He inhabited a 715-km² home range during reporting period (Figure 17).

FP153

On 19 February 2007, we collared FP153 in the Deep Lake Unit. She did not have a transponder, so was estimated to be 6 years of age. She weighed 40 kg. We also treed 2 kittens estimated at 10-11 months of age, but did not handle them. On 3 March 2008, we recollared FP153. She was in good condition at 39 kg. Her home range during the reporting period was 103 km² (Figure 18).

FP161

On 10 February 2008, we collared female FP161. Her transponder confirmed that she was K169, born on 25 May 2004 to female FP70 in a den only 1 km from this capture site. FP161 was in excellent condition, weighing 39 kg. Although she did not palpate as pregnant, her progesterone level and relaxin indicated that she was pregnant. She has not denned, however, since capture. Her home range during the reporting period was 72 km² (Figure 19).

FP162

On 18 February 2008, the hounds began trailing male panther FP138 in the Turner River Unit. He was with an uncollared female that the hounds treed and we collared as FP162. She did not have a transponder, so we estimated her age at 3 years. She was assessed to be in good condition, weighing 33 kg. Her mammary glands indicated that she had not previously lactated and, although her progesterone levels were high, her relaxin was negative. She gave birth in early May, 83 days post-capture, indicating that she was in the early stages of pregnancy when captured. We checked the den on 23 May and found the partially-eaten remains of 2 kittens, a male and a female. Two collared males had recently

been documented in the vicinity of the den. FP162's home range during the reporting period was 98 km² (Figure 20).

FP163

On 21 February 2008, the capture team observed 2 juvenile panthers on Concho Billie Trail. Both were subsequently treed and determined to be the juvenile males, K 226 and K227, of FP93. We collared K227, who, at 1 year of age, was in excellent condition, weighing 32 kg. We fitted the collar too loosely and he slipped out of it 2 days later.

FP164

On 24 February 2008, we collared male FP164. He did not have a transponder, so was estimated at 2 years of age. He was in very good condition at 41 kg. FP164 was located at the same site during routine monitoring flights on 30 June, 2 and 5 July, however, his collar did not emit the mortality signal. On 7 July, his remains are retrieved from that location. Examination of his remains (only bones) at necropsy did not indicate intraspecific aggression or other cause of death. FP164's monitoring lifetime home range was 250 km² (Figure 21).

The average home range (95% MCP) of the 7 resident females and 4 resident males during the reporting period was 127 km² and 678 km², respectively.

Reproduction

Eight adult female panthers were monitored during the reporting period, of which 1 died (FP103) and 2 had collar failures (FP150, 151). Two additional females, FP102 and 145, had previously failed collars and they were not found this reporting period. Three females were raising young (FP93, 103, and 124). We checked 4 dens, 2 of which had failed. We marked 6 kittens, 4 females and 2 males, with transponders.

- FP93: On 8 March 2007, we marked 2 male and 1 female kittens at 16 days of age in the Turner River Unit. On 21 February, 2008, we treed the 2 males and collared 1

of them. Because his collar was fitted too loosely, he slipped out of it 2 days later. Because FP93 has a failed collar, we do not know if she denned again during the reporting period.

- FP102: In June 2007, FP102's collar failed due to a programming error, therefore, she has not been monitored this reporting period. Her collar is scheduled to reactivate in June 2009.
- FP103: On 4 April 2007, we marked 3 kittens, 2 females and 1 male, at 24 days of age. FP103 died in August 2007, so these kittens, at 5 months of age, would not have survived on their own.
- FP124: On 17 Feb 2007, we marked 2 male kittens at 9 days of age in the Stairsteps Unit. We treed her and 1 male juvenile on 27 February 2008 and recollared her. On several occasions, she has been observed in the company of 1 other panther.
- FP145: In June 2007, FP145's collar failed due to a programming error, therefore, she has not been monitored this reporting period. Her collar is scheduled to reactivate in June 2009.
- FP150: On 20 July 2007, we handled 4 kittens, 3 females and 1 male, at the den of FP150. On 3 August, we removed 1 female abandoned at the den and placed her in captivity at the Lowry Park Zoo. FP150's movements until her collar failed on 7 June indicated that she was raising young.
- FP151: On 27 August 2007, we retrieved the partially eaten remains of 2 kittens, 1 male and 1 of unknown gender, at the den of FP151. The presence of fresh scat near the den suggested that a bear had killed them. On 4 March 2008, we marked 2 kittens, a male and a female, at the den of FP151. Her movements until her collar failed on 20 May indicated that she was raising young.

- FP153: On 17 February 2007, we treed 2 juveniles with FP153. When we recollared her on 3 March 2008, her progesterone was elevated, but her relaxin was negative. She did not den during this reporting period.
- FP161: Although FP161 did not palpate as pregnant at her capture on 10 February 2008, her progesterone level and relaxin indicated that she was pregnant. She has not denned, however, since her capture.
- FP162: At her capture on 18 February 2008, FP162's physical examination indicated that she had not previously lactated and, although her progesterone levels were high, her relaxin was negative. She gave birth in early May, 83 days post-capture, indicating that she was in the early stages of pregnancy when captured. We checked the den on 23 May and found the partially-eaten remains of 2 kittens, a male and a female. She did not den again during the reporting period.

Mortality

Six adult and 4 kitten mortalities were documented in the study area during the reporting period (Figure 22). Up to 3 other kittens of FP103 are presumed dead, based on their age when their mother died. Two adults died of collisions with vehicles, 2 of intraspecific aggression, and 2 of unknown causes. Four kittens died as neonates and those of FP103 as dependents.

- FP103: During the first week of August, female FP103 remained at the same location and her remains were retrieved on 8 August 2007. Necropsy indicated that she died of intraspecific aggression. No sign of her 5-month-old kittens (3 marked at den) was found.
- FP138: This male panther died in early May 2008, but the collar's mortality mode was not detected until May 12, at which time his remains were retrieved. The cause of death is unknown. During necropsy, bullet fragments and fractured ribs confirmed that he had previously been shot but survived those injuries.

- FP127: This male panther died on 14 March 2008 of intraspecific aggression. During necropsy, bullet fragments confirmed that he had been previously shot but survived those injuries.
- K259/260: The partially eaten remains of these kittens, 1 male and 1 of unknown gender, were found in the den of FP151 on 27 August 2008. The presence of fresh scat near the den suggested that a bear had killed them.
- K268/269: The partially eaten remains of these kittens, 1 male and 1 female, were found in the den of FP162 on 23 May 2008.
- UCFP102: This male, estimated at 2 years of age, died on 12 September 2007 on I-75 from vehicular trauma. It was hypothesized that he entered the highway through a cut in the fencing (Darrell Land, pers. comm.)
- UCFP104: This uncollared female, estimated at 1-2 years of age, died on 12 April 2008 2.6 km north of US Hwy. 41 on State Road 29 from vehicular trauma.
- FP164: This collared male panther was located at the same site during routine monitoring flights on 30 June and 2 and 5 July, however, his collar did not emit the mortality signal. On 7 July, his remains are retrieved from that location. Examination of his remains (only bones) at necropsy did not indicate intraspecific aggression or other cause of death.

Recommendations

- 1) State Road 29 is a heavily traveled north-south road that bisects large public land areas in south Florida. Since 1979, 28 panther deaths have been verified on this road between Hwy. 41 and County Road 858. Unlike I-75, the construction of sections versus continuous fencing adjacent to wildlife underpasses was implemented on SR 29 on an experimental basis as a cost-

saving measure and to provide access to adjacent canals for fishing. Panthers and other wildlife, however, continue to be struck by vehicles along portions that are not fenced. We continue to recommend the development of a SR 29 Panther Protection Plan so that, as funds become available, this road is secured against further panther and other wildlife road mortality.

- 2) For the first time since its completion in 1993, a panther was killed in the 40-km fenced segment of I-75. A breach found in the fencing was likely how the panther got onto the highway. We recommend the routine inspection of the fencing installed on I-75 and SR 29 for openings that would allow wildlife to get onto the roads and subsequent timely repair.
- 3) We recommend continuation of the level of capture effort in the Big Cypress study area in order to achieve a sample of 20 radio-collared panthers distributed through the sampling blocks.

Acknowledgments from the project leader

The Big Cypress capture team consisted of a diverse group of experts in their fields who worked together to accomplish this year's intensive and successful capture effort. Three NPS DVMs, Margaret Wild, Jenny Powers, and Kevin Castle, shared the team veterinarian role, as such, improved the biomedical aspect of our work through their skills and insight. We thank the NPS Biological Resource Management Division's Wildlife Health Program for providing this technical support. The many years of clinical experience of local DVMs John Lanier and Erik Madison further complemented the biomedical work. Annette Johnson's oversight of the biomedical aspect of our work as vets came and went was always thorough and precise. Mark Cunningham, FWC DVM, generously provided his support and advice on biomedical aspects of panther work. Naples Community Hospital donated biomedical supplies and services and Naples Oxygen, Inc. donated oxygen supplies. Big Cypress volunteer, Charlie Wilson, enthusiastically ran our errands, delivering biomedical samples and picking up needed supplies in Naples.

John Kellam's "can do" attitude ensured that, when a vehicle limped out of the field, another was ready for the next day's work. Because of him, I've bought stock in Redbull. Dennis Giardina's many years of tree-climbing and work on panther capture teams provided welcome input into situation assessment and decision-making. We thank Dennis' employer, the Department of Environmental Regulation, for allowing him to dedicate a month of his time to our work. Ralph Arwood continues to provide the National Park Service with extraordinary photographs of the wildlife and landscapes of Big Cypress. Through the generosity of Ralph's time and talent, the National Park Service can illustrate the beauty and uniqueness of this swamp to its owners, the public.

Although this year Ralph and Dennis actually saw 2 panthers walking along a trail, their attempts to tree the cats without Rocky McBride and his hounds, Chuey, Noonie, Riley, and Newt, failed. Besides being the key element of our capture team, Rocky, along with his father, Roy, and son, Cougar, also documented the presence of uncollared panthers in the study area.

Steve Schulze prepared the maps and determined the home range data in this report. Annette Johnson, along with the skilled pilots from Speed Aviation, located the collared panthers from a plane for many, many hours this year.

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Literature Cited

- Cunningham, M. 2002. Florida Panther Kitten Biomedical Protocol. Florida Fish and Wildlife Conservation Commission. 1 pg.
- Cunningham, M. 2004. Feline leukemia virus in Florida panthers: management recommendations. Florida Fish and Wildlife Conservation Commission. 8 pgs.
- Duever, M. J., J.E. Carlson, J. F. Meeder, L. C. Duever, L. H. Gunderson, L. A. Riopelle, T. R. Alexander, R.L. Meyers, and D. P. Spangler. 1986. *The Big Cypress National Preserve*, National Audubon Society, New York, New York, 444 pgs.
- Florida Fish and Wildlife Conservation Commission. 2003-2007 weekly and annual harvest reports.
- Florida Fish and Wildlife Conservation Commission. 2008. Annual report on the research and management of Florida panthers: 2007-2008. Fish and Wildlife Research Institute & Division of Habitat and Species Conservation, Naples, Florida, USA. 58 pgs.
- Janis M.W. and J. D. Clark. 2002. Responses of Florida panthers to recreational deer and hog hunting. *Journal of Wildlife Management* 66:839-84.
- Jansen, D., S. Schulze, R. McBride, and E. Blankenship. 2003. A review of the status of Florida panthers (*Puma concolor coryi*) in Big Cypress National Preserve 1981-2003 and a summary of the 2003 panther capture season. 2003-2004 annual report. National Park Service, Ochopee, FL. 67 pgs.
- Jansen, D., S. Schulze, R. McBride, and E. Blankenship. 2004. Florida panther (*Puma concolor coryi*) research and monitoring in Big Cypress National Preserve. 2003-2004 annual report. National Park Service, Ochopee, FL. 49 pgs.
- Jansen, D., I. Lundgren, A. Johnson, and S. Schulze. 2005. Florida panther (*Puma concolor coryi*) research and monitoring in Big Cypress National Preserve. 2004-2005 annual report. National Park Service, Ochopee, FL. 53 pgs.
- Jansen, D., S. Schulze, and A. Johnson. 2006. Florida panther (*Puma concolor coryi*) research and monitoring in Big Cypress National Preserve. 2005-2006 annual report. National Park Service, Ochopee, FL. 49 pgs.
- Jansen, D., 2006. Florida panther research and monitoring in Big Cypress National Preserve: 2007 Proposal to the US Fish and Wildlife Service. National Park Service. 9 pgs.
- Jansen, D., A. Johnson, J. Kellam, and S. Schulze. 2007. Florida panther (*Puma concolor coryi*) research and monitoring in Big Cypress National Preserve. 2006-2007 annual report. National Park Service, Ochopee, FL. 49 pgs.

- Land, E.D., D. R. Garman, and G. A. Holt. 1998. Monitoring female Florida panthers via cellular telephone. *Wildlife Society Bulletin* 26 (1): 29-31.
- Land, E. D. 1999. Protocol for handling dead Florida panthers. Florida Fish and Wildlife Conservation Commission. 2 pgs.
- McBride, R. T., R. T. McBride, R. M. McBride, and C. E. McBride. 2008. Counting pumas by categorizing physical evidence. *Southeastern Naturalist*. 2008:381-400.
- Mohr, C. O. 1947. Table of equivalent populations of North American mammals. *American Midland Naturalist* 37:223-249.
- National Park Service. 2000. Final recreational off-road vehicle management plan. Supplemental Environmental Impact Statement. USNPS, Big Cypress National Preserve. Ochopee, Florida 603 pgs.
- Rancher's Supply, Inc. 2008. Synoptic survey of Florida panthers 2008. 172 pgs.
- Schneider, W. J., D. P. Weeks, and D. L. Sharrow. 1996. Water resources management plan – Big Cypress National Preserve. USDI-National Park Service. 178 pgs.
- Seaman, D. E. and R. A. Powell. 1996. An evaluation of the accuracy of kernel density estimators for home range analysis. *Ecology* 77:2075-2085.
- Welch, R., M. Madden, and R. F. Doren. 1999. "Mapping the Everglades." *Photogrammetric Engineering and Remote Sensing* 65(2):166-170.
- Worton, B. J. 1989. Kernel methods for estimating the utilization distribution in home-range studies. *Ecology* 70: 164-168.

Table 1. Florida panthers captured and radio-collared in SBICY in 2008.

FP#	K#	Capture Date	Gender	Age (yrs)	Type	Capture Location	
						Easting	Northing
127		Feb. 5, 2008	M	~5	resident	504360	2869966
161	K169	Feb. 10, 2008	F	3.5	resident	472194	2868252
162		Feb. 18, 2008	F	~3	resident	487723	2873259
133		Feb. 19, 2008	M	~8	resident	473060	2891255
163	K227	Feb. 21, 2008	M	1	juvenile	478290	2876147
164		Feb. 24, 2008	M	~2	resident	481506	2874962
124		Feb. 27, 2008	F	~7-8	resident	513674	2835699
152		Feb. 28, 2008	M	~5-6	resident	494061	2849114
153		Mar. 3, 2008	F	~7	resident	472898	2888087