

Research Plan of Study Submitted to the
Florida Panther Interagency Committee
Technical Subcommittee

ECOLOGY AND POPULATION DYNAMICS
OF THE FLORIDA PANTHER
IN EVERGLADES NATIONAL PARK

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INTRODUCTION

The Florida panther (Felis concolor coryi) originally occurred throughout most of the southeastern United States, and is one of thirty recognized subspecies (Hall 1981; Anderson 1983). According to Cory (1896) the Florida panther was fairly common in undeveloped areas of Florida as late as the 1890's. Because it was considered a threat to humans and livestock, the State of Florida offered a bounty for panthers and animals were killed whenever encountered. In 1950, concern about the uncontrolled hunting of panthers led the State of Florida to classify the panther as a game animal and, since 1958, the panther has been fully protected from legal hunting in Florida. In 1967, the Florida panther was included on the first federal list of endangered and threatened species developed by the U.S. Department of the Interior, and it is presently listed as an endangered species by both the federal government and the State of Florida.

In March 1976, the Florida Audubon Society sponsored a meeting to discuss the status of the Florida panther. The consensus of opinion among those attending was that the continued existence of the Florida panther was in doubt. In July 1976, the U.S. Fish and Wildlife Service appointed a Florida Panther Recovery Team charged to identify needs and develop a recovery plan to insure the survival of the Florida panther. The Florida Panther Recovery Plan, approved in 1981, identified the Florida Game and Fresh water Fish

Commission (GFC) as the lead agency in implementation of the recovery plan.

REVIEW OF PREVIOUS WORK

Few useful data on the biology and population status of the Florida panther have been recorded prior to the late 1970's. Most of the currently available information comes from studies conducted by the GFC. In 1976, the GFC established the Florida Panther Record Clearinghouse to evaluate reported sightings and document panther locations. In addition, the GFC contracted with R. McBride to survey wilderness areas of southern Florida for Florida panthers. McBride's survey determined that a small Florida panther population still existed in the Fakahatchee Strand State Preserve (FSSP), and that portions of the Big Cypress National Preserve (BCNP), Everglades National Park (ENP), and private lands adjacent to these protected areas appeared to provide suitable panther habitat.

In 1981, the GFC began studies based on capture and radio-collaring of panthers in FSSP. To date, 12 panthers have been radio-collared and monitored for varying periods of time in the FSSP and BCNP areas. Studies were also initiated on the panther's principal prey species in BCNP, the white-tailed deer and wild hog. The on-going GFC studies have yielded information on the population dynamics, ecological requirements and general health of the Florida panther population and comprise the principal body of reliable data now available (Belden 1983; Belden et al. 1985).

Preliminary surveys for sign of Florida panthers in ENP (and, less intensively, in BCNP) were begun by NPS in 1978 as part of a general program for monitoring endangered species. Prior to this time many sightings had been reported for these NPS areas, but considerable uncertainty attached to most observations and verified, current records were lacking. The surveys quickly produced definitive evidence of the presence of panthers in the Long Pine Key area of ENP and the Raccoon Point area of eastern BCNP. FGC capture/collaring studies were extended to include Raccoon Point in 1982 and continued occurrence around Long Pine Key and the Hole-in-the-Donut has been verified intermittently by NPS up to the present date.

In 1982 NPS hired R. McBride to survey more widely in ENP, resulting in the first verified, recent records of panthers in the Rattlesnake Ridge area west of Shark Slough. In 1984-85 by means of a combined in-house and contract study, NPS mounted a systematic survey to assess the status of the Florida panther throughout ENP, BCNP, and suitable adjacent private lands. This survey (McBride 1985) indicated that panthers in eastern ENP and on private lands north of BCNP appeared to be stable and reproducing, but that the populations present in the early 1980's in western ENP and eastern and southern BCNP had apparently declined sharply or disappeared.

Survey results - along with evidence from FGC studies in FSSP and western BCNP indicating that most panthers there were aged, in poor condition and non-reproductive - brought a crisis atmosphere to

Florida panther conservation efforts. An internal NPS report (Robertson, Bass, and McBride 1985) recommended that a capture/collaring study should be initiated in ENP to determine reasons for the success of this sub-population in contrast to the decline evident in much of BCNP. Similar requests, along with recommendations for more intensive study of the panther's major prey species, were voiced by the Governor's Technical Advisory Council, by FGC, and by Florida Defenders of the Environment at an emergency conference in April 1986. The acute concern and the many biological questions that had been raised resulted in a February 1986 meeting at ENP of the interested Florida and federal agencies. This two-day session led to formation of the Florida Panther Inter-Agency Committee (with an associated Technical Committee) charged to coordinate research and conservation efforts so that all problems were efficiently addressed. As a result of the initial FPIAC meetings, NPS agreed to fund expanded Florida panther research in ENP. This research proposal outlines a study intended to implement that agreement.

OBJECTIVES

The primary objective of this study is to determine the status of the Florida panther population in Everglades National Park. This study will be an integral part of a comprehensive research program to evaluate the overall status and recovery needs of the Florida panther, in cooperation with the ongoing Florida panther research

program of the Florida Game and Fresh Water Fish Commission and U.S. Fish and Wildlife Service.

The specific objectives of Florida Panther research in Everglades National Park are as follows:

- A. Determine basic population parameters including:
 - 1. Population size and distribution
 - 2. Age structure, sex ratio, reproductive success and recruitment rate
- B. Determine behavioral and ecological requirements including:
 - 1. Food habits, kill rates and utilization
 - 2. Habitat preference and utilization, seasonal movements, and home range size
 - 3. Social organization and behavior
- C. Determine the general health and genetic condition of the population including:
 - 1. Physical condition and reproductive status
 - 2. Parasites and infectious diseases
 - 3. Genetic variability

METHODS

Capture and Immobilization

To obtain basic biological and ecological data on the Florida panther we will capture and radio-collar four to six individuals (ideally, an equal number of males and females) in Everglades National Park. Additional panthers will be captured in the second and third year of the study. Capture and immobilization will be accomplished by using the skilled capture team and well developed procedures of the Florida Game and Fresh Water Fish Commission. The capture team consists of a houndsman and dogs, a wildlife veterinarian, and wildlife biologists and technicians.

Prior to the capture period the houndsman and the NPS wildlife biologist will search the study area for panther sign and determine what areas the animals are using. Capture attempts will begin as soon as daytime temperatures decrease to a point considered safe for the immobilization of panthers, probably by late November 1986. Trained hounds will be used to find, trail and tree panthers. The hounds may trail a panther for hours but the actual chase usually takes less than 30 minutes (Maehr 1986).

The decision whether to immobilize a treed panther will be made at the scene by consultation of the wildlife veterinarian, NPS wildlife biologist and houndsman. Such assessment will be based on the physical appearance of the animal, stress from the chase, and

air temperature and other site conditions (Roelke 1985). Panthers will be immobilized with ketamine hydrochloride delivered by a compressed air dart gun (Roelke 1985). After immobilization the panther will be lowered by rope from the tree or allowed to fall into an air cushion bag and safety net.

Once on the ground the wildlife veterinarian will monitor heart rate, respiration, and body temperature until complete recovery and release. During immobilization each panther will be weighed, measured (body length, girth, foot and teeth), an ear will be tattooed with a unique number, and the animal will be fitted with a radio-collar. Dental and foot impressions will also be made.

Radio Telemetry

Telemetry equipment will be of the same design as used by the ongoing Florida Panther Research Project of the Florida Game and Fresh Water Fish Commission. The transmitter is a radio-collar designed by Teleonics of Mesa, Arizona. It employs conventional solid-state circuitry powered by lithium cell batteries and includes mortality and activity sensors. The collar weighs approximately 900 grams (2 lbs), and has a projected operational life of 24 months.

Standard telemetry techniques of ground and aerial tracking will be used for monitoring radio-collared panthers. A fixed-wing aircraft will be equipped with directional "H" antennas mounted on each

strut and attached to a switch box for selecting right, left or both antennas (Belden 1983). A hand-held directional antenna and receiver will be used for ground tracking.

Biomedical

Determination of the general health and genetic condition of captured panthers will be under the direction of wildlife veterinarian, Dr. Melody E. Koelke. The work proposed by Dr. Koelke is as follows:

1. During capture and immobilization the veterinarian will evaluate physical condition (muscling, fat, haircoat) and reproductive status. Biological samples to be taken will include blood, urine, feces, ectoparasites, hair, skin biopsies, semen, vaginal swabs from females, and swabs for viral and bacteriological culture.
2. Laboratory analyses will be conducted immediately after leaving the field and will include a complete blood count (CBC), serum biochemical determinations (SMA 21), serum protein electrophoresis, urinalysis, bacteriological culture of feces, and antibiotic sensitivity studies. Blood for genetic studies will be processed at a field laboratory within 24 hours of collection and will be frozen for later analysis. Skin biopsies for genetic studies will be shipped via overnight mail service to the National Cancer Institute. Serum for infectious disease

screening and reproductive hormones will be frozen for later analysis. Feces for parasite examination and food habit studies will be preserved appropriately for later evaluation.

3. Blood samples obtained from Florida panthers will be serologically screened for selected infectious disease agents including feline panleukopenia, feline calicivirus, feline rhinotracheitis virus, feline infectious peritonitis, feline leukemia virus, pseudorabies virus, and toxoplasmosis. The majority of these analyses will be conducted by the Feline Health Laboratory, Cornell University, Ithaca, New York.
4. Fecal parasitological examinations will be conducted on all freshly collected feces from captured panthers and any appropriate field collected (scat) specimens. Hair and bone elements will be submitted to the Florida State Museum for identification for food habits study.
5. Bacteriological cultures of fresh panther feces will be screened for the following fecal pathogens: Salmonella spp., Shigella spp., Campylobacter spp., Yersinia spp., Vibrio spp., Pleisiomonas shiggeloides, and Edwardsiella tarda.
6. Florida panthers will be tested for persistent viral infections by culturing swabs of nostril, pharynx, and rectum. Fresh feces will be examined for viruses by electron microscopy.

7. A vaccination trial using killed feline viral vaccines, simulating field conditions will be conducted. Captive cougars at selected zoological institutions will be utilized for this study. If tests indicate that vaccination is a recommended procedure, wild panthers will be vaccinated when handled and their antibody levels determined each time they are immobilized during a capture season.
8. Reproductive assessment of wild Florida panthers will be made during capture procedures for radio-telemetry studies. Females will be palpated for fetuses, mammary glands examined for lactation, and vaginal swabs taken to determine stage of the reproductive cycle. Males will be examined to determine the number, size, and texture of the testicles. Semen will be collected using a standardized electro-ejaculation protocol developed by Dr. D. Wildt of the National Zoological Park, Washington, D.C. Sperm motility and concentration values will be determined immediately on-site. An aliquot of semen will be fixed in gluteraldehyde for subsequent morphological assessment of spermatozoa. Reproductive hormones will be assessed by collecting serial blood samples from both male and female panthers during the handling procedure. Radioimmunoassay techniques will be utilized to test males and females for cortisol and luteinizing hormone, males for testosterone, and females for estradiol-17 and progesterone. Hormone

analysis and semen morphology evaluation will be done at the National Zoological Park endocrinology laboratory.

9. Genetic analysis, utilizing iso-enzyme electrophoretic techniques, will be performed on the Florida panther specimens at the Laboratory of Viral Carcinogenetics, National Cancer Institute, in Fredrick, Maryland, headed by Dr. Stephen O'Brien.

Population and Ecological Parameters

Population Size and Distribution

To determine the relative size and the overall distribution of panthers in Everglades National Park field searches for recognizable panther sign will be conducted throughout the study area. Location, habitat type, and the kind of sign found (tracks, scats, scrapes, etc.) will be recorded. Locations (latitude - longitude) will be plotted on 7.5 minute USGS orthophoto quadrangle maps. All panther sign will be documented by plaster casts of tracks, and photographs of urine markers, scats and panther kills. When possible, panther tracks will be aged (kitten, sub-adult, adult) and sexed (male, female). All fecal samples will be collected and all panther kills will be collected for analysis once the panther completes feeding.

Age Structure and Sex Ratio

At the time of capture and collaring each panther will be aged and sexed. Panthers will be aged according to tooth wear and coloration of the enamel as described by Shaw (1983). Dental impressions will also be made of each panther for follow-up aging studies. During routine field work tracks of panthers known or suspected to be uncollared will provide additional information on the age and sex composition of the population.

Home Range and Movement Patterns

Home range size, seasonal movements and daily activity patterns will be determined by using standard radio-telemetry techniques. Radio-collared panthers will be monitored from a fixed-wing aircraft five times per week throughout the year. After the first year, the frequency of monitoring will be evaluated, and adjusted as needed. The aircraft will be equipped with a Loran Navigation System to obtain the exact location of each radio-collared panther. Locations will be plotted on 7.5 minute USGS orthophoto quadrangle maps. Date, time, location (latitude-longitude) and vegetation type will be recorded for each occurrence. Selected radio-collared panthers will be monitored for a 24-hour period once a week. The use of motion sensor transmitters will provide data on daily movement patterns and activity periods.

Home range size of each radio-collared panther will be determined by connecting the outermost location points and measuring the enclosed area as described by Seidensticker et al. (1973). Home range and movement patterns of each radio-collared panther will be computed and assessed yearly. Comparison of yearly variations in the home range size and movement patterns of radio-collared panthers will provide important insight into population dynamics and ecological requirements.

Food Habits and Kill Rates

To determine what prey items are being taken by panthers, all suspected panther scats and kills will be collected. Ground search of areas used by radio-collared panther will be conducted in an effort to find scats and kills. Panther scats will be sent to the Florida State Museum for analysis. Each scat will be analyzed to determine prey consumed.

Through monitoring of radio-collared panthers, data will be gathered on kill rates of large prey such as white-tailed deer. When it is determined or suspected that a panther has made a kill, a ground search of the area will be made and the remains collected and identified.

Reproduction and Recruitment

A reproductive assessment of each panther will be made by the veterinarian at the time of capture and immobilization (see biomedical section). During the examination female panthers found or suspected to be pregnant or in estrus will be monitored daily, and for a 24-hour period once a week. Intense monitoring of the females will provide information on denning habitat and location, movement and activity patterns associated with reproductive activity, development of the young, and postnatal care. The monitoring of radio-collared males and females will indicate periods of reproductive activity.

A particular effort will be made to capture and radio-collar young (9-24 months old) Florida panthers. These radio-collared young will be monitored to determine characteristics of survival, dispersal, and recruitment into the population.

Habitat Requirements and Utilization

Detailed habitat maps of the study area will be developed using remote sensing techniques (LANDSAT) in cooperation with the Plant Ecology Program, South Florida Research Center, ENP (Gunderson et al. 1986). Habitat use by panthers will be characterized and quantified according to vegetation types.

WORK SCHEDULE

1st Year - FY87

- October - screen applicants and select biological technician for project.
- Conduct systematic field search of study area for recognizable panther sign.
- November through December - capture and radio-collar Florida panthers in ENP. Collect biomedical samples for lab analysis.
- Obtain daily locations of radio-collared panthers from fixed-wing aircraft.
- Conduct once a week 24-hour tracking of selected radio-collared panther.
- Conduct ground search of areas used by radio-collared animals to gather additional data on habitat utilization, food habits, and reproduction.
- Collect panther scats and kill remains. Send scats to Florida State Museum for analysis.
- Begin development of habitat maps.
- Compile data, enter on computer, and conduct preliminary analysis.
- Submit quarterly data summary reports by the end of March, June, September, and December.

2nd Year - FY88

- Continue all field and lab work outlined in 1st year.
- Consider capture and radio-collar young Florida panthers to assess survival, dispersal, and recruitment. Collect biomedical samples for lab analysis.
- Replace any malfunctioning radio-collars as needed.
- Compile data, enter on computer, and do preliminary analysis.
- Submit quarterly data summary reports by the end of March, June, September, and December.

3rd Year - FY89

- Recapture all radio-collared Florida panthers in ENP. Collect biomedical samples for lab analysis.
- Continue all field and lab work outlined in 1st year.
- Compile data, enter on computer and do final analysis.
- Submit quarterly data summary reports by the end of March and June.
- Submit final report by end of September.

PROPOSED BUDGET

1st Year - FY86

Personnel:

Wildlife Biologist, GS 11/4	33,600	
Biological Technician, GS 5/1	16,700	
Premium Pay (overtime, etc.)	1,700	52,000

Travel, Project Business		1,000
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Services:

Fixed-wing Aircraft Rental (Estimated number of hours)	48,100	
Helicopter Rental (Estimated number of hours)	3,500	51,600

*Cooperative Agreement GFC		0
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Supplies

Field supplies	600	
Film and film processing	100	
Maps	200	900

Capitalized Equipment

*Radio-telemetry equipment		0
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Motorized Equipment Operation

1/2 ton van	2,000	
2 ATC Honda 110	500	<u>2,500</u>

Total Costs - FY86		\$108,000
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Estimated costs for 2nd (FY88) and 3rd (FY89) years - \$110,000 per annum

* Cooperative Agreement for services of Florida Game and Fresh Water Fish Commissions panther capture-team and radio-telemetry equipment will be funded for 3 years from FY86 monies (\$50,000 total).

for nearly ten years and has participated in most of the significant meetings connected with that effort. From 1982 to date, he has served as NPS liaison to field activities of the Florida Game Commission panther project and in that capacity he has been involved in many capture/collaring events with Florida panthers in and near Big Cypress National Preserve. In 1984-85, he worked closely with R. McBride to survey Everglades National Park and Big Cypress National Preserve for signs of panther activity (McBride 1985; Robertson, Bass, and McBride 1985). Since 1983, Mr. Bass has served as a member of the Governor's Technical Advisory Council on the Florida Panther.

STAFF CREDENTIALS

William B. Robertson, Jr. (Research Biologist and Wildlife Program Manager, South Florida Research Center, Everglades National Park) will supervise the NPS Florida panther research project. Dr. Robertson has been associated with biological research and natural resources conservation in Florida since the 1950's, with a particular interest in the ecology of rare and endangered animal populations. He is author or co-author of more than 100 scientific papers, research reports, and monographs on aspects of the natural history of southern Florida, especially concerning the avifauna. Through supervision of relevant in-house and contract research, attendance at numerous meetings, and brief service on the Governor's Technical Advisory Council, he is thoroughly familiar with the history of research and conservation efforts concerning the Florida panther.

Oron L. Bass, Jr. (Wildlife Biologist, South Florida Research Center, Everglades National Park) will serve as principal investigator on the NPS Florida panther research project. Mr. Bass has twelve years professional experience in southern Florida with the National Audubon Society and (since 1976) with the National Park Service. He is author or co-author of a number of publications, particularly dealing with endangered species and is prominent in state-wide conservation activities in Florida. Mr. Bass has been associated with the recovery of the Florida panther

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