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FINAL

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

A PROPOSAL TO ESTABLISH A CAPTIVE BREEDING POPULATION
OF
FLORIDA PANTHERS



Prepared by:
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FOREWORD

In 1990, the U.S. Fish and Wildlife Service proposed to establish and manage a captive population of Florida panthers to provide critically needed security against its extinction. Establishment of the proposed captive population has been designed around a removal regime to achieve full genetic representation of the wild population, while having minimal impacts to that wild population. The plan maximizes the use of offspring of key adults (genetic founders) within the wild population over a 3- to 6-year period to achieve the desired genetic representation. Population data indicate that the proposed removal regime if properly implemented would not compromise the present self-sustaining capabilities of the wild population.

Prior to a determination regarding the issuance of the endangered species subpermits necessary to implement the proposed captive program, and under provisions of the National Environmental Policy Act, the U.S. Fish and Wildlife Service undertook an extensive 10-month environmental review of the proposed action. This process consisted of the development of a Draft Environmental Assessment, a 60-day comment period, three public informational meetings, and the review and utilization of information contained in approximately 500 written comments. The Final Environmental Assessment was completed in December 1990.

Based on the results of this extensive environmental review process, the U.S. Fish and Wildlife Service determined in December 1990, that the proposed action was not a major Federal action significantly affecting the quality of the human environment as defined under provisions of the National Environmental Policy Act, and indicated that subpermits to implement the captive program would likely be issued soon after January 19, 1991. On January 15, 1991, The Fund for Animals, Inc., and Holly Jensen filed a lawsuit against the U.S. Fish and Wildlife Service regarding the proposed captive program and requested a court injunction to prevent issuance of the subpermits. This Supplemental Environmental Assessment is being carried out under provision of an out-of-court settlement reached on February 6, 1991 (Civ. No. 91-076). The settlement agreement identified a number of specific elements to be addressed in the Supplemental Environmental Assessment. A listing of these elements and their locations in the assessment are provided in Section VIII. This environmental review process will culminate in a finding of whether the proposed action is a major Federal action that significantly affects the quality of the human environment.

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I. INTRODUCTION

This Supplemental Environmental Assessment (Supplemental Assessment) is provided under the provisions of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321, et seq.) and its implementing regulations (40 CFR 1501.7). This Supplemental Assessment evaluates an array of possible alternatives for providing survival security for the endangered Florida panther (*Felis concolor coryi*). It evaluates potential environmental impacts that may be associated with seven separate alternatives that were identified and examined. Five of the alternatives examined would necessitate the establishment of a captive population. The Supplemental Assessment also identifies a preferred alternative.

The Florida panther recovery plan contains many tasks; ranging from actions needed to prevent the panther from becoming extinct to actions needed for full recovery of the panther (U.S. Fish and Wildlife Service 1987). As might be expected, many tasks are closely interrelated to each other, but may also be totally independent. Tasks have been ranked according to their perceived priority. Priority 1 tasks represent those actions that must be taken to prevent extinction or to prevent an irreversible decline in the foreseeable future. Priority 2 are those actions that must be taken to prevent a significant decline in the population/habitat quality, or some other significant negative impact short of extinction. Priority 3 tasks are all other actions necessary to provide for full recovery of the panther.

Many Priority 1 actions have already been initiated. These have primarily focused around studies to develop critically needed biological data, habitat preservation and enhancement actions, and actions to address specific risks factors that have been identified. Some of these actions have included comprehensive studies of the panther and prey resources (white-tailed deer) over the last 10 years; the recent establishment of the Florida Panther National Wildlife Refuge (FPNWR)(26,300 acres), and ongoing expansions for Big Cypress National Preserve (BCNP)(+146,000 acres), Everglades National Park (ENP)(+108,000 acres) and Fakahatchee Strand State Preserve (FSSP)(+40,000 acres); increased emphasis in using controlled fire to improve habitat conditions for prey species and experimental application of measures to enhance deer browse; the closing of specific areas to deer/hog hunting, to off-road vehicles (ORV's), to the use of dogs for deer and hog hunting, reducing number of hunters, shortening hunting seasons; the closing of roads and trails, provision of wildlife underpasses, realignment of highway segments, establishment of speed zones in panther crossing areas, etc. Although the proposed measure to provide critically needed security to the species and the gene pool through the establishment of a captive population is considered essential to prevent extinction of the panther, the continuation/expansion

of actions to secure and enhance the existing wild population are considered equally important to prevent extinction and will continue to receive priority emphasis.

Environmental analyses undertaken in this document deal solely with the proposed initiation of another specific action and associated components considered essential to prevent extinction of the Florida panther; an action to provide immediate security to the wild population and security to the gene pool. It should, however, be clearly understood that this document does not undertake an evaluation of potential impacts of other possible future actions that may be needed to recover the panther. As an example, future population reestablishments are identified in the recovery plan and are expected to play an integral part in the recovery of the panther. However, population reestablishments are in no way a component of the proposed action, which is deemed necessary to prevent extinction. Proposed actions to secure the panther are totally independent of possible future reestablishment actions. It is important to note that on-going studies to address significant information gaps on future population reestablishment are underway, but results would not be available to meet the urgent first priority task of providing immediate security to the wild population and to the gene pool. It should also be understood that all future actions will undergo full environmental analysis and appropriate public participation prior to their implementation.

This Supplemental Assessment utilizes the U.S. Fish and Wildlife Service's (Service) December 1990 Final Environmental Assessment, incorporates additional information and material as prescribed in the referenced settlement agreement, incorporates additional information to enhance the decision-making process, and addresses comments received during public review. Background and supporting information are referenced throughout the document and are contained in the various enclosures. This Supplemental Assessment will be utilized by the Service in considering whether the proposed action may constitute a major Federal action significantly affecting the quality of the human environment within the meaning of Section 102(2)(C) of NEPA.

II. PURPOSE OF AND NEED FOR PROPOSED ACTION

- A. **Proposed Action** - The proposed action is to establish and maintain a captive breeding population of Florida panthers. It is important to note that, if undertaken, the proposed action would not foreclose opportunities in the future to implement other alternatives considered in this environmental review process, or other possible future actions that may be warranted. However, failure to take action to ensure survival of this species would be inconsistent with the purposes and policy of the Endangered Species Act of 1973, as amended.
- B. **Purpose** - The purpose of the proposed action is to take steps specifically designed to provide immediate security against extinction of the Florida panther and provide for the long-term preservation of the remaining panther gene pool. The Service has concluded that extinction of the Florida panther is probable without immediate steps to accomplish the stated purpose. The identification and priority assignment of actions that may be necessary to achieve full recovery of the panther are outlined in the approved Recovery Plan.
- C. **Need** - The Florida panther represents one of this Nation's most critically endangered animals -- presently consisting of a single population estimated to number 30 to 50 animals (Hines et al. 1987). Recent population viability analysis projections indicate that under existing demographic and genetic conditions the Florida panther will be extinct in 25-40 years, barring the occurrence of a catastrophic population reducing event (Seal et al. 1989). Genetic variability within the population is extremely limited (Roelke 1990) and documented inbreeding is further compromising existing Florida panther viability (Seal et al. 1989)(also see Enclosure B - Section I). Genetic loss within the wild population may be occurring at a significantly faster rate than initially projected at the viability analysis workshop in 1989. At that time, genetic loss was projected at 3-7 percent per generation. However, during the two years since the workshop 13 of 27 (48 percent) identified wild founders have died (Roelke 1991). Genetic losses at this rate could greatly accelerate extinction.

A thorough review and analysis of prevailing conditions and circumstances, coupled with the application of sound population biology and genetic principles, have led to the conclusion that the Florida panther can never be biologically secure under the current single population situation. The Florida panther's precarious existence is severely threatened by both rapid and gradual extinction processes. Factors of concern include habitat loss, environmental contaminants,

highways, prey resources, human activities, disease, and genetic erosion.

Highest priority actions for the Florida panther recovery program represent those actions necessary to secure the species' status; i.e., measures to secure the lone remaining wild population through habitat preservation and enhancement actions, actions to address the many risks factors that have been identified, and measures to preserve and protect the remaining gene pool. Studies and other efforts to address habitat preservation, habitat enhancement and the identified risks factors are underway. The proposed action is deemed necessary to provide species security that can be achieved with a second population and to provide a means to preserve and protect the existing gene resource. Additional future actions that may be needed to recover the panther could include reintroduction actions to accomplishment population reestablishments within the historic range of the species.

Any future proposed action under the recovery plan, including the reintroduction of panthers into their historic range for population reestablishments will be addressed in appropriate environmental documents pursuant to NEPA. These documents will rigorously explore and objectively evaluate all reasonable alternatives and will fully document the potential environmental impacts of those alternatives. The NEPA and Endangered Species Act planning processes for future proposed actions will include appropriate public review, participation, and comment.

This Supplemental Assessment considers the biological, environmental, and socioeconomic effects of issuing Federal Endangered Species Permits (Permits) for the incremental removal of select Florida panthers from the wild over a 3 to 6-year period for the establishment and maintenance of a captive breeding population. Emphasis would be placed on achieving the desired genetic representation for the captive population through the use of offspring from genetically important adults in the wild population. This Supplemental Assessment provides an analysis of various alternatives to the proposed action.

- D. **Location** - The only known population remaining for the Florida panther occurs south of Lake Okeechobee; in and around the south Florida counties of Collier, Dade, Hendry, and Monroe (Figure 1). The periphery of the population may extend into Broward, Glades,

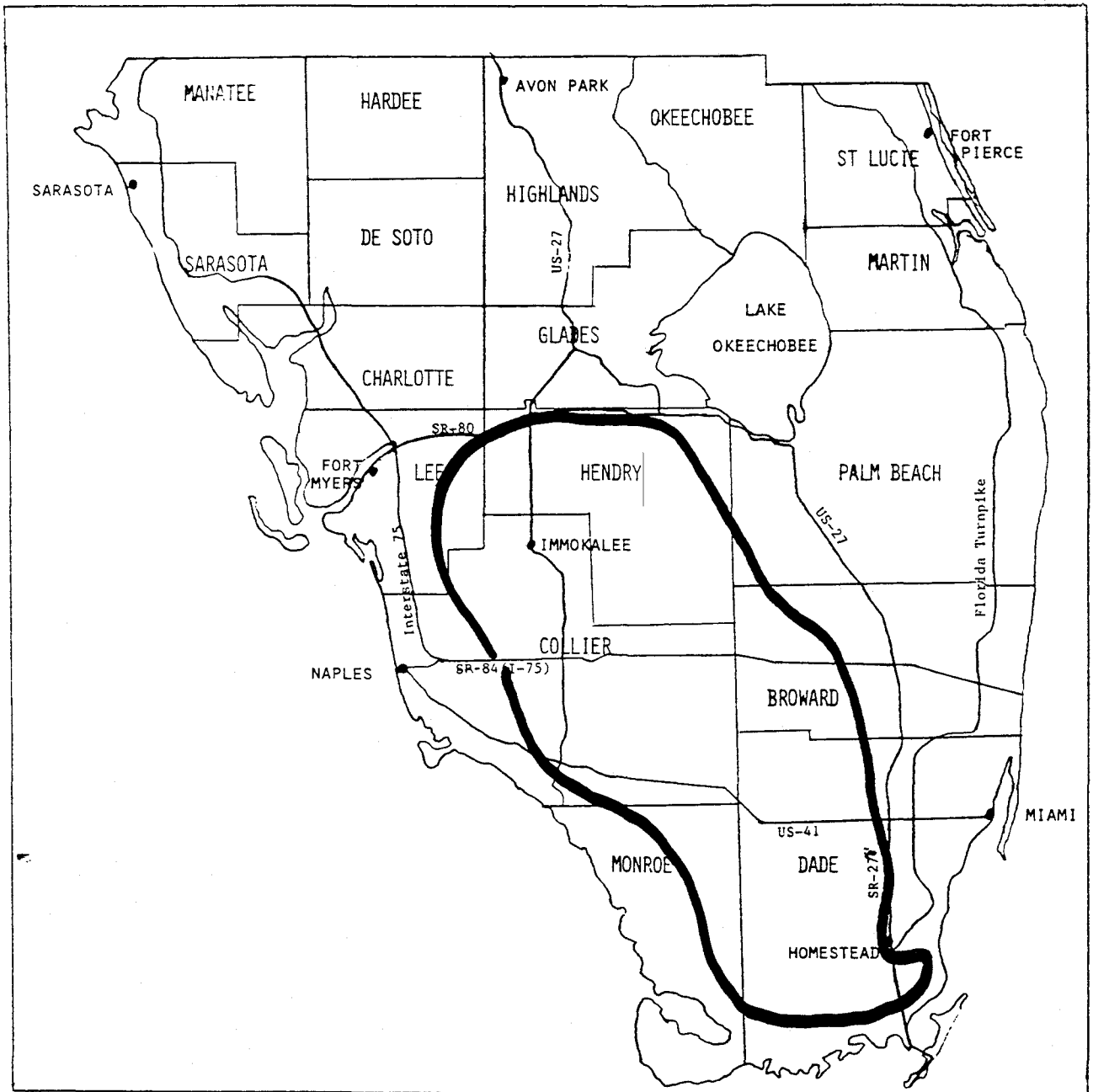


Figure 1. The only known population center for the Florida panther occurs south of Lake Okeechobee, in and around the south Florida counties of Collier, Dade, Hendry, and Monroe. The periphery of the population may extend into Broward, Glades, Highlands, Lee, and Palm Beach Counties.

Highlands, Lee, and Palm Beach Counties. The Big Cypress Swamp/Everglades physiographic region comprises much of this area.

- E. Background** - Based on accepted taxonomic data the Florida panther historically ranged from eastern Texas or western Louisiana eastward across Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, and parts of Tennessee and South Carolina (Young and Goldman 1946). The Florida panther has now been virtually eliminated from its entire former range. Population reductions were initially due to persecution in the form of shooting (Belden 1978) and trapping (included bounties in many areas), which started with the early settlers. Later, habitat destruction further exacerbated the panther's decline. The sole remaining population is centered in and around the Big Cypress Swamp/Everglades region of south Florida.

The Florida panther was initially listed in 1967, under provisions of the Endangered Species Preservation Act of 1966, but not actually afforded Federal protection until 1973, when classified as endangered under provisions of the Endangered Species Act of 1973, as amended. In 1976, the Service appointed a Recovery Team to prepare and assist in coordinating the implementation of a recovery plan for the Florida panther. This initial recovery plan was approved by the Service in 1981. Concurrently, the Florida Game and Fresh Water Fish Commission (Commission) initiated several baseline studies on the panther and prey resources, identified as high priority needs in the recovery plan. Until preliminary data from these initial studies became available, practically nothing was known about the Florida panther. Now, considerable information exists concerning the panther's status, food habits and prey resources, reproduction, population size, density and distribution, health, genetics, mortality, habitat requirements, and habitat status.

The Florida Panther Interagency Committee (Interagency Committee) was formed in 1986. The purpose of the Interagency Committee is to provide for a coordinated, cooperative, and unified Florida panther recovery program. Agencies comprising the Interagency Committee are the Service, National Park Service, the Commission, and Florida Department of Natural Resources. Under the direction of the Interagency Committee, actions were taken in 1986 to revise the original recovery plan. This revision was deemed appropriate in order that new information could be incorporated into the recovery program. The revised recovery plan subsequently received Service approval in 1987 (U.S. Fish and Wildlife Service 1987). Agencies

comprising the Interagency Committee are assigned primary responsibility for implementation of most recovery plan tasks.

- F. **Scoping** - Scoping for the December 1990 Final Environmental Assessment included a Notice of Intent to prepare an Environmental Assessment on the proposed action published in the Federal Register February 15, 1990. The Notice requested comments and information from other agencies and the public on the scope of issues to be addressed in the Environmental Assessment. Copies of the Notice were provided to over 300 agencies, organizations and individuals. Save the Florida Panther, Inc., held public forums on the issue of establishing a captive population February 28, 1990, in Tampa, Florida, and March 1, 1990, in Ft. Lauderdale, Florida. Over 300 comments were received and presented in summary form as Enclosure A of the Draft Environmental Assessment. Notice of availability of the draft assessment was published in the Federal Register June 15, 1990. Over 700 copies of the draft assessment were distributed to agencies, organizations and individuals for review and comment. Public informational meetings were held at Tampa, Florida July 10, 1990, Lake Worth, Florida July 11, and Gainesville, Florida July 12, 1990. In addition, an informational meeting was held for conservation organizations in the Washington, D.C. area June 27, 1990, in Arlington, Virginia. Approximately 500 written comments were received during the comment period and were summarized in Enclosure A of the Final Environmental Assessment.

A Notice of intent to prepare a Supplemental Environmental Assessment was published in the Federal Register March 28, 1991. The Notice requested comments and information from other agencies and the public on the scope of issues to be addressed in the Supplement. A summary of written comments received (7) was provided in the draft Supplemental Assessment. A July 29, 1991 Federal Register Notice advised the public that the draft Supplemental Assessment was available for review, and that written comments would be received through September 12, 1991. Public meetings to provide information and receive oral statements were held on August 19, 1991 at Naples, Florida, August 20, at Orlando, Florida, and August 21, 1991 at Lake City, Florida. One hundred thirty two written comments were received and along with the oral statements (25) are summarized in Enclosure C.

III. RECOVERY PROGRAM

- A. **Recovery Plans** - Recovery plans are documents developed to guide recovery programs for listed threatened and endangered species. Each plan incorporates available scientific and biological data into a series of priority ranked tasks which if successfully implemented are designed to lessen or eventually remove the need for Endangered Species Act protection. In many cases vital information necessary to successfully achieve recovery for a particular species is simply not available during the recovery planning process. However, as this information becomes available, it is important that it be incorporated into the recovery program as quickly as possible. Periodically, recovery plans are revised to reflect such actions and needs. Because of this, recovery plans are dynamic and periodically updated as information on the species and its biology become available. Recovery plans are intended to provide overall guidance and direction for a particular recovery program. However, the flexibility to immediately utilize new information as it becomes available and appropriately implement revised actions must be maintained.
- B. **Recovery Focus** - The revised Florida Panther Recovery Plan focuses planned tasks within three basic areas: (1) actions to secure and enhance the existing wild population, (2) actions to improve public understanding and support of the recovery program, and (3) actions to reestablish additional wild populations within the panther's historic range. Recovery emphasis for the Florida panther, to date, has primarily focused on actions to secure and enhance the existing population and to obtain information deemed important or necessary for the implementation of other high priority recovery tasks. The specific action being proposed (establishment and management of a captive population) represents another action to secure and enhance the survival probabilities of the existing wild population and prevent extinction. These actions are the highest priority needs relative to the Florida panther recovery program.
- C. **Initial Activities** - At the time the initial recovery plan was completed and approved in 1981, very little was known regarding the Florida panther. Only recently had a reproducing population been documented in the Fakahatchee Strand area of the Big Cypress Swamp in southwest Florida (Belden 1978). Baseline studies utilizing radio-telemetry were initiated by the Commission in 1981 (Belden 1986). Over the past 10 years these initial studies have been expanded and many agencies and organizations are now involved in

the recovery program. Emphasis has been placed on gathering biological data on the panther, developing information on panther needs and associated threats, preserving and enhancing habitat, and utilizing information gathered to protect the panther and improve existing conditions (U.S. Fish and Wildlife Service 1987). A summary of information on the panther and details of some actions undertaken to improve conditions for the panther are contained in Enclosure B.

- D. Need For Action** - A vast quantity of information regarding the Florida panther is now available, particularly on the priority 1 focus, and is being utilized and incorporated into the recovery program. Rarely is all desired information available at the time critical decisions must be made and actions taken. This dilemma is particularly true when time is so critical and resources so limited as is typically the case involving a species as endangered as the Florida panther. In situations such as this, decision-makers continually seek to achieve an acceptable balance between a desire for more information and the knowledge that each delay has the potential to cause irreversible shifts toward extinction. This is precisely the situation now facing decision-makers regarding the Florida panther. On one hand there is a recovery plan containing sequential tasks designed to provide direction and guidance to captive breeding, conditioning, and reintroduction technologies for the Florida panther by utilizing non-endangered western cougars as surrogates, and then applying these technologies to the Florida panther. Tasks to develop these technologies are presently under various stages of implementation (see Sections IV.A.3.e. and f., IV.B.1. and Enclosure B - Section P). It is anticipated that these technologies will be available for application to the Florida panther in possibly 3 to 5 years. On the other hand, however, recent population viability data indicate that because of prevailing demographic and genetic conditions, the panther is headed for extinction and actions to provide population and genetic security must be immediately initiated (Seal et al. 1989).

Existing genetic viability is of major concern and documented inbreeding is likely further compromising the panthers' survival probabilities (Seal et al. 1989)(also see Enclosure B - Section I). Additionally, mortality continues to erode founder genetic material, already considered at threshold levels. Seal et al. (1989) projected that genetic diversity is currently being lost at 3 to 7 percent per generation, and this rate would accelerate with a declining population. The Interagency Committee has determined that, to assure the long-term survival of the Florida panther, immediate actions must be taken to provide security for the wild population and preserve the panther's existing gene pool.

To accomplish this, the Service proposes to establish and manage a captive population representative of existing genetic material found in the wild population. Because primarily kittens would be used to establish the proposed captive population, breeding activities in captivity would not be expected for 2 to 4 years. It is anticipated that captive propagation technologies presently under development would be fully available for application within this time period (possibly including artificial insemination and in vitro fertilization - see Section IV.A.3.e).

As other facets of the recovery program progress, future management activities (i.e., possible population reestablishments) that may affect the human environment will be addressed through appropriate environmental documentation and full public review opportunities prior to their implementation.

- E. **Summary** - Ongoing research and recovery activities are essential to the well-being of the Florida panther. These actions and efforts must continue, and many must be accelerated and/or expanded. The Interagency Committee recognizes the critical situation faced by the Florida panther and fully understands that the most important tasks at hand are to secure, protect, and enhance the existing wild population and take actions to ensure the survival of the panther through the establishment of another population and the preservation of existing genetic resources. Thus, the Interagency Committee has fully committed its combined authorities and resources to this end. Because of the multitude of risk factors presently threatening the very survival of the Florida panther, the Interagency Committee has concluded that the single population as presently exists can never be biologically secure. Low numbers and the single population make the panther extremely vulnerable to extinction through either a catastrophic event (i.e., disease outbreak) or insidious genetic deterioration (i.e., inbreeding).

Information presented and/or developed during the Florida panther Population Viability Analysis Workshop in January 1989, and the Species Survival Planning Workshop in October/November 1989, indicated that under existing conditions the present panther population is losing genetic diversity at a rate of 3 to 7 percent per generation and extinction would be probable in 25 to 40 years (Seal et al. 1989). This prediction was made even with all other ongoing and future recovery and protection efforts considered (excluding active genetic management). The continuation of documented inbreeding conditions can only compound existing genetic and viability problems. Although

actual adverse population viability impacts from inbreeding may not be clearly apparent at this time in the Florida panther, it could be totally devastating to delay actions to preserve existing genetic variability and viability until problems do in fact become clearly apparent. Because of existing population conditions (extremely small population, significant inbreeding occurring, and documented undesirable physiological conditions), coupled with the fact that inbreeding can and does cause significant adverse impacts, it would be extremely risky to delay action until documented inbreeding problems become clearly evident. Thus, it has been determined on a preliminary basis that any successful survival and recovery program for the Florida panther must include provisions and opportunities for intensive genetic protection and management.

IV. SUMMARY OF PROPOSED AND POSSIBLE FUTURE ACTIONS

A. Proposed Action

1. General - The proposed action is to establish and maintain a captive breeding Florida panther population. The goal of this effort would be to achieve complete genetic representation of the wild population in captivity (representatives of possibly 15 to 25 founder animals), and to do so in such a way as to have minimal impacts on the wild population and not compromise its self-sustaining capabilities. To accomplish this important goal, select kittens from genetically important adults would be brought into captivity over a 3 to 6-year period to form the core for the captive population (the number of kittens used would not exceed 6 per year). Genetically important non-reproducing adults not represented by offspring in the wild or in captivity could also be candidates for the captive program (not to exceed four the first year and 2 during each of the following years).

Based on existing population data (present reproduction and recruitment levels, documented recycling mechanisms and mortality)(see Enclosure B - Sections G & H) the Service believes that the wild population is capable of sustaining itself through the proposed removal regime without significant adverse impacts. Recycling would generally be expected to result in the production of replacement litters in incidences where complete litters are removed. Removing only a portion of a litter soon after birth could reduce natural kitten mortality for any given litter and enhance survival probabilities of the kittens left in the wild. If adult removal is determined necessary, it would only be undertaken after careful evaluation and consideration of existing conditions in the wild and after an analysis of potential impacts associated with removal indicated that it could be successfully accomplished without significant risk to the social organization and/or well-being of the wild population (see 3.a.ii. below and the Part V, Alternative 3).

2. Permits - Under provisions of the Endangered Species Act (Act) of 1973, as amended, permits are required for "take" of any listed species (take is defined in the Act under Section 3(18)). Specifically, the proposed activity would require Federal permits for the capture and holding of Florida panthers for extended

periods (take for the purpose of captive propagation) and for administration of husbandry techniques (take to enhance propagation).

The Office of Management Authority in Washington D.C., would review and process permit applications for the proposed activities under the provisions of Section 10 of the Act. Permit applications provide detailed information on the proposed activity; listing people directly involved, providing statements of technical expertise pertinent to the proposed activity, and describing facilities (including drawings and photographs). Applications undergo a public review process prior to permit issuance.

A detailed protocol on the proposed maintenance and management of panthers in captivity has been formulated and provides the overall guidance for captive panther management (see Enclosure D). Permits, if issued, would specify that the above-mentioned protocol would be adhered to and would also address other pertinent conditions including permit duration (normally 1 to 2 years), method of capture and transport, the maximum numbers and age categories of panthers that could be captured per year, and disposition of all animals raised and/or maintained in captivity.

3. **Captive Breeding Program Overview** - The proposed captive program consists of a number of actions, including: animal selection, capture, captive management, captive breeding, and actions directed toward genetic management of both wild and captive populations. The wild population would be monitored relative to its response to removal actions. Future recovery actions may also include Florida panther population reestablishment efforts. Therefore, simultaneous actions to develop successful reestablishment protocols and technologies through experimental programs using surrogate cougars would also be undertaken. A general overview of the proposed captive program follows.

It should be made clear that aggressive actions to protect and enhance the present wild population would also compliment any captive program. Design of the proposed captive program is based on the best scientific and biological information available at this time. Some program elements lack extensive information specific to the Florida panther (i.e., actions to breed panthers taken from the wild in captivity, conditioning of captive raised

panthers and reintroductions back into the wild population). However, each proposed action is based on sound biological principles and design, and to the extent possible on similar programs with proven success involving other cougar subspecies. Amendments and modifications in the proposed captive program would be incorporated as data and results indicated a need. Removal of animals from the wild would be immediately halted if significant problems develop regarding the health/safety of captive animals, or indications surface regarding the inability of the wild population to sustain itself through the designed removal regime. **Should the captive program be terminated for any reason, the goal would be to, if at all possible, successfully place all captive animals in the wild as soon as possible.**

- a. **Animal Selection** - Genetic makeup would be the principal basis guiding the animal selection process. At any given point during the captive population establishment process animal selection would generally be dependent on two factors: the specific genetic material available in the wild, and the specific genetic material needed in captivity for complete founder representation. Preliminary recommendations on animal selection, with emphasis on kittens, would be made annually by the Interagency Committee. Target genetic goals would be established prior to any particular capture period. Adjustments, reflecting new data on demographic conditions in the population such as breeding activity, reproduction, mortality, etc., could be made as appropriate during the capture period.
 - i. **Kittens** (12 months of age or less) - Kittens utilized in establishing the captive population would be from radio-instrumented females which would as a minimum provide lineage information from the maternal side. In many cases radio-telemetry data would also provide information on the likely sire. Selection of candidate kittens could depend on a number of factors such as: the number, sex, age and general condition of kittens in a particular litter; the age, general health and reproductive history of mother; lineage information; captive needs and goals; wild population demographics; etc. Final decisions regarding the removal of the complete litter or a portion of the litter could be made at the den site. Removal of complete, consecutive litters from any given female would be avoided. The

level of genetic representation achieved for any given genetic founder would be proportionate to the number of offspring from that particular founder maintained in captivity. One offspring in captivity would result in 50 percent representation, two offspring would result in 75 percent, three offspring 87.5 percent, four 93.8 percent, five 96.9 percent, six 98.4 percent, etc. Therefore, achieving multiple representatives from genetic founders over time would be desirable.

- ii. Adults - Candidate adult panthers would consist of founder animals not producing offspring in the wild and thus, not capable of being represented genetically through kittens. Determinations of breeding activity would be based on a thorough evaluation of all available data regarding each specific candidate animal. Information evaluated would include past radio-telemetry data and physical and reproductive data obtained during previous capture events. As a minimum, telemetry data over the two previous years would be desirable. Past telemetry data have proven capable of providing accurate indications of breeding activity among radio-instrumented animals.

Because potential significant impacts to existing population social structures could be associated with ill-conceived adult removals (as described in Alternative 3, Section V.), a comprehensive pre-decision analysis would be undertaken in evaluating removal considerations involving any adult. The value of a particular individual to the captive program would be closely evaluated and weighed against potential impacts (direct and cumulative) to the wild population. Past social structure responses to individuals exiting the population over the past 10 years (mortality and/or injury) can be evaluated, in part, through the analysis of radio-telemetry data. These data indicate that impacts are basically aligned with the specific role or slot a particular individual occupies in the existing social structure. With the exception of events following the death of a adult male in July 1990, observed social structure impacts associated with 38 documented individuals exiting the population since 1981 in a 3 county area (Collier, Dade, and Hendry)(mortality

and/or injury) have been minimal. The removal of resident adult males would be expected to result in the greatest likelihood of social structure stress and as a general rule removal of such individuals would be avoided. Exceptions to this general rule would be unusual but may be appropriate under special circumstances, i.e., removal might be considered if a situation existed within the wild population where a non-reproducing male became the territorial dominant male over an area that included several adult females, and the subject male was successful in preventing other "productive" males from having access to the females and thus preventing reproduction.

- b. **Capture** - New-born kittens would be removed from the den site during the female's absence, older kittens (6 to 12 months) and adults would be captured by the standard capture techniques (see Enclosure B - Section C). Kittens would be expected to adjust to captivity readily, as has been the case with the six kittens removed in 1991. Capture techniques that have proven safe and successful as developed and refined during the past 10 years would be utilized for animals 6 months or older. All animals brought into captivity would be held in quarantine as prescribed in Enclosure D.
- c. **Captive Management** - After capture and quarantining, panthers involved in the captive program would be maintained at permitted facilities within the guidelines prescribed by the specific permits and Enclosure D. All captive animals would be maintained within human contact and exposure levels necessary and appropriate to achieve overall success of the recovery program. Human contact would vary depending on the role of any particular individual in the overall recovery program. Animals targeted for release into the wild would be exposed to minimal human contact.

Since 1984, 13 wild Florida panthers comprising various ages and sexes have been in captivity for various lengths of time and purposes. Eight are presently in captivity (as of October 1991). Included are the six kittens removed from the wild during 1991 and two adults (a male in captivity since being struck by auto in 1984 and a female since being struck by auto in 1988). The six kittens removed from the wild in 1991 adjusted to captivity quickly and have not shown any

signs indicating problems associated with their captivity (J. Lukas, White Oak Plantation, pers. comm. 1991). One kitten does, however, have a very serious congenital heart defect (#205), and for medical reasons has been moved to the Commission's wildlife research laboratory in Gainesville. Additionally, 14 wild Texas cougars have also been in captivity for various lengths of time as part of the reintroduction experiments associated with the panther recovery program.

Based on responses of wild adult panthers and cougars to captivity for various reasons, animals removed from the wild appear to adjust readily. Several females began reproductive cycling in less than a year under captive conditions and one of the two adult male cougars recently placed in captivity bred and successfully produced young after being in captivity for only a year. Based on responses of these adult animals, it is speculated that acclimation for breeding in captivity could take a year or even less for some panthers. Others would be expected to acclimate within 2 years. There have been no significant health or behavioral problems associated with wild panthers/cougars held in facilities designed for the panther program. A comprehensive captive management protocol has been developed to guide activities (see Enclosure D).

The Service fully recognizes that a certain level of risk is unavoidable in capturing and holding wild panthers in captivity. However, based on the performance record of the ongoing captive program regarding the capture, transportation and captive maintenance of wild panthers and cougars since 1981, coupled with the captive facility requirements and captive protocol dictated under the proposed program, the Service finds nothing to indicate that a significant health or safety risk would exist for panthers brought into captivity.

Potential physiological impacts to individuals removed from the wild for the captive population could include possible injury, health problems, reproductive problems, and even death. The potential for such impacts could vary widely among specific individuals and/or along age or sex classes, how and when removal takes place, and transportation and holding conditions/facilities.

In addition to potential physiological impacts, consideration should also be given to possible psychological impacts.

However, to our knowledge there is no definitive way to accurately assess these issues. Based on available information and the observed actions of the wild panthers and cougars that have been in captivity mentioned earlier, reactions to captivity can vary widely between individuals, ages, sexes, captive conditions and facilities. However, adjustments to captivity have occurred quickly. Considering the facilities and protocols proposed, observed responses of individuals that have been in captivity, and the results of similar programs, it is not anticipated that captive animals would undergo significant emotional or psychological difficulties.

- d. Disease/Immunity - Consideration has been given to immune system response to disease in captivity (for animals removed from the wild) and in the wild (for captive animals released into the wild). Disease possibilities are always a concern, whether in captivity or in the wild. All animals brought into captivity would have already had varying degrees of exposure to pathogens present in the ecosystems from which they came, and thus varying degrees of established immunity. While animals were held in captivity, extreme care and caution would be exercised in order to provide a healthy, disease-free environment. The captive management protocol provides a comprehensive, detailed account of actions to be undertaken to ensure that appropriate conditions are established and maintained in all captive facilities (Enclosure D). Vaccines would be used to provide additional protection against many feline diseases.

Captive animals scheduled for release into the wild would be exposed to disease agents during their conditioning program. Within native habitats, exposure would also result from their diets being converted to native prey resources. This pre-release exposure would be expected to trigger the development of natural immunity to many disease agents in these animals. We do not anticipate that significant disease problems that could not be controlled or corrected would occur in captive or reintroduced animals. Planned reintroduction experiments involving surrogate animals (some produced in captivity and conditioned) would provide additional, valuable insight and information on, and opportunities to address, potential disease problems at each reintroduction site prior to the release of Florida panthers.

- e. **Captive Breeding** - Captive breeding programs would selectively mate panthers to achieve and maintain maximum genetic variability and viability. Prescribed facility design and management programs are presented in a protocol developed by a working group of professionals with experience and expertise in captive feline management (see Enclosure D). The protocol design is based on similar programs with proven success involving other large felids. Given the advancement in animal management technology and captive propagation expertise, the reproductive capabilities of Florida panthers in captivity is not a factor in serious question by those most knowledgeable about captive propagation of *Felis concolor*.

Successful reproduction of Florida panthers in captivity can be documented back to the 1940's (Piper family of Bonita Springs, Florida). The Rare Feline Breeding Center in Center Hill, Florida, presently has 1 male and 6 female Florida panthers (Piper stock) and has successfully produced 68 Florida panther kittens in captivity (Robert Baudy, pers. comm. 1991). Mr. Baudy has also successfully bred 27 recognized cat species in captivity, producing over 2,675 offspring. Based on his 40 years of experience breeding cats, he is of the opinion that wild Florida panthers would not be a problem to breed in captivity, particularly if kittens represent the bulk of the animals used to establish the captive population.

As of December 1990, zoological institutions in the United States maintained 12 different subspecies of *Felis concolor* (W. Zeigler, Miami MetroZoo pers. comm. 1991). Due to space limitations, the proficiency with which *Felis concolor* breeds in captivity, the lack of demand for offspring, and the species' overall lower priority ranking compared to other special concern felids, *Felis concolor* reproduction is actively curtailed in many facilities.

Captive breeding experiments utilizing wild Texas cougars as surrogates were recently initiated at White Oak Plantation, near Yulee, Florida. Three adult females (in holding facilities since July 1986) and two adult males (in facilities since January 1990) are presently being utilized in the experimental breeding program (Belden et al. 1990). Successful breeding occurred in late January 1991, resulting in a litter of two female kittens born April 28, 1991. A second litter of two

kittens was born on August 23, 1991. Kittens produced under this program are scheduled for use in experimental conditioning/reintroduction programs.

At the present time reproductive technologies in the form of artificial insemination (AI) and in vitro fertilization (IVF) appear to be on the threshold for successful application to the Florida panther. D. Wildt reports that significant progress has been made in the development of AI techniques in domestic and exotic felids during the last two years (D. Wildt, pers. comm. 1991). His team of reproductive physiologists at the Smithsonian Institution/National Zoological Park, Washington, D.C. have recently been successful in the application of AI or IVF with the tiger, ferret, cheetah and domestic cat. He is presently involved in a cooperative program with the Service, the Commission, and White Oak Plantation to apply his successful felid AI technology to cougars. After successful implementation, this technology will then be available for application to the Florida panther. Probably within 1 to 3 years, successful use of these technologies in Florida panther breeding would greatly expand alternative techniques for captive propagation and significantly enhance opportunities for a successful recovery program. Such application of these technologies could also result in a reduction in the total number of panthers ultimately needed in a captive program.

Based on the fact that at the present time Florida panther reproduction in the wild appears normal, coupled with past documented Florida panther reproduction in captivity, and the fact that other *Felis concolor* subspecies reproduce readily in captivity, the Service has every reason to expect that Florida panthers taken from the wild would successfully reproduce in the proposed captive program.

- f. **Conditioning** - Conditioning would be undertaken and is necessary if animals are returned to the wild, should the captive program be terminated, or if a future reintroduction program is proposed. Captive raised panthers selected for reintroductions into the wild would undergo intensive conditioning programs prior to release. From birth these individuals would receive minimal human contact and exposure. Candidate animals would undergo pre-release conditioning within natural habitats to develop hunting and

other skills needed for survival in the wild. Live prey would be available within conditioning areas. Conditioning programs could be carried out within large, native habitat enclosures. Consideration would also be given to the possible use of naturally isolated areas such as coastal islands. Precise conditioning techniques will soon be under development using cougars as surrogates. Conditioned animals would be utilized for release into the wild only after they have demonstrated an ability to adequately sustain themselves on live native prey.

It is felt that carefully designed and implemented conditioning programs could greatly enhance the success of possible future panther reintroduction programs. Details on conditioning programs specifically involving the Florida panther, or *F. concolor* in general are few. The Service is aware of three such efforts that have occurred in Florida.

The first effort involved seven captive Florida panthers raised by Everglades Wonder Gardens, in Bonita Springs, Florida, and released into the Everglades during the 1950's and 1960's. The following information was obtained directly from the facility owners (M. Roelke, pers. comm. 1991): All seven panthers were born in captivity to hand-reared females. They were raised by their mothers until 2 to 3 weeks of age, at which time they were removed and hand raised. After weaning, hands-on activities were greatly curtailed. The panthers were kept in cages away from public viewing, but they still could hear people and regularly saw the staff. The panthers were fed whole chickens and wild, live, small prey (rabbits and raccoons). The owner stated that he was convinced that the panthers' innate hunting and killing drive would not be affected by captivity and that all they needed was a little experience. The panthers were released over a 10-year period. Direct evaluation of survival was attempted. However, recent genetic evaluation of Florida panthers in the Everglades confirms that at least one or more of the released panthers survived.

The second incident involved two cougars born in captivity in another state. These animals remained with their mother until weaned and were brought to Florida in 1987, at approximately 3 to 5 months of age (M. Roelke, pers. comm. 1991). During the 3 to 4 months following their arrival in Florida, human contact was reduced and their diet was

changed from primarily beef, chicken, and dog food to include whole (feathered) chickens and wild hogs. Live prey initially consisted of piglets. Killing proficiency was developed in a matter of days. The size of the pigs was gradually increased until the kittens were released into the wild (late 1987 or early 1988) at approximately 6 to 8 months of age, at which time they were easily killing 35- to 40-pound pigs. Approximately 3 months after the pair were released into the wild, the male was killed by a car. During necropsy, the veterinarian, Dr. Melody Roelke was impressed by the excellent physical condition and amount of body fat on the animal. If this animal had not been proficient in obtaining prey during his 3 months in the wild it would have been apparent at necropsy. The fate of the female is unknown.

The third case involved a wild female Florida panther kitten that was orphaned at approximately 6 to 7 months of age (#23). This kitten was in and out of captivity several times during 1987 and 1988 (captivity totalling over 20 months). Prior to her return to the wild she was placed in a 15-acre conditioning facility at White Oak Plantation and provided small live prey (rabbits and young deer). She was returned to the wild in February 1989 at approximately 30 months of age. She has now been back in the wild and radio-monitored for approximately 32 months. When she was recaptured in May 1991 to change her radio-collar, she was found to be in good physical condition. For the most part this female initially sustained herself on small prey items such as raccoons and small to medium size pigs. However, recently she has been documented taking adult deer including an eight-point buck (D. Jansen, Big Cypress National Preserve, pers. comm. 1991). Even though this female has spent a significant portion of her life in captivity and undergone numerous captures and releases, she has made an apparent successful transition back to the wild.

The above three referenced cases provide basic information on three different conditioning programs. The proposed captive program provides for the use of cougar kittens over the next several years to develop and refine conditioning techniques that can be successfully applied to the Florida panther. Based on the results of the three cited cases and other successful conditioning programs it is believed that

conditioning techniques can be developed and successfully applied to the Florida panther.

B. Possible Future Actions - Reintroduction

The information presented below is preliminary in nature and will likely be modified and supplemented by the results of ongoing studies and inclusion of additional information. It should be understood that all future actions will undergo full environmental analysis (i.e., rigorous identification of alternatives and analysis of impacts) and appropriate public participation prior to their implementation. Reintroduction of captive-bred/conditioned or translocated wild Florida panthers is a management tool that could be used in efforts to accomplish the following:

To address specific genetic or demographic needs of an existing wild population or population segment; i.e., select individual panthers could be introduced in attempts to improve existing genetic conditions, or, provide for a missing or under represented sex/age component within a population segment. Such actions would typically involve single individual panthers.

To expand an existing wild population; e.g., panthers could be introduced into unoccupied habitat segments within or adjacent to an existing population in attempts to accelerate population expansion. Such actions would likely involve from 5 to 10 panthers per attempt.

To reestablish populations in extirpated areas of the historic range. Such actions would likely involve from 10 to 20 panthers per site. Reestablishment of populations is not a part of the proposed action but could be undertaken in the future.

1. **Availability of Suitable Habitat for Reintroductions** - Actual selection of sites for reintroduction (population reestablishments) has not been made. However, based on information available at this time, it appears that suitable habitats are available for reintroduction considerations on both private and public lands within the historic range of the Florida panther (see Number 3. below and Enclosure B - Section P.1 for the process proposed for actual site selections). The success of the translocation experiment in Florida is sufficient to conclude that habitats do in fact still exist in Florida that, if combined with appropriate management strategies, appear to represent suitable habitat for

reintroduction purposes. The results of ongoing site evaluations, coupled with planned future reintroduction experiments, are expected to likewise identify suitable reintroduction sites in other southeastern states, and that these reintroduction experiments will provide the technologies and management strategies that can be utilized for development of a successful Florida panther reintroduction program.

2. **Reintroductions into Existing Populations** - It should be noted that extreme care and caution must be exercised when reintroductions are being attempted into existing populations. Such efforts would basically be limited to actions to address a specific genetic or demographic need and in most cases would likely involve a single animal. The potential for social structure disruptions that might lead to serious problems must be carefully considered. Prospects for achieving the desired results must be carefully weighted against potential adverse impacts that could result. Evaluations through radio-telemetry must be made to ascertain if appropriate habitat, social and population vacancies exist within each candidate population segment. Intensive follow-up monitoring of the population via radio-telemetry would follow any reintroduction attempt. If possible, corrective actions would be undertaken if significant problems arise.
3. **Reintroductions for Population Reestablishments** - The successful reestablishment of additional wild populations is considered essential to the recovery of the Florida panther. The recovery objective as presented in the revised Recovery Plan is to achieve a minimum of three viable, self-sustaining wild populations within the panther's historic range. The overall goal of the present recovery program however, is to reestablish the Florida panther as a functioning element in as many ecosystems within the panther's historic range as possible. In this way the program would not limit consideration to only the larger candidate reestablishment sites - those sites considered capable of supporting a viable, self-sustaining population (which possibly could number 50 breeding adults). Some smaller sites (those possibly capable of supporting no more than 5 to 10 adults) could possibly function as subpopulations and be extremely valuable to the recovery program. Through directed management activities several subpopulations could function as a single metapopulation.

Reestablishment sites would be identified and selected through a screening process involving a comprehensive evaluation of many

interrelated factors considered necessary for panther survival. Included in this evaluation would be factors such as size of area, land ownership, prey resources, environmental contaminants, human population density, type and extent of human activity, highway/road density, public attitudes toward the panther, etc. The process of identifying and ranking preliminary candidate reintroduction sites within the State of Florida has been completed (see Enclosure B - Section P.1.a - b.1)(Belden and Frankenberger 1987). Preliminary screening for candidate population reestablishment sites elsewhere within the panther's historic range was initiated in May 1991 (see Enclosure B - Section P.1.b.2). A priority ranking of candidate sites is expected to be developed early in 1992; however, full evaluation of those sites and of impacts that might result from possible future panther reintroductions would occur much later.

The selection of sites to actually receive future Florida panther reintroductions would be based on the results of initial reintroduction site identification, evaluation and ranking processes and the results of planned experimental reintroduction evaluations utilizing sterilized non-endangered cougars as surrogates. The initial reintroduction experiment was conducted by the Commission in a north Florida/south Georgia candidate site in June 1988 (see Enclosure B - Section P). It is expected that additional experimental reintroductions/site evaluations for other candidate sites could be initiated in 1992 or 1993.

Under concepts currently being considered, surrogate cougars comprising experimental reestablished populations would be individually replaced as Florida panthers became available for reintroduction purposes (estimated to be 5 to 10 years after the initial panthers are brought into captivity; Belden et al. 1990). The preservation of habitats comprising population reestablishment sites would be crucial to the long-term success of the recovery program. Therefore, after candidate population reestablishment sites have been identified, evaluated, and actually chosen to receive Florida panthers (as determined through the above referenced selection process), aggressive habitat preservation initiatives would be implemented to assure the long-term availability of suitable habitats. Concepts on how this will be accomplished are presented in Enclosure B, Section P.5.

4. **Reintroduction Impacts on Flora and Fauna** - The following represents a preliminary analysis of potential impacts that may be

associated with possible future reintroduction actions. This analysis is provided under the terms of the referenced Settlement Agreement. Because specific reintroduction sites have not been selected (candidate sites are being identified at this time), it is not possible to conduct a detailed analysis of specific impacts that may be associated with reintroductions for any specific site. The analysis contained in this document describes the rationale for how candidate reintroduction sites will be identified and evaluated, and how sites will be selected and preserved (see Number 3. above). A complete analysis including alternatives, assessment of impacts, and appropriate public review, participation and comment opportunities can only be conducted after specific reintroduction site(s) have been proposed. Such an analysis will be carried out prior to actual Florida panther reintroductions.

Possible impacts of reintroduced panthers on the flora and fauna within a reintroduction area would be evaluated and presented in the above referenced environmental documentation process. At this time, only potential general impacts can be evaluated. Potential impacts on the flora of a reintroduction site would be expected to be minimal. Potential impacts on the fauna could involve prey resources and possible competition with other animals for food and habitat. Prey impacts would be expected to consist of losses of individual prey animals from their associated populations and environs. Food habit studies of panthers in southwest Florida indicated that from 1977 through 1989, wild hog was the most common prey, followed by white-tailed deer, raccoon, and armadillo (Maehr 1990b). The reintroduction experiment in north Florida in 1988, indicated that deer was the preferred prey (67 percent), followed by wild hogs (22 percent)(Belden et al. 1990). Data from throughout the occupied range in south Florida indicate that deer and hogs are the panther's preferred prey items, when available. This preference would be expected to also hold true for candidate reintroduction sites elsewhere.

Intensive monitoring of animals involved in the north Florida reintroduction experiment indicated that these animals made kills of large prey items (deer/hog) at a rate of approximately one every 9 days (Belden et al. 1990). Based on the results of the north Florida experiment, it was estimated that reintroduced animals would harvest approximately 15 percent of the deer population per year (deer densities of approximately 1 per 30 acres and if feeding exclusively on deer)(Belden et al. 1990). It

is felt that many candidate reintroduction sites could approximate deer densities and harvest rates of the experimental site referenced above. Based on this experiment, the projected harvest rate of 15 percent would not be expected to have significant impacts to the deer population or affect the ability of the population to sustain itself at pre-reintroduction levels. Because prey activities would be spread out over such large areas (home ranges of 50 to 300 square miles), significant adverse impacts to specific population segments would also not be expected to occur. In summary, although individual animals (primarily deer) would be lost to predation, and redistribution among some other species may occur, impacts to the fauna resource in any particular reintroduction site may be measurable; but overall, they would not be expected to be significant. Again, potential projected impacts for selected sites would be identified and carefully evaluated in the environmental analysis process for proposed reintroductions as specified above.

5. **Public Attitudes Toward Reintroduction** - Public attitudes toward any proposed reintroduction of Florida panthers would likely play a significant role in whether a reintroduction would be attempted or be successful in any given area. Consequently, a thorough public review and education program would be an integral part of any reintroduction effort. It is impossible to specifically assess public attitudes toward the reintroduction of panthers in any particular area at this time because specific reintroduction sites are yet to be selected. Perceived public attitudes toward reintroductions is one of 10 criteria to be used in the initial identification, evaluation and ranking process of candidate reintroduction sites.

It is possible to assess and draw from public attitudes regarding the 1988-89 western cougar reintroduction experiment by the Commission in the north Florida-south Georgia area (see Enclosure B - Section P). The process used to inform and obtain public support for this experimental reintroduction project would form the basis for initiating similar efforts involving future reintroductions whether in Florida or elsewhere within the historic range of the panther (see Enclosure B - Section P). Obtaining acceptance and compliance from hunting interests would be an important goal.

6. **Anticipated Reintroduction Success Rate** - It is not possible to precisely predict success rates at this time. However, through the

use of surrogate reintroduction experiments, it is anticipated that opportunities to identify and take action to address potential problems prior to the release of Florida panthers would greatly enhance the potential for successful reintroductions within chosen sites. The successful reintroduction of Florida panthers into a single site could result in a doubling of the current distribution and numbers of panthers in the wild, and provide security needed to prevent extinction.

The full impact and success of possible future reintroductions have not been determined and will be subject to future analysis. Proposed actions to reintroduce Florida panthers into their historic range will be addressed in separate environmental analysis, pursuant to NEPA; which will include public review, participation, and comment, as appropriate.

V. THE ALTERNATIVES

Alternative 1 - Protect And Enhance Existing Population (No Action) --

Under this Alternative, all available means would be utilized to work within the existing population in an effort to buffer genetic erosion and provide security against extinction. No endangered species permits would be issued by the Service for the capture of Florida panthers to establish a captive population and no direct intervention actions (no additional handling of panthers such as translocations) would be taken.

Actions identified under this Alternative would be equally applicable with the implementation of Alternatives 2, 3, 4, 5, and 7, except endangered species permits would be needed for their implementation (with the exception of Alternative 2).

Alternative 2 - Translocation -- Under this Alternative, select Florida panthers would be translocated (moved from one location to another) within the existing wild population in an effort to improve overall genetic and demographic conditions. Additionally, select Florida panthers from the existing wild population would also be translocated to candidate population reestablishment sites within the species' historical range in attempts to expand the population.

Alternative 3 - Use Kittens And Select Adults For Establishing A Captive Population (Preferred Alternative) -- This Alternative would emphasize the use of kittens for the establishment of a captive population. Select kittens from the wild population would be utilized to achieve genetic representation to the extent possible. Select, non-reproducing adult animals could be used if necessary to fill key genetic gaps where kittens are not available. The utilization of kittens could involve the removal of complete litters or portions of litters. Endangered species permits would be needed.

Alternative 4 - Use Only Kittens For Establishing A Captive Population -- Under this Alternative, only kittens would be used for the establishment of a captive population. Select kittens from the wild population would be utilized to achieve genetic representation to the extent possible. The utilization of kittens could involve the removal of complete litters or portions of litters. Endangered species permits would be needed.

Alternative 5 - Use Only Older Animals For Establishing A Captive Population -- This Alternative would use only older animals (adults/subadults) for the establishment of a captive population. Select older animals would be utilized to achieve complete genetic representation of the wild population. Endangered species permits would be needed.

Alternative 6 - Use All Panthers For Establishing A Captive Population -- Under this Alternative, an attempt would be made to capture all panthers from the wild and place them in captivity. Endangered species permits would be needed.

Alternative 7 - Introduce Genetic Material From Other Cougar Subspecies -- Under this Alternative, genetic material from other cougar subspecies would be introduced into the Florida panther by a prescribed plan in attempts to improve overall genetic health. Endangered species permits would be needed.

VI. DESCRIPTION OF THE AFFECTED ENVIRONMENT

This section presents a general description of the environment that could be affected by the alternatives presented. Included are discussions of the physical, biological, social, and economic components of the environment.

- A. **Physical and Biological Factors** - The only known population remaining for the Florida panther occurs in and around the South Florida counties of Collier, Dade, Hendry, and Monroe (Figure 1). There are no reliable figures for this population prior to the Commission's radio-telemetry study initiated in 1981. Over the past five years or so the population appears to have stabilized at approximately 30 to 50 panthers. The Big Cypress Swamp/Everglades physiographic region comprises much of the presently occupied area. Water is the dominant natural resource of this Region. Because of the relatively flat limestone underlain topography, 75 to 90 percent of the area may be flooded during the wet season. These conditions typically last for several months and have played a major role in the relatively undeveloped status of much of the Region. Extensive sawgrass marshes, prairies, forested swamps, shallow sloughs and upland hammocks and ridges characterize the Region. Public lands comprise approximately half of the known panther habitats in this Region. Detailed descriptions of the physical and biological environments of the area, including the climate, geology, soils, mineral resources, hydrology, vegetation and wildlife are found in Craighead (1971) and Duever et al., (1986).

Because of the vast, undeveloped nature of much of the area, hunting and associated human activities have played and continues to play a dominant role in the nature of recreational activities within panther occupied areas. With the exception of Everglades National Park, Florida Panther National Wildlife Refuge, and Fakahatchee Strand State Preserve most public and private lands experience various levels of traditional hunting activities. To address panther needs and concerns various regulatory actions have been implemented within the area.

Mercury contamination in various areas of the panther's occupied range is a point of concern. Human health advisories have been issued to curtail consumption of certain aquatic foods in some areas of southern Florida. The role of mercury in various areas of concern relative to the Florida panther is undetermined at this time. Mercury toxicosis was attributed as the cause of death of a female panther in 1989 and considered to have possibly played a role in the death of a

female panther in 1991 (see Enclosure B, Section N for more information).

Since 1981, 45 panthers have been captured, immobilized, radio-instrumented and monitored. As of November 1, 1991, 18 are radio-instrumented (9 males and 9 females). A great deal of biological information has been learned regarding the panther over the past 10 years. According to Maehr (1990c), from a demographic and behavioral perspective, panthers in southwest Florida exhibit characteristics typical of healthy mountain lion populations elsewhere. He found that panthers in southwest Florida prefer uplands, especially hardwood hammocks and pine flatwoods over wetland forest cover. He observed that forested uplands cover a relatively small area of inhabited panther range but receive a disproportionately high level of use. He also found that daytime cover and female den sites usually are located in dense understory vegetation, typically saw palmetto. He reports that daybeds usually are relocated daily, while den sites are used for up to 2 months by female panthers and their litters from parturition to weaning.

Panther home range sizes in southwest Florida varied from 53 to 1,183 km² and averaged 191 km² for adult females and 558 km² for adult males between 1985 and 1990 (Maehr 1990c). Maehr noted that home range shifts in adult females were the result of a home range vacancy and dispersal from a natal range. He observed that shifts in adult male home ranges were due to male deaths and home range establishment by an adjacent male. Maehr reported that mean dispersal distance for 6 males (mean age=17.3 months) was 51.8 km (range 22-80 km), and was 16 km for 1 female.

Florida panthers are essentially solitary except while females raise kittens and during mating or attempted mating. Maehr observed that the most frequent interactions were between females and their kittens, followed by adult males and adult females, and adult males and subadult females (Maehr 1990c). He also observed that panthers are usually >2 km apart.

Since 1972, documented panther mortality has totalled 45 animals (through November 1, 1991). Since the development of the Florida Panther Viability Analysis and Species Survival Plan in 1989, four of the 11 full genetic founders identified at that time in the wild population and radio-instrumented have died. Maehr reports that panthers in southwest Florida exhibit mortality patterns typical of unhunted mountain lion populations (Maehr 1990c). He observed

that turnover in adult residents is extremely low and mortality in subadults males is relatively high. He reports that the lack of frequent home range vacancies makes the likelihood of male recruitment low. He observed that the greatest known cause of panther mortality is highway collision (n=13), however, this number is skewed towards males and panthers living in or adjacent to the Fakahatchee Strand (see Enclosure B - section G for more details on mortality). According to Maehr, adult female panthers avoid busy paved highways, while males readily cross them. He observed that female panthers appear to distribute themselves evenly through available habitat but do not include I-75 as parts of their home ranges.

Studies in southwest Florida from 1977 through 1989 indicated that wild hog was the most common prey followed by white-tailed deer, raccoon, and 9-banded armadillo (frequency of occurrence in 270 scats)(Maehr et al. 1990). The authors reported that no seasonal variation in diet was found; however, panthers inhabiting an area of better soils consumed a greater percentage of large prey.

The productivity of females varies by location, and like physical condition and hematology values, appears to be related to the type and abundance of prey in the respective habitat (Roelke 1990). Females successfully producing and rearing young through dispersal age typically produce one litter every two years. Roelke reported that 23 pregnancies had been documented through actual palpation of fetuses (n=4), ultrasound analysis (n=1), necropsy results (n=2), capture or visual sightings of kittens with the respective females (n=5), kitten remains in panther feces (n=1), and radio telemetry data indicating denning behavior 90+ days following association with males (n=10)(Roelke 1990). The author reports that of these, only 10 (43%) have resulted in one or more offspring surviving beyond 6 months of age. Maehr reports that of 6 females documented as denning in southwest Florida, litter sizes after 2 months ranged from 1 to 4 (Maehr 1990).

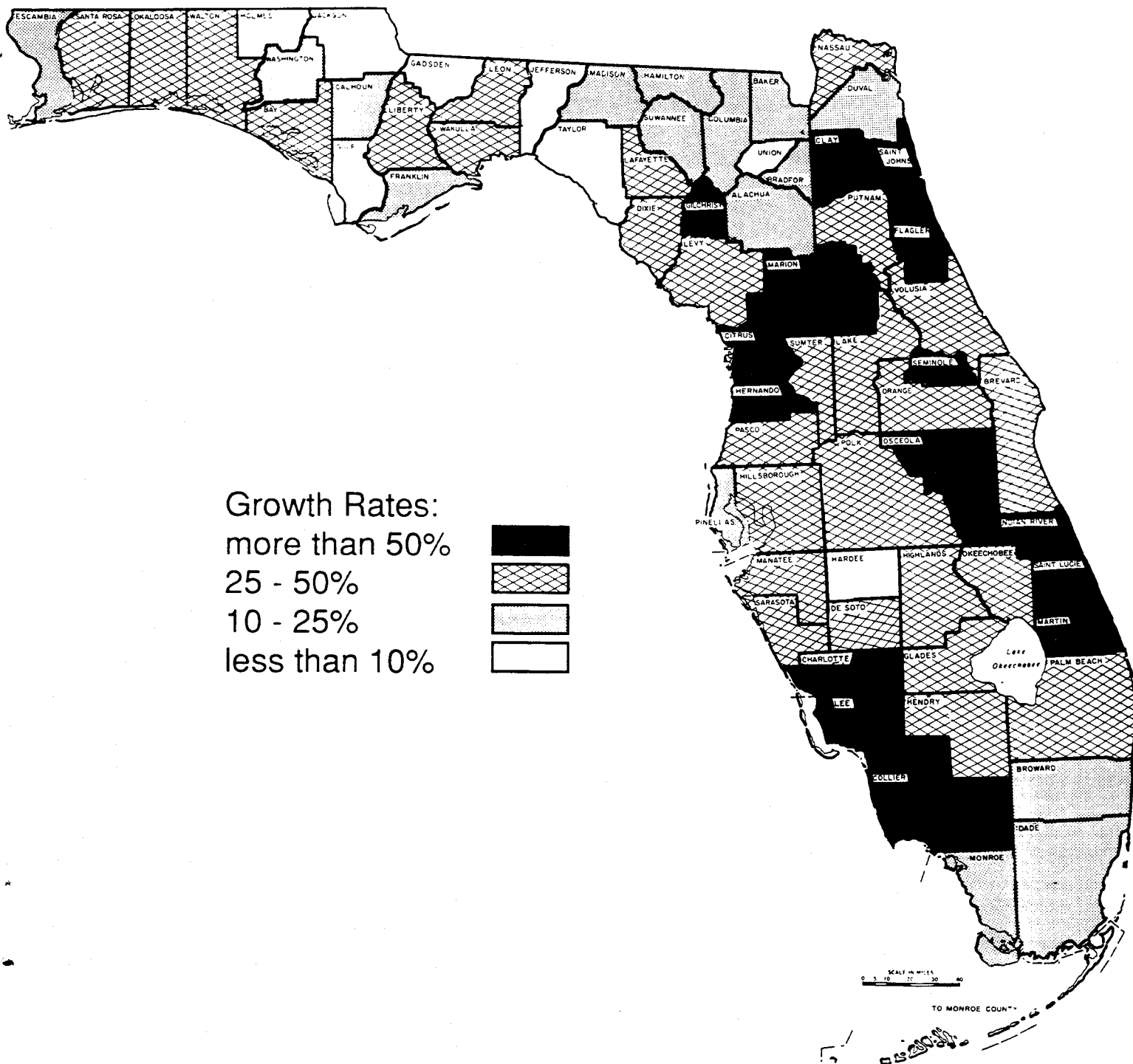
The physical and biological features of sites that may serve as potential future population reestablishment areas cannot be specifically addressed at this time because the sites have not been selected. Possible future reestablishment sites would be located within the panther's historic range. This area includes all or portions of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, South Carolina and Tennessee. By nature of the animal involved, the sites would consist of large expanses of relatively undeveloped

habitats. Public lands could account for large components of some sites.

- B. Socioeconomic Factors** - Clean air, a subtropical climate, and diverse recreational opportunities make the south Florida area extremely desirable to tourists, retirees, and year-round residents. The extensive natural resources of the area have been widely advertised and marketed resulting in phenomenal growth, especially along the coasts. Rapid growth and lack of environmental safeguards prior to 1970 resulted in the loss or significant alteration of many hundred-thousands of acres of productive wetlands and upland habitats. Canal dredging, wetlands drainage, and destructive wildfires have markedly impacted viable interior wetlands in South Florida. This alteration of beneficial wetlands preceded the major growth era, with unmanaged growth further affecting water quality, water storage capacity, and the diversity and abundance of wildlife in the area. The entire Region's economy is heavily dependent upon the tourist industry, which has contributed to the rapid growth of the area. In 1987 there were 499,982 acres or 781 mi² of land designated as urban in southwest Florida. During the decade of the 80's most southwest Florida counties experienced rapid human population growth. Collier County, which receives perhaps the greatest level of panther use of all counties, experienced a population growth in excess of 50 percent (Figure 2). Population densities in 1990 for the two most important counties in terms of recent panther use-levels remain relatively sparse at 50-99/mi² for Collier County and less than 50/mi² for Hendry County (Figure 3). However, the Southwest Florida Regional Planning Council concludes that a doubling of the population in southwest Florida in the next 20 years as projected, will create a demand for an additional 292 mi² of urban land at today's housing densities. Southwest Florida's continued rapid growth has the potential to magnify the loss of natural resources.

Agriculture, another important industry in this region, adds a certain amount of diversification and stability to the economy (U.S. Fish and Wildlife Service 1985). Since the 1984-85 freeze, the southwest Florida region has become the fastest growing citrus area in the state. Citrus acreage has more than doubled in Hendry County in the past ten years. Collier County's 1990 citrus acreage is almost three times its 1980 level.

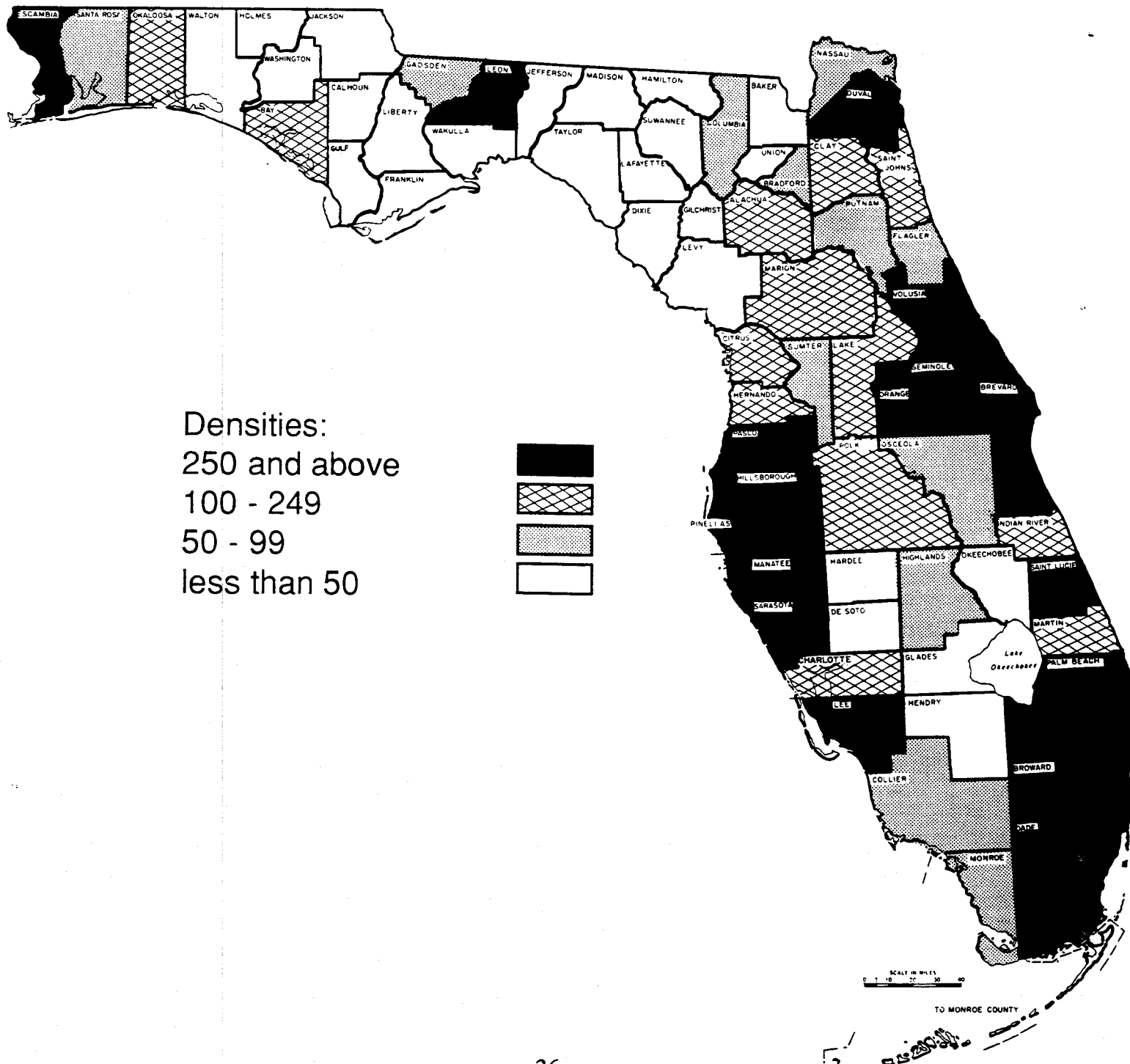
Figure 2.--Percentage Population Change in Florida Counties, 1980 to 1990



Note: The 1990 population counts are subject to possible adjustment for undercount or overcount by the U.S. Bureau of the Census.

Source:
Florida Population: Census Summary 1990

Figure 3.--Population Per Square Mile in Florida Counties, 1990



Note: The 1990 population counts are subject to possible adjustment for undercount or overcount by the U.S. Bureau of the Census.

Mineral resources within the southwest Florida region include: sands, shells, marls, and clays (used in construction); differing grades of phosphatic sands and clays, limestones and Fuller's Earth; and, peats, petroleum and natural gas deposits (A. Eller, pers. comm. 1991). This area has proven important to the petroleum and gas industry, and is currently one of the few areas producing oil and gas in the state.

Public lands comprise much of the panther's current occupied range (Figure 4). Public lands of primary importance in this region include the Big Cypress National Preserve (area B - approximately 600,000 acres), Everglades National Park (area A - approximately 1,500,000 acres), Fakahatchee Strand State Preserve (approximately 50,000 acres), Florida Panther National Wildlife Refuge (area E - approximately 26,300 acres), and the Water Conservation Areas (area C - approximately 800,000 acres). Maehr (1990a) reported that occupied panther range in south Florida totals approximately 2.2 million acres. He also indicated that of these acres, approximately 1.2 million are in public ownership in Broward, Collier, Dade, Monroe and Palm Beach Counties. Nearly all panther range in Glades, Hendry, and Highlands Counties is privately owned (Maehr 1990a). Public lands are managed for varying degrees of resource conservation and recreation. Land use in the Region's private sector is characterized by increasing urban development and an expanding, more intensively managed agribusiness (Figure 5).

Because the Florida panther is a federally listed endangered species, restrictions can apply to certain activities within the panther's occupied range. Proposed projects and land use activities within the panther's present range requiring Federal actions (granting of permits, licenses, funding assistance, etc.) could be limited to only those that would not likely jeopardize the panther's continued existence. Urban and agricultural growth and development within this area could be affected, thus limiting potential economic returns to landowners. Habitat preservation actions (acquisition, easements, etc.) could result in lands being taken out of private ownership or could limit specific land use activities to those compatible with panther habitation. Human activities such as hunting, ORV use, etc., within the occupied range of panthers could also be restricted or regulated to some degree. In summary, maintaining the panther as a component of the South Florida ecosystem will require that existing natural areas remain in a natural state and that uses made of these lands be regulated to the extent necessary to assure such uses are compatible with preservation of natural systems essential to panther recovery.

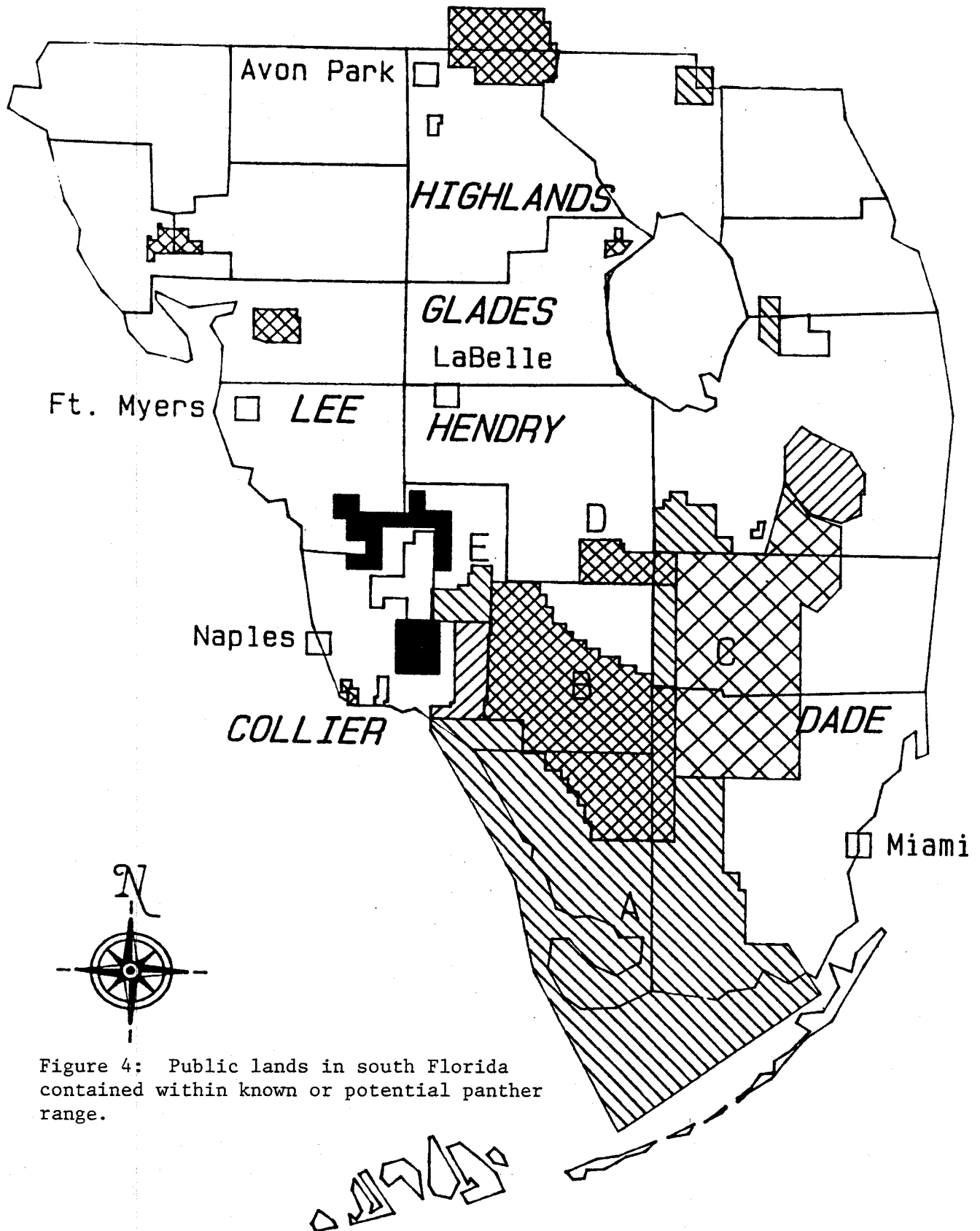
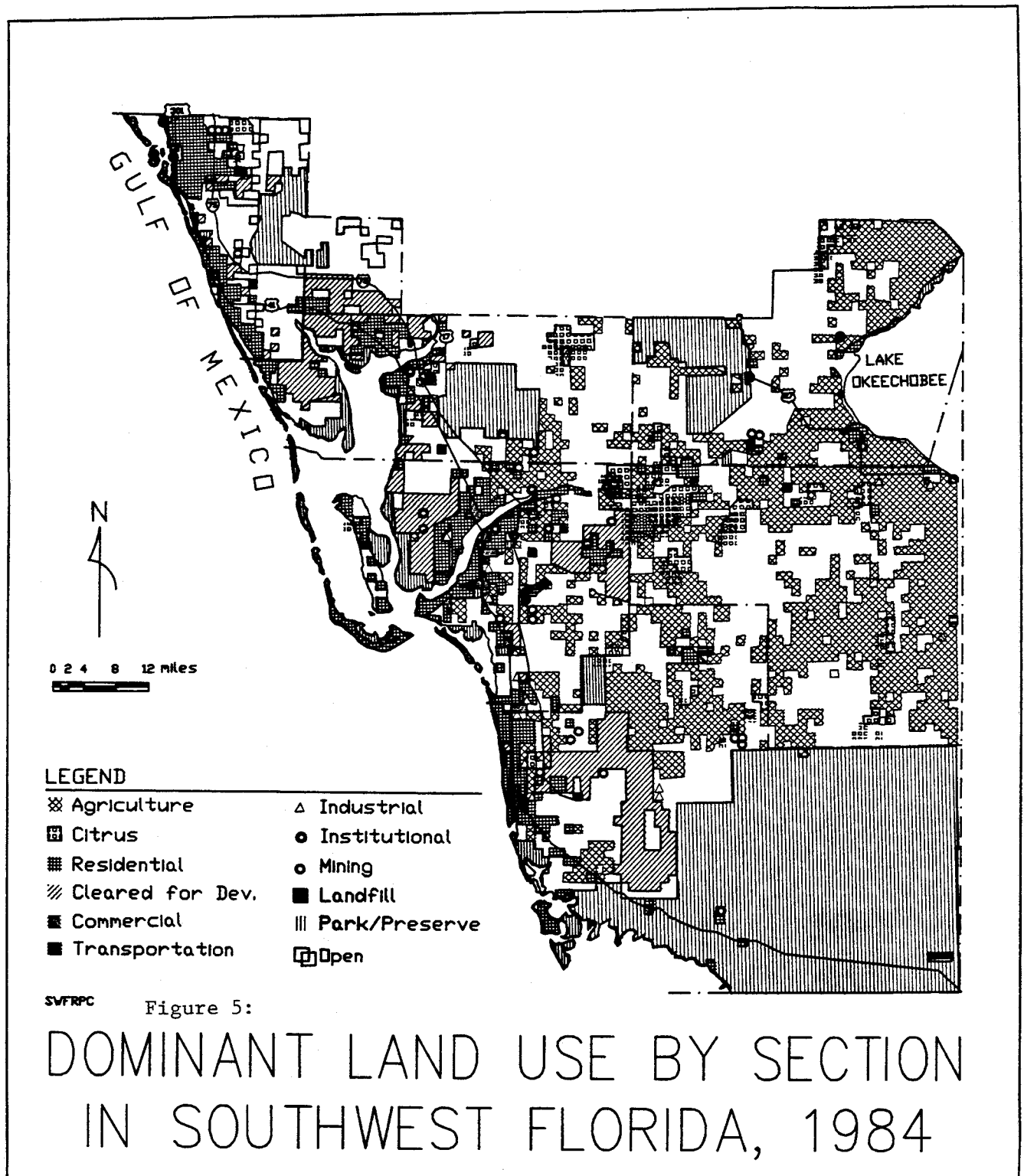


Figure 4: Public lands in south Florida contained within known or potential panther range.



VII. ENVIRONMENTAL CONSEQUENCES

This section discusses and evaluates potential impacts of each alternative on the biological and socioeconomic components of the area. A comparative matrix for the seven alternatives is presented in Enclosure A.

Alternative 1 - Protect And Enhance Existing Population (No Action).

Under this Alternative emphasis would continue to be placed on utilizing authorities and resources available to the Interagency Committee to protect and enhance the existing wild population (i.e., acquire and manage lands, regulate public use activities, establish and enforce hunting regulations, utilize regulatory provisions on proposed project that may affect the panther, etc.). There would be no directed intervention actions taken regarding individual panthers within the wild population (no additional handling of panthers). Habitat preservation and enhancement actions, along with actions to address the various risk factors affecting the panther (i.e., highways, disease, contaminants, hunting, and other human disturbance activities) would continue to receive high priority emphasis in order to make the population as secure as possible (see Enclosure B - Sections L-O). Actions identified under this Alternative would be equally applicable with the implementation of all alternatives that follow (except Alternative 6).

- A. **Biological Impacts** -- Utilizing an intensive habitat preservation and population enhancement program (emphasizing every possible action to address all panther risk factors and managing the habitat to its fullest panther capabilities, see Enclosure B - Sections L-O) might ensure that the Florida panther would survive in the wild for a few more decades, barring the occurrence of a catastrophic population reducing event (Seal et al. 1989). This Alternative would not require the same level of intensive management of individual panthers or intervention actions as would be necessary with the remaining alternatives (i.e., capture and translocate and release, or bring into captivity and manage), and thus would not result in the same level of potential impacts to individual panthers. All other alternatives require various elements and levels of intervention, each of which has the capabilities of impacting individual animals, as well as existing population structures.

Under the provisions of this Alternative inbreeding within the single, small population could not be controlled. Consequently, there would be no feasible way to provide protection to existing genetic variability

or viability. Security against extinction from man-caused or natural catastrophic events can best be provided through a significantly larger total population or through additional populations. Physical and biological limitations (habitat availability and inherent density-limiting factors associated with panther populations) restrict opportunities for significant natural growth or expansion within the present population. Under the existing single population situation, the Florida Panther Viability Analysis and Species Survival Plan projects that the Florida panther will be extinct in 25 to 40 years due to genetic and demographic factors (Seal et al. 1989). A catastrophic event could significantly accelerate extinction.

Present panther/prey relationships within panther-occupied ecosystems, even though not fully documented at this time could be affected under a panther-population-decline-scenario which is projected to occur with this Alternative. These relationships would be significantly disrupted with the panther's total disappearance from the ecosystem. Population increases in some prey resources or compensatory shifts in other predator species may result. Emphasis and regulatory abilities (i.e., Endangered Species Act Section 7) to maintain and preserve various portions of the unique Big Cypress Swamp/Everglades ecosystem could be lessened as the panther population declined (i.e., the ability through Endangered Species Act Section 7 regulations or commitments to preserve the ecosystem may be lessened if the panther were lost as a viable component of the ecosystem).

Under this Alternative, the existing wild population would be expected to initially undergo a gradual decline-process, barring a catastrophic population threatening decline event (a rapid-spreading fatal disease, etc.). The rate of decline would be expected to accelerate over time as demographic and genetic conditions within the population deteriorate - referred to as "extinction vortex" (Seal et al. 1989). Genetic problems of inbreeding depression and lack of adaptability can cause a small population to become even smaller - which in turn worsens the uncertainty of finding a mate and reproducing - leading to further decline in numbers and thus more inbreeding and loss of genetic diversity (Seal et al. 1989). Once a minimum threshold level is reached, the panther population would be expected to experience a rapid decline and eventual extinction.

- B. Socioeconomic Impacts** -- The extinction of the Florida panther, as projected in the Viability Analysis and Species Survival Plan in the next 25 to 40 years or sooner under existing demographic and genetic

conditions (Seal et al. 1989), could have serious impacts to the quality of the human environment. Without panthers in the south Florida Big Cypress Swamp/Everglades ecosystem, regulatory abilities and inherent incentives to protect habitats important to the panther would be lessened, thus developmental pressures could be expected to increase. Threats to the integrity of this unique ecosystem would be expected to accelerate. The Florida Panther National Wildlife Refuge would no longer serve its intended function, i.e., provide sanctuary and optimize conditions for the panther.

- C. **Conclusion** - This Alternative does not have the capabilities of providing security against extinction or genetic maintenance; it is not favored because it would not fulfill the purpose as stated under Section II.B. However, it is important that actions identified under this Alternative be carried out in conjunction with the preferred alternative, should it be implemented.

Alternative 2 - Translocations. Under this Alternative, translocations (moving individual Florida panthers from one site to another) would be utilized as a management tool in attempts to address genetic and demographic problems and to expand the wild population. Actions prescribed under Alternative 1 would apply equally to this Alternative, and actions under this Alternative could also represent important components of Alternatives 3, 4, 5, and 7.

- A. **Biological Impacts** -- Historically, translocations have been the most widely used and successful management tool employed to expand wildlife populations. Translocations simply involve taking animals from an existing wild population and relocating them to another area. Translocations can be employed to either bolster an existing population or establish a new population. Translocating individual animals within a population can also be used as a management tool to address specific needs of a particular segment of that population.

In terms of its application to the Florida panther, relocating specific subadult/adult individuals within the population is a management action that could be employed in attempting to address demographic and genetic conditions. The use of kittens less than 12 months of age in translocations would not be feasible because of their dependence on their mothers for food. The degree that panthers could be successfully relocated within an existing population, or the degree that desired results might be achieved are basically unknown at this time. This Alternative would not be expected to pose the same level of potential risks or impacts to individual panthers that may be associated with

alternatives requiring long-term captivity of panthers (translocated panthers would be in captivity for only a short period of time - possibly only hours to a few days).

As a management tool, translocating individual animals within the existing panther population offers opportunities for improved genetic and demographic management (placing an animal of different genetic lineage, sex or age in a specific population segment to address a identified need) and possibly limited expansion within the existing population area.

Translocations have the capabilities to also result in possible serious negative impacts to existing populations. Potential adverse biological impacts would tend to center around three general areas: (1) the population structure of the donor segment of the population (segment from which the animal(s) originated), (2) the animal(s) actually translocated, and (3) the population structure of the receiving segment of the population. Actual results and effects of each translocation event would be dictated more by the specific individual animal(s) involved than anything else. Imbalances relative to functioning social structures at either the donor or receiver segments of population, or both, could occur. This could lead to reduced breeding activity, reduced breeding success or even mortality due to intraspecific aggression between individual panthers.

Impacts on existing social organizations and population structures resulting from translocating any given animal within a population would be expected to exceed impacts resulting from simply removing that same animal for captivity. Removal impacts (impacts to population segment from which the animal came) would be the same regardless of whether the animal was translocated to another segment of the population or brought into captivity. The potential added impacts would focus around those associated with changes that might occur in the receiving segment of the population when a translocation is carried out. Translocations would not provide the best opportunities for genetic protection and management compared to captive propagation.

Security against extinction for the Florida panther can basically be provided through a significantly larger total population or from additional populations. Successfully establishing additional wild panther populations via translocations would provide a level of security against extinction. However, based on findings of preliminary reintroduction experiments, a minimum of 10 to 20 subadult/adult

panthers should be used initially at each reintroduction site (Belden et al. 1990). The removal of this number of subadult/adult panthers from the existing wild population during a single capture period (removal of 20 to 67 percent of the estimated wild population) would likely result in significant, possibly irreversible adverse impacts to the existing population and could compromise the populations self-sustaining capabilities.

Population reestablishment programs via translocations would require a significantly larger source population than is presently available. Because of physical and biological limiting factors associated with the existing wild population (identified under Alternative 1), the likelihood of developing a significantly larger source population is not considered feasible through translocations alone.

Translocating panthers within the existing wild population has the capability to possibly extend extinction time-frames regarding genetic and demographic associated factors to some degree. However, translocations within the existing wild population would provide no benefits in terms of added security against more rapid extinction-causing factors such as a disease outbreak, and potentially could lead to the spread of infectious diseases. Additionally, because of the number of panthers deemed necessary for population reestablishment programs, translocating panthers from the existing wild population for population reestablishment purposes could greatly accelerate extinction for the panther.

- B. **Socioeconomic Impacts** -- Translocations within the existing population for demographic and genetic management purposes could provide for at least short-term persistence of the wild population, resulting in a continuation of any associated habitat protection incentives (as provided under Endangered Species Act Section 7 provisions, habitat preservation initiatives, etc.). The value of the panther's presence as a functioning component of the ecosystem (as perceived by some segments of the human population) would at least be temporarily maintained. However, this Alternative would not be capable of providing for the long-term survival of the panther. Associated socioeconomic impacts of the panther's eventual disappearance from the ecosystem as described under Alternative 1 would apply equally to this Alternative.
- C. **Conclusion** - The Service concludes that this Alternative by itself would not provide the biological capabilities for achievement of the purpose as stated in Section II.B. and is, therefore, not preferred.

However, limited translocations of individual animals may represent a viable management tool to address specific situations and could be utilized in combination with other programs or any of the other alternatives (except Alternative 6) to achieve specific population objectives.

Alternative 3 - Use Kittens And Select Adults (Preferred Alternative).

One of the major factors in the projected extinction of the Florida panther over the next 25 to 40 years is that the existing population already contains minimal levels of genetic variability, and this variability is being further eroded through inbreeding and mortality of founder stock (Seal et al. 1989). Since the development of the Population Viability Analysis and Species Survival Plan in 1989, 13 of 27 (48 percent) panthers identified as genetic founders have died (Roelke 1991). Any conscientious effort to enhance the survival probabilities of the Florida panther must contain provisions for the preservation and maintenance of the remaining gene pool. Genetic preservation can most effectively be accomplished through controlled propagation available only under captive conditions.

To maintain and preserve the present level of existing Florida panther genetic variability and viability any propagation program must be completely representative of genetic material contained in the existing wild population. Under the preferred alternative the goal would be to establish a captive population completely representative of the available genetic material occurring in the wild population. Details on captive management and breeding are contained in Sections IV.A.c. and e. The core of the captive population would be incrementally established over a 3- to 6-year period. Kittens would be used to the extent possible in achieving complete genetic representation for the captive population (a maximum of 6 during any given year). Adult panthers from the wild population would be candidates for the captive breeding program under this Alternative only if they contain genetic material considered crucial for success and are not reproducing, thus cannot be represented by offspring (see Section IV.A.3.a)(maximum limits for removal are 4 the first year and 2 each following year).

Actions identified under Alternatives 1 and 2 would apply equally to this Alternative.

- A. **Biological Impacts** -- The establishment of a captive population as proposed would, like any additional population whether captive or wild, provide security against extinction. However, when compared to typical population growth expectations in the wild, captive propagation

would provide opportunities and capabilities to achieve significantly greater and more rapid increases in the overall panther population. Through captive propagation, 2 or more litters per female, per year could be expected compared to only 1/2 litter per female, per year in the wild (females typically produce only one successful litter every two years in the wild). Kitten mortality would be expected to be significantly less in captivity also. Security against extinction would be provided much sooner under a rapid population growth scenario. Such a program could also be expected to provide resources for population expansion programs in a much shorter period of time.

Because this Alternative is designed to achieve full genetic representation of available genetic material contained in the wild population, it would provide maximum flexibility and opportunities for preserving and improving overall genetic fitness through the application of captive propagation technologies. Under this Alternative, protection of existing genetic material would be expected to be achieved in 6 years or less (estimated time to achieve full genetic representation for the captive population under proposed removal regime) with minimal impacts on the wild population.

1. **Kitten Removal Impacts** - Under the proposed removal regime the maximum number of kittens that could be removed during any given year would be 6. Based on existing reproduction data (as summarized below and presented in more detail in Enclosure B - Section H), this level of removal would not be expected to significantly impact the sustaining capabilities of the wild population, or represent significant risks to the well-being of the wild population if properly carried out.

Kitten survival in the wild can be dictated by the mother's ability to provide for the needs of her young, and by prevailing habitat and population conditions. Kitten production/survival/mortality function as population self-regulating mechanisms, and regardless of the number of litters or kittens produced, the actual number surviving to dispersal can remain relatively constant under some population conditions. Natural kitten mortality is unquestionably occurring in the wild population (see Enclosure B - Section G). The precise level of this mortality is not known. An estimated 50 percent of suspected litters produced apparently do not result in a single kitten surviving to 12-months age (Roelke, pers. comm. 1990)(see VI.A. above). Individuals from some litters are lost between birth and dispersal age, and in some cases complete litters are lost. Kittens removed immediately after birth could

represent a part of naturally occurring mortality and thus not be totally additive to it. If a complete litter were taken, the prospects that the female would recycle and produce a replacement litter are thought to be high (see below).

Complete data are not available at this time to identify the precise nature or extent of impacts that may be associated with kitten removal activities. However, special emphasis has been placed on monitoring and evaluating events associated with the removal of the six kittens in 1991. Although a complete analysis cannot be made at this time, preliminary data indicate that events have occurred as predicted. The two females that had partial litters removed (removed 1 of 2 kittens) continue to raise their remaining kitten in a normal fashion. The two females that had complete litters removed exhibited normal reproductive behavior (apparent recycling in 5 to 7 weeks and one is thought to be raising a replacement litter and the other is thought to be pregnant). Based on this preliminary data from the 1991 kitten removal, other data summarized below, and data contained in Enclosure B - Section H the Service continues its position that the proposed kitten removal regime can be implemented without significant risk to the wild population.

Indications of recycling have been frequently observed in the existing panther population; documented in 12 of 14 incidences involving 12 females from 1982 through 1991 (M. Roelke, pers. comm. 1991)(see Enclosure B - Section H). Documentation of successful production of replacement litters post suspected recycling events is somewhat difficult utilizing existing data. Successful production of replacement litters can be documented on three occasions, with two additional probable incidences presently underway (see Enclosure B - Section H).

Impacts to the existing social structure of the wild population from the removal of kittens would not be expected to occur (population social structure elements are a function of sub-adult and adult segments of the population). Overall impacts associated with the removal of kittens would be dictated by many of the same factors associated with adult removal discussed below, i.e., the number (number removed during any given year and cumulatively) and composition (age, sex, genetic makeup, etc.) of kittens involved.

Potential kitten removal impacts would be expected to center around effects on the ability of the wild population to sustain itself

through and beyond the removal program, and effects on the population's overall genetic health. Significant problems could arise if kitten removal resulted in a situation where mortality exceeded recruitment in the wild population for an extended period, or if a significant sex-ratio imbalance resulted. Long-term population health could also be affected if removal resulted in a situation where genetically inferior kittens represented the only kittens remaining to support the wild population over an extended period. Extensive knowledge of the present population and the continuation of intensive monitoring activities would provide information that could be used to preclude such situations from developing.

2. **Adult Removal Impacts** - Adult panthers that could be candidates for use in the establishment of the captive population would only be individuals not contributing reproductively to the wild population. For that reason, their removal would not be expected to impact the self-sustaining capabilities of the wild population. It is anticipated that these animals would be replaced through natural recruitment, and the chances of being replaced with productive individuals would be good. The application of health and reproductive technologies available only under captive conditions (i.e., nutrition and hormone supplements, medical management, surgery, artificial insemination, in vitro fertilization, etc.) could significantly increase the reproductive capabilities of adult animals brought into captivity.

Changes in the social organization and population structure resulting from the removal of any older animal would occur. This is also a naturally occurring event as adults and subadults die. The precise impacts of any adult removal would depend on the specific animal removed. However, impacts resulting from the removal of individuals not contributing reproductively could be minimal and the wild population's ability to sustain itself would not be compromised.

Impacts (short and long-term) to the remaining wild population from the removal of adult panthers could vary significantly on a case by case basis. Impacts would be directly influenced by any number of factors associated with the specific individual removed, as well as factors associated with the population segment from which the individual was obtained. Factors that could be important would include the number (over any period of time), age, sex, genetic makeup, and reproductive status of the individual

removed, when removal occurred, the animal's position in the social structure of the donor population, and the size, composition and overall condition (health, viability, etc.) of the donor population.

Actual impacts associated with the removal of any given individual could potentially range from extremely minor to fairly significant. Potential impacts could be that the vacated home-range remains vacant for an extended period of time, or is quickly incorporated into the home-range(s) of other resident or dispersing animals. Little or no apparent strife within the existing social organization could result, or strife could be fairly significant. Social disruption potentially affecting reproduction and/or territorial conflicts resulting in injury or death of one or more animals could occur in extreme cases.

Neither the Service, nor anyone else can precisely predict the outcome of any adult removal action. In actuality, however, the response of the population to removal of an adult for captive breeding purposes would not be expected to differ significantly from what has occurred as a result of 27 documented deaths and/or injuries requiring removal of adults in the wild population since 1981. The population adjusts. These adjustments have not resulted in detectable population threatening consequences. Greatest impacts might be expected to result from removals involving reproducing animals, which would not occur under the proposed program.

Additionally, based on observed reactions of radio-instrumented animals within the wild population in response to 50 documented removal events (deaths and/or other actions resulting in animal removals) since 1981, which have included all age and sex components; population threatening consequences or significant population strife has not been observed (with the exception of a single incident involving the death of a dominant resident adult male in 1990, and the possible related subsequent deaths of two adult females). Additional analysis of existing data on the wild population show that between January 1983 and July 1991, there have been nine occasions where documented adult removals (deaths and other removals) during 12-month segments reached or exceeded 5 panthers.

Based on the above documented losses evaluated in a number of ways (total loss over all ages, total adult loss, and adult loss during

12-month segments), and the fact that population threatening reactions have not been observed as a result of these losses the Service has concluded that the proposed removal regime for adults could be carried out without significant risks to the well-being or self-sustaining capabilities of the wild population.

Factors that would be considered prior to adult removals and that provide opportunities during selections to moderate potential adverse impacts to the wild population are enumerated below.

- (1) Criteria used to define a candidate adult (only non-reproducing),
- (2) Number of animals that might fit the criteria (not expected to exceed 1 during any year, based on present reproductive information),
- (3) Observed responses of the wild population to documented removals (deaths comprising various levels and age/sex compositions),
- (4) Observed apparent self-sustaining capabilities of the wild population (50 panthers documented leaving the population during 10 year period without a detected change in total population estimates),
- (5) Capabilities through radio-telemetry to assess each candidate's role in the social organization of the subject population segment,
- (6) Capability through the analysis of radio-telemetry data to evaluate population responses to past removal actions (deaths, etc.) and be in a position to project potential impacts prior to making decisions and taking actions,
- (7) Ability through radio-telemetry to monitor actual population responses to removal,
- (8) Ability through radio-telemetry to be in a position to recognize potential problem situations resulting from removal, and,
- (9) Ability to immediately implement actions as warranted and available to address observed responses.

The outbreak of disease is just as important a concern for a captive panther population as it is for the wild population. It could be viewed that avenues for a more rapid disease spread may exist in captivity than under wild conditions. However, a detailed

protocol has been developed and would be utilized to ensure utmost care and health of all panthers maintained under captive conditions (Enclosure D) and the likelihood of significant disease problem is considered extremely remote.

Should the proposed action be implemented and it is determined that the well-being of the wild population was being threatened by the program the Service would immediately suspend capture activities. The program would be resumed only after careful analysis of the situation and all available data indicate that the long-range self-sustaining capability of the wild population would not be compromised by the program.

- B. Socioeconomic Impacts** -- Based on the evaluation of approximately 500 comments received during the comment period for the original draft Environmental Assessment, maintaining the panther as a viable component of the unique Everglades/Big Cypress Swamp ecosystem represents an extremely important priority in the views of many residents across Florida and the Nation.

A captive population could provide for increased educational opportunities (i.e., interpretative displays, etc.) at participating facilities. Because the costs of captive facilities would be born by participating entities, the investment for establishing a captive population would not be expected to drain funds from ongoing or future protection and recovery efforts. The intensity of ongoing and future activities would continue and/or be expanded whether the proposed action is implemented or not. Animal captures would continue as part of population monitoring activities of ongoing programs. Participating institutions would bear the primary cost of managing and maintaining the captive panthers. It has been projected that the four institutions likely to be initially involved would contribute approximately \$1,000,000 in facilities and \$500,000 per year in operating costs (Seal et al. 1989).

Projected long-term needs of the program could include further reproductive technology and genetic investigations, and construction of additional pre-release conditioning facilities for animals scheduled for release into the wild. It is speculated that costs of these projects would likely be borne either by participating/contributing organizations and/or the four Interagency Committee agencies.

- C. **Conclusion** - Because this Alternative would provide capabilities for complete achievement of the purpose to provide immediate security against extinction and provide for the long-term preservation of the remaining Florida panther gene pool (Section II.B.), it is the preferred alternative.

Alternative 4 - Use Kittens Only. Under this Alternative up to six kittens per year could be used in obtaining available genetic representation within a 3- to 6-year establishment period for a captive population.

Actions identified under Alternative 1 and 2 would apply equally to this Alternative.

- A. **Biological Impacts** - This Alternative would represent many of the same advantages and impacts as described for the preferred alternative. However, because no older animals would be removed, potential impacts to the wild population could be lessened (for projected kitten removal impacts see Alternative 3). The protection of all available genetic material contained in the wild population may not be possible under this Alternative. Should non-reproducing adult panthers exist in the wild population, and these individuals represent founder genetic material not available in other animals, it would not be possible to represent this material in the captive population under this Alternative. Additionally, there would be no experienced animals (i.e., wild adults) in the captive population to pass along learned/taught survival skills, should this prove important for survival capabilities of captive-raised animals used in possible future reintroduction programs.

- B. **Socioeconomic Impacts** - Same as Alternative 3.

- C. **Conclusion** - Because it may not be possible to assure for the maintenance and preservation of all available genetic material contained in the wild population, this Alternative provides the capabilities for only partial achievement of the purpose as stated under Section II.B.

Alternative 5 - Use Older Animals Only. Under this Alternative the number of adult animals removed per year would likely be between three and five. This represents the approximate number needed to achieve full genetic representation of the wild population's estimated

potential 15 to 25 total founder animals within the specified 3- to 6-year establishment period for the captive population.

Actions identified under Alternatives 1 and 2 would apply equally to this Alternative.

- A. **Biological Impacts** -- Under this Alternative, complete genetic representation could be secured rapidly. However, in order to achieve complete genetic representation for the captive population a total of 15 to 25 older animals may have to be taken from the present wild population (estimated at 30 to 50). This would result in the removal of 30 to 80 percent of the present wild adult population. Such an action would likely result in significant, unacceptable impacts (e.g., disrupt social organization and population dynamics) to the wild population and would without question compromise the wild population's ability to sustain its present level (see Alternative 3 for the nature of projected impacts that may be associated with adult removals). It is projected that under this Alternative the social organization and population structure of the wild population would disintegrate as removal proceeded, the population would decline and eventually go extinct (see Alternative 1 for potential impacts associated with a declining population and eventual extinction).
- B. **Socioeconomic Impacts** -- See Alternative 1 for potential socioeconomic impacts associated with a declining panther population situation.
- C. **Conclusion** - This Alternative would result in significant impacts to the wild population completely contrary to the panther's recovery plan of preserving and enhancing the wild population and is thus not preferred.

Alternative 6 - Utilize All Panthers. Under this Alternative efforts would be made to capture all panthers in the wild population and bring them into captivity. It is expected that the majority of the animals in the wild population could be captured within a 2-year period.

- A. **Biological Impacts** -- Under this Alternative, genetic preservation could be assured (all genetic material would be protected in captivity), and a level of security against extinction provided. However, the wild population would no longer exist (see Alternative 1 for projected impacts of a declining/extinct

population situation). This Alternative is totally unacceptable because it completely counters the primary goal of the species' recovery plan, which is to secure and enhance the wild population. This Alternative would only be considered by the Service as a viable option in a situation where a thorough analysis of available information culminates in a determination that such an action is necessary to ensure the continued survival of the Florida panther.

- B. **Socioeconomic Impacts** -- The removal of all panthers from the wild would be viewed by many as having enormous impacts on the quality of the environment (see Alternative 1 for projected impacts associated with a declining/extinct population situation). The Everglades/Big Cypress Region would be viewed by many as no longer representing a complete ecosystem.
- C. **Conclusion** - This Alternative would result in total removal of the wild population, which is contrary to the fundamental objective of the present recovery effort.

Alternative 7 - Introduce Genetic Material From Other Cougar Subspecies. Under this Alternative, attempts to improve Florida panther genetic health would be addressed by the introduction of genetic material from other cougar subspecies (i.e., breeding Florida panthers with cougars from other areas). Genetic viability and survival probabilities of small, isolated populations may be significantly enhanced through the infusion of "new" genetic material from other populations of the same species.

The possible application of the infusion of new genetic material (genetic augmentation) as a management tool under provisions of the Endangered Species Act is not entirely clear at the present time. Because the overall genetic health of the Florida panther is questionable and prospects for further, accelerated genetic deterioration are projected under existing conditions (Seal et al., 1989), genetic augmentation is included as one of several alternatives considered in this document. The Service believes that the Endangered Species Act authorizes the use of this management tool when essential to the conservation of a listed species. However, many factors as discussed below must be thoroughly examined when consideration is given to genetic augmentation, particularly when listed species are involved.

In May 1991, the Service sponsored a 2-day workshop to examine genetic augmentation and its possible application to the Florida

panther recovery program. Workshop participants included personnel from each of the four Interagency Committee Agencies and scientists in the fields of genetics and small population biology from across the United States. The use of genetic augmentation as a general management tool in small populations, and more specifically how it might apply to the Florida panther situation were examined. A brief summary of the workshop results follows. Specific details are contained in the workshop report titled: Genetic Management Considerations for Threatened Species with a Detailed Analysis of the Florida Panther (U.S. Fish and Wildlife Service 1991).

It was the consensus of workshop participants that human-mediated translocation of plants and animals is fraught with dangers and should be strongly discouraged. However, in some special circumstances, translocation (managed gene flow and population augmentation) may be warranted and desirable to maintain small populations that are isolated because of human-induced fragmentation of the environment. Specific criteria for assessing the appropriateness of genetic augmentation were developed and included the following points: (1) verify that problems facing the population include genetic loss; (2) confirm that genetic problems can be ameliorated by intercrossing; (3) demonstrate lack of negative effects of intercrossing (before gene pools are irreversibly mixed); (4) confirm availability and appropriateness of potential source population(s); and, (5) establish ability (and plan) to monitor impacts of translocations for intercrossing.

A brief summary of the results of the genetic augmentation evaluating process conducted on the Florida panther follows.

Does the Florida panther meet requirements to be a candidate as an exception to the general guideline that proscribes augmentation with genetically divergent stock? It was determined that the Florida panther population meets the criteria of being very small and totally isolated from all conspecifics, due to human activity.

Is the Florida panther population at substantial risk of extinction? The population size is well below criteria that have been suggested for numbers needed to assure viability. Population viability data project extinction for the panther in 25 to 40 years under existing demographic and genetic conditions (Seal et al., 1989).

Do the problems facing the Florida panther include genetic loss? Population viability data project genetic diversity (heterozygosity) losses occurring at a rate of 3 percent to 7 percent per generation under current conditions (Seal et al., 1989). This loss is expected to accelerate over time. Founder mortality (the loss of those animals containing genes not known to be contained elsewhere among the living panthers) has averaged 49 percent for each 2-year period since 1981 (Roelke, pers. comm. 1991). Of *F. concolor* populations sampled by molecular genetic methods and represented by six or more individuals, the Florida panther has the least genetic variation (percent polymorphic loci, mean heterozygosity). Inbreeding among immediate family members has been documented on a number of occasions. There are a number of indicators possibly associated with inbreeding and losses of genetic diversity that could have damaging effects on the population (90+ percent abnormal sperm, 90 percent cryptorchid males, vaginal fibropapillomas, and heart murmurs). The above observations together strongly indicate that loss of genetic variation has been and continues to be substantial in the Florida panther population and that inbreeding and genetic loss has increasing impacts on the panther.

Are the perceived genetic problems correctable via intercrossing? If deleterious genetic traits persist in spite of aggressive management of the existing gene pool, it may be necessary to augment the genetic variability of the Florida panther with genetic material from other subspecies to ensure survival. The history of intercrossing of Florida panthers in captivity and in the Everglades National Park suggest that reproductive and health conditions identified above may be reversible.

Would there be negative effects of intercrossing? The amount of genetic divergence between the Florida panther and other *F. concolor* subspecies appears to be slight, indicating a recent and shallow evolutionary separation of populations that formerly would have been connected by gene flow. The weak inter-population differentiation is consistent with observations that pumas are capable of long-distance dispersal. Based on the success of crossings between much more divergent populations of other carnivores, and the apparent success in crossing between Florida panthers and a South American stock (among the populations most genetically divergent from the Florida panther) during the creation of the Piper stock and the intergradation into the Everglades population, it seems very unlikely that crosses between

Florida panthers and similar subspecies from elsewhere in North America would display any negative effects in the first or later generations. This must first be verified under captive conditions prior to allowing outside genetic material to enter the wild population.

Are appropriate source populations available for intercrossing with Florida panthers? The closest extant geographic wild population to the Florida panther is in west Texas. Animals from this source have already been used for experimental releases in north Florida, and those animals appeared to adapt well to that habitat. Molecular evidence indicates that this population is genetically similar to the Florida panther. Given the apparent close genetic relationships among all the wild North American populations, any population that is not very small, isolated, and low in genetic variation could probably be used to augment the Florida panther population. Captive populations such as the Piper stock are also considered possible genetic sources.

Possible strategy for incorporating intercrossing into the recovery of the Florida panther. As stated in the Recovery Plan, in the Population Viability Analysis, and elsewhere in this document, it is speculated that the Florida panther can be recovered to viable populations with aggressive management of genetic material contained in the existing population. Complete recovery will require protection and enhancement of habitat combined with measures to increase productivity and survival in the wild and in a captive population.

The survival and continued adaptive evolution of the Florida panther is far from assured, however, and many uncertainties in data on the current demographic and genetic status of the population, concerning the future changes in the environment, and in the understanding of basic population processes are recognized in the various recovery documents. The extent of genetic deterioration of the Florida panther and the impact that past and ongoing genetic losses will have on the viability of individual animals and the population remains one of the areas of greatest uncertainty and concern.

Based on the preceding evaluation, it was recommended that the recovery of the Florida panther should proceed through three levels of increasingly interventive management. First, ongoing attempts to secure and enhance the wild population must continue. Second, a captive population be established to provide critical demographic and

genetic security for the wild population and as the probable only source of sufficient Florida panthers to reestablish populations in other parts of the former range. Third, panther management and recovery should include intercrossing experiments. Given the need to protect the panther, and the necessarily long development time to implement captive propagation and intercrossing wisely, it is important that the three referenced components of panther management proceed simultaneously. Time exists now to cautiously and wisely investigate options while not jeopardizing complementary components of an overall program, and while animals exist with which to undertake such actions.

The ability to determine whether genetic augmentation can be successfully applied to the Florida panther and the development of technologies to achieve desired results can best be obtained and applied under captive conditions. Any program resulting in the establishment of a captive population (Alternatives 3 through 6) could be combined with this Alternative to achieve desired results.

- A. **Biological Impacts** -- Potential impacts associated with actions designed to accomplish genetic augmentation in any species are numerous (U.S. Fish and Wildlife Service 1991). Likely consequences of poorly planned translocations of individuals and genetic material from one population to another include: (1) homogenization of the genetic composition of populations through decay of between-population differences; (2) blurring or irretrievable loss of genetic information on the intraspecific evolutionary histories of populations; (3) placement in jeopardy or outright destruction of local adaptations, through introduction of foreign genetic material, breakup of coadapted gene complexes, or genetic swamping; (4) creation of reproductive difficulties when transplanted individuals differ from recipients in karyotype or other genetic characteristics that may decrease fitness of intercross progeny or their descendants; (5) disruption of the social structure and population stability of the recipient population; (6) subsequent spread of introduced forms to unintended areas; (7) unintentional introduction or spread of parasites or disease vectors; and, (8) creation of a false sense of management accomplishment (masking of underlying environmental problems) (U.S. Fish and Wildlife Service 1991).

At the present time, it is believed that planned management of genetic material presently contained in the south Florida

population can ameliorate immediate effects of close inbreeding. The Population Viability Analysis and Species Survival Plan for the Florida panther and the consequent management decisions outline courses of action designed to manage the existing gene pool to recover the taxon. If the existing genetic variation can be captured and the founder base expanded rapidly, it is speculated that the population can be recovered and genetic augmentation actions will not be necessary.

If deleterious genetic traits persist in spite of aggressive management of the existing gene pool, it may be possible and desirable, and perhaps necessary for population survival, to augment the genetic variability of the Florida panther with genetic material from other subspecies. If genetic augmentation is deemed necessary the goal would be to preserve and restore a population that resembles the ancestral populations of the subspecies as closely as possible, augmenting the gene pool of the population only to the extent necessary to assure continued viability of the population.

Controlled, experimental crosses among populations would be needed to confirm that deleterious traits could be prevented by genetic augmentation via intercrossing. Animals produced by experimental inter-populational crosses could be examined for sperm quality, presence or absence of health problems, and morphological irregularities. These experiments could verify the benefits of intercrossing and also provide an opportunity to confirm the lack of deleterious effects of intercrossing. Any evidence of "hybrid breakdown" in health, viability, or reproduction should be examined carefully in experimental crosses. This would be done prior to any decision to release such panthers into the wild. Further genetic research should be done to quantify more precisely the relationship of the Florida panther to other *F. concolor* populations, including populations in the wild as well as the captive Piper stock. This information would be useful in identifying animals for possible intercross experimentation.

The goal of the present recovery program is to first take actions to secure and enhance the existing wild population and then take actions to reestablish the Florida panther into other historic population areas (U.S. Fish and Wildlife Service 1987). All efforts should be taken to protect and preserve the genetic composition

as represented by the present wild population and the eight panthers presently in captivity.

Until a determination is made that the long-term genetic viability of the Florida panther cannot be reasonably assured using this genetic material, genetic augmentation is not considered appropriate. However, there is value in moving forward with the initiation of controlled intercross experiments (as identified above) while actions to secure, enhance and expand the wild population continue. Investigations of intercrossing could proceed without harm to the wild population in Florida or to the captive breeding program designed to preserve existing genetic composition of the Florida panther. If intercrossed panthers are never needed because efforts to protect the Florida panther with its existing gene pool are successful, any such animals produced could be used in planned reintroduction experiments.

- B. **Socioeconomic Impacts** -- This Alternative could assure the perpetuation of *Felis concolor* as a viable element in the south Florida ecosystem. Perceived benefits identified under Alternative 3 would also apply to this Alternative. There would likely be some public opposition to actions taken to "mix" the Florida panther with other subspecies.
- C. **Conclusion** - Under the goal of the present recovery program, which is to preserve and protect the genetic makeup of the Florida panther as it presently exist, genetic augmentation, which would result in changes in the existing genetic makeup, does not represent a viable alternative at this time. However, it does represent an option whose future will in no way be foreclosed or compromised if not taken at the present time. Experimental intercrossing under captive conditions could be initiated so that if it is later determined that the long-term viability of the Florida panther cannot be achieved through aggressive management of the existing gene pool, captive animals would be available to initiate genetic augmentation.

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* Copies available through the Fish and Wildlife Reference Service, 5430 Grosvenor Lane, Suite 110, Bethesda, MD 20814, 1(800)582-3421.

ENCLOSURE A

COMPARISON OF POTENTIAL IMPACTS OF EACH ALTERNATIVE CONSIDERED

- Alternative 1 - No Action
- Alternative 2 - Translocation
- Alternative 3 - Captive Population/Kittens & Adults (preferred alternative)
- Alternative 4 - Captive Population/Kittens Only
- Alternative 5 - Captive Population/Adults Only
- Alternative 6 - Captive Population/All Panthers
- Alternative 7 - Genetic Augmentation (Mix With Other Subspecies)

Y = Yes N = No

COMPARATIVE ELEMENTS	ALTERNATIVES						
	1	2	3	4	5	6	7
<u>ENVIRONMENTAL</u>							
*Impacts wild pop.	N	Y	Y	Y	Y	Y	Y
*Long-term pop. increase	N	N	Y	Y	Y	Y	Y
*Long-term pop. decline	Y	Y	N	N	N	N	N
*Panther likely restored to other southeastern ecosystems	N	N	Y	Y	Y	Y	Y
*Provides security against extinction	N	N	Y	Y	Y	Y	Y
*Ability to protect habitat maintained	Y	Y	Y	Y	Y	N	Y
*May foreclose future options	Y	Y	N	Y	Y	Y	Y
*Recovery prognosis good	N	N	Y	Y	Y	Y	Y
*Extinction likely	Y	Y	N	N	N	N	N
<u>GENETIC</u>							
*Genetic management capability	N	Y	Y	Y	Y	Y	Y
*Preserves FL. panther as distinct taxon	Y	Y	Y	Y	Y	Y	N
*Maintains existing genetic diversity	N	N	Y	Y	Y	Y	N
*Increases genetic diversity	N	N	N	N	N	N	Y
<u>REGULATORY & LEGAL</u>							
*Threatened due to similarity of appearance rule needed	Y	Y	Y	Y	Y	Y	Y
*May require additional NEPA analysis	N	Y	Y	Y	Y	Y	Y
*Requires endangered species permits	N	N	Y	Y	Y	Y	Y
*Emergency determination needed	N	N	N	N	N	Y	N
*Critical habitat designated needed to protect vacated habitat	N	N	N	N	N	Y	N
*Flexible hybrid policy needed	N	N	N	N	N	N	Y

HUMAN ISSUES

***Stimulates opposition to captivity**

N N Y Y Y Y Y

***Results in opposition to mixing FL panthers with other
subspecies**

N N N N N N Y

***Increases educational opportunities**

N N Y Y Y Y Y

ENCLOSURE B

SUMMARY OF INFORMATION ON THE FLORIDA PANTHER

AND

COMPONENTS OF THE RECOVERY PROGRAM

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SUMMARY OF INFORMATION ON THE FLORIDA PANTHER AND COMPONENTS OF THE RECOVERY PROGRAM

The following presents details and information regarding factors that are considered important to the overall Florida panther recovery program. Included is information on the panther, habitats, threats, and various components of the recovery program.

- A. **Present Distribution** - Existing data indicate that the south Florida population represents the sole remaining population of the Florida panther. Systematic field surveys throughout Florida have been underway since 1976 (Frankenberger et al., 1989). In Arkansas, a 3-year Statewide survey was completed in 1991 (McBride et al., 1991). Other surveys have been conducted in various sections of other states within the historic range of the Florida panther. These efforts have produced no evidence of extant populations elsewhere.
- B. **Population Size and Structure** - Over the past several years the south Florida population has been estimated to number 30 to 50 panthers (Hines et al., 1987). Overall, population segments appear to have stabilized during recent years in the northern Fakahatchee Strand and private lands north of SR-84; however, population segments appear to have possibly declined over the past 10 years in the southern Fakahatchee Strand, eastern Big Cypress National Preserve and Everglades National Park (D. Maehr, S. Bass and D. Jansen, pers. comm. 1990).

As of November 1, 1991, 18 individual panthers were being radio-monitored as part of ongoing investigations (9 adult females, 2 juvenile males and 7 adult males). Commission personnel were monitoring 7 males and 7 females in the Fakahatchee Strand and areas north of SR-84. NPS personnel were monitoring 2 males and 2 females in the Everglades and eastern Big Cypress National Preserve. Population units typically contain social structures comprising a resident adult male whose home range may overlap several adult females. Resident adult males typically defend their home ranges and exercise control over the area until they die. Rarely do resident adult male's home ranges overlap to any extent. Home range overlap is not uncommon for resident adult females, however. Home ranges of dispersing females may include at least a portion of the mother's. Dispersing males typically become transients and may move many miles before establishing a home range. In some cases they temporarily occupy fringe areas adjacent to an established population unit until a population/habitat vacancy exist.

- C. **Capture and Monitoring Activities** - Intensive research on the Florida panther was initiated with a radio-telemetry program in 1981. The first panther was successfully captured, immobilized and radio-instrumented on February 10, 1981, within the Fakahatchee Strand, Collier County, Florida (Belden 1981). Through October 1991, 45 panthers have been captured, immobilized and radio-instrumented.

During the third year of the capture program a panther death possibly due to an anesthetic reaction occurred (#3 during recapture in 1983).

Corrective measures were immediately taken to preclude the likelihood of a recurrence of another such incident. It is also a possibility that a 1990 panther mortality may have been linked to an earlier capture. In this case a 10-month old panther died from *E. coli* septicemia nine days after initial capture. It is hypothesized that the bacteria might have gained subcutaneous access via the tranquilizer dart puncture (Roelke 1990).

However, since the beginning of the capture program in 1981 there have been over 100 successful captures involving wild panthers/cougars of various ages and sexes.

To enhance the level of panther safety during capture operations a wildlife veterinarian has accompanied each capture since 1983. Additionally, to avoid potential heat-related stress on panthers, routine capture activities are generally performed during the cooler periods of the year (typically November through March, but may extend into May). Extreme care and caution are exercised throughout capture operations and captures are abandoned if a panther-health or safety question arises. Trained hounds are used to locate and tree panthers. Once treed, immobilization decisions are made on a case by case basis and proceed only after careful consideration of many factors indicate that a safe capture can be achieved. Factors considered during this evaluation include the panther's apparent health status, physical condition, and level/degree of stress experienced/exhibited during pre-immobilization activities coupled with an evaluation of the capture site (panther's height in tree, proximity to open, dry site needed for panther work-up and recovery), ambient temperature, humidity, and other relevant conditions and factors that might affect the panther (Roelke 1989).

Immobilizations are effected through the administration of ketamine hydrochloride or Telazol via a compressed air dart-rifle (Roelke 1989). Additional safety is provided through the use of an inflatable crash bag to cushion falls of immobilized panthers (McCown et al., 1990). Once on the ground, and after stabilization, each panther is given a thorough examination which includes an evaluation of physical condition (muscling, fat, hair coat, etc.) and reproductive status, and immunized as appropriate

(killed viral vaccine for rabies, feline panleukopenia virus, feline calicivirus, and feline viral rhinotracheitis virus). Standard measurements and biological samples are obtained (blood, feces, urine, hair, skin biopsies, ectoparasites, semen, and swabs from pharynx, rectum, and vagina). Vital signs are monitored throughout the procedure. When the workup is complete, panthers may be placed in a nylon mesh tent and held until fully recovered if conditions or circumstances warrant (Roelke 1989).

Instrumented panthers are aerially monitored (fixed-wing aircraft) from 2 to 7 times per week (depending on the agency/study design). Female panthers at den sites are periodically monitored during continuous periods using a digitized data processor (Telonics, Inc., Mesa, AZ) and chart recorder (Maehr 1989a). Maehr 1989a, reported that from December 1985 through June 1989 in Southwest Florida adult male home ranges averaged 275 mi², adult females averaged 96 mi², and subadult males averaged 228 mi². It was also observed that mean daily movements for adult males, adult females and subadult males were 3.5 mi, 1.4 mi, and 1.9 mi, respectively.

- D. Habitat Utilization** - Data obtained via radio-telemetry have provided valuable information on habitats utilized by panthers in south Florida (Hines et al., 1987). These data indicate that the Florida panther population is distributed through public and privately owned lands in south Florida comprised of mixed swamp forest, cypress swamps, sawgrass marshes, mesic hammocks, sand pine scrub, and pine flatwoods (Maehr 1990a). The known breeding distribution of the Florida panther is primarily restricted to large forested tracts south of Lake Okeechobee (Maehr 1990a).

Estimates from telemetry data indicate that occupied panther range in south Florida totals approximately 2.2 million acres. Approximately 1.2 million acres (55 percent) of this area is in State and Federal ownership in Dade, Broward, Palm Beach, and Collier Counties. Nearly all panther range in Highlands, Hendry, and Glades Counties is privately owned. Although 9 of 17 panthers radio-monitored in southwest Florida from 1985 through 1989 were originally captured on public lands, none has restricted its movements solely to State and/or Federal property (Maehr 1990a).

Within the occupied habitat area a general soil quality gradient occurs at approximately 26°11'N latitude, with better drained, higher fertility soils to the north (Maehr 1990b)(this referenced gradient approximates the alignment of SR-84, see Figure 1). Most of the panther habitat north of the referenced gradient is in private ownership, represents better quality

habitat in terms of the physical condition and productivity of occupying panthers, and is under more threat from expanding agricultural and urban development (Maehr 1990a).

- E. **Health and Physical Condition** - Much valuable information regarding the health and physical condition of the Florida panther has been obtained through the collection and analysis of biological data principally obtained during capture operations. It is apparent that differences in physical condition exist between sexes, and within sexes occupying different locations (Roelke 1989). Detailed analysis of available data has led to the conclusion that panthers occupying land north of SR-84 (I-75/Alligator Alley) are generally heavier, in better physical condition, and have more normal hematological values than those occupying the southern Fakahatchee Strand (Roelke 1989). Prevailing nutritional characteristics of the subject habitats offers the most plausible explanation for this disparity. There appears to be a natural north-south soil fertility gradient throughout most of the occupied panther range (approximating the general alignment of SR-84, see Figure 1)(Maehr 1990b). It is hoped that through directed management actions and activities overall panther conditions in these less productive areas can be enhanced.

In addition, cryptorchidism, which is characterized by only one descended testicle, has been documented in 12 of 27 (44 percent) males examined since 1981 (Roelke 1990). As of February 1991, 90 percent of all living males were cryptorchid (Roelke, pers. comm. 1991). Retained testicles are generally sterile. In the domestic cat this trait is known to be genetically controlled, recessive, and passed on by the female (Roelke 1989). The fact that this trait is apparently so prevalent is highly suggestive of an inbred population. This trait in conjunction with the high degree of abnormal sperm found among all males is of significant concern. In the cheetah, the high percentage of abnormal sperm is related to a high degree of monomorphism (lacking diversity) in the genetic makeup of that species. This apparent inbreeding in the cheetah is associated with increased neonatal mortality and an increased susceptibility to diseases (O'Brien et al., 1985). Other physical abnormalities of concern which have surfaced in some individuals include congenital heart defects and vaginal fibropapillomas. Two radio-instrumented females had advanced cases of fibropapillomas. Neither were known to successfully reproduce during a combined 6.5 years of monitoring despite regular association with males (Roelke 1990).

- F. **Disease** - The following specific information on Florida panther disease agents was obtained from Roelke 1990. Serological data from 51 different

Florida panthers indicate that they were exposed to or were infected with several potentially pathogenic agents.

Rabies - There has been one verified rabies Florida panther death, #33 November 1989. It is believed that this represents the first documented case of rabies in a wild *Felis concolor*. All panthers are now vaccinated for rabies upon initial capture.

Feline panleukopenia virus (FPV) - Antibodies to FPV (feline distemper), or a closely related parvovirus, have been detected in serum from 32 of 50 different panthers (64 percent). In domestic cats this virus is a highly contagious, devastating viral disease causing mortality chiefly in immunologically naive adults and young kittens. There have been no previous reports of the occurrence of this virus in free-ranging *Felis concolor* (cougar) populations.

Feline Calicivirus (FCV) - Nineteen of 50 panthers (38 percent) had antibodies to FCV. This is another potential pathogenic virus and is primarily an upper respiratory virus that is typically quite mild. However, certain strains can cause severe oral lesions, pneumonia, and death.

The significance of the above two viruses to Florida panthers is unknown at this time. No panther deaths have been attributed to either. However, this does not diminish the potential importance of these viruses to the panther population.

Other disease agents for which the Florida panther has tested positive include feline enteric corona virus/feline infectious peritonitis virus (23 percent), feline immunodeficiency virus (25.6 percent), rabies virus (26 percent), feline syncytia-forming virus (33 percent), *Toxoplasma gondii* (8 percent) and *Brucella* 2 percent).

Until recently, the majority of the panthers sampled have been "post exposure", antibody positive, surviving adults. However, the group of panthers of greatest concern, particularly regarding FPV, are the sero-negative animals, principally the kittens and juveniles. Unfortunately, kittens and juveniles compose the group about which the least is known, particularly in terms of mortality (Roelke 1989). A great deal remains unknown regarding disease agents and impacts on the panther population. Panthers will continue to be closely monitored for signs of potential problems. The bobcat is basically susceptible to the same disease agents as the Florida panther. Because the bobcat is much more abundant than the panther, plans are to also monitor the bobcat in the wild and use it as a "sentinel" to the extent possible (Roelke 1989).

- G. **Mortality** - Since 1972 (19 years), documented non-kitten (12+ months age) panther mortality has totalled 42 animals (through November 1, 1991). There have been only three documented cases of kitten mortality. **Actual** non-kitten mortality during this same period (documented plus unknown) could be expected to be significantly more than what has been documented.

The level of kitten mortality, particularly during the first 6 months of age, has not been determined. However, in most mammal species examined, both in captivity and in the wild, most mortality occurs in the first 6 months of life and most of that before 1 month of age (Ralls and Ballou 1982, Ralls et al., 1979). Based on existing data for radio-instrumented female Florida panthers it appears that kitten mortality could be quite high. An estimated 50 percent of the suspected litters produced apparently do not result in a single kitten surviving to 12-months age (Roelke, pers. comm. 1990). Of the surviving litters, the average number of kittens at 12-months age typically numbers 1 to 2. However, the number of fetuses at or prior to birth for three females of known litter size averaged approximately four (Roelke, personal communication 1990).

Between 1972 and November 1, 1991, the three leading causes of known Florida panther mortality were: highway related ($n=17=38$ percent), intraspecific aggression within the population ($n=8=18$ percent), and illegal kills ($n=6=13$ percent). Illegal kills do not appear to have been a problem during recent years. The last known illegal kill occurred in 1985. However, a female received a non-fatal gun-shot wound to a foot in 1986. With approximately 25 to 50 percent of the estimated total panther population radio-instrumented over the last 4 years (from 11 to 23 individuals), if illegal kill was occurring at a significant level it would likely have been detected. Known mortality in 1990 was the highest for any year for which records are available (since 1972). During 1990, eight documented deaths occurred within the wild population (possibly 3 to intraspecific aggression, 2 to secondary infections, 2 to highway and 1 unknown).

Because the two segments of the panther population (Big Cypress Swamp segment [southern Fakahatchee Strand and areas north of SR-84] and Everglades segment [Everglades and eastern Big Cypress Swamp]) are somewhat isolated from each other and differ significantly in their respective floras and hydroecology, a more detailed mortality analysis of each area follows.

In southwest Florida (Big Cypress Swamp population segment), total documented mortality from 1979 through 1990 was 28 panthers; excluding

female #8 who was removed from the wild because of health reasons (Maehr 1990c, Roelke 1990). These included 13 road kills, 8 natural deaths, 4 human-related deaths (illegal shooting & capture related), and 3 unknown causes. Mortality in a marked (radio-collared) sample was used to make inferences about the total population in southwest Florida. For panthers collared between 1987 and 1990 average annual mortality was 19.4 percent, a rate similar to or less than unharvested populations of western cougars. Road mortality was infrequent among collared panthers and only one occurred after 1987 (male #13). From 1979 to 1986 roadkills accounted for a total of 10 (67 percent), as compared to only 3 (23 percent) from 1987 to 1990. When only radio-collared panthers are considered, road kills accounted for 50 percent of all mortality from 1979 to 1986, and accounted for only 9 percent of all mortality from 1987 to 1990. This difference is probably due to a larger sample of collared panthers living in areas without busy roads (a smaller proportion of collared panthers crossing roads) and possibly due to the use by some panthers of recently developed wildlife underpasses.

Natural mortality, especially intraspecific aggression represented the greatest known source of recent mortality in collared panthers (five deaths between 1987 and 1990). The common occurrence of fighting among Florida panthers may be related to a lack of unoccupied suitable habitat for subadults to disperse to, and infrequent mortality of resident adults. A similar situation has been observed in New Mexico where an unharvested cougar population inhabits an isolated mountain range (D. Maehr, pers. comm., 1990).

Maehr (pers. comm., 1990) reported that of seven panthers captured as kittens, only one (male #35) died before independence from its mother. One other (female #19) was recruited into the population in 1987 and is currently a breeder. Two males (#10, #30) were killed as dispersing subadults by resident adults, while 3 (males #29, #34, #43) remained as transients (lacking well-established home ranges). Four unrelated deaths of adult transient males (#13, #20, #24, #25) in only an 8-month period (December 1987 - August 1988) had no measurable impact on the social structure of the southwest Florida population segment.

In southeast Florida, during the period from 1978 to June 1990, there were 10 documented panthers killed or injured; 3 in the eastern BCNP, 5 in the Everglades, and 1 each in Palm Beach and Martin counties (Roelke 1990). Roelke, indicated that 4 of these deaths were due to natural causes, 1 was road-killed/injured, 3 illegally killed (Belden and Forrester 1980), 1 orphaned and removed from the wild at 6 months, and 1 of an unknown cause.

Between the winter of 1986/87, when the National Park Service began their radio-telemetry project, and June 1991, 6 of 11 collared panthers either died (n=5), or were removed from the wild due to injury (n=1). The causes of mortality/injury are similar to that seen in southwest Florida, consisting of natural mortality (n=5) and road-injury (n=1). Mercury contamination of panthers was originally detected in the Everglades population segment and is assumed responsible for the death of at least one panther (female #27).

The documented number of panthers lost from the population (mortality + animals injured and removed) from 1981 through November 1, 1991, has ranged from 1 to 8 per year (total 41). Although some individual population units appear to have fluctuated significantly during this time period, the overall population level appeared stable. It should be emphasized that references to "population stability" relates to the estimated total number of animals and demographic patterns in the population and not to "genetic stability". In fact, of 11 radio-instrumented panthers occurring in the wild and identified as possibly being full genetic founders (unrelated to any other representative of the population) when the Viability Analysis and Species Survival Plan was approved in January 1990 (Seal et al., 1989), four are no longer living and there are no known descendants (36 percent loss in approximately 2.5 years). Additional information on genetic variability and viability is presented below in Sections I, J, and K.

- H. **Reproduction/Recruitment** - Even with fluctuating levels of documented annual mortality over the last decade (indicated above), corresponding fluctuations in the overall wild population have not been detected. Consequently, it is the position of most scientists involved in the panther program that recent reproductive recruitment across the entire wild population appears to be compensating mortality, although some specific population units appear to have declined while others have increased.

Within the present radio-instrumented segment of the population it appears that most adult females are breeding. And, as is typical with most animals, female Florida panthers exhibit inherent biological recycling mechanisms. Recycling usually occurs when a female aborts or loses her litter prior to natural dispersal. Recycling can result in the successful production of a replacement litter. Reproductive information involving 12 radio-instrumented adult Florida panther females from 1982 through early 1991 show that there were 27 pregnancies/litters suspected, 14 of which either did not result in offspring surviving to dispersal age (n=12 or 44 percent) or had their litters removed for captivity (n=2) (Roelke, per. com. 1991). Indications of recycling was documented within 3 weeks to

7 months for 12 of these 14 incidences. Mortality claimed the other two females before having opportunities to produce replacement litters. Three females are known to have lost their entire litters in 1991 (#9 & #31 each had their only two kittens removed for captivity, and #11's only kitten was killed crossing SR-29). Radio-telemetry data indicate that all three exhibited behavior indicative of reproductive cycling within 4.5 to 12 weeks of losing kittens (#31 with male at 4.5 weeks, #9 significantly expanded movements at 6 weeks [until late October 1991 there was not a known male within her homerange], and #11 with male at 12 weeks).

Documenting successful production of replacement litters post suspected recycling events is difficult utilizing existing data, but is possible in three incidences and probable in two others. Data indicate that one female lost her litter in late February or early March 1982, was with a male in March, denned in June, and successfully raised 2 female kittens. The second female aborted in January 1987, was with a male in March, denned in June, and had surviving offspring a year later. The third female aborted in early January 1990, was with a male in late January, denned in April, and her 10-month old kitten was killed by auto in February 1991. Two documented incidences of apparent recycling and the probable production of replacement litters are taking place at the present time. Female #11 lost her only apparent kitten to highway mortality on February 3, 1991, was with a male in late April, begin exhibiting behavior of denning in early August, and continues to exhibit behavior of raising kittens. Female #31 had her entire litter (2) removed for the captive breeding program in February 1991, was with a male in early April, begin exhibiting denning behavior in July, and continues to exhibit behavior of raising kittens. Verification of successful production of replacement litters for these two females will not be possible until the 1992 capture season. Verification of the successful production of another replacement litter may also be possible in 1992. Female #9 had her entire litter (2) removed for the captive breeding program in February 1991, begin exhibiting recycling actions in mid-April (based on movement data), and was with a male in late October (first time a known male moved into her territory). If she became pregnant while with the male she would be expected to exhibit denning behavior in late January 1992.

Existing data do not indicate that there would be survival rate differences between initial litters and replacement litters resulting from recycling. There have been no observed litter size or survival rate differences in wild litters with births occurring from January to October (D. Maehr, pers. comm. 1991).

Breeding activity for individual males can be somewhat harder to confirm than for females. It appears that breeding within some population segments may be dominated by a single male. Maehr indicates that this is typical of stable populations of *Felis concolor* elsewhere (D. Maehr, pers. comm. 1991). To some extent, indications of fertility in males can be obtained through the analysis of semen collected during routine capture operations.

Semen collection from each male for sperm-banking is one goal of the ongoing recovery program. As of July 1, 1991, good quality semen for sperm-banking has only been obtained from seven radio-instrumented males (M. Roelke, pers. comm. 1991). Semen from several other males has also been collected and frozen, but due to immaturity, infertility, or post mortem collection, prospects for its utility is dubious (Roelke 1990). Overall sperm quality has been found to be very low. Characteristically, spermatozoa of Florida panthers exhibit an exceedingly high proportion of abnormal sperm forms (>90 percent), with the major defect involving the acrosome or head of the spermatozoa (Roelke 1989). This, coupled with the fact that the sperm-storing process in itself results in a reduced level of viable sperm, further complicates the sperm-banking process.

- I. **Genetics and Inbreeding** - Data are now on hand from recent preliminary electrophoretic and mitochondrial DNA genetic analysis of various populations of the American cougar (*Felis concolor*), including the Florida panther (*F. c. coryi*). As a species, *F. concolor* appears to have abundant biochemical genetic variation compared to other great cats (Roelke 1989). Examined separately however, the percent polymorphism for each wild *F. concolor* subspecies is considerably lower than that for the species as a whole. Of populations represented by six or more sampled individuals, the Florida panther (*F. c. coryi*) exhibited the fewest polymorphic loci and lowest heterozygosity (Roelke 1989).

There are numerous morphologic indicators that suggest that the Florida panther has already experienced a fair degree of inbreeding and concomitant genetic loss. These include the peculiar "kinked-tail" and cowlick traits so prevalent in the Big Cypress Swamp population segment, the extremely high abnormal sperm count with the predominance of primary defects, the genetically controlled cryptorchid trait displayed in 10 of 14 living males (captive and wild), and the finding of severe congenital heart defects in three panthers (Roelke 1991).

The current rate of loss of genetic diversity in the Florida panther has been estimated to be 3-7 percent per generation (generation period = 6 years; Seal et al., 1989). **With a stable population or even with an**

increase in animals the loss of genetic material will continue. Genetic material is lost generation by generation regardless of the demographic makeup of a species when populations are small, isolated, and heavily inbred. This rate of loss would be expected to continue at the present population level and accelerate as the population declines. The present wild population is so small that extensive inbreeding is assured (Seal et al., 1989). If no corrective measures are taken, this situation would likely be sufficient to assure extinction of the Florida panther in a few generations, even without other demographic stochastic events (Seal et al., 1989).

Small populations lose genetic diversity needed for fitness and adaptability. The smaller the population is, and the longer the period of time it remains low, the greater the risks will be and the more likely extinction is to occur. Inbred animals often have a higher rate of birth defects, slower growth, higher mortality, and lower fecundity (inbreeding depression; Seal et al., 1989). Inbreeding depression has been well documented in laboratory and domesticated stocks, zoo populations, and a few wild populations (Seal et al., 1989).

Studies show an average effect of approximately 10 percent decrease in juvenile survival with every 10 percent increase in inbreeding. However, domestic animal sciences recognize that inbreeding effects on reproduction are likely to be more severe than effects on survival. Data on the effects of inbreeding on reproductive rates in free ranging wild species are limited (Seal et al., 1989). Two of three Florida panther litters in which there was genealogical information extending back two generations (thus for which possible inbreeding could be detected) involved inbreeding. One was the product of a mother-son mating, and the other a father-daughter mating. Thus, inbreeding is occurring in the Florida panther and may have already reduced viability, fecundity, and adaptability (Seal et al., 1989).

- J. Gene Flow and Intergradation** - Gene flow is a naturally occurring process within normally functioning wild animal populations and typically occurs among various segments of a population. Historically, gene flow unquestionably occurred among various population segments of the Florida panther. Intergradation among subspecies also is a common phenomenon in nature and likely occurred during subspecies evolution of the puma as well (O'Brien et al., 1990). Goldman indicated that historically the Florida panther intergraded to the north with *F. c. cougar*, and to the west and northwest with *F. c. stanleyana* and *F. c. hipposlestes = shorgeri* (Young and Goldman 1946, Hall 1981).

However, because of man's activities over the past two centuries (i.e., habitat destruction and/or alteration), the Florida panther is now totally

isolated geographically from other wild *F. concolor* populations and normal interpopulation gene flow in the wild is no longer possible. As the Florida panther is now isolated and consists of only 30 to 50 individuals, re-establishing free gene flow throughout the existing population may be essential to this taxon's continued survival.

- K. Genetic Studies - The need to assess a variety of inconsistent morphological traits observed between Everglades panthers and Big Cypress Swamp panthers (i.e., lack of kinked tails and cowlicks in Everglades) led to a recently published study on the genetic makeup of all Florida panthers (O'Brien et al., 1990). Results from this study suggest that present free-ranging Florida panthers contain genetic material that is traceable to two genetically distinct stocks, one of North American origin and one probably from Central or South America. However, the Florida panther's living in the wild in south Florida today are descended from the population that was originally listed under Federal endangered species provisions in 1967; though some individuals contain genetic markers that indicate relatedness to an individual of Central or South American origin that may have been released into the south Florida population prior to the species' listing.

The source of this genetic material is not precisely known, but is surmised from anecdotal information to be from seven captive-bred panthers released by the National Park Service into the Everglades between 1957 and 1967. This scenario is somewhat substantiated by the fact that individuals derived from the suspected donor captive stock also have some of the same genetic markers traceable to Central or South America, even though this captive stock was known to have originated from two litters of wild-born Florida panthers in the early 1940's. However, this captive stock was supplemented occasionally with other Florida panthers, and apparently with an individual (or individuals) having ancestors occurring outside of Florida. Present mitochondrial DNA findings suggest that the genetic markers traceable to Central or South America now being found may have originated from one female of questionable origin. The mitochondrial DNA found in Everglades panthers has yet to be found in any other cougar subspecies, but has its closest affinities to sampled populations in South America.

Assuming that the Florida panthers released into the Everglades between 1957 and 1967 were descended from this one female, one might expect that at least 4 and probably more generations in the wild have passed that could dilute these genetic markers traceable to Central or South America. However, the small number of individual panthers involved and the fact that mitochondrial DNA is not subject to natural selection would suggest

that continuation of inbreeding has allowed the perpetuation of these genetic markers within the Everglades population segment. In addition, these markers have spread into the Big Cypress population segment. Biologists and geneticists studying the Florida panther believe that this unplanned infusion of "new" genetic material may have temporarily benefitted the Florida panther by increasing genetic variation while at the same time not "swamping out" the evolved Florida panther genetic makeup possibly necessary for survival in the south Florida ecosystem.

- L. **Habitat Preservation** - It is abundantly clear to all involved that habitat preservation is absolutely essential to prevent the panther from becoming extinct in the wild. It is not only essential that adequate habitats be preserved to secure, sustain and enhance the existing wild population in south Florida, but also adequate habitats must be preserved elsewhere within the panther's historic range to secure sites for planned future population reestablishment programs that will be vital for full recovery. As indicated below, habitat preservation in south Florida has received major emphasis in terms of ongoing actions to secure the panther.

Several acquisition programs have recently been initiated or expanded that will bring additional important panther habitats under public protection. Recent legislation authorizing expansions for the Big Cypress National Preserve and the Everglades National Park consist of approximately 146,000 acres and 108,000 acres, respectively. The Florida Panther National Wildlife Refuge will comprise approximately 26,300 acres when acquisition is complete. The Southern Golden Gate Estates acquisition project presently underway involves approximately 40,000 acres to be added to the Fakahatchee Strand State Preserve. Just over half the occupied panther range in south Florida is presently in public ownership. These additional actions will bring public ownership of occupied panther habitat to approximately 1.5 million acres, or approximately 68 percent of the known occupied range. Although acquisition efforts by State and Federal agencies are continuing, lands in private ownership must be included in the overall habitat preservation effort. Much valuable habitat in private ownership is being lost daily to urban and agricultural expansion.

Any action that results in the destruction or significant modification of native plant communities and natural habitat conditions, or results in the fragmentation of such habitats could adversely affect the panther. The rate of habitat loss is of extreme concern and actions designed to work with private landowners to achieve habitat preservation are underway. The Interagency Committee recently approved a program designed to implement an aggressive, accelerated habitat preservation initiative. This

initiative involved the establishment of a Working Group by the Interagency Committee in the Spring 1991, to develop a comprehensive plan for panther habitat preservation. A draft plan is expected by the end of the year. The plan will identify the area(s) considered suitable or occupied by panthers in south Florida, identify the minimum area considered essential to maintain a viable, self-sustaining panther population, establish preservation priorities for all areas considered suitable for panthers based on the area's assessed value to panthers and/or developmental risks, establish specific preservation goals and target dates, and present unit-specific strategies for accomplishing goals.

Among the habitat preservation strategies available are conservation easements, landowner agreements, acquisition, regulatory provisions (i.e., Section 7 of the Endangered Species Act), critical habitat designation (as authorized under Section 4 of the Endangered Species Act) and/or habitat conservation plans (under Section 10(a)(1)(B) of the Endangered Species Act, as a provision specifically added by Congress in 1982 to allow for a resolution of conflicts between endangered species protection and private development interests). The present preservation initiative will emphasize working with landowners to achieve preservation goals to the extent possible. The minimum target goal will be to secure sufficient habitats in south Florida to assure the long-term maintenance of a viable, self-sustaining panther population.

The advantages/disadvantages of critical habitat designation have been a point of considerable discussion over the past several years. There exists among most laypersons a gross over-estimation of the level of protection afforded lands designated as "critical habitat" under provision of the Endangered Species Act. It is generally assumed that lands so designated are protected from any action that would adversely modify or destroy them. This is certainly not the case. The Act requires Federal agencies to insure that any action authorized, funded, or carried out by them is not likely to result in the destruction or adverse modification of habitat which has been determined to be critical. Consequently, critical habitat is not protected from all the other actions not requiring Federal participation. In other words, landowners can do as they please with their lands even if designated as critical habitat as long as Federal participation is not required. The present feeling is that taking action to designate critical habitat for the panther has the potential, through possible landowner misunderstanding and adverse reaction, to cause more risk to the panther (through reduced levels of cooperation and monitoring access) and harm to the habitat than protection achieved through designation. It is felt that the jeopardy threshold under Section 7 provisions of the Endangered

Species Act provides a substantial means for achieving protection for panther habitat.

Additionally, steps necessary to identify habitat preservation needs associated with possible future population reestablishment programs are also being initiated at this time (see Sections P.1). Initial efforts will seek cooperation and assistance from all states within the historic range of the panther to identify potential population reestablishment sites. Candidate sites will be evaluated and ranked. The highest ranked sites will be considered for experimental reintroductions involving sterilized non-endangered cougars as surrogates. Comprehensive habitat preservation programs will be undertaken for those sites determined, through reintroduction experiments, to be best suited for Florida panther population reestablishment programs. Minimum target goals will be to secure sufficient habitats to assure the long-term maintenance of reestablished Florida panther populations.

- M. **Habitat Enhancement** - Areas sufficient for panther recovery must not only be preserved, but they must also be appropriately managed and maintained to ensure that panther needs are being met. The Interagency Committee is committed to the implementation of programs to ensure that actions are being taken to provide and maintain habitat conditions appropriate for panthers on public lands. Management programs are being redirected to emphasize specific actions geared to enhancing prey resources for the panther and reducing potential human related impacts. Maintenance of day bed and natal den habitats are also considered important (Maehr et al., 1990) and will receive special consideration. Prescribed burning is one of the most productive management tools available. Involved agencies have taken action to ensure increased use of prescribed fire in their management programs.

The Service and the Department of Natural Resources have implemented various other management actions and programs designed to increase prey resources. These include the use of food plots, adding nutrient supplements in native plant communities, deer feeders, mineral blocks, and various mechanical means to enhance browse conditions within native plant communities.

Interagency Committee agencies continually evaluate all programs and activities on public lands to ensure that ongoing activities are not limiting panther conservation within these areas. Of great concern are human activities (principally hunting and use of ORV's) taking place on public lands and how these activities may be impacting the panther. Everglades National Park, Fakahatchee Strand State Preserve, and Florida Panther

National Wildlife Refuge are completely closed to public hunting and ORV use.

Federal legislation authorizing the establishment of the Big Cypress National Preserve (BCNP) contains provisions ensuring that opportunities for recreational use (including public hunting) be continued. The National Park Service is responsible for assuring compatibility of recreational use with other uses (oil and gas and Indian activities) and the maintenance of the ecological integrity of the BCNP. As data have become available relative to the panther (distribution, habitat needs, threats, etc.), management actions have been taken in an effort to provide appropriate conditions on the BCNP for the panther. Specifically, hunting regulations have been made more restrictive, the number of hunters reduced, areas have been closed to ORV use, ORV use in other areas has been restricted to designated trails and areas only, 11-Mile Road has been closed to public access and use, the use of dogs for deer and hog hunting prohibited, and deer and hog hunting in the Deep Lake Unit has been restricted to archery only.

- N. **Habitat Contamination** - Mercury has been identified as a contaminant with potential significant impacts on free-ranging Florida panthers. Mercury was strongly implicated in the death of one female panther (#27) in the Everglades National Park area in July 1989 (Technical Subcommittee 1989) and may have played a role in the death of another female (#14) from the Everglades area in June 1991 (M. Roelke, pers. comm. 1991). Female #27 had a liver mercury level of 110 parts per million (ppm) (wet weight). Mercury levels in this panther prompted the analysis of samples from additional panthers. Blood, tissue, and hair samples taken from a number of dead panthers that had been archived over the years and from panthers live-captured for radio-telemetry studies have been analyzed. Preliminary data have identified a limited number of other living panthers with mercury at levels of concern.

Associations between observed mercury levels in specific panthers, areas occupied, prey utilized, and age have been identified (M. Roelke 1990). In addition to death due to mercury toxicosis, mercury may be an important factor contributing to reproductive failure and early neonatal mortality in areas where elevated mercury levels have been preliminarily documented, such as the Fakahatchee Strand State Preserve and the Everglades watershed (M. Roelke, pers. comm. 1990).

The most probable source of mercury contamination in panthers is via the food chain. It is believed that mercury is bioaccumulated up the trophic levels in the aquatic food chain. At times, some individual panthers have

sustained themselves almost exclusively on aquatic-associated prey items (raccoons and alligators), and are thus the panthers of most concern. Others, feeding almost exclusively on deer and wild hogs are not as affected. Mercury levels have been found to be less than 1 ppm in liver samples from approximately 100 southern Florida white-tailed deer (Sundlof and Forrester, unpublished data). Mercury analysis has also been carried out on raccoons, bobcats and otters obtained from various sites within the panthers occupied range. Preliminary results of these analyses further substantiate specific areas of concern, i.e., the lower Fakahatchee Strand and the Everglades watershed (Roelke et al., 1991). Plans call for mercury testing to continue on all available free-ranging panthers. Mercury levels for all panthers involved in the radio-telemetry program will also continue to be closely monitored. Additional mercury data in the form of source, magnitude, seasonality, and variation by locality are needed. As a better understanding of the panther/mercury association is achieved, protocols for dealing with various situations will need to be developed and implemented by the Interagency Committee to protect the Florida panther.

- O. **Highway Problems** - Because motor vehicles have represented the greatest known cause of panther injury and mortality, specific actions have been undertaken to help address the problem (Logan and Evink 1988). Of 17 documented road mortalities between 1972 and November 1, 1991, 13 (76 percent) have occurred along SR's 29 and 84 (Alligator Alley). SR-84 bisects the heart of the Big Cypress Swamp in an east-west direction. SR-29 bisects the same area in a north-south direction. Since most panther strikes occurred at night, reduced nighttime speed zones (45 mph) have been designated along strategic segments of the two highways since 1985. Speed limits have been vigorously enforced by Commission wildlife officers; 2,090 citations and 408 warnings have been issued (1985 through June 30, 1989)(Maehr 1989b). Also, in 1986 approximately 4 miles of SR-29 north of SR-84 were realigned and right-of-way widened in attempts to provide for safer crossing conditions for panthers. Additional projects are now underway to further improve crossing conditions for panthers along both highways. SR-84 (Alligator Alley) is presently being upgraded to become part of the I-75 system. Thirty-six wildlife crossings/bridge extensions are being incorporated into the construction of the roadway through the Big Cypress Swamp. Fencing (10' high with 2' top out-rigger) is also being installed to restrict animal access to traffic corridors. A number of the wildlife crossings and associated fencing have been completed. Animal utilization of four completed crossings has been electronically monitored via infra-red photo-sensors. Verified panther use of three of the four crossings was recorded during the period February 1990 through May 1991 (Humphrey et al., 1991).

Other ongoing projects designed to provide for safer crossing conditions for panthers include the realignment and right-of-way widening of the remaining sections of SR-29 south to US-41. Additionally, negotiations are presently underway with the Florida Department of Transportation to incorporate wildlife crossing as part of the ongoing SR-29 project in Collier County and proposed work on US-1 in Dade County.

Recent trends possibly indicate that efforts to reduce the incidence of panther injury and death on highways are being successful. No panther strikes have been documented along SR-84 since November 1986, even though telemetry data have indicated that a number of radio-instrumented panthers continued to cross this highway frequently (Maehr 1989b). Highway conditions throughout the panther's range will continue to be closely monitored, and corrective actions will be recommended by the Interagency Committee to alleviate specific problem situations should they arise.

- P. **Reintroduction** - Reintroducing captive-bred/conditioned or translocated wild Florida panthers is a management tool that could be used in efforts to accomplish the following:

To address specific genetic or demographic needs of an existing wild population or population segment; i.e., select individual panthers could be introduced in attempts to improve existing genetic conditions, or, provide for a missing or under-represented sex/age component within a population segment. Such actions would typically involve single individual panthers.

To expand an existing wild population; e.g., panthers could be introduced into unoccupied habitats within or adjacent to an existing population in attempts to accelerate population expansion. Such actions would likely involve from 5 to 10 panthers per attempt.

To reestablish populations in extirpated areas of the historic range. Such actions would likely involve from 10 to 20 panthers per site.

Experimental reintroductions involving western cougars as surrogates were initiated in 1988. The initial reintroduction site included the Osceola National Forest in northeast Florida, the Okefenokee National Wildlife Refuge in southeast Georgia, and adjacent private lands. This site was selected based on criteria developed from habitat use studies of panthers in south Florida and from cougar habitat requirements reported in literature.

In this initial experimental reintroduction project, actual reintroduction of western cougars was preceded with at least five planning sessions between July 1987 and February 1988 to develop specifics on how to best inform and obtain public support for the project (Belden et al., 1990). The resulting strategy was based on a conclusion that there were key individuals/officials whose support would be critical in obtaining a broad public-support base, and that contacts regarding the proposed project should initiate with these "key constituents". These individuals/groups consisted of local/State/national elected officials, local/State/Federal governmental agencies and officials, major landowners within the proposed reintroduction site, specific local organizations (Farm Bureau, livestock associations, conservation groups, etc.) and a number of other specific individuals. Key contacts were made over a 3-day period, followed by a media conference, a special meeting with hunting club representatives and a public meeting.

An informational packet detailing the proposed project was also developed and distributed. In summarizing the results of the experimental reintroduction, Belden et al., 1990, indicated that of 46 key contacts made, 39 (85 percent) were supportive to very supportive of the proposed reintroduction project, 6 (13 percent) either did not care one way or the other or would not express an opinion, and 1 (2 percent) was opposed. The authors also indicated that basically, the response from the public was very positive.

The Osceola/Okefenokee study area represents a combination of public and private lands and covers approximately 7,702 mi² (Belden et al., 1990). Five mountain lions (2 males, 3 females serving as surrogate panthers) were captured in west Texas in April and May, translocated to Florida in late May, sterilized and released into the study area in mid-June 1988. They were monitored on a daily basis from June 15, 1988 to April 19, 1989. One female died from unknown causes on or around July 19, 1988. Belden et al., 1990, reported that the remaining surrogate animals set up overlapping home ranges, made kills of large prey at a predicted frequency, and adapted well to their new environment prior to the hunting season. However, two animals subsequently died from apparent hunting related events and after the remaining two panthers began to wander from their established home ranges were removed from the study area in the Spring of 1989.

Although the loss of two animals to apparent hunting related events is concerning, there was much valuable information gained through the experiment. It is extremely encouraging that the surrogate animals appeared to adapt readily to the reintroduction site, developed patterns

considered typical of lions elsewhere and the habitats readily supported the animals. The Service considers five basic factors to be most critical for any successful reintroduction. These are: (1) will the animal's basic instinctive nature allow it to remain in the reintroduction site long enough to adapt; (2) will reintroduced animals exhibit normal behavioral and functional tendencies; (3) is the reintroduction site capable of providing basic life support features (food, water, cover, etc.); (4) are existing habitat conditions acceptable to the animal; and, (5) is reintroduction acceptable to the public.

The Service is extremely encouraged with the results of the initial translocation experiment and how it related to the five factors identified above. The fact that factors 1 through 3 appeared to be totally met is considered most significant, for of the five factors these are the ones over which very little, if any, human control is possible. On the other hand, even though factors 4 and 5 were apparently not totally met, these factors readily lend themselves to directed actions that can be taken to overcome problems that did surface. The referenced translocation experiment represents phase one of a planned multi-phased program designed to not only identify and select reintroduction sites, but also develop reintroduction technologies and strategies that can be successfully applied to the Florida panther in future years.

1. **Availability of Suitable Habitat for Reintroduction** - For the basis of analysis, "suitable habitat" is deemed to represent two distinct sets of elements that in combination constitute the suitability of any given area for panther habitation. These are: (1) the biological features necessary to meet the basic life sustaining needs of the panther, i.e., size of area, availability of food, water, cover, etc.; and, (2) the more intangible elements generally associated with human factors, i.e., human population and highway densities, types and levels of human activity, human attitudes, etc. Determining whether a specific area is appropriately represented by elements comprising factor 1 is much easier and more accurately accomplished than for elements comprising factor 2.

Separating private and public lands for the purpose of reintroduction analysis is not considered necessary and will generally not be done in this discussion. The Service recognizes that some inherent differences can exist between private and public lands in terms of management actions, levels of human activity, long-term security of existing conditions, resource protection, etc. However, it is likely that most, if not all candidate reintroduction sites will be made up of a combination of private and public lands. Some inherent differences are factored

during the initial screening and ranking process (see Figure 6). Once a candidate site has been selected as a Florida panther reintroduction site, actions to provide for the long-term maintenance of appropriate habitat conditions and site security will be equally applicable to both private and public land segments (see Section P.5 below).

- a. **Reintroduction Habitat Within South Florida (south of State Road 70)** - Within south Florida there are areas within public-owned land units that are known to have supported panthers in the past or appear to possess habitats considered capable of supporting panthers, but are presently unoccupied or receive panther use at levels considered below that which the habitats appear capable of supporting. It is expected that enhanced management and protection actions undertaken during recent years in such areas will result in panther occupation and use-levels over time more commensurate with the perceived biological capabilities of the sites involved. Under existing conditions, the Service anticipates that should reintroduction considerations surface for such areas or for public lands in general in south Florida they would likely focus around actions to address specific genetic or demographic needs. Undertaking reintroductions of this nature would be based first on a documented need, and must consider potential negative impacts, and the availability of habitat and unoccupied slots in the existing population structure.

There are vast areas of private land in south Florida that, because of access restrictions and other factors, little is known regarding present panther occupation or habitat conditions. In some areas panther use has been documented within the last decade. Based on the existing information, the Service is of the opinion that there are private land areas in south Florida that presently possess habitats suited for panther occupation that are possibly unoccupied or under-occupied at the present. The Commission recently initiated a study to utilize "panther-occupied" habitat data obtained over the last decade in conjunction with satellite-imagery to identify all areas (>200 acres in size) in south Florida that presently appear to possess habitats suited for panther occupation (D. Maehr, pers. comm. 1991). The Service believes that this study, along with the ever-expanding radio-telemetry data base, and information that can be obtained through State and Federal permit review processes and the recently initiated habitat preservation program will provide substantial information on both the suitability of private owned habitats in south Florida for panther habitation and actual panther habitation. At the present

time, the Service anticipates that should reintroduction considerations surface for private land areas in south Florida they could focus around actions to address specific genetic or demographic needs, or to accelerate population expansion.

- b. **Reintroduction Habitat Outside South Florida** - One of the most important steps in proposed population reestablishment programs as provided for in the recovery plan will involve determining whether suitable habitat for panther reintroduction, in fact, still exists. Large areas of what appear to be suitable panther habitat occur outside of south Florida and are apparently unoccupied by panthers.

- (1) **Within Florida** - A comprehensive candidate panther reintroduction site evaluation study was undertaken in 1987 (Belden 1987). The objective of the study was to develop an initial priority list of candidate study areas for further evaluation, which could include the experimental release of surrogate animals. For this study, criteria for initially evaluating candidate sites were developed using habitat data that had been collected since 1978. A standardized site evaluation form for rating candidate reintroduction sites was developed. Site characteristics considered most important were scored on a 1 to 10 scale. Less important characteristics were scored on a 1 to 5 scale. Forms were provided to Commission wildlife biologists to complete for areas they would recommend as candidate sites for panther reintroduction (Figure 7). Locations of the resulting highest ranked 11 sites are indicated in Figure 8. The top four sites were: Apalachicola National Forest and surrounding area, Okefenokee National Wildlife Refuge/Osceola National Forest and surrounding area, Kissimmee valley/St. Johns River headwaters area, and the Big Bend Coast. The candidate reintroduction site evaluation process in Florida progressed to step 2 in 1988, with the initiation of a translocation feasibility experiment (see above).

Figure 6: POTENTIAL PANTHER REINTRODUCTION SITE EVALUATION FORM (OUTSIDE FLORIDA)

Location _____

<u>Characteristics</u>	<u>Possible Score</u>	<u>Actual Score*</u>
I. Size of Area		I. _____
A) greater than 2500 mi ²	8-10	
B) 1500 - 2500 mi ²	4-7	
C) 500 - 1500 mi ²	1-3	
II. Prey Density		II. _____
A) abundant (< 100 acres/deer).....	8-10	
B) moderately abundant (100 - 250 acres/deer).....	4-7	
C) sparse (> 250 acres/deer).....	1-3	
III. Human Population Density		III. _____
A) sparse (< 10/mi ²).....	8-10	
B) moderately abundant (10-20/mi ²).....	4-7	
C) abundant (> 20/mi ²).....	1-3	
IV. Density of Paved Highways		IV. _____
A) sparse (< 0.10 mi/mi ²).....	8-10	
B) moderately abundant (0.10-0.20 mi/mi ²).....	4-7	
C) abundant (> 0.20 mi/mi ²).....	1-3	
V. Land Use (extent)		V. _____
A) wilderness.....	8-10	
B) semi-wilderness.....	4-7	
C) non-wilderness.....	1-3	
VI. Human Attitudes Toward Re-establishment		VI. _____
A) good.....	8-10	
B) fair.....	4-7	
C) poor.....	1-3	
VII. Human Population Growth		VII. _____
A) slow (< 10%).....	8-10	
B) moderate (10-20%).....	4-7	
C) fast (> 20%).....	1-3	
VIII. Land Ownership		VIII. _____
A) public.....	8-10	
B) mixed.....	4-7	
C) private.....	1-3	
IX. Landowners with Small Livestock		IX. _____
A) none.....	8-10	
B) few (1-3/100 mi ²).....	4-7	
C) abundant (4+/100 mi ²).....	1-3	
X. Hunting Activity		X. _____
A) light.....	8-10	
B) moderate.....	4-7	
C) heavy.....	1-3	

*IF CHARACTERISTIC IS NOT APPLICABLE, ENTER NA

Name: _____ Date: _____ Phone: _____

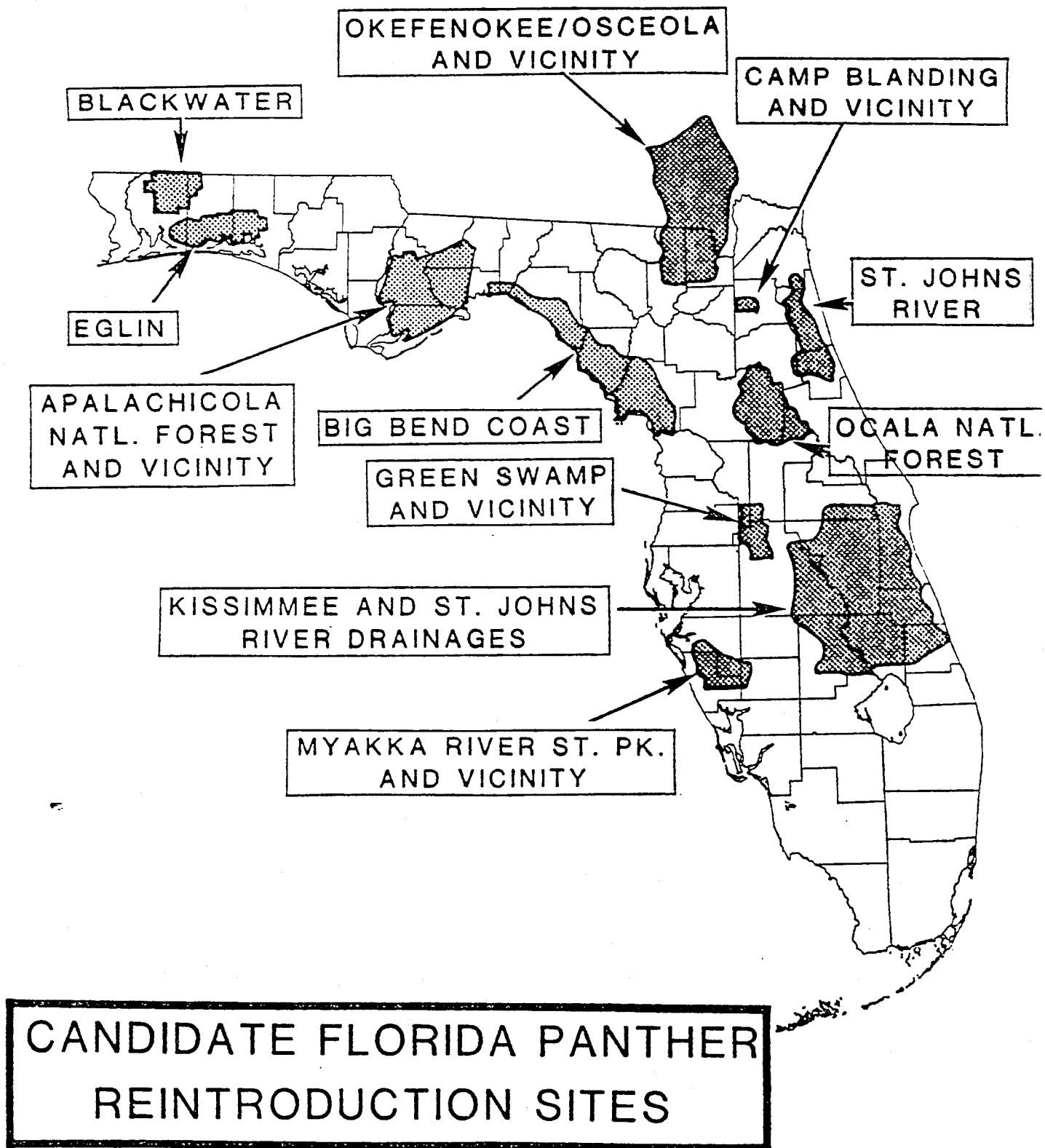
Figure 7: POTENTIAL PANTHER REINTRODUCTION SITE EVALUATION FORM (WITHIN FLORIDA)

Location _____

<u>Characteristics</u>	<u>Possible Score</u>	<u>Actual Score*</u>
I. Size of area		I. _____
A) Greater than 400 mi ²	8-10	
B) 300 - 400 mi ²	4- 7	
C) 200 - 300 mi ²	1- 3	
II. Prey Density		II. _____
A) abundant (< 100 acres/deer).....	8-10	
B) moderately abundant (100 - 250 acres/deer).....	4- 7	
C) sparse (> 250 acres/deer).....	1- 3	
III. Human Population Density Surrounding Area		III. _____
A) sparse (< 10/mi ²).....	8-10	
B) moderately abundant (10-20/mi ²).....	4- 7	
C) abundant (> 20/mi ²).....	1- 3	
IV. Density of Paved Highways		IV. _____
A) sparse (< 0.10 mi/mi ²).....	8-10	
B) moderately abundant (0.10-0.20 mi/mi ²).....	4- 7	
C) abundant (> 0.20 mi/mi ²).....	1- 3	
V. Land Use (extent)		V. _____
A) wilderness.....	8-10	
B) semi-wilderness.....	4- 7	
C) non-wilderness.....	1- 3	
VI. Human Attitudes Toward Re-establishment		VI. _____
A) Good.....	8-10	
B) Fair.....	4- 7	
C) Poor.....	1- 3	
VII. Human Population Growth		VII. _____
A) slow (< 10%).....	5	
B) moderate (10-20%).....	3- 4	
C) fast (> 20%).....	1- 2	
VIII. Land Ownership		VIII. _____
A) Public.....	5	
B) Mixed.....	3- 4	
C) Private.....	1- 2	

*IF CHARACTERISTIC NOT APPLICABLE, ENTER NA AND DO NOT COUNT IT AS A CHARACTERISTIC USED

Figure 8: CANDIDATE FLORIDA PANTHER REINTRODUCTION SITES
(FLORIDA)



(2) **Outside Florida** - Specific candidate reintroduction sites outside Florida have not been identified at this time. However, a range-wide candidate reintroduction site evaluation process is presently underway (initiated in May 1991). This study employs the same basic techniques being utilized in Florida (summarized above), and will identify and rank potential reintroduction sites that may be located in Alabama, Arkansas, Georgia, Louisiana, Mississippi, South Carolina and Tennessee. State wildlife agencies for these states have been requested to complete preliminary evaluation questionnaires on candidate reintroduction sites within their respective states (see Figure 6). Completed questionnaires have been received on over a dozen sites. Initial evaluations on these sites are expected to be completed by early 1992. The Service anticipates that actions to develop experimental surrogate reintroduction plans with States containing the highest ranked sites will immediately follow the identification and ranking process. It is anticipated that additional surrogate reintroduction experiments could be initiated as early as 1993, and could continue until Florida panthers are available for reintroduction purposes, which might be in 5 to 10 years, if the captive program is selected and continues. The results of these additional surrogate reintroduction experiments in the highest ranking areas would help provide the basis for actual selection of sites for possible future Florida panther reintroductions.

2. **Reintroduction Goals and Strategies** - The recovery objective as presented in the approved Florida Panther Recovery Plan is to achieve three viable, self-sustaining populations within the panther's historic range (U.S. Fish and Wildlife Service 1987). Since only one extant population is known to exist, a minimum of two viable, self-sustaining populations will need to be reestablished through reintroduction programs.

During the viability analysis and species survival planning process for the panther in 1989, it was indicated that a minimum of about 500 individuals are needed for long-term maintenance of the genetic variation necessary for adaptive evolution (Seal et al., 1989). Consequently, the present long-range goal is to develop and maintain a minimum total population of 500 panthers (combining all wild and captive populations) distributed in not less than three populations.

The Service's reintroduction goal is to achieve self-sustaining panther populations in as many locations both within and outside the State of Florida as feasible. The strategy to accomplish this goal consists of a planned step-by-step process that begins with initial range-wide reintroduction site identification/ranking evaluations (underway as discussed above, Section P.1), and progresses through selecting sites to receive experimental reintroductions (underway), carrying out experiments to develop successful reintroduction technologies and site evaluations using surrogate cougars (underway), selecting sites to receive future Florida panther reintroductions, taking actions to preserve habitat conditions for reintroduction sites selected (see Section P.5, below), and concludes with actual Florida panther reintroductions.

During the process of identifying reintroduction sites, simultaneous actions will have also been underway to develop captive breeding technologies (underway using surrogate cougars, see Section IV.A.3.e.), develop conditioning techniques for captive raised animals slated for release into the wild (underway using surrogate cougars, see Section IV.A.3.f.), developing a captive Florida panther population (the proposed action), and conditioning panthers for release into the wild.

The number and location of reintroduction sites, or the number of panthers any specific site will be capable of supporting are not known at this time. This information will become available as experimental reintroductions using surrogate cougars progresses (see Section P.1 above, and P.3 below). Site-specific capacities to support panthers are expected to vary from site to site. Based on existing experimental reintroduction data (Belden et al., 1990), each initial release is expected to consist of from 10 to 20 animals. Initial releases could be supplemented for a period of time until a population is deemed established. A single viable, self-sustaining population could consist of several wild sub-populations, in association with a captive population.

3. **Evaluation, Ranking and Selection Criteria for Reintroduction Sites** - The identification and initial evaluation and ranking of candidate reintroduction sites will be carried out on a range-wide basis utilizing the process described above (see Section P.1). Initial ranking criteria are contained in Figure 6 (Potential Panther Reintroduction Site Evaluation Form). The selection of sites to receive Florida panther reintroductions will be based on the results of a comprehensive two-step process. First, candidate sites from throughout the historic range of the Florida panther will be identified and ranked utilizing a 10

factor evaluation process. Factors being considered include: size of area, prey density, human population density, highway density, land use, human attitudes toward panther reestablishment, human population growth, land ownership, livestock operations, and hunting activity. The second step will involve reintroduction experiments utilizing cougars as surrogate panthers for the candidate sites receiving the highest ranking under step one (see P.1 above). Final selections will for the most part be based on the results of reintroduction experiments.

4. **Potential Conflicts with Other Uses of Reintroduction Sites** - There are many factors and activities that could represent potential conflicts with panther reintroductions. The initial evaluation process for candidate reintroduction sites brings into consideration 10 factors considered most important (see Figure 6), and subsequent site rankings reflect such conditions. Some potential conflicts surfaced during the 1988 initial translocation reintroduction experiment involving surrogate cougars in north Florida (see Section P.1 above). These principally involved recreational activities (associated with hunting) and the presence of non-native ungulate populations (goats and blackbuck) within the reintroduction area (Belden et al., 1990). The authors noted that problems only came to bear after apparent human associated actions resulted in the reduction of the population to only two animals at which time these remaining individuals began to wander from their established home ranges.
 - a. **Potential Conflicts from Recreational Activity** - Based on existing data, the Service considers activities associated with hunting (includes ORV use) as being the most likely type of human activity to produce potential conflicts with panther reintroductions. However, the Service does not view hunting and panther occupation as being functionally incompatible. In fact, much of the "better" panther-occupied habitats in south Florida are privately owned and are utilized for hunting purposes. The potential for reintroduction/hunting activity conflicts will likely vary from site to site. Actual conflicts could be directly related to many hunting-associated factors such as the level (hunting pressure), length (hunting period) and type (with/without dogs, etc.). Other factors including availability and distribution of non-hunting areas within reintroduction site, extent of hunter access, and use of ORV's in reintroduction areas could also be important.

If significant conflicts from recreational activities are associated with any highly ranked candidate reintroduction site, such conflicts would be expected to surface during experimental reintroductions involving surrogate cougars. Opportunities would then be available to initiate directed actions to overcome or address problem situations. The Service supports a position where the actions of hunters (or other users) themselves during reintroduction experiments would be used to determine and dictate the nature of future hunting (or other use) activities provided within any given reintroduction area; rather than the actions of hunters (or others) dictating the success or failure of reintroductions. In other words, hunters (or other users) must show that their use of an area is compatible with panther occupation. The Service would utilize its capabilities to work with appropriate Federal and State agencies, involved landowners and others to ensure that appropriate conditions are maintained for panther occupation in selected reintroduction sites. A comprehensive education program geared to the hunting public and other users of reintroduction sites would be an important part of the overall reintroduction program.

- b. **Potential Conflicts from Development Activity** - In all likelihood specific areas within practically any reintroduction site might be subject to future developmental actions that over time could eventually render the site unsuited for panthers. As indicated below, once a particular site has been chosen for panther reintroductions, a comprehensive habitat preservation program must be undertaken to ensure the long-term maintenance of appropriate habitat conditions. All available measures must be considered and utilized to assure successful preservation including; acquisition, easements, landowner agreements, regulatory measures, etc. The following section in conjunction with Section L above provides details.
5. **Preservation and Suitability Maintenance of Reintroduction Sites** - As previously discussed, once a site has been selected as a Florida panther reintroduction site, a comprehensive habitat preservation initiative would be undertaken to ensure the long-term maintenance of appropriate habitat conditions. The program would be similar to the panther habitat preservation planning effort recently initiated for the south Florida area (see Section L above). It is unlikely that Florida panther reintroductions will be undertaken for sites that do not offer reasonably good prospects for a successful long-term habitat preservation program.

6. **Target Dates for Reintroduction Actions** - Should the Service elect to continue the program to establish a captive population, projected target dates for actions associated with subsequent reintroductions are as follows:
- + Establish captive Florida panther population -- 1991-1996
 - + Continue initial range-wide candidate reintroduction site identification and evaluation process (completed for Florida in 1987) -- 1991
 - + Continue development of captive breeding technology using surrogate cougars -- Ongoing (initial 2 litters born April and August 1991), experimental program expected to continue for several more years. 1991-1995
 - + Continue development of conditioning technology for captive animals scheduled for reintroduction using surrogate cougars -- Ongoing with litters born in 1991, experimental program will continue until technology perfected. 1991-1997
 - + Continue suitability evaluation of candidate reintroduction sites and develop reintroduction technology using surrogate cougars (translocated & captive raised) -- Ongoing (initial translocation experiment in Florida in 1988), experimental program will continue until technology perfected, sites selected, and Florida panthers available for reintroduction. 1991-2000
 - + Complete preliminary ranking of candidate reintroduction sites (outside Florida) -- Early 1992
 - + Select sites for Florida panther reintroductions -- 1993-2000
 - + Initiate habitat preservation programs for selected reintroduction sites -- 1993-until completed
 - + Augment existing wild population as necessary for genetic management purposes with individuals from captive population -- 1996 (continued as appropriate)
 - + Make initial Florida panther reintroductions using captive raised animals and monitor results -- 1996-2001

Q. Potential Impacts Associated With The 1991 Kitten Removal - Under provisions of the previously referenced out-of-court settlement agreement the Service issued a subpermit to the Commission for the removal of up to six kittens in 1991. During the period February 20 and May 6, 1991, three kittens of each sex were captured and placed in facilities at White Oak Plantation. Capture and removal activities went smoothly and the kittens readily adjusted to captivity (J. Lukas, pers. comm. 1991). At this point they are reportedly doing fine. However, it has been determined that one of the females suffers from a severe heart abnormality and prospects of her long-term survival are in doubt at this time.

At this point it is impossible to determine or predict the exact nature or extent of impacts that might be associated with this removal action on the wild population. Over time, monitoring activities of the wild population will help provide important insight into probable impacts. The most obvious impact is the fact that these six specific individuals are lost from a demographic standpoint to the wild population for as long as they are maintained in captivity. At the time of their removal the kittens ranged in age from approximately 6 to 8 months. How many of the six might have been expected to survive to and beyond dispersal age (12 to 24 months) and become functioning adults (24 to 36 months of age) if left in the wild is not known. Of 10 previous individuals initially captured and radio-instrumented as kittens (age 12 months or less), 3 (30 percent) did not survive past 13 months after capture. Under this documented natural mortality rate for this age-class, two of the six kittens might have been expected to not survive to become adults if left in the wild.

At this point it is also not known how many of the removed kittens might be replaced by the production of second litters. Complete litters (2 kittens each) were taken from females #9 and #31. This action would be expected to trigger recycling activities in these females. Female #31 spent a minimum of 10 consecutive days with male #12 during the first part of April and present movement patterns are indicative of having a litter of kittens. The successful production of a second litter could replace one or both kittens removed from her. Female #9 demonstrated abnormally wide-ranging movement patterns in mid-April possibly indicative of reproductive cycling activities (seeking a male). However, with the death of male #37 in November 1990, there has not been a known male within #9's present home range until late October 1991, when male #12 crossed I-75 and spent time with #9. It is now possible that she will produce a second litter that could replace one or both of her removed kittens.

Actual impacts to the wild population in terms of kitten losses associated with this action could range anywhere from a net loss of all 6 kittens down to zero. However, even if none of the six kittens are replaced through the production of second litters this year the situation would not be expected to represent a population-threatening event. Wild animal populations have natural self-regulating mechanisms that tend to activate and compensate for short-term factors such as this. If additional removal actions are undertaken in the future, it is anticipated that a high percent will occur immediately after birth (rather than at approximately 6-months age), which would be expected to lessen potential impacts to the wild population.

ENCLOSURE C

**SUMMARY OF COMMENTS RECEIVED
DURING THE PUBLIC COMMENT PERIOD
FOR THE
DRAFT SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT (DSEA)**

**SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT
PERIOD FOR THE DRAFT SUPPLEMENTAL ENVIRONMENTAL
ASSESSMENT (DSEA)**

One hundred fifty seven comments were received (132 written comments and 25 oral statements presented during 3 public meetings). A general overview of the comments is presented below. A more detailed summary of some major points then follows.

- 5 (3%) expressed explicit opposition to establishing a captive population.
- 44 (28%) expressed explicit support for establishing a captive population.
- 49 (31%) referenced a captive population in some way but did not express a clear position one way or the other.
- 59 (38%) provided only general comments and made no reference whatsoever to the proposed program or a captive population in general.

A large number of the comments received did not relate directly to the proposed action or any associated or connected component of the proposed action. As pointed out above, almost 40 percent of the comments fell into this category. Likewise, a large percentage were very general in nature and some did not even reference the Florida panther. Some of the more general comments included statements like: stop destroying nature, preserve the environment, concerned about human population growth, investigate controlling human population, concerned about wildlife problems, ban hunting, establish programs to help the panther, protect the panther, control/halt development, outlaw incinerators, save the Everglades, save remaining wildlife, etc.

As has been the case during previous public comment opportunities over the past two years, habitat issues continue to represent the most frequent category of concern expressed. Preservation of habitat was again the greatest single issue of concern. Other habitat related issues and concerns included environmental contaminants, habitat enhancement, highways, hunting, and travel corridors. Other frequent comments included: the panther's critical status precludes more delays...start captive breeding now; take only kittens for captive population; prey resource concerns; stop human actions that threaten panther; do something to save the panther; etc. Five respondents indicated that they feel an environmental impact statement is needed.

There were many excellent, specific comments and recommendations dealing with the proposed action and various other matters relative to protection and recovery of the Florida panther. As pointed out on numerous instances below, many comments and recommendations dealt with matters and items not directly related

to the proposed action or specific components connected to the proposed action. As such, these items fall outside the purpose and need of the proposed action, and for that reason, are not addressed in detail below. A summary of the more specific comments received and a brief response follow.

GENERAL

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

The environmental analysis in the Supplemental Environmental Assessment (SEA) should include capture, captive breeding, reintroduction and habitat conservation.

RESPONSE: *Capture and captive breeding represent specific components of the proposed action...the establishment and management of a captive population to provide security to the species and protect the existing gene pool to prevent extinction of the panther...and are thus included in the environmental analysis. Reintroduction (for population reestablishment) and habitat conservation are not specific components of the proposed action and thus beyond the scope of this document. Reintroduction and habitat preservation issues will be subject to subsequent environmental analysis, subject to the results of on-going studies and success of the captive breeding program.*

However, basic information on these elements only as they may relate to the overall recovery program are provided. The SEA does not adequately evaluate all actions that will be necessary to recover the panther in the wild. RESPONSE: Again, as indicated above, the scope of this document deals solely with specific components of establishing and managing a captive population to address a specific need...to prevent extinction of the panther...additional actions that may be needed to prevent extinction or recover the panther but not specific to components of the proposed action are not addressed in this document. The Florida Panther Interagency Committee (FPIC) should be taking appropriate actions to eliminate those activities that are so harmful for the panther. RESPONSE: Many actions have been undertaken by The FPIC to address risk factors as they are identified. Many of these actions are detailed throughout the SEA. Emphasis will continue to be directed at addressing known risk factors. If necessary conservation efforts are not taken, panthers will cease to exist in south Florida.

RESPONSE: *The critical status of the panther is fully understood. Many actions have already been undertaken (and will continue) to address the panther's status (see Section III). Proceed expeditiously with rulemaking to address hybrids under the Endangered Species Act (ESA). RESPONSE: Actions are presently underway within the Service to develop and implement a policy to address this matter. The Service has, however, already gone on record indicating that all Florida panthers occurring in the wild are protected under the ESA. If the FPIC were to take an active - not reactive - role in providing a complete picture of the recovery needs of the panther, much could be accomplished...the final SEA provides an opportunity for the public to learn what is necessary if the goal of the captive breeding program - the reintroduction of panthers throughout their historic*

range - is to be reached. **RESPONSE:** *A complete picture of the recovery needs is presented in the revised recovery plan. The SEA provides a great deal of additional information regarding the panther, its needs and factors threatening it. Contrary to the statement in the comment, however, the goal of the proposed captive breeding program is not the reintroduction of panthers throughout their historic range...this is the goal of the recovery plan. The goal of the proposed captive breeding program is to provide security against extinction and provide an avenue to protect the existing gene pool. The proposed captive breeding program if implemented and successful possibly could also provide an avenue to accomplish the recovery goal.*

REINTRODUCTION

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

Devote the same analysis and intense effort to population reestablishment issues as done for genetic and demographic studies. **RESPONSE:** *Reintroduction for population reestablishment purposes is not a component of the proposed action and thus outside the scope of this document. In summary, however, a comprehensive effort was initiated in 1988 and is expected to continue for 5 to 10 years utilizing western cougars as surrogates that will lead to the development of a population reestablishment program for the Florida panther. The draft SEA failed to provide adequate analysis on feasibility and impact of reintroduction. RESPONSE: As indicated previously, reintroduction is not a specific component of the proposed action. However, under the terms of the Settlement Agreement, the Service agreed to provide this analysis in the SEA. It is not possible to provide a complete environmental analysis until specific reintroduction sites are selected, techniques developed, and plans finalized. The SEA provides as thorough analysis as possible based on the information available at present. The SEA also outlines the process that is expected to be used to identify, evaluate, and select reintroduction sites, develop reintroduction techniques and strategies, and secure habitats within selected sites. Expand in the SEA matters dealing with reintroduction sites (availability, identification, evaluation, suitability, ranking, habitat preservation, conflict analysis and resolution...hunting, roads, development, contaminants, etc... curtailment of human activity, removal of roads, public attitudes, etc.); the suitability of the "priority" site for reintroduction of panthers in Florida is questionable; why is the FWS proposing a program to reintroduce up to 350 panthers, when they will not even take the basic minimum steps that are required (curtail human activity) to allow panthers to survive?; clarify statement in draft Supplemental Assessment regarding hunting in reintroduction areas; the present position of the Commission on hunting and development issues in reintroduction sites in Florida will prevent success; much more work regarding habitat and human behavior issues must be initiated immediately if there is to be any hope of having successful reintroductions outside Florida; if the reintroduction goal is to have any chance of success, significant changes in certain forms of*

human behavior are essential...the public must be informed that certain changes are necessary; question "success" of reintroduction experiment. **RESPONSE:** *The preceding are examples of comments received regarding possible future reintroductions. Again, reintroduction is not a specific component of the proposed action and thus not within the scope of this SEA. It is important to understand that the selection of sites has not been made and the impacts, therefore, cannot be determined in any reasonable manner at this time. The process expected to be used to address many of these matters is outlined in the SEA (see Enclosure B - Section P). A full environmental analysis will be conducted of any proposed reintroductions, including appropriate public participation.*

HABITAT PRESERVATION

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

The proposed program does not include needed measures for habitat issues. **RESPONSE:** *Habitat issues are not a specific component of the proposed action and thus not within the scope of the subject SEA. An overview on the importance of habitat preservation in preventing extinction of the panther, habitat preservation actions already accomplished or underway, and details on the development of a comprehensive Habitat Preservation Plan (HPP) is provided in the SEA as background information.* Aggressive habitat preservation needed. **RESPONSE:** *The Service agrees; and the goal of the HPP under development is to accomplish that need.* Other specific comments relative to habitat preservation included: expand analysis of wildlife corridors; public should have opportunity to participate in development of HPP; HPP should be developed by independent scientists not tied to FPIC agencies; critical habitat discussion inadequate; habitat issues analysis not adequate; public oversight of, and input into HPP crucial to long-term success of plan; emphasis on habitat preservation and restoration inadequate; expand analysis of existing threats to present habitat in S. Florida; expand analysis of measures needed to protect essential wilderness areas in S. FL; if adequate steps are not taken to preserve habitat in south Florida, the panther will go extinct there; information has not been given to the public about how the habitat preservation plan will be drawn up, or how the public can participate in the drafting of the plan; it is absolutely essential that the habitat preservation working group be composed of independent scientists not tied to the FPIC agencies; the discussion of critical habitat designation is inadequate; preservation of habitat must be placed on an equal emphasis with the program's procreation efforts if the species is to continue to exist in its historical range; discussion of habitat regulation and rehabilitation is inadequate; a comprehensive policy of land use regulation must be introduced and implemented. **RESPONSE:** *Again, habitat preservation is not a specific component of the proposed action and thus not within the scope of the SEA. Basic information on habitat preservation has been provided in the SEA for information purposes, but is not*

part of the environmental review analysis of the proposed action. The issue of critical habitat designation is discussed in the SEA (Enclosure B - Section L). Additionally, recommendations regarding critical habitat designation may be received through the Department's petition process at 43 CFR Part 14. The proposed action cannot address issues requiring a rulemaking under Section 4 of the Endangered Species Act.

ENVIRONMENTAL IMPACT STATEMENT (EIS)

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

To proceed with habitat preservation, capture, captive breeding, reestablishment programs, and other "connected" recovery actions requires an EIS. Programmatic EIS focusing on habitat-related issues, barriers to reintroduction, and other matters necessary; EIS needed focusing on access points and contamination.

RESPONSE: *Habitat preservation, reintroduction/reestablishment programs, access points, contamination and many other actions to prevent extinction and/or recover the panther are related but not interdependent and thus, are not specific components of the proposed action or within the scope of this SEA. Until reestablishment sites and other future actions are determined and proposed, until such studies are completed, and until there is certainty as to the success of the proposed captive breeding program, a full environmental analysis and public review would be of little benefit at this time. A decision regarding the need for an EIS on the specific proposed action will be made when the SEA and the present environmental analysis process is completed. Decisions on environmental review processes appropriate for other actions possibly needed to prevent extinction and/or recover the panther will be made at the time such actions are proposed for implementation. Question EIS need, how Service determines need, and public comment not solicited. **RESPONSE:** Determination of EIS need is part of the environmental review process underway over the past 2 years. The final decision as to whether the proposed action is a major Federal action that would significantly affect the human environment will be made after this document has been completed. Extensive public comment opportunities have been provided during the two-year environmental analysis period. EIS is essential to consider impact of adult and kitten removal. **RESPONSE:** The analysis of projected impacts of adult and kitten removals are provided in the SEA (see A under Alternative 3, Section VII). A decision by the Service on whether such impacts will likely be significant enough to warrant the preparation of an EIS will be made when this document has been completed. The Service can both prepare a programmatic EIS and take interim steps to deal with genetic problems. **RESPONSE:** The proposed action has been developed so steps can be taken to immediately deal with genetic problems. Decisions on the appropriateness of an EIS for other actions will be made as information becomes available to move conceptual programs to programs ready for implementation. See previous responses.*

PANTHER REMOVAL

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

Analysis of impacts of kitten/adult removal to wild population needs expanding.

RESPONSE: *Precise impacts of removals cannot be fully determined at this time. Impacts can only be projected based on existing data. The final SEA uses existing data to project likely impacts to the fullest extent possible (see A under Alternative 3, Section VII). Impacts of removal for captive population same as impacts from illegal take.*

RESPONSE: *Demographic Impacts to the existing wild population would be the same regardless of whether a particular animal was removed for the captive program, killed crossing a highway or illegally killed. However, in captivity the animal is still alive and its genetic material can be maintained and utilized. This would not be the case involving other situations resulting in the animal's death, resulting in circumstances where genetic related impacts could be very significant. Question value of removing non-reproducing adults for captive population (non-productive in wild=non-productive in captivity). **RESPONSE:** This matter is covered in the SEA (see A.2. under Alternative 3, Section VII). Captive management will provide greatly enhanced opportunities to obtain genetic representation of an animal considered important to the survival of the panther, but for whatever reason not successfully producing offspring in the wild. Correlate indications of recycling to actual production of replacement litter. **RESPONSE:** This has been done in the SEA to the extent possible with existing data (see Enclosure B - Section H). When and why would it ever be necessary to remove adults. **RESPONSE:** Such an action would be considered appropriate if it were determined that a particular individual possessed genetic material considered crucial to the survival of the panther (not contained in other panthers), was not successfully reproducing in the wild, and based on existing data could likely be removed without having significant impacts to the wild population. Adults not breeding in wild may also not breed in captivity. **RESPONSE:** As indicated above, opportunities to achieve successful reproduction from an individual not successfully reproducing in the wild would be greatly enhanced under captive conditions. Term "non-reproducing" as applying to adults under consideration for captive population is not defined in draft SEA. **RESPONSE:** "Non-reproducing" would be an animal that has not produced verified offspring during a minimum period of 2 consecutive years of telemetry monitoring as an adult. There are additional factors, however, that must also be considered before a determination for removing any adult is made (i.e., genetic importance of the particular individual and likely impacts to the wild population). The utmost care must be taken to preserve the integrity of the wild population during removal actions. **RESPONSE:** This is a major goal of the proposed program and as indicated in the SEA the Service believes that this goal can be achieved under the proposed removal regime. If the draft SEA cannot determine impacts that will result from the removal of the 6 kittens in 1991, how can the final SEA reasonably predict the future impacts from removing kittens over a 6 year period? **RESPONSE:** Precise impacts cannot be determined at this*

time. Only probable impacts can be projected based on existing data. These projection have been made in the SEA (see A.1 under Alternative 3, Section VII).

ENVIRONMENTAL CONTAMINANTS

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

Expand analysis on environmental contamination from toxic wastes. **RESPONSE:** *Basic information on environmental contamination is contained in the SEA in order to provide a more complete picture of the many factors affecting the panther. It is not the purpose or intent, and if done, would exceed the scope of the SEA to provide a complete analysis of all factors affecting the panther. The purpose of the SEA is to provide an environmental analysis of all specific components of the proposed action.* Actions which result in a reduction of the problems caused by incinerators are needed; the Interagency Committee should take an active role in identifying sources of contamination and reducing their impact; SEA has no provisions for the preservation of existing habitat from destruction due to mercury contamination; SEA does not make provisions for the remediation of current contamination; the SEA should not rely on shifting the preferred prey base of the panther to herbivores in an effort to insulate the population from mercury bioaccumulation in the food chain; SEA must incorporate bioaccumulating toxins as a criteria for evaluating suitable reintroduction sites; Federal and State agencies have taken no action to protect habitat against the newest and most rapidly degenerating threat...mercury contamination; the continued emissions of mercury from atmospheric deposition will exacerbate existing mercury contamination; courts have held that altering the habitat of an endangered species is equivalent of a "take"...the SEA must address a plan to prevent the taking of panther habitat by atmospheric deposition of mercury; there is no support for the assumptions that mercury levels in preferred prey will remain at a constant level and that observed levels of mercury in deer and hogs will result in no adverse effect upon the panther; young or weak cats are most sensitive to the effects of mercury...young, anti-body negative individuals are far more susceptible to viral vectors...this susceptibility would be worsened by the immuno-suppressive effects of mercury poisoning; it is well established that even low levels of mercury are detrimental to cats...behavioral changes were incoordination, reflex impairment, weakness and insensitivity to pain...all of which would seriously impact the predatory and survival skills of the cats; it is insufficient to rely upon humanly-managed prey base modifications because of factors potentially effecting the future availability of preferred prey. **RESPONSE:** *Concerns over environmental contamination as expressed above are equally shared by the Service. However, as indicated in the preceding response, elements relative to environmental contamination are not within the scope of the proposed action or components of this environmental analysis.*

HIGHWAYS

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

Concerned about highways problems; large wilderness areas without roads are absolutely essential for panthers. **RESPONSE:** *The Service is equally concerned about road related problems. As indicated in the SEA (see Enclosure B - Section O), actions have been initiated to address some of the problems. Additional actions will continue to be taken to address problems as they arise. If reestablishments are proposed, this issue will likely be addressed in further detail in any subsequent environmental documents.*

PUBLIC EDUCATION

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

A program is needed to alter human behavior sufficiently for panther survival. **RESPONSE:** *Public education has been, and will continue to be extremely important to the survival and recovery of the panther. The FPIC took action to establish a Public Affairs Subcommittee to place emphasis on these needs. There are also other organizations and individuals involved in public education matters dealing with the panther. Emphasis will continue and be expanded to ensure success.*

CAPTIVE BREEDING

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

An inseparable link exists between captive breeding and habitat issues; captive breeding without habitat preservation will fail. **RESPONSE:** *The Service is of the opinion that the Florida panther will go extinct without an aggressive, successful habitat preservation program and a successful captive breeding program. Although both programs are equally essential for panther survival they are separate actions. Habitat preservation is outside the scope of this environmental analysis process. A complete disclosure of the impacts of the proposed captive breeding program is essential. RESPONSE: The Service has utilized existing data to thoroughly evaluate and project likely impacts of the proposed action. This analysis is presented throughout the SEA. Question time period given in draft SEA regarding the adjustment of adult panthers to captivity. RESPONSE: The time period indicated in the SEA is based on observed responses of individuals (panthers and cougars) brought from the wild to captivity during recent years as part of the panther program.*

GENETIC AUGMENTATION

CONCERNS IDENTIFIED/ACTIONS RECOMMENDED:

Support initiation of controlled intercross experiments; support position that intercrossing be kept as option if recovery not possible without infusion of outside genetic material. **RESPONSE:** *No response needed.*

ENCLOSURE D

**FLORIDA PANTHER CAPTIVE MANAGEMENT
AND
HEALTH PROTOCOL**

FLORIDA PANTHER CAPTIVE MANAGEMENT AND HEALTH PROTOCOL

I. INSTITUTION EVALUATION

A. Facilities wishing to obtain Florida panthers

1. Questionnaire and felid inventory is to be completed by zoo veterinarians and curators to cover the following topics:
 - a. Summary of current inventory and activity with felids in past 2 yrs;
 - b. Check list indicating results of survey of infectious diseases and summary of results;
 - c. Nursery and hand-rearing techniques used at facility;
 - d. Isolation and quarantine protocol;
 - e. Vaccination history and results of serologic tests and parasite examinations;
 - f. Past and present health problems in felids at facility;
 - g. Husbandry of cougar/puma/panther or Felis species with similar management needs (diet, sanitation, and description of enclosure).
2. Infectious disease and parasite evaluation.

In order to protect the captive zoo stock from infection from wild panthers and vice versa, all felids in the receiving facility will be tested for the following diseases agents before Florida panthers can be received. An initial survey of all resident felids is to be completed on samples collected no longer than 1 year prior to receiving panthers. If following completion of the survey, the arrival of panthers should be delayed for any reason then testing of facility felids should continue following the "on line facilities guidelines" (see I.B. below). Facilities with animals testing positive for any of the following agents will be evaluated by the Florida panther captive management committee on a case-by-case basis in determining the suitability of placement of panthers with that facility and/or special precautions that will be taken to prevent transmission of disease to or from the wild panthers.

a. **MANDATORY TESTING** (Must use designated laboratory)

- (1) Feline infectious peritonitis virus/feline enteric corona virus (FIPV/FECV)

Send serum to:

Dr. Jim Evermann
Wash. Animal Disease Diagnostic Laboratory
Bustad Hall, Rm. 155-N
Washington State University
Pullman, Washington 99164
(509) 335-9696

- (2) *Feline immunodeficiency virus (FIV)*

Submit fresh heparinized whole blood (preferable) or serum for CITE test and "Western Blot" analysis to:

Dr. Stephen O'Brien/Jan Martenson
FCRF-NCI-PRI, Lab of Viral
Carcinogenesis
Building 560, Room 11-10
Frederick, Maryland 21701
(301) 846-1299

- (3) *Feline leukemia virus (FELV)*

Elisa and/or IFA performed at a reliable lab of the facility's choice.

- (4) *Cytauxzoan felis* and *Haemobartonella*
Submit fresh EDTA whole blood or methanol fixed blood smears to:

Dr. John Harvey
Clinical Pathology
Veterinary Medical Teaching Hospital
Build. 215, 16th Ave.
Univ. of Florida
Gainesville, Fl. 32610 (904) 392-4382

b. Desirable **OPTIONAL** testing

- (1) Viral diseases prevented by vaccination. Testing should be mandatory if facility does not have an active vaccination program.

Feline panleukopenia virus (FPLV)
Feline calicivirus (FCV)
Feline viral rhinotracheitis virus (FVRV)

Submit serum to either:

Dr. Jim Evermann (see FIP above)
OR

Dr. Fred Scott (Preferred lab)
Cornell Feline Health Center
College of Veterinary Medicine
Cornell University
Ithaca, N.Y. 14853 (607) 253-3414

- (2) *Encephalomyocarditis virus (EMCV)*

Although this virus has caused sporadic deaths to various species of non-domestic animals in the southeastern United States (particularly in Florida from Tampa and south), none of the documented cases have involved exotic felids. Currently, EMCV is not

considered to be a serious threat to felids. There is anecdotal information indicating that 26 African lions died following consumption of flesh from infected rhinoceros and/or elephant who died of EMCV, but this was never confirmed. If a particular facility has a history of animal loss to this virus, then testing of felids and other select zoo animals (esp. wild rodents) should be MANDATORY. Otherwise, the testing of felids should be optional, but encouraged, in order to learn more about the presence and prevalence of this virus.

Submit serum to:

Dr. Jack Gaskin
Dept. of Infectious Diseases
University of Florida
College of Veterinary Medicine
Gainesville, Florida 32610
(904) 392-1841

(3) *Toxoplasma gondii*

This parasite causes sporadic disease problems in felids. It appears that many captive and wild non-domestic felids are infected with the organism (depending on the laboratory running the test), but differences between facilities have been observed. Therefore testing for this agent would be important to establish the prevalence rate for a particular facility and to learn more about the persistence and cycling of this agent in captive felids.

Submit serum for IgG, IgM, and antigen in batches to:

Dr. Michael Lappin
Dept. of Clinical Sciences
College of Vet. Medicine
Colorado State Univ.
Ft. Collins, CO 80523 (303) 491-1274

c. Testing of Feral cats

Representative feral cats on the premises should be captured and tested for the above MANDATORY and OPTIONAL diseases as described above.

B. "On line facilities" with resident Florida panthers

1. Institute questionnaire and felid inventory will be updated every 2 years.

2. Testing of newly acquired felids:

All incoming felids will be screened for the MANDATORY tests as described above (I.A.2.a.) preferably prior to shipment to the recipient facility or within one week of arrival and at the end of the 30- to 60-day quarantine. EMCV and other OPTIONAL tests should be included as necessary as described in I.A.2.b. The only exception to this will be incoming wild Florida panthers which will be bleed as they are removed from the wild and will be held in strict quarantine until the initial test results are known (see Sec. II below).

3. Testing of resident non-domestic and domestic felids:

All resident felids (including those born on the premises) shall be tested at least once every 2 years for the MANDATORY and OPTIONAL tests as described above (I.A.2.a.& b.)

4. Test positive animals:

The Florida panther propagation group and Florida Game and Fish Commission's (Commission's) veterinarian should be consulted if any of the animal's have positive test results. Recommendations will be made on a case-by-case basis depending on the agent and the magnitude of the potential problem.

II. FIELD EVALUATION AND SAMPLING AT CAPTURE

Standard Field Protocol

The following procedures and analyses will be performed on incoming Florida panthers. Some of the specific treatments may be modified depending on the age on the incoming animal.

- A. Physical exam including weight and measurements.
- B. Complete blood count (CBC) and Serum Chemistries
- C. Serology (Same labs as in I.A.2.a. & b.). Results for agents with * will be available within 48 hours of receipt by laboratory. The remainder will be completed within 30 days.
 - 1. FIP*
 - 2. FIV*
 - 3. FeLV*
 - 4. Toxoplasma*
 - 5. EMCV
 - 6. FPLV
 - 7. FCV
 - 8. FVRV
 - 9. Brucella (Dr. P. Nicolitti, Univ. Fl, Gainesville, FL)
 - 10. Pseudorabies (Dr. P. Gibbs, Univ. Fl, Gainesville, FL)
- D. Virology - Viral isolation culture of nasal, pharyngeal, and rectal swabs.
- E. Parasitology
 - 1. Fecal O + P (floatation, McMaster, and sedimentation)
 - 2. Microfilaria exam
 - 3. Occult heartworm exam
 - 4. Cytauxzoan and Haemobartonella exam
- F. Ectoparasite Removal - thorough manual removal of all ticks (specimens are preserved).
- G. Fecal bacterial culture for enteric pathogens (*Salmonella sp.*, *Campylobacter sp.*, etc.)
- H. Other routine samples possibly taken- saliva, skin biopsies, hair, vaginal smears and biopsies, urine, and blood for mercury analysis.
- I. Treatments: This schedule may be modified if kittens are very young.
 - 1. Vaccination - Fel-O-Vax 3cc divided IM (FPLV, FCV, FVRV killed), Imrab 1cc IM (rabies virus killed)
 - 2. Ivermectin - SubQ (200ug/Kg)
 - 3. Praziquantel - SubQ or IM (5mg/kg)
 - 4. Iron dextran - 3 cc IM

5. B-vitamins - 3-5 cc SQ
6. IV and SQ lactated ringers - 1-3 liters

III. QUARANTINE/ACCLIMATION PERIOD AT RECEIVING INSTITUTION

A. Quarantine period: 0 - 30 days post capture

1. Close observation should be made to note appetite, attitude, behavior, and condition. Physical or "routine" changes should be made to alleviate stress or observed aberrant behavior as needed (e.g., visual barriers, blockade exhibit, white noise, etc.).
2. Whole, natural food items should be available to entice cats to eat (preferably venison and rabbit).
3. Fecal Exams (parasite and microbiologic)- depending on which agents were present when panther was removed from the wild, it may be desirable to repeat tests at least every 2 weeks and treat accordingly. Collect and SAVE ALL FECES defecated, label with date and time collected, refrigerate or freeze as directed by Dr. Roelke. Do not unnecessarily disturb the panther, collect as you can, OK if the feces are a day or two old. These are important samples and will be used for food habits, parasite, mercury excretion, and fecal steroid studies.
4. Remedial therapy may be necessary to treat dehydration, weight loss, etc.
5. If handling of the panther is required due to self-trauma, illness, injury, stress or anorexia, the panther should be immobilized, tranquilized, or physically restrained as the staff veterinarian deems necessary for treatment. The GFC panther veterinarian should be contacted for consultation prior to the action (preferred), but if this is not possible, they should be notified within 24 hours.
6. Preferred immobilization drugs (and dosages) for wild panthers include ketamine hydrochloride (approx. 8-12 mg/kg IM), Telazol® (6.0-7.0 mg/kg IM), or a combination of ketamine and Telazol®

(K= 8-12 mg/kg + T=1.5 mg/kg). Additional ketamine, diazepam, and/or medazolan can be added as needed to stabilize (diazepam or medazolan 1-5 mgs IV slowly! or IM). Doses for stressed, sick, or anorectic animals should be scaled down according to their condition. Atropine or glycopyrolate can be used if desired. After induction, anesthesia of the panther can be maintained by either additional injectable drugs or gas anesthesia as desired.

B. Post-quarantine exam, at 30 to 60 days post capture:

STANDARD VETERINARY EXAMINATION PROTOCOL

1. Routine procedures to be followed every time the panther is handled
 - a. Complete Physical Examination including body weight, measurements, dental exam and prophylaxis (with dentist if necessary).
 - b. Collect Samples for the following procedures
 - (1) Whole blood in EDTA:
 - (a) CBC with reticulocyte count
 - (b) Blood parasite screen (particularly *Cytauxzoan* and microfilaria)
 - (2) Serum:
 - (a) Serum chemistry panel including electrolytes and CPK
 - (b) Serologic testing submit serum for analysis for all the agents listed in II.C. above (at post quarantine exam and at required intervals).
 - (c) **ALWAYS BANK SERUM** - Freeze 5-10 cc minimum for the "Florida Panther Serum and Tissue Bank" at the Wildlife Research Lab (GFC) in Gainesville and a minimum of 5cc for your own serum bank.

- (3) Heparinized whole blood:
 - (a) Genetic and FIV studies - ship to Dr. S. O'Brien at NCI (I.A.2.a.(2)). Submit 10-60cc depending on the size and condition of the panther.
 - (b) Mercury analysis - 10cc frozen whole for later analysis.
- (4) Hair (1.0+ gm desired) and whiskers (3/side). Pluck and freeze sample, also save any shaved hair.
- (5) Feces for enteric pathogen analysis
 - (a) Fecal ova and parasite exam (submit to Univ. of Florida - contact Roelke for appropriate address).
 - (b) Bacterial stool culture (*Salmonella*, *Campylobacter*, etc.)
- (6) Urine - Urinalysis (S.G., dipstick, sediment evaluation, ALWAYS freeze supernatant remainder). On healthy young animals catch urine opportunistically if voided during anesthesia or manually express bladder. If you suspect urinary problems or if the animal is an older adult obtain a urine sample by catheterization or cystocentesis.
- (7) Ectoparasites - remove and preserve all specimens.
- (8) Viral isolation swabs - rectal, pharyngeal, and nasal (freeze $\geq -75^{\circ}$).
- (9) Dental impressions
- (10) Other samples or procedures as needed or requested.

c. Treatments

- (1) Booster vaccinations - Fel-O-Vax and Imrab (rabies)(see IV.D.)
- (2) Routine de-worming as necessary (see IV.E.)
- (3) Other medications as clinical presentation indicates

2. Non-routine and special procedures

- a. Skin biopsies for genetic studies - send fresh to NCI (I.A.2.a.(2)).

- b. Radiographs of chest, skull/teeth, hips and shoulders, and growth plates of long bones (DV and LAT views). The initial set of films will be used to evaluate previous trauma or exposure to lead, heart silhouette, and epiphyseal status. Radiographs of long bones are desirable on subsequent immobilizations to document epiphyseal closure. Other radiographs indicated only if necessary for medical evaluation.
- c. Cardiac evaluation - include EKG and ultrasound if possible. Utilize more detailed procedures if initial examination indicates it is warranted.

IV. LONG TERM HEALTH MAINTENANCE

- A. Documentation of enteric parasites
 - 1. Fresh fecal samples should be collected at day 0, 1 month, 2 months, and 6 months for complete parasite analysis and submitted for analysis: Contact M. Roelke for appropriate address.
 - 2. Routine fecal O + P should be performed at least monthly after quarantine with treatment as necessary until panther is cleared of parasites. Then test at least every 6 months thereafter.
- B. Subsequent health monitoring of individual cats
 - 1. Cats will be immobilized and evaluated as per the Standard Veterinary Examination Protocol (sec. III.A.6.).
 - 2. Cats are to be immobilized and evaluated at 6 months and 12 months post-capture of the first year and at least every 12 months thereafter. Samples as outline above (III.B.1.) should be obtained whenever the panther is handled.
- C. Rigid health screening of other exotic felids entering collection:
 - 1. Evaluation of past medical history before entry.
 - 2. Proper quarantine procedures followed.
 - 3. Screened per I.A.2. Infectious Disease Protocol before and after quarantine.

D. Vaccination Protocol

1. Vaccines - USE ONLY KILLED VACCINES ON FLORIDA PANTHERS

- a. Fel-O-Vax PCT 1-3 cc IM (Fort Dodge Laboratories, Inc., Fort Dodge, Iowa).
- b. Rabies (killed) - Imrab 1cc IM (Rhone Merieux, Inc., Athens, Georgia).
- c. Others may be considered at a future date as deemed necessary (i.e., FeLV, FIP, Lepto, etc.).

2. Vaccination Schedules

COLLECT AND SAVE SERUM EACH TIME CAT IS VACCINATED so that response to vaccination can be evaluated.

a. FEL-O-Vax

- (1) Kittens < 16 weeks old - give at least two 1cc IM doses of vaccine.
 - (a) Born to vaccinated queens and/or queens with adequate FPLV titers: Isolate kitten and begin vaccinations at 6 weeks and repeat every 2 to 3 weeks until at least 16 weeks of age.
 - (b) Born to non-vaccinated queens and/or queens with low or absent FPLV titers: Isolate kitten and begin vaccinations immediately and repeat every 2 to 3 weeks until at least 16 weeks of age
- (2) After initial vaccination schedule, kittens should be vaccinated at 6 and 12 months and then annually.
- (3) Juveniles (>16 weeks), subadults, and mature panthers - give 2-3cc IM.
 - (a) Vaccinate at capture, at 30-day quarantine exam, at 6- and 12-month exams, and then annually.

b. Rabies

- (1) All kittens
 - Vaccinate at 16 weeks, 20 weeks, 12 months, and then annually
- (2) Juveniles (>16 weeks), subadults, and mature panthers
 - Vaccinate at capture, at 30-day quarantine exam, at 12 months, and then annually

E. Anthelmintic Protocol

1. Anthelmintics (Suggested - will depend on type of parasite)
 - a. Pyrantel Pamoate - 12mg/lb PO
 - b. Ivermectin - 200ug/kg SQ
 - c. Praziquantel - 5.0mg/kg IM or SQ
 - d. Other safe, accepted anthelmintics as required
2. Anthelmintic Schedule
 - a. Kittens (<16 weeks)
 - (1) de-worm for nematodes every 2 weeks until 16 weeks of age
 - (2) After 16 weeks, de-worm as required by fecal examination
 - b. Juveniles (>16 weeks), subadults, and mature panthers
 - (1) de-worm at capture, at 30-day quarantine exam, and then as required by fecal examination

V. MEDICAL PROBLEMS

A. Involving exotic cat collection (excluding Florida panthers)

Any outbreak of infectious disease should be immediately reported to the Commission veterinarian and the Florida panther captive management committee so that measures can be taken to protect the Florida panthers.

B. Involving the Florida panthers

1. Minor problems can be treated on site at the respective facility.
2. Major illness and or surgical treatment. Please contact Commission's panther veterinarian for consultation. If condition warrants it, the panther should be transported to the College of Veterinary Medicine for work-up and treatment.

VI. MORTALITY AND NECROPSY PROTOCOL

All panthers are to be necropsied by the Dept. of Pathology, College of Veterinary Medicine following a standard Florida panther protocol

(available from the Commission). Chill carcass as soon as possible and contact appropriate people as listed in the necropsy protocol (primarily Dr. Melody Roelke (904) 336-2230, Dr. Lois Roth (904) 392-1221, and Laurie Wilkins (904) 392-6467 or 1271). If extenuating circumstances will not allow expedient transport and necropsy at Gainesville, carefully follow the details of the protocol (**SAVE ALL TISSUE AND FLUIDS**). Please supply a detailed clinical record and description of illness and cause of death (if known).

VII. MANAGEMENT PROTOCOL

- A. The management of Florida panthers and facility requirements will vary based on the age of the animal and the planned long-term strategy for the individual.

1. Age of panther

- a. Kittens (neonatal) - animals taken from dens, probably still nursing, will generally be less than 6 weeks of age.
- b. Juvenile kitten 4 to 12 months, still dependent on mother.
- c. Young adult 1 to 3 years - dispersing and independent from parent, generally has not yet established territory.
- d. Mature adult - 3 years or older, sexually mature.

2. Long-term management strategy

- a. Category I animal maintained in captivity for life.
- b. Category II animal has potential of future release.

- B. Specific requirements by age class

1. Kitten Age Class

- a. Physical environment:

(1) During isolation period

- (a) Complete isolation of panther litters from other felids and panthers up to 16 weeks of age or at least 4 weeks post entry if kittens are older.

- (b) Kittens should be maintained in ambient temperature range of 85 to 90°F until approximately 4 weeks of age at which time temperatures can be decreased depending on health status.
 - (2) After initial isolation period
 - (a) Kittens may be maintained in other nursery facilities that contain other species, however, they are to remain separated from other animals during the daily management routine.
 - (b) The nursery is not to include convalescing animals.
- b. Nursery staff:
 - (1) During isolation period there will be no contact with other zoo felines.
 - (2) If caretaker has domestic cats -
 - (a) Cats are to be screened under infectious disease protocol (above) and results provided to staff veterinarian for documentation.
 - (b) Any caretakers with sero-positive cats will be reviewed on a case-by-case bases with staff veterinarian, curator and Commission veterinarian.
- c. Nursery Protocol:
 - (1) Wash hands before and after handling with betadine solution. Wear clean smock (only used with kitten in nursery).
 - (2) Check body temperature daily. Normal range is 99 to 101°F.
 - (3) Record weight daily under consistent circumstances.
 - (4) Kitten enclosure is to be cleaned and disinfected daily or more, depending on the circumstances.
 - (5) Sterilize bottles and nipples in boiling water for 10 minutes before every feeding.
 - (6) Kittens should be stimulated to defecate or urinate after every feeding.

- (7) Vaccination and anthelmintic protocol to be followed as described above (see IV.D.& E.)

d. Diet

- (1) Kittens less than 8 weeks of age should be fed Kitten Milk Replacer (KMR) by Borden.
 - (a) KMR should be fed based on label formula at a rate of 25 to 40 percent of body weight per day in divided feedings.
 - (b) Kittens should be fed every 2 to 3 hours for first 3 to 4 weeks of age. After this time the frequency may be reduced as the kitten's condition allows.
 - (c) Young kittens should be fed by a bottle and positioned properly during nursing so as not to inhale formula. Older kittens can be fed their milk from a dish.
 - (d) At 3 to 4 weeks of age, meats can be offered to kittens in addition to formula, i.e., feline diet, baby food, etc.
- (2) Kittens 8 weeks of age and older
 - (a) Weaning from a milk diet can be started at this age
 - (b) Kitten is to be weaned onto a commercial balanced meat diet.

e. Post isolation

After initial isolation period or 16 weeks of age, kittens may be maintained as per other age classes.

2. Remaining Age Classes

a. Facility requirements

Must be in compliance with Commission regulations.

- (1) Management house - category I & II panthers
 - (a) Minimum 200 sq. ft. concrete pad, roofed.
 - (b) Seclusion stall to facilitate isolation, immobilization, and crating, not less than

- 25 percent of pad square footage, with adequate ventilation.
- (c) Automatic water desirable.
- (d) Den box - 4'L x 3'H x 2.5'W
- (e) Any chain link should be lined with snow fencing on the interior.
- (2) Outside enclosure
 - (a) Minimum square footage
 - i) Category I panther, 1,600 sq. ft.
 - ii) Category II panther, 3,200 sq. ft.
 - (b) Barrier material should be minimum 9 gauge chain link.
 - i) Covered facility - minimum 8' height.
 - ii) Open facility - minimum 10' height with 3' turnback.
 - iii) Concrete footer or wire, 12" deep.
 - iv) Recommended hot wire at 9' height on inside of barrier.
 - v) Barrier to be lined with wood snow fencing for initial introduction of cats to facility.
 - (c) Furnishings
 - i) Emphasis on natural vegetation to provide animal privacy.
 - ii) Automatic waterer desirable.
 - iii) Provide scratch logs and natural climbing material.
 - (d) Facility should allow for separation of animals and ability to transfer from one compound to another.

b. Diets

- (1) Category I - convert to commercial diet as soon as possible.
- (2) Category II - convert to commercial diet as soon as possible.
 - (a) Periodic feeding of whole food (carcass) once a week, provided food is screened for health consideration, e.g., brown or grey rabbits.

- (b) Conversion to live food only when scheduled for release with adequate time -- 4 to 5 months in advance.

C. Shipment/movement of panthers between institutions

1. Transportation is to be made by participating institutions or if necessary by commercial airlines. No commercial animal dealers or movers are to be used.

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