To Secretary of the Interior Ken Salazar and
the U.S. Fish and Wildlife Service

Petition for Rule-making:

Reintroduction of the Endangered Florida Panther

Center for Biological Diversity
Cougar Rewilding Foundation
One More Generation
The Florida Panther Society, Inc.

Before the Department of the Interior
U.S. Fish and Wildlife Service

WASHINGTON, D.C. 20240

In Re: Florida panther recovery, Florida,)
Georgia. Petition for rule-making to)
ensure recovery of the endangered Florida)
panther, through reintroduction, in)
accordance with Florida Panther)
Recovery Plan and scientific findings.)

TO THE SECRETARY OF THE INTERIOR AND

THE ACTING DIRECTOR, U.S. FISH AND WILDLIFE SERVICE

Petition for Rule-making

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February 10, 2011

The purposes of this Act are to provide a means whereby the ecosystems on which endangered species and threatened species depend may be conserved [and] to provide a program for the conservation of such endangered species and threatened species . . .

Endangered Species Act (1973)

To reintroduce the panther is to reintroduce a giant fear of the wild, and also a giant wonder. It is not our duty to ask which is greater. To have the animal is always greater.

But the landscape the panther first knew is not the present landscape, so unless its ranging acreage is large enough, we have condemned the animal to the fate of living in a zoo. With Pinhook, we are not trying to create a zoological park, where we can gaze at rare animals up close. We are trying to create a place that mimics as closely as possible a natural order. This Pinhook Swamp is a piece of the world we have not stepped too hard on. It holds black bears yet, and sandhill cranes and bobcats. Getting panthers back wouldn't be impossible. Somewhere in its bosom the land aches for its creatures to be returned.

Janisse Ray, *Pinhook: Finding Wholeness in a Fragmented Land* (2005)

Petition for Rule-making

The Center for Biological Diversity, Cougar Rewildling Foundation, One More Generation, and The Florida Panther Society Inc., pursuant to the Administrative Procedure Act and Endangered Species Act[1] petition the Secretary of the Interior and the U.S. Fish and Wildlife Service to reintroduce the Florida panther to the Okefenokee National Wildlife Refuge and nearby suitable lands in south Georgia and north Florida as an experimental population under authority of section 10(j) of the Endangered Species Act (ESA). Section 10(j) provides for "the release (and the related transportation) of any population (including eggs, propagules, or individuals) of an endangered species or a threatened species outside the current range of such species if the Secretary determines that such release will further the conservation of such species."[2] Additionally, the Administrative Procedure Act directs that "[e]ach agency (of the Federal Government) shall give an interested person the right to petition for the issuance…of a rule."[3] Reintroduction necessarily entails rule-making, since section 10(j)(2)(b) of the ESA states: "Before authorizing the release of any population under subparagraph (A), the Secretary shall by regulation identify the population and determine, on the basis of the best available information, whether or not such population is essential to the continued existence of an endangered species or a threatened species."[4]

[1] 16 U.S.C. §§ 1533(h) and 1539(j).
[2] 16 U.S.C. § 1539(j)(2)(A).
[3] 5 U.S.C. § 553(e).
[4] 16 U.S.C. § 1539(j)(2)(B).

BEFORE THE

SECRETARY OF THE UNITED STATES DEPARTMENT OF THE INTERIOR

AND

THE DIRECTOR OF THE UNITED STATES FISH AND WILDLIFE SERVICE

PETITION TO REINTRODUCE THE ENDANGERED FLORIDA PANTHER

CENTER FOR BIOLOGICAL DIVERSITY

COUGAR REWILDING FOUNDATION

ONE MORE GENERATION

THE FLORIDA PANTHER SOCIETY, INC.

Petitioners

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PETITION TO REINTRODUCE THE ENDANGERED FLORIDA PANTHER

EXECUTIVE SUMMARY

This petition filed by the Center for Biological Diversity, Cougar Rewilding Foundation, One More Generation, and The Florida Panther Society Inc. requests that the Department of the Interior and the U.S. Fish and Wildlife Service promulgate regulations for reintroduction of the endangered Florida panther (*Puma concolor coryi*) to the Okefenokee National Wildlife Refuge and/or nearby lands in south Georgia and north Florida as an experimental population under authority of section 10(j) of the Endangered Species Act.

The Administrative Procedure Act provides a vehicle to petition for federal government action to ensure compliance with other statutes. The Endangered Species Act requires conservation of species that are listed as threatened or endangered, and is also intended to conserve the ecosystems on which endangered and threatened species depend. Conservation is defined as use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the act are no longer necessary; in other words, conservation is equivalent to recovery of the species so that it can be taken off the threatened and endangered list. The ESA provides several methods, procedures and measures to accomplish conservation, including propagation, live trapping, transplantation, release and the related transportation of individuals or a population of an endangered species, outside its current range.

The sole extant breeding population of the Florida panther subsists on less than five percent of its original range, with just 100 to 120 animals surviving in South Florida – as a result of historic persecution coupled with loss of most of its habitat. Despite increasing numbers of Florida panthers in recent decades, that population is not yet viable and is increasingly limited by its own density within a shrinking island of habitat. As described in our petition submitted on September 17, 2009, designation of critical habitat is an urgent imperative. The population is also imperiled by loss of genetic diversity which can only be slowed through rapid growth in the

number of surviving panthers – requiring in addition to habitat protection, the translocation of female panthers to areas of currently unoccupied habitat in south-central Florida.

Separate from the need to save the sole existing Florida panther population through protection of habitat and through active management to increase survivorship and distribution, conservation of the panther depends on establishing two additional populations eventually totaling 240 animals apiece, through reintroduction. Successful reintroduction, according to scientists "would help reduce the risk of extinction for the subspecies."[5]

The ESA directs the Secretary of the Interior to develop and implement recovery plans for endangered species. The 2008 revision of the Florida Panther Recovery Plan is the latest of several iterations of the plan to prescribe reintroduction to establish new panther populations in historic habitat – a longstanding agency intention that has yet to be initiated. The 2008 recovery plan refers to the top three ranking sites from a 2006 GIS assessment of nine potential reintroduction sites (Thatcher et al) as the priority areas for reintroduction planning. This petition requests reintroduction into the top ranking of those sites, the Greater Okefenokee Ecosystem in southern Georgia and northern Florida.

In addition to GIS analysis, two live experiments whose results were incorporated into the goals and management actions prescribed in the Florida Panther Recovery Plan, identified the Okefenokee National Wildlife Refuge in south Georgia and the nearby Osceola National Forest in northern Florida, linked by habitats in the Pinhook Swamp, as suitable for reintroduction. The more comprehensive of these two studies, an experimental 1993 release of 19 western mountain lions to this ecosystem, where they were monitored until recaptured in 1995, evaluated a means of establishing a puma population in northern Florida, and documented that 15 of the animals established home ranges. This study found that panther reintroduction to the region is biologically feasible and suggested measures to increase the likelihood of success.[6]

Reintroduction would also aid an ongoing Okefenokee refuge effort to restore and conserve longleaf pine (*Pinus palustris*) forests, rich with now-rare wildlife and reduced to just three percent of their original multi-state range. Feral hogs (*Sus scrofa*) and to a lesser extent white-tailed deer (*Odocoileus virginianus*) consume and destroy longleaf pine saplings and the mature trees' seed cones, hindering efforts to restore this vital ecosystem as well as nearby

[5] Belden, R. C., and J. W. McCown. 1996. Florida panther reintroduction feasibility study. Final Report 7507. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida, pp. 1-2

[6] *Id* at 1.

aquatic ecosystems that rely on fires that longleaf pine forests foster. Both species also feed on and can damage the diverse understory of shrubs, grasses and forbs that is part of the longleaf pine forest. A population of panthers would curb and reduce the herbivory of these two species and enhance the regeneration of a functional longleaf forest ecosystem..

Reintroduction should be authorized through rule-making to designate an experimental population in the Greater Okefenokee Ecosystem, which is determined to be essential to the continued existence of the Florida panther.

Failure to reintroduce Florida panthers in a timely fashion will prevent the conservation of the panther and violates the Endangered Species Act. On this basis, and under the provisions of the Administrative Procedure Act that require a timely and rational response to citizen petitions, the Fish and Wildlife Service must make an affirmative finding on this petition.

I. PETITIONERS

The Center for Biological Diversity ("Center") is a non-profit 501(c)(3) conservation organization dedicated to protecting and restoring imperiled species and their ecosystems. The Center has over 250,000 members and on-line activists, including thousands who reside and recreate in the States of Georgia and Florida. Many of the Center's members and activists spend time in the much-diminished present range of and in the vast historic range of the Florida panther -- including within the latter category the Okefenokee National Wildlife Refuge and contiguous lands. A large part of their enjoyment of habitats in south Florida, where panthers still reproduce and function as a population, stems from the knowledge that panthers survive there, and that they have the opportunity to observe a panther or its tracks or other sign. Our members' and activists' enjoyment of habitat within the historic range of the panther stems in part from hope, however tenuous, that a roaming panther or its sign may yet be glimpsed therein – and through anticipation that the terms of the Florida Panther Recovery Plan calling for reintroduction and establishment of additional panther populations, which would persist no matter what the fate of any individual panther, might still occur within their lifetimes and before it is too late for this unique felid and for its ecosystems.

The Cougar Rewilding Foundation is a non-profit 501(c)(3) conservation organization dedicated to restoring viable cougar populations in suitable portions of their former range in the

central and eastern United States. Cougar Rewilding Foundation members live in Georgia, Florida and other states with cougar habitat, advocate responsible management and protection of cougars that recolonize former habitats and reintroduction of the Florida panther to suitable areas of its historic range. Members also travel to South Florida to track Florida panthers, and look forward to the time when they can see evidence of cougars and benefit from this top predator's rightful place in its natural ecosystems elsewhere in the Southeast.

The Florida Panther Society, Inc. is a non-profit, educational organization founded in 1994 and dedicated to protecting Florida panthers and recovering them through reintroduction to historic range. Based in north Florida near the Okefenokee National Wildlife Refuge, the Florida Panther Society was an active participant in the U.S. Fish and Wildlife Service Florida Panther Recovery Team, contributing to the development of the 1995 and 2008 recovery plans. The Florida Panther Society engages in science-based outreach to promote panther recovery, educating thousands of people annually at public festivals, through presentations to schools, clubs, civic organizations, and libraries, and additionally through media.

One More Generation is a nonprofit organization in Fayetteville, Georgia dedicated to the preservation of endangered species and our environment whose goal is to ensure all endangered species survive at least One More Generation… and beyond. One More Generation was founded by two elementary students, Carter (now age 9.5) and his sister Olivia (age 8). One More Generation has helped collect animal-rescue supplies for the Gulf Oil Spill cleanup efforts, advocated to local officials opposition to destructive and wasteful "rattlesnake roundups" in Georgia, raised money to support the Ann Van Dyk Cheetah Center in South Africa, met with an aide for U.S. representative Lynn A. Westmoreland in an effort to gain support for the Ocean Acidification Act (H.R.-14), worked with the county commissioner for Athens, Georgia on a Plastic Bag Ban proposal, and partnered with several national agencies in an effort to create a program for kids throughout the United States to get involved with helping to save endangered species. One More Generation is eager to help enable reintroduction of endangered Florida panthers back to their habitats in the Greater Okefenokee Ecosystem.

II. INTRODUCTION: RECOVERY OF FLORIDA PANTHERS WILL BENEFIT NATURAL ECOSYSTEMS AND THOSE ECOSYSTEMS WILL SUSTAIN THE PANTHER

The recovery program for the Florida panther (*Puma concolor coryi*) is intended to fulfill a pledge in the Endangered Species Act to conserve endangered species and the ecosystems upon which they depend. The Greater Okefenokee Ecosystem of northern Florida and southern Georgia evolved with panthers. The deer, raccoons and other wildlife on which panthers prey developed over thousands of years their alertness and other survival traits in part to avoid predation by panthers. Reintroduction of panthers to facilitate recovery would also restore the ecological role of a large stalking and pouncing predator in enhancing the vigor and health of deer and other species of animals and plants.

Furthermore, the biologically rich but much reduced longleaf pine plant associations in the Greater Okefenokee Ecosystem are sensitive to herbivory by non-native feral hogs and by deer, which are no longer kept in check by or required to exercise wariness over panther predation. The longleaf plant community would return to more natural conditions, and benefit many other species including other endangered wildlife, through panther culling of these animals and through resumption of deer's natural browsing behavior. Unhindered restoration of the longleaf pine forest would also benefit nearby wetland habitats that, counter-intuitively, depend on the periodic incursions of natural fires carried along by the flammable grass understory beneath the longleaf pines.

Not only would the Greater Okefenokee Ecosystem benefit from reintroduction of panthers, but the Florida panther would greatly benefit from use of habitats in this ecosystem and beyond. Sustaining the Florida panther's limited genetic diversity is dependent, in part, on increasing panther numbers through establishing a metapopulation with habitat connectivity sufficient for some individual panthers to successfully travel between populations. Given the capacity of panthers to disperse hundreds of miles, and assisted by active habitat protection and management, reintroduction can play a key role in preserving the subspecies' remaining genetic diversity. We envision a breeding metapopulation of Florida panthers from Big Cypress to the Okefenokee, and beyond.

III. ADMINISTRATIVE PROCEDURE ACT

The Administrative Procedure Act of 1946 is one of three statutes, along with the National Environmental Policy Act and the Freedom of Information Act, that together operate as a three-legged legal stool connecting citizens to their government and supporting the integrity of federal decision-making. The APA provides citizens with a means to compel issuance of government rules that are unlawfully withheld or unreasonably delayed, and to overturn government action that is arbitrary, capricious, or an abuse of discretion.

The APA attends to the form of governmental rule-making, not its substance. The Act does not provide a cause of legal action in the absence of a relevant statute whose violation forms the legal basis for the complaint. The standards for unlawful withholding or unreasonably delaying action, and for arbitrary, capricious or abusive rule-making, come from other statutes. This petition is filed pursuant to the APA and with reference to the authorities and requirements of the ESA, whose means and ends provide the legal and managerial context for this petition.

The Supreme Court has held in interpreting the APA that "an action called for in a plan may be compelled when the plan merely reiterates duties the agency is already obligated to perform."[7] The ESA obligates the FWS to conserve and recover the Florida panther. As this petition demonstrates, the agency developed and revised a Florida Panther Recovery Plan which specifies how recovery can occur and, conversely, what conditions will inevitably lead to failure to recover the panther and its eventual extinction. The recovery plan makes clear that reintroduction is necessary for recovery.

IV. ENDANGERED SPECIES ACT

Congress passed the Endangered Species Act in 1973 in order "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved [and] to provide a program for the conservation of such endangered species and threatened species."[8] Reintroduction of the Florida panther would provide a means of

[7] *Norton v. Southern Utah Wilderness Alliance*, 542 U.S. 55, 71 (2004).
[8] 16 U.S.C. § 1531(b).

conserving the ecosystems on which the Florida panther's survival and recovery depends, and is also a necessary and time-sensitive component of the ongoing recovery program.

A. Conservation

Once a species (or subspecies or population) is placed on the threatened and endangered species list, the ESA mandates its conservation. The act defines "conserve," "conserving," and "conservation" as "to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the Act] are no longer necessary."[9] That means that conservation is to continue until the goal of recovery has been assured. The law instructs Federal agencies to utilize their authorities to effect conservation. The ESA specifies conservation methods, procedures and authorities that may be used to affect recovery – such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, transportation, transplantation, release, critical habitat designation, consultation, prohibiting or restricting take, and recovery planning. While not all authorities are appropriate for use for all endangered species, no authority may be withheld if it is necessary to recover a particular endangered species. The recovery planning, propagation, live trapping, transplantation, release and transportation measures that are mandated in the ESA, including a required finding and associated rule-making as to whether a proposed experimental population is essential or non-essential to the continued existence of the species – when viewed together with the recovery plan and plight unique to the Florida panther – provide the legal basis under which the FWS must make an affirmative finding to this petition for rule-making.

B. Recovery Plans

When a species is protected under the ESA, the Secretary (through FWS) "shall develop and implement plans… for the conservation and survival" of the species – called recovery plans.[10] Recovery plans include a description of site-specific management actions necessary to conserve the species, objective, measurable criteria which, when met, will allow the species to be

[9] 16 U.S.C. § 1532(3).
[10] 16 U.S.C. § 1533(f)(1).

removed from the endangered and threatened species list, and estimates of the time and funding required to achieve the plan's goals and intermediate steps.

FWS approved the first recovery plan for the Florida panther on December 17, 1981, and revised that plan on June 22, 1987, March 13, 1995 and November 1, 2008. The 2008 recovery plan, citing scientific reviews, states "that recovery of the panther depends most critically on establishing additional populations outside of south Florida."[11] The recovery plan calls for establishing three viable, self-sustaining populations of at least 240 panthers each and maintaining them for a minimum of twelve years, and for retaining, protecting or securing sufficient habitat to support these populations, as the delisting criteria. The recovery plan also includes an interim recovery goal, in recognition of the "challenging nature of attaining the recovery criteria." The interim goal is to achieve and maintain a minimum of 80 individuals (adults and subadults) in each of two reintroduction areas within the historic range and to maintain, restore, and expand the south / south-central Florida subpopulation.[12]

To help achieve the interim goal and eventually the goal, the recovery plan's second of three objectives is to "identify, secure, maintain, and restore panther habitat in potential reintroduction areas within the historic range, and to establish viable populations of the panther outside south and south-central Florida."[13] The recovery plan lists 40 specific management actions to be conducted in preparation for and concordant with reintroduction, ranging from "select reintroduction areas . . . [using] top three sites identified by Thatcher et al," to "[e]valuate the need for and, if appropriate, designate experimental populations [u]nder section 10(j) of the ESA" -- and including this all-important management action: "Develop a protocol and release panthers into selected reintroduction sites."[14] Yet none of these management actions, which the recovery plan lists to actualize a reintroduction program, have as yet been initiated since approval of the recovery plan in November 2008.

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[11] FWS, Florida Panther Recovery Plan (2008)(hereinafter "Recovery Plan"), p. 76.
[12] *Id.* at xi-xii.
[13] *Id.* at x.
[14] *Id.* at 115, 118, 119.

The recovery plan also identifies 41 public outreach and education actions to address the threat of human intolerance toward panthers,[15] and the majority of these actions that are specifically intended to facilitate reintroduction are likewise not being implemented. Progress on reintroduction is not intended to be dependent on progress in outreach and education or slowed by inaction in these realms. Yet, the U.S. Fish and Wildlife Service cites its own failure to make progress on education as an excuse not to make progress on reintroduction itself: "Due to many factors, including a lack of public awareness and acceptance, reintroduction is not feasible at this time," Fish and Wildlife Service spokesman Ken Warren was quoted as saying in the *St. Petersburg Times* on September 24, 2010. For now, he was quoted, "we don't have a timetable for reintroduction."[16]

The recovery plan's executive summary states that "Public support is critical to attainment of recovery goals and reintroduction efforts. Political and social issues will be the most difficult aspects of panther recovery and must be addressed before reintroduction efforts are initiated."[17] Initiation of a rule-making process for reintroduction would spur FWS to begin to ameliorate the perceived "lack of public awareness and acceptance" whereas tthe current inaction in reintroduction serves to allow inaction in education as well – a self-reinforcing paralysis that is at odds with the vigorous conservation mandate of the ESA.

C. Experimental Populations

The ESA provides that

> The Secretary may authorize the release (and the related transportation) of any population (including eggs, propagules, or individuals) of an endangered species or a threatened species outside the current range of such species if the Secretary determines that such release will further the conservation of such species.[18]

Such reintroduced populations, including any offspring arising solely there-from, are *experimental populations*, but only when and at such times as they are wholly separate geographically from non-experimental populations of the same species.[19]

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[15] *Id.* at 119-126.
[16] Craig Pittman, "Studies Confirm both Florida panther success and gloomy outlook," *St. Petersburg Times*, 9/24/2010.
[17] Recovery Plan, ix.
[18] 16 U.S.C. § 1539(j)(2).
[19] 16 U.S.C. § 1539(j)(1).

Members of experimental populations may be accorded lesser protections from take than are other endangered species. Each member of an experimental population is treated as a threatened species, which requires the Secretary to issue regulations, as required under section 4(d) of the ESA, that are necessary and advisable to conserve the species; such regulations may include prohibitions on take but need not be as stringent or categorical as those issued for endangered species that are not designated as experimental.[20]

The ESA also requires the Secretary to issue regulations, before authorizing the release of an experimental population, to identify the population and determine, on the basis of the best available information, whether or not such population is essential to the continued existence of an endangered species or a threatened species.[21] The FWS's general practice in regard to designation of experimental populations for reintroduction has been to issue a single rule designating the experimental population, making a determination as to whether it is essential or non-essential, authorizing releases, and prescribing conservation of the population.[22] Following FWS's customary rule-making upon the inception of any reintroduction program, encompassing not just the determination of whether an experimental population is essential or not but also the entire suite of issues connected with the decision to release a population, including its conservation, is an appropriate approach for Florida panther reintroduction as well.

Those populations that are not essential to the species' continued existence (except when they occur in an area within the National Wildlife Refuge System or the National Park System) are not subject to ESA section 7's requirements for consultation. Furthermore, the FWS may not designate critical habitat for any experimental population determined to not be essential to the continued existence of a species.[23]

As the remainder of this petition demonstrates, FWS may not lawfully withhold or further delay rule-making to initiate a program for the reintroduction of the Florida panther. To do so would be to guarantee the frustration and non-achievement of the ESA's non-discretionary goals through flouting use of the very means that the act provides to ensure success. The Florida panther needs to be reintroduced as an experimental population in order to survive and recover.

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[20] 16 U.S.C. § 1539(j)(2)(C); 16 U.S.C. § 1533(d).
[21] 16 U.S.C. § 1539(j)(2)(B).
[22] See for example the regulations promulgated to reintroduce the northern Rocky Mountain Gray Wolf to Yellowstone National Park (59 FR 60252, 11/18/1994), and the Mexican gray wolf to the Southwest (63 FR 1752, 1/12/1998).
[23] 16 U.S.C. § 1539(j)(2)(C).

V. ECOLOGY OF THE FLORIDA PANTHER

A. Taxonomy and Description

The puma (also known as cougar or mountain lion) is the most widely distributed large, wild, terrestrial mammal in the Western Hemisphere – originally extending from northern Canada to the southern Andes of South America. A habitat generalist and a carnivore in the *Felidae* family, pumas stalk and ambush rather than course their prey, are more solitary than gregarious, and establish and defend home territories.

Florida panthers typically appear ferruginous on their backs, tawny on the sides and pale gray underneath. Adult males weigh an average of 116 pounds and females 75 pounds. The frontal region of their skulls is broader and flatter than in other pumas and their nasal bones are broader and arched higher.[24]

The Florida panther has variously been characterized as its own species, *Felis coryi*; as a subspecies, *Puma concolor coryi*, of the puma; or as a population of the pan-North America subspecies of puma, *Puma concolor couguar*.[25]

The Florida Panther Recovery Plan, third revision, noting that "the degree to which the scientific community has accepted the use of genetics in puma taxonomy is not resolved at this time," cites three genetic studies that find little variation in all pumas in North America, and one of those studies (Culver et al, 2000) that describes the Florida panther as a genetically unique and inbred population.[26] To address symptoms of inbreeding depression, the Florida panther population was bolstered by importation of eight female pumas from Texas, of which the genes of five of these animals are now significantly introgressed into the Florida panther population.[27] These introduced Texas pumas were carefully monitored and removed from the Florida population once the desired breeding occurrence target was achieved, in order to maintain the genetic integrity of the Florida panther and avoid losing unique local adaptations.

Two new analyses of Florida panther genetics find that there were previous arrivals of exogenous pumas within the Florida panther's range, including captive pumas of western U.S.

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[24] Recovery Plan, at 5.
[25] *Id.* at 8, 11-12.
[26] *Id.* at 12.
[27] *Id.* at 6, 70.

origin who had escaped from enclosures on the Big Cypress Seminole Indian Reservation between 1997 and 1999, as well as pumas with some Central American ancestry released into the Everglades between 1957 and 1967. The totality of these introductions has led to admixed genetic ancestry, or heterozygosity, which is associated with increased survival of kittens and other age classes over that of canonical Florida panthers (those with no genetic introgression from exogenous pumas).[28]

The historic range of the Florida panther abutted that of three other putative puma subspecies, including the Texas cougar (*Puma concolor stanleyana*). Beneficial genetic admixture today may serve part of the same function of reducing inbreeding that gene flow between adjoining subspecies originally served.[29]

Florida panthers are the last remaining representation of the race or races of pumas that previously roamed throughout the eastern United States. They are adapted to a warm and wet climate, and could survive and flourish in suitable habitats throughout their historic range.

B. Distribution and Population Trends

Whether regarded as a subspecies or as a population with distinct morphological traits, Florida panthers originally ranged throughout much of the southeastern United States, from Arkansas and Louisiana eastward across Mississippi, Alabama, Georgia, Florida and parts of South Carolina and Tennessee.[30] See map, next page. The historic range was within the humid temperate and humid tropical domains, and included the following physiographic provinces: Central Appalachian Forest, Eastern Broadleaf Forest, Everglades, Lower Mississippi Riverine Forest, Ouachita Mountains, Ozark Mountains, Outer Coastal Plain Mixed Forest, and Southeastern Mixed Forest provinces.[31]

Habitat loss, conflicts with livestock, and decline in their native prey, along with human persecution, led to their extirpation over almost the entirety of that range. Today, the only known

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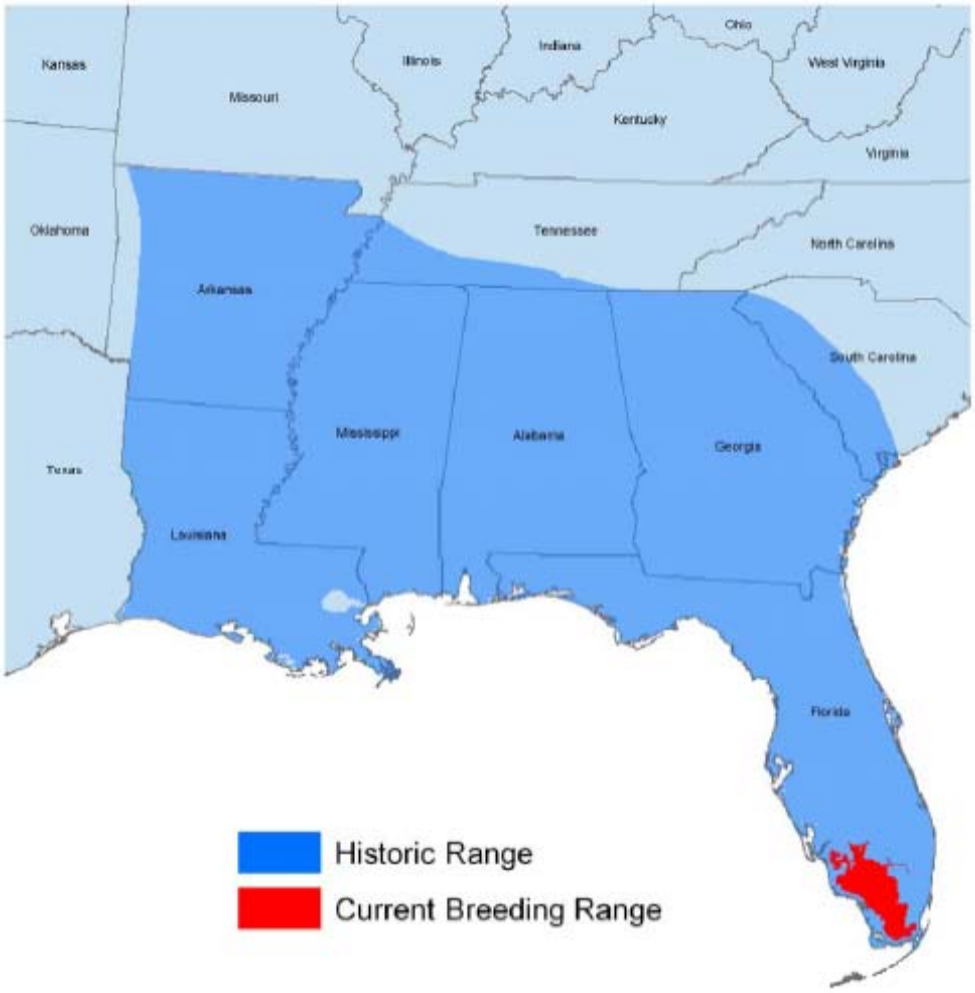
[28] Johnson, W. E., D. P. Onorato, M. E. Roelke, E. D. Land, M. Cunningham, R. C. Belden, R. McBride, D. Jansen, M. Lotz, D. Shindle, J.G. Howard, D. E. Wildt, L. M. Penfold, J. A. Hostetler, M. K. Oli, S. J. O'Brien. 2010. Genetic Restoration of the Florida Panther. *Science* 329, pp. 1642, 1643; Hostetler, J. A., D. P. Onorato, J. D. Nichols, W. E. Johnson, M. E. Roelke, S. J. O'Brien, D. Jansen, M. K. Oli. 2010. Genetic introgression and the survival of Florida panther kittens. Biological Conservation 143, pp. 2789, 2790, 2793.

[29] Johnson et al, 1642.

[30] Recovery Plan, 12.

[31] Thatcher, C. A., Van Manen, F. T. and J. D. Clark. 2006. Identifying Suitable Sites for Florida Panther Reintroduction. Journal of Wildlife Management 70(3):752-763.

reproducing population of the Florida panther is located in the Big Cypress Swamp/Everglades physiographic region on approximately 3,548 square miles south of the Caloosahatchee River in



From Florida Panther Recovery Plan (3rd edition, 2008), Figure 1, p. 176.

the South Florida counties of Collier, Lee, Hendry, Miami-Dade and Monroe.[32] In addition, from 1972 through the present, Florida panthers have been confirmed in the following Florida counties that are north of the Caloosahatchee River: Flagler, Glades, Highlands, Hillsborough, Indian River, Okeechobee, Orange, Osceola, Polk, Sarasota, St. Johns, and Volusia.[33] Furthermore, on November 16, 2008 a Florida panther was shot and killed in west-central Georgia within a few miles of the state border with Alabama.[34]

[32] *Id.* at 4, 13; Young, S. P. and E. A. Goldman. 1964. The Puma: Mysterious American Cat. Dover Publications, New York, New York, pp. 12-31; Parker, 110, 130.

Genetic analysis of current and historic Florida panthers suggests that "the population declined from a relatively high level in the 1890s, went through a bottleneck in Florida in the middle of the last [20th] century, for at least a few generations, and then increased somewhat at the end of the last century."[35] Panther numbers are estimated to have dropped to as low as six animals, perhaps around 1970 when the big cats were believed extinct and prior to field investigations that revealed a few panthers and estimated their total population at 20 to 30.[36]

Since that nadir, the population has slowly increased to an estimated 100 to 120 animals today. The number of uncollared panthers that are captured increased each year between 2000 and 2006. More den sites were known of in 2006 than in 1999. And 2010 is thought to be the most successful year for panther reproduction over the past three years, with the documented birth of 29 panther kittens.[37]

Notably as well, more panthers are believed to have been killed by vehicles in 2006 than 1999, and the years from 2007 to 2010 were the four most lethal years for Florida panthers in recent history.[38] This indicates that the size of the extant Florida panther breeding population in south Florida is increasingly limited by loss and fragmentation of habitat to development.[39] Habitat in the existing breeding range of the Florida panther is saturated at present, as acknowledged in the statement of Florida Fish and Wildlife Conservation Commission panther biologist Mark Lotz in an end-of-2010 news report. Lotz was quoted as follows:

> "Just looking at panther behavior, I think we are kind of pushing the carrying capacity of the habitat down here," Lotz said. "That is part of the reason we have seen panthers north of the Caloosahatchee River. There is no place for them down here, so they are expanding out, and that's what they do naturally."[40]

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[33] Recovery Plan at 15; Cougar Rewilding Foundation database (for record of a 3-year-old male panther killed 6/2005 on I-95 on the Flagler-St. Johns County line).
[34] U.S. Fish and Wildlife Service press release 8/5/2009, http://www.fws.gov/news/newsreleases/showNews.cfm?newsId=F48F71C9-FD69-5C24-650FDEB42F9E60DF, checked on 8/18/2009.
[35] Culver, M., P.W. Hedrick, K. Murphy, S. O'Brien, and M.G. Hornocker. 2008. Estimation of the bottleneck size in Florida panthers. Animal Conservation 11:104-110, p. 109.
[36] *Id*; Recovery Plan, 14.
[37] Recovery Plan, 15; "More Florida panthers born, but habitat shrinks." Herald-Tribune, 12/28/2010, on-line at http://www.heraldtribune.com/article/20101228/ARTICLE/12281040/2055/NEWS?p=1&tc=pg,.
[38] Recovery Plan, 15; data from Florida Fish and Wildlife Conservation Commission, "Florida PantherNet," on-line at http://www.floridapanthernet.org/index.php/reports/ and http://www.floridapanthernet.org/index.php/pulse/.
[39] Kautz et al.
[40] Quotation from "More Florida panthers born, but habitat shrinks." Herald-Tribune, 12/28/2010, on-line at http://www.heraldtribune.com/article/20101228/ARTICLE/12281040/2055/NEWS?p=1&tc=pg,.

C. Reproduction

Male Florida panthers are polygynous, maintaining large, overlapping home ranges containing several adult females and their dependent offspring. Males normally first breed at about three years old, though some may breed as early as 17 months; females on average first breed at two years old, and some as early as 18 months. Courtship and breeding may last from one to seven days, and may be the longest or only period of extensive interaction between mates.[41]

Florida panthers may reproduce throughout the year but most often breed from December to March and bear kittens between March and June. Dens are usually located in dense understory vegetation such as saw palmetto (*Serenoa repens*) and typically house a female and her two or three kittens for up to two months until they are weaned.[42] Young panthers tend to leave their mothers and disperse to seek to establish their own home ranges at 14 to 18 months, but occasionally set out on their own as early as one year.[43]

Until the mid-1990s, male panther fertility was curtailed from cryptorchidism and low sperm quality, a result of inbreeding depression. Those adverse conditions were ameliorated through the 1995 importation of eight female pumas from Texas into the Florida panther population, and the successful introgression of the genes of five of them.[44] As noted, these introduced Texas pumas were removed from the Florida population once the desired breeding occurrence target was achieved.

D. Dispersal

Dispersal is the process by which juvenile Florida panthers leave their mothers and travel to locate home ranges of their own. It is likely that dispersal is in part a response to panthers' territorial imperatives. Because dispersal of their progeny may induce females to mate and reproduce again, and because those juveniles that successfully establish home ranges are thereby facilitated in future matings, dispersal is crucial in reproduction, population growth, and range expansion. But with shrinking habitat available for dispersal of Florida panthers, "successful

[41] Recovery Plan, 16, 21.
[42] *Id.* at 16.
[43] *Id.* at 17, 18.
[44] *Id.* at 6, 70.

male recruitment appears to depend on the death or home-range shift of a resident adult male."[45] Conversely, habitat loss and thwarted dispersal has led to mortality caused by other panthers; intraspecific aggression accounts for 42% of all mortalities among radio-collared panthers.[46]

Juvenile male panthers travel an average of 25 miles in dispersal to establish new home ranges, with a maximum recorded dispersal distance of 139.2 miles followed by a secondary dispersal of 145 miles for one animal. Female panthers disperse shorter distances and usually establish home ranges less than one average home range width from their natal range. Most panther dispersal occurs south of the Caloosahatchee River, with only 20 male panthers confirmed north of the river since 1972, but no females nor reproduction documented north of the river since 1973. The river itself is channelized and not a significant barrier to panther movements, but development and roads, including State Route 80, may be restricting panther dispersal northward.[47] Vehicle collisions account for 19% of deaths of radio-collared panthers.[48]

E. Movements within Home Ranges, and Intraspecific Interactions

Resident adult Florida panthers are largely nocturnal and move extensively within home ranges, not uncommonly moving twelve miles in a night. Peak panther activity occurs around sunrise and after sunset. They do not return to the same resting site day after day, with the exception of females with dens or panthers remaining near kill sites for several days. The sizes of panther home ranges are influenced by habitat quality, prey density, and landscape configuration. Male panthers have significantly larger home ranges than females. Home ranges for adult male resident panthers typically encompass 140 to 251 square miles, while adult resident females typically range across 69 to 153 square miles. Home ranges for temporarily introduced female pumas in north Florida were approximately half the size of home ranges for female Florida panthers in south Florida, likely due to more productive habitat in north Florida and southern Georgia.[49]

Panthers announce their territories through scrapes raked up by the hind feet and marked by urine and occasionally by feces. Most of a panther's life is solitary, interspersed with

[45] *Id.* at 17, quoting Maehr et al 1991.
[46] *Id.* at 17.
[47] *Id.* at 18, 19.
[48] Recovery Plan, 17.
[49] Belden, R. C., and J. W. McCown. 1996. Florida panther reintroduction feasibility study. Final Report 7507. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida, p. 12.

intraspecific interactions. Among those, three types of non-aggressive interaction predominate: courtship and mating, adult female rearing of kittens, and among independent subadult males. In addition, male panthers attack each other, and such incidents are the most common cause of male mortality as well as an important determinant of male spatial and recruitment patterns. Aggressive interactions between adult males and females also occur and may be precipitated by defense of a kill and/or by male attacks on and female defense of kittens.[50]

F. Food

Florida panthers primarily feed on white-tailed deer and feral hogs. Their diets vary geographically in south Florida, with deer predominating north of I-75 and hogs south of the Alligator Alley section of Interstate 75, as measured by biomass. In addition to their primary diets of deer and hogs, secondary prey includes raccoons (*Procyon lotor*), nine-banded armadillos (*Dasypus novemcinctus*), marsh rabbits (*Sylvilagus palustris*) and alligators (*Alligator mississippiensis*).[51]

G. Habitats and Range

Florida panthers in south Florida inhabit a mosaic of habitats in rough proportion to their availability within home ranges. While telemetry data indicate that panthers prefer forested cover types and in particular cypress swamps, pinelands, hardwood swamps, and upland hardwood forests, such data has been criticized as inaccurately measured and based solely on diurnal locations when in fact panthers are largely nocturnal and crepuscular. Panthers hide in small forest patches and use the cover of their edges to stalk and ambush prey.[52] However, at night they also move through and hunt in open areas such as freshwater marshes and agricultural fields which support many of their prey. As such, both open and forested areas have been identified as essential habitat and included in the Primary, Secondary, and Dispersal zones identified by Kautz et. al. and identified in the recovery plan as priorities for habitat conservation.[53]

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[50] Recovery Plan, 17, 19-21.
[51] *Id.* at 21-22.
[52] *Id.* at 28-29; Gross, 1527.
[53] Recovery Plan, 27.

Over their historic range, Florida panthers were similarly reported from a variety of habitats. As their distribution contracted, hard-to-access wetlands and bottomlands served as their last strongholds, and not just in south Florida. For example, an 1854 report from Mississippi stated: "The Panther is now rarely met with, except in dense and extensive swamps and canebrakes." A 1921 report from Louisiana stated: "The few cougars remaining in the State appear to be pretty well concentrated in the bottoms, especially canebrakes along the Black, Tensas, and Ouachita Rivers"[54] And in 1920, in one of the last panther reports in Georgia, U.S. Biological Survey assistant biologist Francis Harper, in summarizing the animal life of the "Okefinokee Swamp," stated that "several panthers have been recorded about its borders within the past few years."[55]

VI. THE GREATER OKEFENOKEE ECOSYSTEM

"Okefinokee Swamp in southeastern Georgia is one of the greatest natural wonders of North America,"[56] exulted the Bureau of Biological Survey's Francis Harper, in 1920, in urging his own agency, predecessor to the U.S. Fish and Wildlife Service, to support federal acquisition of the swamp for protection as a national wildlife refuge. This goal was achieved with the 1937 establishment of the Okefenokee National Wildlife Refuge managed first by the Biological Survey.[57]

A. Okefenokee Refuge and Ecosystem as Part of Regional Landforms

The Okefenokee National Wildlife Refuge is situated in the southeastern Georgia counties of Ware, Charlton, and Clinch and northeastern Florida's Baker County, roughly between latitudes 30o33' and 31o05' North and longitudes 82o07' and 82o33' West. The refuge

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[54] Young & Goldman, 23, 25.

[55] Francis Harper, "Okefinokee Swamp as a Reservation," Natural History. Jan-Feb 1920, p. 29. A more specific though possibly apocryphal account of a panther in the region comes from the pre-presidential Theodore Roosevelt, who wrote of one of his "ancestral relatives, a Georgian" who "moved down to the wild and almost unknown country bordering on Florida . . . surrounded by jungles in which all kinds of wild beasts swarmed," and whose male slave of "colossal strength" and "fierce and determined temper" was killed one night by a panther that ambushed him in the "gloomy, lonely recesses of the swamp." According to Roosevelt, the unnamed slave, armed with a knife, had also succeeded in killing the panther. (Theodore Roosevelt, *Hunting Trips of a Ranchman* (1885), pp. 27-28.)

[56] Harper, map annotation, pp. 30-31

[57] U.S. Fish and Wildlife Service. 2006. Okefenokee National Wildlife Refuge Comprehensive Conservation Plan, Atlanta, GA, at 73. (Hereinafter "Okefenokee Conservation Plan")

presently consists of 401,880 acres, 395,080 of which are currently managed by the Fish and Wildlife Service (with a donated 6,800 acres not under FWS management until 2081), and with an additional 117,600 acres beyond the current refuge acres slated for eventual refuge expansion to an approved size of 519,480 acres. Within the refuge, 353,981 acres are designated wilderness (consisting of the third-largest National Wilderness Area east of the Mississippi River).

In 1986, the Okefenokee refuge was designated by the Wetlands Convention as a Wetland of International Importance. But the refuge is not the entirety of the ecosystem. Nearby Osceola National Forest, privately-owned timberlands, and state-owned forests push the total of contiguous wildlife habitat in the Greater Okefenokee Ecosystem to over a million acres (including the refuge lands), which include not just the immense wetlands of Okefenokee Swamp (the second largest freshwater wetland in the eastern United States, after the Everglades) within its eponymous wildlife refuge, but also the Pinhook Swamp, other cypress and bay swamps, upland pine forests, oak hammocks, and small isolated wetlands.[58] See map, next page.

The Greater Okefenokee Ecosystem with the Okefenokee refuge at its core can also be seen as a northern portion of the North Florida Ecosystem as designated by the FWS based on watersheds, and as a southern portion of the South Atlantic Coastal Plain physiographic area as designated by the Partners-in-Flight initiative. The North Florida Ecosystem includes parts of south Georgia and most of north and central Florida. The northern boundary of this ecosystem includes the watersheds of the St. Marys River and the Suwannee River, including the Okefenokee Swamp which serves as their headwaters. The ecosystem contains southern temperate and subtropical climates, numerous physiographic districts, and many unique and widely varied habitat types, which, besides the wetlands of the Okefenokee Swamp, include barrier islands, xeric scrub, pine flatwoods, freshwater marshes, lakes, streams and springs, mixed hardwood/pine forests, cypress swamps and domes, dry prairies, maritime forests, hardwood hammocks, estuarine marshes, pine rocklands, sandhill woodlands, coastal strands, sawgrass prairies, sloughs, and tree islands.[59]

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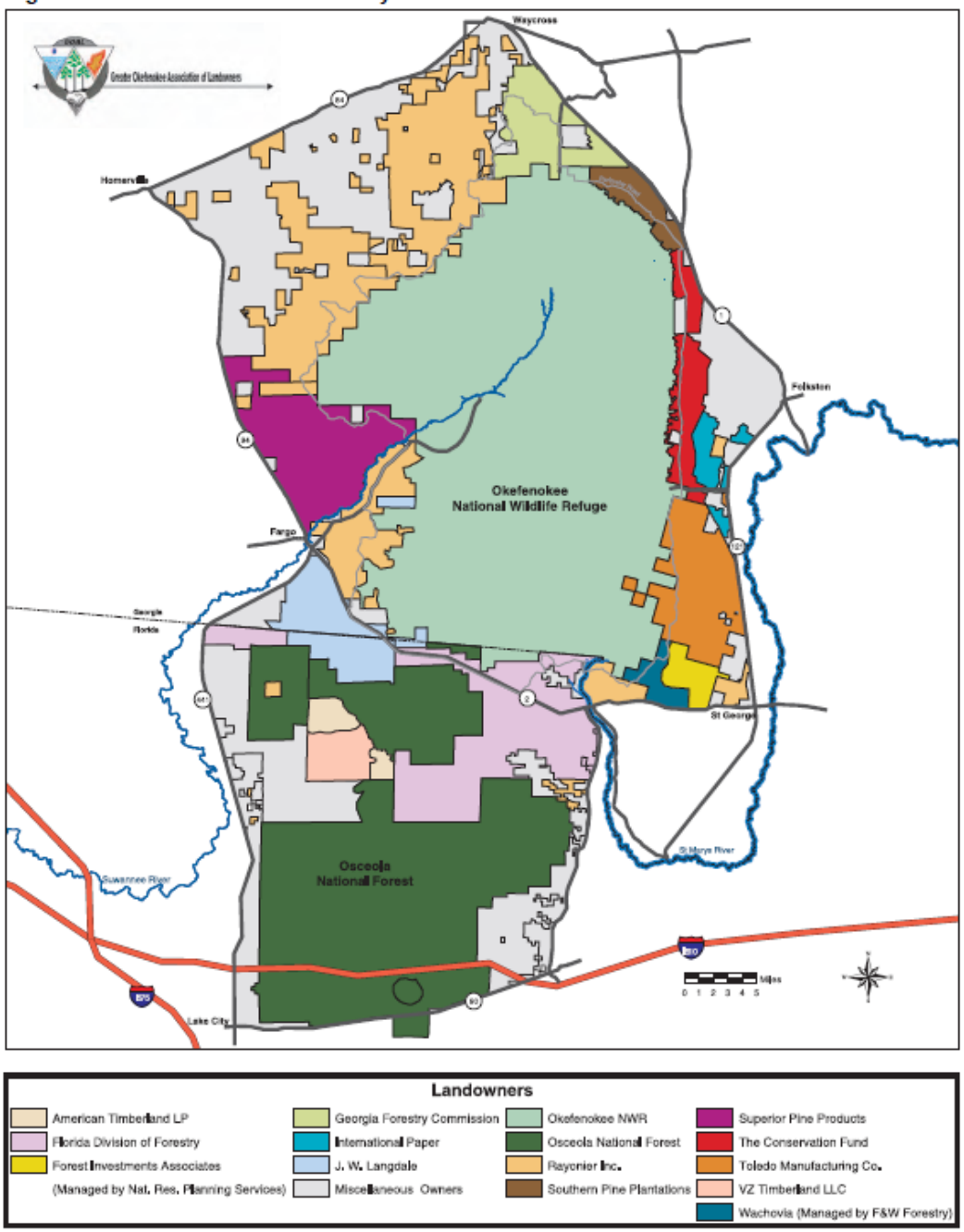
[58] Harper, 29; Okefenokee Conservation Plan, 3-6, 12.
[59] Okefenokee Conservation Plan, 9, 12.

Figure 6. Greater Okefenokee Ecosystem And Its Landowners



Section A. Comprehensive Conservation Plan 13

From: Okefenokee National Wildlife Refuge Comprehensive Conservation Plan, p. 13.

The South Atlantic Coastal Plain covers northeastern Florida, the southern half of Georgia, and the eastern halves of South Carolina and North Carolina. Its western boundary is

the fall line that marks the beginning of the hilly Piedmont and its eastern boundary is the Atlantic Ocean. As part of a continuous coastal plain that extends from New York to Texas, it has arbitrary boundaries at the Alabama-Georgia border and at the North Carolina-Virginia border, extending into the southeast corner of Virginia only to capture the Great Dismal Swamp.[60]

B. Longleaf Pine and Fire Help Shape an Ecosystem

Originally, fire determined the overstory and ground cover species dominating the uplands within the Okefenokee refuge and throughout the South Atlantic Coastal Plain, and indirectly, also helped evolve many of the region's and the refuge's wildlife species.[61] Fire-maintained longleaf pine forests historically dominated the South Atlantic Coastal Plain and inland on sandy soils. The Southeast once supported 60 to 92 million acres of longleaf pines, an upland plant association that supports a wide array of now-rare wildlife including the red-cockaded woodpecker, gopher tortoise, and indigo snake. (In other types of habitats, a mixture of shortleaf pine (*Pinus echinata*) and loblolly pines (*Pinus taeda*), as well as hardwoods, prevailed.)

The fine, resinous, wiregrass understory to the longleaf pine community promoted the spread of frequent, low-intensity wildfires over vast areas, killing seedlings of competing pine species as they attempted to invade the uplands from the edges of swamps, ponds, and river bottoms. The fire-resistant longleaf pine seedlings and mature pines survived, thus perpetuating the open park-like longleaf pine community. Growing season fires, during the normal lightning season, stimulated the seeding of new clones of wire grass and other community plants, while setting back growth of tall shrub species, such as gallberry (*Ilex coriacea*), palmetto, and hurrah bush (*Lyonia lucida*). The understory components and structure of longleaf pine communities provided habitat used by numerous wildlife species.

Upland fire, in addition to perpetuating longleaf community species, created additional habitat diversity by acting with other natural disturbances to create openings in the mature forest overstory. Over many hundreds of years, the regular occurrence of new openings resulted in the

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[60] *Id.* at 9.
[61] *Id.* at 9, 19.

traditional, multi-aged longleaf pine forest. As the new openings seeded in to create new age classes, fire, in turn, destroyed less fire-resistant seedlings, maintaining the pure longleaf stand. During pre-settlement times fire in the longleaf pine association was frequent and widespread; on the uplands surrounding the Okefenokee Swamp fires burned every one to three years.[62]

Fire also played an important part in the formation of the Okefenokee Swamp. The entire floor of the swamp is covered by a bed of peat varying from a few inches thick at the swamp's edge to 3 to 15 feet thick in the swamp's interior. In scrub/shrub and forested areas, the root mat covering the surface of the peat is usually at about the average water level. Most of the peat surface is covered with bog forest or dense scrub/shrub. Approximately 31,246 acres of the swamp (8 percent) are open marshes or "prairies" varying in size up to several thousand acres. Depending on water levels, the peat surface in the prairies is covered with a few inches to two or three feet of water. Most of these prairies are believed to be the result of very severe fires, which killed the woody plants and burned away part of the upper peat bed. However, fires over the past 150 years have not been severe enough to change large areas of forests or shrub to prairies or lakes.[63]

Finally, fires that burned pockets of peat created most of the isolated and ephemeral prairie lakes and ponds in the Okefenokee refuge, and maintained their hydrology. These evanescent wetlands are interspersed throughout the uplands and provide critical reproductive habitat for amphibians and invertebrates (that flourish in part in the absence of resident predatory fish), and that include the flatwoods salamander (*Ambystoma cingulatum)*, striped newt (*Notophthalamus perstriatus*), and gopher frog (*Rana areolata aescpus*).[64]

Logging, fire suppression, conversion to other land uses, and maintenance of short-rotation pine plantations have promoted the growth of the woody understory and eliminated 97% of the longleaf pine community.[65] Furthermore, the prairies and the prairie lakes and ponds are now slowly but steadily reverting to swamp forest, to the detriment of sandhill crane (*Grus Canadensis*), bitterns (*Botaurus* ssp.), rails (*Rallidae* ssp.), gallinules (*Porphyrio* ssp.), herons (*Ardea* ssp.), ibises (*Threskiornithidae* ssp*)*, ospreys (*Pandion haliaetus)* and roundtail muskrats

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[62] *Id* at 9, 19.
[63] *Id.* at 20, 36.
[64] *Id.* at 20-21, 25, 44, 56.
[65] *Id.* at 9, 70, 71; Taylor Schoettle. 2005. A Naturalist's Guide to the Okefenokee Swamp. Darien Printing and Graphics, Darien, GA, p. 43.

(*Neofiber alleni*), among other species.[66] Restoration of fire would benefit these lowland habitats, but is in large part dependent on restoration of the nearby fire-maintained, upland longleaf pine forests.

Although upland forests comprise only nine percent of the Okefenokee refuge's land, these are the most intensively managed habitats. Thirty-thousand acres of upland forests are scattered around the perimeter of and in islands within the swamp. The primary management objective on these refuge lands is the restoration, maintenance, and protection of longleaf pine communities.[67]

The FWS plants longleaf pines, cuts competing trees, and prescribes and ignites fires to stem and attempt to reverse the twinned ecological losses of fire and longleaf pine communities in the Okefenokee refuge. Initial longleaf pine planting efforts were hampered due to the heavy understory resulting from changes in the fire regime, and slash pine usually ended up planted in the originally intended longleaf site. Recent increased use of fire and selective logging has increased longleaf regeneration success.[68]

However, feral, non-native hogs and to a lesser extent white-tailed deer threaten longleaf regeneration. Hogs eat the longleaf pine's taproot, larger lateral roots, succulent inner bark, and the fallen pine seeds. Hogs can completely eliminate a longleaf pine regeneration area in three to five years. Deer herbivory is less of a factor in longleaf regeneration but nevertheless raised a concern among refuge managers in the 1980s[69] – and could in the future aggravate the impacts of hogs on regeneration sites.

Reintroduction of Florida panthers to the Greater Okefenokee Ecosystem would curb and reduce the hog and deer herbivory on longleaf pine saplings, and thus aid in the restoration of the almost-vanished longleaf pine community that once was so common throughout the South Atlantic Coastal Plain. In so doing, panther reintroduction would help conserve the Okefenokee refuge's ecosystem. Mule deer in an arid western ecosystem, Zion National Park in Utah, have similarly been noted to browse on cottonwood (*Populus fremontii*) seedlings and thus depress recruitment in an area where pumas are absent or rare, causing an ecologically-adverse trophic cascade; while browsing deer were seen to do less damage in a nearby canyon where pumas were

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[66] Okefenokee Conservation Plan, 20.
[67] *Id.* at 211.
[68] *Id.* at 71, 76-78.
[69] *Id.* at 70; Sarah Aicher, Okefenokee refuge biologist, telephone conversation on 7/30/2010.

prevalent.[70] It is reasonable to expect similar if as-yet unquantifiable results involving white-tailed deer in the Greater Okefenokee Ecosystem.

C. Florida Panther Habitat in the Greater Okefenokee Ecosystem.

Several studies have assessed the feasibility of reintroduction and the habitat suitability for Florida panthers in the Greater Okefenokee Ecosystem. Two studies, conducted from 1988 - 1989 (Belden and Hagedorn) and from 1993 - 1995 (Belden and McCown), evaluated the feasibility of reintroducing panthers into the Greater Okefenokee Ecosystem. In 1988, seven pumas captured in west Texas were released in north Florida as surrogates for evaluating the feasibility of translocating Florida panthers. The pumas included three adult males, three adult females, and one yearling female. They were monitored from 1988 – 1989 and were found to establish overlapping home ranges and to kill large prey, consisting of 67% white-tailed deer, 22% wild hogs, and 11% domestic goats. Three pumas died during the study, one of unknown cause found floating in the Suwannee River, and two suspected or known to have been shot. Results indicated methods for reducing puma-human interactions, such as placing release pens as far as possible from humans and livestock. The authors recommended additional research on the feasibility of panther translocation with a larger initial stocking rate of 10 - 20 pumas to ensure that a social structure can be established if some of the animals do not survive.[71]

Beginning in 1993, 19 mountain lions (*Felis concolor stanleyana*), 11 females and eight vasectomized males, were released into the Osceola National Forest and Pinhook Swamp within the Greater Okefenokee Ecosystem in north Florida. Six of the pumas were born and raised in captivity, 10 were captured in the wild in western Texas and translocated to Florida, and three were captured in the wild in western Texas and held in captivity in Florida for two to eight years prior to release. They and their progeny (conceived despite sterilization) were monitored via radio-telemetry until the 1995 conclusion of the study, at which point they were removed. The exogenous pumas served as surrogates for evaluating the feasibility of reintroducing Florida panthers. The study found that fifteen pumas established home ranges, and that reintroduction to

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[70] Ripple, W.J. and Beschta, R.L. Linking a cougar decline, trophic cascade, and catastrophic regime shift in Zion National Park. Biological Conservation 133, 2006: 397-408.

[71] Belden, R. C. and B. W. Hagedorn. 1993. Feasibility of translocating panthers into northern Florida. Journal of Wildlife Management, 57(2)388-397.

the region is biologically feasible. The study also found that "deer densities in northern Florida and southern Georgia appear to be sufficient to provide for panther nutritional demands while having minimal impact on a huntable surplus. Furthermore, the availability of wild hogs and other small prey not only add to the panthers diet, they also lessen the number of deer required."[72] The study showed that home ranges for females in north Florida were approximately half the size of home ranges for female panthers in south Florida, likely due to more productive habitat in north Florida and southern Georgia. Finally, the study noted that a 1995 public opinion survey found 80.7% of respondents in the northern Florida counties near the release site (Columbia, Hamilton, Baker, Suwannee and Union) supported efforts to save the Florida panther from extinction, and 75% of these northern Florida respondents near the release site supported reintroduction.[73]

A 2006 GIS study by Thatcher et al sought to identify prospective sites for Florida panther reintroduction within the historic range based on quantitative landscape assessments. With the help of expert opinion, nine potential reintroduction sites of sufficient size to support a panther population were identified: 1) Ozark National Forest region; 2) Ouachita National Forest region; 3) southwest Arkansas; 4) Felsenthal National Wildlife Refuge region in Arkansas; 5) Kisatchie National Forest region in Louisiana; 6) Homochitto National Forest region in Mississippi; 7) southwest Alabama; 8) Apalachicola National Forest region in Florida; and 9) Okefenokee National Wildlife Refuge region in Georgia. In addition, the study evaluated the current range of the panther population in south Florida. The study ranked the potential reintroduction sites based on models that utilized three landscape and four human-influence variables on the landscape: 1) percentage of natural land cover, 2) spatial aggregation of natural landcover patches, 3) habitat patch density, 4) human population density, 5) minor road density, 6) major road density, and 7) percentage of urban land cover.

The evaluation ranked the Okefenokee refuge region first among the nine based on an aggregate of factors. The study recommended that the top three sites identified should be considered for further evaluation as potential reintroduction sites, including through field surveys of local habitat conditions and localized prey densities, as well as evaluation of sociopolitical

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[72] Belden, R. C., and J. W. McCown. 1996. Florida panther reintroduction feasibility study. Final Report 7507. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida, p. 12.

[73] *Id.*

information such as public attitudes towards carnivore reintroduction in the chosen reintroduction sites.[74]

VII. THE FLORIDA PANTHER CANNOT BE CONSERVED UNLESS A REINTRODUCTION PROGRAM IS INITIATED SOON

A. Florida Panther Recovery Plan Requires Timely Reintroduction

As noted, the Florida Panther Recovery Plan explicitly calls for reintroduction to two areas within historic range to establish additional populations, prescribes steps to guide that process, and calls for use of the "top three sites identified by Thatcher et al as a starting point" in identifying reintroduction areas.[75] The recovery plan also outlines five broad "Actions Needed" as follows:

1. Maintain, restore, and expand the panther population and its habitat in south Florida.
2. Expand the breeding portion of the population in south Florida to areas north of the Caloosahatchee River.
3. Identify potential reintroduction areas within the historic range of the panther.
4. Reestablish viable panther populations outside of south and south-central Florida within the historic range.
5. Secure, maintain, and restore habitat in reintroduction areas.
6. Facilitate panther conservation and recovery through public awareness and education.[76]

In an accompanying chart of estimated expenditures listed by the five recovery actions, each action is accompanied by expenditures in each of five sequential years.[77] In other words, according to the 2008 recovery plan, progress on reintroduction as specifically described in the list of management actions (see Part IV, B, above) should be occurring now and not at some future unspecified date.

B. Habitat Degradation, Loss and Fragmentation

Habitat loss, fragmentation, and degradation, and associated human disturbances, are the greatest threats to Florida panther survival. For that reason, the recovery plan delineates areas

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[74] Thatcher, et al.
[75] Recovery Plan, 115.
[76] *Id* at xiii.
[77] *Id* at ix.

essential to the extant population's survival and calls for robust measures to ensure their protection – an as-yet unmet need necessitating designation of critical habitat in south Florida. The recovery plan identifies a Primary Zone consisting of lands essential to the long-term viability and persistence of the panther in the wild; a Secondary Zone that is contiguous with the Primary Zone, currently used by few panthers, but which could accommodate expansion of the panther population south of the Caloosahatchee River; and a Dispersal Zone that may facilitate future panther expansion north of the Caloosahatchee River. The Primary Zone is currently occupied and supports the breeding population of panthers. Although panthers move through the Secondary and Dispersal Zones, these are not currently occupied by resident panthers.[78]

Habitat loss, fragmentation and degradation not only threaten the panther's survival, but its recovery as well. Throughout Florida in the half-century between 1936 and 1987, croplands and rangelands increased by 30%, urban areas increased by an astounding 538%, and, commensurately, herbaceous wetlands and forests decreased by 56% and 21%, respectively. That loss of forest alone represents the habitat for the potential home ranges of between 35 to 70 male panthers and 100 to 200 females. Between the mid to late 1980s and 2003, over 5,000 additional square miles of natural and semi-natural lands were developed, urbanized, and/or converted to agriculture.[79]

Habitat loss, fragmentation and degradation continue today throughout the multi-state historic range of the panther, largely driven by human population growth. For example, the human population of Florida increased from 87,000 to over 17 million between 1850 to 2000, and that trend is projected to continue. Conversion of rangelands with significant value to panthers into row-crop agriculture and urban development that has minimal value for panthers continues to replace, degrade, and fragment panther habitat.[80] The recovery plan states:

> Potential panther habitat throughout the Southeast continues to be affected by urbanization, residential development, conversion to agriculture, mining and mineral exploration, lack of land use planning, and other sources of stress (Appendix B). With human population growth and increased human disturbance, the extent of potentially suitable habitat remaining in the Southeast is expected to decrease. Habitat loss,

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[78] *Id* at 27, 101-107, 110; Robinson, M. J. 2009. Petition for rule-making: critical habitat designation for the endangered Florida panther; submitted to the Secretary of the Interior and posted on-line at http://www.biologicaldiversity.org/species/mammals/Florida_panther/pdfs/Florida_Panther_Critical_Habitat_Petition.pdf, Center for Biological Diversity.

[79] Recovery Plan, 36-37, 76.

[80] *Id.* at 35-37.

> fragmentation, degradation, and disturbance from human activity throughout the Southeast are expected to remain among the greatest threats to reintroduced panther populations. As development pressure and population growth continue, the opportunity for panther reintroduction in the Southeast diminishes.[81]

Because of their wide-ranging movements and extensive spatial requirements, Florida panthers are sensitive to habitat fragmentation.[82] Fragmentation can take place on different scales, ranging from an almost complete blockade of animals' movements, to merely raising the risks inherent to such movements. Construction and expansion of highways play an inordinate role in the less absolute but still extraordinarily consequential level of habitat fragmentation that is piecemeal destroying the panther's opportunities for recovery. Not only do highways directly replace habitats by paving them over (a two-lane road at 108-feet-wide, and four-lane road at 328-feet-wide with cleared rights-of-way, occupy 2% and 6.2% of each 640 acres (one square mile) respectively of land through which they pass), but they also split natural and semi-natural areas into smaller patches and subject animals attempting to cross to the risk of vehicle collisions.[83]

Twenty percent of radio-collared panthers' known causes of deaths since 1981 were caused by vehicles – the third-largest cause of deaths. As a result, small wildlife populations, including subgroupings of the Florida panther population, may become isolated, subjecting them to demographic and stochastic factors that reduce their chances for survival and recovery.[84]

Constructing new and upgrading existing highways may also increase traffic volume and impede panther movements within and between habitats. Increases in traffic, widening existing highways through adding lanes, and habitat alterations adjacent to roads may limit the panther's ability to cross highways and may ultimately separate panthers from each other.[85] Highways can also stimulate residential and commercial development, and not just in their immediate vicinities, but as far away as two miles on either side. Thus, for each mile that a highway is extended, four

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[81] *Id* at 36.
[82] *Id.* at 35.
[83] *Id.* at 35, 38.
[84] *Id.* at 39; up-to-date data obtained from PantherNet, http://www.floridapanthernet.org/index.php/reports/ and http://www.floridapanthernet.org/index.php/pulse/; vehicles accounted for 19% of known deaths of radio-collared panthers according to data used in the 2008 Recovery Plan (49).
[85] Recovery Plan, 39-40.

square miles are potentially opened to new development – furthering loss and fragmentation of habitat.[86]

C. Loss of Habitat Raises the Risks of Disease

The small size and absolute isolation of the sole extant Florida panther population makes it vulnerable to disease or parasite outbreaks. A number of infectious diseases and parasites are capable of threatening the population, including FeLV, PRV, PLV, hookworm and rabies. While diseases and infections are not currently known to kill many Florida panthers – only nine percent of known deaths of radio-collared panthers since 1981 – detection is biased toward radio-collared individuals who are vaccinated at the time of their capture. Unmonitored and unvaccinated panthers, including kittens, may be dying from illnesses at a higher rater, and especially from diseases that are curbed through vaccination. As panther population density increases, the risk of diseases transmitted through intraspecific interactions increases as well.[87]

Panther population density is growing due to the recently increasing population bumping up against the limits of a shrinking habitat.[88] The risk of epizootic disease significantly affecting the panther population points to the possibility that future panther demographics may not track habitat loss directly, but instead will decrease precipitously once a tipping point in habitat loss is reached, combined with the presence of a pathogen (or combined with recrudescence of inbreeding depression).

D. Shrinking Habitat Increases Intraspecific Aggression and Associated Mortality

The growing population density of Florida panthers also contributes to the largest cause of their mortality – intraspecific aggression – which accounts for 42% of radio-collared panthers' known causes of deaths since 1981. When this 42% is added to the 19% mortality due to vehicle collisions, and to the nine percent due to disease infection – totaling 70% – it becomes obvious why the recovery plan concluded that habitat loss, fragmentation and degradation, and associated human disturbance are the greatest threats to panther survival.[89]

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[86] *Id.* at 39.
[87] Recovery Plan, 43-45, 49, 91.
[88] Johnson et al, 1642, 1644.
[89] Recovery Plan, 36, 49.

While some fatal intraspecific aggression would occur even under ideal habitat conditions, as would perhaps a substantial proportion of the deaths due to illness, such exculpatory accounting must be offset in consideration that in 24% of all known panther deaths the cause cannot be ascertained – but some of those mortalities are likely to have been precipitated by anthropogenic limitations of habitat as well.[90] Thus, it seems probable that approximately two-thirds, if not more, of the deaths of Florida panthers in the past 28 years were caused in part by habitat loss, degradation and fragmentation.

New research finds that Florida panther kitten survival is inversely correlated with an index of panther abundance, providing considerable evidence that panther density adversely affects the kittens' survival. This could result from infanticide by sub-adult and adult males during territorial disputes or for mating opportunities, from deaths of the dependent kittens' dams due to intraspecific aggression, or from competition for food or other resources.[91]

The ongoing loss of animals due to increasing panther population density could be reduced, not just through the urgent task of habitat protection and restoration, but also by alleviating some of that population pressure by translocating animals to the Greater Okefenokee Ecosystem as part of a reintroduction program.

E. Population Viability Undermined as Habitat Disappears

While the number and percentage of panther mortalities caused by destruction of habitat can never be known precisely, that number is increasing. Fifty-eight out of 153 panther deaths that were documented from February 1972 through June 2004 – that is 41% – occurred in just the last four years of that 32-year period. After this period, mortality again increased significantly, with 136 known mortalities from 2004 through 2010 and the last four years of that span accounting for 96 deaths.[92] This increase in panther mortality due in large part to intraspecific aggression and collisions with vehicles corresponds with increases in the panther population, but bodes poorly for sustaining such increases. It also indicates that many of the additional animals represented by population growth have no place to go. Even by the early

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[90] *Id.* at 49.
[91] Hostetler et al, 2794, 2795
[92] *Id.* at 50; data obtained from PantherNet, http://www.floridapanthernet.org/index.php/reports/ and http://www.floridapanthernet.org/index.php/pulse/.

1990s, development in southwest Florida had compromised the ability of landscapes to support a self-sustaining panther population.[93]

The recovery plan states:

> There is insufficient habitat in south Florida to sustain a viable panther population and population expansion into south-central Florida will be difficult. Therefore, to achieve a viable population of 240 and to reclassify or delist the species, additional populations will have to be reintroduced into other areas within the panther's historical range. Unfortunately, the distance from the occupied range to potential reintroduction sites (Thatcher et al. 2006b) may far exceed the species' capability for demographic and genetic interchange. In the absence of migration between populations, each panther population will remain isolated and therefore vulnerable to environmental, demographic, and genetic stochasticity as well as catastrophic events (Gilpin and Soulé 1986). These isolated populations will be vulnerable to extinction in the short-term. However, the long-term persistence of the panther will depend on multiple populations that are spatially discrete and able to fluctuate independently from one another in response to catastrophic or other environmental perturbations. If each of these reestablished populations had a moderately low probability of extinction, localized environmental perturbations, and population fluctuations remained asynchronous, all other things being equal, it is highly improbable that the extinction of the panther would result from a simultaneous extinction of all populations. (Seal and Lacy 1989, Carlson and Edenhamn 2000, Kendall et al. 2000, Reed 2004, Li et al. 2005).[94]

New genetic analysis of the Florida panther population concludes:

> In spite of improvements, ongoing density-dependent factors (related to limited and decreasing habitat availability) and stochastic events will continue to regulate population growth, requiring continued commitments to identify and maintain additional quality habitat to preserve Florida panther evolutionary potential for the long term.[95]

F. Reintroduction is in a Race with In-breeding Depression or Genetic Swamping

One indication of the urgency of reintroduction is the fact that the Florida panther lost about 60 to 90% of its genetic diversity during its population bottleneck, and consequently suffered inbreeding depression. That condition was temporarily ameliorated through the introduction of eight female pumas from Texas beginning in 1995 and the ensuing introgression

[93] *Id.* at 39, 50.
[94] *Id.* at 86.
[95] Johnson et al, 1643-1644.

of the genes of five of them after their removal.[96] However, future translocations of western cougars risk swamping the native Florida panther genome and losing the population's uniqueness.[97]

Furthermore, ongoing habitat degradation, loss and fragmentation that is imperiling the sole extant breeding population in south Florida, and the ongoing deaths of panthers due to vehicular strikes and intraspecific aggression, coupled with the threat of renewed inbreeding depression, call for expeditious reintroduction before additional, irretrievable loss of genetic diversity occurs, or disease strikes, and while habitat can still be protected. The threat posed by inaction was recently articulated by two co-authors of both the recent Florida panther genetic studies,[98] Melody Roelke and Dave Onorato, as quoted in a September 2010 article in the *St Petersburg Times*:

> The population needs to climb to at least 300 to be self-sustaining, said Roelke, who now works for Science Applications International Corp. Instead, once the panther population hit 110, it reached a plateau because the cats had no room to expand, she said. That's bad.
>
> "The longer it stays at a flat level, the more the gains we've made are likely to be lost," she said.
>
> Without the room to spread out, some of the males are once again breeding with their female relatives, Roelke said. That means genetic defects are likely to become a major threat again soon.
>
> That's why, Onorato predicted, the state will have to bring in more female Texas cougars.
>
> "It's going to have to happen sooner or later," he said.
>
> But the solution that worked last time may not work again because there's no room for extra cats. And even if there were enough habitat for more Texas cougars, Roelke said, "there would be further diluting of the original Florida panther genes."
>
> Instead, she said, what federal officials should do is "grab some female (panthers) now and put them on the other side of the Caloosahatchee River," starting a colony in Central Florida.
>
> Male panthers have crossed the river on their own to explore other parts of Florida — one even made it to Georgia before it was shot by a frightened hunter. But the less

[96] *Id.* at 10, 53, 91.
[97] Maehr & Lacy, 974-976.
[98] Johnson et al 2010 & Hostetler et al 2010.

> adventurous females have remained in South Florida, and without them, no new panther colony can get started.
>
> Relocating panthers, either to other parts of Florida or other states, is something federal officials have talked of doing since 1981. Since that's the only way to guarantee the state animal continues to have a future, said Roelke, "I don't understand what the impediments are."[99]

Translocating female panthers to Central Florida would help fulfill the recovery plan's action item to "Expand the breeding portion of the population in south Florida to areas north of the Caloosahatchee River." But the same compelling reason described in this article also argues for using translocation to fulfill the recovery plan's different action item to "Reestablish viable panther populations outside of south and south-central Florida within the historic range." Expanding the breeding population in south Florida and re-establishing panthers outside of south and south-central Florida are respectively two of the separately enumerated management goals among six "Actions Needed" listed in the recovery plan.[100]

To maintain genetic diversity and avoid the Scylla and Charybdis choice of inbreeding depression and consequent lower fertility and eventual extinction, on one shore, and on the other shore the genetic homogenization of the Florida panther through hybridization with exogenous pumas, the panther population must be allowed to expand rapidly to maximize expression and perpetuation of remaining genetic diversity. That means that panthers will have to occupy not just their current range, but additional range as well. Much of that range, including within the Greater Okefenokee Ecosystem, requires reintroduction for it to be made available to a panther population. Reintroduction must serve as a complement to, and absolutely cannot be a substitute for conservation of today's sole remaining breeding population of the Florida panther, whose habitats in south Florida must be conserved.

G. The Reintroduced Population in the Greater Okefenokee Ecosystem Should be Determined to be Essential to the Continued Existence of the Florida Panther

Despite the desperate need and legal responsibility to save the existing Florida panther's breeding population through habitat conservation in south Florida, it would not be prudent to

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[99] Pittman.

[100] Recovery Plan at xiii.

assume that a population that is not yet viable, and whose means to ensure viability the FWS has refused to implement through designation of critical habitat, is in fact safe from extinction. As noted, the Secretary must determine whether any reintroduced experimental population is essential or not essential to the continued existence of the species. Because the sole current Florida panther population in south Florida is not yet viable, and in a worst-case scenario would not persist, the first reintroduced population must be found to be essential to the continued existence of the Florida panther.

Non-essential experimental populations may not receive the benefits of critical habitat designation nor of ESA Section 7 consultation outside of national parks or wildlife refuges. Thus, even for an experimental non-essential population that may be designated in the Greater Okefenokee Ecosystem consultation would still occur within the Okefenokee refuge, but it would not take place outside the refuge.

Consultation and critical habitat designation are essential tools to limiting take and conserving habitat for endangered species; as seen, habitat loss is the greatest single threat to the Florida panther's survival. The ESA requires the FWS to consult on and develop a formal biological opinion regarding any federally funded or permitted action that may affect critical habitat, and precludes approval of projects that would destroy or adversely modify critical habitat, thus securing a separate basis, in addition to species listing, for federal agencies to consult with the Secretary regarding actions they perform or permit in the Section 7 consultation process. If a federal action threatens to destroy or adversely modify a species' critical habitat, consultation must occur even if the action will not jeopardize the continued existence of the species.[101]

The Okefenokee refuge alone is not nearly large enough, nor does it contain sufficient terrestrial habitat, to support the 240 panthers required for an additional population that the recovery plan specifies must be in place as part of the criteria for successful conservation and ensuing delisting. The ecological integrity of lands outside the refuge that would not be subject to consultation and critical habitat designation if panthers were designated experimental, non-essential, is vital to establishing the viability of this future reintroduced population. Yet, without protections provided through consultation and critical habitat designation, a reintroduced panther population may not be able to survive outside the refuge; if a significant number of panthers

[101] 16 U.S.C. § 1536(a)(2).

could not persist outside the refuge, those panthers inside the refuge would succumb to inbreeding depression and would suffer from deleterious stochastic events, and thus would be highly likely not to survive.

Under such a scenario, survival of the Florida panther would rest on the sole extant population that is itself, as seen, currently under extraordinary threat of extinction and that has been found to not yet be viable. Given the dire plight of the current population, the initial reintroduced population to occur in the Greater Okefenokee Ecosystem must be determined to be essential to the continued existence of the species.

VIII. CONCLUSION

Reintroduction of Florida panthers is explicitly called for in the Florida Panther Recovery Plan as a complement to the habitat protection measures that are necessary to save the panther in its last redoubt in south Florida.. Moreover, the present moment is critical. Recently rescued from inbreeding depression but threatened with its recurrence, growing in numbers but with a decreased survival rate due to habitat limitations, the Florida panther needs additional habitat in which to multiply its anemic numbers and thus outrace irreversible genetic deterioration.

Several studies have identified the Greater Okefenokee Ecosystem as suitable for panther reintroduction, and an experimental release of western mountain lions determined that reintroduction there is biologically feasible. The Greater Okefenokee Ecosystem, which houses a plethora of life including sensitive and endangered species, would greatly benefit from restoration of panthers to curb hog as well as deer herbivory on regenerating longleaf pine seedlings and seed cones.

The APA requires a decision on this petition consistent with the ESA's conservation mandate and the tools that the ESA provides – most notably, designation of an experimental, essential population and accompanying release of panthers to the Greater Okefenokee Ecosystem.

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