



In 2008, the Florida Panther Protection Program partners convened a scientific review team to evaluate the strategy outlined in the Memorandum of Understanding.

The Panther Review Team (PRT), composed of six scientists with expertise in Florida panther ecology and landscape-level natural resource planning, was asked the simple question: does the Florida Panther Protection Program as a whole provide additional conservation benefit to the Florida panther when compared to current programs? The PRT unequivocally and unanimously responded in the affirmative.

The PRT was also invited to offer comments and suggestions on the program. These will be carefully considered by the partners for feasibility and in relation to other issues not addressed by the PRT including private property rights and economic viability.

The report may be utilized by U.S. Fish and Wildlife Service in the development of a Florida Panther Habitat Conservation Plan which includes a thorough scientific analysis and transparent public process.

**Technical Review of the Florida Panther Protection Program Proposed
for the Rural Lands Stewardship Area of Collier County, Florida**



October 15, 2009

**Prepared for
Rural Landowners and Conservation Organizations
as
Parties to a Memorandum of Understanding
Dated June 2, 2008**

Prepared by

The Florida Panther Protection Program Technical Review Team

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Cover photo by David Shindle – Florida Fish and Wildlife Conservation Commission. This photo depicts a male Florida panther that likely is the individual later identified as FP131. The photo was taken before he was captured and equipped with a radio-collar. FP131 was known to use both public and private lands of the RLSA.

* The members of the PRT acknowledge their employment with agencies, organizations, or companies that may have separate but related missions and views regarding conservation of the Florida panther. However, it should be noted that regardless of employment, the information, analyses, and conclusions presented in this report are a sole reflection of the independent and collective professional and biological opinions of the members and should not be construed otherwise.

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LIST OF ABBREVIATIONS

ACOE.....	U.S. Department of the Army, Corps of Engineers
ACSC.....	Area of Critical State Concern
ANOVA.....	analysis of variance
BCNP.....	Big Cypress National Preserve
CKS.....	Camp Keais Strand
CR.....	County Road
CREW.....	Corkscrew Regional Ecosystem Watershed
DCA.....	Florida Department of Community Affairs
ENP.....	Everglades National Park
ESA.....	U.S. Endangered Species Act of 1973
FDOT.....	Florida Department of Transportation
FPNWR.....	Florida Panther National Wildlife Refuge
FPPP.....	Florida Panther Protection Program
FSA.....	Flowway Stewardship Area
FLUCFCS.....	Florida Land Use, Cover and Forms Classification System
FWC.....	Florida Fish and Wildlife Conservation Commission
GIS.....	geographic information system
GPS.....	Global Positioning System
HCP.....	Habitat Conservation Plan
HSA.....	Habitat Stewardship Area
I-75.....	Interstate 75
MOU.....	Memorandum of Understanding
NRI.....	Natural Resource Index
OSSF.....	Okaloacoochee Slough State Forest
PD&E.....	Project Development and Environment
pdf.....	Portable Document Format
PFA.....	Panther Focus Area
PHU.....	Panther Habitat Unit
PRT.....	Florida Panther Protection Program Technical Review Team
RLSA.....	Rural Land Stewardship Area
SFWMD.....	South Florida Water Management District
SR.....	State Road
SRA.....	Stewardship Receiving Area
SSA.....	Stewardship Sending Area
SSHL.....	Summerland Swamp Habitat Linkage
US.....	United States
USFWS.....	U.S. Fish and Wildlife Service
WRA.....	Water Retention Area

EXECUTIVE SUMMARY

The Florida panther (*Puma concolor coryi*) is a large, wide-ranging carnivore listed as an endangered species by the U.S. Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC). The current breeding range of the population is located on approximately 2.27 million acres of Florida south of the Caloosahatchee River. Portions of the breeding range overlap with 196,000 acres of rural land in eastern Collier County that is under pressure for future growth. Land development in this area is governed by the 2002 Collier County Rural Lands Stewardship Overlay (RLSA). The RLSA program is an incentive-based system in which Stewardship Credits are generated by voluntarily preserving rural lands with high natural resource values, and the credits are used to entitle new developments on other lands within the RLSA. Despite the intent of the RLSA program to protect lands with high natural resource values, the program is based upon the fact that future development will occur within the RLSA. Furthermore, the program does not exempt proposed developments from review for impacts to panthers and their habitats under the provisions of Sections 7 and 10 of the U.S. Endangered Species Act and Florida Rule 68A-27.003, Florida Administrative Code. Proposals for land development must proceed through federal regulatory processes to satisfy the provisions of federal law independent of approvals obtained under the RLSA program. State review also may be appropriate. The result is a project-by-project piecemeal approach to panther habitat conservation rather than a comprehensive landscape-scale planning approach that would ensure that Florida panthers could continue to occupy protected areas of the RLSA at build-out.

Representatives of eight landowners and four conservation organizations (Parties), recognizing the need for a comprehensive and cooperative approach to planning for the protection of Florida panther habitat as well as planning for future development within the RLSA, signed a Memorandum of Understanding (MOU) on June 2, 2008. The Parties agreed to explore the possibilities of a voluntary strategy to enhance Florida panther conservation within the RLSA in eastern Collier County. This conservation strategy, known as the Florida Panther Protection Program (FPPP), is based upon the structure of the existing RLSA program. The measures that are proposed as modifications of the RLSA program or creation of the FPPP are:

- Provision of 25% more mitigation for impacts to the panther Primary Zone
- Generation and use of panther credits on lands set aside as Stewardship Sending Areas
- Protection of agricultural lands through establishment of Agricultural Preservation areas
- Establishment of a core transportation network to serve 45,000 acres of development
- Proposal by the landowners for two corridors intended to enhance landscape connectivity
- Creation of the Paul J. Marinelli Florida Panther Protection Fund

The Parties also agreed to assemble a team of panther biologists and landscape ecologists to provide a technical review of the proposed conservation measures. The team of scientists, known as the Florida Panther Protection Program Review Team (PRT), was asked by the Parties to determine whether the FPPP as a whole provides additional conservation benefit to the Florida panther when compared to the 2002 RLSA Overlay program. The Parties agreed that, if a consensus was reached at the end of the technical review, rural landowners and conservation organizations would enter into a binding agreement, and the landowners would undergo a formal consultation process with USFWS to develop a Conservation Agreement, or its equivalent, for application to future developments. The intent also was expressed that,

if the proposed FPPP is found to be a benefit to panther conservation, it could serve as a model for application to other privately owned lands in south Florida where panthers also occur.

The PRT conducted a technical review of each of the proposed conservation measures. Some of the measures were reviewed for the soundness and validity of concepts. Other measures required detailed analysis of Geographic Information System data. The PRT determined that some areas of the RLSA would require additional protection to provide the desired benefits to Florida panther conservation and management. These areas were mapped, and their values to panther conservation were described in detail. The PRT also reviewed proposals for a new interchange on Interstate 75 (I-75) even though this was not proposed as a conservation measure. The PRT determined that an indirect effect of future development within the RLSA could be increased demand for a new interchange in an area of occupied panther habitat, and review by the PRT was warranted. The PRT also developed conclusions and recommendations regarding the proposed 45,000-acre cap on development within the RLSA and on the impacts of mining. The PRT recognized that the conclusions and recommendations resulting from these analyses may have economic implications for landowners and others, but an analysis of economic impacts of the FPPP was beyond the PRT's scope of work.

The PRT concluded that the proposed FPPP and revisions to the RLSA currently being considered as part of the five-year RLSA review would represent an enhancement of panther conservation over the existing RLSA program. The PRT also concluded that, if its recommendations were incorporated into the RLSA program and the FPPP, the conservation value to panthers would increase. However, the PRT recognizes that the future development within the RLSA has the potential for the loss of panther habitat, and that habitat loss within the historic range of the Florida panther does not aid panther recovery. The conclusions and recommendations of the PRT are summarized as follows:

Proposed Revisions to the RLSA Map:

- The PRT recommends additional protection for approximately 38,746 acres of the RLSA.
- These areas would preserve additional core habitats and adjacent buffers, provide corridors to connect occupied habitats on public lands, and minimize future habitat fragmentation.
- Lands in public ownership, privately owned lands approved as Stewardship Sending Areas (SSAs) or likely to be designated as SSAs, and privately owned lands recommended for preservation by the PRT total 140,922 acres (72% of the RLSA).
- Lands remaining for development would be sufficient to accommodate the 45,000-acre cap.

Additional Mitigation Proposed for Impacts to the Primary Zone:

- More panther habitat would be preserved by the RLSA Stewardship Credit system than by the USFWS Methodology (Panther Habitat Unit [PHU]), even after providing 25% more mitigation for impacts to the Primary Zone.
- More PHUs exist on SSAs than are needed to fulfill USFWS mitigation requirements.
- Use of surplus PHUs from designated SSAs to mitigate panther habitat loss outside of the RLSA would not enhance panther conservation within the RLSA.
- The principal value of a 25% increase in PHUs of mitigation for Primary Zone impacts would be the increased financial contributions to the Panther Fund.

Panther Habitat Units Generated from Stewardship Sending Areas:

- The existing RLSA program will preserve more acres of panther habitat through the Stewardship Credit system than would be accomplished using the USFWS Methodology.

- More PHUs exist on SSAs than are needed to fulfill USFWS mitigation requirements.
- Use of surplus PHUs from SSAs to mitigate panther habitat loss outside of the RLSA would be detrimental to panther conservation.
- Sale of surplus PHUs outside of the RLSA could compete with the economics of establishing panther conservation banks outside of the RLSA.

Agricultural Preservation:

- The PRT identified specific RLSA Open lands in agricultural use that contribute to Florida panther conservation.
- The PRT recommends that changes made to the Stewardship Credit system should provide incentives to encourage preservation of those agricultural lands identified by the PRT as having conservation value to panthers.

Proposed Core Public Transportation Network:

- The PRT recommends that new road construction should avoid bisecting Habitat Stewardship Areas (HSAs), Flowway Stewardship Areas (FSAs), Water Retention Areas (WRAs), or areas identified by the PRT for additional protection.
- Habitat impacts should be minimized if construction in these areas cannot be avoided.
- The need for installation of wildlife crossings and fencing of proven design should be evaluated for upgrades to existing roads and proposals for new roads within the RLSA.
- Mitigation for road projects within the RLSA should occur within the RLSA.

North and South Corridors:

- The PRT recommends that the proposed South Corridor or Summerland Swamp Habitat Linkage should be expanded to include additional agricultural lands and patches of natural habitat to allow this area to continue to function as occupied panther habitat.
- The PRT recommends a redesign of the proposed North Corridor that would increase the minimum width to 1,200 feet; incorporate existing patches of native habitat to function as stepping stones; widen the termini to increase “funneling” effect; and maintain agricultural land uses near the termini.
- Agricultural uses should continue adjacent to the proposed corridor to buffer against more intensive land uses or development.
- The PRT encourages habitat restoration within the North Corridor and recommends continual monitoring to determine success and suggest design changes, as appropriate.

Paul J. Marinelli Florida Panther Protection Fund (Panther Fund):

- The Panther Fund will benefit panther conservation as long as the fund is not considered an alternative to habitat preservation.
- Panther Fund revenues should not be used for mitigation required by regulatory processes.
- Conservation actions within the RLSA should receive priority, but use of revenues should not be restricted to the RLSA.
- Acceptable uses for funds include habitat acquisition, habitat restoration, wildlife crossings, and monitoring of FPPP conservation measures.

Proposed New Interchanges for Interstate 75:

- Construction of an interchange at either Everglades Boulevard or between DeSoto Boulevard and Florida Panther National Wildlife Refuge (FPNWR) could compromise the functionality of occupied panther habitats north of I-75.
- Significant design challenges exist to resolve impacts to panther habitats for either of these interchange options.
- The PRT recommends that the concept of a future interchange with I-75 receive no further consideration due to impacts on panther habitats.

45,000-Acre Development Cap:

- The proposed development cap of 45,000 acres within the RLSA would benefit panther habitat conservation by providing certainty regarding the extent of future urban development that is not provided by the 2002 RLSA.
- The PRT's recommendations should not be construed as an endorsement of 45,000 acres of urban development within the RLSA.

Mining Activities within the RLSA:

- Mining results in a direct loss of panther habitat and may lead to future loss of panther habitats when mine lakes are proposed for waterfront developments after mining operations are completed.
- The PRT recommends that mining should be prohibited in areas of the RLSA identified for additional protection by the PRT.
- The PRT views mining as a form of development, and acreages of future mine lands should be deducted from the 45,000-acre development cap proposed for the RLSA.

1.0 Introduction

Representatives of eight landowners (Landowners) and four conservation organizations (collectively, Parties) signed a Memorandum of Understanding (MOU) (Appendix A) on June 2, 2008, that established a framework for a mutual strategy to voluntarily enhance Florida panther (*Puma concolor coryi*) conservation in eastern Collier County. This conservation strategy, known as the Florida Panther Protection Program (FPPP), is an incentive-based program built upon the 2002 Collier County Rural Lands Stewardship Area Overlay (RLSA). These incentives are generated by a credit-based system whereby credits are earned for preserving rural lands with high natural resource value, and these credits can then be used to entitle new development. The Parties also agreed to assemble a team of panther biologists and landscape ecologists to provide a technical review of the FPPP. This report represents the results of that team's review.

1.1 Status of the Florida Panther

The Florida panther is the last subspecies of *Puma* still surviving in the eastern United States (US). Historically occurring throughout the southeastern US, today the panther is restricted to less than 5% of its historic range in one population located in south Florida. The breeding component of this population is located on approximately 2.27 million acres (Kautz et al. 2006) in Collier, Lee, Hendry, Miami-Dade, and Monroe Counties south of the Caloosahatchee River in southern Florida (Belden et al. 1991). Although confirmed panther sign, male radio-collared panthers, and uncollared males killed by vehicles have been recorded outside of south Florida, no female panthers have been documented north of the Caloosahatchee River since 1973 (Nowak and McBride 1974, Belden et al. 1991, Land and Taylor 1998, Land et al. 1999, Shindle et al. 2000, McBride 2002, Belden and McBride 2006). Although the population recently was estimated at fewer than 100 individuals (Land et al. 2007), the population was estimated to consist of up to 117 adults and juveniles in 2007 (McBride et al. 2008). The panther is federally listed as endangered under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.) and is also listed by the State of Florida as endangered.

Panthers are large, solitary carnivores and require large ranges to obtain the necessary prey (white-tailed deer [*Odocoileus virginianus*] and feral hog [*Sus scrofa*] [Maehr et al. 1990, Dalrymple and Bass 1996]) to meet energy needs required for health and reproduction. Their social and reproductive behavior requires access to large contiguous areas of habitat to maintain viable breeding populations. Mean home range sizes of adult males ($n=19$) and females ($n=24$) are approximately 95,014 acres (29,528 – 254,686 acres) and 37,488 acres (6,894 – 100,965 acres), respectively (Land et al. 2004, Land et al. 2008).

Radio-collar data and ground tracking indicate that panthers use the mosaic of habitats available to them. Forested cover types, particularly cypress swamp, pinelands, hardwood swamp, and upland hardwood forests are the habitat types most selected by panthers (Belden 1986, Belden et al. 1988, Maehr 1990a, Maehr et al. 1991, Maehr 1992, Smith and Bass 1994, Kerkhoff et al. 2000, Comiskey et al. 2002, Cox et al. 2006, Kautz et al. 2006). Global Positioning System (GPS) data demonstrated that panthers ($n=12$) use all habitats contained within their home ranges by selecting forested habitat types and using all others in proportion to availability (Land et al. 2008). Compositional analyses by Kautz et al. (2006) showed that forest patches of all sizes comprise an important component of panther habitat in south Florida, and that other natural and disturbed cover types are also present. The diverse woody flora of forest edges likely provides cover suitable for stalking and ambushing prey (Belden et al. 1988, Cox et al. 2006). Female panthers selected upland hardwoods, pinelands, and mixed forests as natal den sites (Benson et al.

2008), and dense understory vegetation comprised of saw palmetto provides some of the most important resting and denning cover for panthers (Maehr 1990a). Shindle et al. (2003) found that 73% of panther dens were in palmetto thickets.

Natural genetic exchange with other *Puma* spp. populations ceased when the Florida panther became geographically isolated over a century ago (Seal 1994). Isolation, habitat loss, reduced population size, and associated inbreeding resulted in loss of genetic variability and diminished health. Measured heterozygosity levels indicated that the Florida panther had lost approximately 60 – 90% of its genetic diversity (Culver et al. 2000). Genetic problems in the Florida panther included atrial septal defects, a high rate of unilateral cryptorchidism, low testicular and semen volumes, diminished sperm motility, and a high percentage of morphologically abnormal sperm. A genetic management program that involved the release of eight Texas female pumas (*Puma concolor stanleyana*) into selected areas of south Florida was implemented in 1995 to address these threats. The results of genetic restoration have been successful as indicated by an increased population; signs of increased genetic health; recolonization of areas in Big Cypress National Preserve (BCNP), Everglades National Park (ENP), and other areas that had been unoccupied; and increased dispersal (McBride 2000, 2001, 2002; Maehr et al. 2002). A comprehensive assessment of this management action is currently underway. Although the genetic restoration program was successful (Pimm et al. 2006), sufficient habitat does not exist in south Florida to sustain a genetically viable panther population without management intervention (U.S. Fish and Wildlife Service [USFWS] 2008).

Limiting factors for the Florida panther are habitat availability, prey availability, and lack of human tolerance. Rapid development in southwest Florida has compromised the ability of landscapes to support a self-sustaining panther population (Maehr 1990b, 1992), and the panther continues to face numerous threats due to an increasing human population. Habitat loss and fragmentation continue to threaten the panther's existence. Leading sources of panther mortality (vehicular collisions and intra-specific aggression), impediments to population expansion and subsequent gene flow, and biological constraints on population growth and other life history traits also are habitat related. The small size and high degree of isolation of the existing panther population also makes it vulnerable to catastrophic events such as disease or parasite outbreaks.

Human intolerance has the potential to be a major challenge to panther recovery. Florida's human population and panther population continue to increase resulting in a more populated urban/wildland interface. Concomitant with these population increases, the number of reported human-panther interactions and livestock depredations have also been on the rise. If human-panther interactions and livestock depredations continue to increase, the potential for complaints from the public and, in some cases, the need for subsequent management responses could result in harassment of panthers through aversive conditioning in an attempt to teach individuals to avoid humans. However, if a panther's location presents a possible threat to public safety (e.g., a dispersing male panther wanders into an urban/suburban area and cannot find its way out) or there is a threat to the survival of the panther (e.g., a panther wanders into an area that contains numerous physical hazards), depending on specific circumstances, the panther may be captured and relocated, or removed to an approved captive facility. If a panther's behavior indicates a threat to human safety, it would need to be permanently removed from the wild. In extreme circumstances, euthanasia may be necessary.

The biological constraints that have to be taken into consideration when planning Florida panther conservation and management actions include the need for large, contiguous landscapes, the need for large prey for successful reproduction, very low population density, and low reproductive and

colonization rates. The fact that the panther is a large predator requires human social considerations in its conservation and management.

The recovery strategy for the Florida panther is to maintain, restore, and expand the panther population and its habitat in south Florida; expand this population into south-central Florida; reintroduce at least two additional viable populations within the historic range outside of south and south-central Florida; and facilitate panther recovery through public awareness and education. The panther depends upon habitat of sufficient quantity, quality, and spatial configuration for long-term persistence. Therefore, the panther recovery plan is based upon habitat conservation and reducing habitat-related threats (USFWS 2008).

Three priority zones were identified by Kautz et al (2006) as important for panther habitat conservation: (1) Primary Zone—lands essential to the long-term viability and persistence of the panther in the wild; (2) Secondary Zone—lands 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 (3) Dispersal Zone—the area which may facilitate future panther expansion north of the Caloosahatchee River (Kautz et al. 2006). Much of the Primary Zone is currently occupied and supports the breeding population of panthers. Although panthers move through the Secondary and Dispersal Zones, they are not currently occupied by resident panthers. Some areas of the Secondary Zone would require restoration to support panthers. Habitat conservation efforts should focus on maintaining the landscapes that are occupied or have potential to be occupied by Florida panthers in southwest Florida to prevent further loss of population viability. The continued loss of habitat through fragmentation and loss of spatial extent poses serious threats to the conservation and recovery of the panther. Therefore, conserving lands that are occupied or have potential to support panthers and securing biological corridors within and among these lands are necessary to help alleviate these threats.

1.2 Status of the Florida Panther within the Rural Lands Stewardship Area

Researchers with the Florida Fish and Wildlife Conservation Commission (FWC), BCNP, and ENP have been monitoring radio-instrumented Florida panthers from February 1981 through the present. One or more Florida panthers have been observed using habitats within the RLSA every year since 1982. A total of 9,447 telemetry records (out of 85,834 records collected rangewide through June 2008) representing 45 male and 25 female, radio-collared panthers (including three female Texas pumas) have been documented within the RLSA over the period of record (Figure 1). The FWC has employed GPS technology to monitor the movements of selected panthers at a greater frequency during daylight and nighttime hours since 2002. Eight Florida panthers wearing GPS collars were documented using habitats within the RLSA between 2002 and 2005 (Figure 2). This documentation of panther occurrence relied almost entirely on panthers captured originally outside the RLSA; the vast majority of panther captures occurred on public lands adjacent to the RLSA. The number of documented panthers and the number of telemetry locations relative to the RLSA are artifacts of sampling intensity, radio-collar technology and where capture effort was concentrated. However, these data clearly show that portions of the RLSA are within the home ranges of several panthers, and the RLSA has been supporting panthers for decades.

GPS-collar data have confirmed the findings from radio-telemetry data that panthers select forested habitats (Land et al. 2008). Highest concentrations of telemetry records are located south of County Road (CR) 858, along the Okaloocoochee Slough east of State Road (SR) 29, and along the Camp Keais Strand (CKS) between CR 858 and CR 846 (Figures 1 and 2).

Three natal dens of radio-collared female panthers have been recorded within the RLSA, two of which were immediately north of Florida Panther National Wildlife Refuge (FPNWR) and one of which was in the northwest quadrant of the intersection of SR 29 and CR 858 (Figure 1). Additional dens undoubtedly would have been located within the RLSA if more female panthers had been captured and radio-collared here, especially on private lands. This is underscored by the mortality data from this area that include records of uncollared reproductive-aged females and uncollared dependent-aged kittens not previously handled and marked at known dens. The Florida panther mortality database through February 2, 2009, contains 121 records of roadkilled panthers rangewide, and 31 of these records (26%) have occurred within the RLSA. Roadkills generally occurred along SR 29 north and south of CR 858; along CR 858 immediately west of SR 29; along a four- to eight-mile stretch of CR 846 east of Immokalee; along the segment of CR 846 that crosses CKS; and along a segment of CR 858 located approximately two to four miles south of CR 846 (Figure 1). Records of panther mortality due to causes other than collision with motor vehicles also occur within the RLSA (Figure 1).

1.3 Collier County Rural Lands Stewardship Area Overlay

The RLSA program was established in Section 4.08.00 of Collier County's Land Development Code for the purpose of encouraging smart growth patterns within a rural landscape covering 195,846 acres generally in the vicinity of Immokalee, Florida. Collier County's objective was to create an incentive-based land use overlay system referred to as the Collier County RLSA Overlay. The Overlay is intended to protect natural resources and retains viable agriculture by promoting compact rural mixed-use development as an alternative to low-density single use development. The PRT recognizes that new development is the driving force for achieving natural resources conservation within the RLSA program. The RLSA program provides a system of compensation to private property owners for the removal of certain land uses in order to protect natural resources and viable agriculture in exchange for transferable credits that can be used to entitle compact development (Policy 1.2). The system is based upon the principles of rural land stewardship as defined in Chapter 163.3177(11), Florida Statutes.

The RLSA program allows for any land within the RLSA to be designated as a Stewardship Sending Area (SSA). Stewardship Credits are generated from SSAs in return for maintaining the areas in permanent agriculture, open space or conservation uses. Stewardship Credits may be used to entitle a Stewardship Receiving Area (SRA) which can be in the form of self-contained planned urban developments within the RLSA. The SSA Program within the RLSA establishes a method for protecting and conserving the most valuable environmental land, including large connected wetland systems and significant areas of habitat for listed species, while directing compact developments to the least environmentally sensitive areas of the RLSA.

A Natural Resource Index (NRI) was developed to rank lands within the RLSA according to value for wetlands protection, water resource protection and management, and wildlife habitat conservation. Results from the NRI analysis were used to map all areas of the RLSA according to five major categories of land use (WilsonMiller 2002):

- **Flowway Stewardship Area (FSA):** FSAs are privately owned lands that primarily include wetlands located within the CKS and Okaloacoochee Slough ecosystems.
- **Habitat Stewardship Area (HSA):** HSAs are privately owned lands that include areas with natural characteristics that make them suitable for listed species as well as areas without these

characteristics. The latter areas are included because they are contiguous to habitat with natural characteristics, thus forming a landscape continuum that can augment habitat values.

- **Water Retention Area (WRA):** WRAs are privately owned lands that have been permitted by the South Florida Water Management District (SFWMD) to function as agricultural WRAs and that provide surface water quality and other natural resource value. Many of these areas are large natural wetlands that, in some cases, connect to and support FSAs.
- **Open Land:** Open Lands are privately owned lands not otherwise classified as FSAs, HSAs, or WRAs and are generally of lower natural resource quality.
- **Lake Trafford:** The RLSA also includes the open waters of Lake Trafford, which cover approximately 1,460 acres.

Lands designated as FSA, HSA, or WRA are areas of high quality natural resource value based on the NRI analysis. Lands delineated as FSAs, HSAs, or WRAs are the most likely candidates for designation as SSAs because of the greater number of Stewardship Credits available from these lands. Open Lands may be designated as either SSAs or SRAs, but Open Lands are the most likely candidates for SRAs because of the lower Stewardship Credit values applied to these lands. A portion of the RLSA is included within the Big Cypress Area of Critical State Concern (ACSC). Although Big Cypress ACSC lands may be designated as SSAs, additional RLSA standards apply and all Big Cypress ACSC regulations remain in force regardless of SSA designation. In addition, the RLSA contains approximately 15,200 acres of publicly owned lands, which are eligible for designation as FSAs, HSAs, or WRAs, but public lands are not eligible for designation as SSAs or SRAs or for generating or receiving Stewardship Credits.

1.4 U.S. Endangered Species Act and Rural Lands Stewardship Area

Impacts to Florida panther habitats are regulated under Sections 7 and 10 of the ESA, and federal authorization may be required for projects that impact endangered species or their habitats. The provisions of Section 7 apply to projects when a nexus exists with a federal agency, such as projects that impact wetlands under the jurisdiction of the U.S. Department of the Army, Corps of Engineers (ACOE). Section 10, on the other hand, applies to projects with no federal nexus, and negotiations to resolve potential impacts are between individual landowners and the USFWS.

The RLSA includes approximately 71,000 acres of wetlands, and, as a consequence, many proposed development projects are likely to impact wetlands under federal jurisdiction. Authorizations to impact wetlands typically are obtained from the ACOE on a case-by-case basis. The ACOE is required to consult with the USFWS for projects that potentially impact endangered species or their habitats, including the Florida panther, pursuant to Section 7 of the ESA. The ACOE has agreed to consult with the USFWS on all projects that fall within the Panther Focus Area (PFA) (USFWS 2007). The entire RLSA falls within the PFA, and, therefore, the ACOE will consult with USFWS on all projects involving impacts to wetlands within the area. The USFWS employs a Habitat Assessment Methodology (Methodology) to quantify potential impacts to Florida panther habitats in terms of Panther Habitat Units (PHUs). Mitigation of potential impacts to Florida panthers and their habitats most commonly is recommended at a ratio of 2.5:1, although the actual amount of mitigation may vary based on location of impact and mitigation sites. The USFWS typically issues a Biological Opinion with an Incidental Take Statement to complete the consultation process for projects that may impact Florida panthers and their habitats as formal consultation with the ACOE as required under Section 7 of the ESA.

Section 10 of the ESA generally applies to projects that are not anticipated to result in impacts to wetlands. Applicants proposing to impact endangered species or their habitats under Section 10 are required to prepare a Habitat Conservation Plan (HCP) that outlines steps that will be taken to avoid, minimize, and mitigate impacts. Although Section 10 most often applies to individual property owners, the option exists for multiple owners to develop a regional or programmatic HCP, which is essentially a master plan that details the steps that all participating parties agree to follow to ensure the persistence of listed species in the region defined in the HCP. The concept of a regional HCP is attractive for future projects within the RLSA because it would define standard conditions that projects would satisfy to obtain federal authorization for incidental take of the Florida panther or their habitats, and all future projects that conform to the conditions of the HCP generally would be reviewed under an established authorization process.

1.5 Florida Panther Protection Program

Representatives of eight landowners and four conservation organizations (Parties) signed a MOU on June 2, 2008, agreeing to work together to enhance the future of the Florida panther with a focus on the RLSA. The goal of the MOU generally is to protect panther habitat while preserving agricultural lands and identifying appropriate areas for development in eastern Collier County. The MOU proposes an incentive-based land use program, the FPPP, intended to secure a contiguous range of panther habitat connecting major public lands in the region that includes and surrounds the RLSA. The Parties have proposed additional measures to be implemented within the RLSA that are intended to assist the FPPP and conservation of the Florida panther and the habitats upon which they depend. Those measures are described as follow:

- **Paul J. Marinelli Florida Panther Protection Fund (Panther Fund):** The Parties propose establishment of a fund to be held by the Wildlife Foundation of Florida, Inc. The fund would be governed by a board of directors consisting of representatives of the Parties, USFWS, and FWC. The fund has the potential to generate in excess of \$150 million through 2050 with revenues deriving from use or sale of PHUs generated from SSAs, sale and resale of residential housing, and voluntary donations. The fund would be used to underwrite costs associated with underfunded panther habitat restoration and management activities within the region.
- **Additional Mitigation for Impacts to Primary Zone Habitat:** The Parties propose that 25% more PHUs per acre of mitigation would be provided for impacts to Primary Zone habitat within the RLSA.
- **North and South Panther Corridors:** The Landowners propose to incentivize landowners to create, enhance, and restore two corridors intended to facilitate panther movements within selected areas of the RLSA. Proposed locations for a north corridor and a south corridor were mapped by the Landowners.
- **Agricultural Preservation:** The Parties propose the establishment of Agricultural Preservation areas for application to Open Lands within the RLSA that are designated for no greater than agricultural uses in perpetuity. Lands maintained as Agricultural Preservation areas within the Big Cypress ACSC would be eligible to generate an additional 2.6 Stewardship Credits per acre, and lands outside of the Big Cypress ACSC could generate an additional 2.0 Stewardship Credits

per acre. Designation of lands for Agricultural Preservation is proposed as a means of incentivizing landowners to maintain lands in agricultural use in perpetuity.

- **Core Transportation Network:** The landowners propose the establishment of a core transportation network sufficient to support 45,000 acres of development. Conservation measures such as wildlife crossings and fencing have been proposed at specific locations within the network. The Parties had not reached agreement on a conceptual road network at the time of the effective date of the MOU.
- **PHUs Generated from SSA Lands:** The Parties agree that Stewardship Credits and PHUs are both generated from SSA lands whether such land were designated as SSAs prior or subsequent to the effective date of the MOU. The Parties further agreed that PHUs generated from SSAs within the RLSA may be used, transferred, or sold for any project located within the southern PFA (USFWS 2007).

1.6 Florida Panther Protection Program Technical Review Team

The Parties agreed to appoint a FPPP Technical Review Team (PRT) to conduct a technical review of the additional conservation measures that are proposed for implementation within the RLSA. The primary charge of the PRT was to conduct a technical review of the conservation measures proposed by the Parties and to evaluate how those measures may contribute to Florida panther conservation as compared to the status quo. While the PRT recognizes that human development within panther habitat is incompatible with panther conservation and recovery, it recognizes that human development within panther habitat is currently the status quo. The PRT was to focus its review within the RLSA. However, it is anticipated that the findings may have implications for Florida panther conservation throughout the region. This report describes the analyses and findings of the PRT that resulted from the technical review that was requested by the Parties. The report also addresses the potential impacts to Florida panthers associated with two locations proposed for new interchanges on Interstate 75 (I-75) immediately southwest of the RLSA. Although the Parties have not formally advocated a new interchange at one of these locations, these prospective sites have received publicity in the media and would impact panther conservation efforts within the RLSA. The PRT recognized that the conclusions and recommendations resulting from these analyses may have economic implications for landowners and others, but an analysis of economic impacts of the FPPP was beyond the PRT's scope of work

2.0 Proposed Revisions to the Rural Lands Stewardship Area Map

2.1 Introduction

Specific areas have been designated as HSAs, FSAs, and WRAs under the RLSA program with the intent that landscapes of highest resource value within the RLSA would be preserved as SSAs while directing development activities to areas of lesser resource value. A review of radio- and GPS-collar telemetry data revealed that those areas currently designated for preservation within the RLSA support greater use by panthers than other areas within the RLSA. The HSA and FSA categories cover 82,974 acres (42%) of the RLSA (Table 2.1-1) and are comprised of wetlands (60%), pasture and cropland (25%), and natural uplands (14%). Adjacent WRAs account for an additional 13,842 acres that are predominantly wetlands. The existing RLSA system of Stewardship Credits is designed to provide long-term protection for these areas as HSAs, FSAs, and WRAs. However, PRT members concluded during the review of available data that the RLSA contains additional Open Lands that are not designated for protection but that nevertheless could provide and/or complement important habitats being preserved for panthers due to location, existing vegetation types, and records of use by panthers.

The PRT reviewed the RLSA landscape relative to Geographic Information System (GIS) data layers representing various measures of importance to panthers, including telemetry, roadkill, and den records; least-cost-path models of panther dispersal; and various models of panther habitat suitability. The PRT identified and mapped specific areas to consider for additional preservation under an appropriate classification and protected from development. Such additional protection in specific areas will serve to guide planned development into areas of less value to Florida panthers, preserve additional acreages of most important habitats, provide buffers to habitats occupied by Florida panthers, maintain the integrity of the natural habitats of Okaloacoochee Slough and CKS, improve proposed movement corridors connecting larger patches of occupied habitat, and further minimize habitat fragmentation.

2.2 Methods

Creation of a Base Map: The PRT used 2004 Digital Ortho Quarter Quad aerial imagery and applied the following features: 1) major RLSA land use categories; 2) existing public lands; 3) major roads; 4) Big Cypress ACSC; 5) Ave Maria; 6) Town of Big Cypress; and 7) Hogan Mine. Although the Town of Big Cypress and Hogan Mine have yet to be permitted, both projects have active applications for State and Federal permits and are concurrently in the consultation process with the USFWS and FWC. The PRT acknowledges that both project sites include areas of Florida panther habitat that would meet its criteria for consideration for additional preservation. However, the PRT chose to evaluate the FPPP as though the development footprints of the Town of Big Cypress and Hogan Mine had been permitted. . The PRT evaluated the FPPP under the assumption that appropriate conditions regarding preservation of habitat for the Florida panther would be negotiated between the applicants and agencies for these projects. The PRT saw value in evaluating the RLSA landscape with these entities in place because they provide further clarity in its understanding of the potential future development footprint within the RLSA. However, given that the Town of Big Cypress and Hogan Mine have yet to be permitted, the PRT's evaluation in the context stated above should not be construed as an endorsement of these proposed projects.

Identification of Areas Recommended for Preservation: The following GIS data layers depicting various aspects of landscape value to Florida panthers were reviewed in the context of the PRT's base map:

Table 2.1-1 Estimated Acreages, Panther Habitat Units (PHU), and Average PHU-per-Acre Values for Rural Land Stewardship Area (RLSA) Lands by Category and Panther Zone Based on 2004 Land Use/Land Cover Data Obtained from South Florida Water Management District.

RLSA Category	<i>Primary Zone</i>			<i>Secondary Zone</i>		
	Acres	PHU	PHU/Acre	Acres	PHU	PHU/Acre
Open	49,881	278,008	5.5734	43,324	197,588	4.5607
Habitat	45,755	346,646	7.5762	22	87	4.0194
Flowway	37,197	329,882	8.8685	0	0	0.0000
Water Retention	15,439	130,147	8.4300	2,789	22,945	8.2279
Lake Trafford	1,461	17	0.0113	0	0	0.0000
Total	149,732	1,084,700	7.2443	46,134	220,620	4.7822

- Florida panther radio telemetry records for the period from February 23, 1981, through June 30, 2008 (FWC) (Figure 1).
- Florida panther mortality records for the period from February 13, 1972, through January 20, 2009 (FWC) (Figure 1).
- Known Florida panther den locations from March 16, 1992, through July 20, 2008 (FWC) (Figure 1).
- Florida panther GPS-collar location records for seven males and one female that used habitats in the RLSA and surrounding lands between 2002 and 2005 (FWC) (Figure 2).
- Least-cost-path models of routes likely to be followed by panthers moving through the south Florida landscape (Swanson et al. 2005, Kautz et al. 2006); panther roadkill records through January 20, 2009 (Darrell Land, FWC, unpublished data); and existing and proposed wildlife crossings (Logan and Kautz 2006, Smith et al. 2006, USFWS 2007, WilsonMiller 2008) (Figure 3).
- Florida panther Primary and Secondary Zones (Kautz et al. 2006) (Figure 4).

These data layers were reviewed on individual computers or by projection onto a large format screen, which allowed for zoomed in review of local areas of interest. Large format E-size maps of selected features were plotted at scales of 1:14,400 (1 inch = 1,200 feet) and 1:48,000 (1 inch = 4,000 feet). The maps and data were reviewed in the context of the following criteria:

- **Land Cover Types Used by Panthers:** Forested habitats repeatedly have been shown to be selected by Florida panthers, and other habitats (e.g., prairie, pasture and grasslands, shrub swamps, freshwater marshes) are used in proportion to availability. Some areas of Open Lands contain natural land cover types that have a demonstrated history of use by panthers based on telemetry and other data. Areas with these characteristics were identified based on proximity to and connections with other occupied panther habitats.
- **Documented Use by Panthers:** Florida panther telemetry, mortality, and den records provide documented evidence of use of specific areas. These data were reviewed to assess the degree to which areas of known use are protected by RLSA lands designated as HSAs, FSAs, and WRAs and to determine if there were areas of Open Lands that also provide habitats of value to panthers. Of particular importance were areas where these data show continual use over time and where the panther demographics indicate areas that support breeding females. It should be noted that most of the telemetry data used in this analysis are for panthers captured and instrumented within public lands adjacent to the RLSA. Only three panthers, dependent kittens of females captured initially within the FPNWR, have been captured for initial instrumentation on private lands within the RLSA. Telemetry data, therefore, do not indicate or represent where all panther habitat use or activity has occurred within the RLSA, but rather indicate habitat use preferences by panthers that have moved into and utilized areas of the RLSA, subsequent to initial capture outside the RLSA.
- **Landscape Connectivity:** Landscape connectivity often is viewed as a mechanism to mitigate the effects of habitat fragmentation and loss on declining populations (Lindenmayer and Fischer 2006). Three types of landscape connectivity have been described.

- “Habitat connectivity” refers to the connectedness among patches of suitable habitat for an individual species.
- “Landscape connectivity” refers to human perceptions of the connectedness of patterns of vegetative cover in a given landscape.
- “Ecological connectivity” refers to the connectedness of ecological processes across multiple scales.

Features described by Lindenmayer and Fischer (2006) that contribute to landscape connectivity and that have application to the RLSA include wildlife corridors and stepping stones. Wildlife corridors are physical linkages between patches of native vegetation that are believed to accomplish some or all of the following goals:

- Facilitate the movement of animals through suboptimal habitat;
- Provide habitat for resident populations;
- Enhance dispersal success, such as reducing mortality during dispersal;
- Prevent and reverse local extinctions by recolonization of empty patches; and
- Promote the exchange of genes between subpopulations (thereby increasing effective population size, reducing genetic drift and inbreeding depression, and maintaining inherent species richness at the patch and landscape scale).

Stepping stones are relatively small patches of native vegetation scattered about the landscape that facilitate movements by species able to reach the smaller isolated patches. Stepping stone connectivity designs may be a suitable alternative to corridors composed of continuous native cover to facilitate movements of animals that are adapted to habitat mosaics and have proven capabilities to disperse through fragmented habitats (Hilty et al. 2006).

Corridor dimensions of length and width often are considered when assessing existing and designing new landscape connections (Hilty et al. 2006). Although shorter corridors are generally recommended, corridor lengths must be within the movement capabilities of the target species to be effective (Hilty et al. 2006). Corridor lengths were reviewed relative to the movement capabilities of Florida panthers. McBride et al. (2008) reported that 99% of daily movements were less than 5.97 miles for females and less than 10.38 miles for males. McBride et al. (2008) cite unpublished records from 24-hour GPS-collar data of one female traveling a daily mean distance of 1.3 miles (0.05 – 4.60 miles) and one male moving a daily mean distance of 2.17 miles (0.05 – 5.1 miles). Darrell Land (unpublished data) estimated mean daily movements for three male panthers of 3.59 miles (0.15 – 14.47 miles), 4.25 miles (0.13 – 13.66 miles), and 4.89 miles based on 24-hour GPS-collar telemetry data. Maehr et al. (2002) reported effective mean dispersal distances for females of 7.02 miles (3.85 – 20.03 miles; $n=9$) and for males of 23.13 miles (15.38 – 138.94 miles; $n=18$).

Florida panthers require large areas of interconnected suitable habitats. Therefore, the PRT review focused primarily on identification of habitat connections needed by Florida panthers while acknowledging that corridors identified for panthers provide needs of other species, maintain ecological processes, and to some extent are based on human perceptions of landscape connectedness. The PRT identified some small patches of habitat that may function as stepping

stones of connectivity as demonstrated by telemetry records. Corridor widths were reviewed in the context of the recommendations of Beier (1995) and based on PRT measurements of observations of Florida panthers wearing GPS collars and using linear habitat patches.

- **Buffers to Panther Habitats:** Buffers are generally defined as areas of lower intensity land uses that are established adjacent to natural areas and intended to ameliorate the effects of intensive human activity on natural lands (Noss and Cooperrider 1994). Buffer creation around ecologically sensitive areas is an accepted strategy for mitigating adverse impacts of edge effects, which are changes in abiotic and biotic environments occurring at the boundaries of natural and human-modified vegetation types (Lindenmayer and Fischer 2006). Buffer widths are determined as a function of the needs of species inhabiting the natural areas. Although numerous research projects have yielded recommendations for buffer widths needed for amphibians, reptiles, and birds in specific settings (Lindenmayer and Fischer 2006), empirical data useful in determining appropriate widths of buffers for Florida panthers are lacking. Hourly GPS-collar records from several Florida panthers demonstrated that panthers often move along the upland/wetland ecotones of wetlands ecosystems bordered by agricultural fields. This observation suggests that buffers along wetland edges would be beneficial to future panther movements within the RLSA. The PRT opted to draw buffers around selected natural habitats at a distance that either conformed to landscape features (e.g., roads, ditches, fencerows, field edges) based on visual inspection or coincided with the edge of the Primary Zone where obvious landscape features were lacking. Buffers were identified with a vision of the future that included a developed urban landscape in relatively close proximity to preserved and occupied panther habitats. Buffers were specifically intended to protect the natural habitats of Okaloacoochee Slough and CKS, and the North Corridor proposed by the Landowners.
- **Habitat Peninsulas:** Some portions of large wetlands systems exist as narrow peninsulas of habitat that extend into agricultural lands such that they are surrounded on all sides by croplands. These habitat peninsulas are effectively cul-de-sacs with respect to panther movements because there is nowhere for a panther to go to find other suitable patches of habitat beyond the end of the peninsula. Although these areas may be connected to suitable and occupied panther habitats, lands adjacent to peninsulas were not deemed worthy of buffers or other forms of protection for Florida panthers. Conversely, there were some areas where narrow peninsulas of croplands or pasturelands extended into occupied panther habitats, usually wetlands. Such areas were identified as worthy of preservation to avoid intrusions of more intensive human developments into habitat areas that would be occupied on three sides by panthers.
- **Features of the Proposed North Corridor:** Data on the lengths, widths, and land cover types of corridors used by Florida panthers are generally lacking. The PRT analyzed existing panther telemetry data to quantify the dimensions and land cover characteristics of corridors used by two male Florida panthers as an aid to reviewing the proposed North Corridor. The North Corridor was also reviewed relative to the following recommendations made by Beier (1995) for corridor widths for pumas in a California setting of wild lands surrounded by urban areas: 1) corridors less than 0.5 mile in length should be greater than 328 feet wide; 2) corridors with lengths in the range of 0.62 – 4.35 miles in length should be 1,312 feet wide; and 3) corridor width should increase as length increases. More detailed information on the methods used in reviewing the North Corridor is provided in Section 7.3.

- **Restoration:** The value of some areas as panther habitat could be improved through restoration to more natural conditions.

Hard copy maps served as base layers for the PRT to use for hand-drawing boundaries around additional areas determined to be of importance to panthers. Hand-drawn maps were converted to GIS data layers through heads-up screen digitizing and manipulation of existing RLSA data layers. Basic descriptive statistics were derived for lands identified by the PRT as important to panther conservation.

Analysis of Areas Recommended for Preservation: A series of analyses was performed to assess the value of the areas recommended by the PRT for preservation relative to other lands within the RLSA. Individual polygons were created for 1) all areas of the RLSA designated as HSAs, FSAs, and adjacent WRAs (collectively referred to as preserves); 2) lands in public ownership, including the Pepper Ranch which was recently acquired by Collier County; 3) lands identified for preservation by the PRT; and 4) all RLSA Open lands not within a preservation category. The number of VHF-telemetry records for individual female ($n=17$), adult male ($n=14$), and sub-adult male ($n=12$) panthers with >40 observations within the RLSA was determined for each polygon. A minimum of 40 observations within the RLSA was assumed to be a sufficient number for analysis based on a recommendation from Seaman et al. (1999) that home range studies using kernel estimators should employ ≥ 30 locations, and preferably ≥ 50 locations. Data normality was determined using the Kolmogorov-Smirnov test (Minitab 2000), and the data were transformed ($\log [y+1]$) to fit a normal distribution. One-way analysis of variance (ANOVA) and multiple comparisons by Tukey's W were used to determine significant ($P < 0.05$) differences among telemetry locations for individual panthers within the RLSA¹. Tabulations were made by polygon for the number of roadkill records and number of dens, but no statistical testing was performed to determine whether significant differences exist among the four areas based on these measures of value to panthers.

The polygons for the four areas also were used to extract ordinal and continuous data from the following vector and raster databases:

- Acreages of forest cover types contained in the SFWMD 2004-05 land use/land cover database.
- Lengths of least-cost-path model segments within the RLSA (Swanson et al. 2005, Kautz et al. 2006).
- Florida panther potential habitat model (Kautz et al. 2006) (Figure 5).
- Panther habitat suitability model used by Swanson et al. (2005) to derive a cost surface for use in least-cost-path modeling (Figure 6).
- Model of Florida panther habitat suitability based on a Mahalanobis distance analysis of 2003 land cover data in relation to panther home ranges (Thatcher et al. 2006). Dimensionless D^2 distance values ranging from 0 to infinity were converted by Thatcher et al. (2006) to P -values, which range 0 – 1 with values closer to 1 indicating a greater similarity to the landscape

¹ Our enumeration of telemetry points and use of overlapping fixed kernel maps should not be construed as a way to define panther habitat within the RLSA or elsewhere. The PRT used these measures as a way to summarize existing panther information in the context of RLSA preserves, public lands, areas recommended for additional protection by the PRT and Open areas. The number of radio collared panthers represents a small sample of the entire population; the absence of telemetry locations does not indicate the absence of panther habitat.

conditions defined by the panther home ranges (i.e., greater *P*-values correspond to more favorable landscape conditions for panthers) (Figure 7).

- NRI model produced by WilsonMiller (2002) and used to identify major RLSA land use categories (Figure 8).
- Land cover scores used by the USFWS to calculate PHUs at impact and mitigation sites. SFWMD 2004-05 land use/land cover data for the RLSA were reclassified to values of 0 – 10 corresponding to the scores used by USFWS to indicate relative value to panthers (Figure 9).
- Relative use of the landscape by female panthers ($n=69$) as indicated by the sums of inverted distribution probabilities resulting from an analysis of overlapping 95% kernel home ranges derived from 1981 – 2008² radio-telemetry records (Figure 10).
- Relative use of the landscape by adult male panthers ($n=48$) as indicated by the sums of inverted distribution probabilities resulting from an analysis of overlapping 95% kernel home ranges derived from 1981 – 2008³ radio-telemetry records (Figure 11).
- Relative use of the landscape by sub-adult male panthers ($n=46$) as indicated by the sums of inverted distribution probabilities resulting from an analysis of overlapping 95% kernel home ranges derived from 1981-2008⁴ radio-telemetry records (Figure 12).

Acreeges of forest cover types and lengths of least-cost-path segments within the four polygons were extracted directly from existing vector data layers as continuous data. Analyses of all of the above vector and raster datasets were performed only for those portions of the data that were within the RLSA boundary. The NRI model (WilsonMiller 2002) and the USFWS scores derived from SFWMD land cover data existed as vector data layers. These layers were converted to 30-meter pixel grids with an analysis extent matching the RLSA boundary. The pixel values of each raster data layer were converted to a point shape file using the Raster to Point conversion feature in the ArcToolbox of ArcMap 9.3 (ESRI, Redlands, CA). The point shape files created in this fashion were huge data sets of approximately 880,000 points (i.e., one point for each pixel). The Create Random Selection sampling tool of Hawth's Analysis Tools for ArcGIS (version 3.27) was used to randomly select 10% of the points within each file, and the selected points totaling approximately 88,000 records were saved to a new file. These randomly selected records were exported to a Microsoft Excel spreadsheet and sorted by the four RLSA areas defined above. Data normality was determined using the Kolmogorov-Smirnov test. Parameters that did not follow a normal distribution and could not be transformed to fit a normal distribution were analyzed nonparametrically using the Kruskal-Wallis ANOVA on ranks multiple comparisons test (Minitab 13.32, Minitab Inc., State College, PA). Significance level for all tests was $\alpha = 0.05$.

Comparison of Areas Recommended for Preservation with the 2050 Concept Plan: The Parties provided the PRT with the "Draft 2050 Concept Plan" in Portable Document Format (pdf). The map provided a general depiction of one possible non-binding scenario of the location of SSAs, SRAs, Agricultural Areas, and other features of the RLSA at the 2050 horizon year. The pdf file was converted to jpg format, and the jpg file was imported into ArcView and georeferenced. Polygons depicting RLSA Open Lands were extracted from the master RLSA shape file and overlaid on the jpg image. The Open

² Refer to Page 13, Footnote 1.

³ Refer to Page 13, Footnote 1.

⁴ Refer to Page 13, Footnote 1.

Lands polygons were revised through a process of screen-digitizing to create a new shape file depicting the locations of development pods depicted in the 2050 concept plan map. The 2050 concept plan shape file was overlaid on the GIS file of areas recommended for preservation by the PRT, and conflicts between the two layers were identified and quantified.

2.3 Results

Identification of Areas Recommended for Preservation: The map (Figure 13) of additional areas within the RLSA that the PRT recommends receive consideration for some form of protection contains the following features:

1. Revisions to the south corridor proposed by the Landowners (referred to by the PRT as Summerland Swamp Habitat Linkage);
2. Revisions to the north corridor proposed by the Landowners;
3. Buffers along CKS in the vicinities of Ave Maria, Town of Big Cypress, and Hogan Island mine;
4. Open Lands of predominantly agricultural uses interspersed with patches of natural habitat within the Big Cypress ACSC;
5. Buffers and natural habitats along the western edge of SSA 16;
6. Agricultural fields south of CR 858 and north of RLSA lands designated as HSAs and WRAs;
7. Natural habitat areas between Immokalee and the Big Cypress ACSC; and
8. Patches of natural habitat and relatively low intensity land use adjacent to Pepper Ranch.

Areas recommended for additional protection outside of the Big Cypress ACSC include 23,362 acres of land that are predominantly pasturelands, citrus groves, and croplands (Table 2.3-1). Open Lands recommended for additional preservation within the Big Cypress ACSC include 15,384 acres that also are comprised predominantly of agricultural lands.

Summerland Swamp Habitat Linkage (SSHL): The SSHL in the northwest quadrant of the intersection of SR 29 and CR 858 was expanded to include approximately 5,542 acres of existing agricultural lands interspersed with natural habitats. This area has been and currently is used by Florida panthers based on recent radio-telemetry, GPS-collar telemetry, and mortality records. One patch of wetland habitat within this area was used as a den site by FP66 in December 1999, and documented vehicle-related mortalities of dependent-aged kittens and reproductive-aged females demonstrates that this area supports a reproductive component of the panther population. This area is a mosaic of natural habitats interspersed within an agricultural landscape that functions as panther habitat, not just as a corridor linking natural areas south of CR 858 to other natural areas northeast of SR 29. The area identified by the PRT includes existing WRAs that serve as effective buffers even though panther telemetry indicates little or no use of these WRAs. The SSHL also was expanded south from CR 858 to the Habitat area associated with SSA 10. The natural habitats interspersed within the agricultural lands of the area south of CR 858 have sustained frequent panther use.

North Corridor: PRT-recommended revisions to the proposed North Corridor create a 10.5-mile-long linear landscape feature comprising approximately 3,178 acres that are predominantly in agricultural uses

Table 2.3-1 Acreages of Land Cover Types Within Areas Proposed by the Panther Review Team for Some Type of Protection to Meet the Long-Term Habitat Conservation Needs of Florida Panthers Within the Rural Land Stewardship Area.

USFWS ¹ Land Cover Type	SSHL ²	North Corridor	Non- ACSC ³ Open	ACSC Open	Total	Percent
	Acres	Acres	Acres	Acres	Acres	
Grassland/Pasture	2,761	833	2,638	5,495	11,728	30
Orchards/Groves	1,452	1,614	3,590	3,767	10,423	27
Cropland	579	20	5,187	3,570	9,356	24
Freshwater Marsh	33	296	727	930	1,986	5
Hardwood Swamp	61	238	659	396	1,353	3
Pine Forest	49	86	697	53	885	2
Water	26.33	0	26	654	707	2
Cypress Swamp	312	0	250	58	620	2
Shrub and Brush	95	22	170	169	456	1
Exotics	137	46	121	28	331	1
Hardwood-Pine Forest	7	0	233	47	287	1
Hardwood Forest	7	3	192	19	221	1
Urban	14	0	113	82	208	1
Dry Prairie	9	20	40	117	186	0
Total	5,542	3,178	14,643	15,384	38,746	100

¹ U.S. Fish and Wildlife Service

² Summerland Swamp Habitat Linkage

³ Area of Critical State Concern

(Table 2.3-1). The North Corridor as revised by the PRT has a minimum width of 1,200 feet, and the corridor has a mean width of 2,276 feet because it incorporates several wider nodes of existing natural habitats. The recommended revisions to the proposed North Corridor are based in part on observed use of linear landscape features by Florida panthers (Tables 2.3-2 and 2.3-3) and recommendations for corridor dimensions to accommodate puma movements in southern California (Beier 1995). The revised North Corridor (Figure 14) follows the same general alignment as the corridor proposed by the Landowners (Figure 15) with the exception of the corridor's western terminus, particularly where the corridor would cross SR 82 and connect to the Corkscrew Regional Ecosystem Watershed (CREW) Marsh Unit near the intersection of CR 850 and SR 82. The PRT alternative is positioned along the shortest distance between existing habitat blocks north and south of SR 82 and, therefore, would minimize the amount of restoration that is required. The narrow 13,000-foot-long corridor segment extending north from Pepper Ranch as proposed by the Landowners would be eliminated in the PRT alternative. The PRT alternative places the corridor's intersection with SR 82 approximately mid-way between CR 850 to the west and the landowner-proposed Grove Road to the east. This is a better location for construction of a wildlife crossing that adheres to the Florida Department of Transportation (FDOT) line-of-sight safety issue regarding changes in slope for overpasses near intersections. The eastern terminus of the corridor was revised to include multiple points of entry to increase the likelihood of eventual use by panthers moving among large patches of protected habitat including Okaloacoochee Slough State Forest (OSSF) and HSAs, FSAs, and WRAs at the east end of the corridor. Restoration of natural habitats within the corridor as land use intensifies adjacent to the corridor should increase the likelihood of eventual use by panthers. A more detailed description of the PRT proposed revisions to the North Corridor is found in Section 7.3.

CKS Corridor: Several patches of agricultural land along CKS were identified as buffers to the corridor. Some of the patches of agricultural lands are surrounded by natural cover types, primarily wetlands. Maintaining agricultural uses within these patches, and perhaps eventually restoring some or all of these lands to more natural cover types, would serve to buffer the natural habitats that comprise the CKS corridor, and would enhance the likelihood of continued use of these areas by panthers. GPS collar data indicate that panthers often use the edges of wetland habitats, and preservation of agricultural uses adjacent to the Strand would provide buffers to these wetland edges.

Big Cypress ACSC: The PRT considered all RLSA Open Lands within the Big Cypress ACSC as having value to panther habitat conservation. The RLSA contains approximately 17,913 acres of Open Lands that are within the Big Cypress ACSC. These areas are predominantly in agricultural uses. Approximately 2,529 acres already are protected by approved SSAs, leaving approximately 15,384 acres in the Big Cypress ACSC that are not currently protected as SSAs or in public ownership (Table 2.3-1). The agricultural lands within the Big Cypress ACSC provide important buffers to the natural habitats that comprise the Okaloacoochee Slough ecosystem, an area of sustained panther use and a natural corridor connecting BCNP to OSSF. Section 4.3 of the MOU provides for Open Lands within the Big Cypress ACSC to be eligible to send 2.6 Stewardship Credits to support development within SRAs. All non-agricultural uses would be removed from areas designated as SSAs, and remaining uses would be limited to agriculture and uses that support agriculture, including, without limitation, farmworker housing. There would be no intensification from Ag2 (e.g., unimproved pasture, grazing, forestry, ranching) to Ag1 (e.g., croplands, groves, plant nurseries, improved pasture, dairy, poultry production) after SSA approval. Maintenance of existing agricultural land uses in the Open Lands of the Big Cypress ACSC would function to buffer the natural areas of Okaloacoochee Slough that are used by panthers. The Open Lands of the Big Cypress ACSC also contain areas of natural habitat that have supported and would continue to support occasional use by panthers.

Table 2.3-2 Dimensions of Nine Linear Landscape Features Repeatedly Used by Florida Panthers that were Monitored by Global Positioning System Collars Programmed to Record Locations at One-Hour Intervals.

Corridor	Width Samples	Mean Width	Minimum Width	Maximum Width	Length	Width to Length
	(<i>n</i>)	(feet)	(feet)	(feet)	(miles)	(%)
FP130 - No. 1	70	553	88	1,958	4.48	2.34
FP130 - No. 2	44	2,387	278	5,116	5.84	7.74
FP130 - No. 3	37	2,729	192	6,782	8.38	6.17
FP130 - No. 4	29	3,918	842	7,539	6.99	10.62
FP130 - No. 5	20	1,953	970	3,606	3.73	9.92
FP130 - No. 6	31	1,580	357	3,916	6.06	4.94
FP130 - No. 7	29	2,439	552	8,807	5.96	7.75
FP131 - No. 1	20	1,367	461	2,653	1.97	13.14
FP131 - No. 2	25	1,194	419	3,142	2.55	8.86
	305	1,878	462	4,835	5.11	7.94

Table 2.3-3 Relative Acreages of Land Cover Types Within Core Corridor Areas and in the Larger Landscape Surrounding Nine Linear Landscape Features Repeatedly Used by Florida Panthers Monitored Hourly. Corridor Axes Were Buffered by 462 feet and 4,835 feet, the Average Minimum and Maximum Widths of the Nine Corridors. Land Cover Acreages were Clipped from 2004-05 South Florida Water Management District Land Use/Land Cover Data, and Land Cover Types were Generalized to Major Habitat Types Analyzed by Kautz et al. (2006).

Land Cover Type	462-Foot Corridor		4,835-Foot Corridor	
	Acres	Percent	Acres	Percent
Grassland/Pasture	752	28.8	12,312	41.0
Hardwood Swamp	635	24.4	3,407	11.3
Pine Forest	329	12.6	5,197	17.3
Freshwater Marsh	291	11.2	3,330	11.1
Cypress Swamp	243	9.3	1,274	4.2
Hardwood Forest	213	8.2	1,092	3.6
Hardwood-Pine Forest	79	3.0	519	1.7
Dry Prairie	36	1.4	1,112	3.7
Exotics	14	0.6	83	0.3
Shrub and Brush	11	0.4	406	1.4
Cropland	2	0.1	1,153	3.8
Urban	1	0.1	42	0.1
Water	1	0.0	68	0.2
Orchards/Groves	0	0.0	66	0.2
Total	2,608	100%	30,061	100%

Buffers West of SSA 16: The PRT identified an estimated 1,116 acres west of SSA 16 as a buffer to occupied natural habitats of SSA 16 and adjacent SSAs within the Big Cypress ACSC. This buffer area is predominantly citrus groves (74%) interspersed with small patches of freshwater marsh, pine forest, and hardwood swamp. Although agriculture is the dominant use, this buffer area located between existing WRAs, and the patches of natural habitat within the citrus groves have been used by panthers as indicated by VHF- and GPS-collar telemetry records.

Agricultural Fields South of CR 858: The PRT identified approximately 1,686 acres of cropland and citrus groves south of CR 858 as a buffer area to occupied panther habitats. Although agricultural fields in this area have received little use by panthers based on VHF- and GPS-collar telemetry records, these fields are immediately adjacent to occupied natural habitats that connect to the FPNWR to the south. All of the lands between the agricultural fields and FPNWR have been designated as WRAs, HSAs, or FSAs in the RLSA program, and approximately two-thirds of the fields were designated as Primary Zone habitats (Kautz et al. 2006). Preservation of this area in its current state would provide a significant buffer to occupied panther habitats to the west, south, and east.

Habitats and Buffers East of Immokalee: The PRT identified and mapped approximately 2,254 acres of Open Land east and southeast of Immokalee to consider for additional preservation. These areas consist of natural habitats and unimproved pasturelands interspersed with improved pastures and croplands, and they have a history of documented use by panthers based on VHF telemetry records. Some of the agricultural lands in this area contain no telemetry records, but they nevertheless provide buffers to natural areas with documented use and likely provide support for panther prey (e.g., white-tailed deer and feral hog). The PRT also identified approximately 2,021 acres of land with similar features east of Immokalee but outside of the RLSA boundary. These additional 2,021 acres function together with the 2,254 acres within the RLSA as habitats and buffers valuable to panther conservation.

Four Parcels near Pepper Ranch: The PRT identified four parcels totaling 781 acres in the vicinity of Pepper Ranch as having habitats that would be of conservation value to Florida panthers if preserved. These areas contain a mix of natural cover types, but they also include some low density residential and rural development. Maintaining existing land uses in these areas would protect existing natural areas as panther habitat and would provide buffers to panther habitats on adjacent public lands.

Analysis of Areas Recommended for Preservation: Lands categorized as HSAs, FSAs, and adjacent WRAs (i.e., “preserves”) contain approximately 81% – 87% of VHF- and GPS-collar telemetry records that have been recorded in the RLSA, and public lands account for another 3% – 7% of telemetry locations (Table 2.3-4). Lands recommended by the PRT for preservation contain an additional 9% – 11% of telemetry records. These three areas combined contain 98% – 99% of all telemetry locations that have been recorded within the RLSA. Remaining Open Lands not identified for some form of preservation contain only 0.3% – 1.9% of telemetry records. In addition, HSAs, FSAs, and adjacent WRAs contained more dens and roadkill records than other areas, but lands recommended for preservation by the PRT included significant numbers of these records, providing an additional indication of the value of these lands as important to panthers. It should be noted that the VHF- and GPS telemetry data used in this analysis are for panthers captured and instrumented within public lands adjacent to the RLSA. Only three panthers (all dependent kittens of females captured initially on FPNWR) have been captured for initial instrumentation on private lands within the RLSA. Telemetry data, therefore, do not indicate or represent where all panther habitat use or activity has occurred within the RLSA, but rather

Table 2.3-4 Number of Florida Panther Telemetry, Den, and Roadkill Records in Rural Land Stewardship Area Lands Designated for Preservation (i.e., Habitats, Flowways, and Adjacent Wetland Retention Areas), Lands in Public Ownership, Lands Recommended for Preservation by the Panther Research Team, and Areas not Recommended for Preservation.

Area	Telemetry Records			Dens	Roadkills
	VHF Collars		GPS Collars		
	Females	Adult Males	1 Female, 5 Males		
	No.	No.	No.		
Preserves	3,248	2,246	2,015	2	17
Public Lands	159	81	182	0	0
PRT Preservation	325	229	267	1	10
No Recommendation	13	50	39	0	4
Total	3,745	2,606	2,503	3	31

indicate habitat use preferences by panthers that have moved into and utilized areas of the RLSA, subsequent to initial capture outside the RLSA.

PRT analyses show that HSAs, FSAs, and adjacent WRAs had the highest panther value within the RLSA based on the variables we tested except for female panther fixed kernels where public lands were the most important (Tables 2.3-5 and 2.3-6). Although lands recommended for preservation by the PRT generally exhibit lower values as panther habitats than preserves or public lands, they nevertheless add benefit to panther habitat conservation within the RLSA based on the significant differences found between lands recommended for protection by the PRT and lands not specifically recommended for protection. Lands not recommended for protection ranked significantly lower in value to panther conservation than any other areas within the RLSA.

Comparison of Areas Recommended for Preservation with the 2050 Concept Plan: The areas of the RLSA recommended for preservation by the PRT totaled 38,746 acres. Areas identified for potential future development in the 2050 Concept Plan were estimated to contain 42,976 acres. Areas in conflict between the PRT recommendations and the 2050 Concept Plan total 8,904 acres. The principal areas of conflict between the two versions are southeast of Immokalee; the SSSL area in the northwest quadrant of the intersection of SR 29 and CR 858; an area south of CR 858 and east of SR 29; agricultural lands to the south of Ave Maria and CR 858; agricultural lands south of CR 858 in the southwest corner of the RLSA; areas bordering CKS generally north of CR 858 and west of Lake Trafford; and the west entrance to the North Corridor (Figure 16). The two scenarios are in 80% agreement.

2.4 Discussion

The RLSA contains approximately 83,863 acres of privately owned lands designated as HSAs, FSAs, and WRAs within the panther Primary Zone (Table 2.4-1). Approximately 45,389 of these acres (54%) have been approved or are pending approval by Collier County as SSAs (Table 2.4-2). All of these lands are very likely to be preserved in perpetuity under the RLSA program once they are approved as SSAs and Stewardship Credits are transferred to SRAs to support future development. The RLSA also contains approximately 15,236 acres that are protected by public ownership (Table 2.4-3). The PRT identified an additional 38,746 acres of Open Lands that contain natural habitats that support panthers, provide buffers against indirect impacts of future intensive development, or maintain habitat connectivity to support panther movements throughout the landscape in the long term (Table 2.4-3). The PRT recommends that these 38,746 acres of Open Land be considered for additional preservation under an appropriate classification. The areas recommended for preservation by the PRT could remain in existing natural or agricultural uses in perpetuity, thereby expanding the total acreage of panther habitat that would be preserved under the RLSA program. This would be especially true if some portions of these areas would be restored to native cover. However, these lands would not be suitable for mining, an allowable land use under some RLSA categories, because mining constitutes a direct loss of habitat that is not compatible with the conservation of panther habitats.

The entire area that is designated and/or recommended for preservation as panther habitats includes lands already in public ownership; HSAs and FSAs; WRAs that are proximal to important panther habitats; Open Lands within SSAs that have been approved or are pending approval; the additional areas recommended by the PRT; and Lake Trafford (Figure 13). These areas cover 142,383 acres of the RLSA (Table 2.4-3); 59% of which are in HSAs, FSAs, and WRAs; 11% of which are in public ownership; 2% are Open Lands within approved SSAs; 27% of which are in Open Lands that the PRT recommends for consideration and additional protection, and 1% of which is Lake Trafford. Areas that are already in public

Table 2.3-5. Results of Analysis of Variance of VHF-Collar Telemetry Records for Female, Adult Male, and Subadult Male Florida Panthers That Have Occurred within the RLSA and Are Represented by ≥ 40 Observations.

Analysis of Variance for log (y+1)					
Source	DF	SS	MS	F	P
Females					
Location	3	35.753	11.918	46.59	0.000
Error	64	16.371	0.256	—	—
Total	67	52.125	—	—	—
Males					
Location	3	23.483	7.828	41.38	0.000
Error	52	9.837	0.189	—	—
Total	55	33.319	—	—	—
Subadult Males					
Location	3	18.859	6.286	34.13	0.000
Error	48	8.840	0.184	—	—
Total	51	27.699	—	—	—

Mean telemetry records for panthers within the RLSA¹.

Location	Mean Female Telemetry ²	Mean Male Telemetry ²	Mean Subadult Male Telemetry ²
Preserve	189.90 A	148.60 A	79.80 A
PRT	19.12 B	14.86 B	11.00 B
Public	8.41 C	4.07 C	3.69 BC
No Protection	0.77 C	3.57 C	1.85 C

¹ Panthers with 40 or more records within the RLSA were used for analysis.

² Different letters signify a significant difference at the 0.05 probability level (within each column).

Table 2.3-6 Results of Statistical Analyses of the Value of Lands Recommended by the PRT for Preservation for Florida Panthers in Relation to Other Areas Within the RLSA.

Data Layer	RLSA Area	N	Median	Significant Differences*
Habitat Suitability ($P < 0.001$)	Preserves	37,902	9	A
	Public Land	6,870	9	A
	PRT Preservation	18,749	7	B
	No Recommendation	24,561	4	C
	Total	88,082		
FWS Land Cover Score ($P < 0.001$)	Preserves	37,928	9	A
	Public Land	6,890	9	B
	PRT Preservation	18,479	4	C
	No Recommendation	24,797	4	D
	Total	88,094		
Natural Resource Index ($P < 0.001$)	Preserves	37,935	1.5	A
	Public Land	6,744	1.5	B
	PRT Preservation	18,657	0.6	C
	No Recommendation	24,529	0.2	D
	Total	87,865		
Mahalanobis Distance Rankings ($P < 0.001$)	Preserves	37,665	0.2000	A
	Public Land	6,696	0.0800	B
	PRT Preservation	18,443	0.0300	C
	No Recommendation	24,884	0.0001	D
	Total	87,688		
Adult Male Kernel Overlaps ($P < 0.001$)	Preserves	38,011	82	A
	Public Land	6,762	0	C
	PRT Preservation	18,711	39	B
	No Recommendation	24,598	0	D
	Total	88,082		

Table 2.3-6 Continued.

Data Layer	RLSA Area	N	Median	Significant Differences*
Female Kernel Overlaps ($P < 0.001$)	Preserves	37,754	23	B
	Public Land	6,842	33	A
	PRT Preservation	18,752	12	C
	No Recommendation	24,914	0	D
	Total	88,082		
Sub-adult Male Kernel Overlaps ($P < 0.001$)	Preserves	38,001	151	A
	Public Land	6,819	114	B
	PRT Preservation	18,516	111	C
	No Recommendation	24,746	22	D
	Total	88,082		
Panther Habitat Model ($P < 0.001$)	Preserves	38,786	2	A
	Public Land	7,101	1	B
	PRT Preservation	18,883	0	C
	No Recommendation	25,557	0	D
	Total	90,327		
Forest Acres ($P < 0.001$)	Preserves	1,496	7.295	A
	Public Land	239	5.200	B
	PRT Preservation	452	2.655	C
	No Recommendation	353	2.700	C
	Total	2,540		
Least Cost Path Segments ($P = 0.001$)	Preserves	445	0.340	AC
	Public Land	190	0.375	AC
	PRT Preservation	94	0.250	C
	No Recommendation	63	0.040	BC
	Total	792		
*No significant differences ($\alpha = 0.05$) were observed between data layers with the same letter.				

Table 2.4-1 Rural Land Stewardship Area (RLSA) Lands in Natural Resource Categories, Public Ownership, Proposed for Protection by the Panther Research Team (PRT), Approved or Slated for Development, or for which No Protection for Florida Panthers was Identified Based on Location Within the Florida Panther Primary and Secondary Zones.

Panther Focus Area	Protection/Development	Acres
Primary Zone	Area in RLSA	149,742
Protection	Habitat, Flowway, and Panther WRAs ¹	83,863
	Public Land	14,990
	Open Lands Within Approved SSAs ²	2,684
	Lake Trafford	1,461
	PRT Recommended Protection	34,613
	<i>Total Protection</i>	<i>137,610</i>
Development	Ave Maria	2,125
	Town of Big Cypress	3,414
	Hogan Mine	487
	<i>Total Development</i>	<i>6,026</i>
Total Protection/Development		143,636
Lands Not Identified Above		6,106
Secondary Zone	Area in RLSA	46,136
Protection	Habitat, Flowway, and Panther WRAs	388
	Public Land	247
	Open Lands Within Approved SSAs	5
	PRT Recommended Protection	4,133
	<i>Total Protection</i>	<i>4,773</i>
Development	Ave Maria	2,902
	Town of Big Cypress	276
	Hogan Mine	488
	WRAs Not Panther Habitat	4,773
	<i>Total Development</i>	<i>8,140</i>
Total Protection/Development		12,912
Lands Not Identified Above		33,224
RLSA	Total Area	195,878

¹ Wetland Retention Area

² Stewardship Sending Area

Table 2.4-2 Estimated Total Acreages and Panther Habitat Units (PHU) by Rural Land Stewardship Area (RLSA) Categories for All Approved and Pending Stewardship Sending Areas (SSAs), SSAs Dedicated to Mitigation for Ave Maria, and Approved and Pending SSAs not Dedicated to Specific Stewardship Receiving Areas (SRAs).

RLSA Category	All SSAs* (Total)		Ave Maria Mitigation* (SSA 1-6)		No SRA Dedication (SSA 7-16)	
	Acres	PHU	Acres	PHU	Acres	PHU
Flowway	15,508	138,054	6,564	58,081	8,944	79,973
Habitat	28,398	211,089	10,345	70,409	18,053	140,679
Open	2,799	20,270	28	257	2,770	20,014
Water Retention	1,483	12,674	23	179	1,461	12,495
Total	48,188	382,087	16,960	128,926	31,228	253,161

*Acreage and PHU calculations differ slightly due to slight discrepancies in registrations of geographic information system layers. Estimates of acreages and PHUs in Table 4.3-1 have taken into account registration issues and are more accurate than those in Table 2.4-2.

Table 2.4-3 Summary of Rural Land Stewardship Area (RLSA) Lands Currently Protected or Proposed for Protection, Currently Being Developed or Proposed for Development, Wetland Retention Areas (WRAs) Unsuitable as Panther Habitats because they are Surrounded by Open Lands Likely to be Developed in the Future, and Total Acreages of Land Available for Future Development.

Panther Focus Area	Protection/Development	Acres
Total Protection	Habitat, Flowway, and Panther WRAs	84,251
	Public Land	15,236
	Open Lands Within Approved SSAs ¹	2,689
	Panther Review Team Recommended Protection	38,746
	Lake Trafford	1,461
	<i>Total Protection</i>	<i>142,383</i>
Total Development	Ave Maria (AM)	5,027
	Town of Big Cypress (TOBC)	3,691
	Hogan Mine (HM)	975
	WRAs Not Panther Habitat	4,473
	<i>Total Development</i>	<i>14,166</i>
Future Development	Lands Not Identified Above	39,330
	45,000 Acre Cap Minus AM, TOBC, & HM	35,307
	Area Above 45,000 Acre Cap	4,022
RLSA	Total Area	195,878

¹ Stewardship Sending Area

ownership, proposed for protection by the Parties and the PRT, part of Lake Trafford, developed as part of Ave Maria, or are currently in the consultation process with the USFWS and FWC pending permit authorization, such as the Town of Big Cypress or Hogan Mine include 143,636 acres of Primary Zone and 12,912 acres of Secondary Zone habitats (Table 2.4-1). A total of 39,330 acres would remain available for future development (Table 2.4-3), approximately 6,106 acres of which are in Primary Zone and 33,224 acres of which are in Secondary Zone habitats (Table 2.4-1).

The Parties have proposed a 45,000-acre cap on future development within the RLSA. The PRT assume that Ave Maria (5,027 acres) would be included within the cap. The PRT determined that the proposed Town of Big Cypress (3,691 acres) and Hogan Mine (975 acres) should also be included within the cap for purposes of analyses. A balance of 35,307 acres remains under the development cap after deducting the acreages for Ave Maria, Town of Big Cypress, and Hogan Mine (Table 2.4-3). The PRT analysis resulted in the identification of 39,330 acres of RLSA lands that would be more suitable for future development after areas of most conservation value to panthers were identified. These areas contain approximately 4,022 acres more than needed to meet the acreage remaining under the 45,000-acre development cap (Table 2.4-3).

Lands identified by the PRT as potentially suitable for future development contain only 33,224 acres of Secondary Zone habitat, which is not enough to absorb the remaining 35,307 acres under the 45,000-acre development cap. Consequently, impacts to the Primary Zone are likely to occur if the maximum allowable acreage of future development allowable under the cap is eventually reached. The PRT acknowledges and supports the Parties' intent as stated in the MOU to avoid, minimize, and mitigate impacts to areas within the Primary Zone as described by Kautz et al. (2006). Therefore, the PRT recommends that future development occurs first in Open Lands that are within the Secondary Zone before lands within the Primary Zone are considered for conversion to urban uses.

The areas of Open Land recommended by the PRT for preservation or maintenance of existing agricultural uses are strategically located and configured to complement the habitats that will contribute to the conservation of the panther population in southwest Florida. The combination of lands currently designated for preservation and the additional lands recommended by the PRT will result in the preservation of core habitat areas and adjacent buffers, provision of corridors to connect occupied habitats on public lands, and the minimization of future habitat fragmentation within the RLSA. Lands remaining available for development would be more than needed to accommodate the proposed development cap of 45,000 acres and would potentially impact only 2,084 acres of Primary Zone habitat. Approximately 80% of areas identified for preservation by the PRT are in agreement with the non-binding future development scenario depicted in the RLSA 2050 Concept Plan. However, the PRT's recommendations should not be construed as an endorsement of 45,000 acres of urban development within the RLSA.

3.0 Analysis of Additional Mitigation Proposed for Impacts to the Primary Zone

3.1 Introduction

The Parties propose to provide 25% additional mitigation for impacts to RLSA lands that are within the Florida panther Primary Zone (MERIT 2002, Kautz et al. 2006, USFWS 2007). The proposal would also result in a 25% additional financial contribution into the Panther Fund for those impacts.

The Methodology prescribed by the USFWS for evaluating impacts to Florida panther habitats within the PFA (USFWS 2007) provides a means to assess panther habitat in terms of PHUs, which are calculated as the sum of the products of scores multiplied by acreages for each land cover type that may be impacted by a project. The USFWS requires that impacts be mitigated at a ratio of 2.5:1, and, therefore, the amount of mitigation recommended is calculated by multiplying the PHUs in the impact area by 2.5. The PHU values of prospective mitigation sites also are calculated using the same Methodology to determine whether the PHUs available for mitigation meet the mitigation recommended for project impacts. However, the final amount of mitigation required may increase or decrease based on the location of impact and mitigation sites within the Primary or Secondary Zones.

The proposal by the Parties to provide 25% more PHUs of mitigation for impacts to lands within the Primary Zone of the RLSA leads to a new mitigation ratio of 3.125:1 (i.e., $2.5 \times 1.25 = 3.125$) for projects located or proposed within those areas. The Parties further propose a cap of 45,000 acres for the total area available for development at build-out within the RLSA. The Parties requested that the PRT use the USFWS Methodology to provide an assessment of the amount of panther habitat conservation achieved under the proposed increase in PHUs of mitigation relative to the amount expected to occur under existing conditions. However, there are several estimates of the total acreage of possible development at build-out under the existing program. Therefore, the relative value of the current and proposed mitigation ratios to panther habitat conservation was assessed with a GIS analysis of three estimates of allowable development under the existing RLSA program in comparison to benefits associated with capping development at 45,000 acres. The PRT also analyzed the relative values of five scenarios of development of 45,000 acres based on various percentages of future impact in the panther Primary and Secondary Zones. Finally, the PRT analyzed the benefits of the increased mitigation ratio based on a recommendation that all Secondary Zone Open lands be developed before developing in the Primary Zone. The analyses were based on available data layers for land cover, RLSA land use categories, and panther Primary and Secondary Zones. Increased financial contributions to the Panther Fund also were estimated for each scenario.

3.2 Methods

Land use/land cover data for 2004-2005 were downloaded from the SFWMD web site and used as the basis for calculating PHUs. These data were selected because they were the most recent readily available data that depicted the landscape of the RLSA prior to beginning of construction for Ave Maria. Land use/land cover data were clipped to the RLSA boundary, and acreages were recalculated. Fields were added to the resulting land use/land cover data set to crosswalk the SFWMD Florida Land Use, Cover and Forms Classification System (FLUCFCS) (FDOT 1999, as modified by SFWMD) codes to the more general USFWS land cover types and associated land cover scores. The modified land use/land cover data set was clipped to RLSA major categories (i.e., Open, Flowway, Habitat, Water Retention, Lake

Trafford), which were further clipped by Primary and Secondary Zone boundaries. PHUs were calculated for each major RLSA land use category within the Primary and Secondary Zones, and average PHUs per acre were calculated by category and zone (Table 2.1-1). PHUs also were calculated for lands in public ownership as of December 2008 (including lands within the boundary of Pepper Ranch which was recently acquired by Collier County) and within the boundary of Ave Maria.

The PRT conducted three analyses to assess the value of an additional 25% of PHUs for impacts to the Primary Zone to the future of panther conservation. The first analysis was an assessment of the PHUs of impact and mitigation required under three scenarios of baseline conditions for the existing RLSA program as compared to the proposed 45,000-acre development cap. The second analysis was limited to the proposed 45,000-acre development cap and involved an assessment of five scenarios of future development based on varying percentages of panther Primary and Secondary Zone habitats. The third analysis was limited to the proposed 45,000-acre development cap and was based on a recommendation that available Secondary Zone lands be developed before development occurs within the Primary Zone. The following assumptions were made for each analysis:

1. All development will occur only within RLSA Open Lands with no impacts to RLSA lands designated as HSAs, FSAs, or WRAs;
2. PHUs associated with impact and mitigation sites can be estimated using average per-acre PHU values of RLSA lands likely to be impacted or serve as mitigation sites;
3. A reduction factor of 0.69 should be used to calculate mitigation for impacts that occur in the Secondary Zone but which are mitigated in the Primary Zone pursuant to USFWS Methodology;
4. All mitigation will occur within the panther Primary Zone;
5. All areas of the Primary and Secondary Zones within the boundaries of Ave Maria should be deducted from the acreages available for future development, because impacts associated with Ave Maria have been permitted and mitigated;
6. Acreages of impact associated with the Town of Big Cypress and Hogan Mine, which are currently in the consultation process with the USFWS and FWC pending permit authorization, should be deducted from the acreages available for future development, but their permit conditions have not yet been established. Therefore, these projects should be subject to the increased mitigation requirements associated with Primary Zone impacts as proposed in the FPPP;
7. Financial contributions to the Panther Fund should be estimated on a value of \$75 per PHU;
8. Pepper Ranch, which was recently acquired by Collier County, was treated as a component of public lands; and
9. Impacts associated with infrastructure (i.e., roads, utilities, communications) or future mining should be included within the 45,000-acre cap and should not be considered as separate from or in addition to the total number of acres utilized for development.

Analysis 1 (Baseline Conditions vs. 45,000-Acre Development Cap): The first analysis was a calculation of the total number of PHUs for impacts and required mitigation associated with three baseline scenarios compared to the proposed 45,000-acre development cap. Baseline conditions for three RLSA build-out scenarios were obtained from analyses completed by WilsonMiller (Anita Jenkins; memo, December 5, 2008) and Collier County (Thomas Greenwood; spreadsheet, September 5, 2008). The build-out scenarios for baseline conditions and the 45,000-acre development cap are described as follows.

1. Collier County “Full Utilization” Scenario: Collier County estimated that dedication of all lands designated as HSAs, FSAs, and WRAs to SSAs would generate a quantity of Stewardship Credits sufficient to accommodate development of 41,040 acres of SRAs. An additional 46,738 acres of RLSA Open Lands would remain available for development at baseline conditions of 1 unit/5 acres with no clustering. Development of the remaining 46,738 acres of Open Land at 1 unit/5 acres would effectively render these areas unsuitable as panther habitat. Therefore, the total development footprint at build-out would include 82,751 acres after subtracting the 5,027 acres within the boundary of Ave Maria (Table 3.2-1).
2. WilsonMiller “Full Utilization” Scenario: This scenario is very similar to the Collier County “full utilization” scenario. WilsonMiller estimated that dedication of all lands designated as HSAs, FSAs, and WRAs to SSAs would generate a quantity of Stewardship Credits sufficient to accommodate development of 43,300 acres of SRAs. An additional 43,700 acres of RLSA Open Lands would remain available for development at baseline conditions of 1 unit/5 acres with no clustering. Development of the remaining 43,700 acres of Open Land at a density of 1 unit/5 acres would effectively render these areas unsuitable as panther habitat. Therefore, the total development footprint at build-out would include 81,973 acres after accounting for the 5,027 acres within the boundary of Ave Maria (Table 3.2-1).
3. WilsonMiller “Partial Baseline” Scenario: WilsonMiller estimated that dedication of all lands designated as HSAs, FSAs, and WRAs to SSAs would generate a quantity of Stewardship Credits sufficient to accommodate development of 43,300 acres of SRAs. However, WilsonMiller noted that market incentives favor well planned, compact, mixed use communities served by high quality infrastructure and services, and that it is unrealistic to expect development of the remaining 43,700 acres at a density of 1 unit/5 acres. The “partial baseline” scenario assumed 10% conversion of ACSC Open Lands and 25% conversion of non-ACSC Open Land. This scenario would result in a build-out estimate of 51,975 acres of development, but only 46,948 acres remain available for future development after accounting for Ave Maria (Table 3.2-1), and 35,025 acres of Open Land would remain in agriculture.
4. “45,000-Acre Development Cap” Scenario: Proposed revisions to the existing RLSA program would impose a 45,000-acre cap on future development. The existing Stewardship Credit system would be recalibrated to yield the protection of the following areas at build-out: 1) 92,000 acres of NRI-based SSAs, 2) 40,000 acres of agriculture SSAs, 3) 2,300 acres of panther corridors, and 4) 16,546 acres of public and miscellaneous lands. This scenario assumed that approximately 39,973 acres of future development would remain after subtracting the 5,027 acres of Ave Maria from the 45,000-acre cap (Table 3.2-1).

The proposal to provide an additional 25% of PHUs of mitigation for impacts to the Primary Zone does not apply to the existing conditions of the RLSA program as characterized by the three baseline scenarios. The value of the proposed 25% increase in PHUs was evaluated by comparing results from the three baselines

Table 3.2-1 Estimated Benefit to Florida Panther Habitat Conservation Associated with a 25% Increase in the Mitigation Ratio for Impacts to the Florida Panther Primary Zone for Three Scenarios of Future Build-Out Compared to a 45,000-Acre Cap on Future Development Within the Rural Land Stewardship Area.

Development Potential	Development Scenario			
	Baseline Conditions			Proposed
	<i>WilsonMiller Partial Utilization</i>	<i>WilsonMiller Full Utilization</i>	<i>County Full Utilization</i>	<i>45,000-Acre Development Cap</i>
SRAs ¹ Established for Development (Acres)	43,300	43,300	41,040	45,000
Open Lands at 1 Unit/5 Acres (Acres)	8,675	43,700	46,738	0
Total Developable Lands (Acres)	51,975	87,000	87,778	45,000
Ave Maria (Acres)	5,027	5,027	5,027	5,027
Total Area for Future Development (Acres)	46,948	81,973	82,751	39,973
Primary Zone (PZ)				
Fraction of Open Lands in PZ	0.53	0.53	0.53	0.53
Estimated Impact in PZ (Acres)	24,891	43,460	43,872	21,193
Average Panther Habitat Value (PHU ² /Acre)	5.5734	5.5734	5.5734	5.5734
Estimated Impact on Panther Habitat (PHU)	138,725	242,220	244,519	118,115
Mitigation Required at 2.5:1 (PHU)	346,813	605,549	611,296	295,288
Mitigation Required at 3.125:1 (PHU)	0	0	0	369,110
Secondary Zone (SZ)				
Fraction of Open Lands in SZ	0.47	0.47	0.47	0.47
Estimated Impact in SZ (Acres)	22,057	38,513	38,879	18,780
Average Panther Habitat Value (PHU/Acre)	4.5607	4.5607	4.5607	4.5607
Estimated Impact on Panther Habitat (PHU)	100,598	175,648	177,315	85,652
Mitigation Required at 2.5:1 (PHU)	251,495	439,120	443,288	214,131
Reduction Factor for Mitigation in PZ	0.69	0.69	0.69	0.69
Total Mitigation Required (2.5 * 0.69) (PHU)	173,532	302,993	305,868	147,750

Table 3.2-1 Continued.

Development Potential	Development Scenario			
	Baseline Conditions			Proposed
	<i>WilsonMiller Partial Utilization</i>	<i>WilsonMiller Full Utilization</i>	<i>County Full Utilization</i>	<i>45,000-Acre Development Cap</i>
Total PHU Mitigation Requirements				
Existing 2.5:1 Ratio (PHU)	520,345	908,542	917,165	443,038
Proposed 3.125:1 Ratio (PHU)	0	0	0	516,860
Net Benefit of 3.125 Mitigation Ratio (PHU)	0	0	0	73,822
Acreage Benefits				
Existing 2.5:1 Ratio (Acres)	63,801	111,400	112,457	54,322
Proposed 3.125:1 Ratio (Acres)	0	0	0	63,374
Net Benefit of 3.125 Mitigation Ratio (Acres)	0	0	0	9,052
Panther Fund Benefits (\$75/PHU)				
Existing 2.5:1 Ratio	\$0	\$0	\$0	\$33,227,843
Proposed 3.125:1 Ratio	\$0	\$0	\$0	\$38,764,487
Net Benefit of 3.125 Mitigation Ratio	\$0	\$0	\$0	\$5,536,644

¹ Stewardship Receiving Area.

² Panther Habitat Unit

with similar calculations of impact and mitigation requirements associated with the proposed 45,000-acre cap on future development. Mitigation requirements were calculated using the existing 2.5:1 ratio for the baseline scenarios, but both the existing 2.5:1 and the proposed 3.125:1 ratios for impacts occurring in the panther Primary Zone were calculated for the 45,000-acre cap scenario. Development impacts were assumed to be distributed in the Primary and Secondary Zones in proportion to their occurrence within RLSA Open Lands. RLSA Open Lands available for development are comprised of 53% Primary Zone and 47% Secondary Zone after subtracting acreages that are in public ownership or are within the boundary of Ave Maria. The total area of impact was estimated by zone based on these fractions because, with the exceptions of Ave Maria, the Town of Big Cypress, and Hogan Mine, actual locations of future developments were unknown at the time of this analysis. Average PHU/acre values for Open Lands in the Primary Zone and Secondary Zone were used to estimate the number of PHUs of mitigation required as a function of location of impact.

Analysis 2 (Five Scenarios for the 45,000-Acre Development Cap): The second analysis was a calculation of the total number of PHUs for impacts and mitigation associated with five scenarios of impact to Primary and Secondary Zone habitats under the 45,000-acre cap on future development. This analysis was intended to assess a range of possible benefits associated with a 25% increase in PHUs for impacts to the Primary Zone because, with the exceptions of Ave Maria, the Town of Big Cypress, and Hogan Mine, specific locations for the maximum of 45,000 acres of future development have not yet been determined. Current and proposed mitigation ratios were applied to the mitigation requirements for each scenario to evaluate benefits to Florida panther conservation.

The calculations for this analysis were based on a total future development footprint of 39,973 acres, the acreage of potential future development remaining after the 5,027 acres of Ave Maria were subtracted from the 45,000-acre development cap. The acreage for Ave Maria was subtracted from this analysis because the project has been permitted for development, impacts have been mitigated, and the Parties have agreed that Ave Maria would be included within the 45,000-acre development cap. However, the 3,691 acres of the Town of Big Cypress and 975 acres of Hogan Mine were included with the 39,973 acres remaining under the development cap for this analysis of potential benefits of the FPPP to panther conservation because those projects are currently in the consultation process with the USFWS and FWC pending permit authorization, and the permit conditions for those projects have not yet been established. Although the locations and sizes of these projects are known, the PRT determined that they should be evaluated under the provisions of the proposed FPPP and that they would be included under the 45,000-acre development cap. The proposed conservation measures (i.e., 25% more PHUs for Primary Zone impacts and generation of revenue to the Panther Fund) will apply to the Town of Big Cypress, whereas, they do not apply to Ave Maria. The following scenarios for development of the 39,973 acres within the RLSA were evaluated.

1. Scenario 1: Assumes that 100% of future impacts occur within the panther Secondary Zone.
2. Scenario 2: Assumes that 75% of future impacts occur within the Secondary Zone and 25% of future impacts occur within the Primary Zone.
3. Scenario 3: Assumes that 50% of future impacts occur within the Secondary Zone and 50% of future impacts occur within the Primary Zone.
4. Scenario 4: Assumes that 25% of future impacts occur within the Secondary Zone and 75% of future impacts occur within the Primary Zone.

5. Scenario 5: Assumes that 100% of future impacts occur within the Primary Zone.

Analysis 3 (Development of Secondary Zone Before Primary Zone): The third analysis was a calculation of the total number of PHUs for impacts and mitigation associated with a scenario which follows the PRT recommendation that development should occur within the Secondary Zone before development occurs in the Primary Zone. The PRT recommended that 38,746 acres of RLSA Open lands should be dedicated to protection as areas important to conservation of the Florida panther (Table 2.4-3). No protection needs under existing or proposed RLSA categories were identified for 39,330 acres (Table 2.4-3), of which 33,224 acres were in the Secondary Zone and 6,106 acres were in the Primary Zone (Table 2.4-1). A total of 35,307 acres would remain available for development after the acreages for Ave Maria, the Town of Big Cypress, and Hogan Mine are subtracted from the 45,000-acre development cap (Tables 2.4-1 and 2.4-3). This scenario assumes that all 33,224 acres of Secondary Zone lands not identified for protection are developed, and the 2,084 acres remaining for future development under the cap occur in the Primary Zone.

3.3 Results

Analysis 1 (Baseline Conditions vs. 45,000-Acre Development Cap): The combination of the existing RLSA program and baseline development densities applicable in areas that would not be designated as SRAs have the potential to result in 46,948 – 82,751 acres of future development (Table 3.2-1). The “full utilization” scenarios would require approximately 913,000 PHUs of mitigation, which would be sufficient to protect approximately 112,000 acres of Primary Zone habitat (Table 3.2-1). However, the cost for protecting 112,000 acres of panther habitat would be the development of approximately 87,000 acres of Open Lands, some areas of which are important panther habitats. The “partial utilization” scenario would require approximately 520,000 PHUs of mitigation, which would be sufficient to protect approximately 63,800 acres of Primary Zone habitat (Table 3.2-1). However, the “partial utilization” scenario would leave approximately 35,000 acres in agricultural uses without protection from future development. These acres could be developed at baseline densities of 1 unit/5 acres if future market conditions increased the demand for this type of development. The proposal for 25% more PHUs of mitigation for impacts to the Primary Zone does not apply to the “full utilization” or “partial utilization” scenarios.

The proposed 45,000-acre cap on development would result in a requirement for approximately 443,000 PHUs of mitigation under the 2.5:1 ratio and 517,000 PHUs of mitigation under the 3.125:1 ratio, for a net benefit of approximately 74,000 additional PHUs (Table 3.2-1). These PHUs would result in the protection of approximately 54,300 and 63,400 acres, respectively, of panther Primary Zone under the existing and proposed mitigation ratios for a net benefit of approximately 9,000 acres of added protection. The PHUs of mitigation needed under the proposed 3.125:1 mitigation ratio would protect approximately the same number of acres as the “partial utilization” scenario. However, there is a significant difference between these two scenarios in terms of protection of panther habitats. The “partial utilization” scenario would leave approximately 35,000 acres of agricultural land at risk of future development at baseline densities of 1 unit/5 acres. Conversely, the 45,000-acre development cap scenario is achieved by a recalibration of the Stewardship Credit system such that all lands that are not developed at build-out will be protected as NRI-based or agriculture SSAs because all of these areas are needed to generate enough Stewardship Credits to enable development of 45,000 acres. Most of the NRI-based SSAs and many of the agriculture SSAs provide habitats valuable to the conservation of Florida panthers. Protection of these areas would be achieved by the Stewardship Credit system without involving PHUs. Implementation of

the proposed 3:125 mitigation ratio would result in a total financial benefit to the Panther Fund of approximately \$38.8 million compared to no financial benefit under the three baseline scenarios.

Analysis 2 (Five Scenarios of 45,000-Acre Development Cap): A greater acreage of impact in the Primary Zone results in a greater number of PHUs of additional mitigation credit, a greater number of acres of panther habitat protected, and a higher financial contribution to the Panther Fund (Table 3.3-1). The additional 25% of PHUs for impacts to the Primary Zone results in 0 – 139,241 PHUs of additional mitigation with a net result of 0 – 17,073 acres of additional panther habitat protection assuming the average value of 8.1557 PHU/acre applies to all areas of Primary Zone habitat likely to be protected. Total financial benefits to the Panther Fund ranged from \$0 to approximately \$52.2 million.

Analysis 3 (Development of Secondary Zone Before Primary Zone): The existing 2.5:1 mitigation ratio would require approximately 301,045 PHUs of mitigation compared to 310,000 PHUs resulting from the proposed 3.125:1 ratio, for a net benefit of 8,956 PHUs (Table 3.3-2). The proposed mitigation ratio would yield net benefits of approximately 1,098 acres of additional protection and \$671,682 of revenue to the Panther Fund.

3.4 Discussion

The principal conclusion of this analysis at first inspection is that the FPPP, which proposes to cap development at 45,000 acres and provide an additional 25% of PHUs of mitigation for impacts to the Primary Zone, would result in greater benefit to Florida panther habitat conservation than the three baseline scenarios of the existing RLSA program. The 45,000-acre development cap apparently would provide certainty that the future extent of development would be limited to a specific number of acres (although not tied to known locations), and all remaining areas of the RLSA, including important panther habitats, would be protected as SSAs. Moreover, financial benefits to the Panther Fund would range from \$23.6 million to \$52.2 million depending on the acreage of Primary Zone impacted by future development (Table 3.3-1). However, the unsettling and perhaps counterproductive aspect of this conclusion is that greater benefit would accrue as a consequence of greater impacts to the Primary Zone, an area that has been described as essential to the survival of the Florida panther (Kautz et al. 2006). This concern is addressed by the PRT recommendation to protect an additional 38,746 acres for panther conservation because it leaves approximately 39,330 acres in which future developments could be located with certainty. The additional PRT recommendation to develop all 33,224 acres of Secondary Zone and only 2,084 acres of Primary Zone remaining under the development cap further minimizes future development impacts on panther habitats. The scenario recommended by the PRT would result in approximately \$23.25 million to the Panther Fund using the 3.125:1 mitigation ratio, for a net benefit of approximately \$672,000 over the existing 2.5:1 mitigation ratio.

The value of the proposed 45,000-acre cap and additional PHUs of mitigation can be compared with the baseline scenarios in terms of total number of acres eventually protected. The 45,000-acre cap scenario would result in the protection of virtually all RLSA lands not developed, which amounts to approximately 150,878 acres, because every acre of undeveloped land would be protected as natural resource or agriculture SSAs to generate the Stewardship Credits needed to develop 45,000 acres. Protected lands and waters would include approximately 15,236 acres currently in public ownership, 84,251 acres of HSAs, FSAs, and WRAs that are outside of public ownership, 1,461 acres of Lake Trafford, and 49,930 acres of agricultural lands designated as agricultural SSAs (Table 2.4-3).

Table 3.3-1 Estimated Benefit to Florida Panther Habitat Conservation Associated with a 25% Increase in Mitigation for Primary Zone Impacts for Five Scenarios of Primary and Secondary Zone Impacts Under the Proposed 45,000 Acres Cap on Development.

	Scenario 1 100% SZ	Scenario 2 75:25	Scenario 3 50:50	Scenario 4 25:75	Scenario 5 100% PZ
Secondary Zone (SZ)					
Acres	39,973	29,980	19,987	9,993	0
Panther Habitat Unit (PHU)/Acre	4.5607	4.5607	4.5607	4.5607	4.5607
Impact (PHU)	182,307	136,730	91,153	45,577	0
PZ Reduction Factor	0.69	0.69	0.69	0.69	0.69
Mitigation Required (PHU x 2.5 x 0.69) (PHU)	314,479	235,859	157,240	78,620	0
Primary Zone (PZ)					
Acres	0	9,993	19,987	29,980	39,973
PHU/Acre	5.5734	5.5734	5.5734	5.5734	5.5734
Impact (PHU)	0	55,696	111,393	167,089	222,786
Mitigation Required at 2.5:1 (PHU)	0	139,241	278,482	417,723	556,965
Mitigation Required at 3.125:1 (PHU)	0	174,051	348,103	522,154	696,206
Total Mitigation Required (PHU)					
Status Quo 2.5:1 (PHU)	314,479	375,100	435,722	496,343	556,965
Proposed 3.125:1 (PHU)	314,479	409,911	505,342	600,774	696,206
Net Benefit (PHU)	0	34,810	69,621	104,431	139,241
Mitigation Provided in Primary Zone Habitat and Flowways (Acres)					
2.5:1 Ratio (Acres)*	38,559	45,992	53,425	60,858	68,291
3.125:1 Ratio (Acres)*	38,559	50,261	61,962	73,663	85,364
Net Benefit (Acres)	0	4,268	8,536	12,805	17,073
Panther Fund Impacts (\$75/PHU)					
2.5:1 Ratio (Dollars)	\$23,585,931	\$28,132,533	\$32,679,135	\$37,225,736	\$41,772,338
3.125:1 Ratio (Dollars)	\$23,585,931	\$30,743,304	\$37,900,677	\$45,058,050	\$52,215,422
Net Benefit (Dollars)	\$0	\$2,610,771	\$5,221,542	\$7,832,313	\$10,443,084

*Assumes combined average of 8.1557 PHU/acre for Habitat and Flowways in PZ.

Table 3.3- 2 Estimated Benefit to Florida Panther Habitat Conservation Associated with an Increase in the Mitigation Ratio for Developing 45,000 Acres of Rural Land Stewardship Area Lands Within the Primary Zone Based on a Scenario Which Follows the Panther Research Team Recommendations for Protection.

		Panther Research Team Scenario
Secondary Zone (SZ)	Development Area (Acres) ¹	33,712
	PHU/Acre	4.5607
	Impact (PHU)	153,752
	PZ Reduction Factor	0.69
	Mitigation Required (PHU x 2.5 x 0.69) (PHU)	265,222
Primary Zone (PZ)	Development Area (Acres) ¹	2,571
	PHU/Acre	5.5734
	Impact (PHU)	14,329
	Mitigation Required at 2.5:1 (PHU)	35,823
	Mitigation Required at 3.125:1 (PHU)	44,779
Total Mitigation Required (PHU)	Status Quo 2.5:1 (PHU)	301,045
	Proposed 3.125:1 (PHU)	310,000
	Net Benefit (PHU)	8,956
Mitigation Provided in Primary Zone Habitat and Flowways (Acres)	2.5:1 Ratio (Acres) ²	36,912
	3.125:1 Ratio (Acres) ²	38,010
	Net Benefit (Acres)	1,098
Panther Fund Impacts (\$75/PHU)	2.5:1 Ratio (Dollars)	\$22,578,347
	3.125:1 Ratio (Dollars)	\$23,250,028
	Net Benefit (Dollars)	\$671,682

¹ Acres of impact due to Ave Maria and Town of Big Cypress have been subtracted from the 45,000-acre development cap.

² Assumes combined average of 8.1557 PHU/acre for Habitat and Flowways in PZ.

The “full utilization” scenarios would result in the development of approximately 87,000 acres within the RLSA (Table 3.2-1). Protected lands within the RLSA would include approximately 16,846 acres of public and miscellaneous land and 92,000 acres of NRI-based SSAs (WilsonMiller 2008). In addition, the “full utilization” scenarios have the potential to protect panther habitats outside of the RLSA. The “full utilization” scenarios would result in a need for approximately 913,000 PHUs of mitigation (Table 3.2-1), or approximately 212,350 PHUs more than would be available from remaining NRI-based SSAs. These additional PHUs of mitigation would have to originate outside of the RLSA because all areas within the RLSA would either be developed or protected. The 212,350 PHUs of additional mitigation have the potential to protect approximately 26,000 acres of Primary Zone outside of the RLSA. The total area ultimately protected would then be 134,900 acres consisting of 16,846 acres of public and miscellaneous lands, 92,000 acres of NRI-based SSAs inside the RLSA, and 26,000 acres outside of the RLSA.

The “partial utilization” scenario would result in the development of approximately 52,000 acres (WilsonMiller 2008). This scenario includes the protection of 92,000 acres of NRI-based SSAs and 16,846 acres of public and miscellaneous lands. The remaining 35,000 acres of Open Land would continue to be used for agriculture; however, these lands would have no protection from being developed at baseline conditions of 1 unit/5 acres. The “partial utilization” scenario would result in a need for approximately 520,345 PHUs of mitigation under existing conditions. Therefore, the total area likely to be protected under the “partial utilization” scenario would include approximately 108,846 acres consisting of 92,000 acres of NRI-based SSAs and 16,846 acres of public and miscellaneous lands. The “partial utilization” scenario would leave approximately 35,000 acres of Open Land in agricultural use with no protection from future development at baseline conditions.

3.5 Conclusions

The Parties have proposed to limit future development within the RLSA to 45,000 acres. The existing Stewardship Credit system with proposed revisions would result in the eventual protection of approximately 150,846 total acres within the RLSA. WilsonMiller (2008) indicates that the protected areas would include 92,000 acres of HSAs, FSAs, and WRAs; 16,546 acres in public ownership; approximately 40,000 acres of agricultural lands that contain natural habitat areas or have some value as buffers to natural areas used by panthers; and 2,300 acres of proposed panther corridors. The Wilson Miller (2008) estimate that 40,000 acres of agriculture would remain as a result of the development cap would be sufficient in size to accommodate the 38,746 acres (Table 2.4-3) recommended for preservation by the PRT. The “full utilization” scenarios, on the other hand, would be expected to protect a total of 134,900 acres of total habitat, 26,000 acres of which would be outside of the RLSA; and the “partial utilization” scenario would protect an estimated 108,846 acres while leaving approximately 35,000 acres of agricultural lands at risk of future development at baseline densities. The net benefit generated by an additional 25% PHU mitigation ratio for Primary Zone impacts ranges from 0-17,073 acres of additional protected panther habitat depending on the acreage of Primary Zone impacts (Table 3.3-1). The total number of acres protected through the use of PHUs, with or without the proposed increase in mitigation ratio, is significantly less than the number of acres that would be protected by the Stewardship Credit system. Therefore, the principal value of the proposed 25% increase in PHUs of mitigation for Primary Zone impacts would be the increased financial contributions to the Panther Fund.

4.0 Analysis of Panther Habitat Units Generated from Stewardship Sending Areas

4.1 Introduction

The Parties acknowledged that the acres preserved following approval of SSAs under the RLSA program will also generate PHUs to fulfill USFWS panther habitat mitigation requirements. The accounting system for PHUs generated from SSAs would be in addition to and independent of the RLSA Stewardship Credit system used to transfer Stewardship Credits from SSAs to sites proposed as SRAs where development may occur. The Parties anticipate that more PHUs than are required for mitigation may be generated as a result and contemplate an agreement with the USFWS and the FWC that unused PHUs generated from SSA lands may be used, sold, or transferred to third parties for use within the southern PFA.

The PRT was charged with conducting a technical review of the generation and use of PHUs that may be derived from SSA lands. The review was accomplished by using a GIS analysis to estimate the PHUs associated with existing and proposed SSAs as well as RLSA lands most likely to be designated as SSAs (i.e., HSAs, FWAs, and WRAs). The quantity of PHUs available from these areas was compared to the mitigation requirements resulting from impacts to 45,000 acres of RLSA land eventually subject to development. The mitigation requirements associated with Ave Maria were estimated and compared with PHUs of designated SSAs. A similar analysis was not possible with the Town of Big Cypress or Hogan Mine because SSAs have yet to be dedicated for these projects. These projects are currently in the consultation process with the USFWS and FWC pending permit authorization. The number and impact of PHUs potentially available for sale to mitigate developments outside of the RLSA was assessed.

4.2 Methods

Land use/land cover data for 2004-2005 were downloaded from the SFWMD web site and used as the basis for calculating PHUs. These data were selected because they were the most recent readily available data that depicted the landscape of the RLSA prior to beginning of construction for Ave Maria. Land use/land cover data were clipped to the RLSA boundary, and acreages were recalculated. Fields were added to the resulting land use/land cover data tables to crosswalk the SFWMD FLUCFCS (FDOT 1999, as modified by SFWMD) codes to the more general USFWS land cover types and associated land cover scores. The modified land use/land cover data set was used to calculate PHUs associated with the major RLSA land use categories (i.e., Open, HSA, FWA, WRA, and Lake Trafford). These data were further clipped to the boundaries of SSAs 1 through 16, and PHUs were calculated for each SSA and for each major RLSA land use category within each SSA.

4.3 Results

Approved and Pending SSAs: The SSA log obtained from the Collier County web site indicates that, as of November 26, 2008, Collier County had approved 15 applications to designate specific parcels of land as SSAs for the generation of Stewardship Credits for transfer to SRAs. The site numbers of approved SSAs are 1, 2, 3, 3A, 4, 5, 5A, 6, 7, 8, 9, 11, 14, 15, and 16. In addition, applications were pending for designation of two sites (SSAs 10 and 12), and an application for designation of SSA 13 was pending submittal. SSAs 1-6 were dedicated to the generation of Stewardship Credits needed for Ave Maria (Tom Jones, Barron Collier, personal communication).

The 17 approved and pending SSAs cover 48,280 acres (25% of the total area of the RLSA). The total panther habitat value of all SSAs was estimated at 382,938 PHUs (Table 4.3-1). Wetlands are the dominant land cover type within the SSAs, accounting for 53% of the total area. Pasture and croplands account for an additional 31% of the area within all SSAs, and natural uplands account for 15%. Lands approved or pending for designation as SSAs consist primarily of HSA and FSA categories, which account for 59% and 32% of all SSAs respectively (Table 2.4-2). Lands within the RLSA Open and WRA categories comprise only 6% and 3%, respectively, of lands within the SSAs.

Protection of Habitat, Flowways and Adjacent Water Retention Areas as SSAs: Given that all HSAs, FSAs, and WRAs will eventually be designated as SSAs to obtain the Stewardship Credits needed to develop 45,000 acres of SRAs, an estimate of the PHUs of these lands provides information useful in assessing the value of these future sending areas to panther habitat conservation. All HSAs, FSAs, and WRAs within the Primary Zone of the RLSA contain an estimated 98,390 acres with a panther habitat value of 806,675 PHUs (Tables 4.3-2 and 4.3-3). Approximately 29,499 acres containing an estimated 239,736 PHUs are already in public ownership or dedicated as SSAs for Ave Maria (Tables 4.3-2 and 4.3-3). This leaves approximately 68,691 acres with an estimated 566,939 PHUs available for future mitigation (Table 4.3-2), of which 31,228 acres and 253,161 PHUs are in approved or pending SSAs 7-16.

Mitigation for 45,000 Acres of Impact: The Parties propose to limit future development within the RLSA to 45,000 acres. The PRT estimated the number of PHUs of mitigation needed for 45,000 acres of development based on five scenarios of Primary versus Secondary Zone impacts and based on application of the existing 2.5:1 and proposed 3.125:1 mitigation ratios for impacts to the Primary Zone (Table 3.3-1). Only Scenarios 4 and 5, which assume 75% and 100% of future development impacts occurring in the Primary Zone, would require enough PHUs to protect an acreage of habitat equivalent to the number of acres that would be preserved as SSAs using the Stewardship Credit system. Development scenarios involving less than approximately 75% impact to the Primary Zone would result in the preservation of fewer acres of habitat than will be preserved as SSAs. (see Section 4.0).

Approximately 39,373 acres remain available for future development after the acreage for Ave Maria is subtracted from the 45,000-acre development cap (Note: acreages for the Town of Big Cypress and Hogan Mine were not subtracted from the development cap for purpose of this analysis because permit conditions for these projects have not yet been established and both projects would be subject to the 3.125:1 mitigation ratio for Primary Zone impacts proposed by the Parties). The PRT has recommended a development scenario in which the remaining acreage for future growth would occur first within the Secondary Zone, and the remaining acreage would occur within Primary Zone habitats within the RLSA. The PRT estimates that this development scenario would result in a requirement for 342,000-361,000 PHUs of mitigation based on the existing 2.5:1 and proposed 3.125:1 mitigation ratios for impacts occurring in the Primary Zone. The proposed 45,000-acre development cap would be accomplished by dedicating all remaining areas of the RLSA as HSAs, FSAs, WRAs, and Agriculture Preservation SSAs. The PRT estimates that remaining HSAs, FSAs, and WRAs with panther habitat value contain an estimated 567,000 PHUs (Table 4.3-3), and the 38,746 acres identified by the PRT for additional protection contain approximately 214,000 PHUs. These areas combined contain approximately 781,000 PHUs, but no more than 361,000 PHUs of mitigation would be required to reach the 45,000-acre development cap. Thus, all lands eventually dedicated as SSAs would contain approximately 420,000 PHUs more than needed to mitigate impacts within the RLSA.

Table 4.3-1 Estimated Total Acreages and Panther Habitat Units (PHU) by Major Land Use Category Within All Approved and Pending Rural Land Stewardship Area Stewardship Sending Areas (SSA), SSAs Dedicated to Mitigation for Development of Ave Maria, and SSAs Approved or Pending but not Dedicated to Specific Stewardship Receiving Areas (SRA).

Land Use	All SSAs		Ave Maria Mitigation		No SRA Dedication	
	Total	Total	SSA 1-6	SSA 1-6	SSA 7-16	SSA 7-16
	Acres	PHU	Acres	PHU	Acres	PHU
Natural Uplands	7,313	64,877	2,592	22,855	4,721	42,022
Wetlands	25,428	228,853	8,175	73,577	17,253	155,275
Pasture/Cropland	14,994	87,680	5,919	32,207	9,075	55,473
Exotics	509	1,528	360	1,080	149	448
Urban/Barren/Water	36	0	1	0	34	0
Total	48,280	382,938	17,048	129,720	31,232	253,218

Table 4.3-2 Acreages of FSAs, HSAs, and WRAs Within the Florida Panther Primary Zone Within the Entire RLSA, on Public Lands as of December 2008, and SSAs Used to Mitigate Ave Maria and Available for Future Mitigation After Subtracting Acreages on Public Lands and Ave Maria SSAs.

SSA Category	RLSA Total	Public Lands ¹	Ave Maria SSAs	Public & Ave Maria	Available For SSAs
	Acres	Acres	Acres	Acres	Acres
Flowways	37,197	6,670	6,564	13,234	23,963
Habitat	45,755	5,898	10,345	16,243	29,512
Water Retention	15,439	0	23	23	15,416
Total	98,390	12,568	16,931	29,499	68,891

¹ As of December 2008; includes pending purchase of Pepper Ranch.

Table 4.3-3 PHUs of FSAs, HSAs, and WRAs Within the Florida Panther Primary Zone Within the Entire RLSA, on Public Lands as of December 2008, and Within SSAs Used to Mitigate Ave Maria and Available for Future Mitigation After Subtracting Acreages on Public Lands and Ave Maria SSAs.

SSA Category	RLSA Total	Public Lands ¹	Ave Maria SSAs	Public & Ave Maria	Available For SSAs
	PHU	PHU	PHU	PHU	PHU
Flowways	329,882	59,992	58,081	118,073	211,809
Habitat	346,646	51,075	70,409	121,484	225,162
Water Retention	130,147	0	179	179	129,968
Total	806,675	111,067	128,669	239,736	566,939

¹ As of December 2008; includes pending purchase of Pepper Ranch.

SSAs for Ave Maria: The Ave Maria project is authorized for construction; SSAs 1-6 have been approved as dedicated sending areas to generate the Stewardship Credits needed for the project; and impacts to Florida panther habitats have been mitigated (USFWS 2005). The Ave Maria project would have required an estimated 50,584 PHUs of mitigation based on the data sets, assumptions, and methods used for this analysis. SSAs 1-6, which were dedicated to sending Stewardship Credits for Ave Maria (Tom Jones, personal communication), contained an estimated 129,720 PHUs (Table 4.3-1). This analysis indicates that the SSAs used to send Stewardship Credits to the Ave Maria SRA contained 79,136 PHUs (2.56 times) more than needed to mitigate impacts to panther habitats. This finding suggests that the Stewardship Credit system is a better tool for protecting significant panther habitats in the RLSA than the PHU credit system.

4.4 Discussion

The Parties have proposed to limit future development within the RLSA to 45,000 acres. The existing Stewardship Credit system with proposed revisions would result in the eventual protection of approximately 150,846 total acres within the RLSA. WilsonMiller (2008) indicates that the protected areas would include 92,000 acres of HSAs, FSAs, and WRAs; 16,546 acres of public and miscellaneous lands; approximately 40,000 acres of agricultural lands that have some value as buffers to natural areas used by panthers; and 2,300 acres of proposed panther corridors. The WilsonMiller (2008) estimate that 40,000 acres of agriculture would remain as a result of the development cap, and this acreage would be sufficient to accommodate the 38,746 acres (Table 2.4-3) recommended for preservation by the PRT. The PRT estimated that the mitigation needed to reach the 45,000-acre development cap would require protection of between 38,559 acres and 85,364 acres of Primary Zone habitat, depending on extent of Primary Zone impacts (Table 3.3-1). Under the worst case scenario where all 45,000 acres of development occurred within the panther Primary Zone, the quantity of PHUs of mitigation would result in the preservation of approximately 132,000 acres of habitat in comparison to the 150,846 acres that would be preserved under the Stewardship Credit system. The PRT cautions that using unused PHUs generated from designated Stewardship areas to mitigate for panther habitat loss outside of the RLSA would be detrimental to panther conservation.

The PRT's analysis of the PHU value of SSAs shows that less mitigation acreage is required by the USFWS Methodology when compared to acres required by the RLSA credit system. The net result is that landowners of SSAs would be able to bank approximately 420,000 PHUs that would be available for sale to developers outside of the RLSA. These PHUs are sufficient to mitigate the development impacts to approximately 20,600 acres of Primary Zone habitat or 53,400 acres of Secondary Zone habitat outside of the RLSA.

5.0 Agricultural Preservation Proposal

5.1 Current Rural Lands Stewardship Area Policies Relevant to Agricultural Preservation

A primary goal of the current RLSA program is to protect agricultural lands from conversion to non-agricultural uses and continue the viability of agricultural production through a combination of voluntary stewardship incentives and land-efficient compact rural development (Group 2 Policies, Collier County RLSA Program). Agricultural lands protected through the use of stewardship incentives are designated as SSAs (Policies 1.6, 1.7, and 1.17, Collier County RLSA Program). Agricultural lands determined to have high natural resource values and that would qualify for designation as a SSA have been categorized in the current RLSA program as FSAs, HSAs, or WRAs. Stewardship Credits are generated when these agricultural lands are approved by Collier County for designation as SSAs. Agricultural lands determined to have lower natural resource values were categorized as Open Lands and are eligible for development through the receipt of transferred Stewardship Credits. A significant portion of the lands designated as SSAs under the current RLSA program is used or available for lower intensity agriculture (Florida Department of Community Affairs [DCA] 2007). Therefore, the current Stewardship Credit System provides a mechanism for designating agricultural lands that may have higher natural resource values as SSAs. Conversely, agricultural lands in Open Areas that have lower natural resource values would more likely become either SRAs or be developed at the underlying land use of one dwelling unit per five acres (DCA 2007).

5.2 Agricultural Preservation Component of the Florida Panther Protection Program

The Parties have proposed the creation of Agricultural Preservation areas that have not been designated as FSAs, HSAs, or WRAs as a system for compensating private property owners in the RLSA for the voluntary stewardship and retention of agriculture on Open Lands. The Agricultural Preservation system of compensation provides an alternative to developing these Open Lands under regulatory processes within the current RLSA (Policy 4.3, Collier County RLSA). Landowners would be eligible to receive 2.0 Stewardship Credits for each acre of Open Land that is designated for Agricultural Preservation outside of the Big Cypress ACSC and 2.6 Stewardship Credits for each acre of Open Land that is designated for Agricultural Preservation within the Big Cypress ACSC. Lands designated for Agricultural Preservation and approved as SSAs would have all non-agricultural use options removed and the remaining uses would be limited to agriculture and associated support operations such as farm worker housing that exist prior to designation. Intensification from Ag2 to Ag1 would not be permitted subsequent to Agricultural Preservation designation and SSA approval. The Parties did not identify specific areas of Open Lands proposed for future SRA or Agricultural Preservation designation within the RLSA inside or outside of the Big Cypress ACSC.

5.3 Technical Merits of the Agricultural Preservation Policy

The Agricultural Preservation components of the FPPP as proposed by the Parties would increase the number of Stewardship Credits necessary to entitle development within the RLSA up to the proposed 45,000-acre SRA cap. Limiting future development to 45,000 acres and preserving agricultural lands may address DCA criticism that the current RLSA program does not sufficiently protect and conserve agricultural lands from conversion to urban development (FPPP MOU, DCA 2007). The Agricultural Preservation component as proposed has the capability to preclude future development of all Open Lands

outside of the proposed 45,000-acre SRA footprint because the option for development under the existing base zoning of one housing unit per five acres would be removed. The PRT understands and supports the Parties' stated intent (Tom Jones, personal communications) to limit future development to 45,000 acres and remove baseline development densities for all other RLSA lands.

Whereas the Agricultural Preservation proposal would provide a mechanism to promote the Agricultural Preservation goals described in the MOU, conservation of the Florida panther was not specifically identified as an objective of these goals. The 2.0 and 2.6 proposed Agricultural Preservation credit values are calibrated to achieve the proposed 45,000-acre development cap and are not tied to underlying natural resource values, with the exception of the additional 0.6 credit awarded to lands that would be designated for Agricultural Preservation within the Big Cypress ACSC. The PRT was not provided the site-specific locations or acreages of proposed future SRAs or Agricultural Preservation areas, even though information from WilsonMiller (2008) indicates that approximately 40,000 acres would be designated for Agricultural Preservation to achieve the 45,000-acre cap. Therefore, insufficient information was available to determine whether the entitlement of 45,000 acres of RLSA-style development through the proposed Agricultural Preservation component and reduction of the existing baseline zoning density benefits the Florida panther relative to the existing RLSA program. Although the Agricultural Preservation component does have the capacity to protect specific agricultural areas with high panther value (Section 2.0), this component does not appear to have the capability of steering preservation to these same areas.

The PRT finds that specific areas (currently designated as Open Lands that would qualify for the proposed Agricultural Preservation designation and SSA approval) have natural resource value and could contribute to the conservation of the Florida panther by maintaining the spatial extent and integrity of existing panther habitat. The PRT estimated that approximately 40,462 acres of agricultural cover types are categorized as Open Lands within the Primary Zone (Kautz et al. 2006). The PRT also identified specific agricultural areas within these Open Lands with high conservation value for panthers (Section 2.0) and should be considered for additional preservation and protected from development (Figure 13). Whereas agricultural areas may rank lower in importance as panther habitats (Kautz et al. 2006, Land et al. 2008), many agricultural areas contain important natural landscape connections that support panther home ranges, panther reproduction, dispersal movements, and prey populations (Maehr et al. 2002). Open Lands, particularly those within the Big Cypress ACSC, also contain areas of natural habitat that support use by panthers. Therefore, designating agricultural lands with high conservation value for the panther for Agricultural Preservation would benefit the panther if those lands are restricted in perpetuity to agricultural uses at levels no greater than existed prior to designation. These areas would, therefore, be protected from future urban development. This benefit is predicated on the assumption that the amount and configuration of natural cover types interspersed within the agricultural landscape recommended for preservation is also maintained in perpetuity. However, the PRT finds that the proposed credit system for Agricultural Preservation for Open Lands inside and outside of the Big Cypress ACSC will not provide the appropriate incentives necessary to secure areas identified by the PRT that have conservation to the panther (Figure 13). The proposed Agricultural Preservation credit system also would not provide the appropriate converse incentive to designate as SRAs those Open Lands with minimal panther conservation value relative to the areas identified by the PRT for additional preservation, most importantly those Open Lands outside of the Primary Zone (Figure 13 and 17).

The PRT recommends that the proposed Agricultural Preservation component be modified to incorporate a panther-resource value for certain agricultural lands categorized as Open Lands that the PRT identified as important to panther conservation. These areas deserve additional preservation and protection from

development. The provision of adequate incentives to encourage the preservation of these lands through either designation of these specific areas for Agricultural Preservation or as SSAs using existing categories (e.g., HSA) would meet the Agricultural Preservation Goals described in the MOU. Most importantly, this approach would direct future SRA development away from lands of conservation value to the panther. It is beyond the PRT's charge to recommend specific credit values for Open Lands specifically designated for Agricultural Preservation that would simultaneously contribute to the number of Stewardship Credits needed to meet the proposed 45,000-acre SRA development cap and protect those Open Lands identified as having important conservation value to the panther. However, the 2.0 and 2.6 Stewardship Credits as proposed appear arbitrary and not scaled appropriately for the underlying natural resource values identified for panthers, even though the additional 0.6 credit proposed for Open Lands within the Big Cypress ACSC is intended to reflect the natural resource value of the Big Cypress ACSC. Therefore, the PRT recommends that if an Agricultural Preservation system is implemented, the Stewardship Credit values should be revised to more appropriately reflect the underlying natural resource value for preserving these lands for panthers inside and outside the Big Cypress ACSC. The PRT also recommends that a greater benefit to the panther would be achieved if portions of these lands designated for Agricultural Preservation would be restored or enhanced to native land cover types and landscape configurations that would increase the quality, functionality, and availability of habitat for panthers and their prey.

5.4 Summary Conclusions and Recommendations

5.4.1 Conclusions

1. Conservation of the Florida panther was not specifically identified as a goal of the Agricultural Preservation policy proposed in the MOU.
2. The 2.0 and 2.6 proposed Agricultural Preservation credit values appear arbitrary and not tied to underlying natural resource values, with the exception of the additional 0.6 credit awarded to lands that would be designated for Agricultural Preservation within the Big Cypress ACSC.
3. The Parties did not identify specific areas proposed for future SRA or Agricultural Preservation designation within the RLSA; therefore, the PRT has insufficient information to determine whether the entitlement of 45,000 acres of RLSA-style development through the proposed Agricultural Preservation component and reduction of the existing baseline zoning density benefits the Florida panther relative to the existing RLSA program.
4. The PRT identified specific areas currently designated as Open Lands that would
 - A. Qualify for the proposed Agricultural Preservation designation.
 - B. Contribute to Florida panther conservation, if preserved, because these lands have natural resource value.
 - C. Maintain more of the spatial extent and integrity of existing panther habitat.
 - D. Direct future developments away from areas of greatest conservation value to the panther.

5. The PRT finds that designating Open Lands for Agricultural Preservation as proposed by the Parties and focusing on those lands identified by the PRT in Figure 13, would provide a greater benefit to the Florida panther when compared to the current RLSA program. This conclusion assumes the following: 1) these lands would be restricted in perpetuity to agricultural uses at levels no greater than their current condition and therefore protected from future urban development; and 2) the amount and configuration of natural cover types interspersed within the agricultural landscape designated for preservation would also be maintained in perpetuity.

5.4.2 Recommendations

1. The PRT recommends that the proposed Agricultural Preservation component be modified to incorporate a panther-resource value for certain agricultural lands that the PRT identified as important to panther conservation and deserving of additional preservation and protection from development.
2. The PRT recommends that a greater benefit to the panther would be achieved if portions of those lands designated for Agricultural Preservation would be restored or enhanced to native land cover types and landscape configurations that increase the quality, functionality, and availability of habitat for panthers and their prey.

6.0 RLSA Transportation Network

6.1 Introduction

Florida panthers have increased in number from an estimated 20 – 30 panthers in the 1980s to a current estimate of 80 – 100 animals. Concurrent with the increase in panther numbers, the number killed in collisions with vehicles also has increased since 2000 (Figure 18). Collisions with vehicles are one of the most significant sources of mortality for Florida panthers, but they are human-caused and, therefore, preventable. Annual panther roadkills were 4 or fewer prior to 2000, but these numbers increased ranging from 6 to 11 between 2000 and 2006. This trend continued in 2007 and 2008 with 15 and 10 panthers killed, respectively.

Certain segments of the primary road network in the RLSA impede, obstruct, or alter wildlife movement, in many instances resulting in road-kills (Main and Allen 2003, Smith et al. 2006). A minimum of 31 Florida panthers have been killed or injured in vehicle collisions on roads in the RLSA since 1990, and most of these mortalities occurred on four road segments (Figure 3): 1) SR 29, north of CR 858 (5); 2) SR 29, south of CR 858 (8); 3) CR 846, east of Immokalee (8); and 4) CR 858, from Camp Keais Road to SR 29 (3).

Future development within the RLSA would require the construction of new roads in addition to maintenance and upgrading of existing roads. Nine proposed new roads are of concern because they either bisect or abut important conservation and agricultural areas used by Florida panther and other wildlife.

The following section provides a review of how and to what extent Florida panthers may be affected by the existing and proposed road networks within the RLSA and includes recommendations to avoid or minimize adverse affects.

6.2 Methods

This review includes two elements: 1) a basic assessment of roadway characteristics and traffic volume, and 2) identification of road segments that intersect or abut important resource areas used by the Florida panther.

Location, proposed number of lanes, and traffic volume projections of existing and proposed roads in the RLSA were obtained from WilsonMiller, Inc., Collier County and the FDOT. Datasets used to identify important road segments included Florida panther telemetry and road-kill locations (FWC), least-cost-path model results for Florida panther (Swanson et al. 2005, Kautz et al. 2006), existing and proposed conservation lands (Florida Department of Environmental Protection), HSAs, FSAs, and WRAs designated under the RLSA program (Collier County), PRT-proposed revisions to the RLSA map (Section 2.0), and Primary and Secondary habitat zones for the Florida panther (USFWS).

6.3 Results

The PRT identified 17 segments of existing roads and 24 segments of proposed roads within the RLSA that potentially could impact important resource areas used by the Florida panther (Table 6.3-1). The length of each segment (in miles) was calculated, and lane widths and traffic levels were tabulated.

Table 6.3-1. A Summary of Roadway Characteristics and Traffic Levels for Existing and Proposed Roads in the RLSA.

Road	Segment	Segment Length (m)	Miles	Current Number of Lanes	Proposed Number of Lanes	FDOT Actual Daily Trips 2006	FDOT Projected Daily Trips 2011	FDOT Projected Daily Trips 2016	Landowner Projected Daily Trips 2050	Magnitude Increase in Daily Trips (2006-2050)
Existing										
CR 850	South of SR 82 ²	8,397	5.22	2	6	1,910	Not Applicable	Not Applicable	44,886	23.5
SR 82	West of SR 29	11,274	7.01	2	6	12,200	14,500	Not Applicable	60,994	5.0
SR 29	North of SR 82	3,334	2.07	2	6	6,200	7,100	8,000	23,686	3.8
SR 29	South of SR 82	4,771	2.96	2	6	15,372	19,100	Not Applicable	44,499	2.9
Lake Trafford Road	West of Little League Road	1,440	0.89	2	2	Not Applicable	Not Applicable	Not Applicable	Not Applicable	—
CR 846	East of Immokalee City Limit	11,155	6.93	2	2	1,488	Not Applicable	Not Applicable	4,637	3.1
CR 846	Camp Keais Road to City of Immokalee	3,200	1.99	2	6	10,285	Not Applicable	Not Applicable	40,081	3.9
CR 846	West of Camp Keais Road	10,200	6.34	2	6	5,408	Not Applicable	Not Applicable	42,458	7.9
SR 29	City of Immokalee to CR 858	12,099	7.52	2	4	8,200	8,400	Not Applicable	22,259	2.7
SR 29	South of CR 858	5,673	3.53	2	4	3,000	3,900	4,800	12,997	4.3
Ave Maria Boulevard	CR 858 to Anthem Parkway North	6,164	3.83	2	4	Not Applicable	Not Applicable	Not Applicable	19,125	—
Ave East	In Town of Ave Maria	2,166	1.35	2	4	Not Applicable	Not Applicable	Not Applicable	39,272	—
Camp Keais Road	CR 858 to CR 846	8,030	4.99	2	6	Not Applicable	Not Applicable	Not Applicable	35,235	—
CR 858	West of Camp Keais Road ³	11,257	6.99	2	6	6,788	Not Applicable	Not Applicable	50,366	7.4
CR 858	Camp Keais Road to SR 29	7,584	4.71	2	4	Not Applicable	Not Applicable	Not Applicable	8,468	—
CR 858	East of SR 29	7,517	4.67	2	2	Not Applicable	Not Applicable	Not Applicable	2,085	—
CR 858	County Line ⁴	12,345	7.67	2	2	309	Not Applicable	Not Applicable	2,085	6.7
New										
Immokalee Loop Road	North of CR 846	13,448	8.36	—	4	—	Not Applicable	Not Applicable	10,210	—
Immokalee Loop Road	South of CR 846	5,364	3.33	—	4	—	Not Applicable	Not Applicable	10,201	—
Gopher Ridge	North of Immokalee Circle	3,169	1.97	—	4	—	Not Applicable	Not Applicable	30,668	—
Gopher Ridge	Immokalee Circle to City of Immokalee	3,684	2.29	—	6	—	Not Applicable	Not Applicable	39,511	—
Little League Road	North of SR 82	2,696	1.68	—	2	—	Not Applicable	Not Applicable	3,589	—

Table 6.3-1. Continued.

Road	Segment	Segment Length (m)	Miles	Current Number of Lanes	Proposed Number of Lanes	FDOT Actual Daily Trips 2006	FDOT Projected Daily Trips 2011	FDOT Projected Daily Trips 2016	Landowner Projected Daily Trips 2050	Magnitude Increase in Daily Trips (2006-2050)
Little League Road	SR 82 to Immokalee Circle	4,254	2.64	—	4	—	Not Applicable	Not Applicable	27,270	—
Little League Road	South of Immokalee Circle	9,917	6.16	—	6	—	Not Applicable	Not Applicable	41,679	—
Grove Road	South of SR 82	5,138	3.19	—	4	—	Not Applicable	Not Applicable	14,251	—
Carson Road	North of Immokalee Circle	3,826	2.38	—	2	—	Not Applicable	Not Applicable	3,510	—
Carson Road	Immokalee Circle to City of Immokalee	1,266	0.79	—	4	—	Not Applicable	Not Applicable	15,415	—
Immokalee Circle	East of SR 29	5,389	3.35	—	4	—	Not Applicable	Not Applicable	8,544	—
Immokalee Circle	West of SR 29	5,890	3.66	—	4	—	Not Applicable	Not Applicable	17,617	—
Serenoa Circle	East of CR 846	2,284	1.42	—	4	—	Not Applicable	Not Applicable	12,764	—
Serenoa Circle	West of CR 846	4,894	3.04	—	4	—	Not Applicable	Not Applicable	16,413	—
Serenoa East	Serenoa Circle to CR 846	1,521	0.95	—	4	—	Not Applicable	Not Applicable	14,470	—
Ave Maria Boulevard	North of Anthem Parkway North	3,095	1.92	—	4	—	Not Applicable	Not Applicable	16,771	—
Anthem Parkway	In Town of Ave Maria	5,475	3.40	—	4	—	Not Applicable	Not Applicable	15,000	—
Randall Extension	Big Cypress Parkway to CR 858	3,379	2.10	—	6	—	Not Applicable	Not Applicable	34,320	—
Big Cypress Parkway	In Town of Big Cypress	7,187	4.47	—	4	—	Not Applicable	Not Applicable	26,903	—
Horse Trail	CR 858 to SR 29	3,638	2.26	—	4	—	Not Applicable	Not Applicable	11,205	—
Citrus East	Camp Keais Road to Immokalee Extension	7,795	4.84	—	4	—	Not Applicable	Not Applicable	8,718	—
Citrus West	CR 858 to Immokalee Extension	11,078	6.88	—	4	—	Not Applicable	Not Applicable	17,215	—
Immokalee Extension	CR 846 to SR 29	6,190	3.85	—	6	—	Not Applicable	Not Applicable	23,043	—
Stockade Road	East of SR 29	2,748	1.71	—	4	—	Not Applicable	Not Applicable	6,186	—

¹ CR = County Road; SR = State Road

² actual daily trips from 2004

³ actual daily trips from 2005

⁴ actual daily trips from 2001

Existing Road Network

Approximately 105 centerline miles of roads currently exist within the RLSA (excludes local city/town roads); road density is relatively low at 0.32 mi/mi² (Table 6.3-1, Figure 19). All existing roads are currently two-lane configurations with traffic levels (on certain segments) as high as 15,000 trips/day (SR 29) and as low as 300 trips/day (CR 858). Most roads in the RLSA have traffic levels well below 10,000 vehicles per day. The FDOT provided some traffic projections for State roads; SR 29 is projected to experience traffic levels of 19,000/day by 2011.

The proposed plan to accommodate anticipated development would include adding lanes to all but four segments of existing roads (Table 6.3-1, Figure 19). Traffic projections at build-out (in 2050) range from 2,000 to 61,000 trips/day. Seven of these road segments could have more than 40,000 trips/day; another four road segments are projected to have over 20,000 trips/day. Even very low-level traffic roads (CR 858 east of Camp Keias Road and east of SR 29, CR 846 east of the City of Immokalee, and SR 29 south of CR 858) are projected to increase significantly over current levels and likely would increase the probability of panther collisions with vehicles (Seiler 2003).

Road mortality and telemetry records (Table 6.3-2, Figures 1 and 3) indicate that panthers have crossed (or attempted to cross) 10 of the 17 existing road segments within the RLSA, and all but two (SR 29 south of SR 82 and Lake Trafford Rd) were crossed multiple times. Least-cost-path results support these findings. Important existing road segments crossed include CR 846 east of Immokalee, CR 846 west of Camp Keias Road, SR 29 north of CR 858, SR 29 south of CR 858, and all segments of CR 858 in the analysis (Figure 18).

The identified road segments also bisect designated HSAs, FSAs, and WRAs, PRT-proposed revisions to the RLSA map, and Primary and Secondary habitat zones for the Florida panther (Table 6.3-3, Figure 20). Two existing roads (SR 82 and SR 29) would divide the proposed northern corridor; also, PRT-proposed modifications to the northern corridor would increase the length of the corridor affected by SR 82. Only CR 850 borders existing conservation lands (Table 6.3-3). A significant number of wildlife roadkills was documented (Main and Allen 2002) on CR 850 adjacent to Corkscrew Marsh, including one Florida panther.

Proposed Road Network

The proposed road network includes 87.5 centerline miles of additional roads (Table 6.3-1, Figure 19). Road density for existing and proposed roads (excludes all city and town streets) would be 0.59 mi/mi², nearly doubling the size of the current road network. All but two of the 24 road segments examined are proposed as four or more lanes wide. Traffic projections on these road segments are expected to range from 3,500 to 41,700 vehicles/day; average traffic level for the proposed roads will be 17,728 vehicles/day.

The PRT also estimated that panthers would have crossed 16 of the 24 proposed roads (Table 6.3-2). Seven would have been crossed multiple times, nine only once (8 of the 9 were occurrences in 1989-1990). Proposed road segments identified that intersect important existing travel routes of panthers include Immokalee Loop Road (SR 29 bypass), Stockade Road (east of SR 29), Horse Trial, Little League Road (south of Serenoa Circle), and Randall Boulevard extension (Figure 20).

Segments of other proposed roads pose threats to more minor travel routes of panthers or encroach on HSAs, FSAs, WRAs, PRT-proposed revisions to the RLSA map, the Corkscrew Marsh and wetlands associated with

Table 6.3-2. A Summary of Florida Panther Road-kills, Telemetry Path and Least Cost Path Crossings by Road Segment for the RLSA.

Road	Segment	Miles	Florida Panther Road-kill (1990-2008)	Florida Panther Telemetry Path-Road Crossing (ID-year)	Least Cost Paths Cross
Existing					
CR 850	South of SR 82	5.22	1	None	None
SR 82	West of SR 29	7.01	None	None	3
SR 29	North of SR 82	2.07	None	None	1
SR 29	South of SR 82	2.96	None	28-1989	1
Lake Trafford Road	West of Little League Road	0.89	None	64-1998	None
CR 846	East of Immokalee City Limit	6.93	8	11-2001, 126-2004, 13-1987, 132-2004, 139-2005, 143-2007, 18-1987, 20-1987, 28-1989, 46-1993, 50-1993, 52-1995, 58-1997, 62-1998, 65-2002, 97-2001	4
CR 846	Camp Keais Road to City of Immokalee	1.99	None	None	None
CR 846	West of Camp Keais Road	6.34	3	131-2008, 28-1989, 96-2002	1
SR 29	North of CR 858	7.52	5	11-2001, 131-2006, 135-2006, 154-2007, 31-1994, 52-1994, 59-2000, 97-2001	1
SR 29	South of CR 858	3.53	8	05-1983, 11-2000, 13-1987, 131-2007, 135-2006, 143-2007, 19-1997, 29-1989, 30-1989, 47-1992, 48-2006, 51-1998, 52-1993, 59-1999, 63-2000, 64-1998, 75-2005, 98-2002	None
Ave Maria Boulevard	CR 858 to Anthem Parkway North	3.83	None	None	None
Ave East	In Town of Ave Maria	1.35	None	None	None
Camp Keais Road	CR 858 to CR 846	4.99	None	None	None
CR 858	West of Camp Keais Road	6.99	None	96-2002, 59-2002, 34-1990, 31-1991, 131-2008, 12-1992, 04-1984	1
CR 858	Camp Keais Road to SR 29	4.71	3	106-2002, 11-2000, 12-1992, 131-2008, 135-2006, 154-2007, 19-1997, 31-1993, 48-1992, 51-1998, 52-1993, 59-2002, 66-2000, 75-2000, 97-2001	1
CR 858	East of SR 29	4.67	1	13-1987, 131-2005, 135-2005, 143-2007, 20-1987, 29-1992, 48-2006, 59-2000	2
CR 858	County Line	7.67	2	13-1987, 132-2004, 143-2007, 17-1989, 18-1990, 20-1988, 28-1991, 46-1998, 50-1993, 52-1994, 58-1997, 65-2008	1
New					
Immokalee Loop Road	North of CR 846	8.36	Not Applicable	11-2001, 143-2007, 28-1989, 50-1993, 58-1996, 62-1998, 65-2002,	2
Immokalee Loop Road	South of CR 846	3.33	Not Applicable	143-2007, 52-1994, 58-1997, 65-2002	None
Gopher Ridge	North of Immokalee Circle	1.97	Not Applicable	28-1989, 58-1996, 62-1998	1
Gopher Ridge	Immokalee Circle to City of Immokalee	2.29	Not Applicable	None	None

Table 6.3-2. Continued.

Road	Segment	Miles	Florida Panther Road-kill (1990-2008)	Florida Panther Telemetry Path-Road Crossing (ID-year)	Least Cost Paths Cross
Little League Road	North of SR 82	1.68	Not Applicable	None	1
Little League Road	SR 82 to Immokalee Circle	2.64	Not Applicable	28-1989	None
Little League Road	South of Immokalee Circle	6.16	Not Applicable	99-2001	1
Grove Road	South of SR 82	3.19	Not Applicable	28-1989	2
Carson Road	North of Immokalee Circle	2.38	Not Applicable	28-1989	None
Carson Road	Immokalee Circle to City of Immokalee	0.79	Not Applicable	None	1
Immokalee Circle	East of SR 29	3.35	Not Applicable	62-1998	None
Immokalee Circle	West of SR 29	3.66	Not Applicable	28-1989	1
Serenoa Circle	East of CR 846	1.42	Not Applicable	None	None
Serenoa Circle	West of CR 846	3.04	Not Applicable	None	None
Serenoa East	Serenoa Circle to CR 846	0.95	Not Applicable	None	None
Ave Maria Boulevard	North of Anthem Parkway	1.92	Not Applicable	12-1990	None
Anthem Parkway	In Town of Ave Maria	3.40	Not Applicable	None	None
Randall Extension	Big Cypress Parkway to CR 858	2.10	Not Applicable	131-2006, 59-2002, 96-2001	None
Big Cypress Parkway	South of Randall Extension	2.33	Not Applicable	96-2001, 34-1990, 30-1989, 60-1999, 66-1998, tx104-1996	None
Citrus East	Camp Keais Road to Immokalee Extension	4.84	Not Applicable	None	None
Citrus West	CR 858 to Immokalee Extension	6.88	Not Applicable	65-1998	None
Immokalee Extension	CR 846 to SR 29	3.85	Not Applicable	65-1998	None
Horse Trail	From CR 858 to SR 29	2.26	Not Applicable	11-2000, 131-2007, 135-2006, 154-2007, 31-1994, 48-1992, 51-1996, 52-1993, 59-2002, 66-2000, 97-2001	1
Stockade Road	East of SR 29	1.71	Not Applicable	52-1994, 58-1997, 65-2002	None

¹ CR = County Road; SR = State Road

Table 6.3-3. A Summary of Resource Area Overlap by Road Segment for the RLSA.

Road	Segment	Miles	Existing Conservation Lands	Proposed Conservation Lands	HSA's	FSAs	WRAs	PRT-Proposed Revisions to RLSA Map	PRT-Proposed North Corridor	Primary Zone	Secondary Zone
Existing											
CR ¹ 850	South of SR 82	5.22	3,750 and 9,750	1,250 and 2,250	—	—	—	—	—	6,000, 3,500, and 8,500	3,250, 3,750, and 15,000
SR ¹ 82	West of SR 29	7.01	—	—	—	—	—	—	5,000	—	37,000
SR 29	North of SR 82	2.07	—	—	—	—	—	—	—	—	11,500
SR 29	South of SR 82	2.96	—	—	—	—	—	—	—	—	14,500
Lake Trafford Road	West of Little League Road	0.89	—	—	—	—	—	—	—	—	—
CR 846	East of Immokalee City Limit	6.93	—	—	15,000 and 9,000	2,500	—	—	—	36,500	—
CR 846	Camp Keais Road to City of Immokalee	1.99	—	—	—	—	750	—	—	—	10,500
CR 846	West of Camp Keais Road	8.33	—	10,750	1,000 and 5,500	2,750	3,250 and 6,750	3,750 and 6,000	—	3,500 and 26,000	9,000 and 6,000
SR 29	North of CR 858	7.52	—	—	—	—	5,750 and 2,000	23,000	5,500	39,500	7,000
SR 29	South of CR 858	3.53	—	—	6,250	—	—	2,500 and 2,000	—	18,750	—
Ave Maria Boulevard	CR 858 to Anthem Parkway North	3.83	—	—	—	—	—	—	—	7,500 and 2,500	4,000 and 6,000
Ave East	In Town of Ave Maria	1.35	—	—	—	—	—	—	—	—	7,500
Camp Keais Road	CR 858 to CR 846	4.99	—	—	—	—	2,000	—	—	4,000	22,500
CR 858	West of Camp Keais Road	6.99	—	8,000	250 and 4,750	3,750	1,500	—	—	18,000 and 6,250	6,500 and 5,500
CR 858	Camp Keais Road to SR 29	4.71	—	—	2,000	—	9,000	25,000	—	25,000	—
CR 858	East of SR 29	4.67	—	—	3,250 and 1,500	2,250	—	—	—	25,000	—
CR 858	County Line	11.71	—	—	12,250, 7,000, and 4,000	1,500	3,000	—	—	40,000	—
New											
Immokalee Loop Road	North of CR 846	8.36	—	—	—	—	500, 500, 250, 250, 1,000, 500, and 500	—	—	5,250 and 15,500	3,750, 9,500, and 19,000

Table 6.3-3. Continued.

Road	Segment	Miles	Existing Conservation Lands	Proposed Conservation Lands	HSA's	FSAs	WRAs	PRT-Proposed Revisions to RLSA Map	PRT-Proposed North Corridor	Primary Zone	Secondary Zone
Immokalee Loop Road	South of CR 846	3.33	—	—	—	—	—	—	—	17,500	—
Gopher Ridge	North of Immokalee Circle	1.97	—	—	—	—	1,250 and 1,000	—	—	—	10,500
Gopher Ridge	Immokalee Circle to City of Immokalee	2.29	—	—	—	—	750	—	—	—	7,000
Little League Road	North of SR 82	1.68	—	—	—	—	—	—	1,500	—	9,000
Little League Road	SR 82 to Immokalee Circle	2.64	—	—	—	—	—	—	—	—	14,000
Little League Road	South of Immokalee Circle	6.16	4,000	2,750 and 4,000	500, 750, 1,000, and 1,000	500 and 750	—	3,750 and 4,000	—	8,000 and 7,250	2,500 and 7,250
Grove Road	South of SR 82	3.19	—	—	—	—	3,750	—	—	13,500	15,750
Carson Road	North of Immokalee Circle	2.38	—	—	—	—	—	—	—	—	12,500
Carson Road	Immokalee Circle to City of Immokalee	0.79	—	—	—	—	—	—	—	—	3,250
Immokalee Circle	East of SR 29	3.35	—	—	—	—	1,000	—	—	—	17,750
Immokalee Circle	West of SR 29	3.66	—	—	—	—	1,500 and 1,000	—	—	2,500	16,500
Serenoa Circle	East of CR 846	1.42	—	—	—	—	—	—	—	—	8,250
Serenoa Circle	West of CR 846	3.04	—	—	—	—	500	—	—	12,000	5,500 and 5,250
Serenoa East	Serenoa Circle to CR 846	0.95	—	—	—	—	—	—	—	2,500	500 and 2,250
Ave Maria Boulevard	North of Anthem Parkway	1.92	—	—	—	—	2,000	6,500	—	9,750	—
Anthem Parkway	In Town of Ave Maria	3.40	—	—	—	—	—	—	—	6,000 and 3,750	11,500 and 500
Randall Extension	Big Cypress Parkway to CR 858	2.10	—	—	—	—	7,250	—	—	8,250	—
Big Cypress Parkway	South of Randall Extension	2.33	—	—	—	—	2,000 and 2,500	—	—	12,500 and 1,500	10,750
Citrus East	Camp Keais Road to Immokalee Extension	4.84	—	—	—	—	—	250	—	1,500, 2,000, and 2,000	6,500, 1,250, and 7,500
Citrus West	CR 858 to Immokalee Extension	6.88	—	—	—	—	1,250 and 2,500	—	—	15,500	1,750 and 20,750

Table 6.3-3. Continued.

Road	Segment	Miles	Existing Conservation Lands	Proposed Conservation Lands	HSA's	FSAs	WRAs	PRT-Proposed Revisions to RLSA Map	PRT-Proposed North Corridor	Primary Zone	Secondary Zone
Immokalee Extension	CR 846 to SR 29	3.85	—	—	—	—	—	—	—	—	20,250
Horse Trial	From CR 858 to SR 29	2.26	—	—	—	—	500	n/a	—	11,750	—
Stockade Road	East of SR 29	1.71	—	—	—	—	—	—	—	8,500	—

Notes: Each value represents an occurrence (in linear feet) where a road crosses or is adjacent to the respective features; figures are approximate and rounded to nearest 250 ft

¹ CR = County Road; SR = State Road

Lake Trafford, and Primary and Secondary habitat zones for the Florida panther (Tables 6.3-2 and 6.3-3, Figure 20).

Planning for all new roads constructed within the RLSA should attempt to avoid bisecting HSAs, FSAs, WRAs, and areas the PRT recommends for protection. All new roads should be designed to minimize the loss or fragmentation of panther habitat if no alternative routes that avoid panther habitat exist. The PRT identified five examples where impacts could be avoided. FDOT has proposed three planning corridors as alternatives for the SR 29 bypass: eastern, central and western planning corridors (Figure 21). An alignment within the central planning corridor would be preferable from an ecological perspective; it avoids all significant wetlands and would affect less panther habitat important to panthers. The eastern segment of Stockade Road would be unnecessary with the realignment of Immokalee Loop (SR 29 Bypass) to the central planning corridor (Figure 21). The PRT has recommended consideration of additional preservation to protect the SSSL as an important habitat segment for Florida panthers; construction of Horse Trial Road within this area would greatly diminish value of the SSSL as habitat for Florida panthers (Figure 20). The proposed alignment of Little League Road (south of Serenoa Circle) and Ave Maria Boulevard (proposed north extension) would effectively separate two large, valuable, supporting wetland-habitat areas from Camp Keais Strand (Figure 20). Little League Road (north of SR 82) would cross over the proposed northern corridor if constructed (Figure 20).

Wildlife Crossings

Analyses of road-kill data for the Florida panther, similar to studies for other species (Huijser et al. 2007, Gilbert and Wooding 1994), were useful (along with telemetry data and landscape characteristics) for identifying potential locations for wildlife crossings within the RLSA. The PRT identified significant segments of four existing roads where wildlife crossings or alternative effective measures (e.g., Roadside Animal Detection Systems [RADS]) should be considered to reduce the occurrence of road-kills and maintain connectivity between resource areas (Figure 20). These include Immokalee Road (CR 846), Oil Well Road (CR 858), SR 29, and SR 82. These results are supported by Logan and Kautz (2006), Smith et al. (2005), and a proposal by representatives of the landowners (Figure 3).

Several wildlife crossing designs have been implemented and proven effective at reducing the occurrence of vehicle related mortalities of panthers on I-75, SR 29 and CR 850 (Foster and Humphrey 1995, Land and Lotz 1996). As such, several designs are available for application to minimize transportation effects on panthers that may exist within the RLSA. Three crossings are currently in the planning/design phase: two on CR 858 in the Camp Keais Strand and another is planned for CR 846, east of Immokalee. Wildlife crossings should only be constructed in areas where the landscape on either side of the road is in some form of permanent protection.

The function of wildlife crossings and other mechanisms to facilitate safe crossing of transportation corridors by panther and other wildlife is enhanced by proper use of fencing that directs animals toward the crossings and away from the road surface and associated traffic (Huijser et al. 2007). Fencing specifications such as type, height, and distance that it extends away from the crossing vary based on site details and requirements of the species it is intended for protection.

6.4 Discussion

The magnitude of the proposed development and associated traffic projections on most of these roads will convert much of this area from rural to urban in character. The extent of proposed increases in lane widths

and traffic could detrimentally affect wildlife through increased risk of wildlife-vehicle collisions and increased aversion to roads resulting in altered movement patterns, habitat use and behavioral changes (Brody and Pelton 1989, Forman et al. 2003, Seiler 2003, Smith 2003, Huijser et al. 2007).

These projections stress the need to make informed decisions regarding construction of roads in areas that may impact panthers. Planning should focus on impact avoidance, minimization, and mitigation, in that order. The need for incorporating wildlife crossings at selected locations on new and existing road construction projects should be evaluated early in the planning stages of the transportation project, preferably prior to the Project Development and Environment (PD&E) phase. Once a determination is made that a wildlife crossing is required, details of the site design and structure specifications can be determined in the PD&E phase. Transportation planners should consult with state and federal wildlife and land management agencies when making decisions regarding the need, location, and design of wildlife crossing structures.

Roads, in some cases, may border resource areas of high value on one side with lands of lower habitat value on the other. These areas may require fencing or other measures to prevent wildlife-vehicle collisions. Specific areas where future development may result in the need for fencing are CR 850, Little League Road and Grove Road (adjacent to the CREW lands), Immokalee Loop Road (north and south of CR 846), Serenoa Circle and Serenoa Circle East adjacent to the large water retention area (connected to Camp Keais Strand) east of Camp Keais Road (Figure 20).

6.5 Conclusions

Eight existing road segments were identified where wildlife crossings or other proven alternative measures should be considered to reduce the occurrence of panther mortality and maintain connectivity between resource areas. These include where CR 846 and CR 858 bisect Camp Keais Strand and OK Slough, on CR 858 just west of SR 29 and along the Hendry County Line, and on SR 29 north and south of CR 858. Creation of a northern corridor will require that wildlife crossings be installed on SR 82 and SR 29.

Segments of twelve proposed roads could significantly fragment, degrade, or encroach on important habitat and movement corridors of the Florida panther, including

- Big Cypress Parkway and the Randall Boulevard extension,
- Little League Road (north connection to County Line Road and south of Immokalee Circle),
- Ave Maria Boulevard (proposed northern extension),
- Serenoa Circle (west of Serenoa Circle East),
- Serenoa Circle East,
- Horse Trial,
- Immokalee Loop Road north and south of CR 846,
- Stockade Road (eastern segment), and
- Grove Road.

The PRT recommends relocation/alternative alignments for four of these proposed road segments:

- Immokalee Loop Road north of CR 846 (SR 29 bypass),
- Immokalee Loop Road south of CR 846 (SR 29 bypass),

- Serenoa Circle, and
- Serenoa Circle East.

The PRT proposes a no-build alternative for five others:

- Horse Trial,
- Little League Road (northern connection to County Line Road),
- Stockade Road (eastern segment),
- Little League Road (south of Serenoa Circle), and
- Ave Maria Boulevard (proposed northern extension).

General Recommendations

- Construction of new roads that bisect public conservation lands, HSAs, FSAs, WRAs, or areas recommended by the PRT for additional protection should be avoided.
- Plans for construction of new roads through or adjacent to public conservation lands, HSAs, FSAs, WRAs or areas recommended by the PRT for additional protection, should be designed to minimize habitat impacted.
- Wildlife crossings and fencing should be evaluated for existing road upgrades and new road projects in accordance with Local, State and Federal regulations and through the use of generally accepted standards and guidelines for identifying need, design and construction.
- Wildlife crossings should only be constructed in areas where the landscape on either side of the road is in some form of permanent protection unless site-specific circumstances suggest otherwise.
- Wildlife crossings and other technologies of proven design and effectiveness should be incorporated where appropriate.
- Mitigation for road project impacts that occur within the RLSA should be provided within the RLSA.

7.0 Evaluation of Proposed Corridors

7.1 Introduction

The Collier County RLSA is strategically located between three major areas used by Florida panthers: CREW, FPNWR/BCNP, and OSSF. Florida panthers currently have the ability to move among these areas, but maintaining connectivity within and among these panther habitats is essential to the long-term viability of the panther population (Morrison and Boyce 2008). HSAs, FWAs, and WRAs have been designated within the RLSA to protect areas of high resource value; these areas also are known to be used by Florida panthers and other listed species. However, these areas do not fully address the need to protect panther movement pathways within and through the RLSA to adjacent areas of high importance to panthers. Therefore, the Landowners have proposed two wildlife movement corridors within the RLSA to accommodate future panther movements.

The Landowners' proposed south corridor, referred to by the PRT as the SSSL, would preserve a connection between FPNWR and the Okaloacoochee Slough flowway (and ultimately to OSSF) by preserving existing panther habitat north of the FPNWR, west of SR 29 through Summerland Swamp and across SR 29 near Owl Hammock (Figure 22). This area has been used by several Florida panthers over the past two decades.

A proposed northern corridor would connect CREW to the OSSF through active citrus groves, WRAs, Open Lands, and some remnant native upland habitats (Figure 15). Establishment of this corridor would involve some habitat restoration and would cross both SR 82 and SR 29 north of Immokalee.

7.2 Summerland Swamp Habitat Linkage

The Landowners' proposed SSSL connects the FPNWR through approved SSA 10 and land designated as an HSA south of CR 858 to the Okaloacoochee Slough system to the north. The northern terminus of SSSL abuts the western side of SR 29 near Owl Hammock. CR 858 marks the southern terminus of the proposed linkage, but panther movements continue south through natural habitats associated with an HSA and SSA 10 and ultimately to FPNWR.

Since 1992, 17 radio-collared Florida panthers (6 females, 11 males) have utilized SSSL between Owl Hammock and CR 858. One female panther (FP66) denned within SSSL in December 1999. Panther use within the SSSL, as indicated by telemetry data, is concentrated within Summerland Swamp south to CR 858 and in the Horse Trial grounds northwest of the intersection of SR 29 and CR 858 (Figure 23). These data show that panthers successfully cross SR 29 at two locations: 1) at the Owl Hammock curve of SR 29; and 2) near a southeast extension of the Summerland Swamp approximately 1.5 miles north of CR 858 (Figure 23). Additionally, eight Florida panthers (since 2000) have been killed by vehicles in failed attempts to cross SR 29 and CR 858 at various locations adjacent to the SSSL; half of these deaths were juvenile panthers between three and eight months of age (Table 7.2-1).

These data clearly indicate that the SSSL area not only functions to facilitate panther movements but also constitutes a portion of male and female panther home ranges.

An Agricultural Preservation Area that coincides with the Big Cypress ACSC east of SR 29 has been proposed as a component of the FPPP. The PRT understands that these Agricultural Preservation Areas will

Table 7.2-1 Florida Panthers Killed by Vehicles on State Road (SR) 29 and County Road (CR) 858 Within the Summerland Swamp Habitat Linkage Since 2000.

Date	PantherID	Sex	Age (years)	Location	Cause
2/28/2000	K76	M	3 months	CR 858, 1 mile west SR 29	Vehicle
5/25/2003	UCFP53	F	2-3	SR29, 1.4 miles north of CR858	Vehicle
6/3/2003	UCFP54	M	8-10 months	SR29, 1.7 miles north of CR858	Vehicle
11/2/2003	UCFP59	M	3-4 months	CR 858, 1.2 miles west of SR 29	Vehicle
10/25/2004	UCFP69	F	2	SR 29, 2.5 miles N of CR 858	Vehicle
12/1/2004	UCFP70	F	1	SR 29 at Owl Hammock Curve	Vehicle
6/19/2005	UCFP75	M	2	SR 29 at Owl Hammock Curve	Vehicle
11/28/2008	UCFP114	F	4	CR858, 1 mile east of Camp Keais Rd	Vehicle

be maintained as agricultural lands and will be protected from more intensive land uses. Florida panthers currently use this mosaic of agriculture and native habitats, and, therefore, these preservation areas should serve to ensure the long-term functionality of the eastern destination for the SSHL.

The Landowners' proposed corridor west of SR 29 is comprised of 65% designated WRA and 35% areas designated as Open Land. Land cover types within these WRAs and Open Lands are primarily cypress swamps and agriculture, respectively. Habitat restoration will be necessary in portions of the corridor currently in agricultural use to increase the amount of acceptable cover for Florida panther. The Landowners' proposed SSHL does not protect the Horse Trial area, and only a single location is proposed for panthers to cross SR 29. The PRT recommends that additional areas consisting of native land cover and agriculture be protected within the SSHL to allow this area to continue to function as occupied panther habitat into the future (Figure 23). A mechanism that provides incentives to designate this area under an appropriate form of preservation is warranted.

7.3 North Corridor

The proposed North Corridor (Figure 15) would be a restoration project within the RLSA, whereby a connection between CREW and OSSF would be re-established through an area dominated by agriculture, primarily citrus production. The greater CREW area, comprised of state lands, Audubon's Corkscrew Swamp Sanctuary, Lee County preserves, and lands preserved through the Collier County RLSA program, is roughly 40,500 acres. This area is bordered by I-75 to the west, SR 82 to the north and CR 846 to the south (Figure 24). The greater CREW area is currently occupied by both male and female panthers. However, panthers can only move into and out of the area via the CKS to the south. A three-year-old male panther (FP155) was documented traveling along the proposed North Corridor, north of SR 82, lending credibility to the future utility of this restoration project.

The greater CREW area is largely a dead-end destination for panthers and probably, at best, could support fewer than ten panthers at any given time. Recruitment and dispersal, key mechanisms for ensuring genetic exchanges among the entire panther population, are compromised by the restricted access into the CREW. By creating a new connection between the CREW and Okaloacoochee Slough, panthers would be able to travel through CKS from the south and through the new corridor to the north and east. Panther use of the proposed North Corridor is likely to be less than the use of larger habitat blocks more typical within a panther's home range. Nevertheless, the corridor could offer a potential benefit to the panther population as a whole because the corridor could maintain and improve gene flow within the occupied range.

The PRT recommends the following design principles be considered in the restoration of a functional corridor: 1) broad approaches should be included at either end to create a "funneling" effect; 2) habitat nodes along the corridor should be preserved or created to act as stopovers or stepping stones; and 3) adequate buffers along the corridor should be established to avoid negative edge effects (i.e., increased risk of human/panther interactions, disturbance from human and domestic animal presence, noise and artificial lighting in adjacent areas, overall reduction in functionality due to proximity of hostile habitat). The PRT recognizes that a corridor with these characteristics will be comprised of native habitat and agricultural land uses. In fact, preservation of existing agricultural land uses could provide quality corridor buffers. The PRT does note, however, that the northern edge of the corridor is also the northern boundary of the RLSA and Collier County, so buffering under RLSA and FPPP guidelines would only apply along the corridor's southern edge. Nevertheless, we suggest that similar measures be implemented to protect the integrity of the corridor from the Hendry County side.

Data on the lengths and widths of corridors used by Florida panthers are generally lacking. The PRT analyzed existing panther telemetry data to quantify the dimensions of corridors used by Florida panthers as an aid to reviewing the proposed North Corridor. Movement patterns of two male Florida panthers (i.e., FP130, FP131) were measured by using Hawth's Analysis Tools (version 3.27) to create lines from time-series hourly GPS-collar telemetry records. Telemetry records and movement paths were overlaid on 2004 aerial photography, and nine areas were located where panthers appeared to have used linear landscape features on a repeated basis to move from one patch of larger habitat to another. Length was estimated by digitizing a multi-segment line along the approximate center of each linear feature, and width was estimated by digitizing a series of lines at random intervals perpendicular to the axis of each corridor. The termini of width lines were located visually from landscape features in relation to telemetry records. Metrics concerning the average lengths, widths, and width:length ratios of the corridors were quantified. The center line of each corridor was buffered to create 462-foot- and 4,835-foot-wide corridors, the average minimum and maximum widths of the nine corridors. The relative importance of land cover features within the corridors was quantified by extracting 2004 land use/land cover data within the average minimum and maximum buffers, calculating acreages of land cover types, and comparing acreages of vegetation types within core corridor areas to acreages within the larger buffer along the corridors.

The PRT found that corridors used by panthers averaged 5.1 miles in length and ranged between 1.97 and 8.38 miles in length. The land cover types within corridors used by GPS-equipped male panthers were principally forest and grassland/pasture (80-90% of the area) and the corridors had more area of forest habitats near their centerlines (Table 7.3-1). In comparison, citrus groves dominate the landscape in and surrounding the proposed North Corridor, and forest and grassland/pasture cover types constitute less than 30% of the area. These results are not surprising because the North Corridor is intended to be a restoration component of the FPPP, not the preservation of an existing corridor. Also considered in the review of the North Corridor were the following recommendations made by Beier (1995) for corridor widths for pumas in a California setting of wild lands surrounded by urban areas: 1) corridors less than 0.5 mile in length should be greater than 328 feet wide; 2) corridors with lengths in the range of 0.62 - 4.35 miles in length should be 1,312 feet wide; and 3) corridor width should increase as length increases.

The PRT revised North Corridor is a linear landscape feature comprising approximately 3,178 acres that are predominantly in agricultural uses (Table 2.3-1). The PRT recommends that the minimum width of the north corridor should be increased from 600 feet to 1,200 feet. This increase allows for the interior core of the corridor to be buffered from the affects of future developments likely to occur adjacent to the corridor. The recommended increase in the minimum width also is more consistent with Beier's (1995) recommendation that corridors up to 4.35 miles long should be at least 1,320 feet wide. Although the PRT revised North Corridor is approximately 10.5 miles in total length, the distances between nodes of existing habitat average approximately 0.5 miles in length and ranged between 0.15 - 0.85 mile in length ($N=12$). The total length of the proposed North Corridor is significantly greater than the 4.35-mile length suggested by Beier (1995) as the maximum length for corridors with a width of 1,312 feet. However, the PRT North Corridor has a mean width of 2,276 feet ($n = 17$; $s = 446$ ft.). This mean width is greater than the mean width of 1,884 feet for nine corridors used by panthers wearing GPS collars (Table 2.3-2). The PRT also recommends that the North Corridor should include two islands of existing natural habitat that could serve as additional stepping stones for panthers that may eventually utilize the corridor.

The eastern terminus of the corridor was revised to include multiple points of entry to increase the likelihood of eventual use by panthers moving among large patches of protected habitat including OSSF and HSAs, FSAs,

and WRAs at the east end of the corridor. The western terminus of the north corridor has been increased to approximately 1,800 feet wide to improve the likelihood that panthers using the CREW area could eventually find the corridor entrance. The corridor was located such that it crosses SR 82 between the intersections of CR 850 and the proposed Grove Road. This location is designed to allow sufficient distance for a grade increase between the intersections as needed to accommodate a future underpass constructed to FDOT specifications for road design. The PRT recommended design also includes buffer areas along the east and north sides of CREW to further ameliorate the affects of future intensive human developments on the west entrance to the corridor. Existing agricultural operations could continue adjacent to natural habitats in the entrance and exit areas of the corridor as long as the integrity of natural wetlands and uplands leading to the corridor are maintained.

Some initial restoration will be required to connect the habitat nodes or stepping stones. Identifying existing farm roads, dikes or other linear features between these nodes and then enhancing them with native vegetation would be the most practical form of restoration. The importance of existing patches of natural habitat and the proposed restoration of stepping stones of natural habitats along the proposed corridor is demonstrated by the predominance of natural cover types within the core areas of nine corridors used by Florida panthers (Table 2.3-3). Panthers are known to frequently use dirt roads and trails (Beier 1995). The North Corridor passes currently through a predominately agricultural landscape; from a panther perspective, there would be little to distinguish the corridor boundaries. If the agricultural lands are converted to other uses in the future, increased restoration within the corridor would become necessary. This restoration should be planned with future management needs in mind (exotic plant control, prescribed fire); a combination of native forests and grasslands is recommended.

Recommendations

- Current land uses at both ends of the corridor should remain in agriculture and future intensification of land use in these areas should be discouraged. These agricultural lands and WRAs, some of which are already in designated SSAs, will have significant value in directing panther movement into the corridor. Restoration of the corridor approach areas to native cover types would be even more beneficial to encouraging use of the corridor. Existing native habitats along the corridor were identified that should also be protected because they would function as habitat nodes within the corridor.
- A minimum corridor width of 1,200 feet comprised of existing agricultural lands and habitat nodes is recommended. If future development is planned adjacent to the corridor, land uses should be designed along a gradient of more intensive uses to less intensive uses as the corridor boundary is approached. Design elements such as perimeter lakes or fencing may be appropriate to discourage panther movements into new developments. Ultimately, if the surrounding agricultural lands are destined for development, habitat restoration within the PRT corridor boundary will become necessary to ensure future use by panthers.
- Restoration activities should focus on connecting habitat nodes within the corridor. Panthers will travel along farm roads, dikes, ditches and trails, so identifying and enhancing these existing features within the corridor would be advantageous. Vegetative cover should exist along the prospective path and could be comprised of native trees and other plant species. Citrus groves could complement native cover as well as provide added buffer adjacent to the corridor.

Agricultural operations could continue on farm roads that comprise a panther pathway. Some habitat nodes are in need of restoration, primarily in the form of providing for vegetative cover; habitat nodes with existing native vegetation should be managed to maintain existing cover. If the citrus operations are stopped within the corridor, the groves should be restored with a combination of native forest and grassland/pasture.

These recommendations are intended to increase the probability that a proposed North Corridor will successfully facilitate movements by Florida panthers and other wildlife within and through the RLSA. Restoration efforts needed to establish a successful corridor should be approached from an adaptive management perspective. The PRT recommends continual monitoring prior to, during, and after construction of the corridor to determine actual use of the corridor and to design and implement changes, if necessary, to improve its functionality.

8.0 Paul J. Marinelli Florida Panther Protection Fund

8.1 Introduction

The Parties have established the Paul J. Marinelli Florida Panther Protection Fund (Panther Fund) to receive and facilitate funding for implementation of conservation actions within the RLSA that are intended to assist implementation of the FPPP and conservation of the Florida panther. They further have proposed an additional conservation measure for implementation within the RLSA that would provide funds for deposit into the Panther Fund generally associated with the generation and utilization of PHUs from SSAs or other designated/approved conservation lands within the RLSA.

The Parties propose to deposit funds into the Panther Fund that would be derived from the sale and use of PHUs for mitigation for project impacts and for sale and resale of residential housing within the RLSA. A rural landowner would make a contribution to the Panther Fund in an amount of 1) 10% of the sale price of the PHU for each PHU transferred or sold to third persons for use as mitigation or 2) the lesser of \$75 or 10% of fair market value for each PHU used internally or as part of a joint venture by a rural landowner for mitigation purposes. Those PHUs may be used as mitigation for project impacts within or outside the RLSA. Deposit of that amount would be made at time of transfer or sale of a PHU to a third party to satisfy mitigation that is specified as a condition of project authorization. The deposit for internal use of approved PHUs by a landowner would be phased, with one-third of the amount due to be deposited upon issuance of an ACOE permit (Section 7 of the ESA) or other federal authorization (Section 10 of the ESA), and the remaining two-thirds of the amount due would be deposited within 90 days of the first Certificate of Occupancy being issued for a residential or commercial facility within the approved project. The Parties also propose that a fee of \$200 be imposed on each sale of residential housing (both initial and resale) to occur within the RLSA. All deposits would be made to and administrated by the Wildlife Foundation of Florida (within the FWC) as governed by a Board of Directors that would be comprised of selected representatives of the Parties.

The Parties estimate that approximately \$150 million dollars may be generated for deposit into the Panther Fund for management through 2050. Uses proposed for these funds include the following:

- Restoration of panther habitat.
- Establishment and creation of buffers to minimize undesirable human/panther interactions.
- Determination of appropriate locations and construction of wildlife crossings to minimize the occurrence of panther mortalities resulting from collisions with motor vehicles along public transportation corridors.
- Acquisition of habitat demonstrated to be important to panther protection and management.

8.2 Conclusions

Management programs typically are designed and recommended for implementation without thought for funds that will be required to support management or, even more importantly, the mechanisms for generating the required funds. The Parties, in this case, have proposed a mechanism that would both generate needed management funds and serve as an additional incentive for landowners to commit important habitats of the Florida panther for perpetual conservation and benefit to the species.

Although explanation was provided in the available documents for how and when funds would be deposited into the Panther Fund on a per PHU use and/or sale basis, it was not clear how or when PHU values would be approved and/or established as available for sale and use, other than for individual projects for which federal authorization would be requested under Sections 7 or 10 of the ESA. Management action is needed now to most expediently benefit and assist conservation of the Florida panther. Therefore, essential funding for those actions should be generated and approved for qualifying management actions at the earliest convenience. This will require that a mechanism be established for assessment and necessary agency approval of PHU values for early dedication of lands for conservation within the RLSA, independent of and prior to agency authorization of proposed development and associated mitigation. PHUs approved in this manner for preserved lands would be available for use or sale at anytime in the future, dependant upon necessary authorization for use of such PHUs as mitigation on a project-by-project basis. The mechanism also would provide an incentive for landowners to dedicate lands for conservation now regardless of when and if approved PHUs would be used and/or sold in the future. Early approval of PHUs for use and sale would also potentially accelerate deposit of payments into the Panther Fund for timely management use.

8.3 Recommendations

The following general recommendations are intended to improve the utility of the Panther Fund and timely application of received funds for conservation action:

- A mechanism should be designed and implemented to facilitate early assessment and authorization of PHU values for future use and/or sale as an incentive for landowners to dedicate additional valuable habitats for the Florida panther for perpetual conservation and management early on and independent of future project-related mitigation needs. This will encourage more timely preservation of valuable habitat and generation of management funding.
- The Panther Fund should not be used to finance land management activities that would be implemented to satisfy conditions or authorizations for project-related impacts to Florida panthers and/or their habitats (i.e. residential or commercial developments, construction and/or upgrading public transportation corridors, etc.).
- The Panther Fund should consider conservation actions proposed within the RLSA as first priority for funding but not limit expenditures for approved conservation actions within other important habitats of the Florida panther outside the RLSA.
- Payments into the Panther Fund should not be considered an alternative to habitat preservation.

Conservation actions the PRT recommends for Panther Fund support include but are not limited to the following:

- Construction of wildlife crossings with fencing at recommended locations where approved project-related funding sources (i.e. conditions of agency authorization) are not available. Wildlife crossing and fencing should be of designs with proven success at facilitating safe movements of Florida panthers and other wildlife across public transportation corridors with reduced occurrence of animal mortality. Experimental designs for wildlife crossings and other technologies that would facilitate safe movements of Florida panthers across public transportation corridors may be approved for installation and evaluation, with expected success.
- Acquisition of key landscape features or parcels to complement broader management actions (i.e. corridors, buffers, lands adjacent to wildlife crossings, key linkages, etc.) where other funding sources are not available.

- Habitat restoration to complement other management where such restoration has not been required as a condition of agency authorization for land development activities (i.e. Agricultural Preservation lands that are no longer used for agriculture and/or where habitat restoration may be voluntarily implemented to enhance prey base and panther cover and access to prey).
- Habitat management or restoration activities on public lands (fee title or easements) where funding is limited and where such investments would provide more immediate enhancements to panther conservation.
- Research and monitoring of the RLSA Program, proposed conservation measures and related management actions to provide evaluation and design for adaptive management within the RLSA and for other areas outside the RLSA and within the functional range of the Florida panther. Research that would be conducted under the normal responsibility of agencies or as conditions of agency authorizations for land development projects should not be candidates for Panther Fund support. Research methods and results should be transparent.

9.0 Proposed New Interchanges for Interstate 75

9.1 History of Alligator Alley Conversion to Interstate 75

The portion of I-75 known as Alligator Alley connects Collier and Broward counties and was constructed from 1988 – 1992. This project was the culmination of more than 20 years of planning that examined projected population growth, expected traffic levels, alternative corridors, access issues and environmental concerns. Authorization for the expansion of I-75 was provided by the 1968 Federal Highway Act (FDOT, Final Environmental/Section 4(f) Statement, 1972), and designs were completed for the portion of I-75 from Tampa to a point south of Fort Myers. However, further planning for the remaining link between Fort Myers and Fort Lauderdale in 1970 was suspended pending resolution of a route across the peninsula. An Environmental Study Panel was assembled in August 1970 to provide recommendations on alternative routes across the peninsula as well as recommendations to limit the impact of the proposed interstate on natural resources. This panel submitted its findings in September 1971, and its recommendations provided the basis for selecting the Alligator Alley corridor as the final portion of I-75 between Naples and Ft. Lauderdale.

Access to I-75 along the Alligator Alley portion was recognized as a potential detriment to surrounding sensitive ecosystems. Improved access to undeveloped lands was identified as a secondary impact of this project in the Final Environmental/Section 4(f) Statement (FDOT 1972, page 17). Therefore, limited access to this portion of I-75 was a deliberate decision to minimize this impact. Specific language in the Environmental/Section 4(f) document states: “The major purpose of the east-west length of this I-75 project is to provide fast, safe, and efficient transportation across South Florida, *not to improve transportation and accessibility for the intermediate land areas. Interchanges would be limited as previously described*” (page 19, emphasis added). Only four interchanges were included in this segment of I-75: 1) CR 951; 2) SR 29; 3) Indian Reservation Road (Snake Road); and 4) US 27. Subsequent to this report, the SR 29 interchange was removed from the project because of Florida panther concerns. This interchange was ultimately included in the project once specific conditions intended to prevent development along SR 29 and to provide safe passage for panthers across SR 29 were put into place. Clearly, the possibility for later inclusion of new interchanges was not built into the original planning for this portion of I-75.

Significant conservation lands inhabited by panthers have been acquired along I-75 since its construction: BCNP and Fakahatchee Strand State Preserve were acquired in 1974; the FPNWR was created in 1989; the majority of Picayune Strand State Forest was acquired by 2003. Within the Primary Zone for panthers (Kautz et al. 2006), conservation lands are present on either side of I-75 for 38 miles. Just to the east of Naples, conservation lands are present for 10.5 miles along the south side of I-75. The lands north of I-75 to the east of Naples include northern Golden Gate Estates and the North Belle Meade; both of these areas are regularly used by panthers. These acquisitions have certainly minimized the likelihood of secondary impacts to panther habitat identified during the original planning for the I-75 corridor but they have not completely eliminated them.

9.2 Overview of Two Proposed Locations for New Interstate 75 Interchange

Two locations for a potential new interchange have been discussed: 1) Everglades Boulevard in north Golden Gate Estates and 2) between DeSoto Boulevard and the FPNWR. Everglades Boulevard is a north-south road that serves northern Golden Gate Estates and has an existing overpass across I-75. The

conceptual second interchange would be approximately two miles east of Everglades Boulevard and would require that a new road be constructed through the Collier RLSA. The northern terminus of this new road would be at Randall Boulevard and the Town of Big Cypress.

Panthers currently occupy Primary Zone habitat north of I-75 between the FPNWR westward into the North Belle Meade including the northern Golden Gate Estates. The functionality and contiguity of this panther habitat would be compromised by either of the two proposed interchange locations. Improved access to hundreds of undeveloped residential lots in Golden Gate would lead to more residences within areas occupied by panthers and, over time, the portion of north Golden Gate Estates within the Primary Zone may be lost as panther habitat. If panthers no longer can use Golden Gate, the only remaining link to the Primary Zone habitat within North Belle Meade would be from the south out of Picayune Strand State Forest requiring panthers to cross I-75. No dedicated wildlife crossings or protective fencing exist along this segment of the interstate but some panthers have learned to use an existing bridge to safely cross beneath the highway.

The road corridors that lead to a new interchange would face some significant design challenges with respect to accommodating panther movements. Road projects elsewhere have incorporated wildlife crossings and barrier fencing to manage human and wildlife safety issues but these tools are only effective for long-term conservation if substantial property on either side of the highway has been permanently protected. There is no current conservation acquisition program within North Golden Gate Estates. Therefore, including wildlife crossings into the design for either Everglades Boulevard or the conceptual new eastern road could not adequately accommodate movements of panthers between the Collier RLSA and North Belle Meade without also preserving lands within North Golden Gate Estates. Barrier fencing could only be considered along the new conceptual eastern road as a way to prevent panthers from crossing the highway from FPNWR and accessing Golden Gate Estates. However, barrier fencing would also lead to unwanted side effects such as trapping black bears, deer, panthers and other wildlife within Golden Gate Estates as they move eastward from the North Belle Meade. Finally, the conceptual eastern interchange access road would be built primarily through lands designated as HSAs, FWAs and WRAs within the Collier RLSA and would result in a “take” of panther habitat.

9.3 Recommendation

The PRT recommends that the conceptual new interchange within the Collier RLSA boundaries receive no further consideration based on the projected loss of existing panther habitat required for constructing a new road and the overall cumulative impacts this alternative would have on the surrounding Primary Zone panther habitat. The PRT also cautions that an interchange at Everglades Boulevard, as proposed without preservation of the lands between the Collier RLSA and North Belle Meade, would impact the Collier RLSA by reducing the availability of panther habitat to the west of the RLSA boundary.

10.0 Summary of Conclusions and Recommendations

Florida panther habitat typically was conserved or enhanced prior to the creation of the 2002 Collier County RLSA through land acquisition (fee simple or easements) or through mitigation. These approaches achieved some levels of long-term preservation on portions of occupied panther habitat but they seldom worked in unison over a larger landscape nor did they take into consideration that panther conservation is compatible with rural land uses such as agriculture and production of large livestock. The 2002 RLSA is a voluntary program that encompasses nearly 200,000 acres of northeastern Collier County. Areas were assigned to one of four RLSA land use categories based on their natural resource values (primarily wetland and wildlife habitat qualities). A credit-based system was then created such that new developments were entitled only after areas with high natural resource values were preserved. The PRT found that the RLSA credit system preserved more acres of panther habitat than the USFWS Methodology would require. This fact alone demonstrates that the 2002 RLSA program enhances panther conservation when compared to existing regulatory processes.

The Parties developed new conservation measures during the five-year review of the Collier County RLSA that are proposed by the Parties as either modifications to the RLSA program or the FPPP. These measures generally consist of the following: 1) the Paul J. Marinelli Florida Panther Protection Fund; 2) additional mitigation for impacts to Primary Zone habitat; 3) maintenance of an existing corridor and the creation of a new corridor; and 4) an Agricultural Preservation component. The PRT believes that the greatest enhancement for panther conservation would result from an Agricultural Preservation component that could successfully steer development away from areas with high panther value identified by the PRT (Section 2). The PRT proposes that the Parties adopt a strategy to avoid, minimize, and mitigate impacts to panther habitat in the Primary Zone; however, if this approach is successful, it may reduce financial deposits into the Panther Fund and provide a minimal amount of additional mitigation. The PRT concludes that preserving existing panther habitat is far more valuable than generating funds or providing more mitigation for impacts to the Primary Zone. Finally, the creation of a North Corridor would be a panther conservation enhancement, but only if its design is robust enough to ensure use by panthers as future land use changes occur.

The PRT was given the charge of evaluating whether or not the additional conservation measures the Parties propose for implementation within the RLSA would represent a panther conservation enhancement over the status quo. The PRT believes that the existing RLSA program plus the additional measures proposed as the FPPP would be an enhancement over the existing regulatory processes and that, if its recommendations are incorporated, the conservation value to panthers would be increased further. However, the PRT also recognizes that the on-going loss of panther habitat within the occupied range as well as the loss of potential habitat within the historic range conflicts with Florida panther recovery. Therefore, the PRT makes a clear distinction in its assessment of enhancements to panther conservation within the RLSA over the status quo versus the conservation implications of habitat loss and fragmentation within the occupied range of the Florida panther. The PRT also recognizes that the conclusions and recommendations resulting from these analyses may have economic implications for landowners and others, but an analysis of economic impacts of the FPPP was beyond the PRT's scope of work.

The PRT's conclusions and recommendations concerning the proposed conservation measures and associated issues follow.

10.1 Proposed Revisions to the Rural Lands Stewardship Area Map

- Public lands, approved as SSAs, future SSAs, and recommended for preservation consideration by the PRT would result in the preservation of 140,922 acres (71.9% of the RLSA).
- The additional areas the PRT recommends for preservation consideration (Figure 13) were strategically identified to best complement the habitats that will contribute to the conservation of the panther within the RLSA and southwest Florida.
- The combined preservation of these lands will result in the preservation of core habitat areas and adjacent buffers, provision of corridors to connect occupied habitats on public lands, and minimize future habitat fragmentation within the RLSA.
- The lands remaining available for development would be sufficient to accommodate the proposed cap of 45,000 acres and impact only 2,084 acres of Primary Zone panther habitat.
- The PRT recommends that future development occurs first in Open Lands that are within the Secondary Zone before lands within the Primary Zone are considered for conversion to urban uses.

10.2 Analysis of Additional Mitigation Proposed for Impacts to the Primary Zone

- The PRT's analyses show that more panther habitat would be preserved by the RLSA Stewardship Credit system than by the USFWS Methodology, even after including the proposed 25% increase in PHUs for impacts to the Primary Zone.
- More PHUs exist on SSAs than are needed to fulfill USFWS mitigation requirements; therefore, the unused PHUs could be banked for future use. The 25% increase in PHUs for Primary Zone impacts would reduce, but not eliminate, those unused PHUs.
- The PRT cautions that using unused PHUs generated from designated SSAs to mitigate panther habitat loss outside of the RLSA conflicts with Florida panther conservation.
- The PRT acknowledges that the proposed 25% increase in mitigation of Primary Zone impacts would result in a commensurate increase in revenues for deposit within the Panther Fund

10.3 Analysis of Panther Habitat Units Generated from Stewardship Sending Areas

- The PRT finds that the existing RLSA program will preserve more acres of significant panther habitat through generation of stewardship credits than could be accomplished using the USFWS Methodology. Therefore, use of the USFWS Methodology provides no additional conservation benefit when compared to the RLSA program.
- More PHUs exist on Stewardship areas than are needed to fulfill USFWS mitigation requirements; therefore, the unused PHUs could be banked for future use.
- The PRT cautions that using unused PHUs generated from designated Stewardship areas to mitigate for panther habitat loss outside of the RLSA would be detrimental to panther conservation.
- Sale of proposed unused PHUs for uses outside the RLSA would have the potential to compromise the economics associated with the establishment of Florida Panther Conservation Banks in other important areas of the panther's range.

10.4 Agricultural Preservation Proposal

- The PRT identified specific areas currently designated as Open Lands within the RLSA both inside and outside the Big Cypress ACSC that have natural resource value and could contribute to Florida panther conservation by maintaining the spatial extent and integrity of existing panther habitat.
- The PRT finds that an Agricultural Preservation designation of RLSA Open Lands that the PRT identified as important to panthers would accomplish the following: 1) provide certainty that future uses of those lands would be restricted at no greater than existing uses; 2) remove the potential for those lands to be developed at 1 unit per 5 acres; and 3) preserve the value of these lands to conservation of the Florida panther in perpetuity.
- The PRT recommends that any proposed changes to the Stewardship Credit system include an incentive-based mechanism that directs future SRA development away from and steers preservation towards those agricultural lands identified by the PRT as having value to panthers.

10.5 Evaluation of Proposed Core Public Transportation Network

- The PRT recommends that transportation planners avoid constructing new roads that bisect HSAs, FSAs, WRAs or areas identified by the PRT for additional protection.
- The amount of habitat impacted should be minimized if construction of a new road through HSAs, FSAs, WRAs or an area recommended by the PRT for protection can not be avoided.
- Wildlife crossings and fencing should be constructed of proven designs other than in those cases where installation of experimental new designs may be appropriate for evaluation.
- Wildlife crossings should only be constructed in areas where the landscape on either side of the road is in some form of permanent protection, unless site-specific circumstances suggest otherwise.
- Mitigation for road projects within the RLSA should occur within the RLSA.

10.6 Evaluation of Proposed Corridors

- The PRT recommends that additional areas consisting of native land cover and agriculture be protected within the SSSL to allow this area to continue to function as occupied panther habitat.
- The PRT recommends that the following three design principles be considered for restoration of a functioning North Corridor: 1) broad approaches should be planned at either end to create a “funneling” effect; 2) habitat nodes along the corridor should be preserved or created to act as stopovers or stepping stones; and 3) adequate buffers should be established along the corridor to avoid negative edge effects (e.g., increased risk of human/panther interactions, disturbance from human and domestic animal presence, noise and artificial lighting in adjacent areas, overall reduction in functionality due to proximity of hostile habitat).
- The PRT recommends a redesign of the North Corridor that follows the same general alignment as the corridor proposed by the Landowners with the exception of the corridor’s western terminus.

- Current land uses at both ends of the North Corridor should remain in agricultural uses or restored to native land covers, and future intensification of land use in these areas should be discouraged.
- Existing native habitats along the PRT revised North Corridor should be protected because they would function as native habitat nodes within the corridor.
- The PRT recommends a minimum corridor width of 1,200 feet comprised of existing agricultural lands and native habitat nodes.
- Habitat restoration within the PRT revised North Corridor should focus first on connecting habitat nodes along the entire length of the corridor.
- The PRT recommends continual monitoring prior to, during, and after construction of the revised North Corridor to determine actual use of the corridor and to design and implement changes, if necessary, to improve its functionality.

10.7 Paul J. Marinelli Florida Panther Protection Fund

- The Parties have established the Paul J. Marinelli Florida Panther Protection Fund (Panther Fund) to support Florida panther conservation actions and, in particular, those actions where no funding was available previously. Revenues would be generated from a proposed PHU transaction fee as well as a proposed transaction fee on residential housing sales (new and existing) within the RLSA. The PRT believes that the Panther Fund will benefit conservation efforts as long as the fund is not considered as an alternative to habitat preservation.
- The PRT recommends that Panther Fund revenue should not be used for project-related mitigation such as funding a wildlife crossing for a new road project.
- Conservation actions within the RLSA should receive priority for use of Panther Fund revenues but the use of revenues should not be restricted to the RLSA.
- Habitat acquisition (fee simple or easements), habitat restoration, wildlife crossings and monitoring of FPPP conservation measures would be acceptable uses of the Panther Fund.

10.8 Proposed New Interchanges for Interstate 75

- It is the opinion of the PRT that construction of an interchange with I-75 at either Everglades Boulevard or between DeSoto Boulevard and the FPNWR could compromise the functionality and contiguity of the habitats along the north side of I-75 that are used by panthers to travel between North Belle Meade and the FPNWR.
- The PRT recommends that the conceptual interchange between DeSoto Boulevard and FPNWR receive no further consideration based on the projected loss of existing panther habitat required for constructing a new road and the overall cumulative impacts this alternative would have on the surrounding Primary Zone panther habitat.
- The PRT stresses that significant design challenges exist if an interchange with I-75 at Everglades Boulevard receives further consideration. These challenges include the following:
 1. Preventing the isolation of Primary Zone panther habitat in the North Belle Meade;
 2. Preserving movement corridors between North and South Belle Meade and between North Belle Meade and FPNWR;

3. Facilitating safe panther movements across I-75 and Everglades Boulevard;
4. Minimizing the potential for human-panther interactions in the northern Golden Gate Estates; and
5. Ensuring that these panther considerations are compatible with the needs of other wildlife species.

10.9 Evaluation of 45,000-Acre Development Cap

- The Parties have proposed a 45,000-acre development cap as one of the added conservation measures of the FPPP within the RLSA. The proposed development cap would be a good measure to provide certainty that additional development that is theoretically possible under existing conditions (2002 baseline) within the RLSA does not occur. Such certainty does not currently exist.
- The Stewardship Credits that could be generated if all HSAs, FSAs and WRAs are designated and approved as SSAs will only support 43,000 acres of development; so, additional SSAs will be necessary to entitle the remaining 2,000 acres of development under the proposed cap. Agriculture Preservation within the areas identified by the PRT could be a source of additional Stewardship Credits.
- The existing RLSA program would allow for 43,000 acres of development through credits transferred from SSAs, and an additional 44,000 acres could be developed at one unit per five acres if the 45,000-acre cap were not implemented.

10.10 Mining Activities within the Rural Lands Stewardship Area

- Mining is a land use that results in the direct loss of panther habitats. Mining may also have secondary impacts as the water bodies remaining at the end of mining operations may provide attractive amenities for future waterfront developments that may further result in the loss of panther habitats.
- The PRT recommends that mining should be a prohibited land use in areas of the RLSA identified for additional protection by the PRT.
- The PRT views mining as a form of development, and acreages of future mine lands should be deducted from the 45,000-acre development cap proposed for the RLSA.

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FIGURES

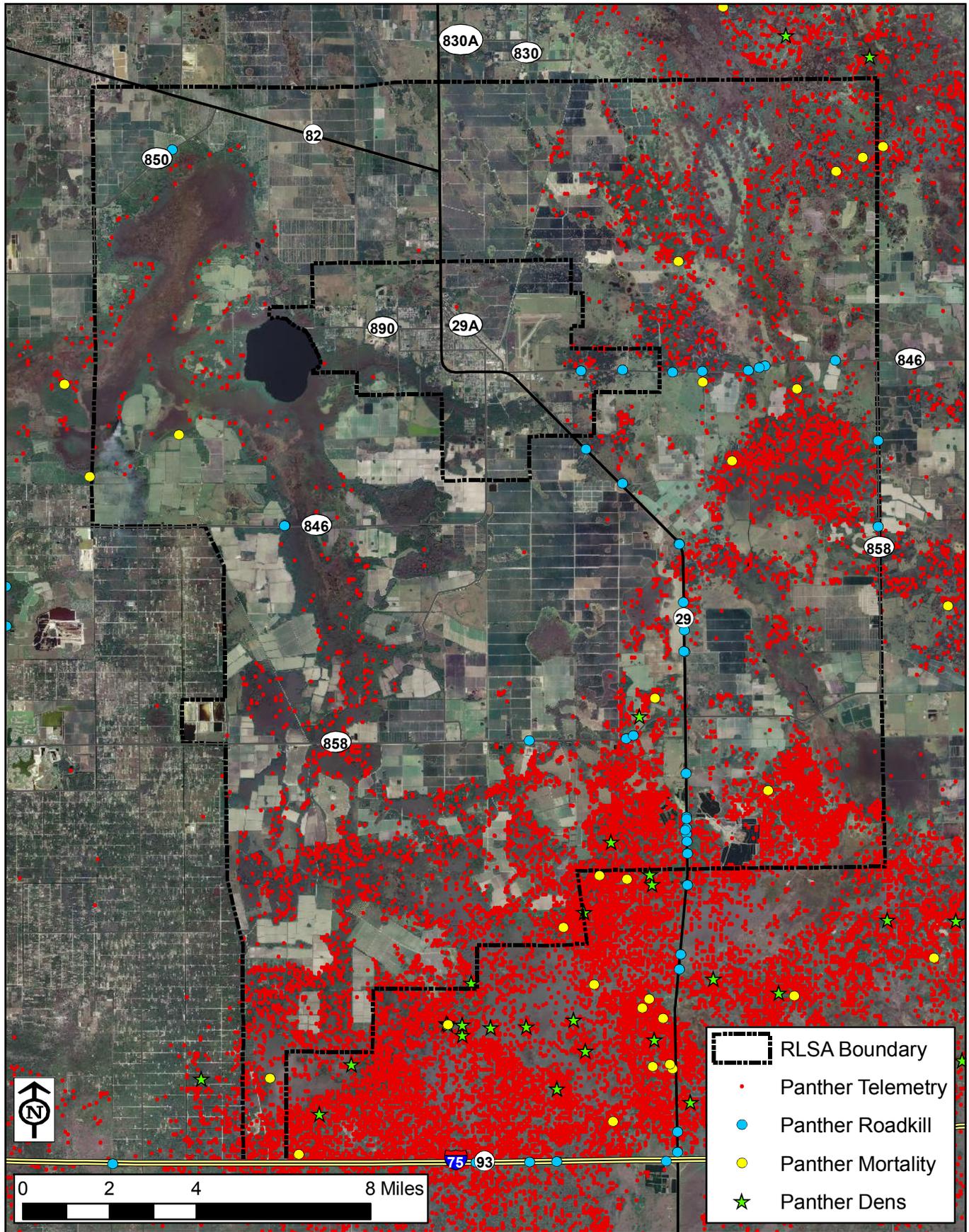


Figure 1. Florida panther radio-telemetry records (Feb 1981-Jun 2008), roadkill and other mortality records (thru January 20, 2009), and mapped den locations (thru Jun 2008) overlaid on 2004 aerial photography.

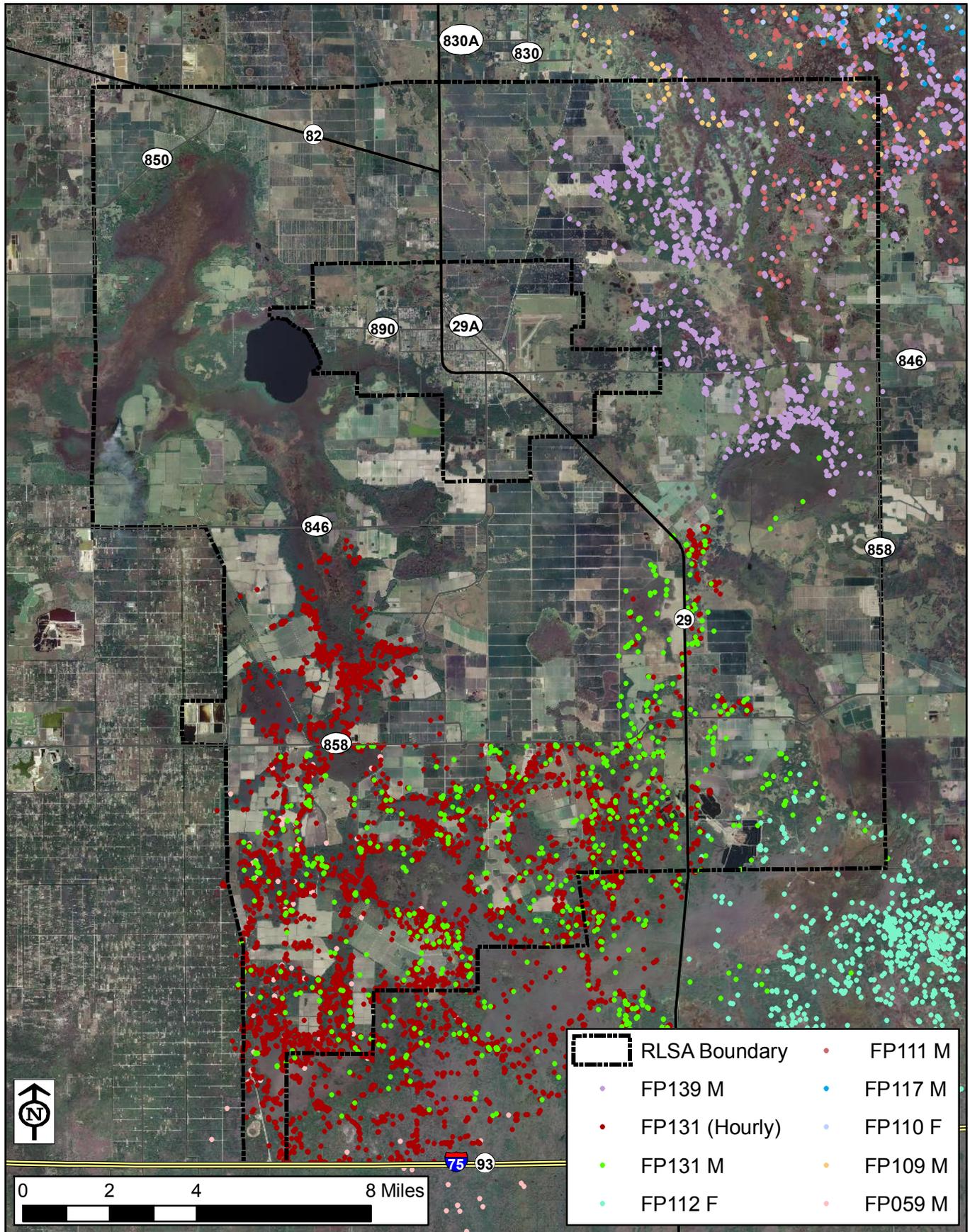


Figure 2. GPS collar location records for 8 Florida panthers that occurred in the vicinity of the Collier Rural Land Stewardship Area between 2002 and 2005 overlaid on 2004 aerial photography.

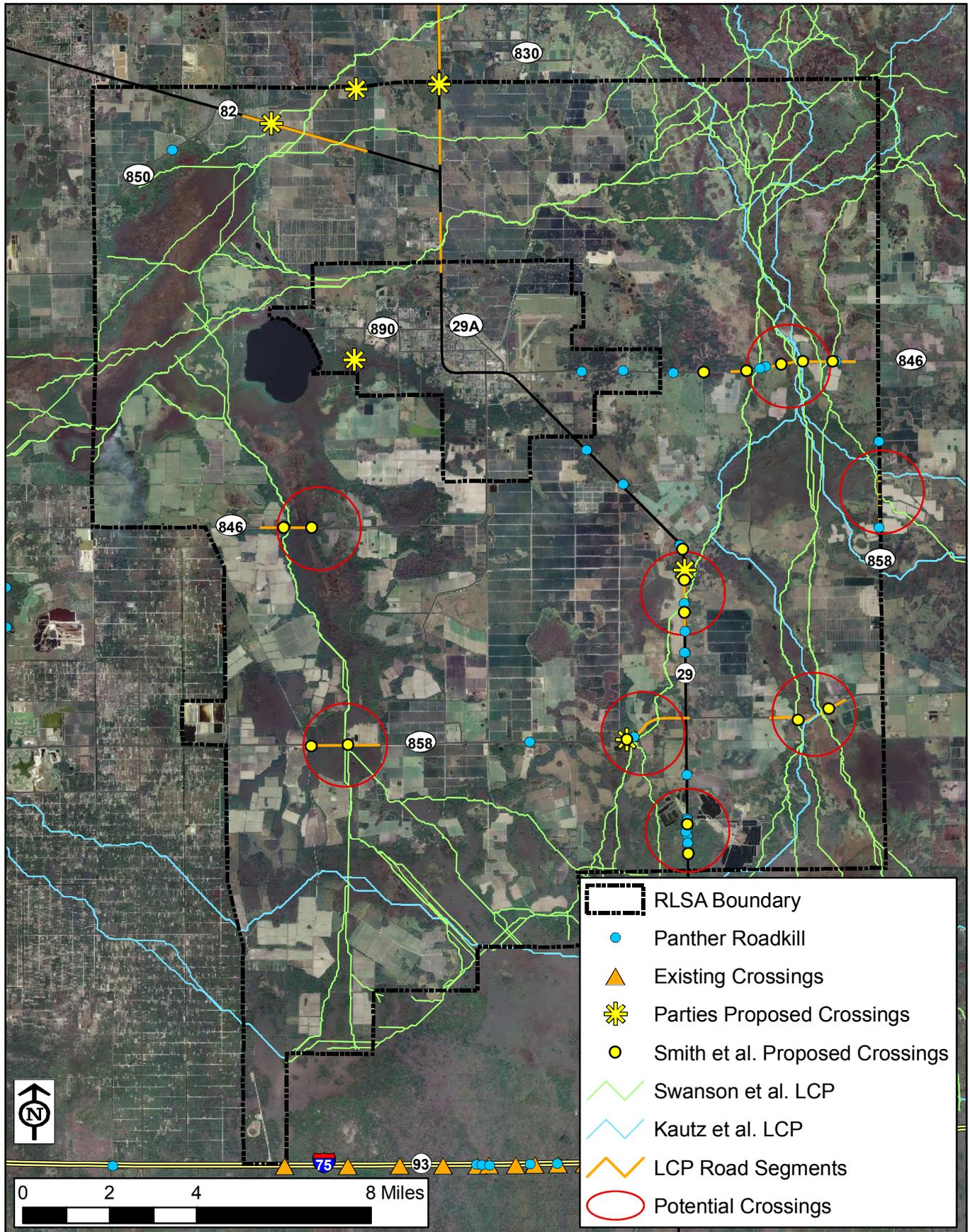


Figure 3. Panther roadkills, existing wildlife crossings, panther crossings proposed by the Parties and Smith et al. (2006), potential crossing locations identified by Logan and Kautz (2006), least-cost-path (LCP) models of routes likely to be followed by panthers moving among tracts of public land (Swanson et al. 2005, Kautz et al. 2006), and key road segments indicated by Swanson et al. (2005).

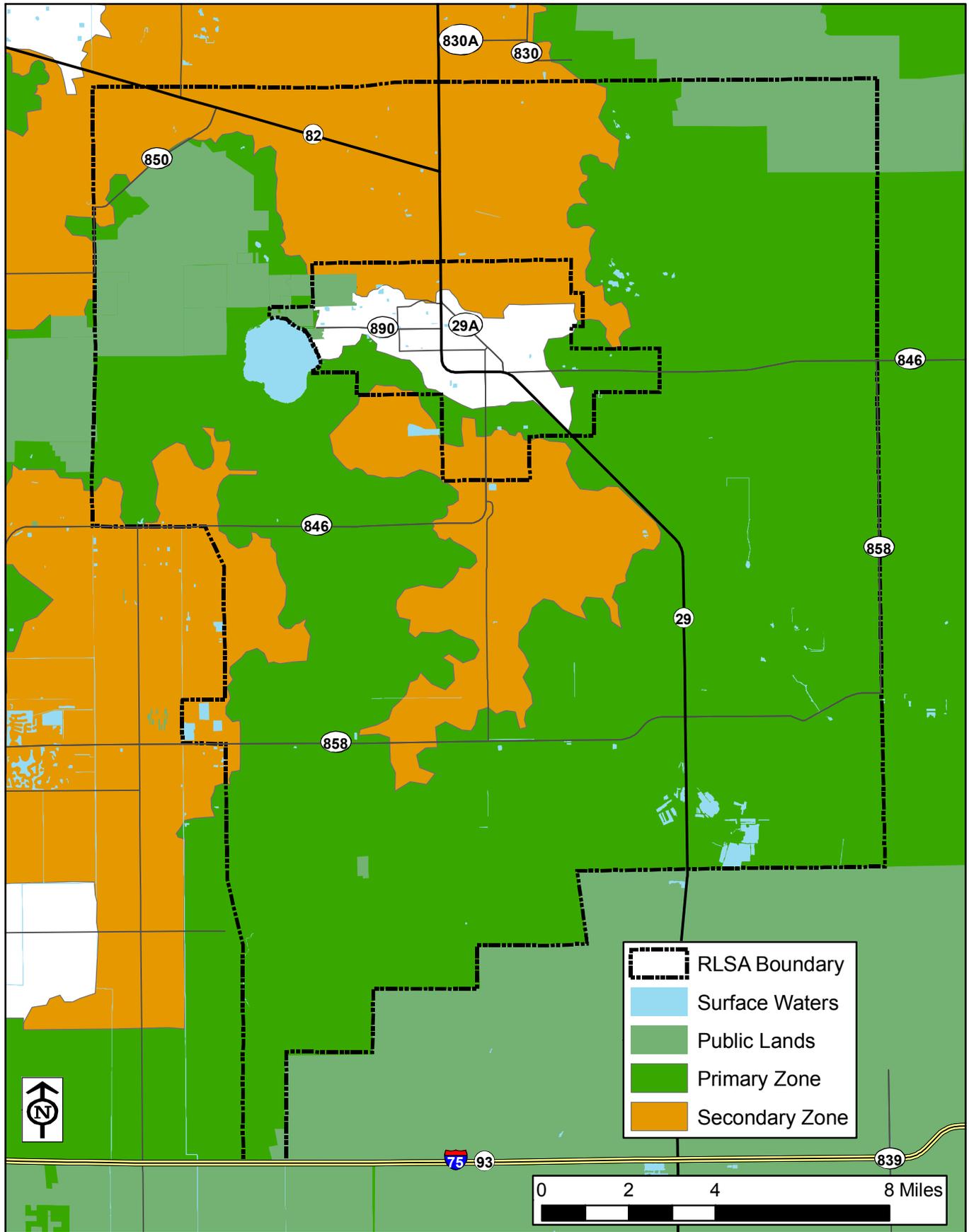


Figure 4. Primary and Secondary Zones as mapped by Kautz et al. (2006) and adopted by the U.S. Fish and Wildlife Service as part of the Panther Focus Area (USFWS 2007).

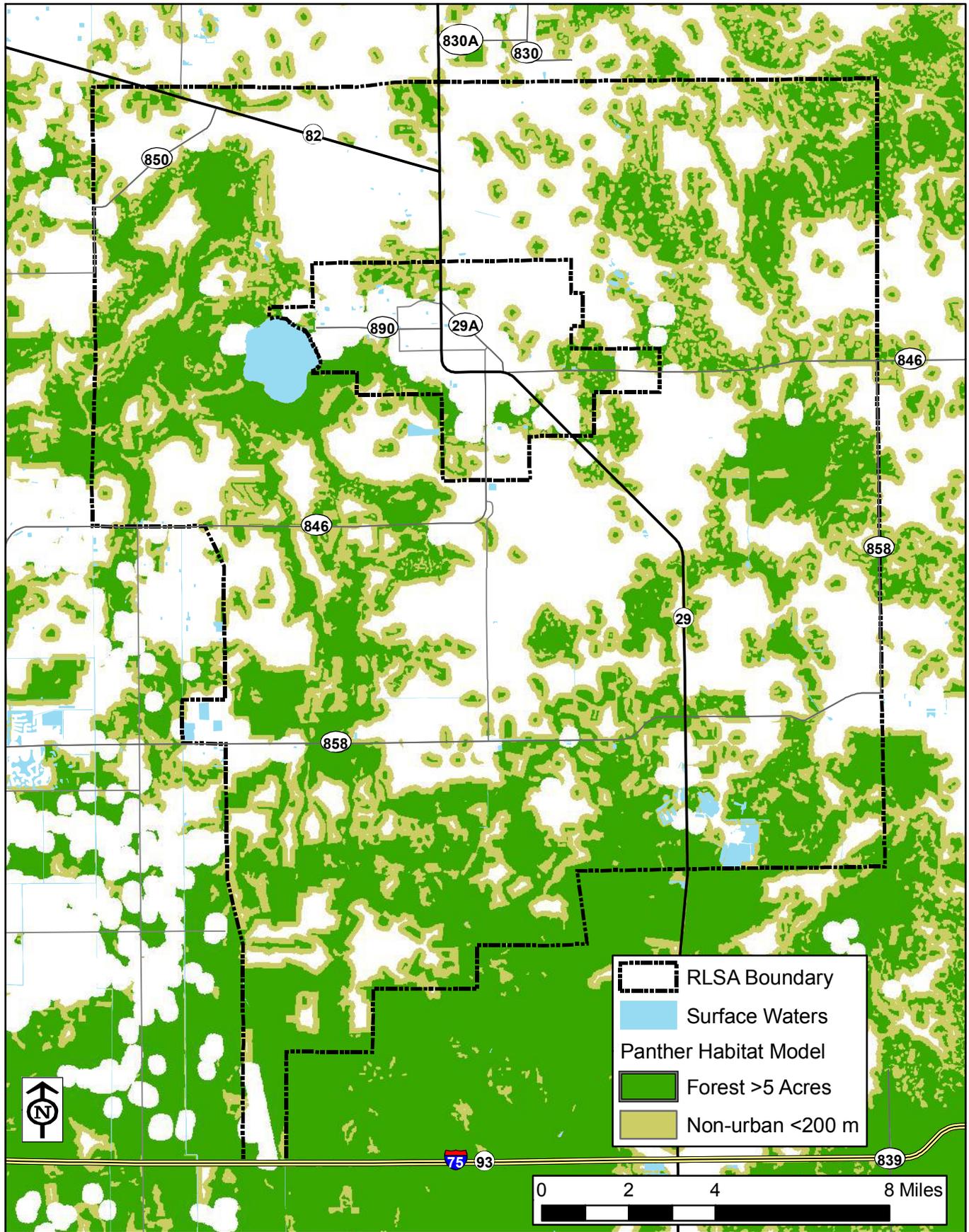


Figure 5. Florida panther habitat model depicting forest patches >5 acres and non-urban cover types <200 m from forest patches. The model was used as an aid to the identification of Primary and Secondary Zone boundaries (Kautz et al. 2006).

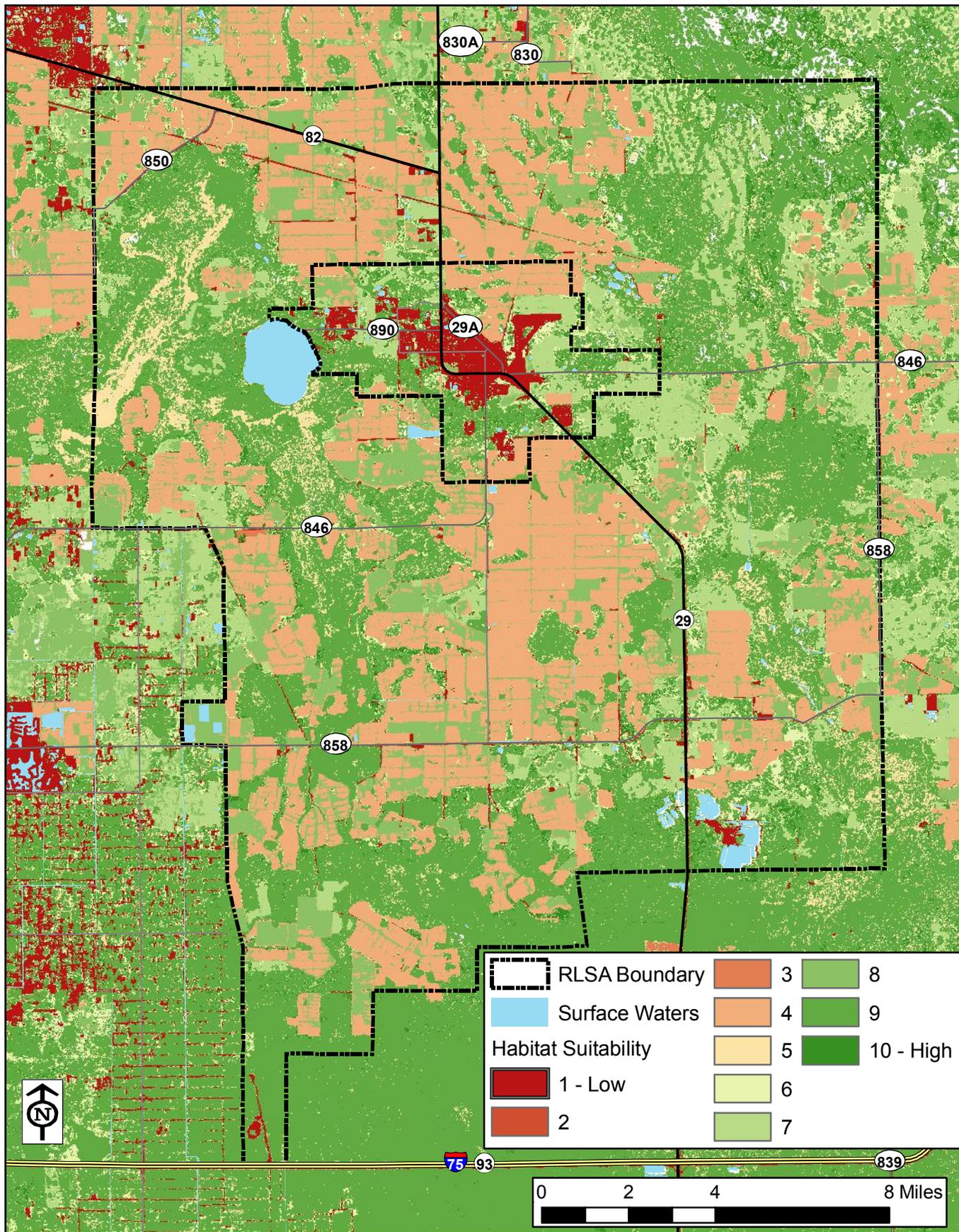


Figure 6. Habitat suitability rankings (1=low, 10=high) used by Swanson et al. (2005) for least cost path models of routes most likely to be used by Florida panthers moving between parcels of public land in South Florida.

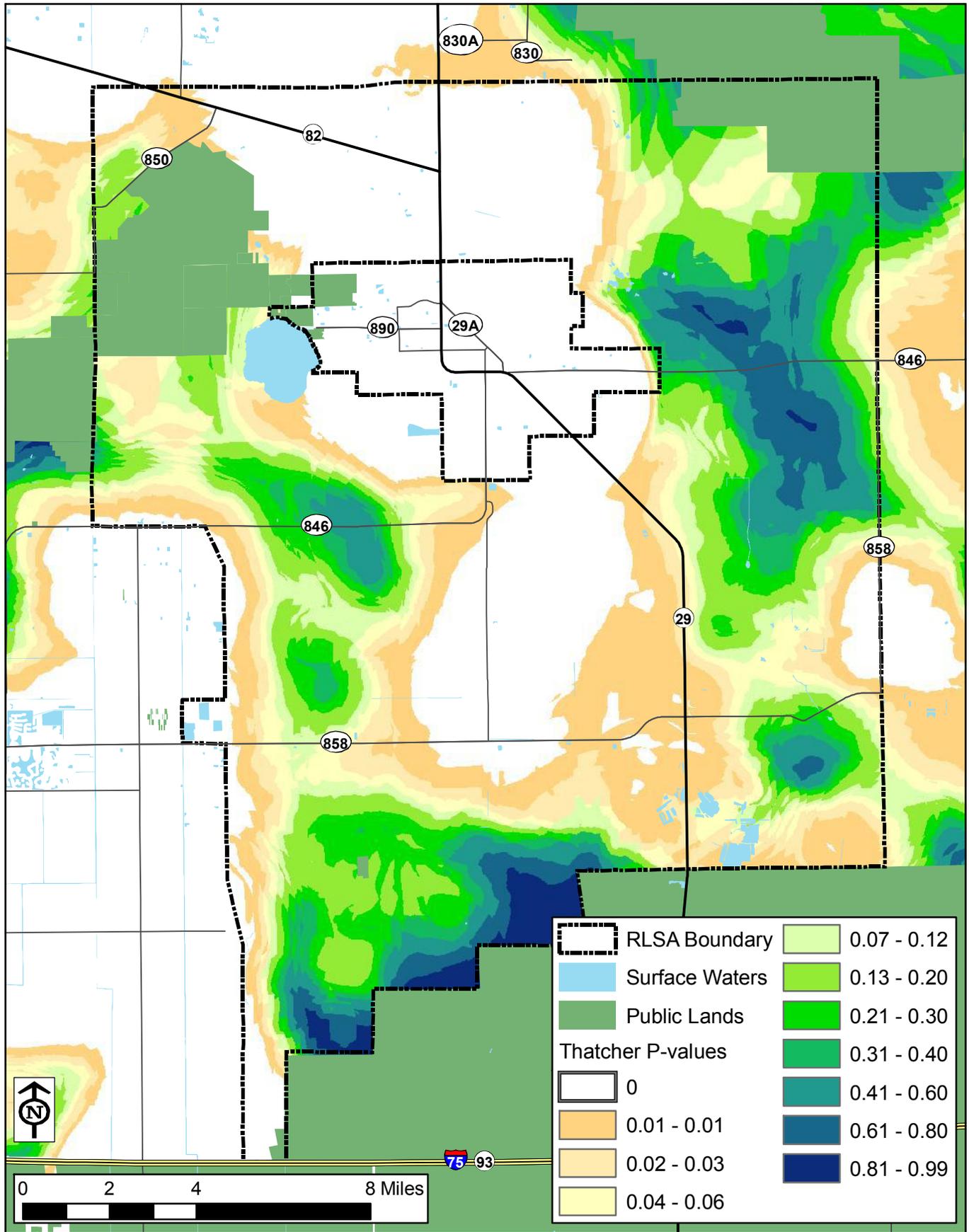


Figure 7. Ranking of habitat suitability based on a Mahalanobis distance analysis of 2003 land cover relative to panther home ranges (higher *P* values correspond to more suitable habitat conditions) (Thatcher et al. 2006).

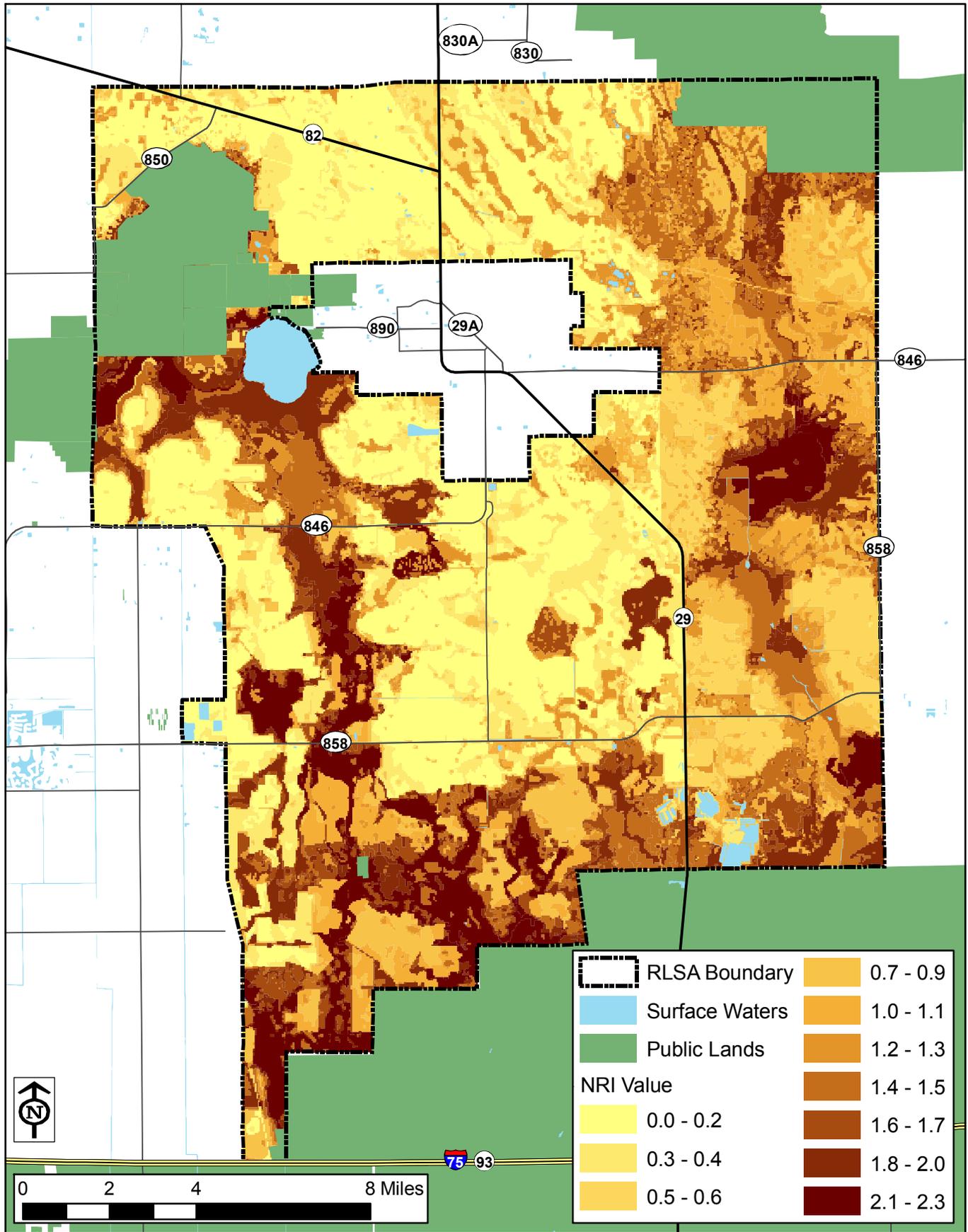


Figure 8. Natural Resource Index (NRI) values for the Collier Rural Land Stewardship Area (higher scores have higher natural resource value) (WilsonMiller 2002).

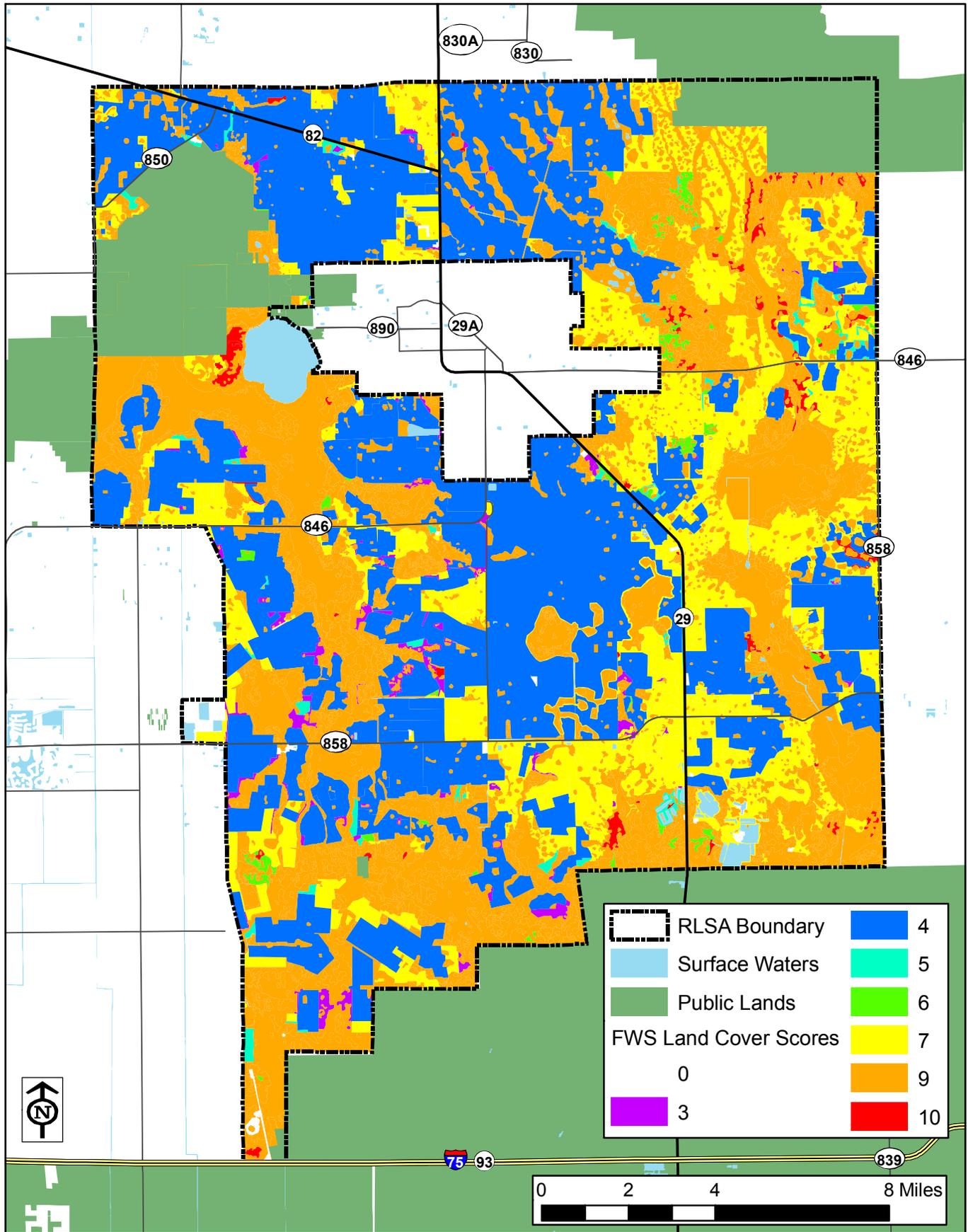


Figure 9. South Florida Water Management District 2004 land use/land data cover reclassified to the land cover scores used by the U.S. Fish and Wildlife Service to calculate Panther Habitat Units (10=highest habitat value).

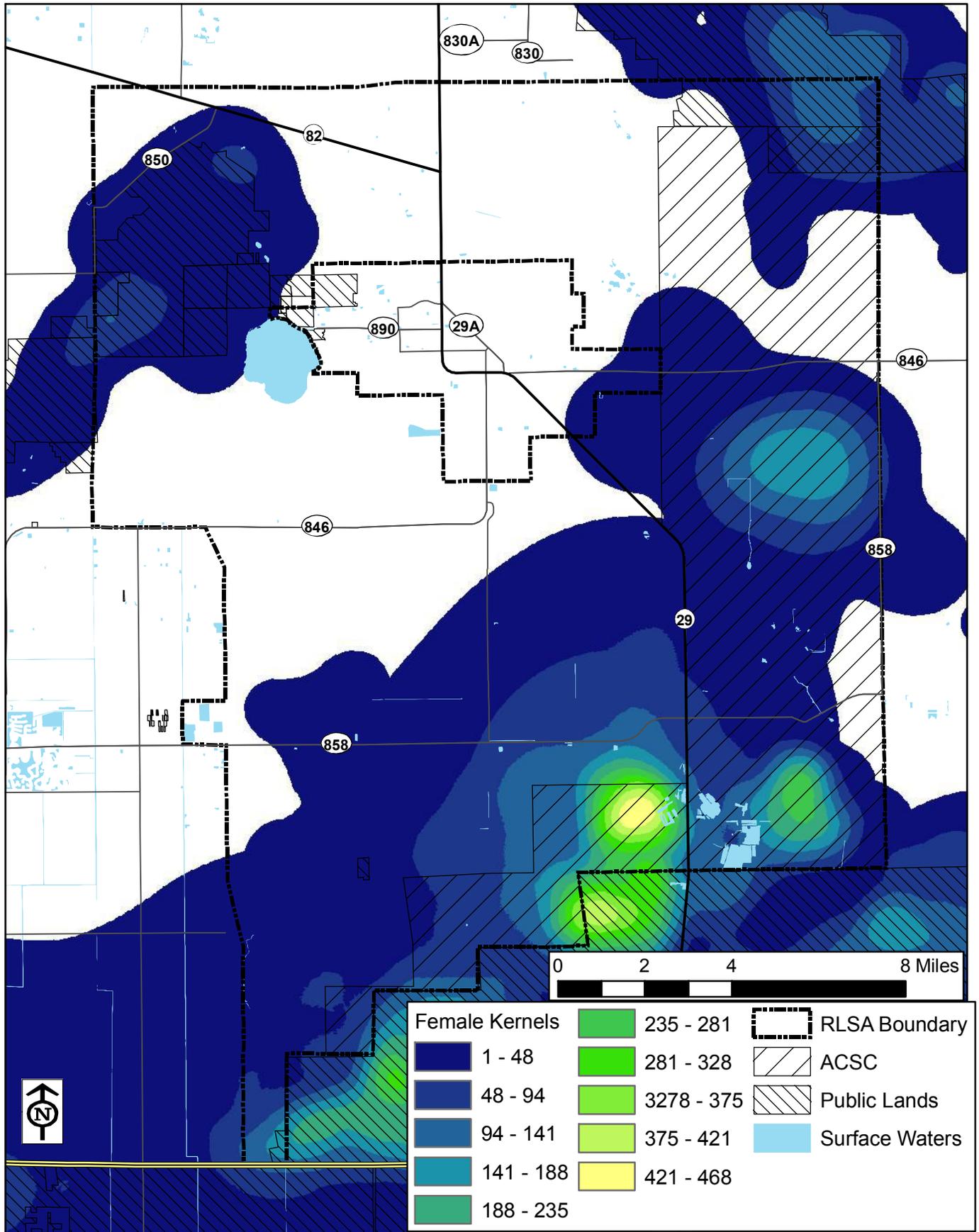


Figure 10. Sum of inverse probabilities of distribution of female Florida panthers ($n = 73$) based on 95% kernel home range models for all females and derived from radio-telemetry data collected between 1981 and June 2008.

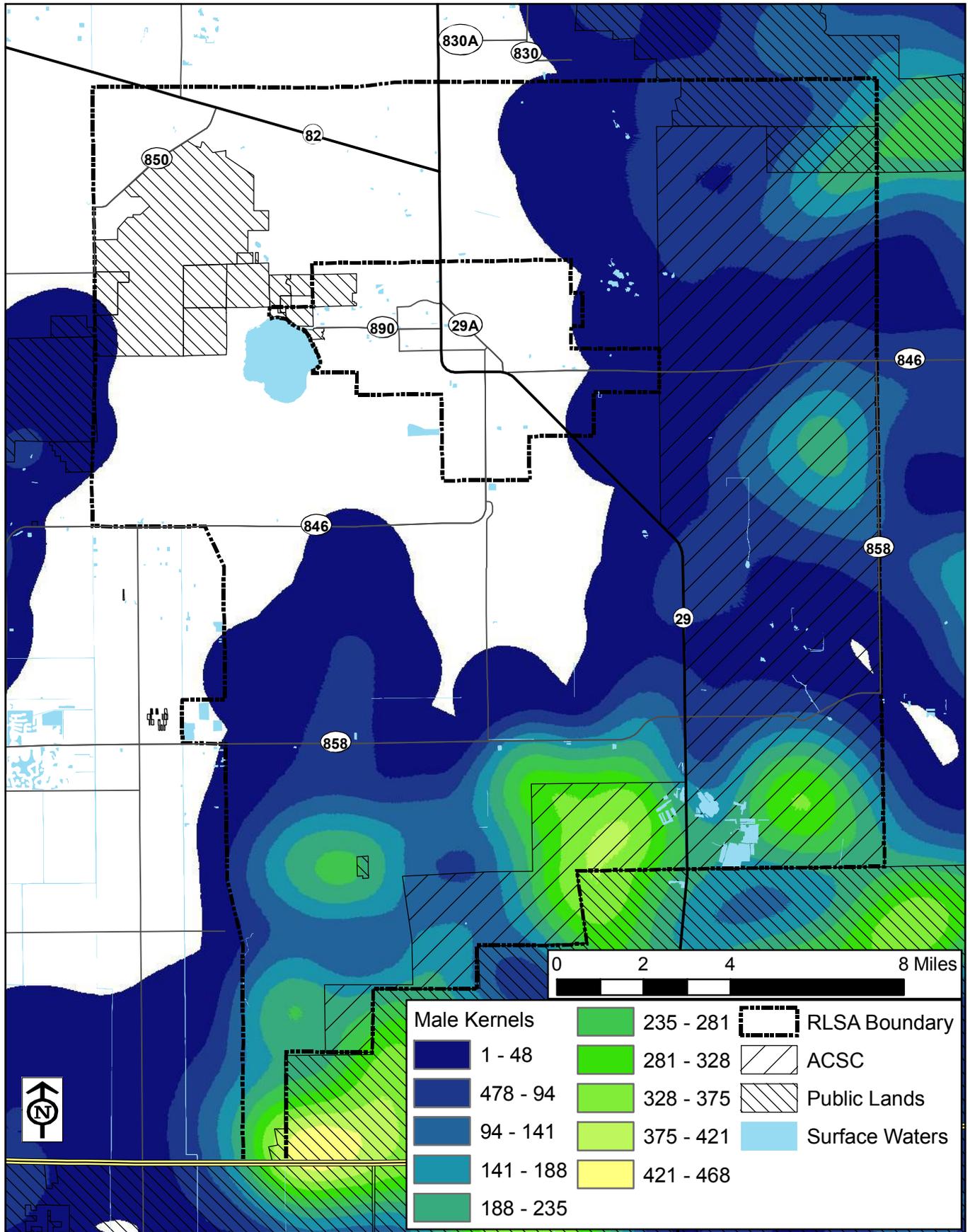


Figure 11. Sum of inverse probabilities of distribution of adult male Florida panthers ($n = 48$) based on 95% kernel home range models for all males greater than 36 months of age and derived from radio-telemetry data collected between 1981 and June 2008.

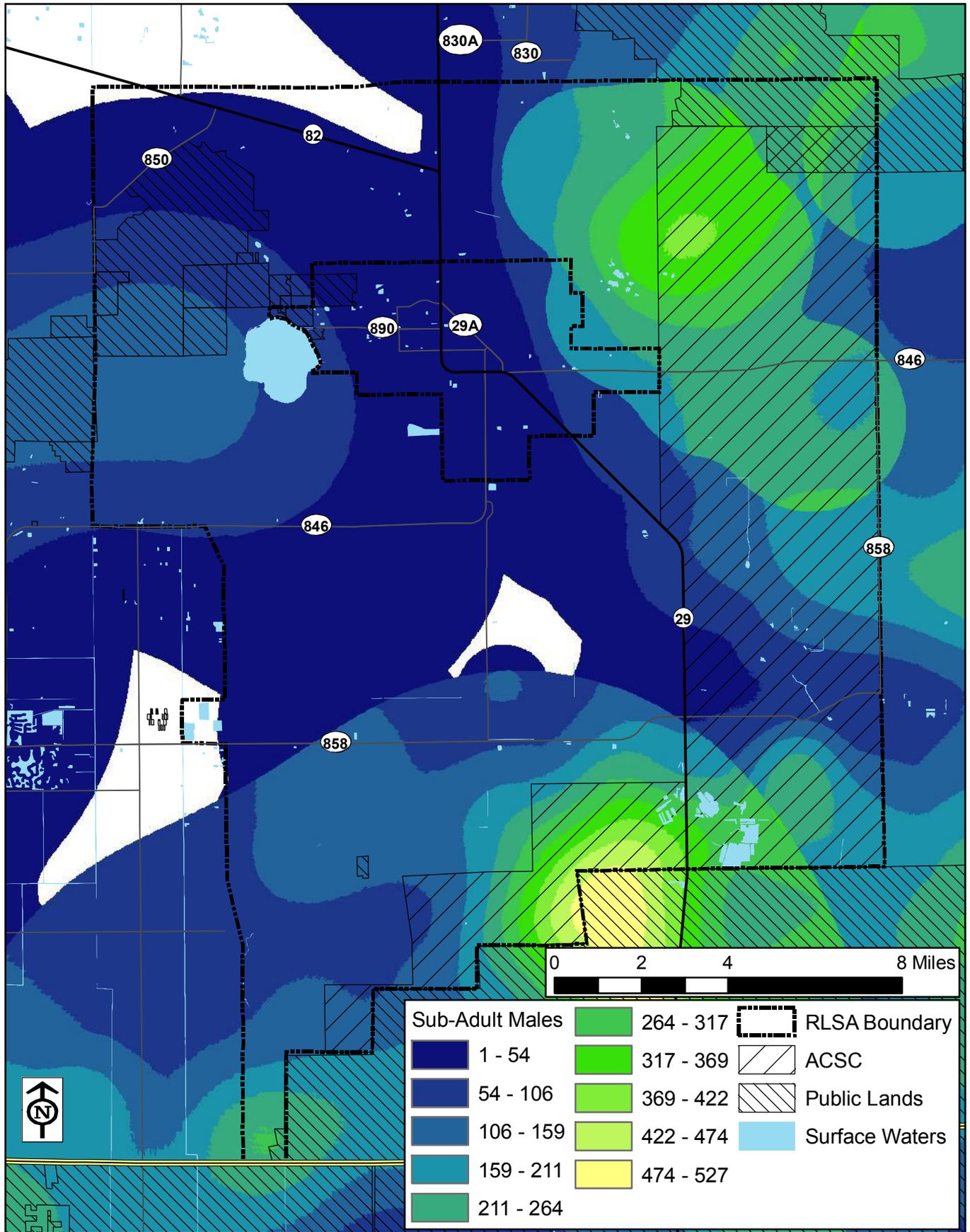


Figure 12. Sum of inverse probabilities of distribution of sub-adult male Florida panthers ($n = 49$) based on 95% kernel home range models for all males less than 36 months of age and derived from radio-telemetry data collected between 1981 and June 2008.

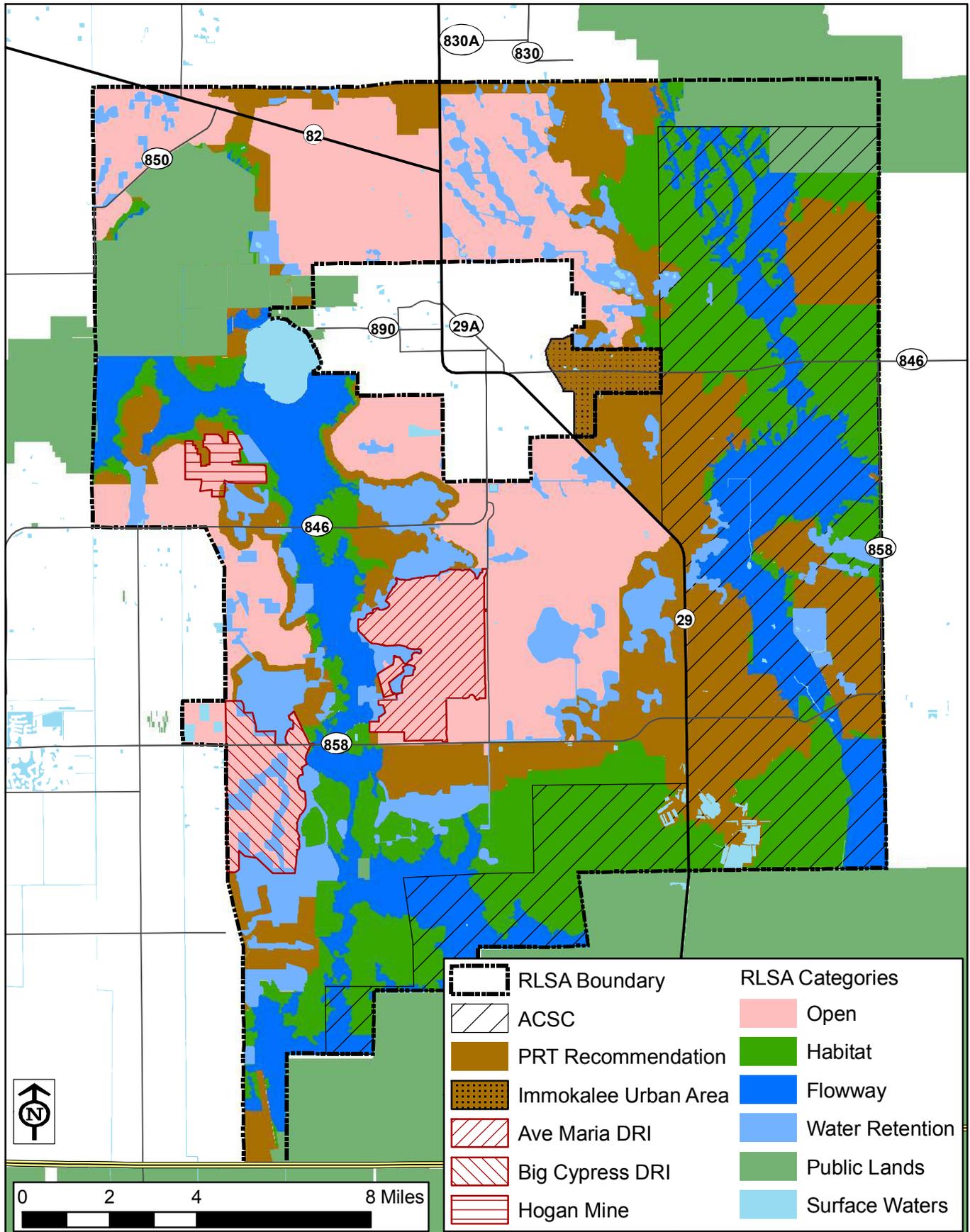


Figure 13. RLSA lands for which the Panther Review Team (PRT) recommends that land uses should be maintained at no greater than existing uses. Natural area restoration may be appropriate for some areas to enhance them as functional habitats for Florida panthers. It is the PRT's understanding that the Parties are recommending that RLSA Open Lands within the ACSC should be dedicated to Agricultural Preservation.