

Appendix F

Panther Review Team Analysis: The PRT described landscape connectivity as a mechanism to mitigate the effects of habitat fragmentation and loss on declining populations (Lindenmayer and Fischer 2006). The PRT noted three types of landscape connectivity have been described in scientific literature:

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 (2008) cite unpublished records from 24-hour GPS-collar data of one female traveling a daily mean distance of 1.3 miles (0.05 ± 4.60 miles) and one male moving a daily mean distance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 Camp Keias Strand, 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.

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

With these principles in mind, the PRT identified the following existing and corridors important for panther conservation:

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

Camp Keias Strand Corridor (CKS): 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 nonagricultural 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.

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.

The PRT analysis concluded 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, including these corridors. Specifically, the PRT identified approximately 105 centerline miles of roads currently existing within the RLSA (excludes local city/town roads); all of which 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). The PRT reported most roads in the RLSA had traffic levels well below 10,000 vehicles per day. The PRT determined the proposed plan to accommodate anticipated development would include adding lanes to all but four segments of existing roads analyzed. Traffic projections at full build-out (estimated to occur in

2050) ranged from 2,000 to 61,000 trips/day. The PRT estimated seven existing road segments could have more than 40,000 trips/day; another four road segments were projected to have over 20,000 trips/day. Even very low-level traffic roads (CR 858 east of Camp Keais Road and east of SR 29, CR 846 east of the City of Immokalee, and SR 29 south of CR 858) were projected to increase significantly over current levels and likely would increase the probability of panther collisions with vehicles (Seiler 2003).

Based on road mortality and telemetry records (that the PRT identified road segments panthers have crossed, or attempted to cross. They found 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 Keais Road, SR 29 north of CR 858, SR 29 south of CR 858, and all segments of CR 858 in the analysis. The identified road segments also bisected designated HSAs, FSAs, and WRAs, in addition to PRT-proposed revisions to the RLSA map, and Primary and Secondary habitat zones for the Florida panther. They also found two existing, affected 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 bordered existing conservation lands. A significant number of wildlife mortality was documented (Main and Allen 2002) on CR 850 adjacent to Corkscrew Marsh, including one Florida panther.

The PRT also found proposed road network included 87.5 centerline miles of additional roads. They estimated road density for existing and proposed roads (excluding all city and town streets) would be 0.59 mi/mi², nearly doubling the size of the current road network. Furthermore, the PRT found all but two of the 24 new, proposed road segments examined were proposed as four or more lanes wide. Landowner-provided traffic projections on these road segments ranged from 3,500 to 41,700 vehicles/day; with average traffic level for new proposed roads being approximately 17,728 vehicles/day. The PRT also estimated that panthers would have crossed 16 of the 24 proposed roads, that 7 of these would have been crossed multiple times, and nine only once. Proposed road segments identified that intersect important existing habitat linkages and corridors that serves as travel routes for 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. Finally, the PRT found segments of other proposed roads would 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

In response to their analysis the PRT made several recommendations to preserve habitat connectivity for Florida panthers. They specifically proposed all planning for all new roads constructed within the RLSA should attempt to avoid bisecting HSAs, FSAs, WRAs, and areas the PRT recommends for protection. They also recommended 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. The PRT also recognized an alignment within the central planning corridor would be preferable from an ecological perspective; as it avoids all significant wetlands and would affect less habitat important to panthers. The PRT also recommended consideration of additional preservation to protect the SSSL as an important habitat segment for Florida panthers; noting construction of Horse Trial Road within this area would greatly diminish value of the

SSHL as habitat for Florida panthers. The PRT also observed 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. Lastly, the PRT noted Little League Road (north of SR 82) would cross over the proposed northern corridor if constructed.