Appendix G

BO section 5.3.1.1 Habitat Loss

We first converted Cooperative Landcover types to more generalized habitat categories more biologically meaningful to Florida panthers (Table 1). We used preference measures for land cover types from a published panther telemetry study (Tables 2 & 3) to weight the relative value of habitats in the Plan Area. We estimate by the "Reasonable Maximum Impact method" of the BO effects analyses that the 39,973 acres of proposed development would remove between 5,567 and 6,033 acres of forest cover from a total development envelope of 66,742 acres (Table 4). In addition to forest cover, though, telemetry studies have found that panthers will use habitat types within 300m of forest cover in proportion to their availability, and that these too should be counted as "panther habitat" (Table 5). Thus, the loss of 5,567 to 6,033 acres of forest cover would reduce the extent of Plan Area panther habitat (forest cover plus non-forest cover within 300 meters) a maximum of 30,616 acres (Table 6). We paired these estimated reductions in habitat value with the low- and high-panther density estimates from within the Plan Area above to compute reductions in panther carrying capacity. We estimate development distributed across a development envelope encompassing habitat in Covered Activities areas, Base Zoning, and Lands Eligible for Inclusion would reduce carrying capacity by the equivalent of 2.5-4.4 adult panthers annually at full buildout (Tables 7 & 8).

Table 1 Habitat Crosswalk

CLC CODE	COOPERATIVE LANDCOVER CLASS	Panther Habitat Class
1120	Mesic Hammock	Upland Forest
1210	Scrub	Other
1311	Mesic Flatwoods	Upland Forest
1312	Scrubby Flatwoods	Upland Forest
1340	Palmetto Prairie	Prairie–Grassland
1400	Mixed Hardwood-Coniferous	Upland Forest
1500	Shrub and Brushland	Other
1800	Cultural - Terrestrial	Other
1821	Low Intensity Urban	Other
1822	High Intensity Urban	Other
1830	Rural (Rural Open Lands)	Prairie–Grassland
1833.1	Cropland/Pasture	Agriculture
1833.13	Improved Pasture	Prairie–Grassland
1833.2	Orchards/Groves	Agriculture
1833.4	Fallow Orchards	Agriculture
1833.5	Other Agriculture	Agriculture
1840	Transportation	Other
1850	Communication	Other
1860	Utilities	Other
1870	Extractive	Other
1880	Bare Soil/Clear Cut	Other

2100	Freshwater non-Forested Wetlands	Marsh–Shrub–Swamp
2110	Prairies and Bogs	Prairie–Grassland
2120	Marshes	Marsh–Shrub–Swamp
2121	Isolated Freshwater Marsh	Marsh–Shrub–Swamp
2200	Freshwater Forested Wetlands	Wetland Forest
2210	Cypress/Tupelo	Wetland Forest
2211	Cypress	Wetland Forest
2213	Isolated Freshwater Swamp	Wetland Forest
2213.1	Dome Swamp	Wetland Forest
2214	Strand Swamp	Wetland Forest
2220	Other Coniferous Wetlands	Wetland Forest
2221	Wet Flatwoods	Wetland Forest
2230	Other Hardwood Wetlands	Wetland Forest
2232	Hydric Hammock	Wetland Forest
3000	Lacustrine	Other
3100	Natural Lakes and Ponds	Other
3200	Cultural - Lacustrine	Other
4200	Cultural - Riverine	Other
7000	Exotic Plants	Other

Table 2 Third-order habitat selection determined via Euclidean distance analysis using GPS location data from 20 indepened Florida panthers monitored in South Florida. Rations < 1.0 indicate habitat preference, whereas rations > 1.0 indicate avoidance (P > 0.05). Habitats sharing any common letter rank were similarly preferred or avoided (P> 0.05, Bonferroni adjustment) or used in proportion to their availability Onorato et al, 2010).

Panther Habitat Class	Ratio	*P*-value	Ranks
Upland Forest	**0.532**	**< 0.001**	**A**
Wetland Forest	**0.620**	**< 0.001**	**AB**
Prairie–Grassland	**0.785**	**0.001**	**B**
Marsh–Shrub–Swamp	**0.799**	**0.004**	**BC**
Agricultural	**1.039**	**0.618**	**C**
Other	**1.047**	**0.555**	**C**

Table 3 Weighting factors for acres of habitat in each class using the inverse of EDA ratios to indicate preference, with higher weights indicating greater preference by Florida panthers.

Panther Habitat Class	Ratio	Inverse
Upland Forest	**0.532**	**1.880**
Wetland Forest	**0.620**	**1.613**
Prairie–Grassland	**0.785**	**1.274**
Marsh–Shrub–Swamp	**0.799**	**1.252**
Agricultural	**1.039**	**0.962**
Other	**1.047**	**0.955**

Table 4 Total acres of Panther Habitat Classes by HCP land-use designation

Panther Habitat Category	Development	Preservation	Very Low Density	Base Zoning	Eligible for Inclusion	Plan Area Total	Row Percent	Development Envelope Total
Agriculture	33,370	17,605	0	698	10,289	61,962	38.85%	44,357
Marsh-Shrub-Swamp	1,785	23,630	223	536	2,591	28,766	18.03%	4,913
Other	1,233	2,620	1,119	4	1,891	6,867	4.31%	3,128
Prairie-Grassland	5,446	10,544	507	1,082	1,783	19,361	12.14%	8,311
Upland Forest	1,696	9,704	309	16	1,052	12,777	8.01%	2,764
Wetland Forest	722	25,988	510	94	2,453	29,768	18.66%	3,269
Total	**44,252**	**90,092**	**2,667**	**2,431**	**20,059**	**159,501**	**100.00%**	**66,742**

Table 5 Acres of Panther Habitat Classes within 300m of a Forest Edge by HCP land-use designation

Panther Habitat Category	Development	Preservation	Very Low Density	Base Zoning	Eligible for Inclusion	Plan Area Panther Habitat	Development Envelope
Agriculture	11,342	9,181	0	418	3,174	24,115	14,934
Marsh-Shrub-Swamp	998	15,388	217	350	1,680	18,633	3,028
Other	754	1,987	867	2	915	4,525	1,671
Prairie-Grassland	3,361	7,094	491	727	862	12,534	4,950
Upland Forest	1,696	9,704	309	16	1,052	12,777	2,764
Wetland Forest	722	25,988	510	94	2,453	29,768	3,269
Total	**18,872**	**69,342**	**2,394**	**1,608**	**10,136**	**102,352**	**30,616**
Plan Area Total Acres	**44,252**	**90,092**	**2,667**	**2,431**	**20,059**	**159,501**	**66,742**
% Plan Area that is within 300m of Forest Cover	**42.6%**	**77.0%**	**89.7%**	**66.1%**	**50.5%**	**64.2%**	**45.9%**

Table 6 Panther habitat calculations

A. Panther Habitat Category	B. Total Plan Area Panther Habitat Acres[1]	C. Panther Habitat Acres within Development Envelope[2]	D. Panther Preference Factor[3]	E. Preference-Weighted Plan Area Habitat Acres (B*D)	F. Preference-Weighted Development Envelope Acres (C*D)	G. Post-Development Preference-Weighted Habitat Acres (E-F)	H. Panther Habitat Acres within HCP Development/ Mining Designation	I. Preference-Weighted Development/ Mining Habitat Acres (D*H)	J. Post-Development Preference-Weighted Habitat Acres (E-I)
Agriculture	24,115	14,934	0.962	23,210	14,374	8,836	11,342	10,916	12,294
Marsh-Shrub-Swamp	18,633	3,028	1.252	23,321	3,789	19,532	998	1,249	22,072
Other	4,525	1,671	0.955	4,322	1,596	2,726	754	720	3,602
Prairie-Grassland	12,534	4,950	1.274	15,967	6,305	9,662	3,361	4,281	11,686
Upland Forest	12,777	2,764	1.880	24,016	5,196	18,820	1,696	3,188	20,829
Wetland Forest	29,768	3,269	1.613	48,012	5,273	42,739	722	1,164	46,848
Total	**102,352**	**30,616**		**138,848**	**36,534**	**102,315**	**18,872**	**21,519**	**117,330**

1. Forest cover plus the extent of all other cover categories within 300 meters.
2. Panther habitat within the Development, Base Zoning, and Eligible HCP land-use designations.
3. The inverse of habitat selection ratios reported in Onorato et al. 2010.

Table 7 Interpreting habitat loss as a long-term loss in ecological carrying capacity

Interpreting habitat loss as a long-term reduction in panther carrying capacity.

Variable	Source or Calculation	Value	Units	Measure
a	draft SSA	6,336	acres	Low panther density; 3.9/100km2 = 1 panther per 6336 acres.
b	draft SSA	6,178	acres	High panther density; 4.09/100km2 = 1 panther per 6178 acres.
c	Habitat Calculations B9	102,352	acres	Total Plan Area panther habitat acres (forest cover plus other types within 300m)
d	c/a	16.2	adult panthers	Plan Area low-density carrying capacity.
e	c/b	16.6	adult panthers	Plan Area high-density carrying capacity.
f	Habitat Calculations E9	138,848	weighted acres	Preference-weighted Plan Area habitat acres (total pre-development).
g	Habitat Calculations G9	102,315	weighted acres	Post-development preference-weighted habitat acres; capacity loss from the full development envelope.
h	Habitat Calculations J9	117,330	weighted acres	Post-development preference-weighted habitat acres; capacity loss from the Development/Mining HCP designation only.
i	(g/f)*d	11.9	adult panthers	Post-development Plan Area carrying capacity; low density; loss from the full development envelope.
j	(g/f)*e	12.2	adult panthers	Post-development Plan Area carrying capacity; high density; loss from the full development envelope.
k	(h/f)*d	13.7	adult panthers	Post-development Plan Area carrying capacity; low density; loss from the Development/Mining HCP designation only.
l	(h/f)*e	14.0	adult panthers	Post-development Plan Area carrying capacity; high density; loss from the Development/Mining HCP designation only.
m	d-i	4.3	adult panthers	**Reduction** in post-development Plan Area carrying capacity; low density; loss from the full development envelope.
n	e-j	4.4	adult panthers	**Reduction** in post-development Plan Area carrying capacity; high density; loss from the full development envelope.
o	d-k	2.5	adult panthers	**Reduction** in post-development Plan Area carrying capacity; low density; loss from the Development/Mining HCP designation only.
p	e-l	2.6	adult panthers	**Reduction** in post-development Plan Area carrying capacity; high density; loss from the Development/Mining HCP designation only.

Table 8 Habitat Loss equivalent in Florida panther carrying capacity under "worst" and "best" case scenarios

Estimated Reduction in Carrying Capacity (adult panthers, both sexes)	Habitat Loss (acres)	
	If Preferred Panther Habitat is taken First	If Preferred Panther Habitat is taken Last
Plan Area Habitat Quality Supports:	30,616	18,872
Equivalent in *K* at Low-Estimated Panther Density	4.3	2.5
Equivalent in *K* at High-Estimated Panther Density	4.4	2.6