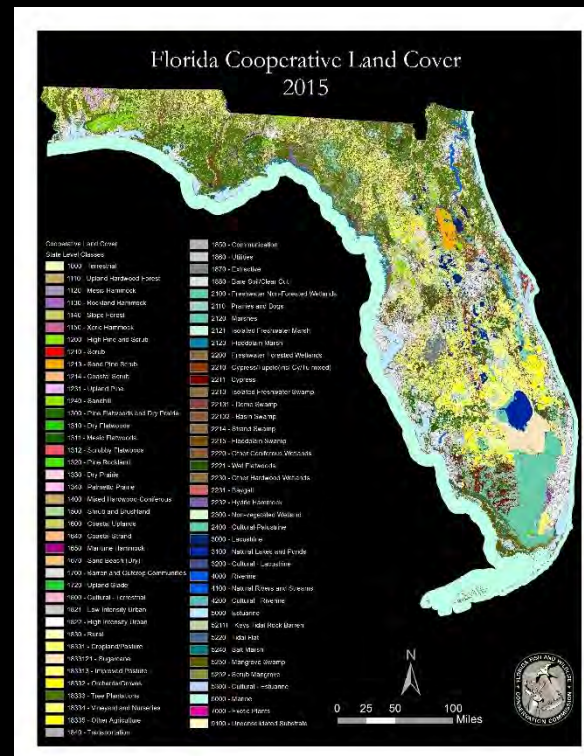
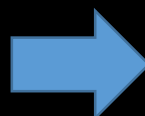
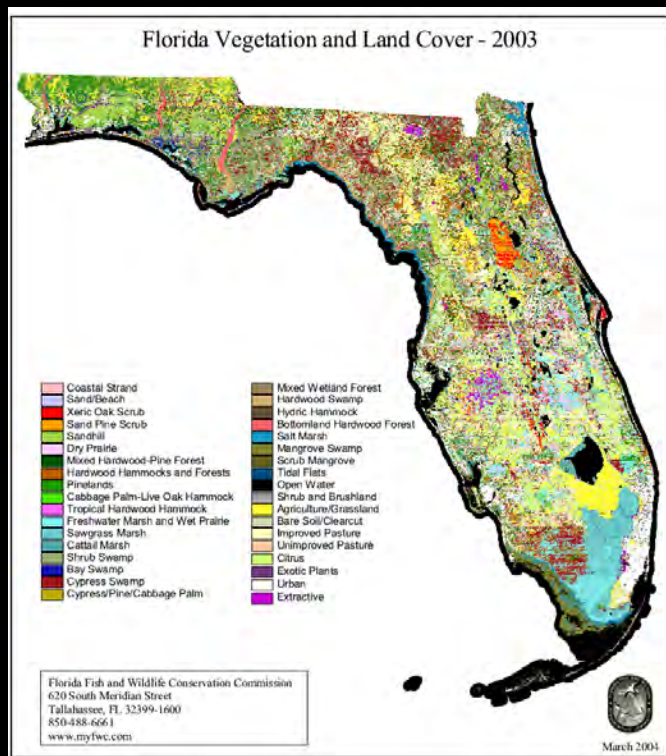


Habitat Loss 2003-2015



Robert Kawula – FWC-FWRI
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Objectives

- Brief history of land cover classification in Florida
 - Classification schemas
 - Data sources
- Panther-centric habitat change analysis
- Data needs and requirements

Land Cover Classification in Florida

- FWC - 1985-89
 - Landsat 5 TM satellite imagery (30 m resolution)
 - 21 classes
- FL Water Management District Land Use Land Cover (LULC) - 1990's - ?
 - Aerial photography (MMU 2 ac wetlands, 5 ac uplands)
 - Classes based on FDOT – FL Land Use and Forms Classification System (FLUCCS)
 - Different “Flavors” used by WMDs
 - Land Use vs. Land Cover
- FWC - 2003
 - Landsat 7 TM imagery (30 m resolution)
 - 43 classes

Land Cover Classification in Florida

- Florida Natural Areas Inventory (FNAI) – 2010
 - Aerial photography – WMD
 - Cultural/human disturbed areas lacking
 - Mash-up from other sources: Surveys, Florida Park Service, Forest Service, Local Governments

Conflicting Maps?

- Temporal differences – newer is “better”
- Spatial differences
- Accuracy?
- Classification incongruence
 - Emphasis on land use vs. land cover
 - Inability to cross-walk among classification schemas
 - class definitions

Florida Land Cover Classification System

- Objective - design and develop, with its conservation partners, a standardized, hierarchical, consistent, *a priori* land cover classification system containing systematic and strict class boundary definitions
- Goal - produce a land cover classification system that meets the needs of FWC and its conservation partners but is also flexible and extensible to incorporate future changes and additions

Florida Land Cover Classification System

METHODS

- **Strawman classification**
- **Partner meetings**
- **Revisions, revisions, revisions**

Florida Land Cover Classification System

RESULTS

Florida Land Cover Classification System

FINAL REPORT

December 31, 2009

State Wildlife Grant
SWG 9851-185-6325

Project Investigator: Dr. Robert Kawula

Center for Spatial Analysis
Fish and Wildlife Research Institute
Florida Fish and Wildlife Conservation Commission
Tallahassee, Florida



- Terrestrial 1000
 - Hardwood Forested Uplands 1100
 - Upland Hardwood Forest 1110
 - Dry Upland Hardwood Forest 1111
 - Mixed Hardwoods 1112
 - Mesic Hammock 1120
 - Evergreen Levee Hammock 1121
 - Prairie Mesic Hammock 1122
 - Live Oak 1123
 - Pine - Mesic Oak 1124
 - Cabbage Palm 1125
 - Rockland Hammock 1130
 - Thorn Scrub 1131
 - Slope Forest 1140
 - Xeric Hammock 1150

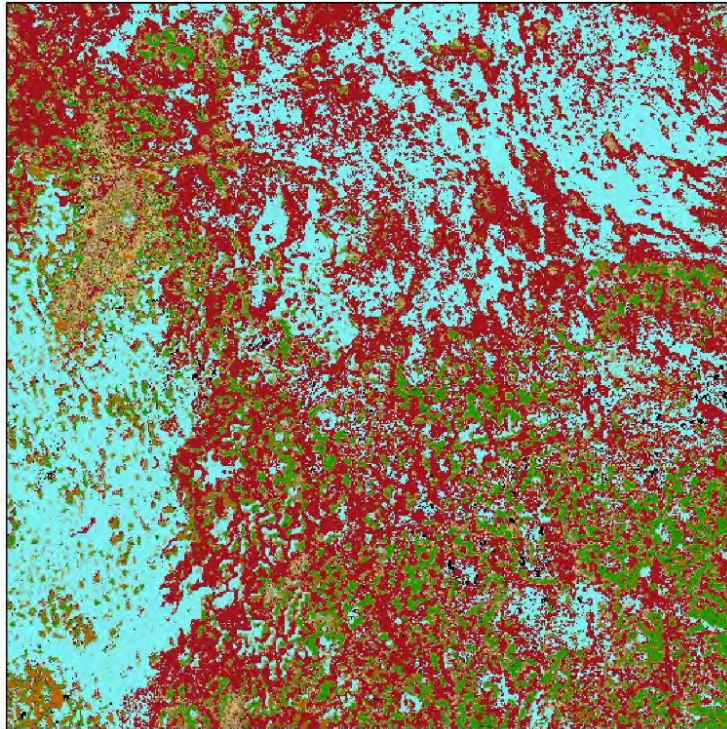
Cooperative Land Cover

- Partnership between FWC and FNAI to develop ecologically-based statewide land cover
- Derived from existing data sources (Federal, State, Local) and expert review of aerial photography
- Source Imagery: SPOT V – 10 m
- Continuously updated: New versions released every 6 – 12 months

Cooperative Land Cover

- Follows the Florida Land Cover Classification System (Kawula 2009)
- Hierarchical classification schema, capable of being updated as new information emerges.
- Can be cross-walked among the currently used and maintained classifications.
- The cross-walk enables the incorporation of other classification efforts and facilitates collaboration between entities producing land cover datasets.

Florida Veg 2003 (43 Classes statewide)

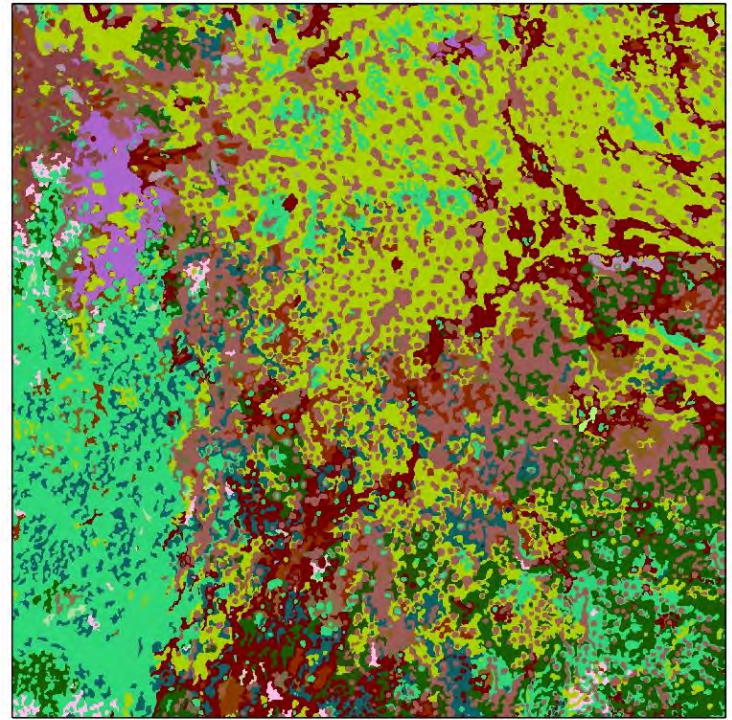


Florida Veg '03

Habitat Class

	Dry Prairie		Shrub Swamp
	Mixed Pine-Hardwood Forest		Cypress Swamp
	Hardwood Hammocks and Forest		Cypress/Pine/Cabbage Palm
	Pinelands		Mixed Wetland Forest
	Freshwater Marsh and Wet Prairie		Hardwood Swamp
			Open Water
			High Impact Urban

CLC (240+ Classes statewide)



CLC v 3.1

SITE Classes

	1125 - Cabbage Palm		2200 - Freshwater Forested Wetlands
	1130 - Rockland Hammock		2210 - Cypress/Tupelo(incl Cy/Tu mixed)
	1311 - Mesic Flatwoods		2211 - Cypress
	1340 - Palmetto Prairie		2213 - Isolated Freshwater Swamp
	1500 - Shrub and Brushland		22131 - Dome Swamp
	1832 - Rural Structures		2214 - Strand Swamp
	1840 - Transportation		2220 - Other Coniferous Wetlands
	2100 - Freshwater Non-Forested Wetlands		2221 - Wet Flatwoods
	2112 - Mixed Scrub-Shrub Wetland		22211 - Hydric Pine Flatwoods
	2113 - Marl Prairie		2230 - Atlantic White Cedar
	2120 - Marshes		2232 - Hydric Hammock
	2121 - Isolated Freshwater Marsh		2233 - Mixed Wetland Hardwoods
	2125 - Glades Marsh		2240 - Other Wetland Forested Mixed
	2131 - Sawgrass		2242 - Cypress/Pine/Cabbage Palm
			3100 - Natural Lakes and Ponds
			3220 - Artificial Impoundment/Reservoir

Panther Habitat Use Summary

Habitats	Kautz compositional second order	Kautz Euclidean second order	Cox Euclidean second order	Cox Euclidean third order	Land VHF Euclidean third order	Land GPS Euclidean third order	Onorato Euclidean third order	Average
Hardwood swamp	10	7	9	10	10	9	9	9.1
Pineland	9	8	10	10	10	10	10	9.6
Cypress swamp	8	9	9	10	10	9	9	9.1
Upland forest	10	6	8	10	10	10	10	9.1
Dry prairie	6	5	8	6	6	7	8	6.6
Shrub and brush	7	3	no data	no data	6	6	6	5.6
Xeric scrub	8	1	no data	no data	no data	no data	5	4.7
Marsh	6	1	6	3	6	6	7	5.0
Unimproved pasture	4	3	8	6	6	7	8	6.0
Barren	5	1	7	6	6	6	6	5.3
Improved pasture	2	4	7	6	6	6	8	5.6
Urban	3	2	7	6	6	6	5	5.0
Cropland	2	2	7	6	6	6	6	5.0
Citrus	1	2	7	6	6	6	6	4.9
Coastal wetlands	0	2	no data	no data	no data	no data	5	2.3
Open water	1	0	no data	no data	6	6	5	3.6

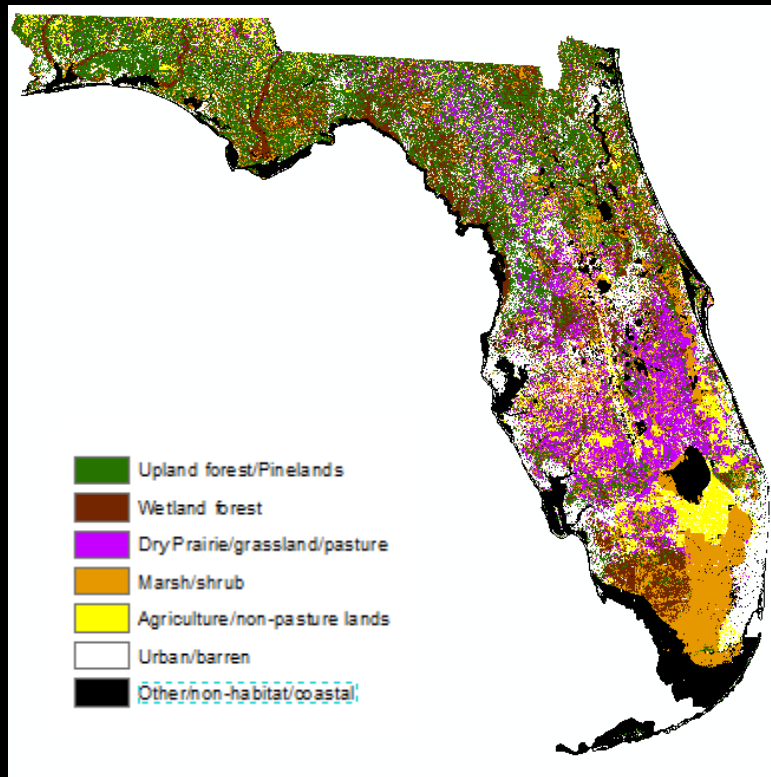
Sources: Kautz et al. Bio. Conserve., 2006; Cox et al. *JWM*, 2006; Land et al. *JWM*, 2008; Onorato et al. Animal Conserve., 2010

Panther Habitat Reclassification

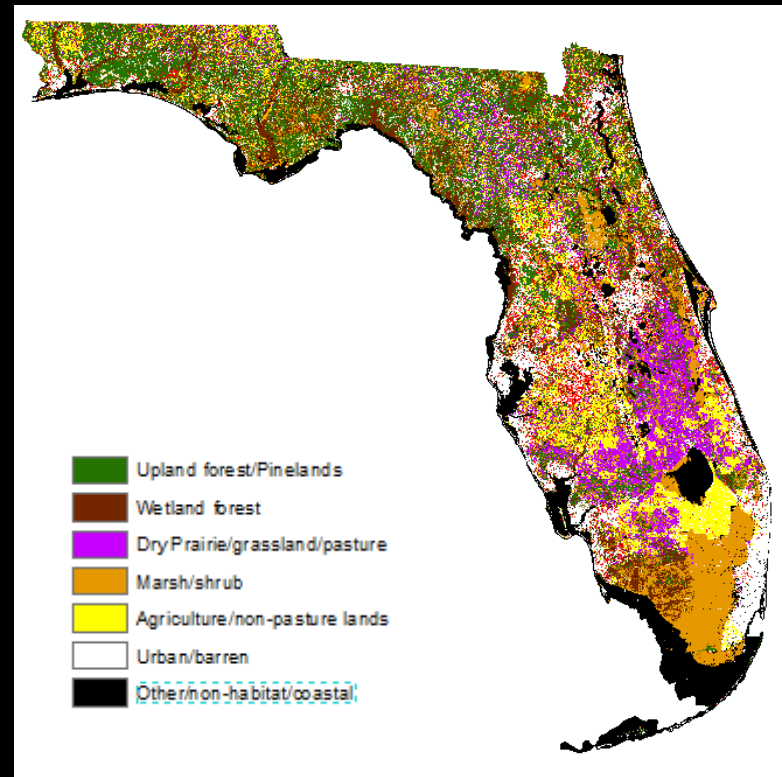
Class	Habitat Type
1	Upland forest/Pinelands
2	Wetland forest
3	Dry Prairie/grassland/pasture
4	Marsh/shrub
5	Agriculture/non-pasture lands
6	Urban/barren
7	Other/non-habitat/coastal classes

Panther Habitat Reclassification

FWC 2003



CLC

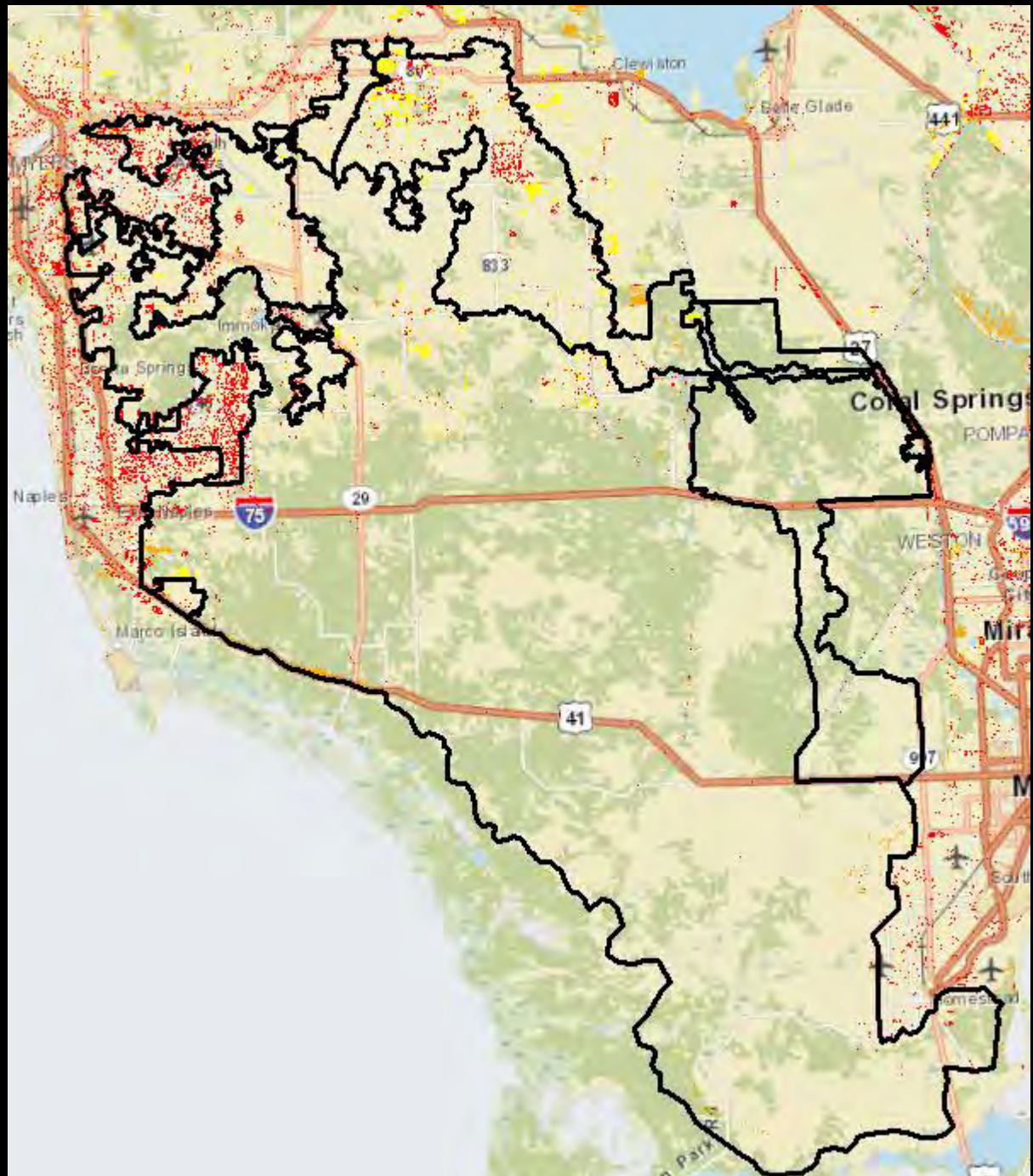


Habitat Change in Florida 2003-2015

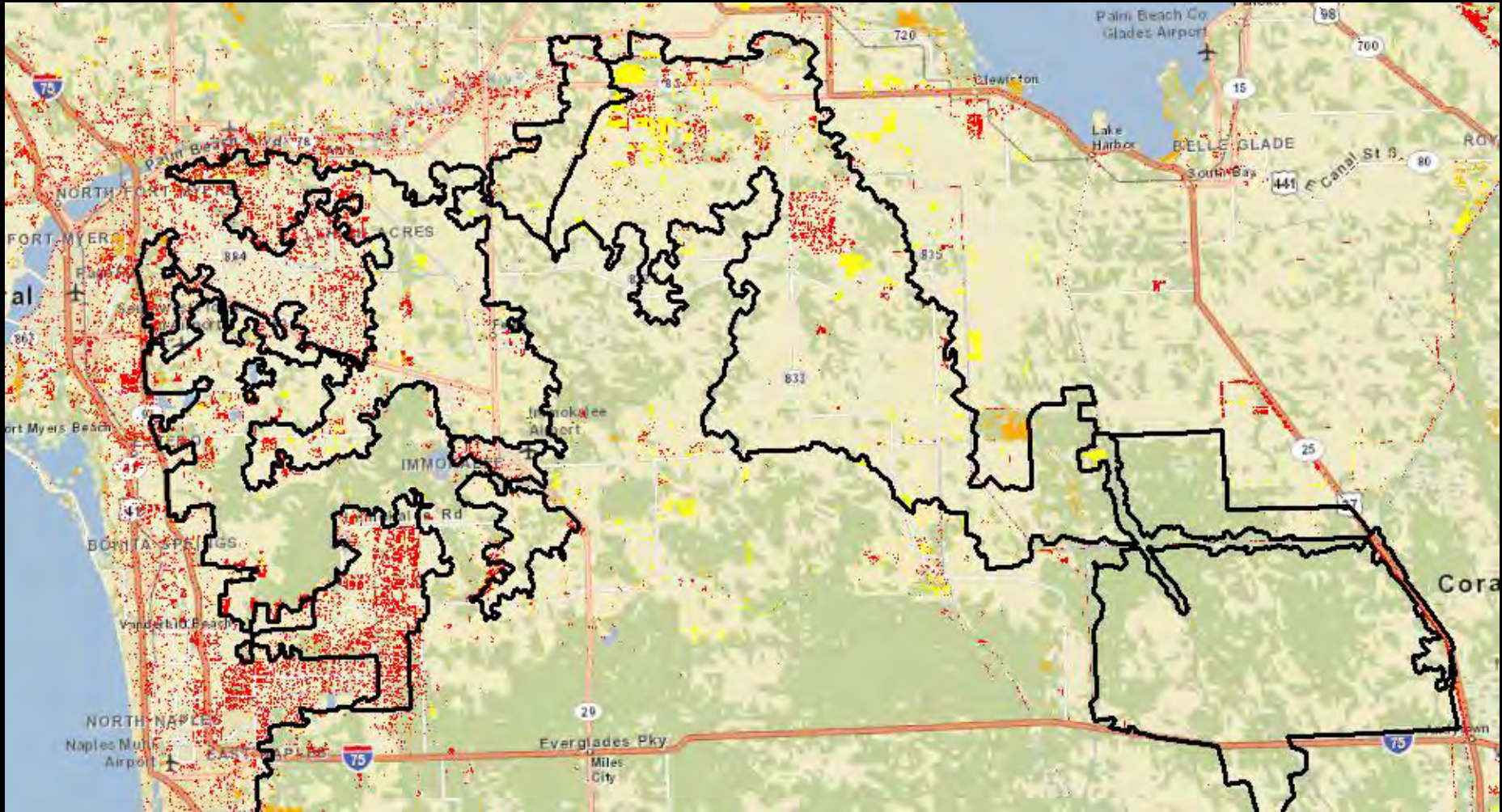


Habitat Change 2003-2015

-  Natural Habitat → Agriculture (non-pasture)
-  Natural Habitat → Urban/Developed
-  Natural Habitat → Other Non-habitat

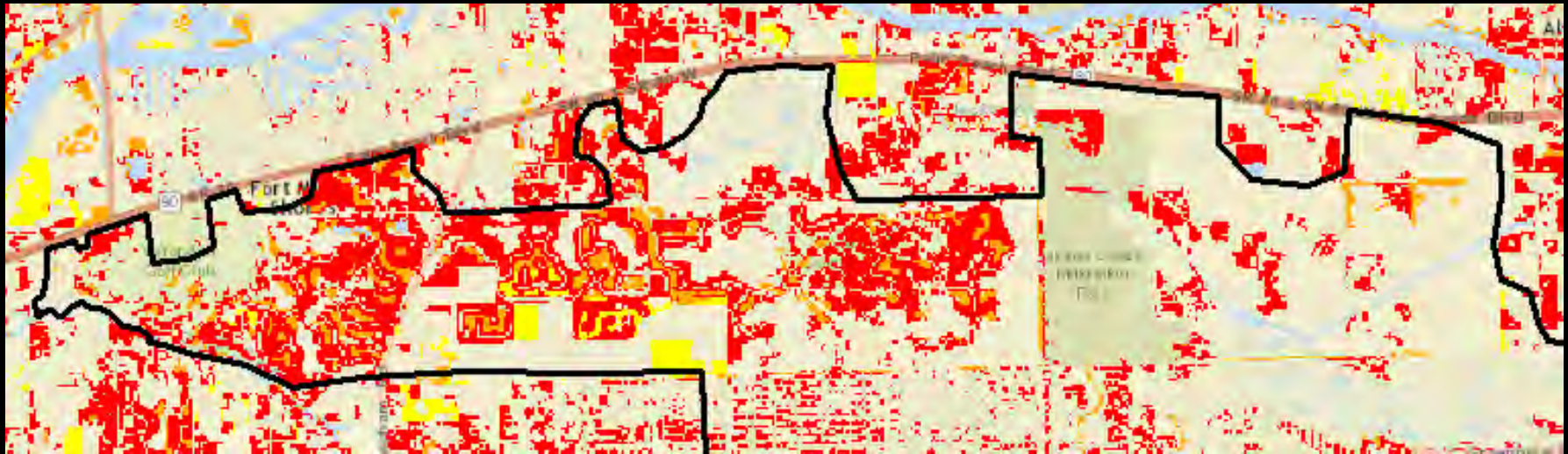


Habitat Change (2003-2015)



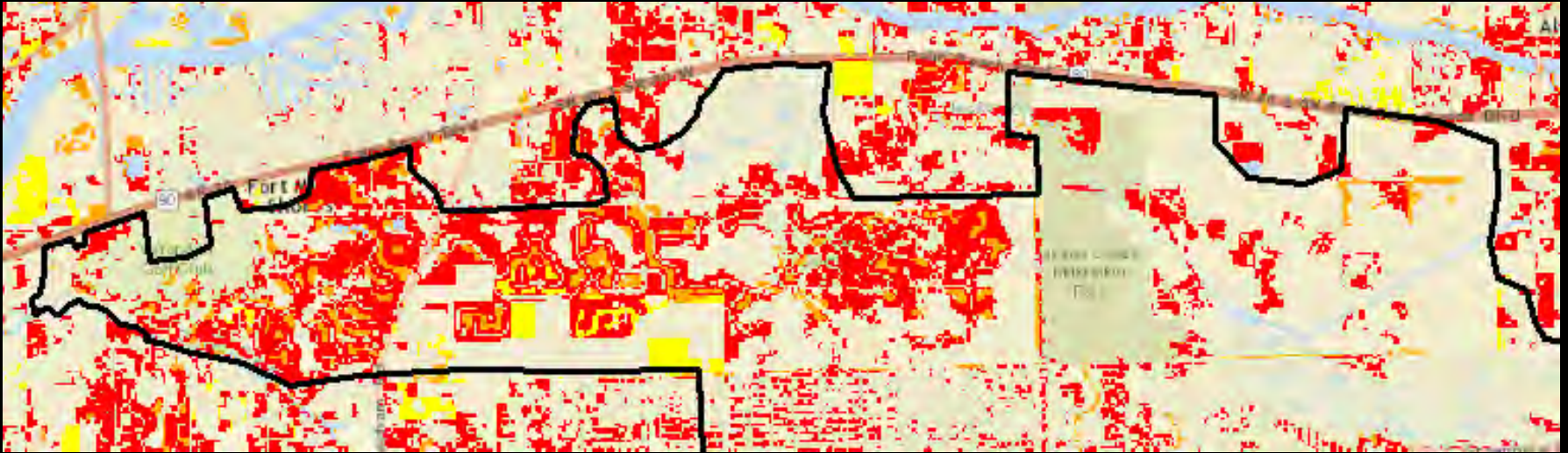
Natural Habitat → Agriculture (non-pasture)
 Natural Habitat → Urban/Developed
 Natural Habitat → Other Non-habitat

Habitat Change (2003-2015)



December 2004

Habitat Change (2003-2015)



January 2013

Habitat Change (2003-2015)



Natural Habitat → Agriculture (non-pasture) **Natural Habitat → Urban/Developed** **Natural Habitat → Other Non-habitat**

Difference between 2003 and current CLC 2015 (ac)

Habitat Type	Primary	Secondary	Dispersal	Total difference
Upland Forest	-23372	-12480	-526	-36377
Wetland Forest	-136677	-3433	594	-139517
Open grassland/pasture	1737	-25331	306	-23288
Marsh/shrub/scrub	130613	3333	-215	133731
Agriculture	288	297	-256	330
Urban/developed	15035	31953	-773	46215
Other	12376	5661	-182	17855

What's Next?

- Modifications?
 - Cross-walk
 - Area of interest
- Accuracy assessment
- Other landscape metrics – edge, juxtaposition, patch size
- Updates?