



# **The South Florida Ecosystem Portfolio Model: Integrating ecological, community, and economic values for land use planning**

**Bill Labiosa, Rich Bernknopf, Paul Hearn, Dianna Hogan,  
Dave Strong, Leonard Pearlstine, Amy Mathie, Kevin Gillen,  
Anne Wein, and Susan Wachter**





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Streaming 100%

Pointer 25°28'44.95" N 80°26'41.16" W elev 6 ft

Pumpkin  
© 2007  
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# The EPM is an online, updatable tool, not an analysis or report

- Multi-criteria evaluation of potential land use patterns
  - Criteria: Ecological, economic, and quality-of-life
- Potential users: Park Service planners, county land use planners, tribes, stakeholders
- Design protocol: users influence design
- Everglades NP actively participating on development team
- Design reflects real-world land use planning

South Florida Ecosystem Portfolio Model - Mozilla Firefox

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Layers

- Miami-Dade County Boundary
- NHD Flowlines
- 2015 UFA
- NHD Waterbodies
- 2005 UFA
- Managed Areas
- Bird Drive Basin
- Elevation (NED)

Land Use/Land Cover

Selected Study:  Preferred Scenario  None

Map Imagery

- 1.0 Foot Color Orthos (January 2006)
- 0.3 Meter Color Orthos (January 2005)

Query Results

Lat: Lon:

Run Load Upload LULC

0 6 12 18 24

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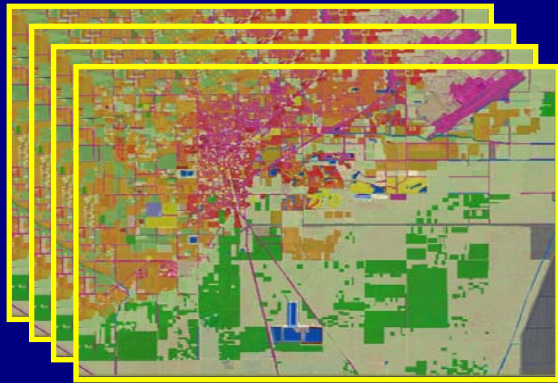
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# How the EPM works ...

1. Multiple land use plans considered

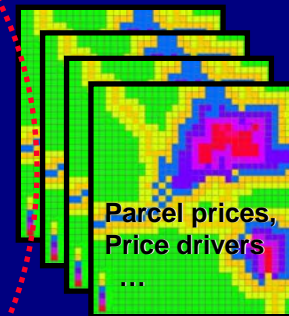


2. Analyzed against multiple (model-based) criteria

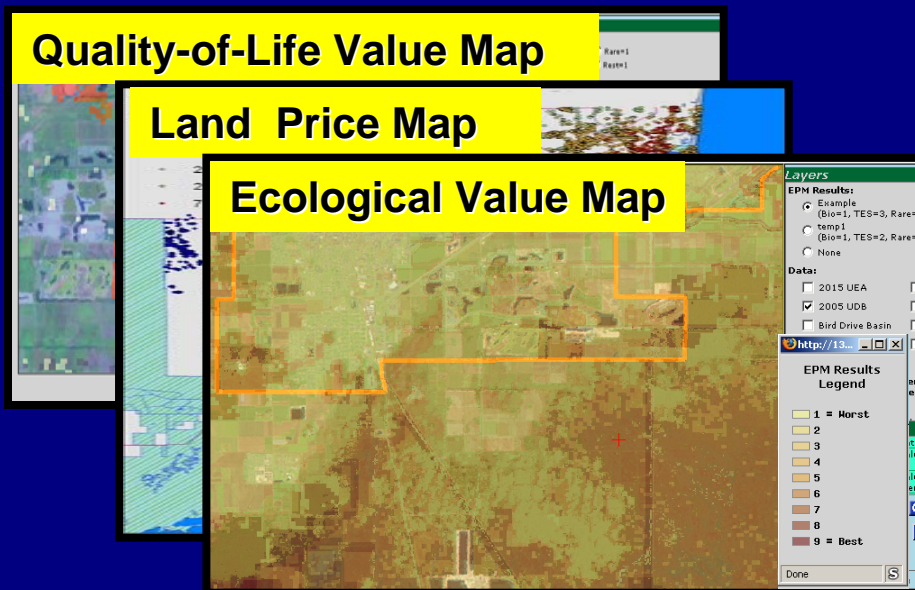
Data,  
Models

Ecological  
Value Model

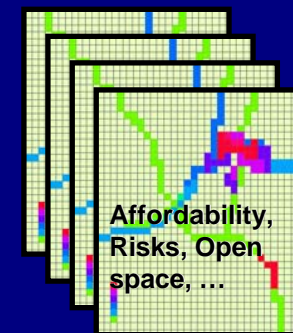
Land Price Model



3. Value map combines user-elicited value judgments and criteria scores



Quality-of-Life  
Indicators

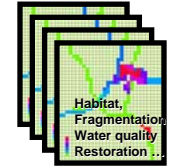


User  
Weights

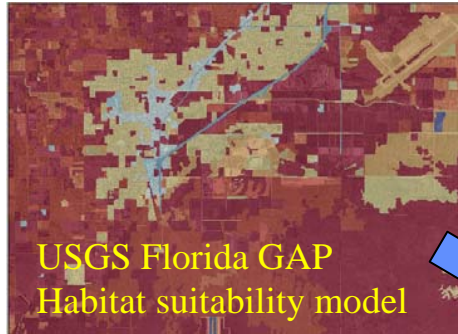


# Ecological Criteria

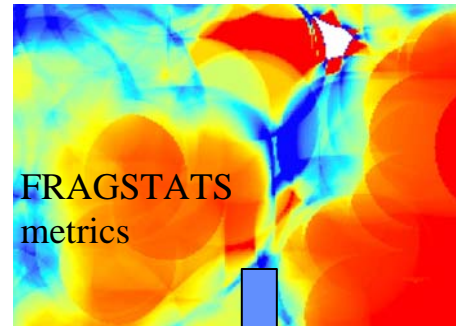
## Ecological Value Model



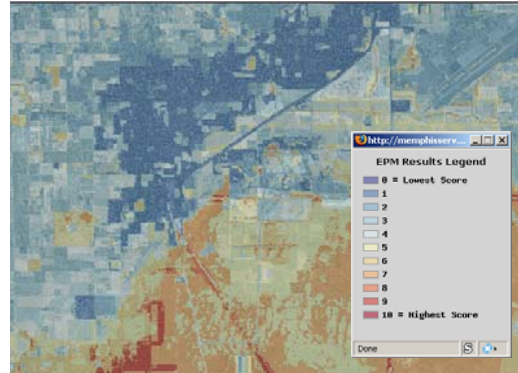
Biodiversity Potential Criterion



Fragmentation & Patterns Criterion



Threatened & Endangered Species Criterion

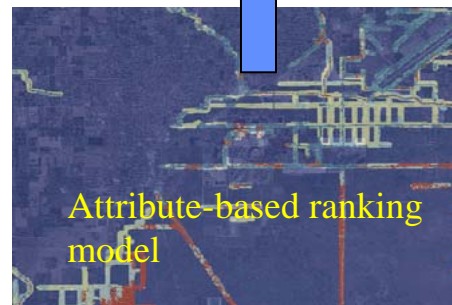


Aggregate "Ecological Value"  
for each cell

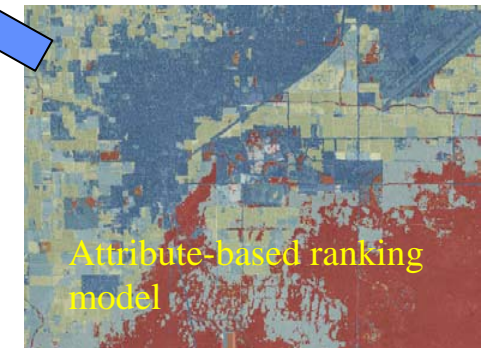
$$= \sum_i^6 w_i s_i$$



Rare & Unique Habitats Criterion



Water Quality Buffer Potential Criterion



Restoration Potential Criterion

# Using the EPM to compare landscapes: Landscape “inputs”

**South Florida Ecosystem Portfolio Model (Prototype)**

**Layers**

- Data**
  - Miami-Dade County Boundary
  - 2015 UEA
  - 2005 UDB
  - Bird Drive Basin
  - Roads and Streets
  - NHD Flowlines
  - NHD Waterbodies
  - Managed Areas
  - Elevation (NED)
- Land Use/Land Cover**
  - Existing
  - Watershed Study Preferred Scenario
  - None
  - Planning & Zoning 2006 (Land Use)
  - FLUCCS 2004-05 (Land Cover)
  - FLUCCS 2004-05 (Land Use)
  - FFWCC 2003 (Vegetative Land Cover)

**Query Results**

Lat:      Lon:

**Run** **Load** **Upload LULC**

**Select Zipped Land Use/Land Cover File to Upload**

**Browse...** **Submit** **Cancel**

Done

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# Using the EPM to compare landscapes: Running the models

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### South Florida Ecosystem Portfolio Model (Prototype)

**EPM Location Selection**

- Whole County
- Select Box
- Select Polygon

OK Cancel

Done

**Layers**

- Price Per Sq Ft
- Price Per Sq Ft
- Vacant Parcels
- Vacant Parcels
- None

**Land Use/Land Cover**

- Existing
- Watershed Pref Scenario
- User
- None

- Planning & Zoning 2006 (Land Use)
- FLUCCS 2004-05 (Land Cover)
- FLUCCS 2004-05 (Land Use)
- FFWCC 2003 (Vegetative Land Cover)
- FLUCCS 2000 (Land Use/Land Cover)
- FNAI Habitat Conservation Priorities
- FFWCC Integrated Wildlife Habitat Ranking System

**Query Results**

Lat: Lon:

EPM Run Load LULC Upload View

MI

6 12 18 24

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# Using the EPM to compare landscapes

**South Florida Ecosystem Portfolio Model (Prototype)**

**EPM Criteria**

Name of Run:  Land Cover:

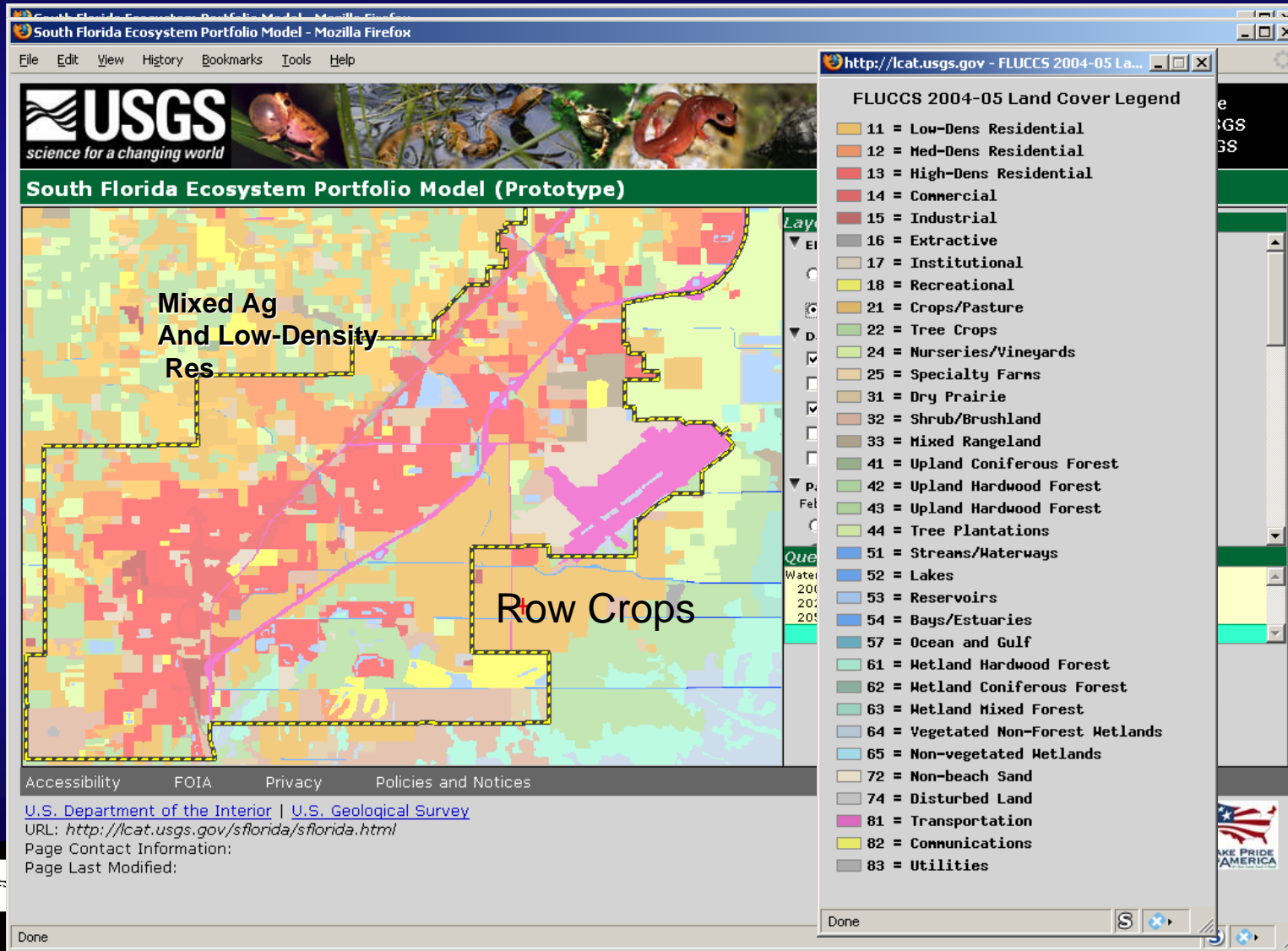
**Weight the relative importance of each ecological criterion:**

Biodiversity Potential:	<input type="text" value="1.0"/>	pt:	<input type="text" value="6.0"/>						
Threatened, Endangered & Focal Species:	<input type="text" value="1.0"/>	Prf p:	<input type="text" value="3.0"/>	Wt:	<input type="text" value="2.0"/>	Suit p:	<input type="text" value="5.0"/>	Wt:	<input type="text" value="1.0"/>
Rare & Unique Habitats:	<input type="text" value="1.0"/>	pt:	<input type="text" value="1.302"/>						
Waterway Quality Buffer Potential:	<input type="text" value="1.0"/>	TN Wt:	<input type="text" value="1.0"/>	TP Wt:	<input type="text" value="1.0"/>	SS Wt:	<input type="text" value="1.0"/>		
Landscape Patterns & Fragmentation:	<input type="text" value="1.0"/>	CA p:	<input type="text" value="53.06"/>	Wt:	<input type="text" value="1.0"/>	ENN p:	<input type="text" value="500.0"/>	Wt:	<input type="text" value="1.0"/>
		Cohesion Wt:	<input type="text" value="1.0"/>	FRAC Wt:	<input type="text" value="1.0"/>				
Restoration Potential:	<input type="text" value="1.0"/>	CORE p:	<input type="text" value="50.0"/>	Wt:	<input type="text" value="1.0"/>	SIDI p:	<input type="text" value="0.15"/>	Wt:	<input type="text" value="1.0"/>
		Biodiversity Wt:	<input type="text" value="1.0"/>	Nat. Wt:	<input type="text" value="4.0"/>	Decay:	<input type="text" value="1.0"/>		
		TES Wt:	<input type="text" value="1.0"/>	Water Wt:	<input type="text" value="4.0"/>	Decay:	<input type="text" value="1.0"/>		
		PnRkld/Hammock Wt:	<input type="text" value="2.0"/>	Well Wt:	<input type="text" value="4.0"/>				

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# “Ecological value” for 2004 land cover input



# Ecological value for Watershed Study 2050 Preferred Scenario

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### South Florida Ecosystem Portfolio Model (Prototype)

**Land Use Changes Only, 2050**

**Ag to Commercial**

**Layers**

- Bird Drive Basin
- Elevation (NED)
- Roads and Streets
- Parcels/Land Value Hedonic**
  - February 2008:  Price Per Sq Ft  Price Per Sq Ft  None
  - December 2006:  Vacant Parcels  Vacant Parcels
- Land Use/Land Cover**
  - Existing  Watershed Pref Scenario  User  None
  - Baseline Land Use 2004
  - Preferred Land Use 2025  Preferred Land Use 2050
  - All  Changes Fr 2004  No Changes Fr 2004
- Base Imagery**
  - Landsat 7 (543 bands)

**Query Results**

FLUCCS 2004-05 LC Value at Lat 25.519, Lon -80.457: 243 = Ornamentals
FLUCCS 2004-05 LC Value at Lat 25.518, Lon -80.471: 221 = Citrus Groves
FLUCCS 2004-05 LC Value at Lat 25.519, Lon -80.467:

Lat:      Lon:

EPM   LULC

0 1 2 3 4

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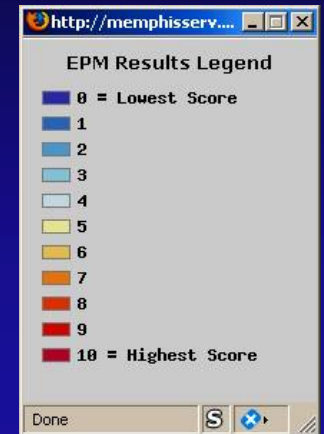
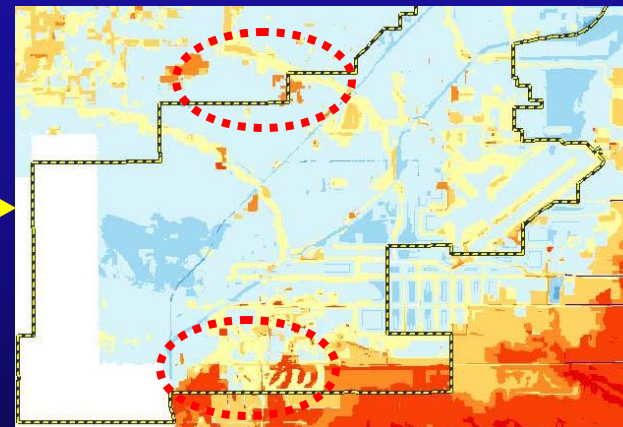
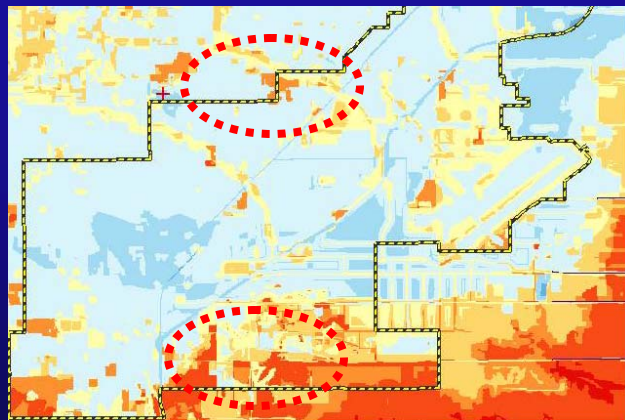
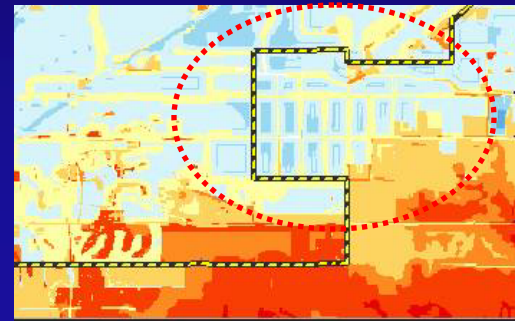
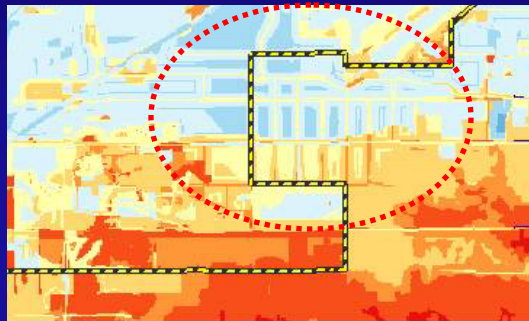


# Comparing landscapes: Current vs. 2050

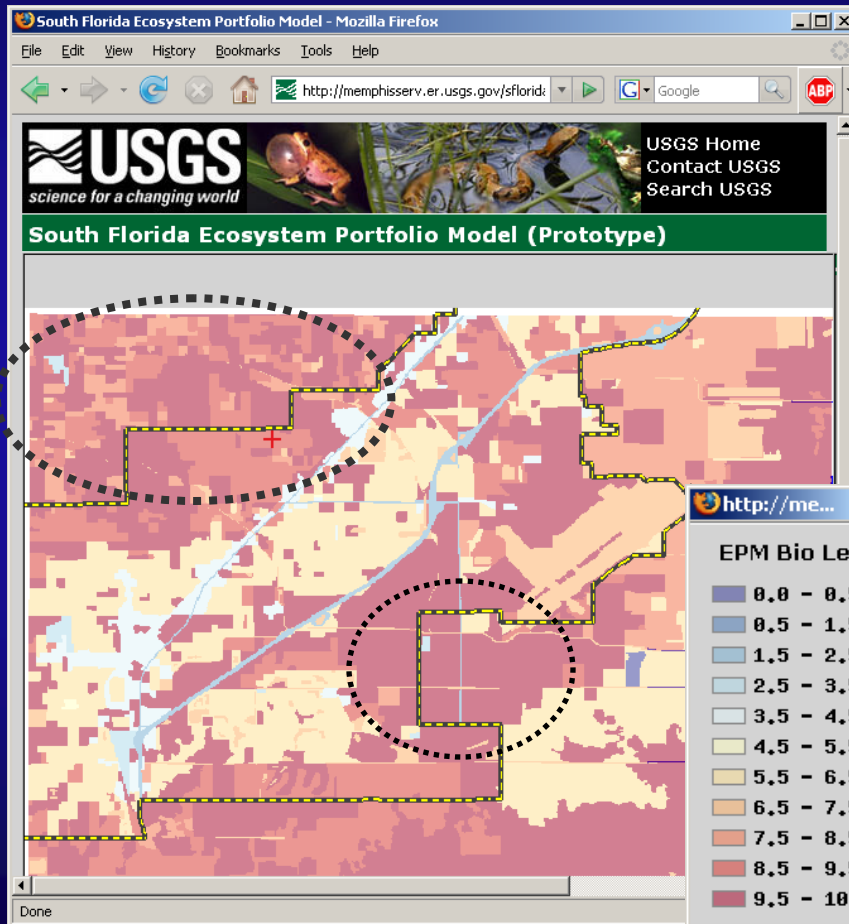
## Watershed Study Preferred Scenario

2004

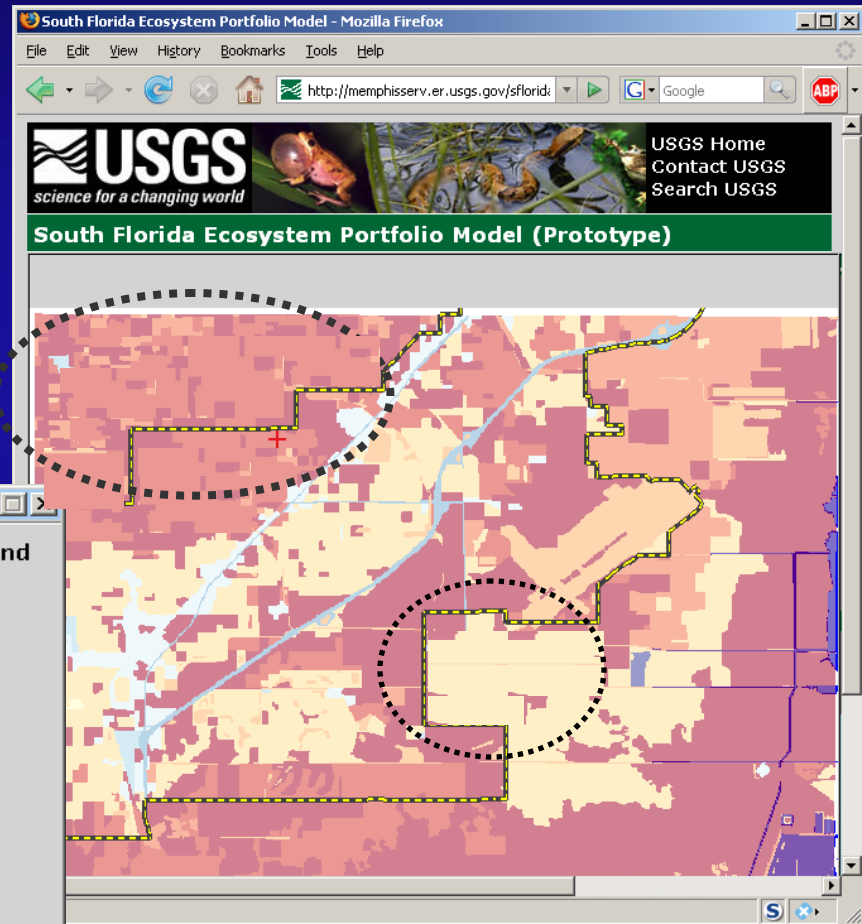
2050



# Evaluating 2050 Preferred Scenario Using a Single Criterion: Biodiversity Potential



Current



2050



# Evaluating Proposed Developments-of-Regional Impact Using Patterns & Fragmentation Metrics

“DRIs”

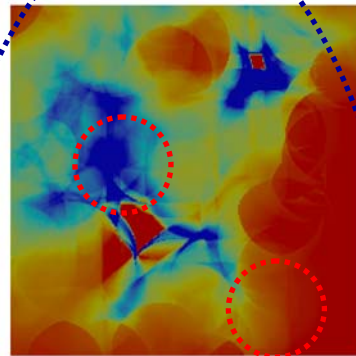


Cutler Ridge with DRI #1  
Legend: Green = Habitat, Yellow = Not Habitat

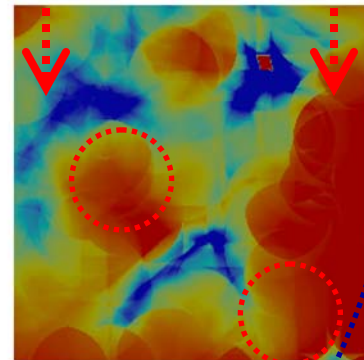
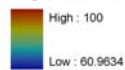


Cutler Ridge with DRI #2  
Legend: Green = Habitat, Yellow = Not Habitat

Cohesion



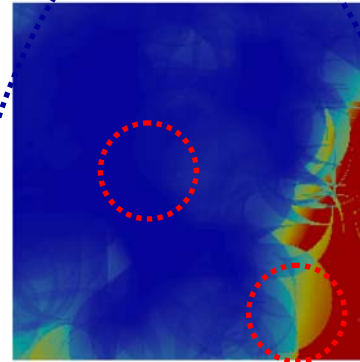
Cutler Ridge DRI #1 Cohesion



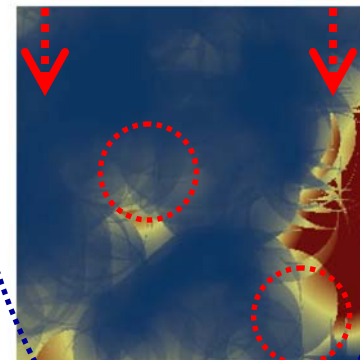
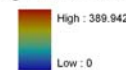
Cutler Ridge DRI #2 Cohesion



Core Area



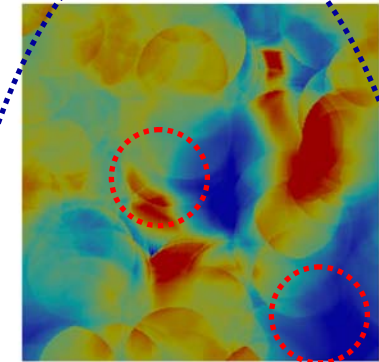
Cutler Ridge DRI #1 Core Area Mean



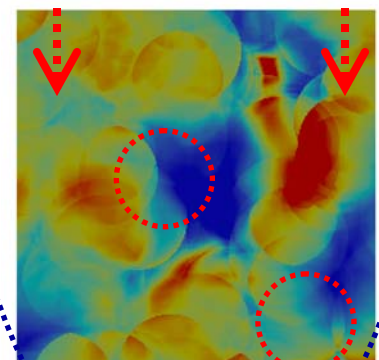
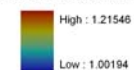
Cutler Ridge DRI #2 Core Area Mean



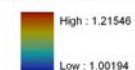
Shape



Cutler Ridge DRI #1 Fractal Dimension Index Area-weighted Mean



Cutler Ridge DRI #2 Fractal Dimension Index Area-weighted Mean



# “Phase-2 EPM” ...

- Evaluating proposed large developments, competing land use plans, restoration and preservation options
- Developing Quality-of-Life indicators component
- Incorporating “hydrological component” keyed to land use change
- Under scenarios
  - sea level rise
  - demographic trends
  - growth management policies
  - environmental policies
- Simulating urbanization under scenarios, evaluating outcomes using EPM modules and models





# EPM contributors

- **PIs (USGS):** Bill Labiosa, Rich Bernknopf, Paul Hearn
- **USGS core team:** Dianna Hogan, Amy Mathie, Dave Strong, Anne Wein
- **National Park Service:** Leonard Pearlstine\*, Dave Hallac, Sarah Bellmund, Linda Friar
- **US FWS:** Patrick Pitts, Les Vilchek
- **USGS BRD:** Don DeAngelis
- **Univ. of Florida:** Frank Mozzotti, Leonard Pearlstine\*
- **Miami-Dade Env Resources:** G. Burzycki
- **Miami-Dade Planning and Zoning:** S. Basu
- **Univ. of Pennsylvania Wharton School:** Kevin Gillen, Susan Wachter, Paul Amos
- **Florida Atlantic Univ:** A-M Esnard
- **Florida Int'l Univ:** Hugh Gladwin, Jennifer Borum
- **Funders:** USGS PES, NPS CESI, USGS GAM

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