South Florida Natural Resources Center

Everglades Vegetation Succession Modeling

For Restoration Planning And Climate Change

SFNRC Ecological Modeling Team

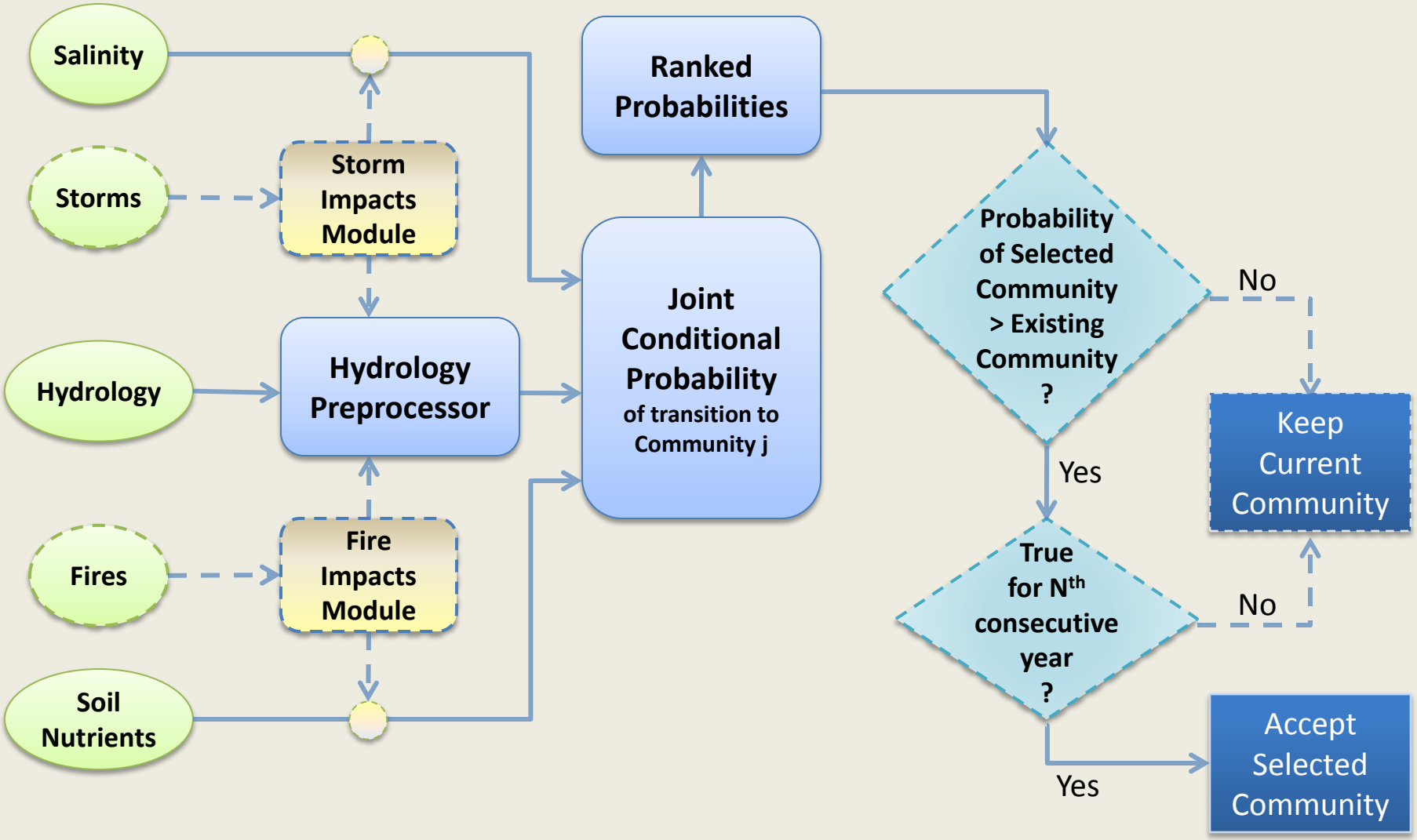
January 20, 2011

Everglades Landscape Vegetation Succession (ELVeS) Model

- CERP Restoration Planning and Assessment
- Temporally Dynamic Wildlife Habitat Layers
- Climate and Sea Level Change Scenarios

Vegetation Community Succession

South Florida Natural Resources Center



Freshwater Marsh Vegetation Communities

South Florida Natural Resources Center

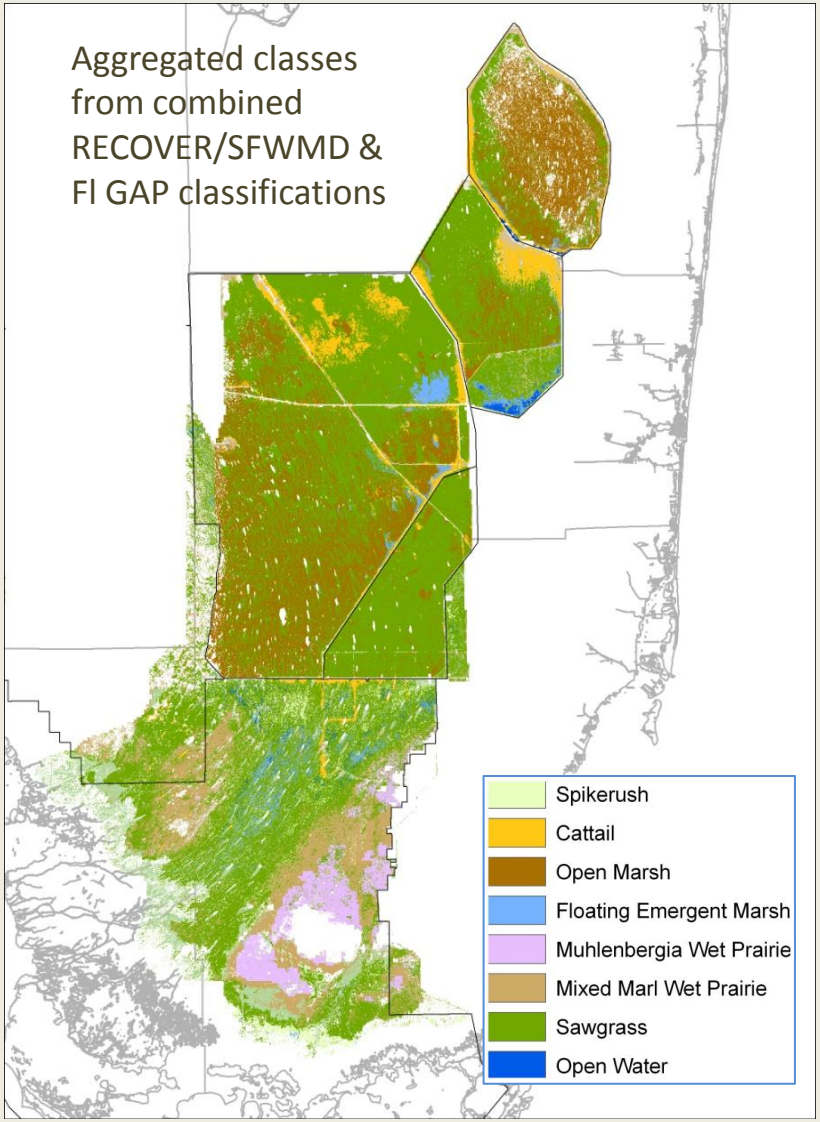
Community

1. Spikerush
2. Cattail
3. Open Marsh
4. Floating Emergent Marsh
5. Muhlenbergia Wet Prairie
6. Mixed Marl Wet Prairie
7. Sawgrass
8. Open Water

Adapted from Rutchey et al. 2006
Vegetation Classification for South Florida Natural Areas

Mapping Relationships

South Florida Natural Resources Center

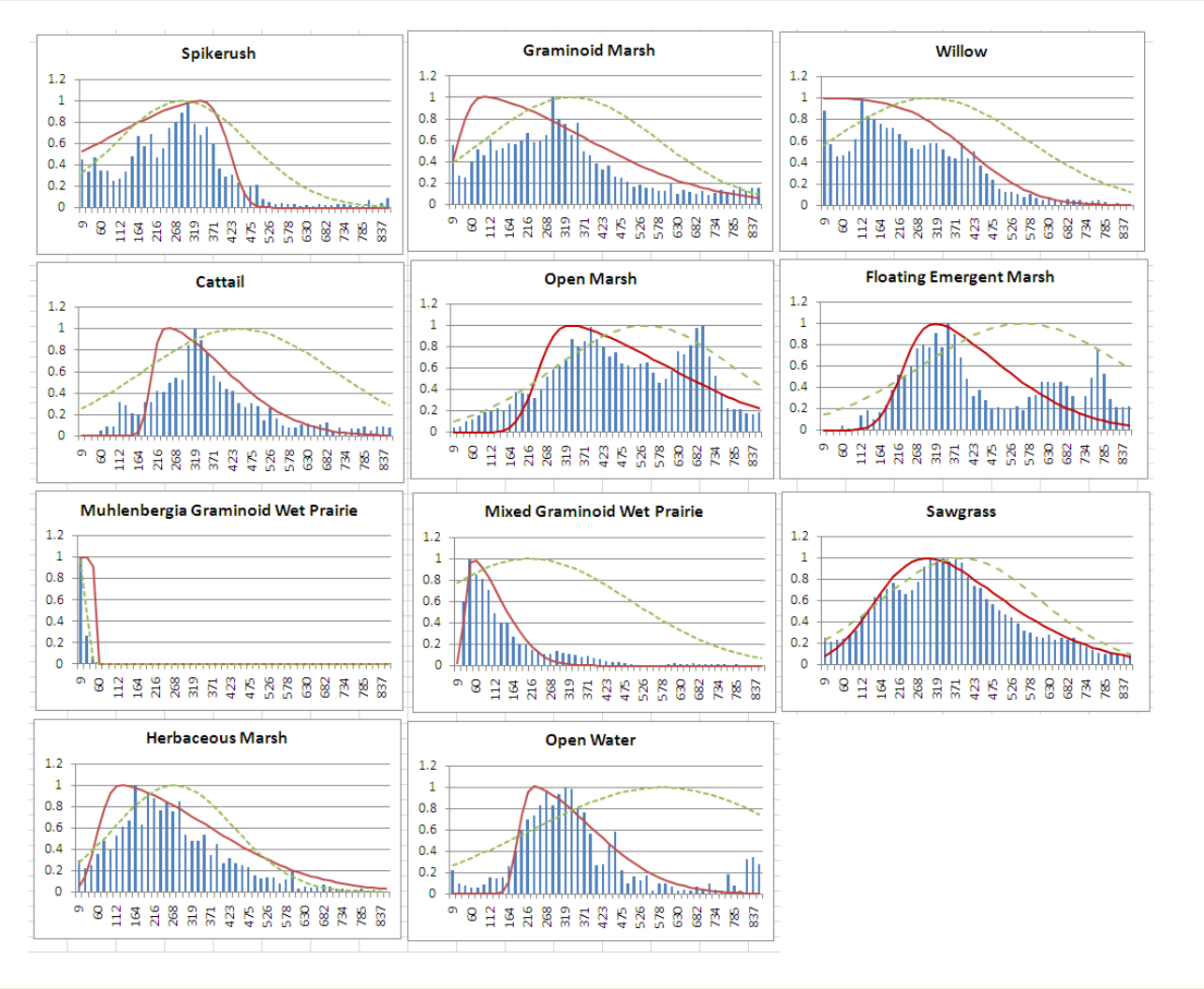


EDEN Hydrologic Metrics Examples (from 49 Total)
number of days water above 0 mm
number of days where water above 50 mm
number of days where water below -50 mm
mean annual water depth
standard deviation of annual water depth
median annual water depth
upper quartile annual water depth
lower quartile annual water depth
mean annual water depth where water above 50 mm
minimum of the seventeen day moving average water depth
maximum of the seventeen day moving average water depth
day of year seventeenDayWaterDepthMin occurred
day of year seventeenDayWaterDepthMax occurred

Skewed Distributions

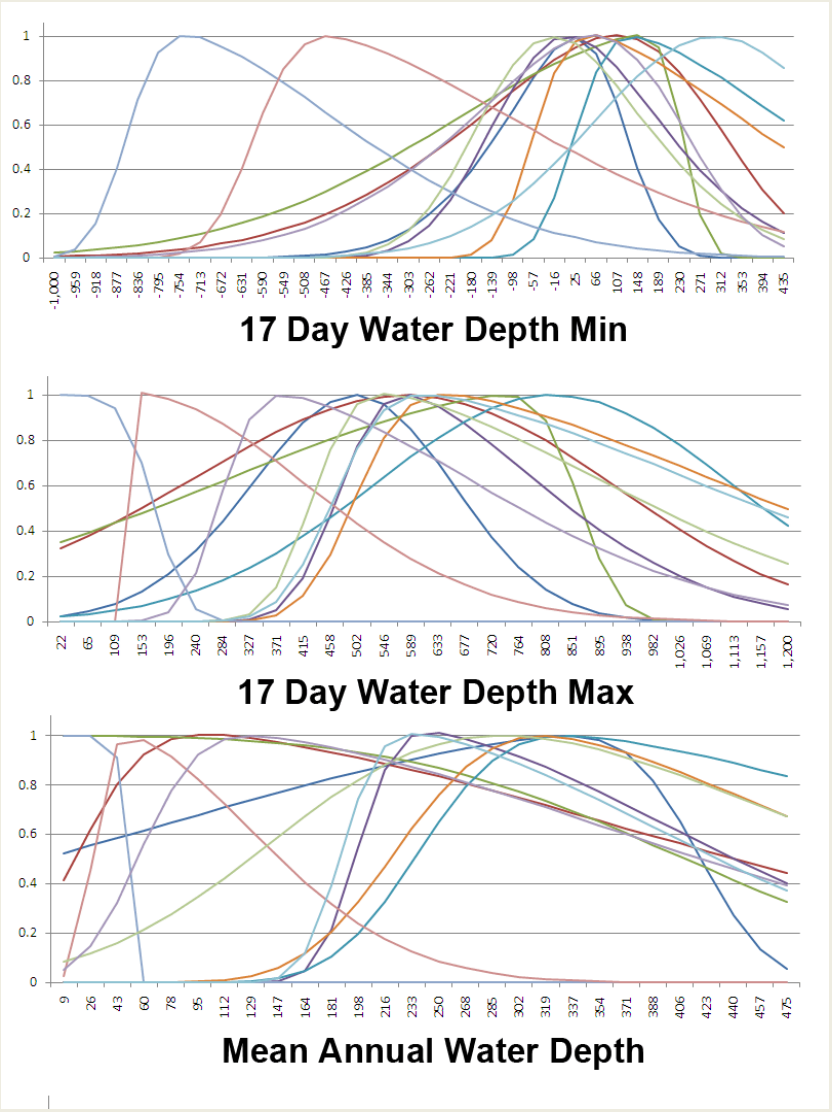
South Florida Natural Resources Center

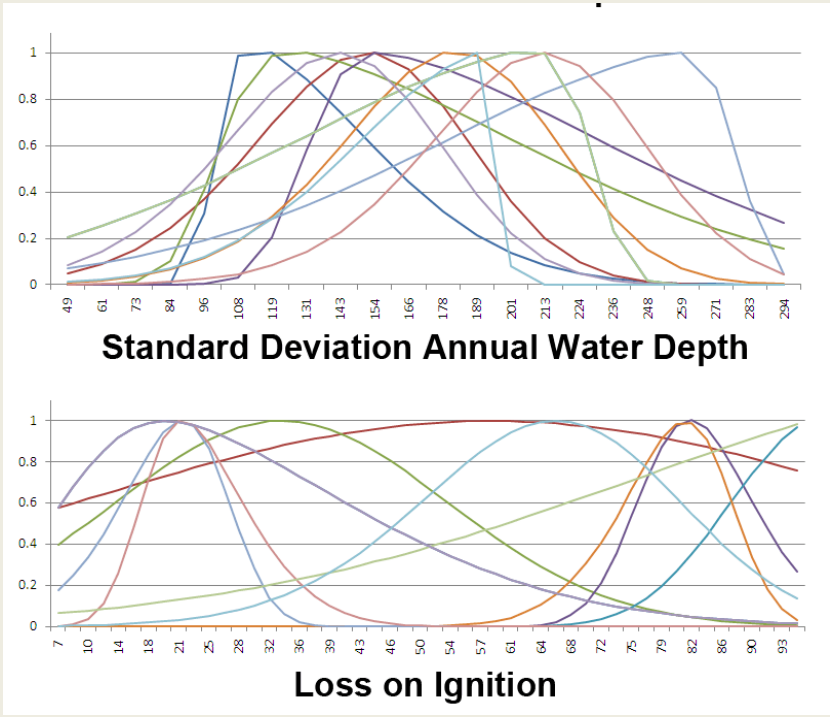
Example: Mean Annual Water Depth (mm)



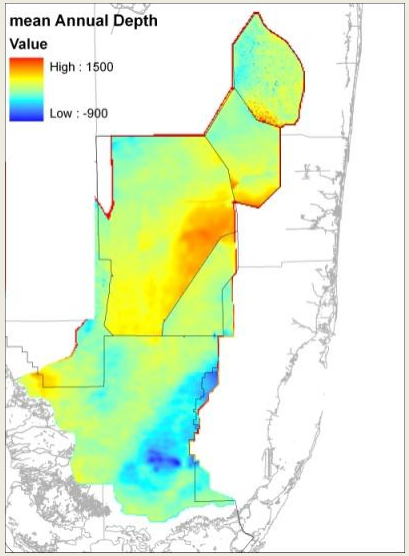
Class confusion

South Florida Natural Resources Center

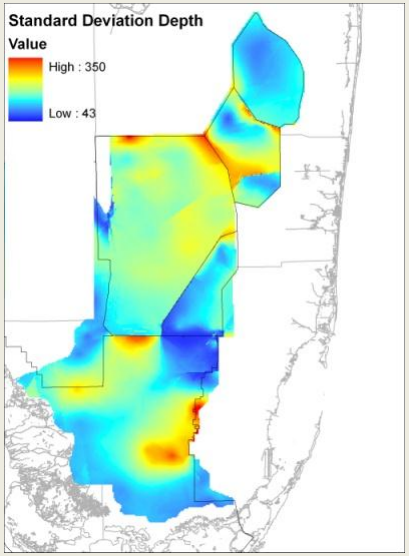




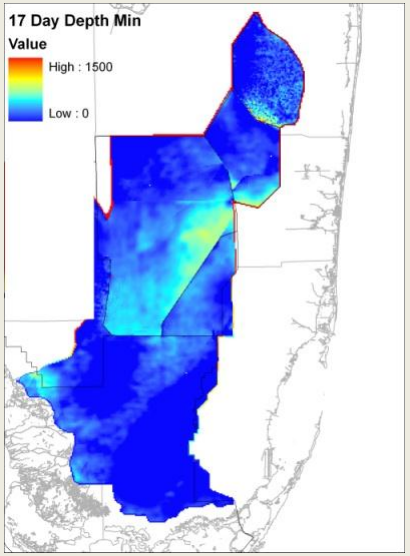
Hydrology Metrics



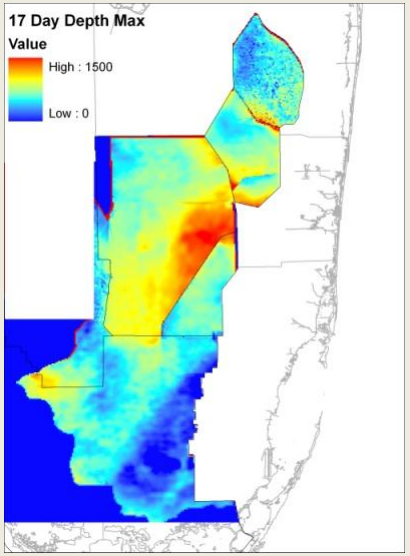
Mean Annual Depth



Std. Dev. Annual Depth



17 Day Depth Min.

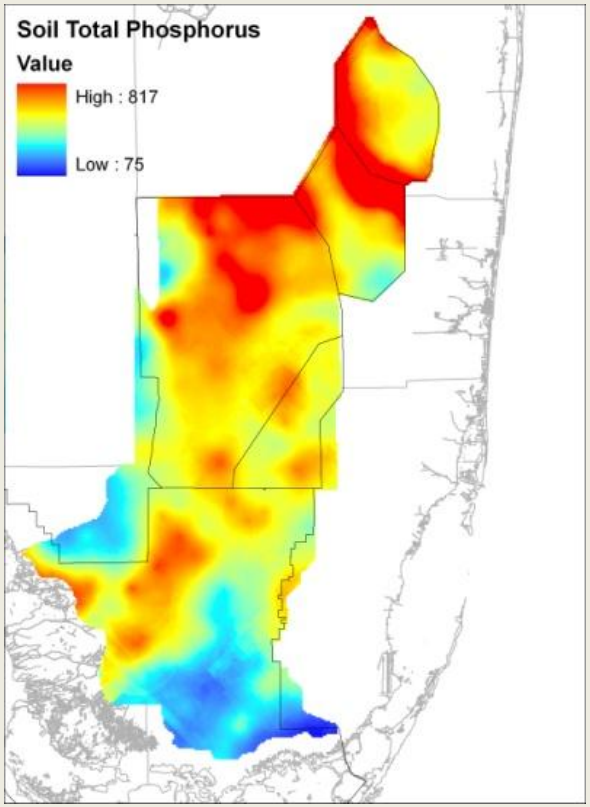


17 Day Depth Max.

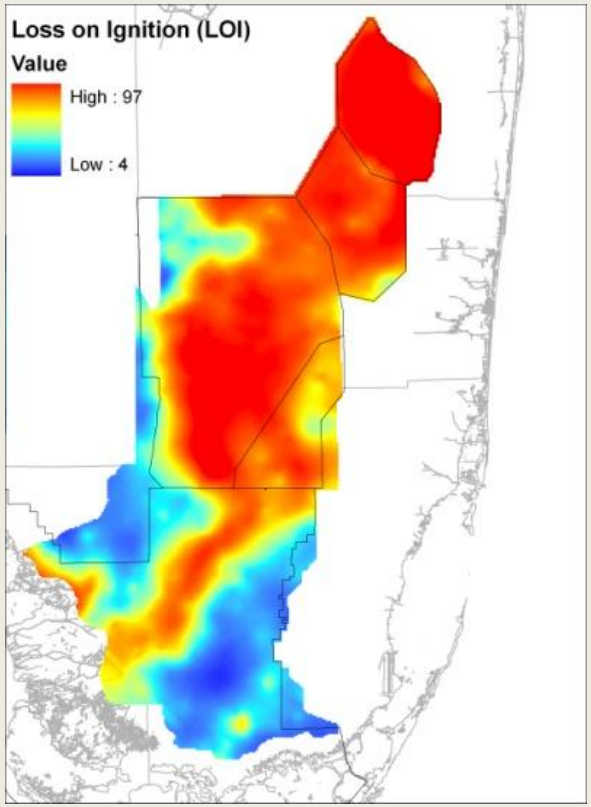
Derived from EDEN 2003 water depth data

Community Drivers

Soil Metrics



Soil Total Phosphorus

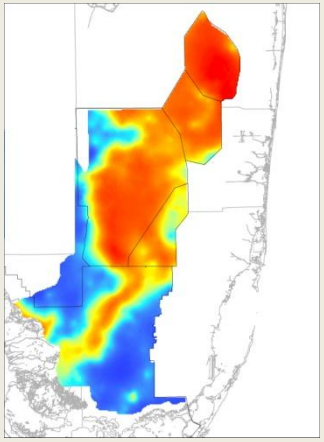


Loss on Ignition

Interpolated from Newman and Osborne 2003 data, unpublished

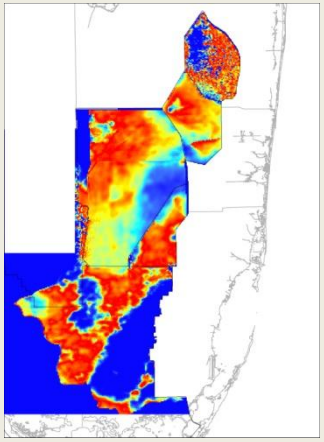
Instantaneous Joint Probability

South Florida Natural Resources Center



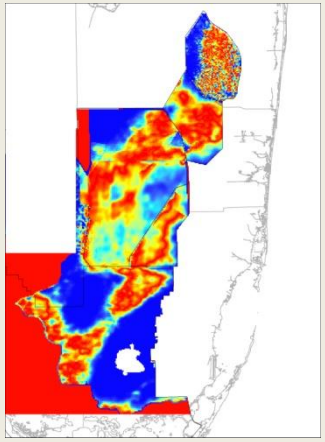
LOI

X



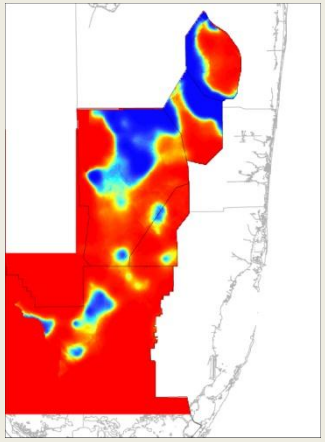
17DayDepth Max

X



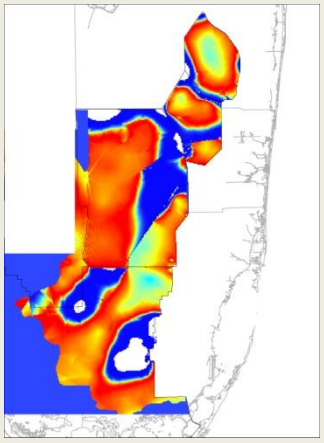
17DayDepth Min

X



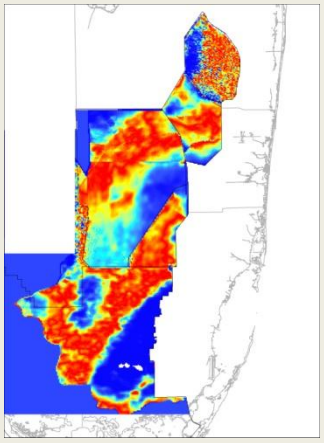
Phosphorus

X



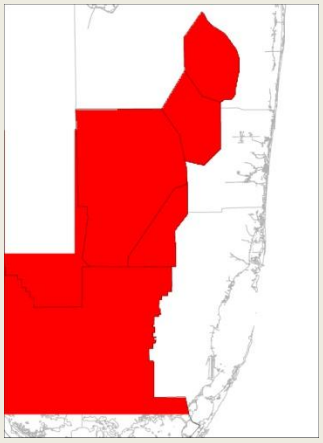
StdDev Annual Depth

X



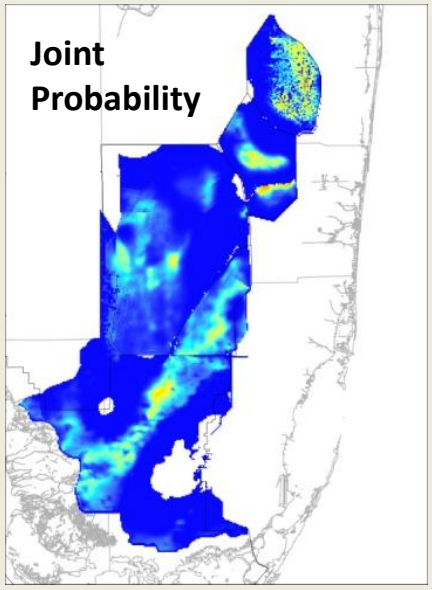
Annual Depth

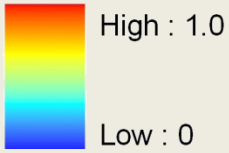
X



marlMask

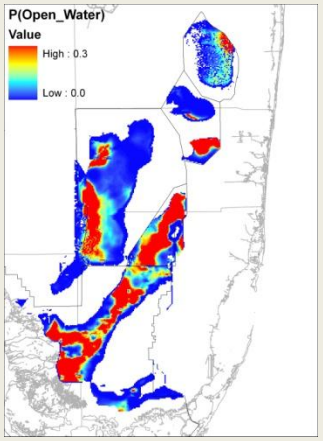
=



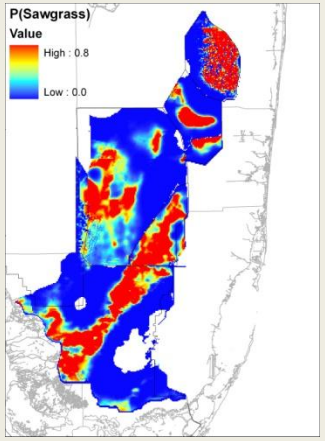


Joint Probabilities

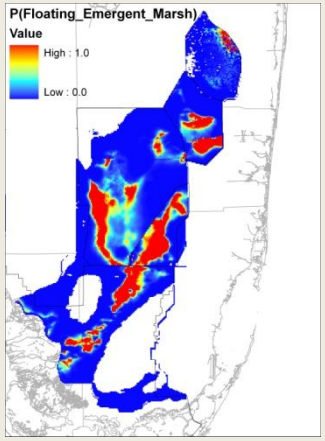
South Florida Natural Resources Center



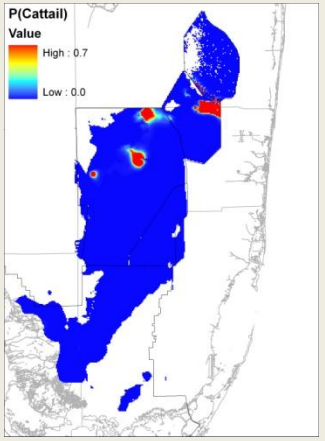
Open Water



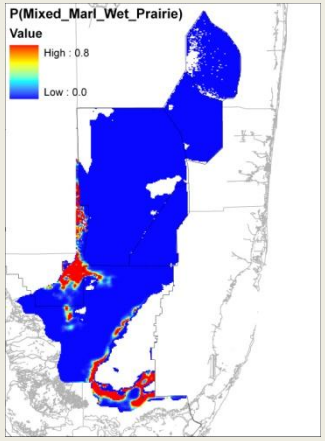
Sawgrass



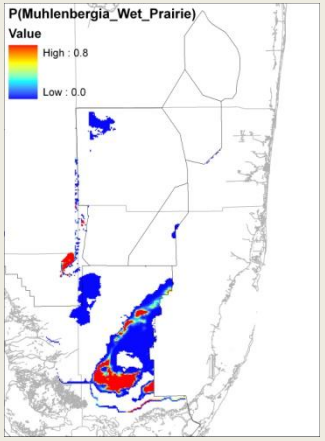
Floating Emergent Marsh



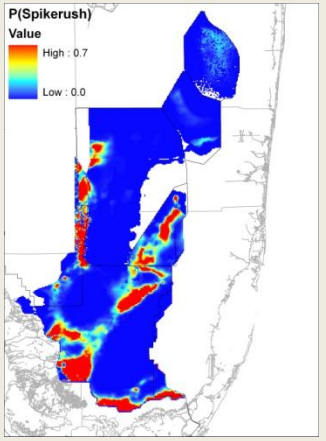
Cattail



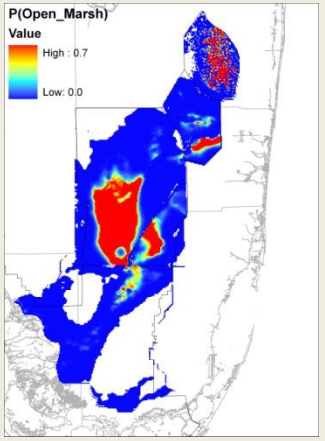
Mixed Marl Wet Prairie



Muhly Wet Prairie



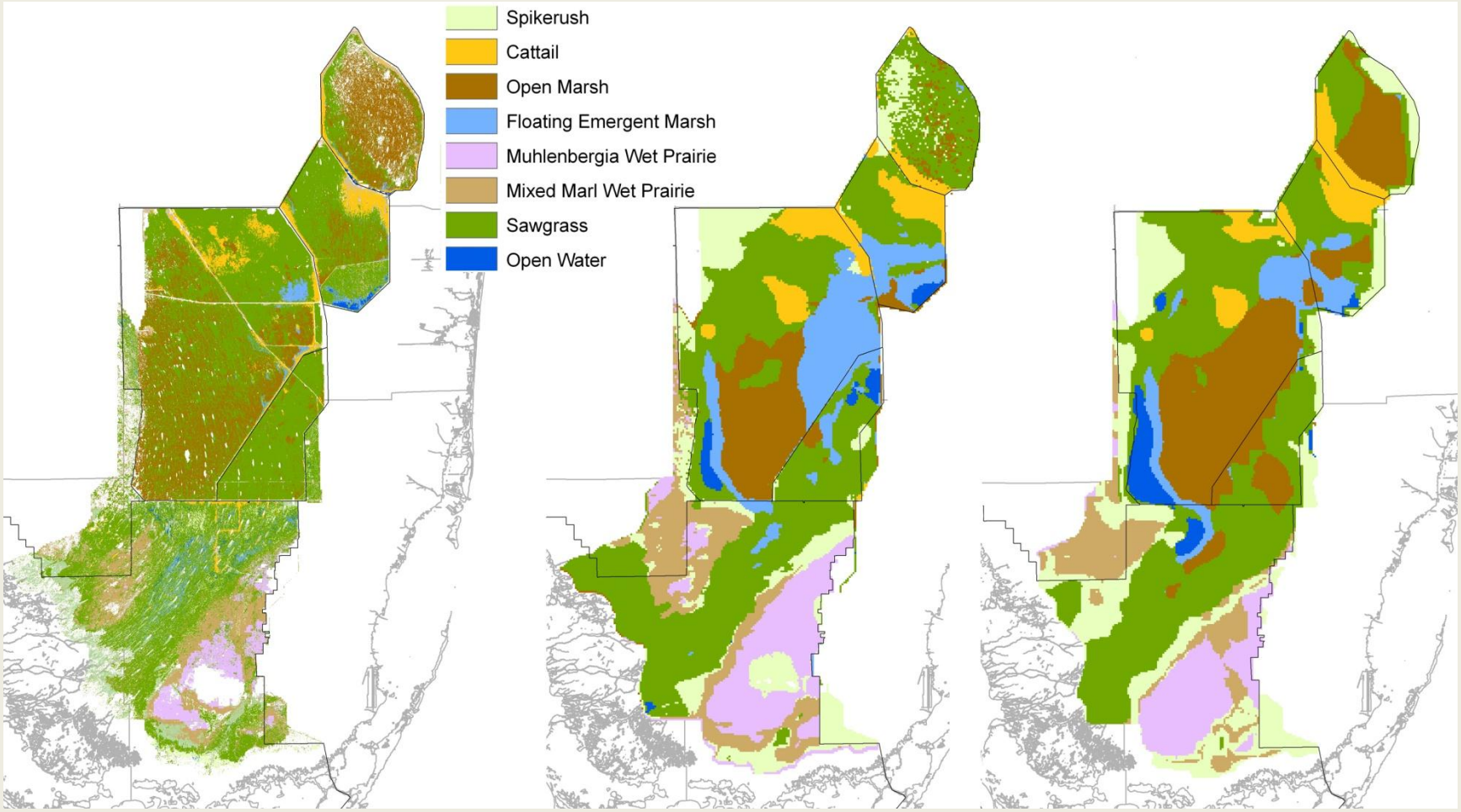
Spikerush



Open Marsh

Succession

South Florida Natural Resources Center



RECOVER-SFWMD/GAP

50m spatial resolution

EDEN 2003

400m spatial resolution

SFWMM ECB3 1997

400m spatial resolution

Model Parameterization

South Florida Natural Resources Center

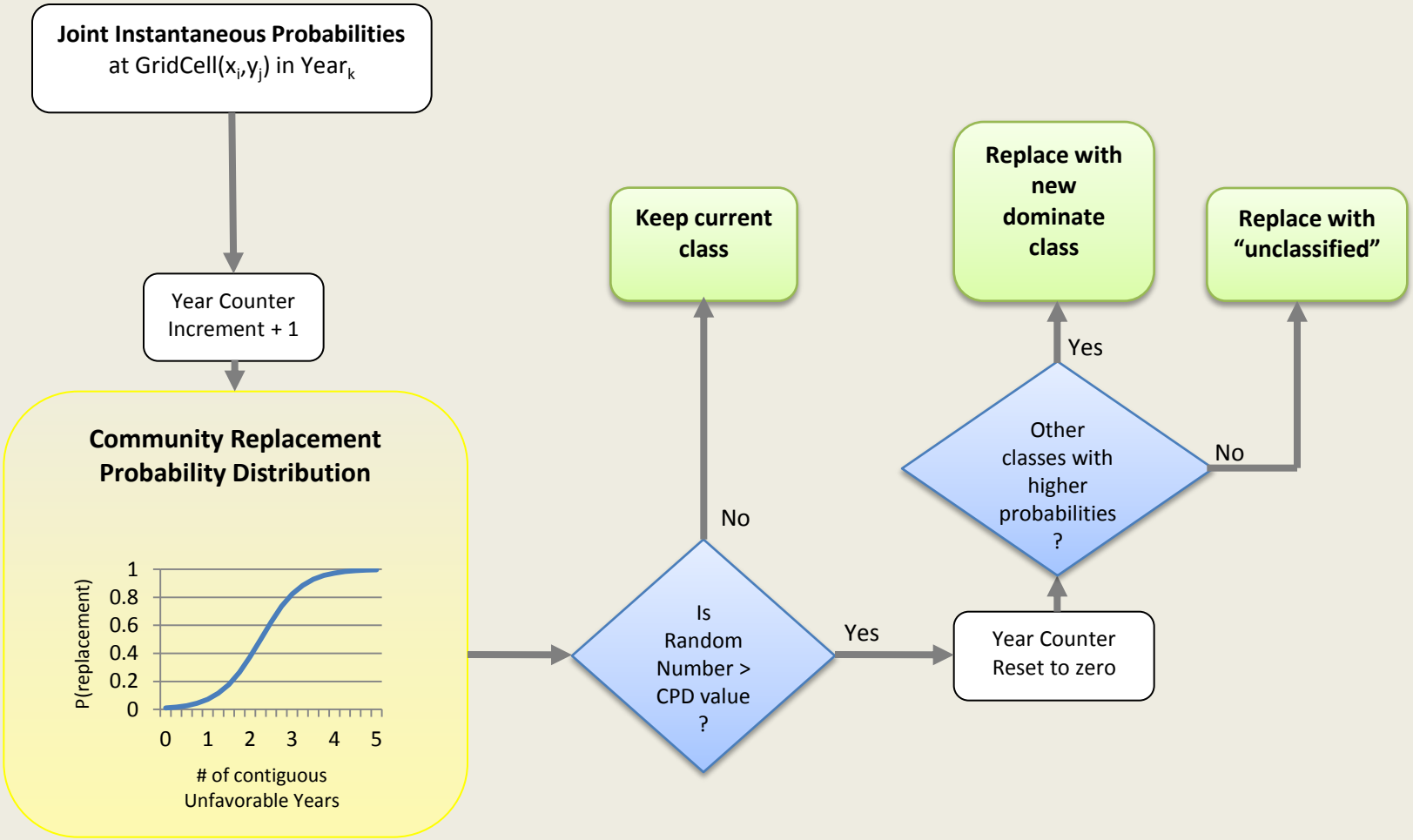
Freshmarsh_arguments.xls [Compatibility Mode]

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		MeanAnnualDepth				StdDevAnnualDepth				17DayDepthMax			
2	Community	Location	Scale	Shape	Max	Location	Scale	Shape	Max	Location	Scale	Shape	Max
3	Notes												
4	out	-1000.00	-800.00	1.00	1.00	-1000.00	-800.00	1.00	1.00	-1000.00	-800.00	1.00	1.00
5	Spikerush	417.46	350.00	-9.83	0.77	99.33	50.00	8.57	0.74	600.00	200.00	-1.00	0.49
6	Cattail	197.46	200.00	10.17	0.76	129.33	100.00	8.57	0.76	470.00	300.00	5.00	0.72
7	Open_Marsh	237.00	350.00	8.00	0.76	229.33	100.00	-11.43	0.77	820.00	290.00	0.00	0.40
8	Floatin_Emergent_Marsh	225.00	250.00	5.00	0.72	209.33	50.00	-1.43	0.53	431.82	500.00	8.71	0.76
9	Muhlenbergia_Graminoid_Wet_Prairi	47.46	3350.00	-1049.83	0.80	279.33	100.00	-11.43	0.77	151.82	3650.00	-101.29	0.80
10	Mixed_Graminoid_Wet_Prairie	27.46	100.00	10.17	0.77	239.33	50.00	-1.43	0.54	111.82	250.00	68.71	0.79
11	Sawgrass	150.00	300.00	3.00	0.66	229.33	100.00	-11.43	0.77	371.82	400.00	8.71	0.76
12	Open_Water	187.46	200.00	10.17	0.76	199.33	50.00	-41.43	0.78	401.82	500.00	8.71	0.76
13													
14													
15													
16													
17													
18													
19													

Contents | Inputs | Output | Notes | NormalCurve | **SkewedNormal** | TemporalLag | SCurve

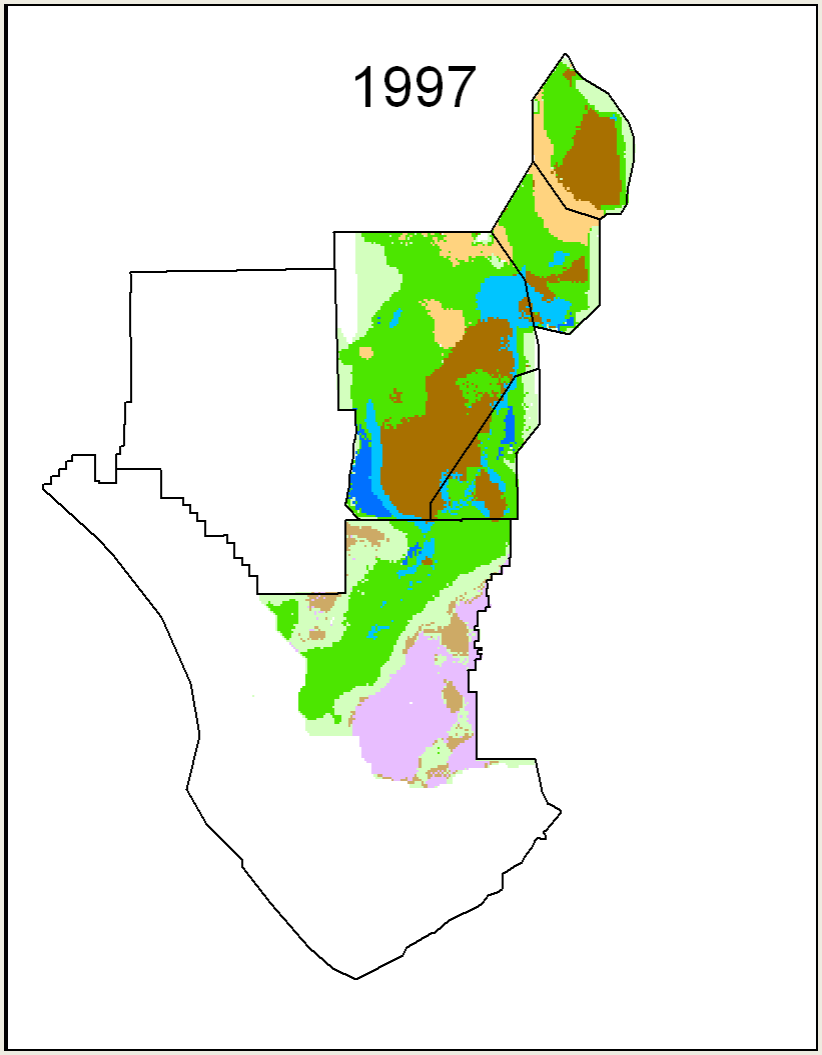
Temporal Lag Routine

South Florida Natural Resources Center



Temporal Vegetation Community Probabilities

South Florida Natural Resources Center



SFWMM ECB3

Vegetation Class

- Spikerush
- Cattail
- Open Marsh
- Floating Emergent
- Muhly
- Mixed Marl
- Sawgrass
- Open Water

Summary

South Florida Natural Resources Center

- ELVeS models probabilistic functions of vegetation community response to changing environmental conditions.
- Design encourages updating
- Additional communities and l processes planned for future versions.
- Link with wildlife models
- Hierarchically link with finer scale process models
- Improved parameterization requires tighter observed relations between hydrologic processes & vegetation