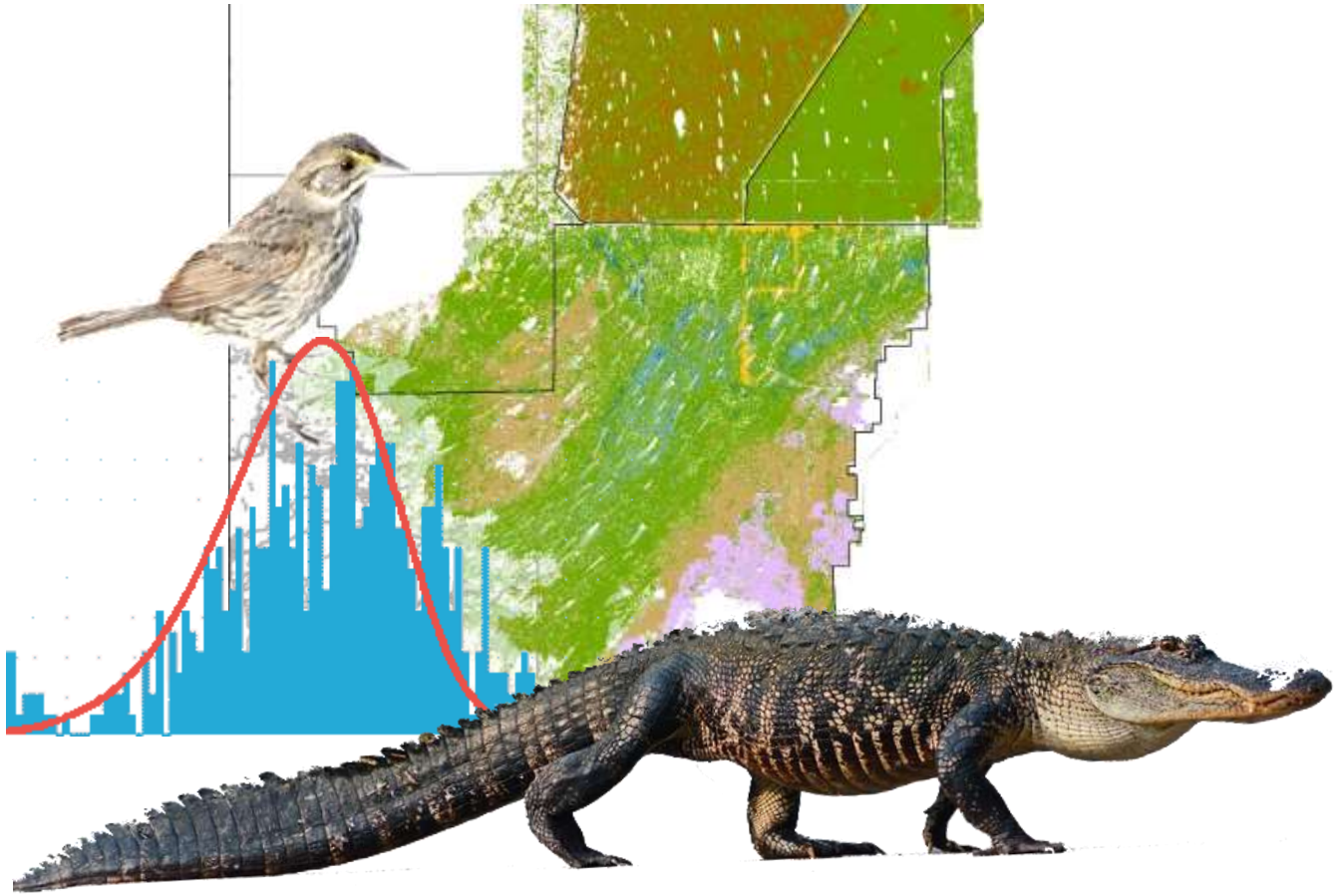
# Revisiting Everglades Species Ecological Models for Planning & Assessment



Leonard Pearlstine[1], James Beerens[2], Stephanie Romañach[2],
Dilip Shinde[1], Jay Sah[3], Mike Ross[3], Laura A Brandt[4], Amy Nail[5]

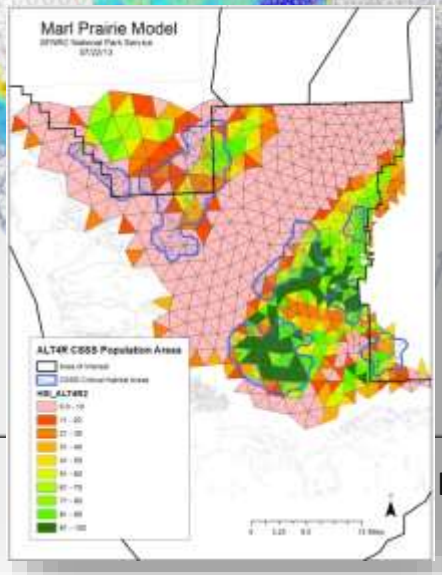
[1] National Park Service, [2] U.S. Geological Survey, [3] Florida International University,
[4] U.S. Fish & Wildlife Service, [5] Honestat Statistics & Analytics

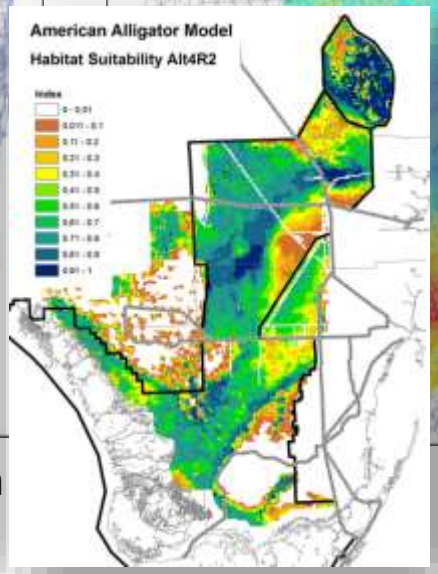
# Everglades Ecological Modeling

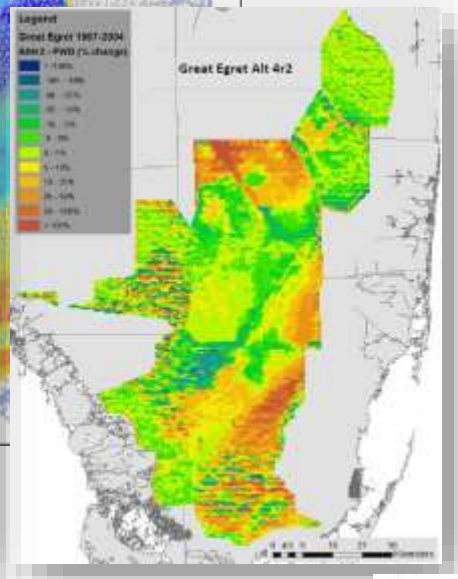
2012EC
Daily depths

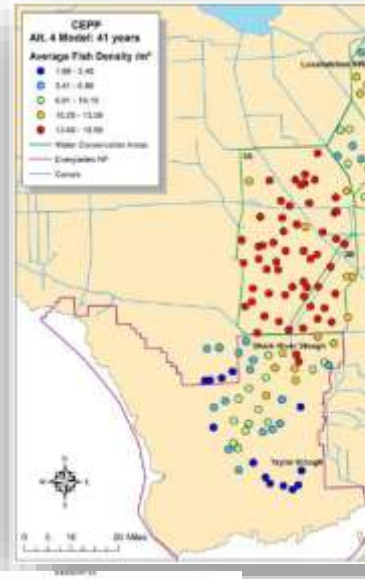
Alt4r2
Daily depths

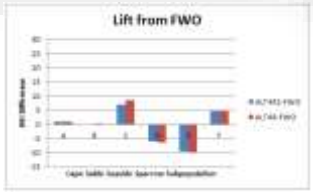
Species Models

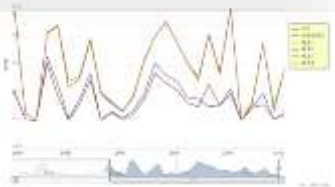


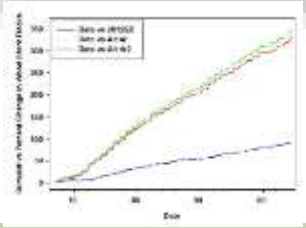





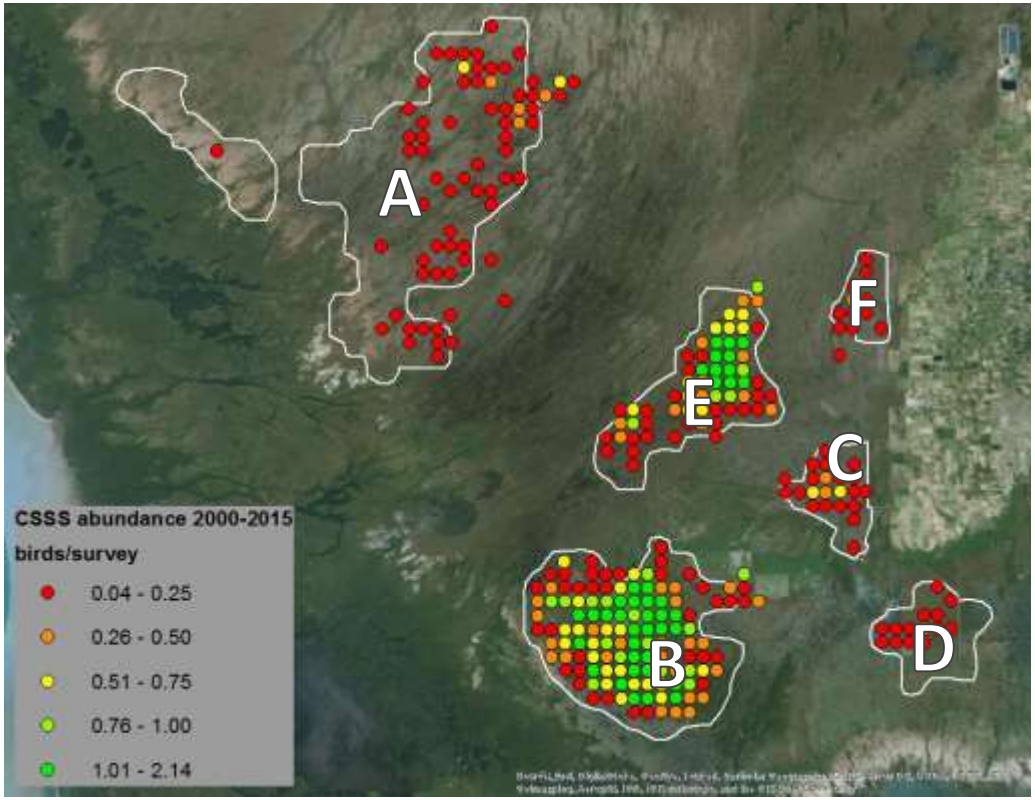


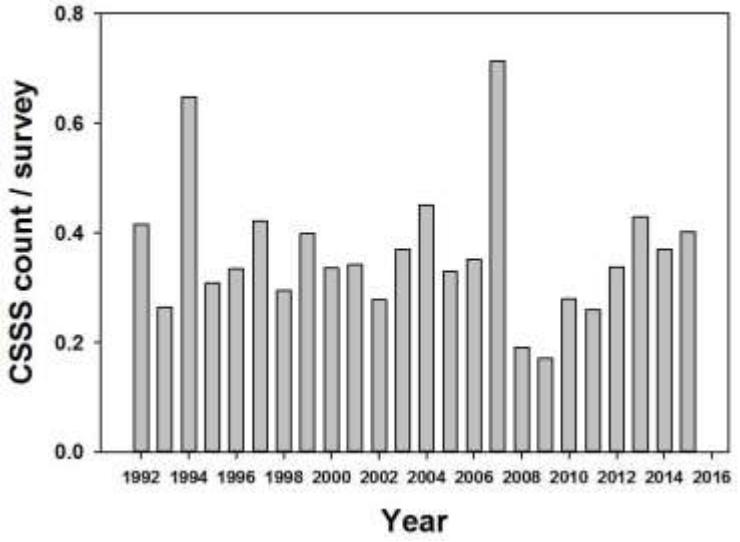
# Everglades Ecological Modeling

**Multiagency & university improvements underway on:**

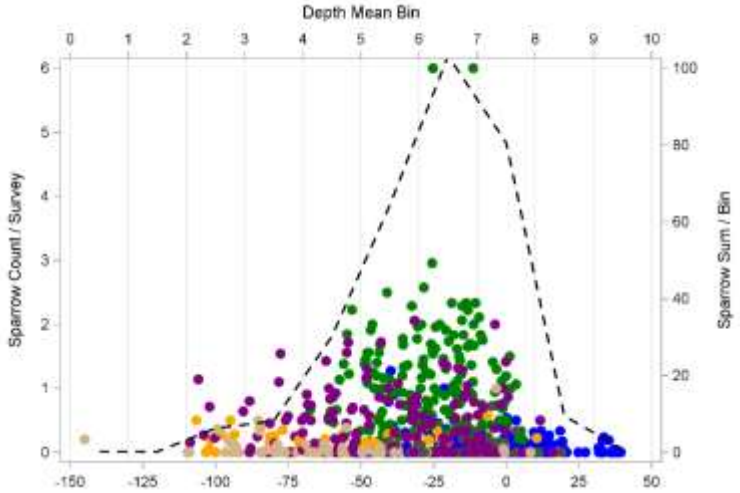
- Cape Sable seaside sparrow model
- American alligator production model
- Everglades landscape vegetation succession model (ELVeS)
- Adaptation of the models to near real-time forecasting

# Cape Sable Seaside Sparrow

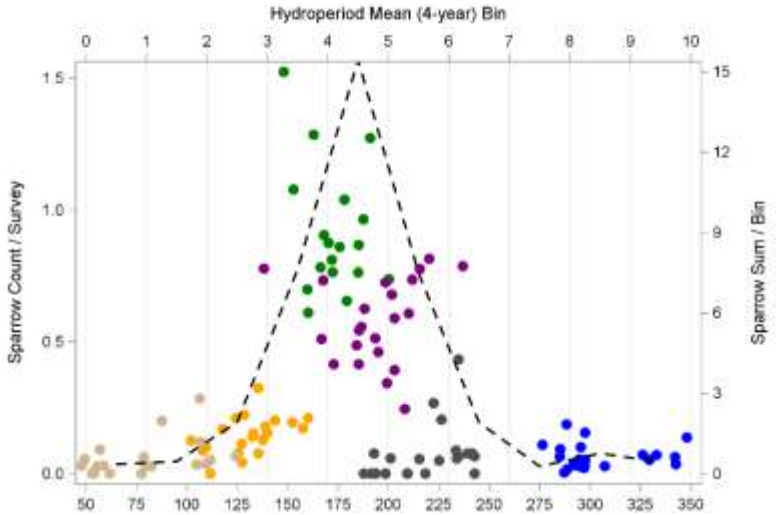


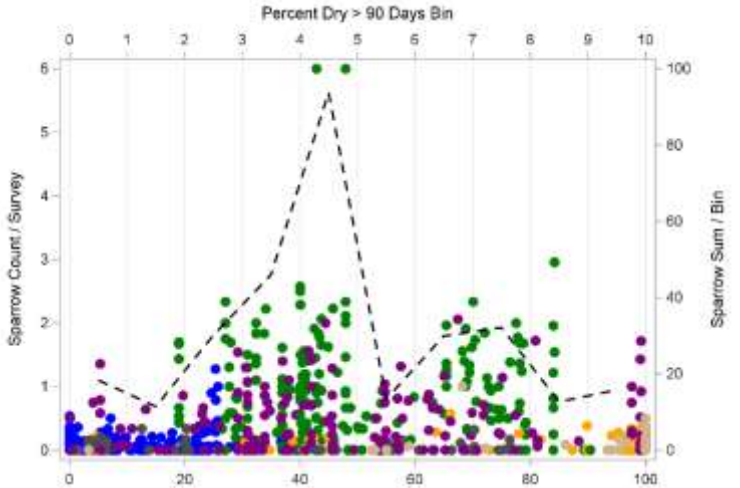
# Cape Sable Seaside Sparrow



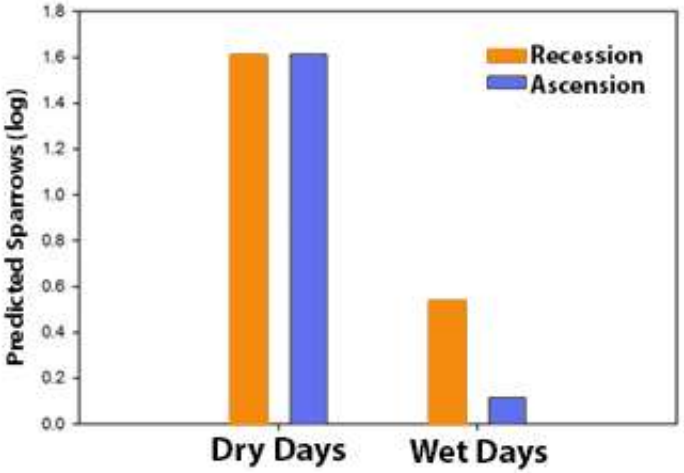

**Water Depth Mean**




**4 year Hydroperiod Mean**




**Percent Dry > 90 Days**







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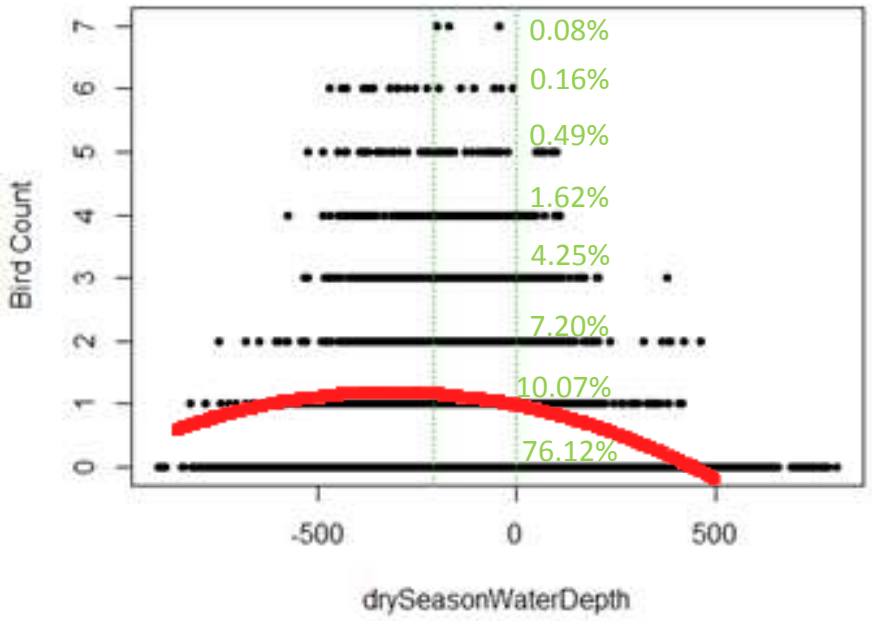
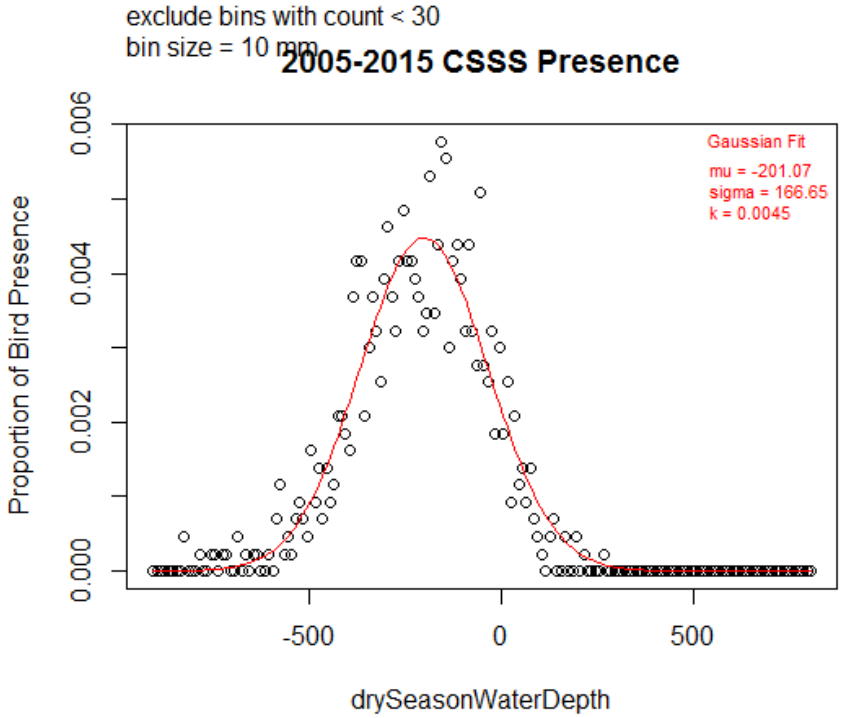
# Cape Sable Seaside Sparrow

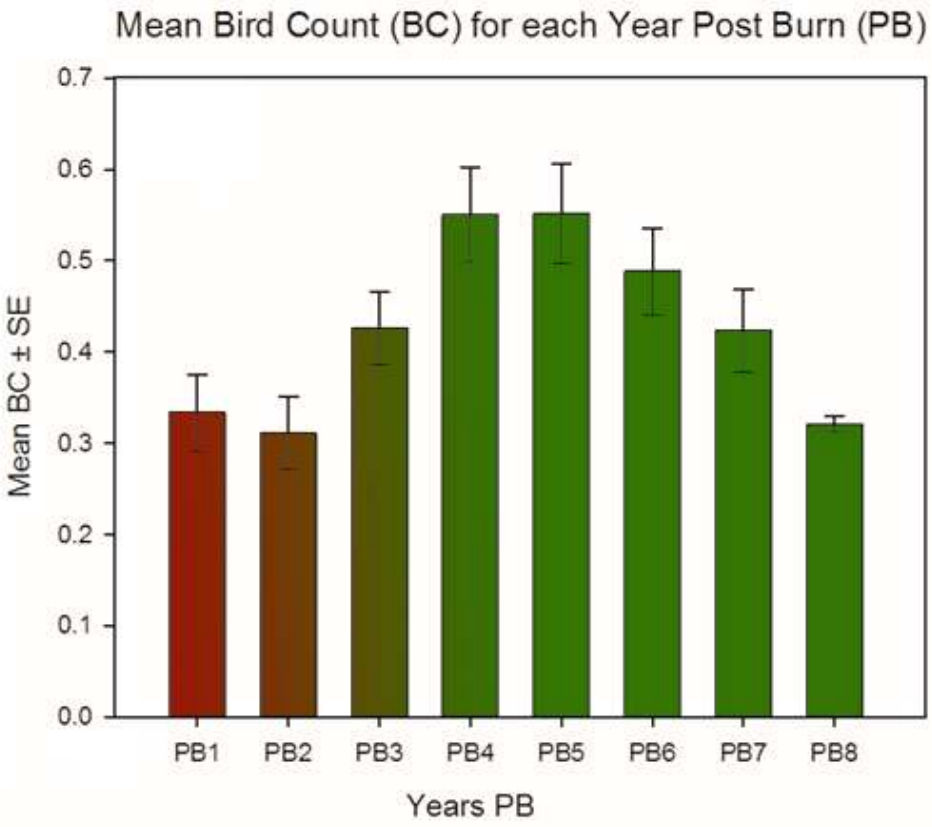



Quadratic fit, R2 = 0.0162

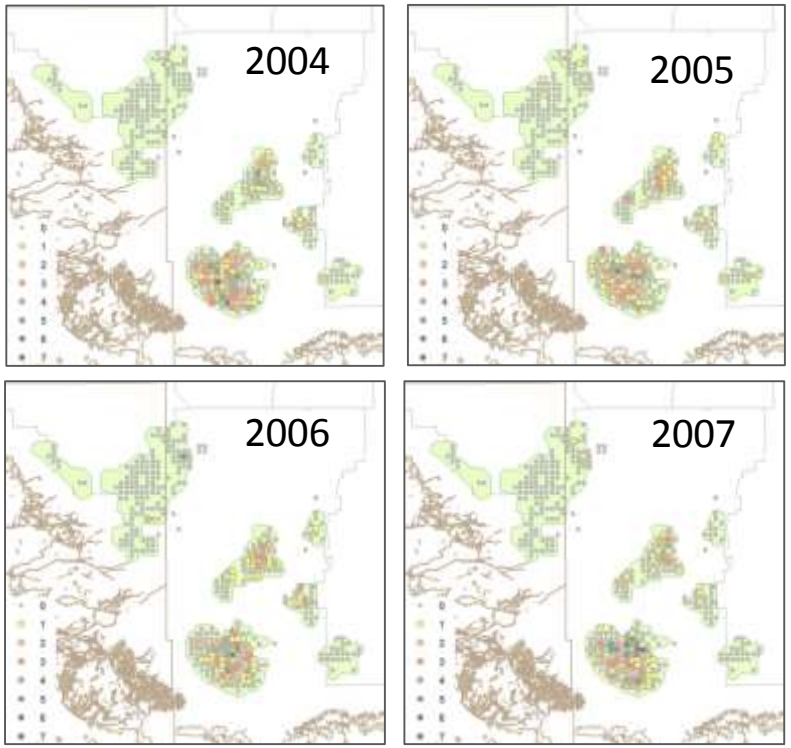


# Cape Sable Seaside Sparrow

## FIRE




## Spatio-Temporal auto correlation



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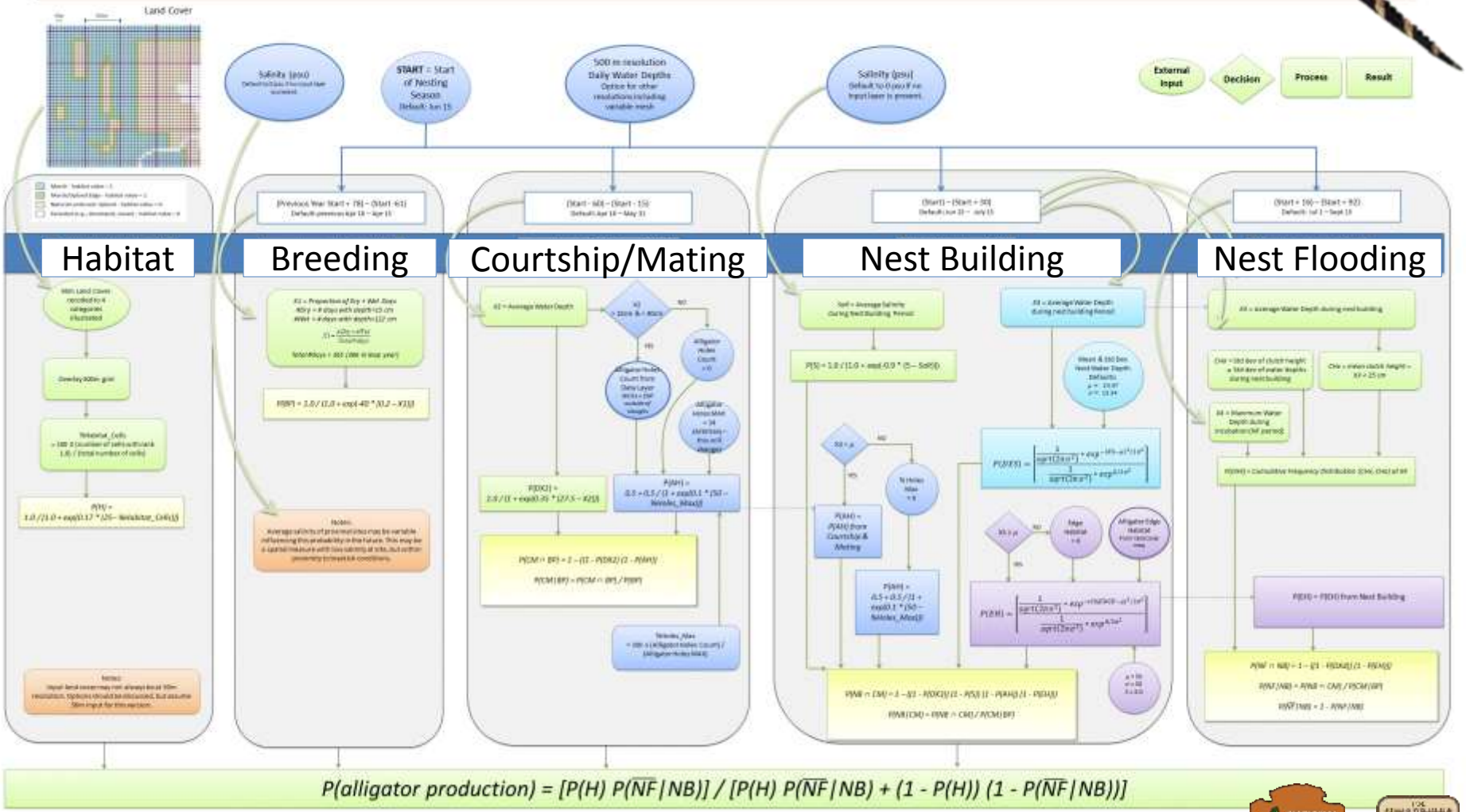
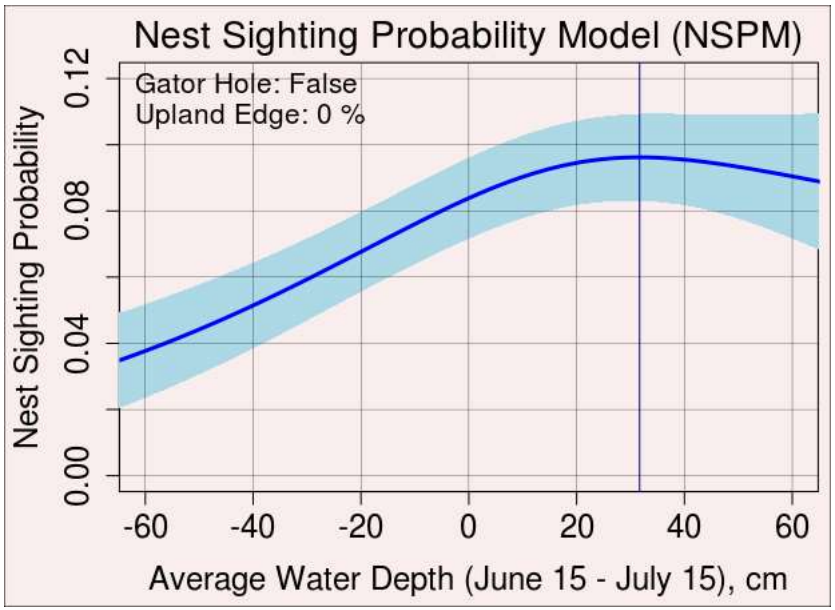
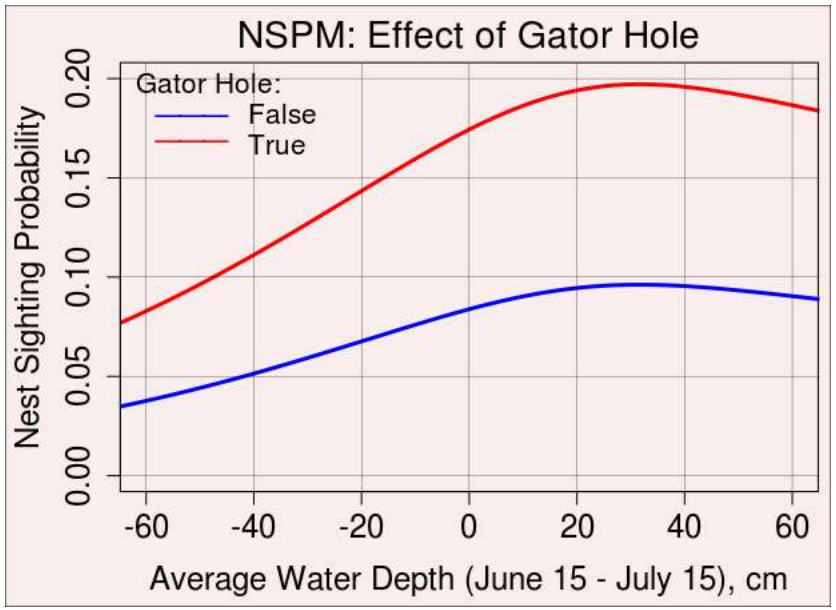
# Alligator

## Alligator Production Probability Index

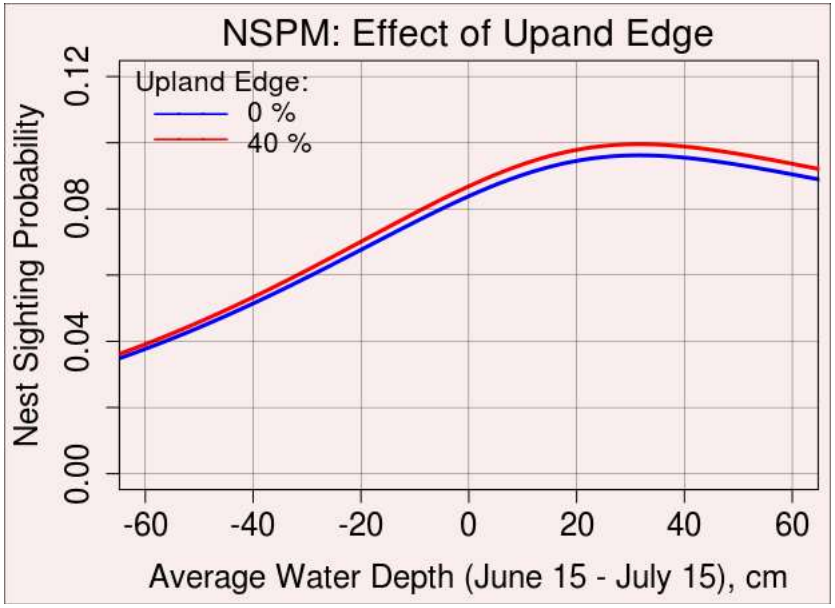


# Alligator


Nest Sighting Probability Model (NSPM)
Gator Hole: False
Upland Edge: 0 %
Nest Sighting Probability
0.00
0.04
0.08
0.12
-60
-40
-20
0
20
40
60
Average Water Depth (June 15 - July 15), cm


NSPM: Effect of Gator Hole
Gator Hole:
False
True
Nest Sighting Probability
0.00
0.05
0.10
0.15
0.20
-60
-40
-20
0
20
40
60
Average Water Depth (June 15 - July 15), cm

# Alligator




ENP SRF
Nest Count in Grids

LOX Plot
Nest Count in Grids

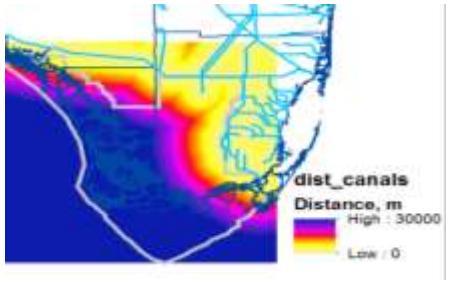
Independent Variable(s) (e.g. C&M water depth)

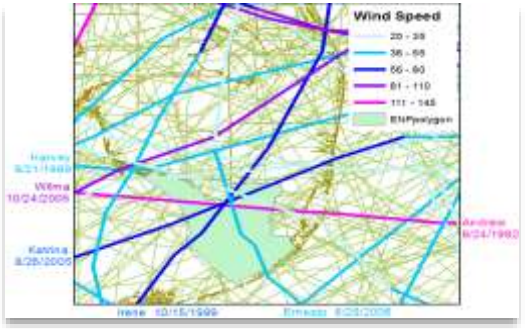
- What is the relationship?
- Does the relationship match expectations?
- What is dissimilarity of ENP vs LOX?

# Alligator

## Additional exploratory variables:

1. Proximity to canals and roads
2. Proximity to and strength of storm events
3. Temperature & precipitation



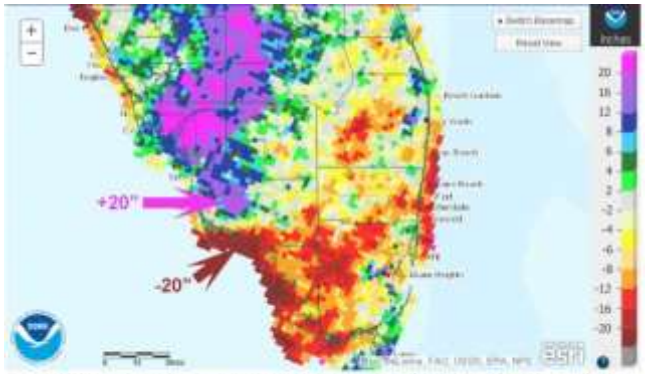




Fig. 3 - Departure from average annual rainfall (through Dec. 28, 2015). Collier County in southwest Florida has rainfall that ranges from 20 inches below to 20 inches above average across relatively short distances.



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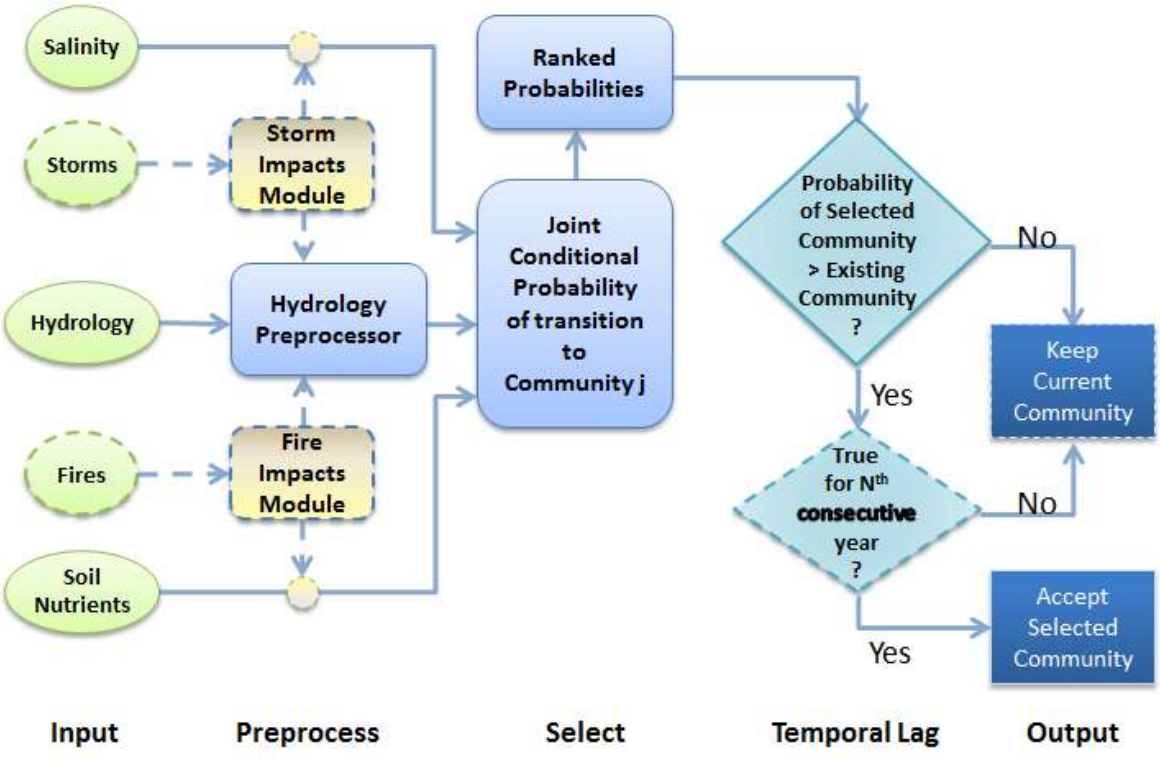
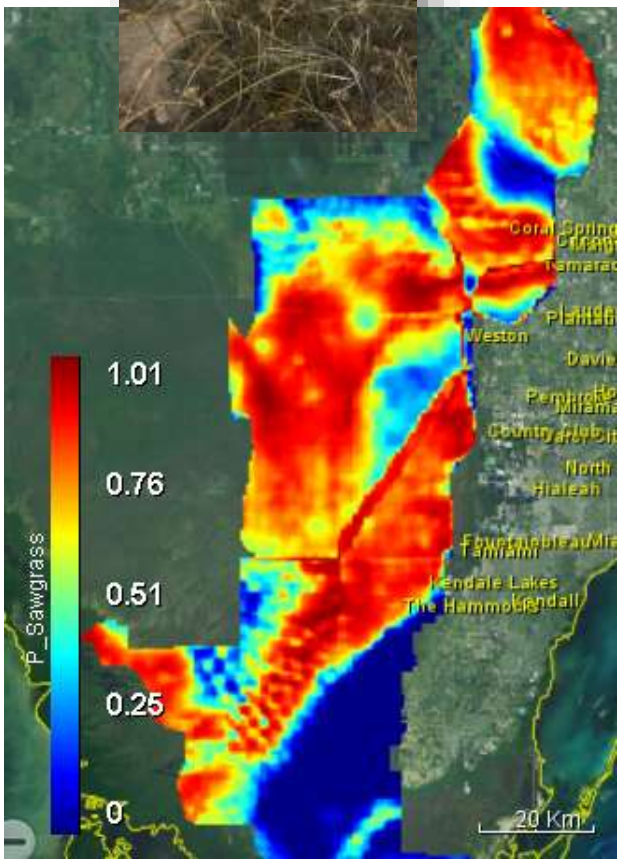
National Park Service

# Vegetation Succession

Everglades Landscape Vegetation Succession (ELVeS)



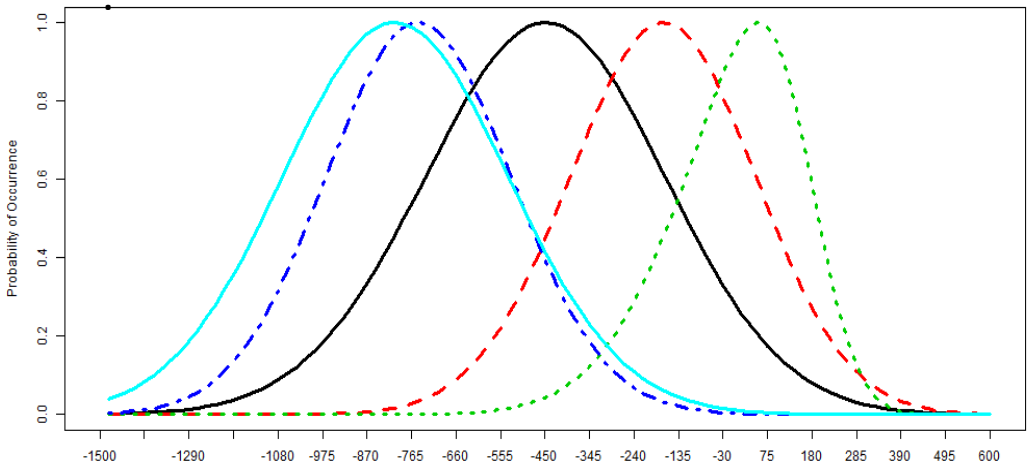




Sawgrass probability

# Vegetation Succession

Explore models that discriminate among Marl Prairie vegetation assemblages

- along **hydrologic** gradient,
- **soil** characteristics,
- **fire** occurrences and
- **neighborhood** prevalence/absence of like communities and fire history



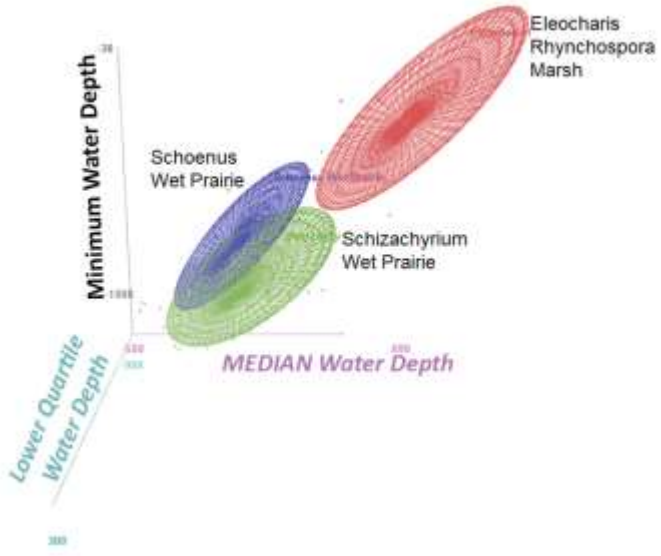

*Muhlenbergia* + *Schizachyrium* + *Schoenus* Wet Prairie

*Cladium* Wet Prairie

*Cladium* Marsh

*Cladium*-*Rhynchospora* Marsh

*Rhynchospora*-*Eleocharis* Marsh



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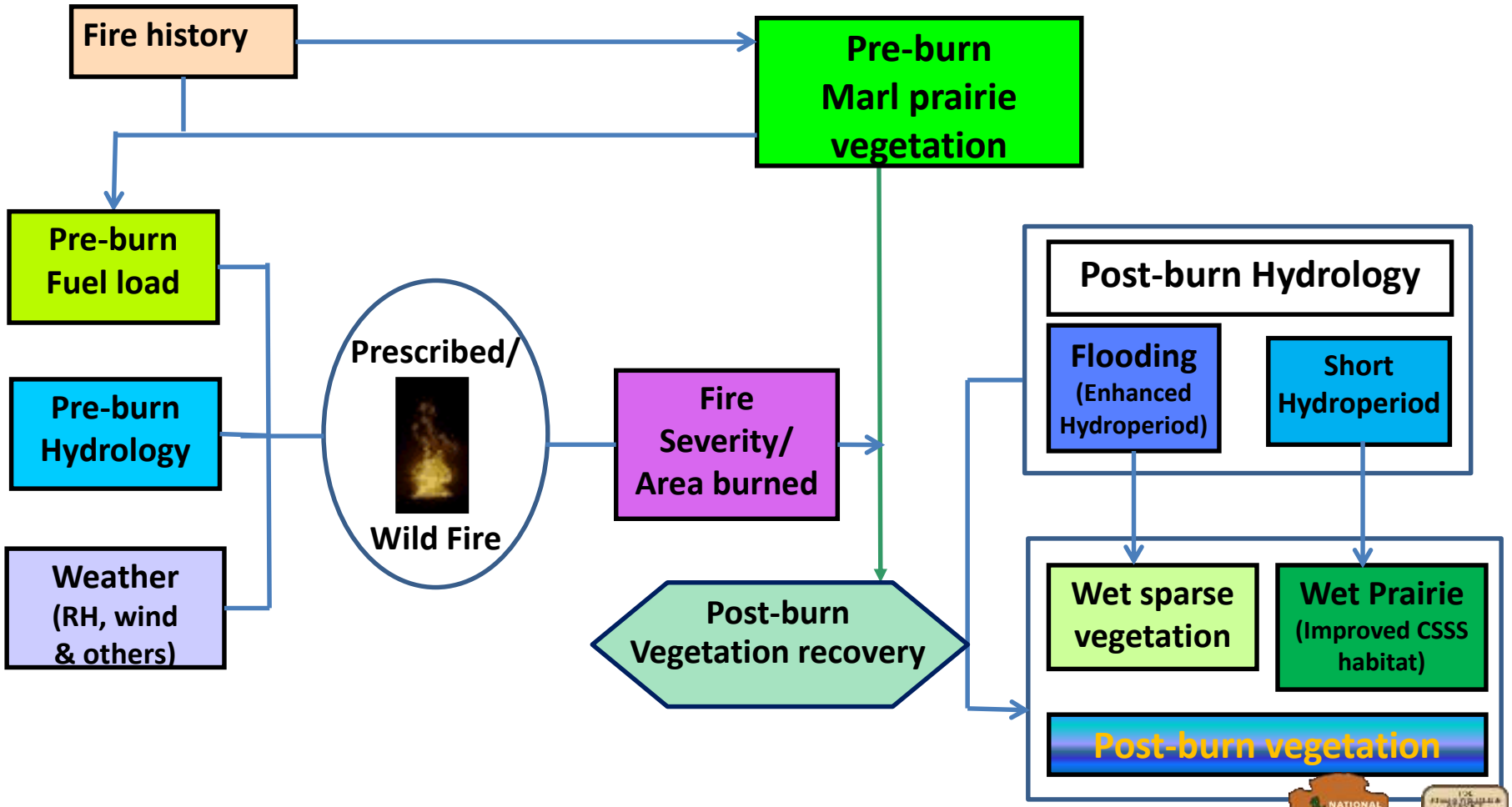
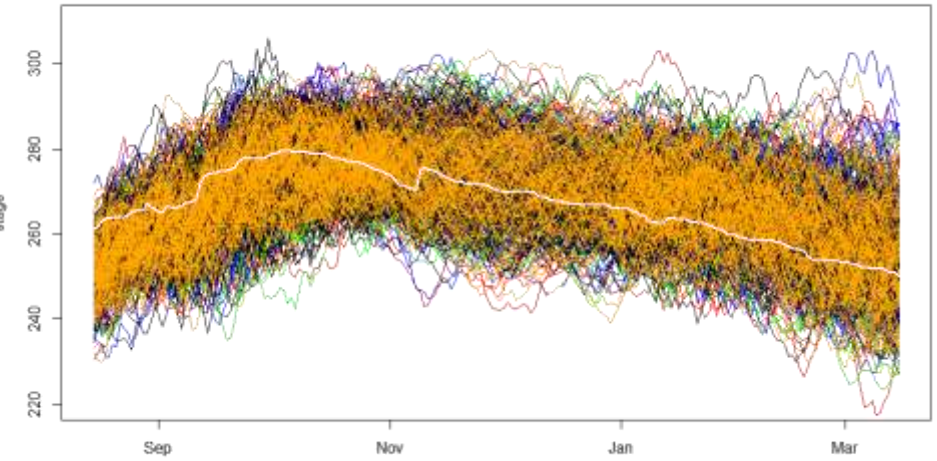
# Vegetation Succession

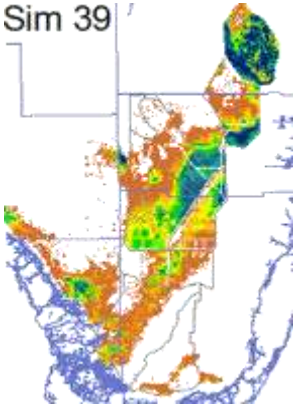
## Marl Prairie Fuel Model/Fire Behavior Module



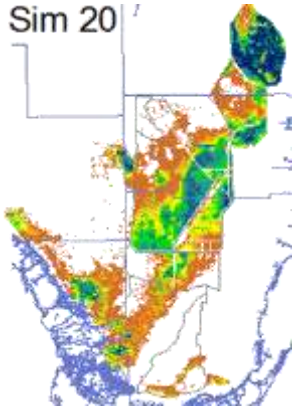
# Real-Time Decision Support



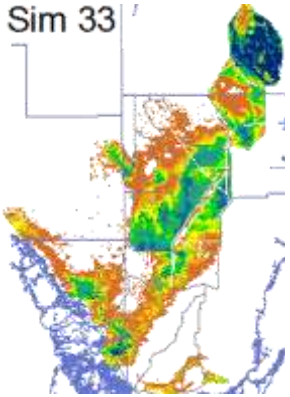

Drier

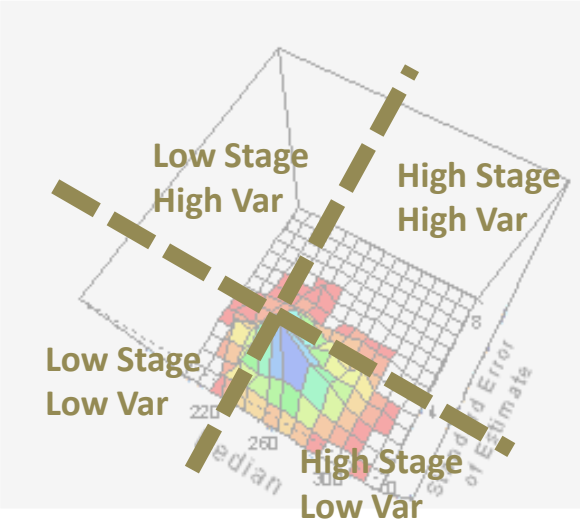



Median




Wetter




## Weighted Decision Table

| Sim | CSSS | GREG | WHIB | WOST | PYTHON | GLOBAL |
|---|---|---|---|---|---|---|
| **Sim 73** | **66** | **83** | **84** | **65** | **61** | **71.8** |
| Sim 15 | 64 | 82 | 78 | 69 | 50 | 68.6 |
| Sim 26 | 61 | 84 | 81 | 66 | 42 | 66.8 |
| Sim 74 | 60 | 86 | 70 | 26 | 79 | 64.2 |
| Sim 93 | 52 | 71 | 57 | 58 | 74 | 62.4 |
| Sim 100 | 50 | 74 | 64 | 43 | 78 | 61.8 |
| Sim 48 | 40 | 77 | 71 | 79 | 40 | 61.4 |
| Sim 8 | 76 | 31 | 80 | 70 | | |



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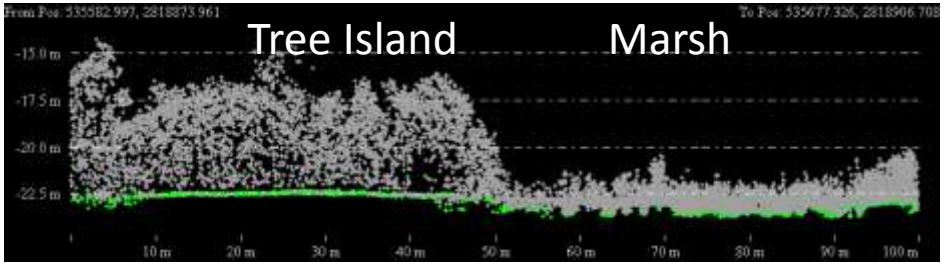
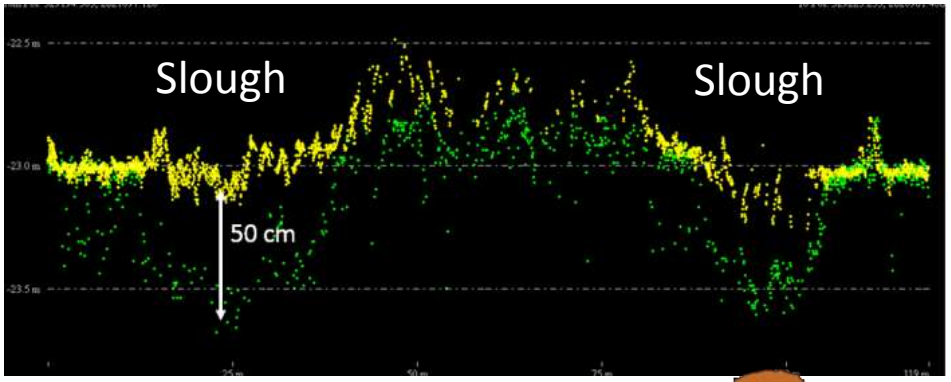
# Lidar topography & Bathymetry




Lidar *combined with other information layers* enhances our ability to

**Understand,**
**Detect and Predict**

influences on wildlife habitat and ecological processes at appropriate scales for species and landscape.

# Summary

**New modeling iterations include:**

- Compilation and assessments of new data,
- Fire history as a spatial variable,
- Transition from deterministic modeling to increasingly empirical-based probabilistic approaches,
- Response variables and temporal scales appropriate for near real-time modeling applications.