Revisiting Everglades Species Ecological Models for Planning & Assessment

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Everglades Ecological Modeling

2012EC
Daily depths

Alt4r2
Daily depths

Species Models
Everglades Ecological Modeling

Multiagency & university improvements underway on:

• Cape Sable seasidesparrow model
• Americanalligator production model
• Everglades landscape vegetation succession model (ELVeS)
• Adaptation of the models to near real-time forecasting
Cape Sable Seaside Sparrow

CSSS abundance 2000-2015
birds/survey
- 0.04 - 0.25
- 0.26 - 0.50
- 0.51 - 0.75
- 0.76 - 1.00
- 1.01 - 2.14

Year
CSSS count / survey

Cape Sable Seaside Sparrow

Water Depth Mean

4 year Hydroperiod Mean

Percent Dry > 90 Days

Predicted Sparrows (log)

Recession
Ascension

Dry Days
Wet Days
Cape Sable Seaside Sparrow

Quadratic fit, $R^2 = 0.0162$

exclude bins with count $< 30$
bin size = 10 m

Gaussian Fit
mu = -201.07
sigma = 166.65
k = 0.0043
Cape Sable Seaside Sparrow

**FIRE**

Spatio-Temporal auto correlation

Mean Bird Count (BC) for each Year Post Burn (PB)

2004  2005

2006  2007

GEER 2017
Alligator

Alligator Production Probability Index

Habitat
Breeding
Courtship/Mating
Nest Building
Nest Flooding

P(alligator production) = [P(H) P(NF|NB)] / [P(H) P(NF|NB) + (1 - P(H)) (1 - P(NF|NB))]

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Alligator
Alligator

NSPM: Effect of Upand Edge

Upland Edge:
- 0%
- 40%

Average Water Depth (June 15 - July 15), cm

Nest Sighting Probability

-0.00
-0.04
-0.08
-0.12

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?

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Joint Ecosystem Modeling

FIU
Florida International University

USGS
US Geological Survey

NATIONAL PARK SERVICE
Alligator

Additional exploratory variables:

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

Everglades Landscape Vegetation Succession (ELVeS)

Salinity → Storm Impacts Module → Storm Impacts Preprocessor → Hydrology Preprocessor

Hydrology → Fire Impacts Module → Fire Impacts Module

Soil Nutrients → Input

Ranked Probabilities

Joint Conditional Probability of transition to Community j?

Probability of Selected Community > Existing Community?

Keep Current Community

Sawgrass probability

Truth for Nth consecutive year?

Accept Selected Community

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Joint Ecosystem Modeling
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

Minimum Water Depth

- Muhlenbergia + Schizachyrium + Schoenus
  - Wet Prairie
- Cladium
  - Wet Prairie
- Cladium
  - Marsh
- Cladium-Rhynchospora
  - Marsh
- Rhynchospora-Eleocharis
  - Marsh
Vegetation Succession

Marl Prairie Fuel Model/Fire Behavior Module

- Fire history
- Pre-burn Fuel load
- Pre-burn Hydrology
- Weather (RH, wind & others)
- Prescribed/Wild Fire
- Fire Severity/Area burned
- Post-burn Vegetation recovery
- Post-burn Hydrology
  - Flooding (Enhanced Hydroperiod)
  - Short Hydroperiod
  - Wet sparse vegetation
  - Wet Prairie (Improved CSSS habitat)
  - Post-burn vegetation
Real-Time Decision Support

Weighted Decision Table

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<th>Sim</th>
<th>CSSS</th>
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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.
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.