Everglades Spatially-Explicit Hydrological Near-Term Forecasts for Ecological Modeling

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Objectives

- Develop spatially-explicit framework to rank species landscape responses to near-future hydrologic simulations

- Improve integration between water management operators and natural resource managers

Map showing Florida with regions marked: Everglades, Florida Bay, and Miami.
CEPP Ecological planning tools

2012EC
Daily depths

Alt4r2
Daily depths

Species Models

Regional Simulation Models

NCER 2016

Joint Ecosystem Modeling

CEPP

2012EC

Alt4r2

Species Models

Marl Prairie Model

American Alligator Model
Habitat Suitability Alt4R2

Great Egret Alt4r2

Lift from PWO

Joint Ecosystem Modeling

CEPP

Alt 4 Model: 45 years
Average Fish Density per

NCER 2016
Near Real-time Automated Modeling

External Data Acquisition → Evaluation Modeling → Open Web Access

Spatio-temporal Results and Reports

Decision support in Everglades water management and restoration

**Multi-agency:** local, state, regional, and federal scientists, technical staff, and decision-makers.

**Regular review** of compliance with water release regulations and impacts on ecological, agricultural, urban and cultural priorities.

**Flexibility** within regulation schedules and structural capacities for modification of water delivery timing and spatial distribution.
Near real time eco-modeling facilitates integrated understanding of hydrologic conditions and ecological responses.

BUT, it is not enough.

We’ve shown where we are now, but managers still are left to speculate on likely ecological trends into the near future.
Ecological Position Analysis

For each forecast month:

- **RMSE match to gauge values**
- **RSM 2012EC Water Stage**
  (or Alt4r2 or ModWaters or ...)
- **Subset**
- **Closest Match from each stage-similar year to NMME & precipitation forecasts**
- **Plot shifted analog month**

1/1/1965

12/31/2005
Select Analog Month

**Site 64**

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainfall, in.</th>
</tr>
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<tbody>
<tr>
<td>Nov</td>
<td>2.18</td>
</tr>
<tr>
<td>Dec</td>
<td>1.66</td>
</tr>
<tr>
<td>Jan</td>
<td>1.95</td>
</tr>
<tr>
<td>Feb</td>
<td>1.99</td>
</tr>
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<td>Mar</td>
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<td>Jun</td>
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<td>Jul</td>
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<td>Aug</td>
<td>7.16</td>
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<tr>
<td>Sep</td>
<td>6.83</td>
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<tr>
<td>Oct</td>
<td>3.91</td>
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<tr>
<td>Nov</td>
<td>2.18</td>
</tr>
<tr>
<td>Dec</td>
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</tr>
</tbody>
</table>
Forecast Stage for the Upcoming Year

Site 64

P 36
Validations

SITE 64

MAE @ 90 days = 9.2 cm

NP205

MAE @ 90 days = 13.5 cm
P(NextStage) = P(CurrentChangeStage | MonthlyVariation)
Monte Carlo Simulations about a Central Tendency
Monte Carlo Simulations about a Central Tendency
Summary Features

• Quantitative Monte Carlo forecasts of water depth changes based on hydrologic modeled depth distributions and historic variability
• Incorporates precipitation forecast to restrain the projections to likely near-term shifts in regional wetness/dryness
• Increased focus on ecosystem spatial conditions to maximize system-wide benefits
• Improved integration between water management operators and natural resource managers