ALLIGATORS, HYDROLOGY, AND AQUATIC FAUNA, OH MY!
INTEGRATING ECOSYSTEM RESPONSES

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• Background- Everglades restoration
• Alligators as indicators
• Conceptual ecological model
• What we have learned
• Next steps
Everglades Background
Everglades Restoration Goals
(South Florida Ecosystem Restoration Task Force)

• Get the Water Right

Comprehensive Everglades Restoration Plan (CERP)

• Foster Compatibility of the Built and Natural Systems
• **Restoration Coordination and Verification**
  – Multi-agency team to organize and apply scientific and technical information
  – Evaluation, assessment and planning
  – Development and implementation of a monitoring plan
CERP MONITORING AND ASSESSMENT PLAN

Restoration Coordination and VERification
(RECOVER)

the journey to restore
America's Everglades

Comprehensive Everglades Restoration Plan

Central and Southern Florida Project

Revised
December 2009
Indicators

• Crocodilians
  – Alligators
  – Crocodiles

• Aquatic fauna
  – Small fish
  – Large fish

The alligator, like the buffalo of the plains, dominated the ecology of the Everglades Swamps – Craighead (1968)
<table>
<thead>
<tr>
<th>Metric</th>
<th>Restoration Goal</th>
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<tbody>
<tr>
<td>Alligators</td>
<td></td>
</tr>
<tr>
<td>– Relative Abundance</td>
<td>&gt;1.7 alligators/km</td>
</tr>
<tr>
<td>– Body Condition</td>
<td>&gt;2.27 (Fulton’s K)</td>
</tr>
<tr>
<td>– Alligator Hole Occupancy</td>
<td>&gt;70%</td>
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Alligators and Everglades Restoration

• American alligator populations have been reduced as a result of altered
  – hydrologic conditions
  – reduced abundance and accessibility of prey

• Hydrologic restoration will result widespread increase in
  – alligator relative abundance
  – alligator body condition
Why Alligators?
Hydrology
- Hydroperiod
- Frequency of dry events
- Intensity of dry events
- Water depth
- Range in water depth
- Timing of water depth

Aquatic fauna
- Growth and survival
- Body condition

Productivity

Landscape patterns
- Microtopography
- Wading birds
- Nesting sites
- Alligator holes
- Shallow depressions
  - Trails
  - Pockets

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Dry Years Decrease Abundance of American Alligators in the Florida Everglades
J. Hardin Waddle, Laura A. Brandt, Brian M. Jeffery, Frank J. Mazzotti

Estimating Trends in Alligator Populations from Nightlight Survey Data
Ikuko Fujisaki, Frank J. Mazzotti, Robert M. Durazo, Kenneth G. Rice, Michael Cherki, Brian Jeffery

Presence of Breeding Birds Improves Body Condition of American Nest Protectors
Lucas A. Brandt, Frank J. Mazzotti, Kent A. Vilet, Laura A. Brandt
What Have We Learned?
Alligators/km

Relative Abundance

Trends in Alligator Relative Abundance
Alligator abundance has declined in drier areas but has not changed in wetter areas

- Hydroperiods longer than 11 months per year
- Drydowns no longer than about 40 days (1 ¼ months)
- At least two years between drydowns
Dry Conditions

• Declining trends (2001-2008) in abundance of small and medium sized animals (Fujisaki et al. 2011).

• Annual population growth rate in A.R.M. Loxahatchee NWR lower in drier years (Waddle et al. 2015).
Body Condition
Water Depths

• Alligator body condition depends on water depth 10-49 days prior to capture (Fujisaki et al. 2009)

• Alligator body condition is correlated with annual range in water depth and fall water depth (Brandt et al. in press)
Fish Biomass from Trexler et al. 2012

ENP-SS

Average Alligator Body Condition

Water Year

Model Residuals

Site 6

Site 7

Site 8

\[ y = -0.0186x + 39.34 \]

\[ R^2 = 0.2303 \]
Next Steps

• Integration of alligator captures and aquatic fauna work
• Better understanding of what alligators are eating in different areas
  – Stable isotope
  – Food sampling
Alligators eat...

- Everything that moves
- Some things that don’t
- The bigger they are the bigger the things they eat.

What is the relative role of small and large fishes in the Everglades?

Are existing performance measures telling us what we need to know?
FOOD WEBS, INTERACTION WEBS, AND MONITORING: USING A TROPHIC CONCEPTUAL MODEL TO SELECT ECOLOGICAL INDICATORS

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