Review of current Everglades ecosystem, landscape, and hydrodynamic models and potential applicability to evaluate climate change effects

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What might change?

• Physical parameters:
  - Rainfall, Up – Down?
  - Water depth, hydroperiod
  - Dry-down intensity, duration, and frequency
  - Salinity, water chemistry parameters
  - Air and water temperatures
  - Tropical storm intensity and frequency
What about the biological organisms?

- All estuarine organisms
- Uplands may convert to wetlands – coastal forests, tree islands, pine rocklands
- Species with extreme sensitivity to hydrology
- Species with cues based on temperature and salinity
Do we have any models that can be used to predict potential effects on habitat?

- Seagrass production model
- Across Trophic Level System Simulation (ATLSS)
- Habitat Suitability Indices (HSIs)
- SWFL Feasibility Estuarine Models
- Cape Sable Seaside Sparrow HIE
Coastal Salinity and Water Quality Simulations

Aggregated FATHOM Groups

FATHOM basin numbers

Long Sound

Hamrick (2006)
### South Florida Biological and Ecological Models Inventory

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A password is required when you select an editing option:

- To edit, enter the ID #
- To delete, enter the ID #
Environmental effects on seagrass growth

- Nitrogen Uptake
- Phosphorus Uptake
- Sulfide Toxicity
- Temperature Effect
- Salinity Effect

Graphs showing the effects of various environmental factors on seagrass growth, including nitrogen, phosphorus, temperature, and salinity.
Changes in seagrass productivity with changing salinity

Salinity output from FATHOM Cosby et al. (2005)
SAV from Madden et al. (2006)
Annual White Ibis and Small Heron Habitat Suitability

(Tarboton et al. 2004)
Scaled Number of Cycle

Year

(Donaldson 2006)
Hydroperiod Frequency Distribution: Area A

(Dong and Donalson 2006)
Sensitivity to temperature and salinity

IPCC (2007): 2° - 3° or 5°

Mapped Values

Degrees C

Spawning Female Blue Crabs (Barnes et al. 2006)
The toads are running...

Oak Toad Salinity Component

- HSI

< 5 >= 5

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
Additional Modeling Needs

- Disease
- Migration
- Exotic species
- Fragmentation/Dispersal Vegetation Succession
- Species interactions
- Fire frequency, duration, and intensity
- Adaptability
- Other rare species – forgotten fauna
Rare Plant Species

- 12 Endangered coastal plants (state listed)
- Institute for Regional Conservation lists 14 as extirpated or “critically imperiled”
- Easy to model with information on salinity- and flooding-tolerance

*Chromolaena frustrata* ENDEMIC to S. Florida
Freshwater flowing into the park is enhanced with the help ofumps, floodgates, and retention ponds. However, the Everglades is presently on life support, alive but diminished.
High ground – future biodiversity hotspots...

(Pearlstine et al. 2008)
Summary

• Identify areas of potential habitat transition
• Prioritize areas for conservation
• Relative risk of species extinctions
• Biodiversity Hotspots
• Assist with regional conservation strategies for individual species
• We have the tools to do the job, but we need input scenarios