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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

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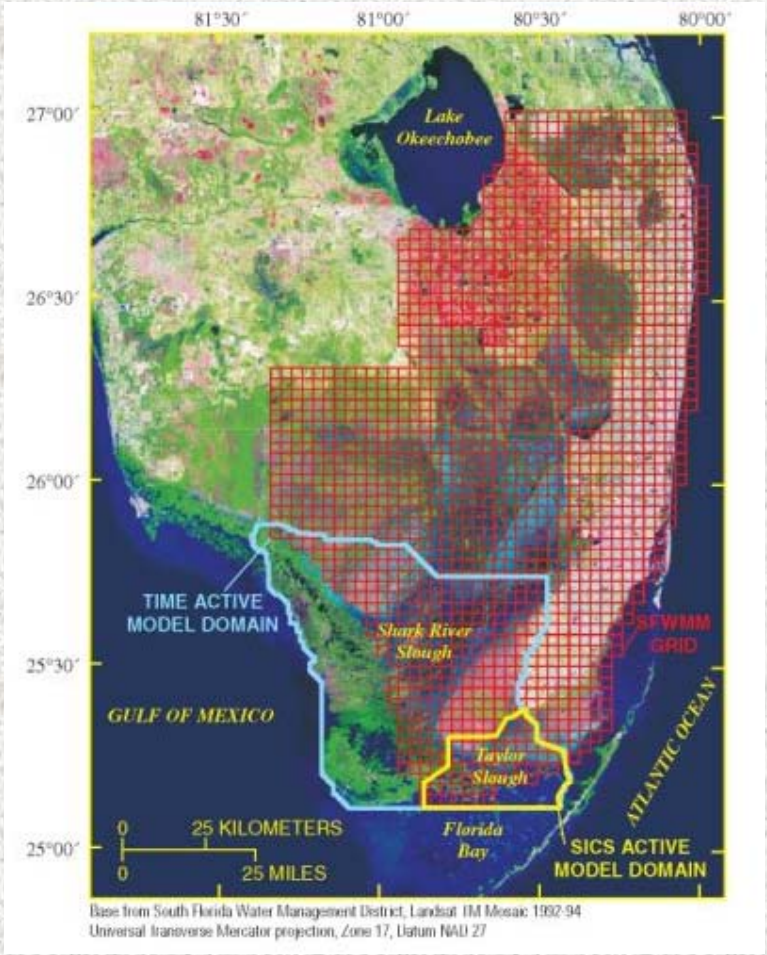
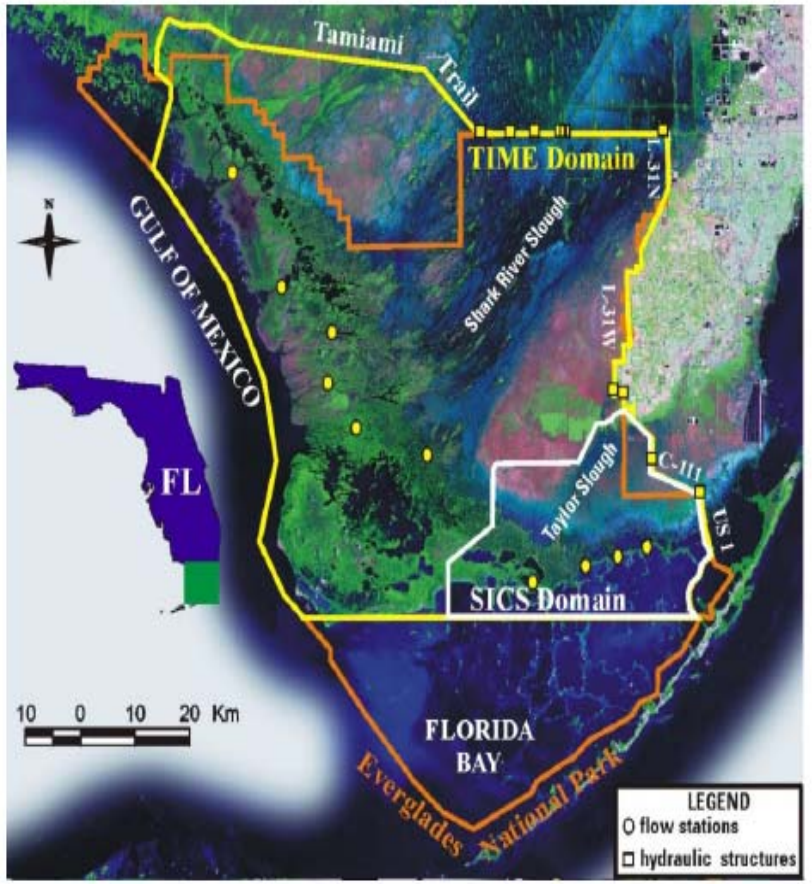
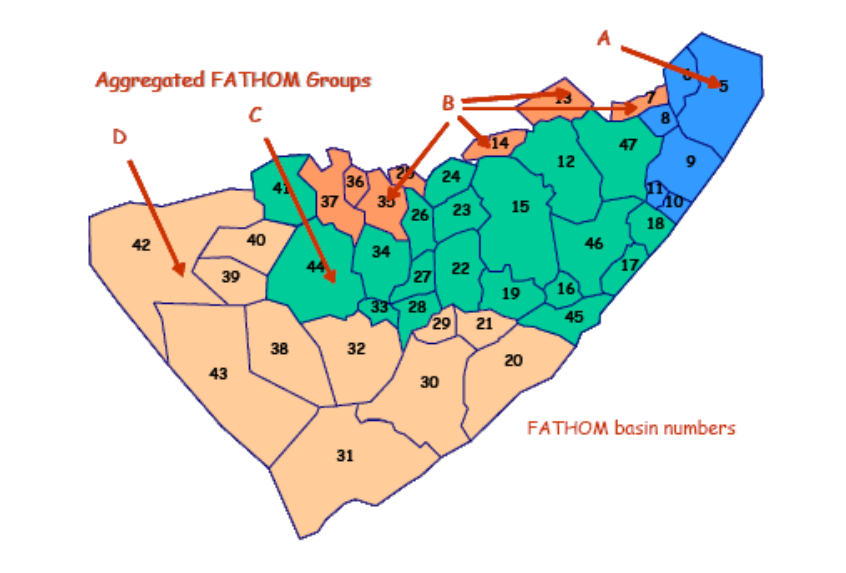
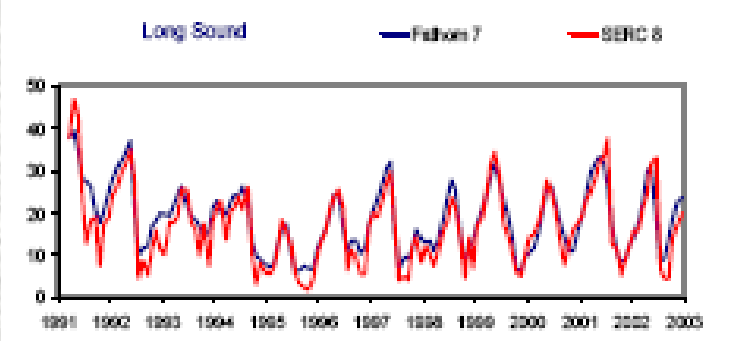
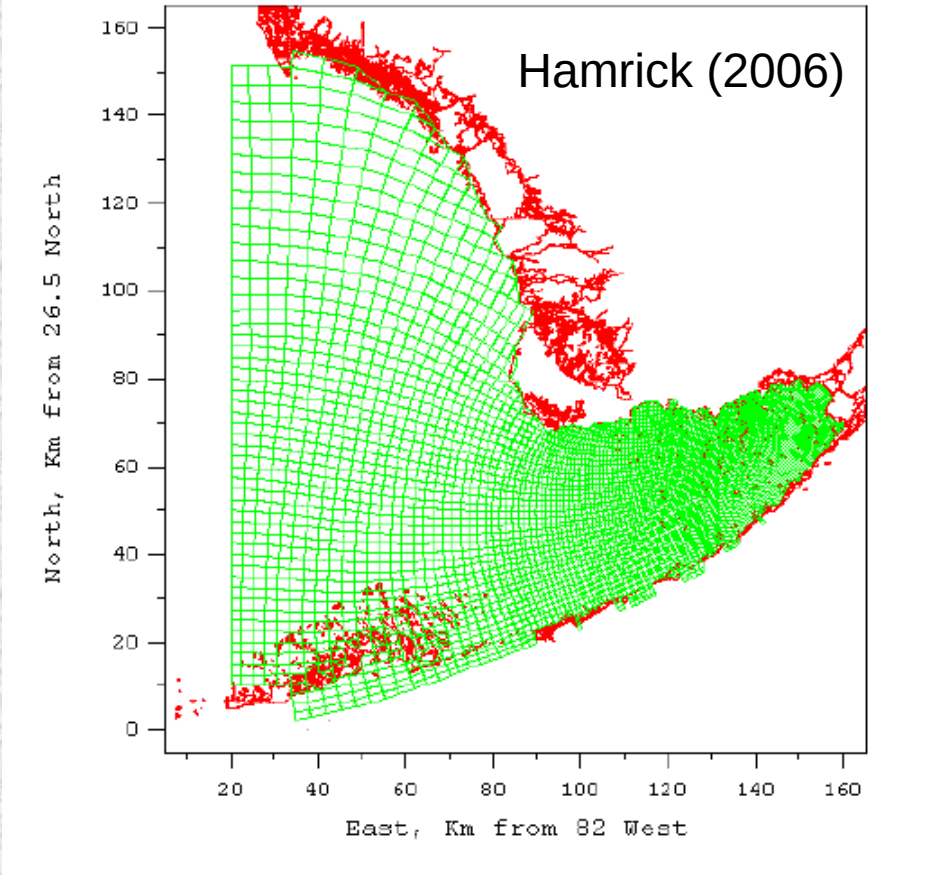




Coastal Salinity and Water Quality Simulations







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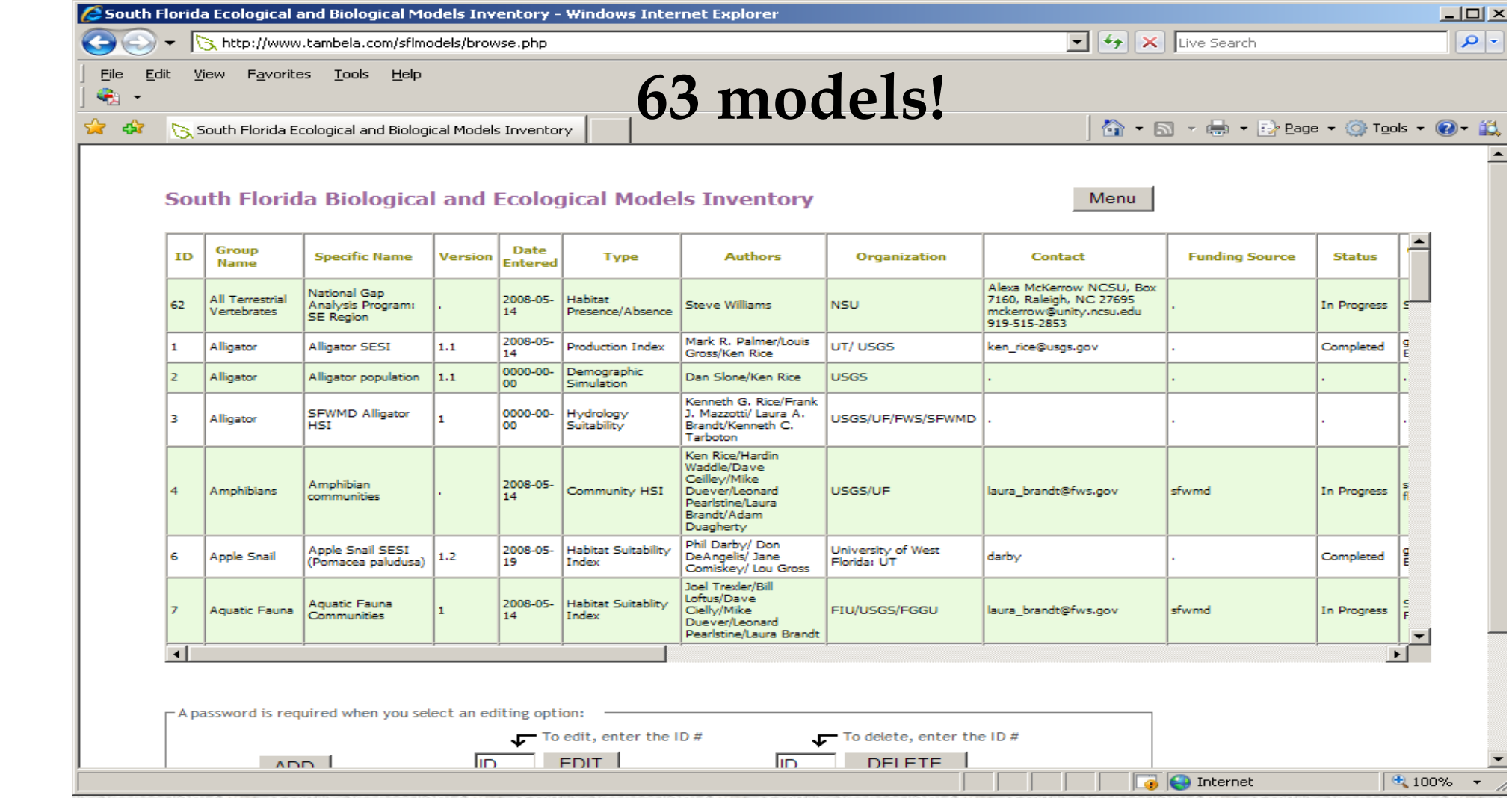

ID	Group Name	Specific Name	Version	Date Entered	Type	Authors	Organization	Contact	Funding Source	Status
62	All Terrestrial Vertebrates	National Gap Analysis Program: SE Region	.	2008-05-14	Habitat Presence/Absence	Steve Williams	NSU	Alexa McKerrow NCSU, Box 7160, Raleigh, NC 27695 mckerrow@unity.ncsu.edu 919-515-2853	.	In Progress
1	Alligator	Alligator SESI	1.1	2008-05-14	Production Index	Mark R. Palmer/Louis Gross/Ken Rice	UT/ USGS	ken_rice@usgs.gov	.	Completed
2	Alligator	Alligator population	1.1	0000-00-00	Demographic Simulation	Dan Slone/Ken Rice	USGS	.	.	.
3	Alligator	SFWMD Alligator HSI	1	0000-00-00	Hydrology Suitability	Kenneth G. Rice/Frank J. Mazzotti/ Laura A. Brandt/Kenneth C. Tarboton	USGS/UF/FWS/SFWMD	.	.	.
4	Amphibians	Amphibian communities	.	2008-05-14	Community HSI	Ken Rice/Hardin Waddle/Dave Ceilley/Mike Duever/Leonard Pearlstine/Laura Brandt/Adam Duagherty	USGS/UF	laura_brandt@fws.gov	sfwmd	In Progress
6	Apple Snail	Apple Snail SESI (Pomacea paludusa)	1.2	2008-05-19	Habitat Suitability Index	Phil Darby/ Don DeAngelis/ Jane Comiskey/ Lou Gross	University of West Florida: UT	darby	.	Completed
7	Aquatic Fauna	Aquatic Fauna Communities	1	2008-05-14	Habitat Suitablity Index	Joel Trexler/Bill Loftus/Dave Cielly/Mike Duever/Leonard Pearlstine/Laura Brandt	FIU/USGS/FGGU	laura_brandt@fws.gov	sfwmd	In Progress

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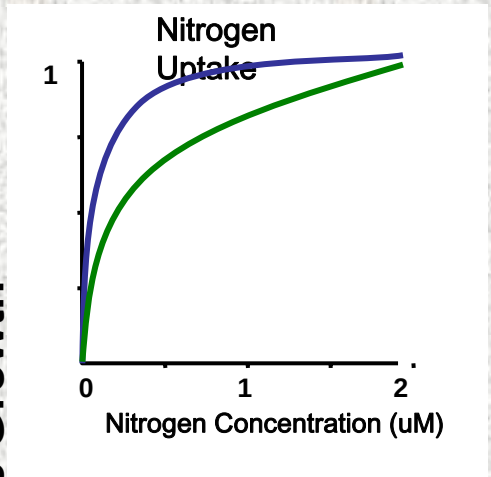
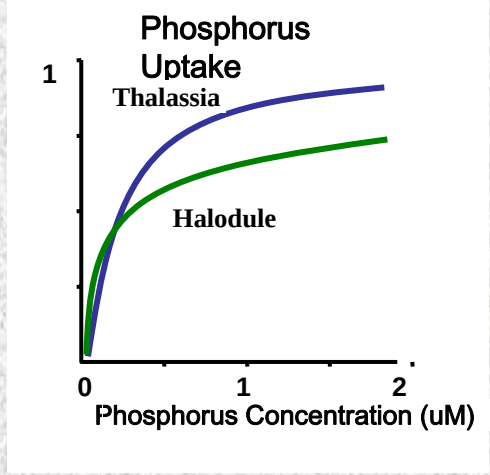
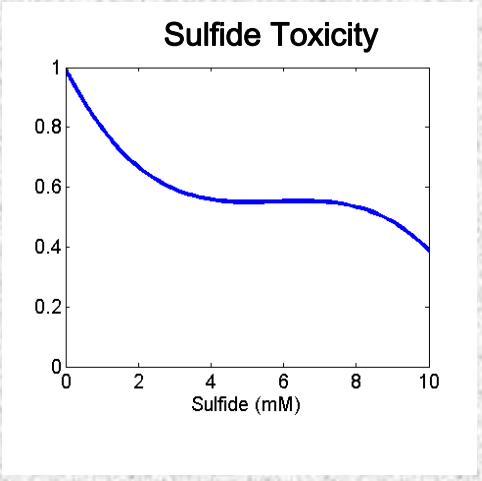
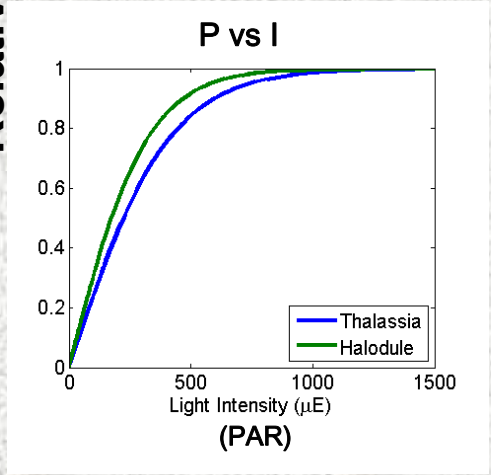
Environmental effects on seagrass growth

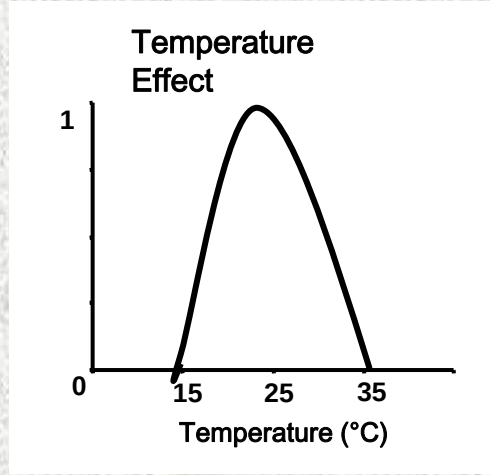
Relative Growth

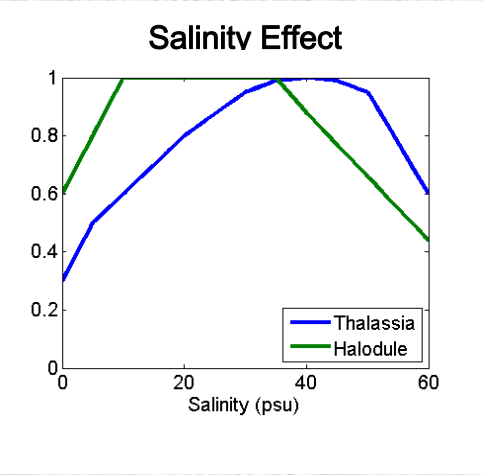




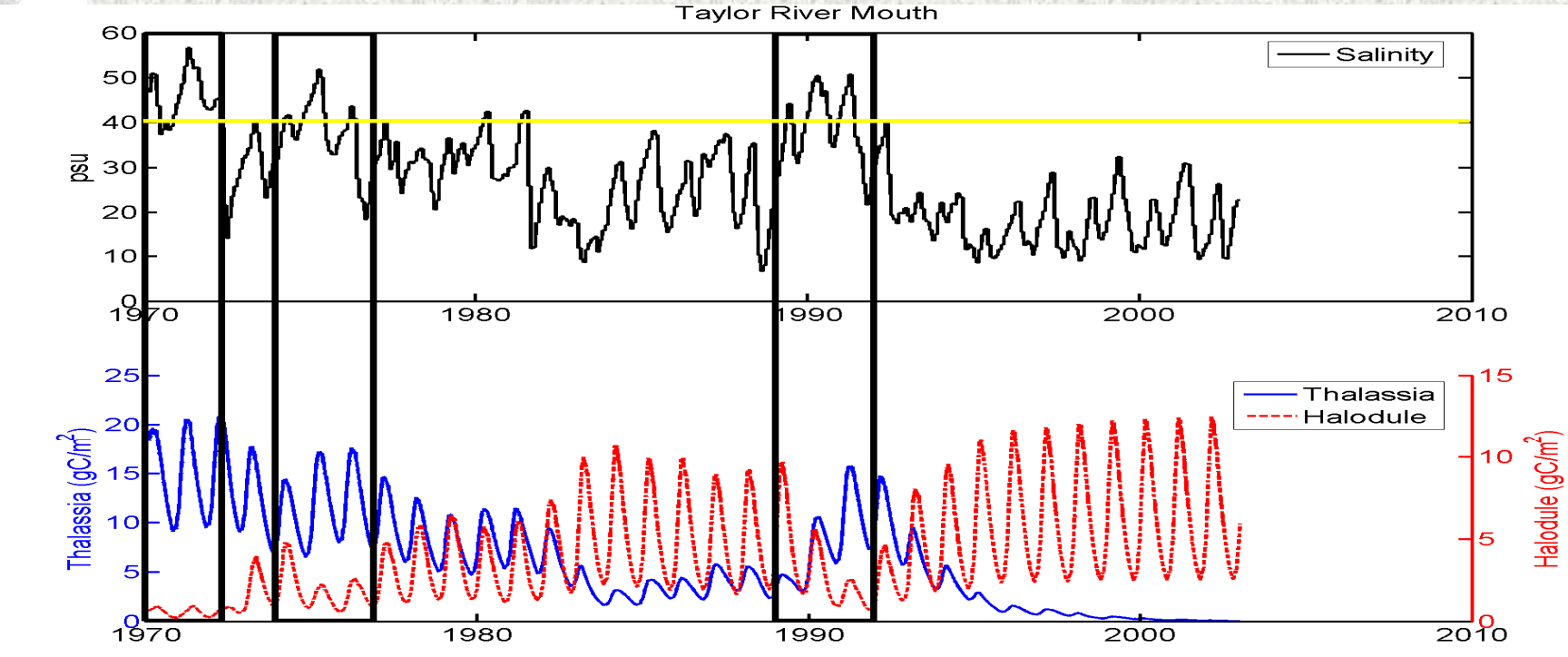




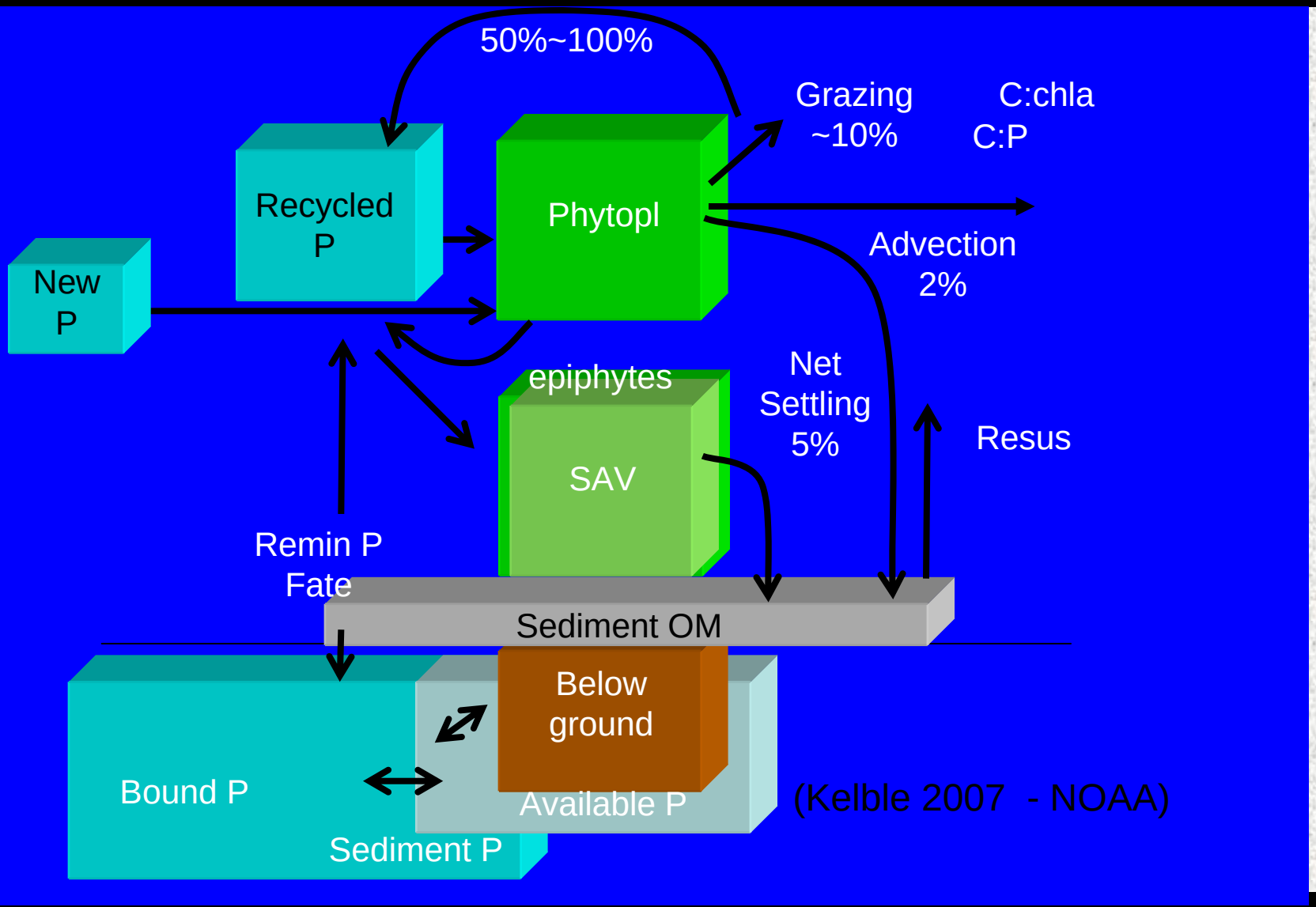




Changes in seagrass productivity with changing salinity



Salinity output from FATHOM Cosby et al. (2005)
SAV from Madden et al. (2006)


50%~100%
Grazing
~10%
C:chla
C:P
Recycled
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Phytopl
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Advection
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epiphytes
Net
Settling
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SAV
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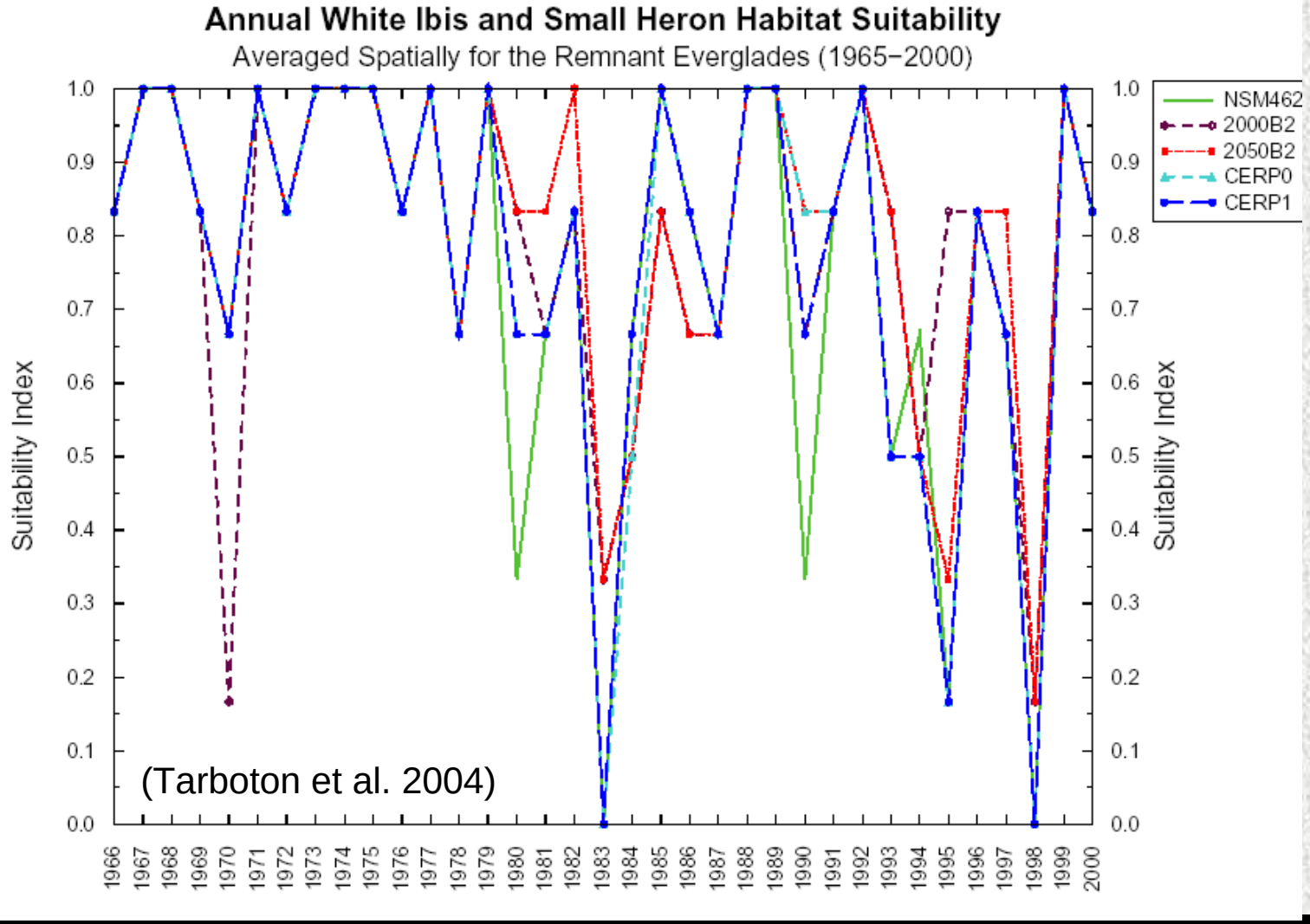
Below
ground
Bound P
Available P
Sediment P
(Kelble 2007 - NOAA)


Annual White Ibis and Small Heron Habitat Suitability
Averaged Spatially for the Remnant Everglades (1965–2000)
Suitability Index
Suitability Index
NSM462
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2050B2
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(Tarboton et al. 2004)

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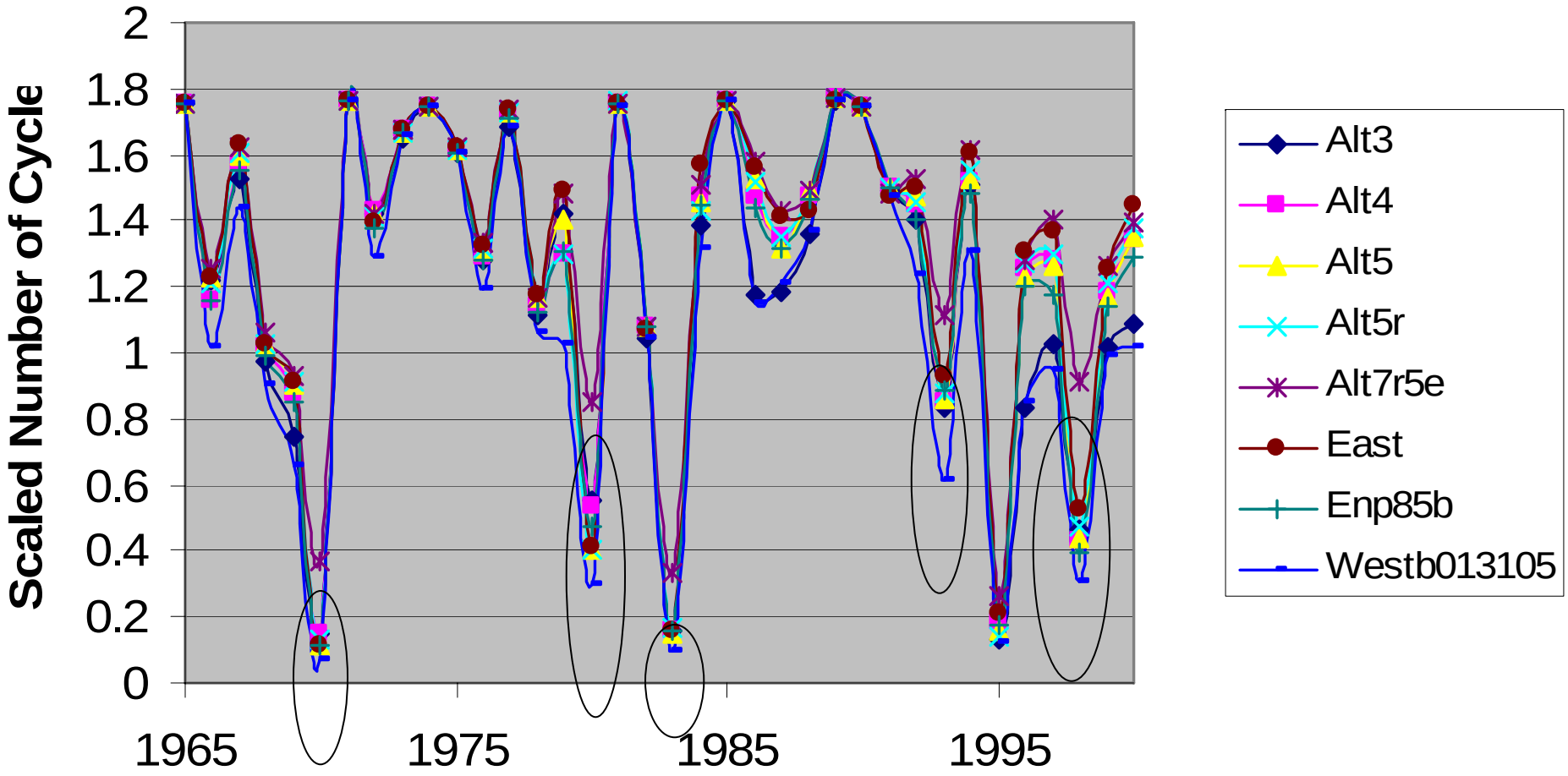
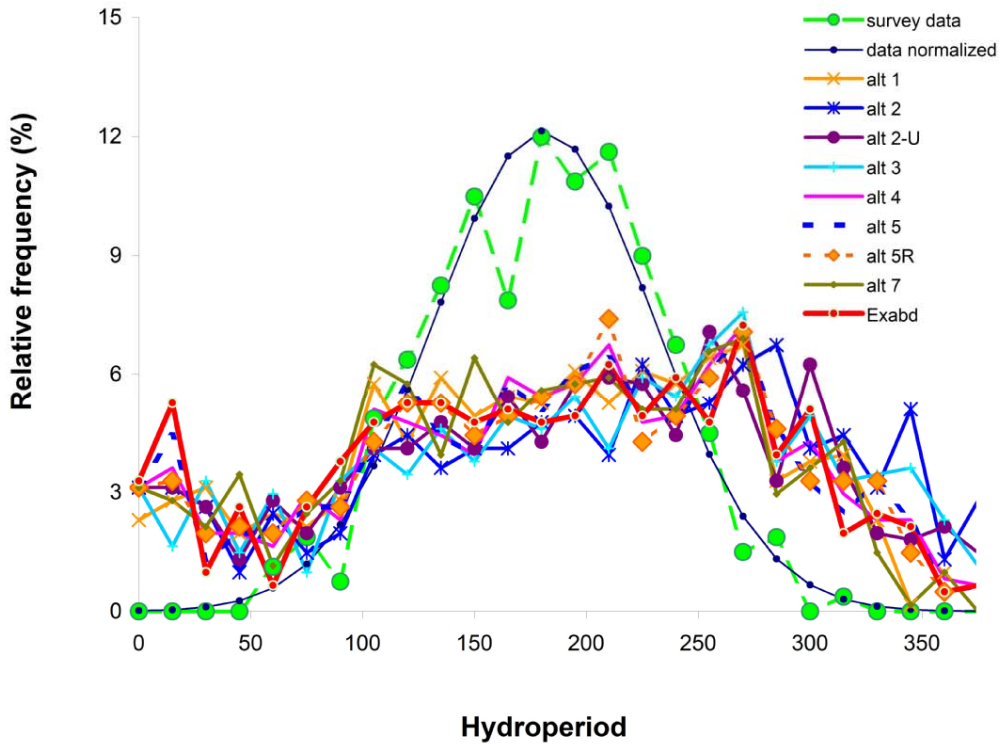


(Donalson 2006)

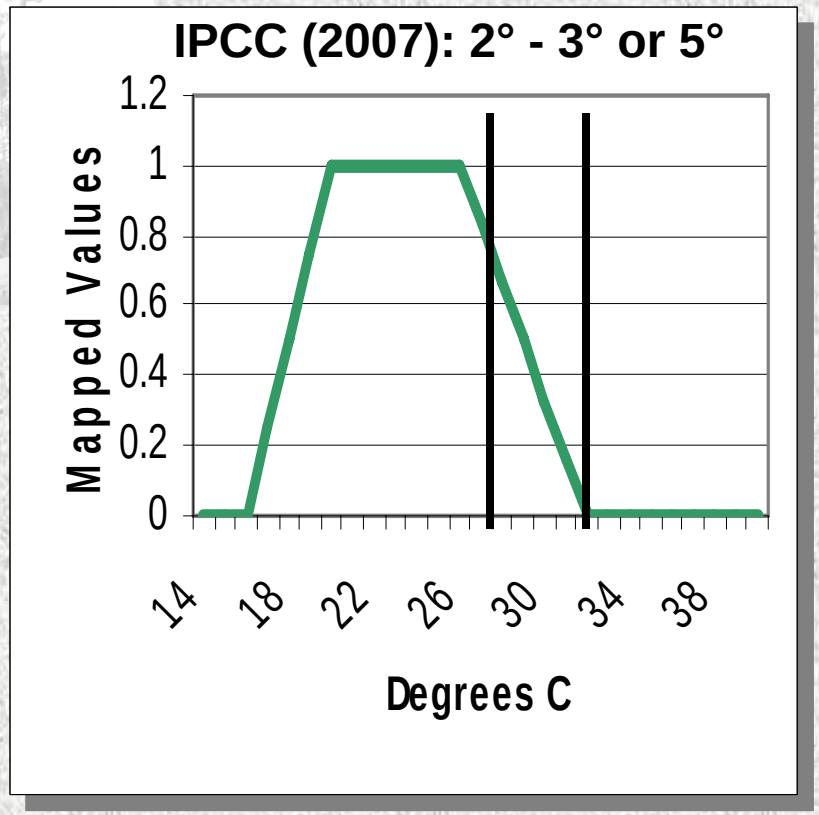


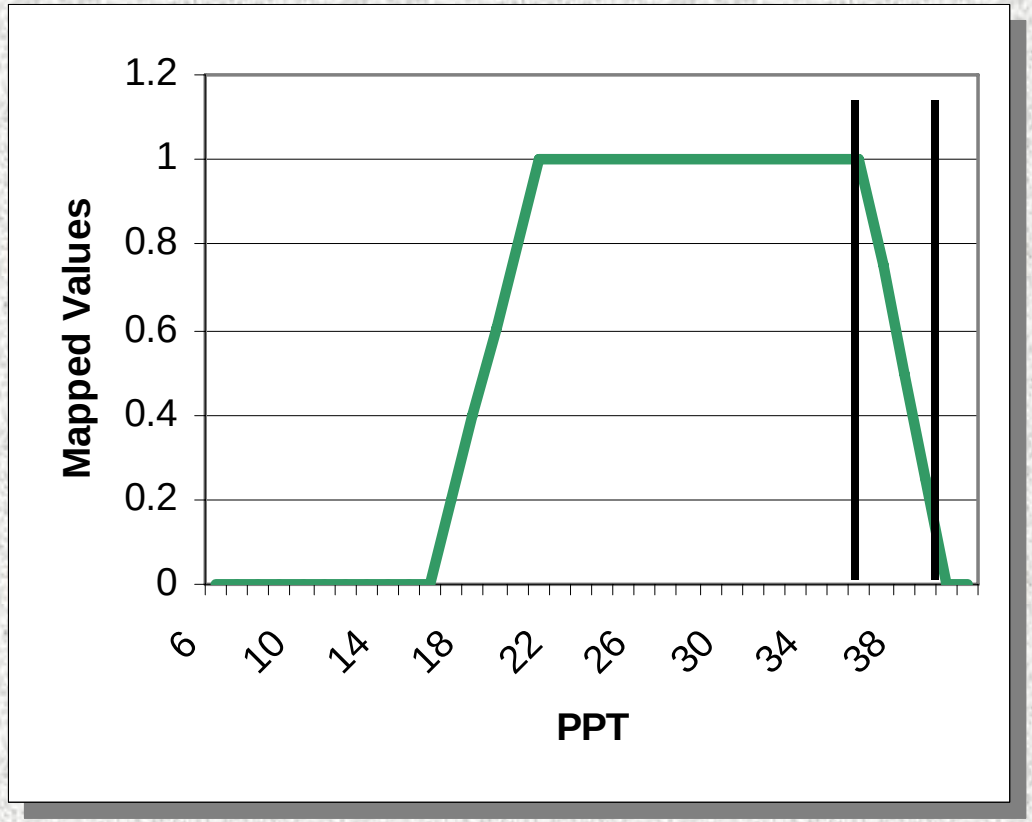
Hydroperiod Frequency Distribution: Area A

PrairieHydroperiod9ScenariosMAP54200702quan5Yr6Pop.xls 3/8/20074:49 PM

(Dong and Donalson 2006)

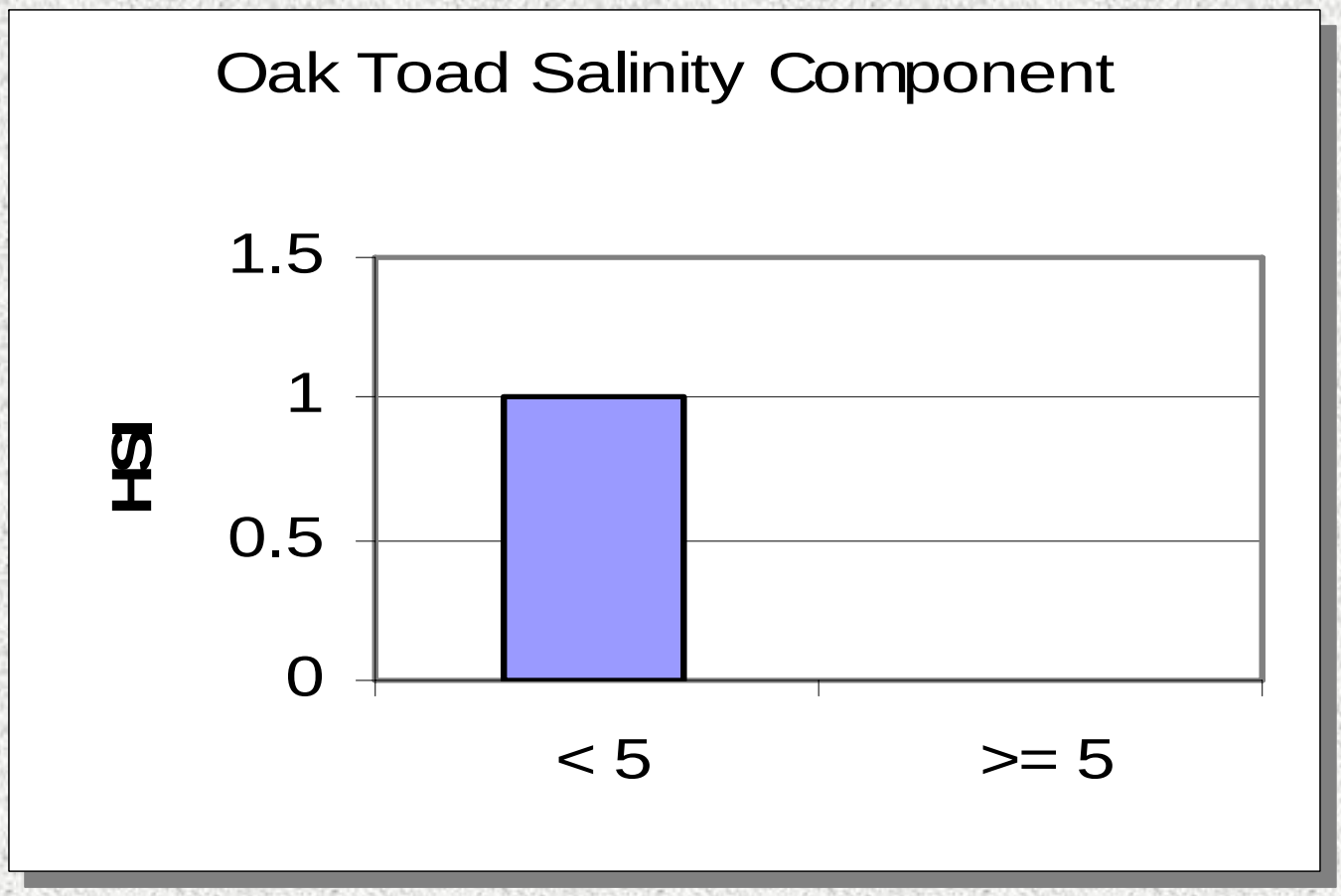
Sensitivity to temperature and salinity





Spawning Female Blue Crabs (Barnes et al. 2006)

The toads are running…



Additional Modeling Needs

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

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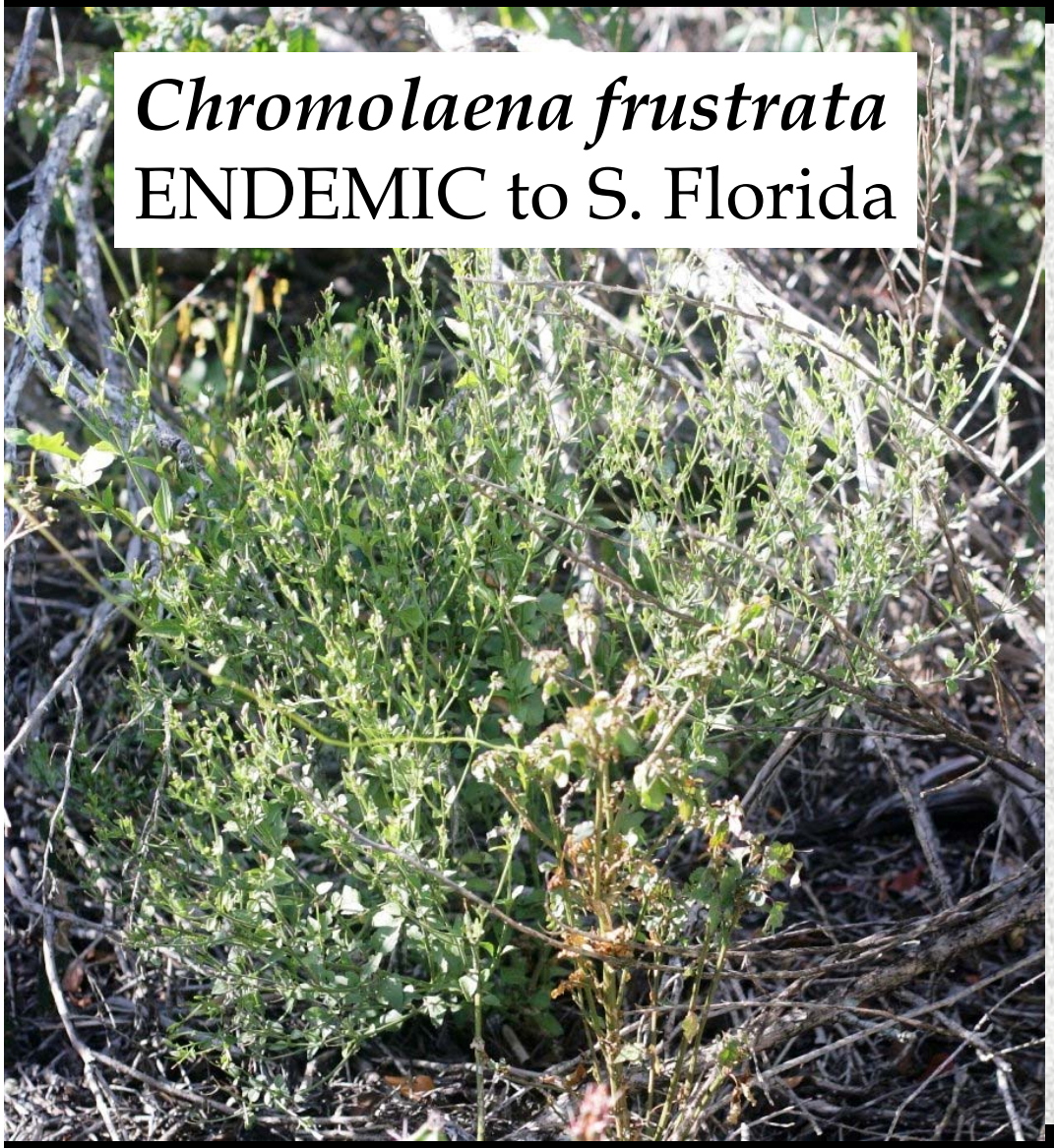

Chromolaena frustrata
ENDEMIC to S. Florida

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

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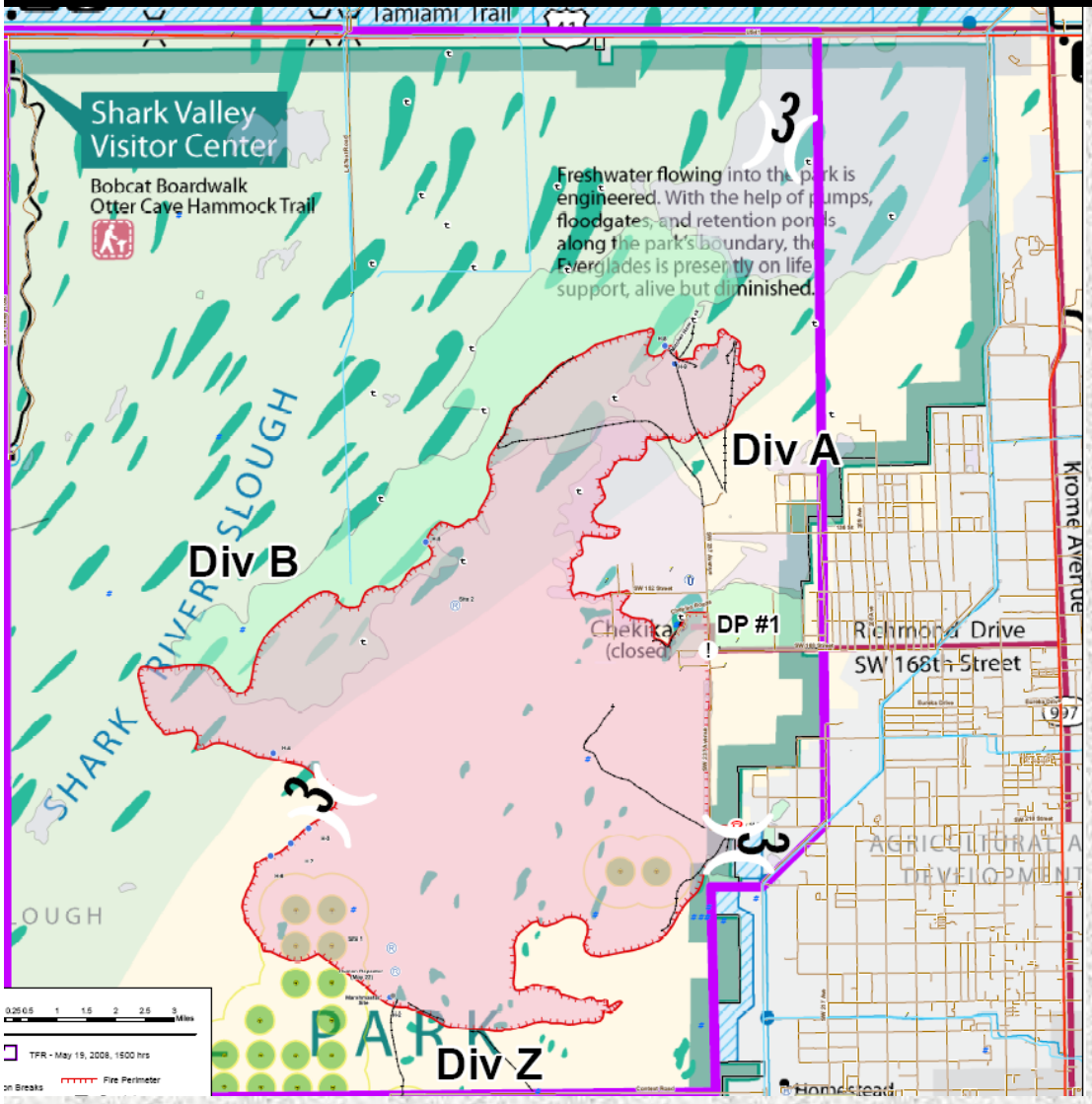

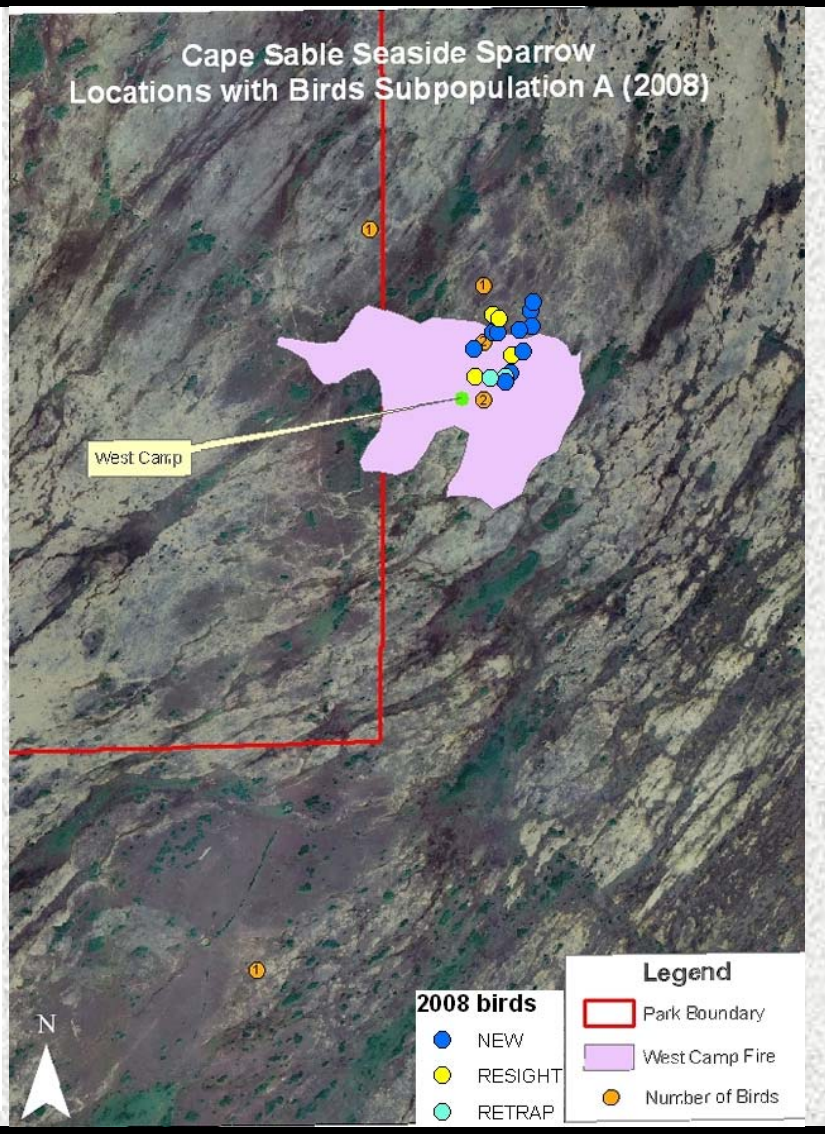

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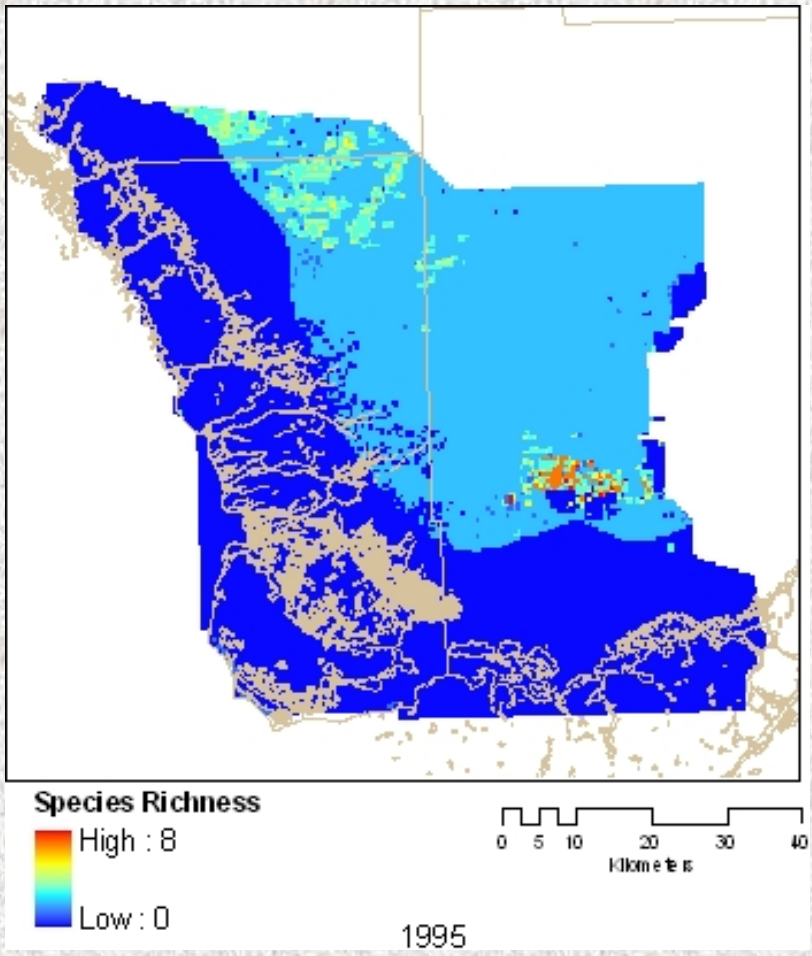
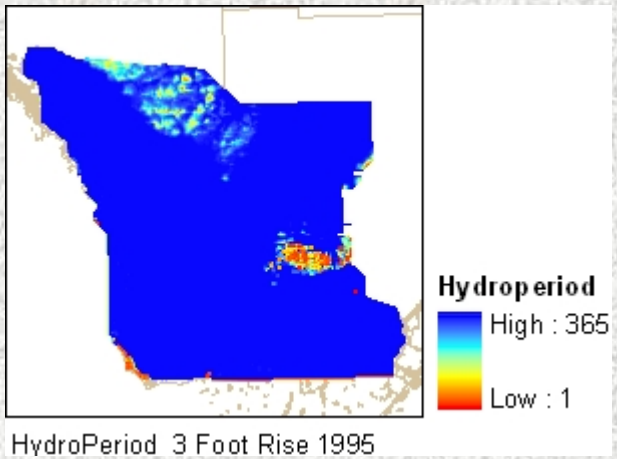
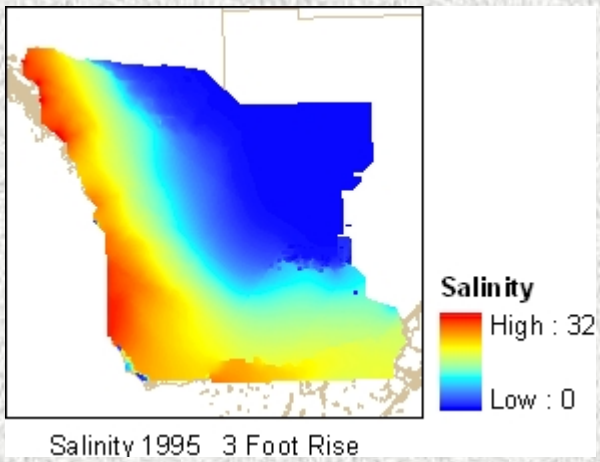
High ground – future biodiversity hotspots…







(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