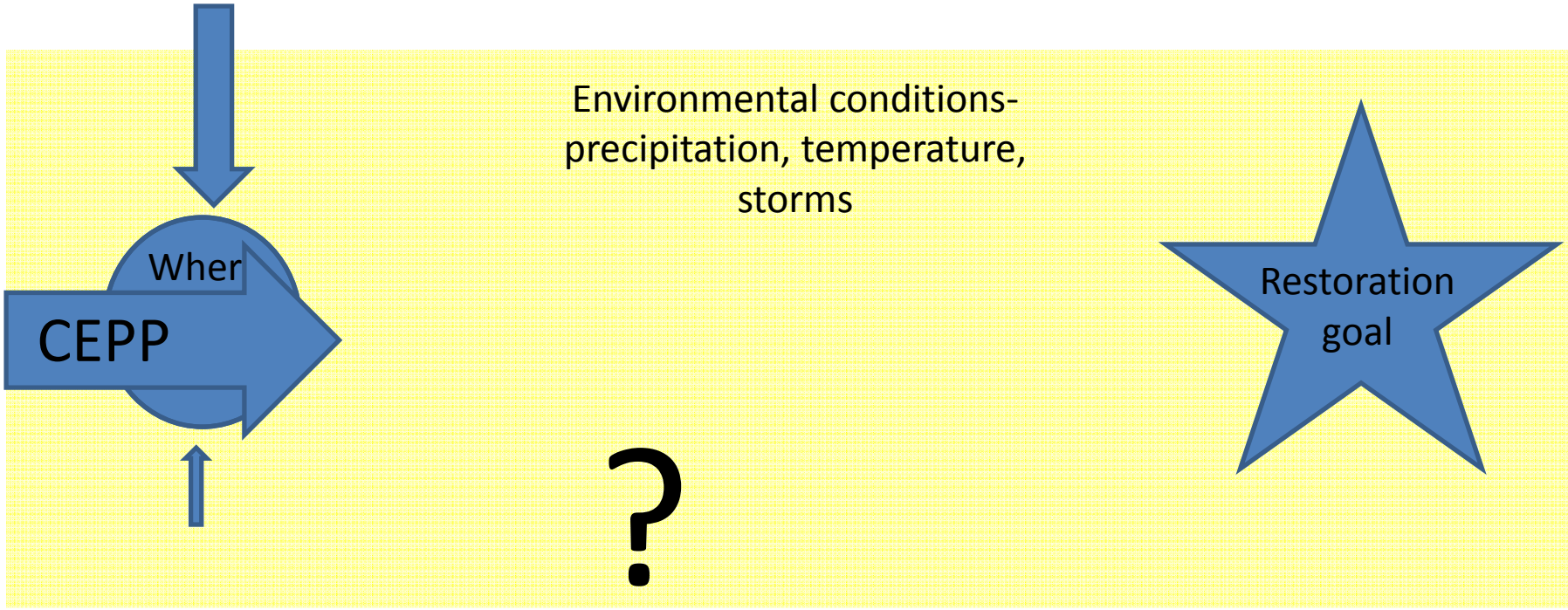
How do we know if we are going in the right direction? Are we there yet?

Crocodilian Ecological Thresholds Specific to Central Everglades Planning Project (CELPP)

Laura A. Brandt and Frank J. Mazzotti

Outline

- Laura's view of the world
- Framework
- Example using alligator body condition


Wher
CEPP
Environmental conditions-
precipitation, temperature,
storms
?
Restoration
goal

Challenges

- Natural variation
- Spatial scale
- Response time
- Uncertainty

- Resources
- Integration
- Evaluations are approximations
- Making linkages between evaluation tools and reality
- Uncertainty

What do we need to know?

- W
- R
- D

Status/Goals and Objectives

- Pre-project monitoring
- Conceptual ecological models/cause effect studies

- A
- H
  affect drivers of change and attributes
- How actions do affect d
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Planning and Evaluation

(drivers and attributes)

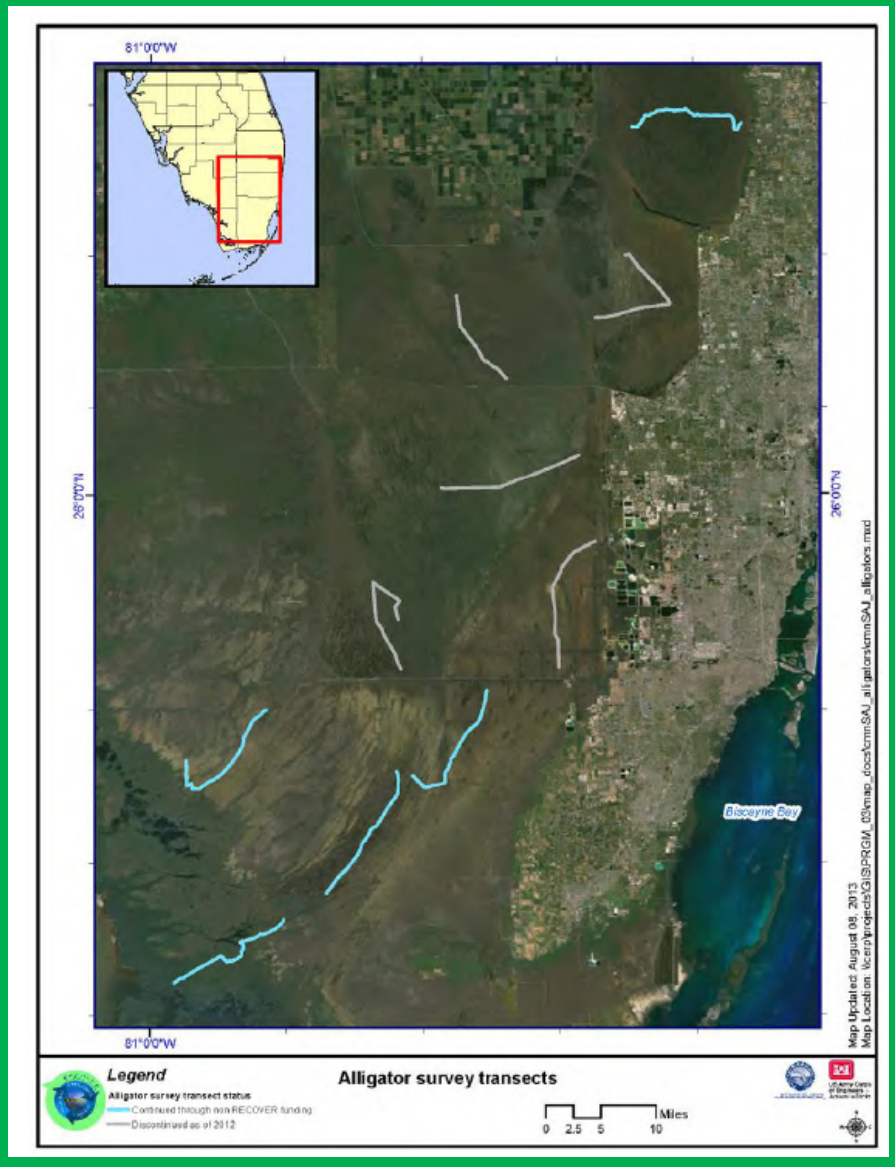
- Monitoring and assessment

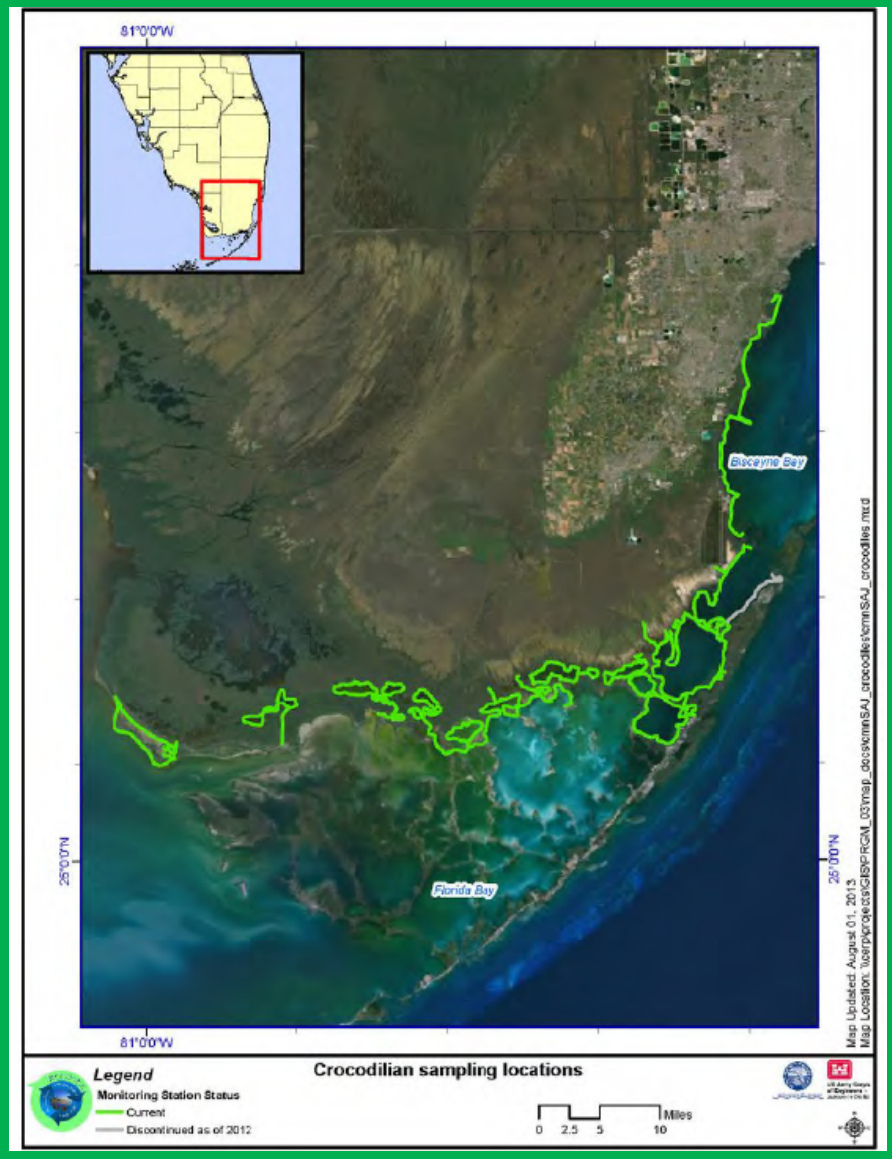
Monitoring and Assessment

ent of attributes

Example using Crocodilians

Status


81°0'0"W
25°0'0"N
26°0'0"N
Biscayne Bay
Legend
Alligator survey transect status
Continued through non-RECOVER funding
Discontinued as of 2012
Alligator survey transects
0 2.5 5 10
Miles
Map Updated: August 08, 2013
Map Location: \\corp\projects\GIS\PRGM_03\mxp_docs\cmnSAJ_alligators.mxd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Current
Discontinued as of 2012
Crocodilian sampling locations
0 2.5 5 10
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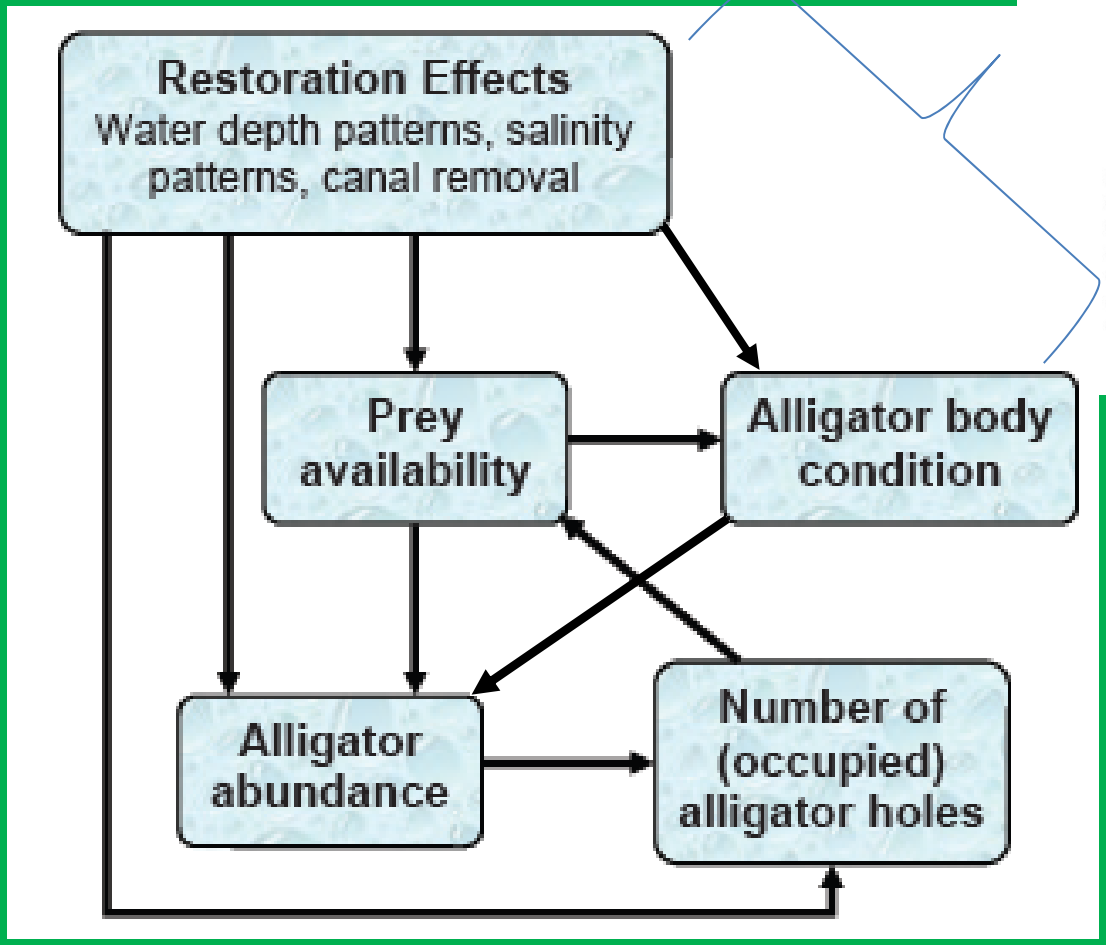
Map Updated: August 01, 2013
Map Location: \\corp\projects\GIS\PRGM_03\mxp_docs\cmnSAJ_crocodiles.mxd

Goals and Objectives
Crocodilian Performance Measures

Metric	**Restoration Goal**
• Alligators	
– Relative Density	>1.7 alligators/km
– **Body Condition**	>**2.27 (Fulton's K)**
– Alligator Hole Occupancy	>70%
• Crocodiles	
– Growth	>0.15 cm/day
– Survival	>0.85 (mean monthly survival)

Goals and Objectives Conceptual Ecological Models

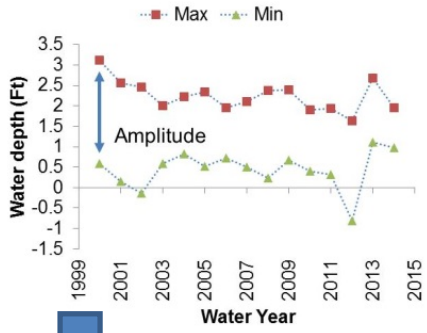


What hydrologic factors influence body condition?

Generalized linear mixed effects model

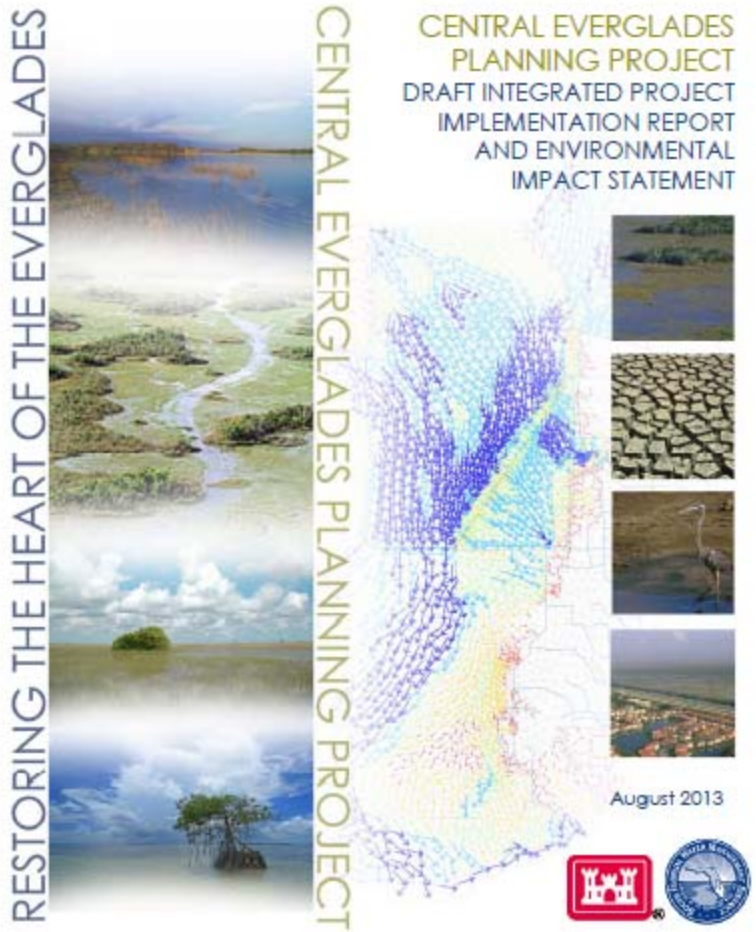
Random Effect
- Water Year
- Area

Fixed Effects
- Amplitude
- Hydroperiod
- Days since the last dry down
- Days in the last dry down
- Average spring water depth
- Average fall water depth



Predictions about body condition given expected or actual hydrology

Planning and Evaluation



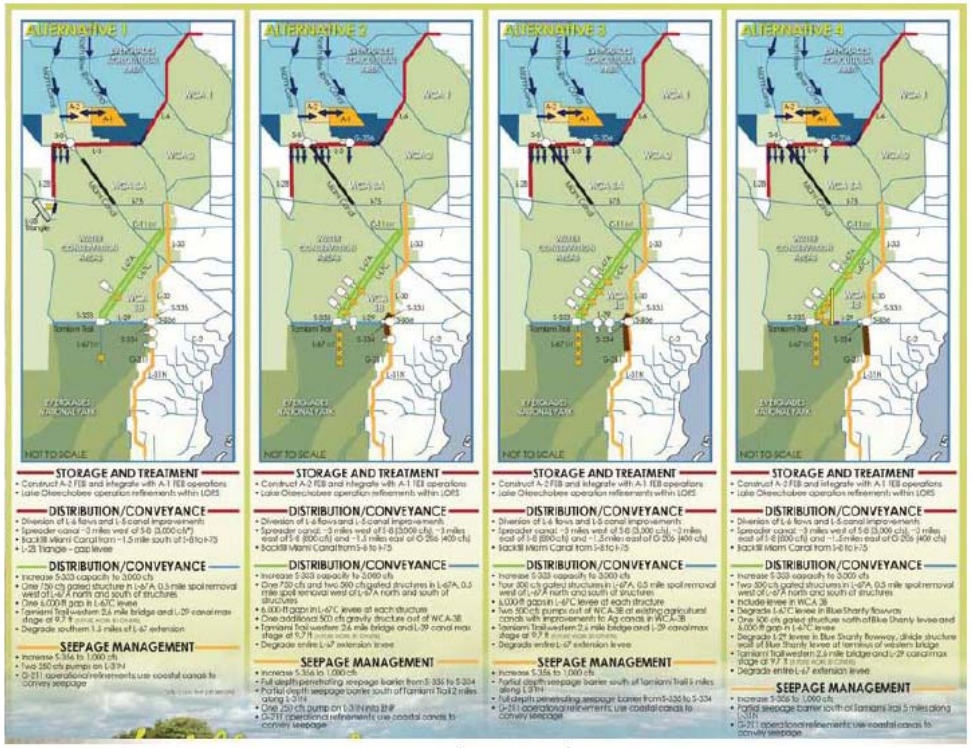
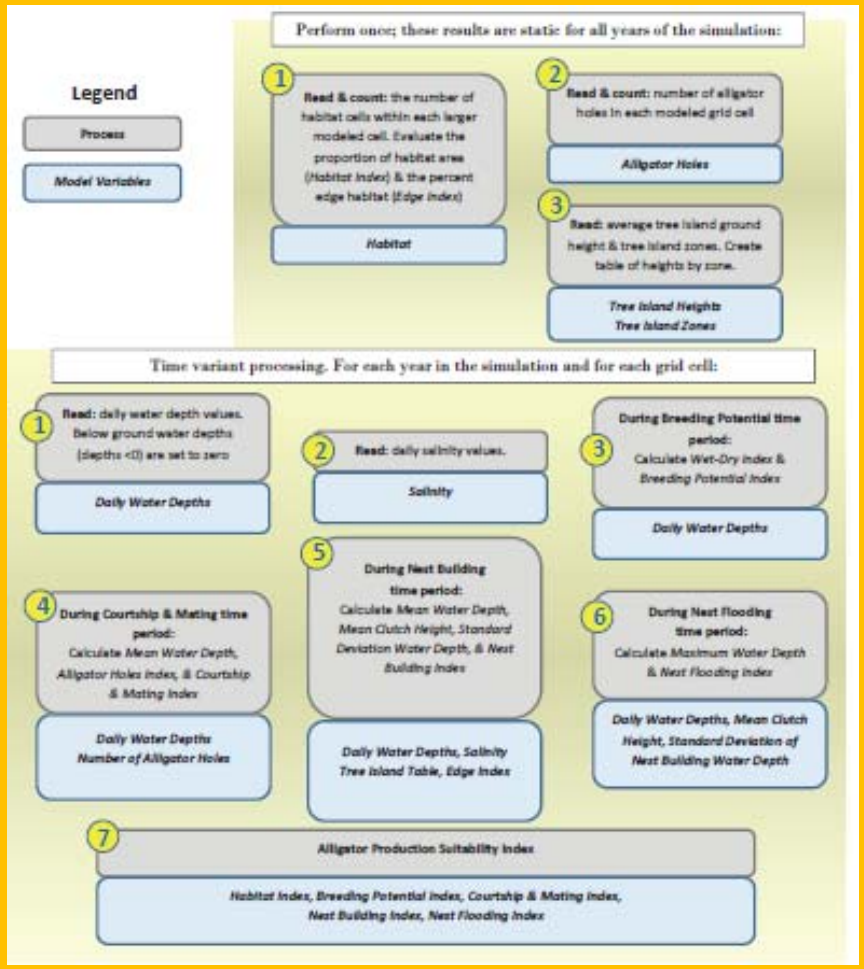


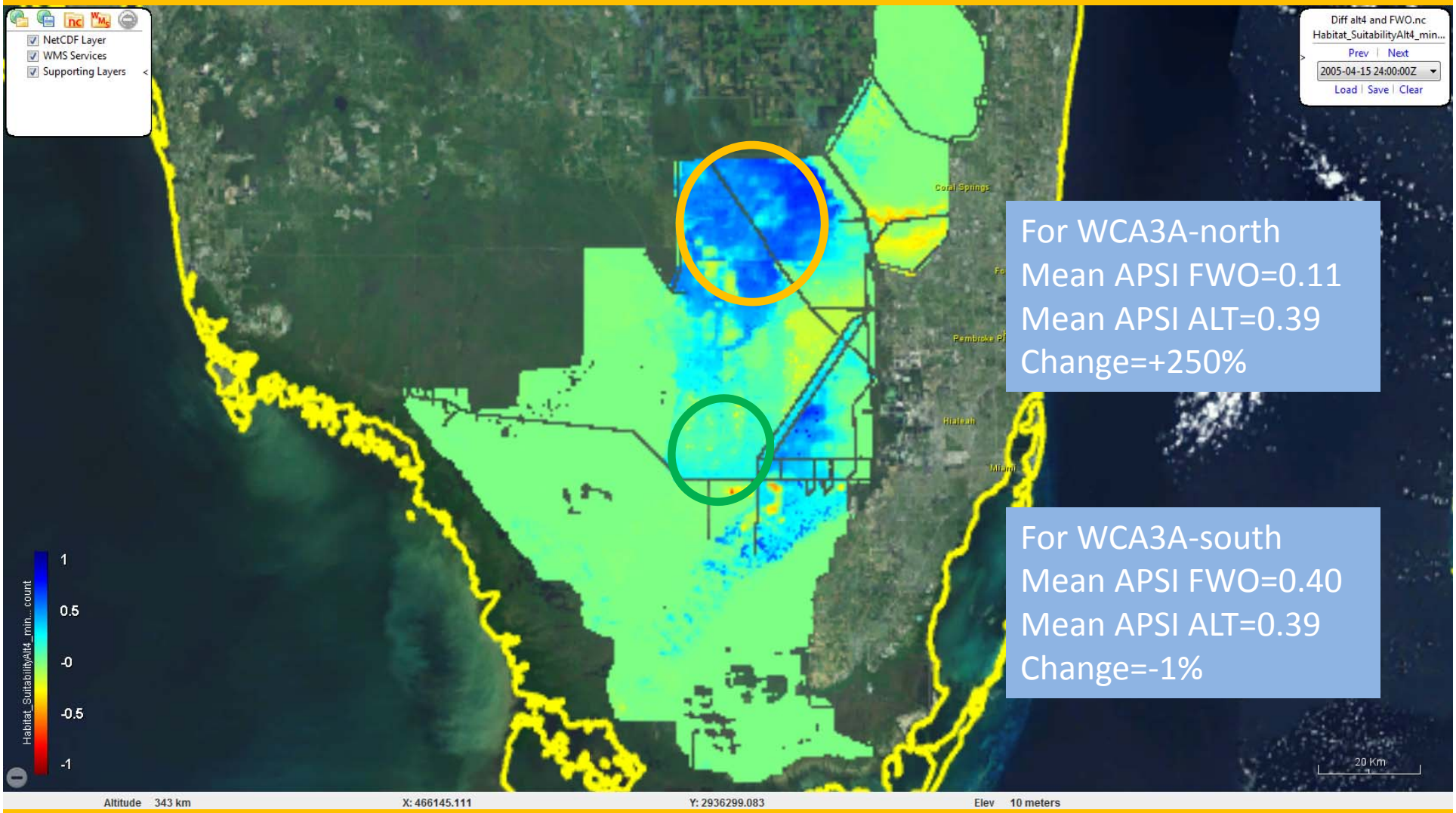
Figure 2. Alternative Plans

Modeled hydrology drives ecological planning tools

Ecological Planning Tool



Alligator Production Suitability Index



Large positive change in Alligator Production Index in NW WCA3A

Little change in Alligator Production Index in SW WCA3A

Expectations

- Little change in body condition of animals in WCA3A south
- Big change in body condition of animals in WCA3A north

What is big?

Use long-term monitoring data to develop statistical models

What hydrologic factors influence body condition?

Generalized linear mixed effects model

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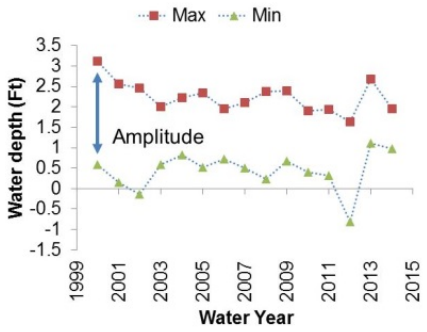


Predictions about body condition given changes in hydrology

Body Condition = 1.81 + (0.040)Sph20 + (-0.095)Fallh20 + (0.462)AMP + (-0.255)Amp*Fallh20

- Average spring water depth
- Average fall water depth
- Amplitude
- Interaction of amplitude and average fall water depth

Expected or Actual Hydrology

Take Action!

What did we get?

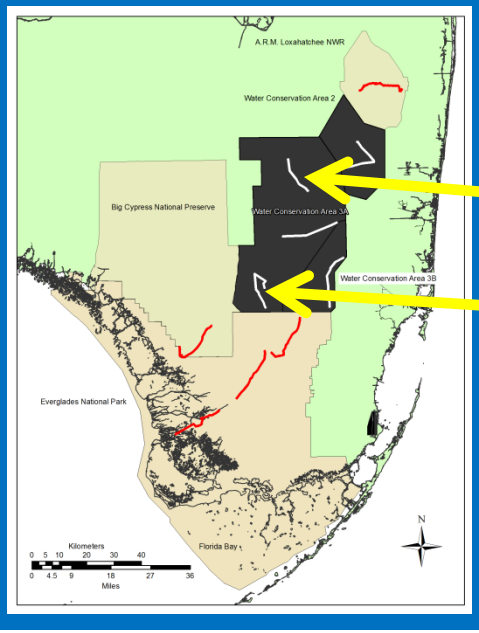
Was it what we expected?

Monitoring and Assessment

- Drivers
  - What hydrology resulted from the action?
    - Spring water depth
    - Fall water depth
    - Amplitude
    - Interaction of amplitude and average fall water depth
- Attributes
  - What is the alligator body condition after the action?

Monitoring and Assessment
Compare predictions to reality

- Given the resulting hydrology what do we expect alligator body condition to be?
- Compare to actual values and restoration goal of >2.27



	Average 2000-2012	Example predicted	Example measured
NW WCA3A	2.18±0.08	2.26	2.23±0.10
SW WCA3A	2.15±0.08	2.16	2.14±0.14

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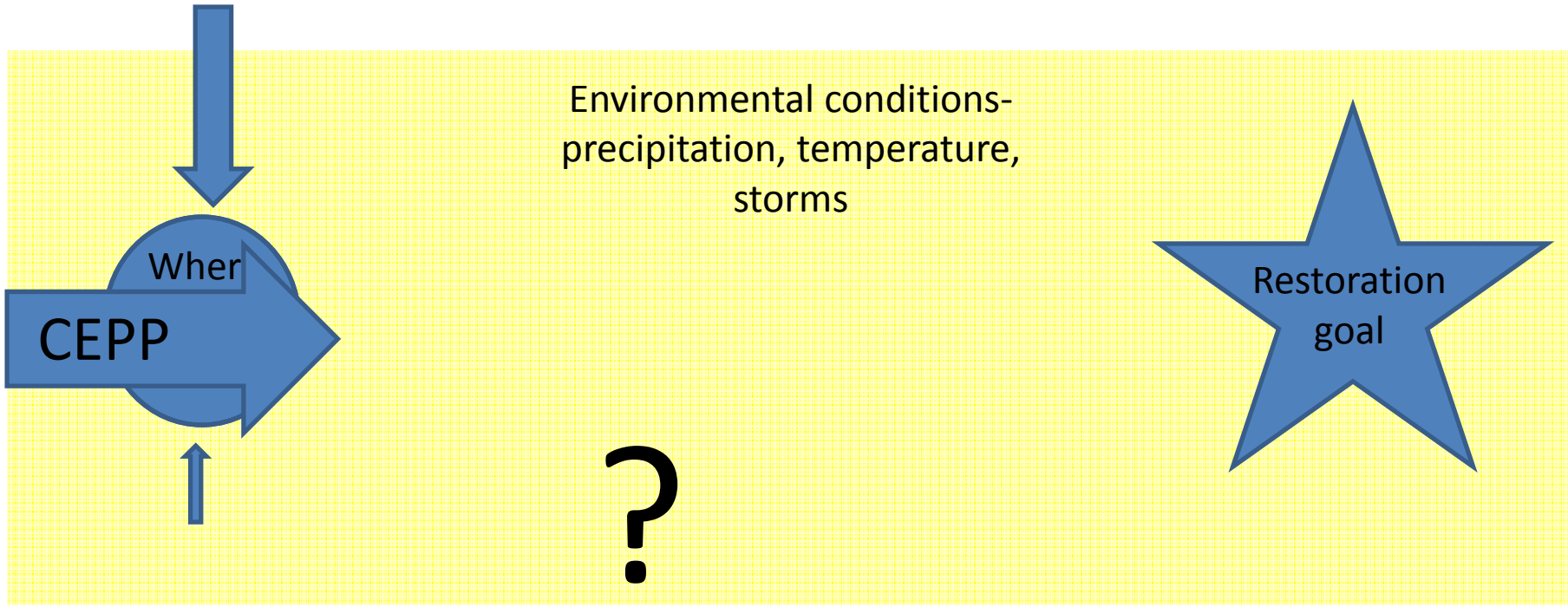
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In memory of Rafael G. Crespo, Jr