Endangered Species Habitat Restoration

U. S. Forest Service Science Forum

March 29-30, 2010

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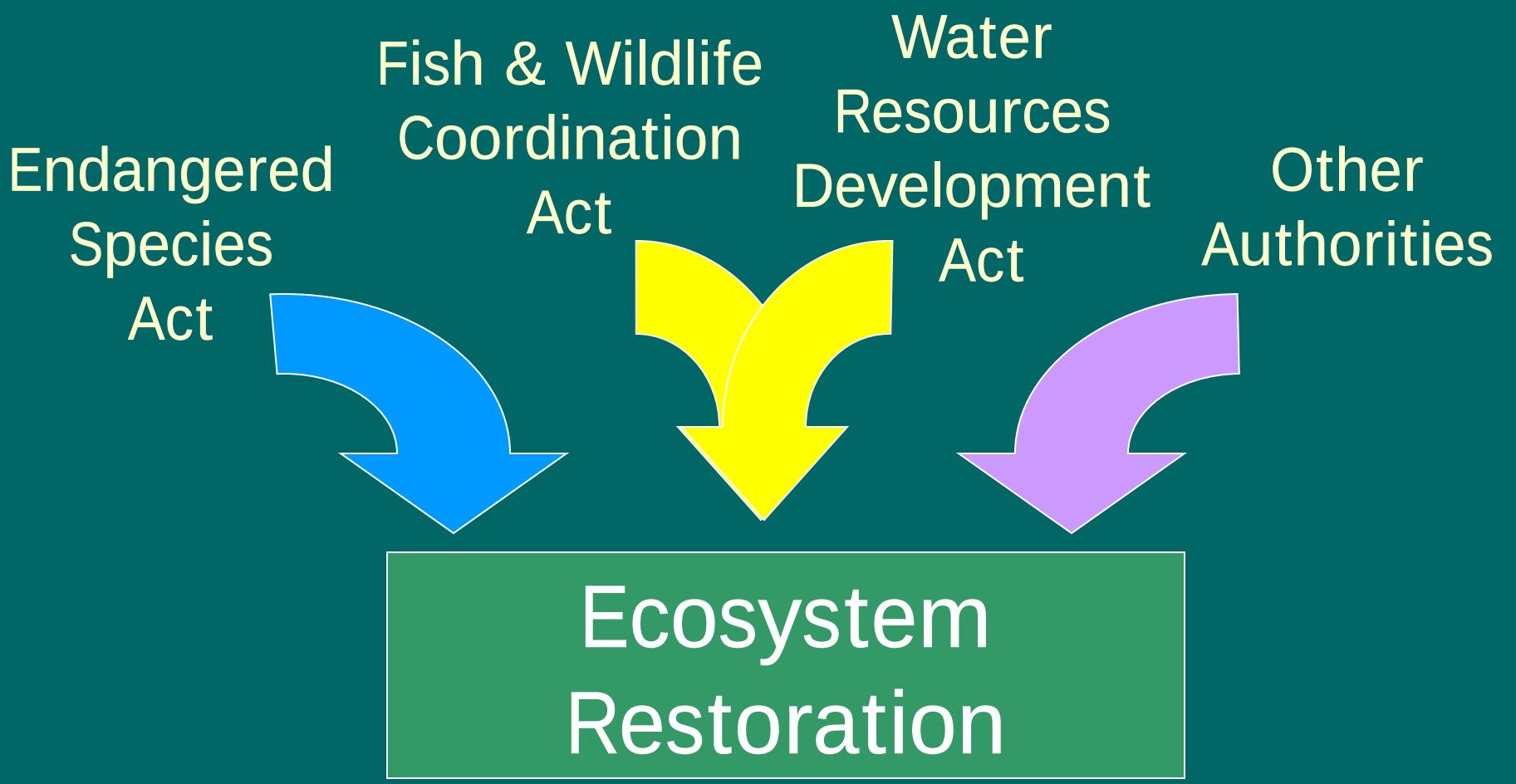
Some Take Home Messages

- Consider new ways of thinking about recovery & restoration
- Conservation partnerships are more important than ever
- Ecosystems are dynamic
- Sciences, Models, PMs, Monitoring Plans evolve
- Develop new tools for daily evaluations to support decisions
- Plan restoration to weather change

Integrating the Authorities



Ecosystem Restoration in South Florida

Covers:

- Identifies hundreds of conservation partners
- 19 counties
- 25,000 square miles
- 16 million acres
- 3 major watersheds
  -Greater Everglades

Habitat for:

- 68 Federally listed species
- 13 candidate species
- 23 natural ecological communities.

http://www.fws.gov/endangered/

Conceptual Model

Jeopardy - Adverse Modification

Condition of:

Species

-population

-numbers

-metapopulations

-demographics

-range

Habitat

-quality

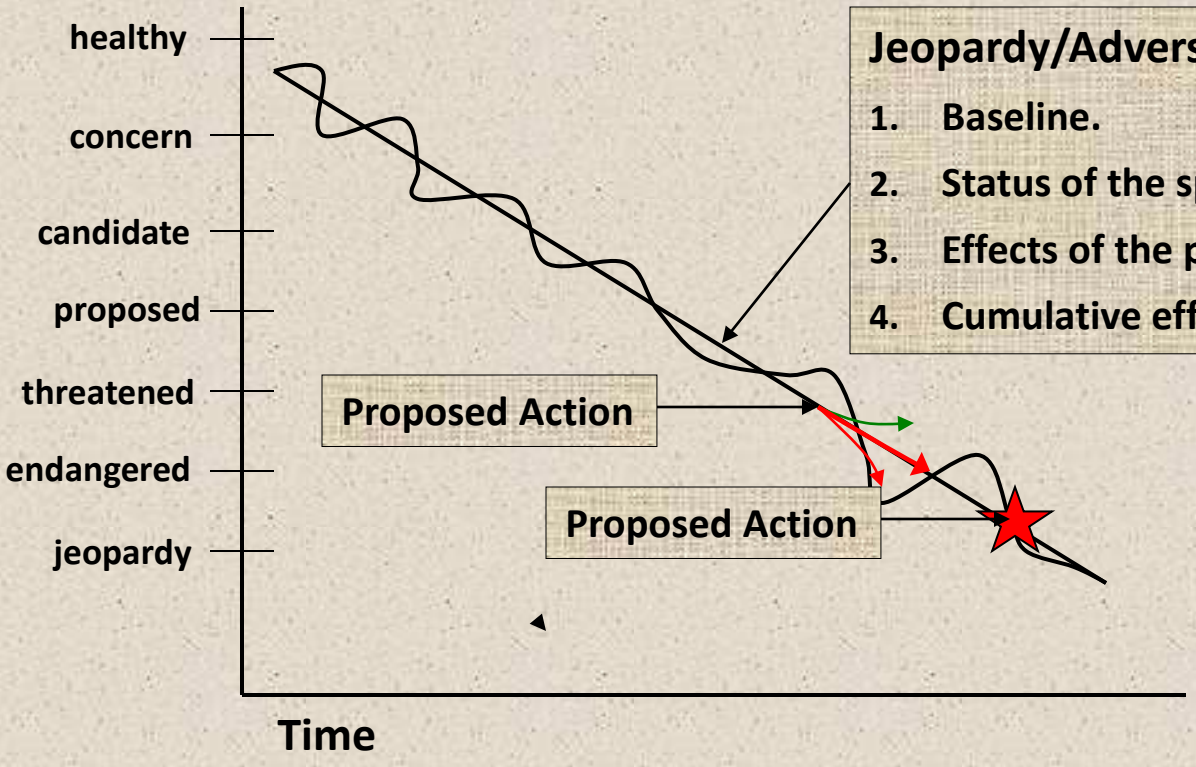
-quantity

-pattern

-distribution

Critical Habitat

-Primary Constituent Elements



Jeopardy/Adverse Modification:

1. **Baseline.**
2. **Status of the species.**
3. **Effects of the proposed action.**
4. **Cumulative effects.**

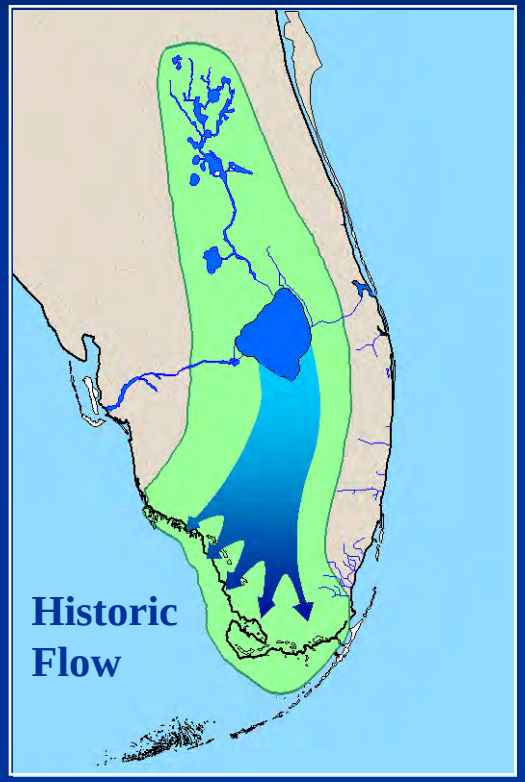
1. Space. 2. Food, water, air, light, minerals. 3. Cover and shelter. 4. Sites for breeding, reproducing, rearing off-spring, germination, seed dispersal. 5. Habitat representative of historic geographical or ecological distribution.

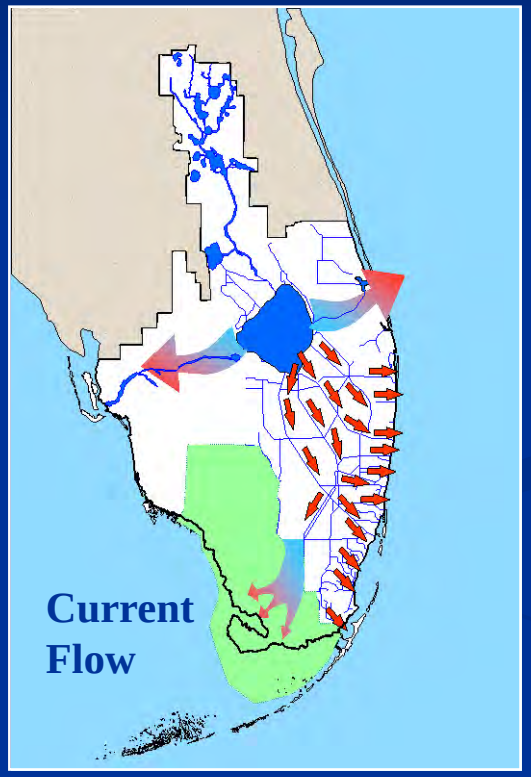
Everglades Restoration

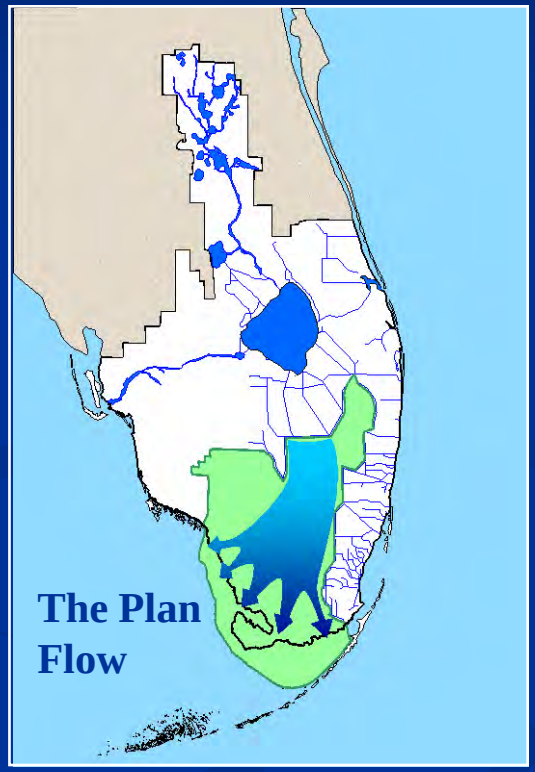
Restore and maintain biodiversity of the natural communities

Restore natural hydrology
quality, quantity,
timing, distribution

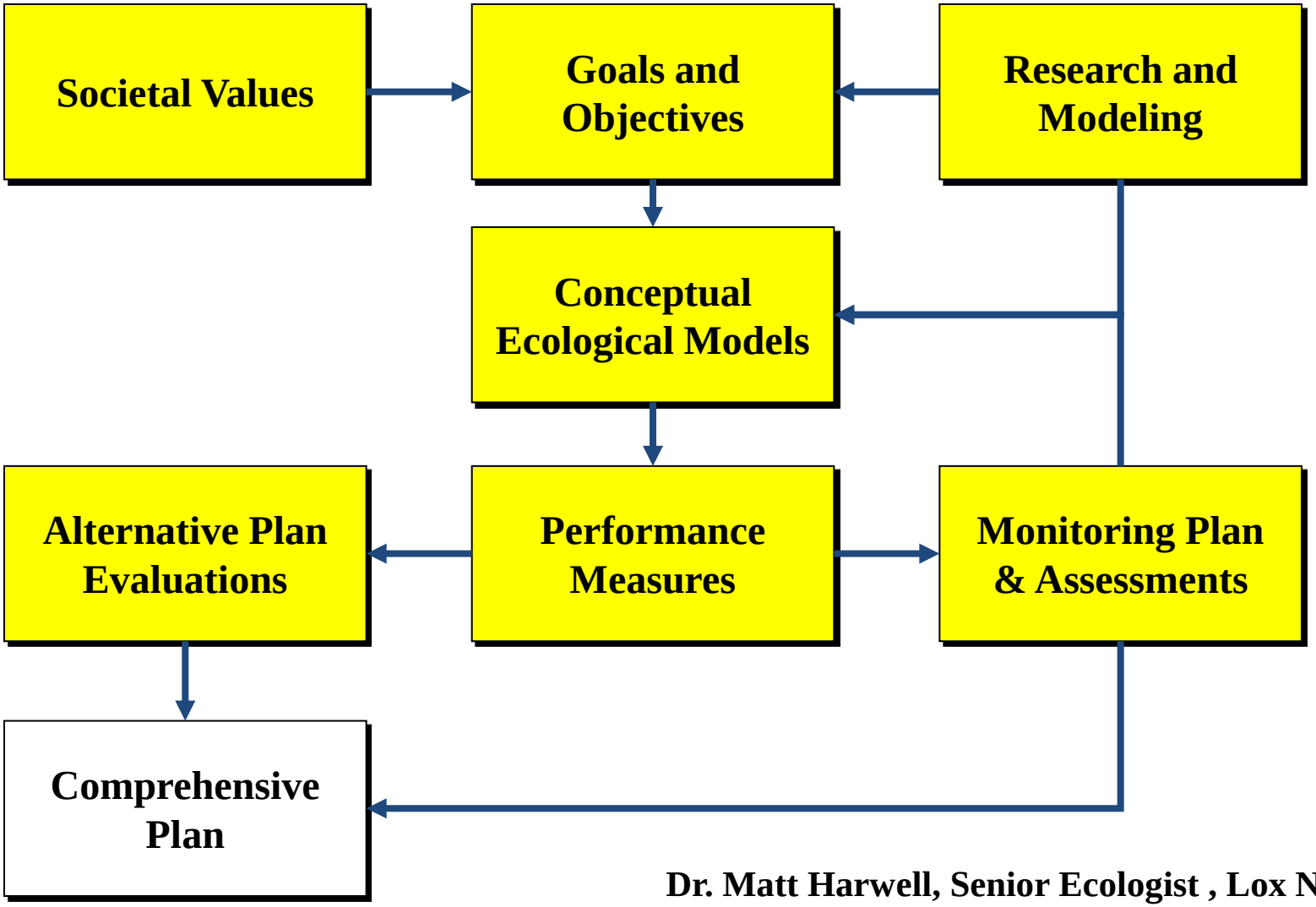
WATER FLOW PATTERNS







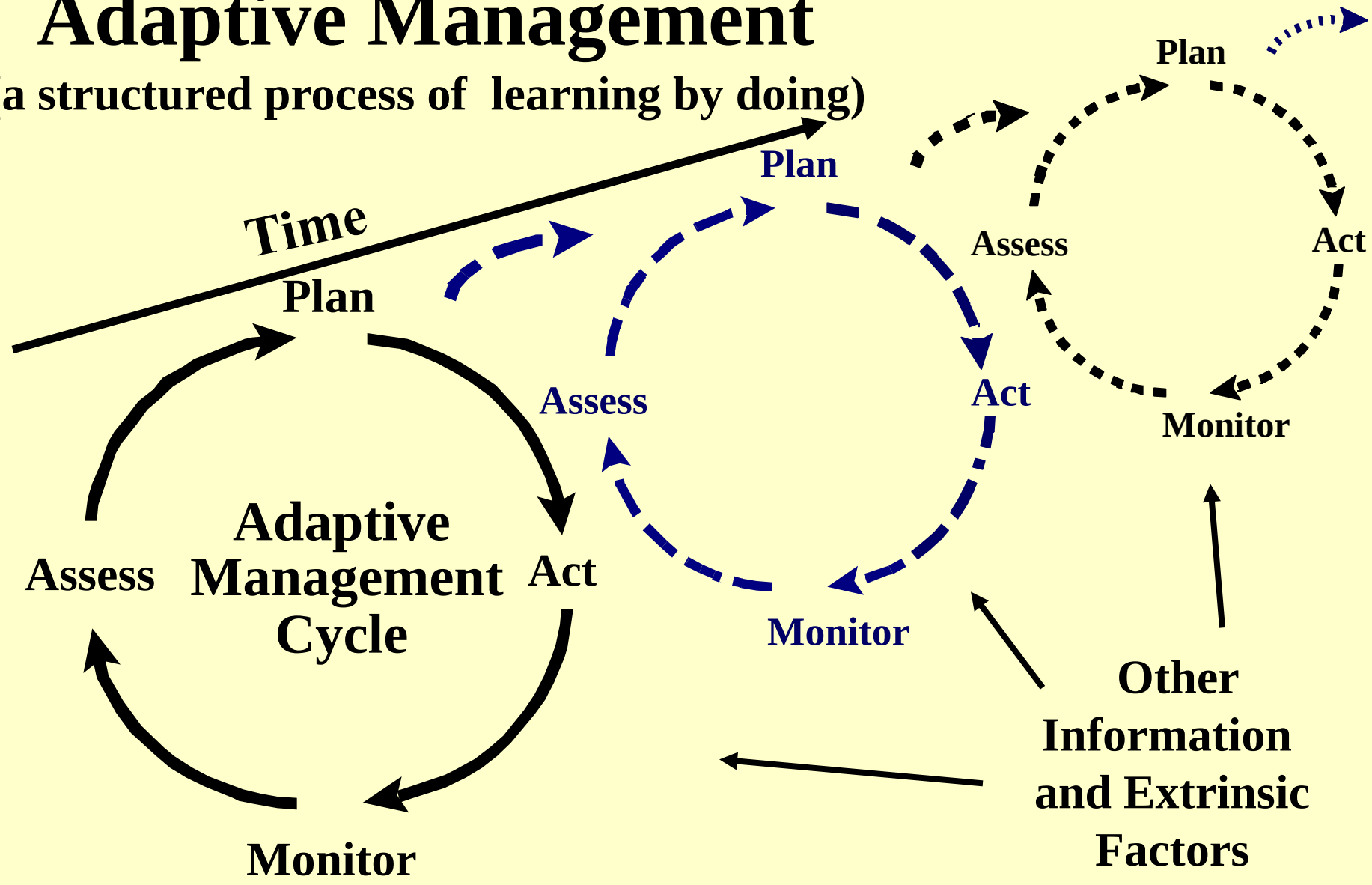
Integrated Science: Applied Science Strategy



Dr. Matt Harwell, Senior Ecologist , Lox NWR

Integrated Science: Adaptive Management

(a structured process of learning by doing)

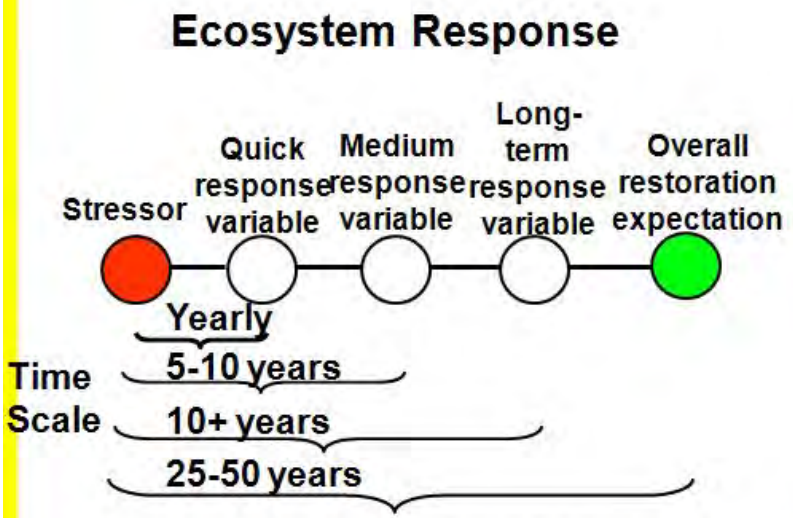


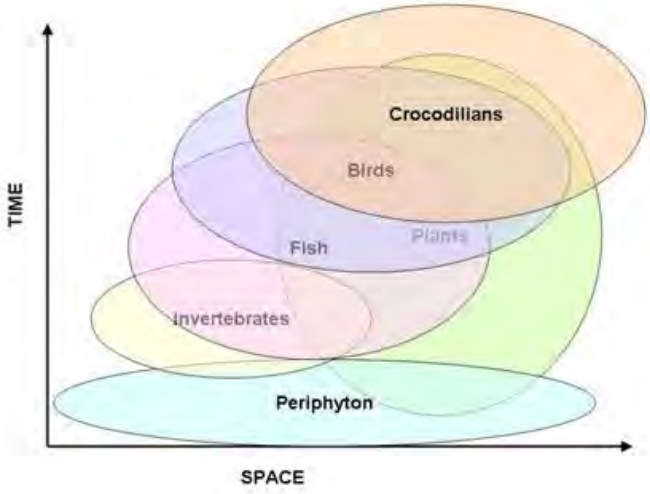
Integrated Science:

Communicate Science

Broad Spatial & Temporal Scales

Recognizing that the ecosystem responds over difference scales…



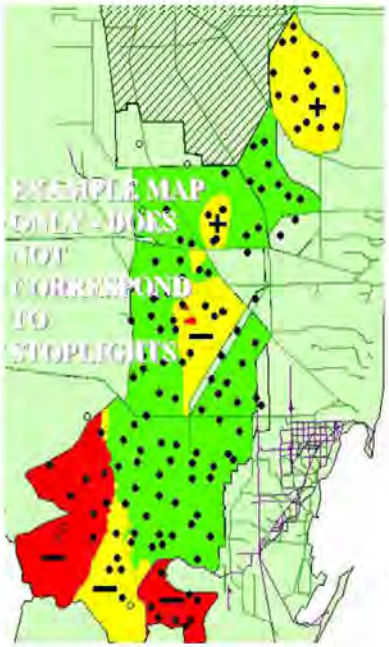


...creates opportunity to best leverage monitoring efforts.

Report Card for the Everglades

KEY FINDINGS – FISH

SUMMARY FINDING: Fish density was lower than expected—based on rainfall—throughout Shark and Taylor Sloughs since 2000, coinciding with the onset of the ISOP/IOP water management programs. Several dry-downs have occurred that were not predicted from rainfall patterns and appear to have resulted from operation schedules. Starting with each drying event, fish populations decline and remain lower than expected for two or more years. Fish density in WCA-3A and 3B was less affected by ISOP/IOP than in Everglades National Park. There was a slight increase in fish density consistent with a movement of fish into the area of WCA-3A which held water while the surrounding marshes did not.

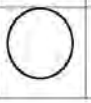


- Legend. Standardized difference between Observed Density and Predicted Density. Plus sign = too many fish; minus sign = too few fish. Green is the target range.
- **RED +** (greater than 0.4)
- **YELLOW +** (0.2 to 0.4)
- **GREEN** (-0.2 to 0.2)
- **YELLOW –** (-0.2 to -0.4)
- **RED –** (less than -0.4)

KEY FINDINGS:

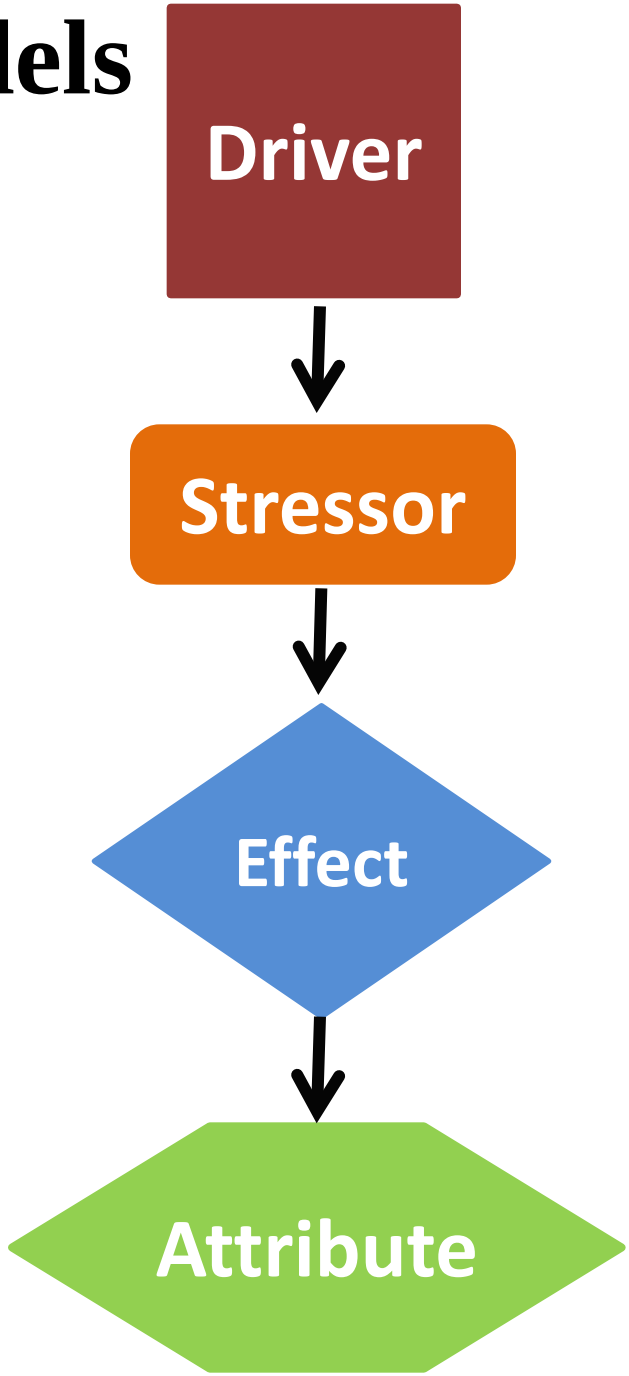
1. Taylor Slough had the largest decrease in fish density overall.
2. Shark Slough also had statistically significant decreases in fish density at most monitoring sites.
3. The Pre-ISOP/IOP versus Post-ISOP/IOP conditions show that fish densities have decreased significantly in much of the southern Everglades because of dry-downs that would not have occurred prior to ISOP/IOP, as predicted by rainfall.
4. Fish density in Water Conservation Areas 3A and 3B were less affected by ISOP/IOP, though they are inconsistent with expectations from NSM conditions because of ponding in 3A and drainage of 3B. Fish are more sensitive to drying frequency than water depth, which explains why ISOP/IOP had little impact in 3A because of the high-water conditions of 3A during the ISOP/IOP period.
5. Overall fish densities (and crustaceans) were lower than expected for the much of the 6 year post-ISOP/IOP period as compared to the Pre-ISOP/IOP period.
6. Water management operations in regions that showed significant decreases in fish densities from the expected should be evaluated by managers and hydrologists to determine hydrological operations that would improve fish densities toward target (predicted) levels.
7. Additional water is needed for Taylor Slough.
8. Implementation of DECOMP should lead to greater densities of small fish in WCA-3A and 3B, and will probably also shift large-fish populations from WCA-3A to 3B.

-translating data into information into technically-sound stoplights

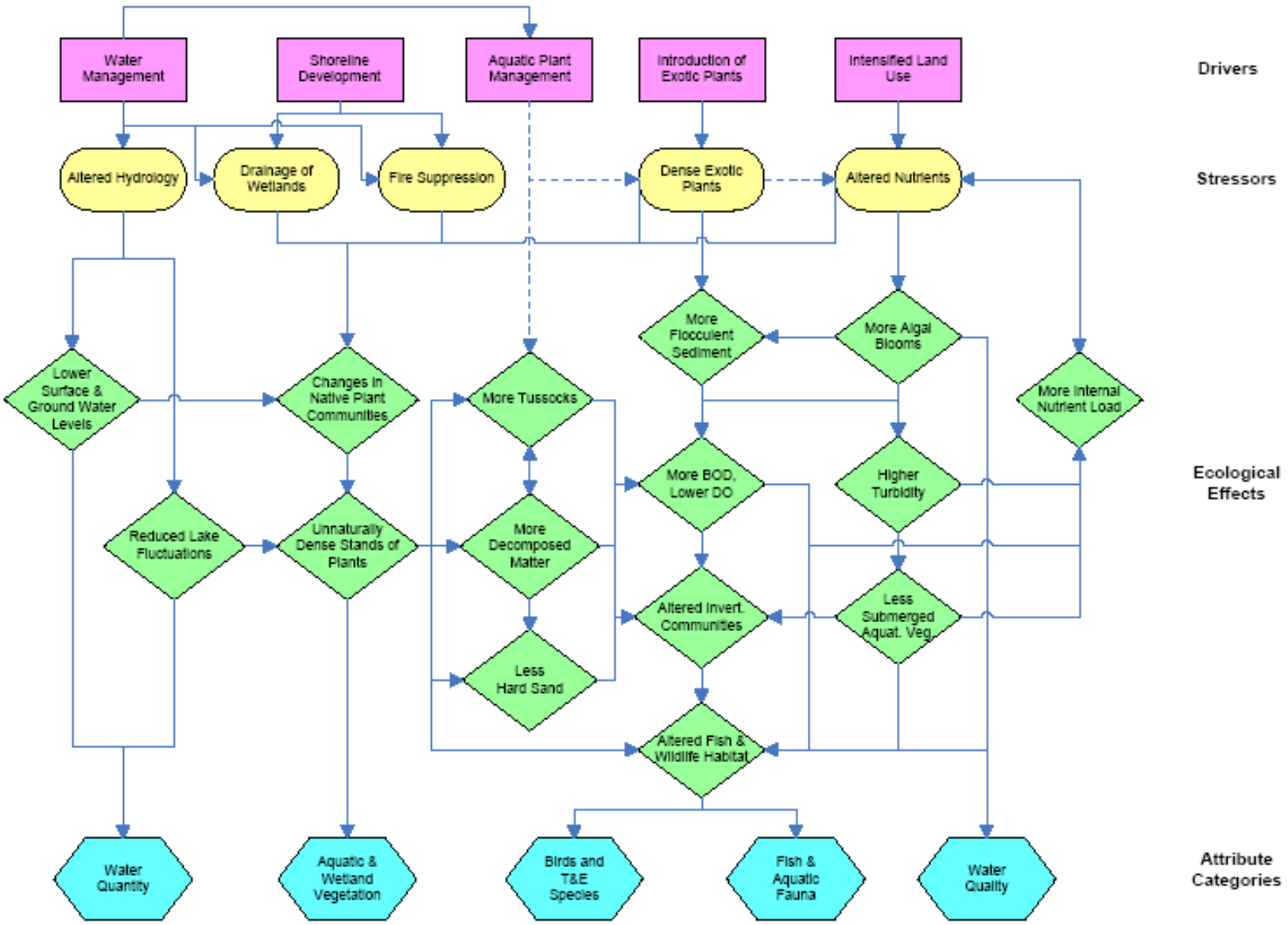
PERFORMANCE MEASURE	LAST STATUS[1]	CURRENT STATUS[2]	PROGNOSIS[3]	CURRENT STATUS	PROGNOSIS
TOTAL FISH DENSITY TAYLOR SLOUGH				All five monitoring sites in Taylor Slough showed a lower fish density than would be expected based on rainfall. Two sites had deviations indicative of a significant trend of lower fish densities overall. Pre-IOP fish densities were within the green range and Post-IOP fish densities decreased into the red range.	Pre-IOP water conditions were more favorable for fish populations than Post-IOP hydrologic conditions. Without significant changes in water management we expect the lowered fish density to continue. This may be a long term decreasing trend without improvements in water management.
BLUEFIN KILIFISH DENSITY TAYLOR SLOUGH				Bluefin Killifish also displayed a lower than predicted density in all sites in Taylor Slough during the Post-IOP period. This corresponds to several dry-downs that, based on rainfall, should not have occurred under the Pre-IOP water management operations. Killifish are particularly well correlated with water levels and Days Since Rewetting (from a drydown), and are well suited for predicting fish density.	Bluefin Killifish are expected to continue lower than predicted populations as noted above without significant changes in water management (IOP) that has been creating dry-downs that based on rainfall should not have occurred.
TOTAL FISH DENSITY SHARK RIVER SHOUGH				Five of six monitoring sites in Shark Slough showed lower fish density than would be expected based on rainfall. Only site 6 showed no change from Last Status condition or from predictions (green) and it is located such that water management actions have no impact on that site. We consider site six to be an index, or reference, of overall aquatic faunal productivity.	We expect to see the same patterns in fish density for Shark Slough that we found in Taylor Slough (see above) without changes in water management.
BLUEFIN KILIFISH SHARKRIVER SLOUGH				Bluefin Killifish densities were much less than predicted for Shark Slough beginning in July 2001. This corresponds to several dry-downs that, based on rainfall, should not have occurred under the Pre-IOP water management operations.	See Bluefin Killifish noted for Taylor Slough above.
TOTAL FISH DENSITY WATER CONSERVATION AREA 3				Fish density was indistinguishable from rainfall-based expectations at all 11 monitoring sites during the Post-IOP period. However, Pre-IOP and Post-IOP conditions are not consistent with expectations from the historical ecosystem because of ponding in WCA-3A and over-drying in WCA-3B. Both conditions lead to fewer small fish than expected. Ponding supports more predatory fishes and over-drying kills fish.	We expect this area to remain in the yellow light for the foreseeable future, pending action on management programs such as DECOMP.
BLUEFIN KILIFISH DENSITY WATER CONSERVATION AREA 3				Bluefin Killifish density was lower than expected based on rainfall at one monitoring site in western WCA-3A and one in southern WCA-3B. Their density was consistent with expectations at 9 other monitoring sites during the Post-IOP period. Pre-IOP and Post-IOP conditions earned a yellow status because of ponding in southern WCA-3A and over-drying in WCA-3A compared to historical conditions.	We expect this area to remain in the yellow light for the foreseeable future, pending action on management programs such as DECOMP.
TOTAL FISH DENSITY WATER CONSERVATION AREA 1				No information on Loxahatchee at this time.	
BLUEFIN KILIFISH DENSITY WATER CONSERVATION AREA 1				No information on Loxahatchee at this time.	

Conceptual Ecological Models

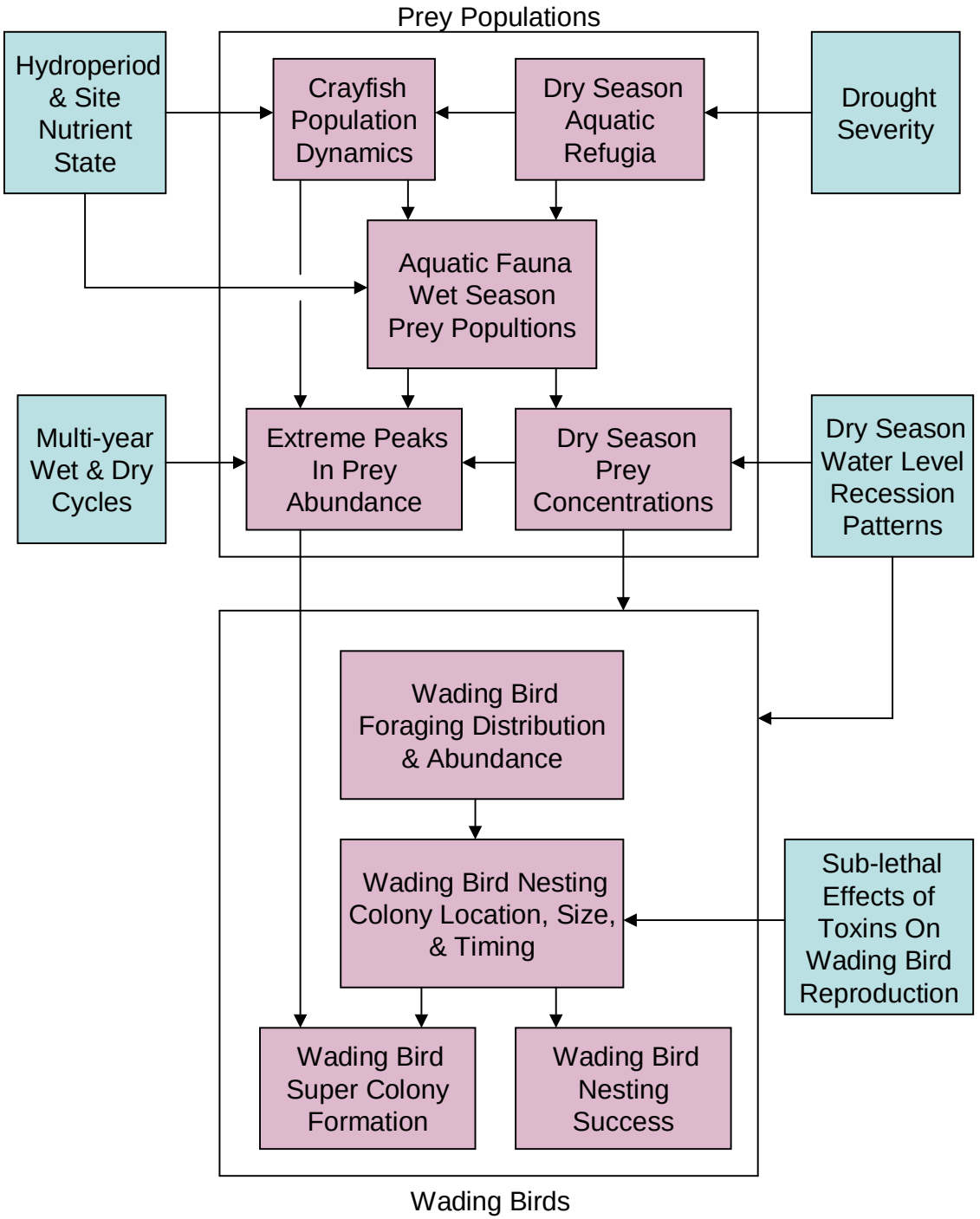
- Illustrate ecological linkages between the physical, chemical and biological elements
- Develop a suite of causal hypotheses linking the most important stressors with their major ecological effects
- Create a set of measurable indicators of success
  - performance measures
- Creates a level playing field for funding science components
- Major component of Ecological Risk Assessment (ERA); uncertainty characterization

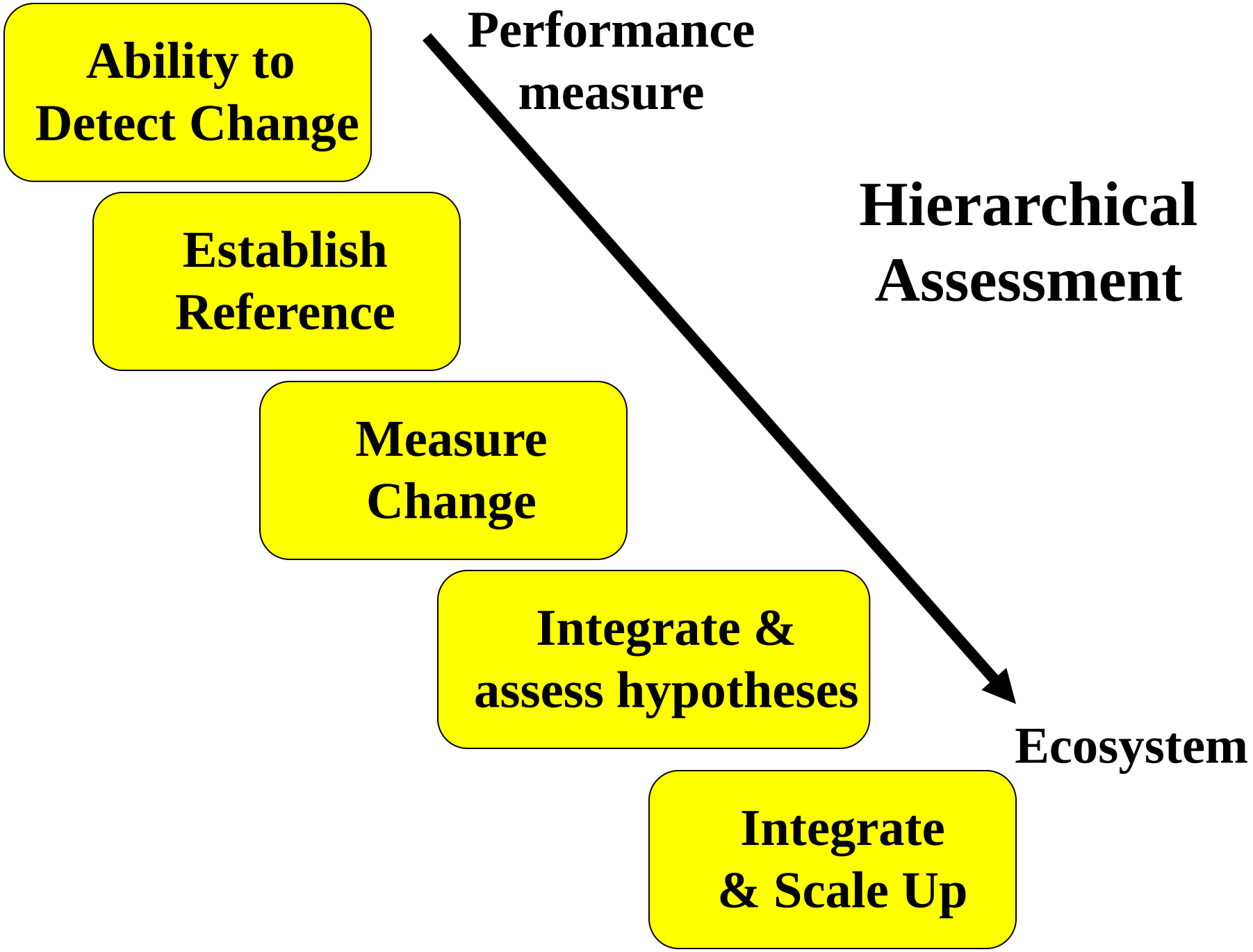


Conceptual Ecological Models



Zoom in on hydrology-fish-wading bird *HYPOTHESIS CLUSTER* that can be influenced by management actions

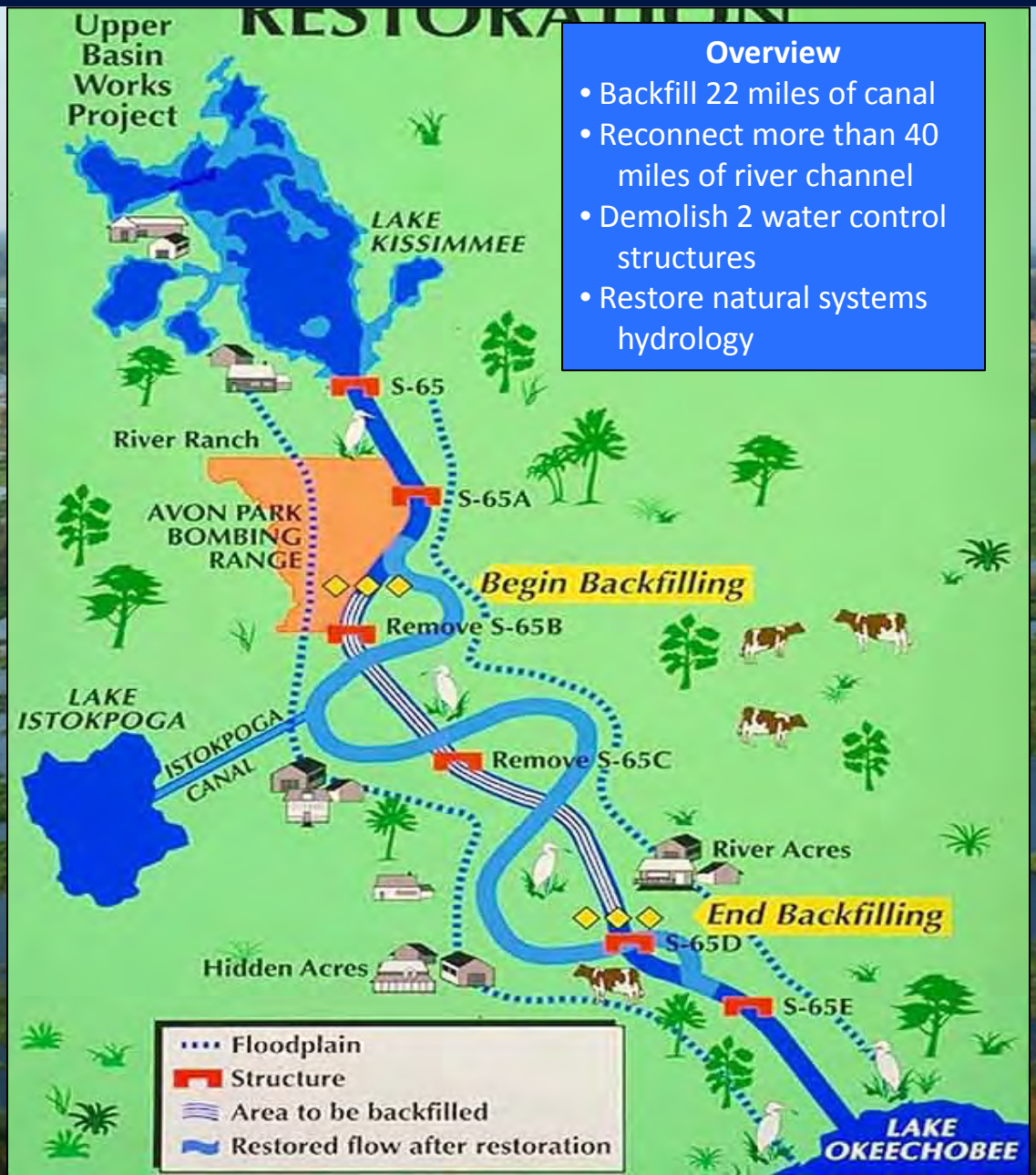



Ability to Detect Change
Performance measure
Hierarchical Assessment
Establish Reference
Measure Change
Integrate & assess hypotheses
Ecosystem
Integrate & Scale Up

Example of linking ecosystem metric to management actions for planning and AM

Stressor metric	Target	Management Action OPTION 1	Management Action OPTION 2	Management Action OPTION 3
Salinity	Salinity range of 10-25 ppt	Change operations to meet flows		
Recruitment	Presence Absence adults and larvae	Stock larvae	Stock adults	Operations to avoid too much or too little flow in key months
Substrate	Acres of Suitable habitat	Add oyster shell cultch	Try different substrate e.g., concrete	Dredge muck

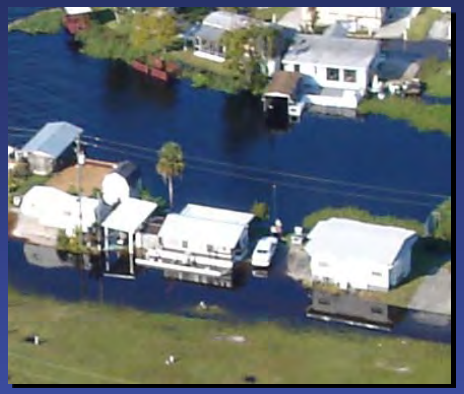
Kissimmee River Restoration



Overview

- Backfill 22 miles of canal
- Reconnect more than 40 miles of river channel
- Demolish 2 water control structures
- Restore natural systems hydrology

Objectives



Flood Control

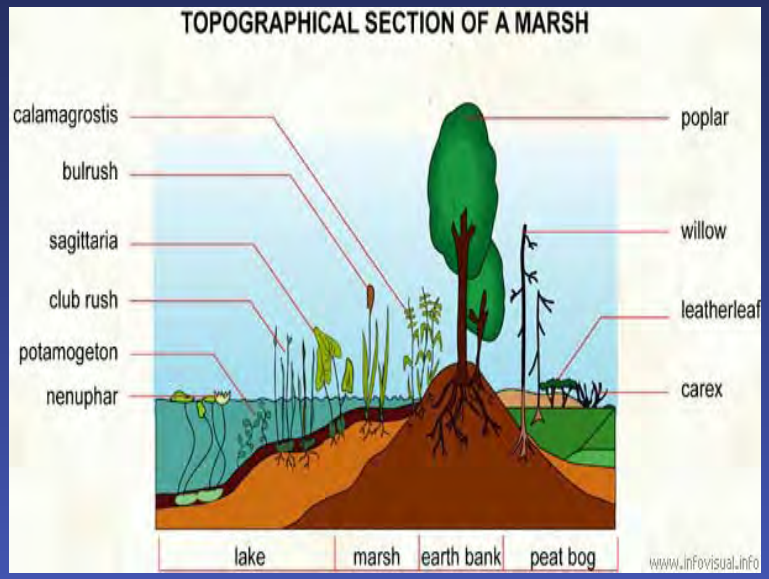
Kissimmee River Natural System Requirements

Water Supply

Downstream Ecosystem Requirements

Aquatic Plant Management

Fish & Wildlife Linkages to Hydrology



Water → Habitat Structure → Fish and Wildlife Requirements → Snail kite density

Floodplain inundation or Lake stage characteristics

Plant species composition and areal coverage

Apple snail production in marshes

sfwmd.gov

Kissimmee Chain of Lakes Long-term Management Plan
Draft Performance Measures/Monitoring Programs

4. Everglade Snail Kite Nesting Success

Type: Assessment Performance Measure

Information Availability:

Baseline Data	Historical Data	Reference Condition from Disturbance Gradient	Reference Condition from Similar System(s)	Habitat Requirements from Literature
Yes	No	Unknown	Yes	Yes

Expectation:

Nesting success of snail kites will be consistent with the requirements for maintenance of a viable breeding population within the KCOL.

Target:

Nesting success of snail kites will be at least _ at least __ out of __ years.

Evaluation Locations:

Kissimmee, Toho, East Toho

Notes:

Does expectation need to reflect South Florida snail kite population?

Should a second metric be added for post-fledging survival, an important population viability component ?

Aerial view looking north from the south end of Phase 4 backfill

sfwmd.gov

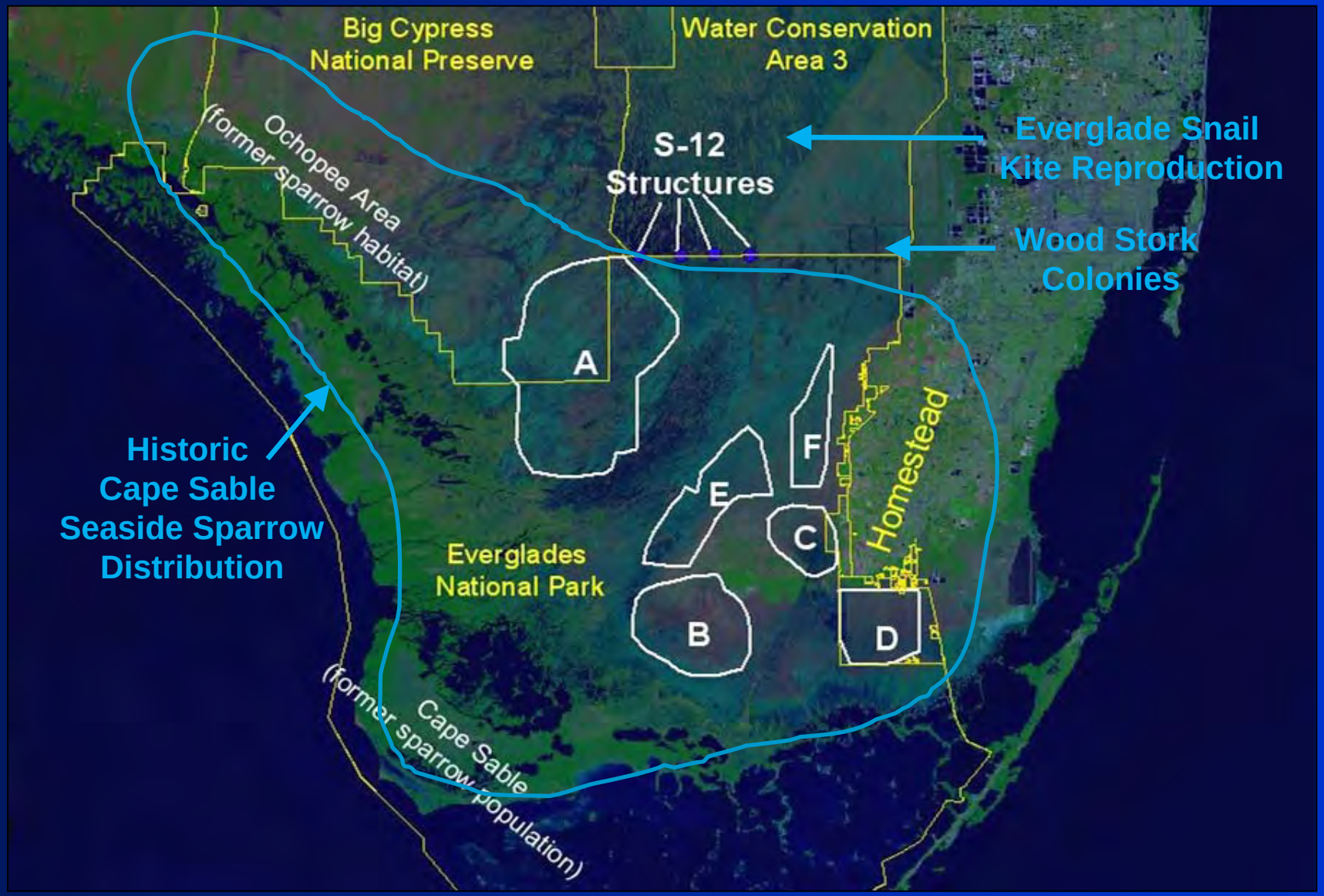
1955

2009

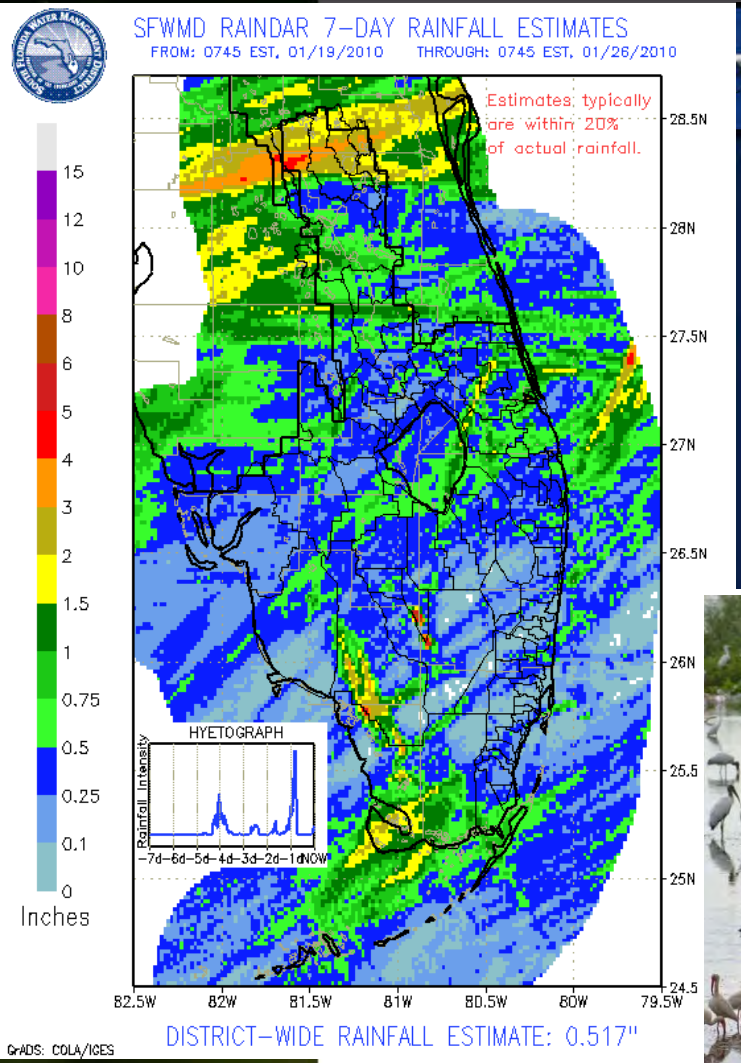
sfwmd.gov

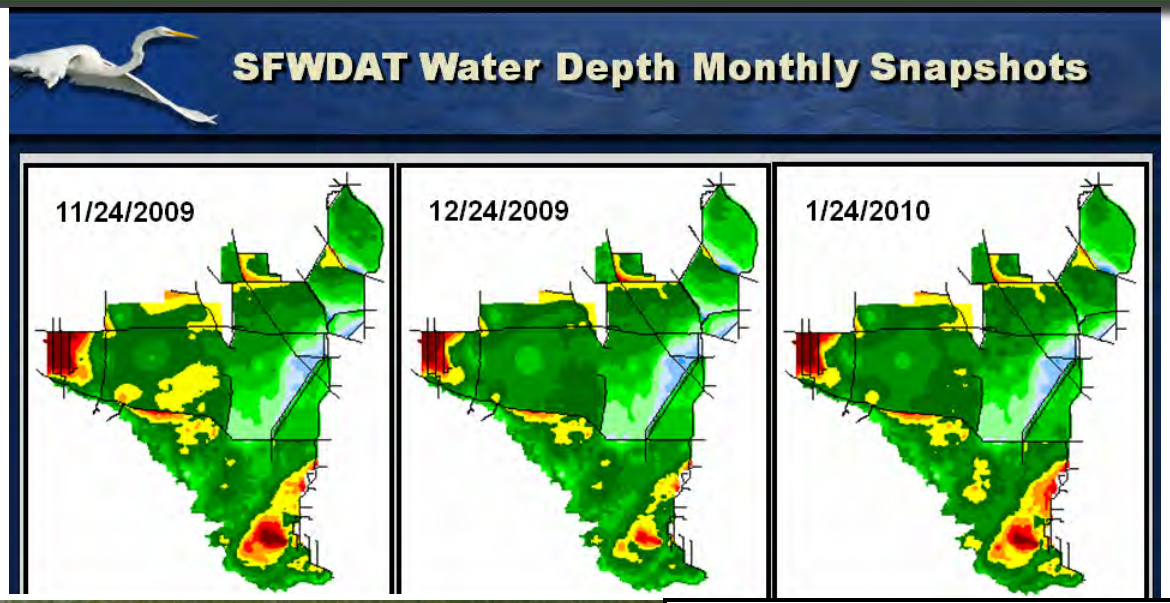
Concentrations of wading birds observed in Phase I floodplain as water levels in drying pools reached optimal foraging depths

Everglades Restoration Transition Plan



Everglades Ecological Conditions, Performance Measures
Everglades Rainfall/Evaporation/Depth/Recession





Water depth (9ft) criteria for wading bird nesting success
Poor: > 1.0'
Fair: 0.80 ft to 1.0 ft
Good: 0.1 ft to 0.79 ft
Fair: 0.02 ft to 0.09 ft
Poor: < 0.02 ft

Recession criteria for wading bird nesting success (Δ in stage)
Poor: -0.17' to -0.59' for > 2 wks or ≤ -0.60 for 1 wk
Fair: -0.17' to -0.59' for 1 wk
Good: - 0.05' to -0.16'
Fair: -0.04 to +0.04' for 1 wk
Poor: -0.04 to +0.04' for > 2 wks or ≥ +0.05' for 1 wk

Avian Ecology Workshops

Sustainable Ecosystems Institute

Everglades Multi-Species Avian Ecology And Restoration Review

Final Report

Sustainable Ecosystems Institute
PO Box 80605
Portland OR 97280
Website http://sei.org
Tel 503 246 5008
Email: sei@sei.org

December 2007

Agenda

- Review related ongoing research
- Preview panel recommendations (49)
- Develop management action plan
- Identify next Steps
  - Identify needs for future funding
  - Posting of action plan on website

Cape Sable Seaside Sparrow

Wood Stork

Everglade Snail Kite

Roseate Spoonbill

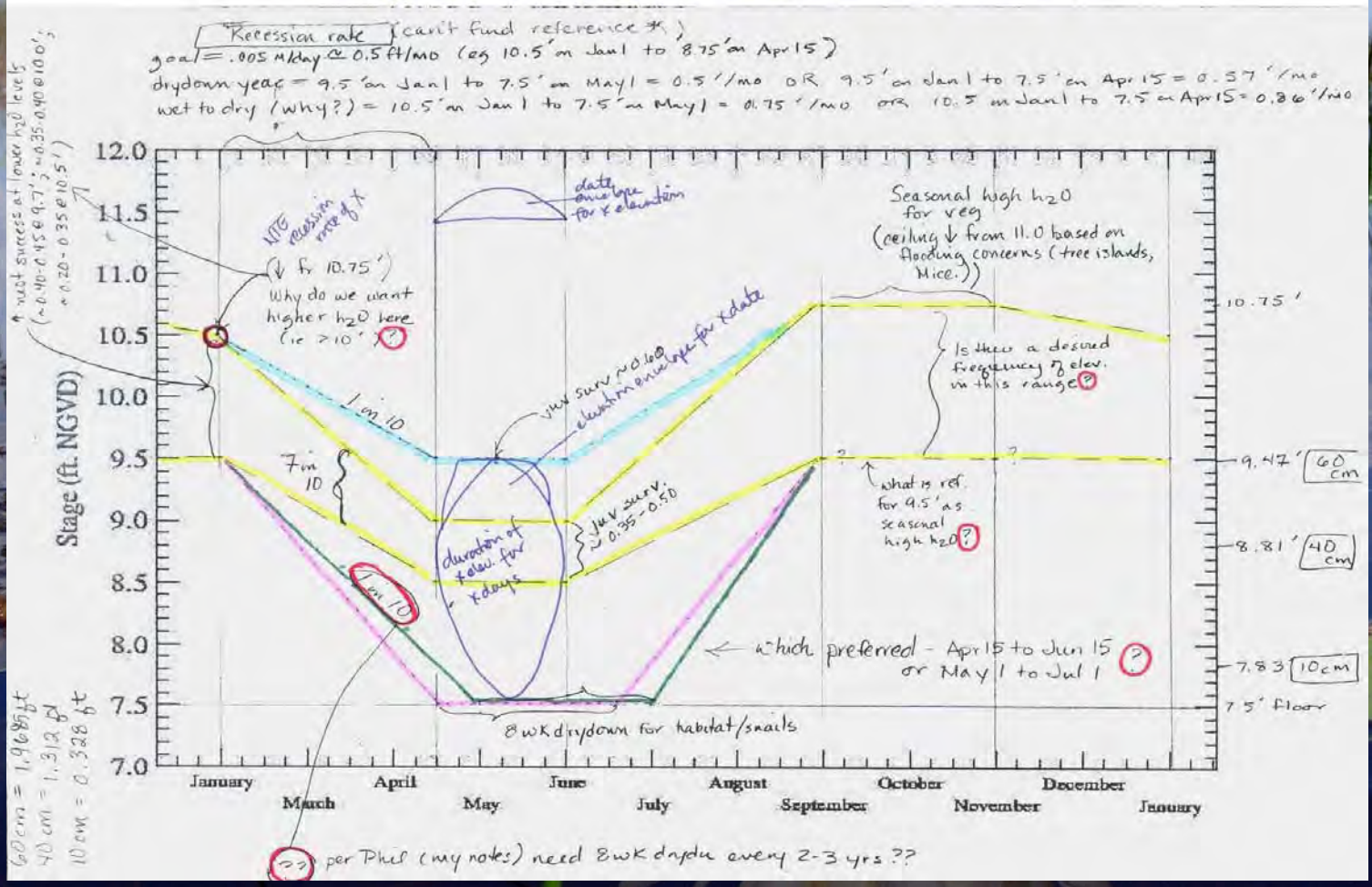
Collaborative Research

Snail Kite

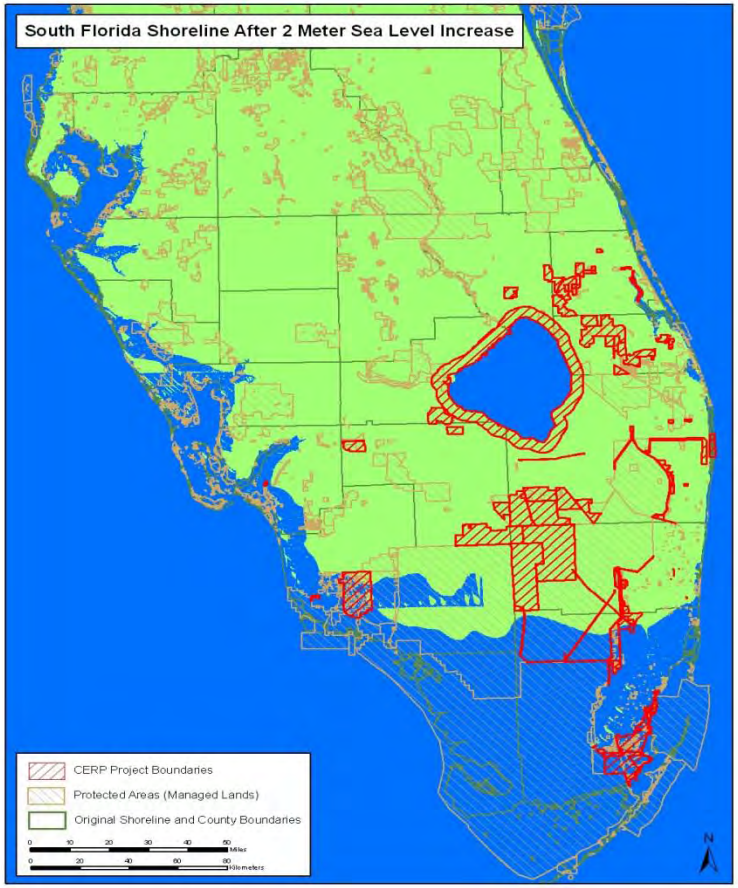
Apple snail

Vegetation

Water Management Strategies & effects on Snail Kite, vegetation, and apple snails (address recos. SK2 & 5)

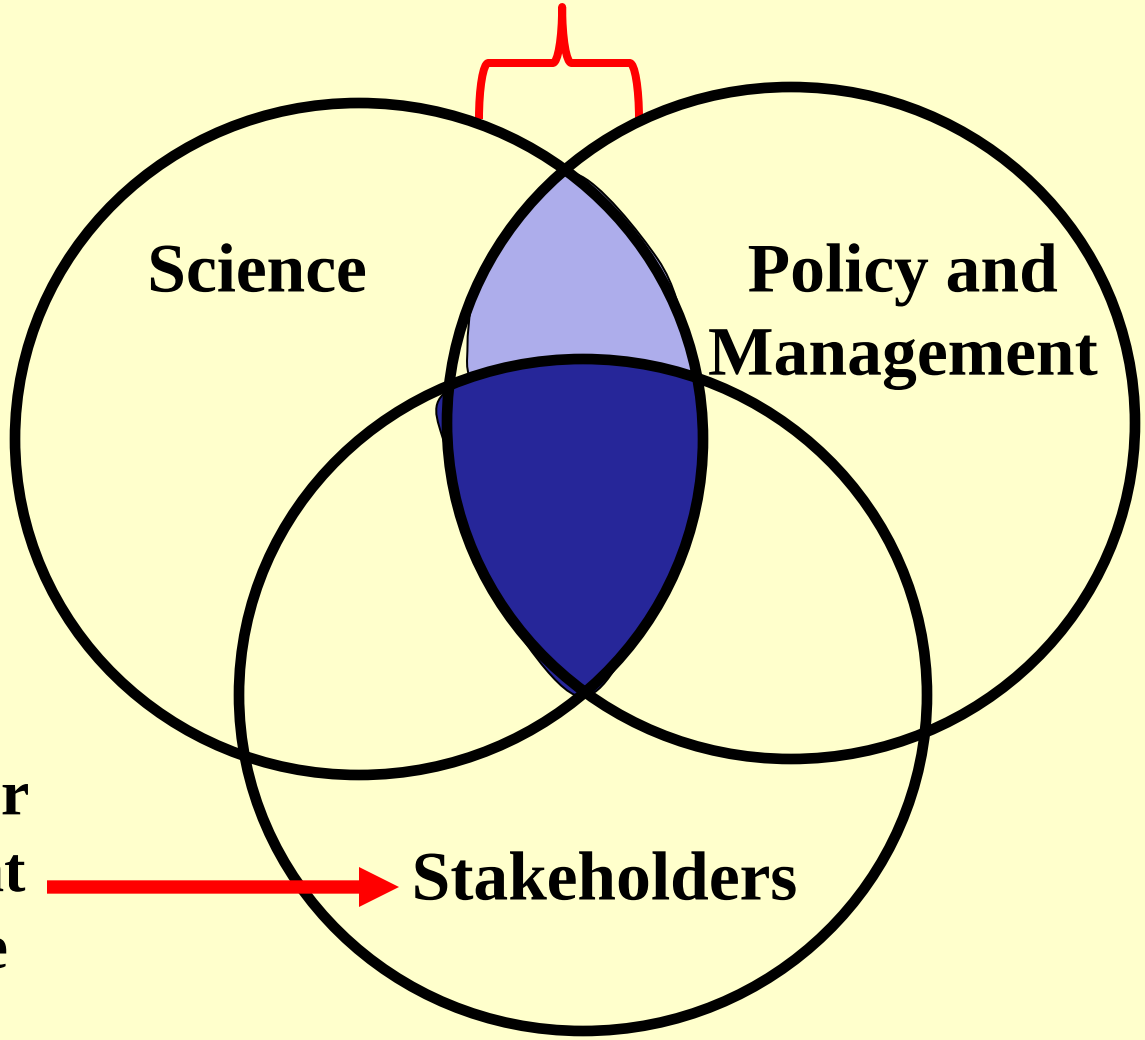


Potential Sea Level Rise Effects

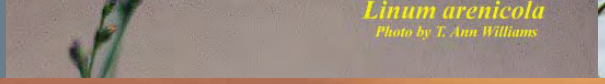


Effective Use of Science

Maximum opportunity for ecosystem restoration success occurs in this blue intersection



Stakeholder engagement needs more attention



Pelican Island NWR, Established March 14, 1903