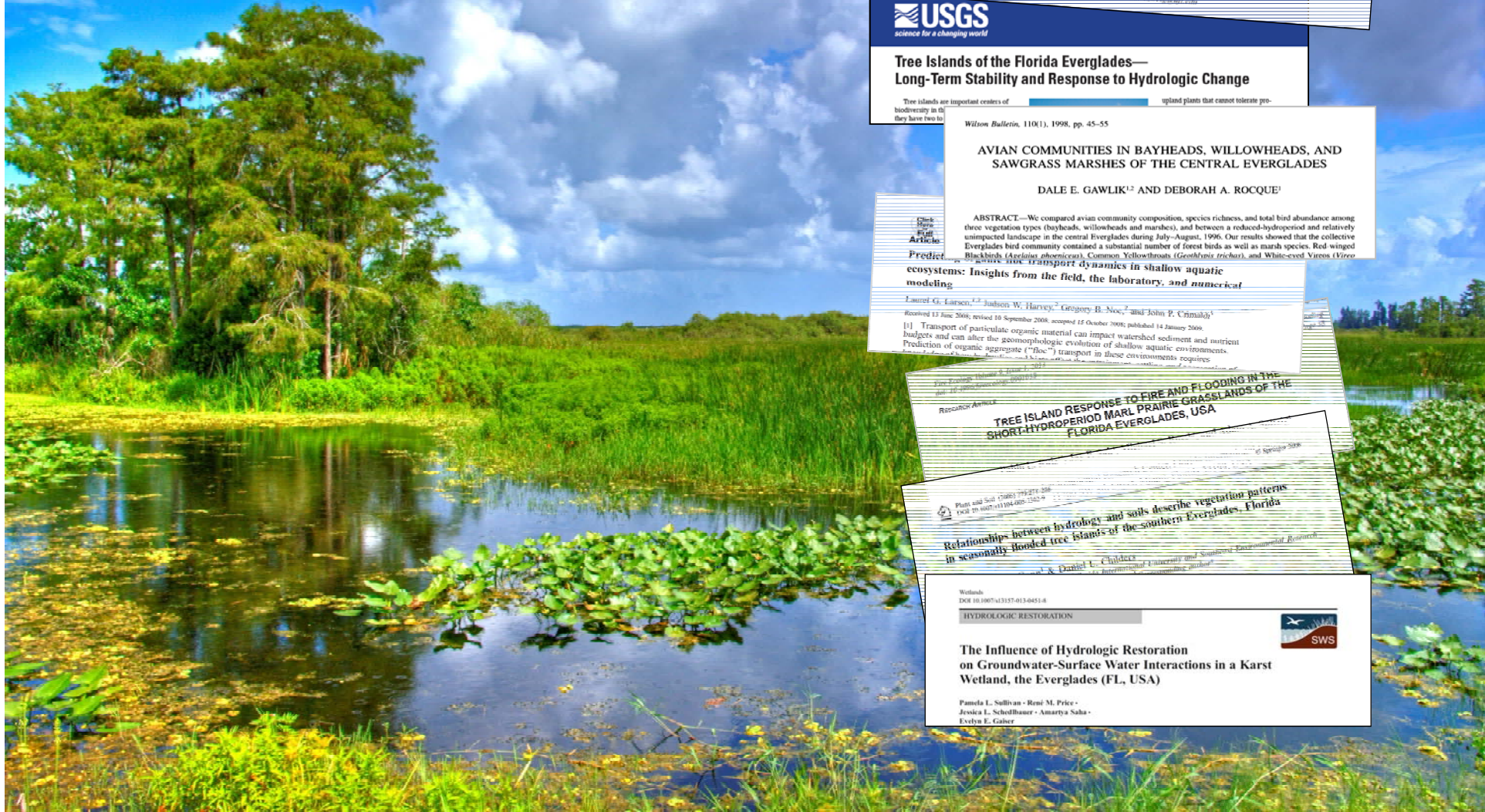


# **Synthesis of Everglades Restoration and Ecosystem Services (SERES)**

***Critical Ecosystem  
Studies Initiative***

Aida Arik	Everglades Foundation
James Beerens	U.S. Geological Survey
Rena Borkhataria	University of Florida
Daniel Childers	Arizona State University
Stephen E. Davis III	Everglades Foundation
Steven M. Davis	Stephen M. Davis, Consulting
Carl Fitz	EcoLandMod, Inc.
Evelyn Gaiser	Florida International University
Judson Harvey	U.S. Geological Survey
Hiram Henriquez	H2h Graphics
Thomas Lodge	T.E.L. Ecological Advisors, Inc.
Frank Marshall	Cetacean Logic Foundation, Inc.
Bobby McCormick	Clemson University
Melodie Naja	Everglades Foundation
Todd Osborne	University of Florida
Michael Ross	Florida International University
Jay Sah	Florida International University
Joel Trexler	Florida International University
Thomas van Lent	Everglades Foundation
Paul Wetzel	Smith College

# Put science into a social context



Florida International University  
FIU Digital Commons

SERC Research Reports Southeast Environmental Research Center

3-1-2010

**MOORE, SOUTHERN, CHANGING, STRONG**

**EFFECTS OF LANDSCAPE GRADIENTS ON WETLAND VEGETATION COMMUNITIES: INFORMATION FOR LARGE-SCALE RESTORATION**

Florida International University  
Southeast Environmental Research Center  
11015 NW 12th St., Room 300  
Miami, FL 33199

**USGS**  
science for a changing world

**Tree Islands of the Florida Everglades—  
Long-Term Stability and Response to Hydrologic Change**

Tree islands are important centers of biodiversity in the Everglades. They have tree to upland plants that cannot tolerate pro-

Wilson Bulletin, 110(1), 1998, pp. 45-55

**AVIAN COMMUNITIES IN BAYHEADS, WILLOWHEADS, AND SAWGRASS MARSHES OF THE CENTRAL EVERGLADES**

DALE E. GAWLIK<sup>1,2</sup> AND DEBORAH A. ROCQUE<sup>1</sup>

**ABSTRACT.**—We compared avian community composition, species richness, and total bird abundance among three vegetation types (bayheads, willowheads and marshes), and between a reduced-hydroperiod and relatively unimpacted landscape in the central Everglades during July–August, 1996. Our results showed that the collective Everglades bird community contained a substantial number of forest birds as well as marsh species. Red-winged Blackbirds (*Agelaius phoeniceus*), Common Yellowthroats (*Geothlypis trichas*), and White-eyed Vireos (*Vireo vicinior*) were the most abundant species. We discuss the implications of our findings for the restoration of Everglades ecosystems: *Insights from the field, the laboratory, and numerical modeling*

Laurent G. Larsson,<sup>1,2</sup> J. D. Janssen, W. Harvey,<sup>2</sup> Gregory B. Noe,<sup>2</sup> and John P. Crimshaw<sup>1</sup>

Received 13 June 2006; revised 10 September 2006; accepted 18 October 2006; published 14 January 2007.

[1] Transport of particulate organic material can impact watershed sediment and nutrient budgets and can alter the geomorphologic evolution of shallow aquatic environments. Prediction of organic aggregate ("floc") transport in these environments requires

**TREE ISLAND RESPONSE TO FIRE AND FLOODING IN THE SHORT-HYDROPERIOD MARL PRAIRIE GRASSLANDS OF THE FLORIDA EVERGLADES, USA**

**Relationships between hydrology and soils describe vegetation patterns in seasonally flooded tree islands of the southern Everglades, Florida**

by Daniel L. Childers  
Florida International University and Southeast Environmental Research Center

Methods  
DOI: 10.1007/s11337-013-0451-8

**HYDROLOGIC RESTORATION**

**The Influence of Hydrologic Restoration on Groundwater-Surface Water Interactions in a Karst Wetland, the Everglades (FL, USA)**

Pamela L. Sullivan - René M. Price -  
Jessica L. Schoffhauser - Amartya Naha -  
Evelyn E. Gaber

SWS

Analyze range of restoration scenarios that are relevant to decision maker questions

Alternatives evaluation process must be credible and relevant

Convey results in a useful way for multiple audiences

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SERC Research Reports Southeast Environmental Research Center

3-1-2013

**EFFECTS OF LANDSCAPE GRADIENTS ON WETLAND VEGETATION COMMUNITIES: INFORMATION FOR LARGE-SCALE RESTORATION**

Florida International University  
Southeast Environmental Research Center  
P.O. Box 19800  
Miami, FL 33199

**USGS**  
science for a changing world

**Tree Islands of the Florida Everglades—  
Long-Term Stability and Response to Hydrologic Change**

Tree islands are important centers of biodiversity in the Everglades. They are home to many species of plants and animals that cannot tolerate prolonged flooding.

Wilson Bulletin, 110(1), 1998, pp. 45-55

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DALE E. GAWLIK<sup>1,2</sup> AND DEBORAH A. ROCQUE<sup>1</sup>

**ABSTRACT.**—We compared avian community composition, species richness, and total bird abundance among three vegetation types (bayheads, willowheads and marshes), and between a reduced-hydroperiod and relatively unimpacted landscape in the central Everglades during July–August, 1996. Our results showed that the collective Everglades bird community contained a substantial number of forest birds as well as marsh species. Red-winged Blackbirds (*Aegialitis phoenicea*), Common Yellowthroats (*Geothlypis trichas*), and White-eyed Vireos (*Vireo gilvus*) were the most abundant species. Our results suggest that the hydroperiod dynamics in shallow aquatic ecosystems: *Insights from the field, the laboratory, and numerical modeling*

Laurel G. Larsen,<sup>1,2</sup> Judson W. Harvey,<sup>2</sup> Gregory B. Nee,<sup>2</sup> and John P. Crimaldi<sup>1</sup>

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Patricia L. Sullivan - Rene M. Price -  
Jessica L. Schoffhauser - Amartya Naha -  
Evelyn E. Galzer

Hydrologic Restoration

**The Influence of Hydrologic Restoration on Groundwater-Surface Water Interactions in a Karst Wetland, the Everglades (FL, USA)**

**SWS**

Restoration trade offs  
Political considerations  
Economic benefits  
Desire consensus  
Make decisions



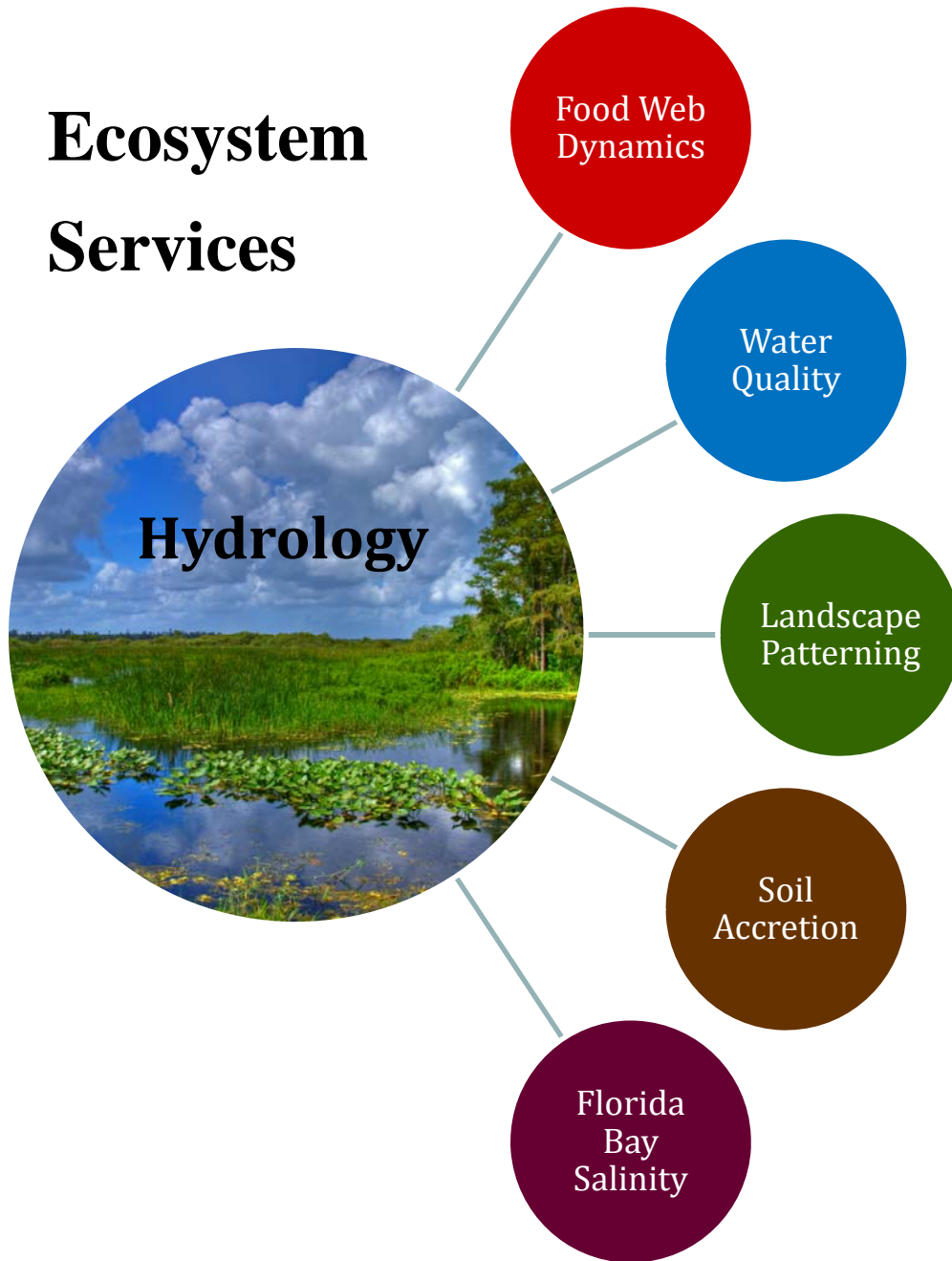
Detailed and focused  
Comfortable with  
uncertainty  
Never know enough



# Developed Key Restoration Questions

**Decision maker** questions  
focused on hydrology, economics,  
questions that help prioritize  
decisions

# Ecosystem Services



## *What do people care about?*

- Water supply
- Real estate
- Park visitation
- Open space
- Fishing (commercial & recreational)
- Wildlife habitat & hunting

# Example Alternatives Analyses

Tool to Estimate  
Wading Bird  
Abundance

Benefit People  
Care About

Bird Population Difference  
between Alternatives  
Converted to Economic  
Benefit/Loss

Wading Bird  
HSI Model

Annual Wading  
Bird Abundance

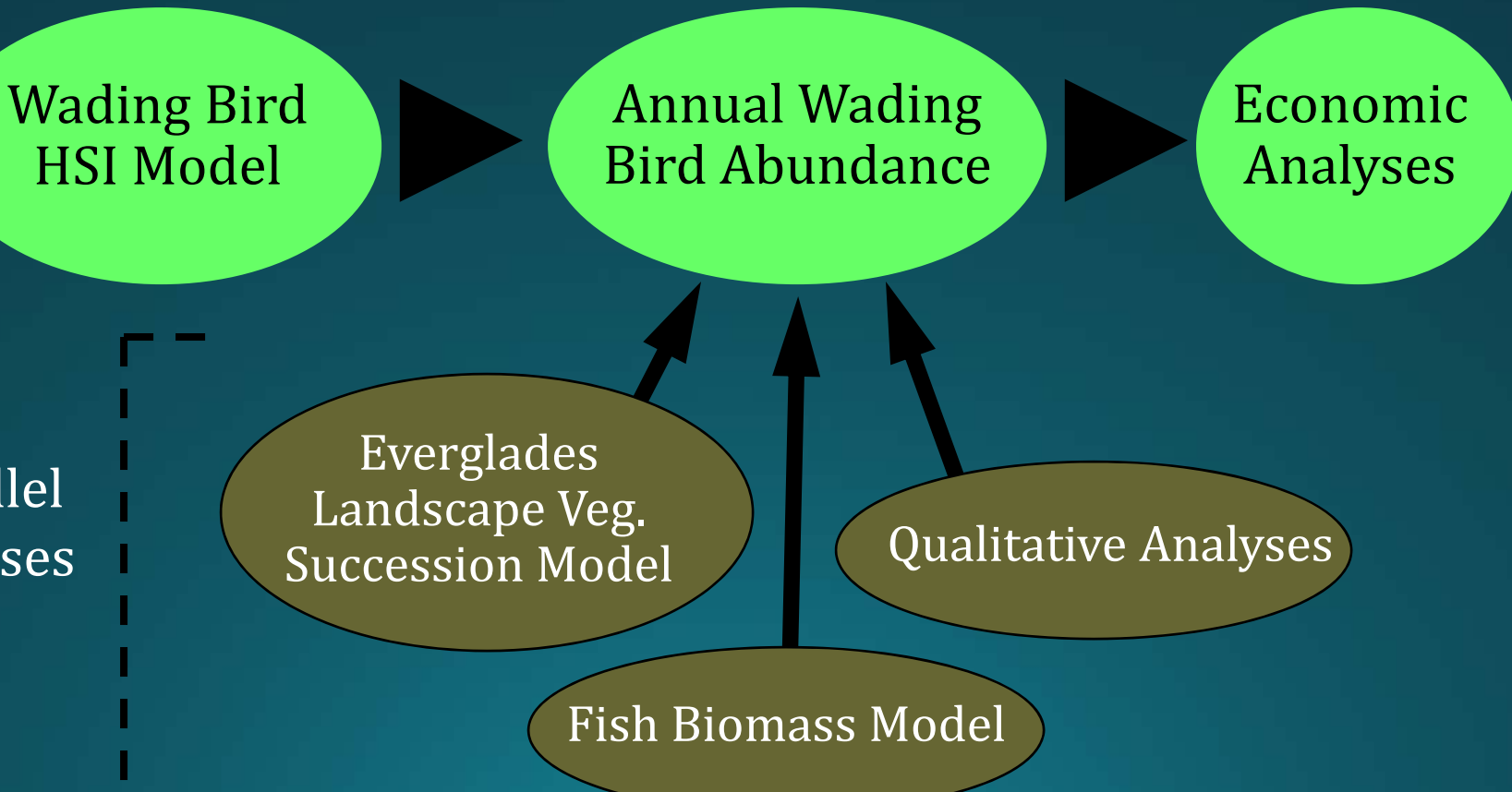
Economic  
Analyses

Everglades  
Landscape Veg.  
Succession Model

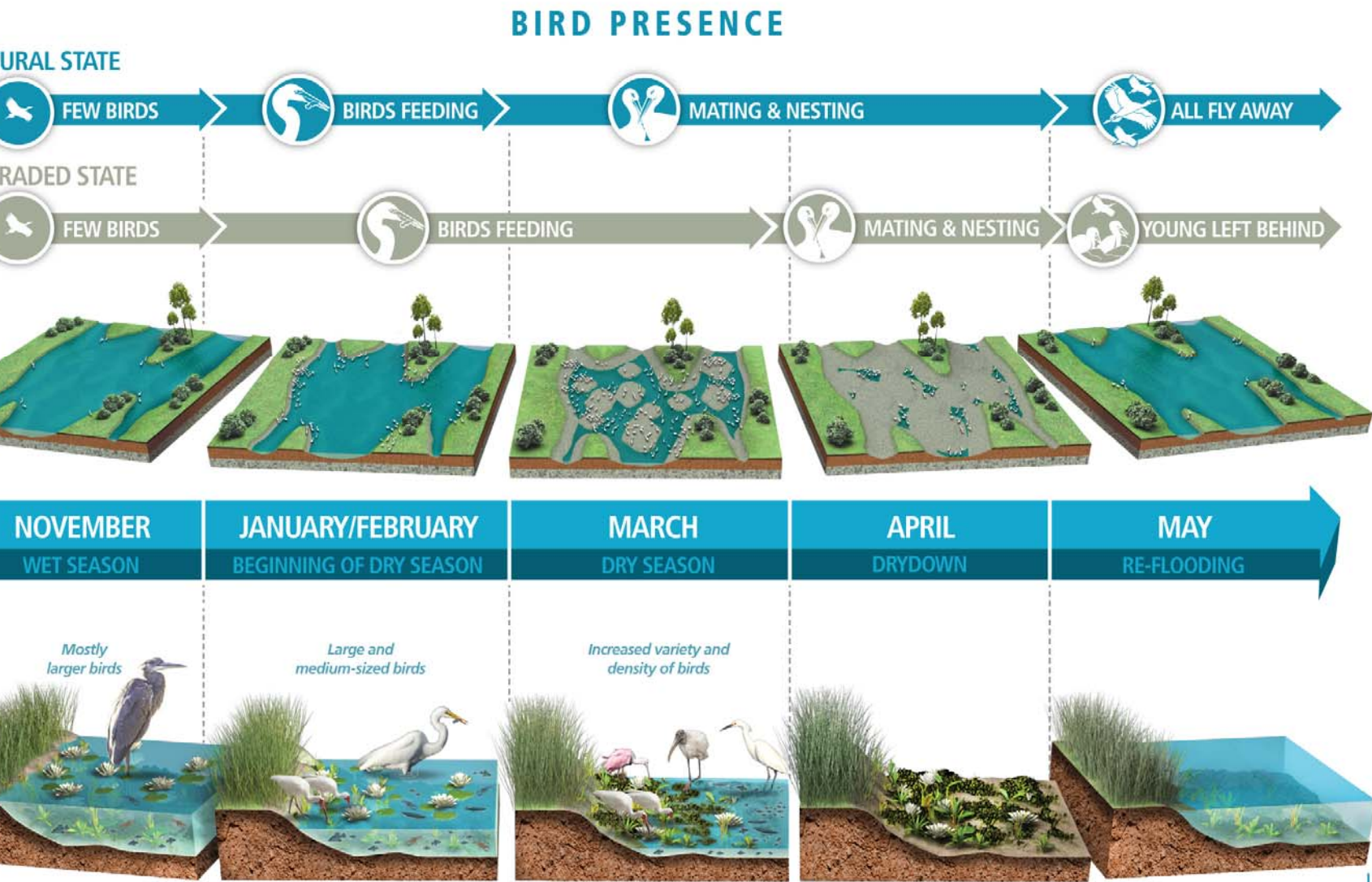
Qualitative Analyses

Fish Biomass Model

Alternative  
Analyses



# Ridge and Slough Fish Concentration and Bird Food

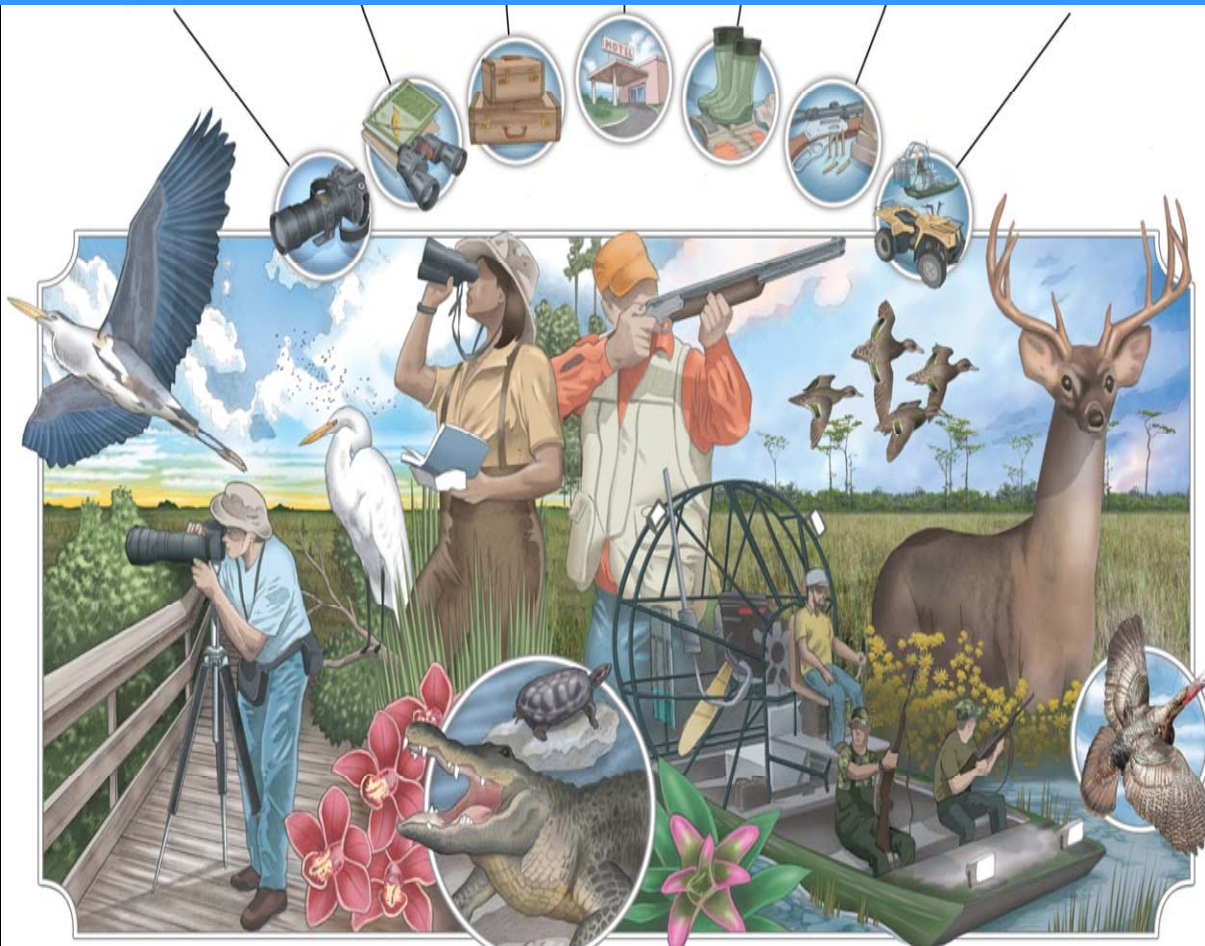




# *Hunting & Bird Watching* \$1.04 Billion over 40 years

Looking at  
benefits a way of  
streamlining the  
analyses

to claim that  
ERES is an  
analyses of the  
ecosystem



# Storage

# Decomp

# Cost

ASR (MGD)	EAA (kacre- feet/yr)	Lake Belt (kacre- feet/yr)
1000	360	144
250	360	0
0	1300	0
0	2500	144

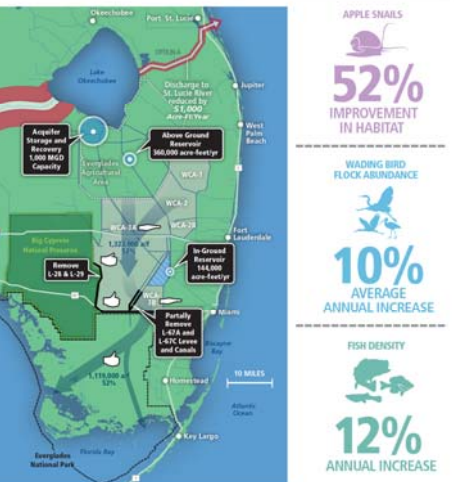
L-67 Levees Removed	L-67A Canal Filled	L-38 (WCA- 2A/3A)
Partially	Lower 4 miles	Existing
Partially	Lower 4 miles	Existing
Removed	14 miles	Existing
Removed	14 miles	Removed

New STAs (kacres)	Annualized Cost (\$ millions; 3.25% discount over 50 yrs)
33	1,137
28.5	699
47	742
30.5	1,159

# Restoration Alternatives Analyses

making it to Gulf of Mexico, requiring an additional 33,000 acres of STA

- Lakebelt reservoirs in the Northern and Central Lakebelt projects will be constructed.
- EAA and Bird Drive reservoirs will be constructed.
- Lake Okeechobee ASR is slated for 1000 MGD capacity around Lake Okeechobee.
- The "Decomp" features of CERP remain the same.



**APPLE SNAILS**  
**52% IMPROVEMENT IN HABITAT**

**WADING BIRD FLOCK ABUNDANCE**  
**10% AVERAGE ANNUAL INCREASE**

**FISH DENSITY**  
**12% ANNUAL INCREASE**

**9% INCREASED AREA OF PEAT SOILS**

**65% MARSH POLLUTION REDUCTION**

**50% FLORIDA BAY SALINITY REDUCTION CLOSER TO TARGET**

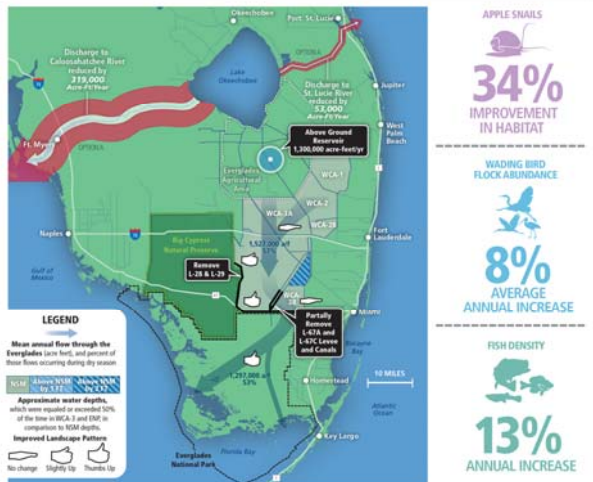
**78% RISK OF FIRE OVERALL DECREASE**

Annualized \$1,137 M

EXPANDED STORAGE AND DECOMP = 91% of NSM flows making it to Gulf of Mexico, requiring an additional 47,000 acres of STA

**OPTION D**

- Lakebelt reservoirs infeasible and will not be constructed.
- EAA and Bird Drive reservoirs will not be constructed.
- Lake Okeechobee ASR would not be implemented.
- EAA reservoir expanded from 360,000 to 1.3 million acre-ft to expand connectivity in WCA3.



**APPLE SNAILS**  
**34% IMPROVEMENT IN HABITAT**

**WADING BIRD FLOCK ABUNDANCE**  
**8% AVERAGE ANNUAL INCREASE**

**FISH DENSITY**  
**13% ANNUAL INCREASE**

**38,285 INCREASED AREA OF PEAT SOILS**

**36% MARSH POLLUTION REDUCTION**

**62% FLORIDA BAY SALINITY REDUCTION CLOSER TO TARGET**

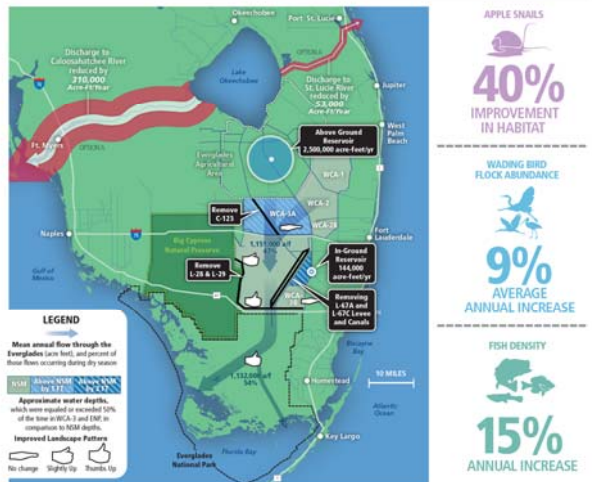
**36% RISK OF FIRE OVERALL DECREASE**

Annualized \$742 M

MAXIMUM STORAGE AND DECOMP = 90% of NSM flows making it to Gulf of Mexico, requiring an additional 30,500 acres of STA

**OPTION E**

- Lakebelt reservoirs constructed.
- Removal of L-38 levee, and L-67A and L-67C levee and canal.
- Lake Okeechobee ASR would not be implemented.
- EAA reservoir expanded from 360,000 to 1.3 million acre-ft to expand connectivity in WCA3.



**APPLE SNAILS**  
**40% IMPROVEMENT IN HABITAT**

**WADING BIRD FLOCK ABUNDANCE**  
**9% AVERAGE ANNUAL INCREASE**

**FISH DENSITY**  
**15% ANNUAL INCREASE**

**55,623 INCREASED AREA OF PEAT SOILS**

**26% MARSH POLLUTION REDUCTION**

**61% FLORIDA BAY SALINITY REDUCTION CLOSER TO TARGET**

**89% RISK OF FIRE OVERALL DECREASE**

Annualized \$1,159 M

- Hydrologic improvement in all scenarios
- Sheet flow & annual hydroperiods restored

1,750%



## Process for large restorations

### Pros

- Focus on “things people care about”
- Directly addresses management needs
- Best available science & scientific judgement
- Uses existing tools

### Cons

- Difficult to organize
- Requires centralized management
- Requires time

