# *Using Stakeholder Engagement, Translational Science and Decision Support Tools for Ecosystem Based Management in the Florida Everglades*

**Rebekah Gibble**
US Fish and Wildlife Service

**Matt Harwell**
US Environmental Protection Agency

**Lori Miller**
US Fish and Wildlife Service

**Greater Everglades Ecosystem Restoration**

**April 2019**

# Outline

- Background
- Translational Science
- Framework for Ecosystem Based Management
- Decision Support Tools
- Best Practices/Future needs

**Disclaimer**

*The views expressed in this presentation are those of the authors and do not necessarily represent the views or policies of the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and South Florida Water Management District*





- 3 Conservation Areas north of ENP
  - Separated by levee/canal system
  - Water conveyance to ENP
- Water supply
- Flood Control
- Habitat and Wildlife Conservation

# An Ecosystem in Trouble

- Too much/too little water
- Everglades half of original extent
  - Impoundments block flow
- Massive reductions in wading birds, other wildlife
- Degradation of water quality
  - Extensive expansion of cattail and 6,000 km$^2$ exotics infestation
- Repetitive water shortages and salt water intrusion
- Declining estuary health


*Watkins and Wilber*





# *Stakeholders in Everglades Management*

(in no order)

## Federal:

- FWS
- NPS
- EPA
- USACE
- USGS
- NOAA
- USDA
- FKNMS
- NMFS
- NOS
- OOAR
- Tribes

## State:

- SFWMD
- DEP
- FFWCC
- DACS
- DCA
- FDOT
- County

## Academia:

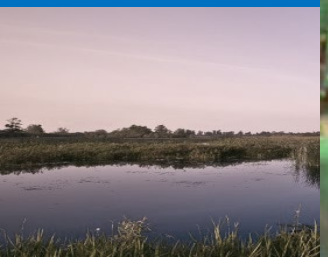
- UF - IFAS
- FAU
- FIU
- UM - RSMAS

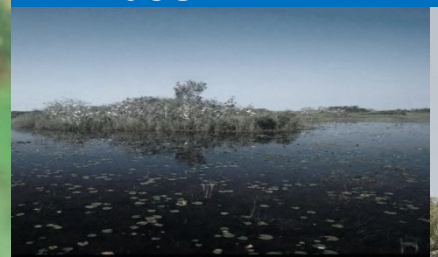
## Others:

- NGOs
- Public

## Local:

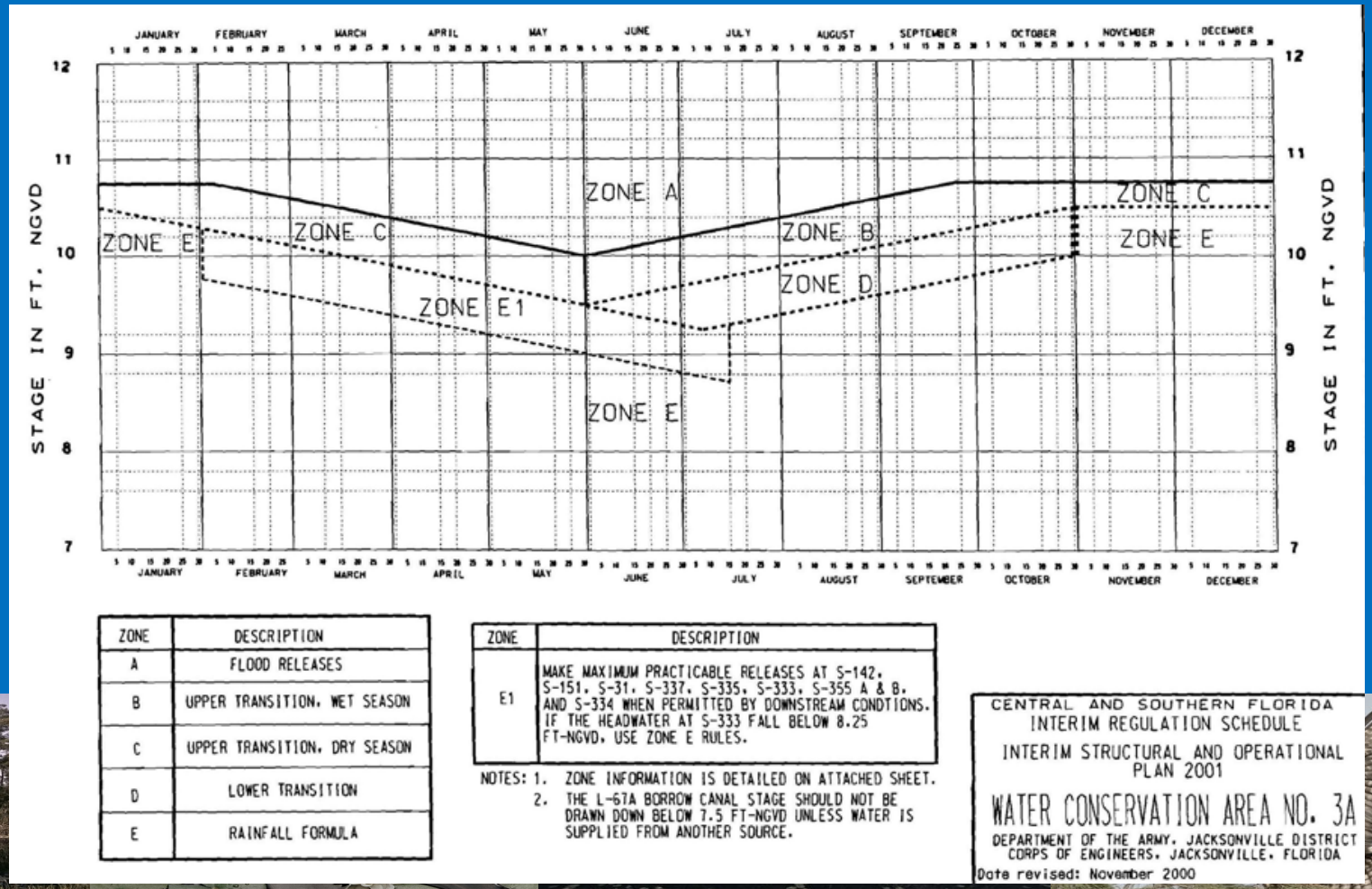
- LWDD
- Wellington





# Water Management Operations

- **Managed based on regulations such as:**
  - **Water Regulation Schedules (area-specific)**
    - **Provide flood control and water supply**
    - **Ecological Considerations**




| ZONE | DESCRIPTION |
|---|---|
| A | FLOOD RELEASES |
| B | UPPER TRANSITION, WET SEASON |
| C | UPPER TRANSITION, DRY SEASON |
| D | LOWER TRANSITION |
| E | RAINFALL FORMULA |

| ZONE | DESCRIPTION |
|---|---|
| E1 | MAKE MAXIMUM PRACTICABLE RELEASES AT S-142, S-151, S-31, S-337, S-335, S-333, S-355 A & B, AND S-334 WHEN PERMITTED BY DOWNSTREAM CONDTIONS. IF THE HEADWATER AT S-333 FALL BELOW 8.25 FT-NGVD, USE ZONE E RULES. |

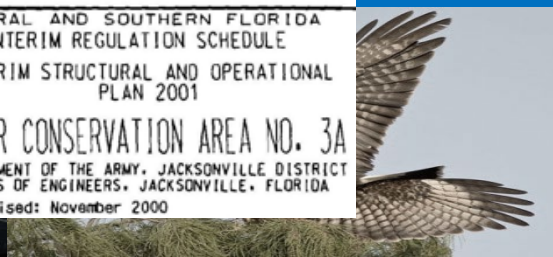
NOTES: 1. ZONE INFORMATION IS DETAILED ON ATTACHED SHEET.
2. THE L-67A BORROW CANAL STAGE SHOULD NOT BE DRAWN DOWN BELOW 7.5 FT-NGVD UNLESS WATER IS SUPPLIED FROM ANOTHER SOURCE.

CENTRAL AND SOUTHERN FLORIDA
INTERIM REGULATION SCHEDULE
INTERIM STRUCTURAL AND OPERATIONAL PLAN 2001

WATER CONSERVATION AREA NO. 3A

DEPARTMENT OF THE ARMY, JACKSONVILLE DISTRICT
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA
Date revised: November 2000




# Water Management Operations

- Managed based on regulations and environmental assessments

**WCA-3A RAINFALL-BASED MANAGEMENT PLAN**

Target Flow January 5, 2016 to January 11, 2016 MAX cfs

S-12 Discharge MAX cfs
S-333 Discharge MAX cfs

| ------- Data Summary ------- | December 25, 2015 to January 1, 2016 | |
|---|---|---|
| WCA-3A Stage (end of week) | 10.53 | ft. msl |
| Angel's | 6.65 | ft. msl |
| G3273 | 7.04 | ft. msl |

| Station | Rainfall (in) | Pan Evaporation (in) |
|---|---|---|
| NEXRAD Rain for WCA-3A and S7 evaporation | 0.17 | 1.02 |
| S-140 | | 0.90 |
| ENP | | M |
| This Week's Avg | 0.17 | 0.96 |
| Pre-Project Avg | 0.27 | 0.75 |

----- Transition Zone Information -----

WCA-3A is in Zone A Discharge Coeff. (cfs/ft) = N/A
Supplemental discharge is MAX cfs
Distance to Bottom of Current Zone -0.03 feet
Distance to Top of Current Zone N/A feet

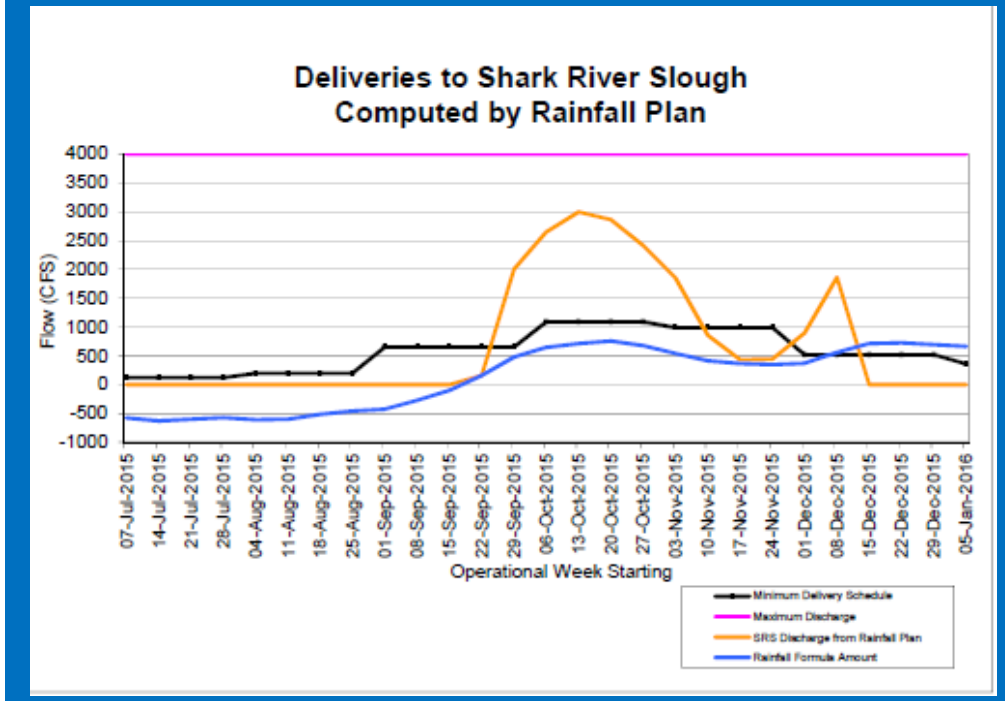
----- Statistical Parameters -----

Rainfall Formula Amount 668 cfs
Last Week's Rainfall Formula 699 cfs
Pre-Project Mean Discharge 247 cfs

Rainfall Excess Terms
RL1 -0.06 RL2 4.62 RL3 0.24

COMMENT: S7 estimated evap data and S140 estimated evap data were used. ENP evap data were missing

*NOTE: Actual discharges may vary from target discharges because of changing hydrologic conditions.

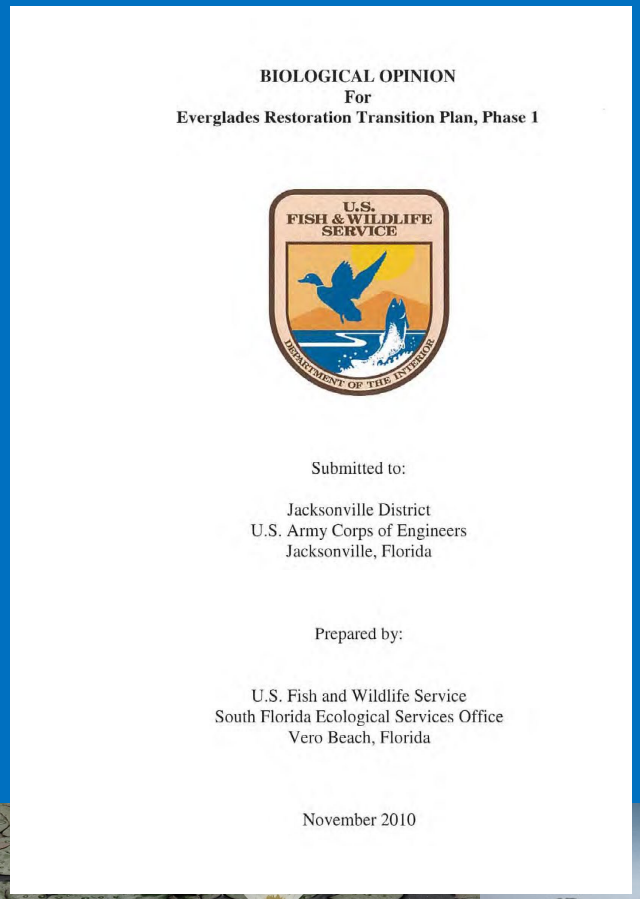







# Water Management Operations

- Managed based on regulations and environmental assessments



BIOLOGICAL OPINION
For
Everglades Restoration Transition Plan, Phase 1

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

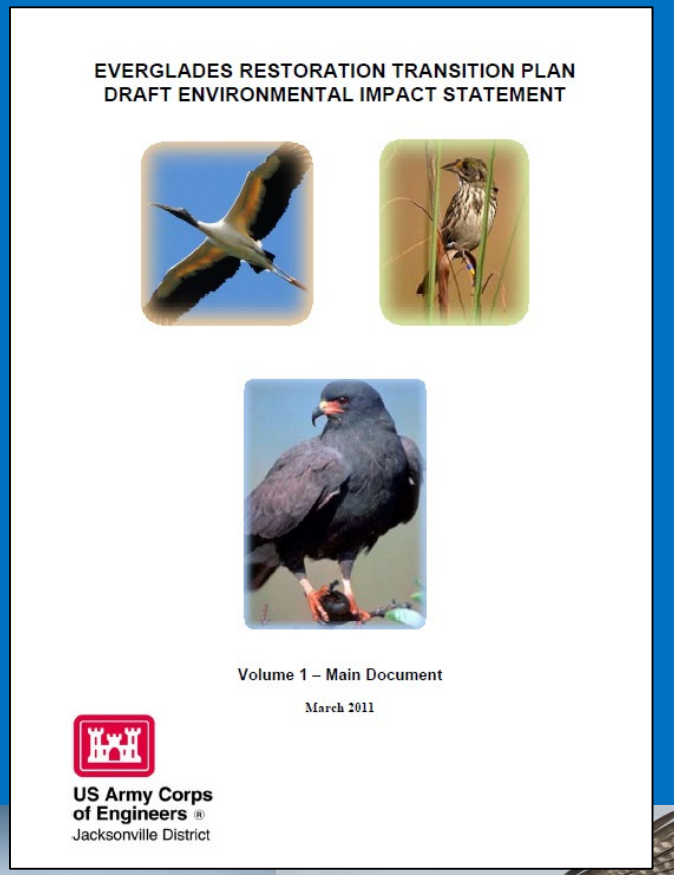
Submitted to:

Jacksonville District
U.S. Army Corps of Engineers
Jacksonville, Florida

Prepared by:

U.S. Fish and Wildlife Service
South Florida Ecological Services Office
Vero Beach, Florida

November 2010



EVERGLADES RESTORATION TRANSITION PLAN
DRAFT ENVIRONMENTAL IMPACT STATEMENT



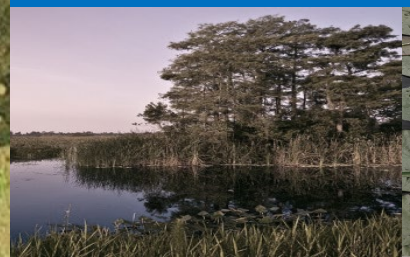


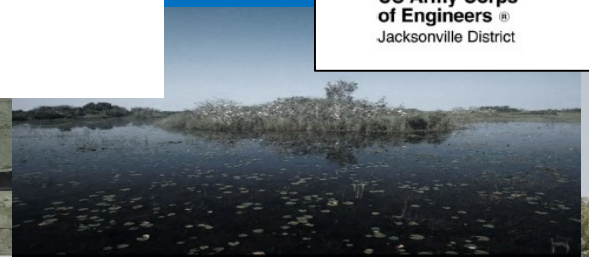


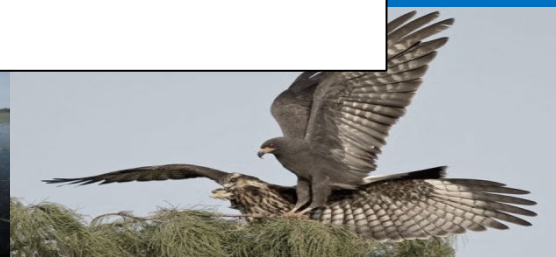
Volume 1 – Main Document

March 2011

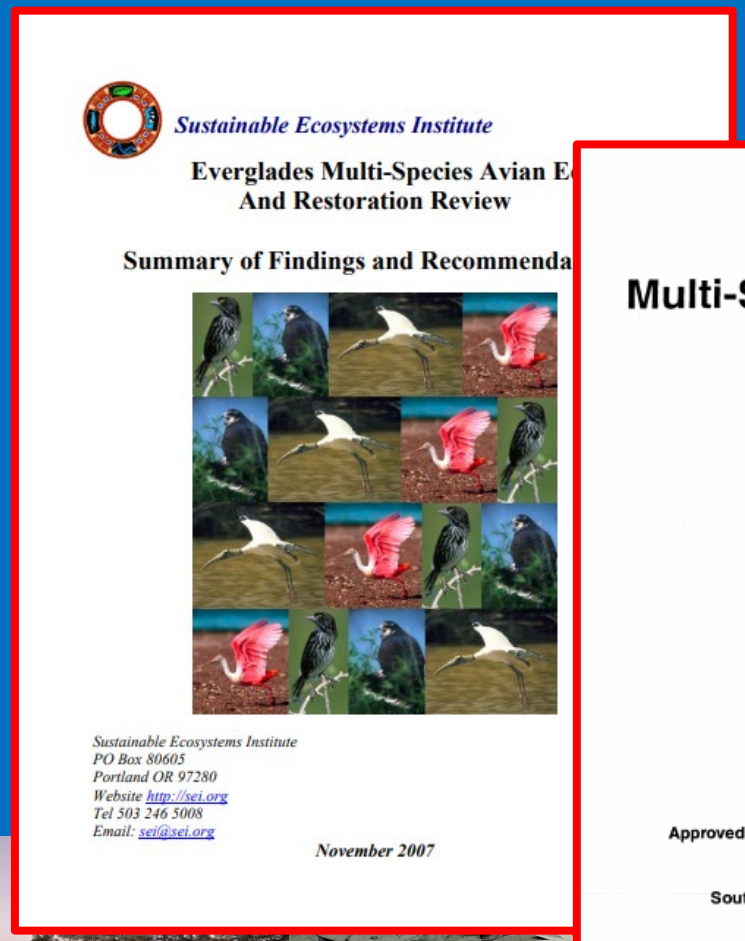
US Army Corps of Engineers ®
Jacksonville District



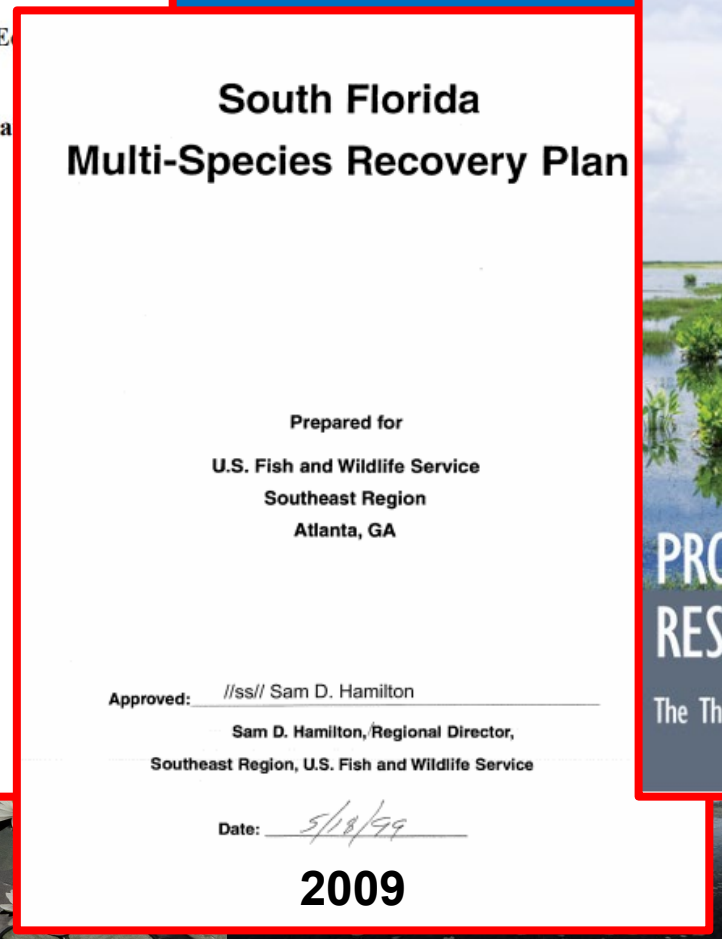




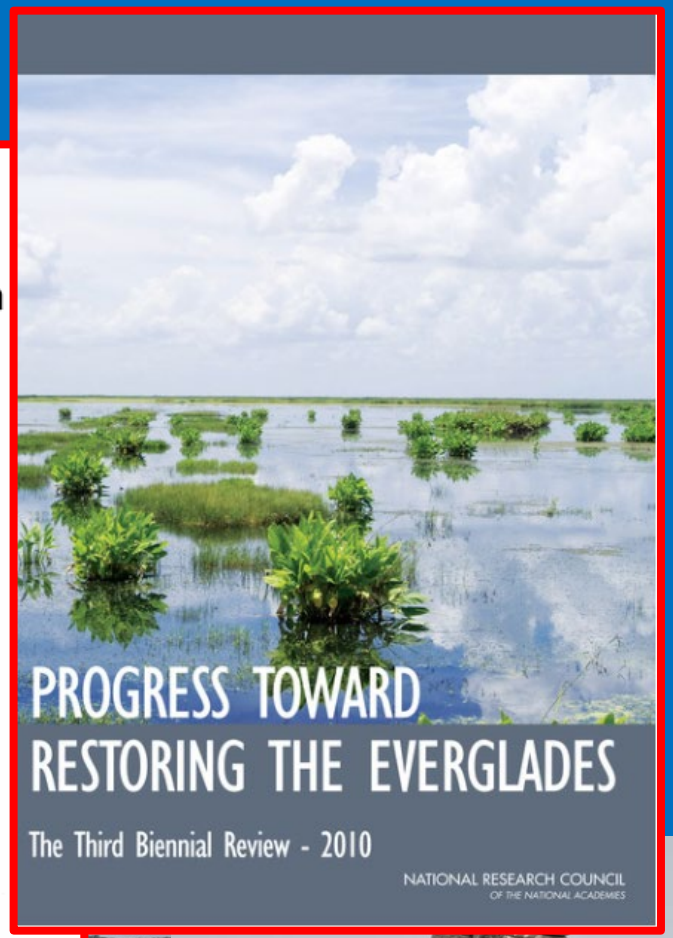
# *Multi-Dimensional Solutions Needed to integrate restoration, research, habitat management, monitoring, operations*




2007



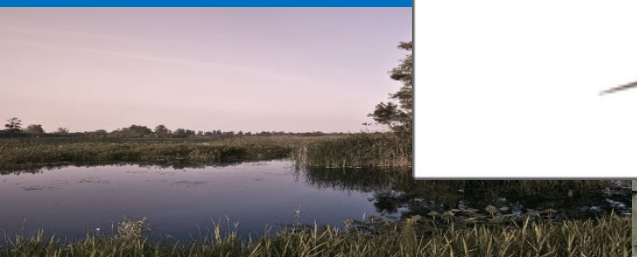

2009




2010


Enquist CAF et al. (2017)

**Translational science focuses on the importance of communicating scientific information to "connect end-users of environmental science to the field research carried out by scientists" (Schlesinger 2010).**





Translational Science

Issue

Decision Support Tool(s)

Other information and data layers

Specific research questions

MANAGEMENT OBJECTIVE(S)

How achieve/which management objectives?

Synthesis of information for decision makers

Information

AAAA

BBBB

CCCC

DDDD

How questions?

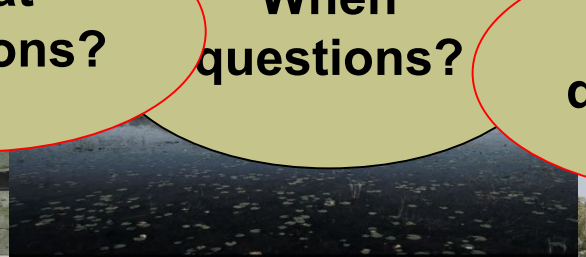
What questions?

When questions?

Where questions?

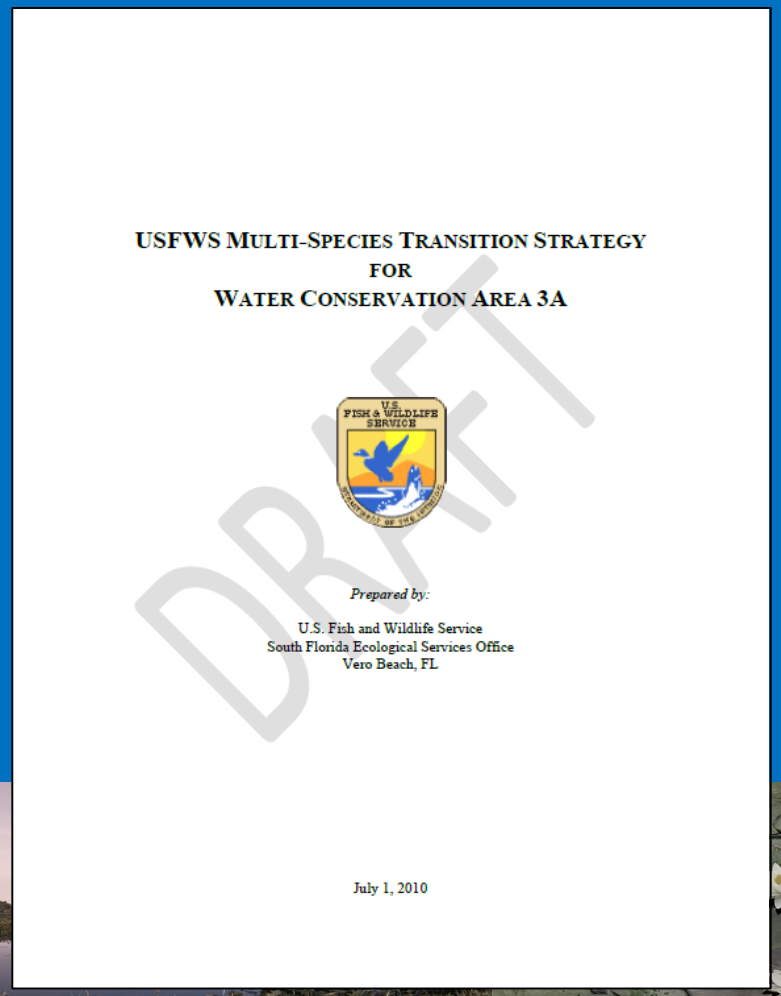
Managers (Users)

Scientists (Producers)



# Managing Ecohydrology in the Everglades

- Everglades Restoration Transition Plan
- Multispecies Transition Strategy



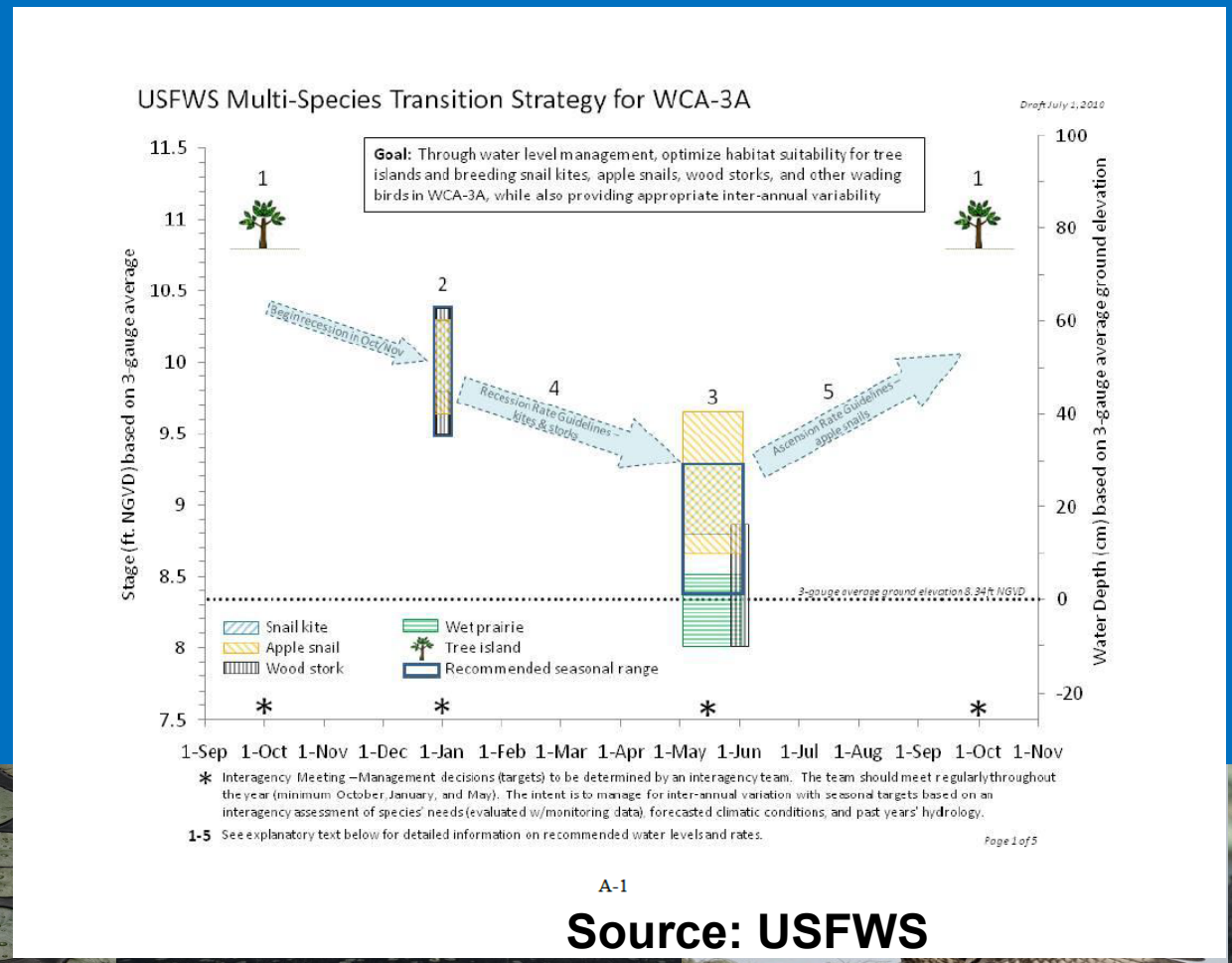
USFWS MULTI-SPECIES TRANSITION STRATEGY
FOR
WATER CONSERVATION AREA 3A

DRAFT

*Prepared by:*

U.S. Fish and Wildlife Service
South Florida Ecological Services Office
Vero Beach, FL

July 1, 2010




A-1

**Source: USFWS**

# *Decision Support Tools – Past, Current, Future Temporal scales*

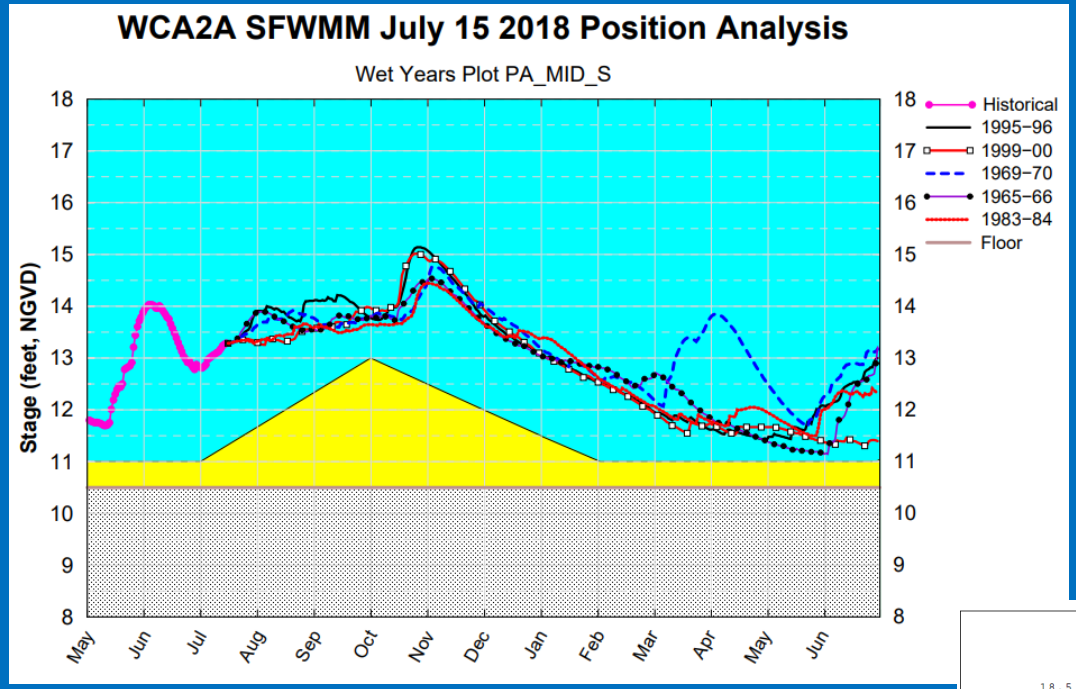
## *Individual/Specific Purposes*

- SFWMD Position Analysis
- USACE Conditions Update
- USGS Gauge Data
- Weather Forecasts (daily, seasonal)
- USFWS Species Climate Outlook
- EverVIEW
- Habitat Suitability Indices
  - WADEM
  - CSSS
  - Many others

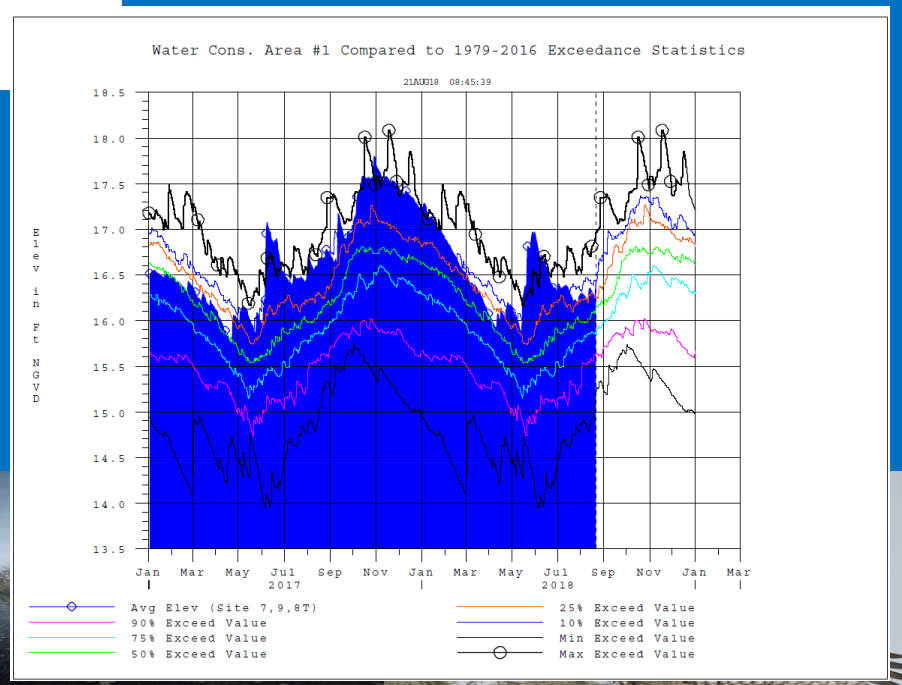
**Past:** Individual Use

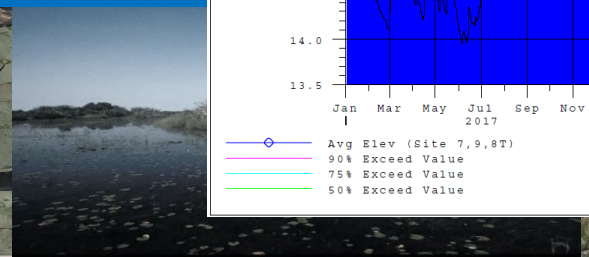

**Current:** Combine

# SFWMD – Position Analysis

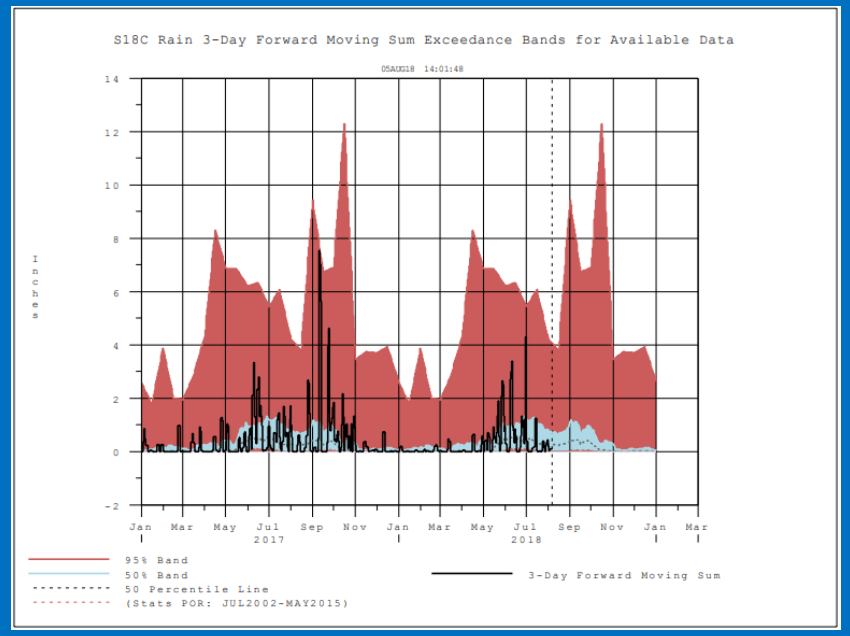



# USACE – Water Level Exceedence Statistics

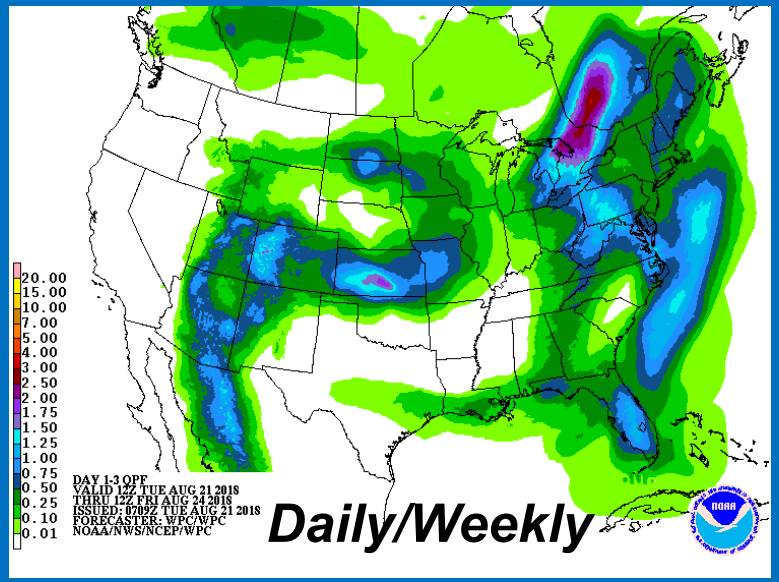


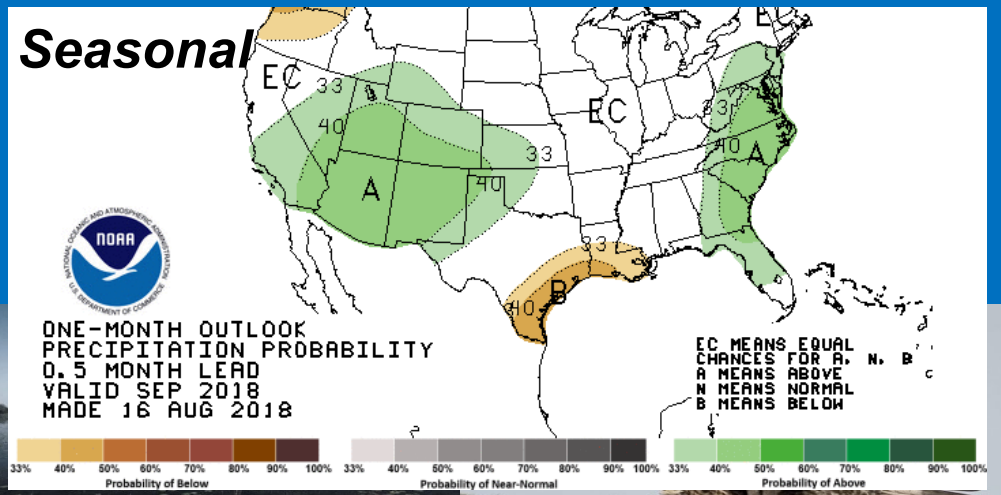



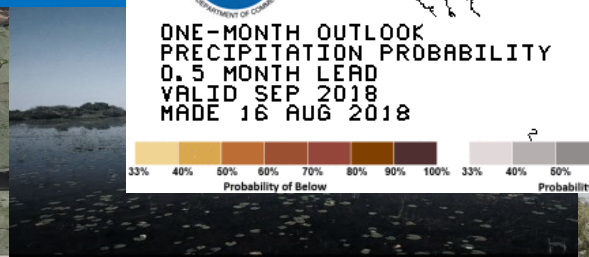
# USACE Structure Rainfall Forecast



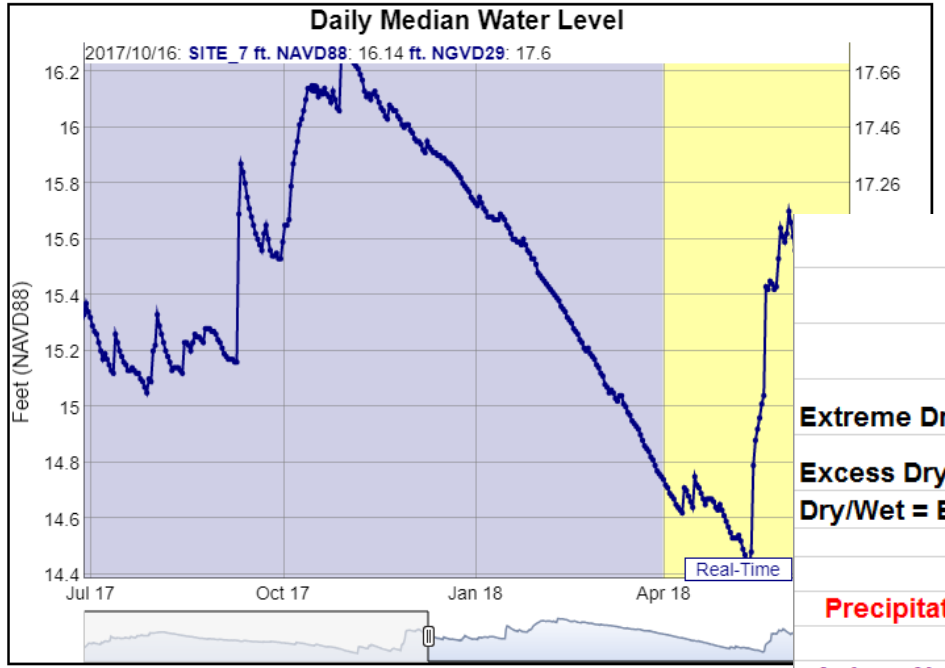

# NOAA Rainfall Predictions



# USGS Gage Data
# Explore and View EDEN




# USFWS Species Climate Outlook

## Precipitation Outlook for Species Seasons through the next 12 months

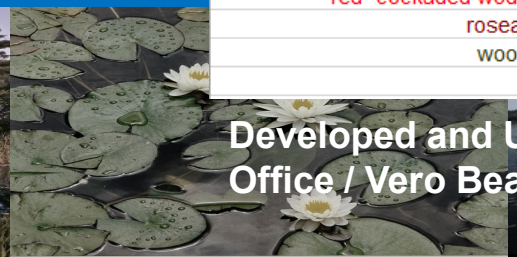
**January 17, 2018**

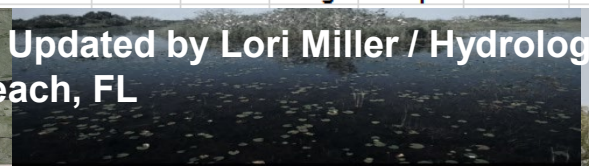
**Extreme Dry/Wet = Very Much Below/Above Normal Precip**

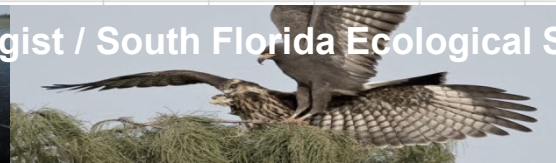
**Excess Dry/Wet = Much Below/Above Normal Precip**

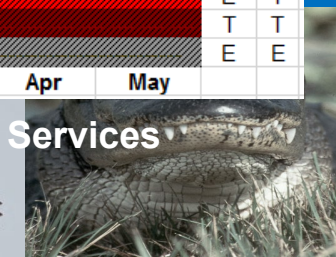
**Dry/Wet = Below/Above Normal Precip**

| Precipitation Outlook --> | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Fed | FL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Wet | Wet | Wet | Avg. | Avg. | Wet | Wet | Excess Wet | Wet | Avg. | Avg. | Avg. | | |
| **Avian - Nesting, Migrating** | | | | | | | | | | | | | | |
| **alphabetically by common name** | | | | | | | | | | | | | | |
| Audubon's crested caracara | | | | | | | | | | | | | T | T |
| bald eagle | | | | | | | | | | | | | BEPA | T |
| Cape Sable seaside sparrow | | | | | | | | | | | | | E CH | E |
| Everglade snail kite | | | | | | | | | | | | | E CH | E |
| Florida grasshopper sparrow | | | | | | | | | | | | | E | E |
| Florida scrub-jay | | | | | | | | | | | | | T | T |
| Kirtland's warbler migration | | | | | | | | | | | | | E | E |
| piping plover wintering | | | | | | | | | | | | | T CH | T |
| red -cockaded wodpecker | | | | | | | | | | | | | E | T |
| roseate tern | | | | | | | | | | | | | T | T |
| wood stork | | | | | | | | | | | | | E | E |
| | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | | |



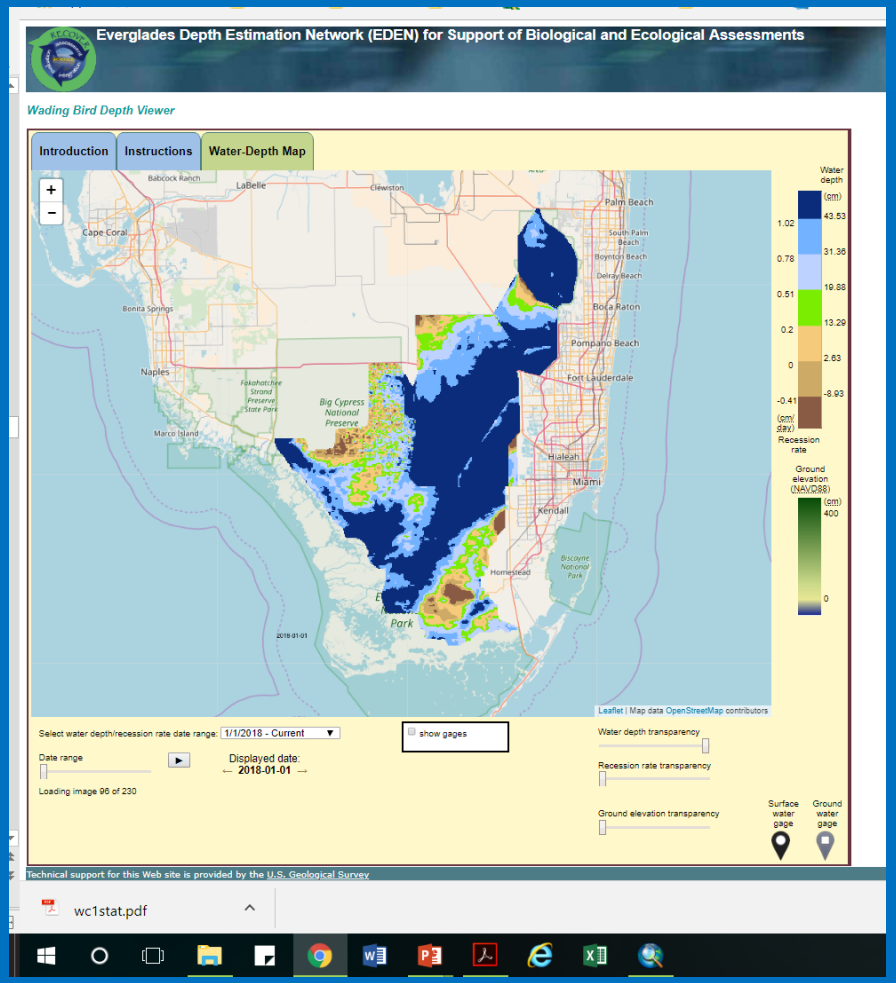




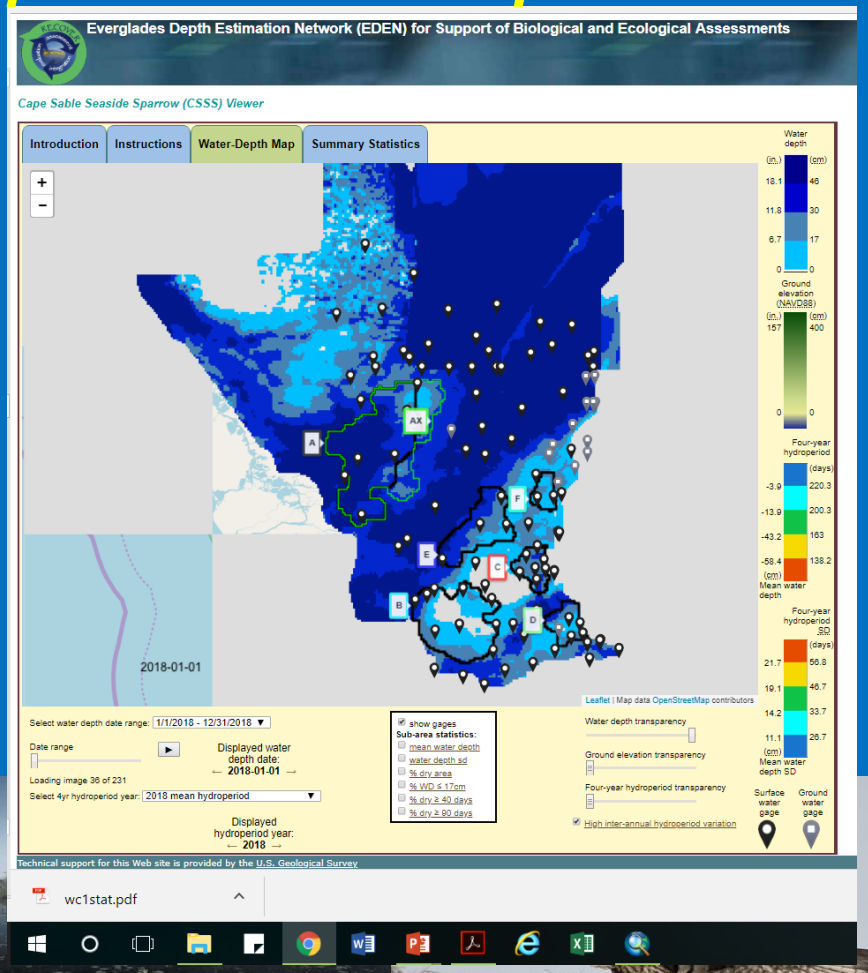


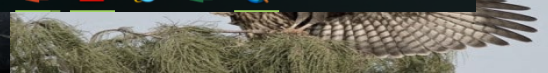

Developed and Updated by Lori Miller / Hydrologist / South Florida Ecological Services Office / Vero Beach, FL

# Wading Bird Depth Viewer




# Cape Sable Seaside Sparrow Water Depth Viewer

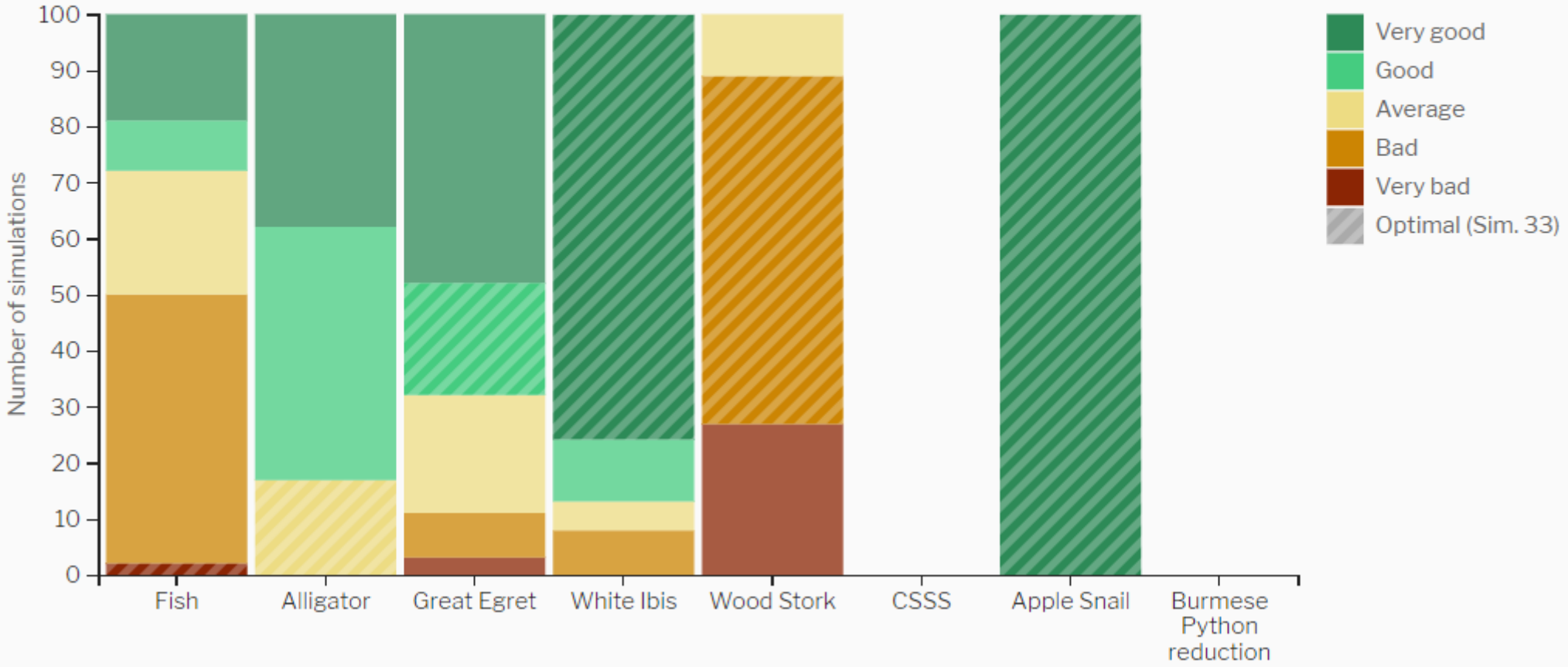


# Multi-species scorecard

## Ever4Cast Tool - USGS

Species model outcomes for each simulation are compared against historical averages, and rated as *very bad*, *bad*, *average*, *good*, or *very good*. This scorecard may indicate the likelihood of included species to perform generally well or poorly under the forecasted hydrologic conditions.




https://www.jem.gov/

# Translational Science Framework – Ecosystem Based Management

**Stakeholder Engagement**

**Researchers:**
***Management-based Science***

**Agency Scientists:**
***Science-based Management***

**Agency Managers**
- **Rainfall**
- **Objectives**

**TS and DST**

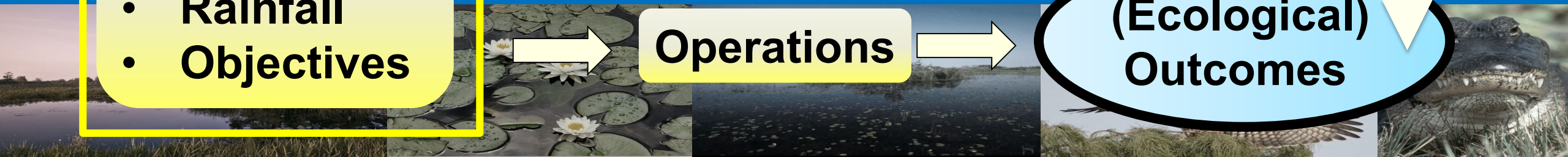
**Seasonal Recommendations**
- ***Landscape***
- ***Local***

**TS and DST**

**Quarterly/Weekly Recommendation Refinement**
- ***Landscape***
- ***Local***

**Operations**

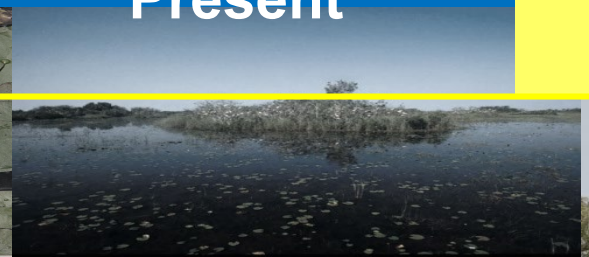
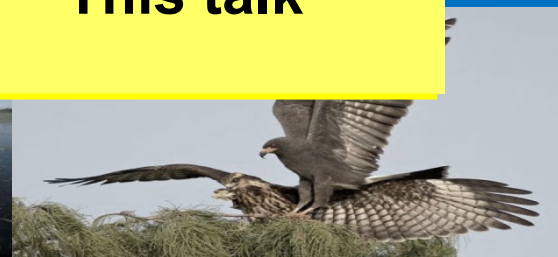
**(Ecological) Outcomes**



# *Ecosystem Based Management*

| Information | Then | Now |
|---|---|---|
| • Structure Operations | Available | Available |
| • Canal & Marsh Stage | Available | Available |
| • Tracking Water Movement into Marsh | Limited | More extensive |
| • Water Quality in Marsh | Limited | More extensive |
| • Ecological Condition | Limited | More extensive |
| • Tool Applications | Limited | This talk |
| • Management Recommendations | Present | This talk |



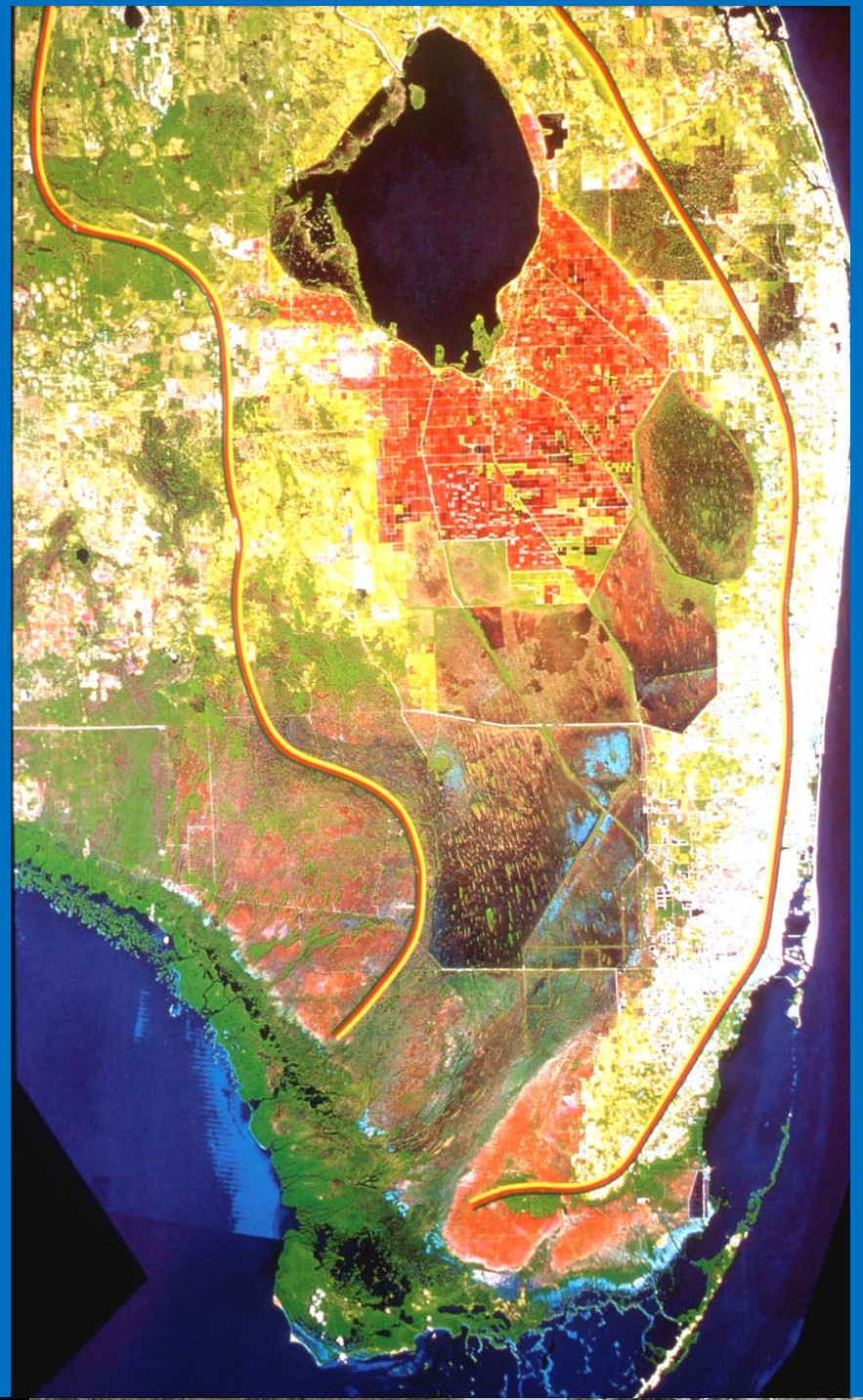

# Summary

## *Best Practices*

- Multi-agency requirements
- Multi-stakeholder engagement
- Recurring engagement scientists and managers
- Individual tools → Multi-tool approach
- "Joint" input to operations managers
  - Group recommendations for areas collaboratively developed

## *Future Needs*

- Measuring effectiveness
  - Quantify impacts to ecosystem resources**
  - Continue to integrate tools
  - In-depth evaluation of past season recommendations
- Continue to refine integration with operational decisions
  - Communication tools



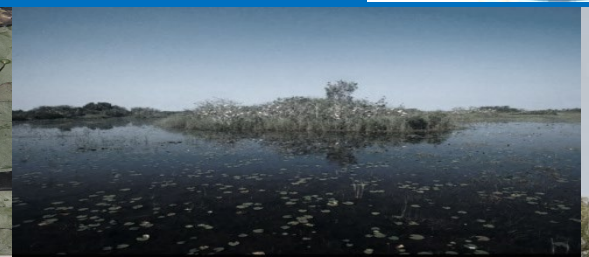
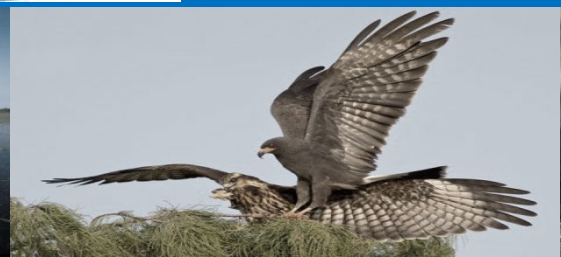
# Acknowledgements

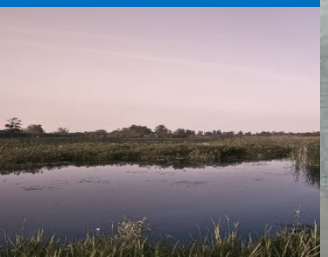

- Heather Tipton, Eric Cline, Marsha Ward, Tyler Beck, Mark Cook, Kevin Palmer, Tylan Dean, Marla Hamilton, James Beerens, Leonard Pearlstine, Olice Williams


US Army Corps of Engineers®

USGS science for a changing world




E. BUCKNER