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

Outline

- Everglades Set-up
- Defining Stakeholders
- Translational Science
- Decision Support Tools
  - Hydrologic/climate forecast Projections
  - Species Climate Outlook
  - Habitat Suitability Indices
- Examples at Different Scales
  - Daily-scale Water Management
  - Quarterly/Seasonal Scales
  - Larger Spatial Scales
- 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

An Ecosystem Managed for Multiple Purposes

- Highly managed system
- Ecological
  - Supports 67 T & E species
  - Endemic species
  - Important migration stop
  - Imperiled habitats
- Ecosystem Services
  - Wet and Dry Seasons
    - Water supply
      - Agricultural
      - Urban
    - Flood Control

EVERGLADES FOUNDATION

Multiple impounded areas
Everglades Restoration
Filter marshes, reservoirs, etc

An Ecosystem Managed for Multiple Purposes

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Map Source: Everglades Foundation

An Ecosystem Managed for Multiple Purposes

- **Highly managed system**
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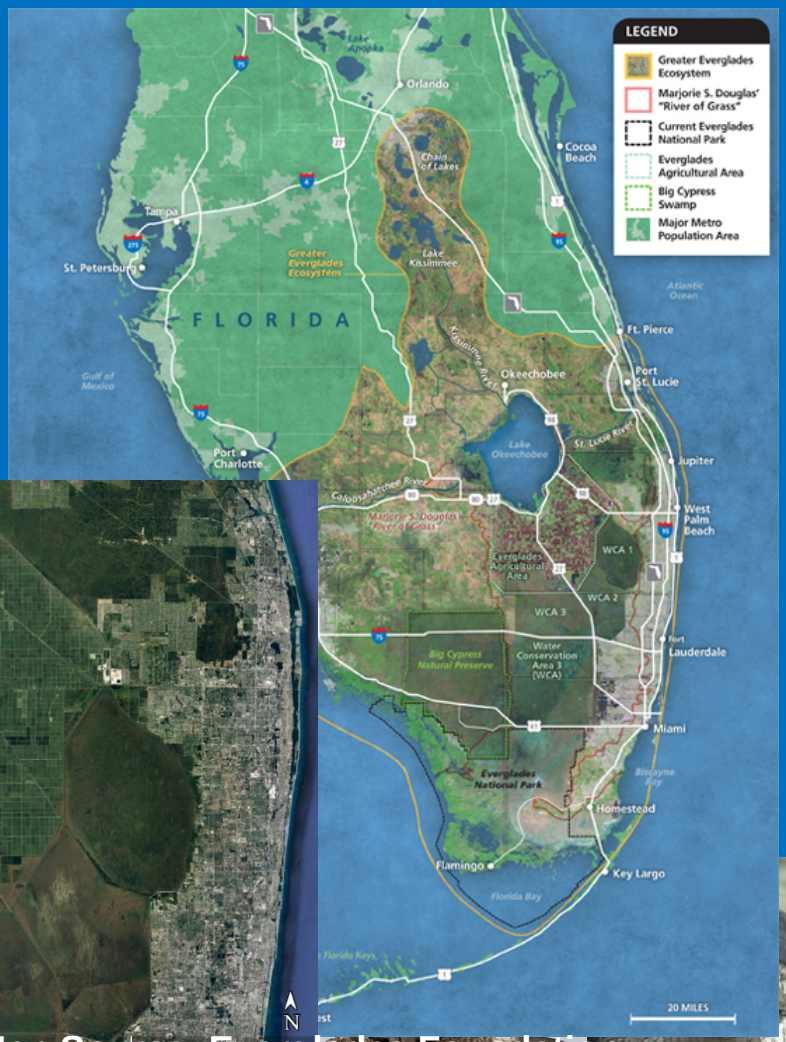
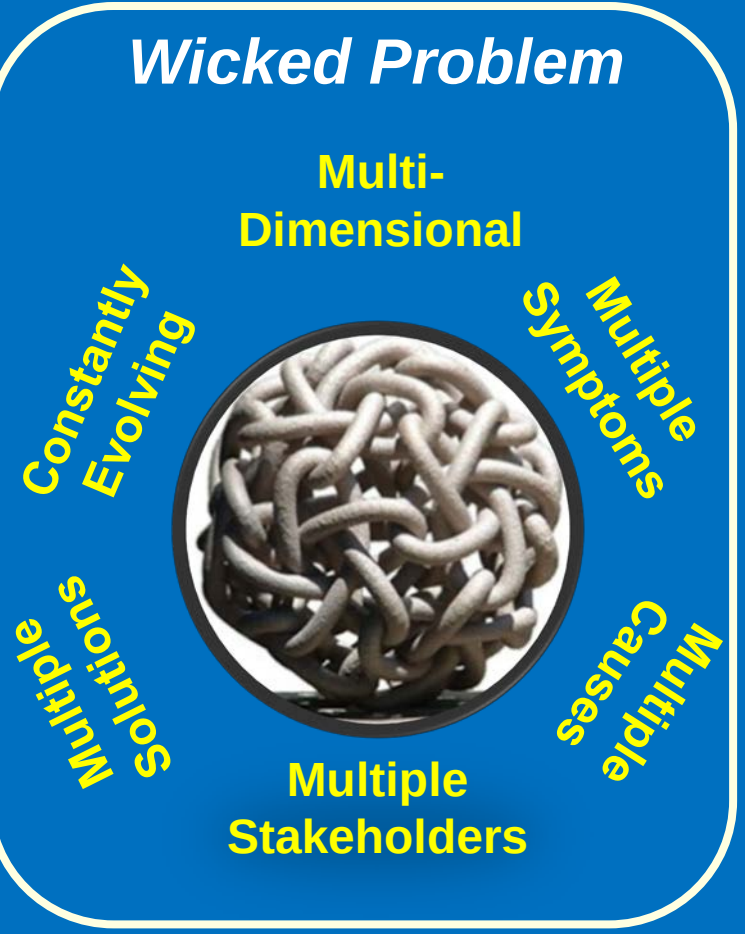
- **Ecosystem Services**
  - **Wet and Dry Seasons**
    - **Water supply**
      - **Agricultural**
      - **Urban**
    - **Flood Control**



Map Source: Everglades Foundation

An Ecosystem in Trouble

- Too much/too little water
- Everglades half of original extent
  - Impoundments block flow
- Massive reductions in wading birds
  - Down 90-95%
  - Actively manage for 3 T&E species
  - Suite of white, long-legged wading birds
- 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:

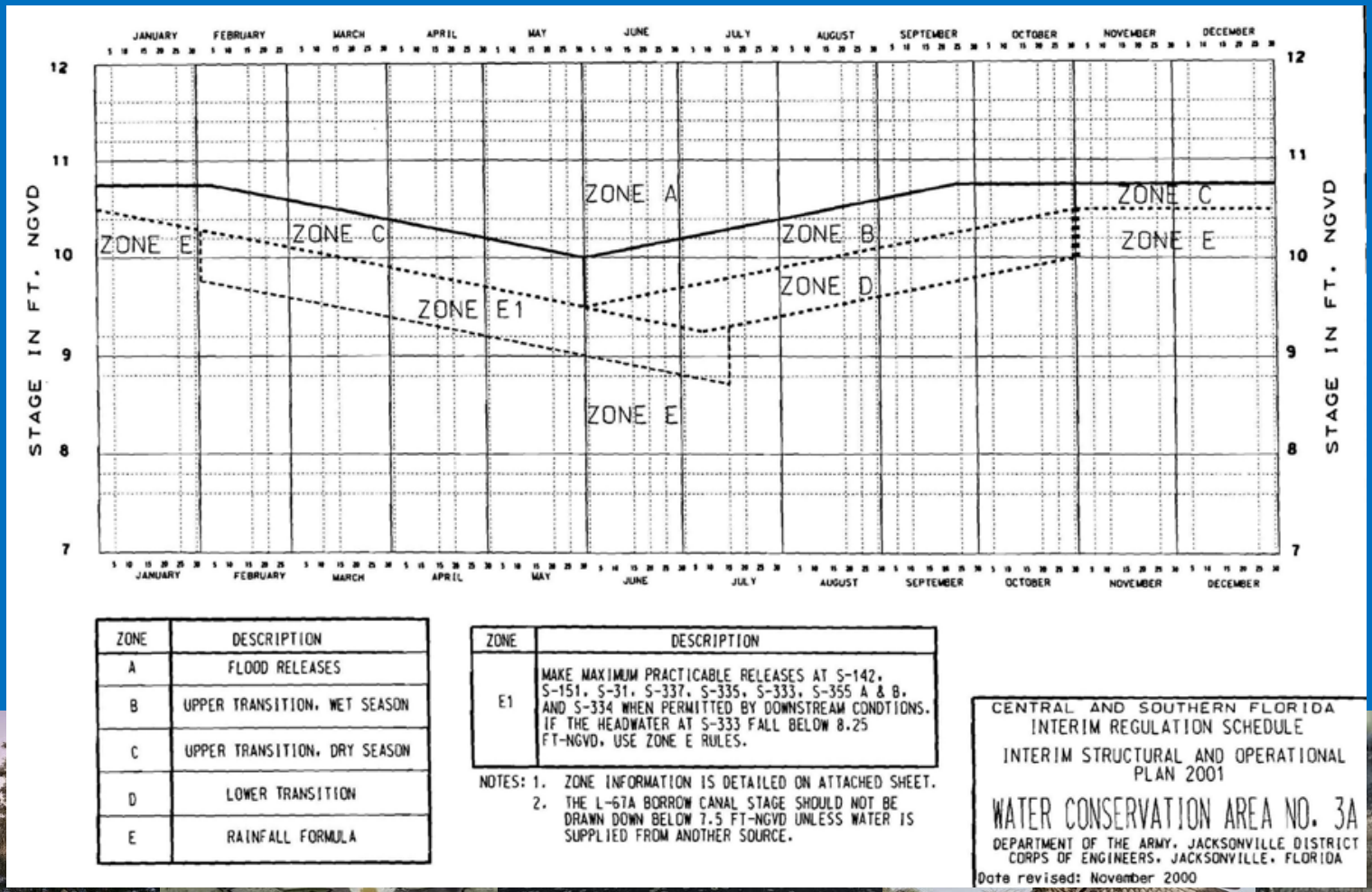
- NGOs
- Public

Local:

- LWDD
- Wellington

Water Management Operations

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



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

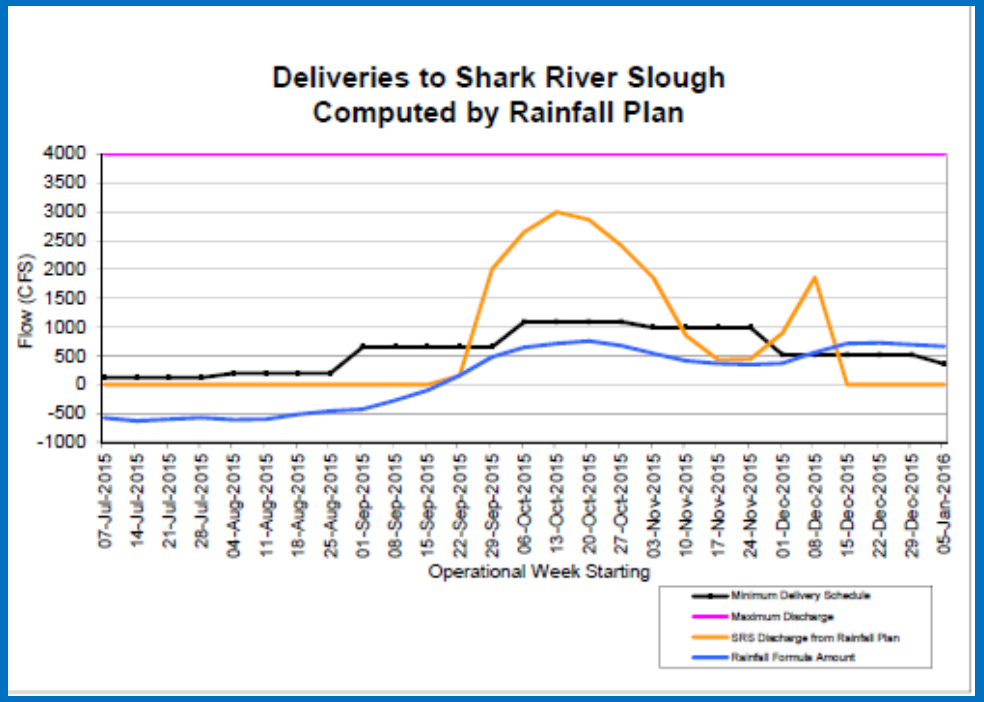
----- Transition Zone Information -----
WCA-3A is in Zone A Discharge Coeff. (cfs/ft) = N/A
Supplemental discharge is MAX cfs
Distance to Bottom of Current Zone -0.03 feet
Distance to Top of Current Zone N/A feet

----- 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.

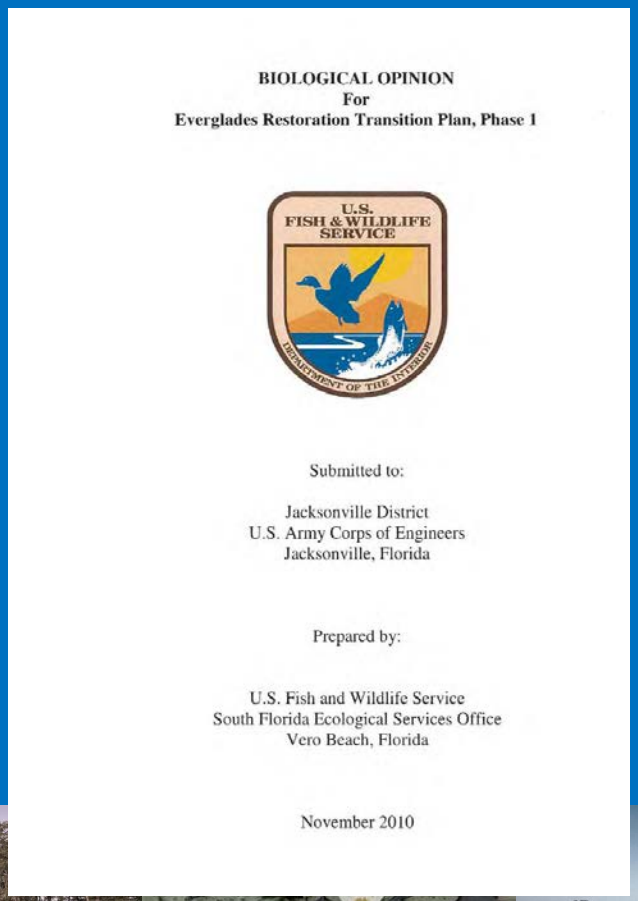






Water Management Operations

- **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

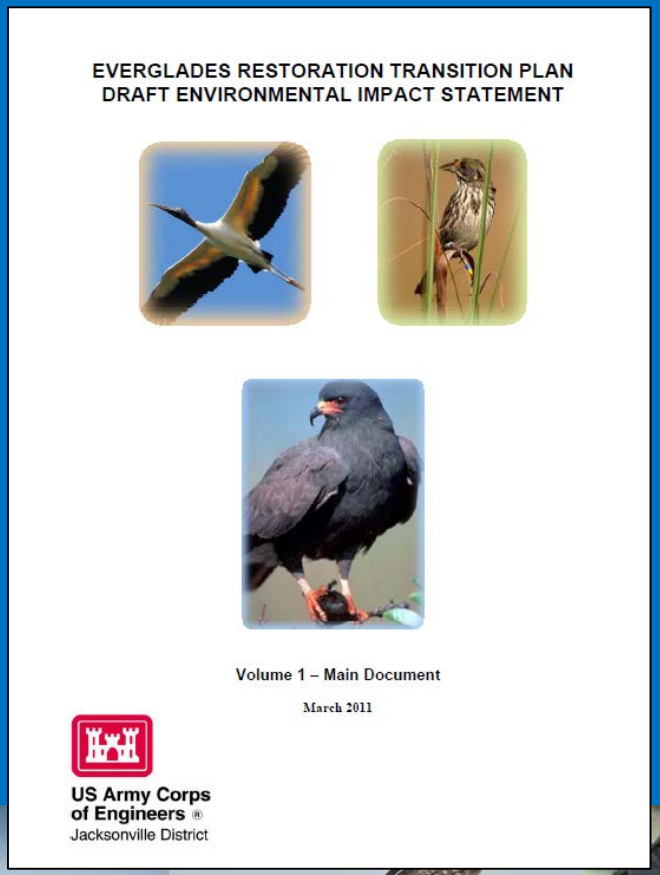
Submitted to:

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

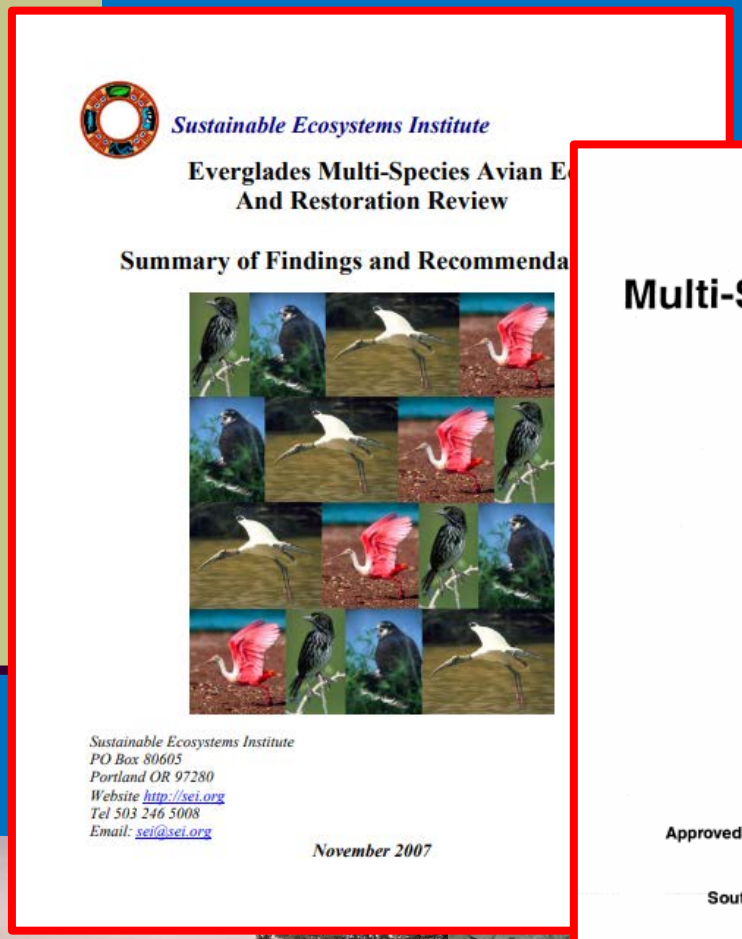
March 2011

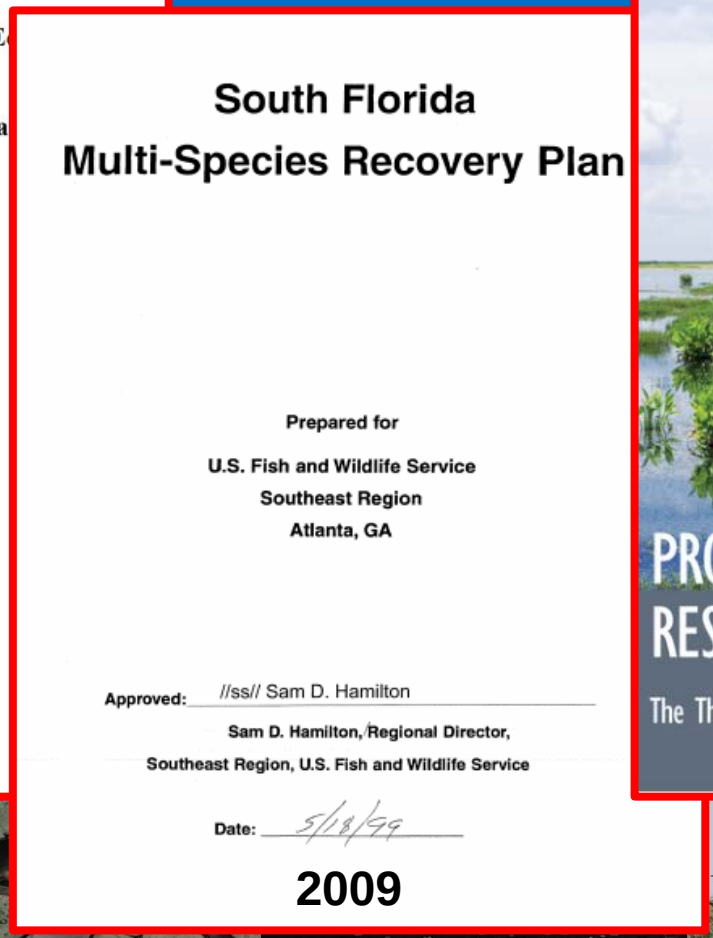
US Army Corps of Engineers ®
Jacksonville District

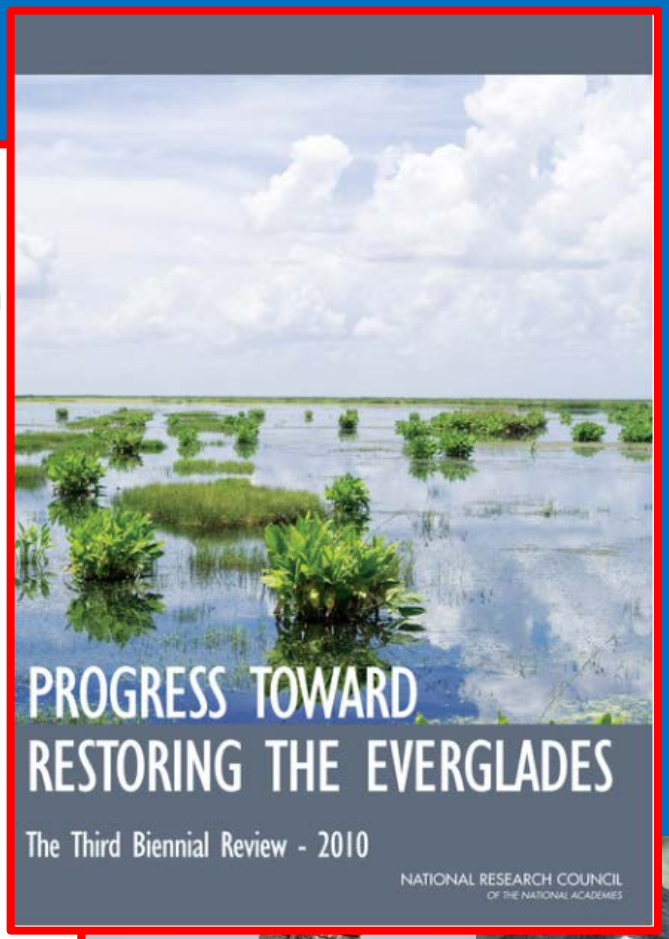
Managing Ecohydrology in the Everglades – Species info

- **Apple snails (snail kite prey)**
  - Water depth, Mar-Oct: > 10 cm (0.325 ft)
  - Ascension rate (reversals), dry season: < 7.6 cm/week (0.25 ft/week)
- **Prey (small bodied) fish**
  - Maintain water above ground surface (*if not, 3-year recovery period*)
- **Wading birds (indicator species)**
  - Breeding. Recession rate, Jan-Feb: 1.5-4.3 cm/week (0.05-0.14 ft/week)
  - Foraging/nesting. Avoid reversal of > 3 cm (0.10 ft) [dry season]
  - Maintain water above ground through dry season
- **Snail kites (Endangered)**
  - Foraging. Recession rate, dry season: 1-2 cm/week (0.03-0.06 ft/week) [< 3 cm/week (0.10 ft/week)]
- **Tree islands (imperiled habitat)**
  - Flooded < 120 days (60-300 days?)
  - 1-8C stage for 3 weeks > 5.2 m, msl (17.0 ft, msl) [3 of 4 years]
- **Others**

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

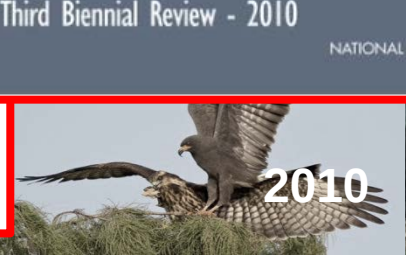




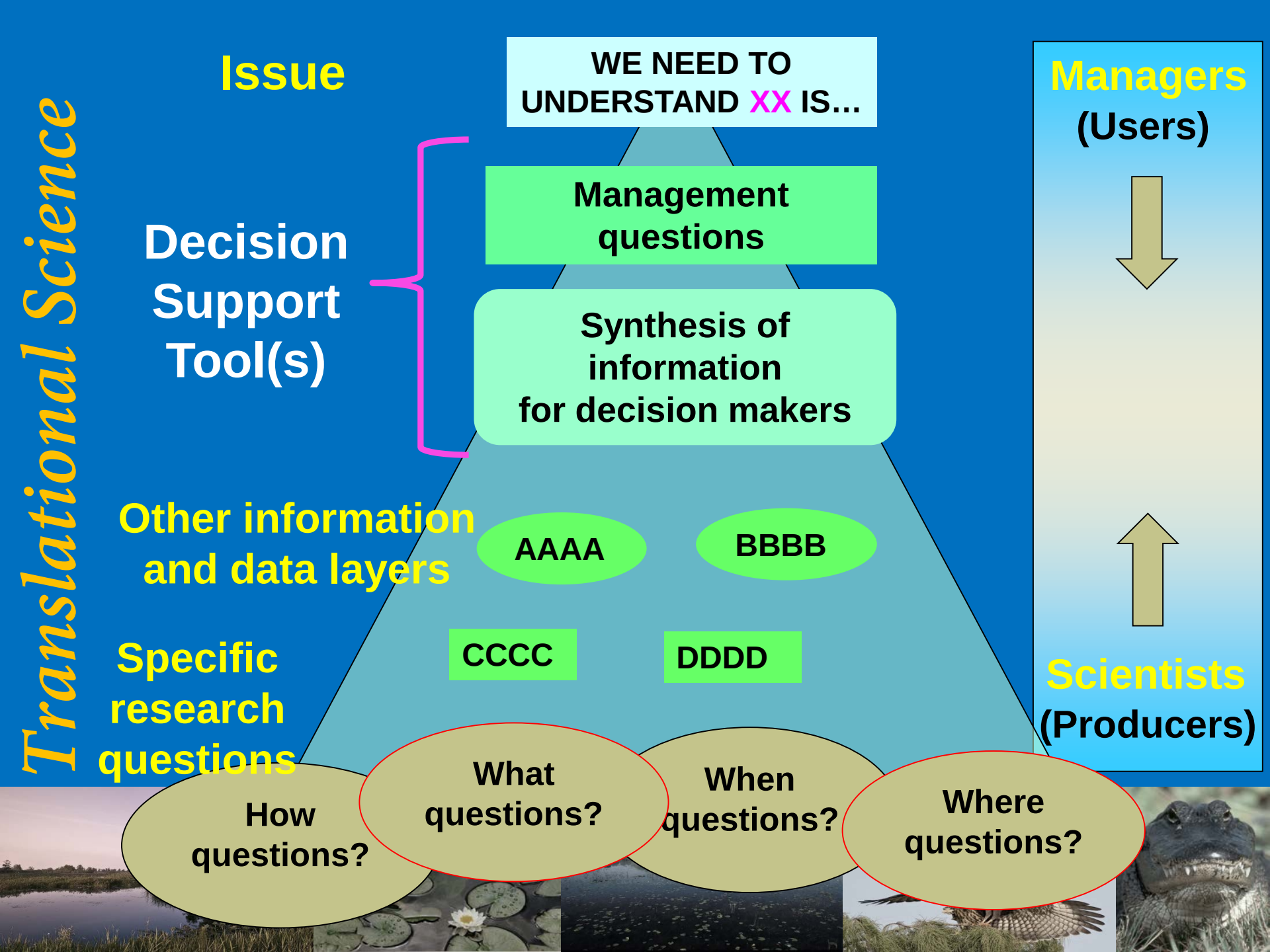


2007

2009



2010


Translational Science
Issue
WE NEED TO UNDERSTAND XX IS…
Managers (Users)
Decision Support Tool(s)
Management questions
Synthesis of information for decision makers
Other information and data layers
AAAA
BBBB
CCCC
DDDD
Specific research questions
How questions?
What questions?
When questions?
Where questions?
Scientists (Producers)

Managing Ecohydrology in the Everglades

- Everglades Restoration Transition Plan
  - Multispecies Transition Strategy

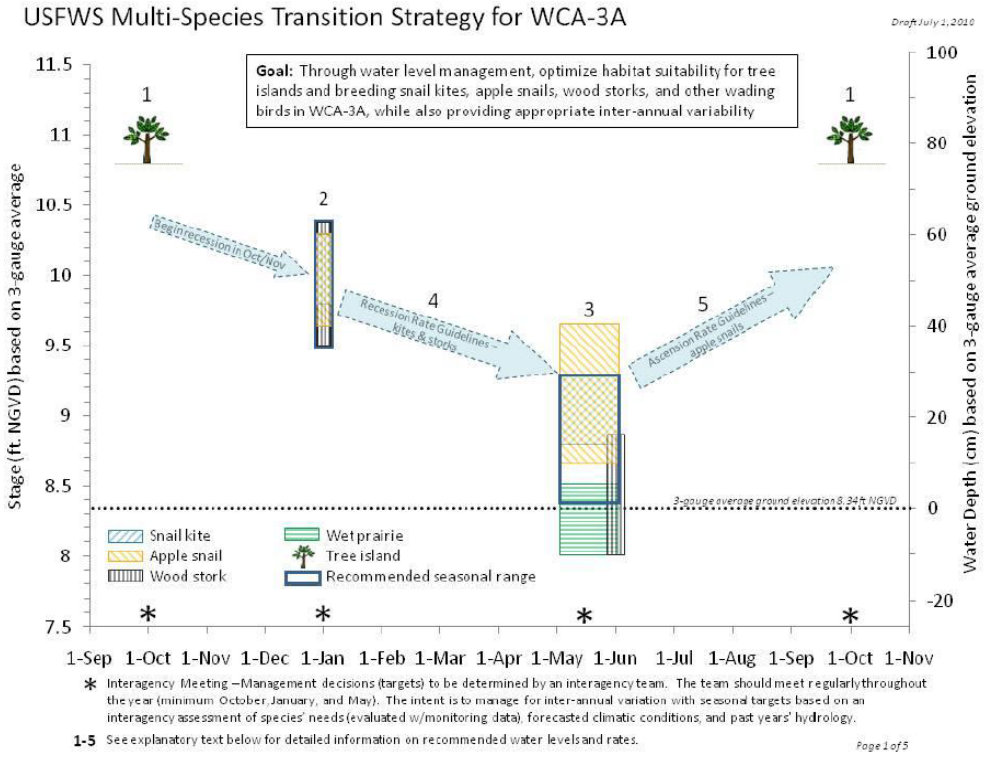
USFWS MULTI-SPECIES TRANSITION STRATEGY
FOR
WATER CONSERVATION AREA 3A

DRAFT

Prepared by:

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

July 1, 2010



A-1

Source: USFWS

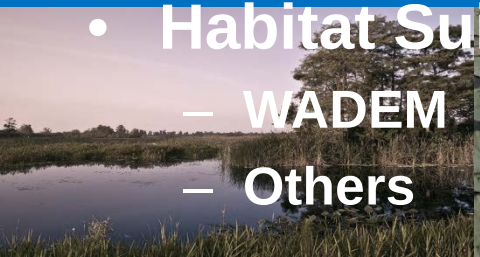
Decision Support Tools – Past, Current, Future Temporal scales

Individual/Specific Purposes

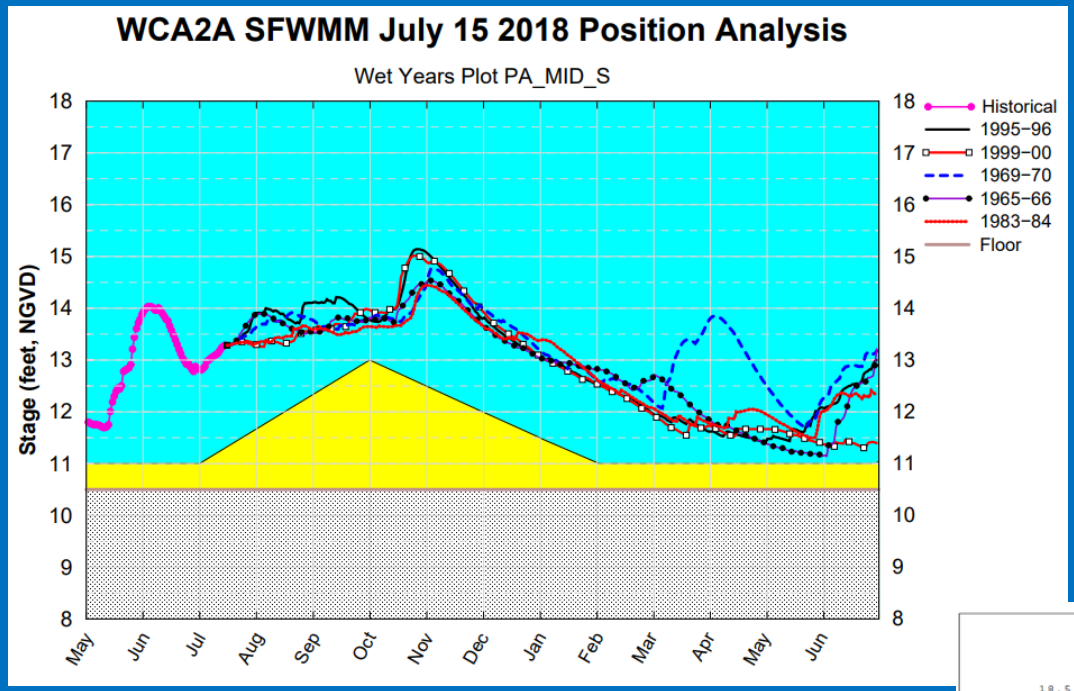
- SFWMD Position Analysis
- USACE Conditions Update
- USGS Gauge Data
- Weather Forecasts (daily, seasonal)
- EVER4cast/Multi-Species Modeling
- USFWS Species Climate Outlook
- EverVIEW
- Habitat Suitability Indices
  - WADEM
  - Others

Past: Individual Use

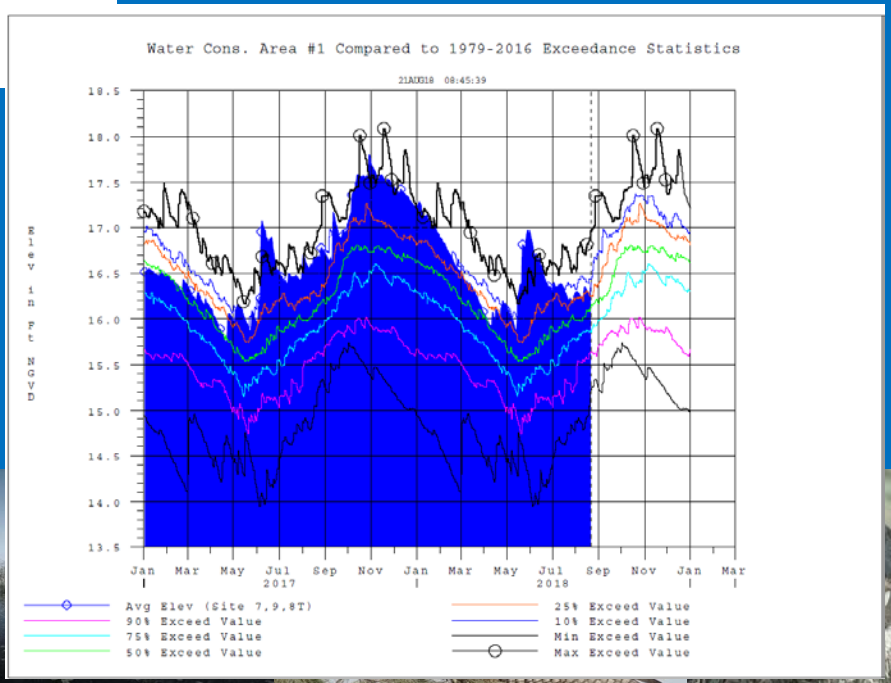
Current: Combine



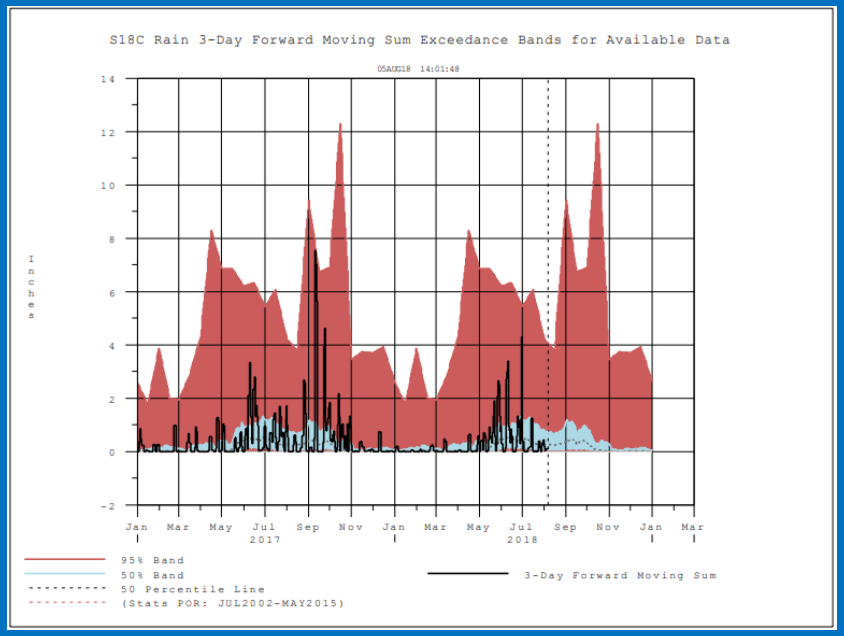
SFWMD – Position Analysis



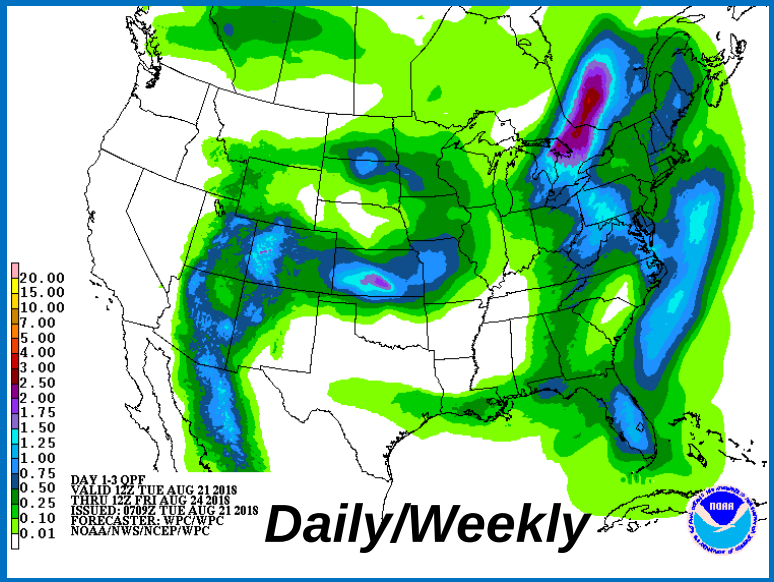
USACE – Water Level Exceedence Statistics

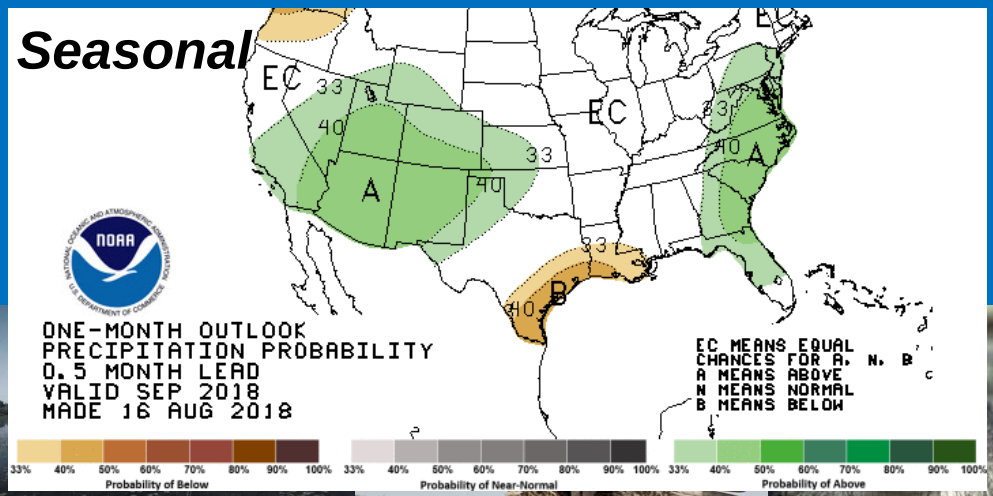


USACE Structure Rainfall Forecast

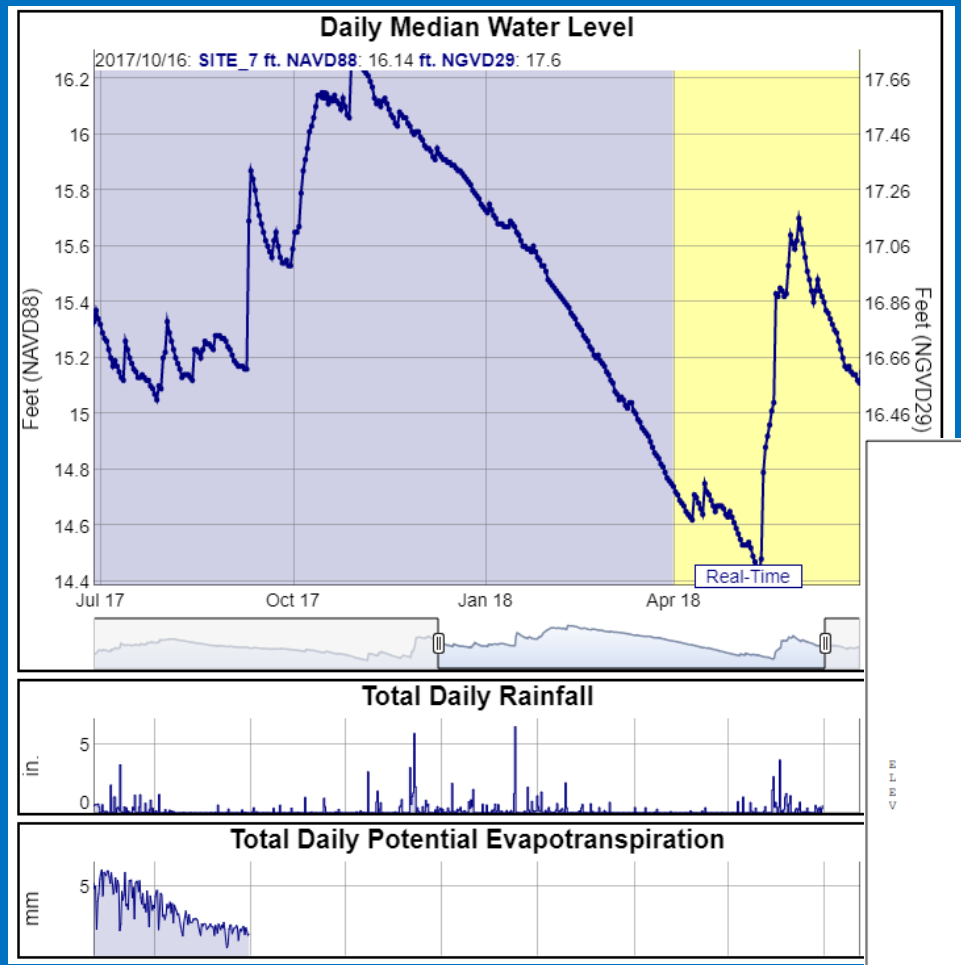


NOAA Rainfall Predictions

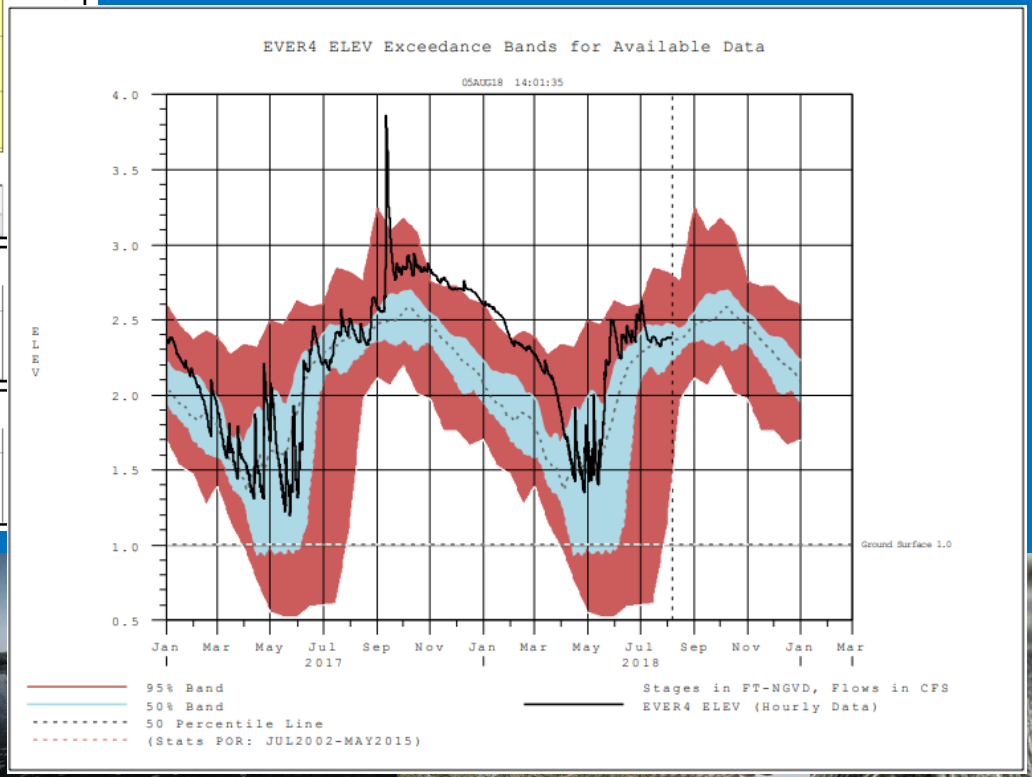




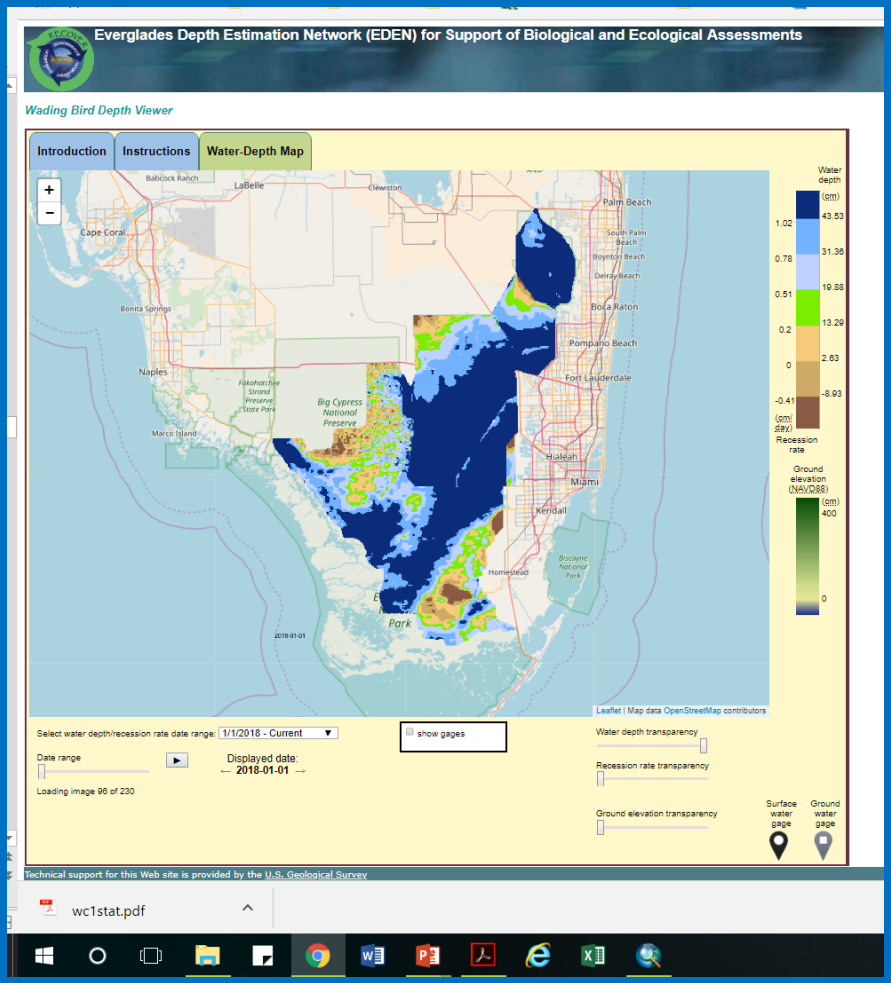
USGS Gage Data
Explore and View EDEN



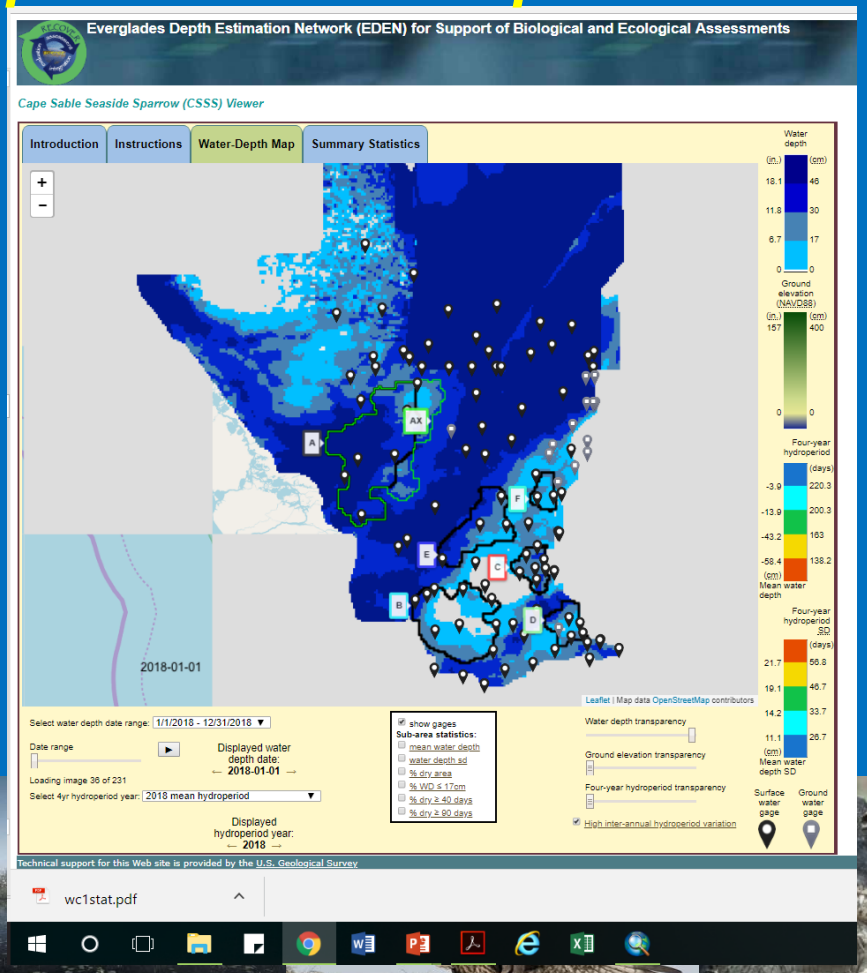
EVER4cast



Wading Bird Depth Viewer



Cape Sable Seaside Sparrow Water Depth Viewer



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 -->	Wet	Wet	Wet	Avg.	Avg.	Wet	Wet	Excess Wet	Wet	Avg.	Avg.	Avg.		
Avian - Nesting, Migrating														
alphabetically by common name	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Fed**	**FL**
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





Approach to integrate info:

Participants

- Managing Agency Scientists
- Researchers/Species experts

Meetings

- Seasonal
- Monthly
- Weekly
- Daily**

Operations Managers

Tools

All relevant & available
Looking forward
Most likely conditions

Integrated Recommendations

Management Units/Landscape
Current conditions
Climate expectations
Species status
Antecedent conditions

Integrated Recommendations

Researchers

Agency Scientists

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

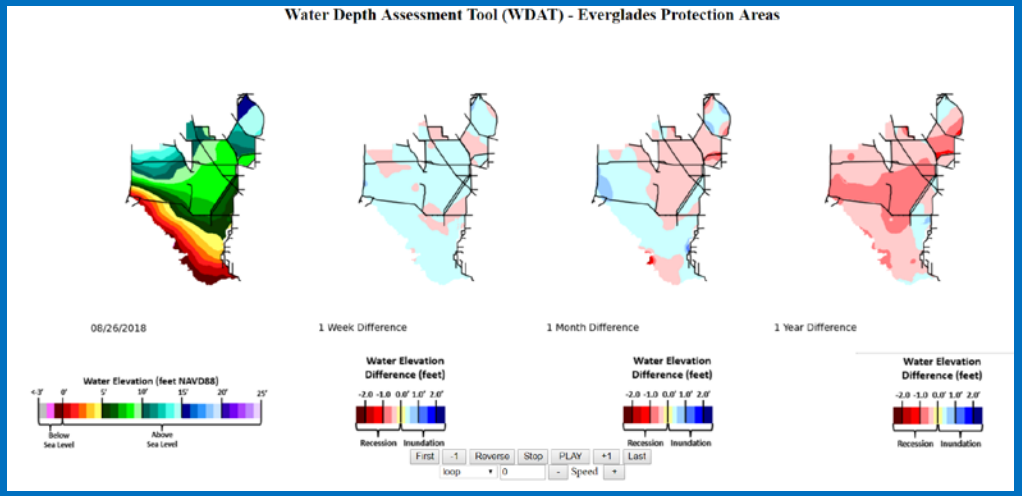
Quarterly/Weekly Recommendation Refinement
- **Landscape**
- **Local**

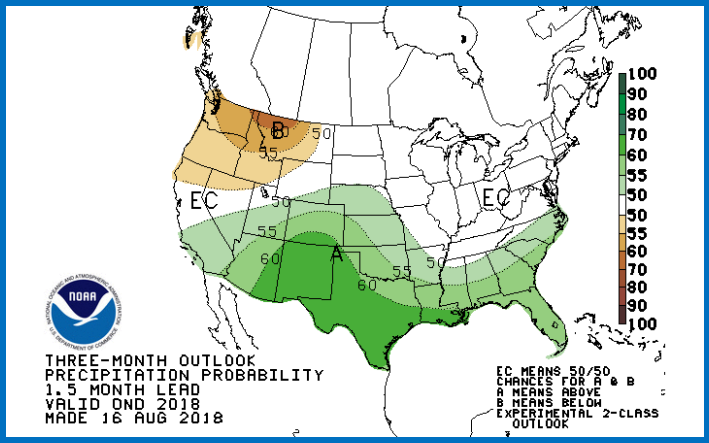
Agency Managers
- **Rainfall**
- **Objectives**

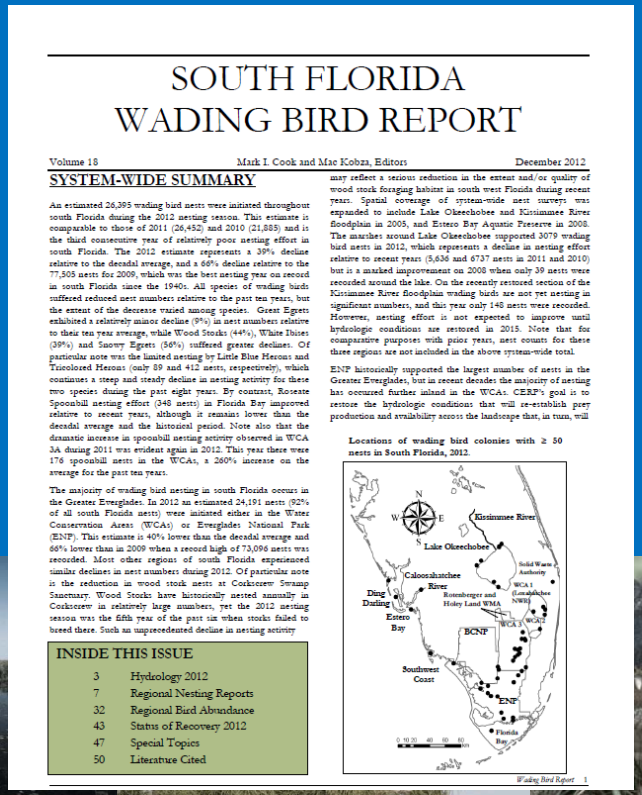
Operations

(Ecological) Outcomes

Develop Seasonal Recommendations







SOUTH FLORIDA
WADING BIRD REPORT

Volume 18 — Mark I. Cook and Mac Kobza, Editors — December 2012

SYSTEM-WIDE SUMMARY

An estimated 26,395 wading bird nests were initiated throughout south Florida during the 2012 nesting season. This estimate is comparable to those of 2011 (26,452) and 2010 (21,885) and is the third consecutive year of relatively poor nesting effort in south Florida. The 2012 estimate represents a 39% decline relative to the decadal average, and a 66% decline relative to the 77,505 nests for 2009, which was the best nesting year on record in south Florida since the 1940s. All species of wading birds suffered reduced nest numbers relative to the past ten years, but the extent of the decrease varied among species. Great Egrets exhibited a relatively minor decline (9%) in nest numbers relative to their ten year average, while Wood Storks (44%), White Ibises (39%) and Snowy Egrets (56%) suffered greater declines. Of particular note was the limited nesting by Little Blue Herons and Tricolored Herons (only 89 and 412 nests, respectively), which continues a steep and steady decline in nesting activity for these two species during the past eight years. By contrast, Roseate Spoonbill nesting effort (348 nests) in Florida Bay improved relative to recent years, although it remains lower than the decadal average and the historical period. Note also that the dramatic increase in spoonbill nesting activity observed in WCA 3A during 2011 was evident again in 2012. This year there were 176 spoonbill nests in the WCAs, a 260% increase on the average for the past ten years.

The majority of wading bird nesting in south Florida occurs in the Greater Everglades. In 2012 an estimated 24,191 nests (92% of all south Florida nests) were initiated either in the Water Conservation Areas (WCAs) or Everglades National Park (ENP). This estimate is 40% lower than the decadal average and 66% lower than in 2009 when a record high of 73,096 nests was recorded. Most other regions of south Florida experienced similar declines in nest numbers during 2012. Of particular note is the reduction in wood stork nests at Corkscrew Swamp Sanctuary. Wood Storks have historically nested annually in Corkscrew in relatively large numbers, yet the 2012 nesting season was the fifth year of the past six when storks failed to breed there. Such an unprecedented decline in nesting activity may reflect a serious reduction in the extent and/or quality of wood stork foraging habitat in south west Florida during recent years. Spatial coverage of system-wide nest surveys was expanded to include Lake Okeechobee and Kissimmee River floodplain in 2005, and Estero Bay Aquatic Preserve in 2008. The marshes around Lake Okeechobee supported 3079 wading bird nests in 2012, which represents a decline in nesting effort relative to recent years (5,636 and 6737 nests in 2011 and 2010) but is a marked improvement on 2008 when only 39 nests were recorded around the lake. On the recently restored section of the Kissimmee River floodplain wading birds are not yet nesting in significant numbers, and this year only 148 nests were recorded. However, nesting effort is not expected to improve until hydrologic conditions are restored in 2015. Note that for comparative purposes with prior years, nest counts for these three regions are not included in the above system-wide total.

ENP historically supported the largest number of nests in the Greater Everglades, but in recent decades the majority of nesting has occurred further inland in the WCAs. CERP's goal is to restore the hydrologic conditions that will re-establish prey production and availability across the landscape that, in turn, will

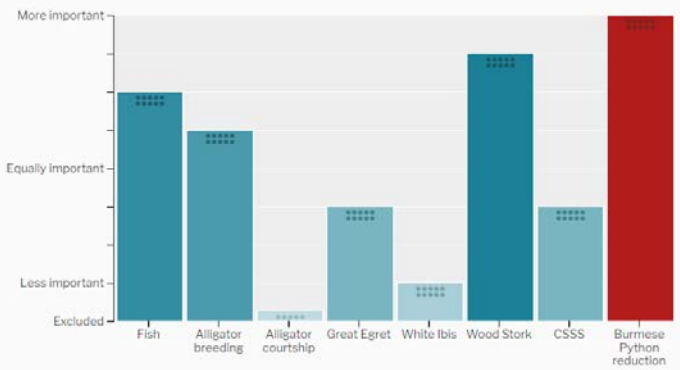
Locations of wading bird colonies with ≥ 50 nests in South Florida, 2012.

INSIDE THIS ISSUE

Ever4Cast Multi-Species Modeling – USGS
https://jem.gov/ever4cast/

Species weighting

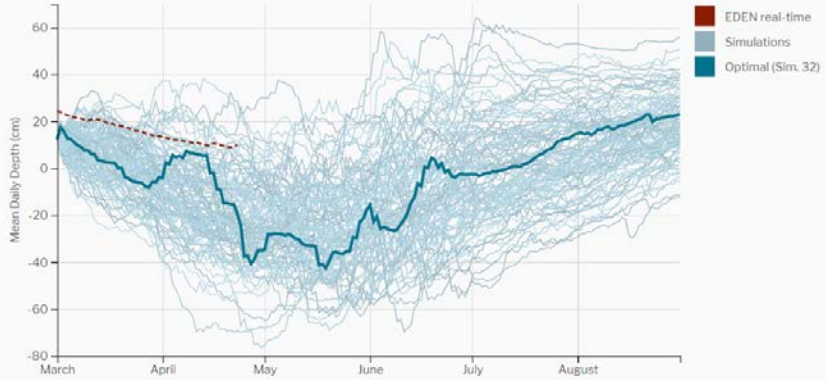
Use the chart below to set the relative importance of each species outcome. Weights can be set by clicking above or below, or by dragging, the top edge of the bar. Alternatively, press the Tab key to focus on a bar and move it with the Up/Down arrow keys. The optimal simulation graph will update in real-time as weights are changed.



Optimal simulation

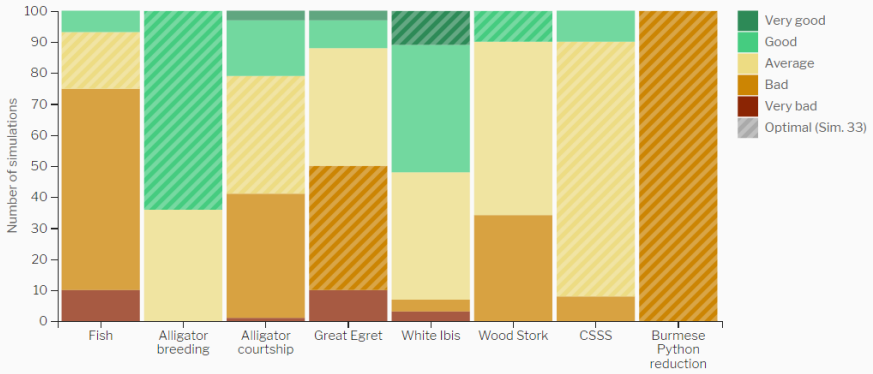
Given the above species weighting, simulation **32** is the optimal choice, with a weighted average score of **100.00** across all modeled species.

Simulated hydrographs

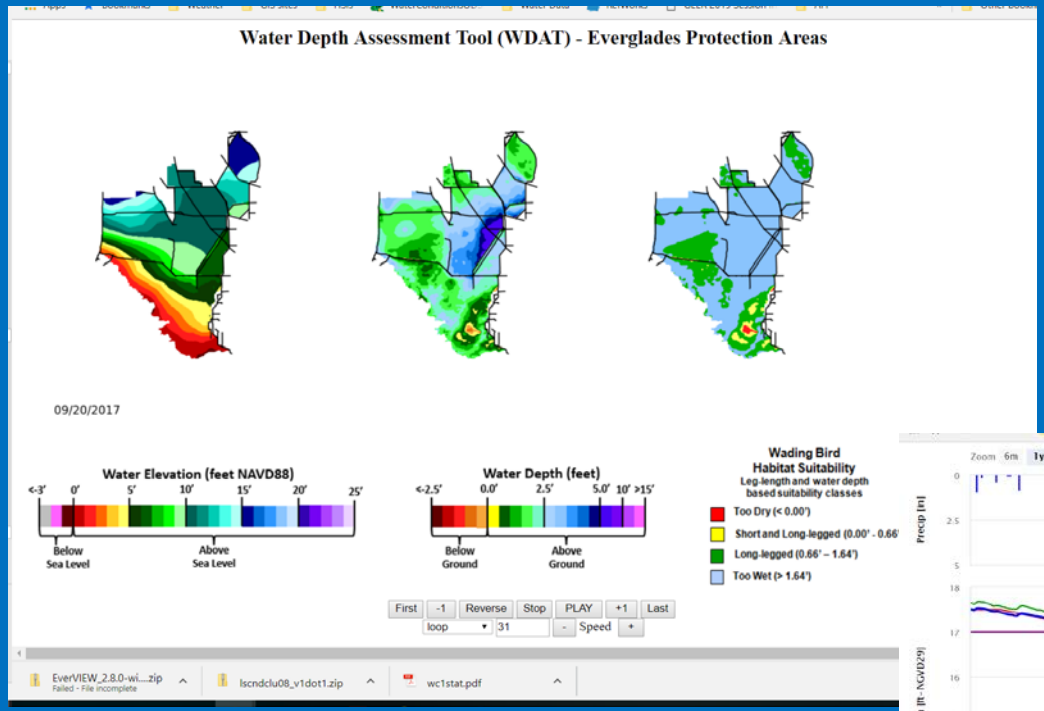


Multi-species scorecard

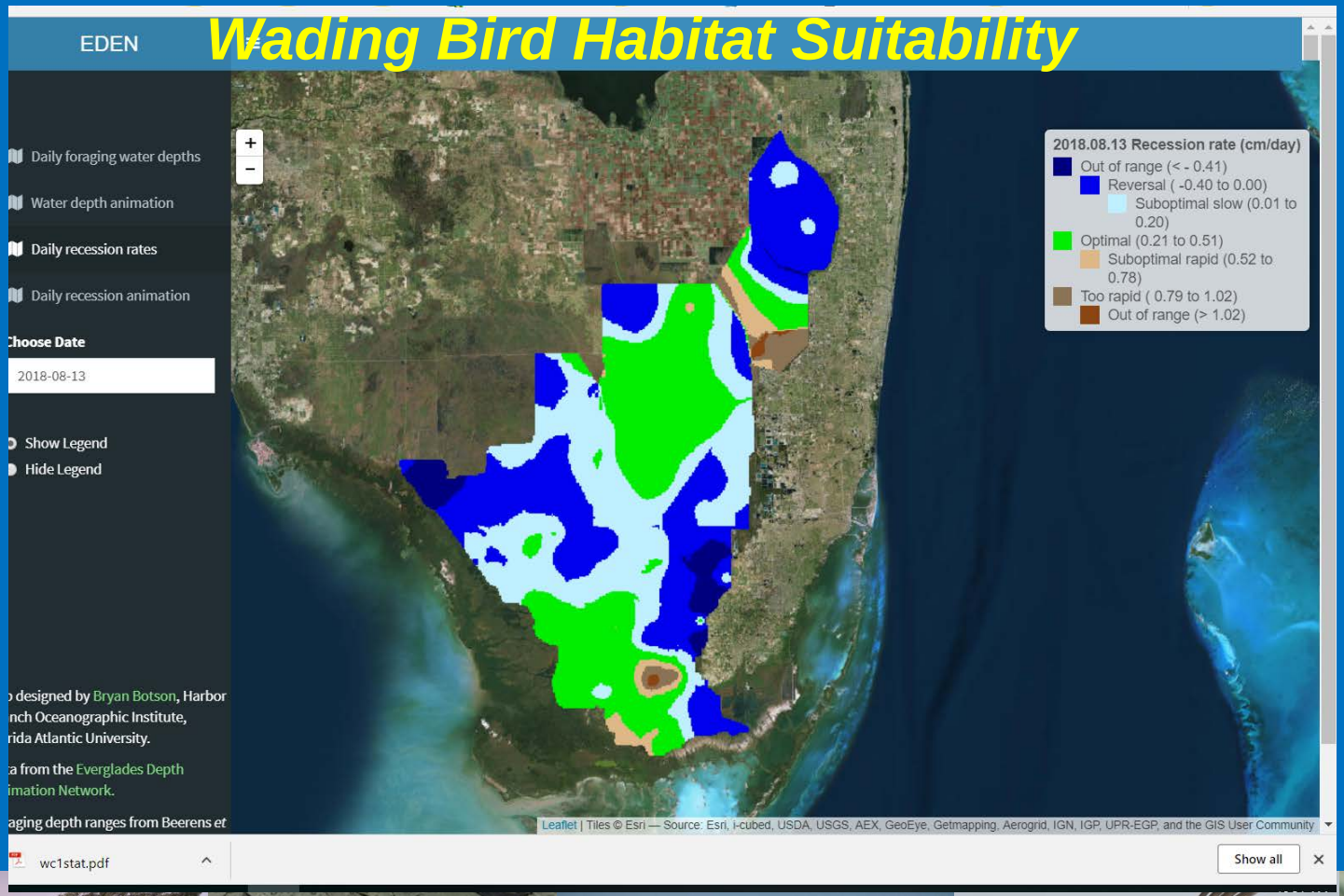
Species model outcomes for each simulation are compared against historical averages, and rated as *very bad, bad, average, good,* or *very good.* This scorecard may indicate the likelihood of included species to perform generally well or poorly under the forecasted hydrologic conditions.



Monthly and Weekly coordination (update/refine recommendations, as needed)



Monthly and Weekly coordination (update/refine recommendations, as needed)



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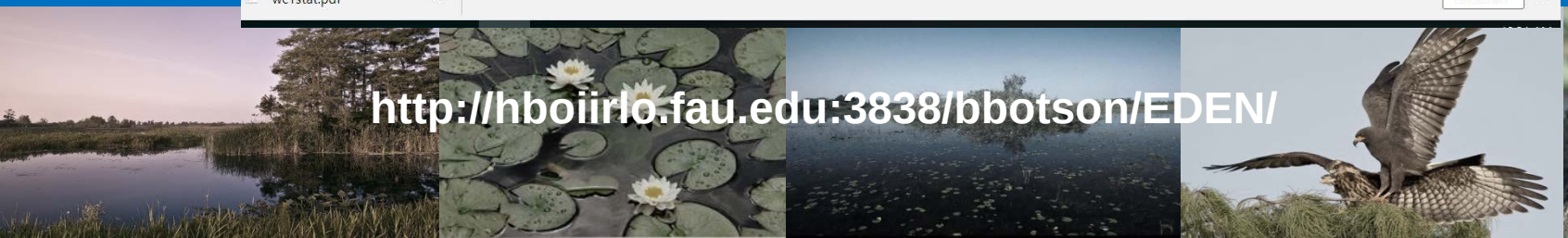

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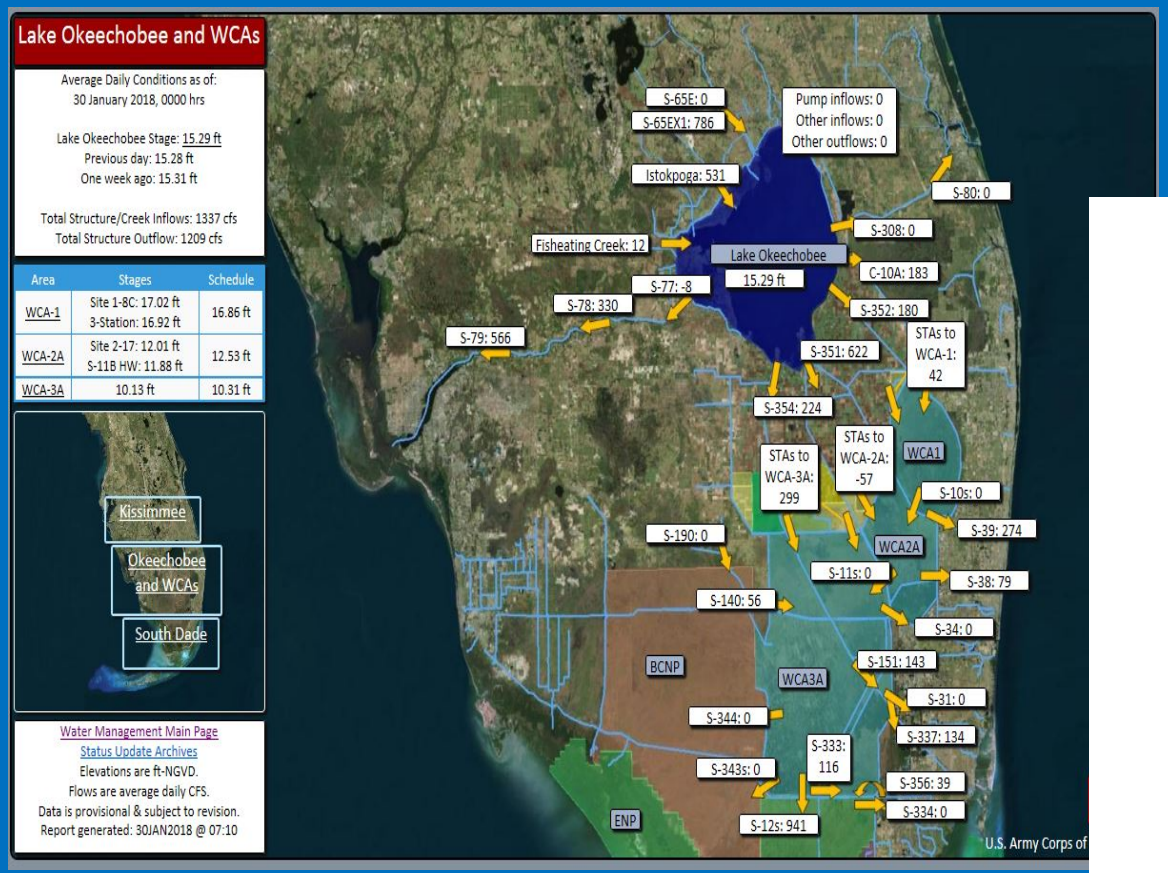


Interagency Everglades Ecological Recommendations
June 5, 2018
FFWCC, USFWS, ENP, SFWMD, USACE

General Recommendations to protect habitat and wildlife, foster conditions for optimal snail kite and wading bird foraging and protect nesting habitat for species:

-Limiting ascensions to 0.25 ft/wk or 0.5 ft/2 weeks during high rainfall.

-Flows into northern 3A is preferred over flows through S-11s.

-Slowing ascension rates in 2A would provide ecological benefits.

-Available inflows would be mostly beneficial in northern 3A.

-Incremental increases (350 – 500 cfs or less) in water flow through structures is ecological beneficial when opening or closing.

-When open S12s, opening from west to east S12D, C, B, A. But recommend keeping them closed until CSSS nesting over in Subpop A or as long as possible.

-Minimizing flows through S332s to eastern CSSS subpops.

Wading Birds

-Water depths are currently too deep for foraging birds across the northern WCAs (WCAs 1, 2A and 3AN). Despite this, adult birds are finding food from somewhere because many of the nesting colonies in this region are still active with hundreds of late stage nestlings (White Ibis, Snowy Egret, tricolored Herons and Little Blue Herons). The majority of Great Egret nestlings have now fledged.

-Recent new nesting attempts by White Ibis (1000 nests in WCA1 and 1500 nests in 3AN have all abandoned except for 150 nests in WCA1).

-Wood Stork colonies in WCA-3AS will be monitored on June 6.

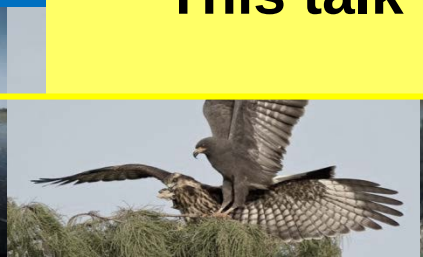
Snail Kites

-0 active nests in Rotenberger, only 4 birds counted in most recent survey (31 unknown status nests are no longer active). 5 active (4 new) nests in 3A. 1 nest STA-1E, I nest incubating in LOX, courtship behavior observed in Hungryland WEA

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




Conclusions

Best Practices

- Multi-agency requirements
- Multi-stakeholder engagement
- Recurring engagement
  - "In it together" attitude
- Engaging suite of science/scientists
- Individual tools → Multi-tool approach
- "Joint" input to operations managers
  - Group recommendations for areas collaboratively developed

Future Needs

- Measuring effectiveness
  - De-briefings
  - In-depth evaluation of past season recommendations


E. BUCKNER