
# Everglades Restoration Transition Plan – Phase 1

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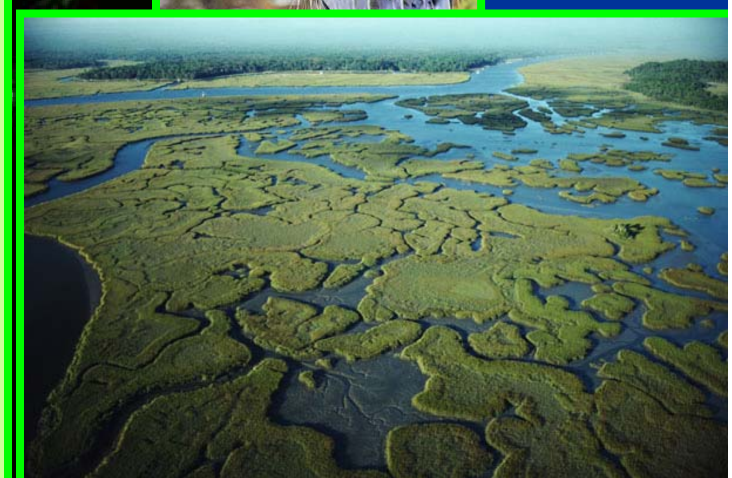
Technical Oversight Committee

19 October 2010



# Goal of Presentation

Receive input from TOC on ERTP and the water quality analysis. Discuss issues and concerns with implementation.

# Presentation Overview

- ERTP Overview
- Water Quality Analysis
- Conclusions

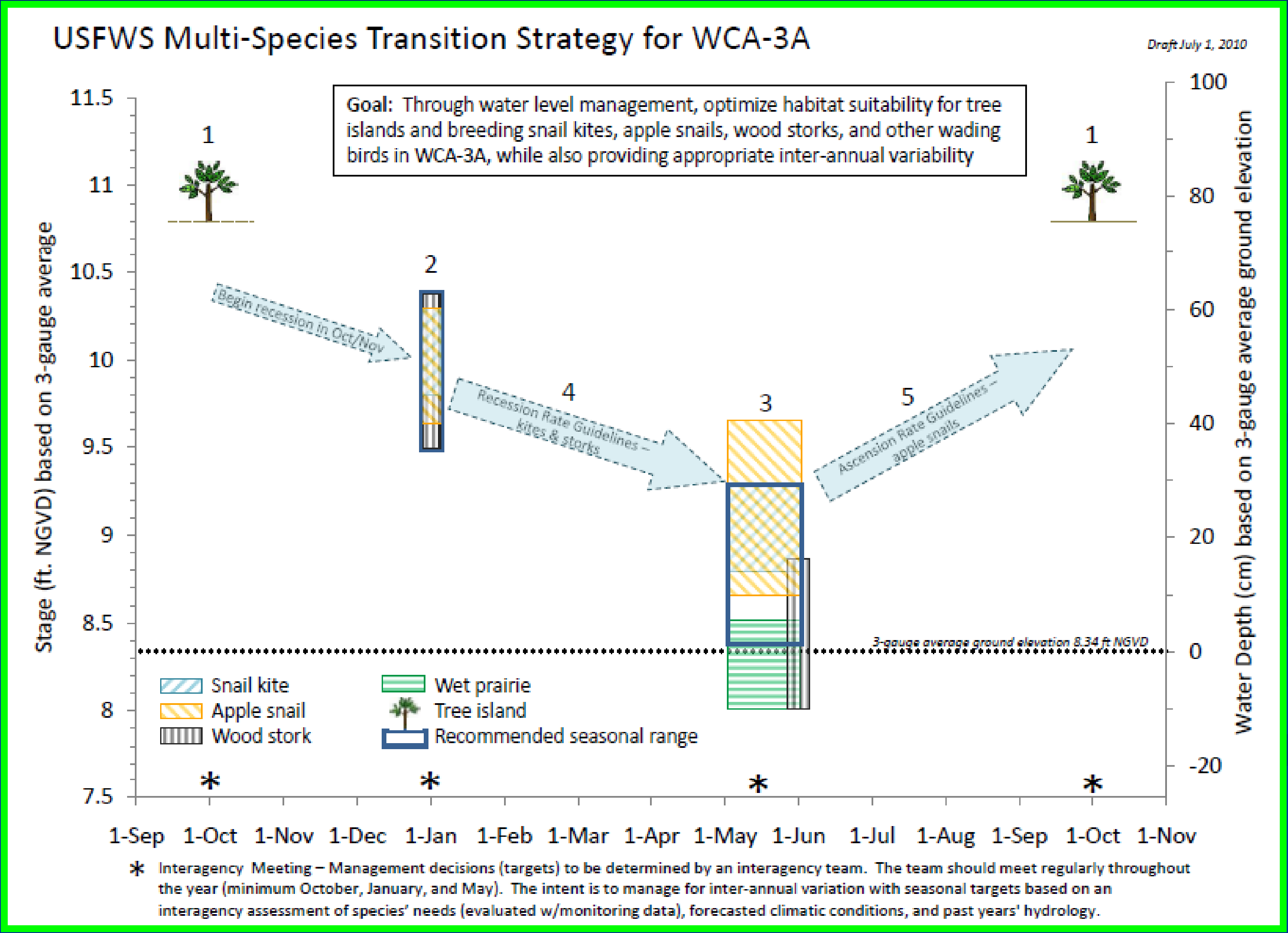
# ERTP Objectives

- To improve conditions for the Everglade snail kite, wood stork and other wading birds and their habitats in WCA-3A
- To maintain nesting season requirements for the Cape Sable seaside sparrow
- To maintain other C&SF project purposes

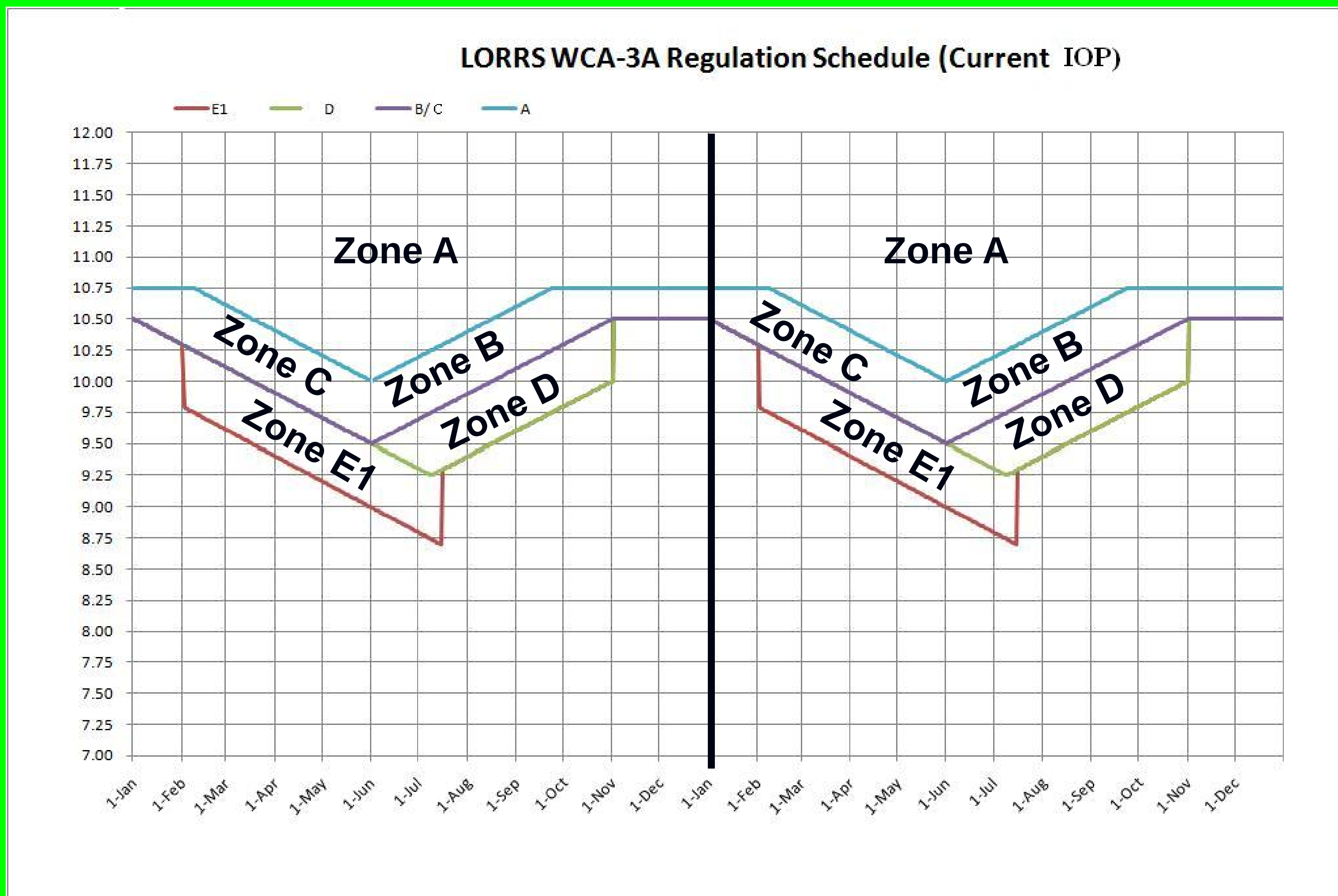
# ERTP Process

- ERTP was developed in coordination with FWS under the Endangered Species Act
- Other affected agencies have been briefed throughout the process
- Due to the potential concern of overtopping and/or breach of the L-29 levee, Zone A of the WCA-3A Regulation Schedule was lowered as a part of ERTP
- Water Quality was not used to choose the selected plan

# FWS Multi-Species Transition Strategy



# IOP Regulation Schedule



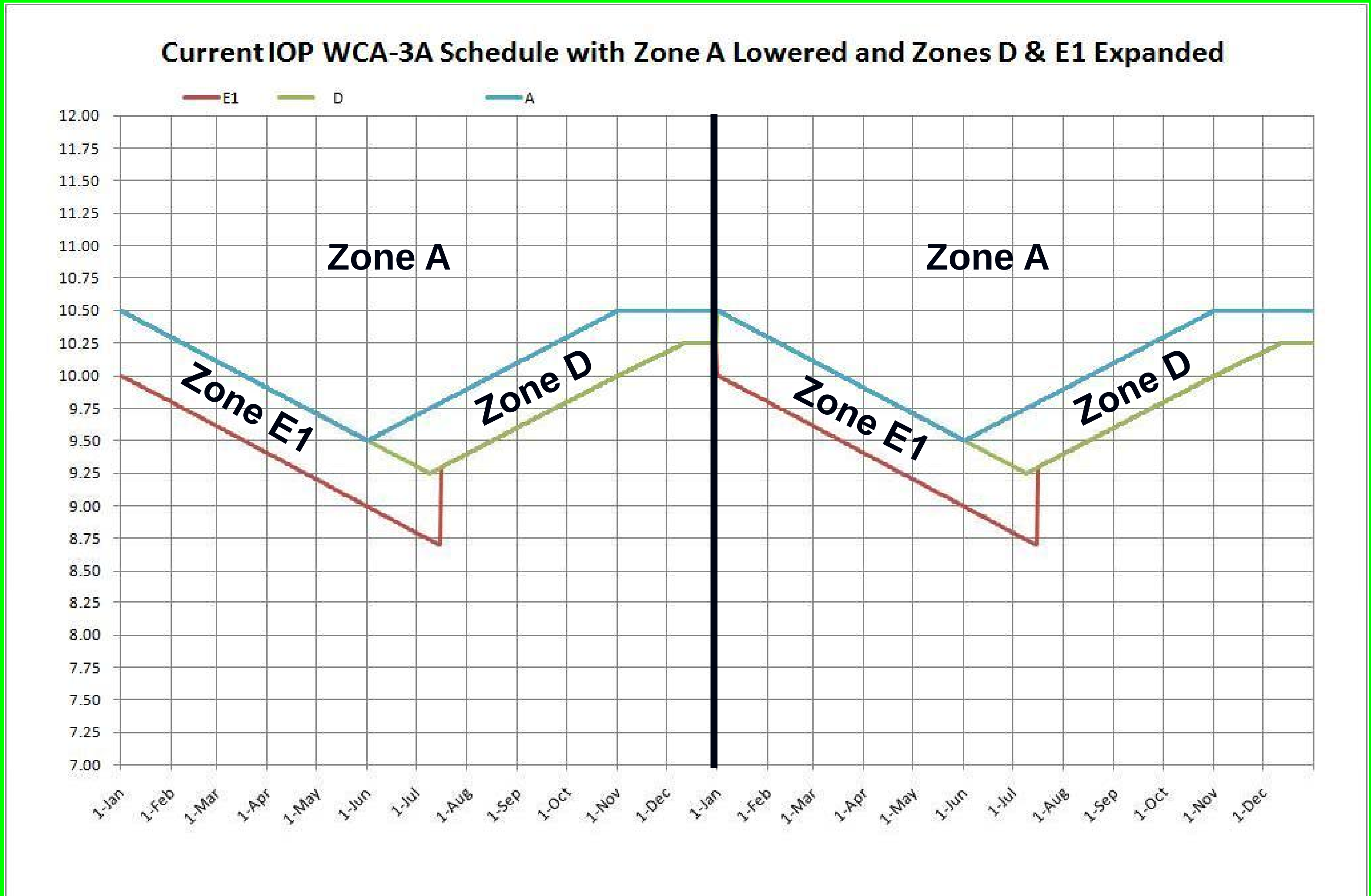
# SELECTED PLAN
# Alternative: Run 9E1

- Similar to IOP Regulation Schedule, with the following exceptions:
  - Revised Regulation Schedule – Zone A at 9.5/10.5
  - Zone D expanded forward to 31 December;
  - Zone E1 expanded backwards to 01 January
- IOP closure dates for S-12A and S-12B
- No closure dates for S-12C and S-12D
- S-151 regulatory releases in zones A, D and E1

# SELECTED PLAN
# Alternative: Run 9E1

- S-343A&B, S-344 maintain IOP seasonal closure periods
- Increased S-333 flow targets into NESRS during the dry season (80% to east, 20% to west)
- Tram Road stoppers
- S-346 open when S-12D is open for Rainfall Plan targets
- WCA-3A regulatory coefficient increased to 5000 cfs/foot above the base of the lowest regulatory zone (July-December)
  - IOP includes regulatory coefficient of 2500 cfs/foot (January – December)
- No inclusion of C-111 marsh operations restrictions
- Maximum WCA-3A stage for Lake O. regulatory releases to WCA-3A when Lake O. stage above the low sub-band set at 10.5 ft NGVD
  - IOP cuts off Lake O. inflows to WCA-3A when WCA-3A stage exceeds 10.75
- Manage for MSTS Recession and Ascension Rates
- Periodic Scientist Calls

# SELECTED PLAN
# Regulation Schedule

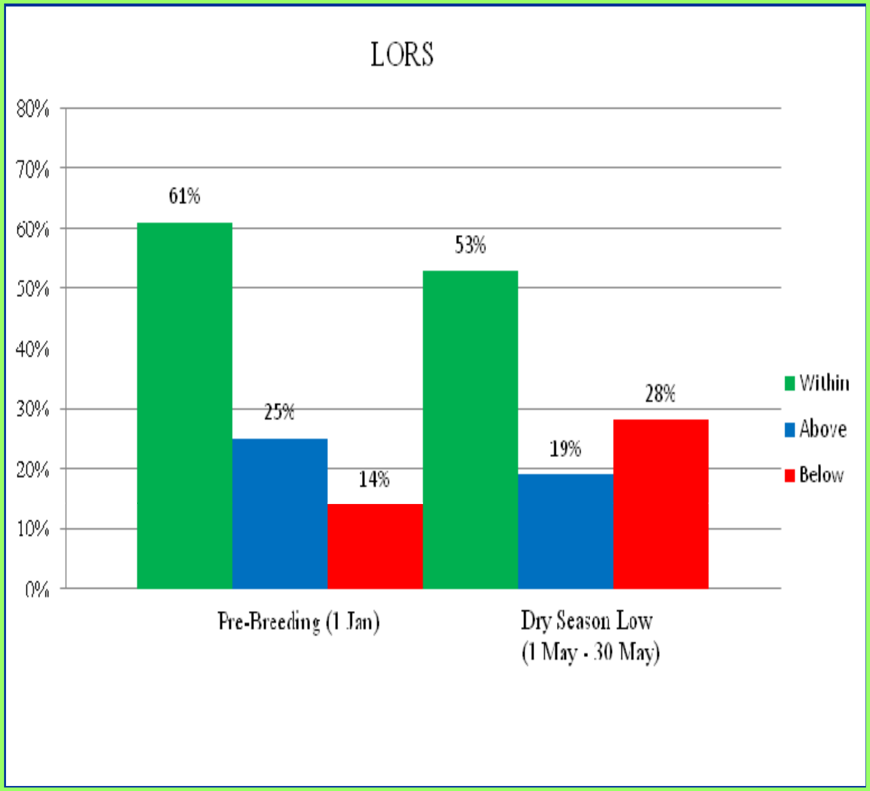


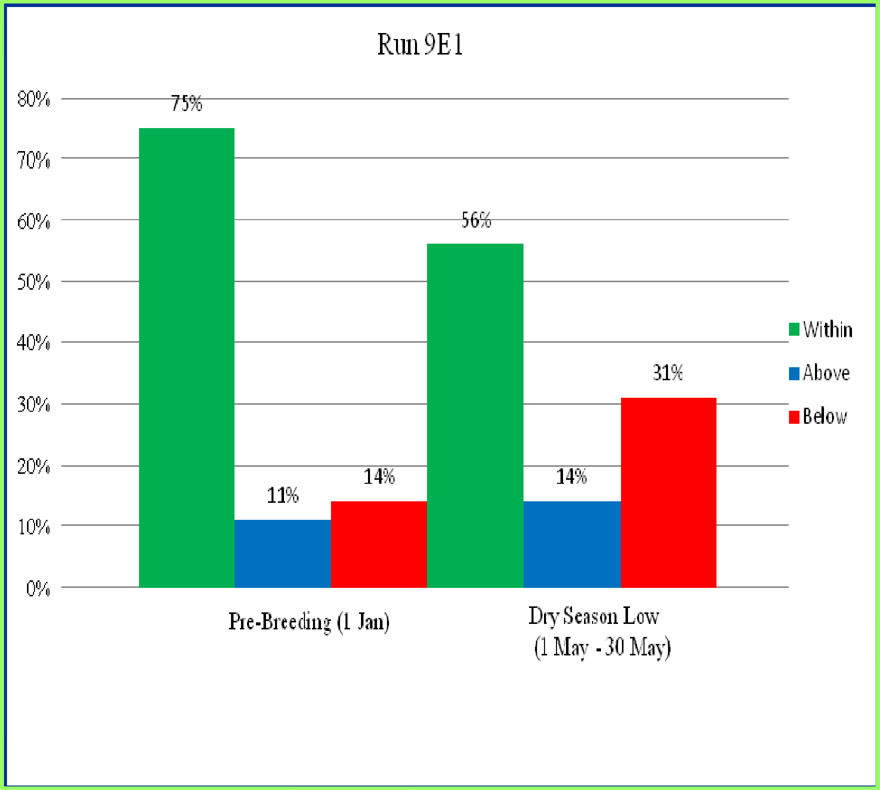
# Ecological Measures

- Evaluation of the Alternatives utilized ecological performance measures
- Selected Plan was chosen based on ecological performance as compared to other Alternatives

# SFWMM Model Run Results: MSTS Depths

**Percentage of Years in which WCA-3A water depths are within, above or below the FWS Multi-Species Transition Plan recommended depth range.**

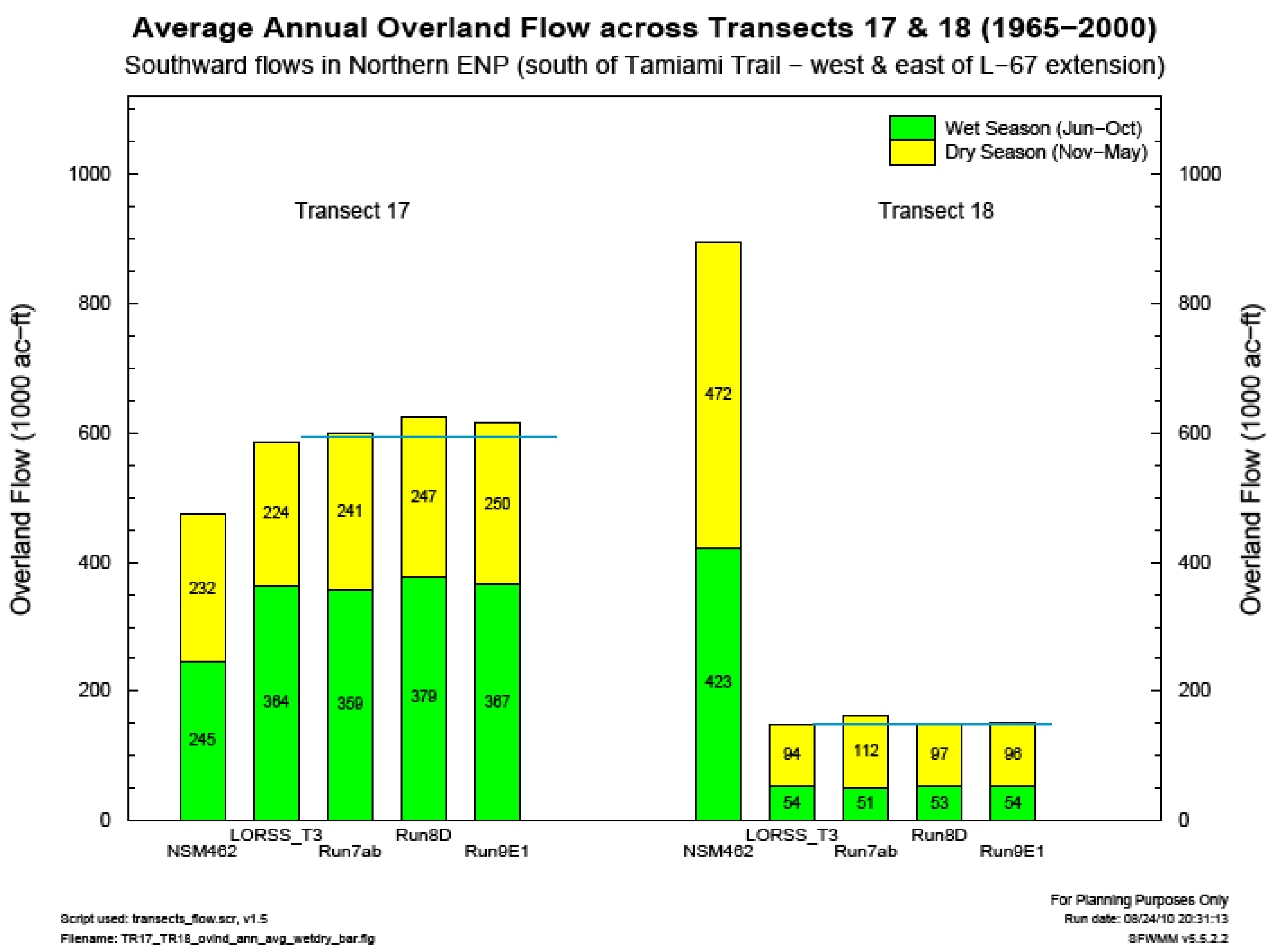


# Other Evaluations

- An assessment of water supply performance was performed on the final array of alternatives and will be included in the EIS
- Generally, we have identified a few issues that we are working through, but have not yet found any significant unacceptable impacts

# SFWMM Model Run Results:  ENP Inflow



# SFWMM Model Run Results of Run 9E1: Modeling Summary by Region

- WCA-3B
  - Increased inflow (Zone D)
  - No high water issues
- WCA-3A
  - Reduction in highest 20% of high water levels
  - Small increase in dry down conditions
  - Significant improvement in tree island indicators
- ENP
  - No significant change in NESRS inflow
  - Increased flow through S-12 structures
  - Maintained CSSS-A nesting
  - No significant change in hydroperiod

# SFWMM Model Run Results of Run 9E1: Modeling Summary by Region

- South Dade – No change
- Water Supply
  - Modeled LOSA rules from 2007 LORSS FSEIS
  - Least impact of all alternatives
  - Some impact to SA-3 (Miami-Dade) in drought years
  - No impact to LOSA water supply
- Lake Okeechobee
  - Minor reduction lowest stages
  - Potential Increase in MFL exceedance (from 6 to 7)
  - Performance same as other alternatives
- Estuaries and Bays – No change

# Water Quality Analysis

- Analysis performed to determine the impact of proposed operational changes to the SDCS on Flow-Weighted Mean (FWM) Total Phosphorus (TP) Concentrations and loads to Shark River Slough (SRS)
- Evaluation used output from the SFWMM for: LORSS (IOP), Run 7AB, Run 8D, Run 9E1
- Data used include:
  - Stage (3A-3, 3A-4, 3A-28)
  - Flows (S12A, S12B, S12C, S12D, S333, S334, S334FC)
- DOI has conducted independent analysis using Dr. Walker's equations, and are in agreement on the numerical output for LORSS T3 and Run9E1

# Water Quality Analysis: Methodology

- The Corps used five methods used to calculate the average annual FWM TP concentrations for each year of the 35 year Period of Record
- All methods assume that changes to the distribution, source and timing of flows in WCA-3A are minimal for the considered alternatives relative to the base condition and that such changes will not materially alter water quality conditions within the compartment
- NESRS flows and loads are defined as the net of S333-S334
- Full descriptions of each method are in Corps ERTP WQ paper. Brief descriptions follow.

# Water Quality Analysis: Walker Equations

Developed in May of 2010 as part of Preliminary Analysis of ERTP by William Walker, PhD. for Dept. of Interior

- Regression Equations linking stage, change in stage, and day of year to WCA-3A TP concentrations for S333 and S12x.
  - Properties: Inverse relationship between stage and TP concentration

- Advantages:
  - Can use with simulated 2x2 output to predict potential WQ impact resulting from operational changes.
  - Relatively robust prediction equations (measure of fit r-squared = 0.60)
- Inherent Assumptions:
  - Relationship between stage and TP from past 10 years will hold forth in the future under present operating scheme (LORSS) or other future operating schemes. In other words, any change in stage resulting from different operations will result in a different TP concentration regardless of stage or time of year.
  - There is no difference in TP concentration at S12A versus S12D given the lumped S12x TP prediction equation.

# Water Quality Analysis: Stage Neutral Analysis

Uses Walker ERTP Equations to calculate daily TP concentrations at S333 and S12x for LORSS and applies these daily TP concentrations to all four of the operating alternatives.

- Advantages:
  - Isolates effect of changes in flow quantity and distribution on FWM TP concentrations by eliminating effect of changed stage on daily TP concentration estimates.
- Inherent Assumptions:
  - Change in stage resulting from implementation of alternative operating scheme will not result in change in daily TP concentrations at WCA-3A outflow structures.

# Water Quality Analysis: Partial Stage Neutral Analysis

Uses Walker ERTP Equations to calculate daily TP concentrations at S333 and S12x using stages from each alternative when these stages are less than 9.5 ft, and uses the daily TP estimates from LORSS for days when the alternative stage in 3A is greater than 9.5 ft.

- Advantages:
  - Limits operationally caused increased TP concentrations to periods when stages are less than 9.5 ft which is coincident with high TP. (Use of the Walker ERTP results in higher TP concentrations anytime an alternative has a lower stage than LORSS. However, inverse relationship between stage and TP at S333 is not nearly as pronounced for stages above 9.5 ft. For instance: Slope of linear Regression equation (TP vs Stage) for stages below 9.5 ft is -0.0075. For stages above 9.5 ft it is -0.0006. For stages between 9.5 ft and 10.5 ft it is 0.0006. This is indication that lower stages during high stage periods are likely not to always result in higher TP concentrations. )
- Inherent Assumptions:
  - Change in stage resulting from implementation of alternative operating scheme will not result in change in daily TP concentrations relative to LORSS except when stages are below 9.5 ft in WCA-3A.

# Water Quality Analysis: Structure FWM and Seasonal Structure FWM Analysis

Uses FWM concentrations (either seasonal or annual estimates) computed using 2000-2009 WY Flow and TP data. Applies a single estimate of FWM TP concentrations across the entire 36 year simulation period for each structure rather than a daily estimate of TP (Seasonal uses 2 values per structure).

- Advantages:
  - Allows comparison of alternatives based upon the distribution of S12x flows across S12A, S12B, S12C, and S12D. This is important since there are significant differences in FWMs and flows across these structures.
- Inherent Assumptions:
  - Historic FWM TP concentrations at the S12x structures are representative of FWM concentrations that will occur once flow patterns change.
  - Ignores effect of stage on TP concentrations.

| FWM Concentrations (Historic Data 2000-2009 WY) | | | | | |
|---|---|---|---|---|---|
| | 12A | 12B | 12C | 12D | S333 |
| Annual | 8.1 | 6.8 | 7.4 | 10.3 | 13.5 |
| Dry Season | 10.4 | 6.9 | 6 | 8.4 | 11.2 |
| Wet Season | 7.7 | 6.7 | 8.1 | 11.5 | 17.5 |

# Water Quality Analysis: Results

All of the five ERTP WQ methods applied by Corps predict that excursions of the SA LTL will be frequent (>60 percent of time) under any of the operating plans unless further improvement in TP concentrations within WCA-3A occurs in the future. (Note that higher SRS flows result in lower LTL SA compliance concentrations.)

# Water Quality Analysis: FWM

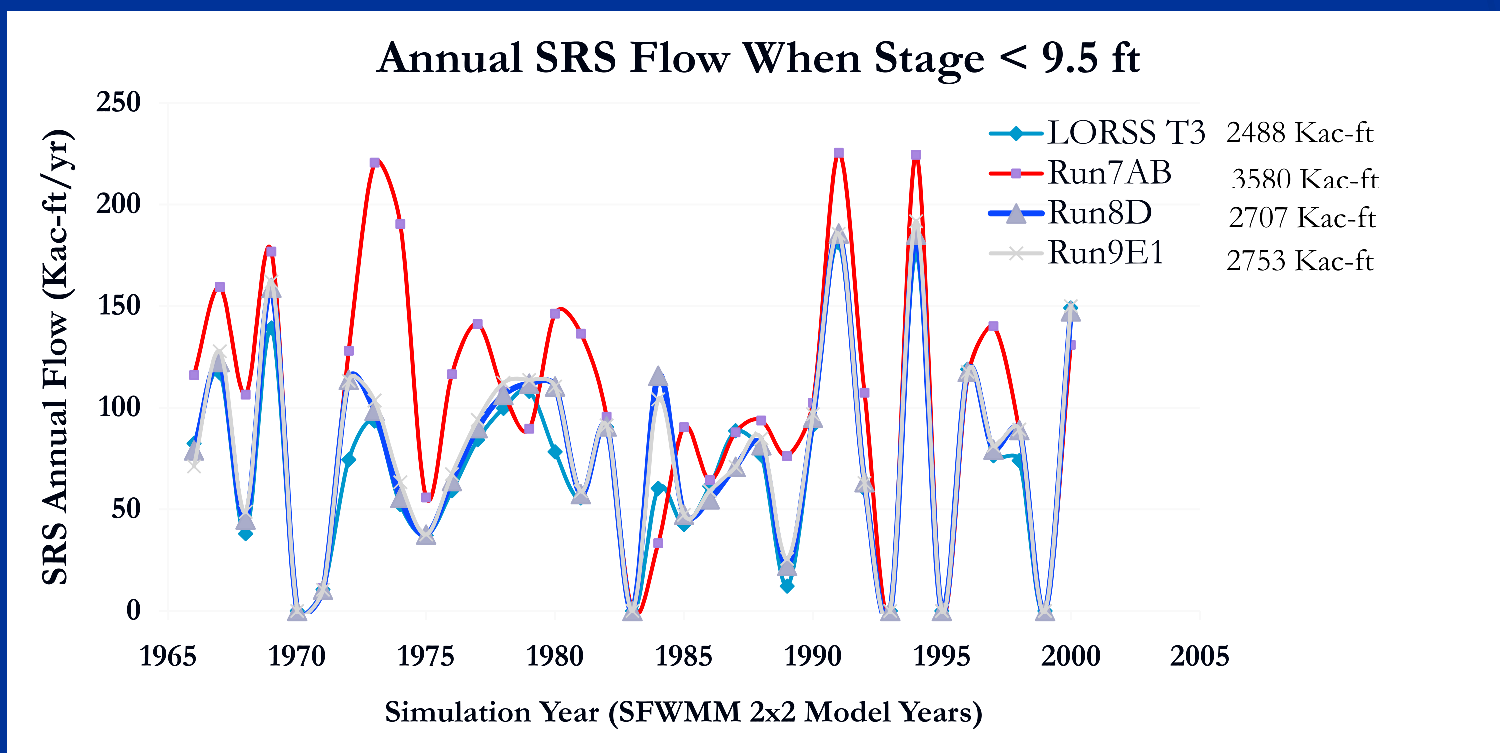
| Alternatives | Average FWM (ppb TP) | Average Difference Between FWM and LTL (ppb) | Average Difference Between FWM and LTT (ppb) | Number of LTL Exceedance Years |
|---|---|---|---|---|
| Walker ERTP Equations | | | | |
| LORSS | 11.1 | 1.5 | 3.5 | 31 |
| Run7AB | 11.5 | 2.1 | 4.0 | 32 |
| Run8D | 11.3 | 1.9 | 3.8 | 31 |
| Run9E1 | 11.4 | 1.9 | 3.8 | 31 |
| Stage Neutral | | | | |
| LORSS | 11.1 | 1.5 | 3.5 | 31 |
| Run7AB | 11.0 | 1.6 | 3.5 | 31 |
| Run8D | 11.0 | 1.6 | 3.5 | 31 |
| Run9E1 | 11.1 | 1.5 | 3.5 | 31 |
| Partial Stage Neutral | | | | |
| LORSS | 11.1 | 1.5 | 3.5 | 31 |
| Run7AB | 11.2 | 1.8 | 3.7 | 31 |
| Run8D | 11.1 | 1.7 | 3.6 | 31 |
| Run9E1 | 11.2 | 1.7 | 3.6 | 31 |
| Structure FWM | | | | |
| LORSS | 10.6 | 1.1 | 3.0 | 27 |
| Run7AB | 10.5 | 1.1 | 3.0 | 30 |
| Run8D | 10.2 | 0.8 | 2.7 | 25 |
| Run9E1 | 10.2 | 0.7 | 2.6 | 25 |
| Seasonal Structure FWM | | | | |
| LORSS | 10.7 | 1.1 | 3.0 | 32 |
| Run7AB | 10.4 | 1.0 | 2.9 | 30 |
| Run8D | 10.3 | 0.9 | 2.8 | 32 |
| Run9E1 | 10.3 | 0.8 | 2.7 | 30 |

# Water Quality Analysis: Load

| | Total SRS Flow (Kac-ft/yr) | Total SRS Load (1,000 Kg TP) | Change in Load (1,000 Kg TP) | Annual Change in Load (Kg/yr) | Change in Total Load (%) |
|---|---|---|---|---|---|
| Walker ERTP Equations | | | | | |
| LORSS | 28,501 | 390 | 0 | 0 | 0.0 |
| Run7AB | 30,102 | 427 | 36 | 1010 | 9% |
| Run8D | 30,409 | 425 | 34 | 947 | 9% |
| Run9E1 | 29,707 | 418 | 28 | 765 | 7% |
| Stage Neutral | | | | | |
| LORSS | 28,501 | 390 | 0 | 0 | 0.0 |
| Run7AB | 30,102 | 407 | 17 | 459 | 4% |
| Run8D | 30,409 | 414 | 24 | 661 | 6% |
| Run9E1 | 29,707 | 406 | 15 | 417 | 4% |
| Partial Stage Neutral | | | | | |
| LORSS | 28,501 | 390 | 0 | 0 | 0.0 |
| Run7AB | 30,102 | 414 | 24 | 667 | 6% |
| Run8D | 30,409 | 418 | 27 | 762 | 7% |
| Run9E1 | 29,707 | 410 | 19 | 539 | 5% |
| Structure FWM | | | | | |
| LORSS | 28,501 | 374 | 0 | 0 | 0.0 |
| Run7AB | 30,102 | 389 | 14 | 402 | 4% |
| Run8D | 30,409 | 382 | 8 | 215 | 2% |
| Run9E1 | 29,707 | 373 | -1 | -27 | 0% |
| Seasonal Structure FWM | | | | | |
| LORSS | 28,501 | 375 | 0 | 0 | 0.0 |
| Run7AB | 30,102 | 384 | 9 | 260 | 2% |
| Run8D | 30,409 | 387 | 12 | 323 | 3% |
| Run9E1 | 29,707 | 378 | 2 | 66 | 1% |

# Water Quality Analysis: Results

High TP concentrations coincident with low WCA-3A stages results in a disproportionate fraction of total load being delivered during low stage periods. The higher fraction of flow during low stage periods that occurs under 7AB relative to the other operating schemes is likely to result in higher TP loads to SRS for this alternative. Of the increase of 1,200 kaf over POR for 9e1 relative to LORSS, only 22% is coincident with stages < 9.5 ft.



# Water Quality Analysis: Results

While Run8D provides similar results to Run9E1 for most of the metrics, the increase in total TP load for Run9E1 is less than that of Run8D for all of the calculation methods. This is an indication that Run9E1 likely will result in fewer SRS WQ impacts than Run8D.

# Water Quality Analysis: Results

The results from the Structure FWM and the Seasonal Structure FWM methods for Run9E1 show that increases in total TP load to SRS over LORSS loads are minimized by sending the increased flow through the S12A, S12B, or S12C structures rather than the S12D or S333 structure which both have relatively higher TP concentrations. (This assumes that redistributing water across the 12s will not change FWM concentrations at these structures.)

# Water Quality Analysis: Results

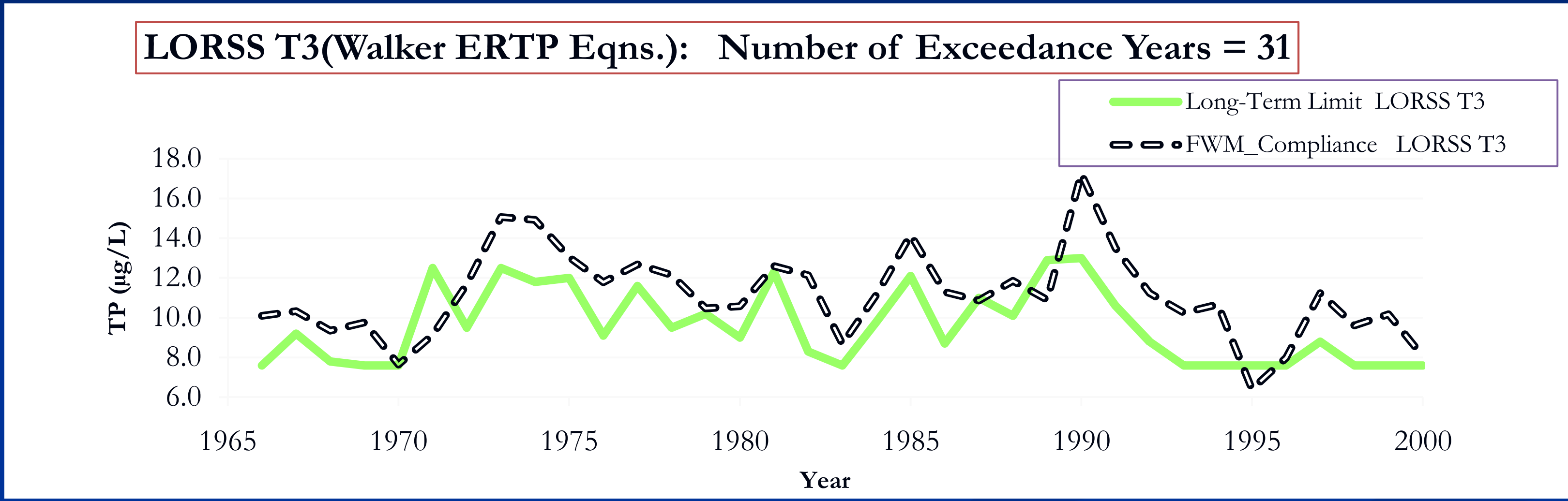
The S334 bypass flow is 9 to 12 percent of the S333 flows in the simulated data for LORSS T3, Run7AB, Run8D, and Run9E1. The historical percentage of S333 bypass flow is 38% for the 2000 to 2009 time period. As Walker points out, if the S334 flow is not decreased as predicted by these model results once a selected operating scheme is invoked, the results provided here would be conservative since actual net NESRS flows and loads would be less than predicted thus resulting in a lower annual FWM TP concentration and fewer exceedances than predicted here.

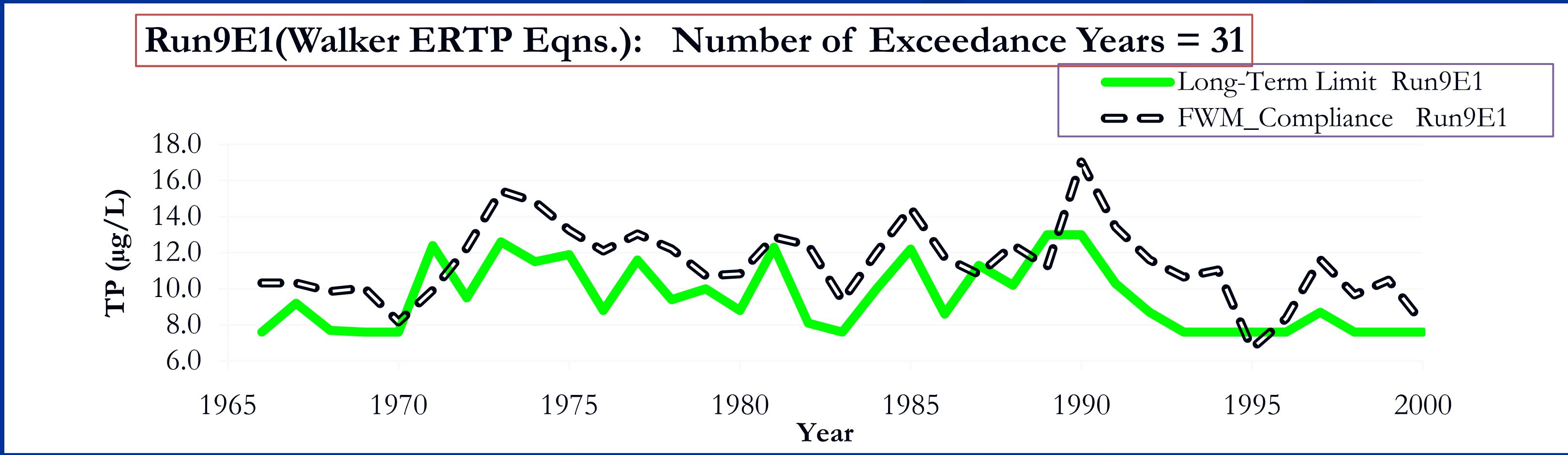
# Water Quality Analysis: 9E1 Results

- Relative to IOP, the increase in flow to SRS over the simulation period is 4 percent
- Since the S12 structures generally have lower TP concentrations than the S333 structure, sending more water through the S12s would provide a lower overall FWM concentration to SRS
- Given that each of the proposed alternatives will increase flows, the total TP load to SRS will increase unless the flow distribution is changed such that significantly greater proportion of the flow is delivered through the S12 structures

# Water Quality Analysis: 9E1 Results

## No Increase in Number of Annual Exceedances of LTL



# Water Quality Analysis: 9E1 Results

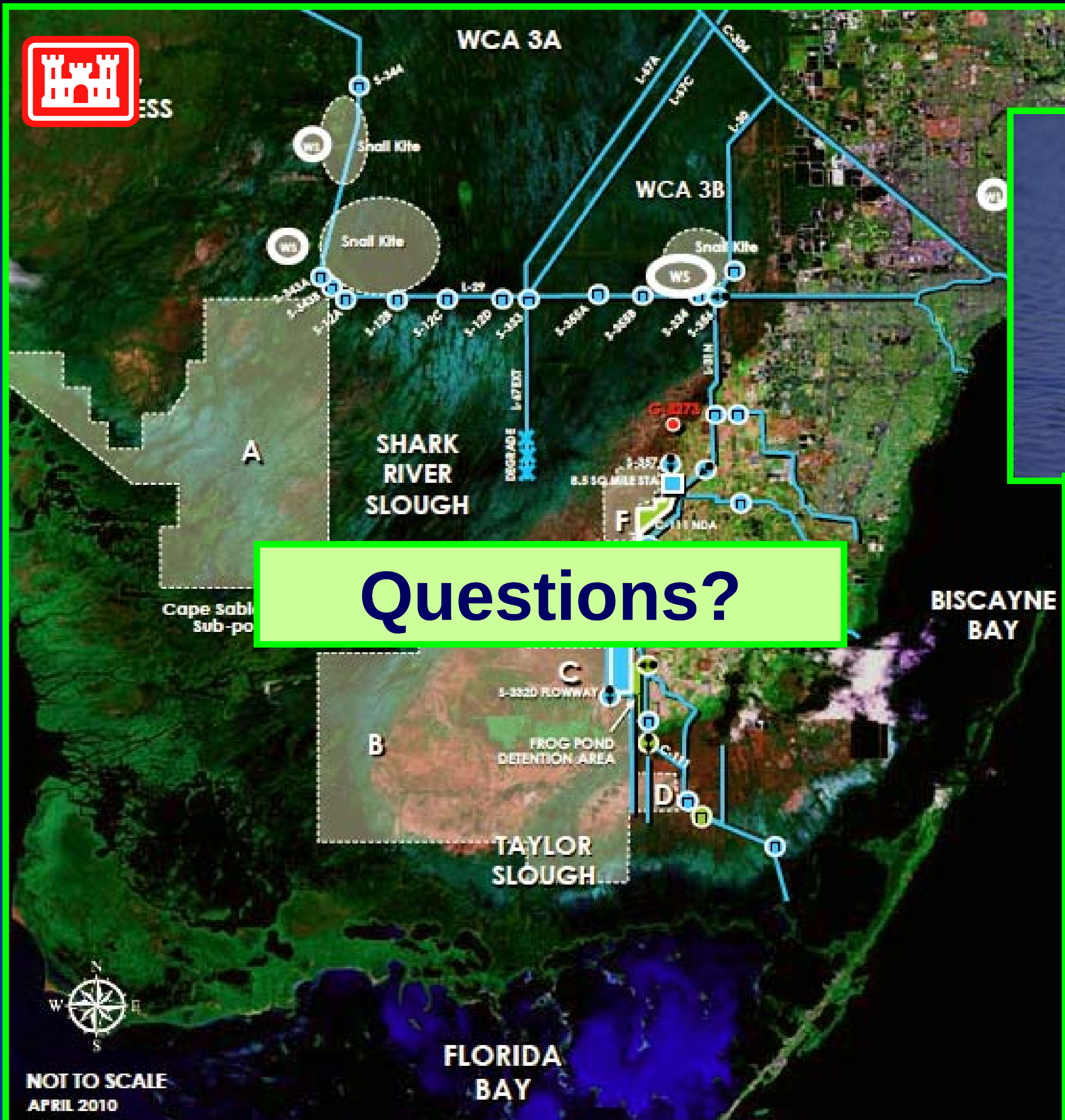
Under Run9e1, seepage flows from WCA-3B into L-29 Canal are likely to increase as a result of additional flows through S-151 Structure and marginally higher stages in WCA-3B. Though not counted in the SA calculations, this should mitigate some of the predicted increase in TP loads to SRS.

# Water Quality Analysis: USACE Conclusions

- Based on this analysis, 9E1 results in NO additional LTL exceedances as compared to IOP
- The five methods used by USACE predict between 1% and 7% TP Total Load increase to SRS. TP concentrations in WCA-3A are trending down so it is likely that net increase will be less.
- The change in average FWM concentration for 9E1 ranges from a decrease of 0.4 ppb to an increase of 0.4 ppb.
- USACE position is that “no action” is not an option due to ESA issues as well as the need to lower WCA-3A Regulation Schedule Zone A line
- 9E1 generally had the least impacts to water quality of all of the action alternatives
- The benefits from implementation of ERTP (Run 9E1) to multiple Everglades species outweigh the potential water quality risk as presented in this evaluation

# ERTP Path Forward

- 17 NOV: Receive BO from FWS
- 31 DEC: Draft EIS published in Federal Register
- JAN 2011: Public Meeting for Draft EIS
- Spring 2011: Final EIS and ROD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WCA 3B
Snail Kite
Snail Kite
Snail Kite
WS
L-29
SHARK
RIVER
SLOUGH
A
B
C
D
F
S-332D FLOWWAY
FROG POND
DETENTION AREA
TAYLOR
SLOUGH
BISCAYNE
BAY
FLORIDA
BAY
NOT TO SCALE
APRIL 2010

# Questions?