

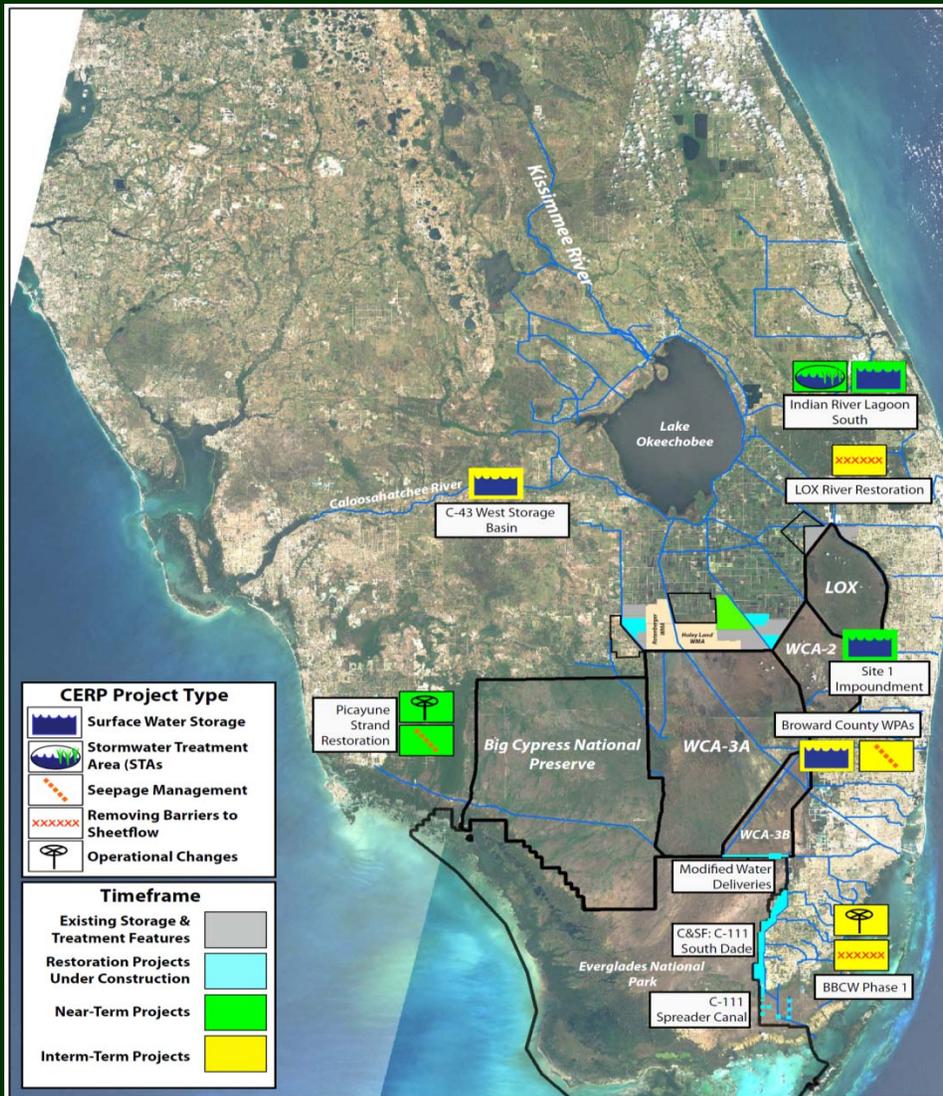
National Park Service - DOI
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***Everglades Restoration Update:
Water Quality,
Central Everglades and
Tamiami Trail Next Steps Project***

For the Florida Keys Water Quality Protection Program, February 20, 2013

Foundation and CERP Ongoing/Planned Projects



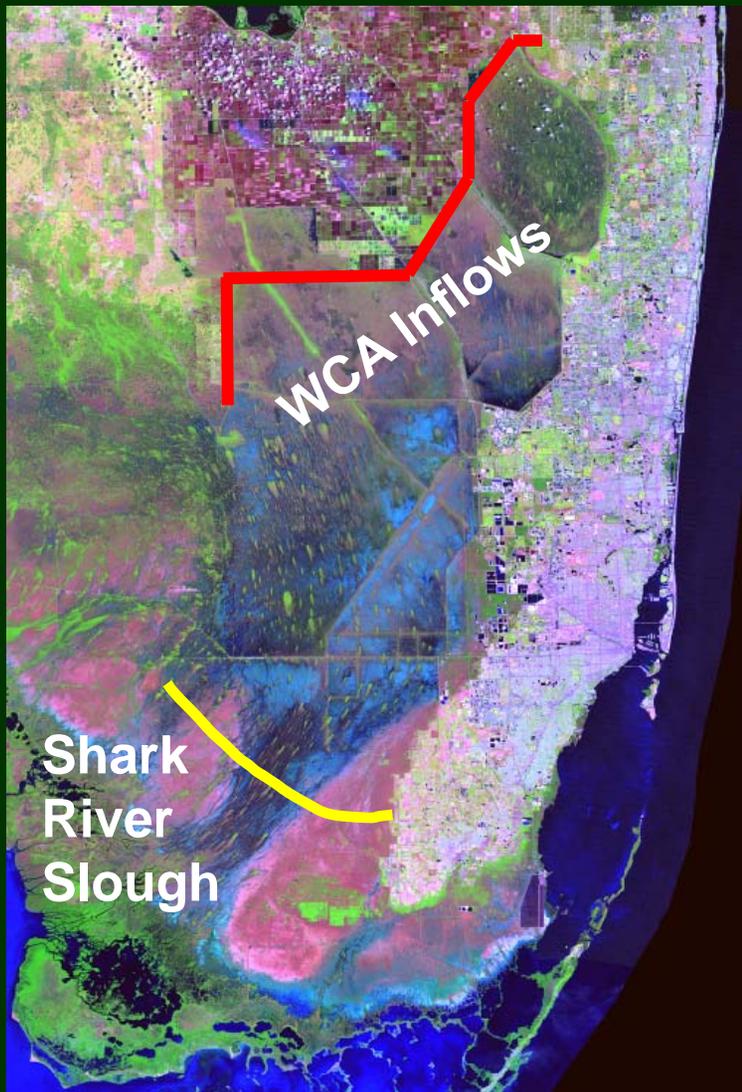
- **Existing Features** (grey) include Stormwater Treatment Areas with 45,000 effective acres.
- **Under Construction** (blue) includes projects nearing completion include STA expansions (approx. 11,000 acres), the Modified Water Deliveries and C-111 South Dade projects, and C-111 Spreader Canal West.
- **Near-Term Projects** (green) were authorized by WRDA 2007 and include Picayune Strand, Site 1 Impoundment, and Indian River Lagoon South, **EAA A-1 Storage**.
- **Interim-Term Projects** (yellow) are projects that are planned for authorization in the next WRDA bill (2014?), and include C-43 Storage, Loxahatchee River, Broward County WPAs, and Biscayne Bay Coastal Wetlands.
- **What's Missing** – Projects in the Central Everglades.



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Alterations in Water Flows through the Everglades



Re-evaluating Natural System Flows

- Paleo-ecological studies and close review of early surveys of the Everglades have revised our understanding of the pre-drainage Everglades.
- New hydrologic modeling of the Pre-Drainage Everglades (ENPMod1, NSRSM).

Water Conservation Area Inflows

- For Pre-drainage models - overland flows from the northern Everglades southward.
- For Post-Drainage models - structure flows (S-5A, S-6, S-7, S-150, S-8, and S-140) plus future CERP overland flows.

Shark River Slough (Transect C)

- Estimates of overland flows from the Rocky Glades (east) across Shark River Slough to the Ochopee Rise (west).

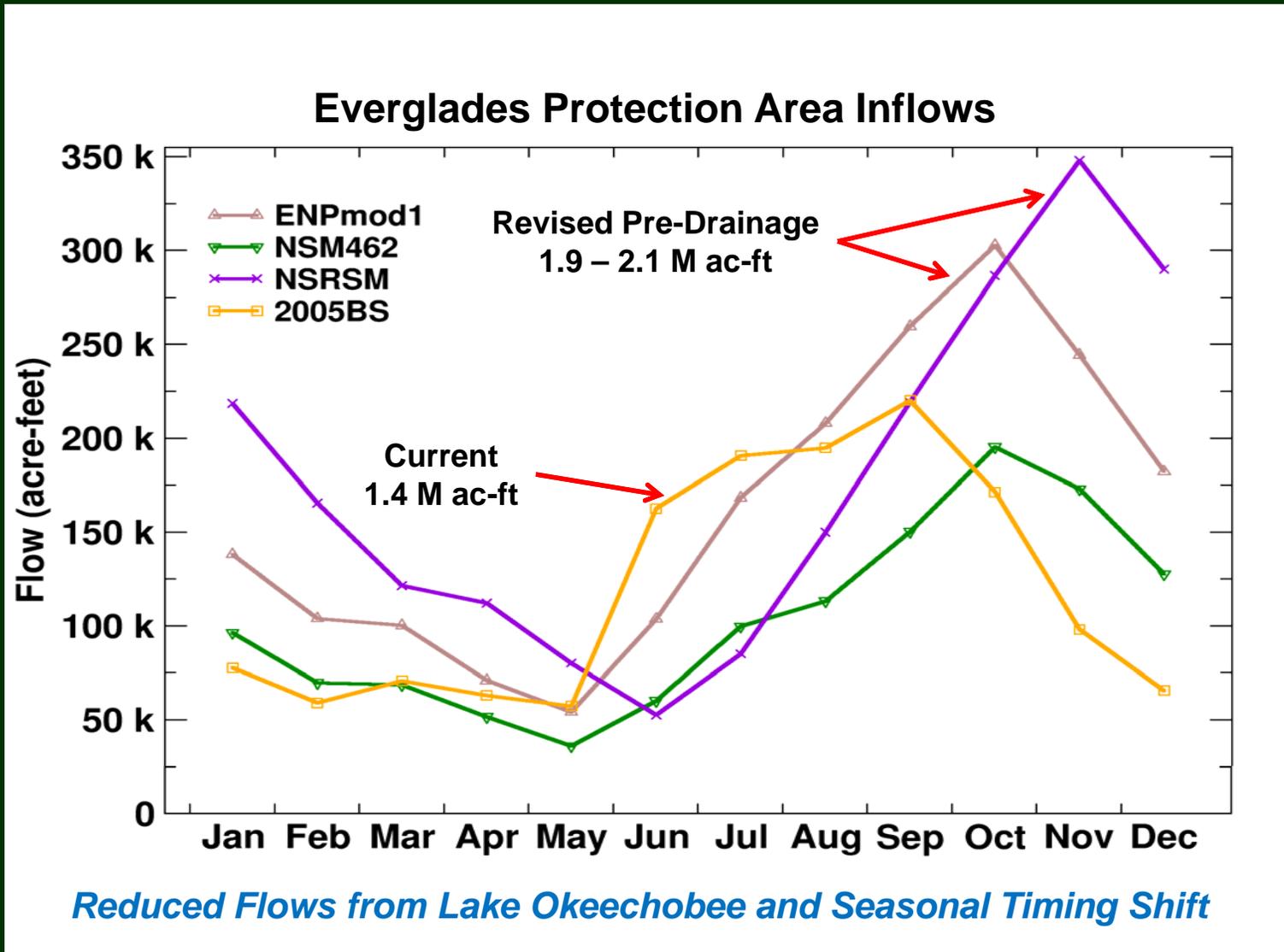
From the SFWMD River of Grass Phase II Planning process (preliminary information).



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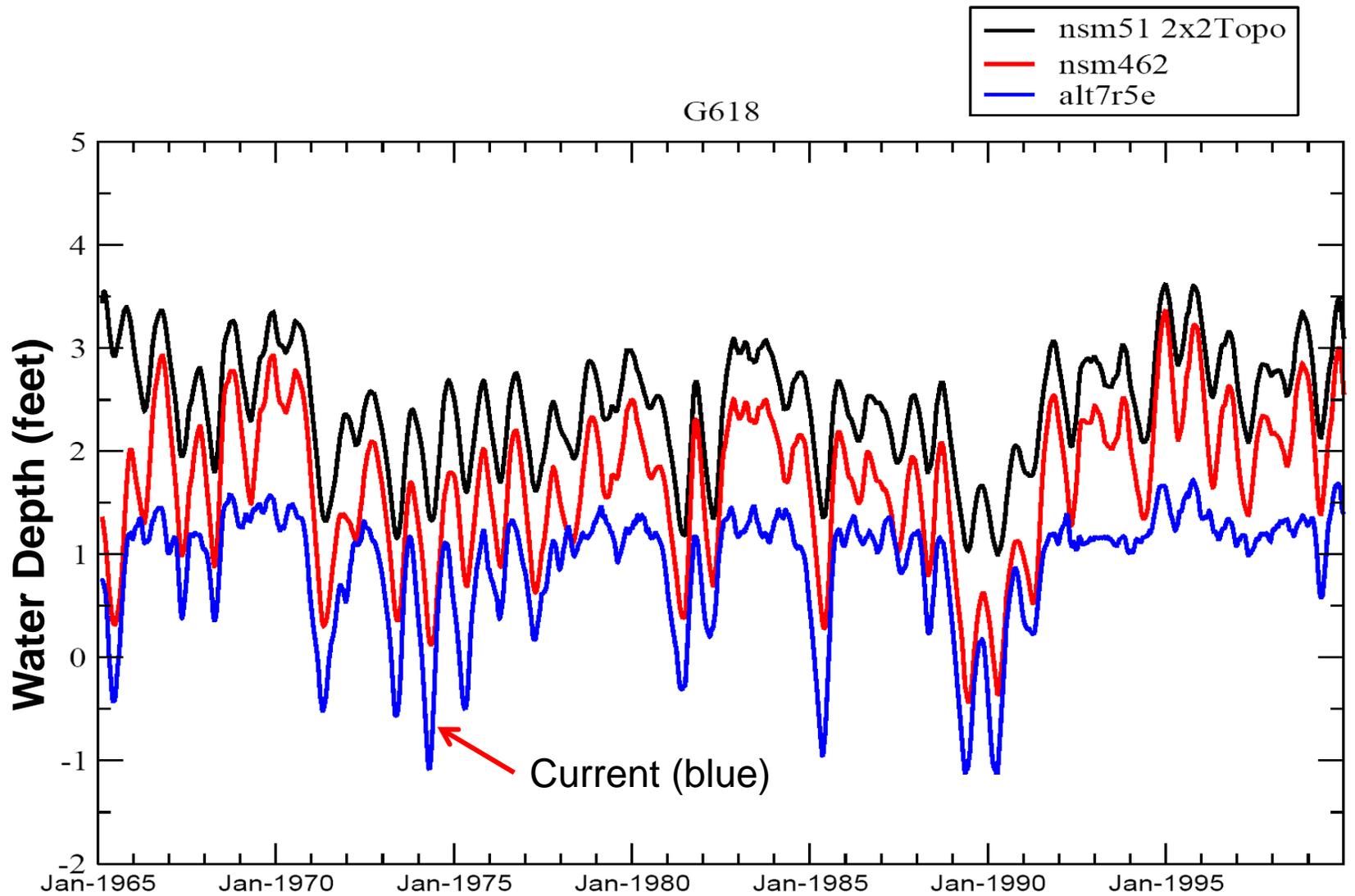
Alterations in Water Flows through the Everglades



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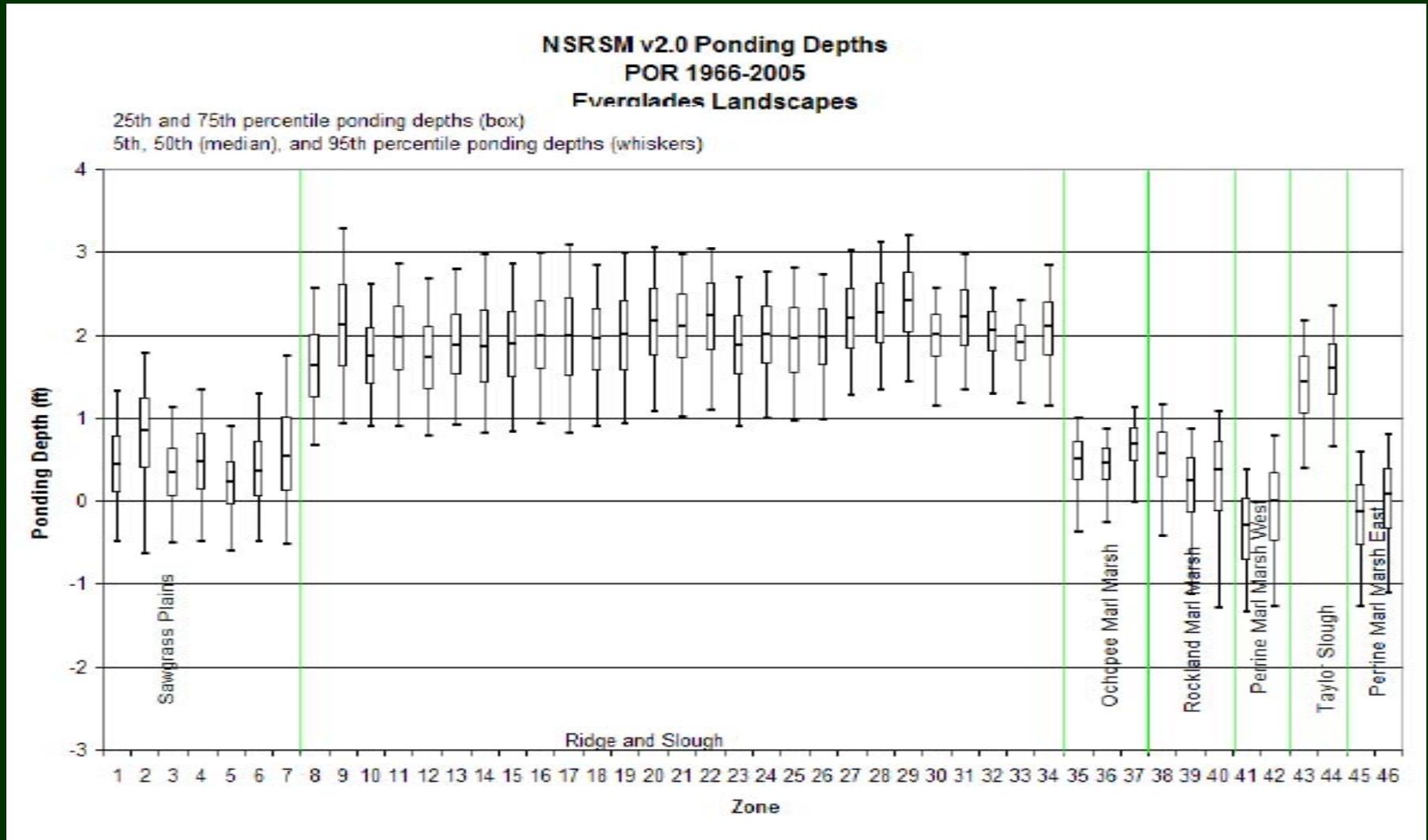
Water Depth Comparisons in NESS



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Ponding Depth Comparisons and Everglades Plant Communities

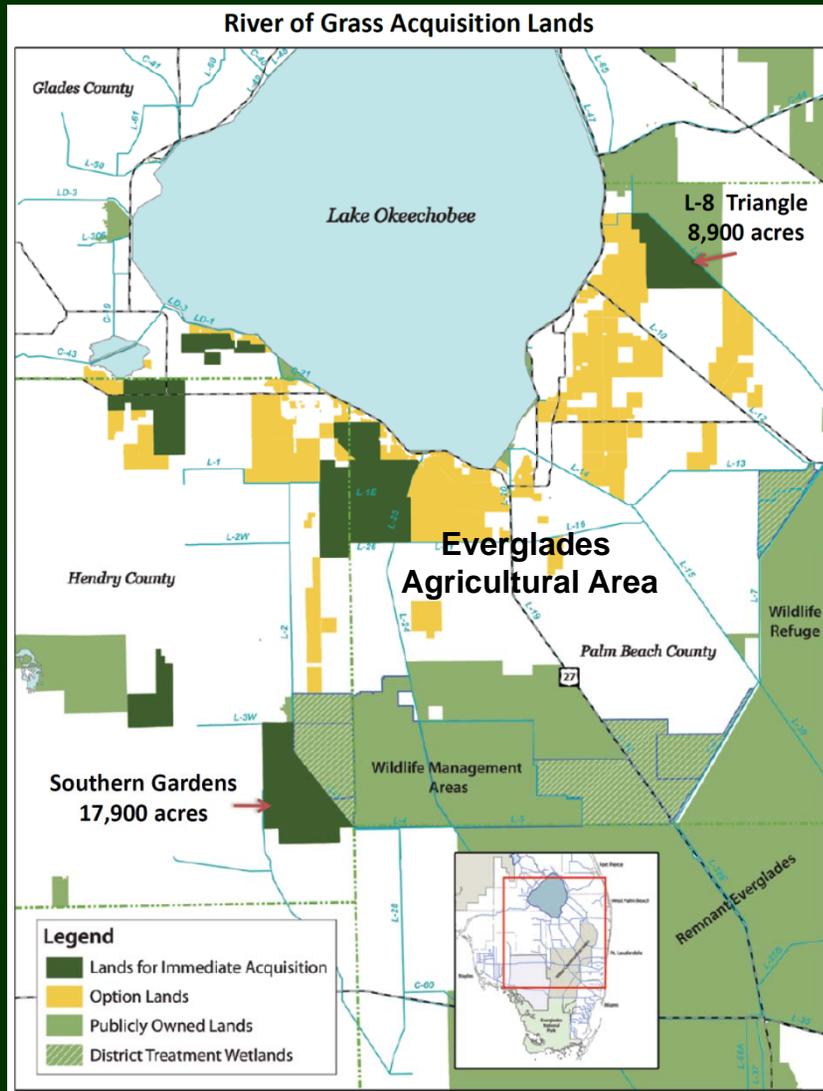


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Source: *SFWMD, 2009*

Reviving the River of Grass



EAA Land Becomes Available (for Water Storage/Treatment)

In 2008, the South Florida Water Management District develops a proposal to acquire more than 180,000 acres of agricultural land for Everglades restoration from the United States Sugar Corporation.

Economic conditions revise the transaction to 26,800 acres with options to purchase the remaining acreage over ten years.

New Restoration Targets are Developed –

Confirmation that the Pre-Drainage Everglades were Wetter and the Downstream Estuaries were Fresher than Previously Understood.



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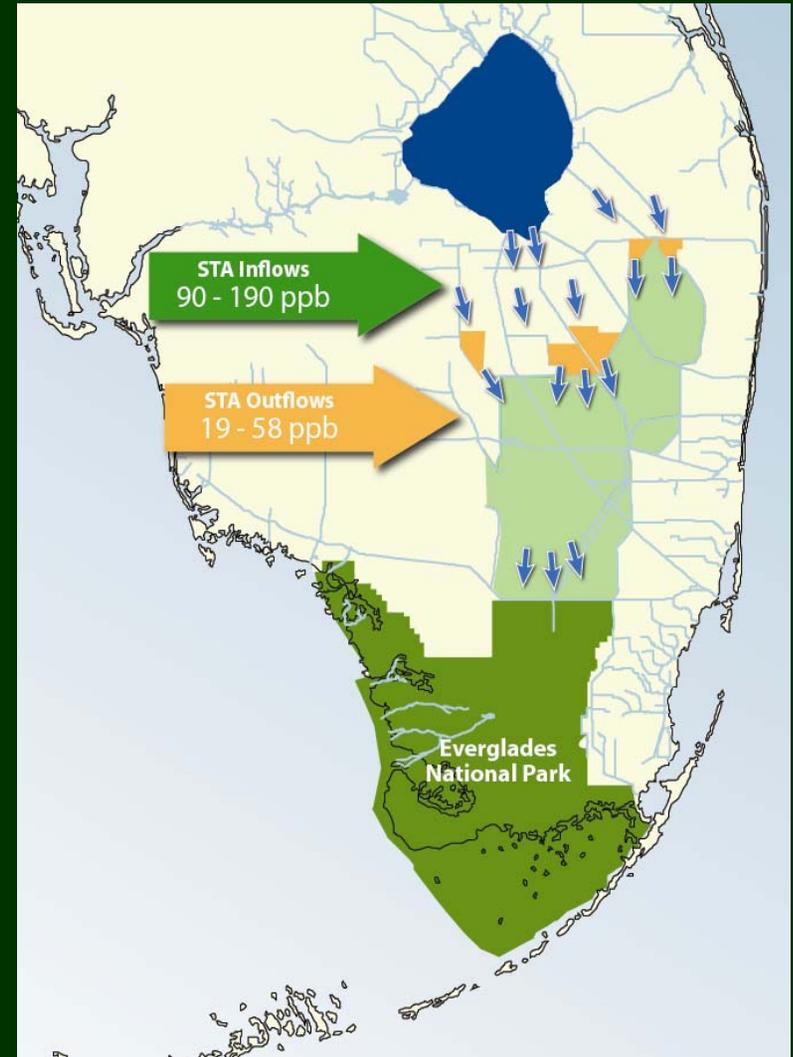
Early Everglades Water Quality Initiatives

Everglades Construction Project (ECP) Began in 1994 with the goal of reducing TP concentrations and loads from the EAA to protect the downstream Everglades.

57,000 acres of Stormwater Treatment Areas (STAs) and agricultural BMPs have lowered TP to 19-59 ppb, with load reductions of 70-80% EAA-wide.

Florida's Phosphorus Rule In 2002 the State set a Total Phosphorus Limit at 10 ppb to protect the Everglades from imbalances in native flora/fauna. ▣

EPA Amended Determination In 2008 a federal judge ordered the EPA to conduct a review of the Everglades Forever Act amendments and Phosphorus Rule to determine if they comply with Clean Water Act. This review has driven STA expansion requirements and a new water management approach.



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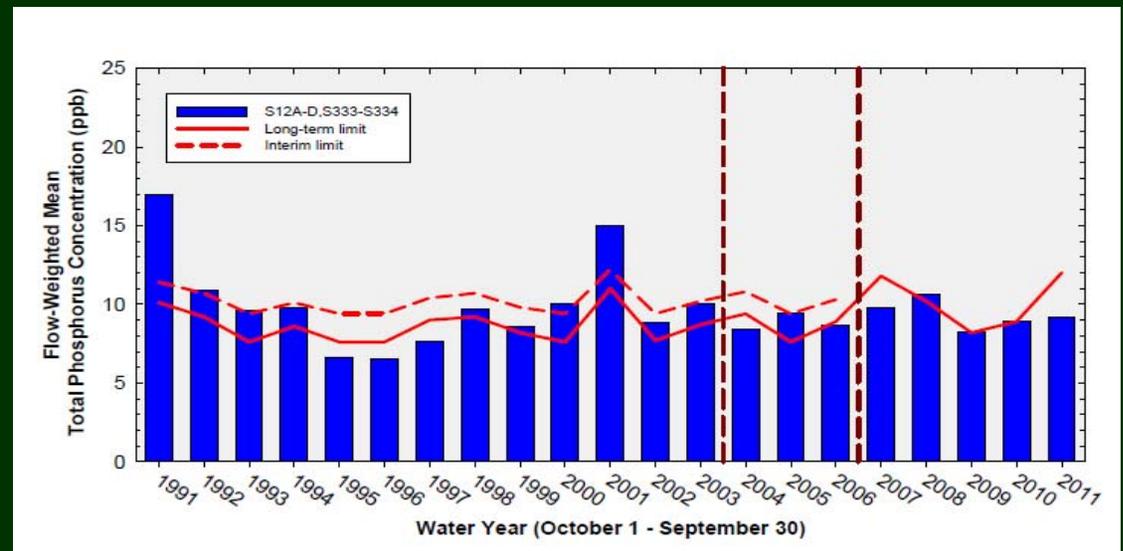
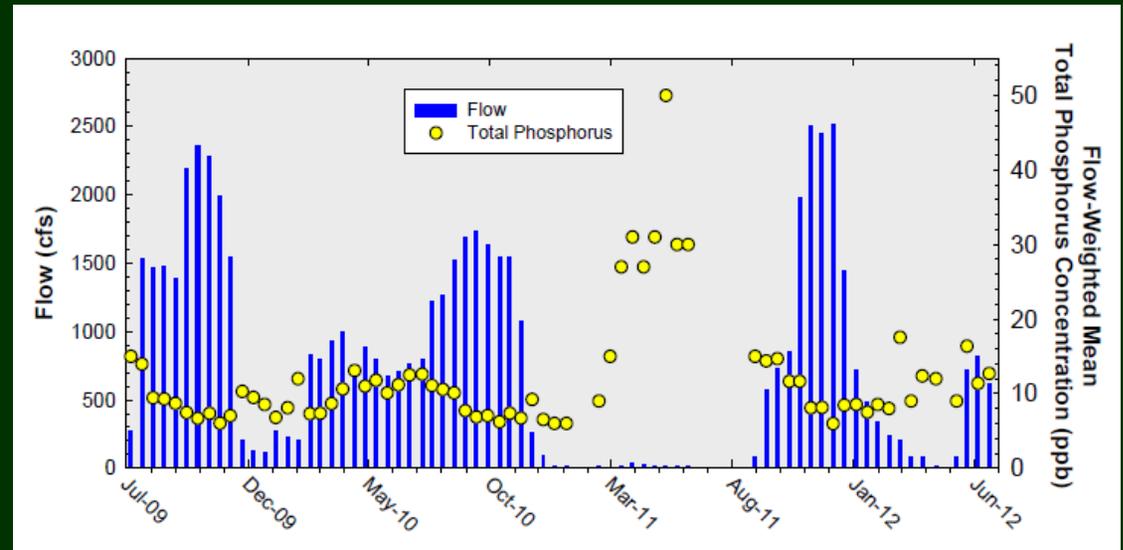
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Water Quality in Shark River Slough

Total Phosphorus in SRS
Total Phosphorus (TP) measurements at the Shark Slough inflow structures routinely spike during lower flow periods when the WCA-3A marsh is drying, and inflows are largely contained within the upstream canal system.

TP measurements have been hovering right at the long-term TP limit for the last 3-4 years.

This raises serious concerns about increasing inflows into Northeast Shark River Slough, because the S-333 structure receives much of its inflows from the L-67A canal.



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Planned Everglades Water Quality Restoration Strategies

2012-2016

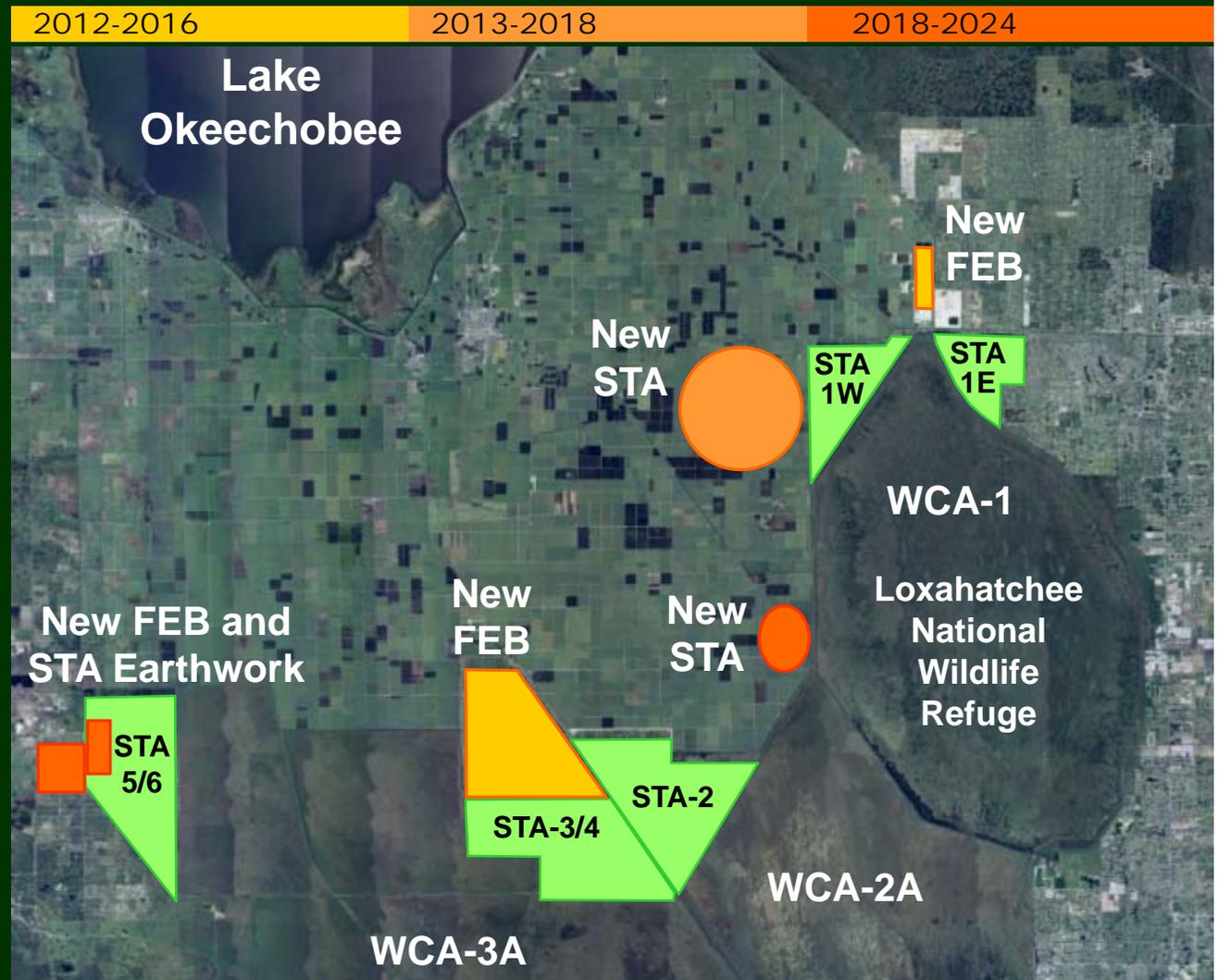
- Eastern Flow-Path: 45,000 acre-foot Flow Equalization Basin
- Central Flow-Path: 54,000 acre-foot Flow Equalization Basin

2013-2018

- Eastern Flow-Path: 4,700 acres of Stormwater Treatment Area (STA)

2018-2024

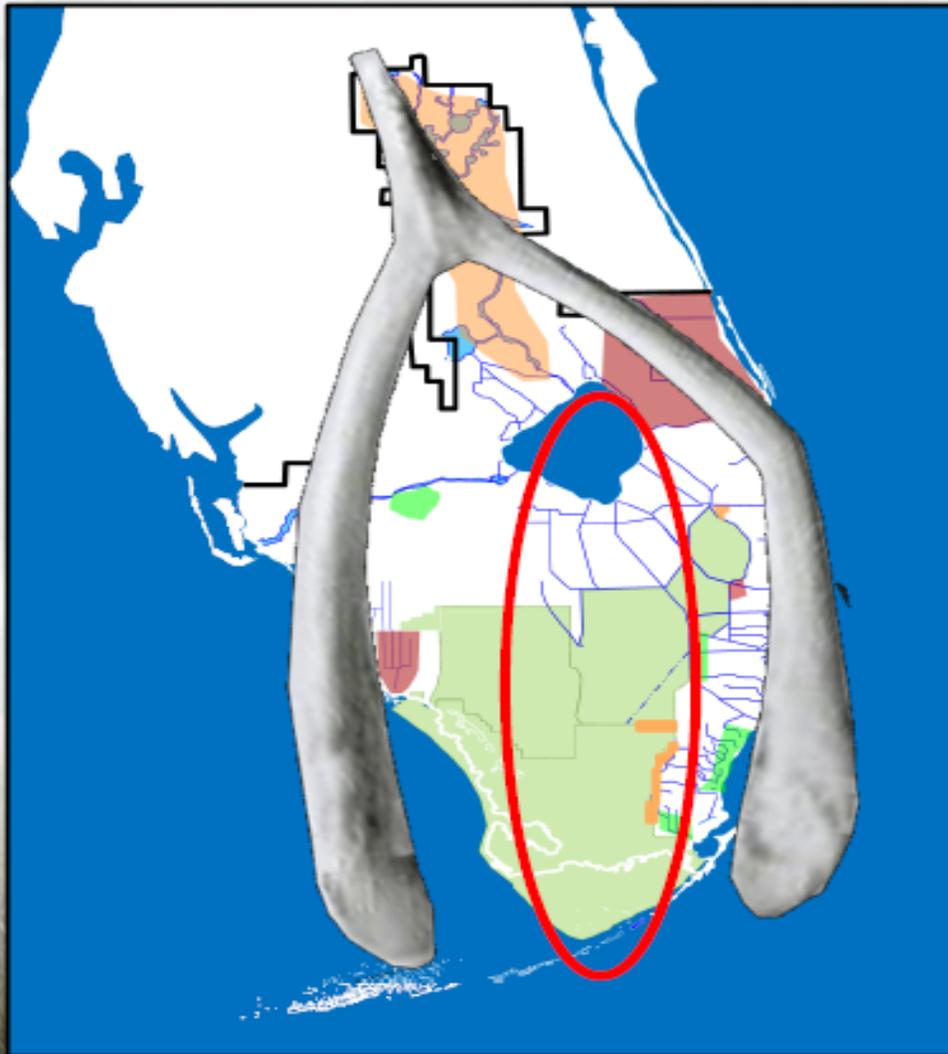
- Eastern Flow-Path: 1,800 acres of STA (2018-2022)
- Western Flow-Path: 11,000 acre-foot Flow Equalization Basin (2018-2023)
- Western Flow-Path: 800 acres of earthwork within existing STAs to maximize effective treatment area (2019-2024)



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Central Everglades Planning Process



What's Next

- "Central Everglades" in context of "center" of the wishbone
- Goals
 - Reduce damaging discharges to east and west coast estuaries
 - Restore habitat in the central Everglades, focusing on the "River of Grass"
 - Deliver "new" sources of clean water to the Central Everglades and ENP
- Considerations
 - Land Available
 - Water Quality
 - Herbert Hoover Dike
 - Savings Clause

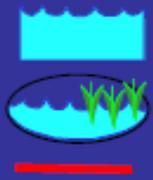


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Central Everglades Planning Project

CERP Components Under Consideration



Storage, treatment and conveyance in the EAA



Decompartmentalization and sheetflow enhancement

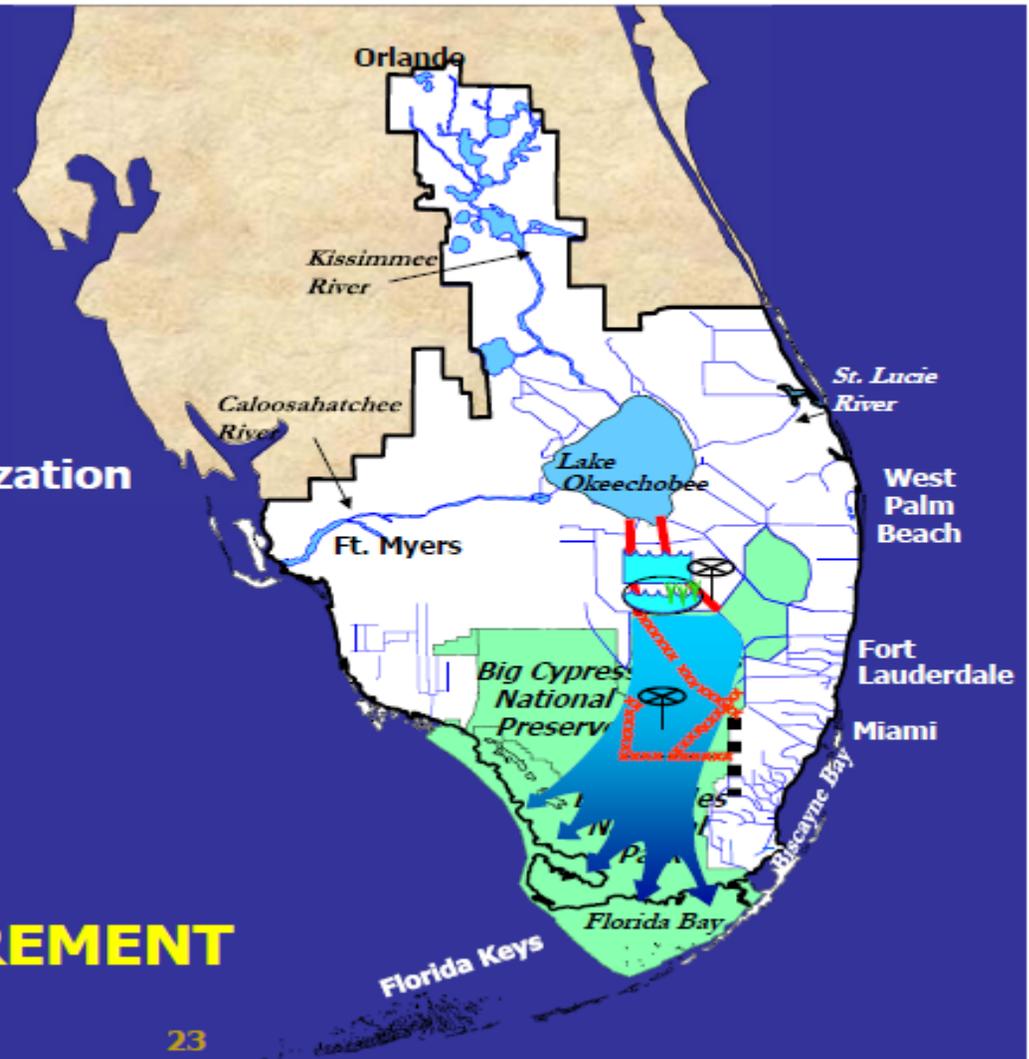


Seepage management



Operational Changes

Feasible 1st INCREMENT



23

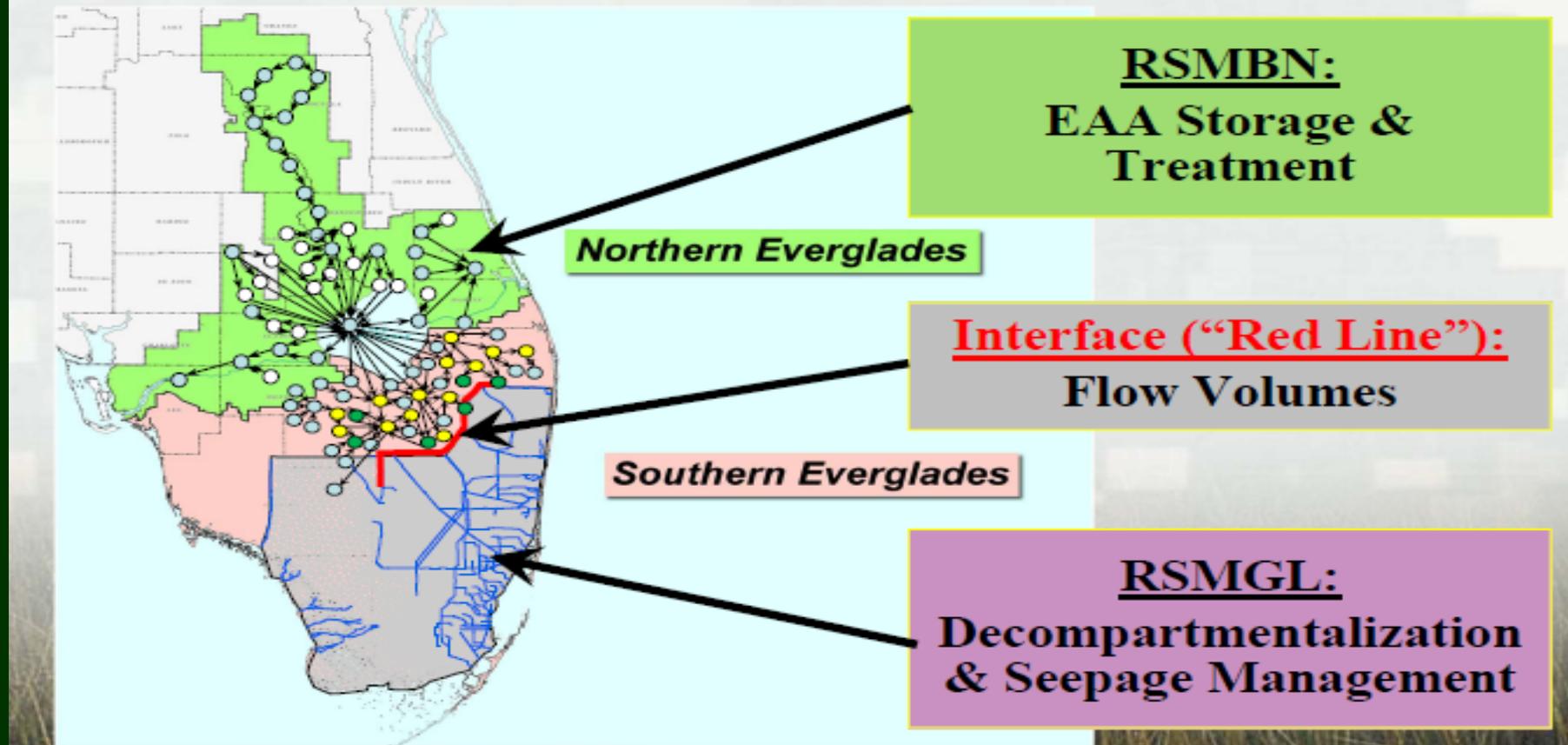


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Central Everglades Planning Project Hydrologic Modeling Tools

Decoupled Modeling Approach



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Central Everglades Planning Project Primary Performance Metrics

Performance Measure	Description
Sheet flow in the Everglades Ridge and Slough Landscape	Measure of the timing and distribution of sheet flow across the landscape.
Number and Duration of Dry Events in Shark River Slough	Measure of the number of times and mean duration in weeks that water level drops below ground.
Inundation Pattern in Greater Everglades Wetlands	Measure of the number and duration of inundation events used to calculate the percent period of record of inundation.
Slough Vegetation Suitability	Measure to evaluate the hydrologic suitability for slough vegetation.
Hydrologic Surrogate for Soil Oxidation	Measure of cumulative drought intensity to reduce exposure of peat to oxidation.
Extreme High and Low Water Levels in Greater Everglades Wetlands	Measure of the number and duration of extreme high and low water depth events.
Prey-Based Freshwater Fish Density Performance Measure	Measure of small-sized fish density based on frequency of dry downs.
Northern Estuaries Oyster Habitat and Submerged Aquatic Vegetation	Measure of oyster and sea grass habitat based on frequency of flows from S-79 and S-80.



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Central Everglades Planning Project Hydrologic/Ecological Tradeoffs

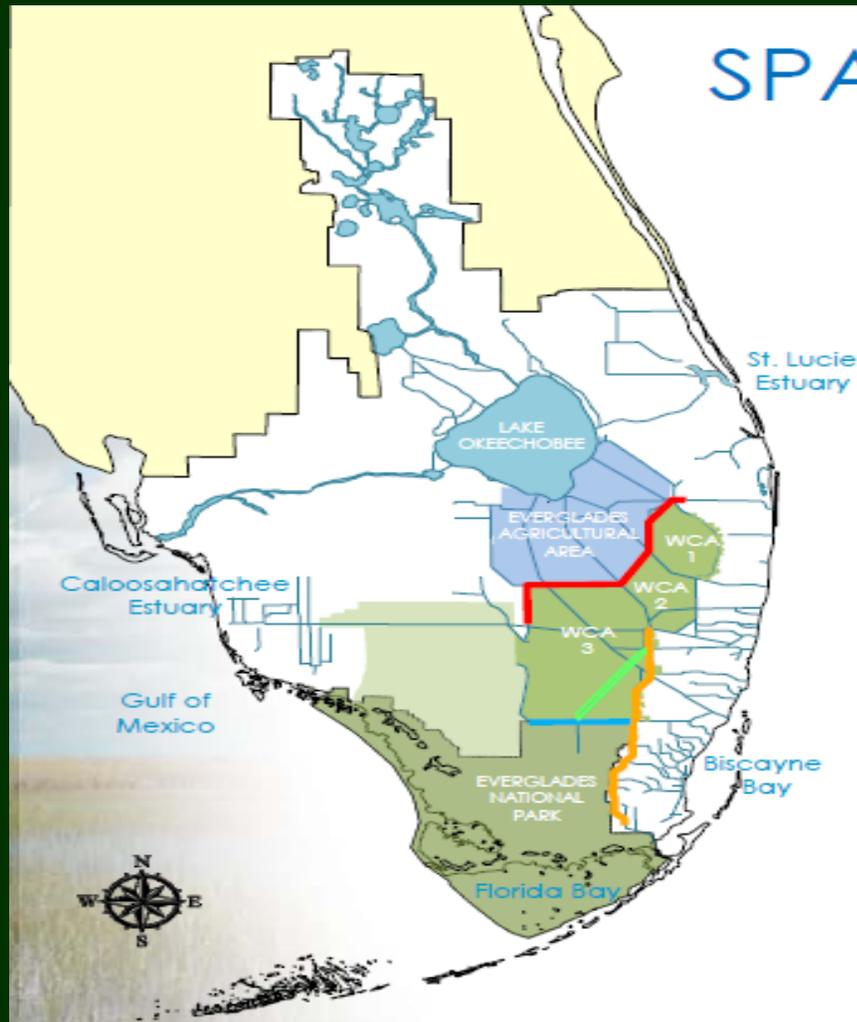
- 1) Restoration of Ridge-Slough headwaters while preserving extant sawgrass plain in northern WCA-3A.
- 2) Reconnection of historic slough flow patterns while preserving extant tree islands in WCA-3B.
- 3) Restoration of SRS hydrology and FI Bay salinity while preserving extant CSSS habitats.



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Central Everglades Planning Project Regional Water Flow Analyses



SPATIAL PERSPECTIVE

REDLINE

- Flows from EAA into WCA 3A (L-4, L-5 and L-6 levees and canals)
 - EAA Storage and Treatment
 - Northern WCA 3A Hydropattern Restoration
 - L-28 Triangle Rehydration/connectivity

GREENLINE / BLUELINE

- Flows through WCA 3A and WCA 3B (L-67A and C levees and associated canals)
- Flows from WCA 3A/3B into Everglades National Park (Tamiami Trail roadway and L-29)
 - WCA 3A/3B and ENP Conveyance

YELLOWLINE

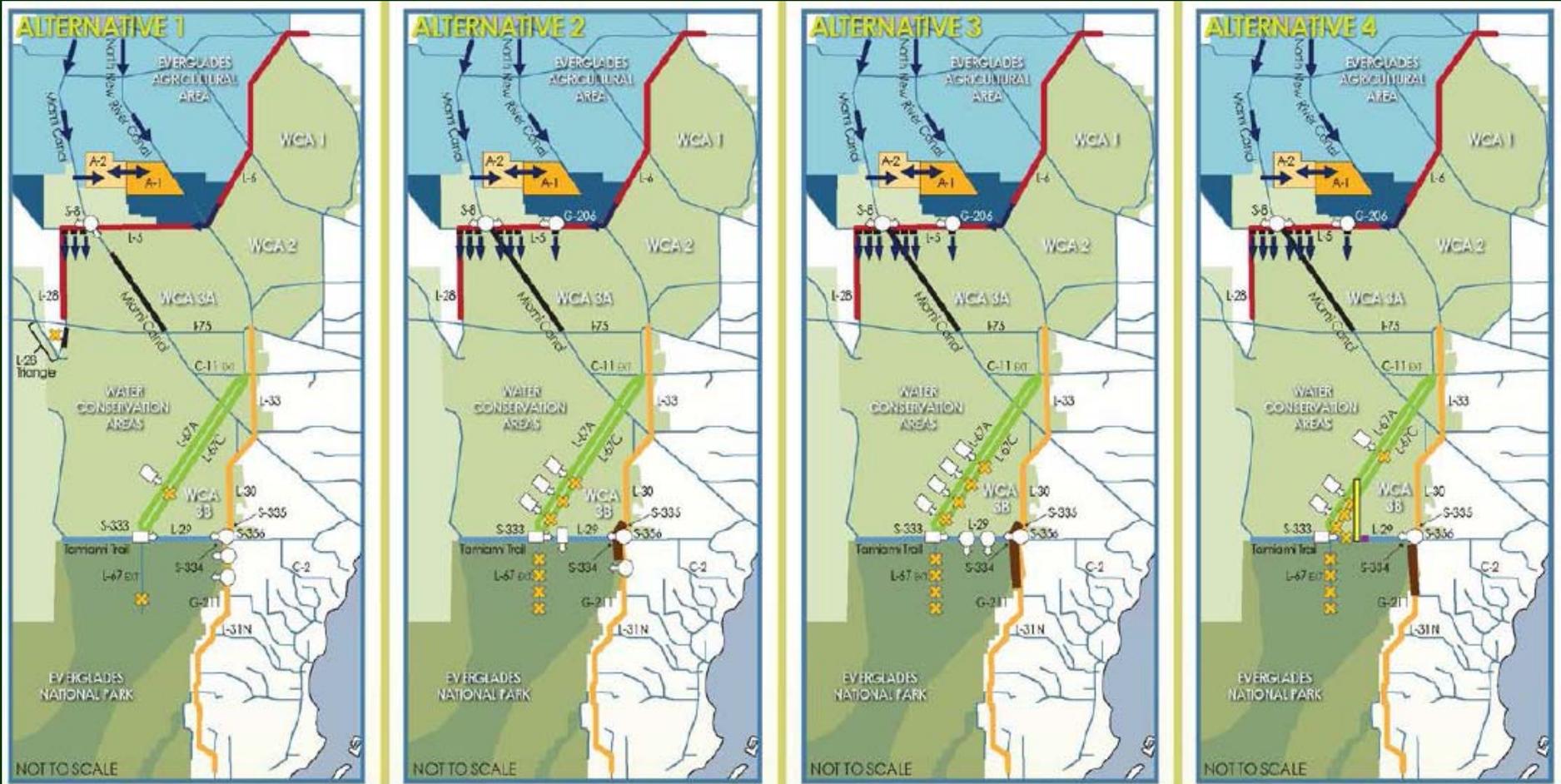
- Flows from WCA 3A/3B and ENP to the lower east coast (east coast protective levee system, the L-30 and L-31N)
 - Seepage Management Options



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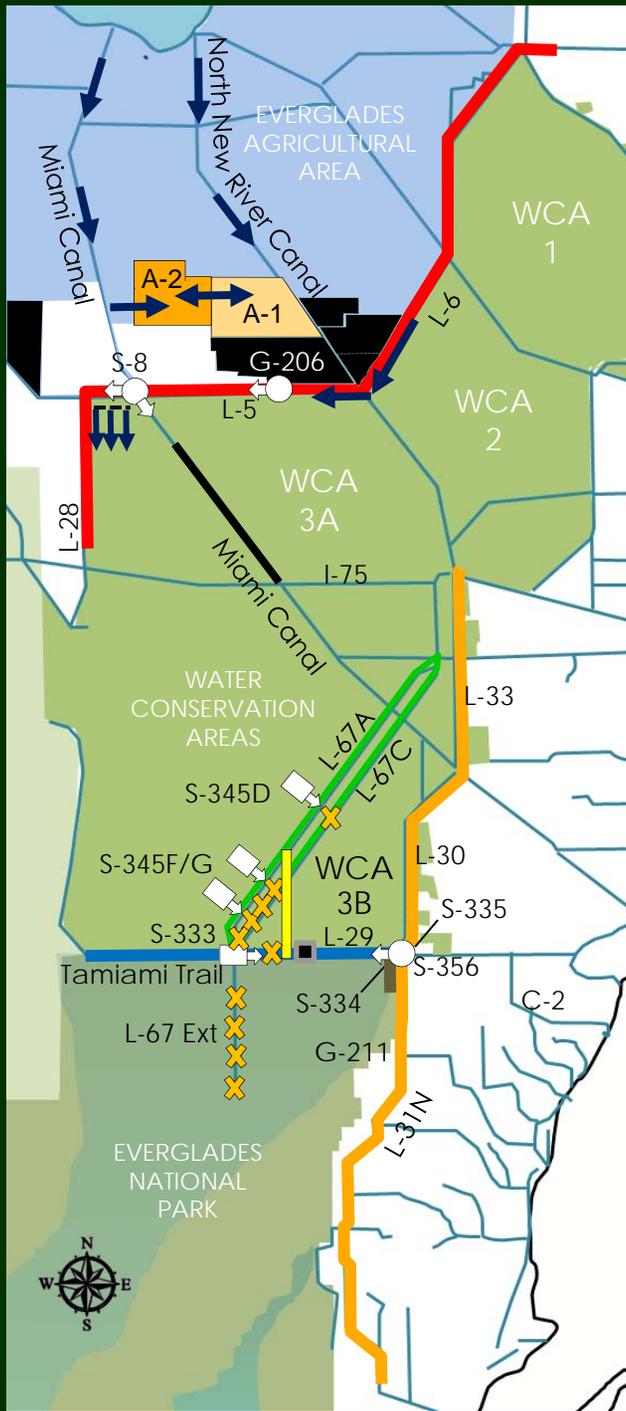
Central Everglades Planning Project Final Array of Alternatives



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Tentatively Selected Plan (ALT4R)



STORAGE AND TREATMENT

- Construct A-2 FEB and integrate with A-1 FEB operations
- Lake Okeechobee operation refinements within LORS

DISTRIBUTION/CONVEYANCE

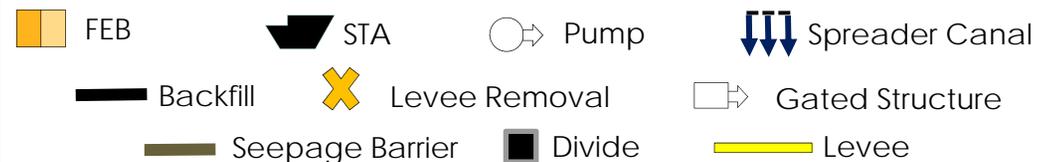
- Diversion of L-6 flows and L-5 canal improvements
- Spreader canal ~3 miles west of S-8 (3,000 cfs)
- Backfill Miami Canal from ~1.5 miles south of S-8 to I-75
- L-28 Triangle – gap levee

DISTRIBUTION/CONVEYANCE

- Increase S-333 capacity to 2,500 cfs
- Two 500 cfs gated structures in L-67A, spoil removal west of L-67A north and south of structures
- Relocated L-67A levee to form Blue Shanty levee in WCA 3B
- Degrade L-67C levee in Blue Shanty flowway
- One 500 cfs gated structure north of Blue Shanty levee and 6,000-ft gap in L-67C levee
- Degrade L-29 levee in Blue Shanty flowway, divide structure east of Blue Shanty levee at terminus of western bridge
- Tamiami Trail western 2.6 mile bridge and L-29 canal max stage at 9.7 ft (FUTURE WORK BY OTHERS)
- Degrade entire L-67 extension levee

SEEPAGE MANAGEMENT

- Increase S-356 to 1,000 cfs
- Partial depth seepage barrier south of Tamiami Trail 5 miles along L-31N
- G-211 operational refinements; meet Savings Clause requirements and use coastal canals to convey seepage eastward to Biscayne Bay



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Alt4R Features

Enlarged S-333

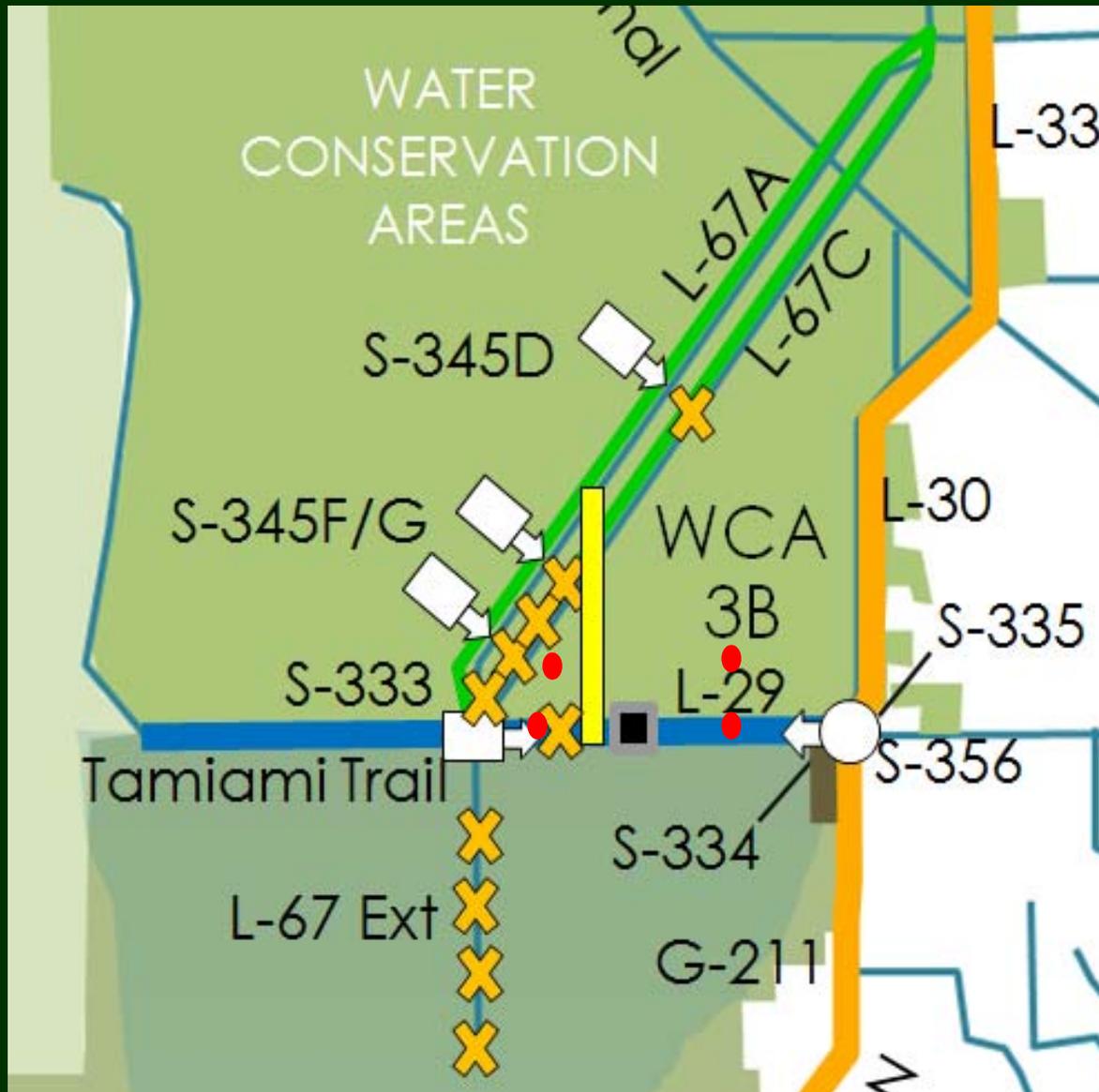
Shanty
Two-way

L-67C & L-29
Weirs Degraded

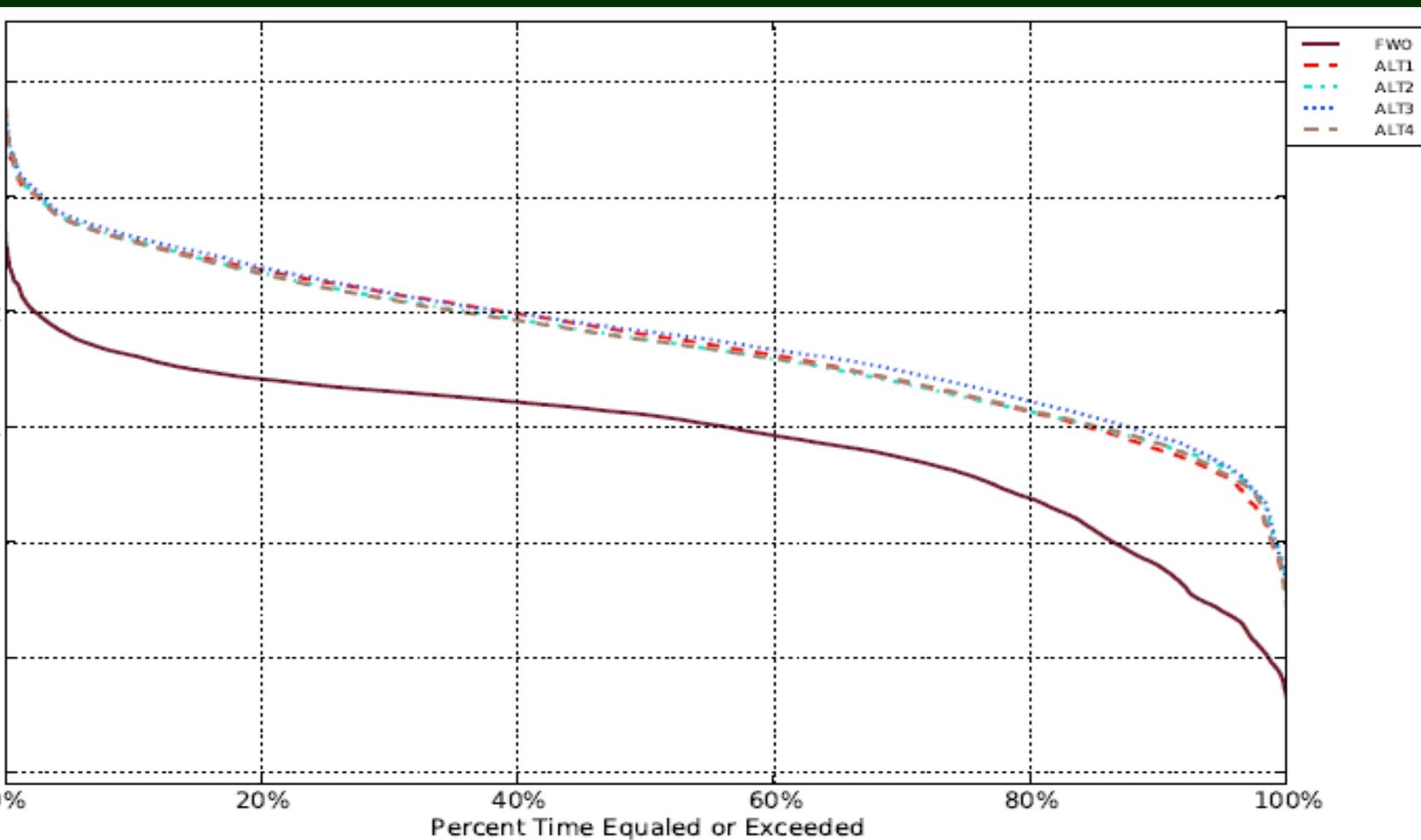
L-29 Divide Structure

Flow S-356

Marsh/Canal Sites



Central Everglades Planning Project Northeast SRS Water Depths (NESRS2)



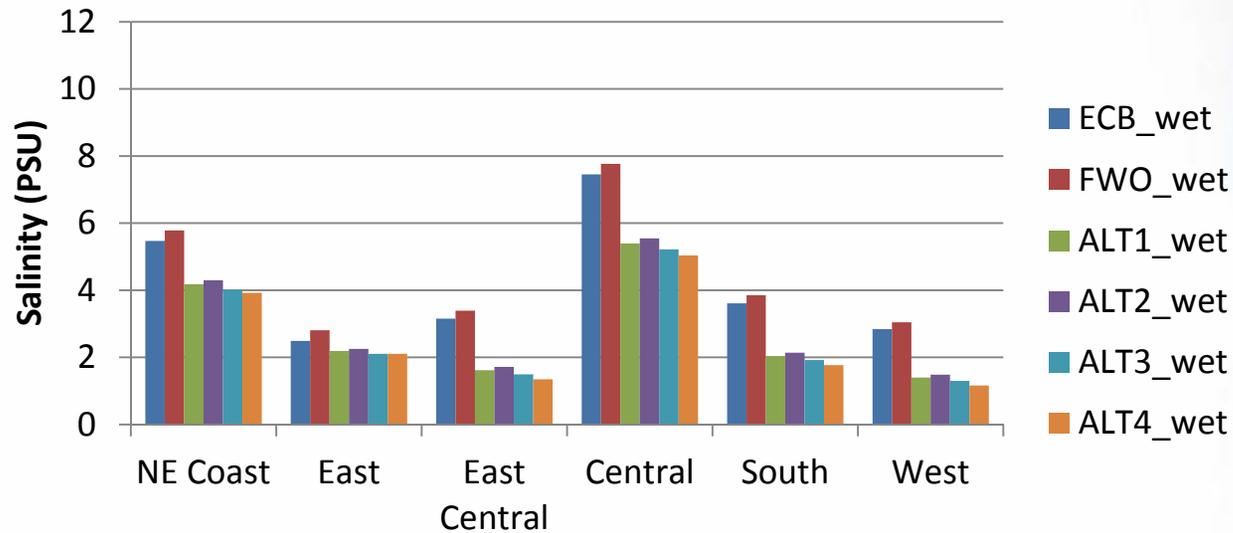
Central Everglades Planning Project Final Array Cost/Benefit Summary

	ALT1	ALT2-R	ALT3-R	ALT4-R
Total Average Annual Cost	\$ 74,400,000	\$ 85,400,000	\$ 90,000,000	\$ 83,600,000
	Habitat Unit Lift			
WCA 3A	125,931 Cost Effective	122,917	122,135	123,741
WCA 3B	9,426 Cost Effective	10,282 Cost Effective	8,569	5,998
ENP	91,844 Cost Effective	90,593	100,253	112,283 Cost Effective
Florida Bay	64,363 Cost Effective	62,565	79,455	90,671 Cost Effective
Caloosahatchee Estuary	4,968 Cost Effective	4,968	4,968	4,968
St. Lucie Estuary	1,199 Cost Effective	1,199	1,199	1,199
Total Habitat Units	297,731 Cost Effective	292,524	316,579	338,860 Cost Effective

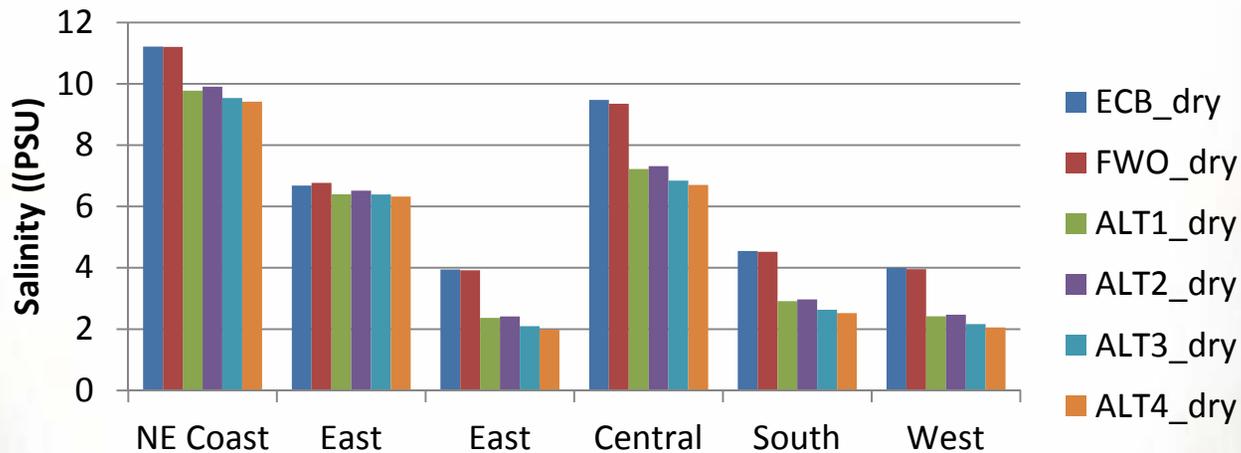
Cost increase from Alt 1 to Alt 4: 12% (Previously 20%) --- Cost Per HU \$250
 Benefit Increase from Alt 1 to Alt 4: 14% --- Cost Per HU \$247

Salinity Offset Metric (PSU difference from NSM target)

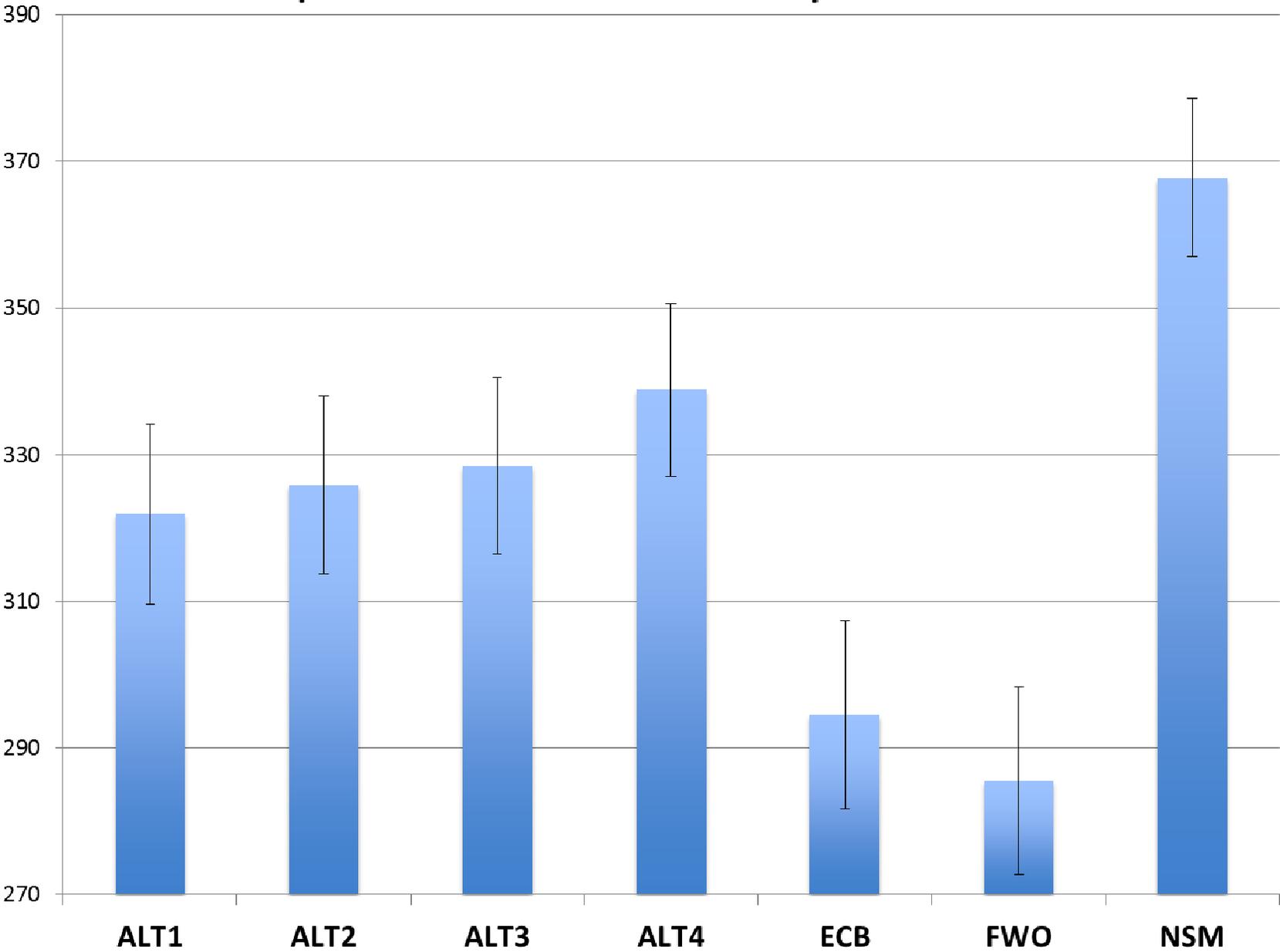
Florida Bay Wet Season Salinity: Difference Between Target and Alternative Means



Florida Bay Dry Season Salinity: Difference Between Target and Alternative Means



Mean Optimal Habitat Area for Juvenile Spotted Seatrout



Florida Bay Salinity Performance Measure Conclusions

- All CEPP alternatives yield improved salinity conditions in Florida Bay, relative to Future Without (FWO) project or Existing Condition Base (ECB)
- Mean salinity for all alternatives still higher than NSM conditions:
 - about 2 ppt to 9 ppt saltier than NSM in the dry season across different Florida Bay zones,
 - but, about 2 ppt closer to NSM than salinity under FWO or ECB.
- Expected benefits (“lift”) consistently greatest with Alt 4 (Alt 4 > Alt 3 > Alt 1 > Alt 2). However, the magnitude of differences among alternatives was modest.