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Hydrologic & Environmental Systems Modeling

Summary of Model Scenarios

WRAC Issues Workshop
June 27, 2013

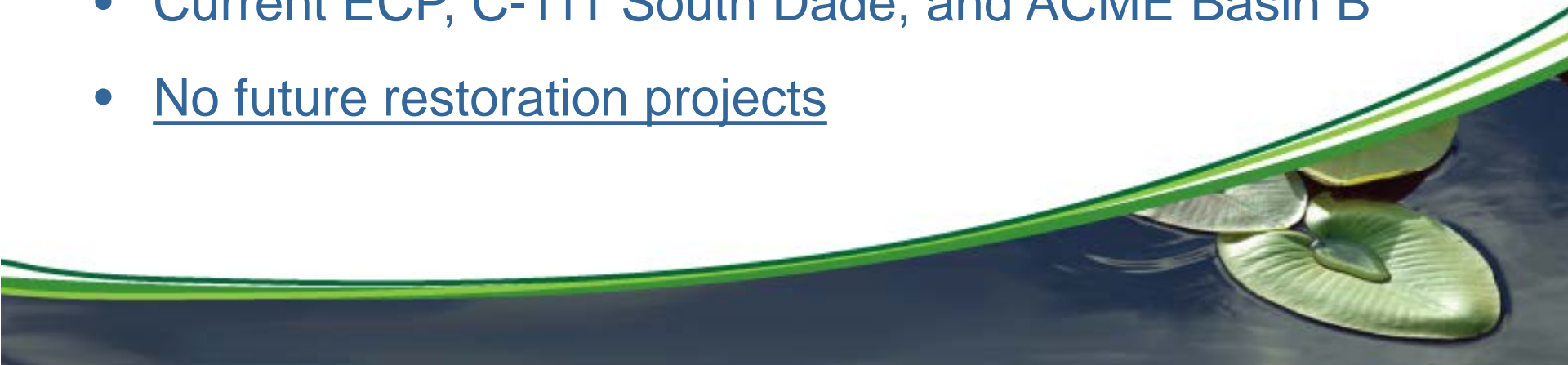
Objective

- To assess the potential differences in the hydrologic response of the South Florida system as a result of differences in water demand and land use in the Lower East Coast planning area between 2010 and 2030



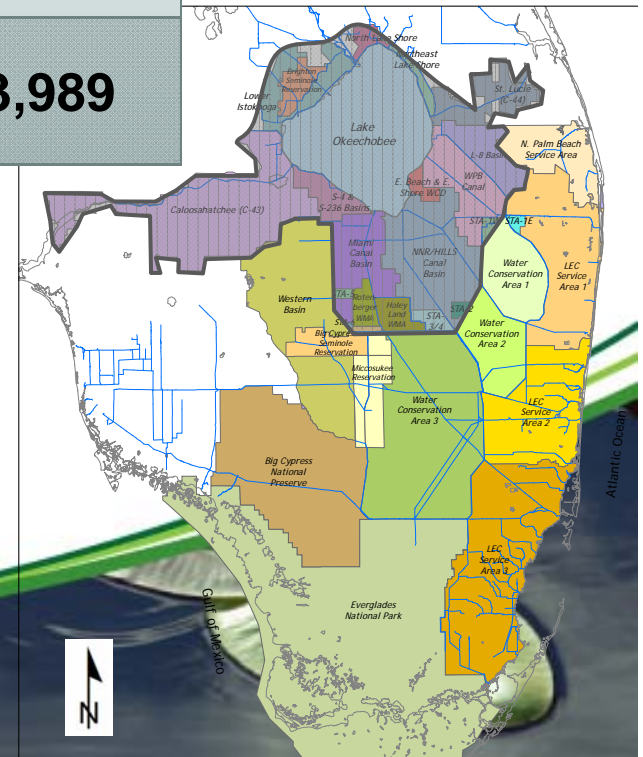
Key Modeling Assumptions

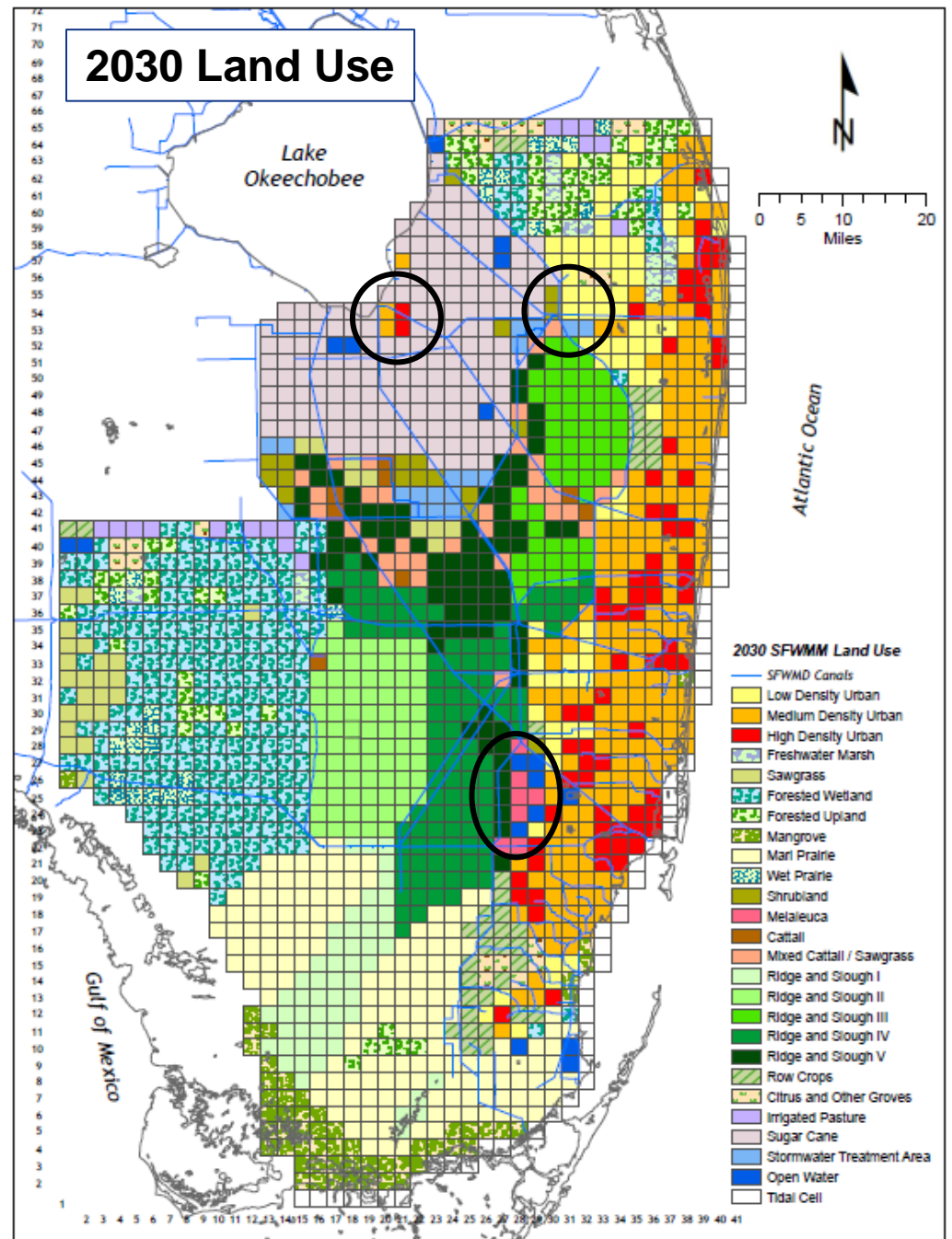
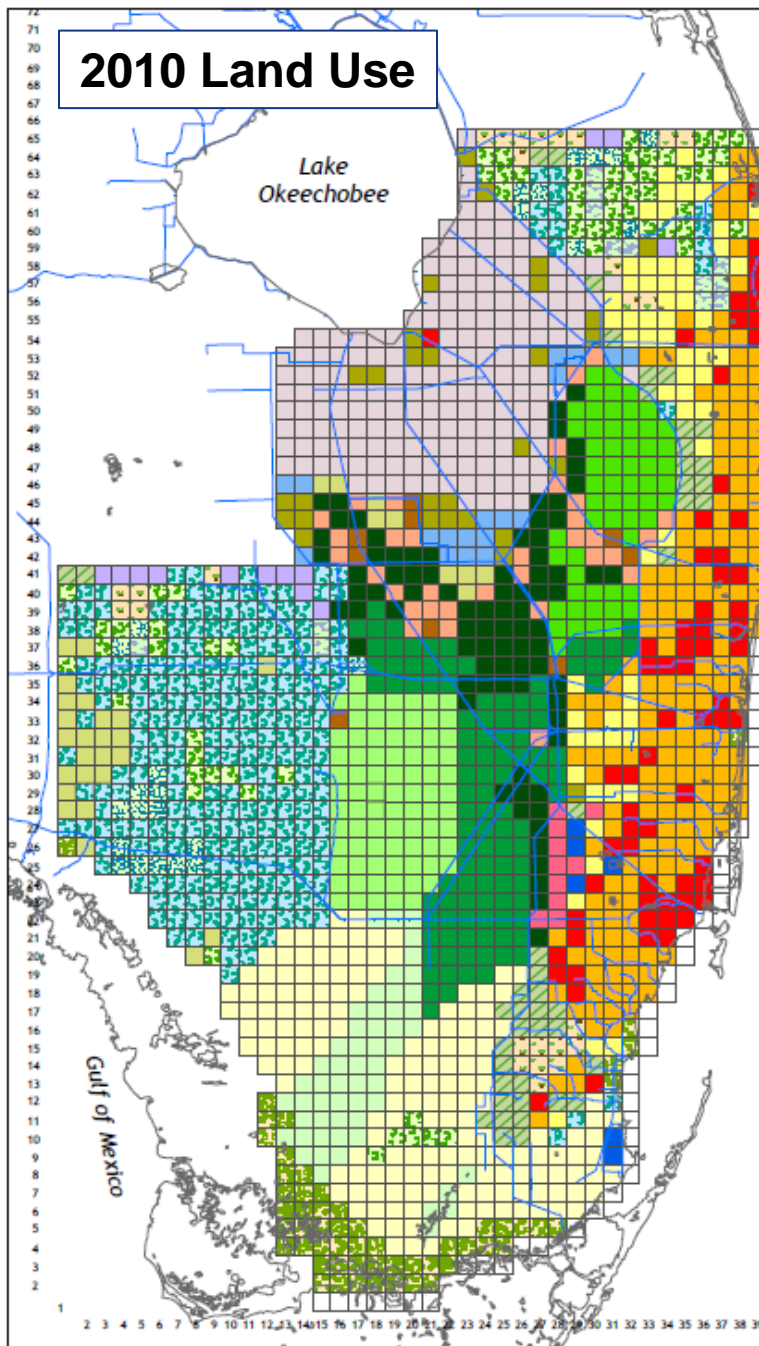
- System Operations as of 2012, such as:
 - C&SF operating rules and schedules
 - LORS 2008 for Lake Okeechobee with estimated Adaptive Protocols
 - LOWSM per rule 40E-21 and 40E-22
 - E RTP for WCA 3A
- Current ECP, C-111 South Dade, and ACME Basin B
- No future restoration projects



LOSA Irrigated Area (acres)

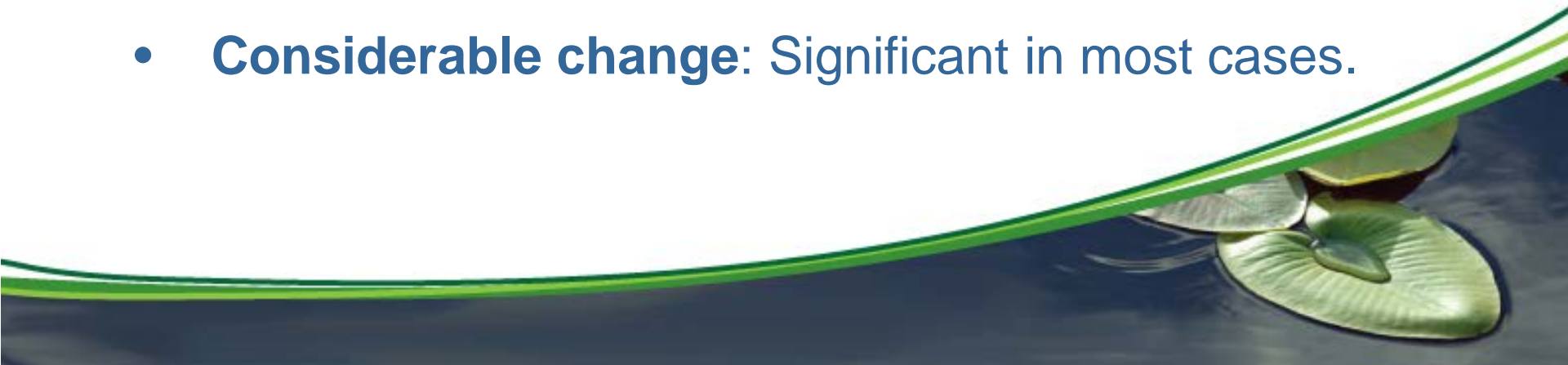
	2010 Permitted	2030 Permitted
Everglades Agricultural Area	458,240	458,240
Other LOSA	245,749	245,749
Total	703,989	703,989

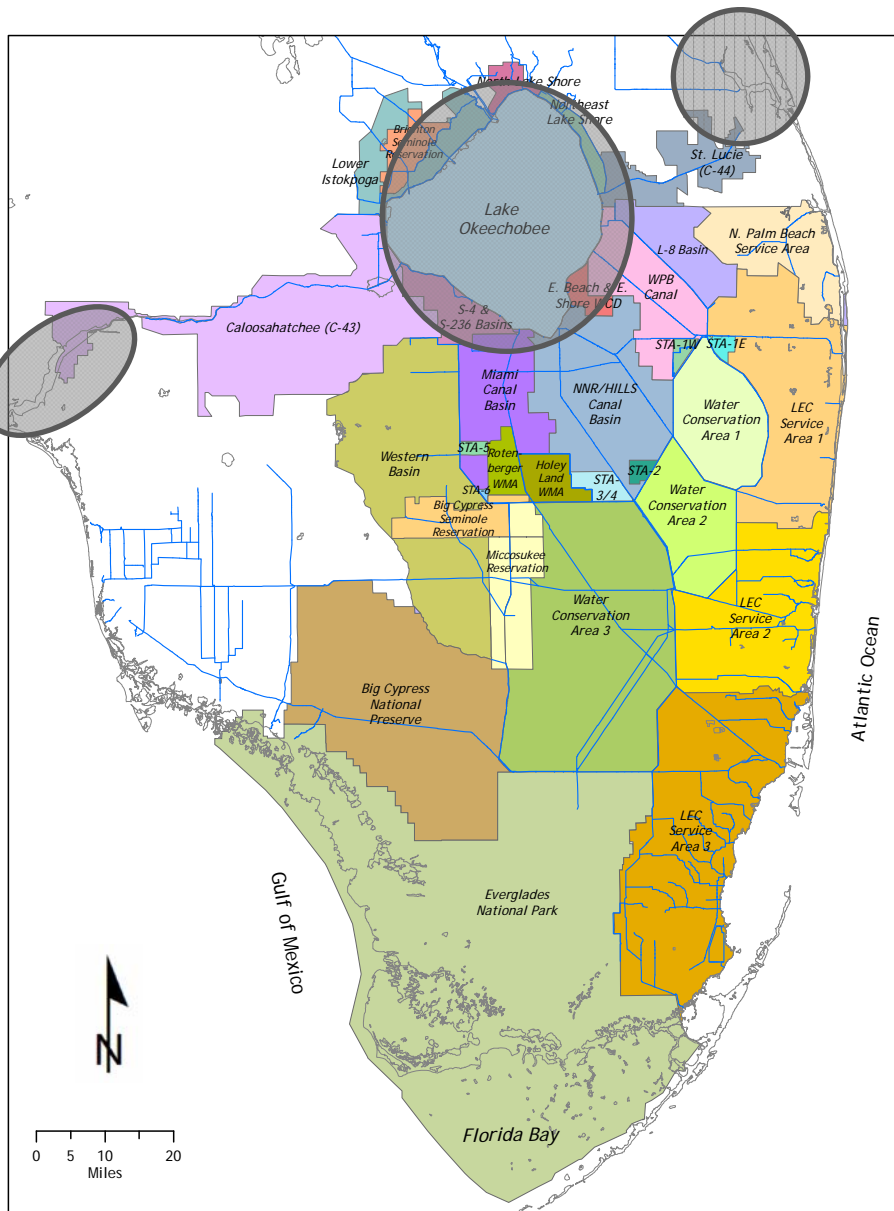




Definition of Terms for Hydrologic Change

- **No change or minimal change.** Detectable but not significant.
- **Slight change:** 1% of volume or 0.1 ft of stage. Not significant in most cases.
- **Small change:** 2% of volume or 0.2 ft of stage. Significant in some cases.
- **Moderate change:** 5% of volume or 0.5 ft of stage. Significant in many cases.
- **Considerable change:** Significant in most cases.





Lake Okeechobee

- Minimal change in stage
- No change in MFL exceedances

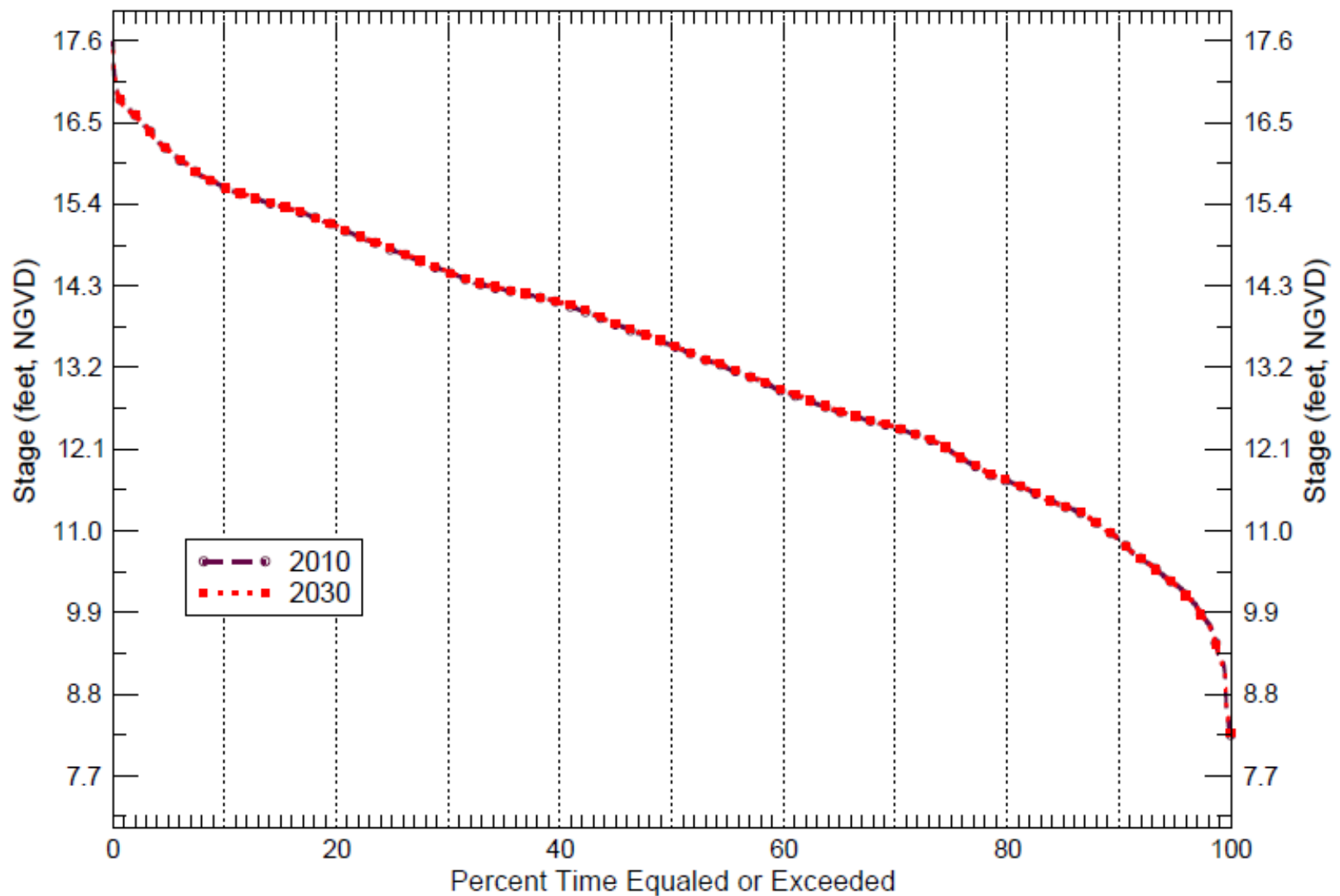
Caloosahatchee Estuary

- No change in MFL exceedances
- Minimal change in flows for salinity envelope

St. Lucie Estuary

- Minimal change in flows for salinity envelope

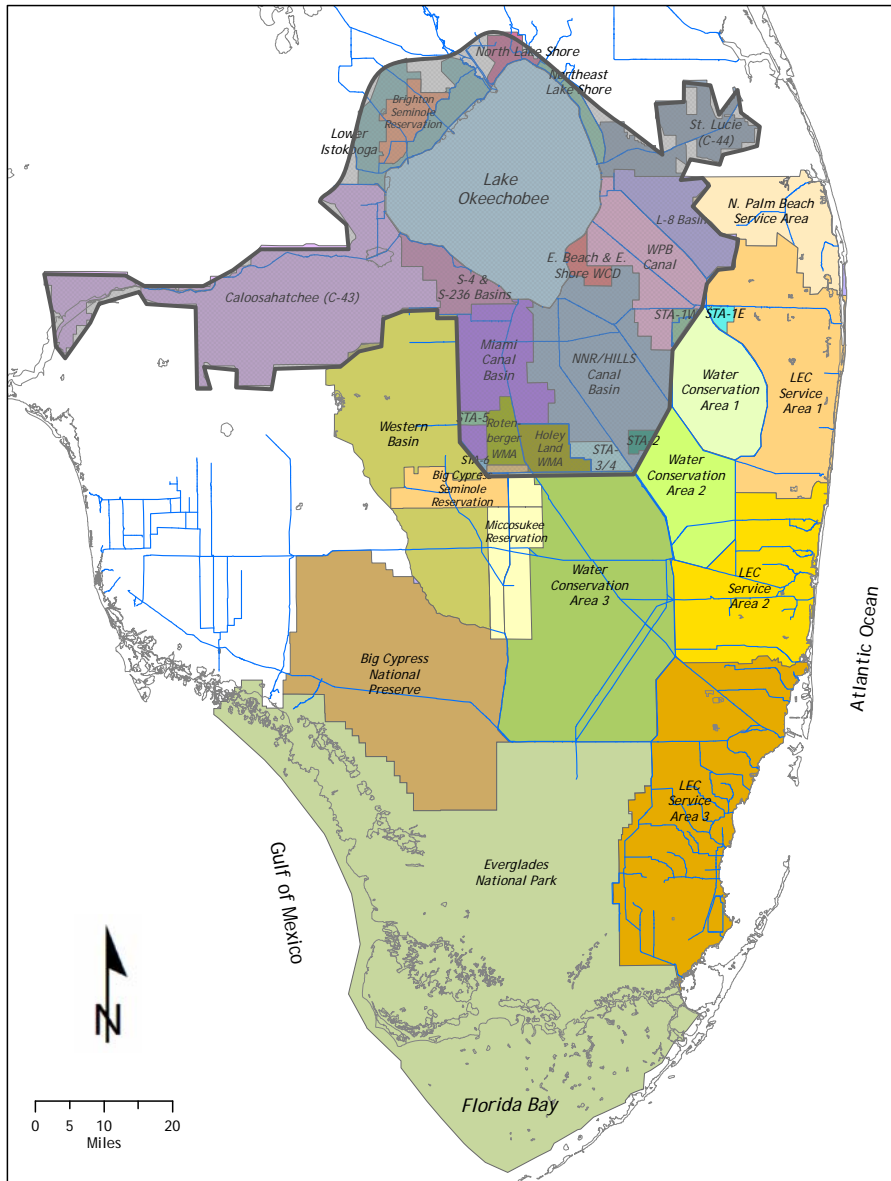
Stage Duration Curves for Lake Okeechobee



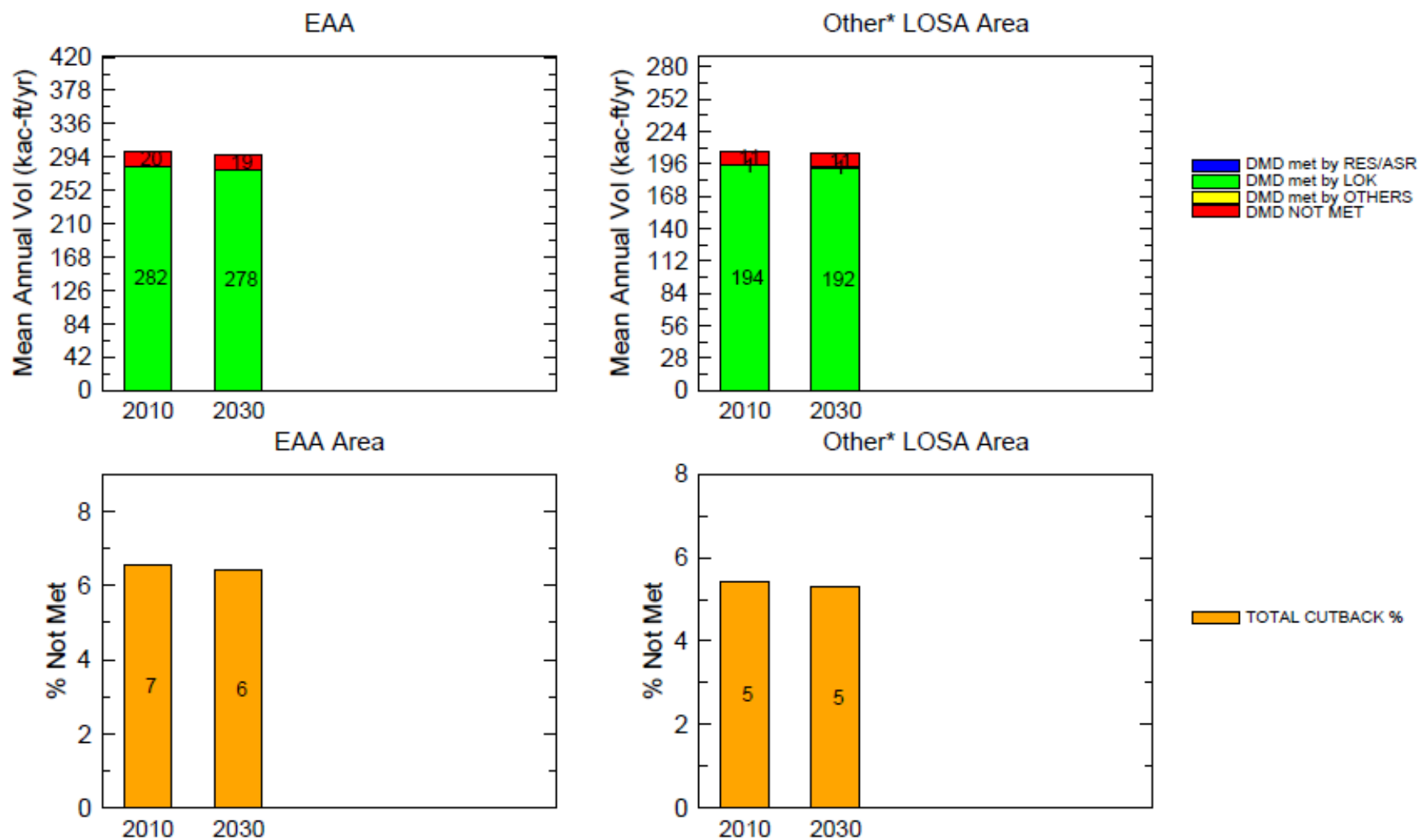
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Lake Okeechobee Service Area

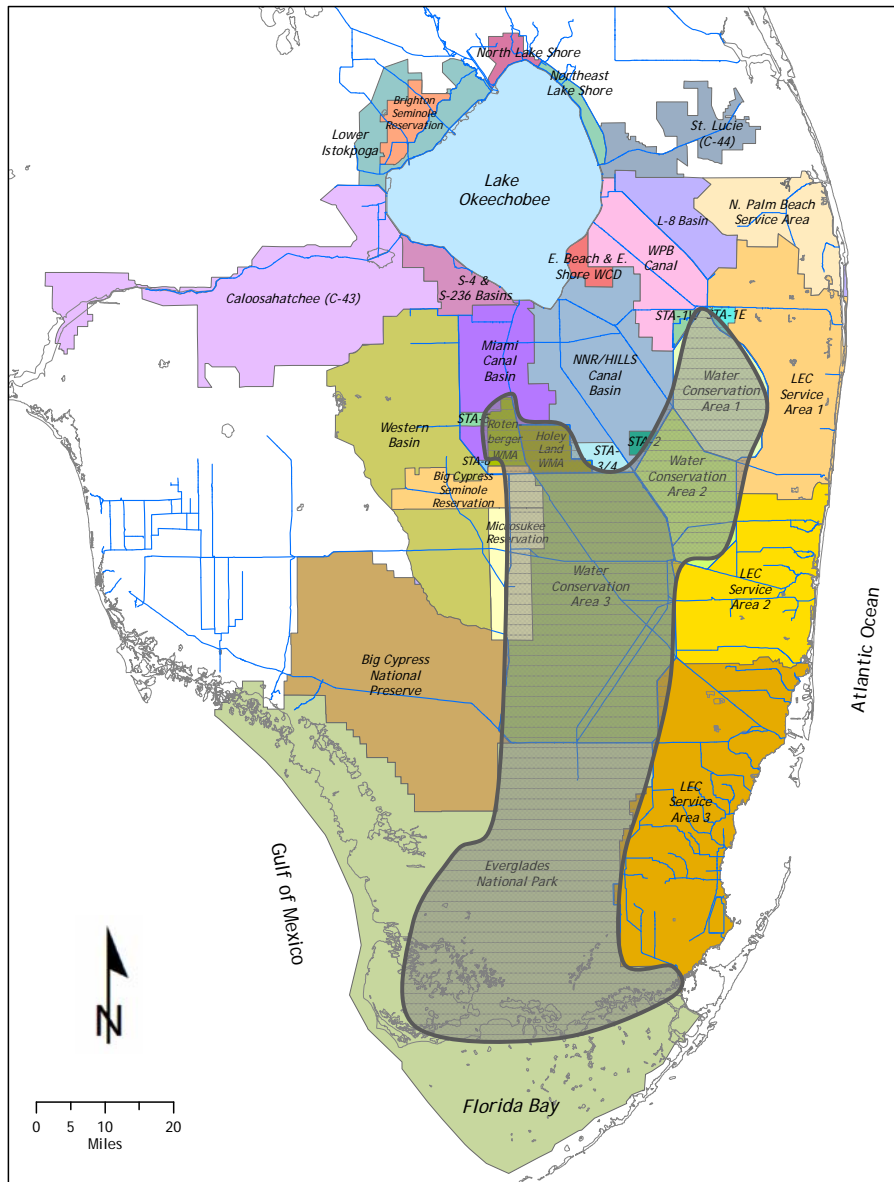
- Slight increase in demand met



Mean Annual EAA/LOSA Supplemental Irrigation: Demands & Demands Not Met for 1965 - 2005



Other LOSA Areas: S236, S4, L8, C43, C44, North & Northeast Lakeshore, & Lower Istokpoga



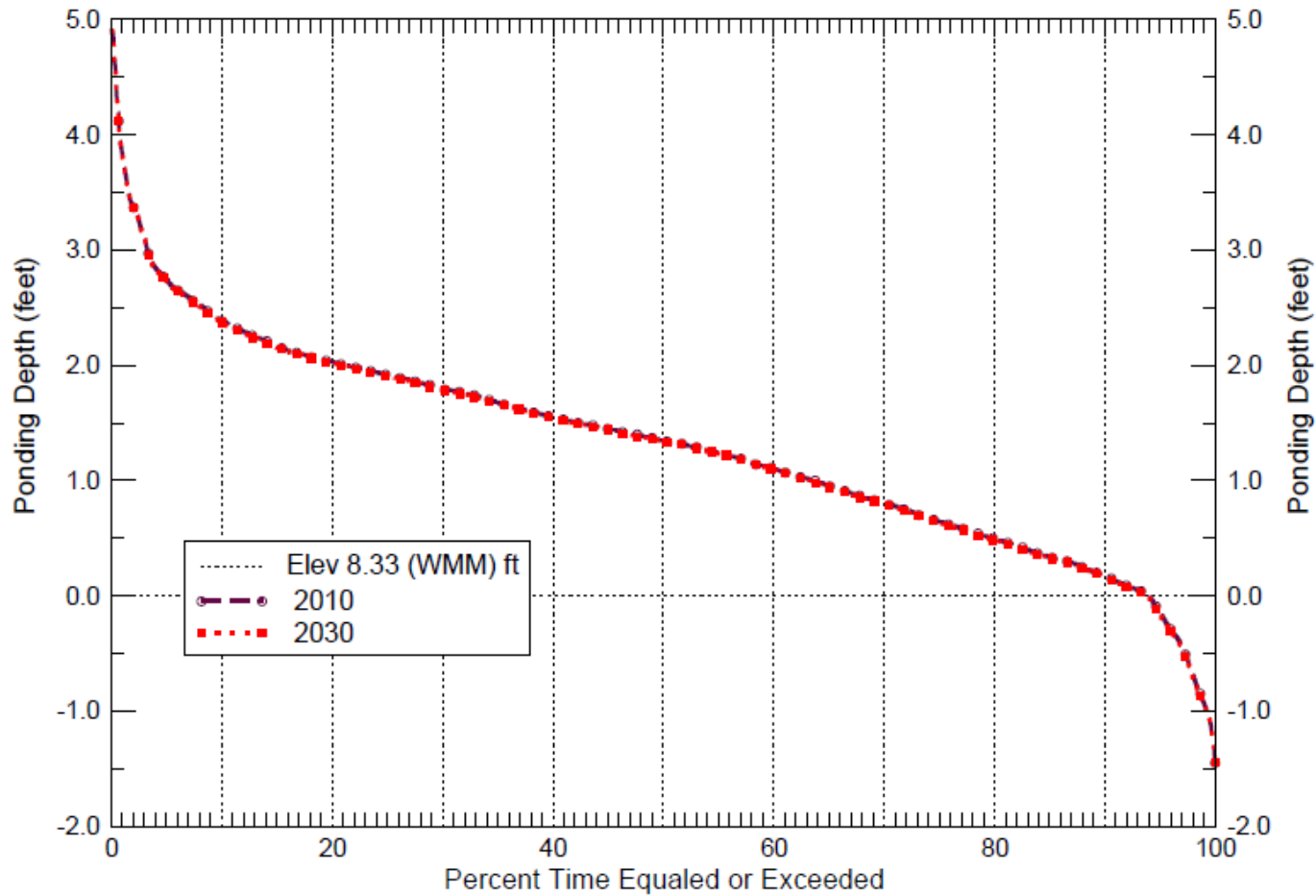
Everglades Protection Area

- Minimal or slight change in water depths
- Minimal change in MFL return frequency at one of the key gauges



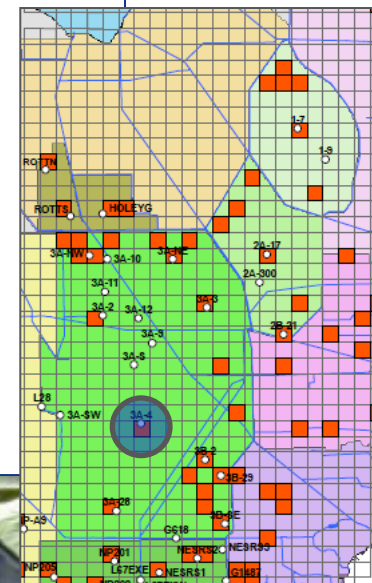
Normalized Duration Curves for Central Portion of WCA-3A

(Gage 3A-4, Cell Row 29 Col 21)



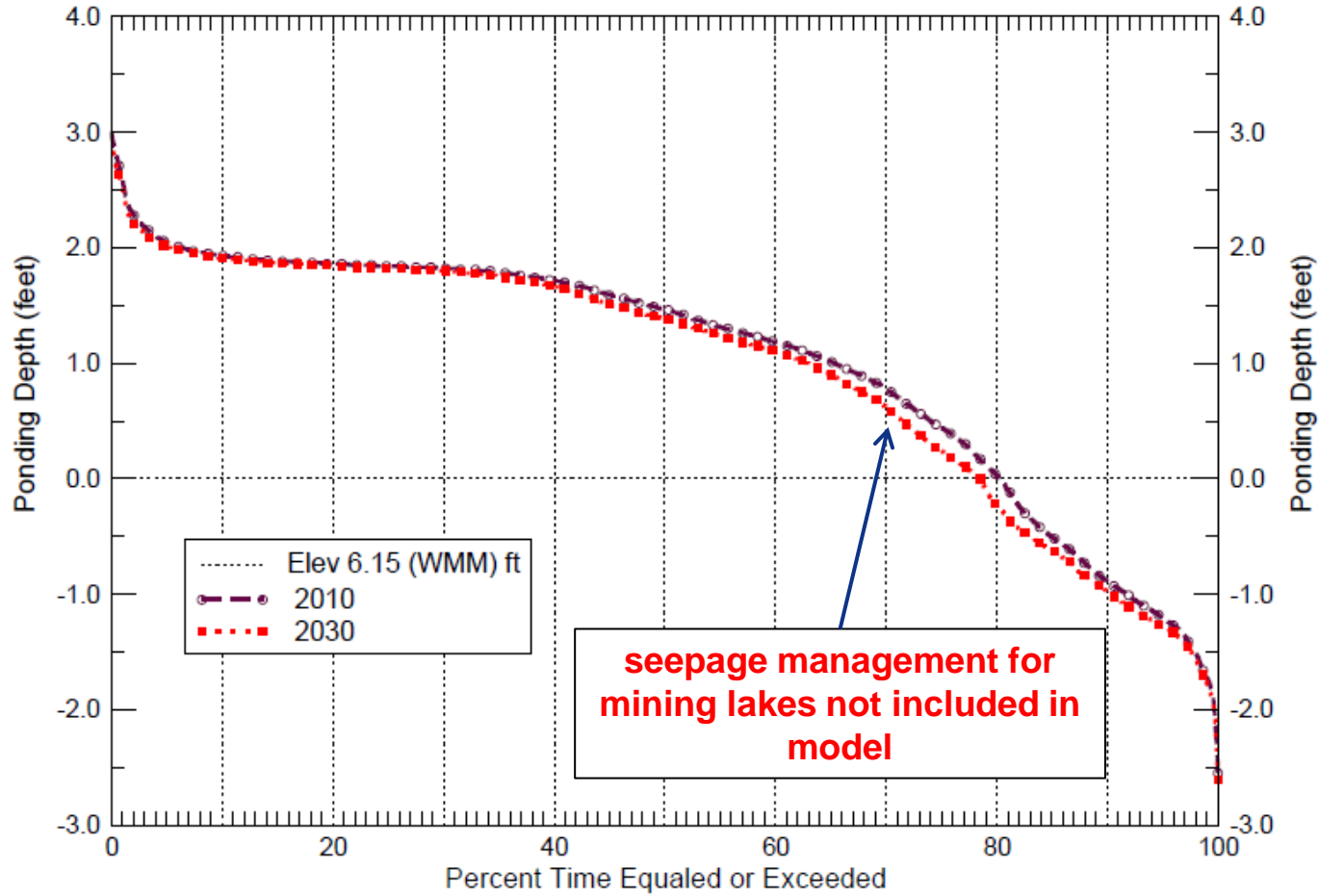
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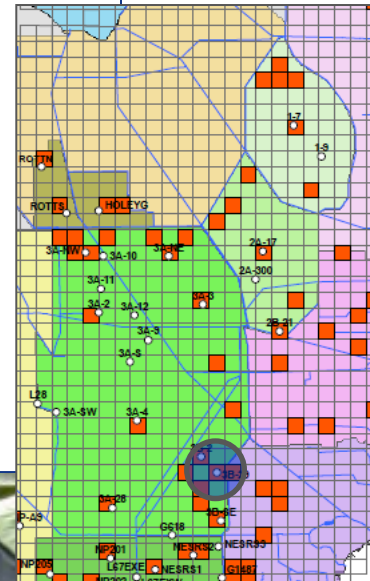
Normalized Duration Curves for East-Central WCA-3B

(Gage 3B-29, Cell Row 26 Col 26)



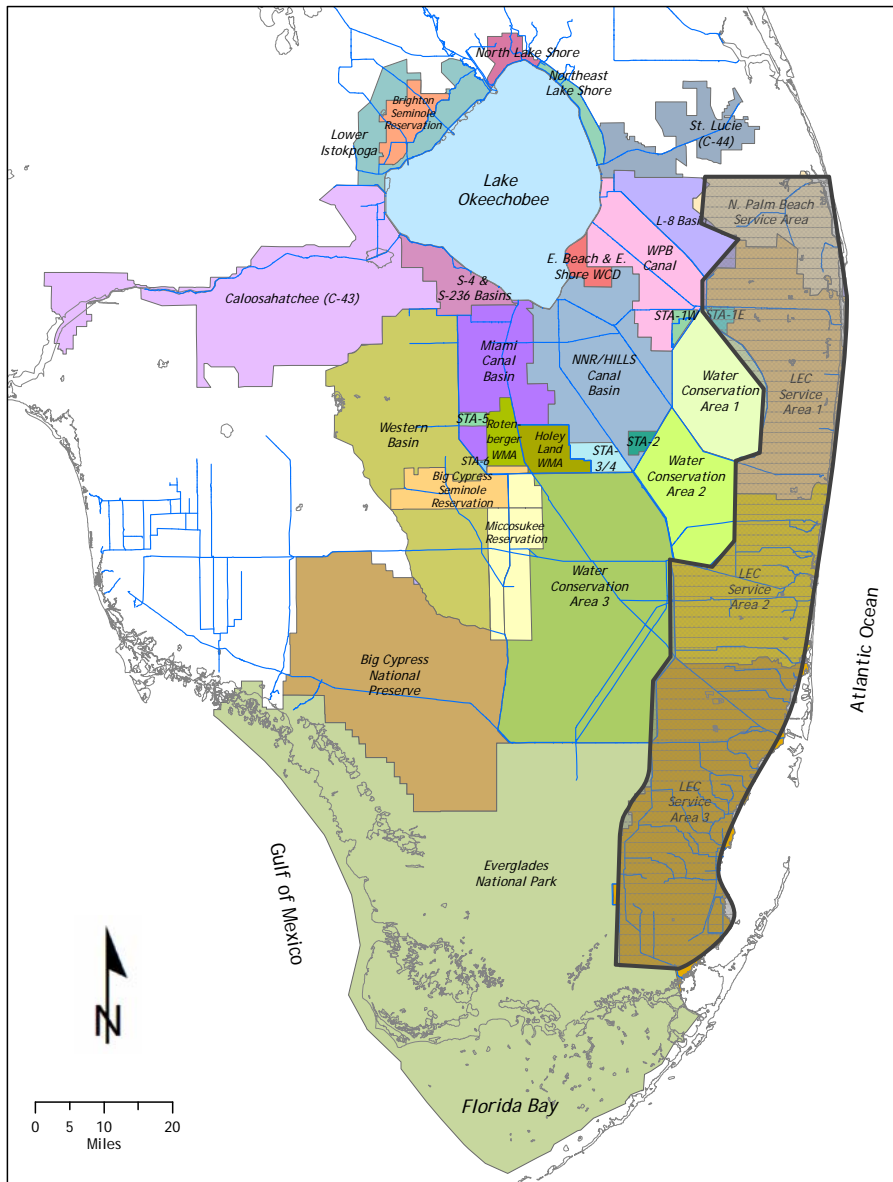
SFWMM P.O.S. 1965 - 2005

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Everglades MFL

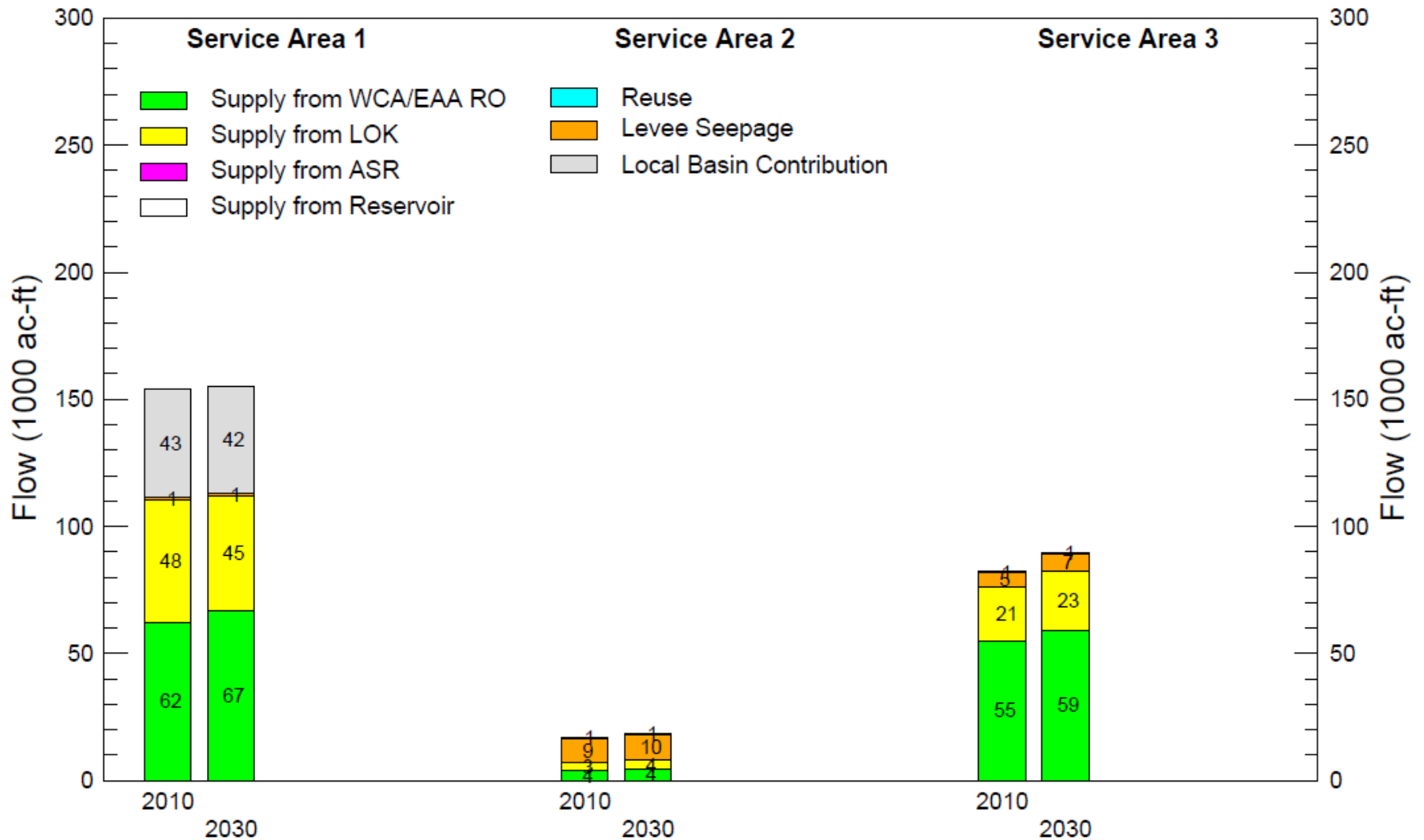
Location	Target Max. Frequency of Occurrences	Return Frequency of Occurrences	
		2010	2030
WCA-1_1-7	1_in_4	1_in_41.0	1_in_41.0
WCA-2A_2A-17	1_in_4	1_in_6.8	1_in_6.8
WCA-2B_3-99	1_in_3	1_in_2.9	1_in_2.9
WCA-3A_NOR_3A-NE	1_in_2	1_in_5.1	1_in_5.1
WCA-3A_NOR_3A-NW	1_in_4	1_in_6.8	1_in_6.8
WCA-3A_NOR_3A-2	1_in_4	1_in_20.5	1_in_20.5
WCA-3A_NOR_3A-3	1_in_3	1_in_3.7	1_in_3.7
WCA-3A_CEN_3A-4	1_in_4	1_in_5.9	1_in_5.9
WCA-3A_STH_3A-28	1_in_4	1_in_20.5	1_in_20.5
WCA-3B_3B-SE	1_in_7	1_in_4.1	1_in_4.1
ROTENBERGER_ROTTS	1_in_2	1_in_41.0	1_in_41.0
HOLEY_LAND_HOLEYG	1_in_3	1_in_4.1	1_in_4.1
NE_SRS_NESRS-2	1_in_10	1_in_5.9	1_in_5.9
CEN_SRS_NP-33	1_in_10	1_in_4.1	1_in_4.1
CEN_SRS_NP-36	1_in_7	1_in_4.1	1_in_4.1
MARL_EAST_NP-38	1_in_3	1_in_4.1	1_in_4.1
MARL_WEST_NP-201	1_in_5	1_in_2.4	1_in_2.4
MARL_WEST_G-620	1_in_5	1_in_2.9	1_in_2.9
ROCKLAND_G3273	1_in_2	1_in_1.7	1_in_1.6
TAYLOR_NP-67	1_in_2	1_in_3.7	1_in_3.7



Lower East Coast

- Small increase in regional water supply deliveries
- More years with water shortage in North Palm Beach County and Service Area 1
- No change, zero MFL exceedances for Biscayne Aquifer

Average Annual Regional System Water Supply Deliveries to LEC Service Areas for the 1965 - 2005 simulation

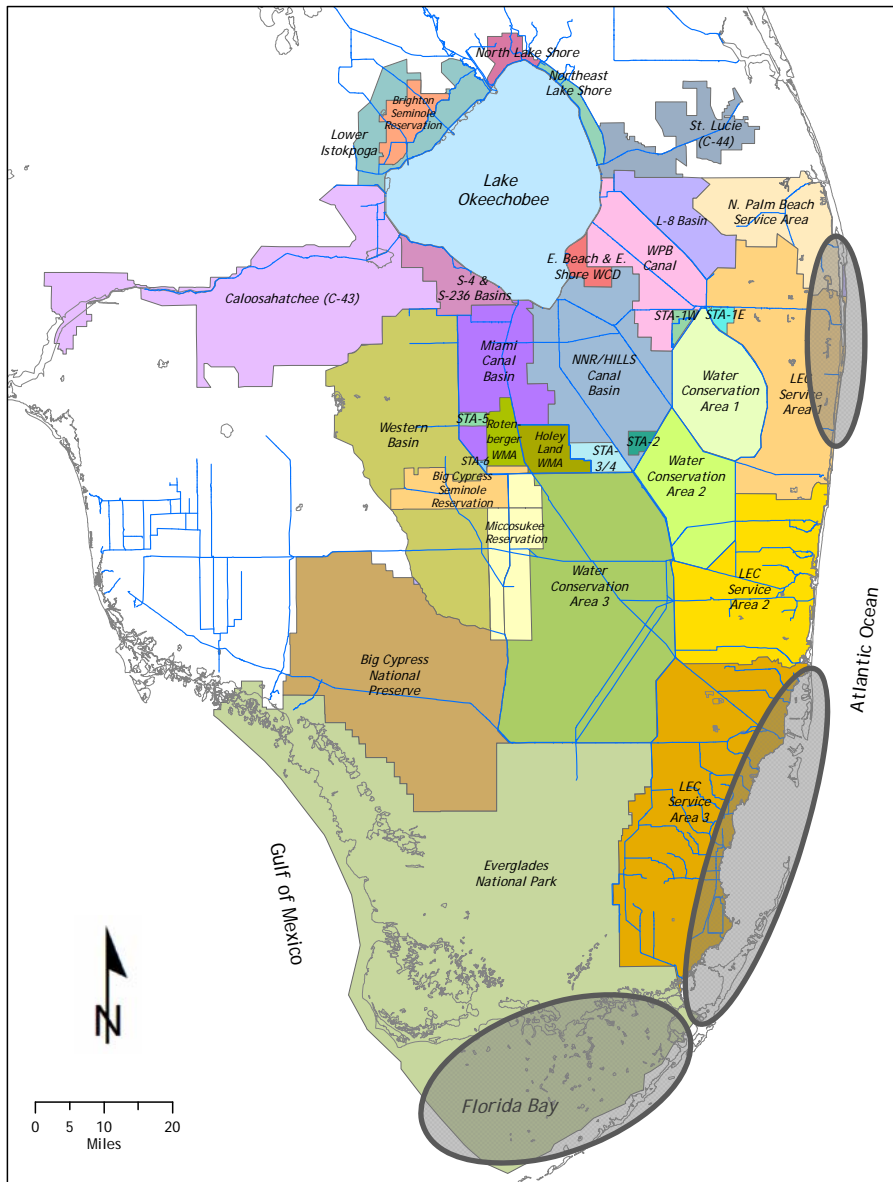


Note: Supply RECEIVED from LOK may be less than what is DELIVERED at LOK due to conveyance constraints.
Regional System is comprised of LOK and WCAs.

Number of Years with Water Restrictions in LECSA Triggered by Local Wells

Service Area	2010	2030
Service Area 1	0	6
Service Area 2	12	12
Service Area 3	0	0
North Palm Beach County	0	2





Lake Worth Lagoon

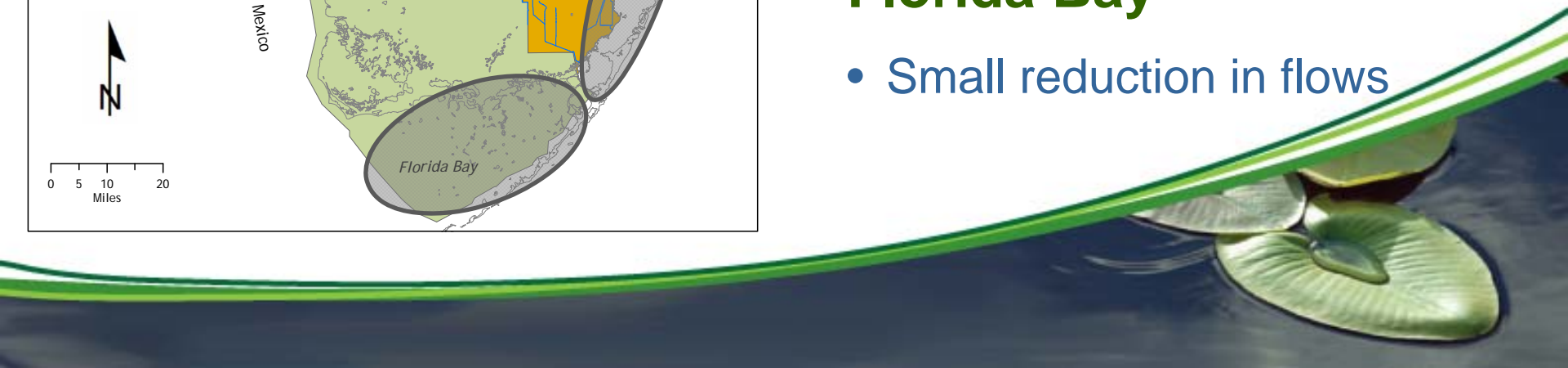
- Small reduction in flows
- Decrease in frequency of high flows
- Increase in frequency of zero flows

Biscayne Bay

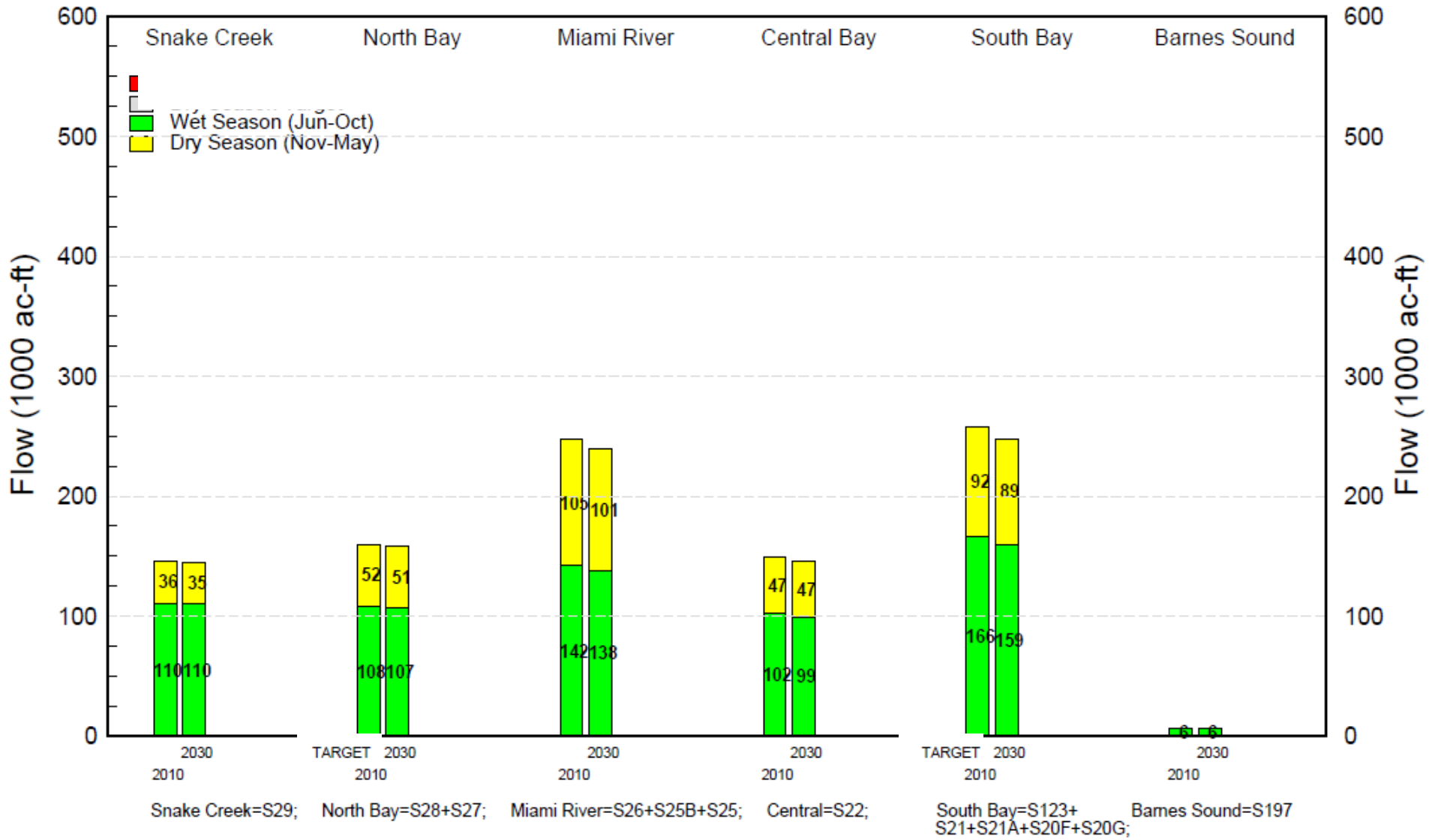
- Small reduction in flows, results same as BBCW Reservations

Florida Bay

- Small reduction in flows



Simulated Mean Wet & Dry Seasonal Structure Flows Discharged into Biscayne Bay for 1965 - 2005



Targets for Central and South Bay reflect a 30% increase in the mean annual dry season flows over the 2000 Base.
Targets for South Bay provide sufficient flows to create an average bottom salinity of 20 ppt in a zone extending 500 meters from shore during the wet season and in a zone extending 250 meters from shore during the dry season.

Run date: 05/22/13 16:45:39
SFWMM V6.6.5
Script used: biscayne_scr_ID469
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Summary of Assumptions

- 2030 demands within existing CUPs
- No restoration or mitigation projects
- 2030 land use changes consistent with Comprehensive Plans or permits
- Did not allow flexibility to shift from SAS to FAS during water shortages



Summary of Results

- **Natural Systems**

- Minimal changes for Lake Okeechobee and the Everglades
- Improved performance of natural systems will require restoration projects
- Reduction of WCA-3B stages should be prevented by required mitigation
- Small decrease in stormwater to tide

- **Lake Okeechobee Service Area**

- Isolated land use changes slightly increases storage and demands met

- **Lower East Coast Service Area**

- Small increase in regional water supply
- Increased water shortages in two service areas should be offset by existing FAS and RO facilities at Jupiter and Hollywood

Questions?

