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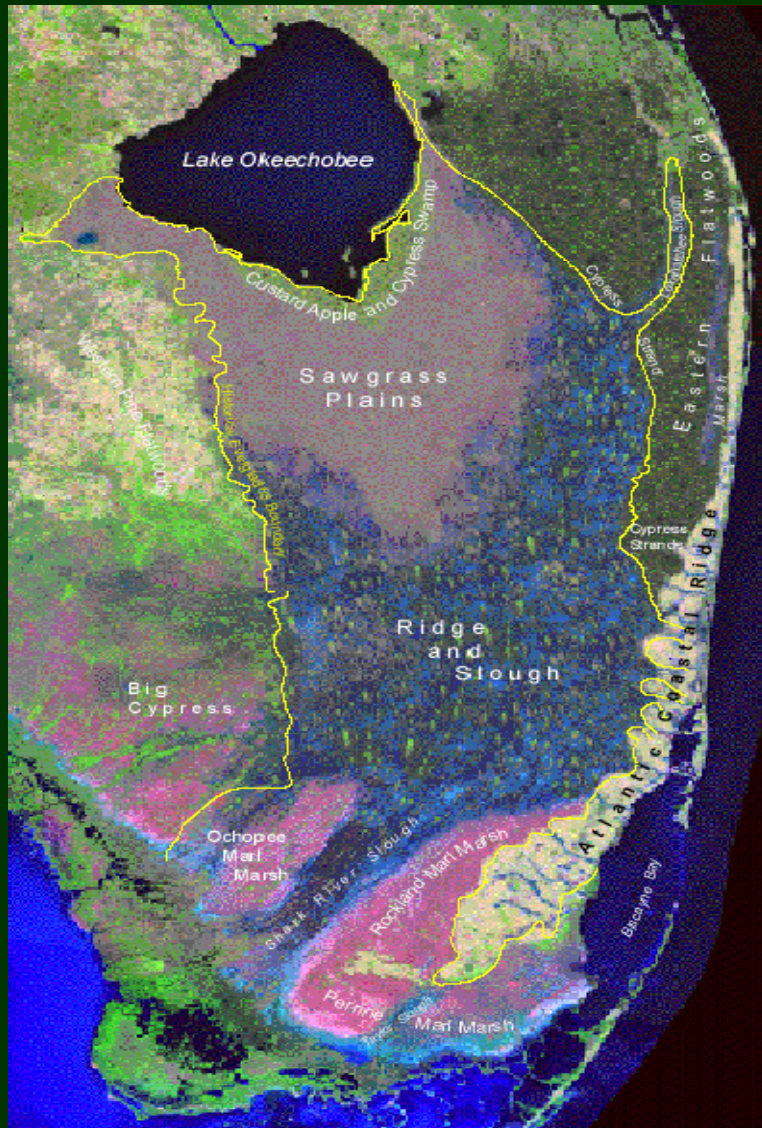
National Park Service
U.S. Department of the Interior



***A Wetter Everglades
Evidence for Higher Pre-Drainage Flows
and their Implications for Restoration***

Robert Johnson and Robert Fennema
GEER Conference 2010

Refining our Understanding of the Pre-Drainage Everglades



General Outline

- Extensive information from paleo-ecological indicators and pre/post-drainage information that describes the evolution of the Everglades ecosystem.
- A growing consensus of a wetter Everglades ecosystem (20th century), and how this influences restoration targets (Natural System Modeling).
- The importance of Lake Okeechobee in driving Everglades hydrology and salinities in the downstream estuaries.
- How these major changes in our understanding of the Everglades should influence our approaches for Everglades restoration.

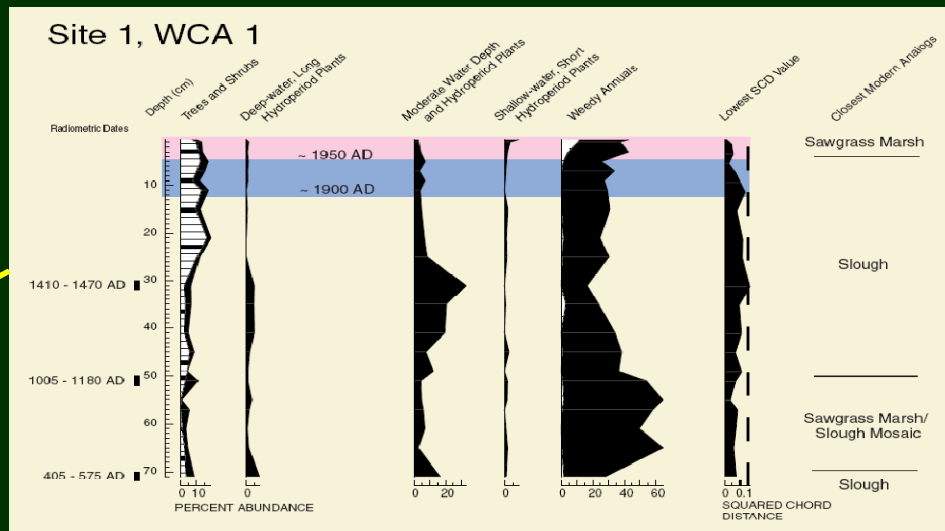
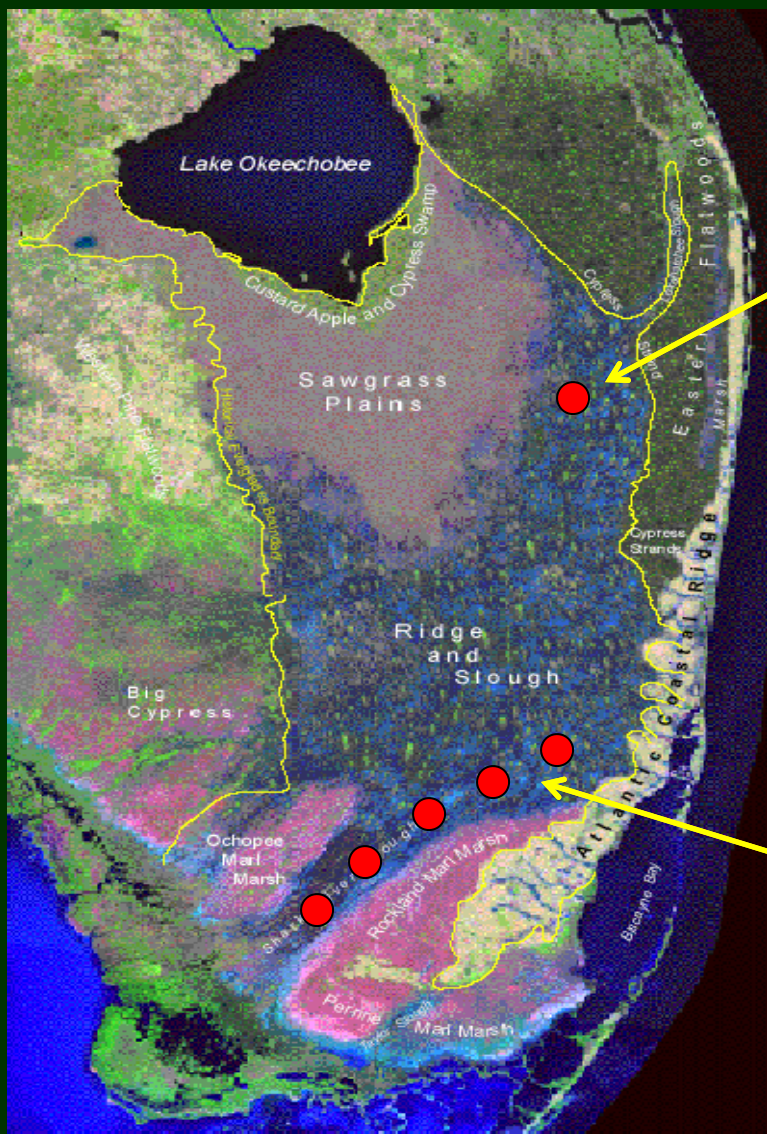
Image of the Pre-Drainage Ecosystem (1850's), from McVoy et.al., (in press) SFWMD



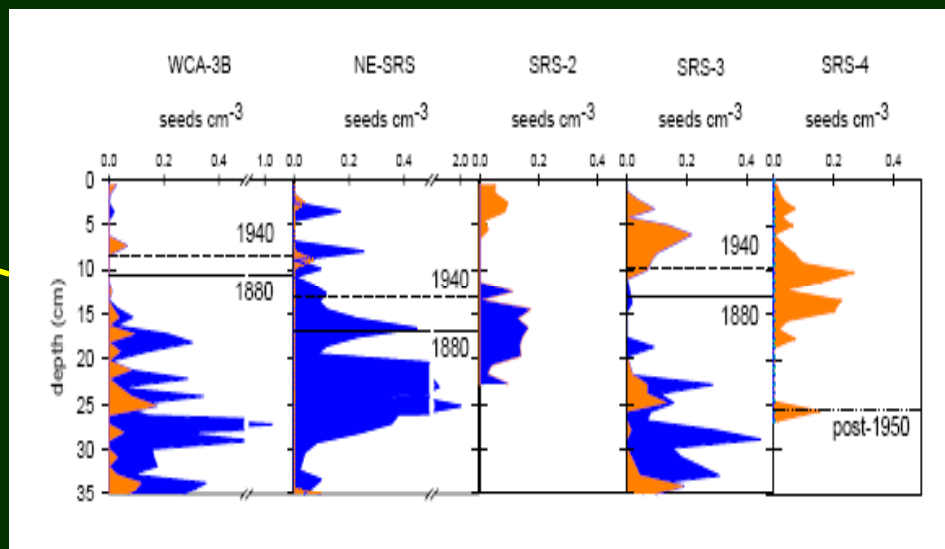
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Paleoecological Indicators of a Wetter Everglades



Willard, et. al., USGS, 1999.



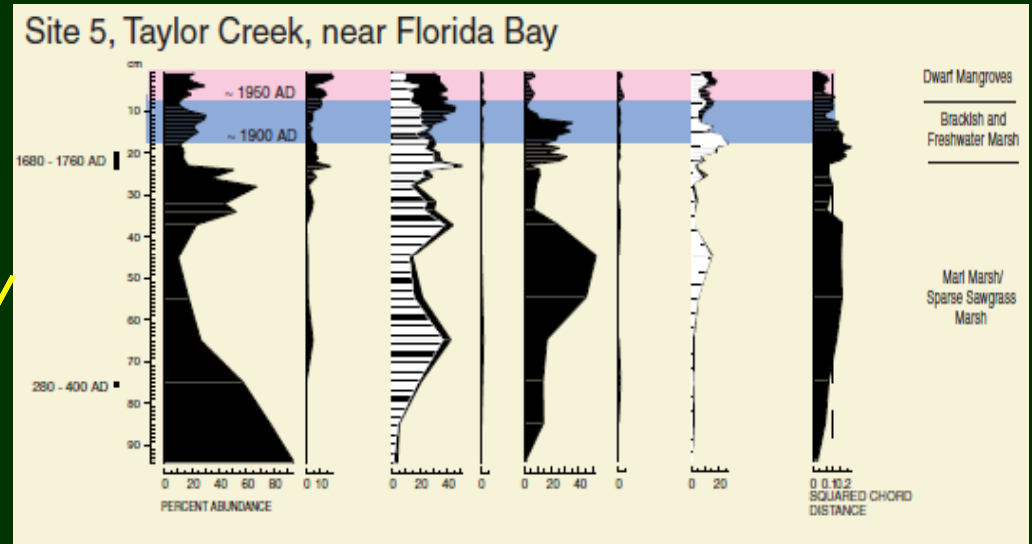
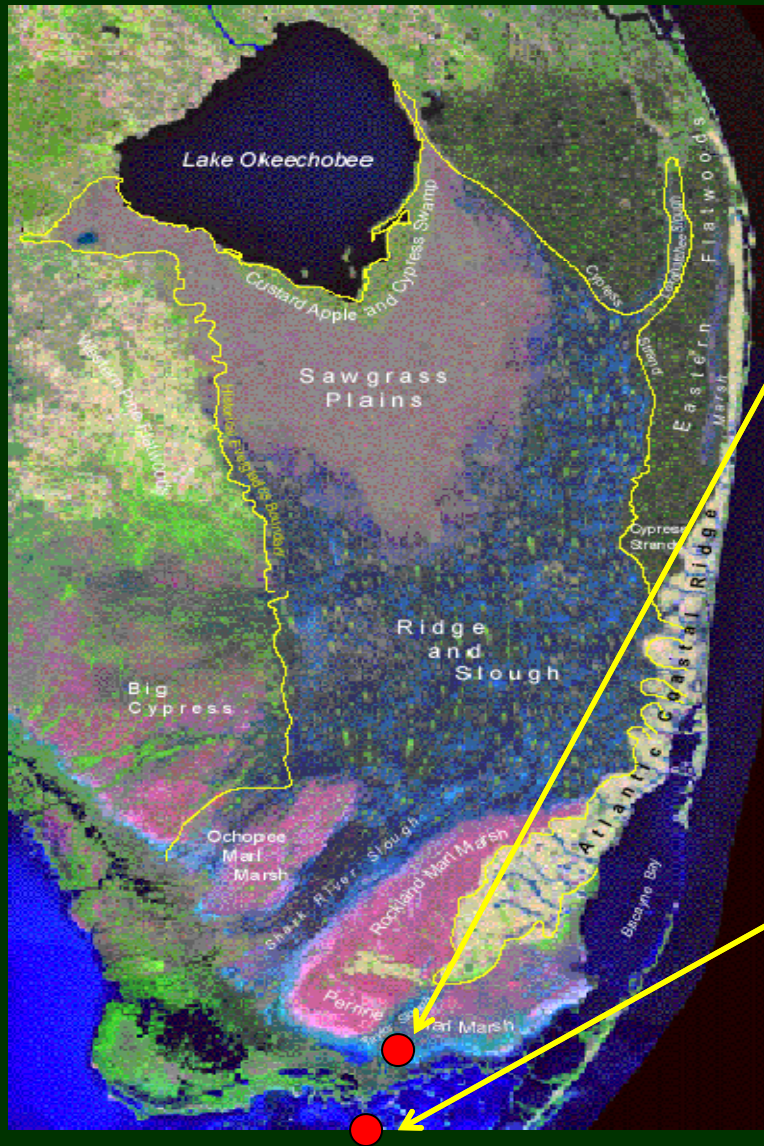
Saunders et. al., SFWMD, 2008.



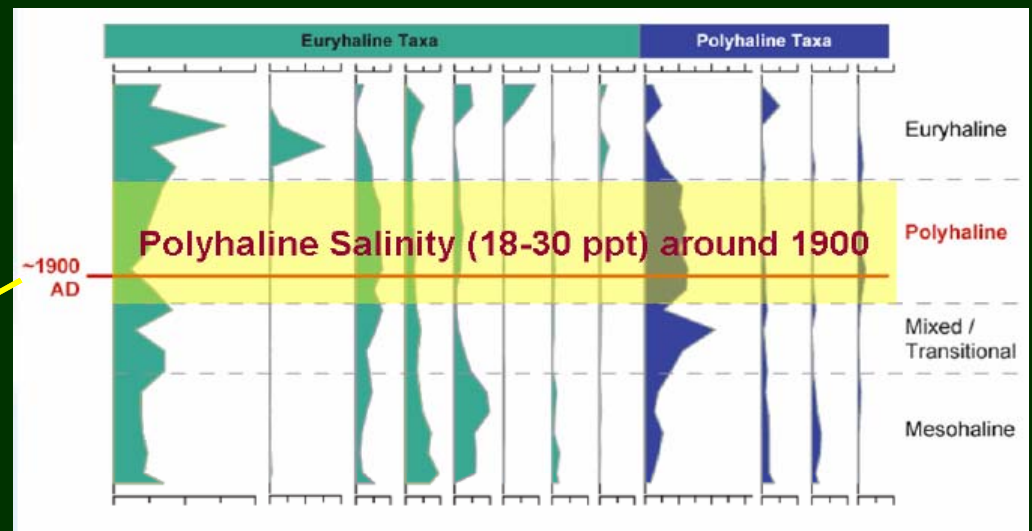
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Paleoecological Indicators of a Wetter Everglades



Willard, et.al., USGS, 1999.



Wingard, et.al., USGS, 2007.



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Characterizing Pre-Drainage Vegetation/Hydrology

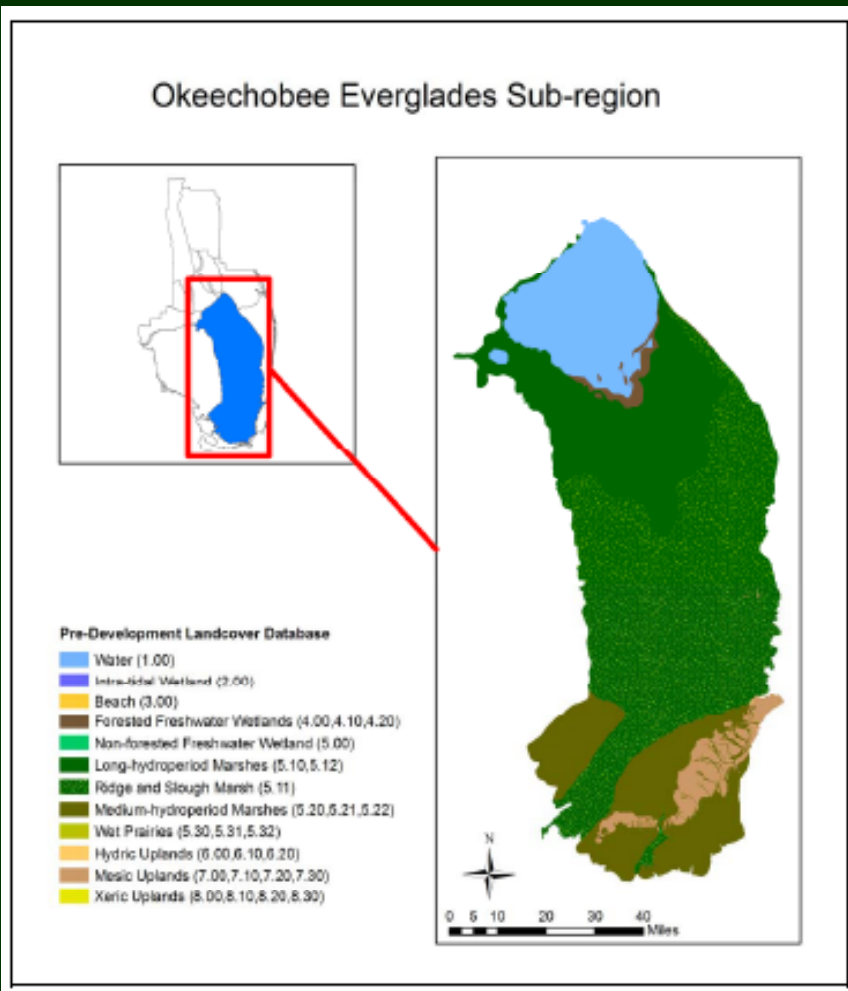


Table A-1. Vegetation Classes for the Pre-Development Landscape (Continued).

Vegetation Type	Description	Hydrology
Non-Forested Freshwater Wetland (5.0)	Freshwater wetland dominated by herbaceous vegetation; may also contain scattered shrubs or trees	Annual average depth range from -2.0 ft. below the soil surface to 2.5 ft. above; annual average duration of flooding ranged from 2 to 12 months
Long-hydroperiod Marsh (5.1)	Freshwater marsh with hydroperiods extending from 9-12 months on average	Annual average depth range from -0.5 ft. below the soil surface to 3.0 ft. above; annual average duration of flooding ranged from 9 to 12 months
Ridge and Slough Marsh (5.11)	Everglades-specific community mosaic of alternating open water sloughs and sawgrass ridges interspersed with tree islands	Annual average depth in ridges were from 0.5 ft. below the soil surface to 1.5 ft. above and in sloughs were from 1.0 to 3.0 ft deep; annual average duration of flooding in ridges were from 9 to 10 months and were 12 months in sloughs
Sawgrass Plain (5.12)	Historical northern Everglades community generally consisting of a unbroken expanse of sawgrass across a large spatial extent	Annual average depth range from -0.5 ft. below the soil surface to 1.5 ft. above; annual average duration of flooding ranged from 9 to 10 months
Medium-hydroperiod Marsh (5.2)	Freshwater marsh; may also include mixed shrubs	Annual average depth range from -0.6 ft. below the soil surface to 1.5 ft. above; annual average duration of flooding ranged from 6 to 10 months
Marsh with Scattered Cypress (5.21)	Freshwater marsh that contains scattered stunted cypress	Annual average depth range from -0.6 ft. below the soil surface to 1.5 ft. above; annual average duration of flooding ranged from 6 to 10 months

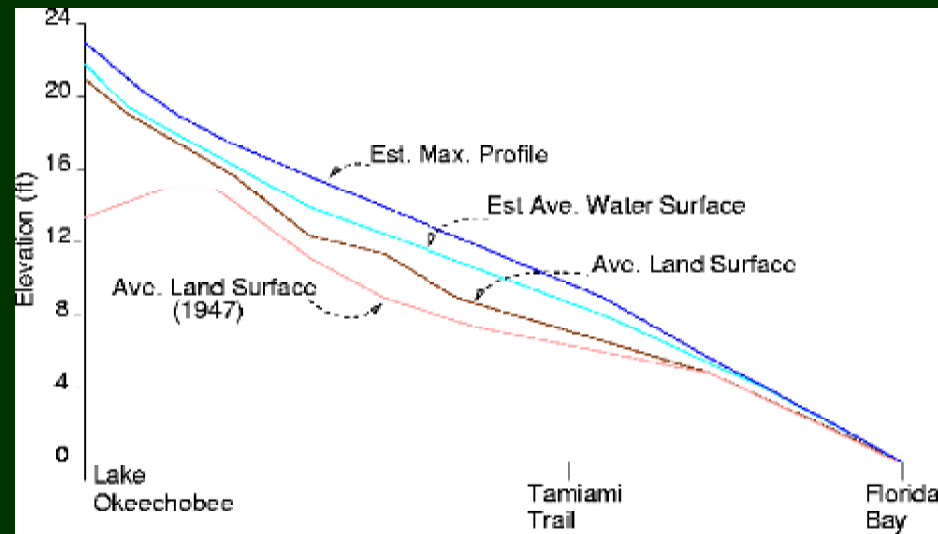
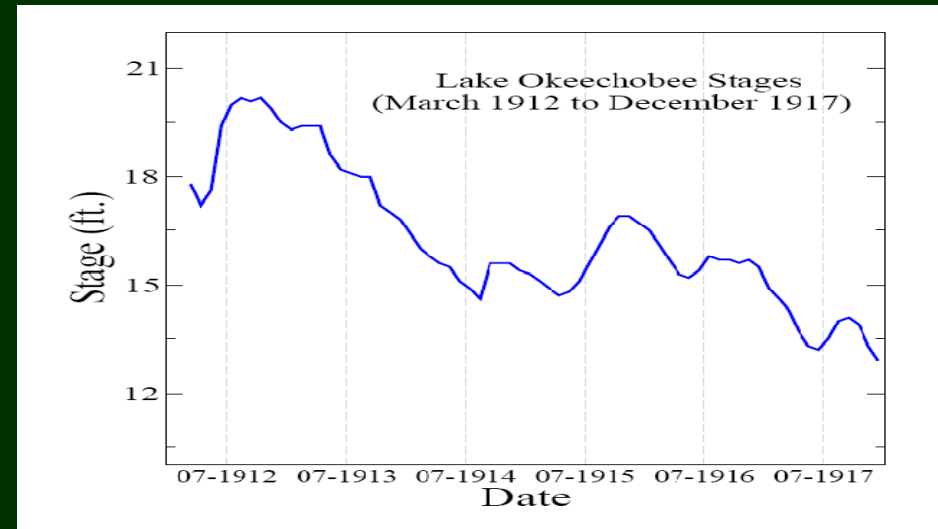
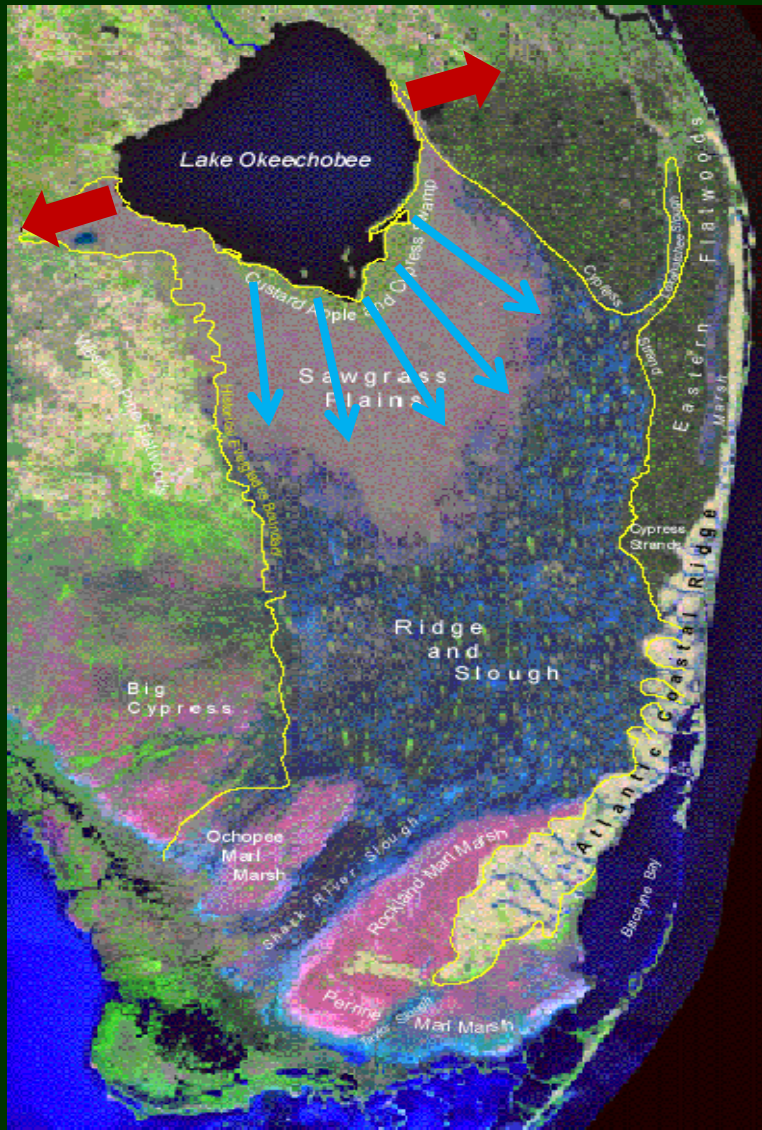
McVoy et. al. (in press) and Pre-Development Vegetation Communities of Southern Florida, SFWMD, 2007



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Lake Okeechobee Driving Everglades Hydrology



U.S. Army Corps of Eng., 1960 & 1978



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Alterations in Water Flows through the Everglades



- **Integrating with Natural System Models**
 - Revised hydrologic modeling of the Pre-Drainage Everglades (NSM 4.6.2, ENPMod1, NSRSM)
- **Everglades Protection Area Inflows**
 - For Pre-drainage models - estimates of overland flows from the northern Everglades southward.
 - For Post-Drainage models - estimates of structure flows (S-5A, S-6, S-7, S-150, S-8, and S-140) plus future CERP overland flows.
- **Shark Slough (Transect C)**
 - Estimates for overland flows from the Rocky Glades (east) across Shark Slough to the Ochopee Rise (west).

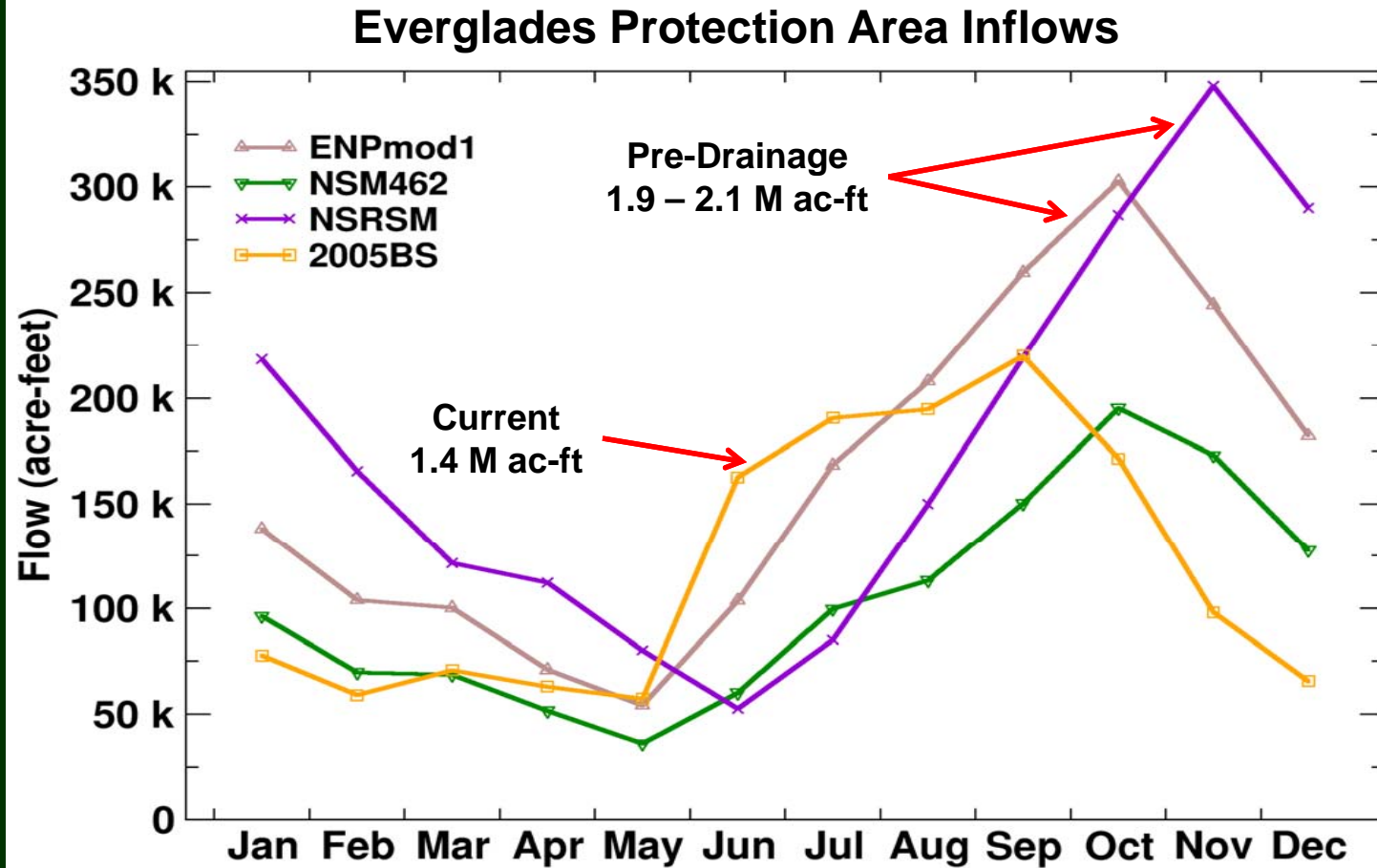
From the SFWMD River of Grass Phase II Planning process (preliminary information).



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Alterations in Water Flows through the Everglades



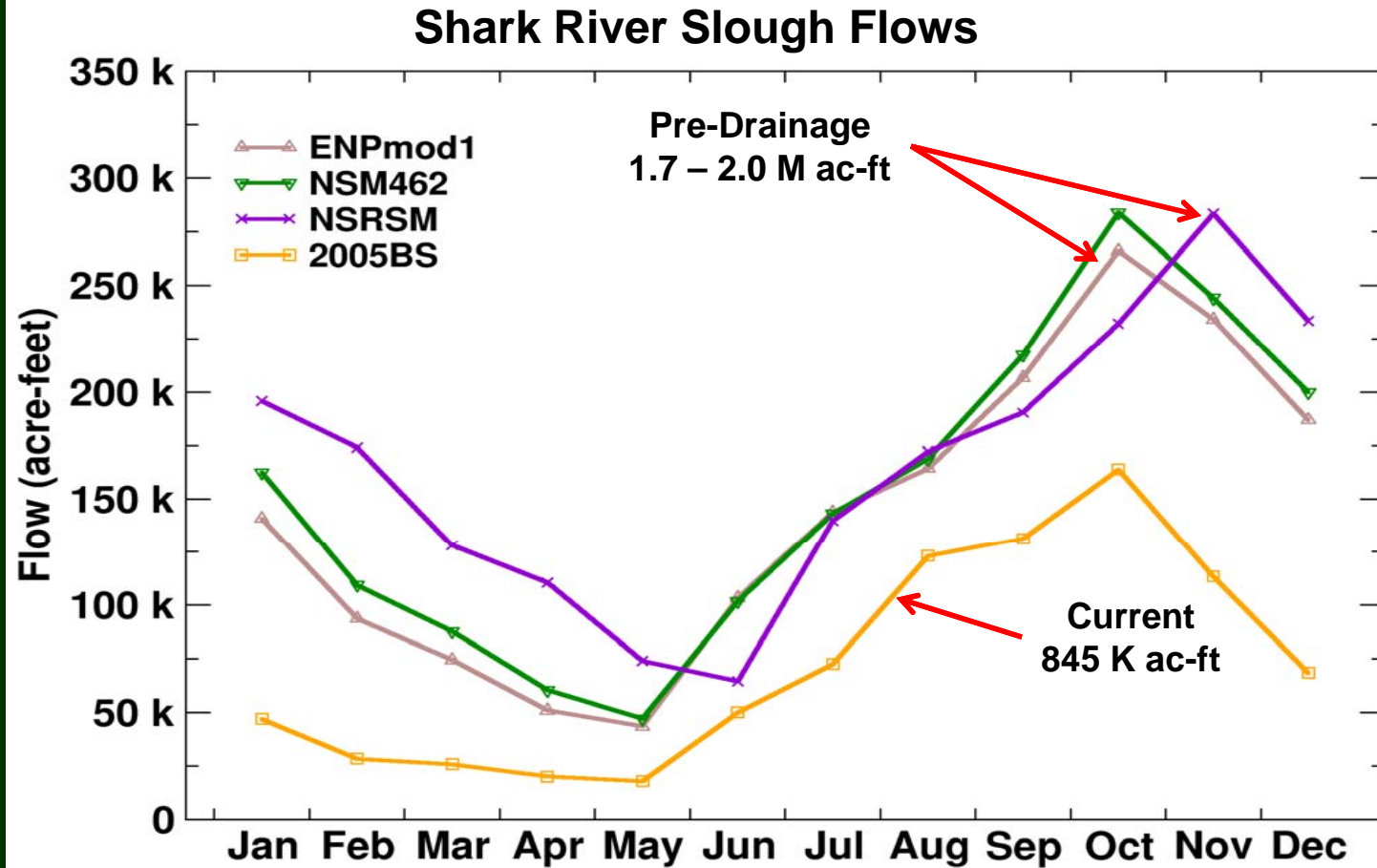
Reduced Flows from Lake Okeechobee and Seasonal Timing Shift



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Alterations in Water Flows through the Everglades



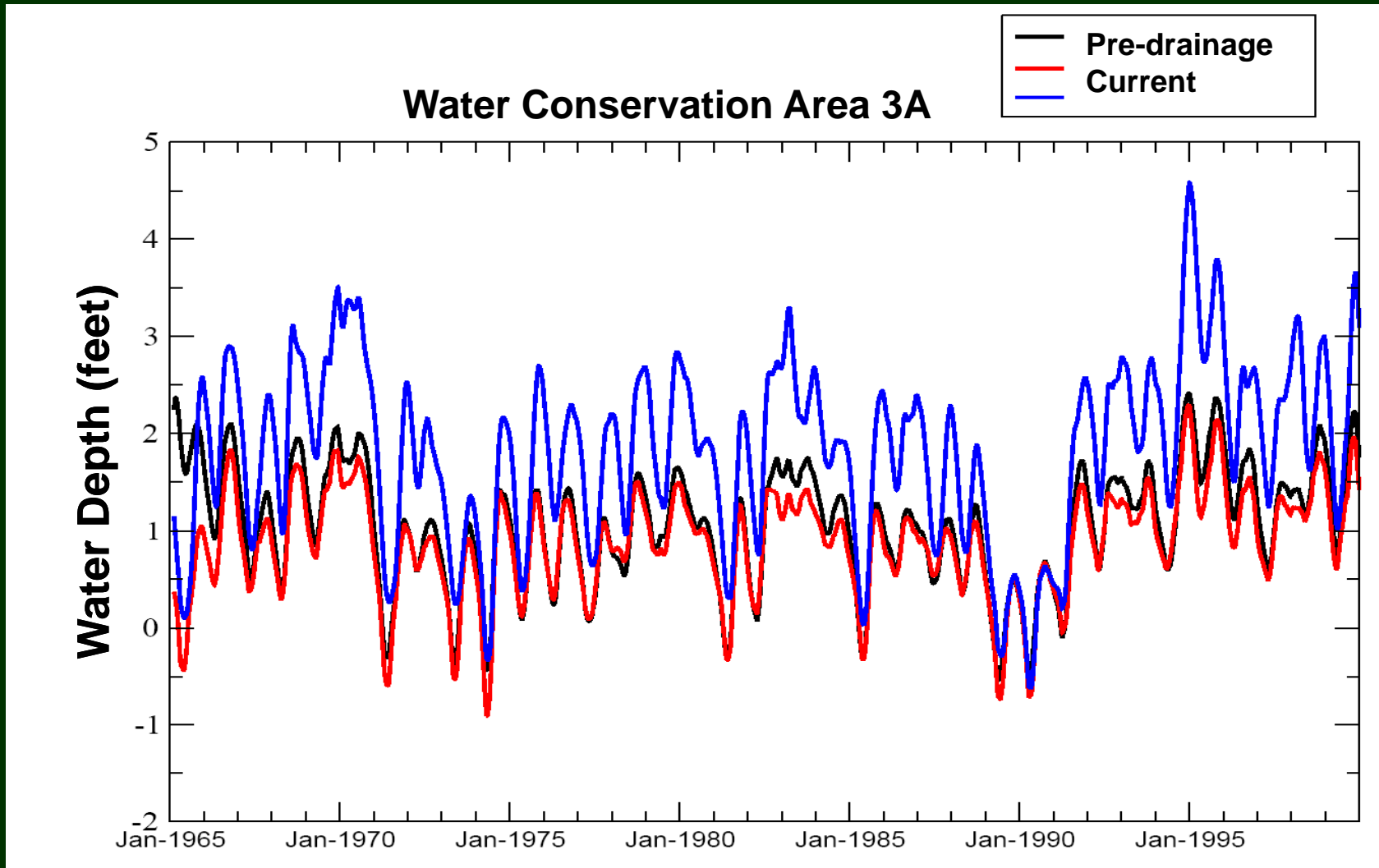
Flow Reduction of 50-60 Percent, Very Low Dry Season Flows



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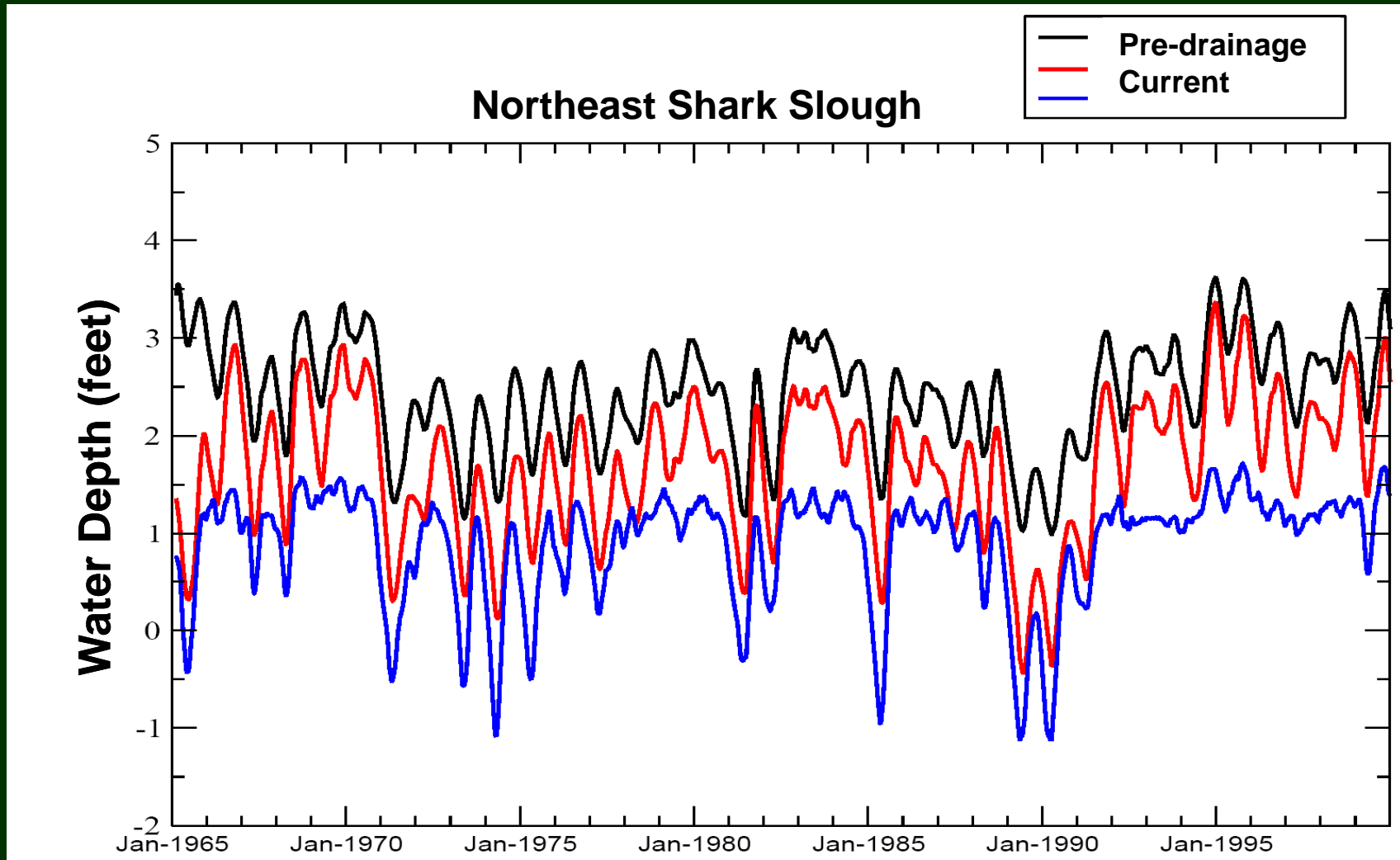
Water Depth Changes in the Central Everglades



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Water Depth Changes in the Southern Everglades

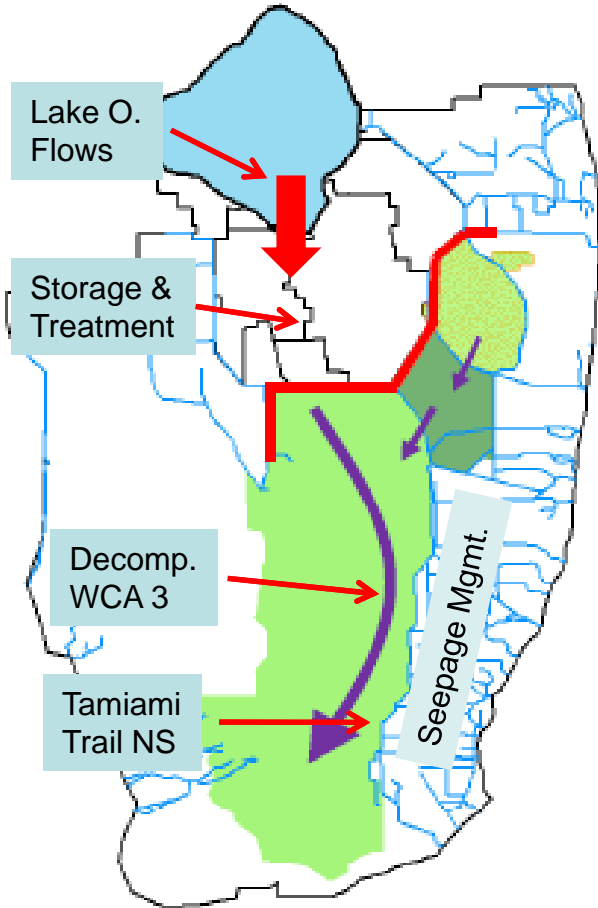


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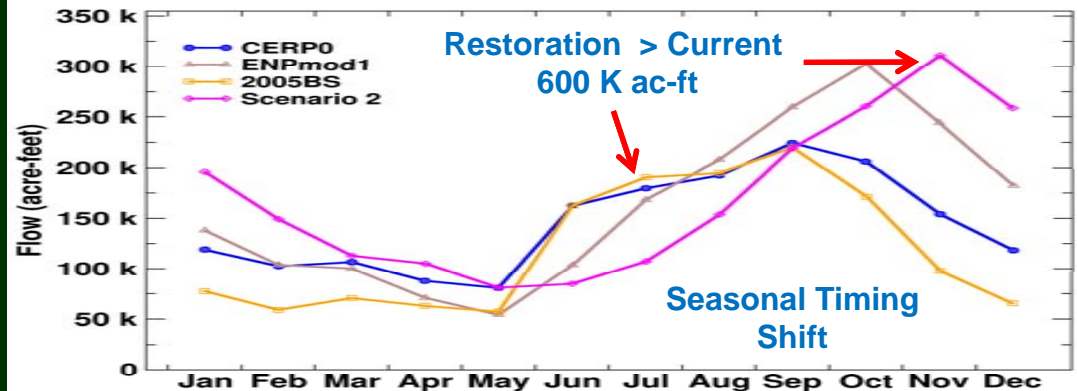
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Requisites for Increasing Flows to the Everglades

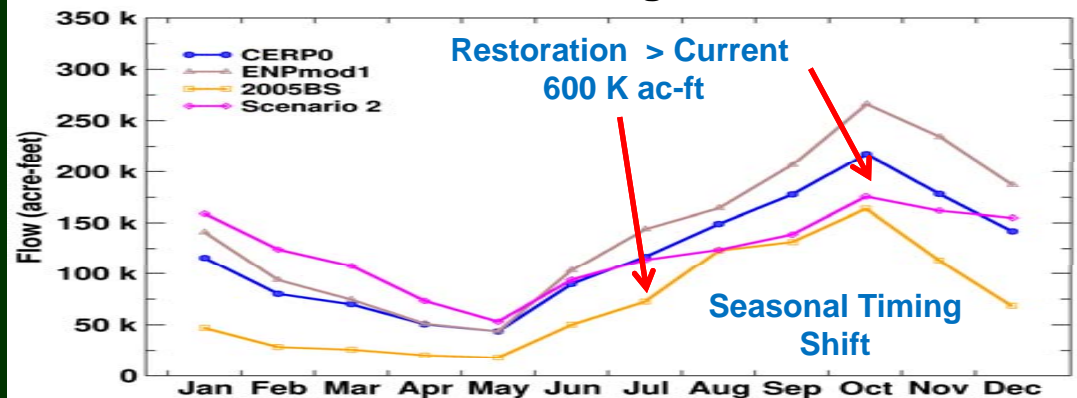
System Configuration & Primary Flow Directionality



Everglades Protection Area Inflows



Shark River Slough Flows



Preliminary Scenario from the SFWMD River of Grass Phase II Planning process.



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