

Climate Change Considerations for Surface Water and Groundwater Flows in the Everglades

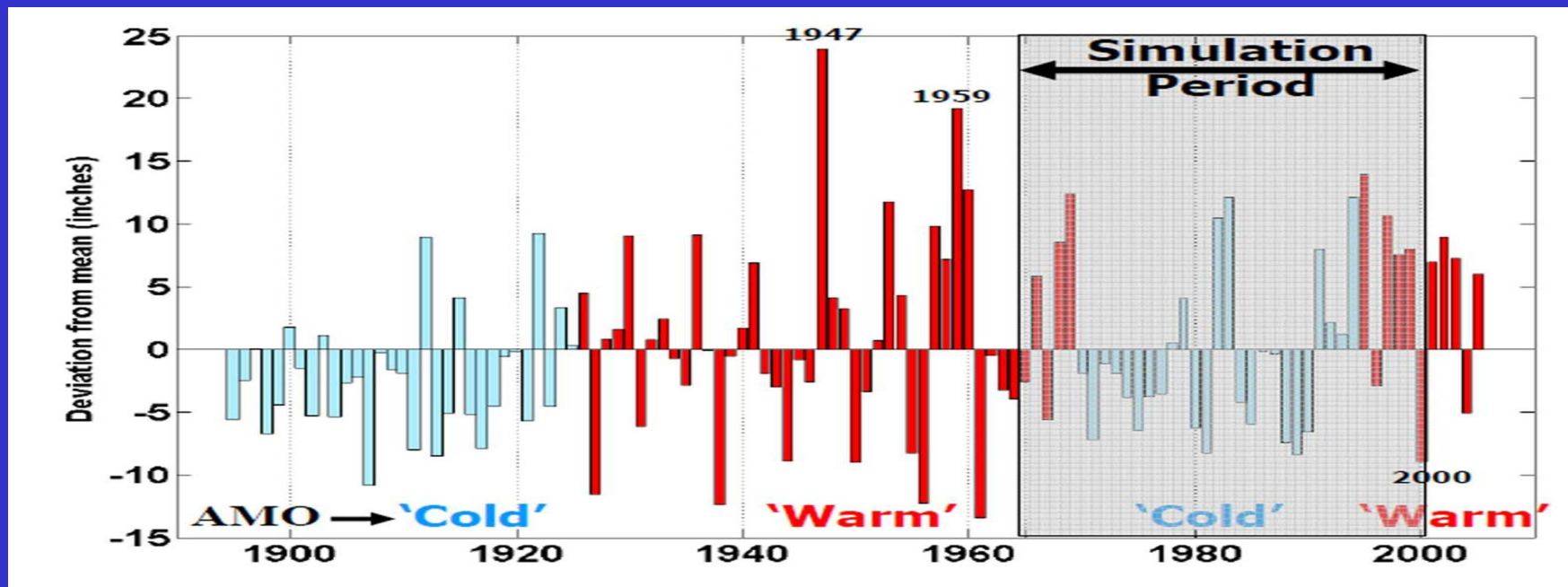
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National Park Service/ENP

Hydrology of the Everglades in the
Context of Climate Change
March 30, 2012

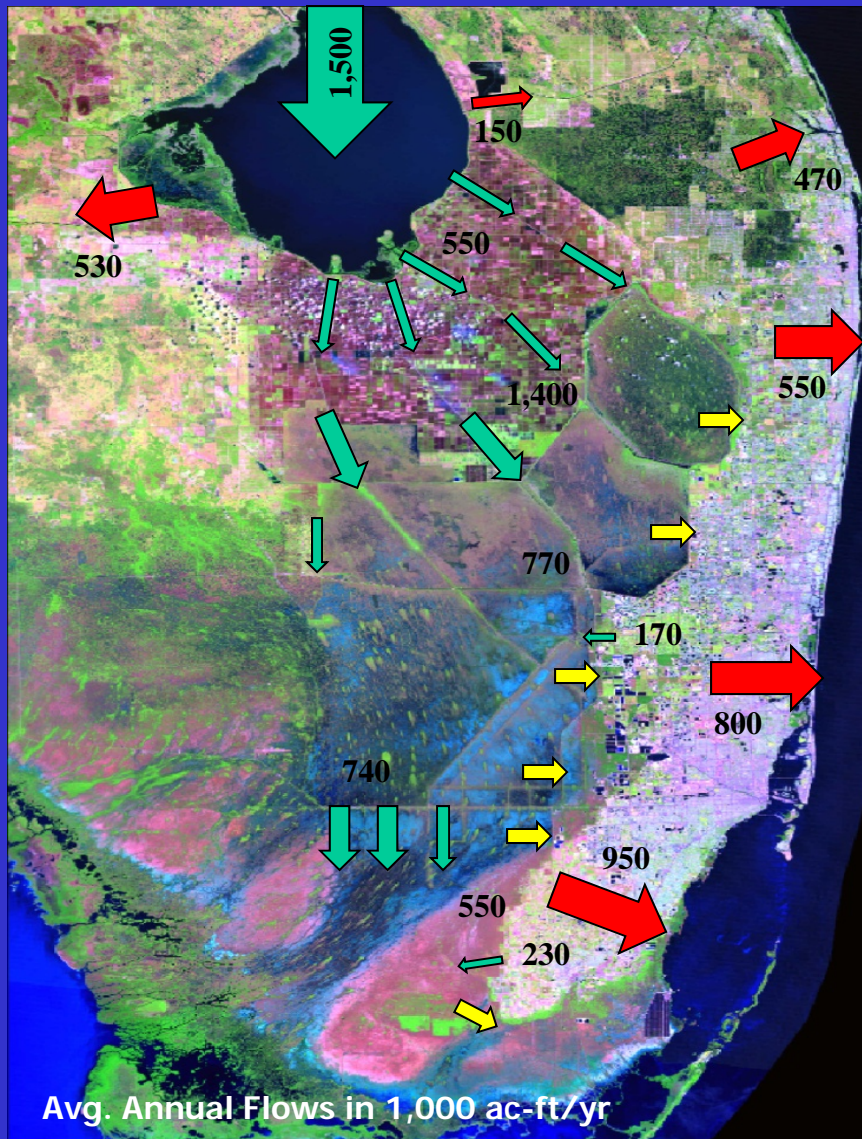


Climate Variability and Water Management

- South Florida rainfall patterns create alternating wet and dry periods, which are difficult to manage.
- Stationary assumptions are no longer valid, making it harder to evaluate water resource demands and risks.
- Climate change predictions suggest increased rainfall variability, slightly drier wet seasons with increased tropical cyclone intensity.
- Knowledge Gap: Managing extreme rainfall events.



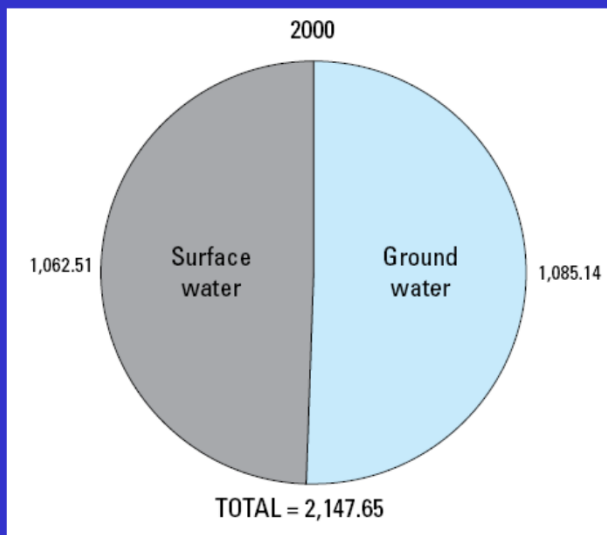
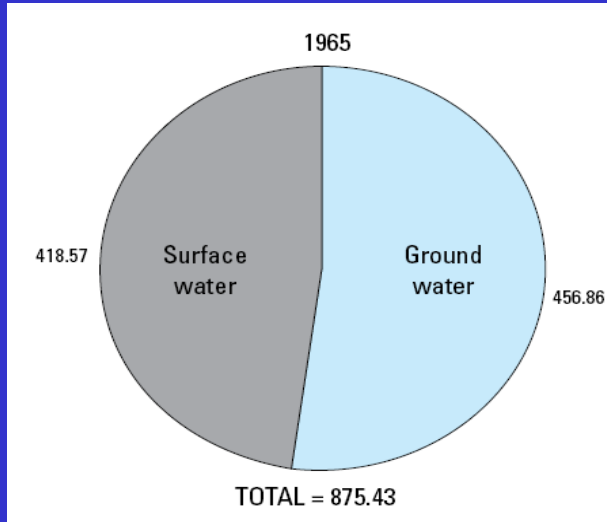
The Current Water Management System



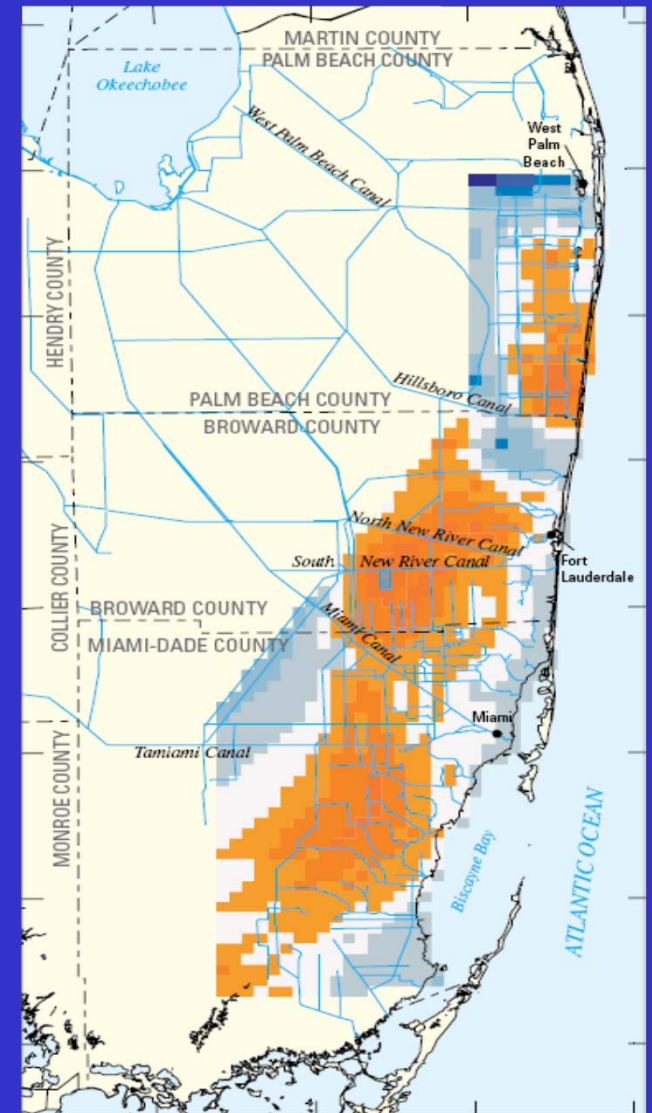
Current Water Budget (LORS/T3)

- The Central and Southern Florida (C&SF) Project features are rather poor at retaining excess water following high rainfall periods.
- More than 3.5 million acre-feet of water is lost to tide in an average year, with 25% coming from Everglades seepage losses.
- The most viable options retaining this water are adjusting Lake Okeechobee operations, increasing flows into the Water Conservation Areas, and reducing groundwater seepage into the Lower East Coast.
- Each of these options create tradeoffs between flood control, water supply, and water quality.

The Impacts of Urban/Agricultural Development In the Lower East Coast



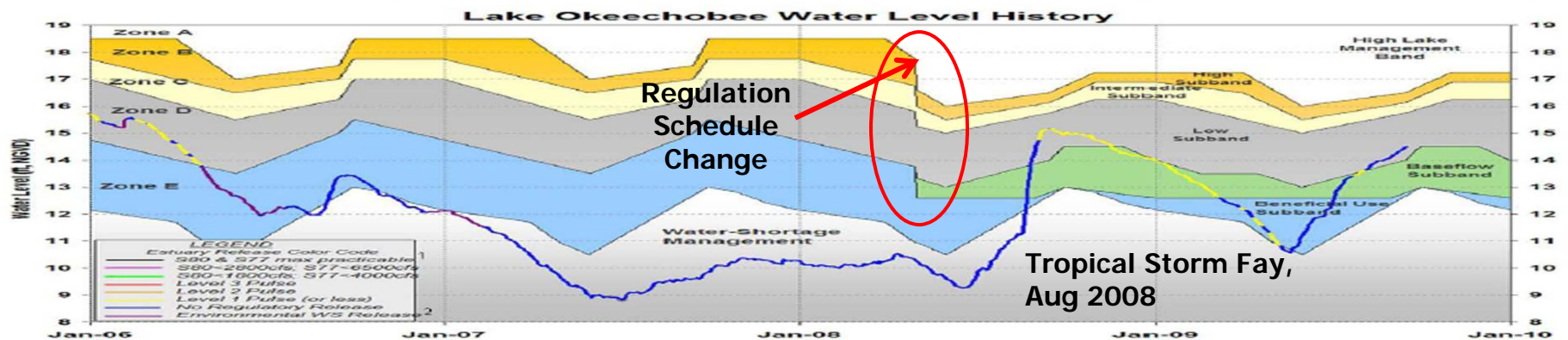
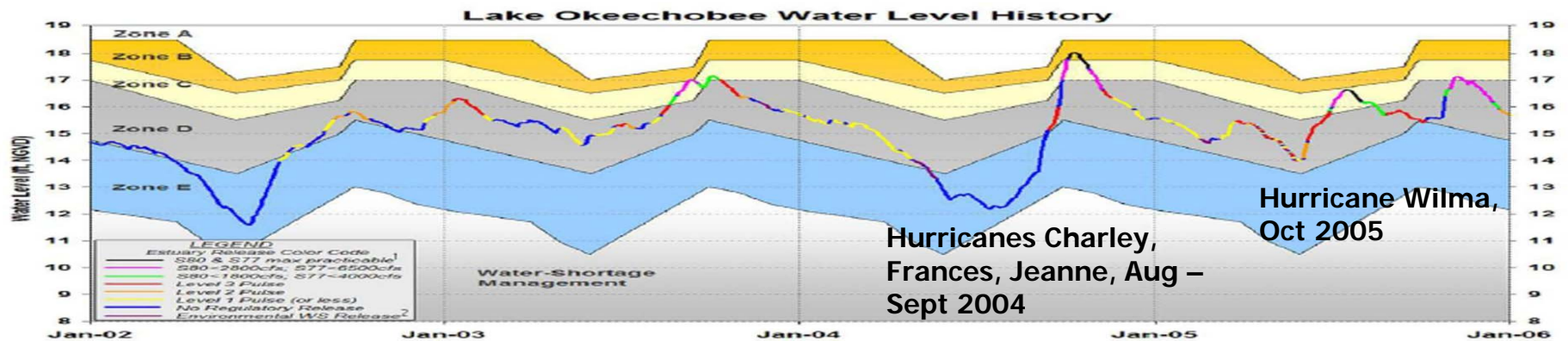
- Total water use in Miami-Dade, Broward, and Palm Beach Counties increased from 875 to 2,147 MGD between 1965 and 2000.
- Average wet season groundwater levels declined by 1-3 feet (orange colors) from the 1940's to the 1990's.



Source: Impact of Anthropogenic Development in SE Florida, USGS, 2005.

Water Management in Lake Okeechobee

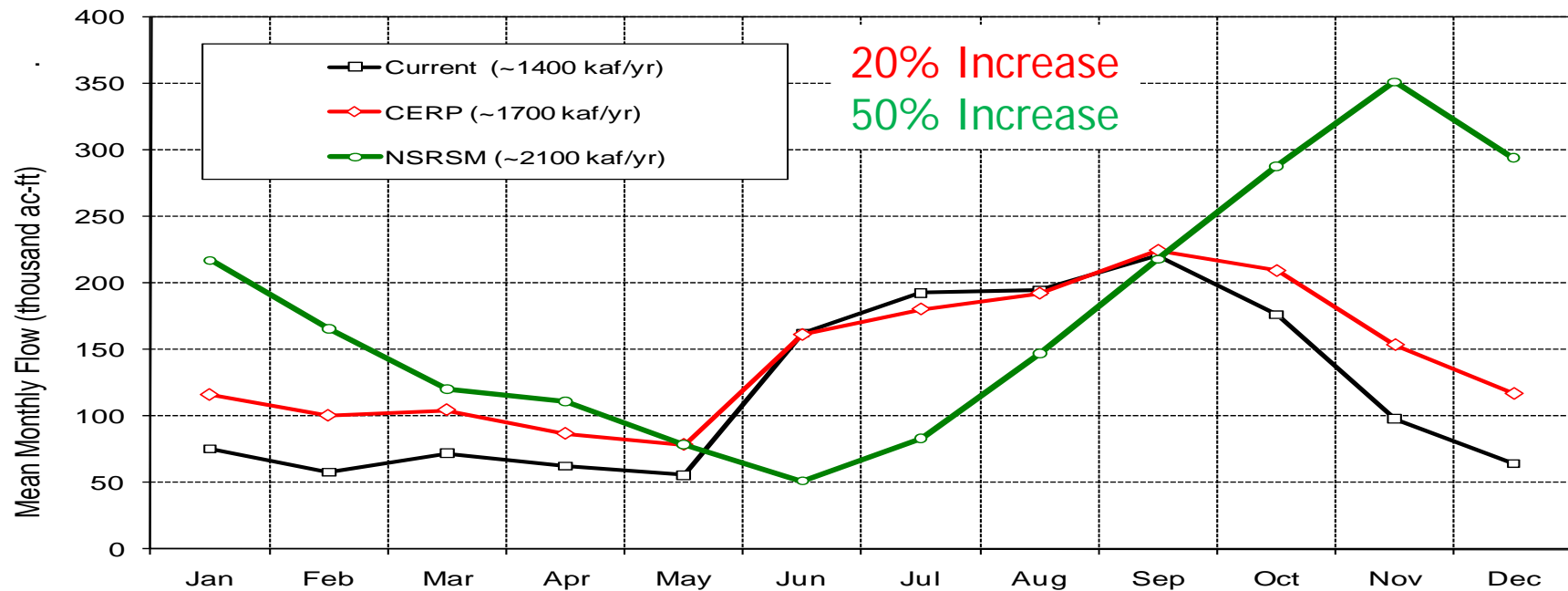
- Lake Okeechobee inflows routinely exceed outflows, and high Lake levels impact levee safety and damage the littoral zone.
- Lowering Lake levels creates harmful discharges to the northern estuaries, and significantly impacts regional water availability.
- Knowledge Gaps: Greater outflow flexibility, development of optimal long-term operations for sustainability.



Water Flow Improvements in the Everglades

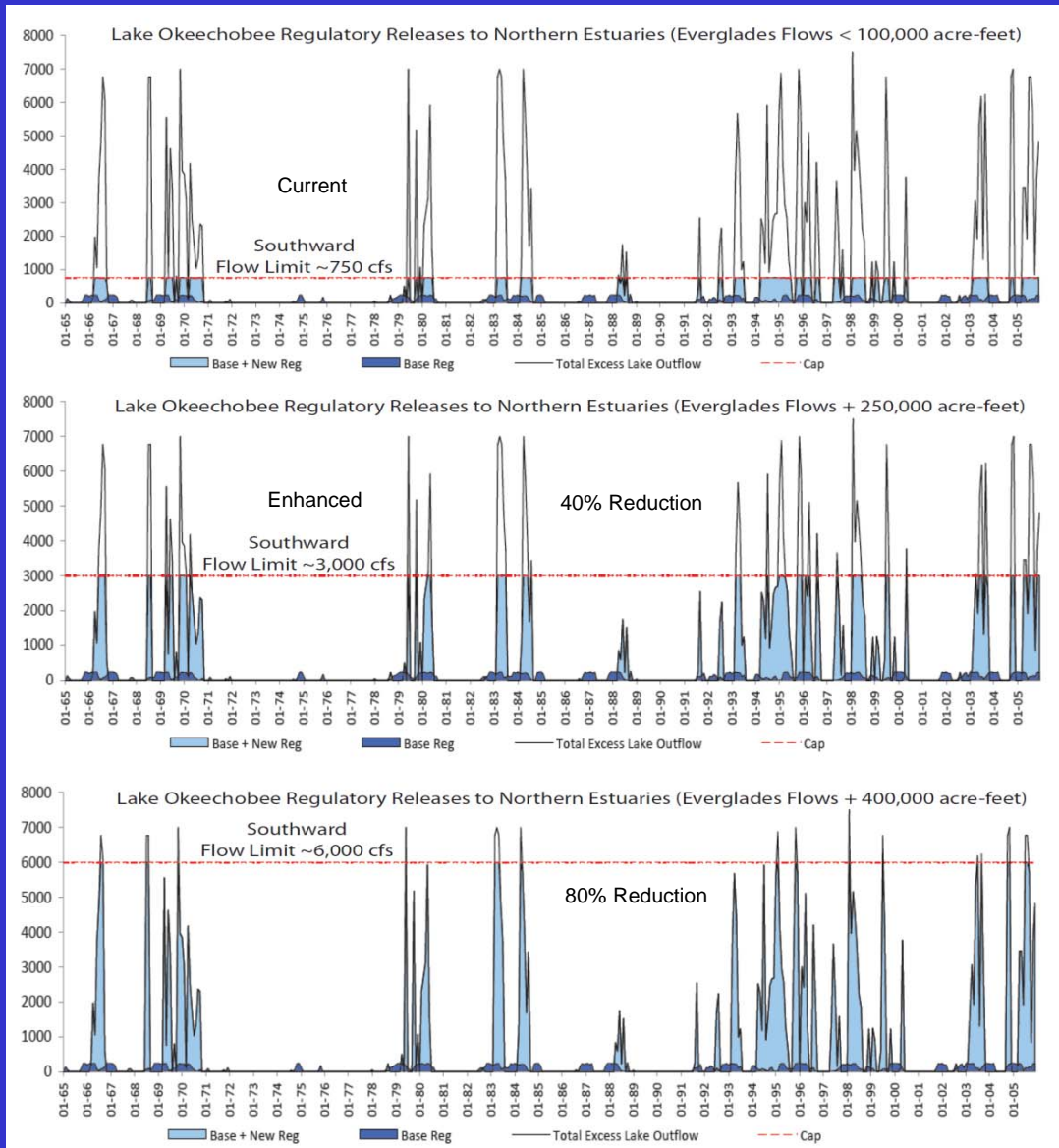
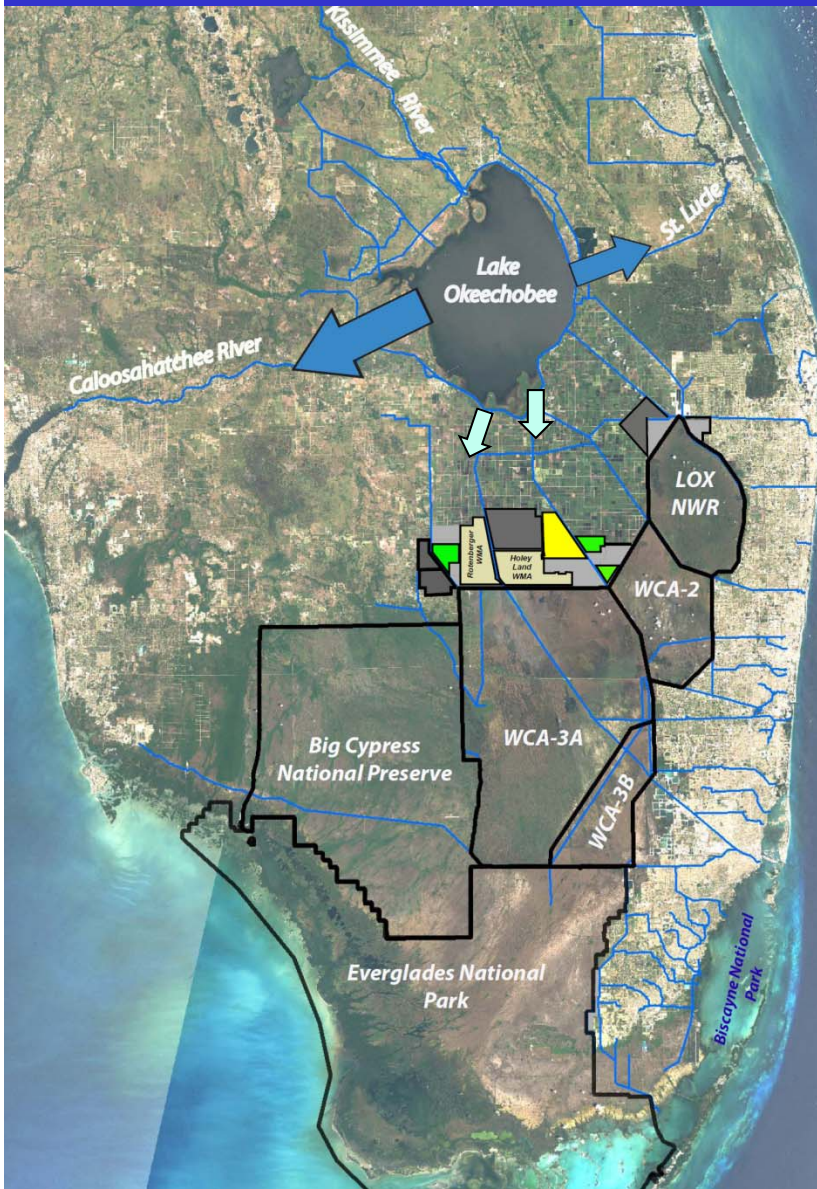
- Improved wetland health and resilience is linked to increasing water depths/flooding durations and soil accretion.
- Flow increases support Everglades restoration and water supply availability by redirecting excess flows currently going to tide.
- Knowledge Gap: Improved conveyance to allow sheetflow and rainfall-driven operations.

Average Everglades Protection Area
Monthly Inflow Distribution



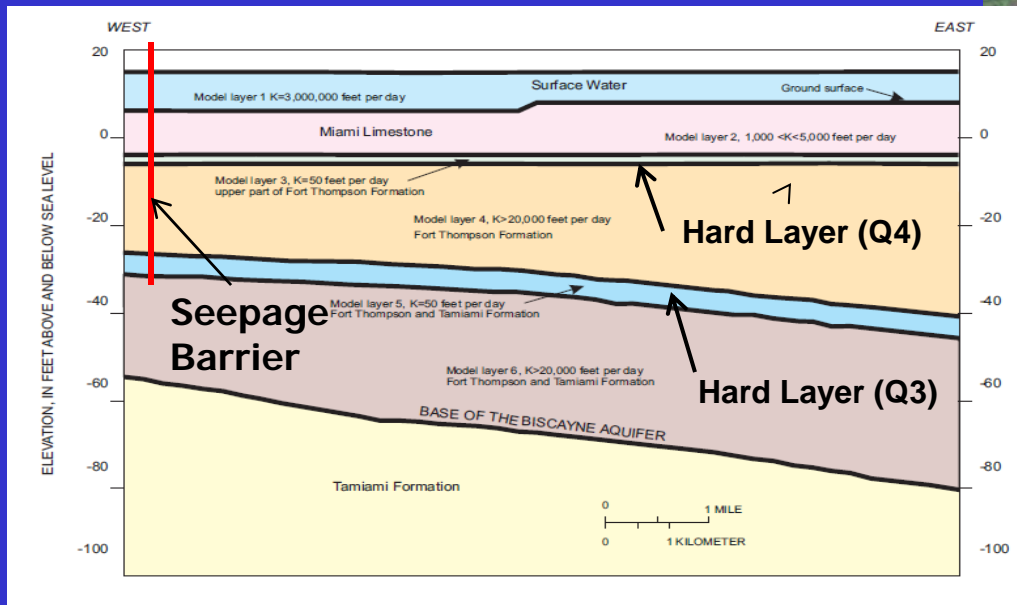
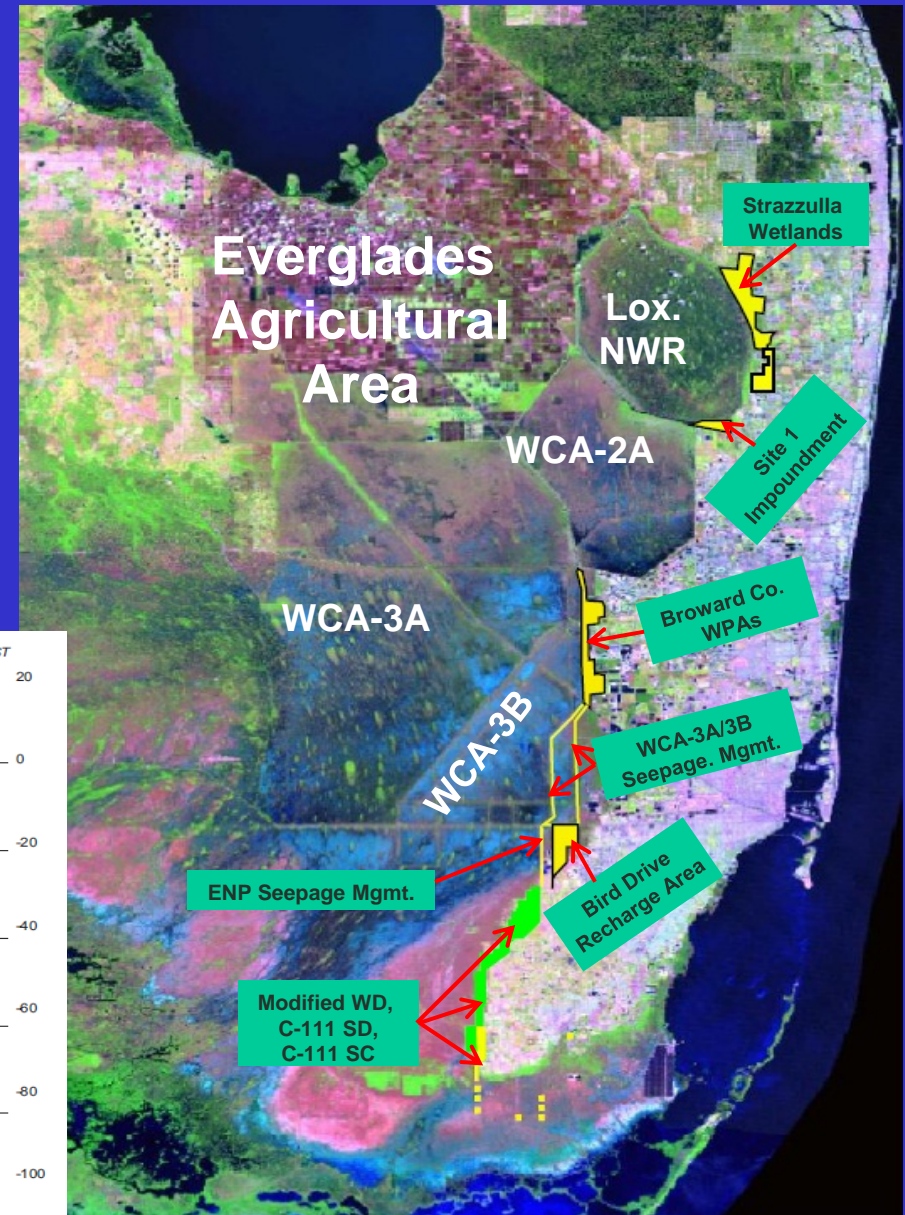
Increased Everglades Inflows via Reduced Northern Estuary Regulatory Releases

Enhanced Everglades Inflows = Reduced Estuarine Harm

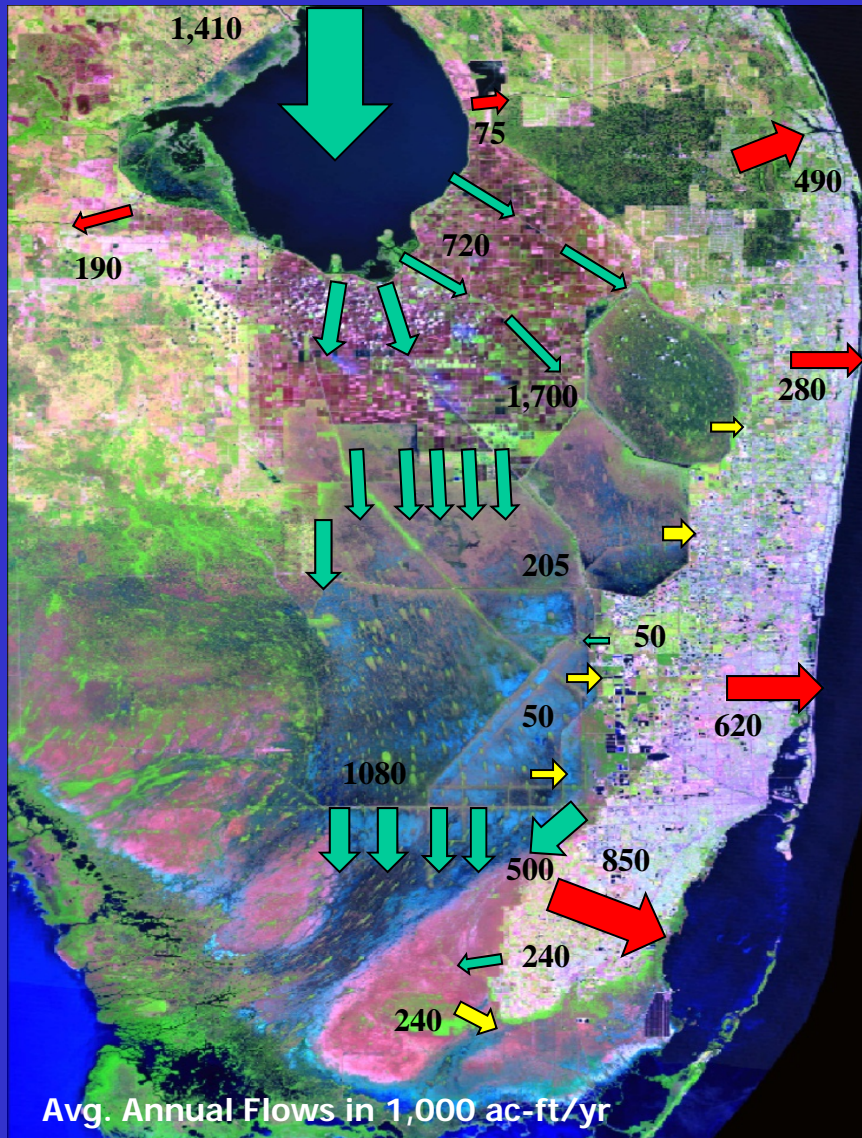


Reducing Seepage Losses from the Everglades

- Water Preserve Areas: Capture and store excess runoff from the Lower East Coast currently going to tide.
- ENP Seepage Mgmt.: Install a barrier to block groundwater seepage.
- Knowledge Gap: Determine the most cost effective method.



The Post-CERP Water Management System



Avg. Annual Flows in 1,000 ac-ft/yr

Future Water Budget (CERPA)

- Proposed CERP features would retain on average 950,000 acre-feet/year currently lost to tide.
- This would increase resilience of the water management system to climate variability, climate change, and sea level rise.
- The concern is that many of the original CERP water storage features (regional ASR, Lakebelt, Water Preserve Areas) are no longer considered viable.
- Knowledge Gaps: New storage approaches (Lake O./EAA/WCAs), and new optimization tools that maximize restoration benefits while enhancing long-term water sustainability for the built system.