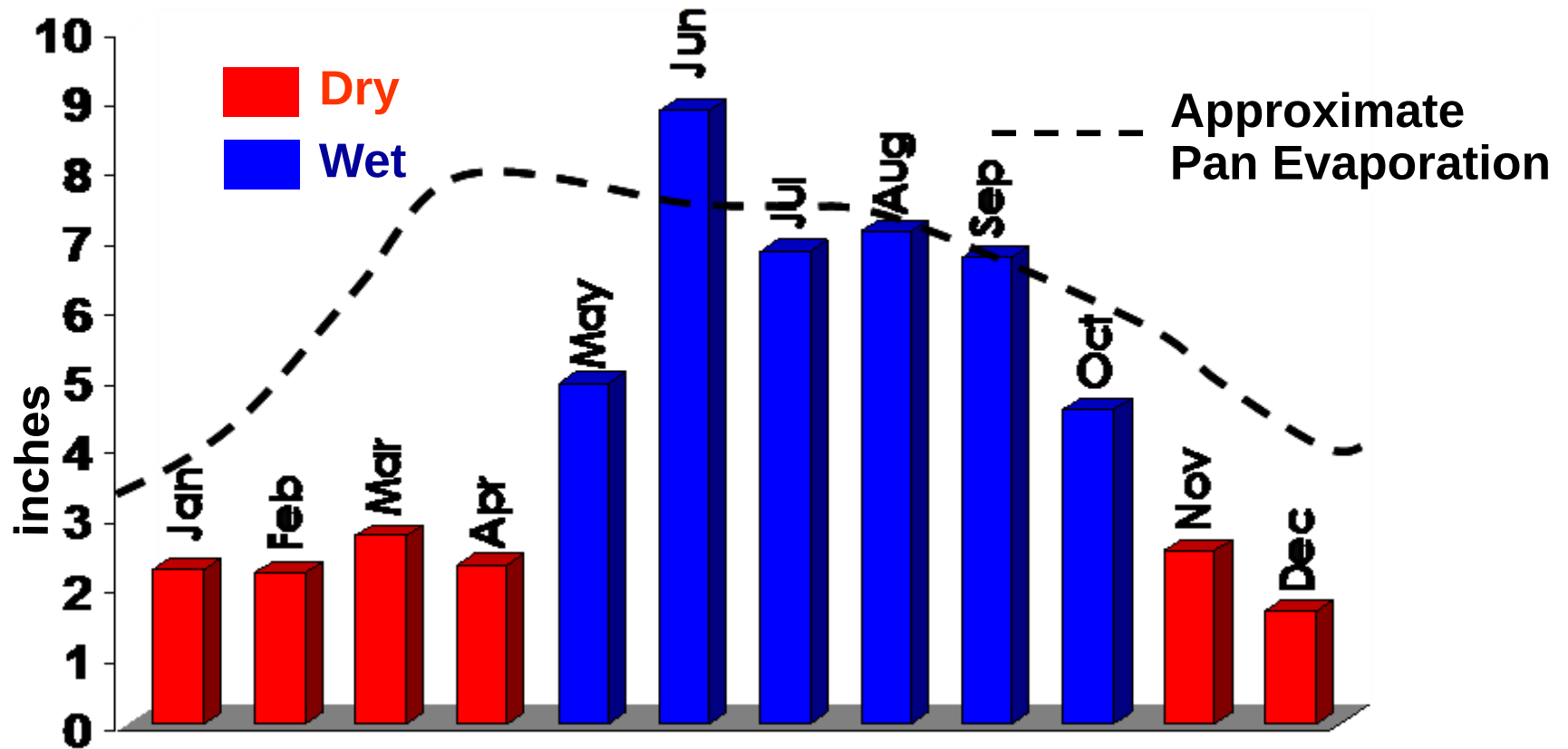


Water Academy - Broward Leaders SFWMD Primary Water Control System Overview

Calvin Neidrauer, P.E. – Chief Engineer,
Operations Control Department

January 19, 2011

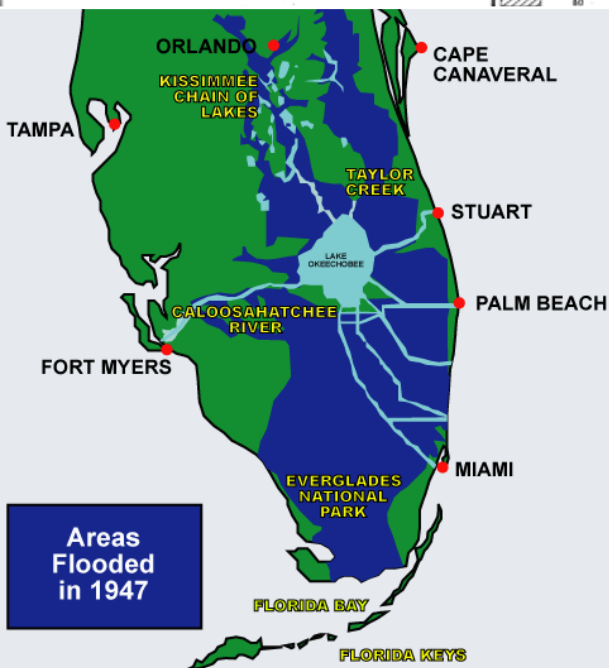
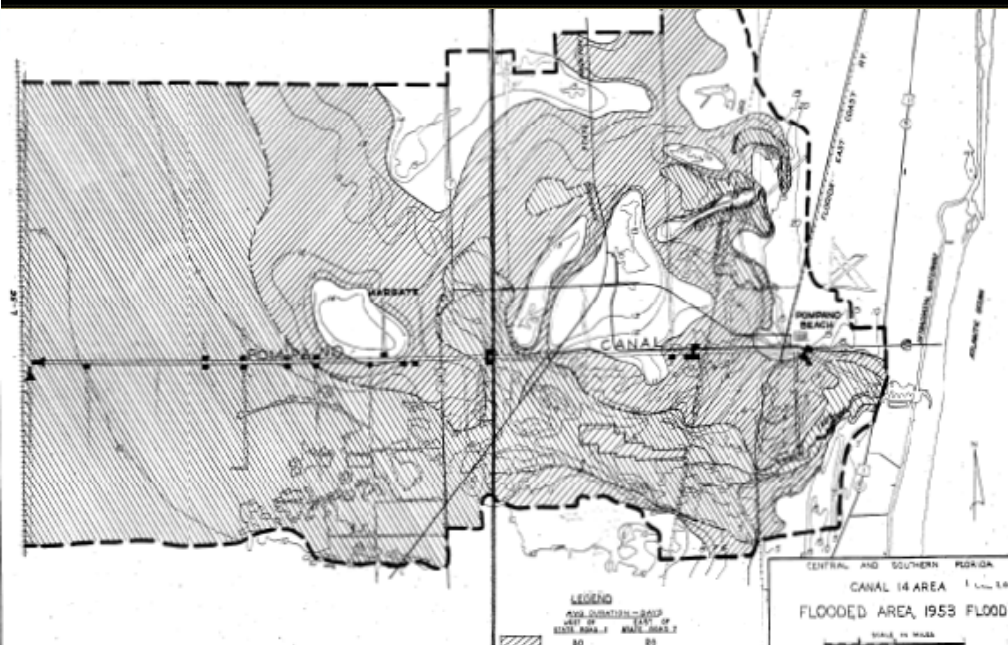
Seasonal Rainfall Variation in South Florida



Average Monthly Rainfall 1965-1995

Annual Rainfall averages 52" and varies historically from less than 40" to over 78"

The Entire Region Flooded in 1947, 1950 & 1951



DATE 15-10-07 DEPT



Chronology of Water Management Changes

Pre-Central & South Florida Projects

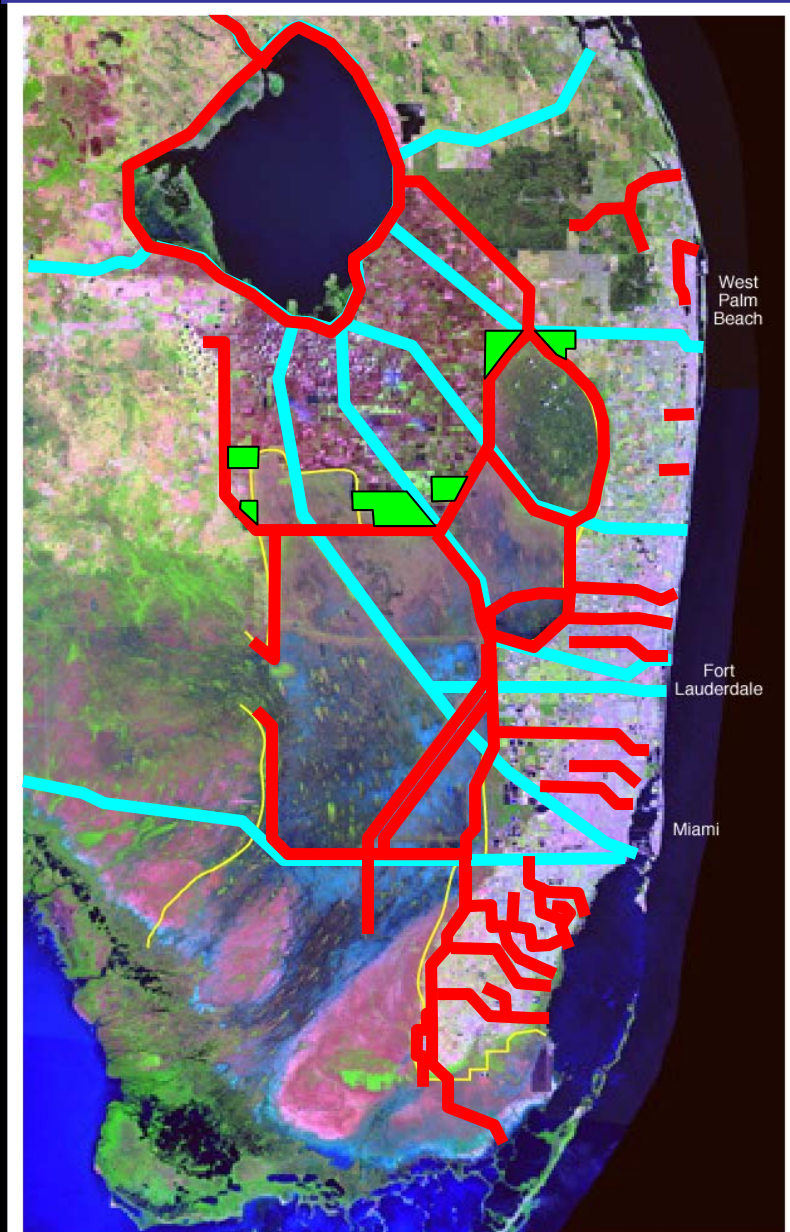
- Caloosahatchee/Kissimmee Rivers 1881-93
- East Coast Canals/St. Lucie Canal 1905-24
- Tamiami Trail – 1915-28
- Lake Okeechobee HH Dike – 1932-38

Central & Southern Florida Project

- Eastern Protective Levee System – 1952-54
- Everglades Agricultural Area – 1954-59
- Water Conservation Area Levees – 1960-63
- Lower East Coast Canals – 1954-65
- Lake Okeechobee Levees – 1960-64
- Kissimmee River Channelization – 1962-71
- South Dade System – 1965-83

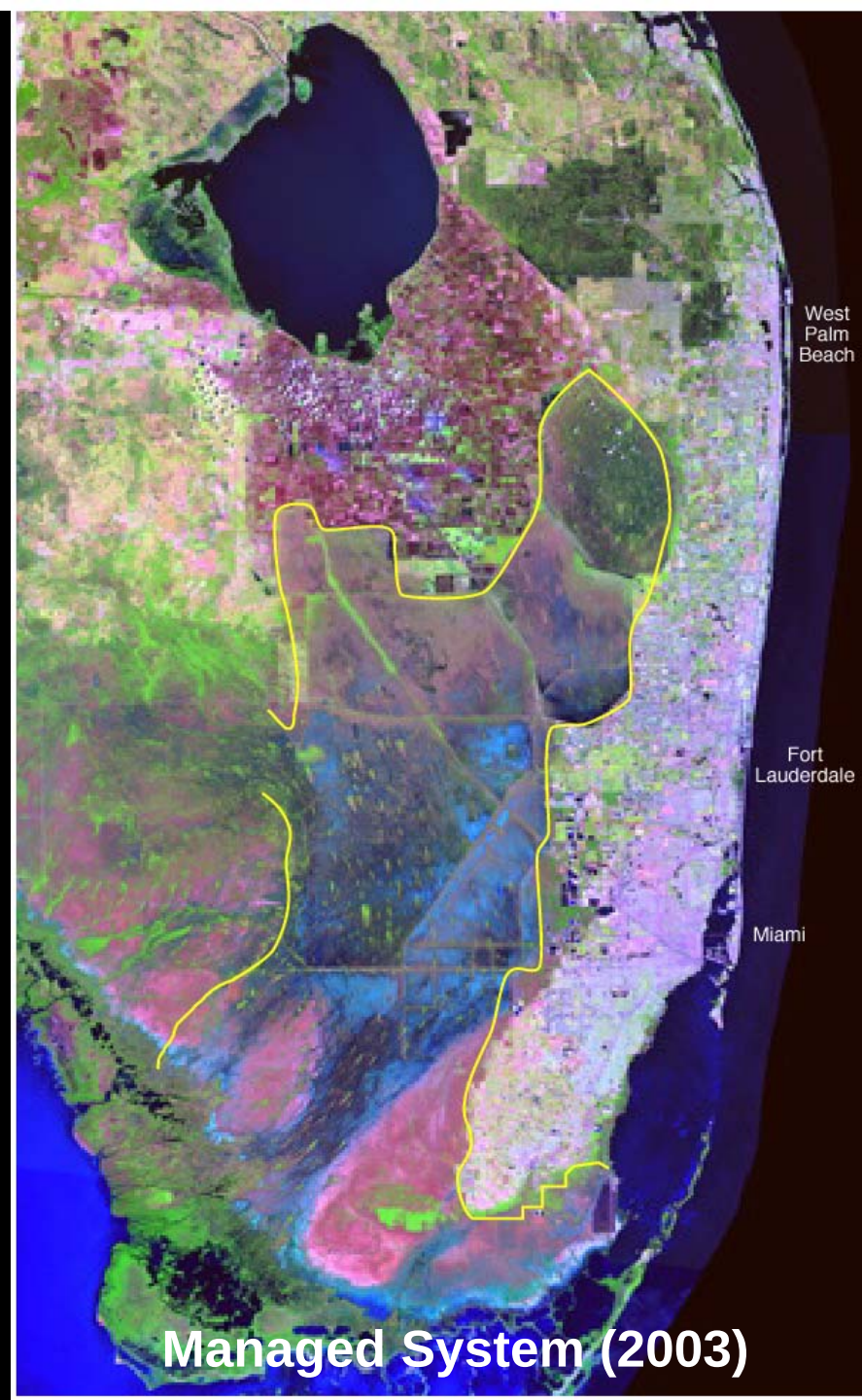
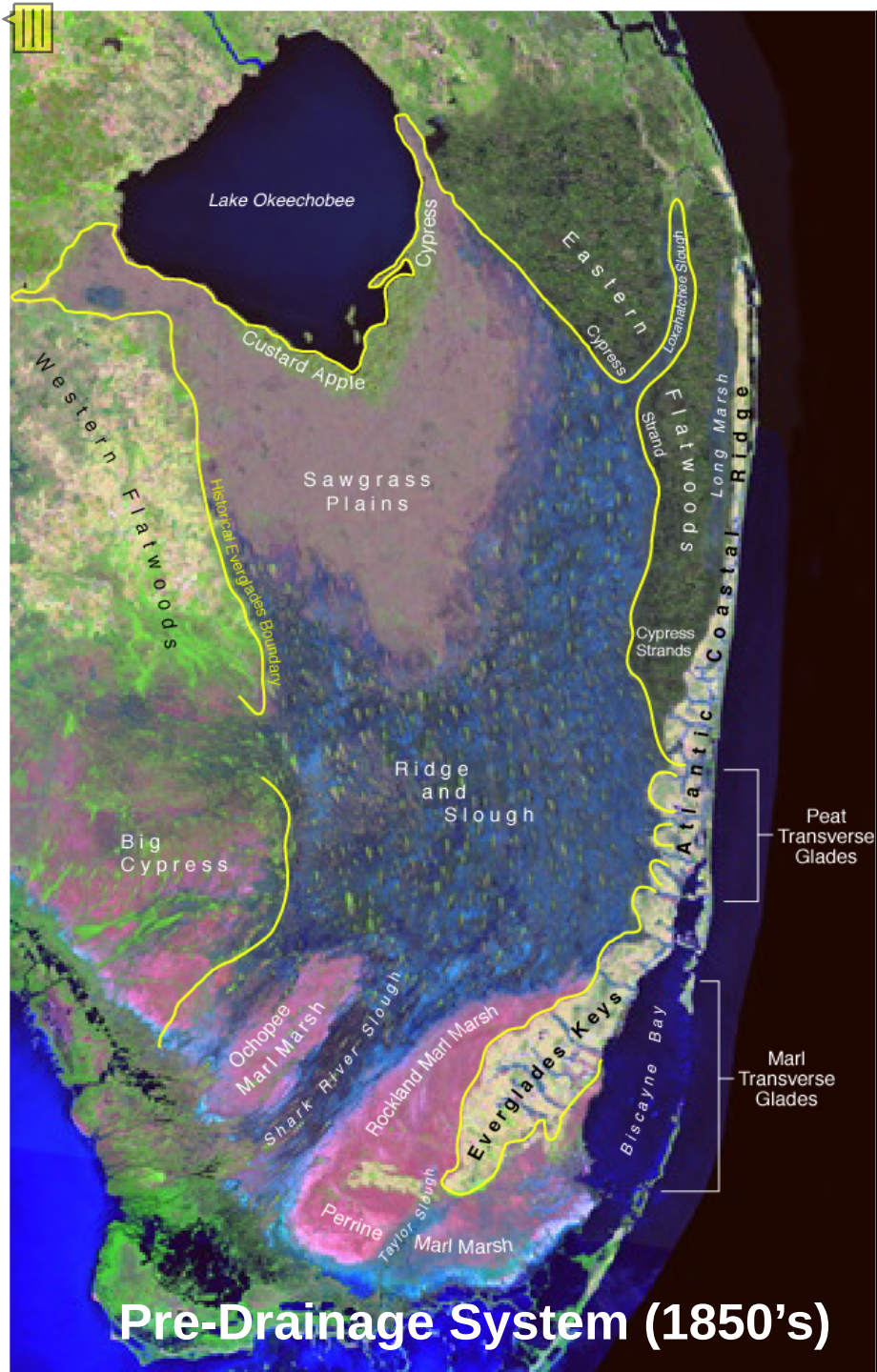
Everglades Construction Project

- Stormwater Treatment Areas – 1994-2003



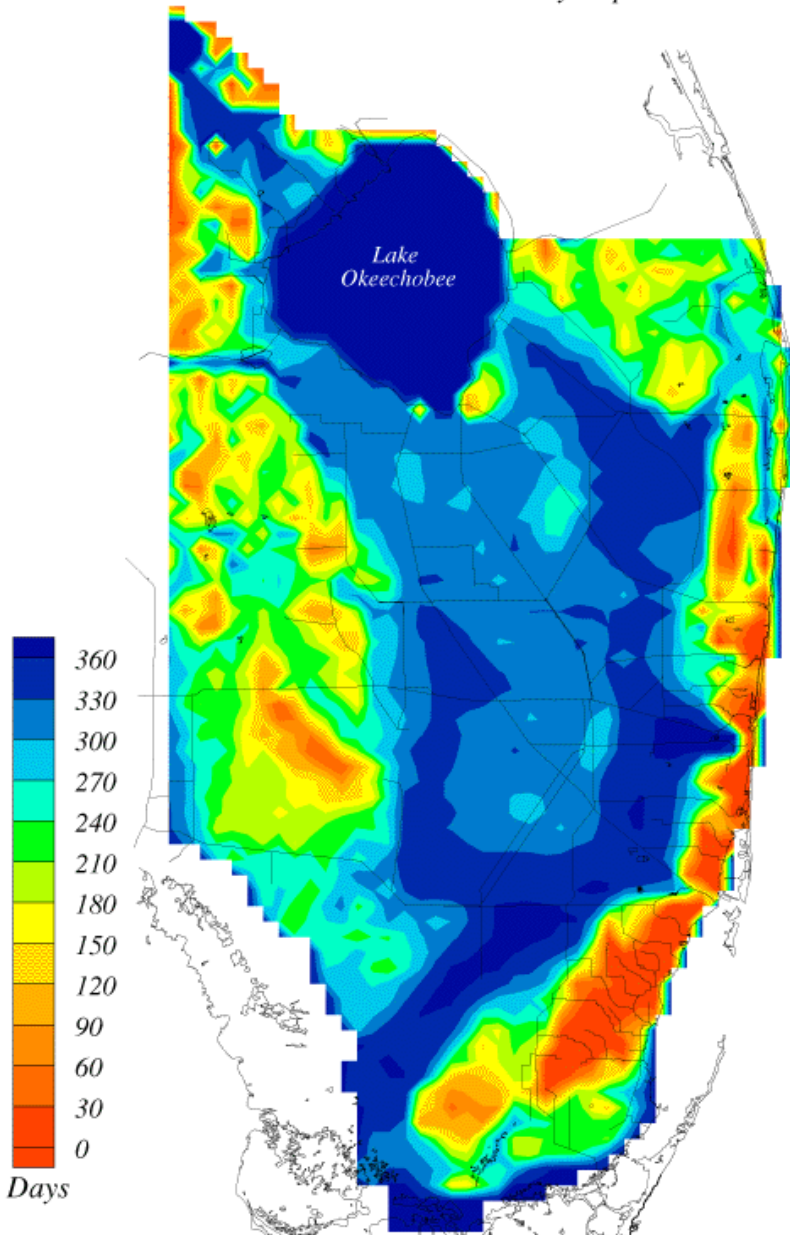
Managed System (2003)

Source: Light and Dineen, 1994; SFWMD & USACE, 2008

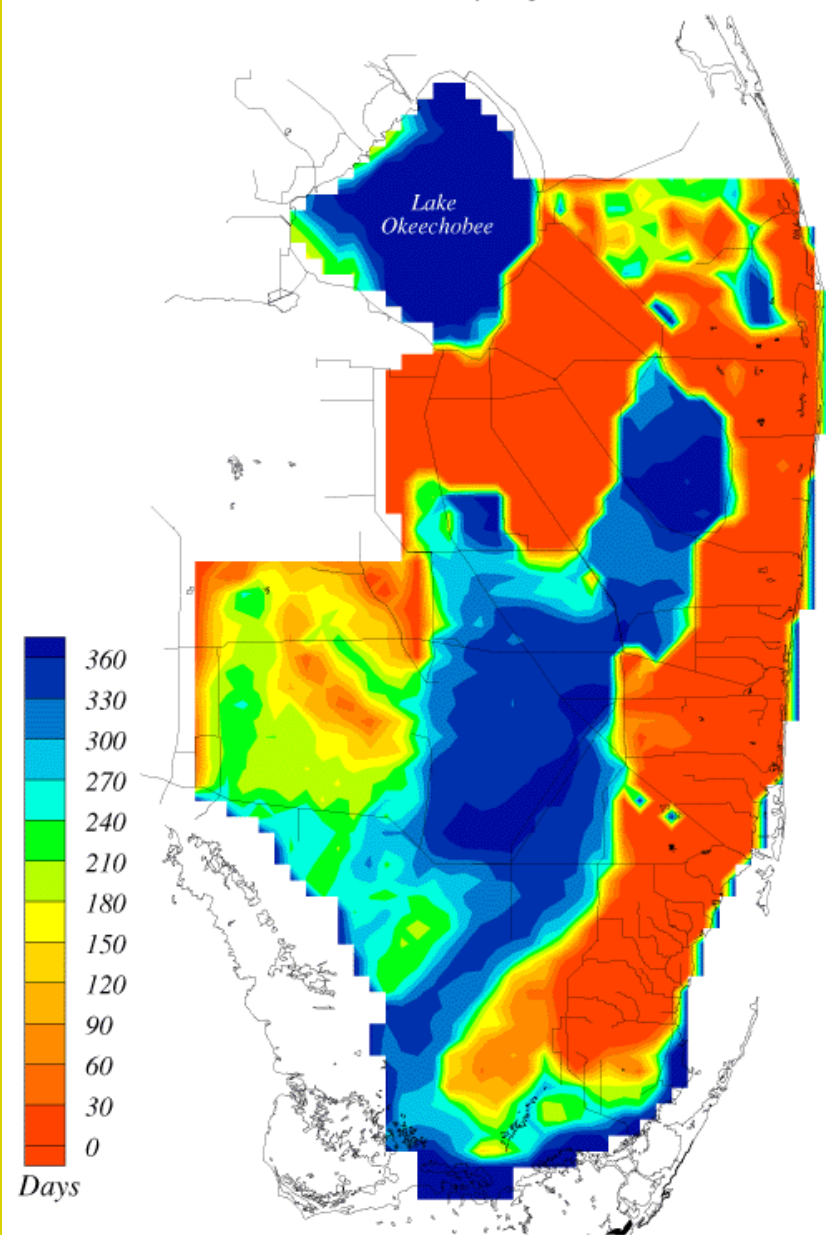


Natural vs. Altered Hydroperiod Patterns

NSM V.4.5 Mean Annual Hydroperiod



SFWMM Mean Annual Hydroperiod (1995 Base)





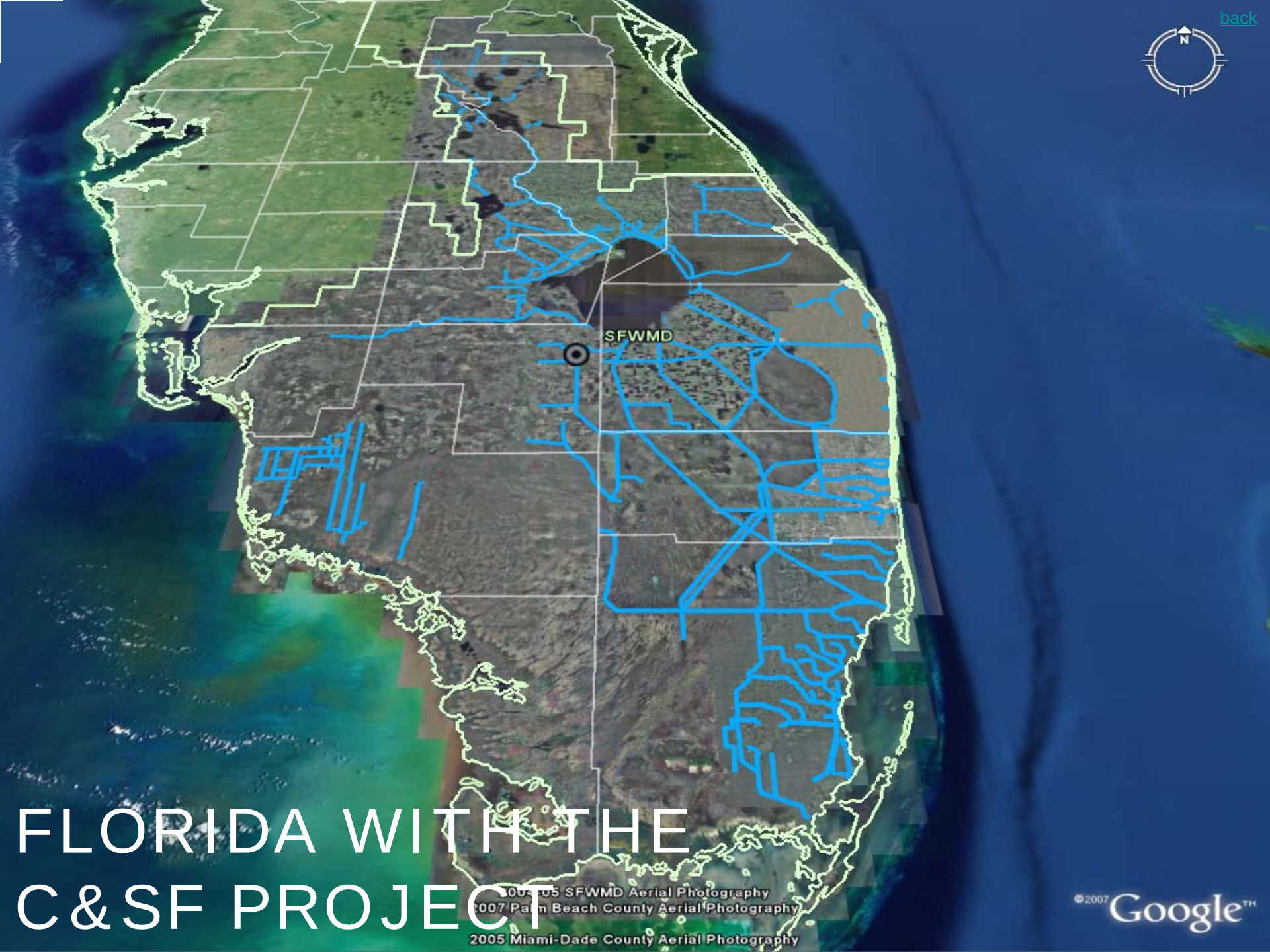
FLORIDA WITHOUT THE C&SF PROJECT

2003-05 SFWMD Aerial Photography
2007 Palm Beach County Aerial Photography
2005 Miami-Dade County Aerial Photography



EXTENT OF THE 1947 FLOODING

Estimation of flooded areas
Reference House Document
No. 643 – 80th Congress.



SFWMD

FLORIDA WITH THE C&SF PROJECT

© 2005 SFWMD Aerial Photography
© 2007 Palm Beach County Aerial Photography
© 2005 Miami-Dade County Aerial Photography



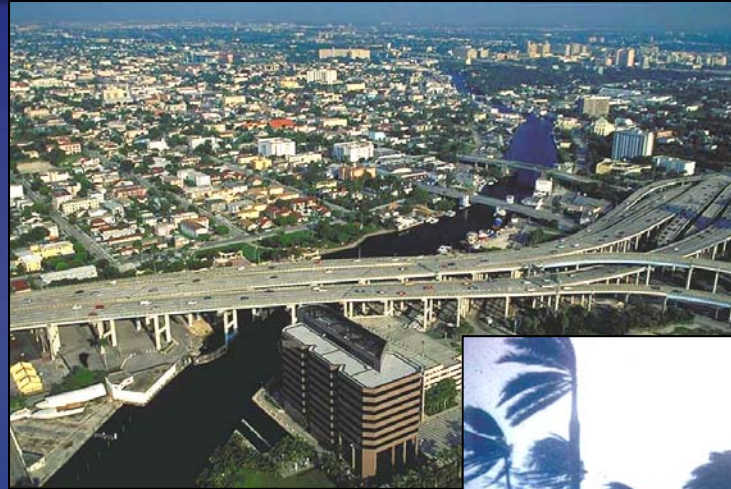
EXTENT OF THE 2008 FLOODING

Estimation of problem areas
from phone calls received or
observation by Field Staff.

2007 US SFWMD Aerial Photography
2007 Palm Beach County Aerial Photography
2005 Miami-Dade County Aerial Photography

The “Project Purpose”

- Flood Control
- Water Supply
 - Agriculture
 - Urban
 - Everglades National Park
 - Saltwater Intrusion
- Navigation
- Protection of “fish and wildlife”



Water Management System Components

- Primary System is more than just the C&SF Project
- More than 1,600 miles of canals & 1,000 miles of levees/berms
- 160 major drainage basins
- More than 500 major structures
 - ~200 remotely operated
 - ~300 manually operated or fixed structures
- 60 pump stations
 - Almost ½ with remote operation capability



How does the SFWMD manage the system?

$$\left\{ \begin{array}{l} \text{FIELD} \\ \text{INFRASTRUCTURE} \\ \text{(WMFS)} \end{array} \right\} + \left\{ \begin{array}{l} \text{INFORMATION} \\ \text{MANAGEMENT} \\ \text{(WMIS)} \end{array} \right\} \times \text{INFORMATION TECHNOLOGY (ITD)} = \text{WATER MANAGEMENT SCADA SYSTEM (WMSS)}$$



Remote Terminal Units (RTUs)
 –RACUs, MOSCADS, CR10s
 Sensors–environmental,
 structure monitoring
 Actuators–pump, gate control
 Data acquisition, test,
 maintenance, problem-tracking
 systems



Data
 management/warehousing
 Data verification and
 validation
 Quality control/quality
 assurance
 Analysis, Web publishing
 Database - DBHYDRO



Microwave backbone
 Spread-spectrum
 RF feeder networks
 District WAN interfaces
 (T1, etc.)



SCADA (Supervisory Control and Data Acquisition)
 Software/hardware systems for data
 acquisition and control
 System administration / Software
 development
 Operations Control Center (OCC) staff
 Water managers / SCADA technicians
 Meteorologists / STA Site Managers
 ModComp to Telvent conversion
 Operation Decision Support System
 (ODSS)

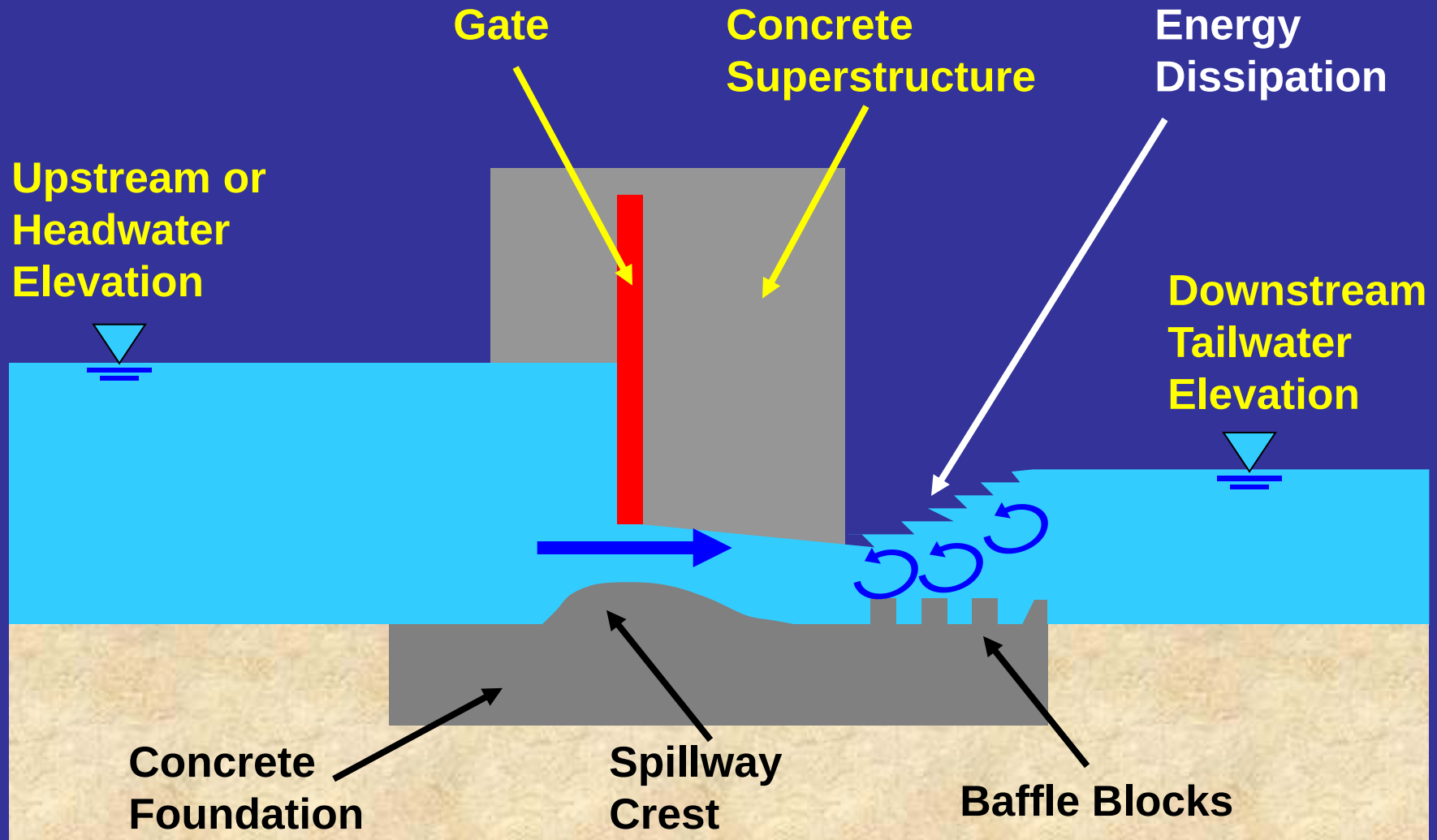
C-## Basin Operations in Broward Co.

- Canal levels are regulated by opening and closing of water control structures.
- Structures have automatic controls and opening and closing are determined by headwater levels.
- Canal level optimum generally measured at coastal structure headwater.
- Water is supplied, in so far as possible from WCA-1 via S39 (Hillsboro) & WCA-2 via S-38 (C-14).
- C-11 has Pump station 9 & seepage pump 9A and Obermeyer weir structure S-381

Gated Spillway Basics

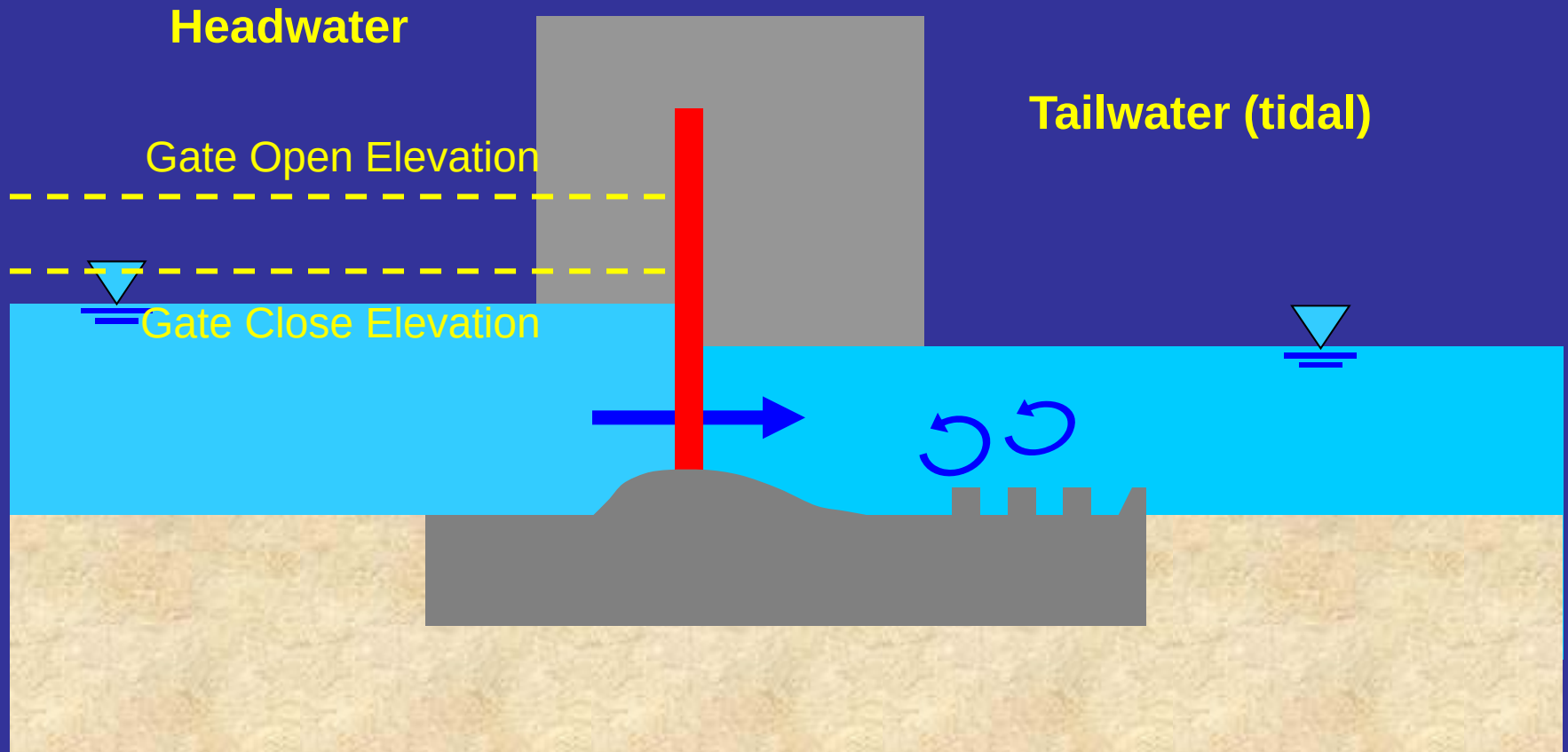


Gated Spillway Basics



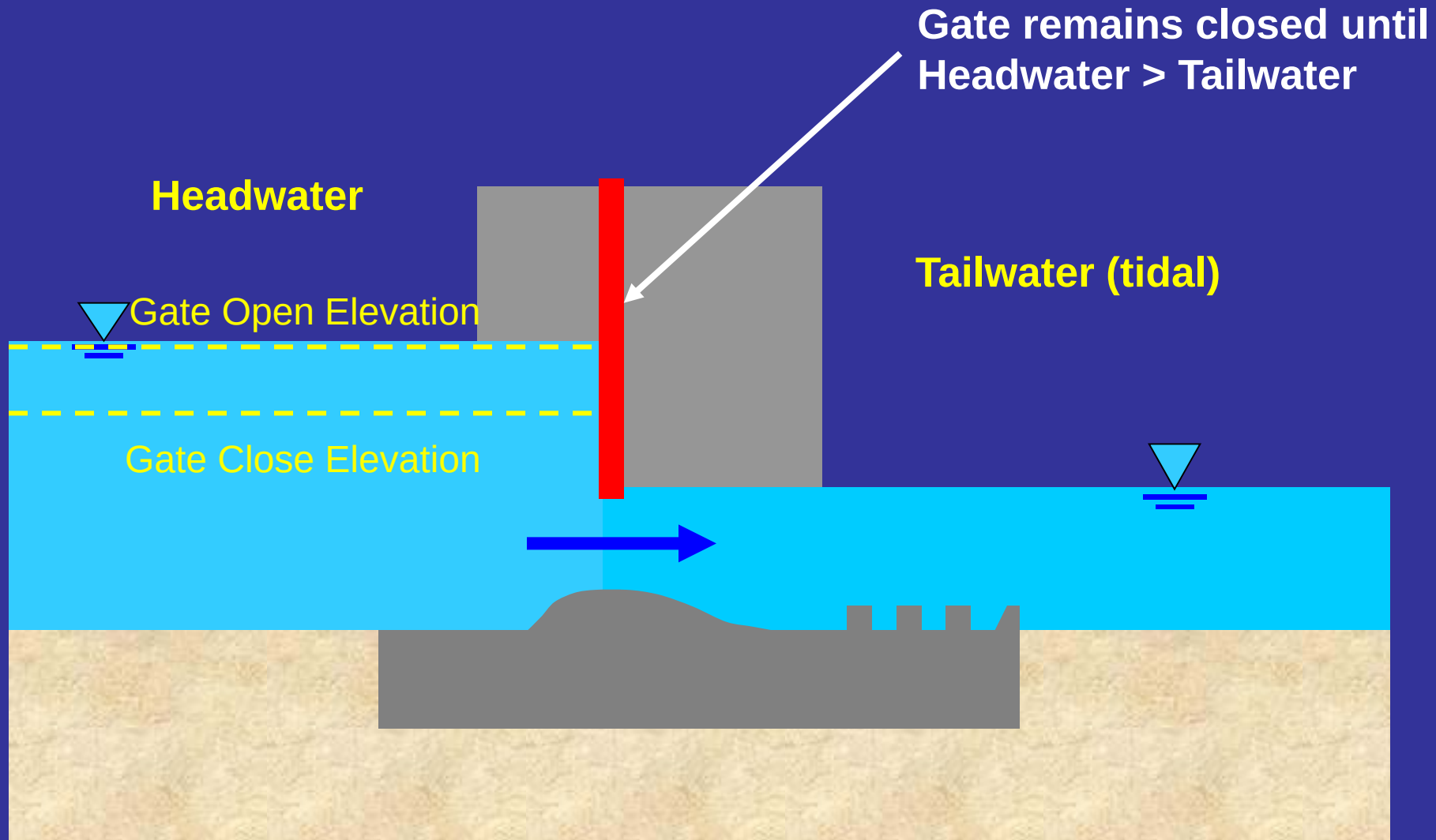
Gated Spillway

(coastal structures)



Gated Spillway

(coastal structures)



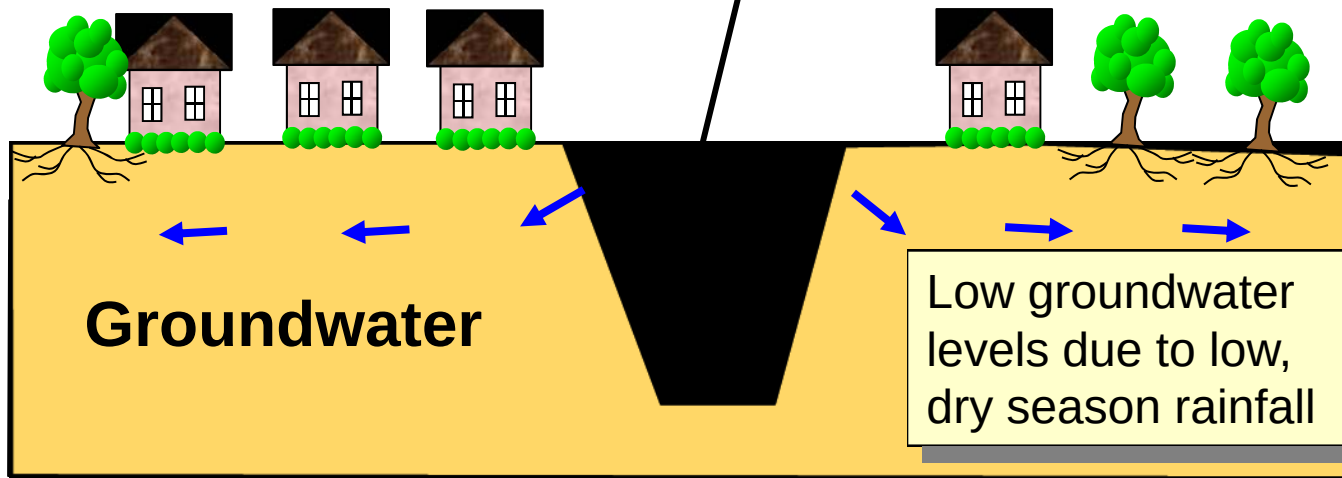
Canal / Groundwater Interaction

Normal Dry Season Operations

Canals serve two primary purposes....

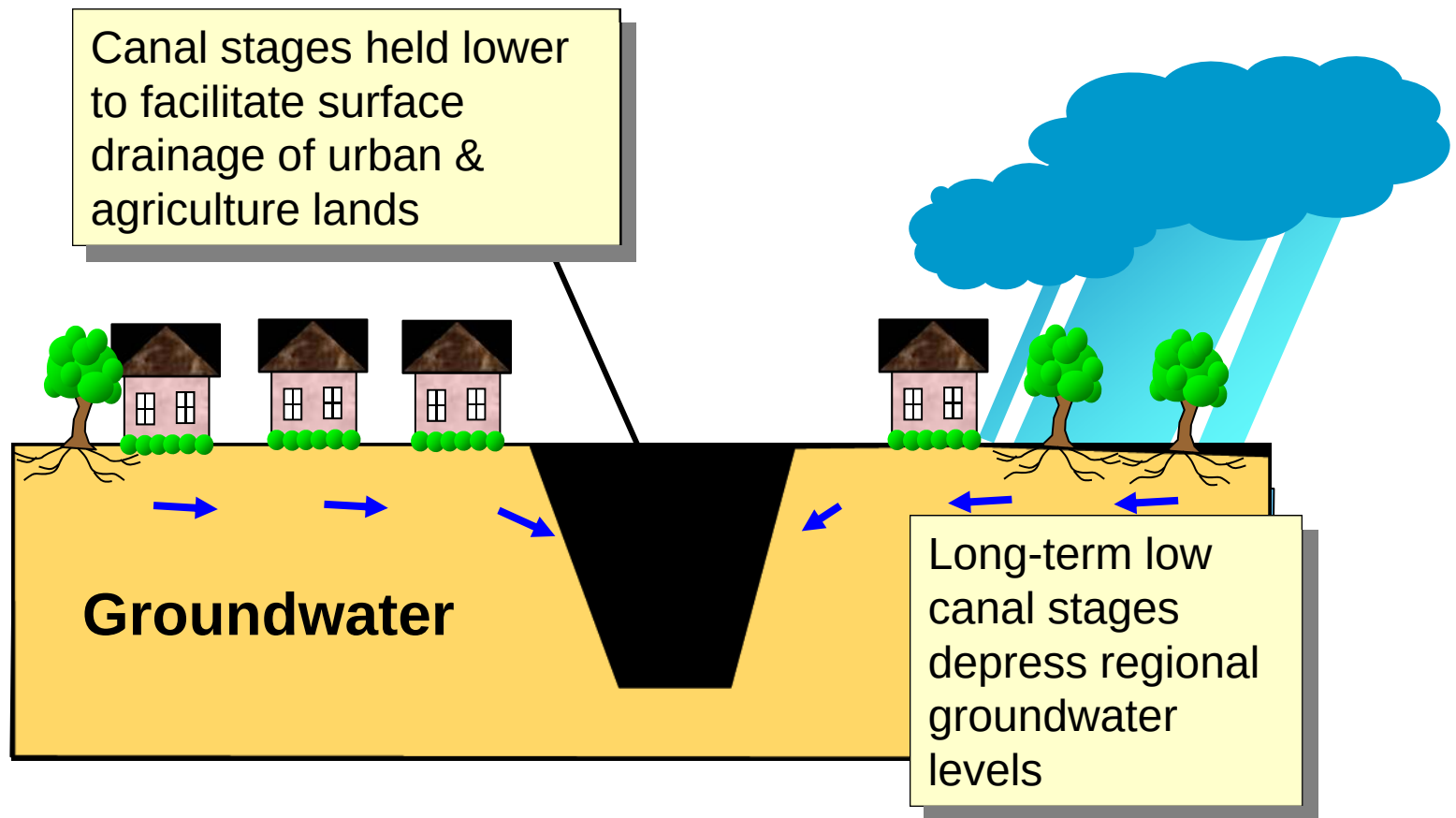
1. Flood Control
2. Water Supply

Canal stages held high to facilitate groundwater recharge and assist supplemental irrigation



Canal / Groundwater Interaction

Normal Wet Season Operations

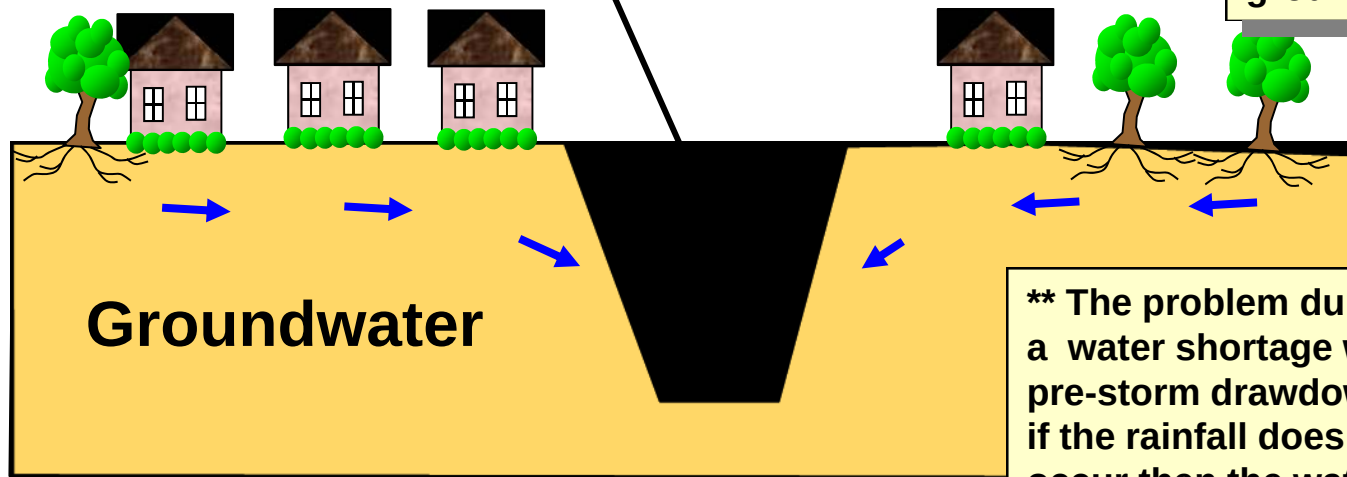


Canal / Groundwater Interaction

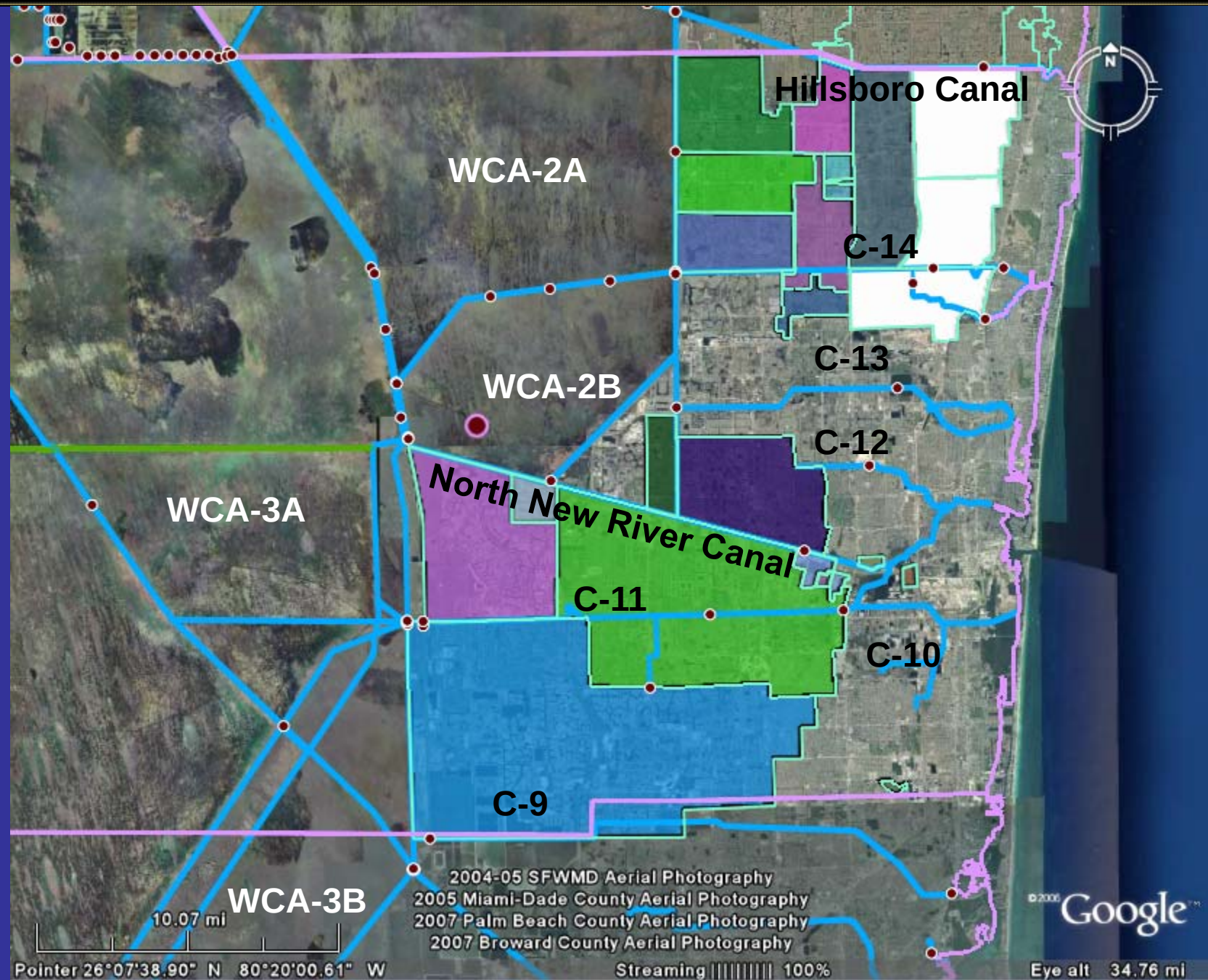
Wet Season Pre-Storm Drawdown Operations

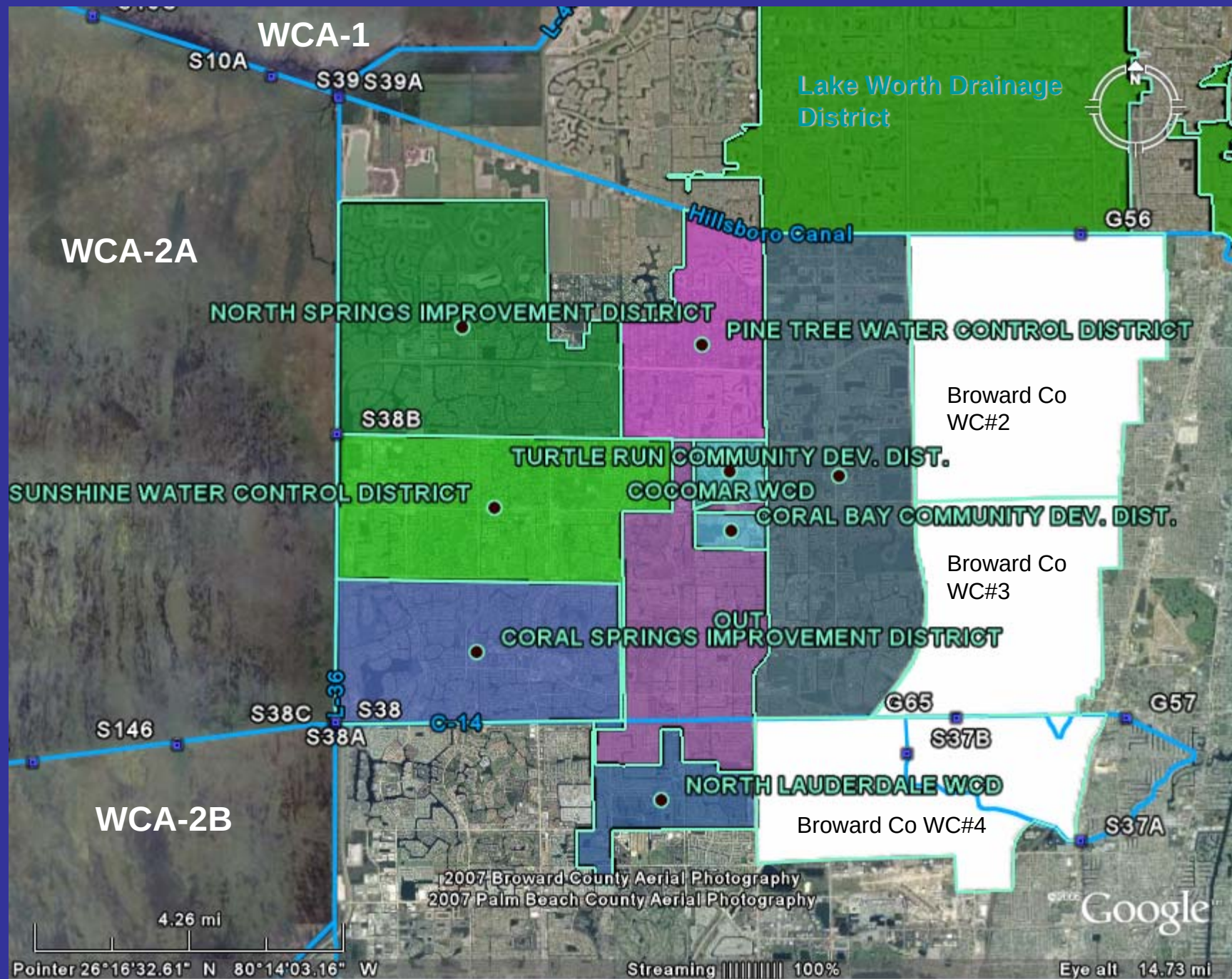
Canal stages lowered up to an additional ~1 foot to increase **surface drainage** of urban & ag lands prior to forecasted storms

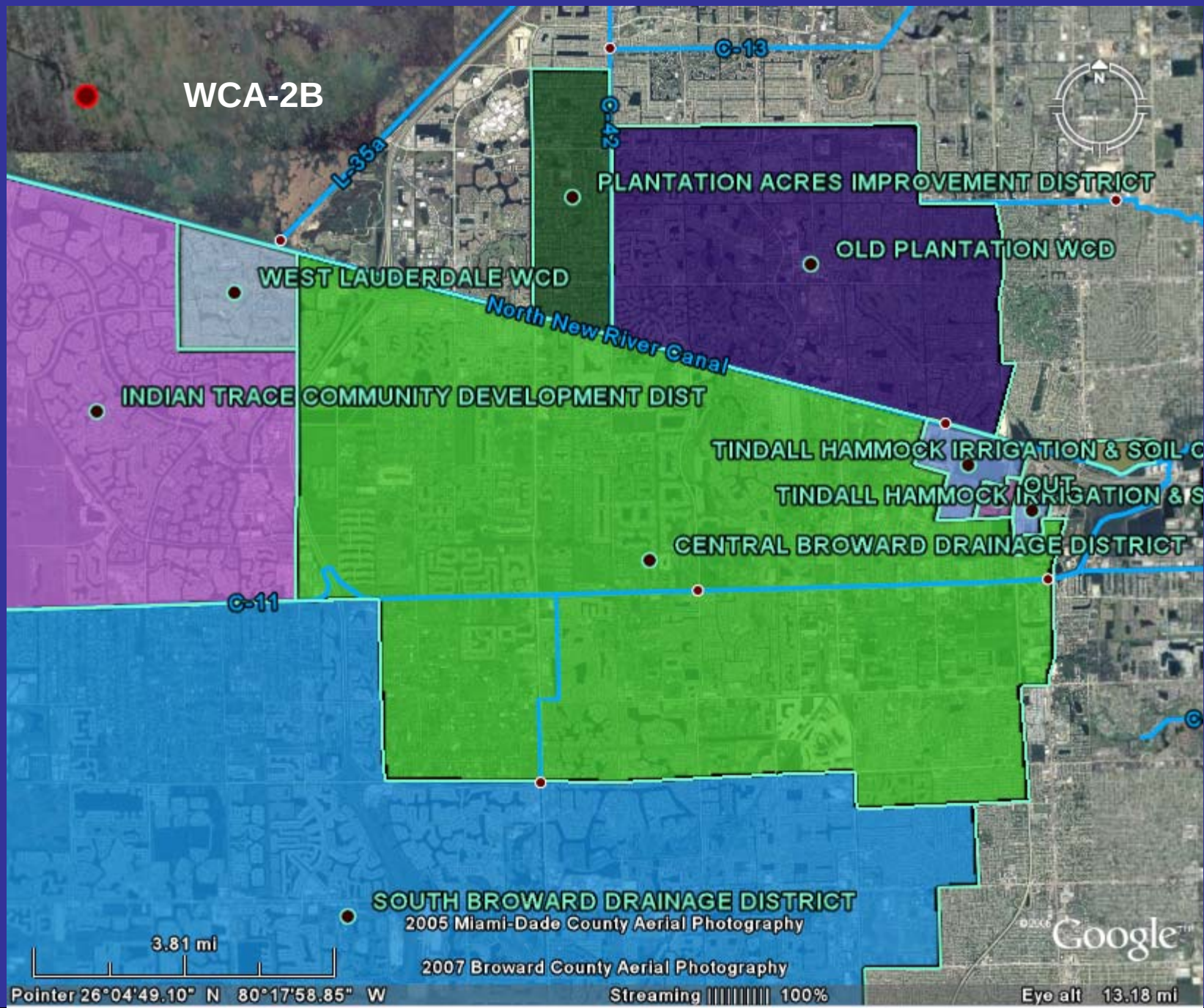
Short-term lowering of canal stages generally does not** significantly decrease regional groundwater levels.

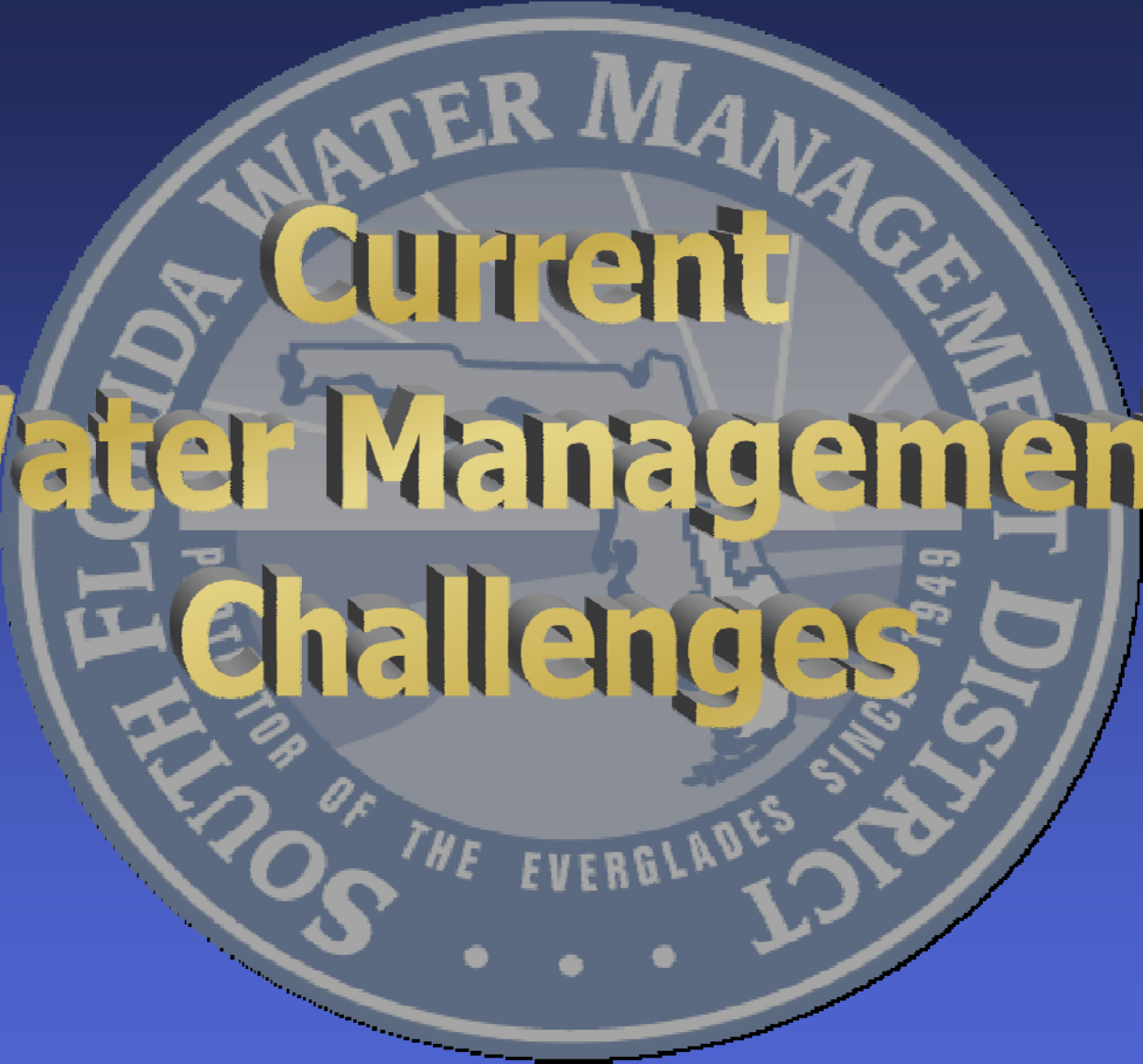


**** The problem during a water shortage with pre-storm drawdown is if the rainfall does not occur then the water is lost from the system.**







The seal of the South Florida Water Management District is a circular emblem. The outer ring contains the text "SOUTH FLORIDA WATER MANAGEMENT DISTRICT" at the top and "ESTABLISHED 1949" at the bottom, separated by three dots. The inner circle features a map of South Florida with a network of waterways and a central sunburst design.

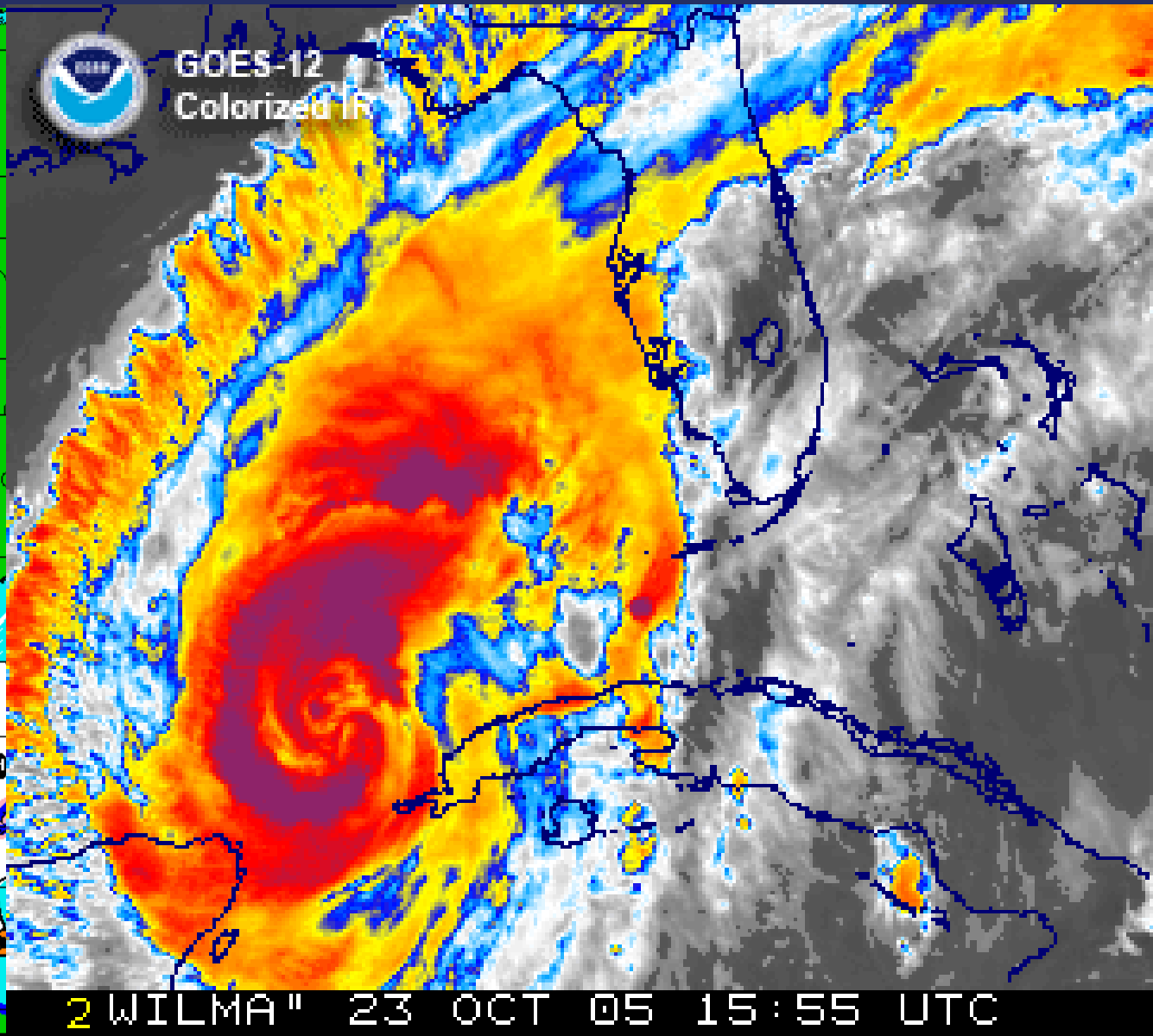
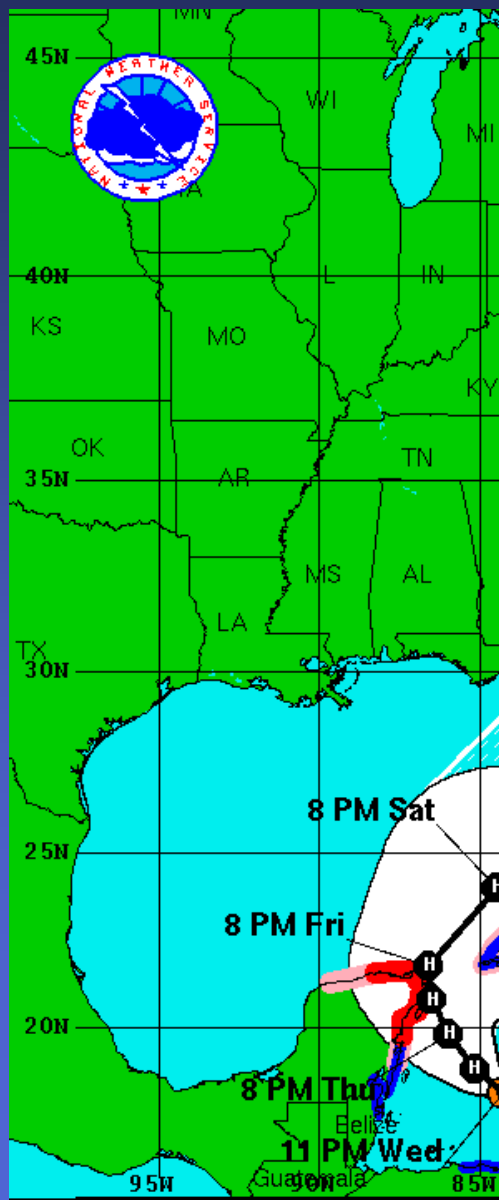
Current Water Management Challenges

Lake Okeechobee

- 730 square miles, with a contributing basin of over 5,000 sq. miles
- Poor water quality inflows (phosphorus)
- HH Dike Rehabilitation
- Serves multiple purposes...
 - Water Supply Storage
 - Flood Protection
 - Unique Ecosystem

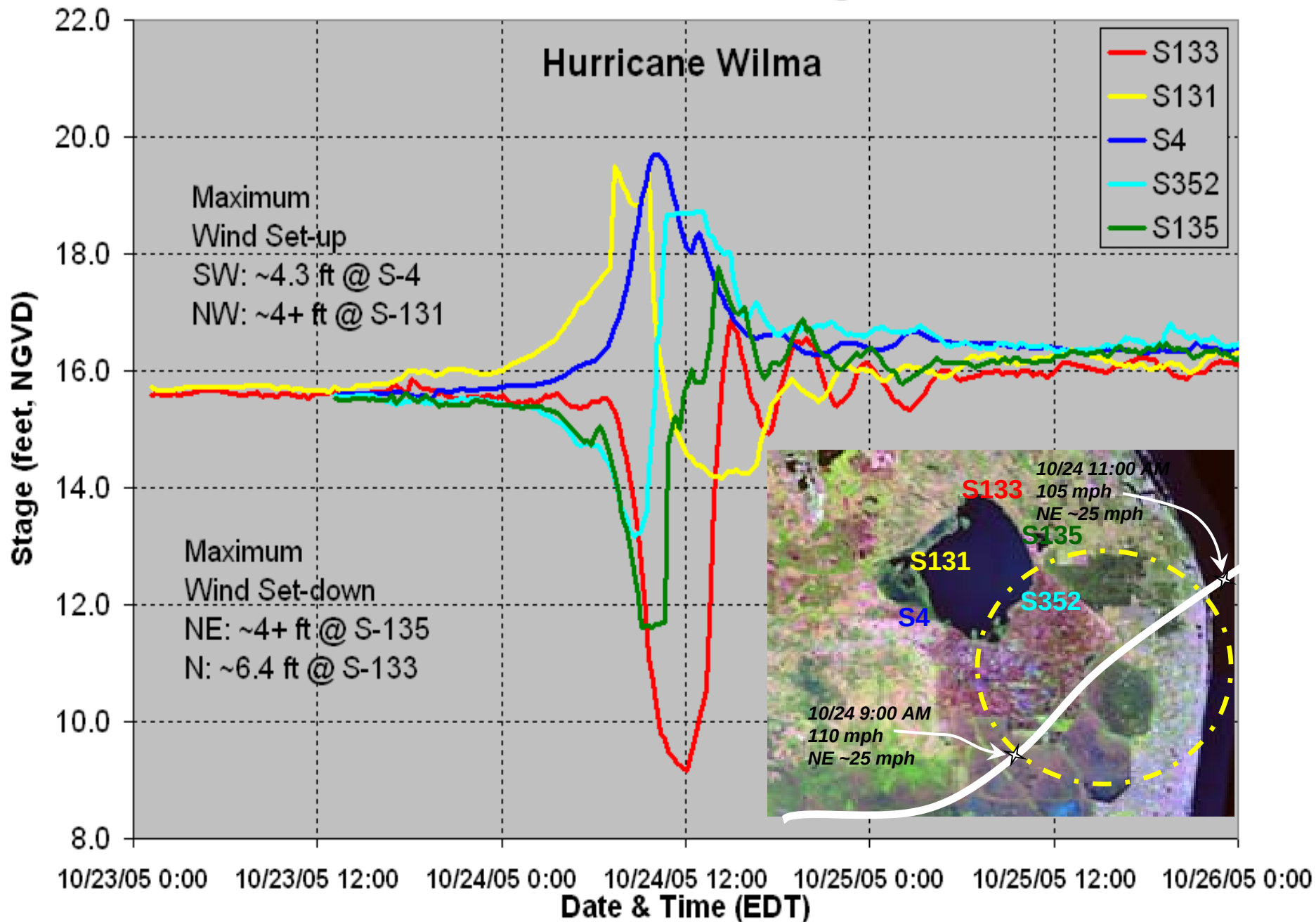


Hurricane Wilma – October 2005



2 WILMA" 23 OCT 05 15:55 UTC

Lake Okeechobee Stages



Herbert Hoover Dike

(U.S. Army Corps of Engineers)



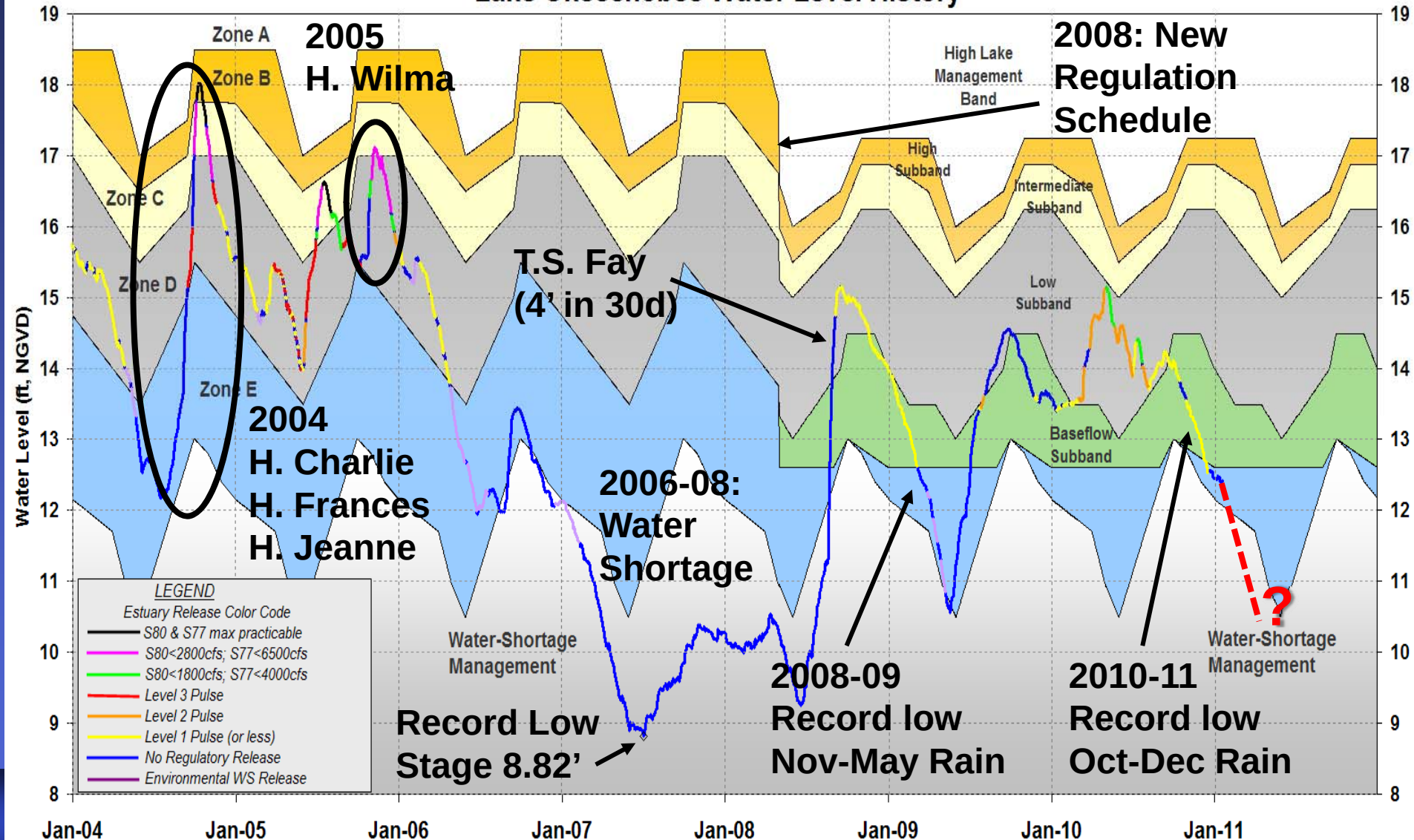
Damaging freshwater discharges to St. Lucie & Caloosahatchee Estuaries



- Low salinity
- Sedimentation
- Low light penetration
- Ecosystem Damage
 - Seagrasses
 - Oysters

Lake Okeechobee: Either Too Much Water or Not Enough

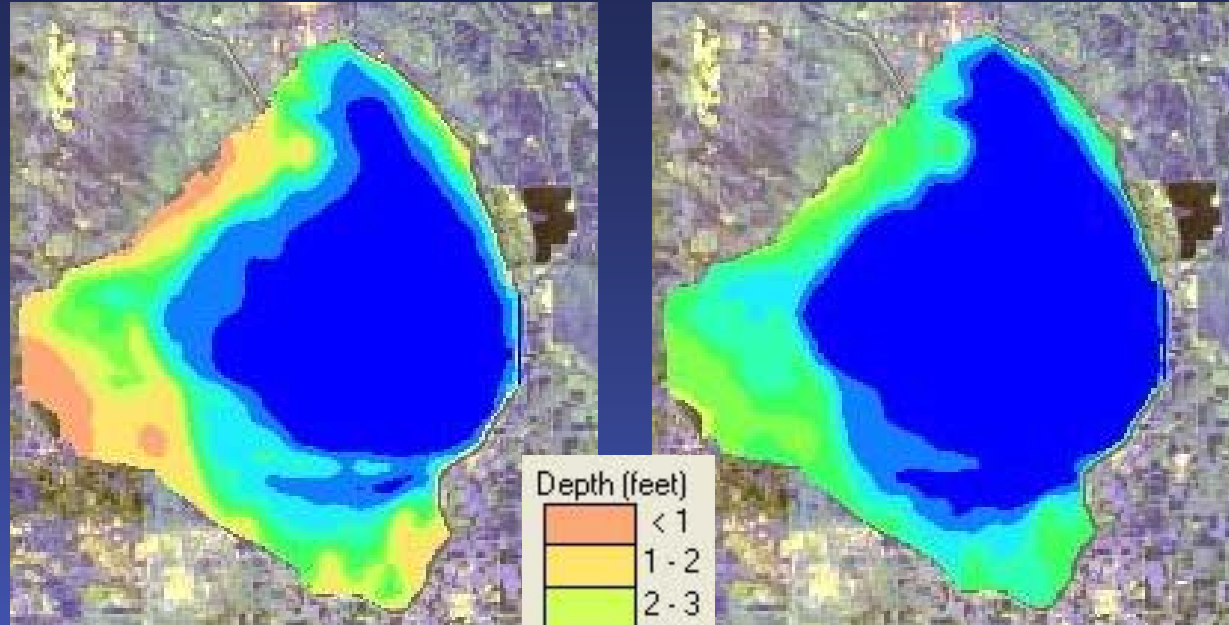
Lake Okeechobee Water Level History





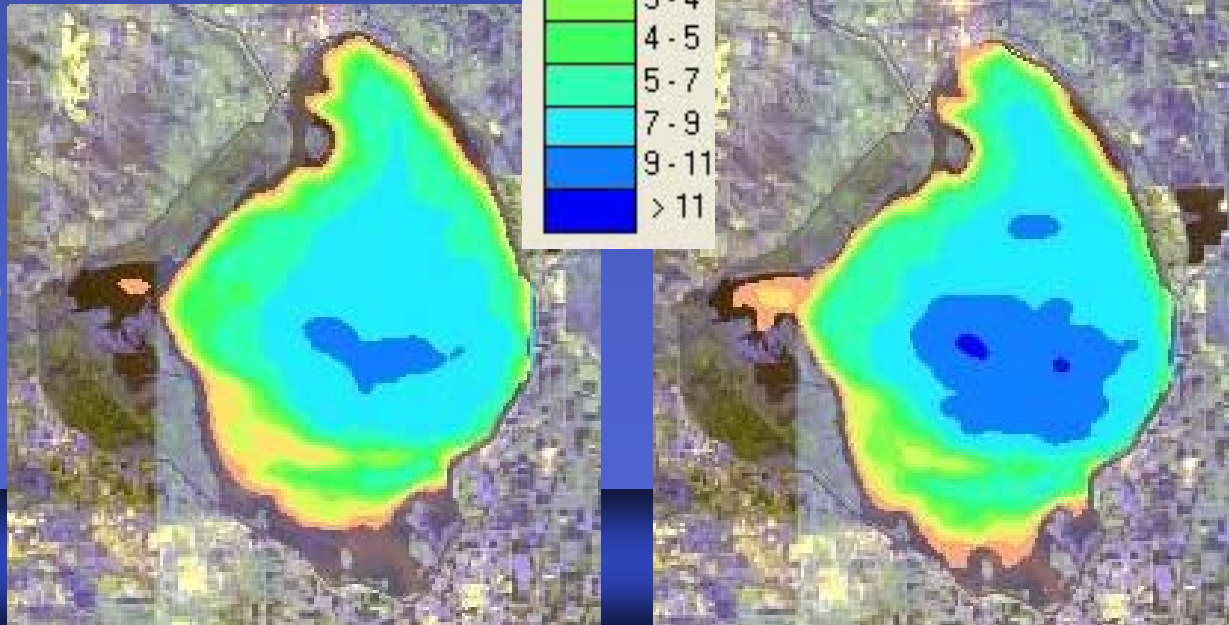
Lake Okeechobee Water Depth Comparison

<http://spatial1.sfwmd.gov/losac/sfwmd.asp>



Elevation
14.3 ft, NGVD
Long-term
Average
(1965-2005)

Elevation
17.0 ft, NGVD
H. Wilma
Nov-2005



Elevation
8.82 ft, NGVD
Record Low
02-July-2007

Elevation
10.0 ft, NGVD
Predicted Low
for 2011



Water Management





**...the challenge is
balancing
competing &
conflicting
objectives**



Questions?