SOUTH FLORIDA WATER MANAGEMENT DISTRICT

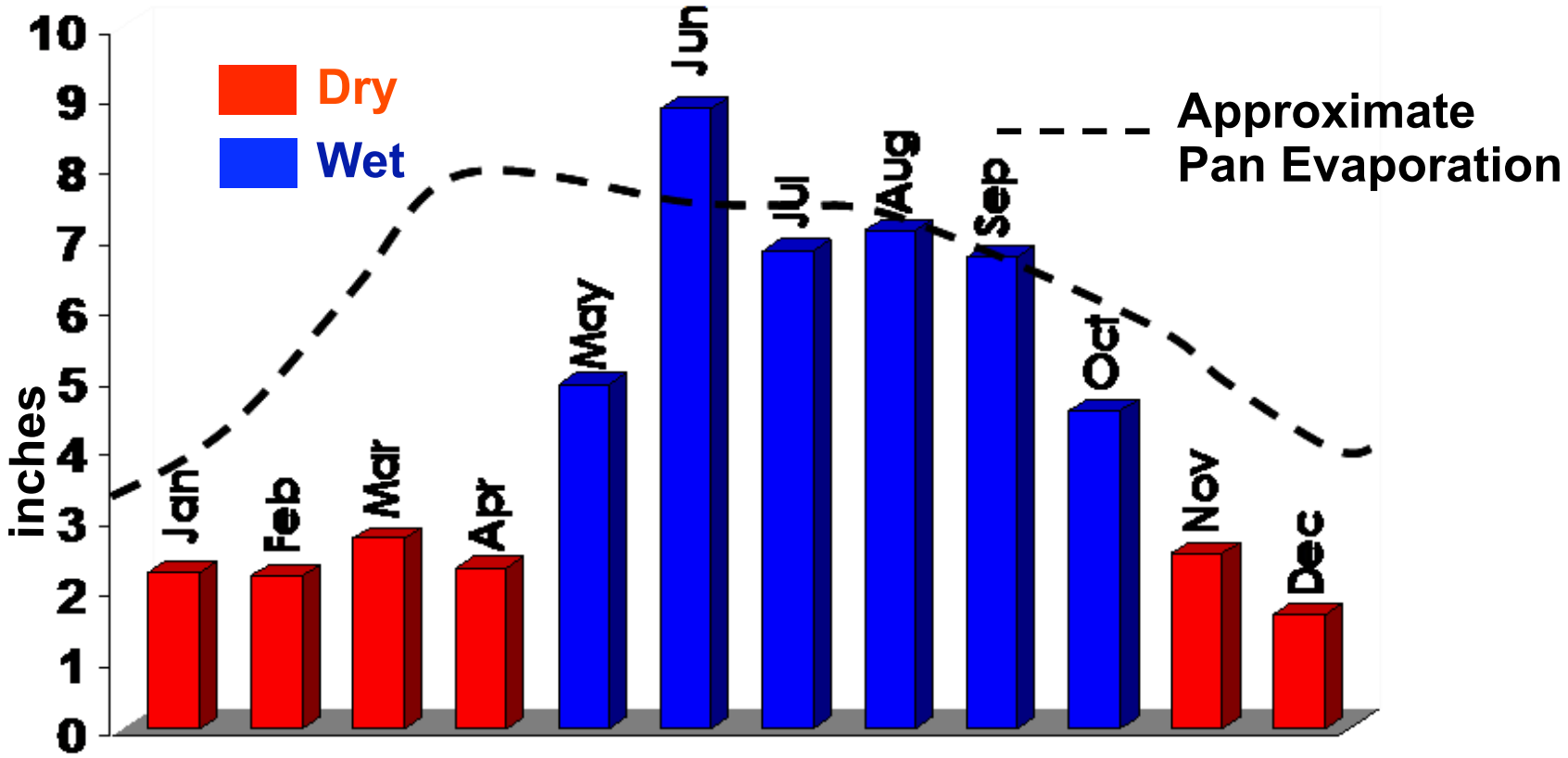
Water Academy - Broward Leaders
SFWMD Primary Water Control System Overview

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

April 8, 2011

sfwmd.gov

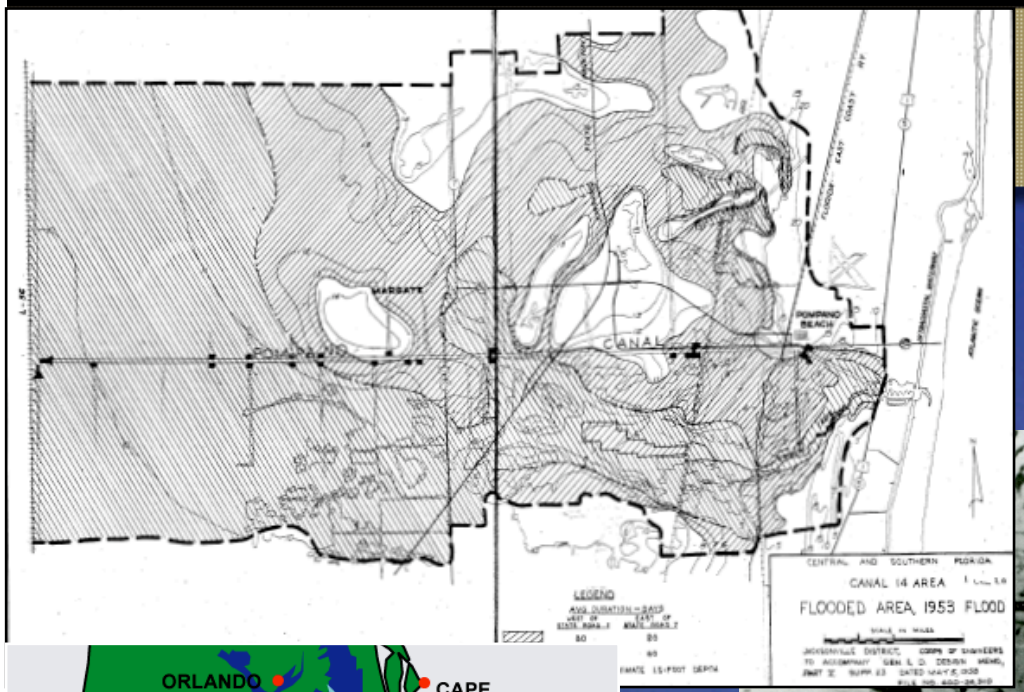
Seasonal Rainfall Variation in South Florida

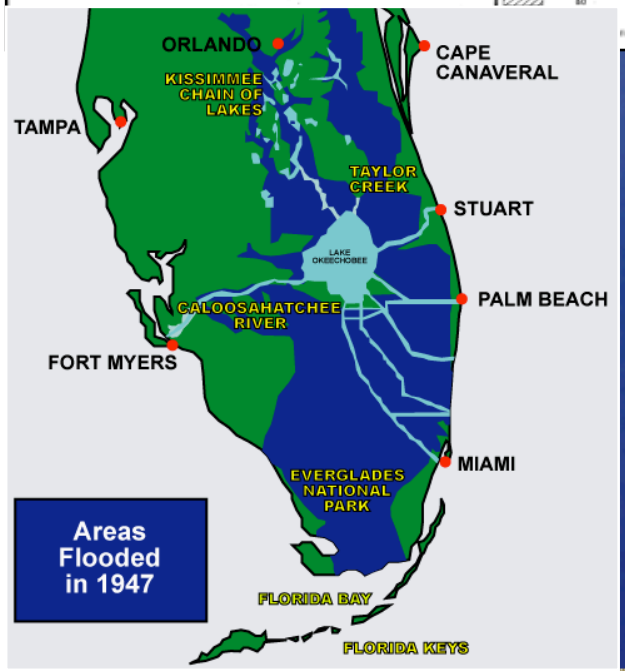


Average Monthly Rainfall 1965-1995

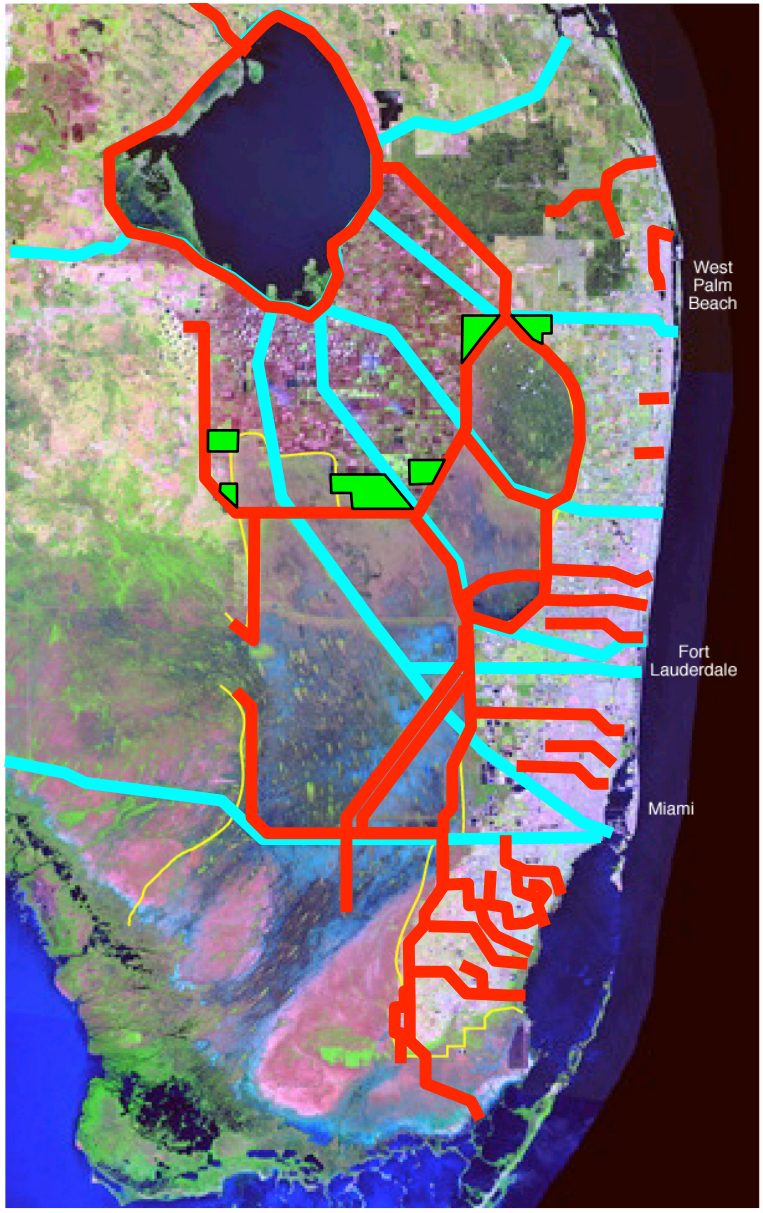
Annual Rainfall averages 52” and varies historically from less than 40” to over 78”

The Entire Region Flooded in 1947, 1950 & 1951





Chronology of Water Management Changes



Managed System (2003)

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

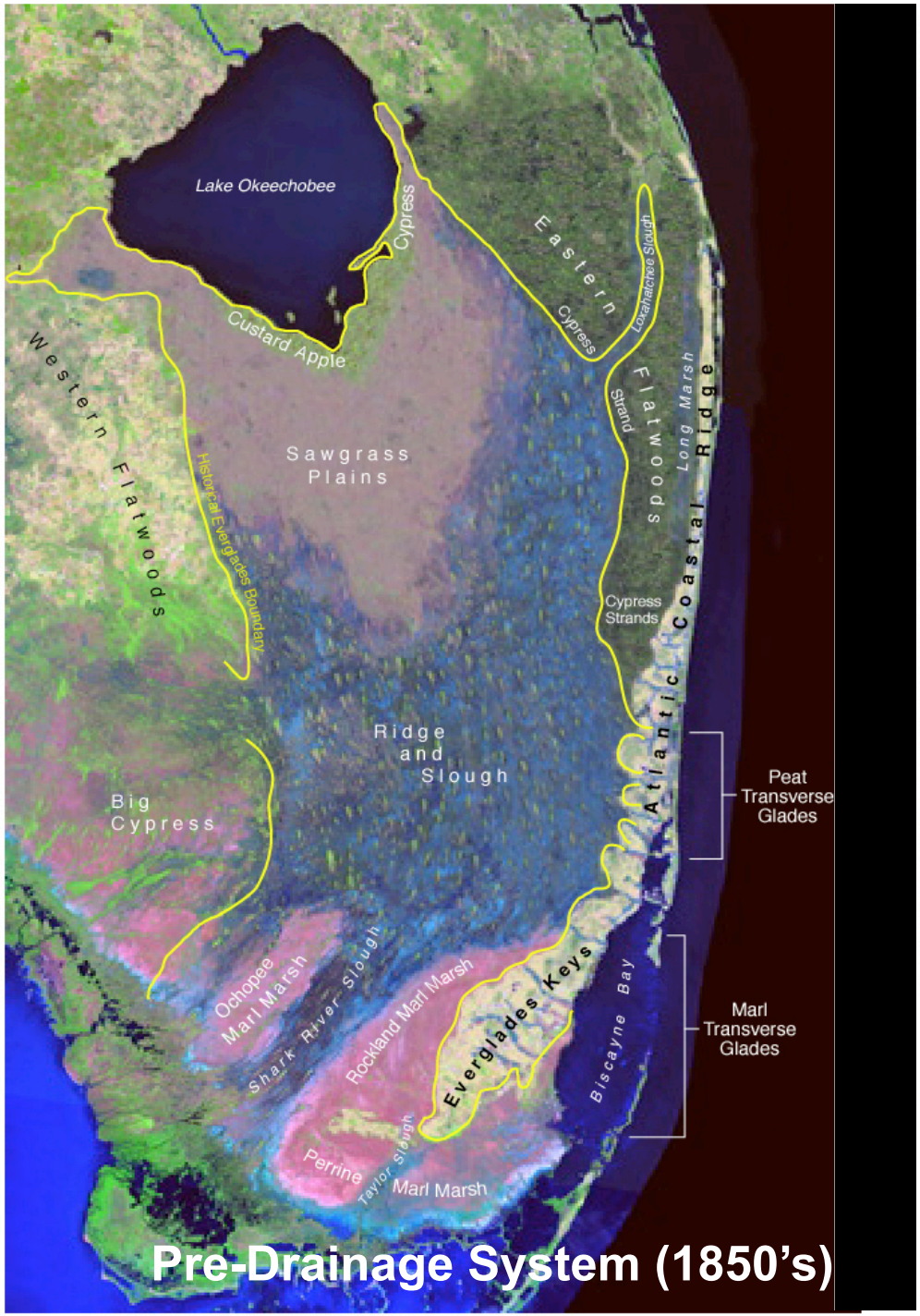
Central & Southern Florida Project

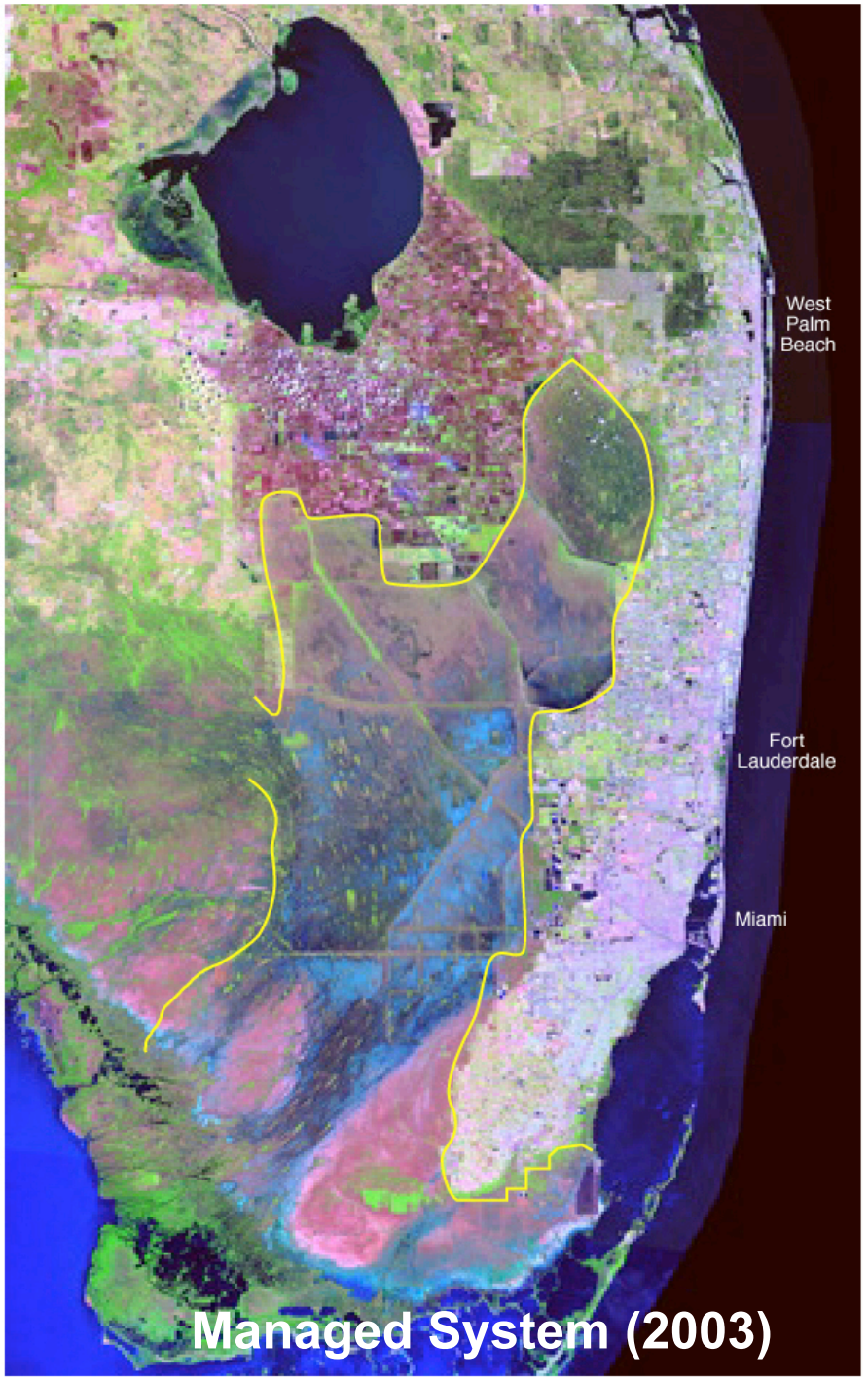
- Eastern Protective Levee System – 1952-54
- Everglades Agricultural Area – 1954-59
- Water Conservation Area Levees – 1960-63
- Lower East Coast Canals – 1954-65
- Lake Okeechobee Levees – 1960-64
- Kissimmee River Channelization – 1962-71
- South Dade System – 1965-83

Everglades Construction Project

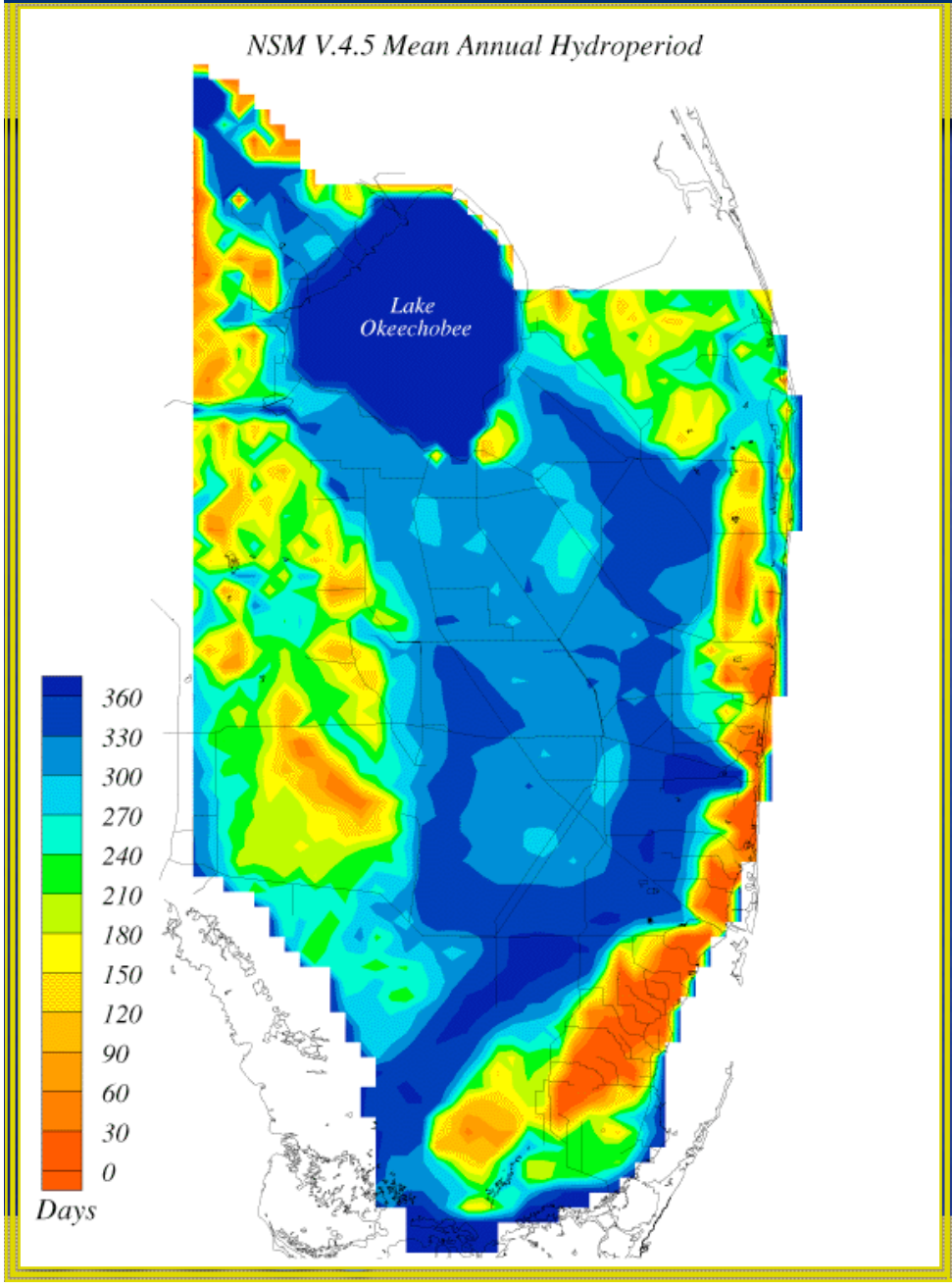
- Stormwater Treatment Areas – 1994-2003

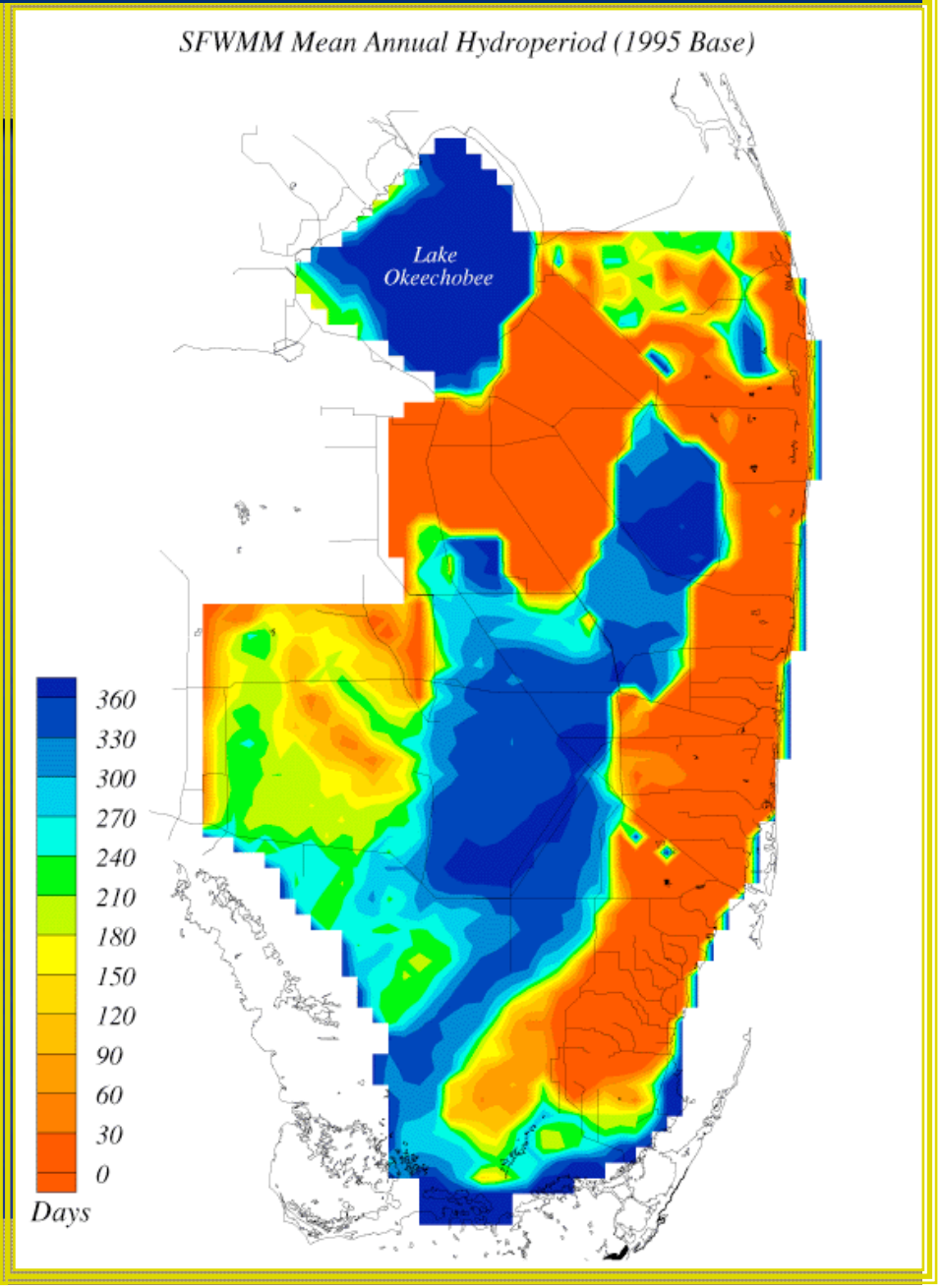
Source: Light and Dineen, 1994; SFWMD & USACE, 2008


Lake Okeechobee
Cypress
Eastern Cypress
Loxahatchee Slough
Custard Apple
Western Flatwoods
Historical Everglades Boundary
Sawgrass Plains
Strand
Flatwoods
Long Marsh
Atlantic Coastal Ridge
Cypress Strands
Ridge and Slough
Big Cypress
Peat Transverse Glades
Ochopee Marl Marsh
Shark River Slough
Rockland Marl Marsh
Everglades Keys
Biscayne Bay
Marl Transverse Glades
Perrine
Taylor Slough
Marl Marsh
Pre-Drainage System (1850's)

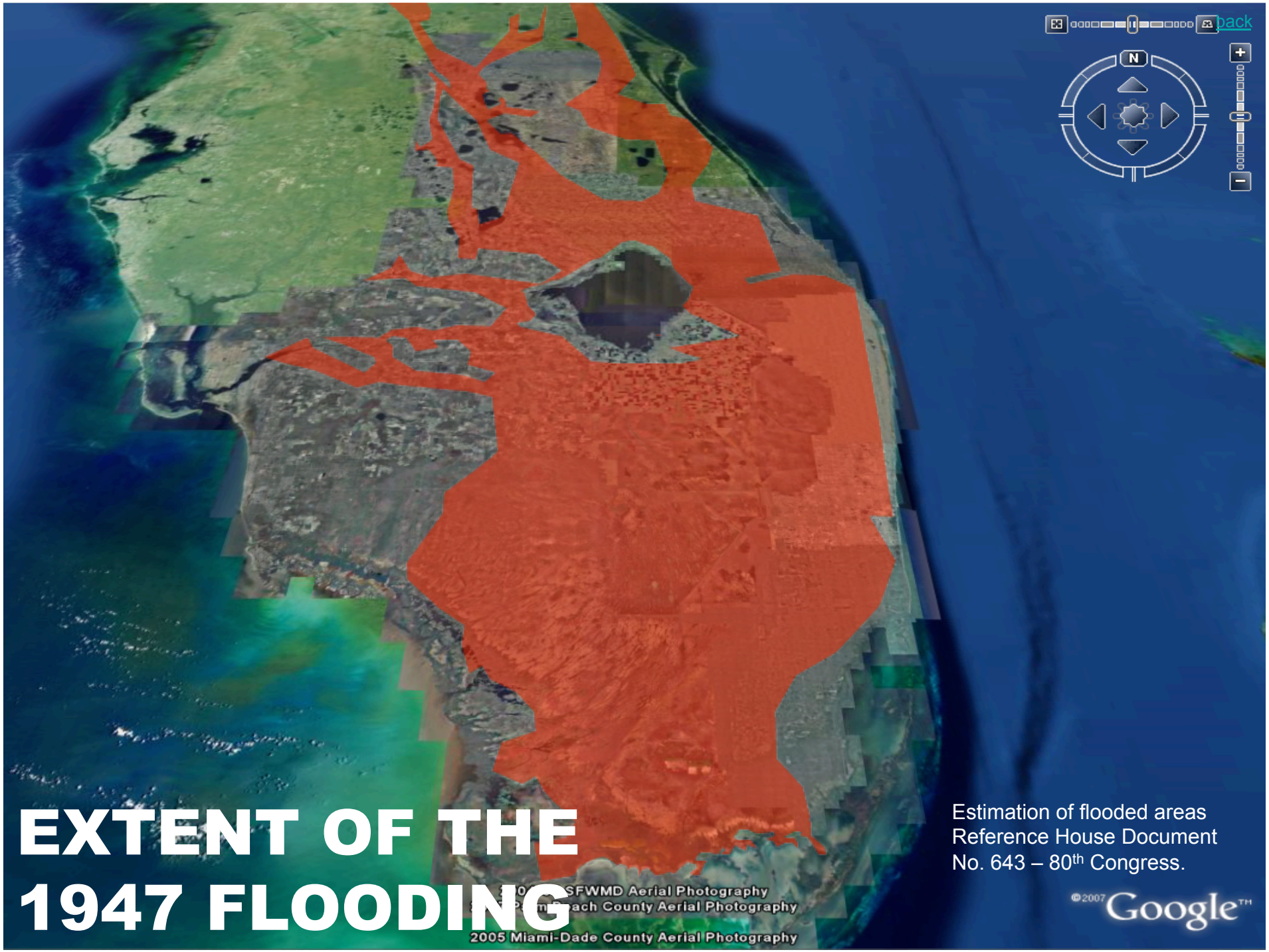

West Palm Beach
Fort Lauderdale
Miami
Managed System (2003)

Natural vs. Altered Hydroperiod Patterns



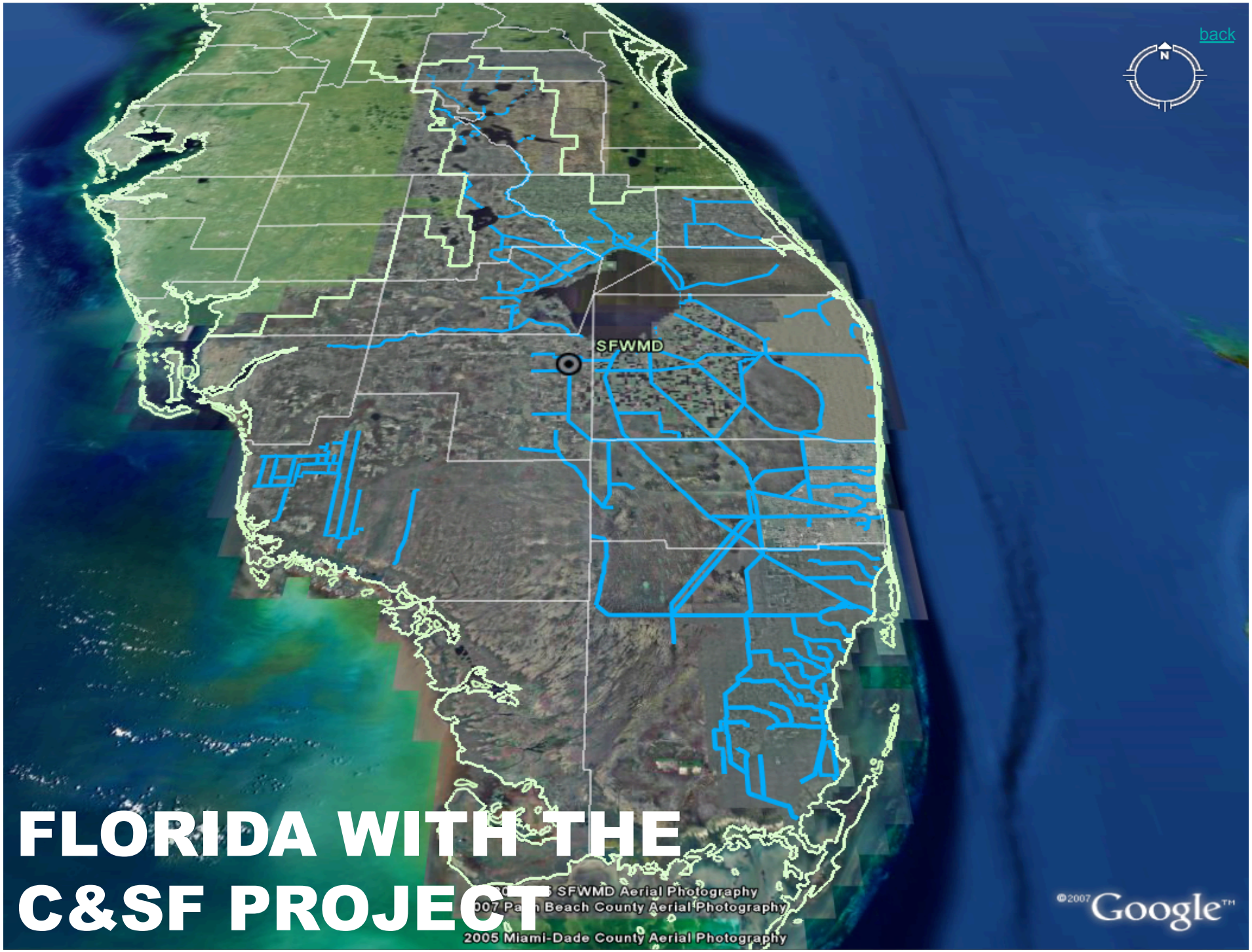


FLORIDA WITHOUT THE C&SF PROJECT



EXTENT OF THE 1947 FLOODING

Estimation of flooded areas
Reference House Document
No. 643 – 80th Congress.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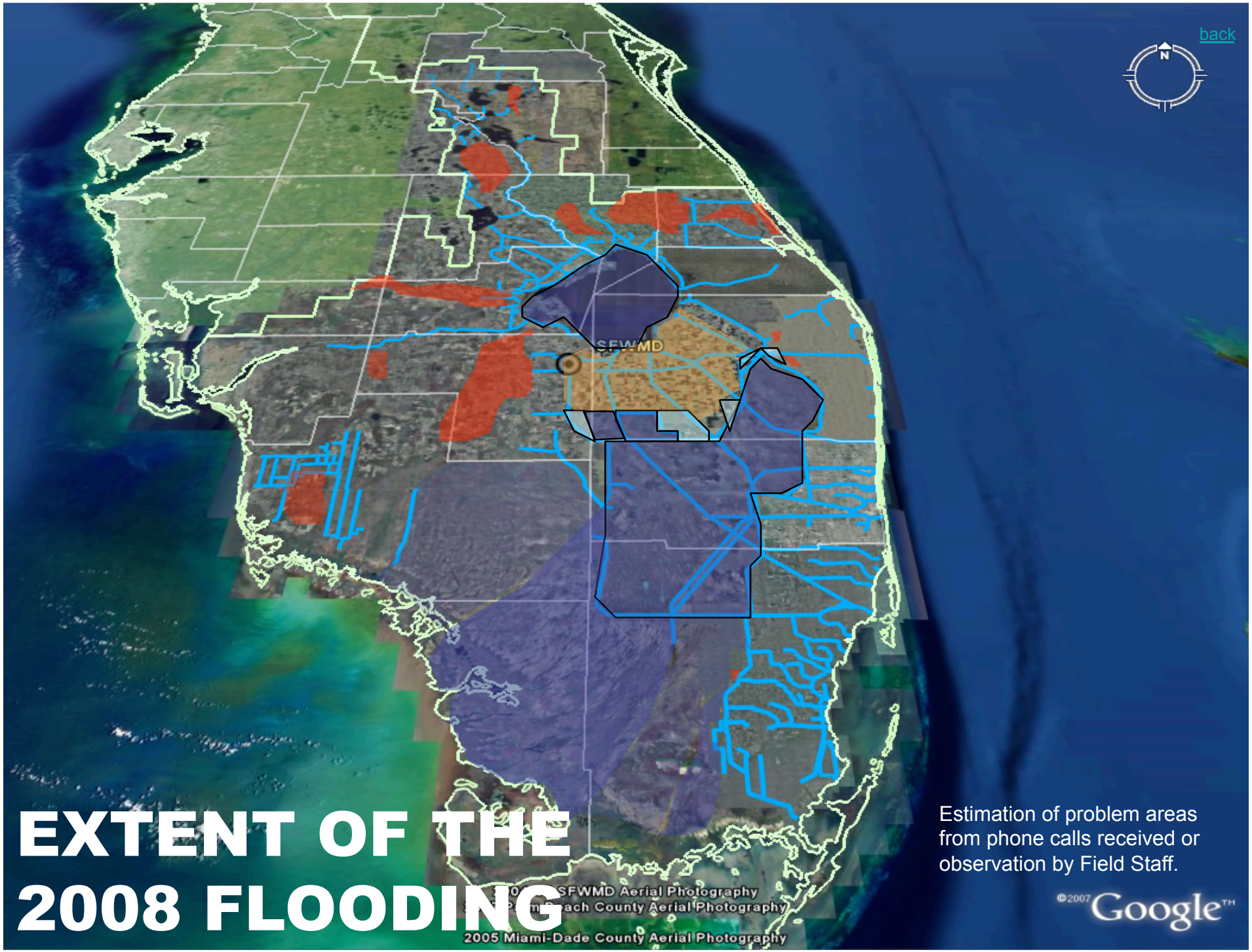
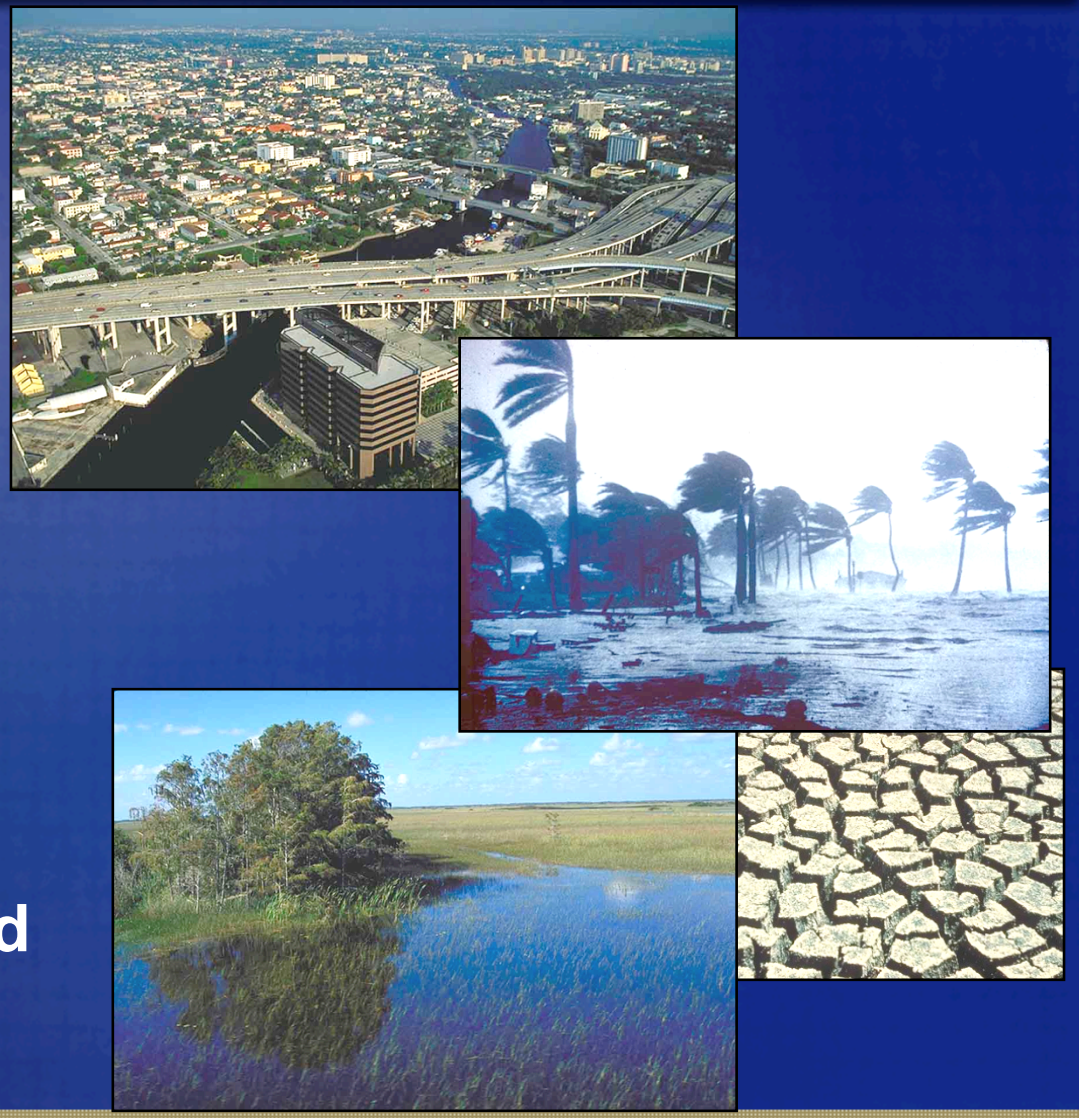
SFWMD
FLORIDA WITH THE C&SF PROJECT
SFWMD Aerial Photography
Beach County Aerial Photography
2005 Miami-Dade County Aerial Photography
©2007 Google™


back
SFWMD
EXTENT OF THE
2008 FLOODING
Estimation of problem areas
from phone calls received or
observation by Field Staff.
SFWMD Aerial Photography
2005 Miami-Dade County Aerial Photography
©2007 Google™

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

Know the Flow Animation

How does the SFWMD manage the system?

FIELD INFRASTRUCTURE (WMFS) + **INFORMATION MANAGEMENT (WMIS)** x **INFORMATION TECHNOLOGY (ITD)** = **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

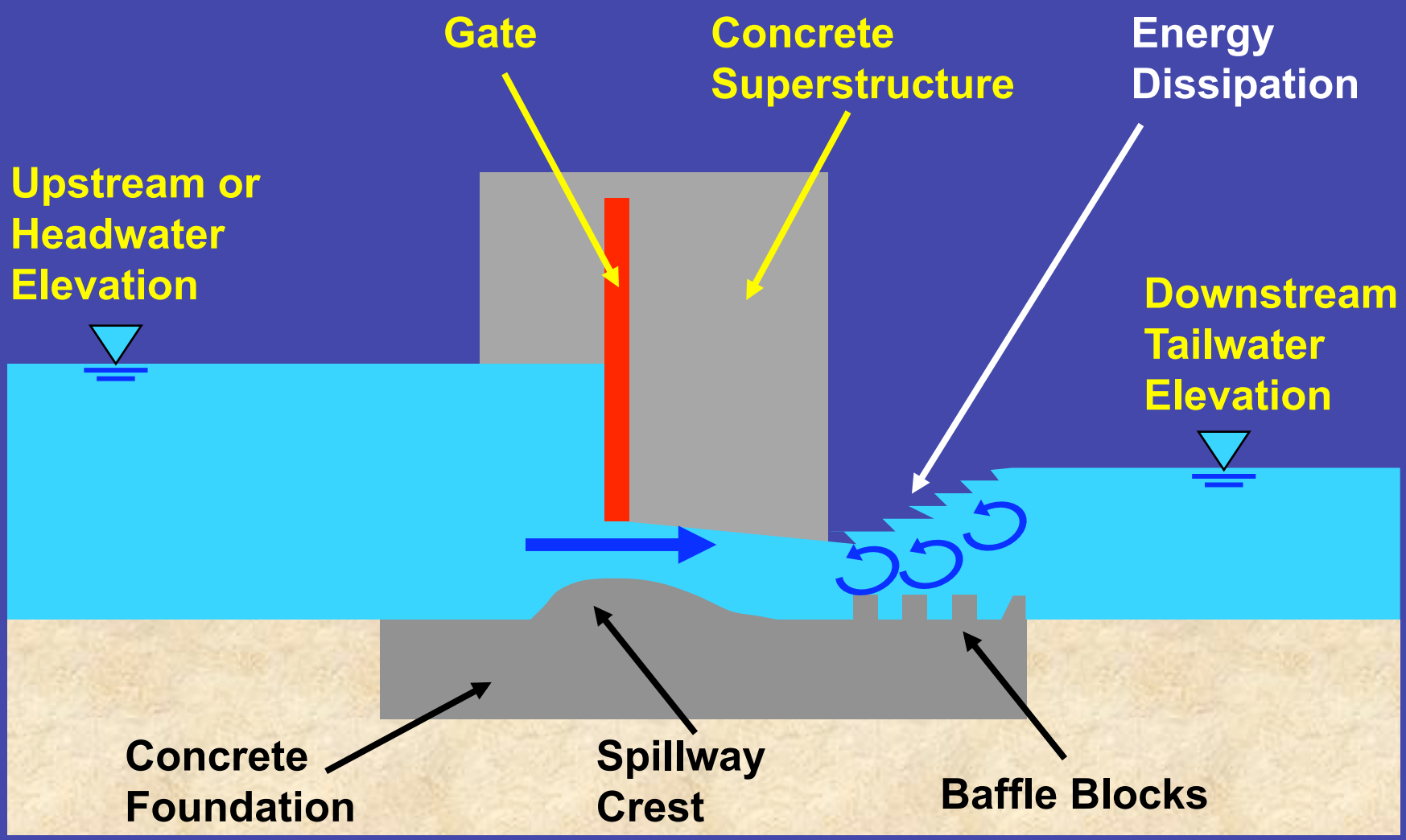
ModComp to Telvent conversion
Operation Decision Support System (ODSS)

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

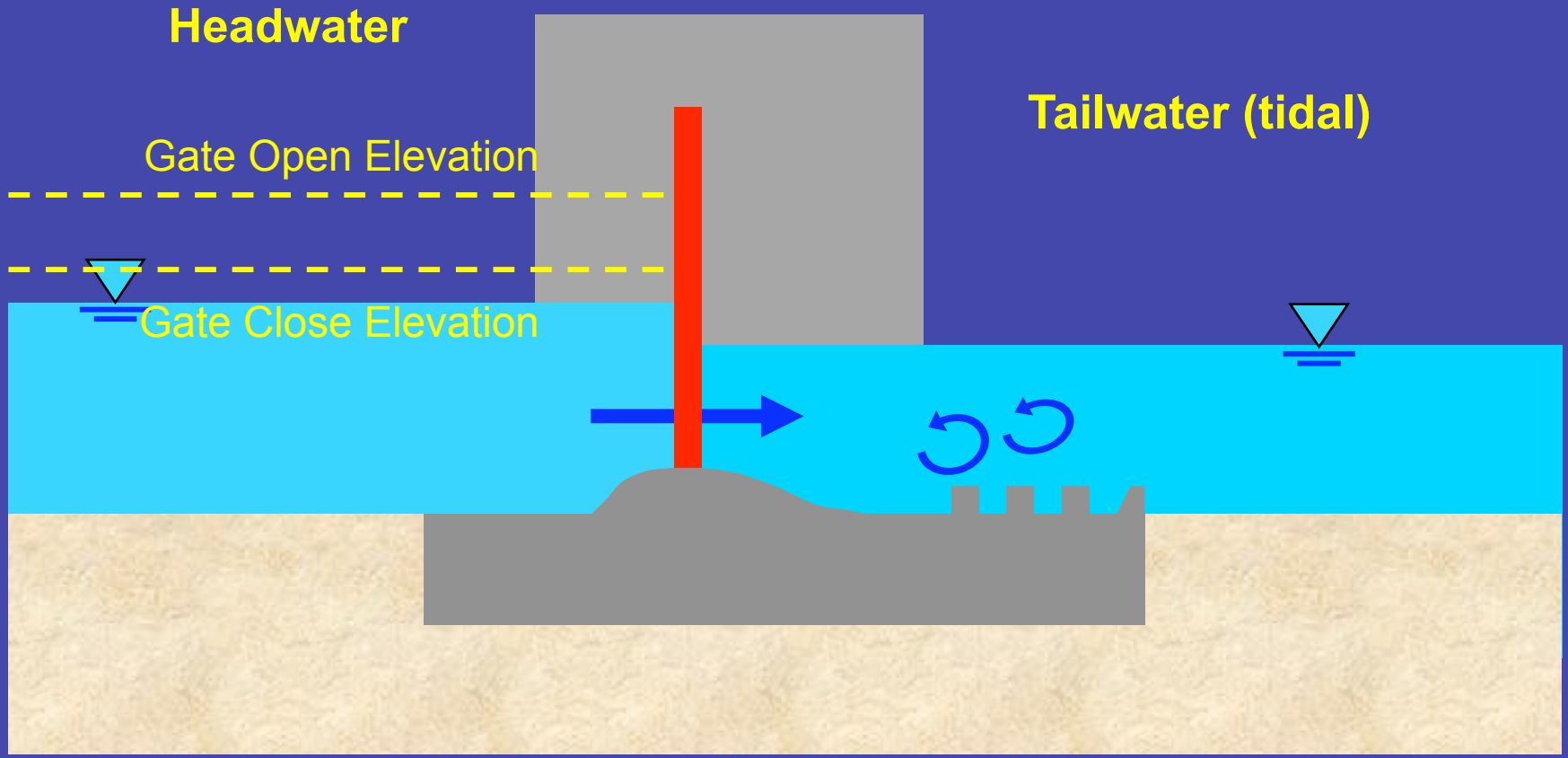
Gated Spillway Basics



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Gated Spillway

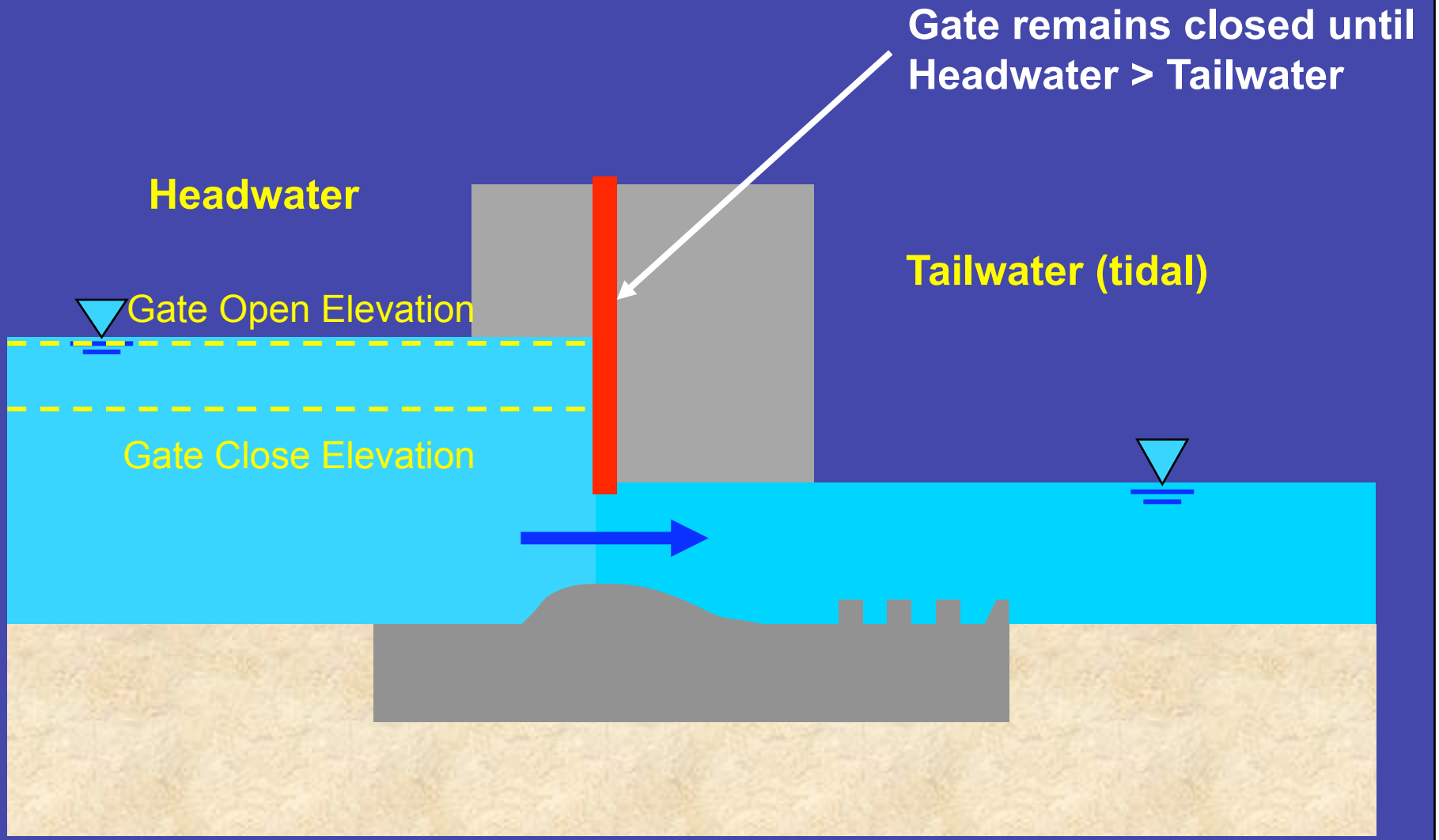
(coastal structures)



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Gated Spillway

(coastal structures)



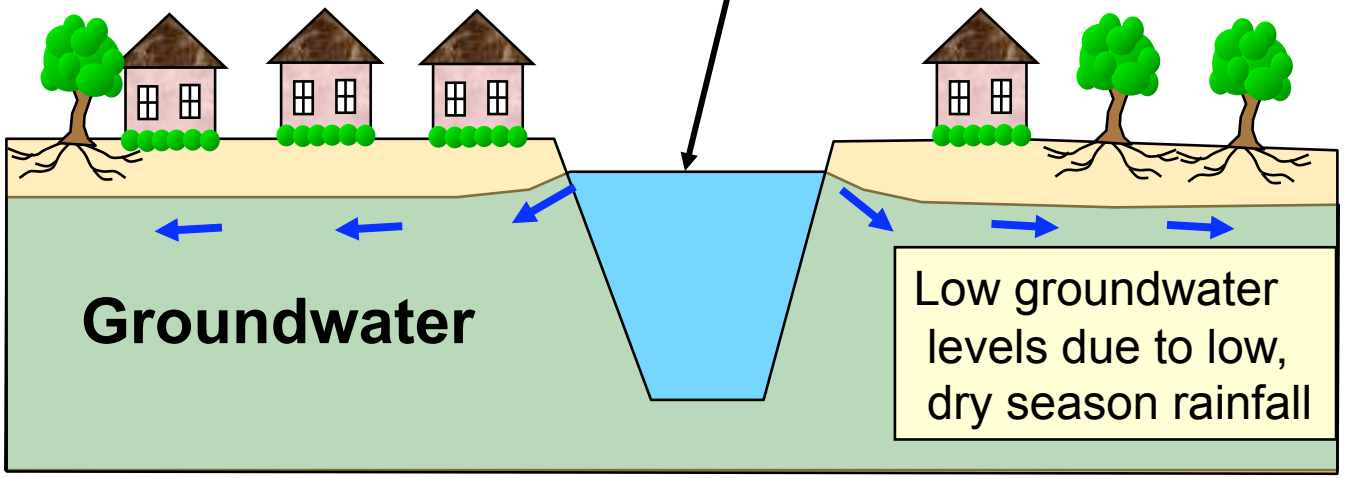
Canal / Groundwater Interaction

Normal Dry Season Operations

Canals serve two primary purposes….

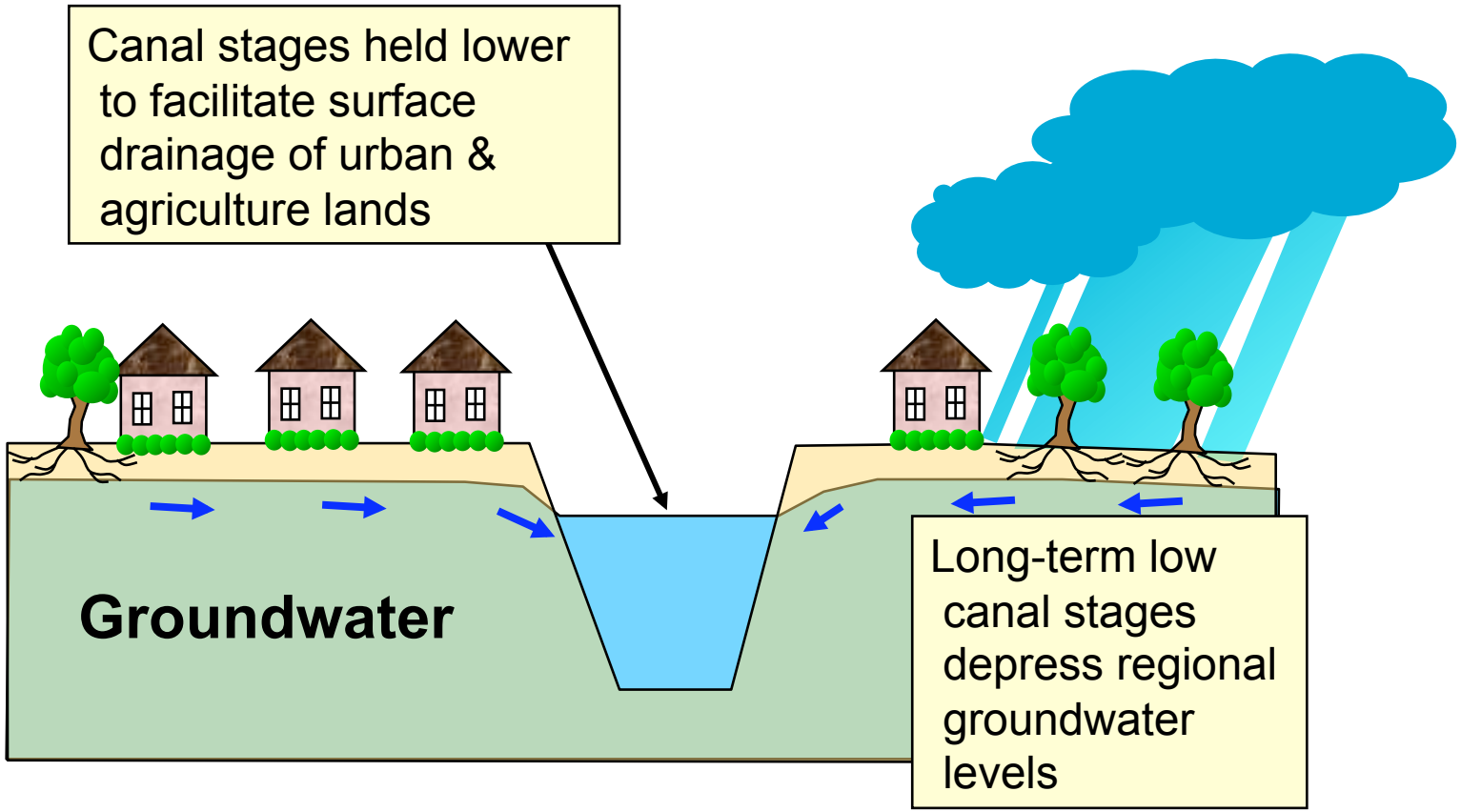
1. **Flood Control**
2. **Water Supply**

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



Canal / Groundwater Interaction

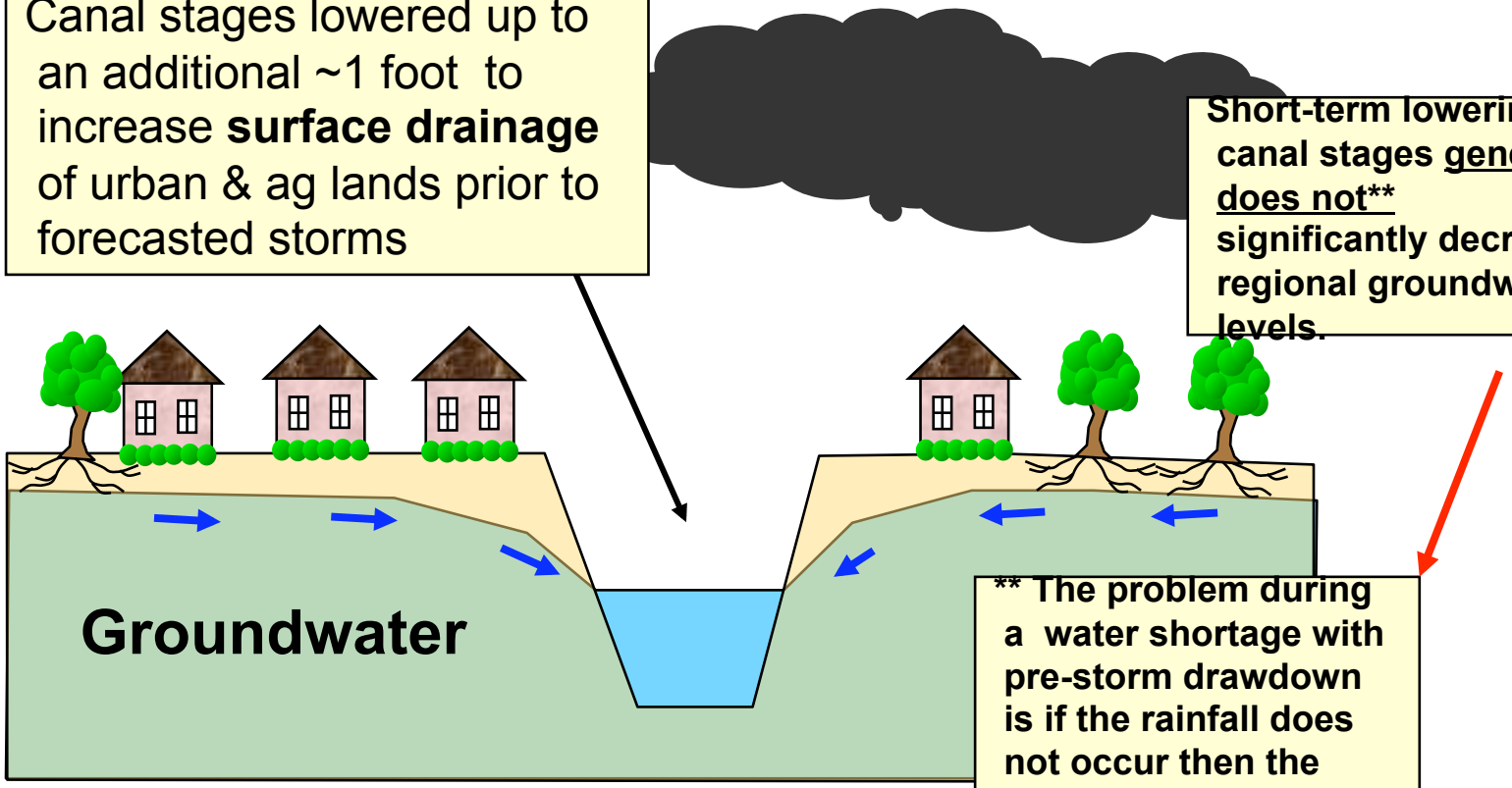
Normal Wet Season Operations



Canal / Groundwater Interaction

Wet Season Pre-Storm Drawdown Operations

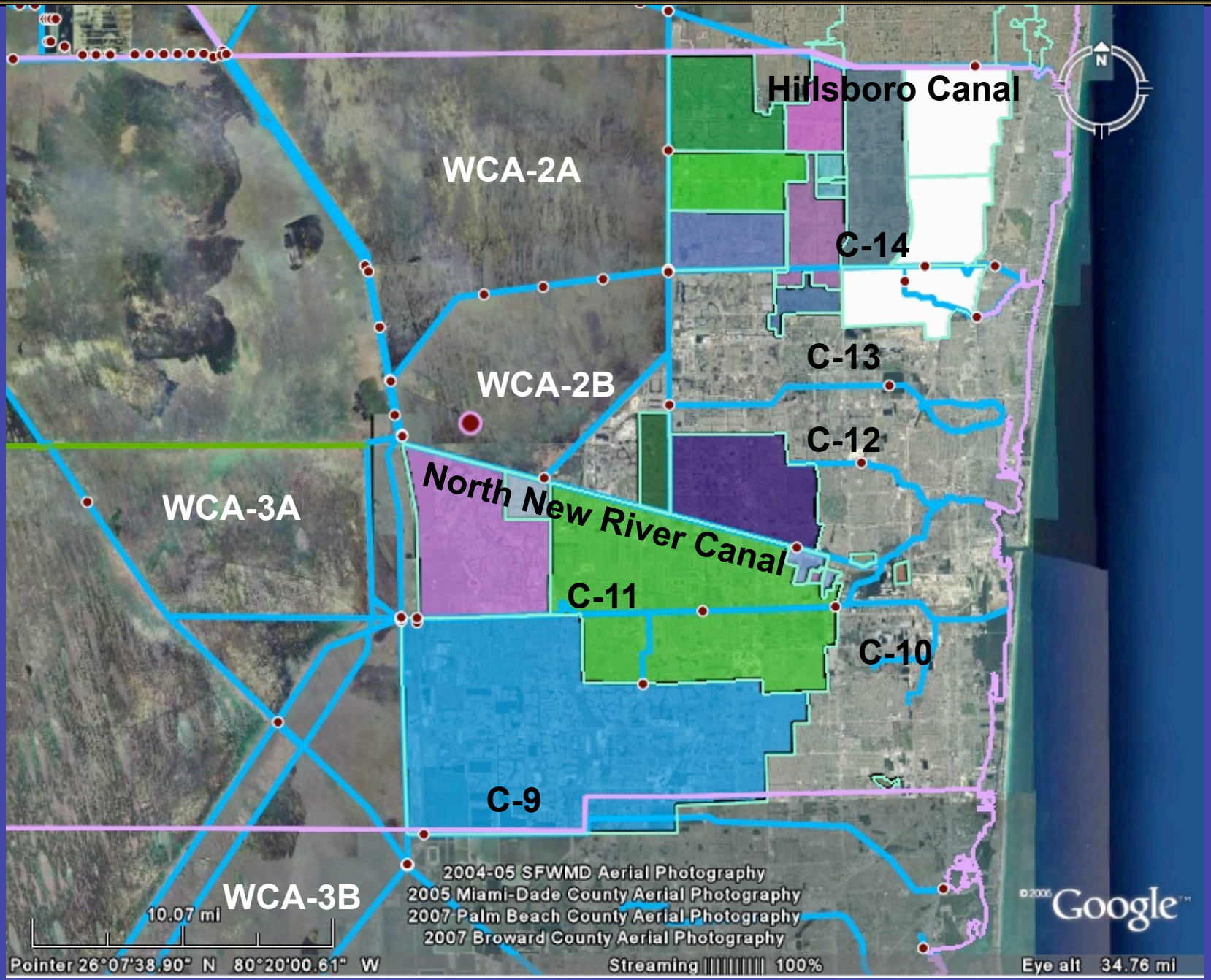
Canal stages lowered up to an additional ~1 foot to increase **surface drainage** of urban & ag lands prior to forecasted storms

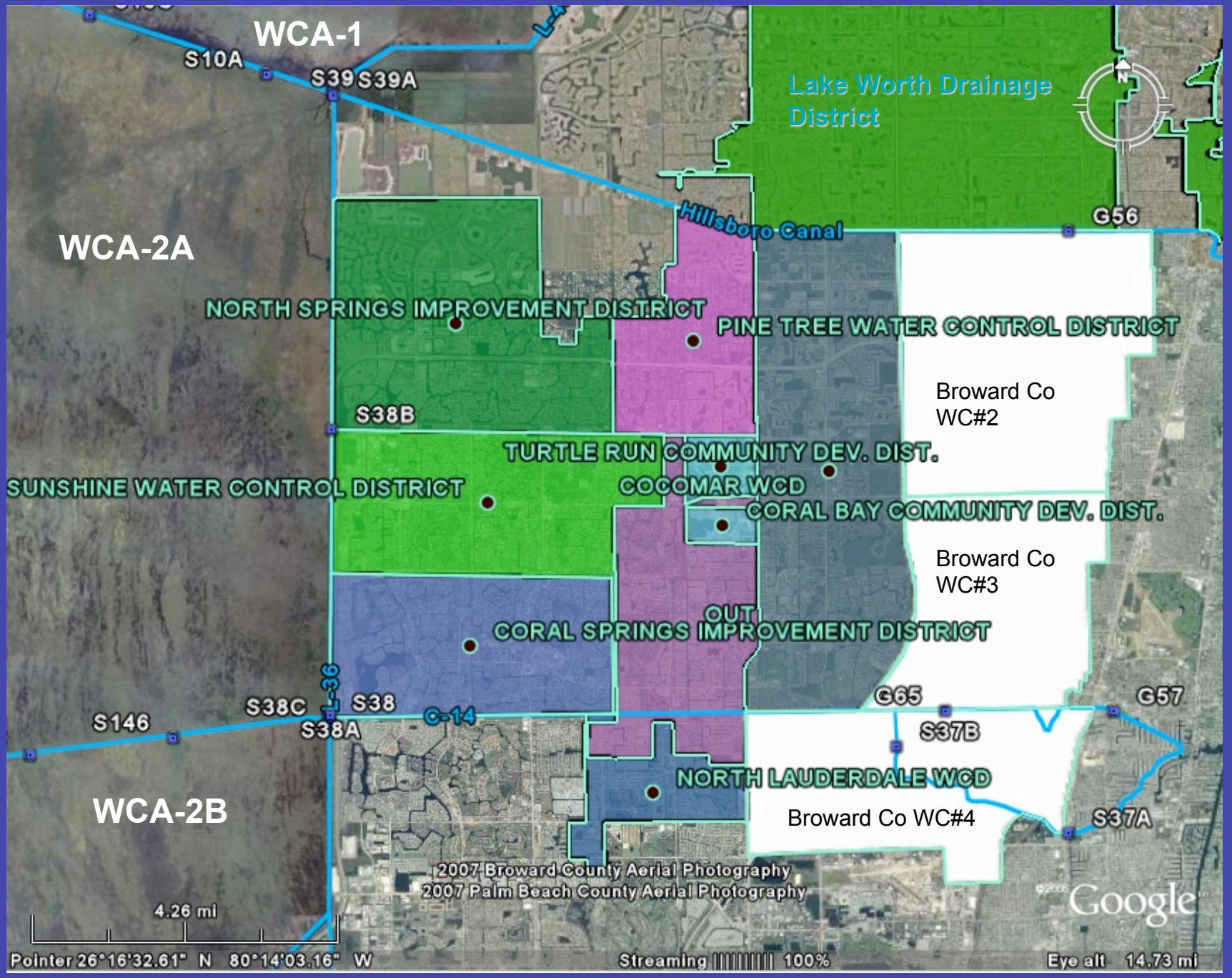


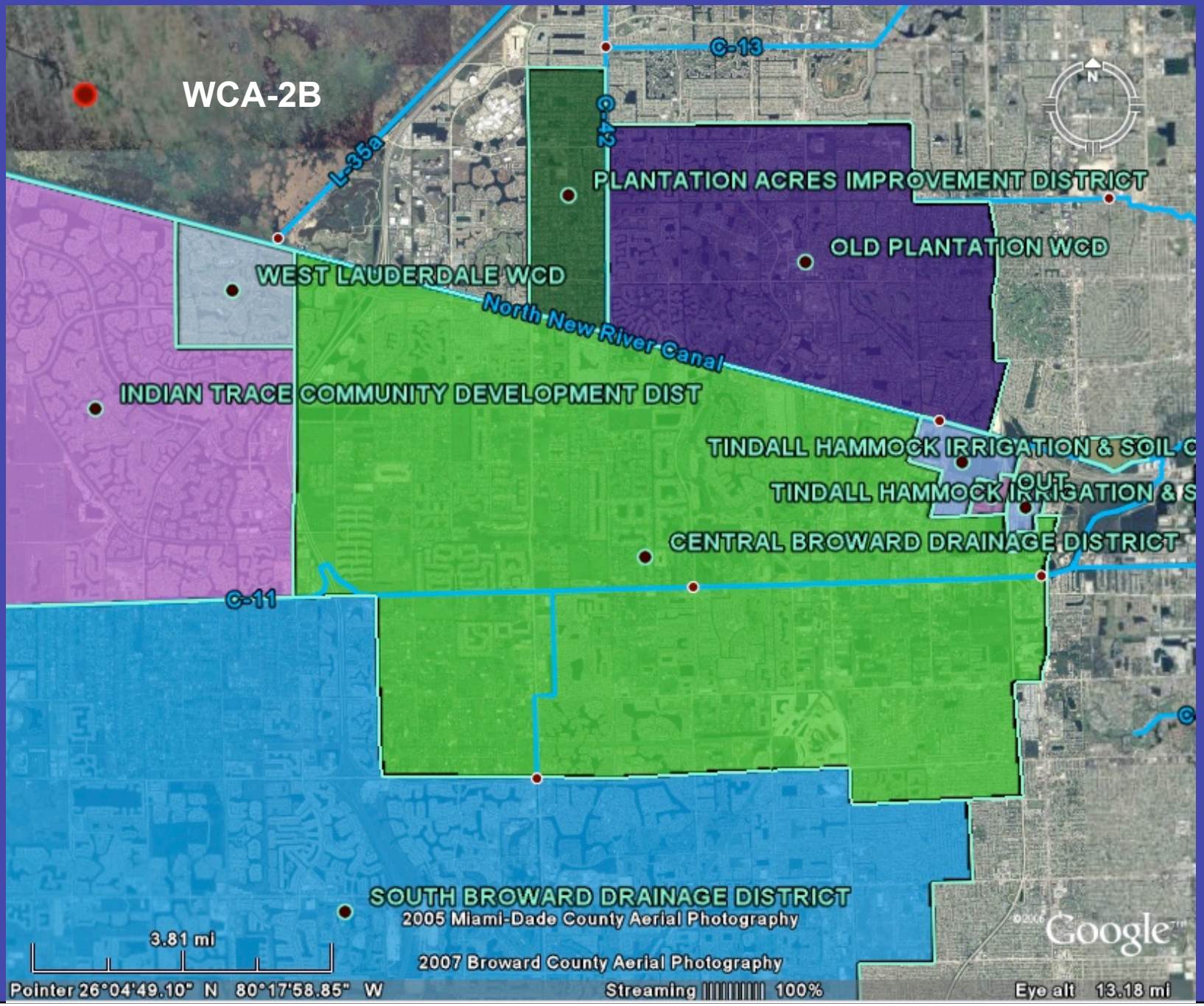
Short-term lowering of canal stages <u>generally does not</u> significantly decrease regional groundwater levels.**

**** 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.**

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



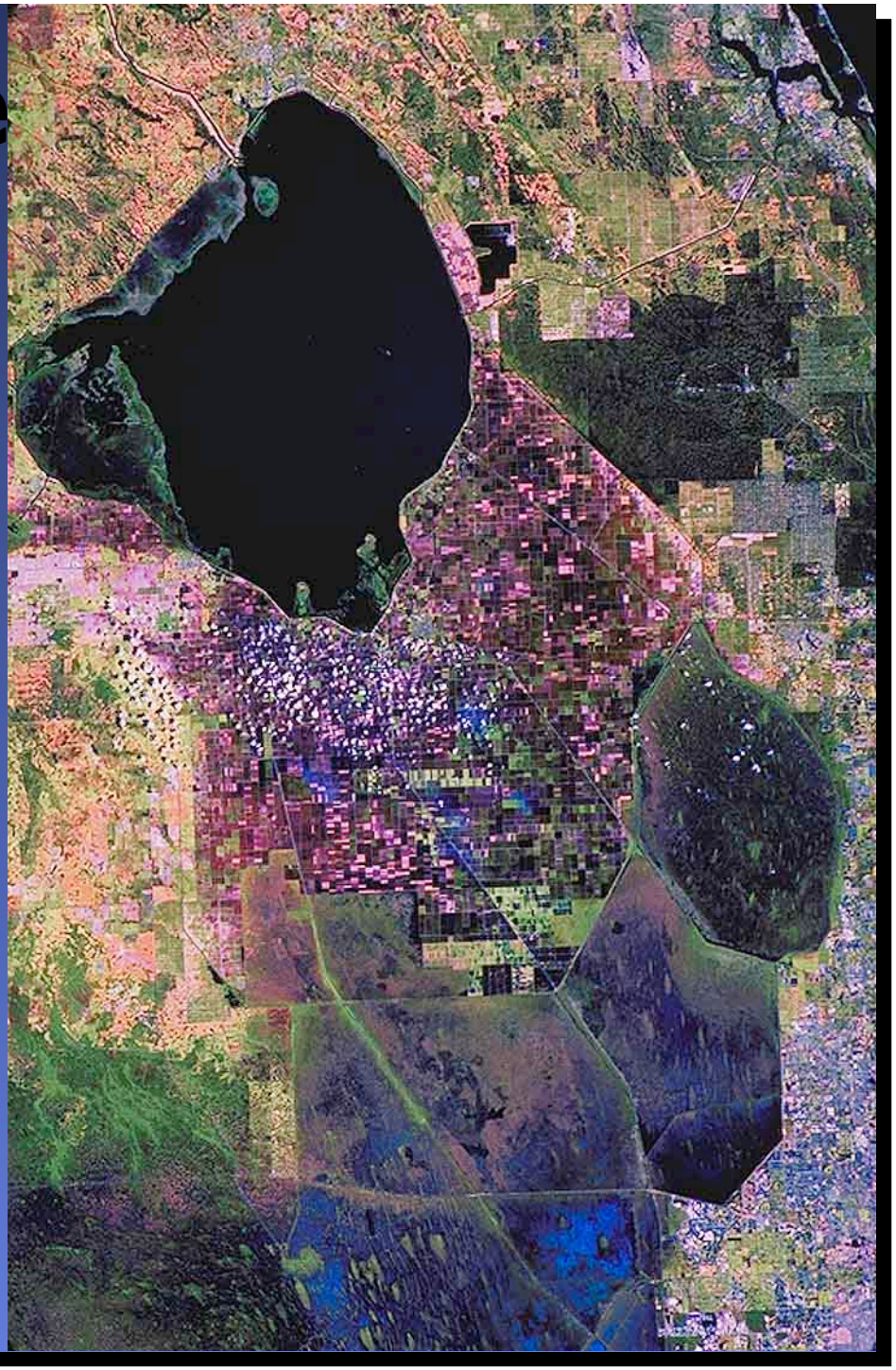

WCA-1
S10A
S39
S39A
L-4
Lake Worth Drainage District
Hillsboro Canal
G56
WCA-2A
NORTH SPRINGS IMPROVEMENT DISTRICT
PINE TREE WATER CONTROL DISTRICT
Broward Co WC#2
S38B
TURTLE RUN COMMUNITY DEV. DIST.
SUNSHINE WATER CONTROL DISTRICT
COCOMAR WCD
CORAL BAY COMMUNITY DEV. DIST.
Broward Co WC#3
OUT
CORAL SPRINGS IMPROVEMENT DISTRICT
L-36
S38C
S38
S38A
C-14
S146
G65
G57
S37B
NORTH LAUDERDALE WCD
WCA-2B
Broward Co WC#4
S37A
2007 Broward County Aerial Photography
2007 Palm Beach County Aerial Photography
4.26 mi
Pointer 26°16'32.61" N 80°14'03.16" W
Streaming 100%
Eye alt 14.73 mi
Google


WCA-2B
C-13
L-35a
C-12
PLANTATION ACRES IMPROVEMENT DISTRICT
OLD PLANTATION WCD
WEST LAUDERDALE WCD
North New River Canal
INDIAN TRACE COMMUNITY DEVELOPMENT DIST
TINDALL HAMMOCK IRRIGATION & SOIL C
TINDALL HAMMOCK IRRIGATION & S
OUT
CENTRAL BROWARD DRAINAGE DISTRICT
C-11
SOUTH BROWARD DRAINAGE DISTRICT
2005 Miami-Dade County Aerial Photography
2007 Broward County Aerial Photography
3.81 mi
Pointer 26°04'49.10" N 80°17'58.85" W
Streaming 100%
Eye alt 13.18 mi
Google

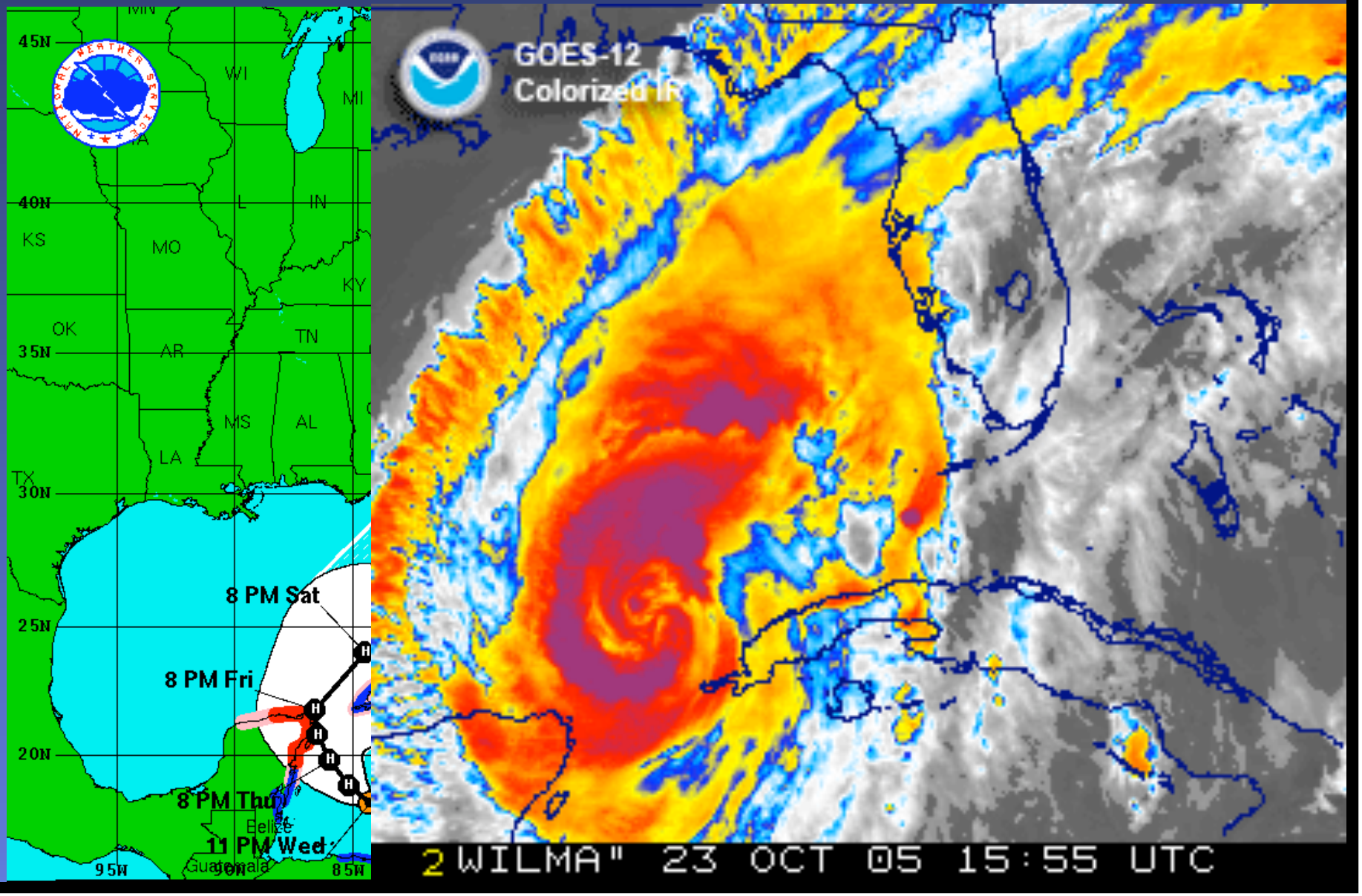
Current Water Management Challenges

Lake Okeechobee

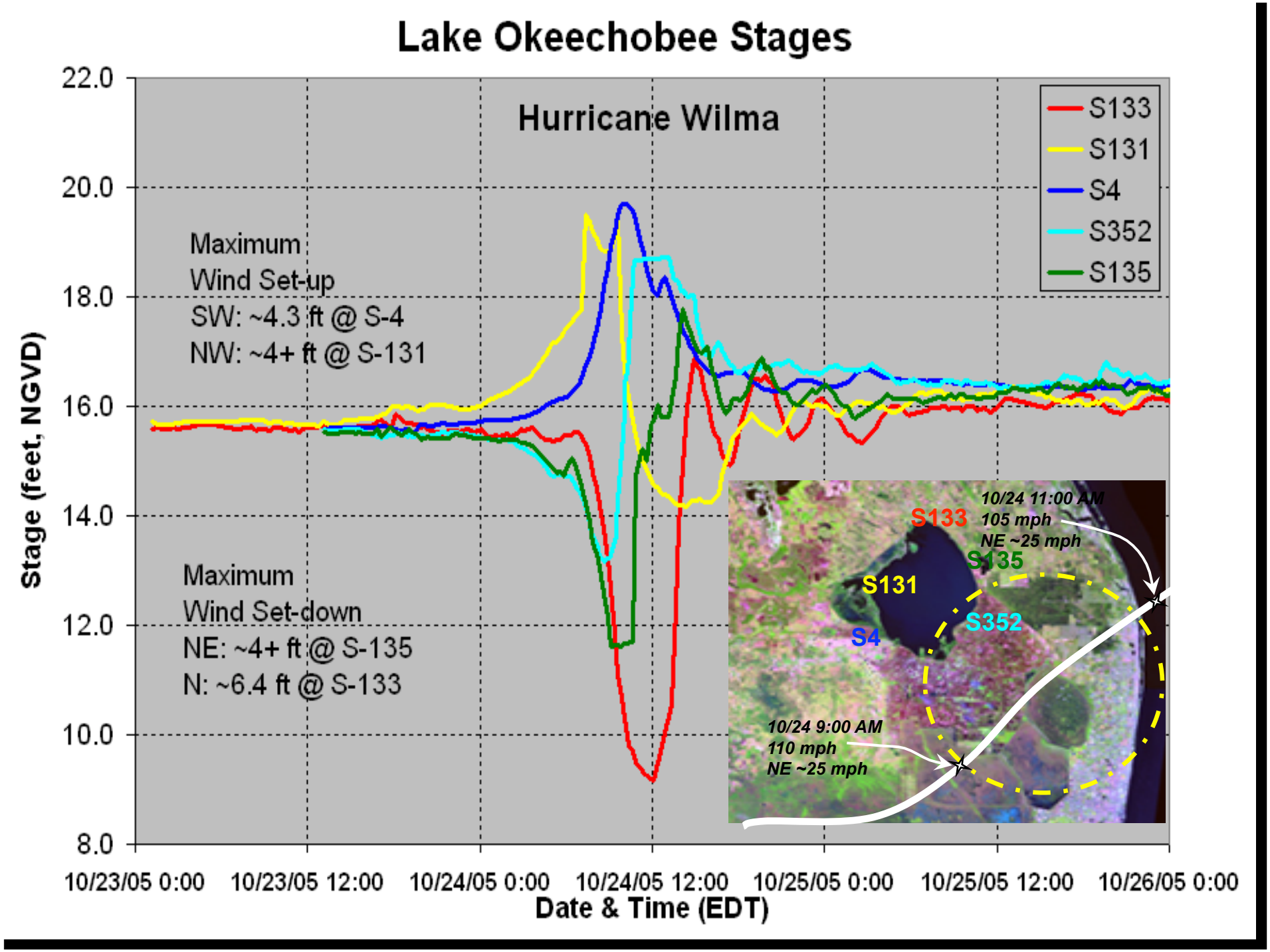
- 730 square miles, with a contributing basin of over 5,000 sq. miles
- Poor water quality inflows (phosphorus)
- HH Dike Rehabilitation
- Serves multiple purposes...
  - Water Supply Storage
  - Flood Protection
  - Unique Ecosystem



Hurricane Wilma – October 2005



Lake Okeechobee Stages



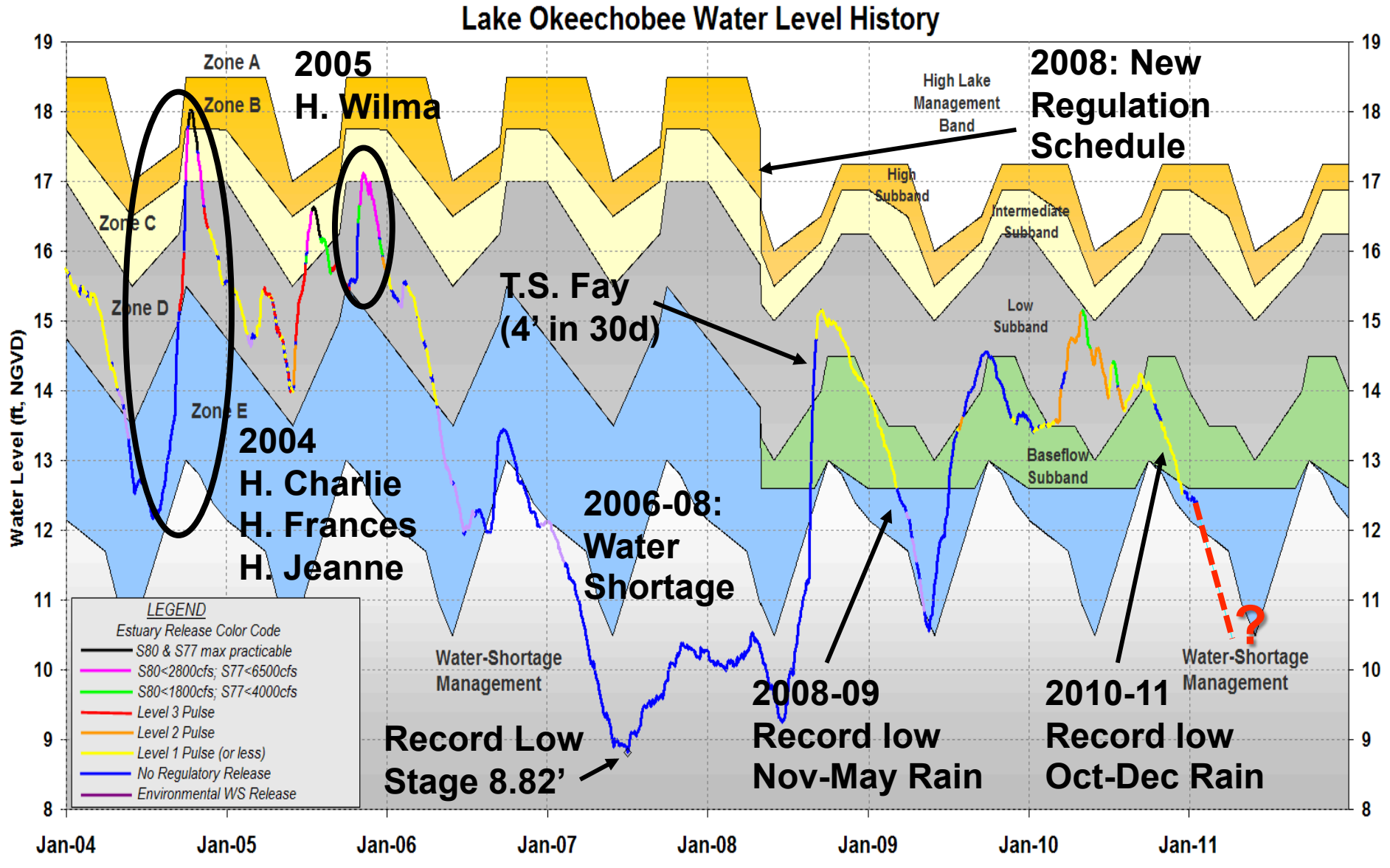
Herbert Hoover Dike
(U.S. Army Corps of Engineers)

Damaging freshwater discharges to St. Lucie & Caloosahatchee Estuaries

- Low salinity
- Sedimentation
- Low light penetration

- Ecosystem Damage
  - Seagrasses
  - Oysters

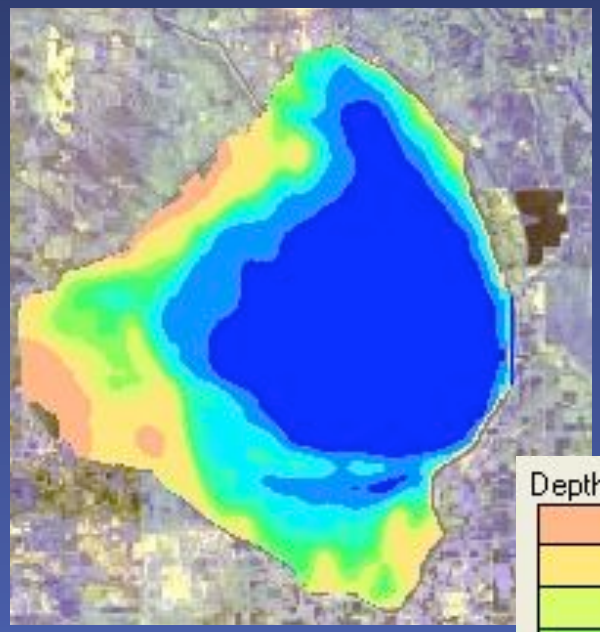
Lake Okeechobee: Either Too Much Water or Not Enough



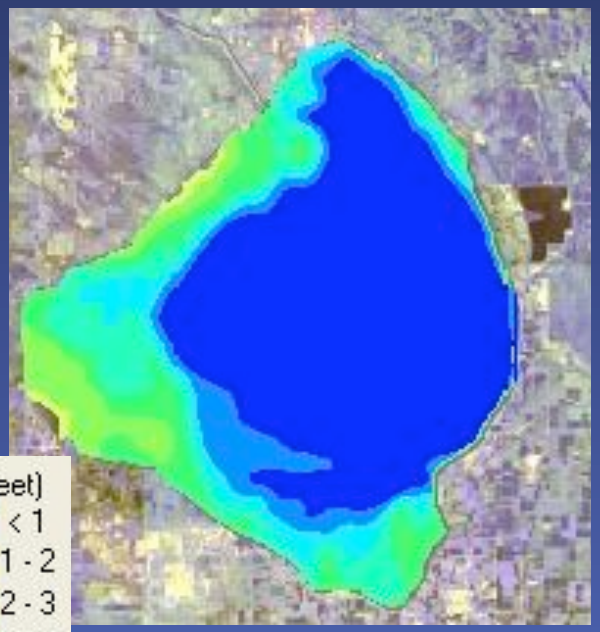
Lake Okeechobee Water Depth Comparison

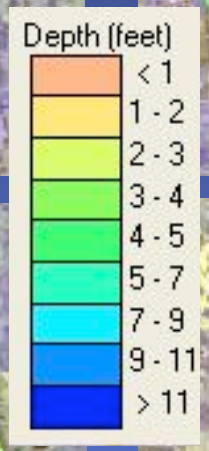
http://spatial1.sfwmd.gov/losac/sfwmd.asp

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

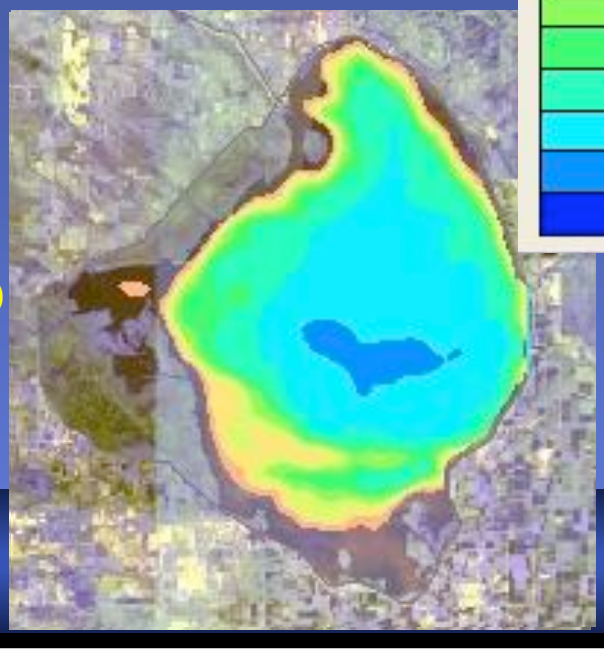


Elevation
17.0 ft, NGVD
H. Wilma
Nov-2005

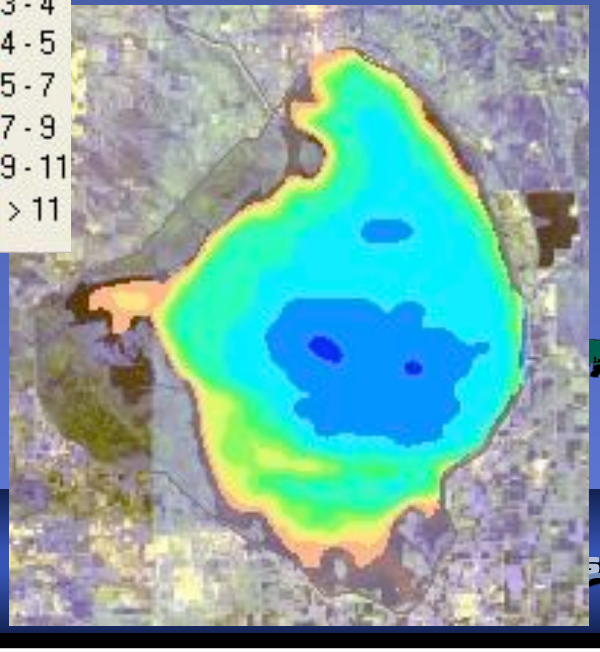




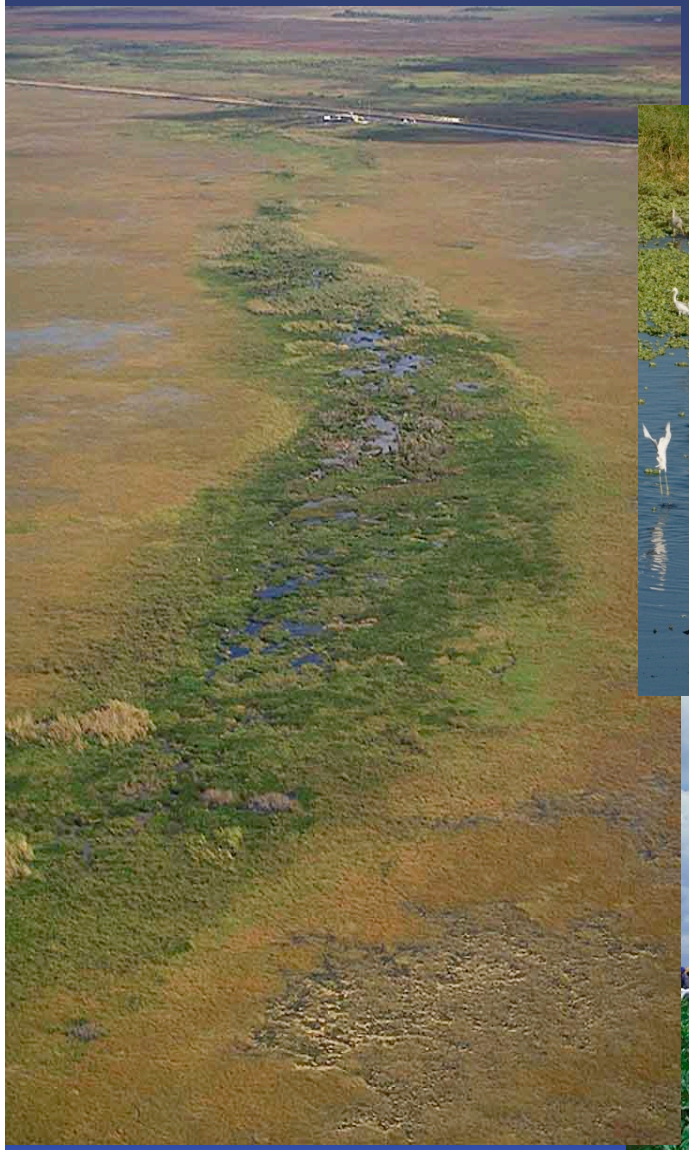
Elevation
8.82 ft, NGVD
Record Low
02-July-2007

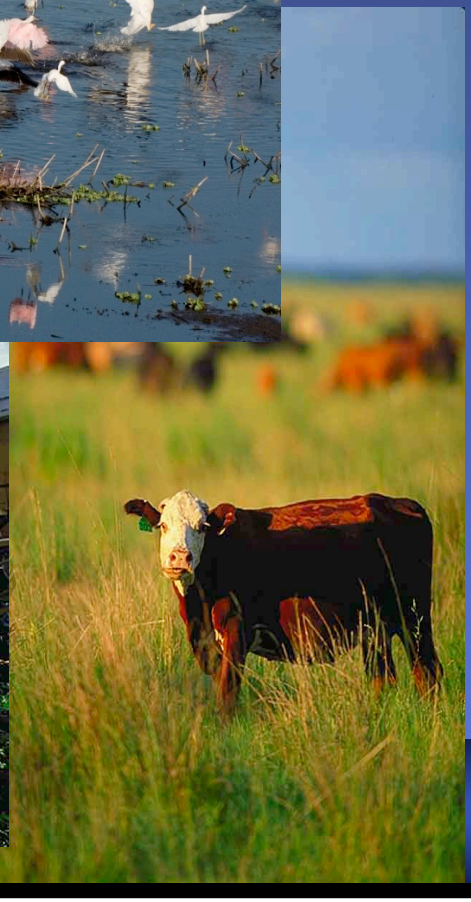


Elevation
10.0 ft, NGVD
Predicted Low
for 2011



Water Management .....





...the challenge is balancing competing & conflicting objectives

Questions?