SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Water Management and the Nature of Canals In South Florida

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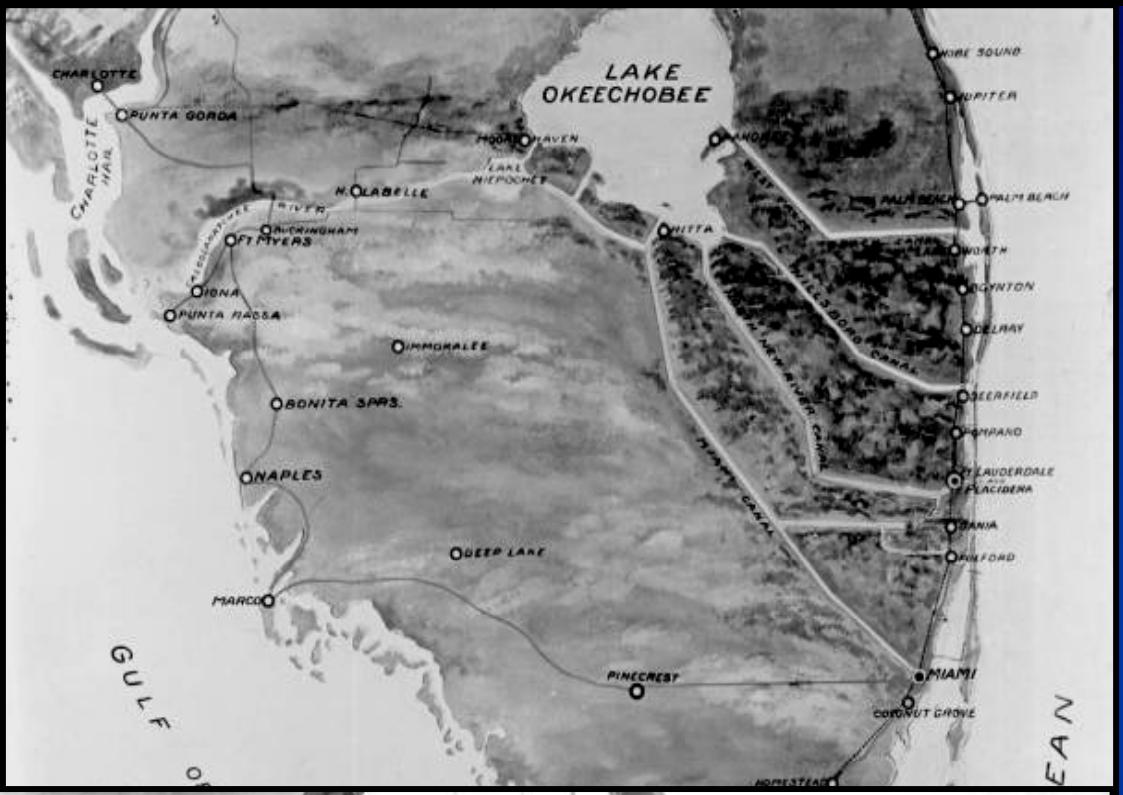
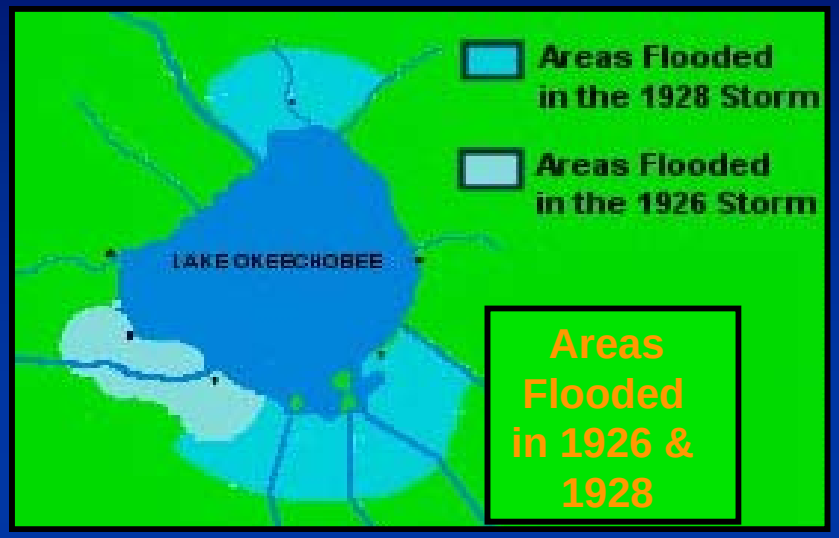
- PURPOSE: To provide the Scientific Advisory Board with facts on water management and canal science as a precedent to the review of approaches to setting nutrient criteria for canals:
  - Tom Teets will provide a brief overview and history of water management
  - Garth Redfield will summarize information on the basic ecology of canals and what little is known on the role of nutrients



South Florida History

- By 1917, four primary canals had been dug from Lake Okeechobee to the Atlantic:
  - *West Palm Beach Canal*
  - *Hillsboro Canal*
  - *North New River Canal*
  - *Miami Canal*
- By 1940, the lake was diked and opened to the Gulf and Atlantic:
  - The watershed was altered fundamentally and canals became the backbone of water movement and control

Historic Problems for Water Management



- Flood Control:
  - 1926/1928: Lake Okeechobee levee failed
  - 1947: Hurricane & regional flooding
- Water Supply:
  - 1931 – 1945: Lower East Coast saltwater intrusion threat identified
- Environmental Impacts:
  - Marshes over-drained in dry years and extensive areas of peat were burned
  - Watershed connections altered

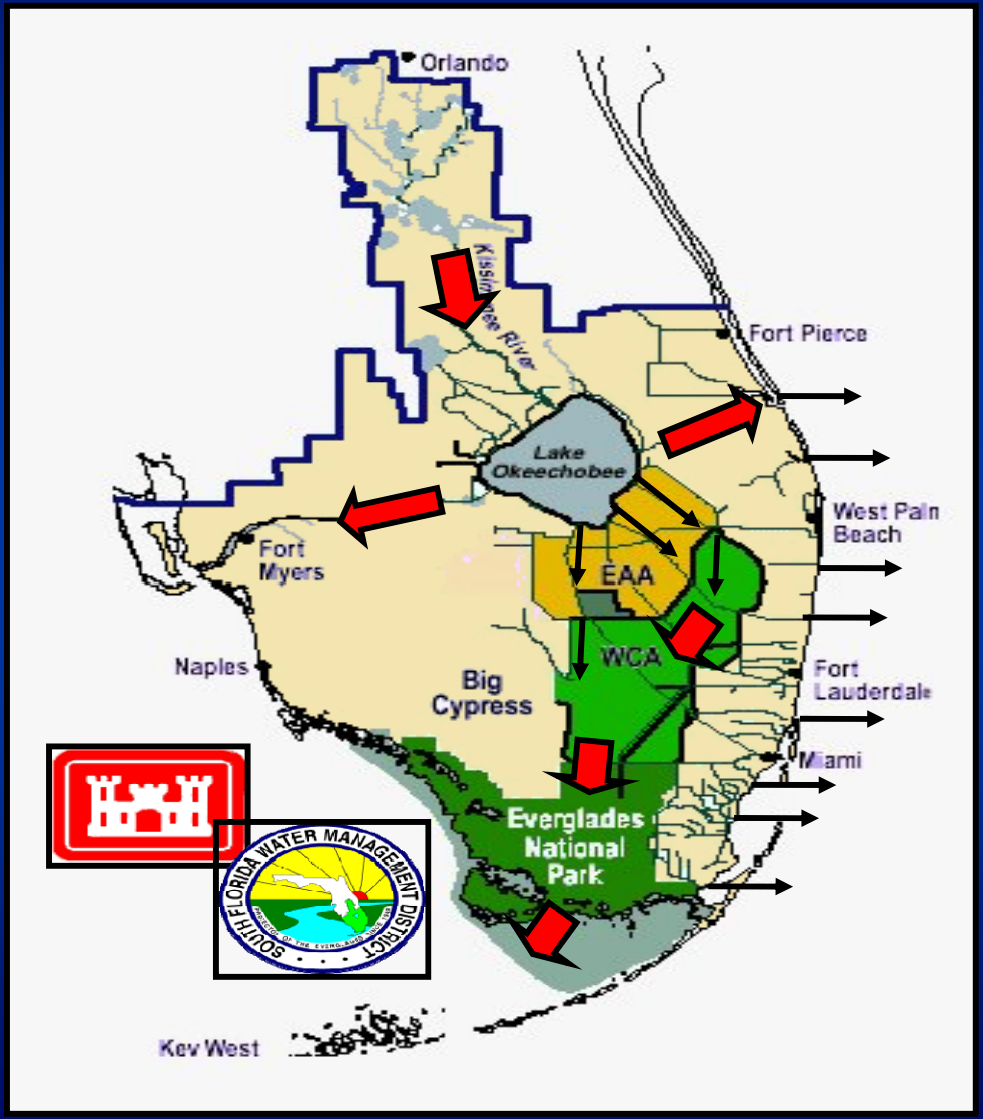
State of Florida requested federal assistance to encircle Lake Okeechobee with a high levee to allow more control of discharges and water levels.

1947 Hurricane Season

State of Florida requested federal assistance to build a regional system to allow better water management.

The Central and Southern Florida Project

- Central and Southern Florida Project for Flood Control and Other Purposes (Project):
  - Authorized in 1948
  - Constructed between 1950s and 1970s
- Operated in accordance with US Army Corps of Engineers (USACE) criteria
- Now the South Florida Water Management District



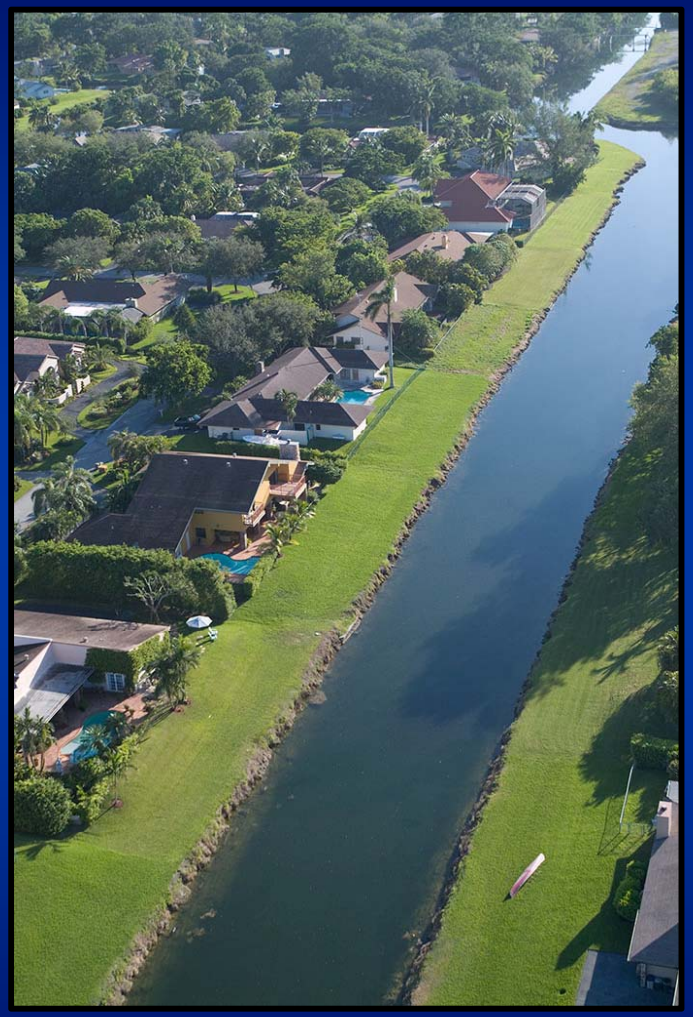
South Florida Water Management District

- The District Provides:
  - Flood Control
  - Water Supply
    - *Agriculture*
    - *Urban*
    - *Water Conservation Areas*
    - *Everglades National Park*
  - Water Quality Controls
  - Navigation
  - Protection of Fish and Wildlife

Water Management Infrastructure

64 pump stations

501 control structures

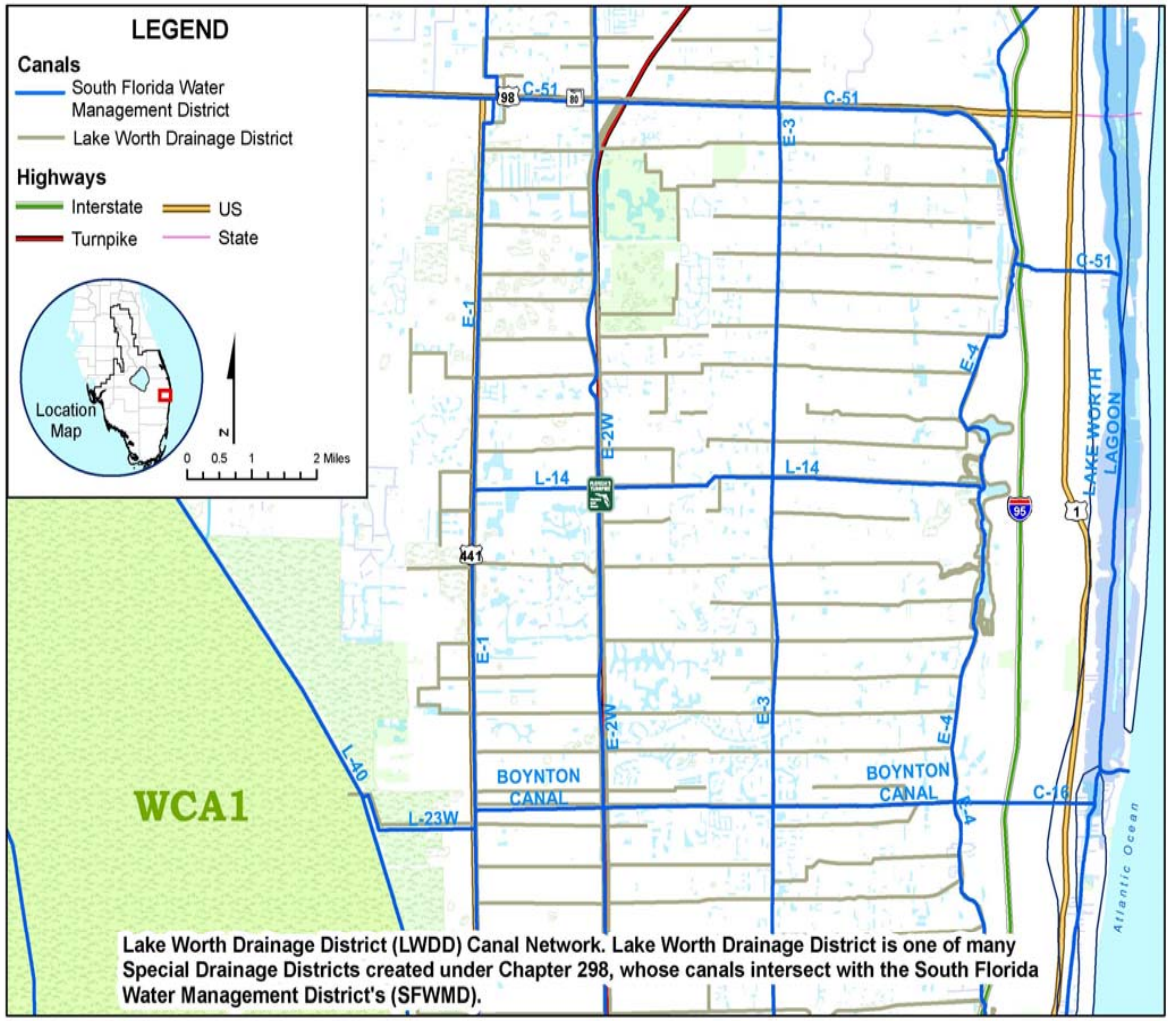


2600 miles of canals

Water Management Infrastructure (cont.)

- Most secondary canals are also subject to criteria

(e.g., Lake Worth Drainage District, in Palm Beach County)

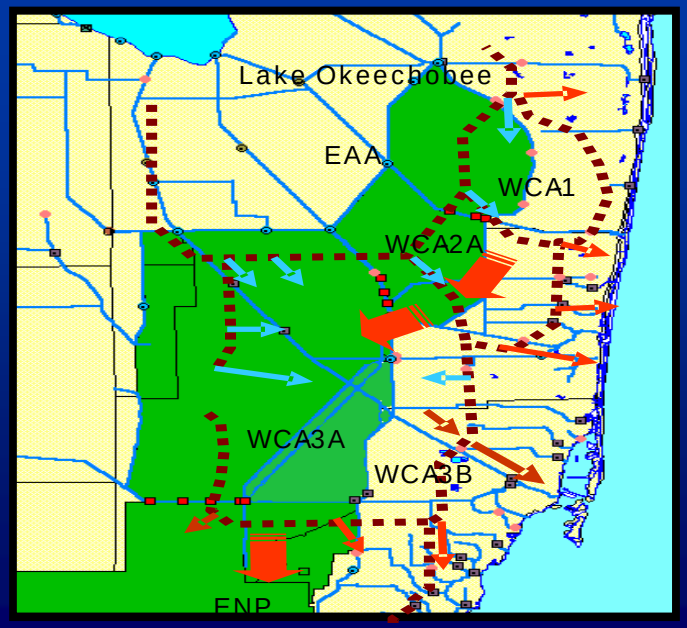


Lake Worth Drainage District (LWDD) Canal Network. Lake Worth Drainage District is one of many Special Drainage Districts created under Chapter 298, whose canals intersect with the South Florida Water Management District's (SFWMD).

Canal Infrastructure Links Drainage Basins to Management Objectives

South Florida Water Management Central Themes

- Drain the land for agriculture and other development:
  - 1880s through 1940s
- Major District infrastructure designed and built:
  - 1950s through 1970s
- Provide water supply, flood control, water quality and environmental management:
  - 1970s through 1990s
- Develop more intricate system with complex operational criteria:
  - 2000 into future with <u>Everglades Restoration</u>



Getting the Water Right Requires: Quantity Quality Timing and Distribution

These aspects of water are Linked

Sustainable management requires their integration

Canals are the means to that end in South Florida……

Canals in South Florida: Information to Support Proposed Criteria Development

- Peer review of EPA's methods and approaches document is challenging:
  - More of a concept report
  - Details and complete examples are largely lacking, particularly for canals (EPA's document, Chapter 5)
- Limits SAB's ability to provide constructive and detailed guidance for proposed criteria development

Canals in South Florida: Information to Support Proposed Criteria Development (cont.)

- South Florida research has been focused on the Kissimmee River, Lake Okeechobee, Everglades and Coastal Ecosystems
- Regional modeling has been primarily hydrological

Canals in South Florida: Information to Support Proposed Criteria Development (cont.)

- A critical step is missing from EPA's document Figure 5-1: data on nutrient thresholds impairing uses:
  - *"If you don't know where you are going, any road will get you there."* Lewis Caroll

- As we will explain, canal science is not in a position to provide this information and without it, any process for criteria development produces numbers without protective endpoints

Canals in South Florida: Context for Instream Numeric Nutrient Criteria

- Canals are maintained for flood protection and water supply for 7.5 million people:
  - Canal flows are often unnatural in order to meet operational needs

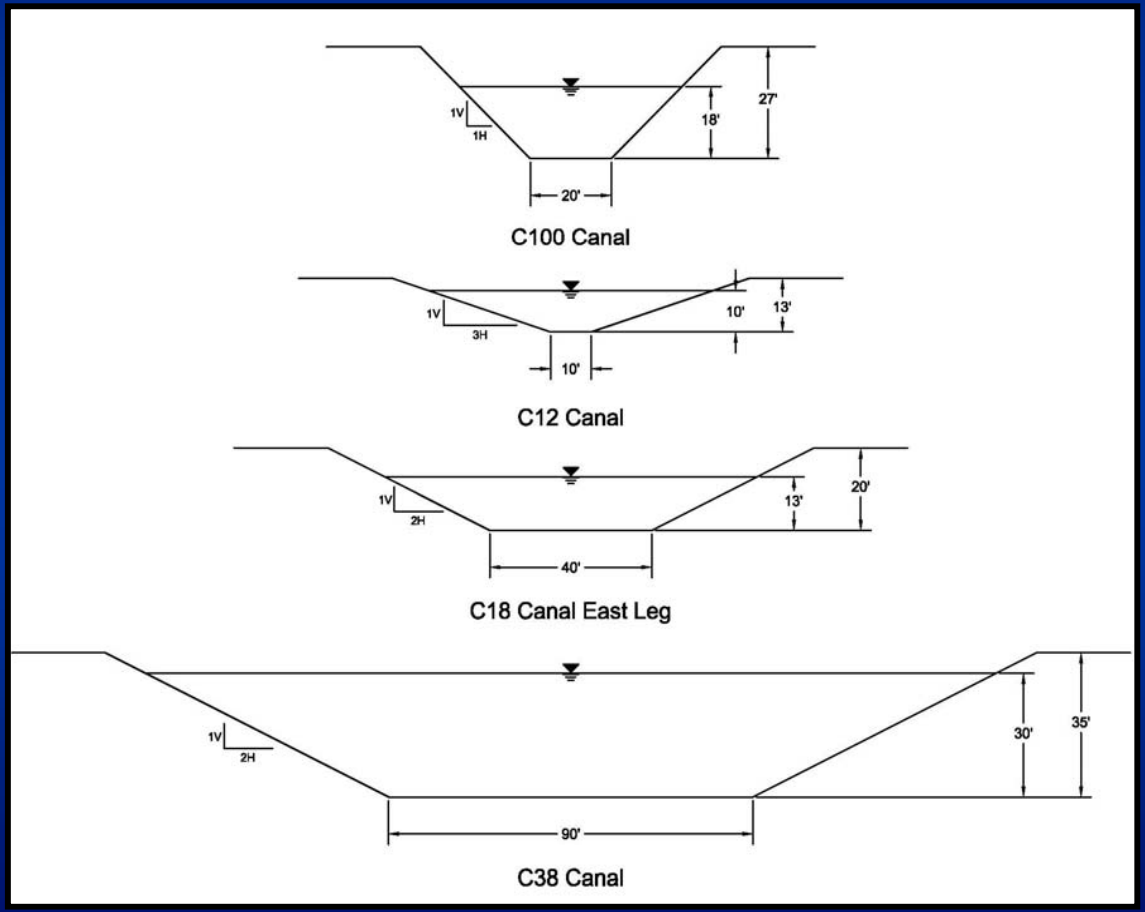
- Defensible means to demonstrate impairment or protective endpoints in these ecosystems is not currently known

Canals in South Florida: A Technical Support Document. SFWMD, April 2010

- Canals are engineered waterways designed to convey water for human uses, including environmental management:
  - Ecological functions and values are therefore secondary attributes for canals

Canals in South Florida: Findings

- Poor habitat due to engineered design
- Exotic species abound
- Large alligators do well in canals:
  - Strong swimmers only, please!



Canals in South Florida: Findings (cont.)

- Canals have a diverse assemblage of invertebrates, dominated by species able to deal with stressed and unstable conditions:
  - Do not score well on the Florida Stream Condition Index

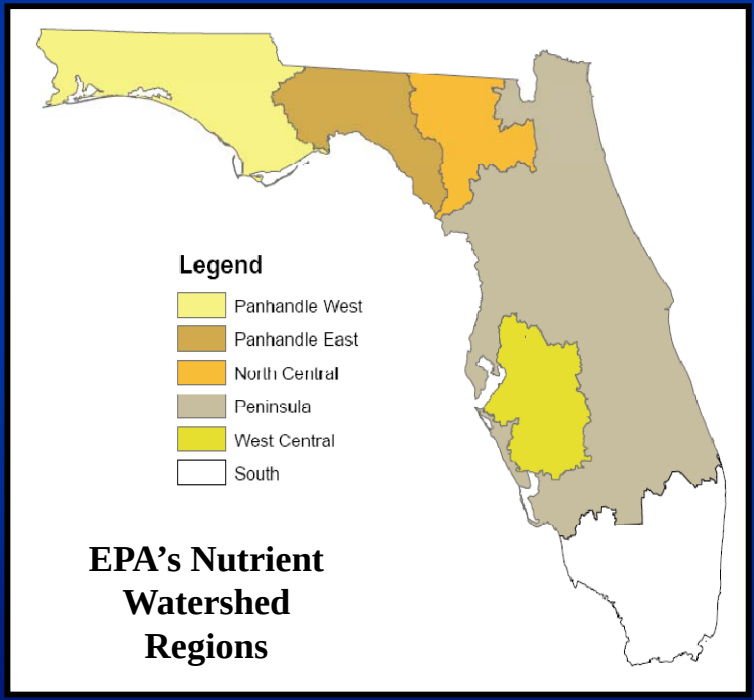
- Fish communities in canals are dominated by large predatory species, many exotics:
  - Some have high recreational value

Canals in South Florida: Findings (cont.)

- Link between nutrients, chlorophyll ‘a’ and biology not established in canals:
  - Land Developmental Index problematic in canals
  - Riparian linkages can be important (e.g., EPA document Figure 5-8)
- Chlorophyll ‘a’ is generally low <10 ug/L despite TP levels often >100 ug/L:
  - Chlorophyll can be imported
  - Drainage basins are interconnected

Context for Instream Numeric Nutrient Criteria in Canals

- Canal water quality is highly variable:
  - Within individual canals (higher concentrations are seen inland)
  - Across geologic sub-regions (e.g., Biscayne Aquifer)
  - Use of subregions is appropriate
- Canals around and above Lake Okeechobee are considered <u>streams</u> while those in South Florida are considered <u>canals</u>



EPA's Nutrient Watershed Regions

Context for Instream Numeric Nutrient Criteria in Canals (cont.)

- Experience indicates that the vast majority of canals are meeting their water management uses as artificial Class III bodies of water

- In view of what little is known about canal ecology, there is no known scientific way to use the ‘reference site’, ‘stressor response’, or ‘all data’ approach to derive criteria:
  - District scientists provided comments to both EPA and SAB detailing concerns

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Questions are Welcome

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