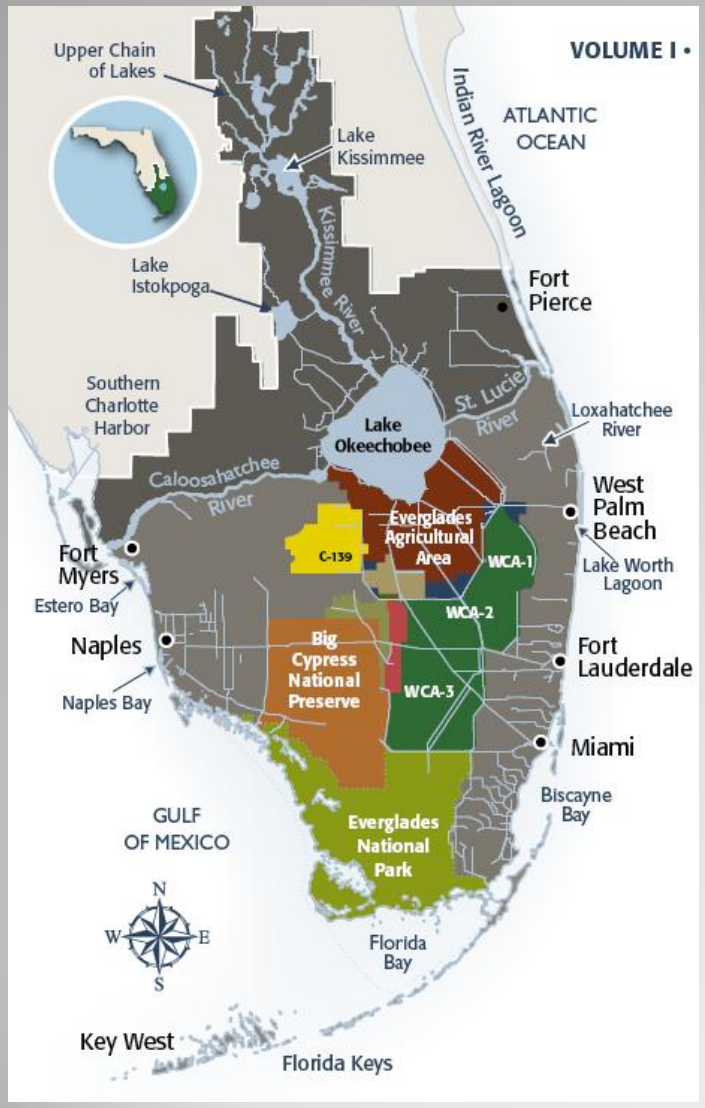
-- SERA 17 --

Water Quality in the Everglades: An Overview

By
Joffre Castro, ENP
June 21, 2011

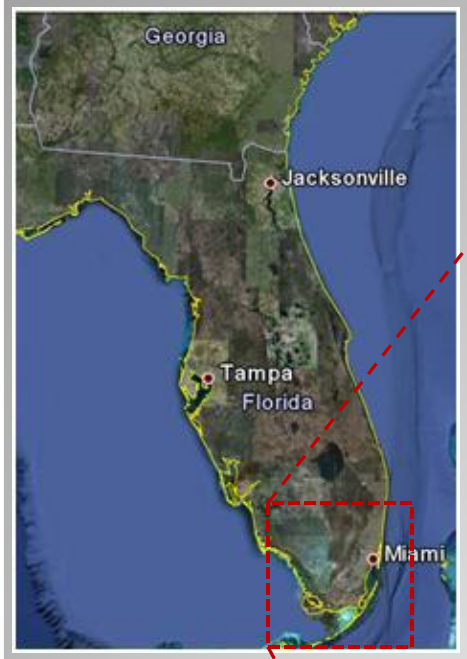


LEGEND

- CANALS
- NORTHERN EVERGLADES
- WATER CONSERVATION AREAS
- STORMWATER TREATMENT AREAS
- MICCOSUKEE INDIAN RESERVATION
- SEMINOLE INDIAN RESERVATION
- ROTENBERGER AND HOLEY LAND WILDLIFE MANAGEMENT AREAS

Source: 2008 SFER

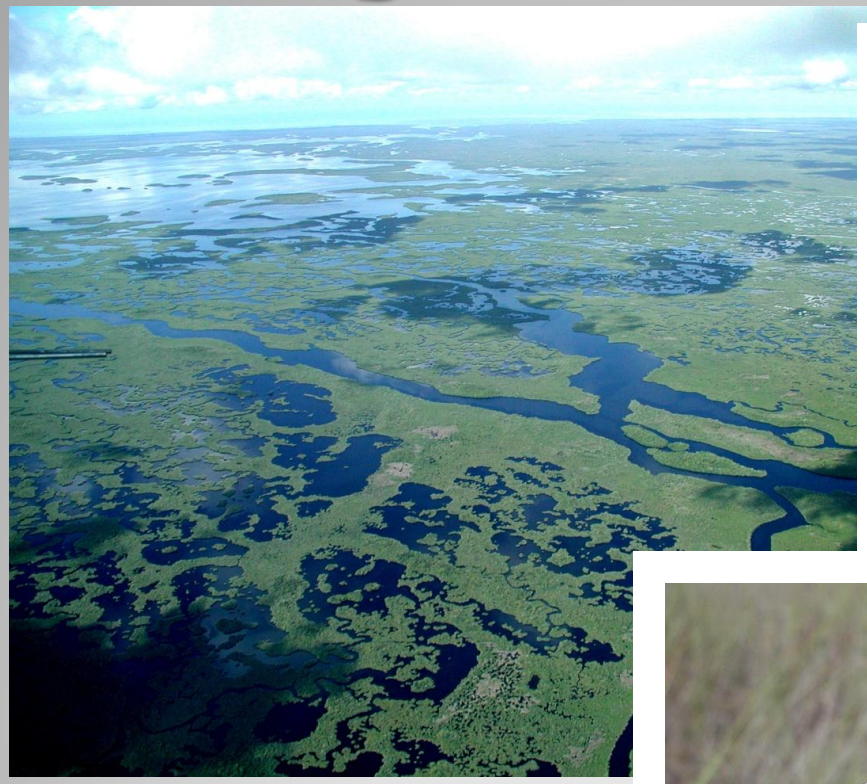
South Florida and DOI's National Parks



Dry Tortugas National Park

- Spanish conquistadors, 1513
- Fort Jefferson National Monument, 1935
- Dry Tortugas National Park, 1992
- Research Natural Area (marine reserve),

Everglades National Park



- Park 1947
- Biosphere Reserve 1976
- World Heritage List 1979
- Ramsar Site 1987
- WH Endangered List 1993

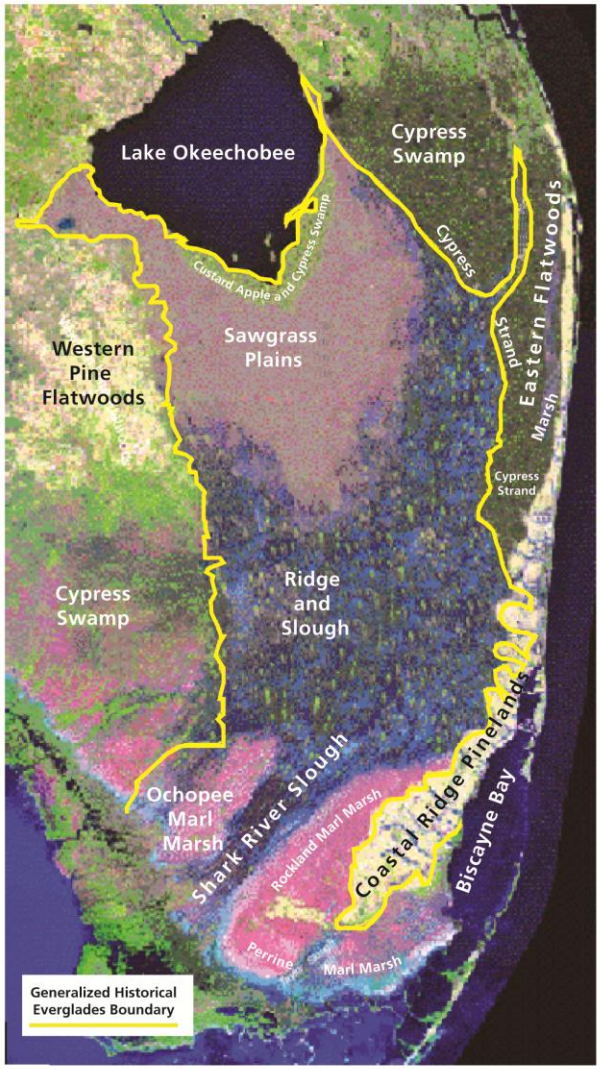
Biscayne National Park

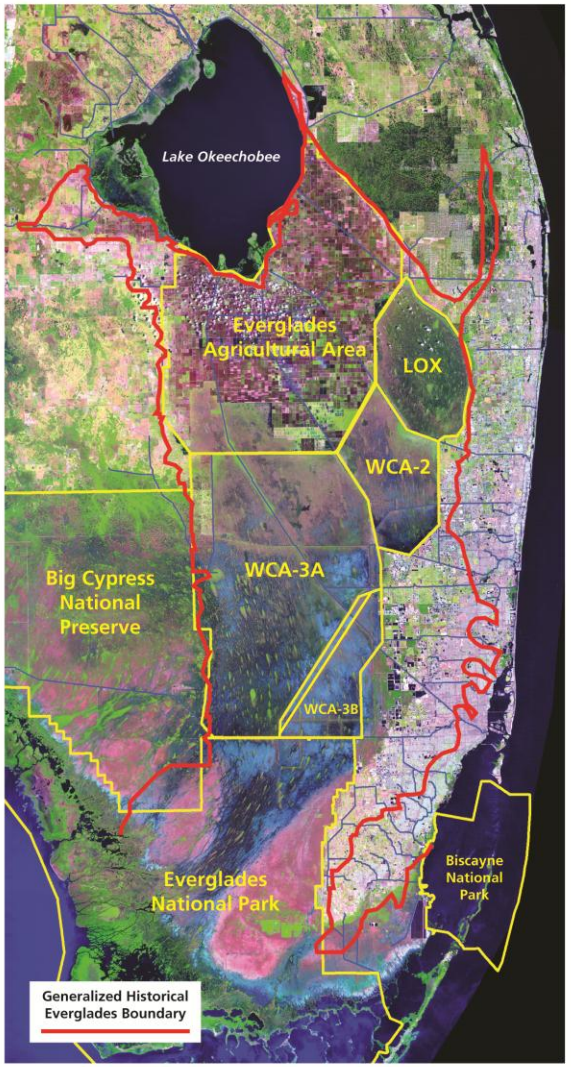
- National Monument, 1968 and expanded 1974
- Park, 1980
- Area: 300 mi^2
  - 95% is open water,
  - 5% small islands and narrow strip of mainland

Big Cypress National Preserve

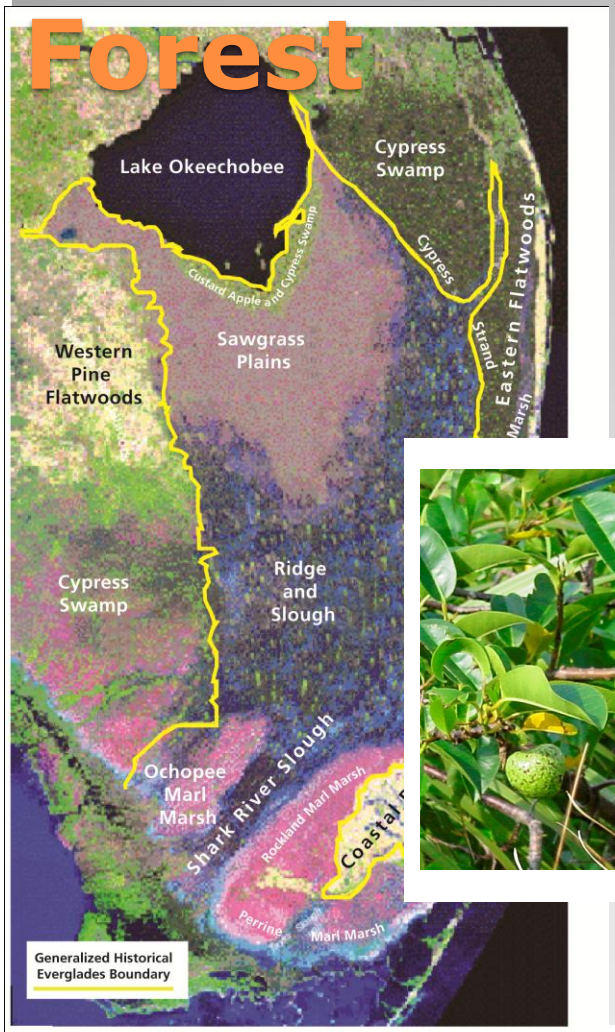
- Preserve 1974
- Area: 1,100 mi^2
- Home of Native Americans
- Florida first production oil well 1943

Historic and Present-Day Everglades

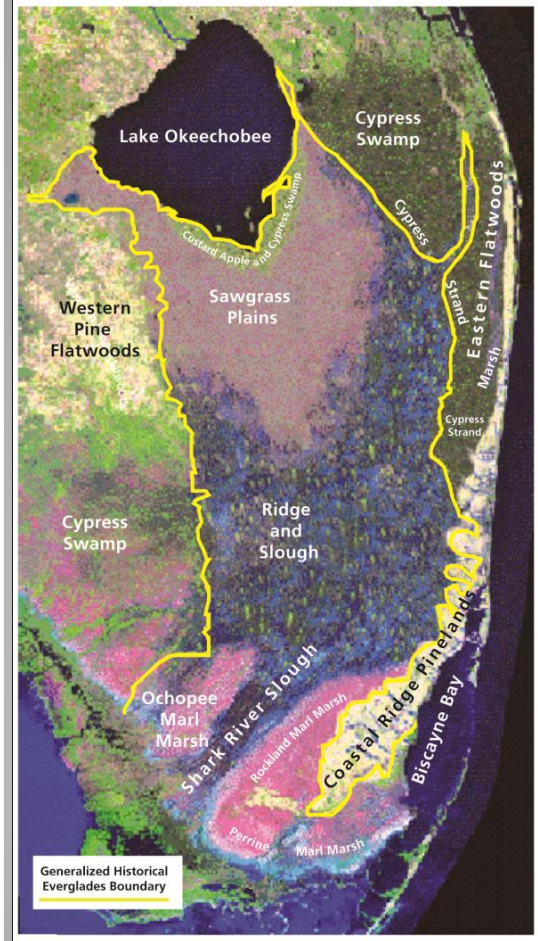




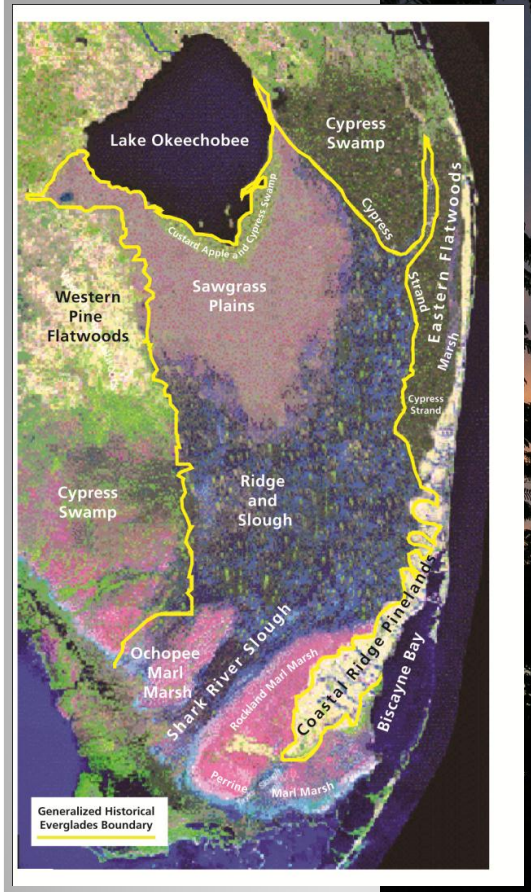
Pond Apple Forest



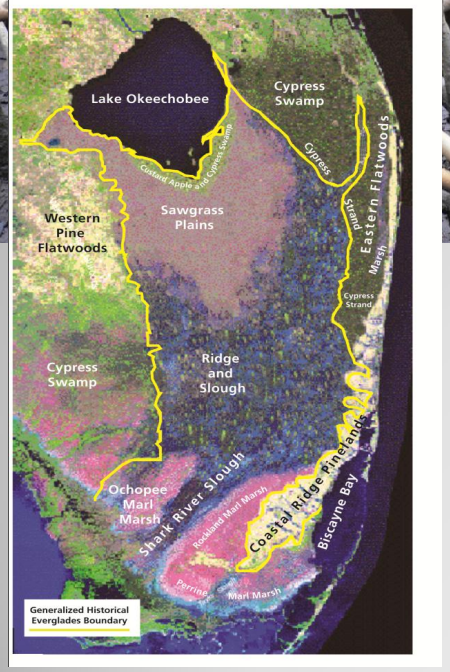
Sawgrass Prairie



Pinelands

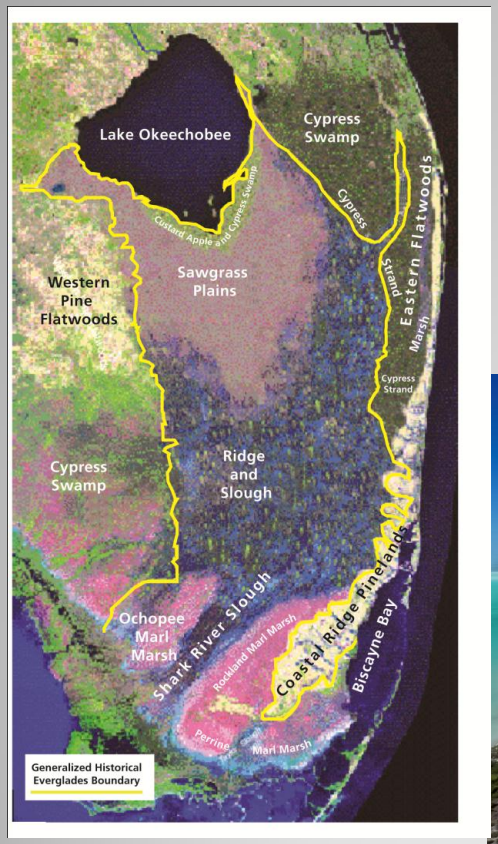

Lake Okeechobee
Cypress Swamp
Cypress
Custard Apple and Cypress Swamp
Sawgrass Plains
Western Pine Flatwoods
Strand
Eastern Flatwoods
Marsh
Cypress Strand
Ridge and Slough
Cypress Swamp
Coastal Ridge Pinelands
Biscayne Bay
Shark River Slough
Ochopee Marl Marsh
Rockland Marl Marsh
Perrine
Marl Marsh
Generalized Historical Everglades Boundary

Coastal Marshes



Mangrove Forest

Florida Bay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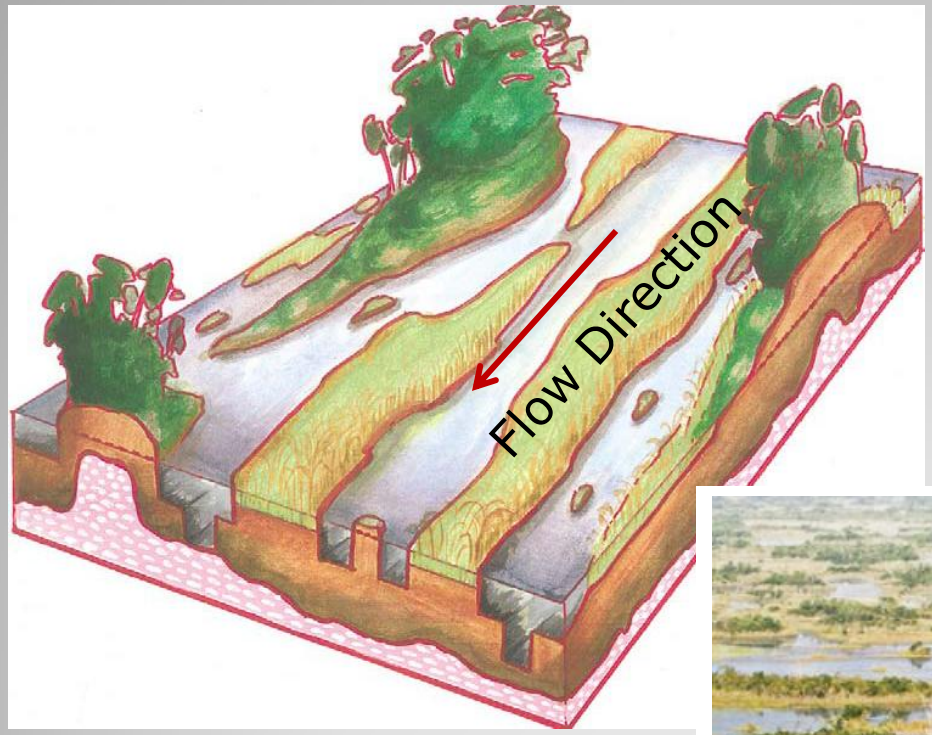
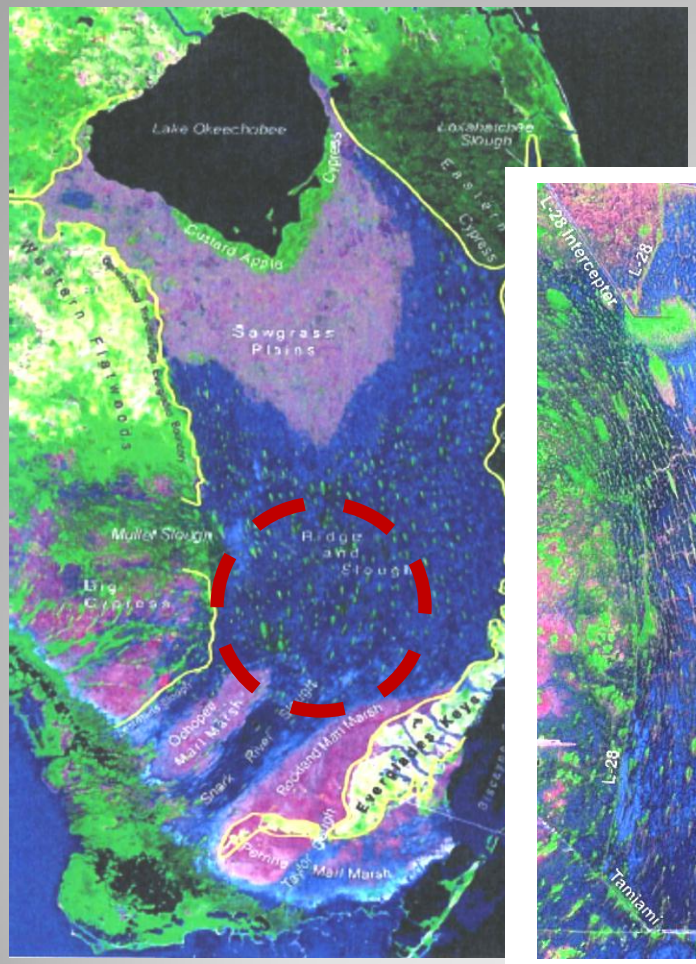
Generalized Historical Everglades Boundary

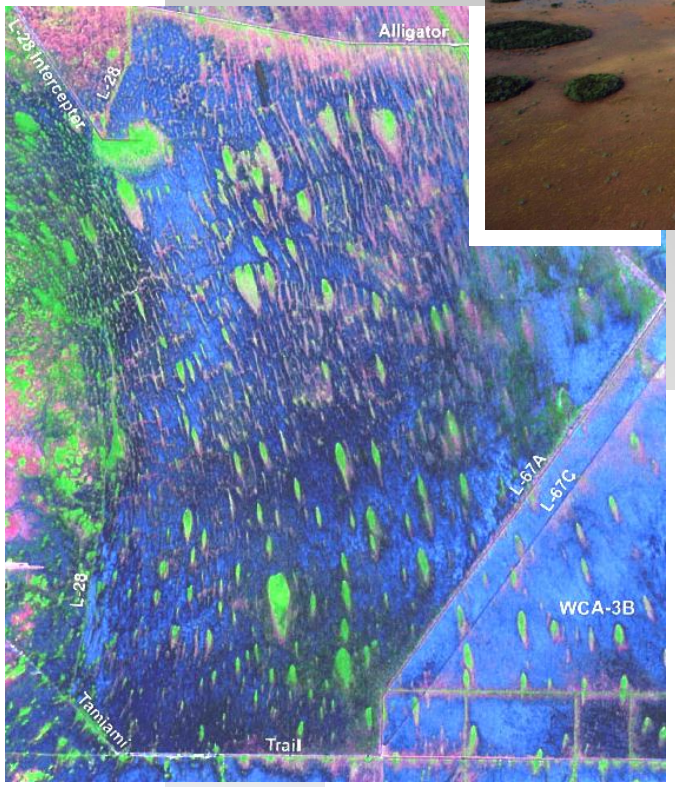
Ridge and Slough Patterns



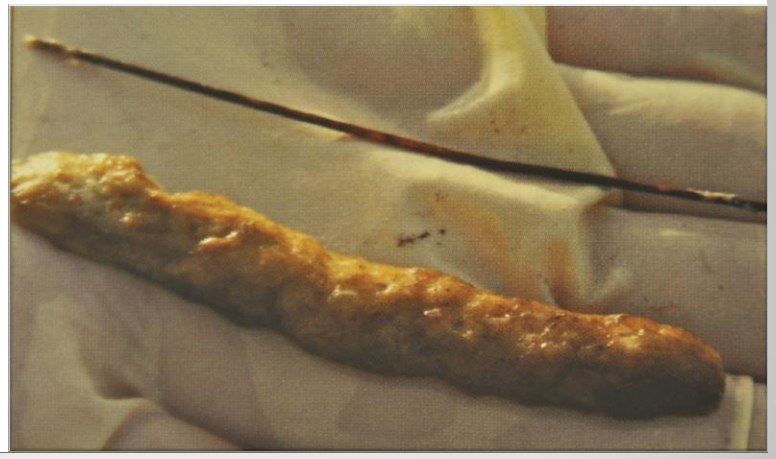
Source: Lodge, 2010; 2010 SFER

Tree Islands

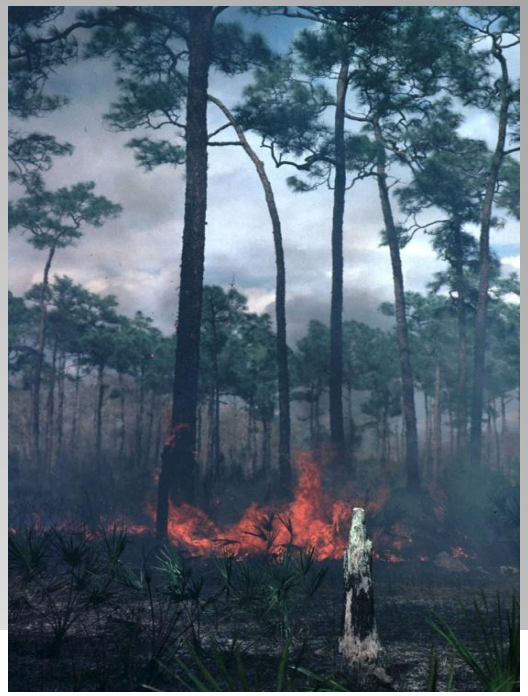




Periphyton



Fires



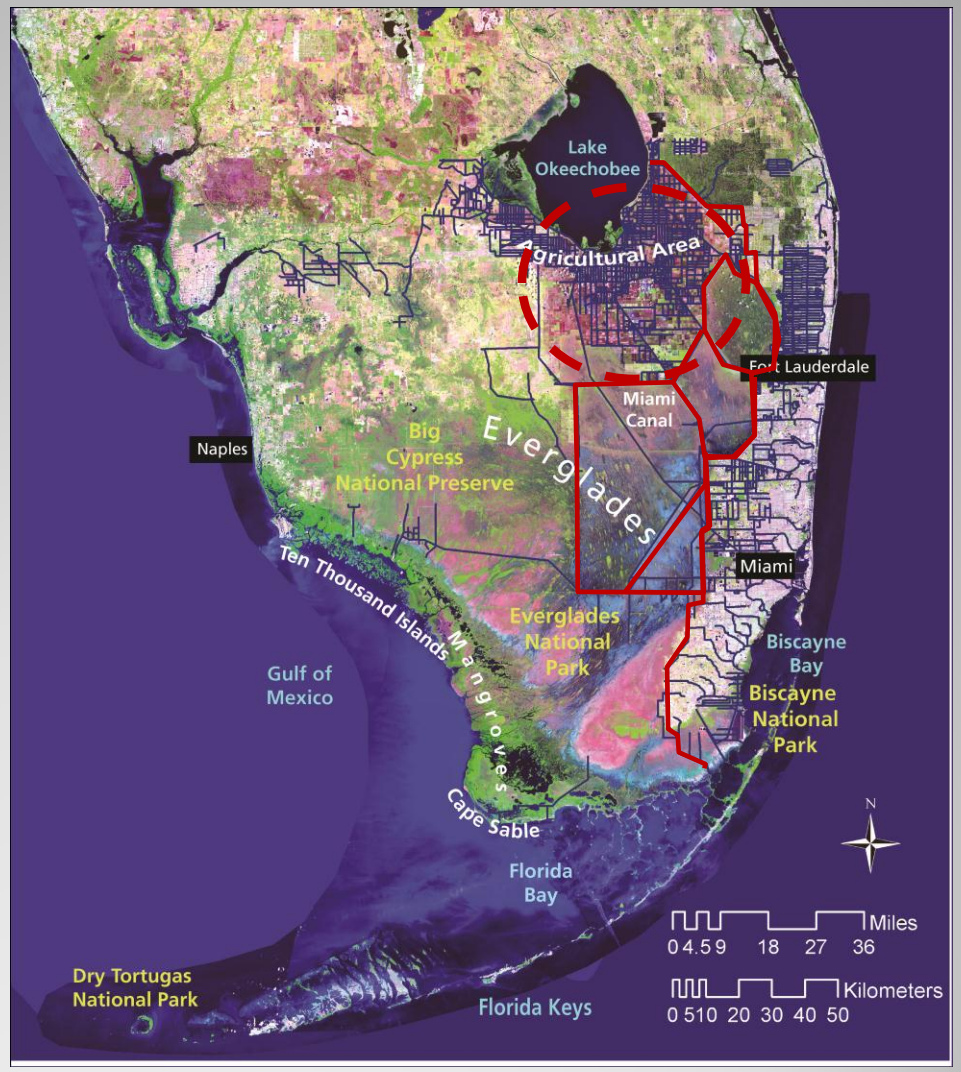
Hydrology

Source: 2011 SFER

Central and Southern Florida Project

C&SF purpose:

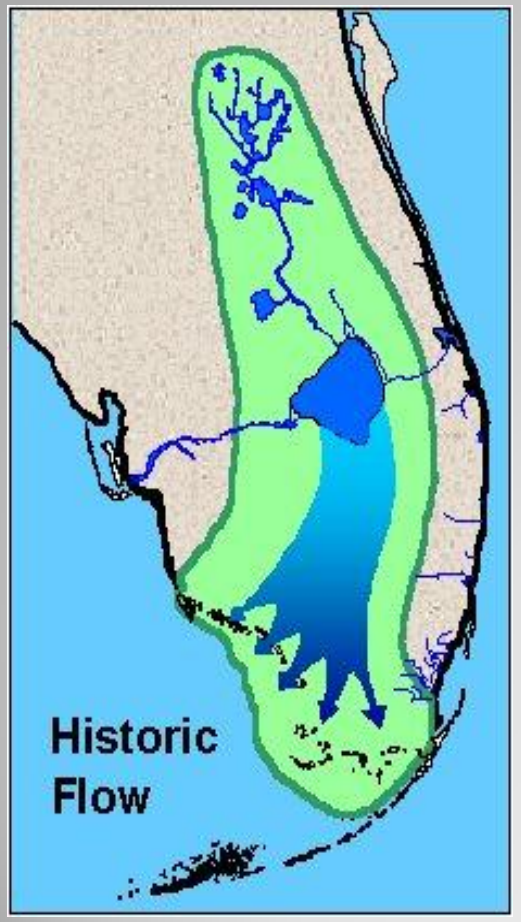
- Perimeter levee
- Everglades Ag. Area
- Water Conservation Areas
- System of canals, levees, structures

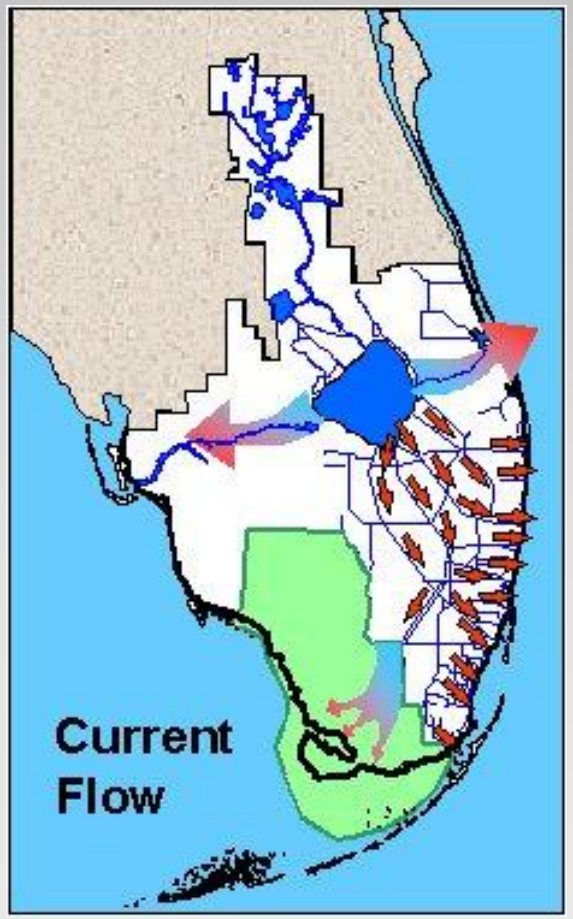


C&SF Project Consequences

- Reduction in size of Everglades:
  - Loss of wildlife habitat
  - Loss (60%) of water
  - Sharp decline in wading bird population
  - Hypersaline conditions in bays
- Fragmentation of ecosystem
  - Loss of connectivity, destruction of R&S patterns
- Changes in delivery of water:
  - Natural sheetflow to canal discharges;
  - Change in timing and distribution
- Changes in fire regimes:
  - Increase in frequency of winter fires
- Spread of invasive species

Water Flow and CERP





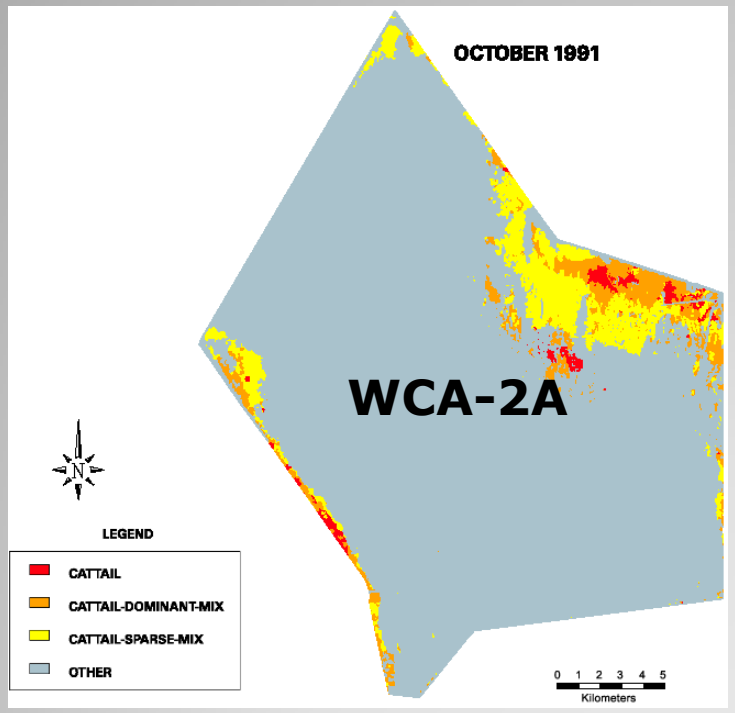
Water Quality

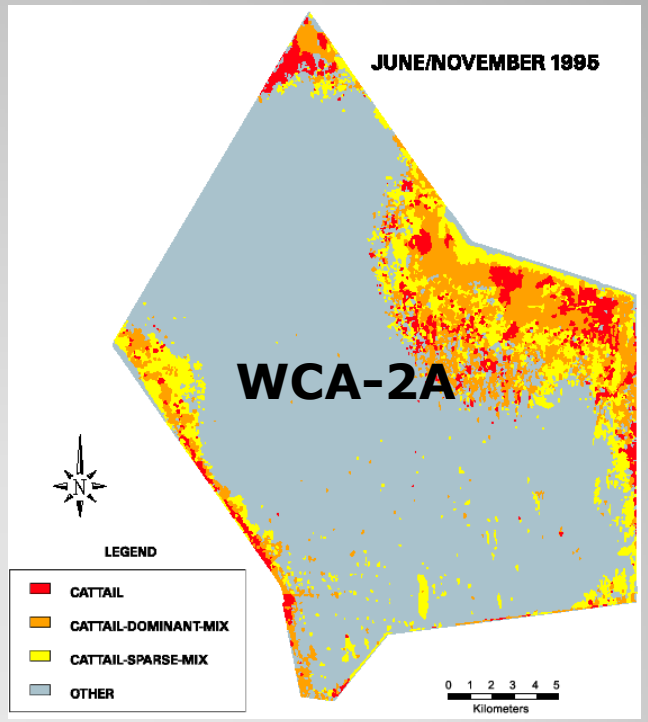
Some of the ecological problems of the Everglades, such as marsh eutrophication, are caused by the use and distribution of marginal-quality water that is poorly suited for these ecosystems.

Main concerns:

- Phosphorus
- Mercury and sulfate
- Pesticides

Cattail Expansion



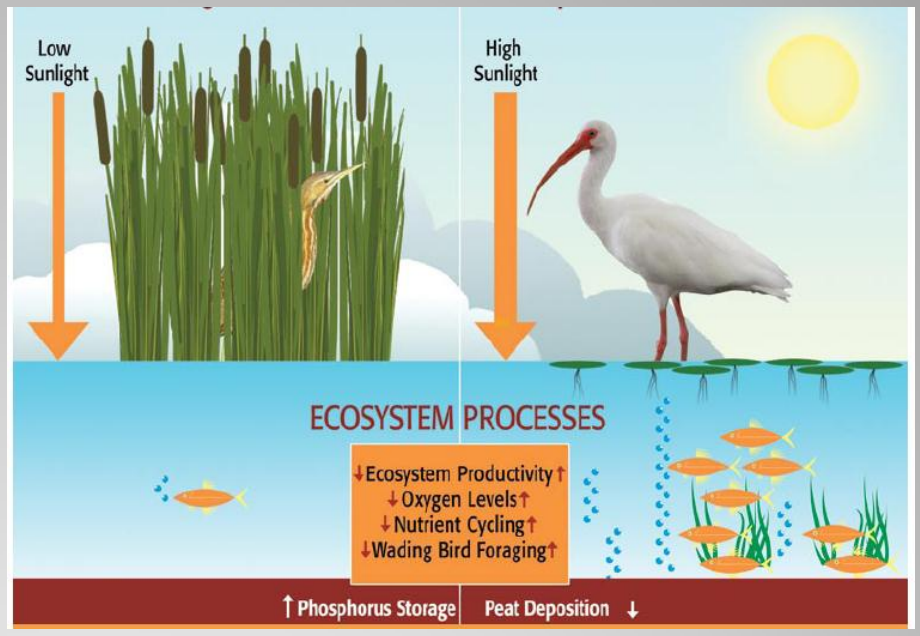


Cattail Expansion in WCA-2A

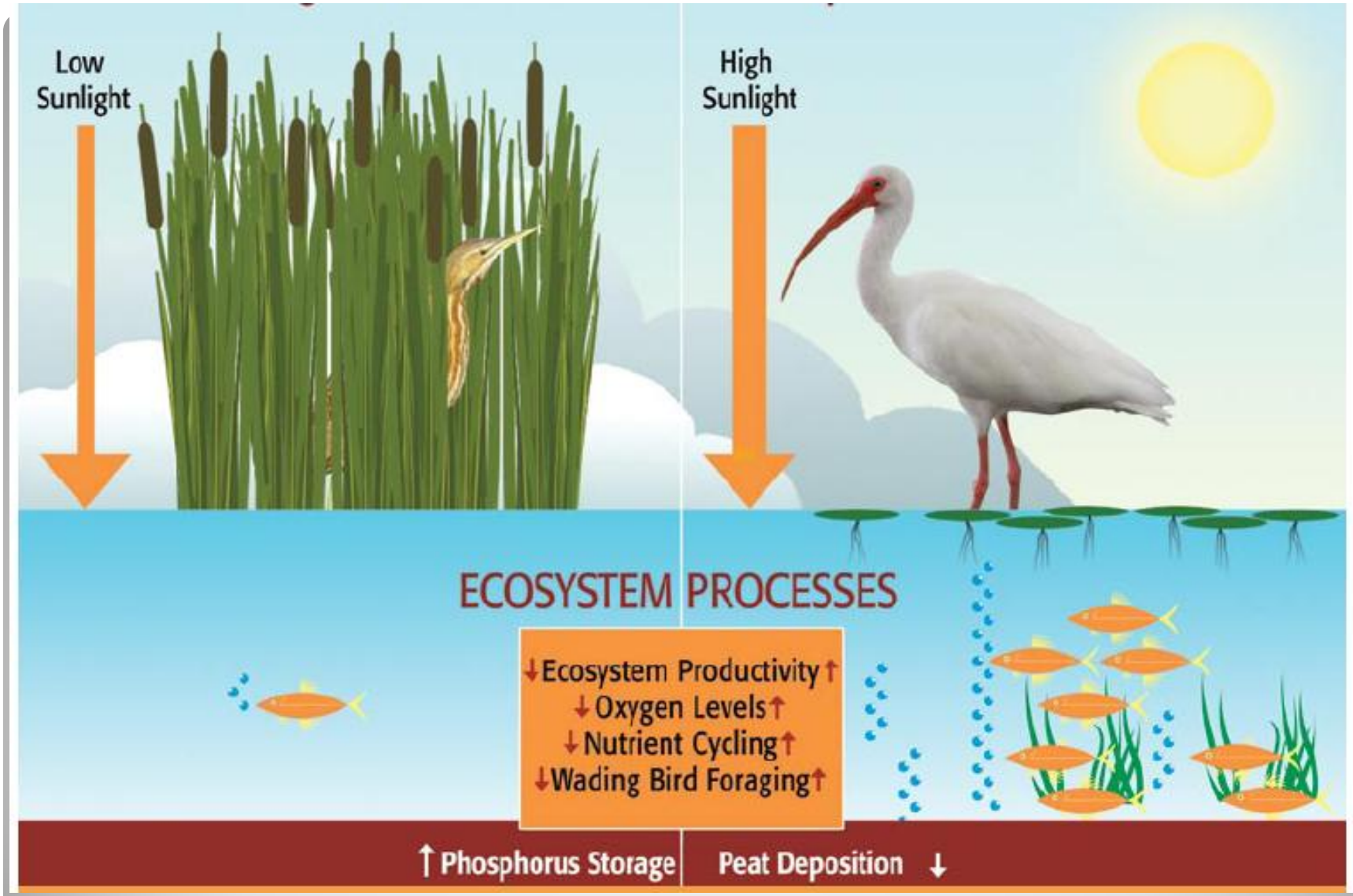
	Acres	%	Total Area
1991	5470	13	42000
1995	9312	22	42000

Source: USGS-SOFIA

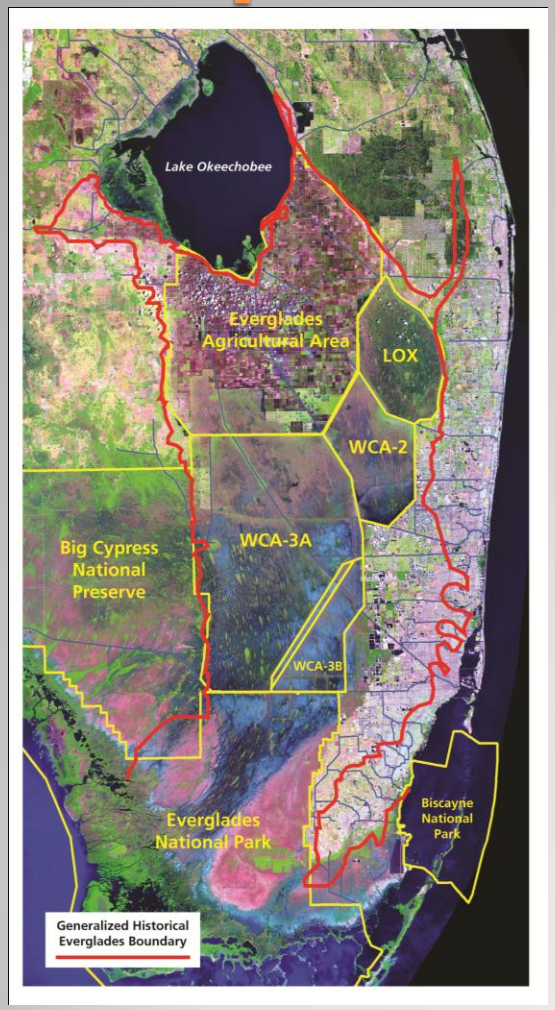
Eutrophication



Source: 2007 SFER


Low Sunlight
High Sunlight
ECOSYSTEM PROCESSES
↓Ecosystem Productivity↑
↓Oxygen Levels↑
↓Nutrient Cycling↑
↓Wading Bird Foraging↑
↑Phosphorus Storage
Peat Deposition ↓

Phosphorus in the Everglades



- EAA runoff to Lake O.
- EAA runoff redirected to WCAs, 1979
- Feds sued State, 1988 for violations of WQ standards
- Lawsuit settle 1994-
- Everglades Forever Act

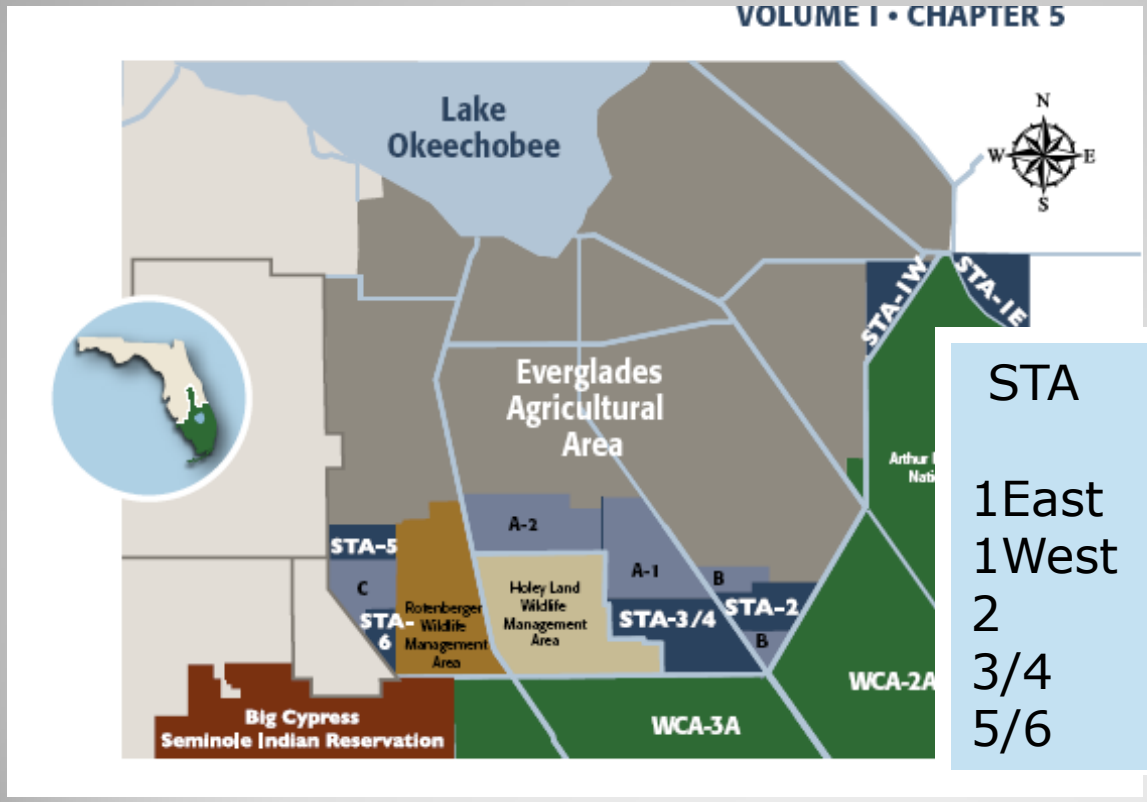
BMPs

AGRICULTURAL AREA NEAR LAKE OKEECHOBEE WHERE SOURCE CONTROLS ARE USED TO HELP REDUCE NUTRIENT INPUTS.

Phosphorus source controls, at landscape level for agricultural and non agricultural land uses, are part of the effort to improved water quality in the Everglades

Source: 2008 SFER

Stormwater Treatment Areas (STAs)



STA	Area (acres)
1East	5,100
1West	6,700
2	15,000
3/4	16,500
5/6	13,000

Modified from 2008 SFER

Phosphorus in the Everglades

Water Years 2005-09 (parts per billion)

- **Inflow FWM**
- **Interior GM**

Refuge:
Inflow = 95.0
Interior = 10.7

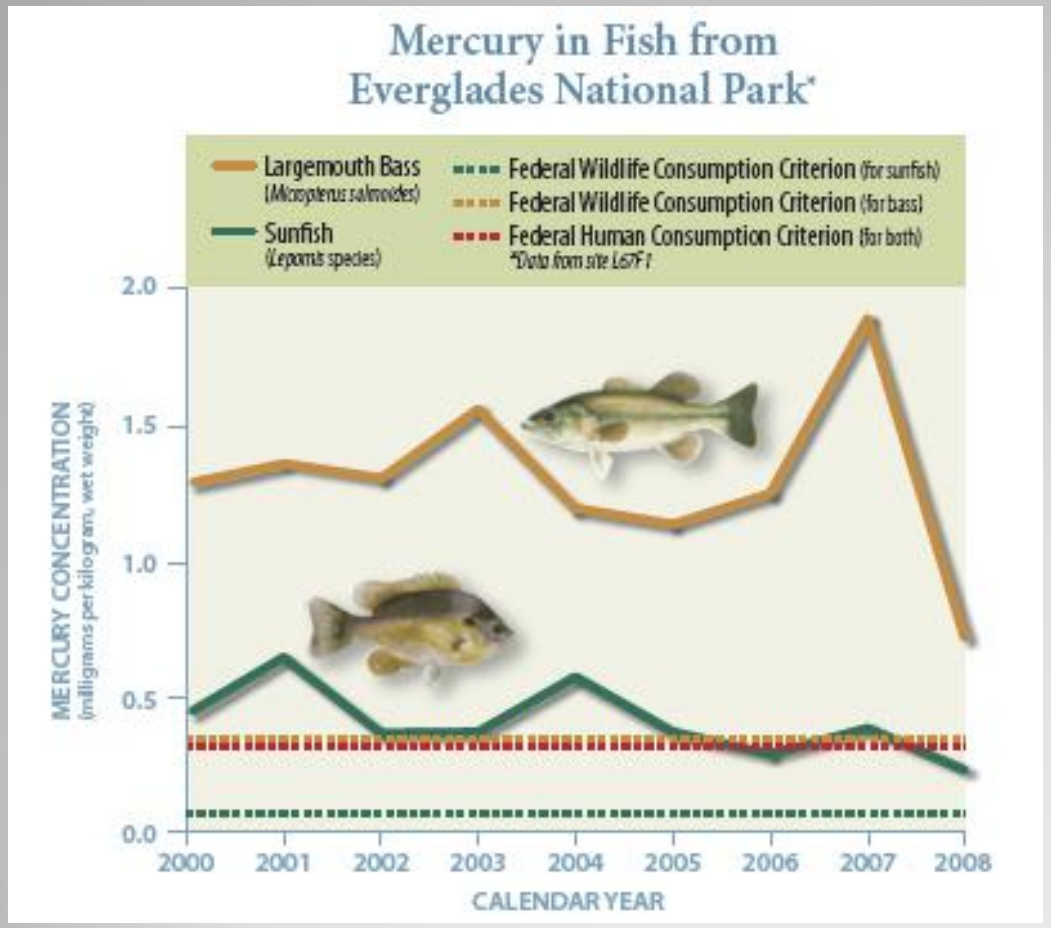
WCA-2A:
Inflow = 32.0
Interior = 12.9

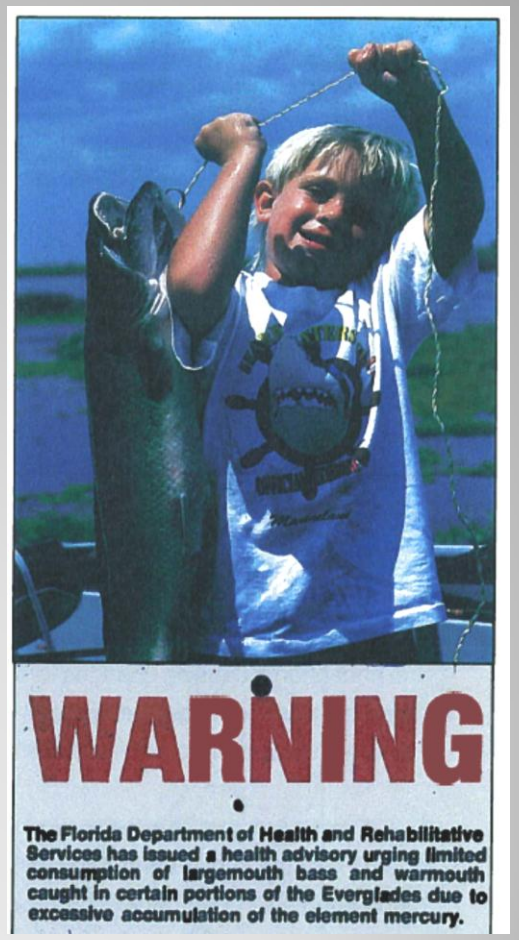
WCA-3A:
Inflow = 35.3
Interior = 8.3

Park:
Inflow = 9.0
Interior = 5.6

Modified from 2011 SFER

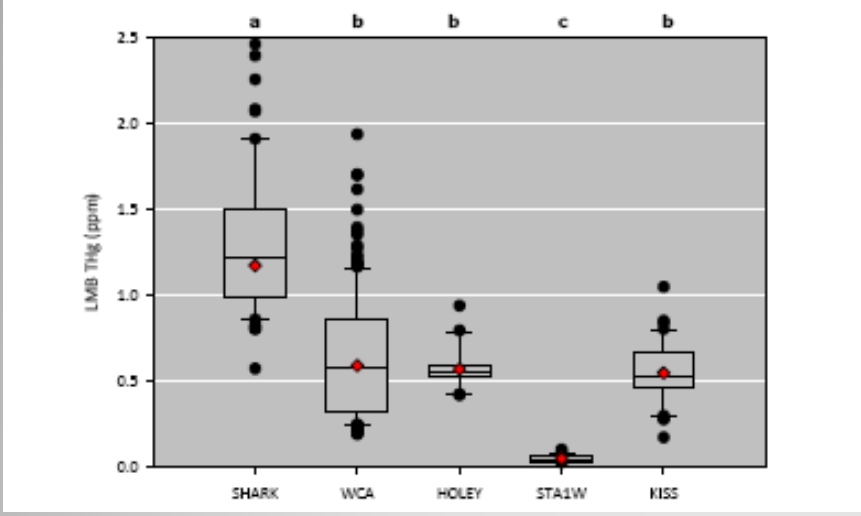
Mercury in the Everglades



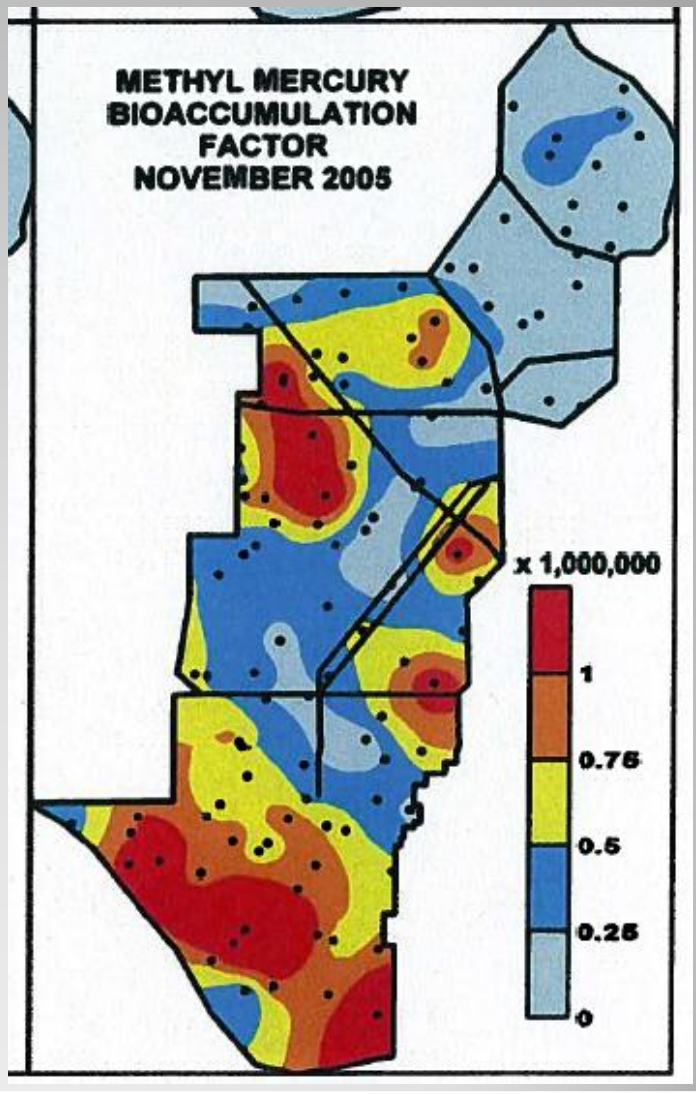


Sources: 2010 SFER & R-EPAM-2007

Mercury Contamination

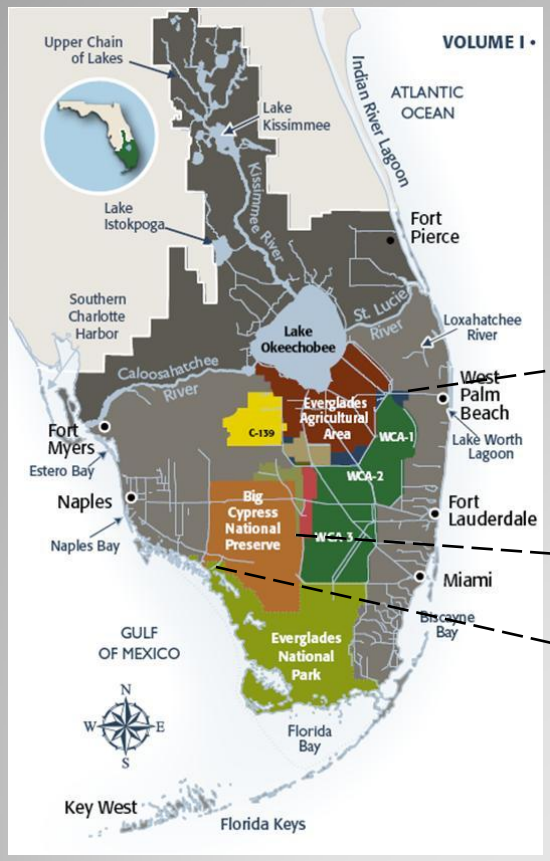


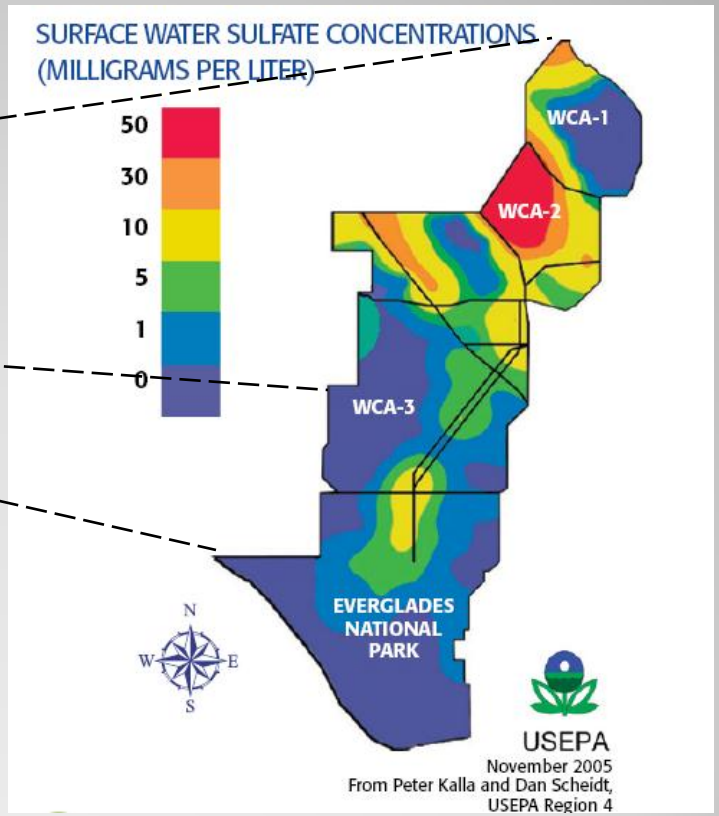
Largemouth Bass median concentrations, ppm (mg/Kg), 2009-2010



Sources: 2011 SFER & R-EMAP-2007

Sulfate in the Everglades

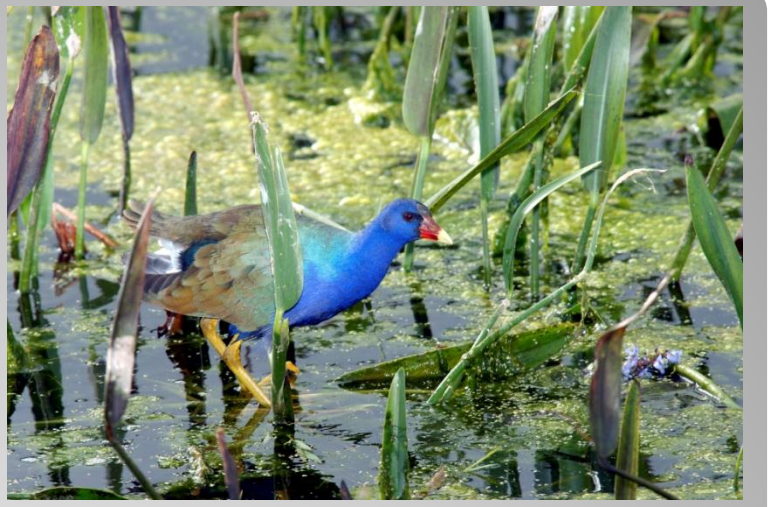




Source: SFER 2007

Agricultural Influences

Summary



C&SF changes in hydrology & land use:

- Exacerbated habitat loss
- Deteriorated water quality
- Reduced (~60%) inflows to marshes and coastal basins

- Caused severe declines in wading bird population
- Switched from sheetflow to canal deliveries
- Provided flood protection and water supply

Comprehensive Everglades Restoration Program (CERP)

- Improve: quantity, quality, timing, and distribution
- Maintain current levels of flood protection