The Everglades & Northern Estuaries; St. Lucie Estuary-Indian River Lagoon and Caloosahatchee Estuary

September 19, 2013

Florida Oceanographic Society

Upper Chain of Lakes (8) flow south into Lake Kissimmee

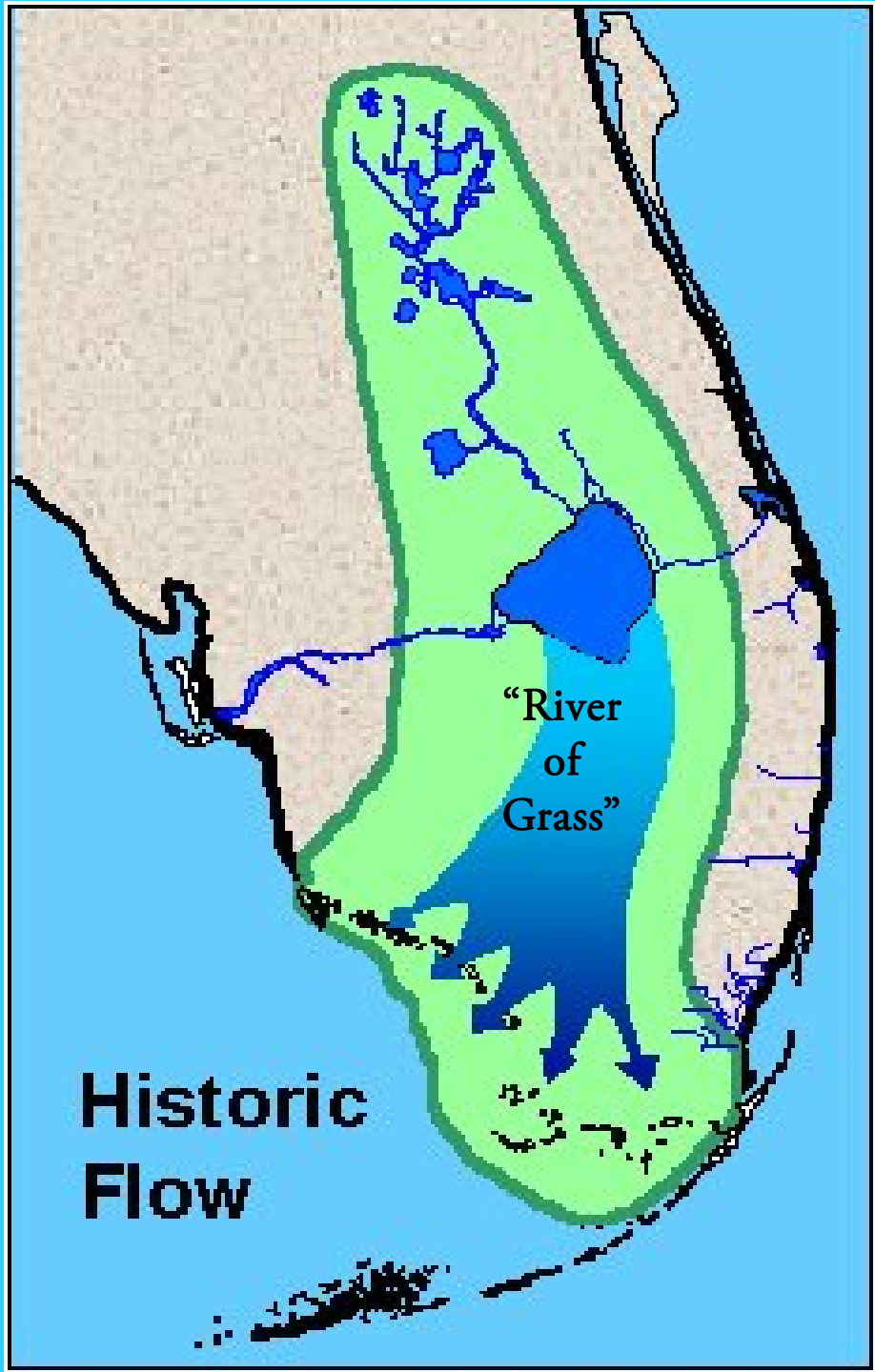
Lake Kissimmee flows south into the Kissimmee River – 105-mile Oxbow River with 2-mile-wide floodplain

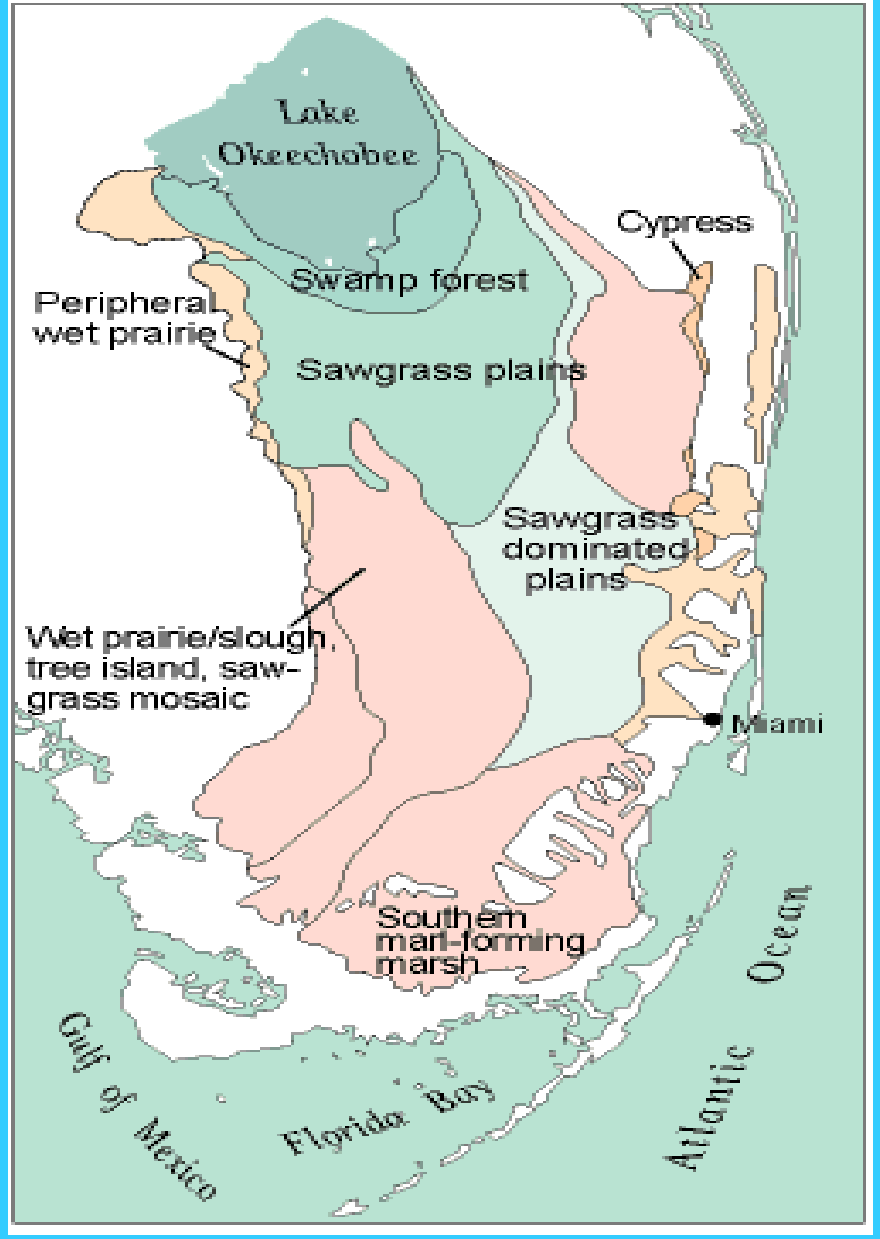
Water takes 6-8 Months to reach Lake Okeechobee

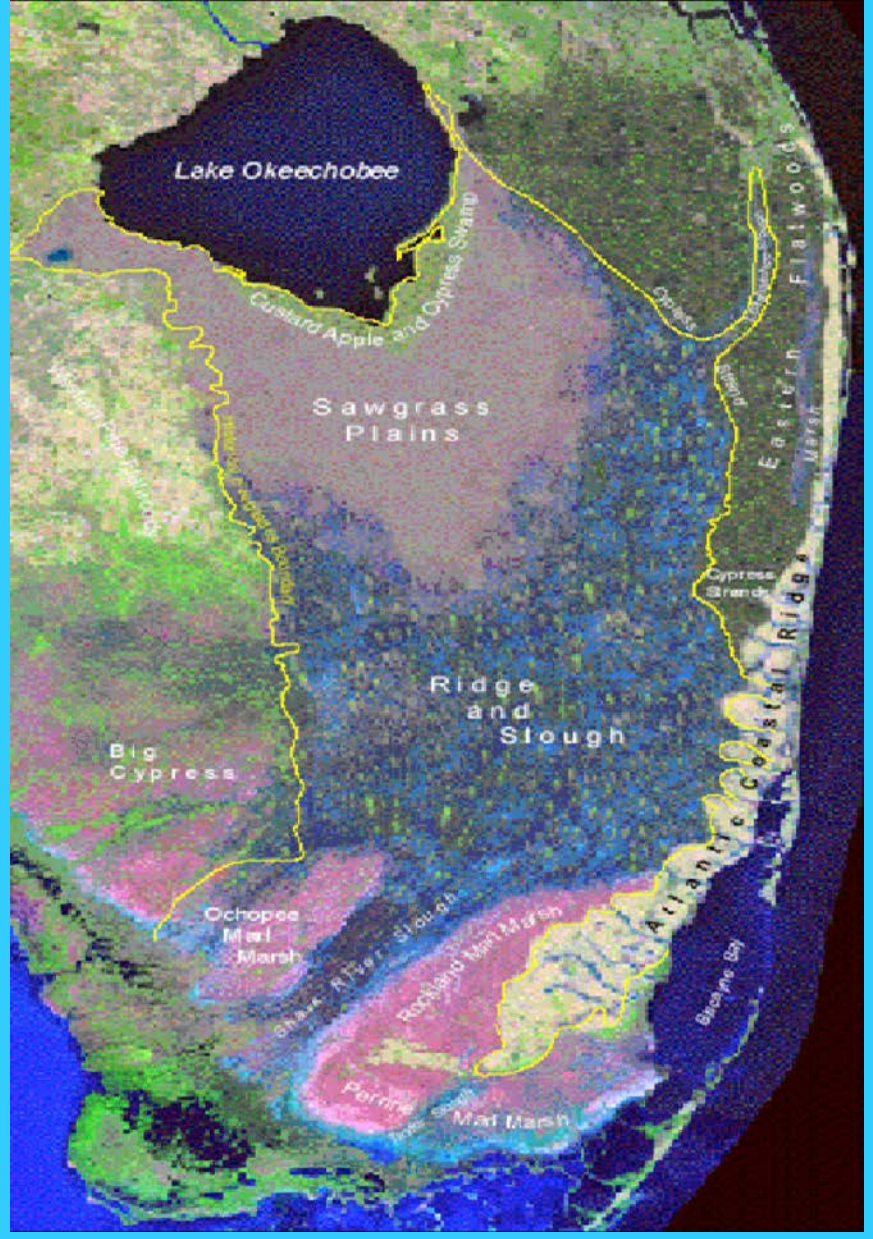
Lake Okeechobee flows south through "River of Grass", 60-mile-wide shallow (1 ft deep) river flowing at 1 mile in 4 days.

Water takes 16 Months to reach Florida Bay

Florida Oceanographic Society

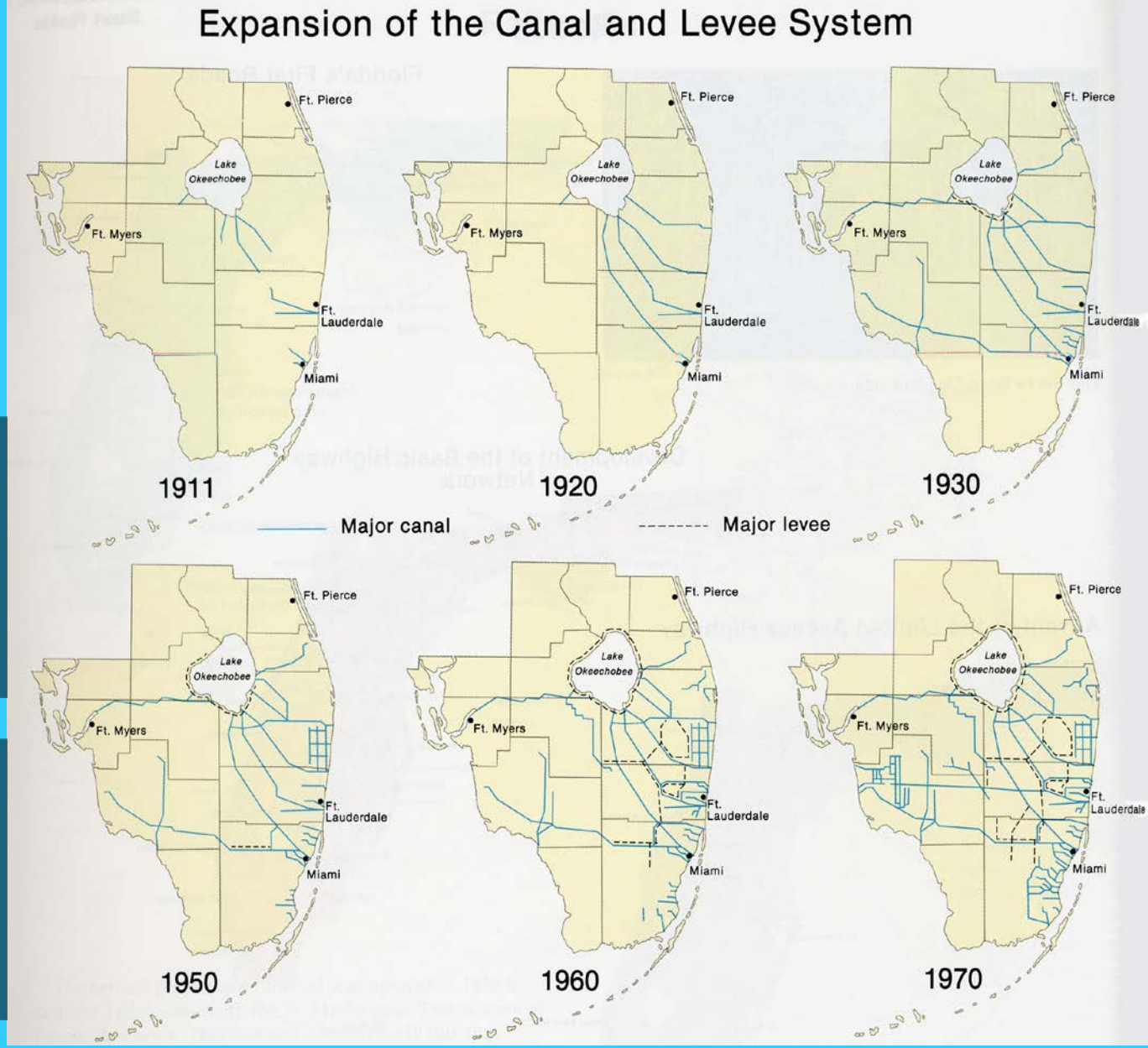






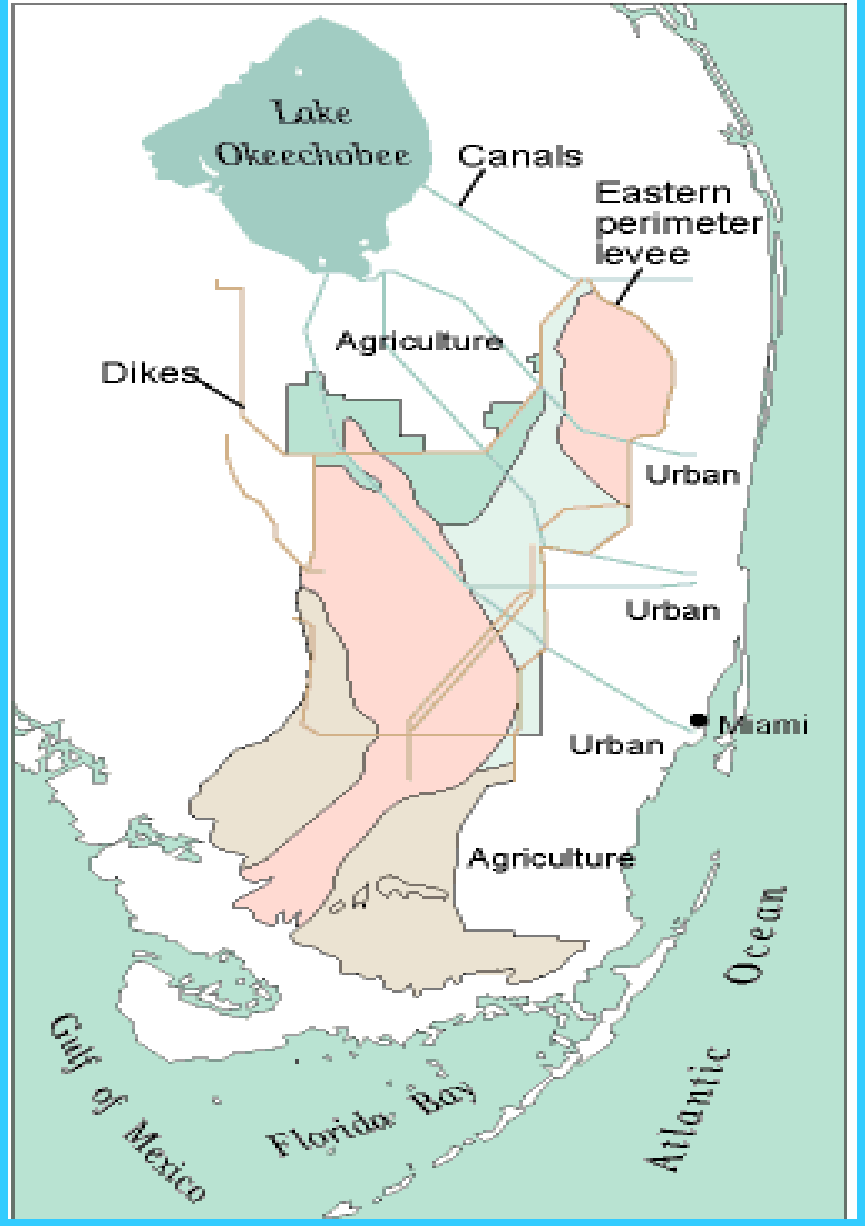
Florida Oceanographic Society

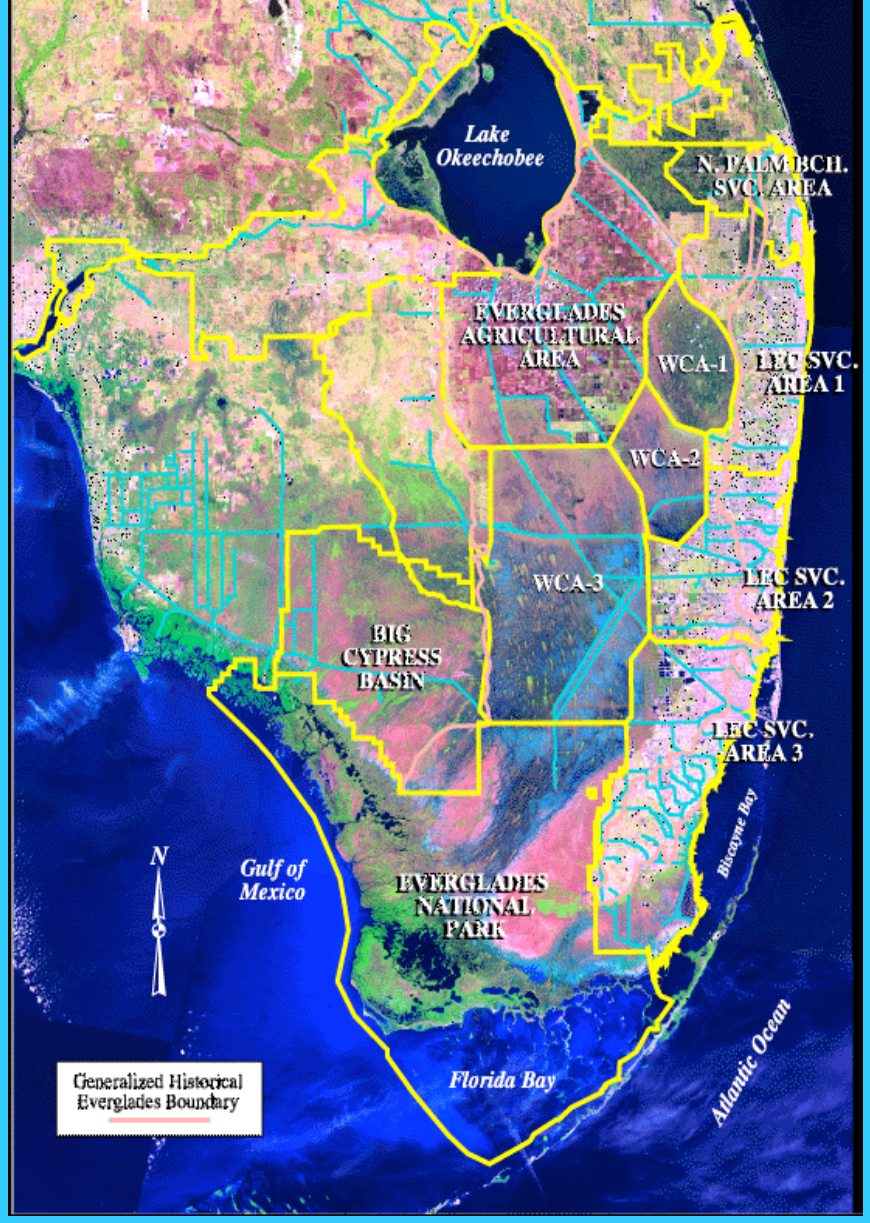
Everglades Changes - **Then**



Florida Oceanographic Society

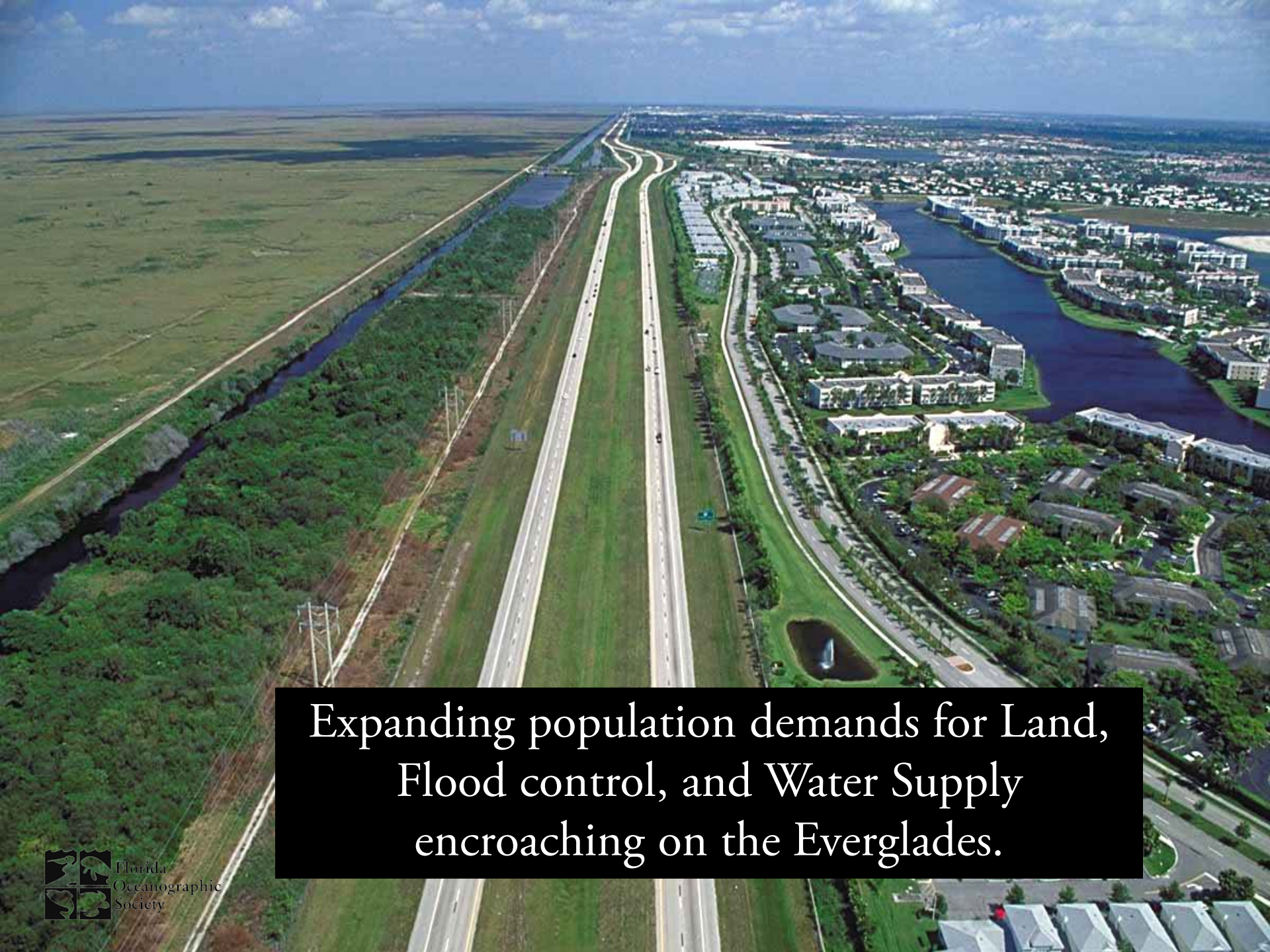
"Drain The Swamp"





Florida Oceanographic Society

Everglades Changes - **Now**



Florida
Oceanographic
Society

Hurricanes in 1926 & 1928

Florida Oceanographic Society

"Dam The Lake"

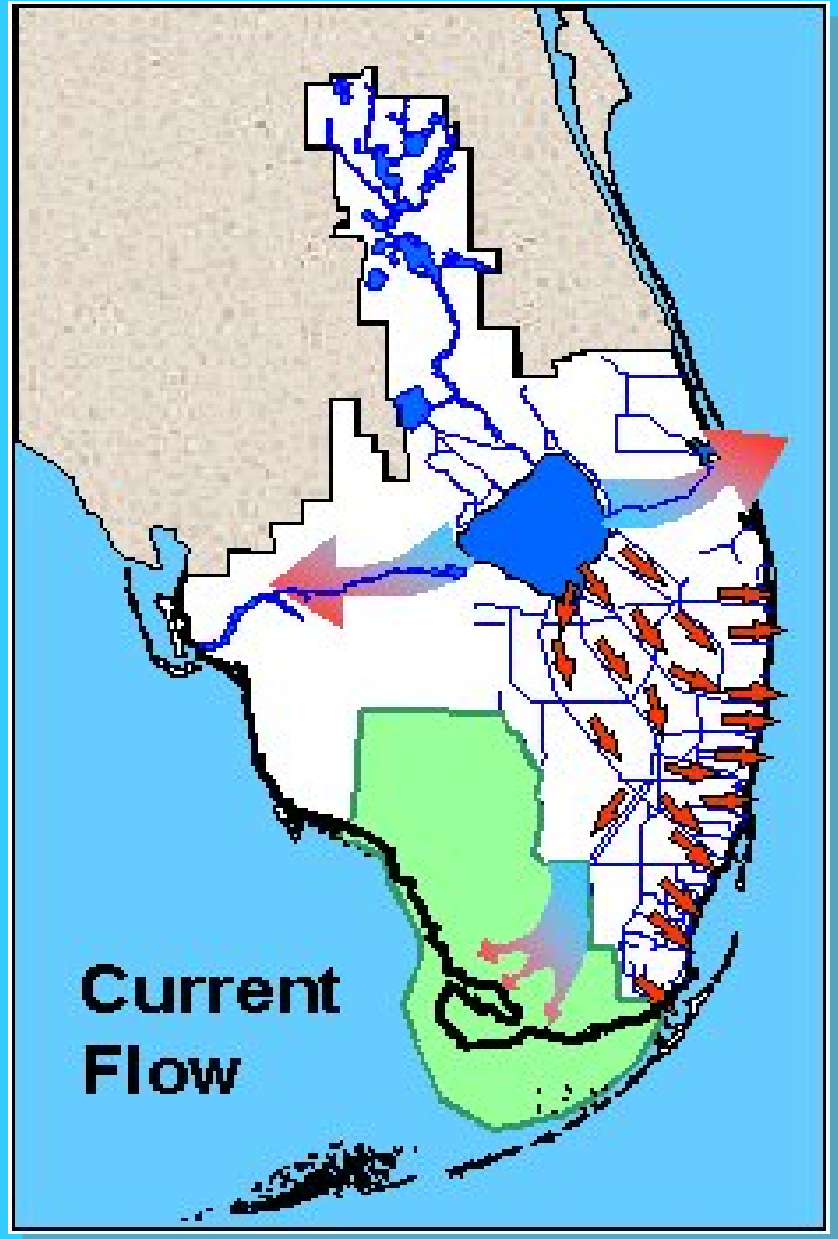
Dam Lake Okeechobee- Stop the flow to the River of Grass (Killed the River of Grass)

Florida Oceanographic Society


Digging the Kissimmee River canal in the early 20th century in response to a devastating flood.
Photo copyright 2008, DEP

Florida Oceanographic Society

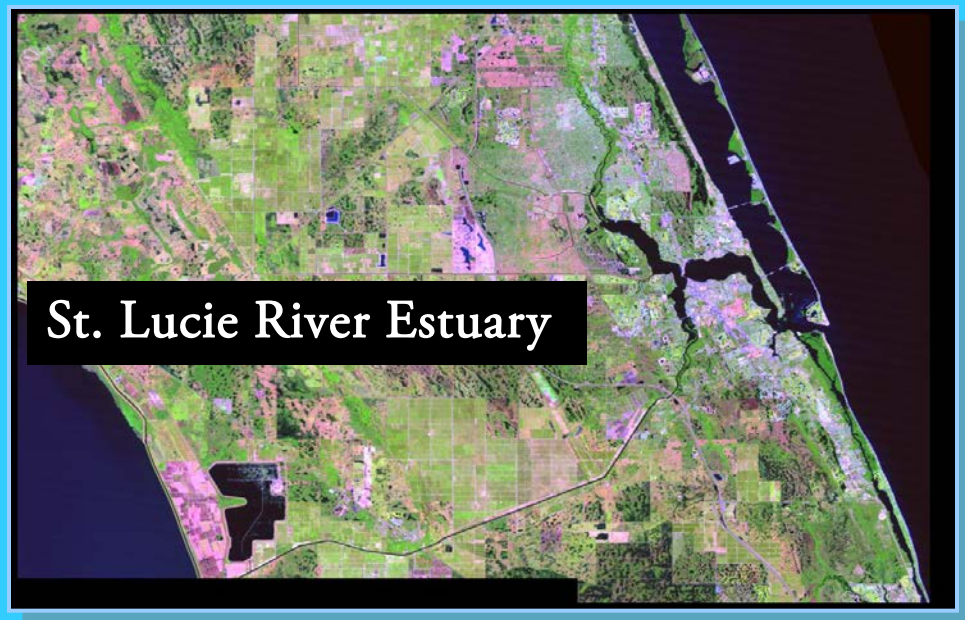
Killed the Kissimmee River- 1962-1970 Dug C-38 Canal up 105 mile oxbows-drained floodplain

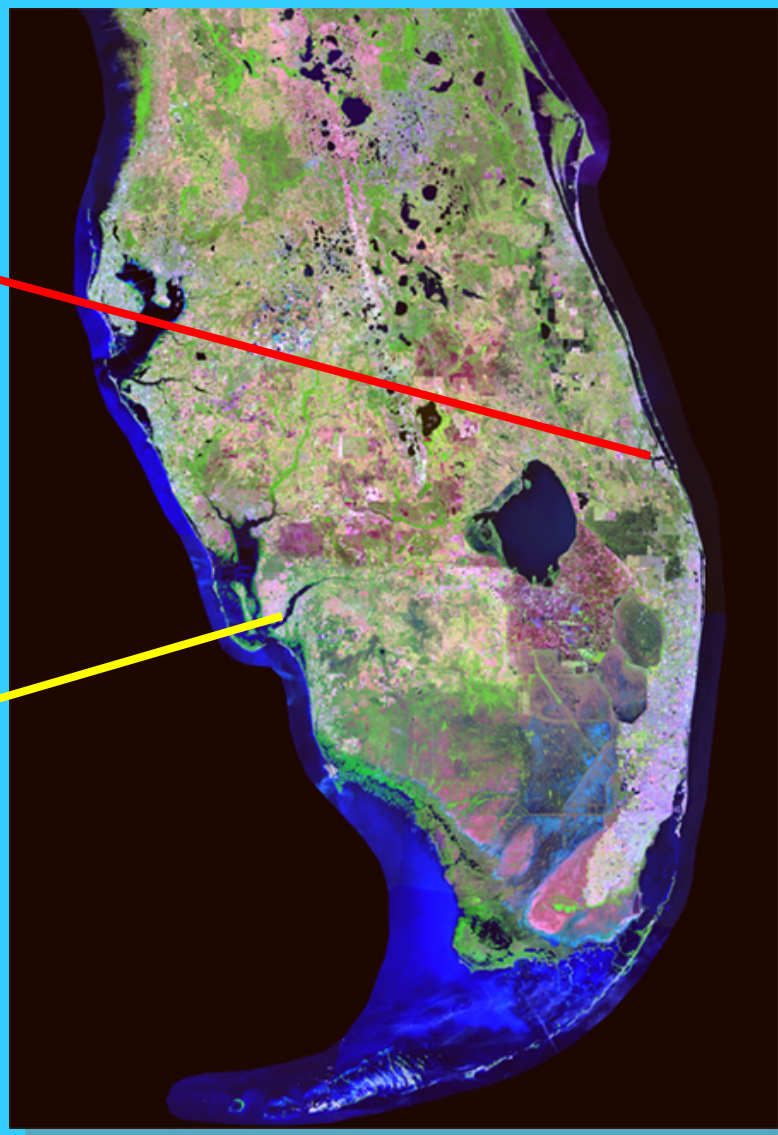


Florida Oceanographic Society

1.7 Billion Gallons per Day of freshwater is wasted to the Atlantic Ocean and Gulf of Mexico! ($5.9 million/day)

South Florida's Northern Coastal Estuaries





Major Impacts

Caloosahatchee Estuary

"Dark Water" at Point Ybel, Sanibel

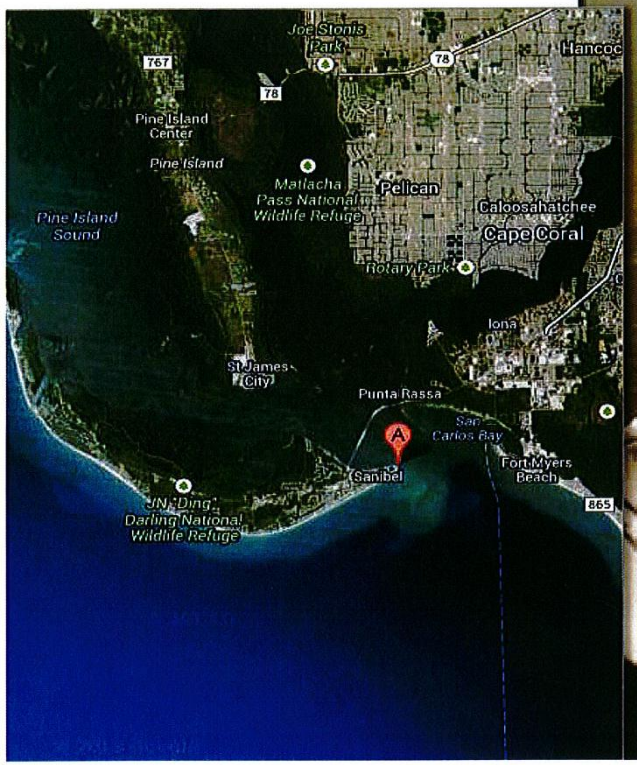


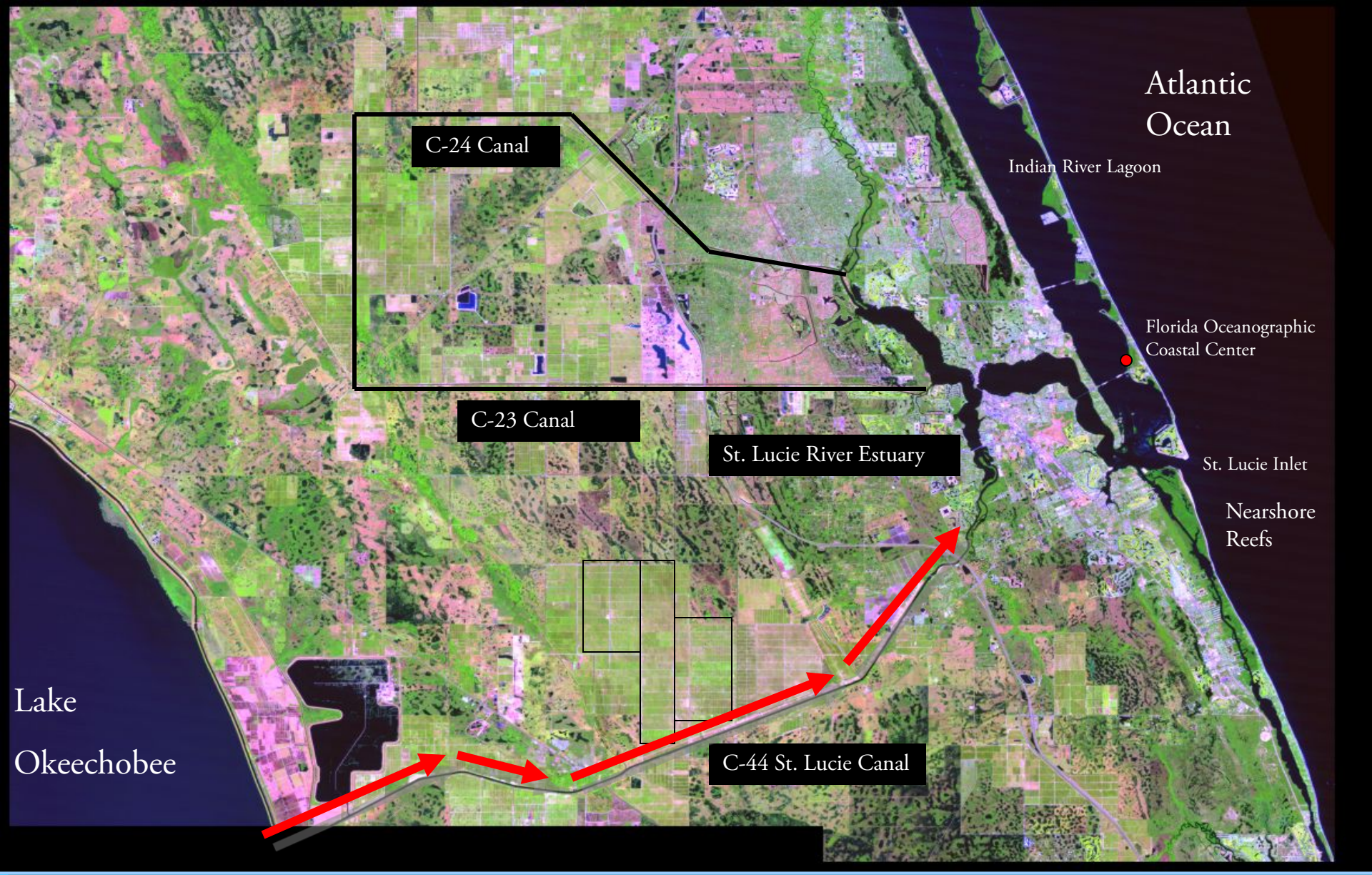
Photo by: Greg Rawl
Illustrative of past high discharge events Mid-2000

Toxic Algae in the Caloosahatchee River From Lake Okeechobee (2005)

Florida Oceanographic Society

Caloosahatchee River Water Treatment Plant Closed Due To Toxic Algae (2005)

Florida Oceanographic Society



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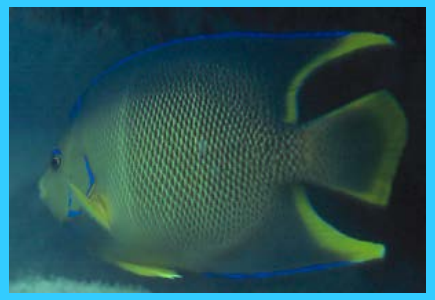
Discharges from Lake Okeechobee to the St. Lucie River Estuary and Indian River Lagoon

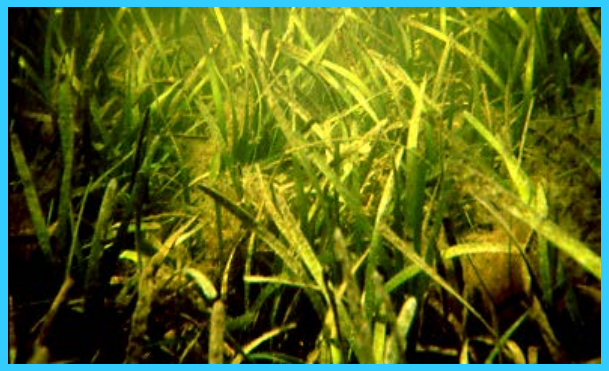
Florida Oceanographic Society

Discharges from Lake Okeechobee and St. Lucie Canal to the Estuary. Up to 4.6 Billion Gallons per Day!

Loss of Fisheries & Coastal Habitat



Seagrass Beds



Oyster Reefs

Mangroves

Coral Reefs

Florida Oceanographic Society

Indian River Lagoon Seagrass Beds

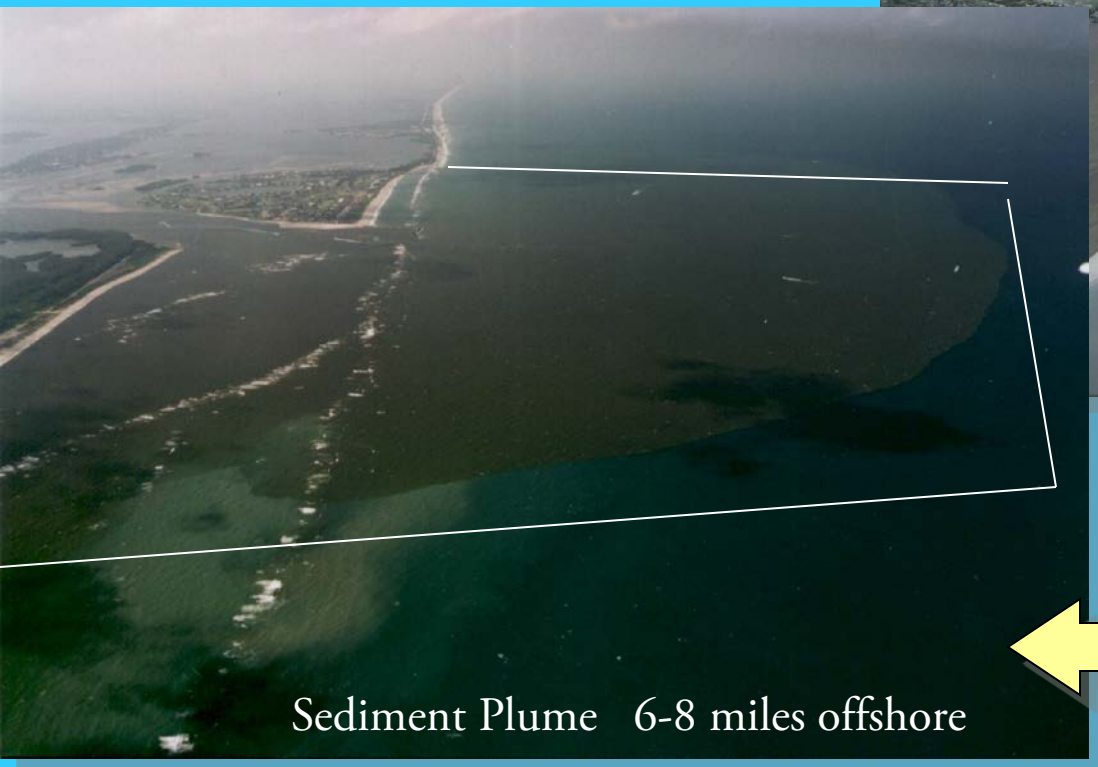
Before Discharges

During Discharges

Florida Oceanographic Society

St. Lucie Inlet Nearshore Reefs

Before Discharges



During Discharges

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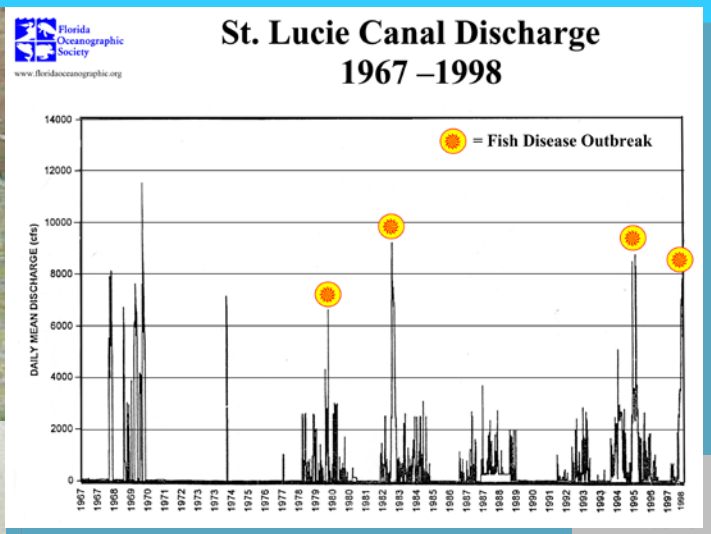
St. Lucie River Estuary
Muck Bottom

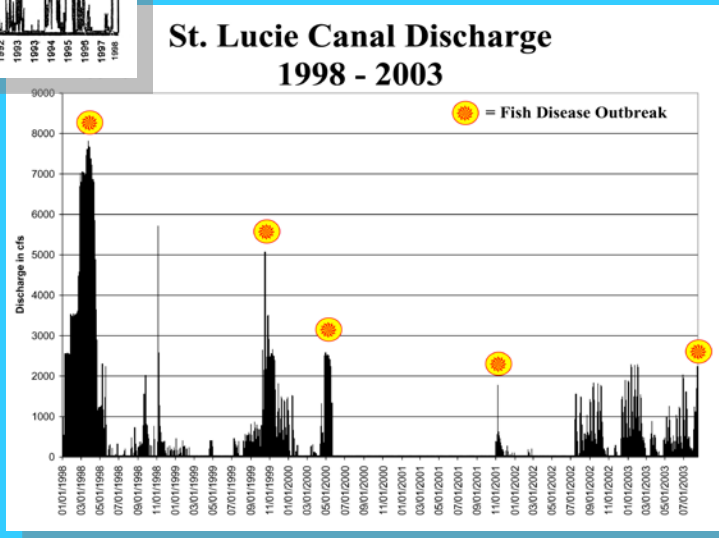
4-8 ft. thick on bottom

7.9 million cubic yards ++

Florida Oceanographic Society

Fish Lesions and Abnormalities





<u>33</u> Species of Fish

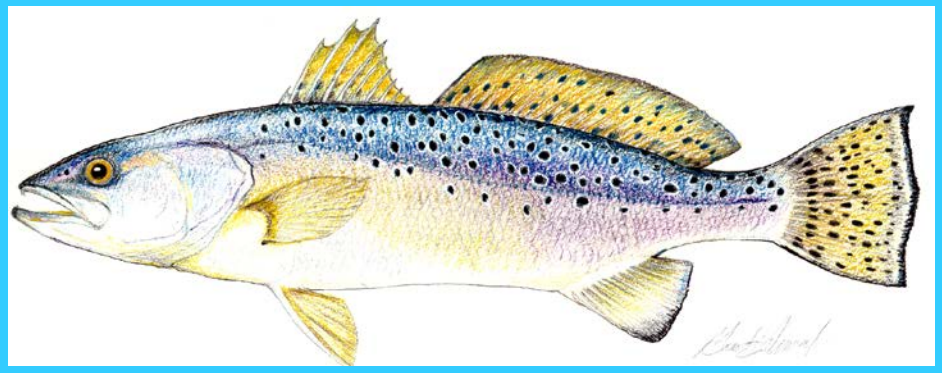
<u>6%</u> of the population

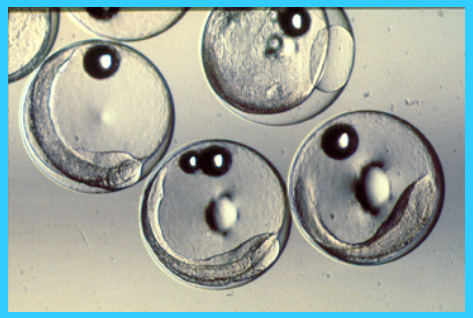
Florida Oceanographic Society

Direct Effects on Fisheries

Economically important **Spotted Seatrout**

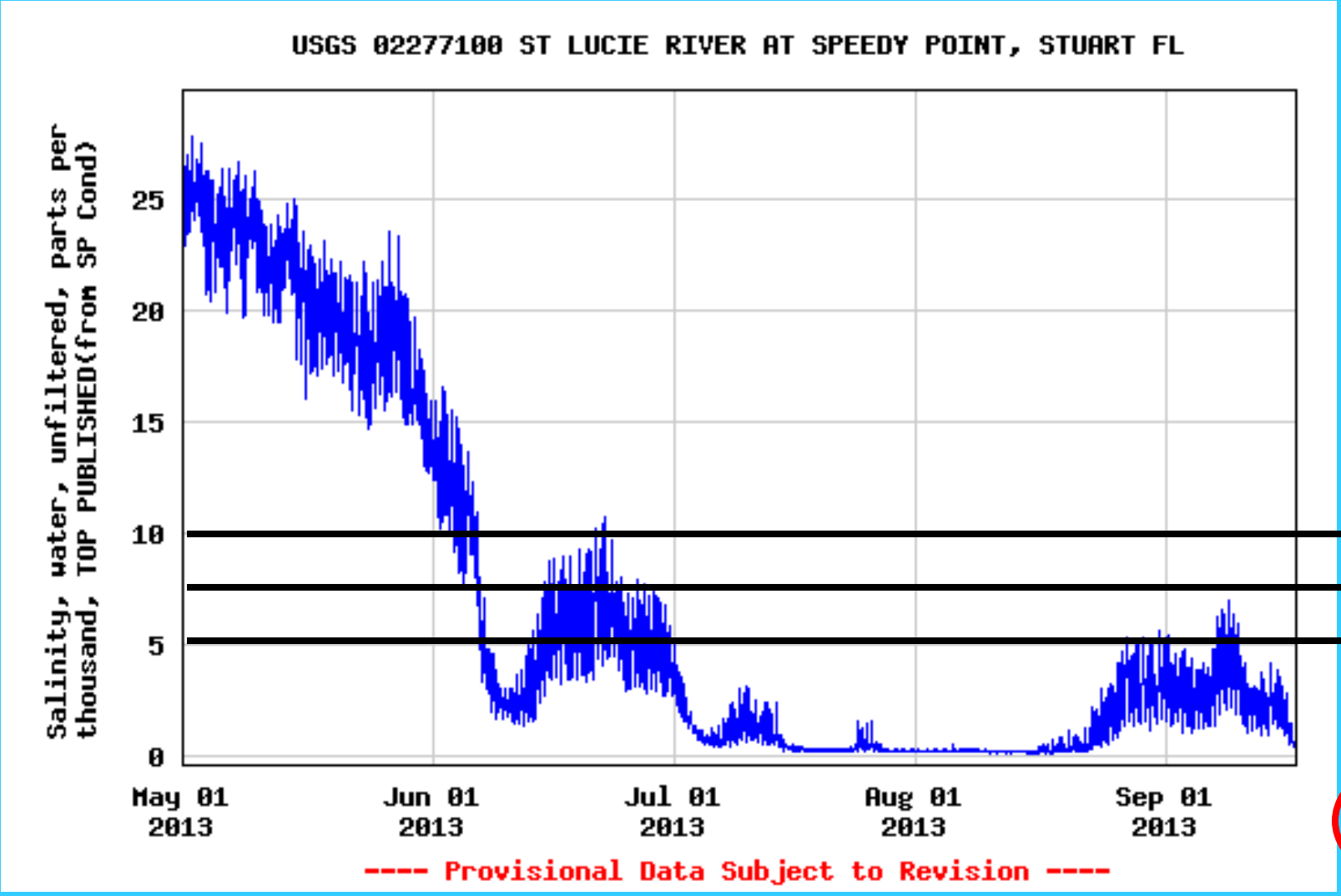
Reproduction is inhibited by low salinity levels in the estuary.





Florida Oceanographic Society


N
0
0.5
1
2 Miles
North Fork
Middle Estuary
Lower Estuary
South Fork
Florida Oceanographic Coastal Center
Martin Co./NOAA Reefs
Historic Oyster Reefs
OYSTER REEF RESTORATION
FLORIDA
YES24
INDIAN RIVER LAGOON



Stress

Harm

Death

104 Days

Salinity Tolerance for <u>Oysters</u>

Florida Oceanographic Society

<u>Death</u>

<u>7 Days For Spat & Juveniles</u>

<u>14 – 28 Days For Adults</u>

Pollution Discharges from Lake Okeechobee & C-44 Basin to the North Fork St. Lucie River and Indian River Lagoon- State Aquatic Preserves

Pollution over the St. Lucie Inlet State Preserve Reef

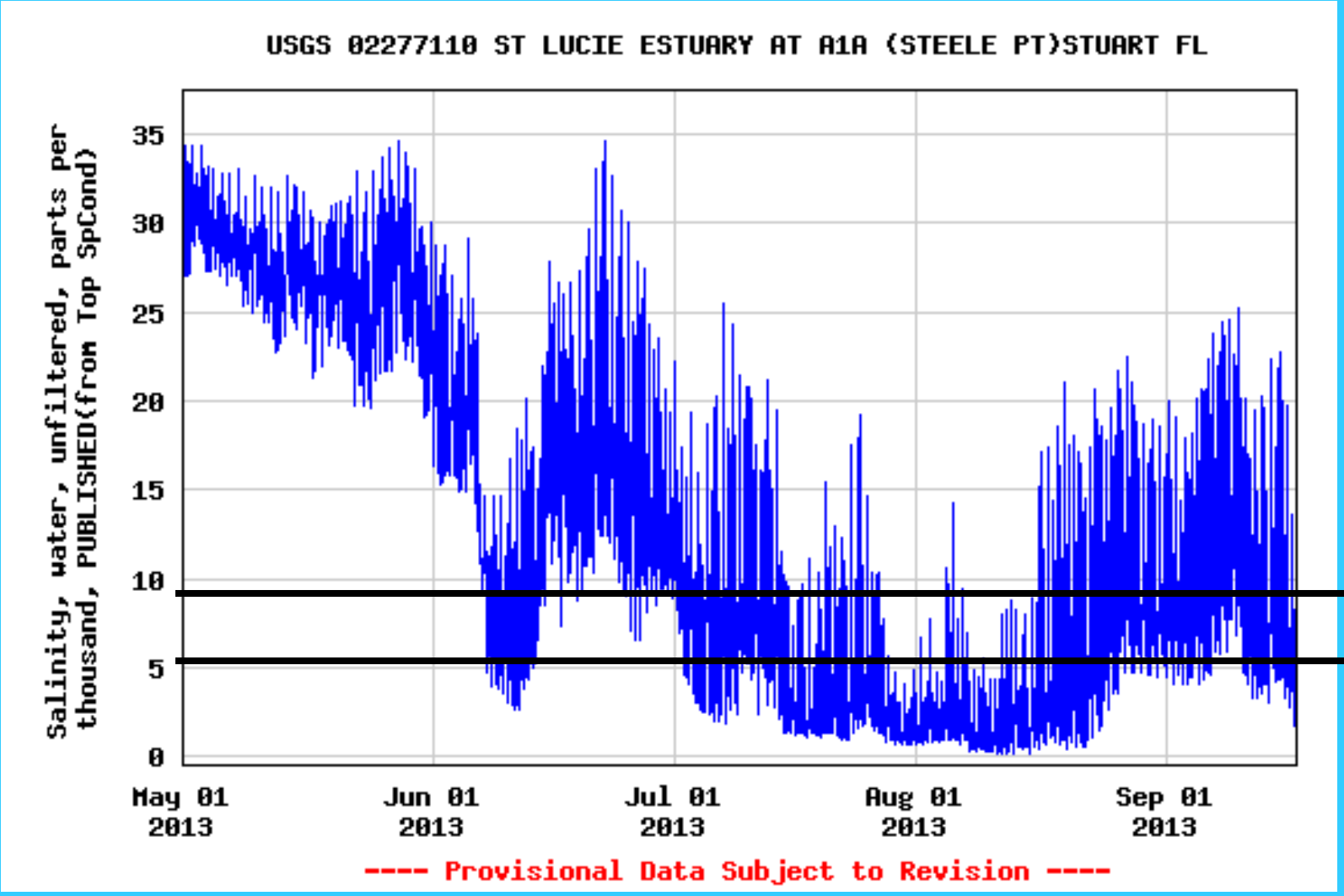
and Hobe Sound National Wildlife Refuge

St. Lucie Inlet 7-6-13 (photos by J. Thurlow-Lippisch)

Florida Oceanographic Society

Pollution Discharges from Lake Okeechobee & C-44 Basin to the St. Lucie River Estuary and Indian River Lagoon- State Aquatic Preserves- covering 700 acres of Seagrass Habitat 6-28-13 (photos by J. Thurlow-Lippisch)

Florida Oceanographic Society



Death

Death

79 Days

Salinity Tolerance for Seagrass

Death

14 days < 9 ppt

3 days < 5ppt

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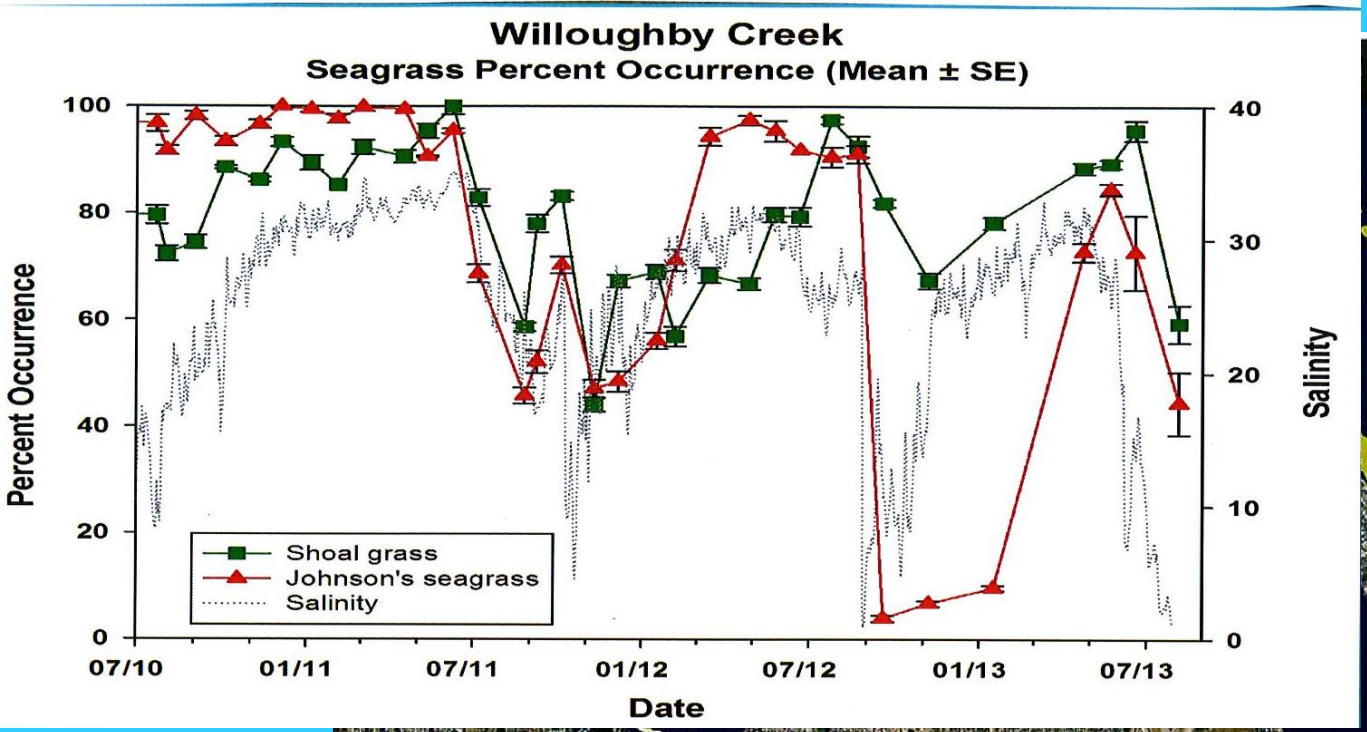
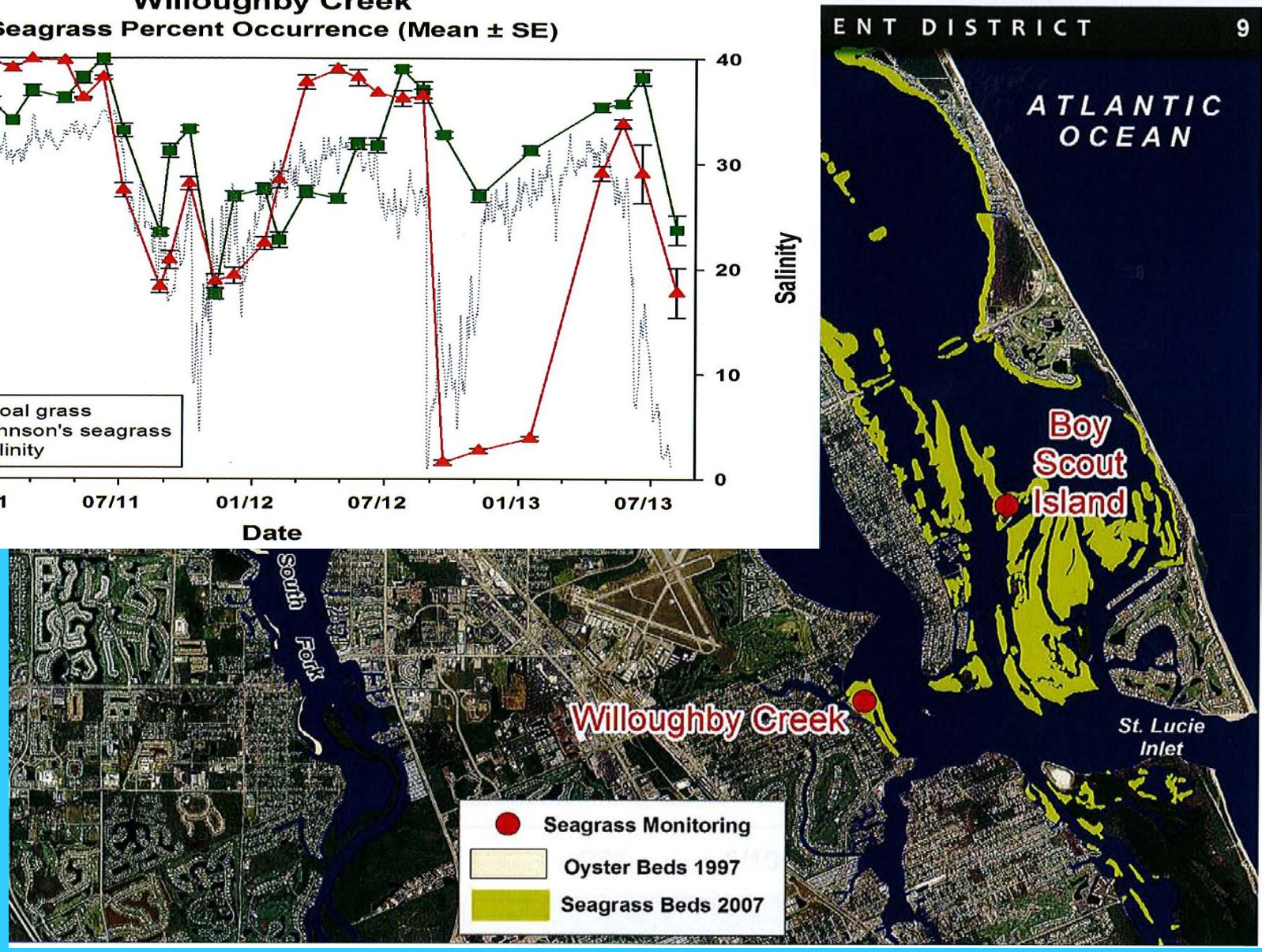




Florida Oceanographic Society

Effects of Freshwater Discharges on Seagrasses – Johnson's Seagrass is a Threatened Species under the ESA

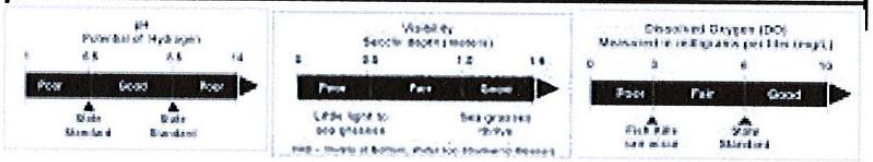
St. Lucie River Estuary
Water Quality Outlook

This information is provided by the Florida Oceanographic Society with support of the Marine Resources Council. It is collected by the Citizen Volunteer Water Quality Monitoring Network. For complete data go to our website at: http://www.floridaoceanographic.org/water.htm
For sample results related to bacteria levels go to:
www.martincountyhealth.com and click on the Environmental Health link.

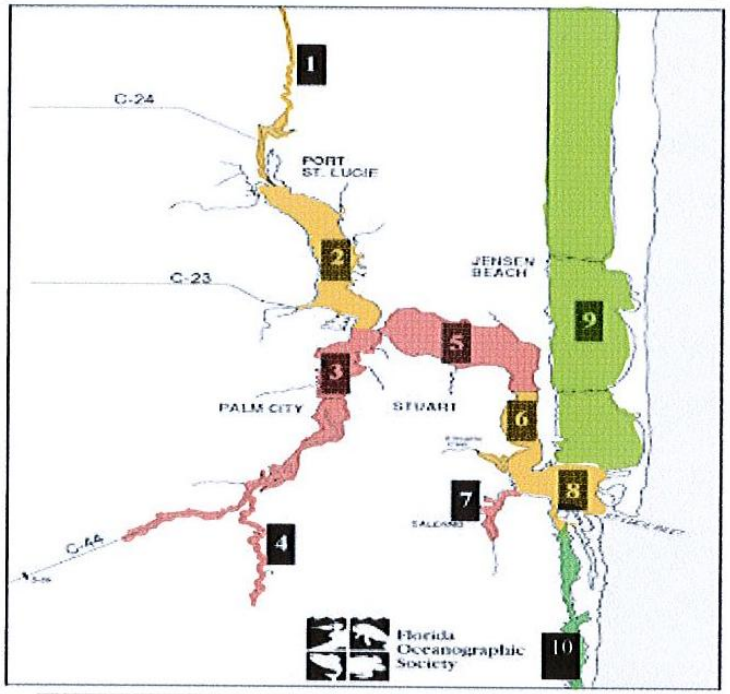
Posted: **07/18/13**

Overall Grade:	65.2%	D	POOR

Zone/ Location	Water Temp. Deg. F	pH	Visibility (Secchi) Meters	Salinity ppt	Dissolved Oxygen mg/L	Location Score	Grade
1. Winding North Fork	82	7.7	0.60 Fair	0.0 Poor	6.5 Good	66% Poor	D
2. North Fork	82	7.5	0.64 Fair	0.5 Poor	3.8 Fair	61% Poor	D
3. South Fork	78	7.6	0.45 Poor	0.0 Poor	6.2 Good	56% Destructive	F
4. Winding South Fork	79	7.2	0.50 Fair	0.0 Poor	2.8 Poor	56% Destructive	F
5. Wide Middle River	80	7.6	0.42 Poor	1.7 Poor	5.3 Good	56% Destructive	F
6. Narrow Middle River	83	7.7	0.83 Fair	2.0 Poor	3.3 Fair	61% Poor	D
7. Manatee Pocket	81	7.6	0.08 Poor	0.0 Poor	8.1 Good	56% Destructive	F
8. Inlet Area	83	8.2	0.98 Fair	24.5 Poor	4.6 Fair	61% Poor	D
9. Indian River Lagoon	79	8.2	1.37 Good	26.0 Fair	5.0 Fair	81% Good	B
10. Intracoastal Waterway South	80	8.0	1.50 Good	32.0 Good	5.6 Good	97% Ideal	A



Comment: The data above may indicate areas of concern in the St. Lucie Estuary. Citizens should call the Florida Department of Environmental Protection (DEP) at 871-7662 or the South Florida Water Management District (SFWMD) 223-2600 to ask about the quality of a specific area and report observations of pollution.



Grading				
A	B	C	D	F
90-100	80-89	70-79	60-69	0-59
IDEAL	GOOD	SATISFACTORY	POOR	DESTRUCTIVE

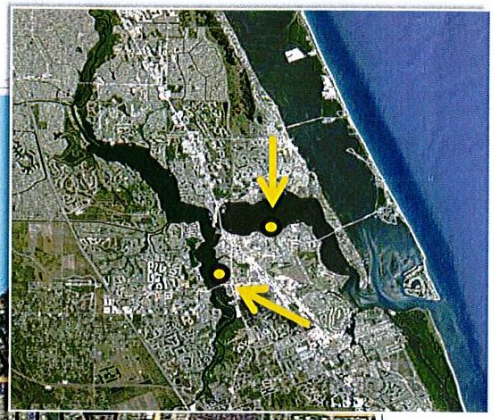
Salinity (Parts per Thousand)				
Zones	Description	Good	Fair	Poor
1 & 4	Winding North & South Forks	2 to 8	1 to 2 or 8 to 15	< 1 or > 15
2 & 3	Inner St. Lucie Estuary (North & South Fork)	15 to 25	10 to 15 or > 25	< 10
5	Wide Middle St. Lucie River	> 20	15 to 20	< 15
6	Narrow Middle St. Lucie River	> 25	20 to 25	< 20
7	Manatee Pocket	> 27.5	20 to 27.5	< 20
8, 9 & 10	Inlet, Indian River Lagoon, & Intracoastal Waterway South	>30	25 to 30	< 25

Health Warnings posted in the St. Lucie River Estuary – 2004, 2005, 2006, 2010, 2012 and 2013

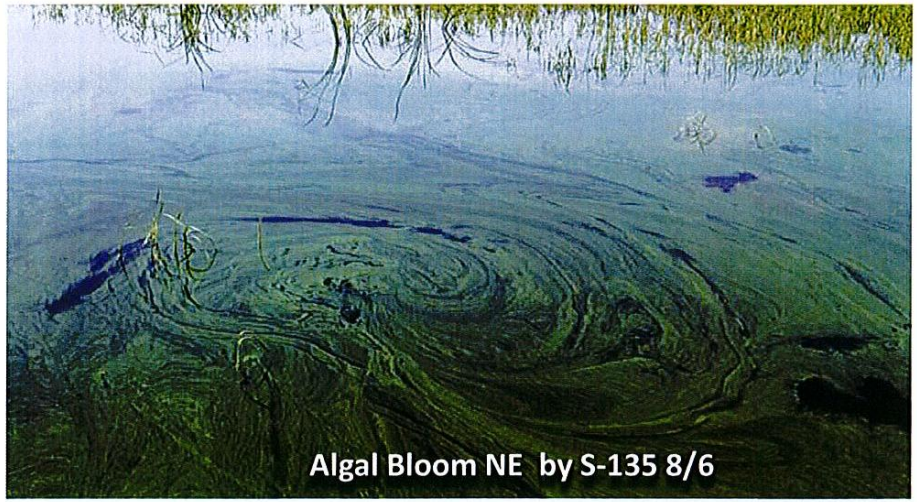
Green Algae Bloom Observed in St. Lucie River along shoreline in Rio – Microcystis - Douglas Ashley – 7-13-13

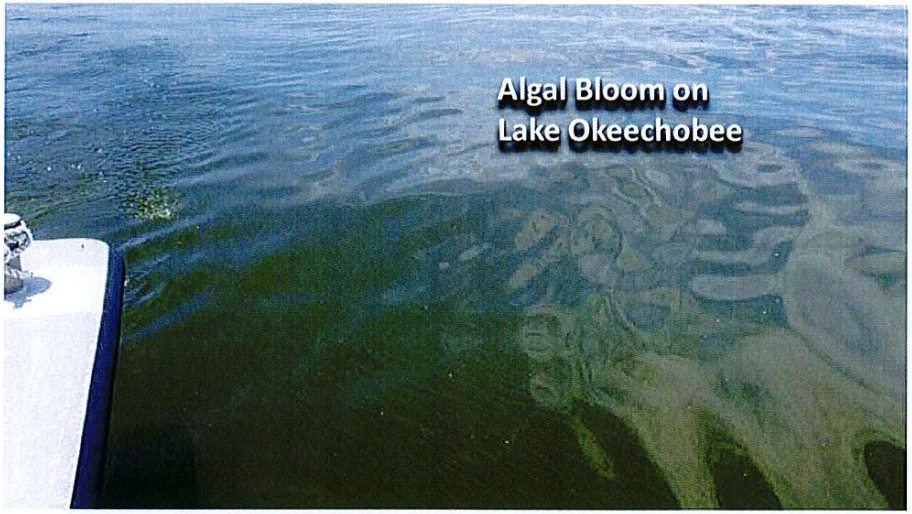
St Lucie Estuary

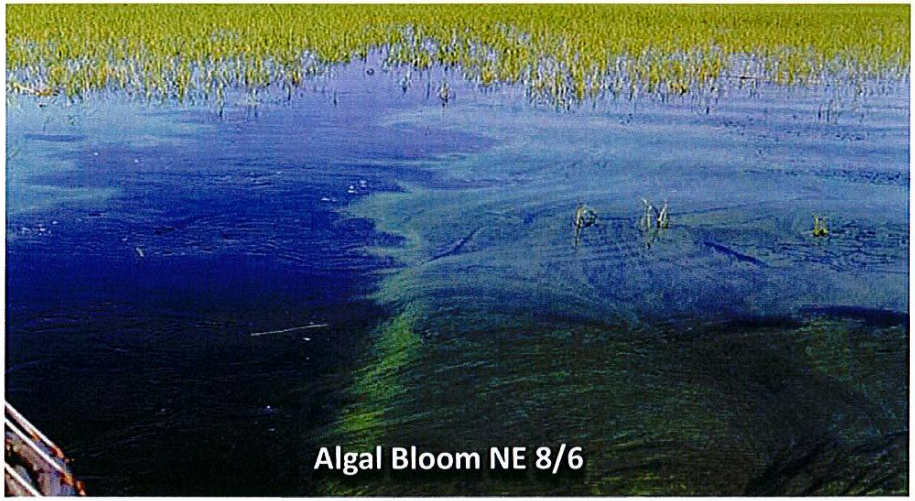
Algal Blooms

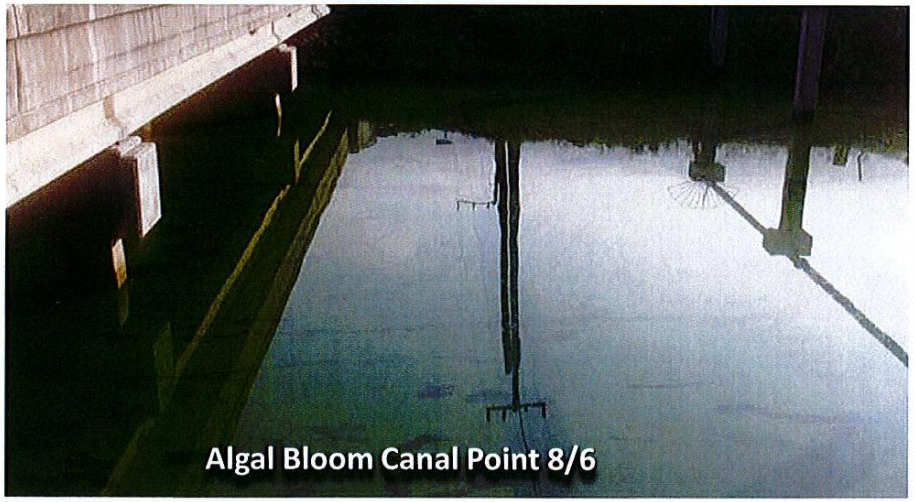


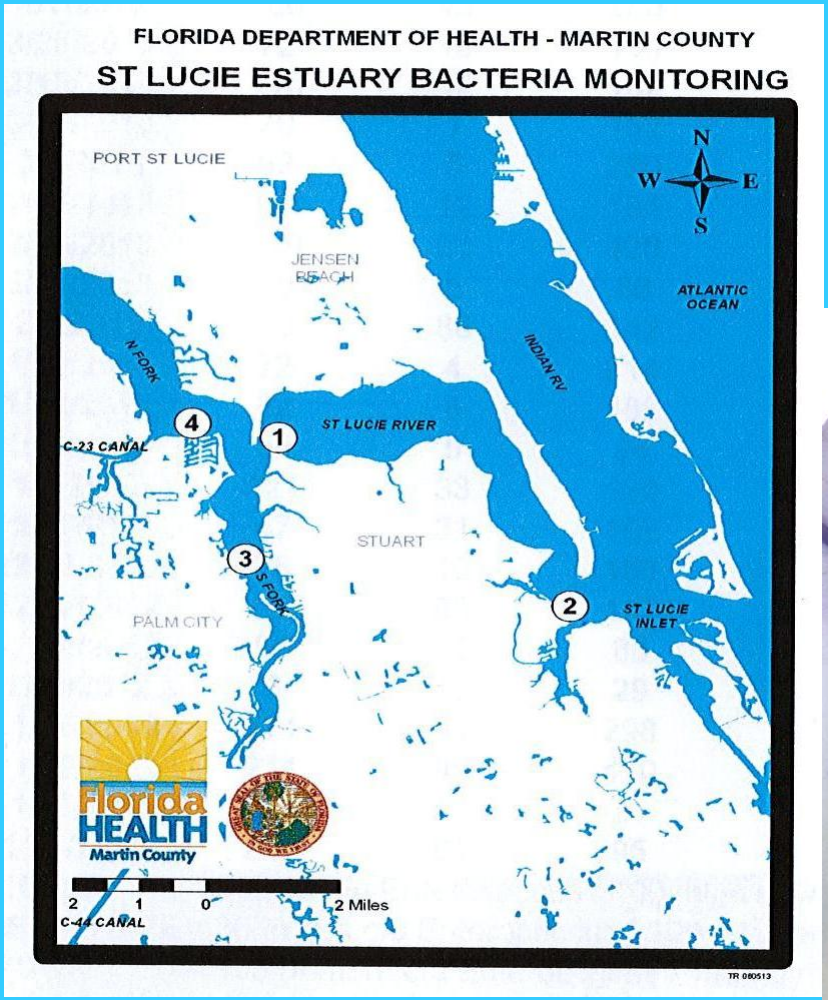
Lake Okeechobee
Current Conditions


Algal Bloom NE by S-135 8/6


Algal Bloom on Lake Okeechobee


Algal Bloom NE 8/6


Algal Bloom Canal Point 8/6

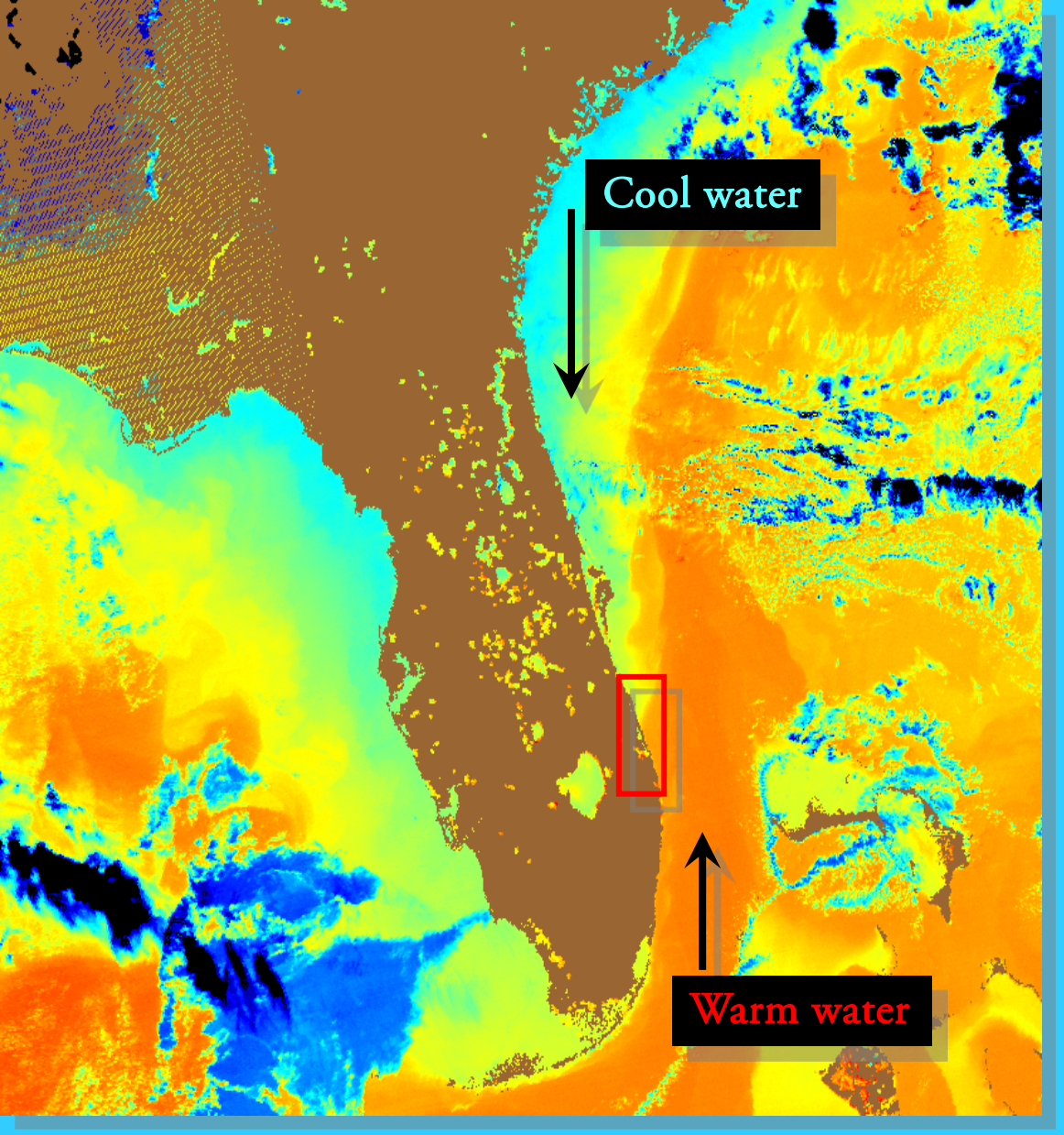


Date	Roosevelt Bridge (1)	Sandsprit Park (2)	Leighton Park (3)	E of Bessey Creek (4)
7/15/2013	1140	354	1440	1480
7/8/2013	910	156	1020	1560
7/2/2013	790	216	2020	1080
6/24/2013	560	102	1640	1400
6/17/2013	302	86	700	590
6/12/2013	Not sampled	134	Not sampled	Not sampled
6/10/2013	600	122	1620	1500

Highest Bacteria Levels Observed

Health Warnings Posted

Avoid Contact with Water



Most Biodiverse Ecosystem in North America

- 2100 plant species
- 2200 animal species
  - 800 fish species
  - 310 bird species

Florida Oceanographic Society

Uniqueness of the Indian River Lagoon Estuary

Indian River Lagoon
Economic Assessment and Analysis Update
Contract No. 24706

For the
Indian River Lagoon National Estuary Program

In cooperation with
St. Johns River Water Management District
South Florida Water Management District

Final Report
August 18, 2008

Photo by E. Vamos courtesy of the SJRWMD

HAZEN AND SAWYER
Environmental Engineers & Scientists

Executive Summary

The Indian River Lagoon is an Estuary of National Significance and one of twenty-eight (28) national estuary programs in the U.S. The Indian River Lagoon National Estuary Program is working toward the goals of attaining and maintaining the water and sediment quality needed to support a healthy seagrass-based ecosystem, endangered and threatened species, fisheries and recreation in the Lagoon.

Study Purpose

This study updated the economic values of the Indian River Lagoon that were estimated in 1995. The study area for this project is the Indian River Lagoon, including Mosquito Lagoon and Banana River Lagoon, and associated tributaries including but not limited to the St. Lucie River Estuary, St. Sebastian River, Turkey Creek, Crane Creek, Moore's Creek, and the inlets of Ponce de Leon Inlet, Port Canaveral Inlet, Sebastian Inlet, Ft. Pierce Inlet, St. Lucie Inlet, and Jupiter Inlet. The residents surrounding the Indian River Lagoon are located in the counties of Volusia, Brevard, Indian River, St. Lucie and Martin. The uses and values presented in this study represent the year 2007.

Economic Value of the Indian River Lagoon

The 2007 economic value of the Indian River Lagoon is provided in Table ES.1. Overall, residents and visitors of the five Indian River Lagoon counties received about $3.7 billion in benefits in 2007 because of the existence of the Indian River Lagoon in its 2007 environmental condition.

Table ES.1
Estimated Annual Economic Value of the Indian River Lagoon in its Existing Environmental Condition, 2007

Indian River Lagoon Related-	Value
(1) Recreational Expenditures	$1,302,000,000
(2) Recreational Use Value	$762,000,000
(3) Non-Use Value of Lagoon	$3,400,000
(4) Real Estate Value, annualized	$934,000,000
(5) Income Generated in IRL Counties	$629,700,000
(6) Restoration, Research, Education Expenditures	$91,000,000
(7) Commercial Fishing Dockside Value	$3,800,000
Total Annual Value	**$3,725,900,000**

405548-001\Wpdocs\Report\R2 Final

Florida Oceanographic Society

Indian River Lagoon – Economic Value **$ 3.725 Billion** 2007

Water-Related Benefits to Martin and St. Lucie Counties

TOTAL: $840 million annually

Sales - *$519 million/yr*

- Marinas
- Boat sales/repairs
- Fishing tackle/bait/charters

Personal income - *$206 million/yr*

- *6,600* jobs supported—Marine Industries
  - Guide/commercial fishing
  - Repair personnel
- *20,500* jobs supported—Tourism
  - Food/beverage services
  - Hotel/motel personnel

Tourism - *$115 million/yr*

- Visitation to beaches/hotels
- Recreational fishing/boating

PLUS-Property Values - *$588 million Plus (Martin County)*

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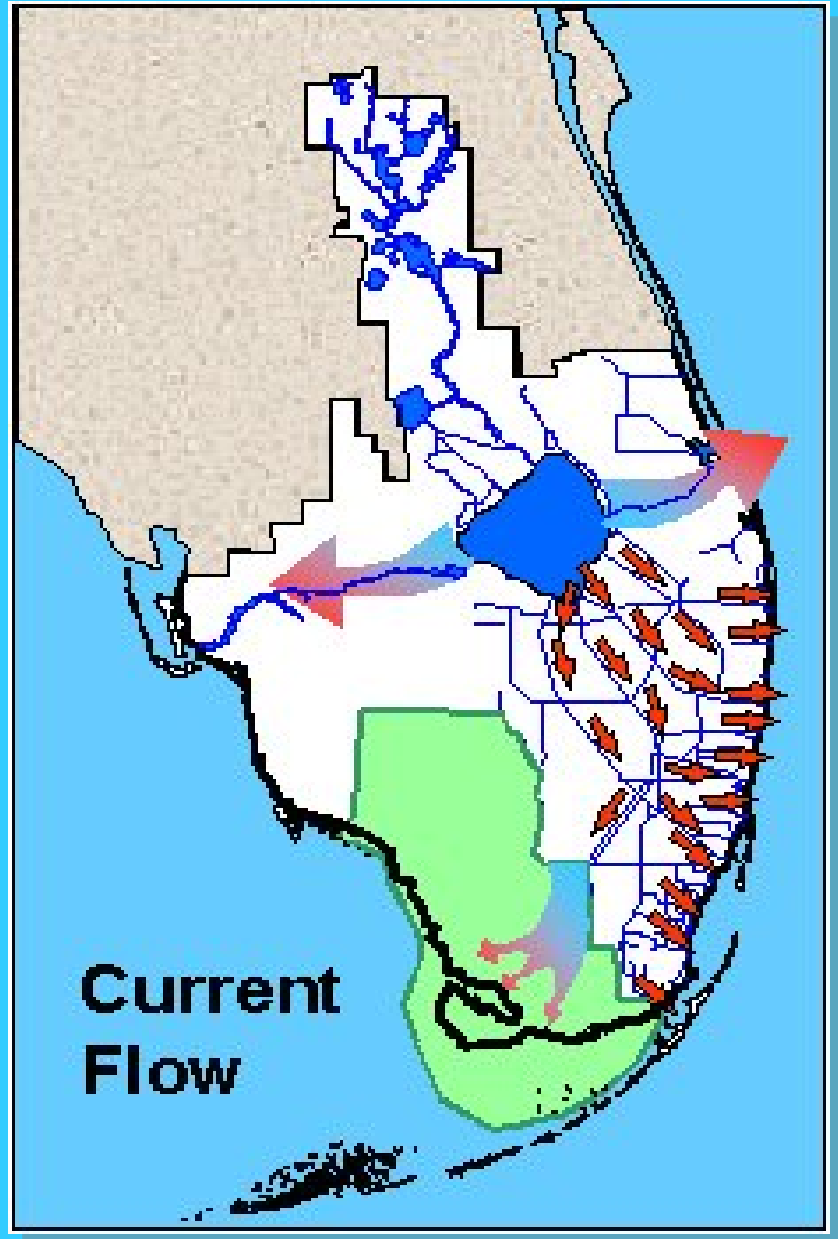
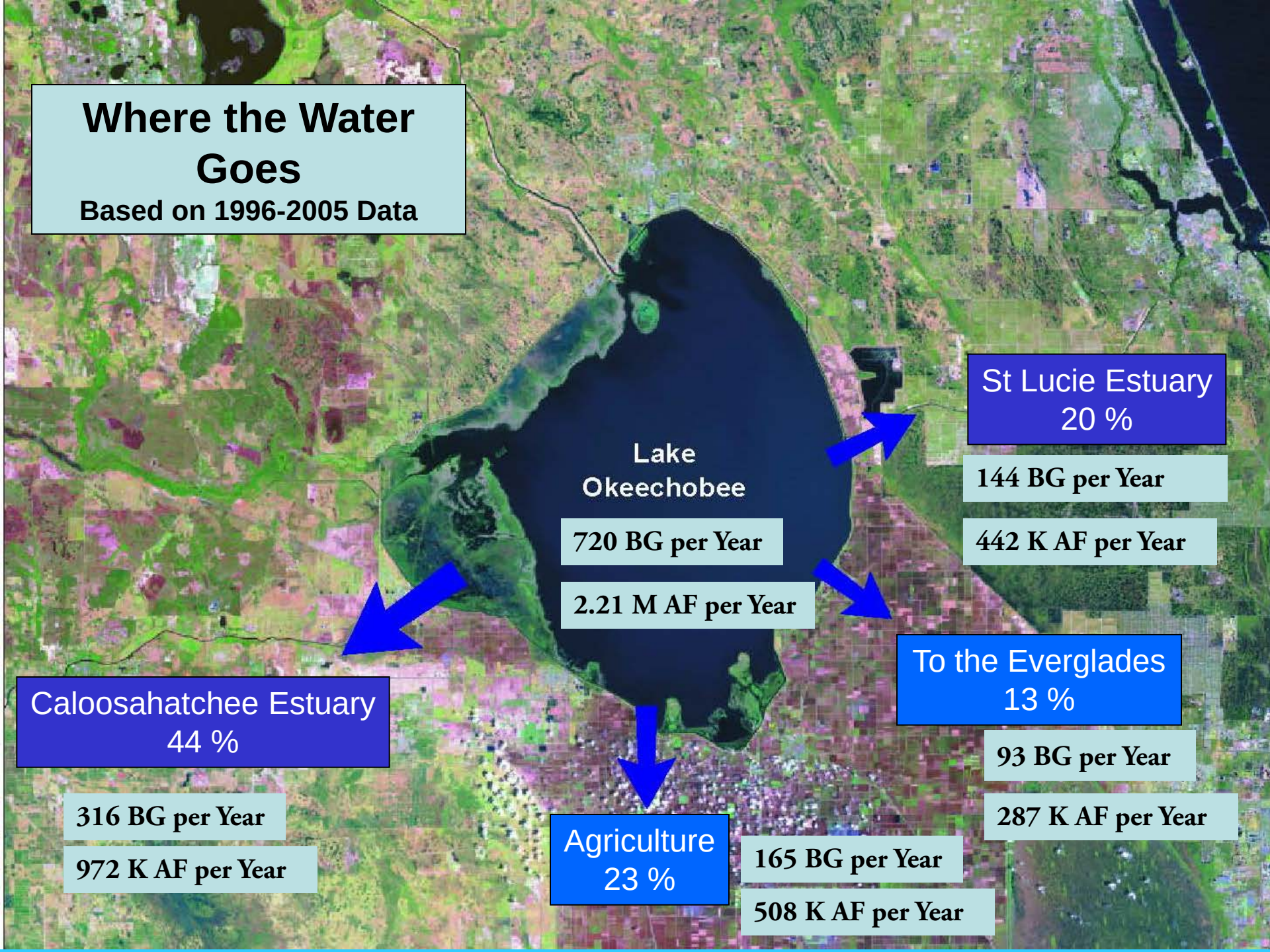
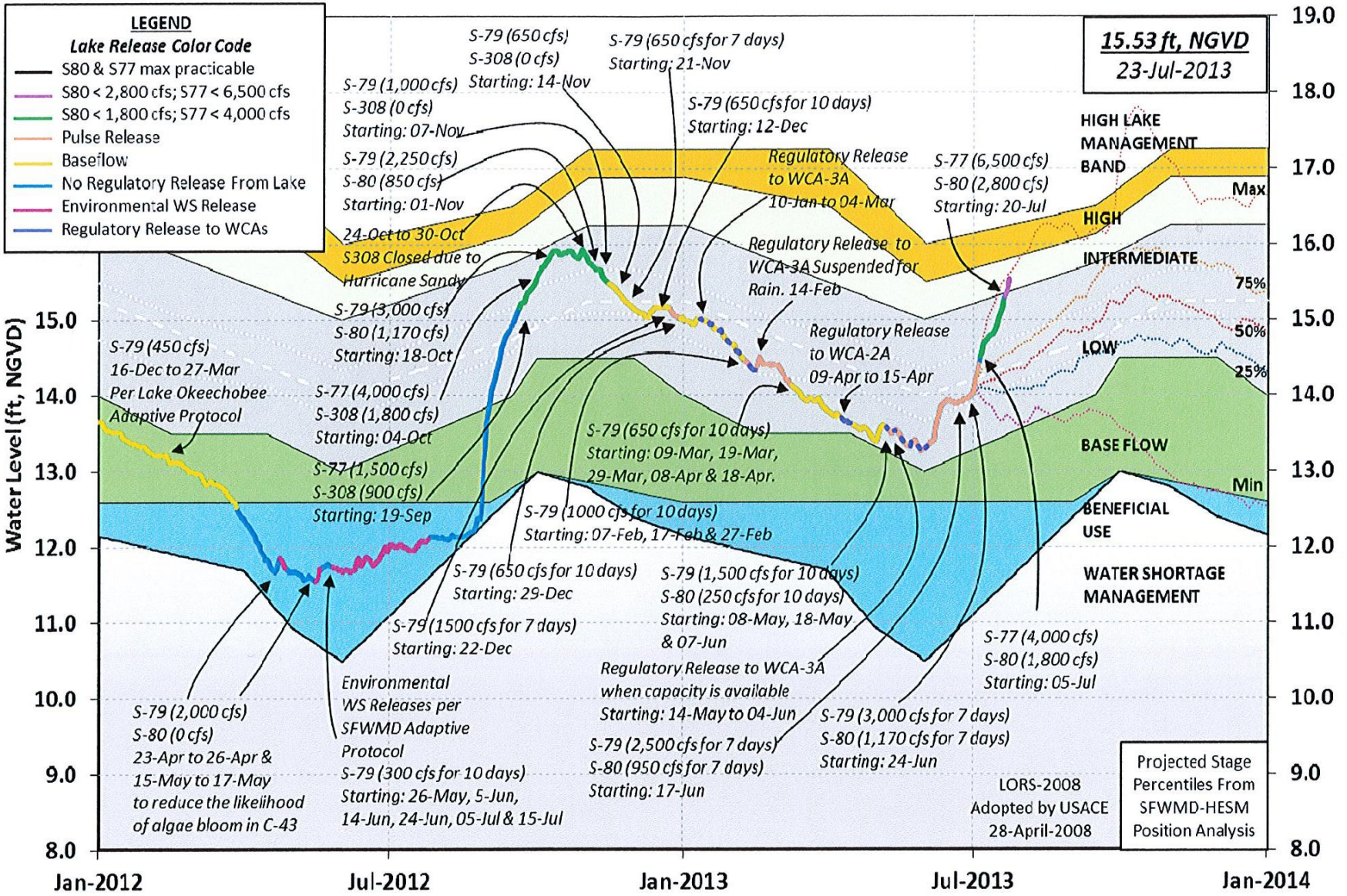


Florida Oceanographic Society

1.7 Billion Gallons per Day of freshwater is wasted to the Atlantic Ocean and Gulf of Mexico! ($5.9 million/day)


Where the Water Goes
Based on 1996-2005 Data
Lake Okeechobee
720 BG per Year
2.21 M AF per Year
St Lucie Estuary
20 %
144 BG per Year
442 K AF per Year
To the Everglades
13 %
93 BG per Year
287 K AF per Year
Caloosahatchee Estuary
44 %
316 BG per Year
972 K AF per Year
Agriculture
23 %
165 BG per Year
508 K AF per Year

Lake Okeechobee Water Level History and Projected Stages



2008 LORS

Part D: Establish Allowable Lake Okeechobee Releases to Tide (Estuaries)

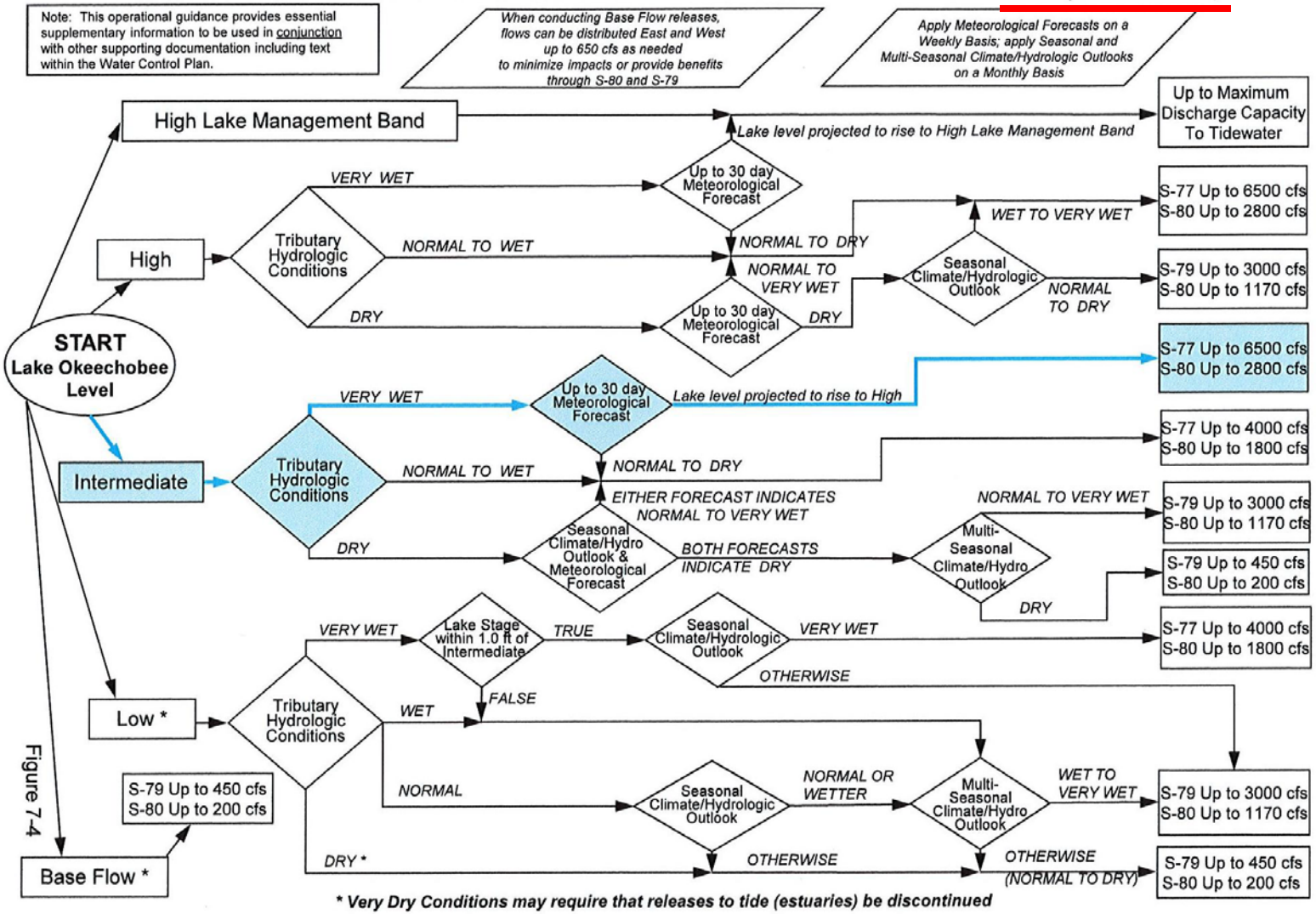


Figure 7-4

2008 LORS

Part C: Establish Allowable Lake Okeechobee Releases to the Water Conservation Areas

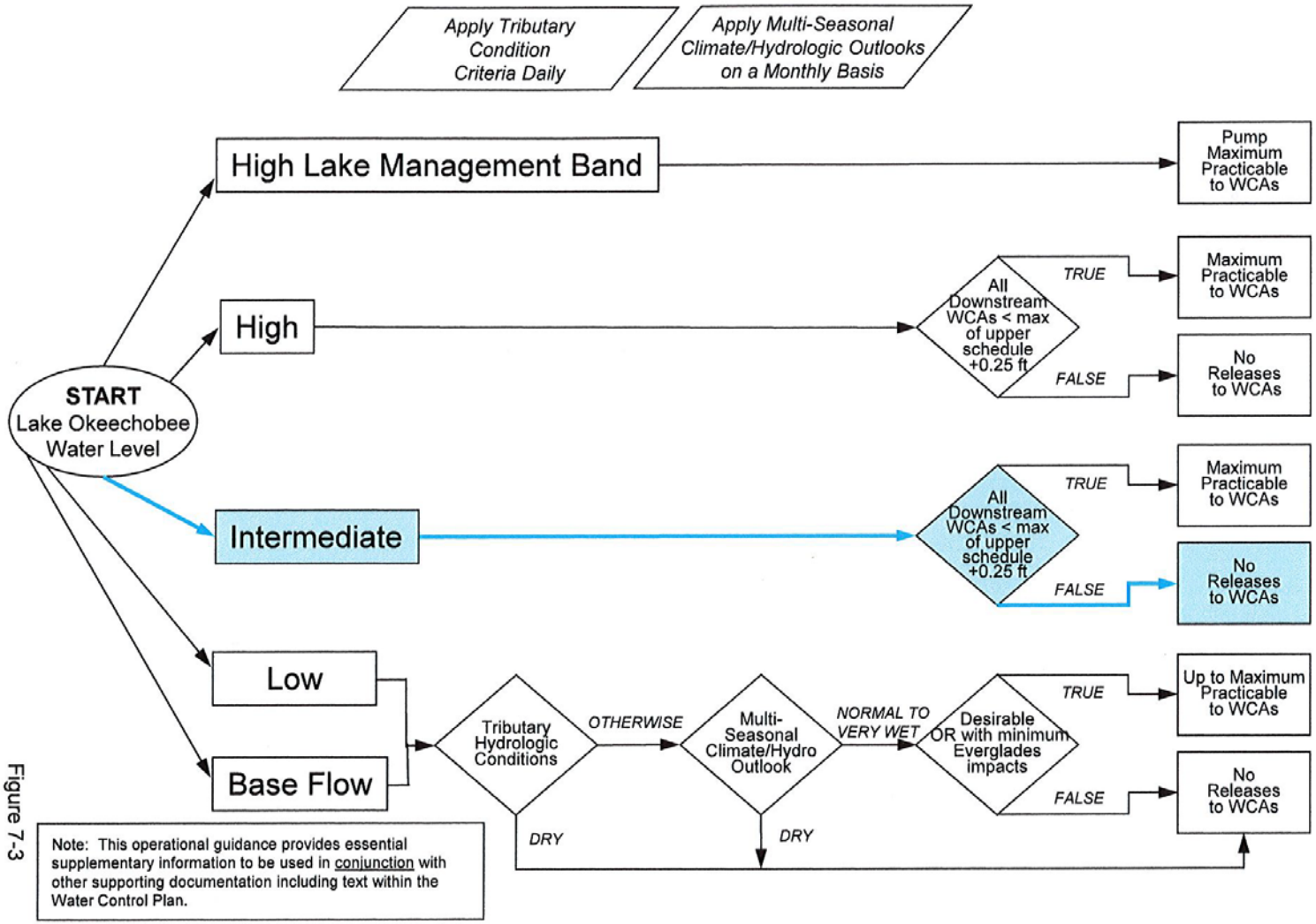
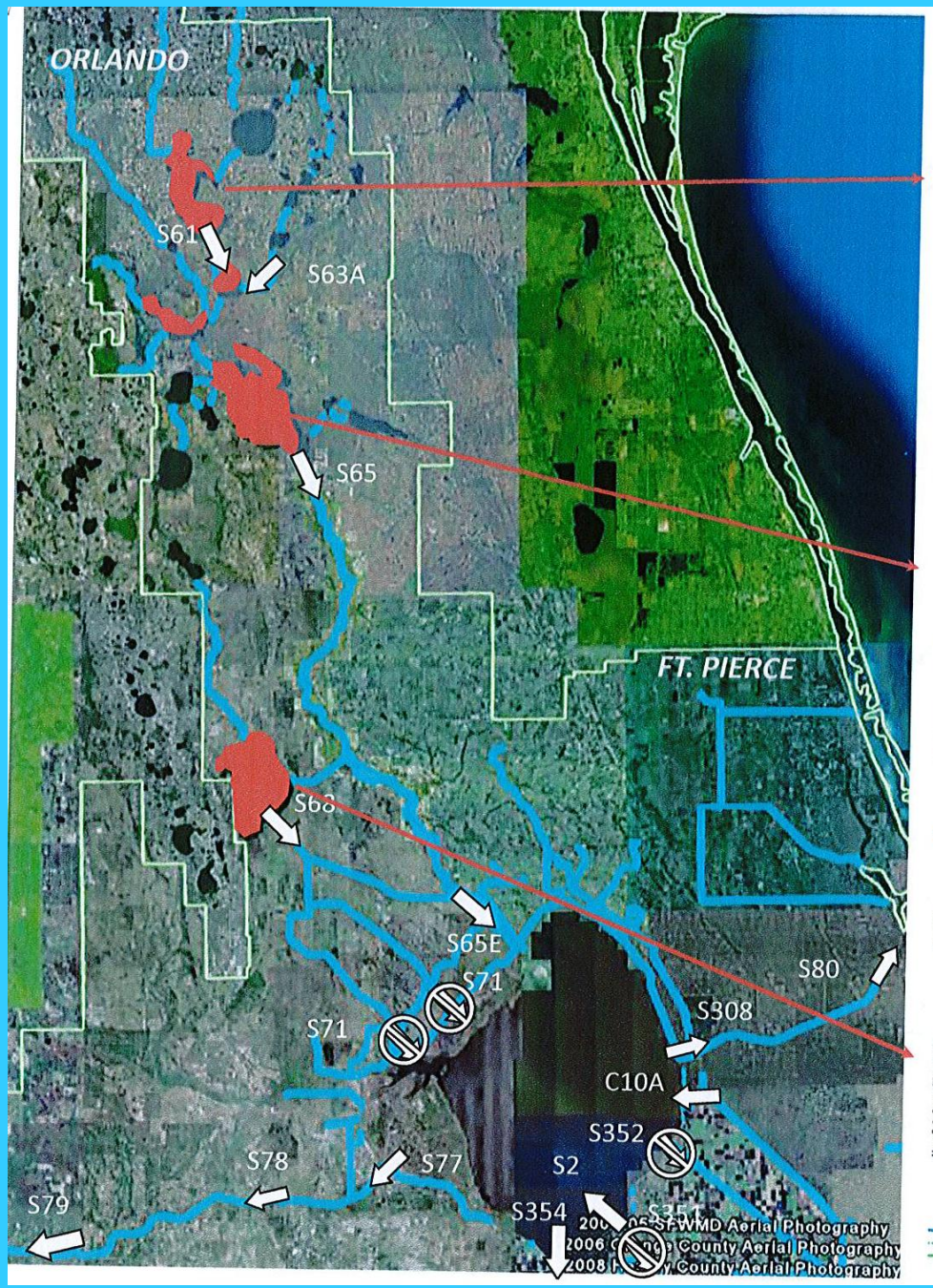
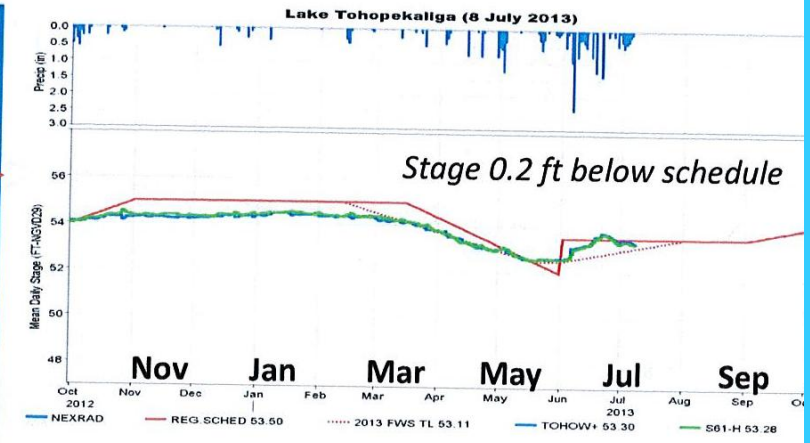
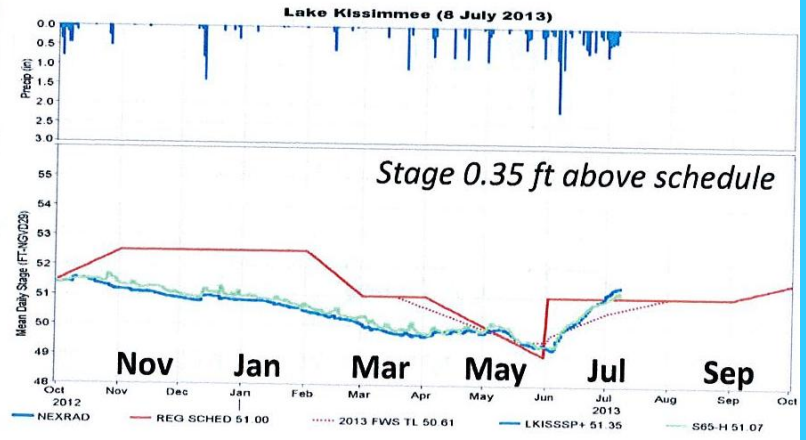
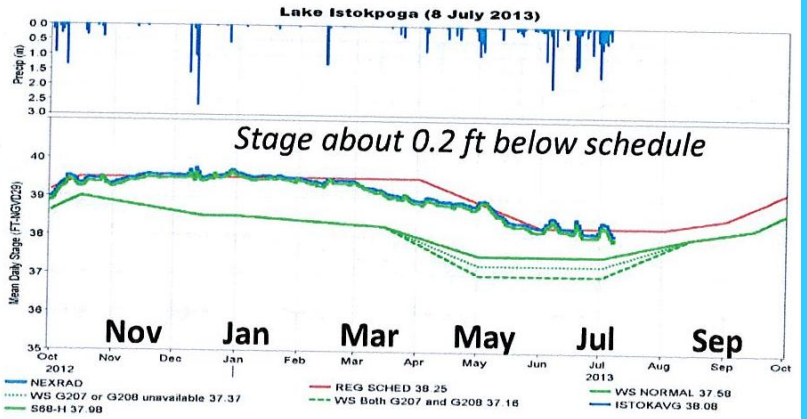


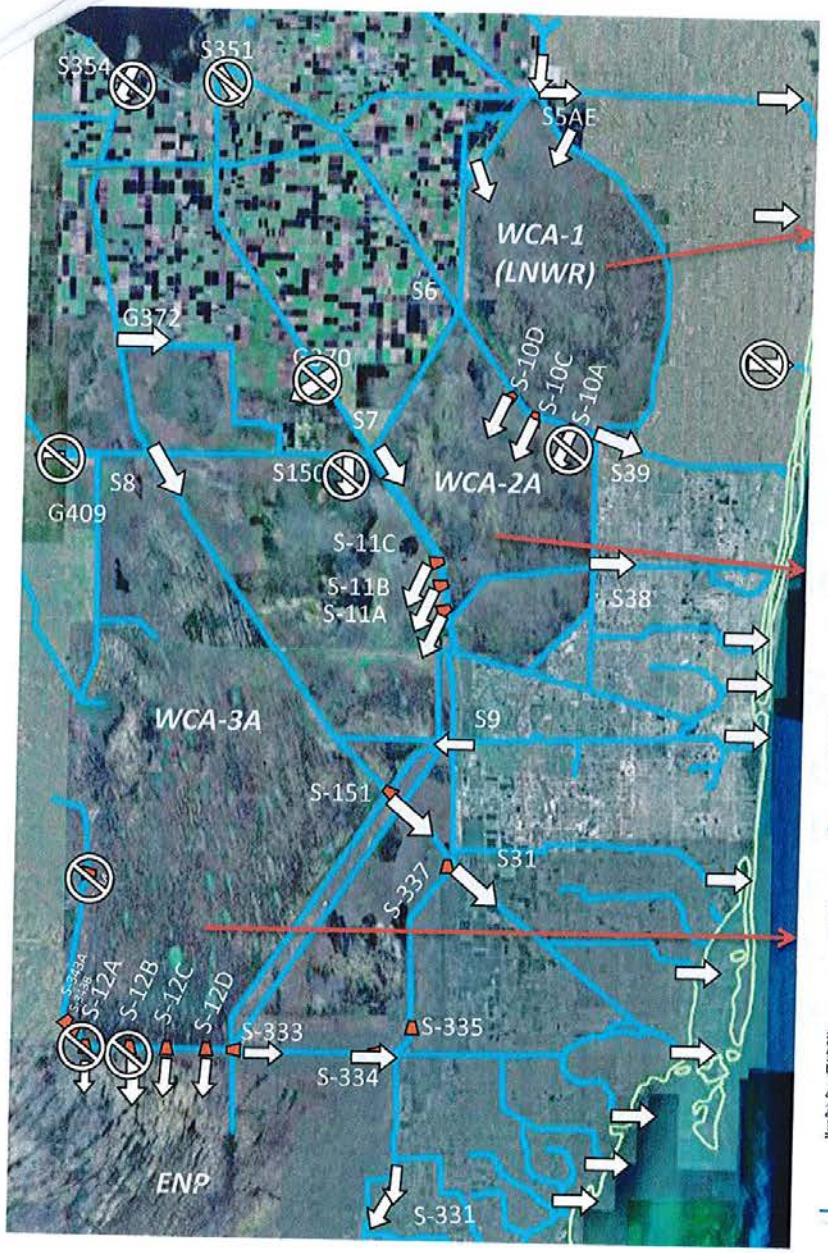
Figure 7-3

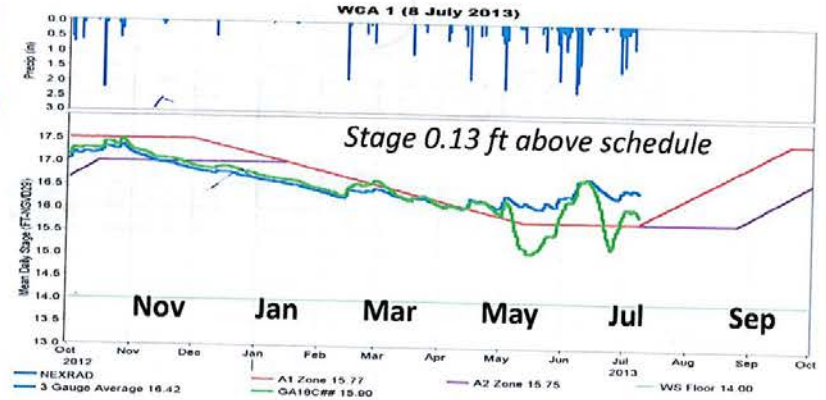

ORLANDO
S61
S63A
S65
S65E
S71
S71
S80
S308
C10A
S352
S2
S78
S77
S79
S354
FT. PIERCE
SFWMD Aerial Photography
2006
2008

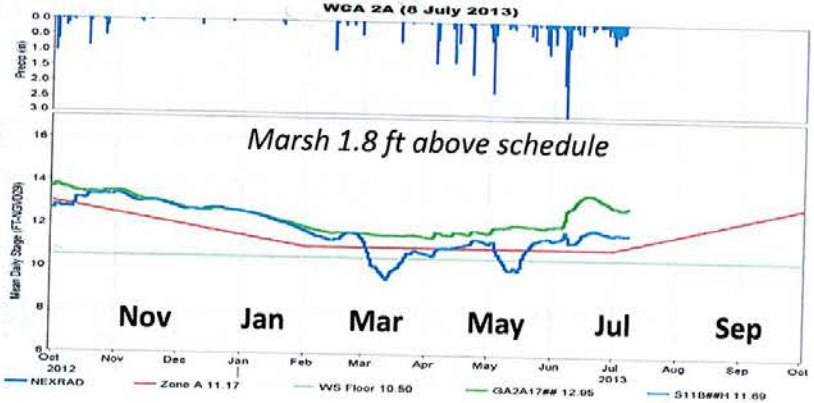

Lake Tohopekaliga (8 July 2013)
Precip (in)
Stage 0.2 ft below schedule
Mean Daily Stage (FT-NGVD29)
Nov
Jan
Mar
May
Jul
Sep
NEXRAD
REG SCHED 53.50
2013 FWS TL 53.11
TOHOW+ 53.30
S61-H 53.28

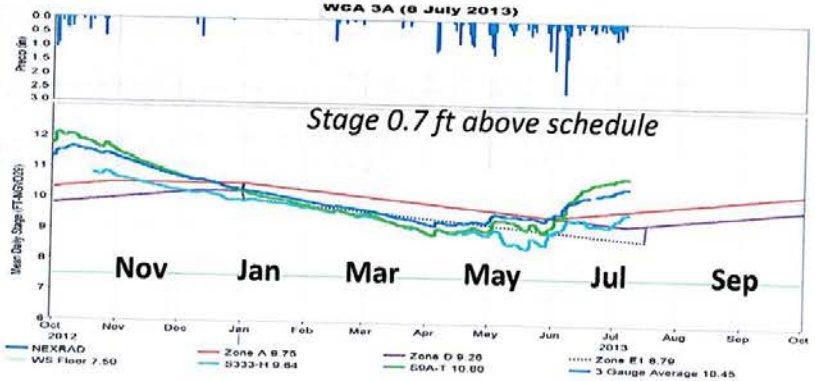

Lake Kissimmee (8 July 2013)
Precip (in)
Stage 0.35 ft above schedule
Mean Daily Stage (FT-NGVD29)
Nov
Jan
Mar
May
Jul
Sep
NEXRAD
REG SCHED 51.00
2013 FWS TL 50.61
LKISSSP+ 51.35
S65-H 51.07


Lake Istokpoga (8 July 2013)
Precip (in)
Stage about 0.2 ft below schedule
Mean Daily Stage (FT-NGVD29)
Nov
Jan
Mar
May
Jul
Sep
NEXRAD
WS G207 or G208 unavailable 37.37
S68-H 37.98
REG SCHED 38.25
WS Both G207 and G208 37.16
WS NORMAL 37.58
ISTOKAVG 38.08


S354
S351
S5AE
WCA-1
(LNWR)
S6
G372
S7
S-10D
S-10C
S-10A
S8
G409
S150
WCA-2A
S39
S-11C
S-11B
S-11A
S38
WCA-3A
S9
S-151
S31
S-337
S-12A
S-12B
S-12C
S-12D
S-333
S-335
S-334
ENP
S-331


WCA 1 (8 July 2013)
Stage 0.13 ft above schedule
Nov
Jan
Mar
May
Jul
Sep


WCA 2A (8 July 2013)
Marsh 1.8 ft above schedule
Nov
Jan
Mar
May
Jul
Sep


WCA 3A (8 July 2013)
Stage 0.7 ft above schedule
Nov
Jan
Mar
May
Jul
Sep

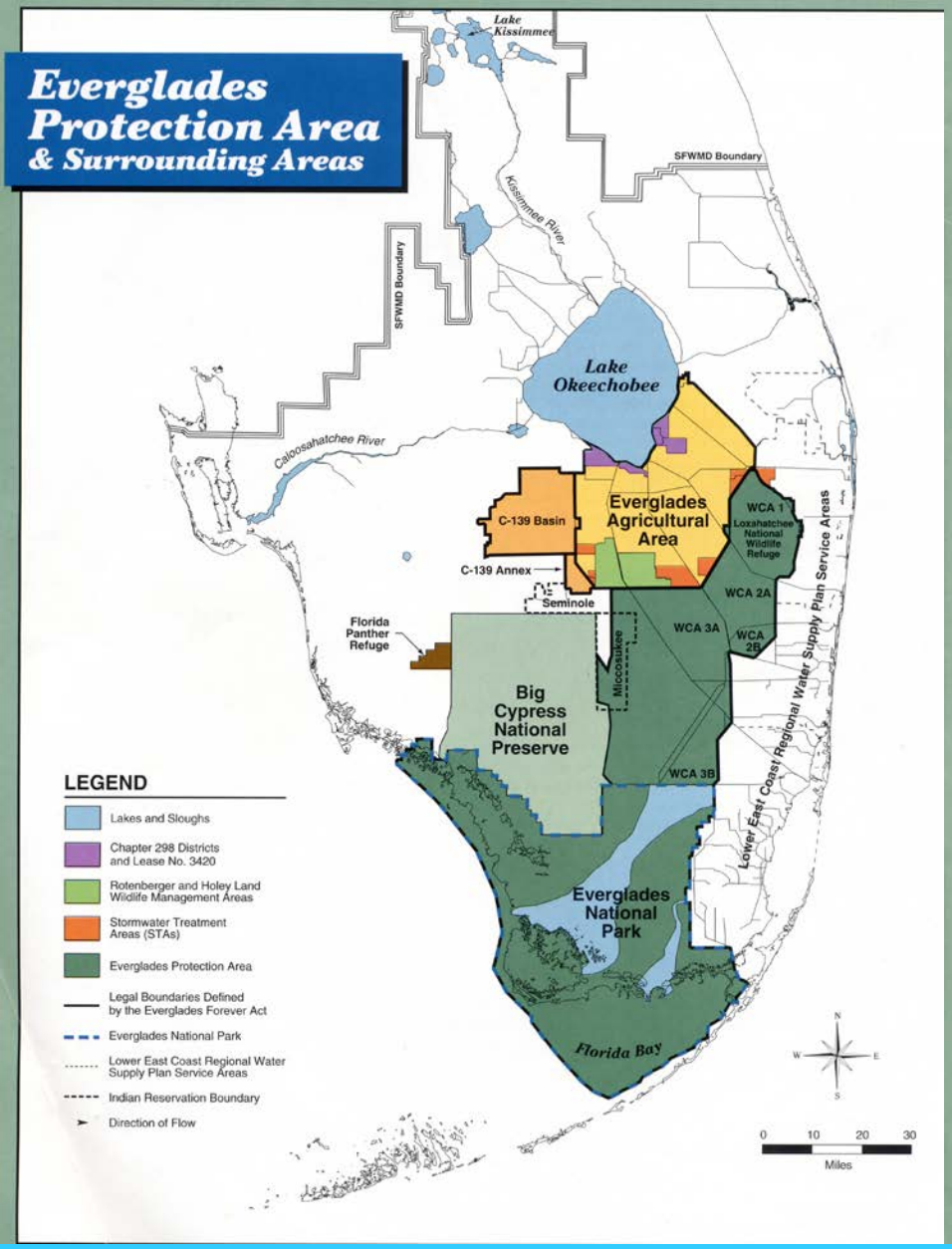
Now What?

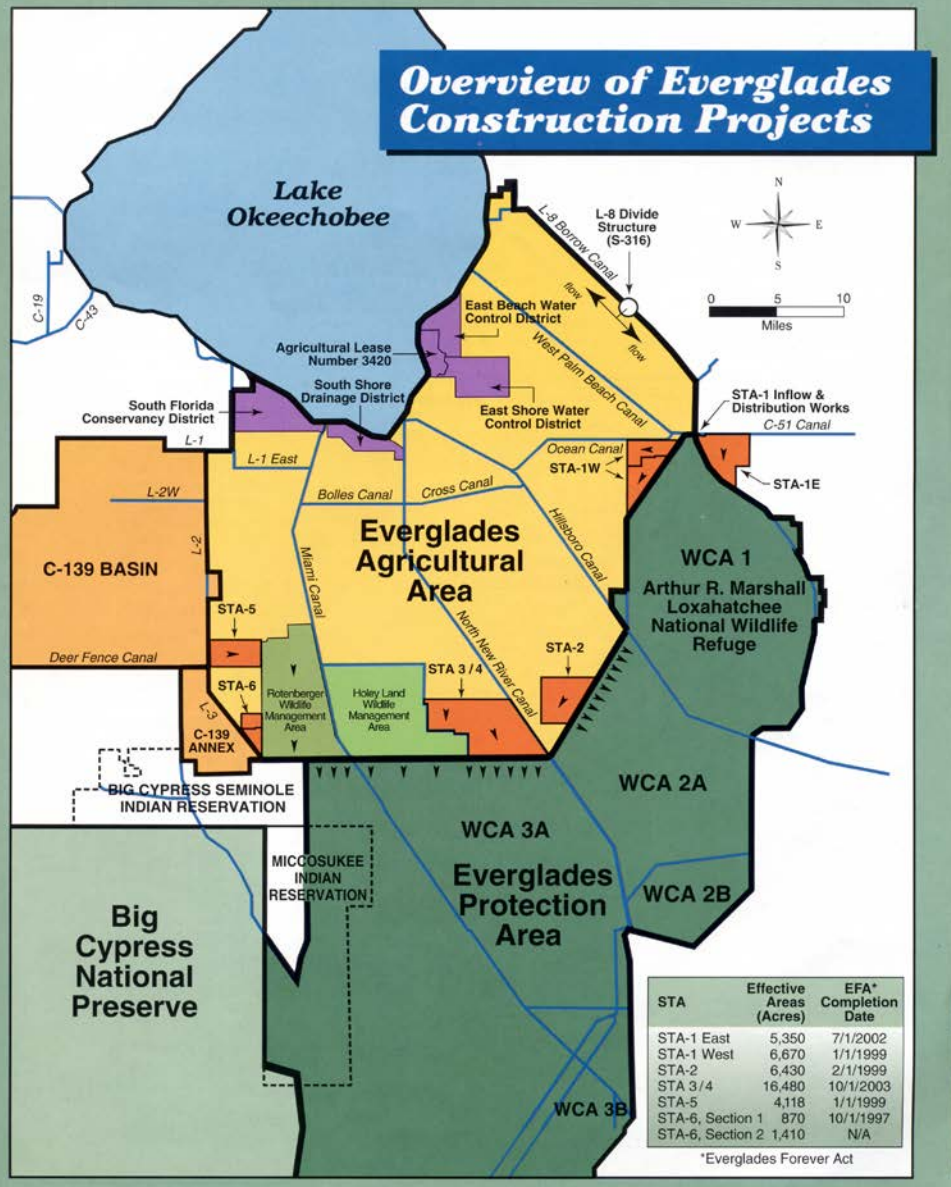
Restoration Plans & Efforts for the Greater Everglades Ecosystem

Florida Oceanographic Society


Kissimmee River
Channalized 1962-1971
C-38 Canal


Kissimmee River
Restoration- July 11, 2001
C-38 Canal
(filled in)





Florida Oceanographic Society

1994 Everglades Forever Act – Projects $ 1.8 Billion

Rescuing an Endangered Ecosystem: The Plan to Restore America's Everglades

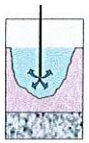
The Central and Southern Florida Project Comprehensive Review Study (The Restudy)

<u>On December 11, 2000</u>, the President signed the Water Resources Development Act (WRDA) of 2000, approving:

Comprehensive Everglades Restoration Plan

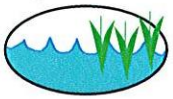
A series of environmental and other improvements over 30+ years with an estimated cost of ~~$7.8 billion~~ *($ 14 billion)*

Comprehensive Everglades Restoration Plan
68 Components

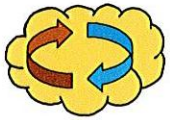


Aquifer Storage & Recovery – 330 Wells

Surface Water Storage Reservoir – 170,000 acres



Stormwater Treatment Areas (STAs) – 36,000 acres

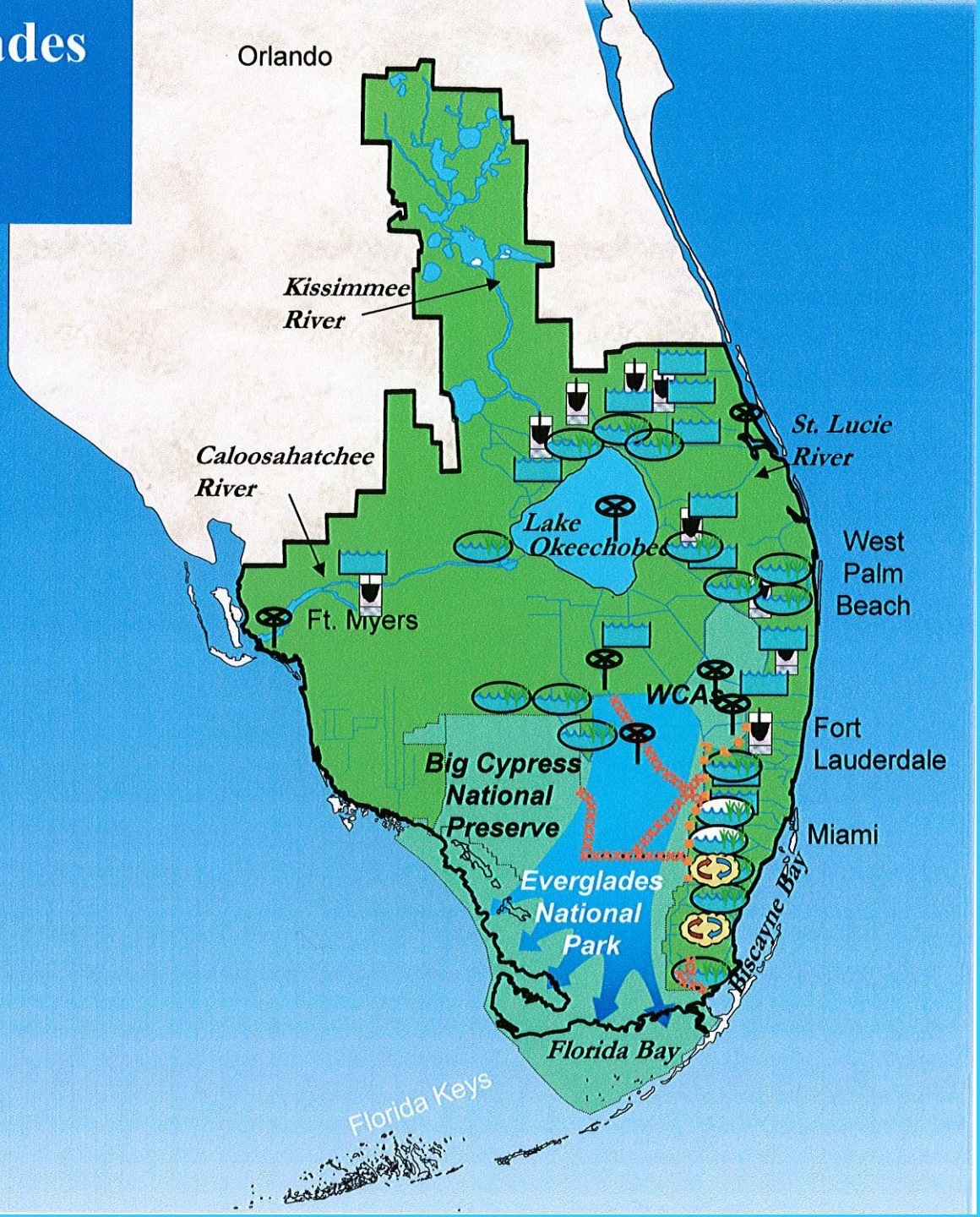


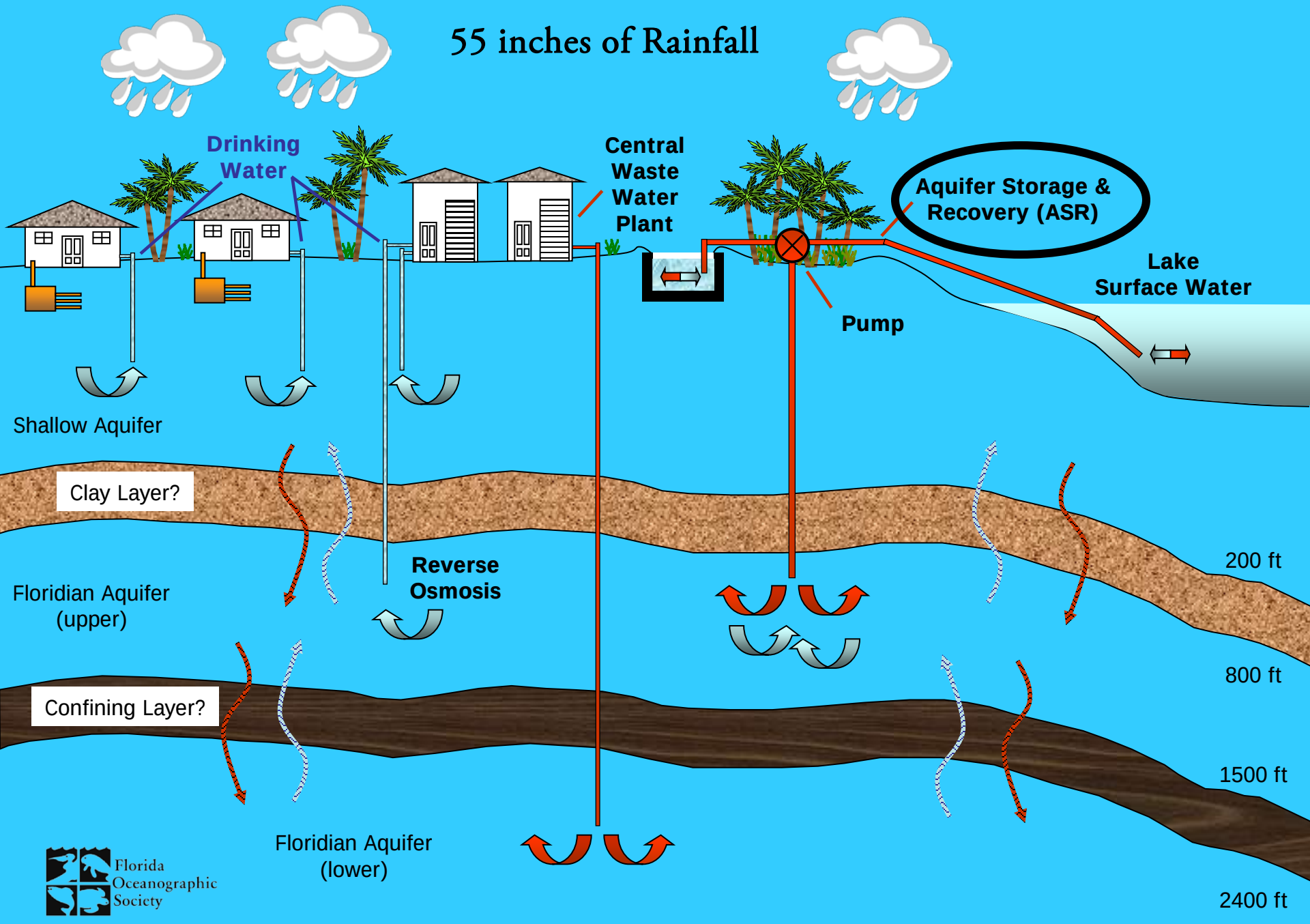
Reuse Wastewater at 2 Regional Plants

Seepage Management

Removing 240 miles of Barriers to Sheetflow

Operational Changes




55 inches of Rainfall
Drinking Water
Central Waste Water Plant
Aquifer Storage & Recovery (ASR)
Lake Surface Water
Pump
Shallow Aquifer
Clay Layer?
Reverse Osmosis
Floridian Aquifer (upper)
200 ft
800 ft
Confining Layer?
1500 ft
Floridian Aquifer (lower)
2400 ft
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South Florida Water Management District –State Efforts

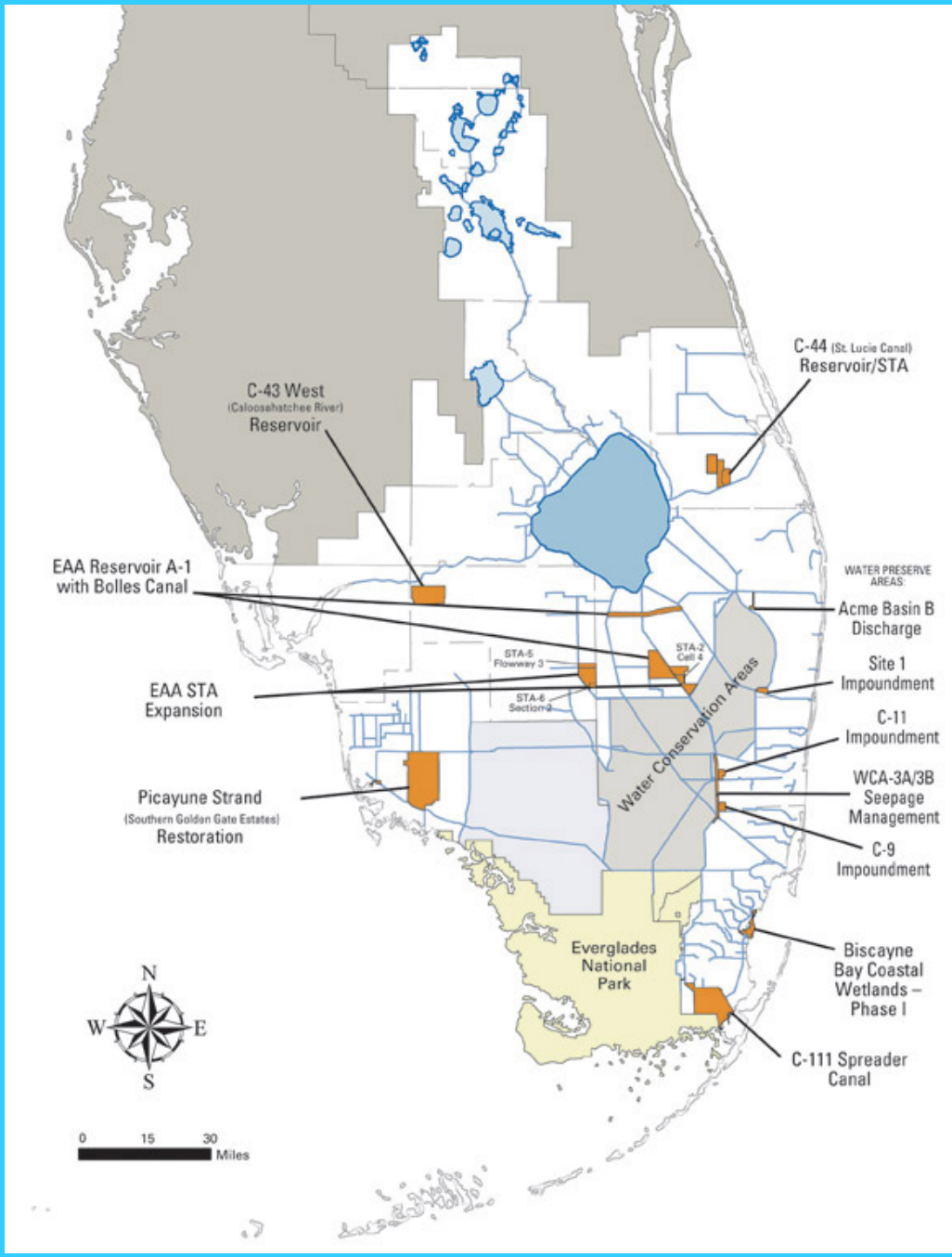
Everglades Restoration

“Acceler8 Projects”

2000-2008

State Investment

$ 2.1 billion



Florida Oceanographic Society

$1.75 billion deal aims to protect Everglades

■ Florida would pay U.S. Sugar to go out of business and get firm's land.

BRIAN SKOLOFF
THE ASSOCIATED PRESS

WELLINGTON, Fla. — U.S. Sugar Corp., the nation's largest producer of cane sugar, would go out of business in a $1.75 billion deal to sell its nearly 300 square miles of land to Florida for Everglades restoration, the company and the state's governor said Tuesday.

Under the deal, announced at a news conference with Republican Gov. Charlie Crist and company representatives, the state would buy U.S. Sugar's holdings in the Everglades south of Lake Okeechobee, the virtual heart of the ecosystem.

Negotiations are still ongoing, but officials hope to sign an agreement by September. Once the deal is in place, U.S. Sugar would be allowed to farm the 187,000 acres of land for six more years before closing.

Crist said the deal is "as monumental as the creation of our nation's first national park, Yellowstone."

"This represents, if we're successful, and I believe we will be, the largest conservation purchase in the history of the state of Florida," Crist said.

The land would be used to help restore a more natural flow to the wetlands that has been stymied for years by agriculture and development. Farming in the region has long been considered a hindrance to restoration.

The deal wouldn't end sugar production in the Everglades. At least 250,000 acres of land used by other companies would remain operational.

U.S. Sugar CEO Robert Buker called the deal "monumental" but also was saddened to see the demise of his company, which employs 1,700 people.

BILL INGRAM The Associated Press

U.S. Sugar Corp. CEO Robert Buker, left, walks with Florida Gov. Charlie Crist, and South Florida Water Management District Board Vice Chair Shannon Estenoz at a news conference Tuesday.

"We built a company that right now is the pillar of the agriculture community in Florida," Buker said. "Because of that, I stand here today with mixed feelings ... On the other hand, I'm excited about what we're doing here today."

He said the company's decision to sell had nothing to do with profits, though the entire American sugar industry has struggled with stiff competition from cheap foreign imports.

U.S. Sugar has also in recent years been facing hefty bills to clean up its water before it enters the Everglades ecosystem. Buker acknowledged that the sugar industry's presence in the Everglades has led to years of "partial fixes" as the state works to restore the once famed River of Grass.

David Guest, an attorney who has fought over Everglades restoration for years and is a longtime foe of U.S. Sugar, called Tuesday's announcement a victory.

McClatchy Newspapers 2007 file photo

The nearly 300 square miles of land that U.S. Sugar owns would be used to help restore a more natural flow to the Everglades, which is threatened by agriculture and residential development.

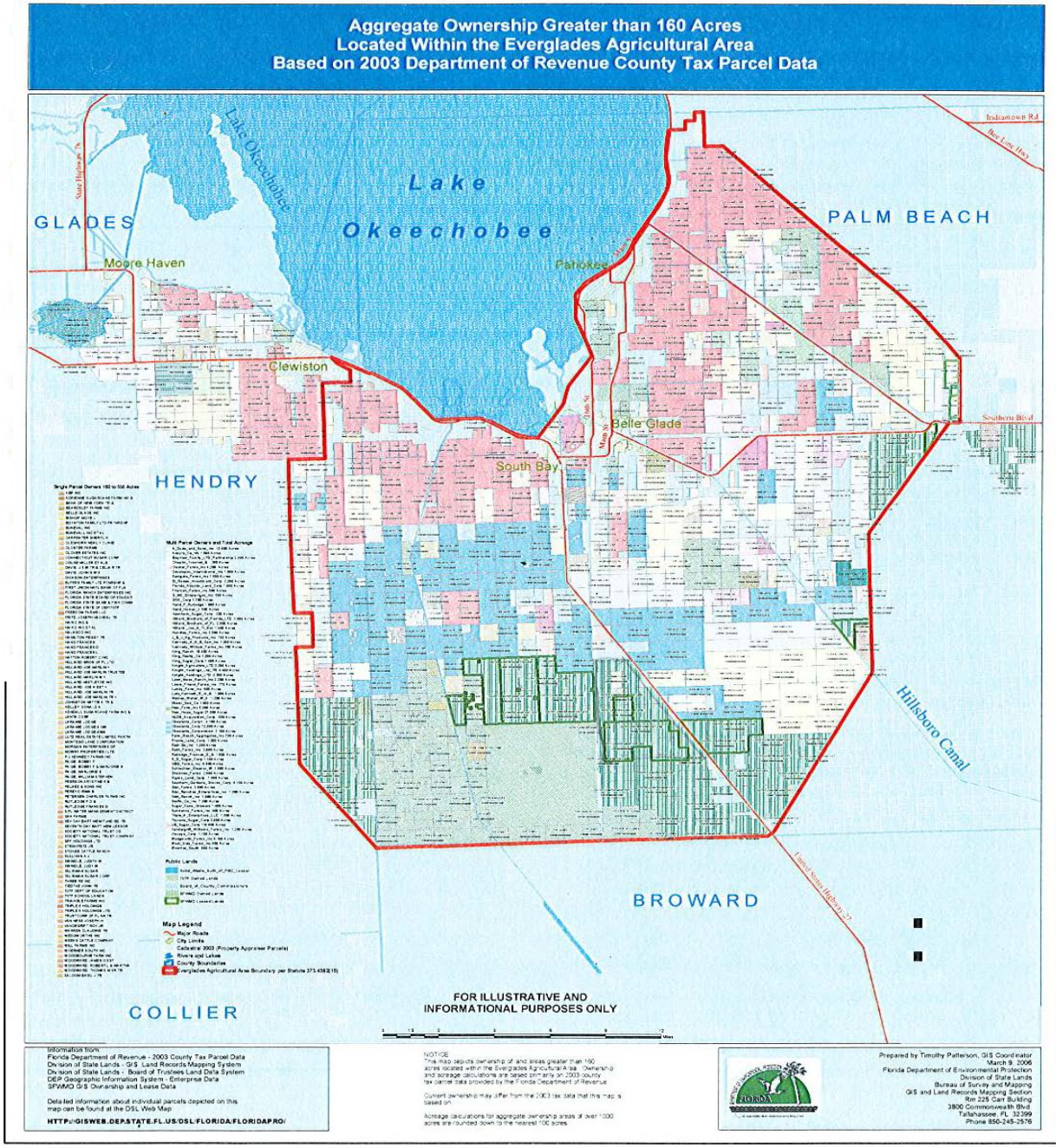
"In the old days, you didn't just beat your opponent, you also ate them," Guest said. "Today, we're eating U.S. Sugar." ❑

June 24, 2008

187,000 acres

US Sugar Corp. farmlands

(red color on map)



Florida Oceanographic Society

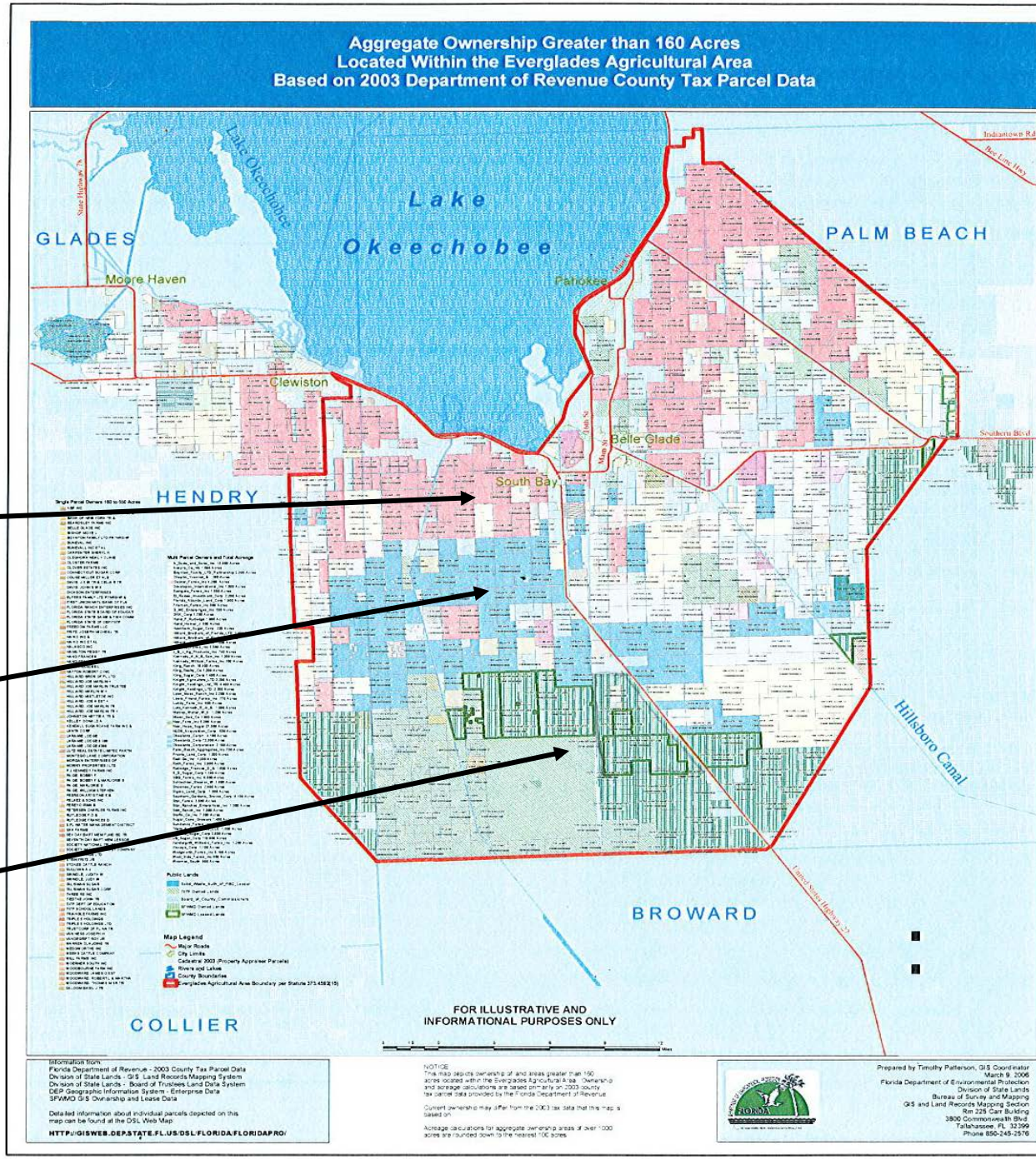
187,000 acres US Sugar Corp. farmlands (red color on map)

Build the "Missing Link" between Lake Okeechobee and the Everglades

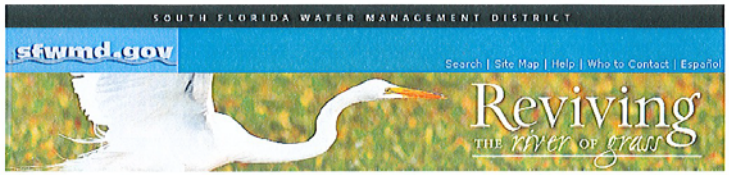
US Sugar
23,000 acres

Florida Crystals
32,000 acres

State-Public
76,000 acres



Florida Oceanographic Society



Governor Shares Proposal to Achieve Everglades Restoration Vision in Tough Economic Climate - APRIL 1, 2009

TALLAHASSEE – After gathering key input from the public, legislators and South Florida's communities and in recognition of the nation's current economic climate, Governor Charlie Crist today shared details of a revised strategy to acquire land for Everglades restoration from the United States Sugar Corporation. The approach incorporates today's fiscal realities by saving $800 million at closing, providing ready access to strategically located acreage for restoration projects and preserving thousands of jobs.

"By taking this fiscally conservative approach, we can secure this once-in-a-lifetime opportunity to restore and revive the Everglades despite continued economic challenges," said Governor Crist. "The proposal represents a balance for both the environment and the economy by allowing us to acquire hundreds of square miles of prime property in affordable steps."

Under the proposal, the district would initially invest approximately $530 million for 72,500 acres of property south of Lake Okeechobee – a land mass nearly twice the size of Orlando. Approximately 32,000 acres of that land, currently in citrus production, would be available to the district within a year after closing. The United States Sugar Corporation would lease back the other approximately 40,500 acres of sugar cane land for $150 per acre per year for at least seven years. The district would have an option to purchase the remaining 107,500 acres of United States Sugar Corporation property for restoration within the first 10 years after closing.

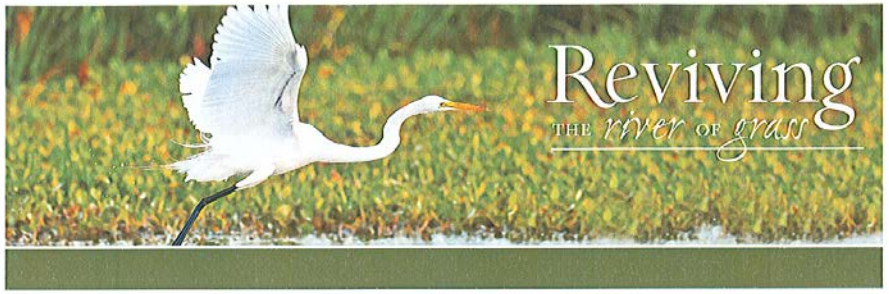
Highlights of the proposed acquisition terms include:

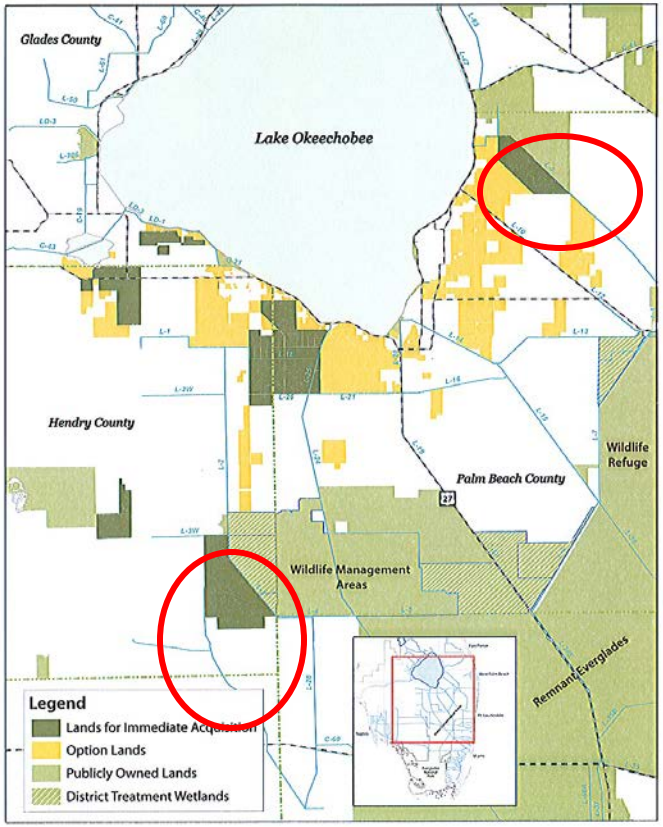
- Reducing the immediate public investment by 60 percent, or $800 million, in addition to reducing annual debt service payments by an estimated $65 million.
- Tripling the land lease rate to $150 an acre per year to generate a minimum of $40 million in revenue and avoid at least $11 million in land management costs.
- Potentially freeing up revenue over the coming years for "shovel-ready" restoration projects that could create jobs and deliver environmental benefits to the Everglades Protection Area and Florida's coastal estuaries.
- Sustaining regional agriculture.
- Keeping 1,700 direct jobs intact and protecting 10,000 indirect jobs for at least another decade with the continued operation of the United States Sugar Corporation's mill and refinery.

Environmental goals of the acquisition include:

- Increasing the availability of water storage, significantly reducing the potential for harmful discharges from Lake Okeechobee to the St. Lucie and Caloosahatchee rivers and estuaries when lake levels are high.
- Delivering cleaner water to the Everglades during dry times and greater water storage to protect the natural system during wet years.
- Preventing tons of phosphorus from entering the Everglades every year.
- Significantly reducing the need for "back-pumping" water into Lake Okeechobee from the Everglades Agricultural Area.
- Relieving some pressures on the Herbert Hoover Dike while the federal government undertakes repairs by providing alternative water storage alternatives.
- Improved flexibility in managing Lake Okeechobee levels in a more environmentally friendly way.

www.sfwmd.gov/riverofgrass

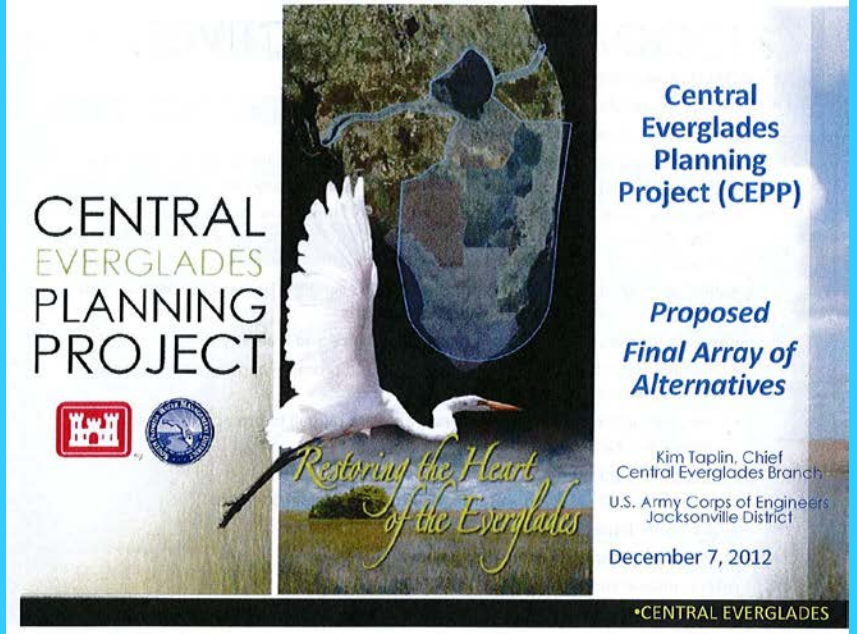


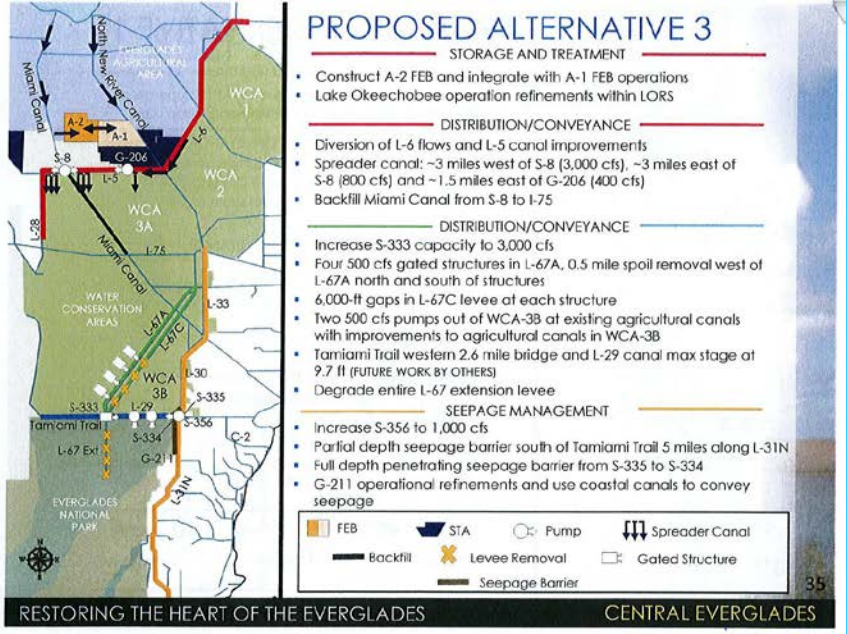


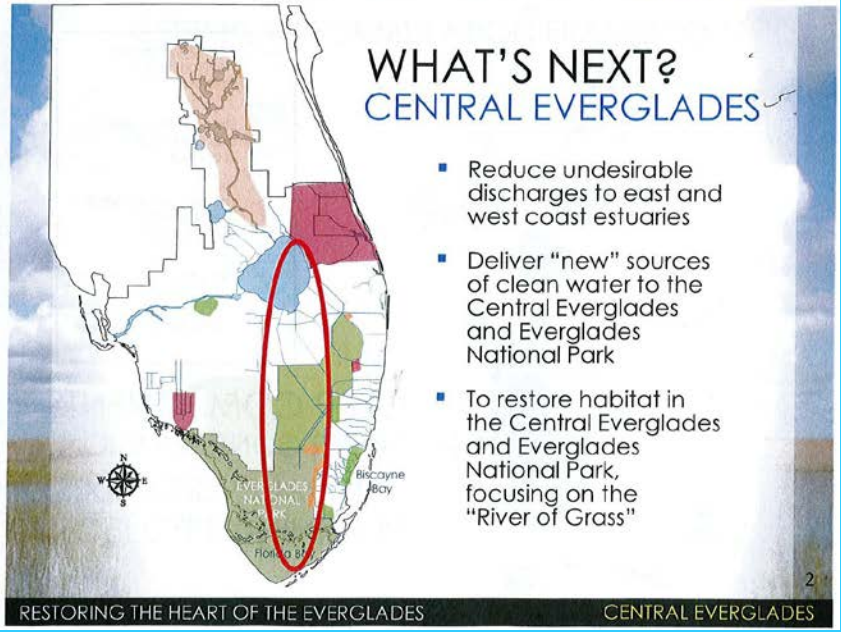
Florida Oceanographic Society

US Sugar Corp purchase reduced- 73,000 ac $530 M in April 2009

Then to **27,000 acres for $197 M - October 2010- 10-year option**







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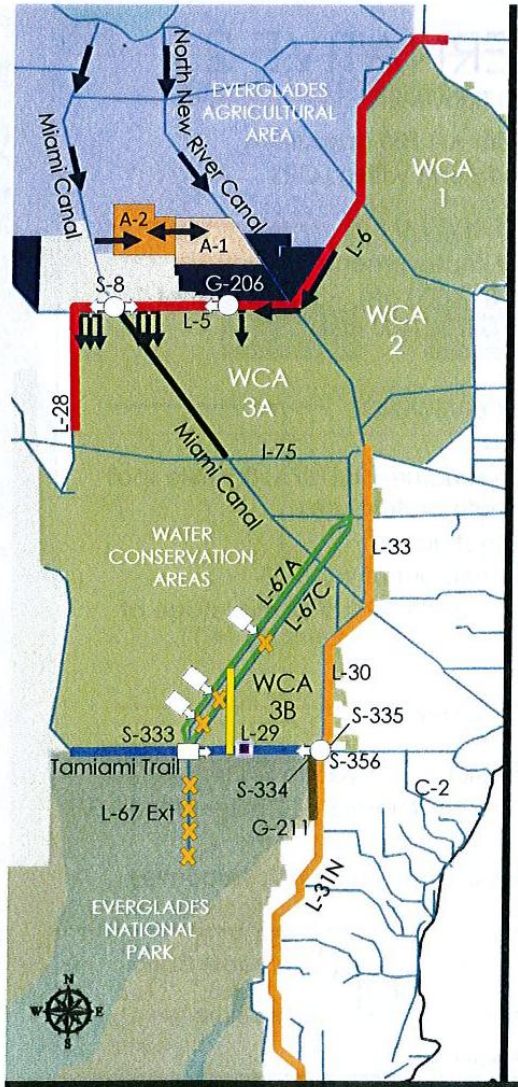
Central Everglades Planning Project – Nov. 2011 to Apr. 2013
Including "Key Projects" Mandated State WQ Improvements



PROPOSED ALTERNATIVE 4

STORAGE AND TREATMENT

- Construct A-2 FEB and integrate with A-1 FEB operations
- Lake Okeechobee operation refinements within LORS

DISTRIBUTION/CONVEYANCE

- Diversion of L-6 flows and L-5 canal improvements
- Spreader canal: ~3 miles west of S-8 (3,000 cfs), ~3 miles east of S-8 (800 cfs) and ~1.5 miles east of G-206 (400 cfs)
- Backfill Miami Canal from S-8 to I-75

DISTRIBUTION/CONVEYANCE

- Increase S-333 capacity to 3,000 cfs
- Two 500 cfs gated structures in L-67A, 0.5 mile spoil removal west of L-67A north and south of structures
- Include levee in WCA 3B
- Degrade L-67C levee in Blue Shanty flowway
- One 500 cfs gated structure north of Blue Shanty levee and 6,000-ft gap in L-67C levee
- Degrade L-29 levee in Blue Shanty flowway, divide structure east of Blue Shanty levee at terminus of western bridge
- Tamiami Trail western 2.6 mile bridge and L-29 canal max stage at 9.7 ft (FUTURE WORK BY OTHERS)
- Degrade entire L-67 extension levee

SEEPAGE MANAGEMENT

- Increase S-356 to 1,000 cfs
- Partial depth seepage barrier south of Tamiami Trail 5 miles along L-31N
- G-211 operational refinements; use coastal canals to convey seepage

FEB · STA · Pump · Spreader Canal · Backfill · Levee Removal · Gated Structure · Seepage Barrier · Divide · Levee

36

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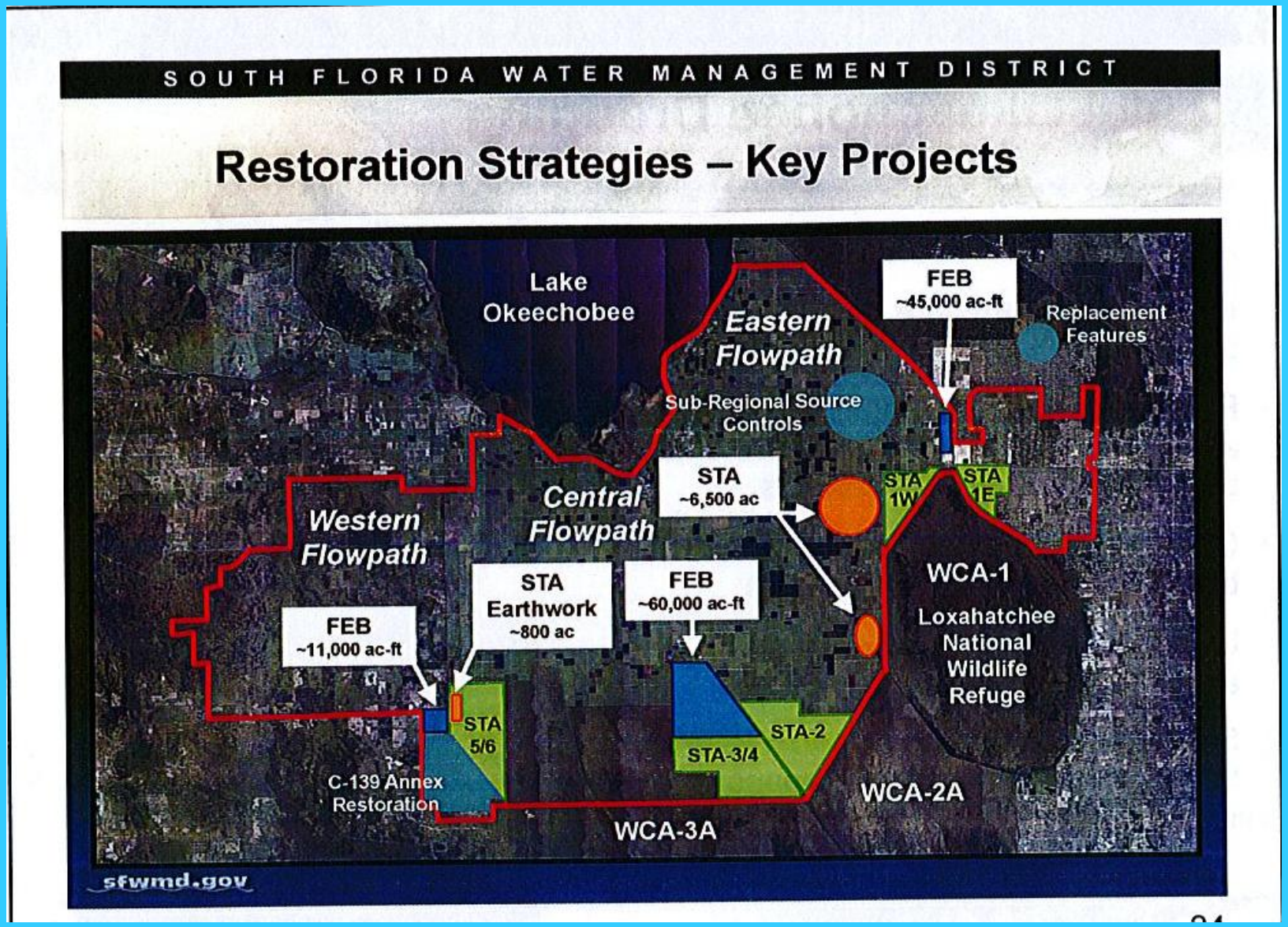
Including "Restoration Strategies" Water Quality Improvements, A-1 & A-2 FEBs, Miami Canal, Tamiami Trail …

Principals' Meeting
October 6, 2011

Florida

Governor- Rick Scott
SFWMD – Melissa Meeker



"Restoration Strategies" – Mandated Water Quality Treatment projects - $ 880 Million – State of Florida – (CS/HB 7065-May 28, 2013)

Everglades Forever Act (1994) Existing 6 – Stormwater Treatment Areas (STAs) <u>Cost $ 1.2 Billion</u>

Now WQ Mandated Projects (2013 – 2026) 2 – Flow Equalization Basins (FEB) Cost <u>$ 890 Million</u>

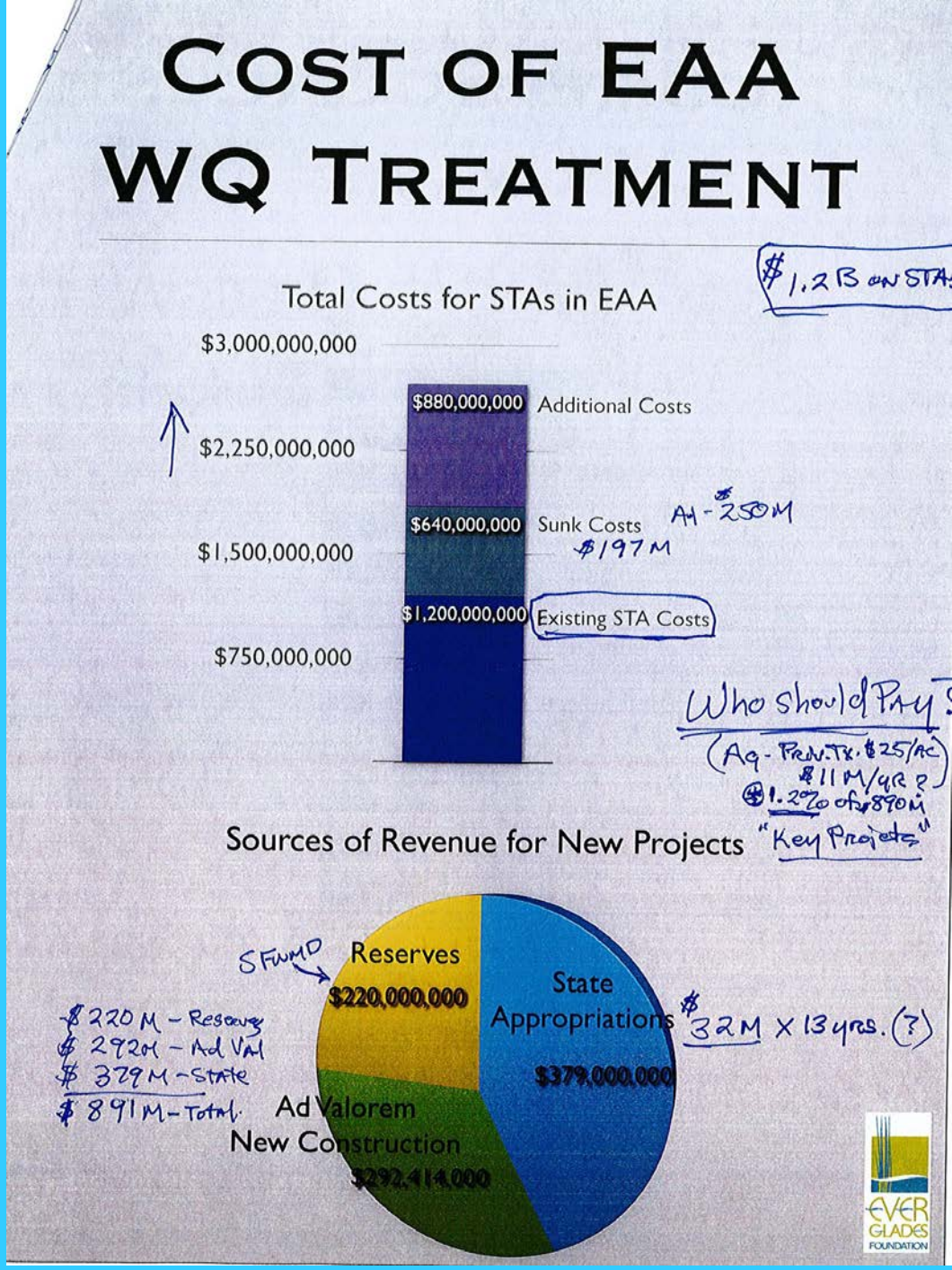
$ 220 Million SFWMD Reserves

$ 292 Million New Ad Valorem

$ 379 Million State Appropriation

Agricultural Privilege Tax is $ 25 per Acre = $ 11 Million per Year Over 13 Years = <u>$ 143 Million</u>

(NOT ENOUGH)



Florida Oceanographic Society

ST. LUCIE WATERSHED ASSESSMENT

VOLUME B: BASIN PRIORITIES

Prepared for:

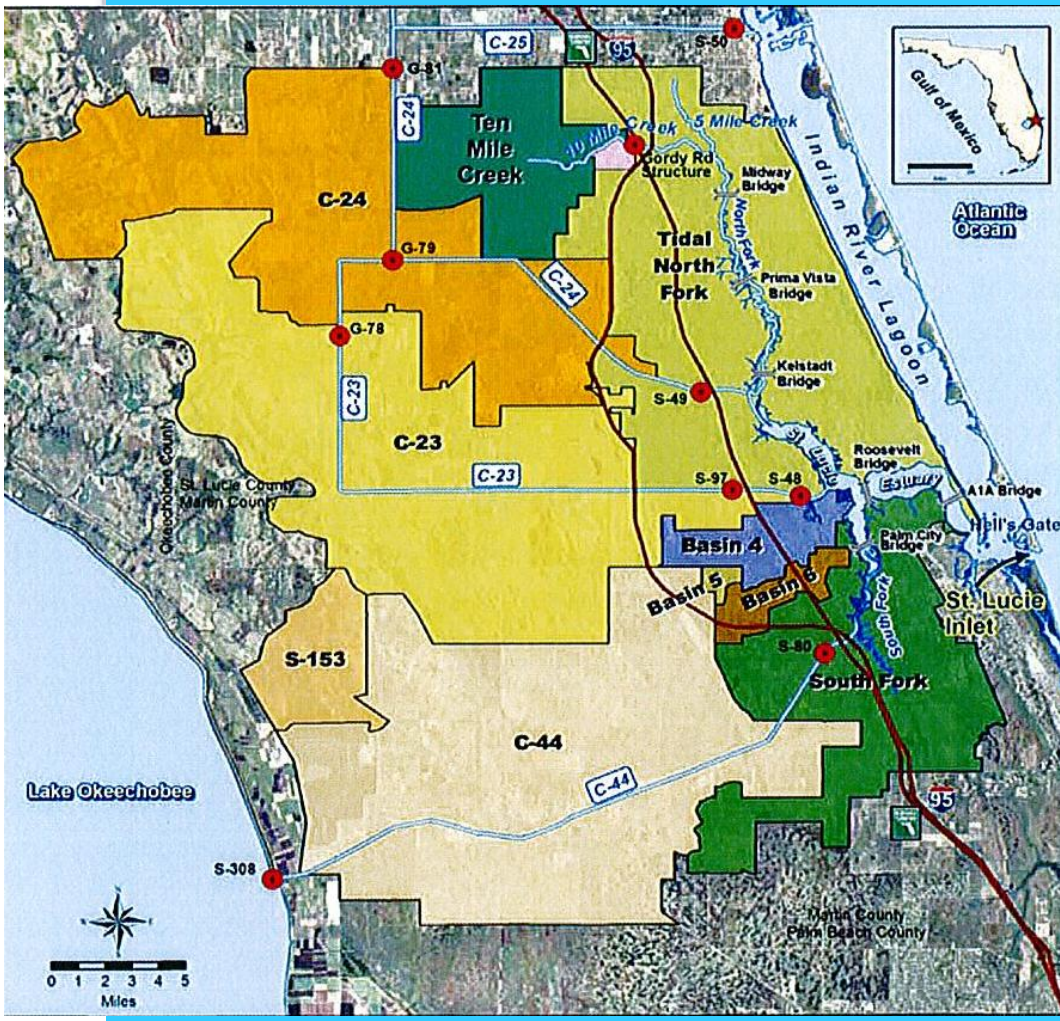
South Florida Water Management District
P.O. Box 24680
3301 Gun Club Road
West Palm Beach, Florida 33416-4680

Prepared by:

Anthony Janicki, David Wade, J. Raymond Pribble, Pam Latham
PBS&J
5300 West Cypress Street
Suite 300
Tampa, Florida 33607-1712

FINAL REPORT

February, 1999

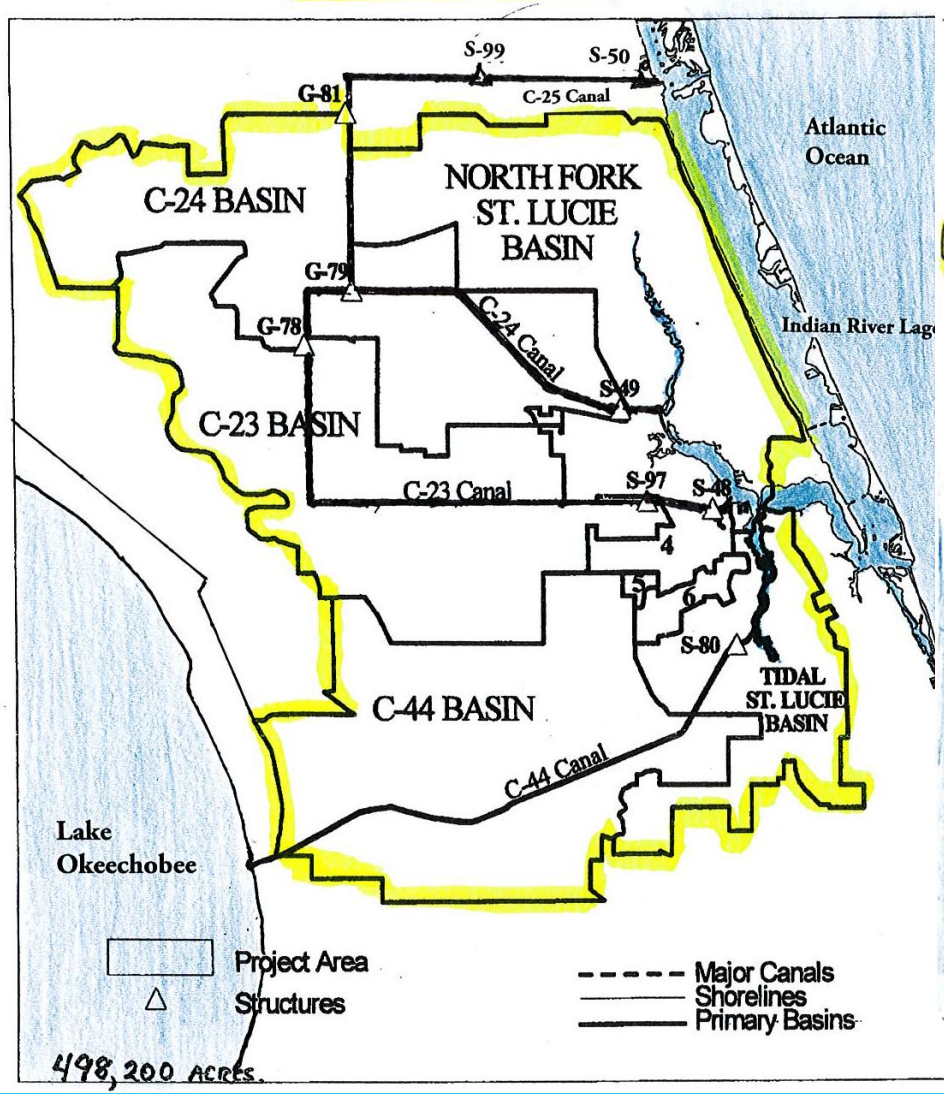


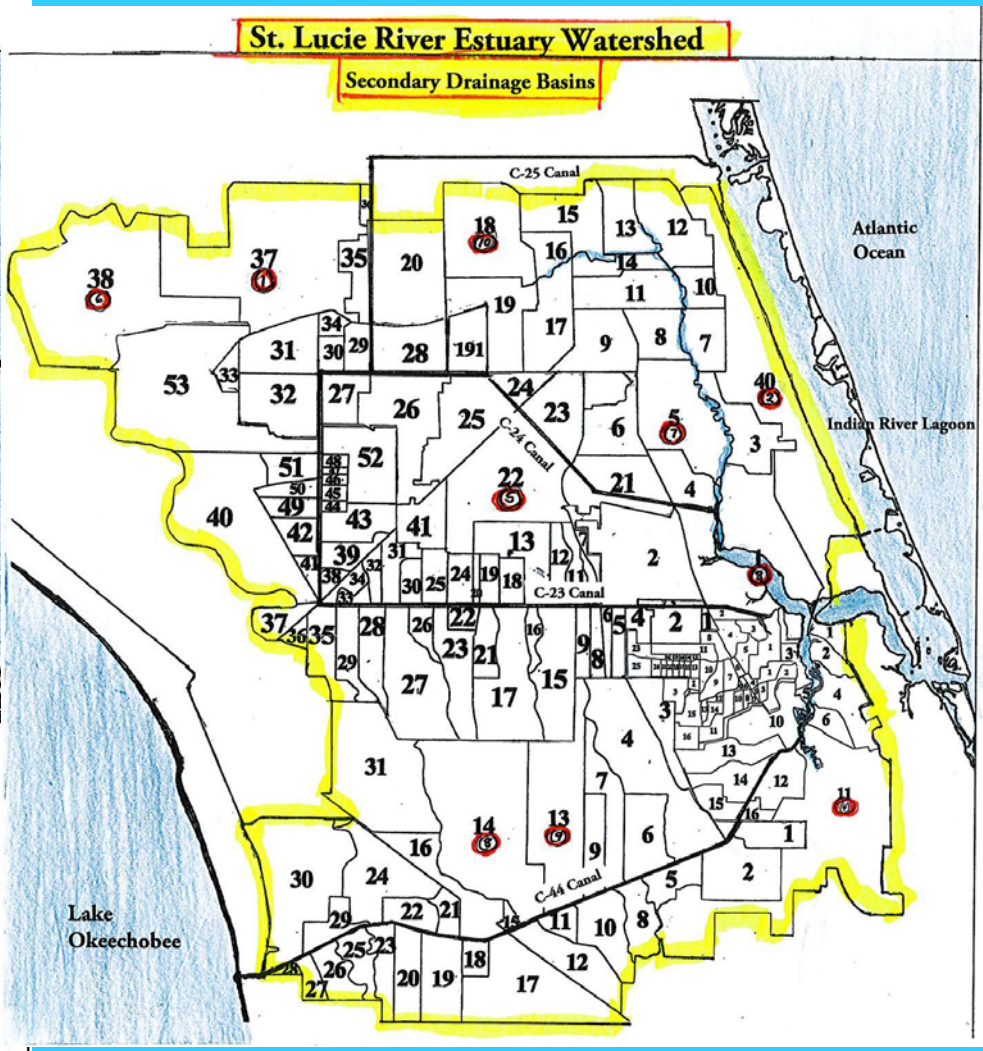
St. Lucie River Watershed

514,646 Acres

Watershed Assessment - February 1999

Florida Oceanographic Society





8 Basins – 186 Secondary Basins

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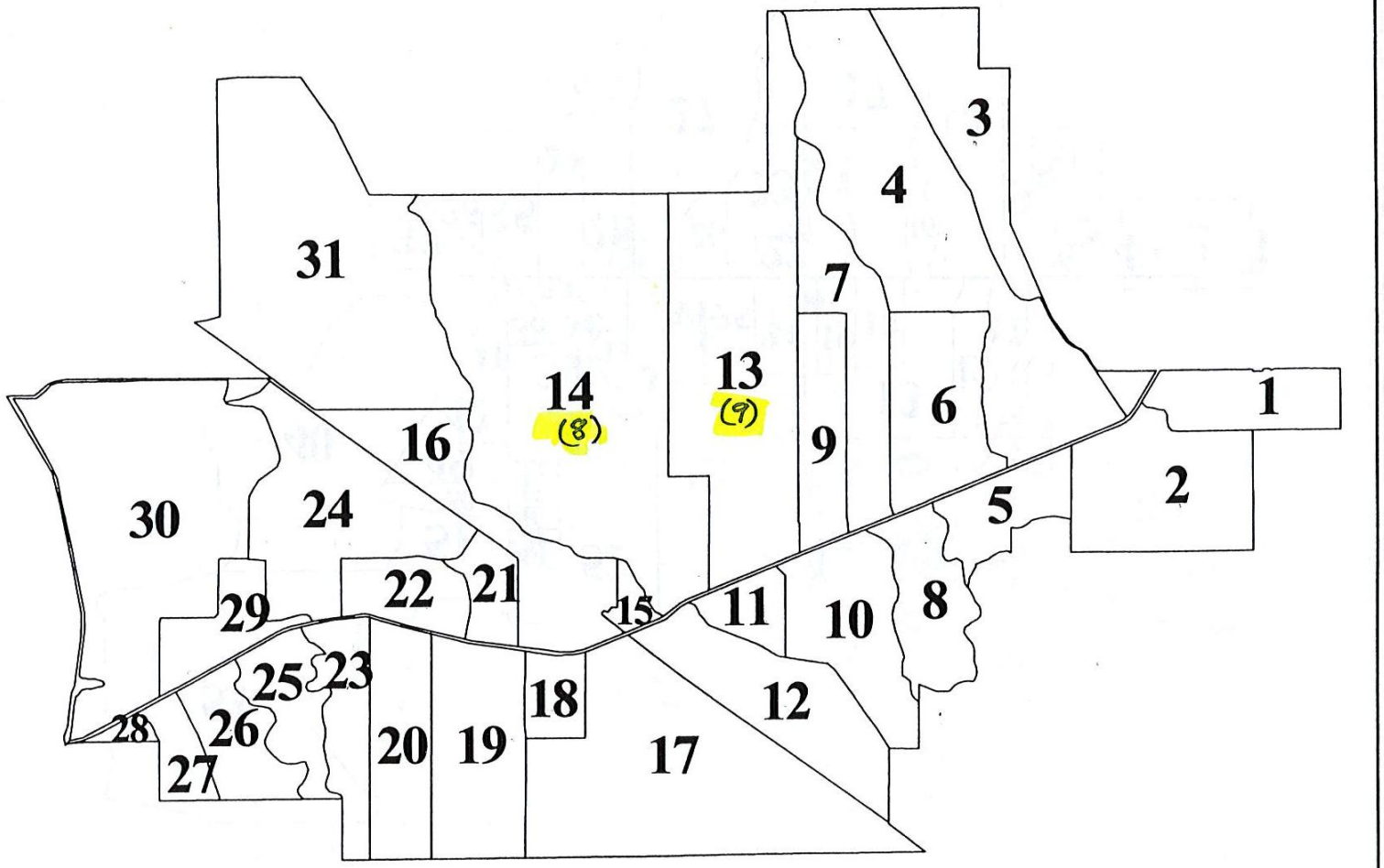
St. Lucie River Estuary Watershed



116,095 AC

Figure 1-2 (a). Location of secondary basins in Basin C-44 in the St. Lucie Watershed study area.

(31)

C-44 Basin - 31 Secondary Drainage Basins

25 Pump Stations for Agriculture Irrigation

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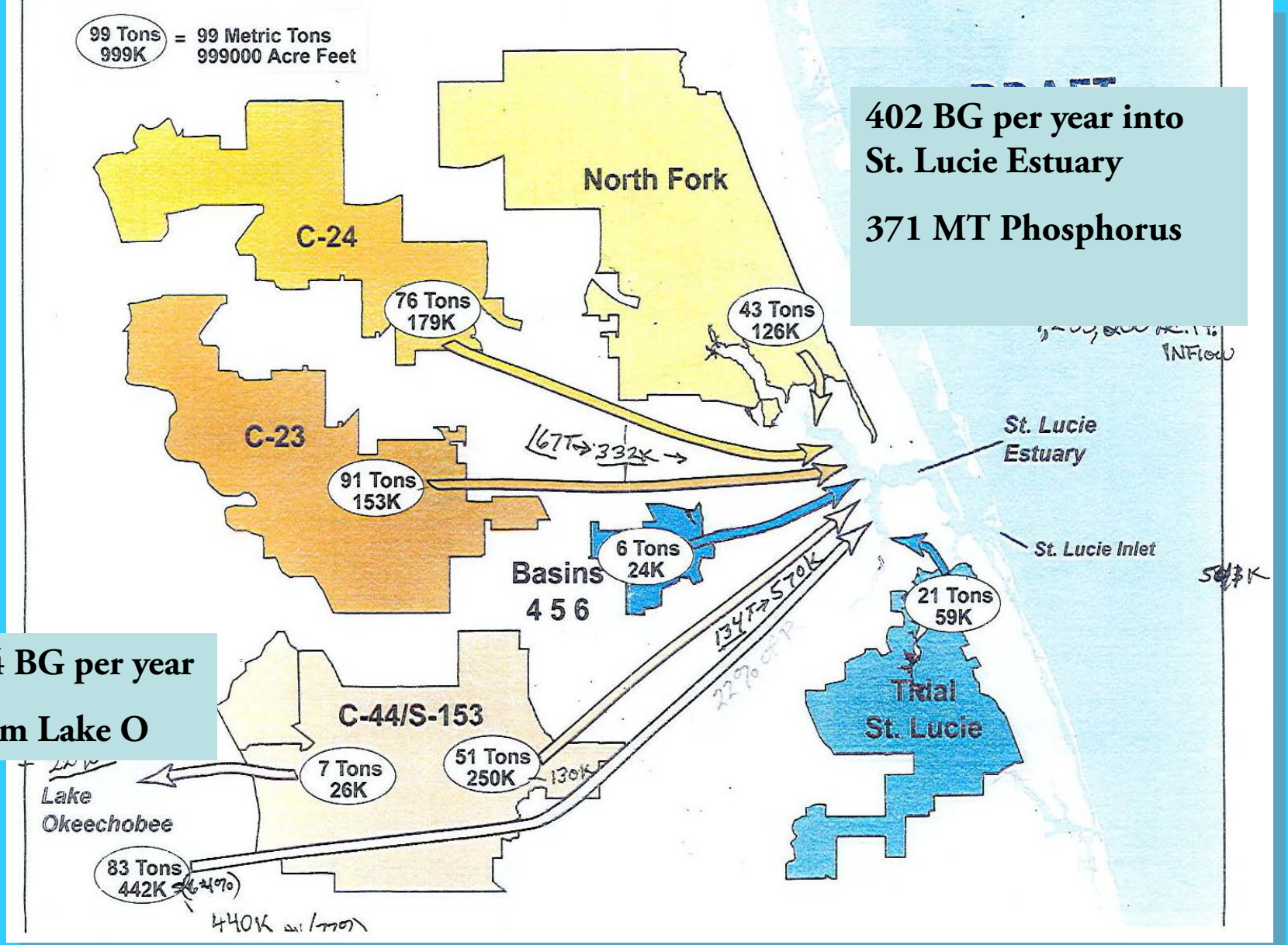


402 BG per year into St. Lucie Estuary

371 MT Phosphorus

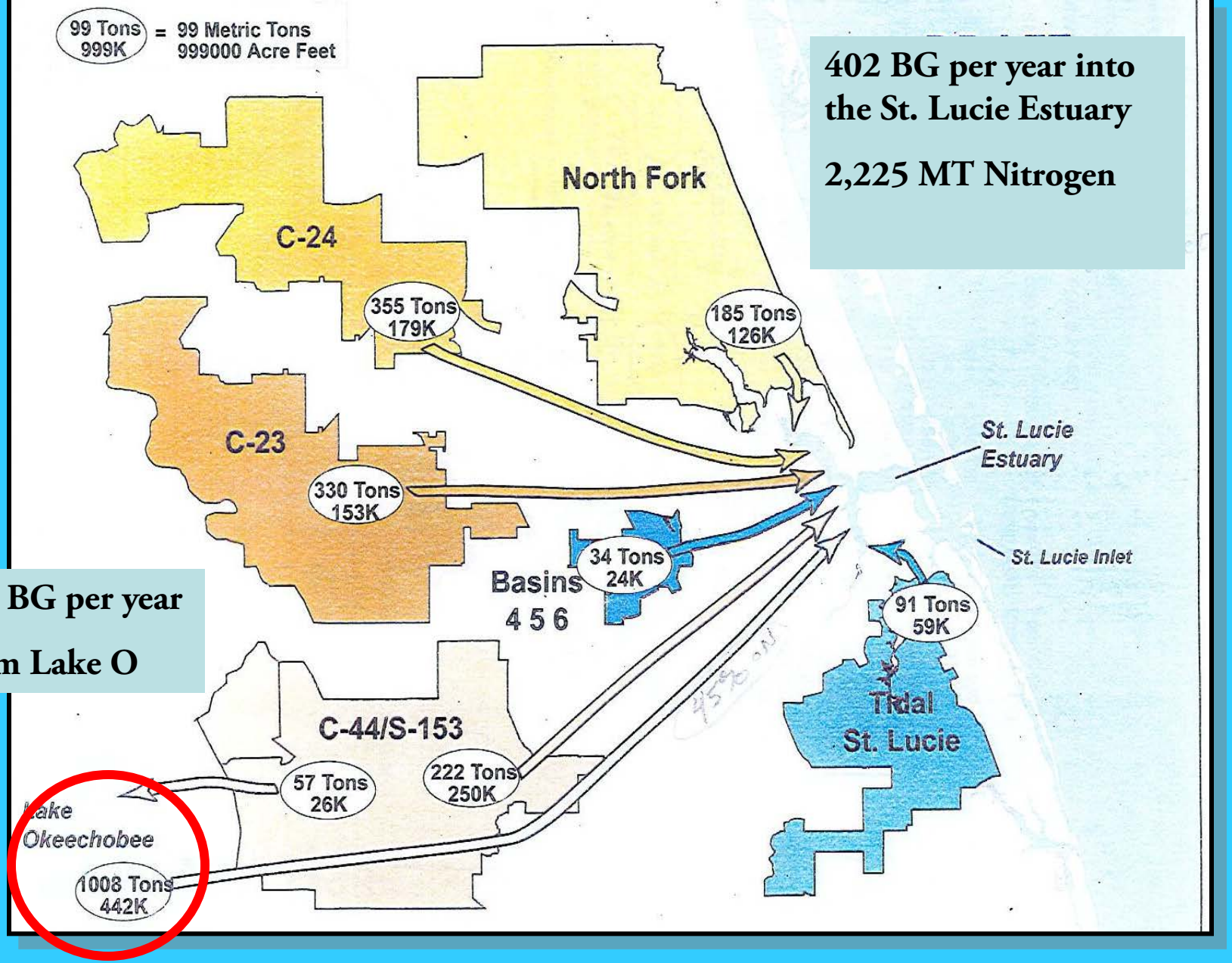
144 BG per year

From Lake O

Florida Oceanographic Society

Annual **Phosphorus** Loads by Basin to the St. Lucie Estuary

Period of Record 1995-2005 SFWMD



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Annual **Nitrogen** Loads by Basin to the St. Lucie Estuary

Period of Record 1995-2005 SFWMD

DRAFT

BASIN MANAGEMENT ACTION PLAN

for the Implementation of Total Maximum Daily Loads for Nutrients and Dissolved Oxygen Adopted by the Florida Department of Environmental Protection

in the

St. Lucie River and Estuary Basin

developed by the
St. Lucie River and Estuary Basin Technical Stakeholders

in cooperation with the
Florida Department of Environmental Protection
Division of Environmental Assessment and Restoration
Bureau of Watershed Restoration
Tallahassee, Florida 32399

April 2013

Florida Oceanographic Society

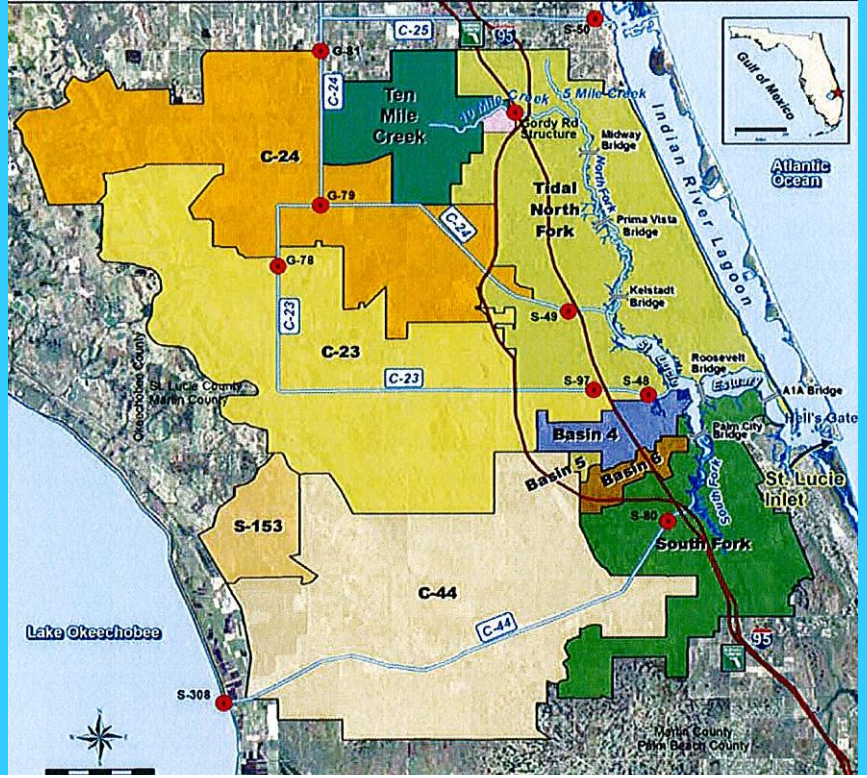

TABLE 8: ACRES BY ENTITY

ENTITY	BASINS 4, 5, AND 6 (ACRES)	C-23 (ACRES)	C-24 (ACRES)	C-44 S-153 (ACRES)	NORTH FORK (ACRES)	SOUTH FORK (ACRES)	TOTAL (ACRES)
Agriculture	2,445	84,744	63,488	65,937	3,967	18,176	238,757
Copper Creek CDD	-	-	2	-	-	-	2
FDOT District 4	171	306	137	270	864	636	2,384
Fort Pierce MS4	-	-	-	-	3,706	-	3,706
FPL Pond	-	-	-	6,501	-	-	6,501
Hobe St. Lucie Conservancy District	-	-	-	2,949	-	1,945	4,894
Martin County MS4	4,989	1,738	-	2,231	4,378	7,763	21,099
Natural Lands	7,830	23,706	15,701	37,163	33,129	18,987	136,516
North St. Lucie River WCD	-	-	4,028	-	32,491	-	36,519
Okeechobee County MS4	-	574	30	-	-	-	604
Pal Mar WCD	-	-	-	1,161	-	4	1,165
Port St. Lucie MS4	-	326	1,258	-	34,118	-	35,702
Sewall's Point MS4	-	-	-	-	457	-	457
St. Lucie County MS4	-	-	-	-	3,995	-	3,995
St. Lucie County Non-MS4	-	763	2,172	-	1,146	-	4,081
Stuart MS4	-	-	-	-	353	2,386	2,739
Tradition CDD	-	-	923	-	6	-	929
Troup-Indiantown WCD	-	-	-	13,649	-	-	13,649
Turnpike	147	10	-	-	528	226	911
Verano CDD	-	-	36	-	-	-	36
Total	**15,582**	**112,167**	**87,775**	**129,861**	**119,138**	**50,123**	**514,646**

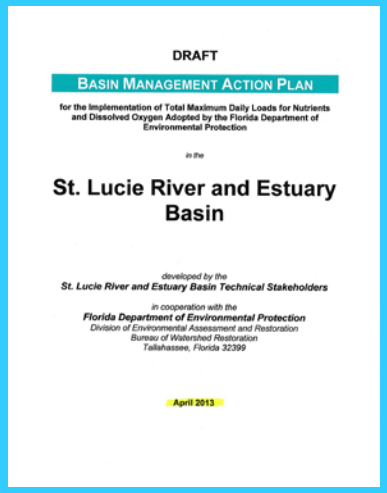
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TABLE 6: TN STARTING LOADS BY ENTITY

Nitrogen

y cell/no data

ENTITY	BASINS 4, 5, AND 6 (LBS/YR)	C-23 (LBS/YR)	C-24 (LBS/YR)	C-44 S-153 (LBS/YR)	NORTH FORK (LBS/YR)	SOUTH FORK (LBS/YR)	TOTAL (LBS/YR)	TOTAL (MT/YR)
Agriculture	17,051	470,081	574,852	350,703	24,355	126,080	1,563,122	709.02
Copper Creek CDD	-	-	14	-	-	-	14	0.01
FDOT District 4	952	1,510	950	1,176	4,277	3,649	12,514	5.68
Fort Pierce MS4	-	-	-	-	17,041	-	17,041	7.73
FPL Pond	-	-	-	41,022	-	-	41,022	18.61
Hobe St. Lucie Conservancy District	-	-	-	13,374	-	10,819	24,193	10.97
Martin County MS4	26,394	5,947	-	8,243	19,806	40,423	100,813	45.73
Natural Lands	15,128	14,991	24,792	49,942	43,326	26,980	175,159	79.45
North St. Lucie River WCD	-	-	37,251	-	160,152	-	197,403	89.54
Okeechobee County MS4	-	3,184	121	-	-	-	3,305	1.50
Pal Mar WCD	-	-	-	6,758	-	22	6,780	3.08
Port St. Lucie MS4	-	1,515	8,275	-	146,691	-	156,481	70.98
Sewall's Point MS4	-	-	-	-	1,771	-	1,771	0.80
St. Lucie County MS4	-	-	-	-	18,114	-	18,114	8.22
St. Lucie County Non-MS4	-	1,594	16,757	-	5,409	-	23,760	10.78
Stuart MS4	-	-	-	-	1,614	12,384	13,998	6.35
Tradition CDD	-	1	7,057	-	31		7,089	3.22
Troup-Indiantown WCD	-	-	-	62,219	-	-	62,219	28.22
Turnpike	789	51	-	-	2,651	1,286	4,777	2.17
Verano CDD	-	-	257	-	-	-	257	0.12
TOTAL	**60,314**	**498,874**	**670,326**	**533,437**	**445,238**	**221,643**	**2,429,832**	**1,102.18**

Total Required Reduction	1,053,414 (Lbs/yr)	477 (MT/yr)
Target Load	1,136,633 (Lbs/yr)	515 (MT/yr)

TMDL – BMAP Implementation June 2013 - Adopted & Enforceable

2013 – 2018 "First Phase" -30% Reduction

2018 – 2028 "Second & Third Phase" Remaining 70% Reduction

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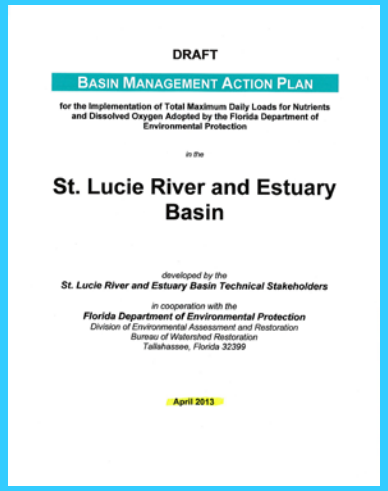
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Bureau of Watershed Restoration
Tallahassee, Florida 32399

April 2013

TABLE 7: TP STARTING LOADS BY ENTITY

Phosphorus

y cell/no data

ENTITY	BASINS 4, 5, AND 6 (LBS/YR)	C-23 (LBS/YR)	C-24 (LBS/YR)	C-44 S-153 (LBS/YR)	NORTH FORK (LBS/YR)	SOUTH FORK (LBS/YR)	TOTAL (LBS/YR)	TOTAL (MT/YR)
Agriculture	3,920	150,255	136,471	66,809	5,988	26,869	390,312	177.04
Copper Creek CDD	-	-	3	-	-	-	3	0.00
FDOT District 4	200	464	226	175	818	659	2,542	1.15
Fort Pierce MS4	-	-	-	-	3,879	-	3,879	1.76
FPL Pond	-	-	-	8,361	-	-	8,361	3.79
Hobe St. Lucie Conservancy District	-	-	-	2,689	-	2,563	5,252	2.38
Martin County MS4	5,930	2,250	-	1,431	4,339	8,419	22,369	10.15
Natural Lands	3,383	19,795	11,341	3,525	9,639	5,054	52,737	23.92
North St. Lucie River WCD	-	-	9,063	-	36,821	-	45,884	20.81
Okeechobee County MS4	-	937	38	-	-	-	975	0.44
Pal Mar WCD	-	-	-	1,008	-	4	1,012	0.46
Port St. Lucie MS4	-	518	2,206	-	32,292	-	35,016	15.88
Sewall's Point MS4	-	-	-	-	384	-	384	0.17
St. Lucie County MS4	-	-	-	-	4,127	-	4,127	1.87
St. Lucie County Non-MS4	-	838	3,961	-	1,273	-	6,072	2.75
Stuart MS4	-	-	-	-	379	2,727	3,106	1.41
Tradition CDD	-	-	1,903	-	7	-	1,910	0.87
Troup-Indiantown WCD	-	-	-	12,623	-	-	12,623	5.73
Turnpike	170	16	-	-	506	233	925	0.42
Verano CDD	-	-	63	-	-	-	63	0.03
TOTAL	**13,603**	**175,073**	**165,275**	**96,621**	**100,452**	**46,528**	**597,552**	**271.03**

Total Required Reduction	404,166 (Lbs/yr)	183 (MT/yr)
Target Load	127,016 (Lbs/yr)	57 (MT/yr)

TMDL – BMAP Implementation <u>June 2013</u> - Adopted & Enforceable

<u>2013 – 2018</u> "First Phase" -30% Reduction

<u>2018 – 2028</u> "Second & Third Phase" Remaining 70% Reduction

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Tallahassee, Florida 3

April 2013

TABLE 24: AGRICULTURAL TN AND TP LOAD REDUCTION ALLOCATIONS AND ESTIMATED REDUCTIONS IN TN AND TP LOAD IN THE FIRST 5 YEARS

ESTIMATED LOADS	TN (LBS/YR)	TP (LBS/YR)
Agricultural Starting Load	1,563,122.0	390,312.0
Agricultural Required Reduction	812,924.0	307,059.0
Required Reduction for First Phase of BMAP	243,877.2	92,117.7
Estimated Load Reductions via BMPs, 90% Target Enrollment*	197,216.6	40,442.0
Estimated Load Reduction Credit for Land Use Changes*	171,776.4	54,191.1
Total Estimated Reductions	***368,993.0***	***94,663.1***
Remaining Load Reductions Needed for First Phase of BMAP	-125,115.8 (credit)	-2,515.4 (credit)

* **Note**: Load reduction estimates/credits do not include agricultural lands within WCDs.

TMDL – BMAP Implementation

June 2013 - Adopted & Enforceable (?)

2013 – 2018 "First Phase" -30% Reduction

2018 – 2028 "Second & Third Phase" Remaining 70% Reduction

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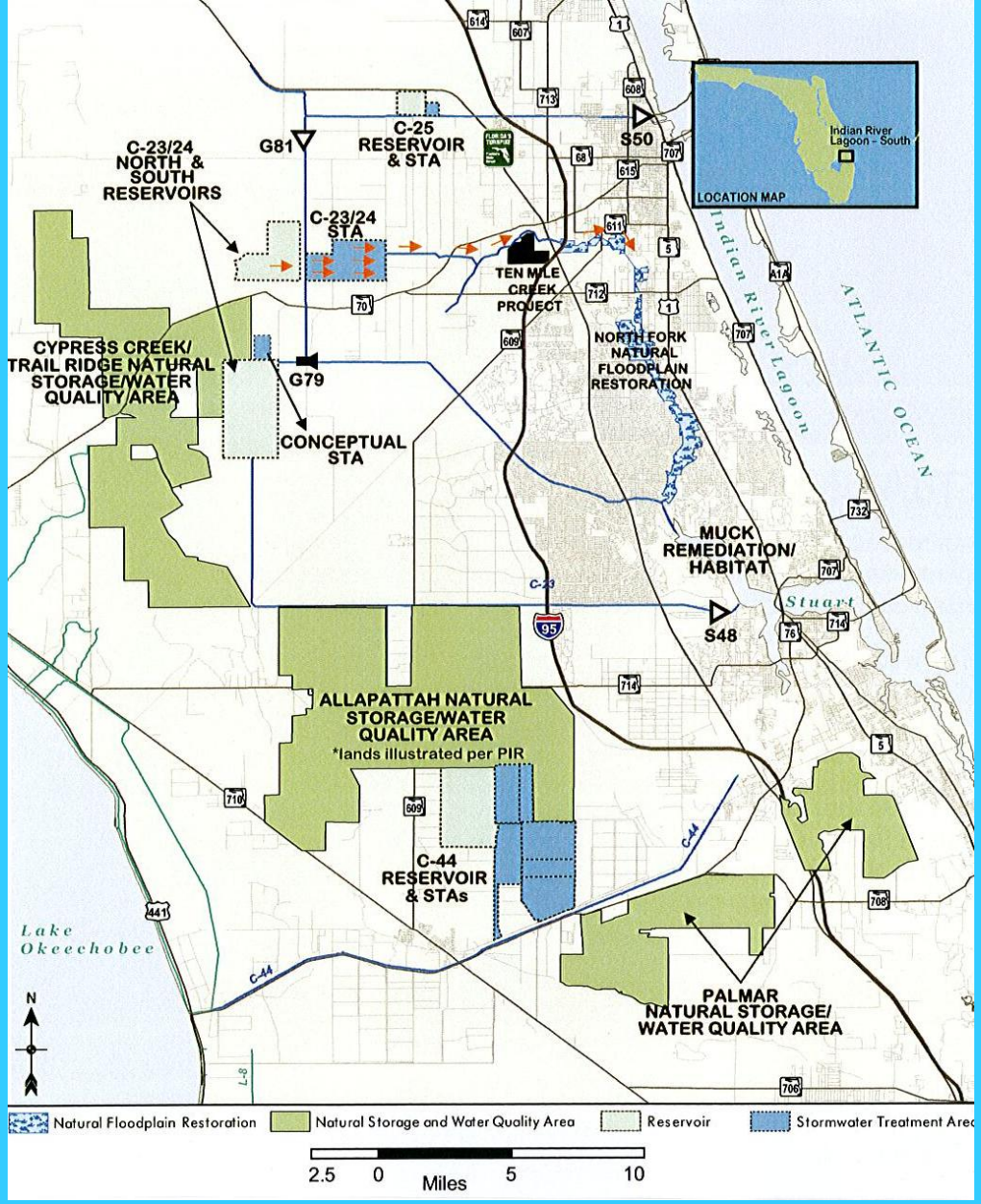

Indian River Lagoon-South Plan

12,000 acres above ground Storage Reservoirs

9,000 acres STA manmade wetlands

90,000 acres Natural Area Storage

2,650 acres benthic habitat created- 922 acres submerge aquatic habitat restored

7.9 million cubic yards of muck removed

889 acres of restored oyster habitat

41% reduction in Phosphorus

26% reduction in Nitrogen

C-44 BASIN COMPONENTS

- C-44 – Reservoir
- C-44 – Stormwater Treatment Area
- Palmar Complex – Natural Storage and Water Quality Area

C-23/24 BASIN COMPONENTS

- C-23/24 – North and South Reservoirs
- C-23/24 – Stormwater Treatment Area
- Allapattah, Cypress Creek and Trail Ridge Complex – Natural Storage and Water Quality Area

C-25, NORTH FORK AND SOUTH FORK BASIN COMPONENTS

- C-25 – Reservoir
- C-25 – Stormwater Treatment Area
- North Fork Natural Floodplain Restoration Muck Remediation and Artificial Habitat

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Part of Comprehensive Everglades Restoration Plan

Plan 6 Project

Stop the destructive discharges to the Northern Estuaries and Restore the River of Grass

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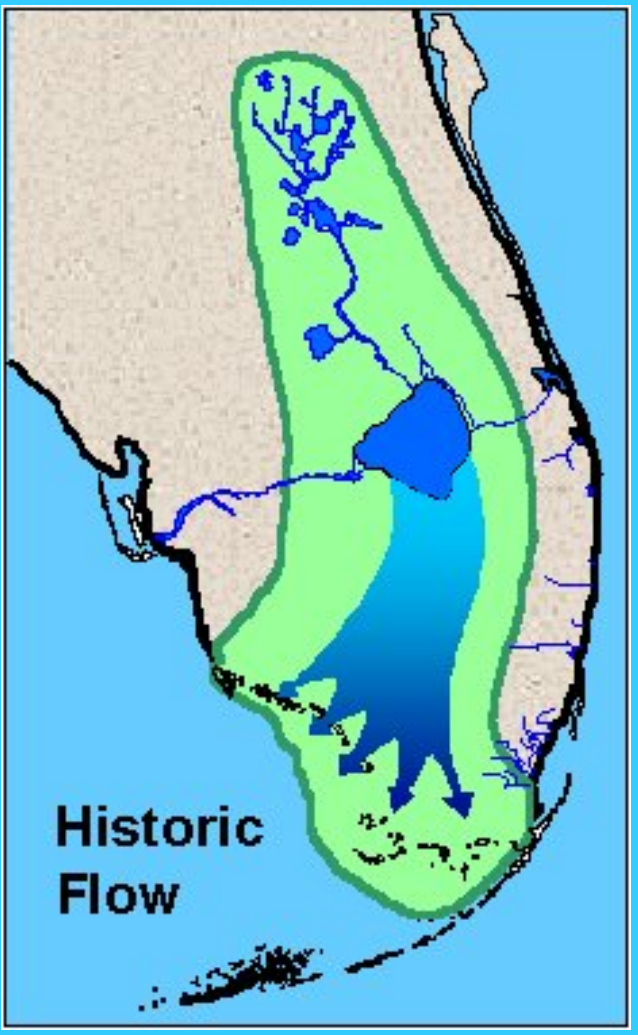
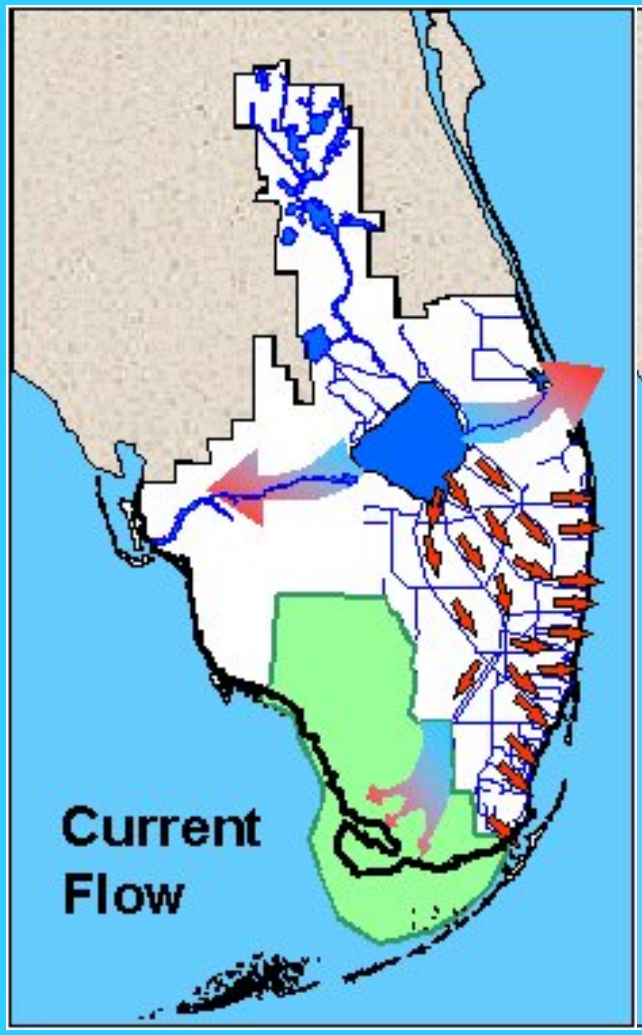
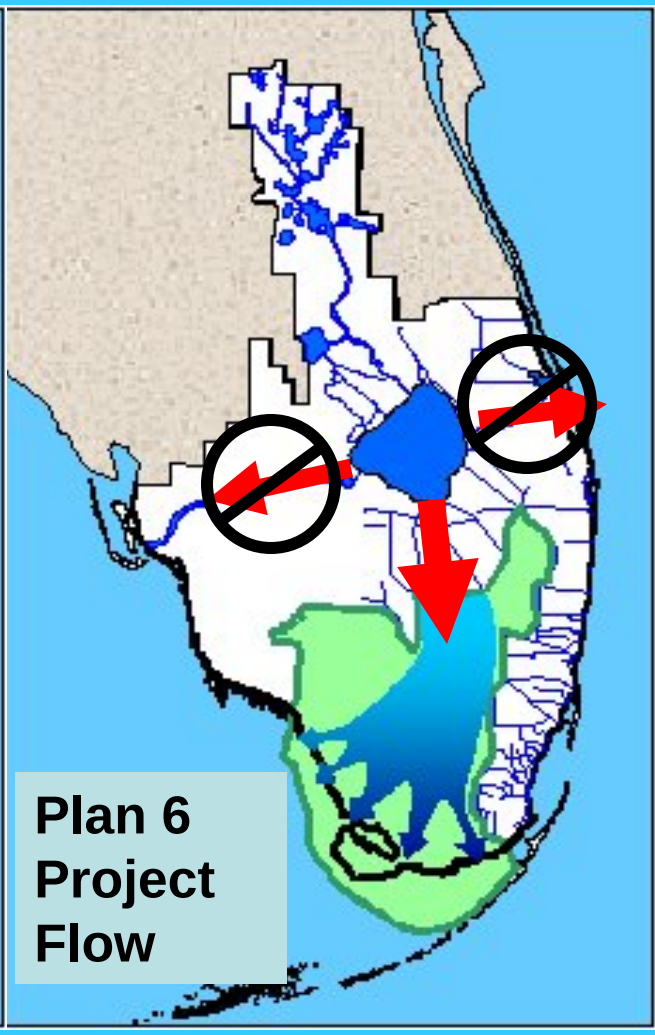


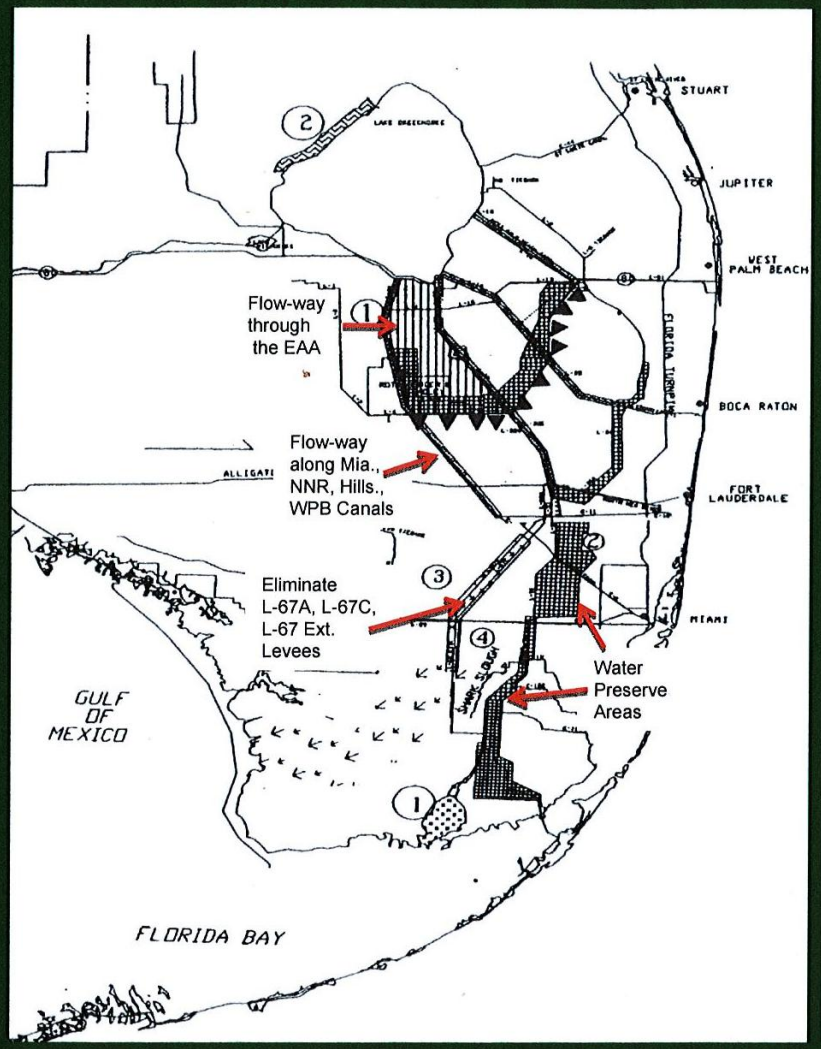




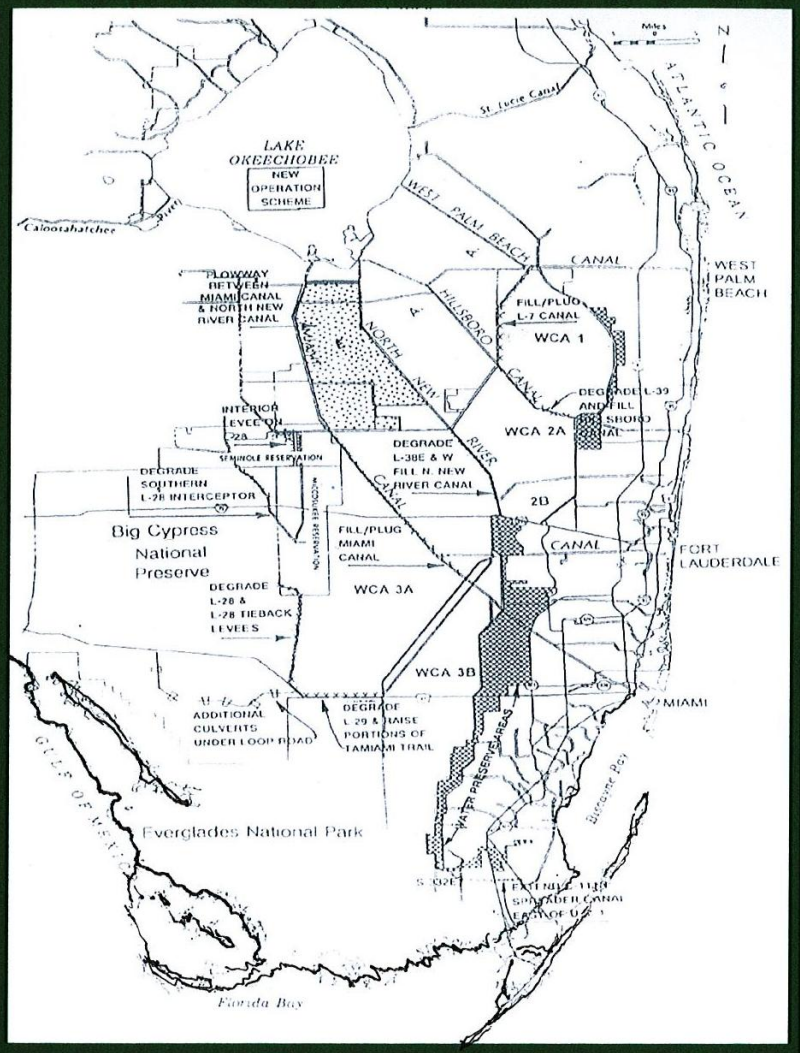
Historic, Current & Plan 6 Project Flows

Plan 6 Project – Stop destructive discharges to the Northern Estuaries and Restore the River of Grass

Early Conceptual Plans - Everglades Restoration



Science Sub-Group Report, Minimum Plan, 1993.



C&SF Restudy Recon. Report, Plan 6, 1994.

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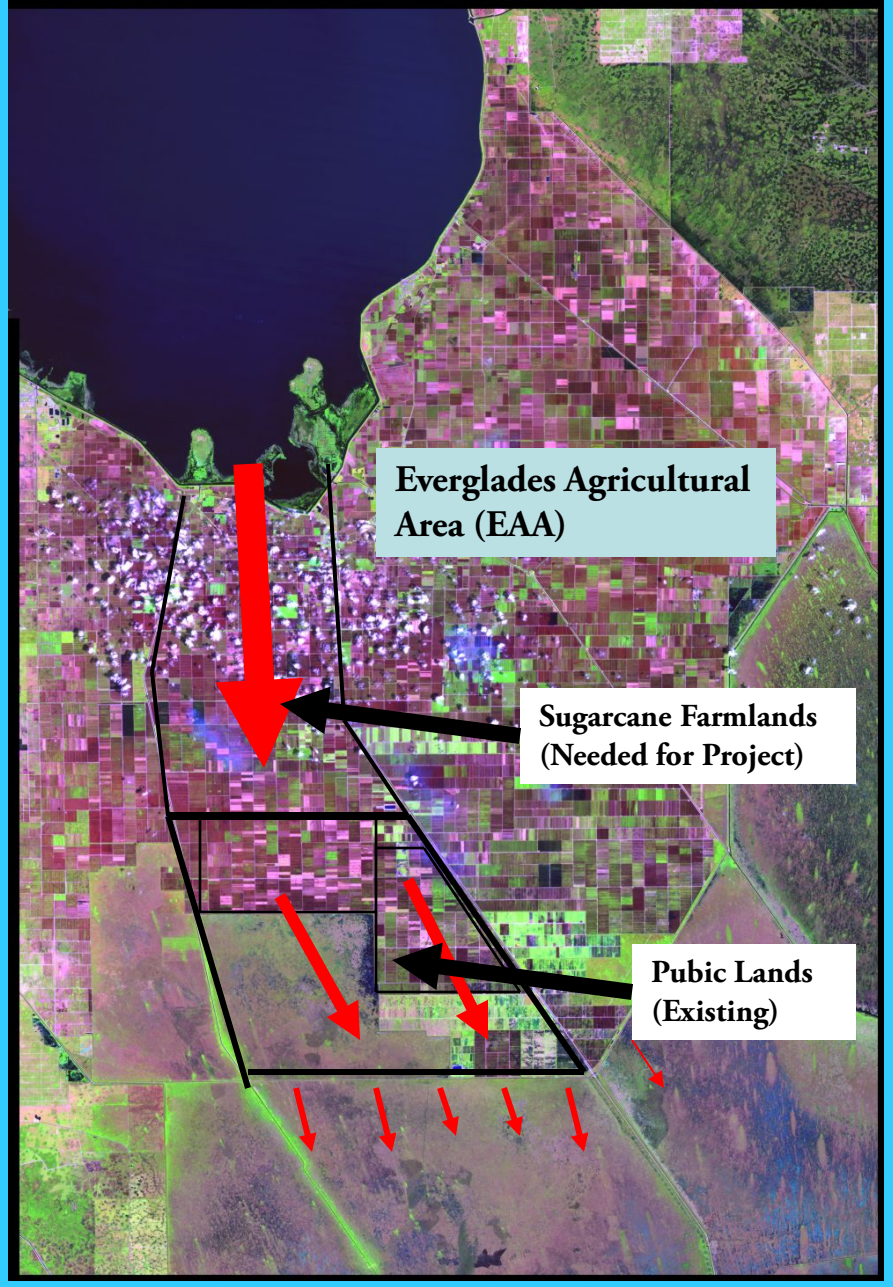
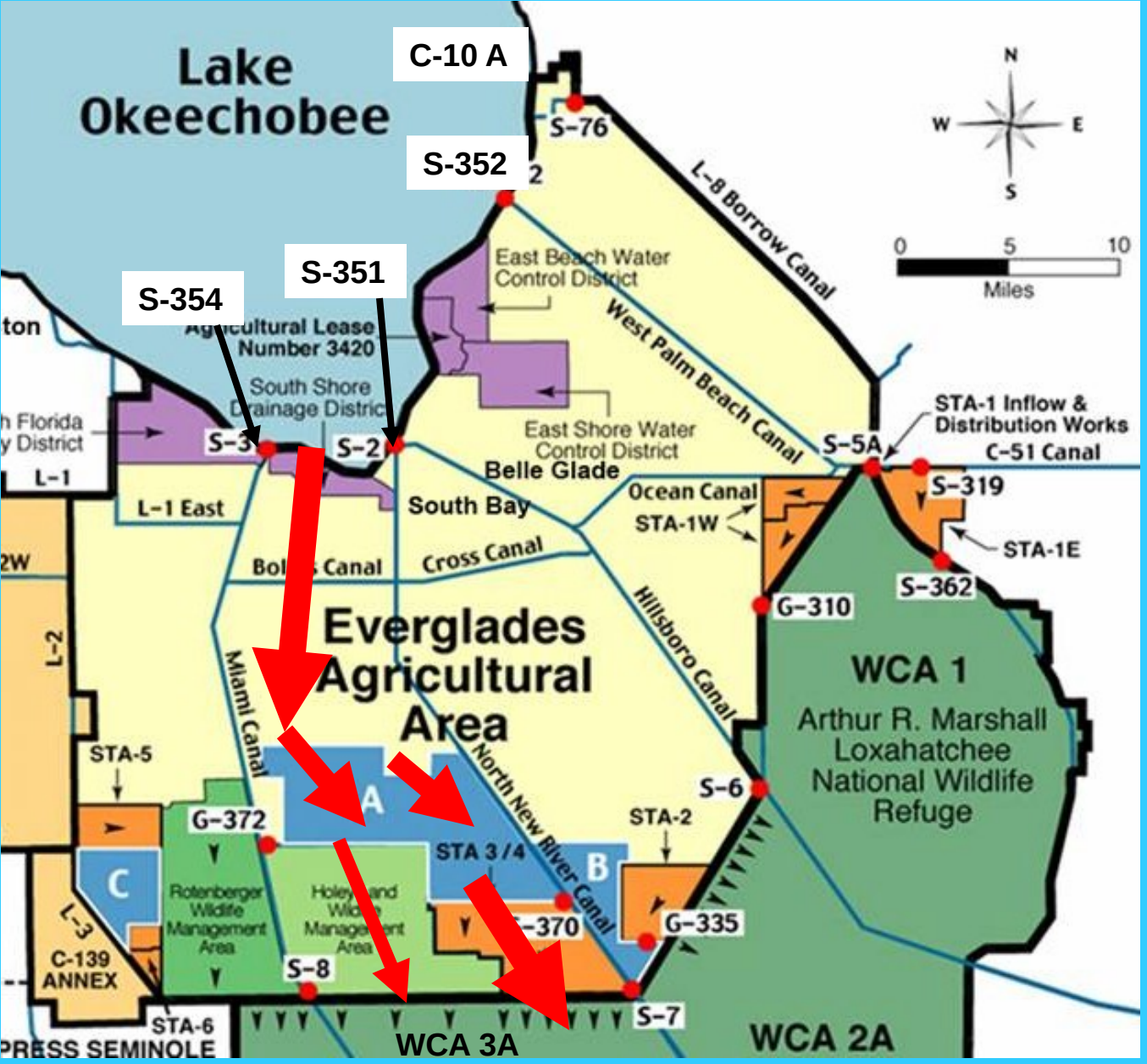
Reconnect Lake Okeechobee to the Everglades- River of Grass- Move Water South



Plan 6 Project – Stop destructive discharges to the Northern Estuaries and Restore the River of Grass

www.FloridaOcean.org

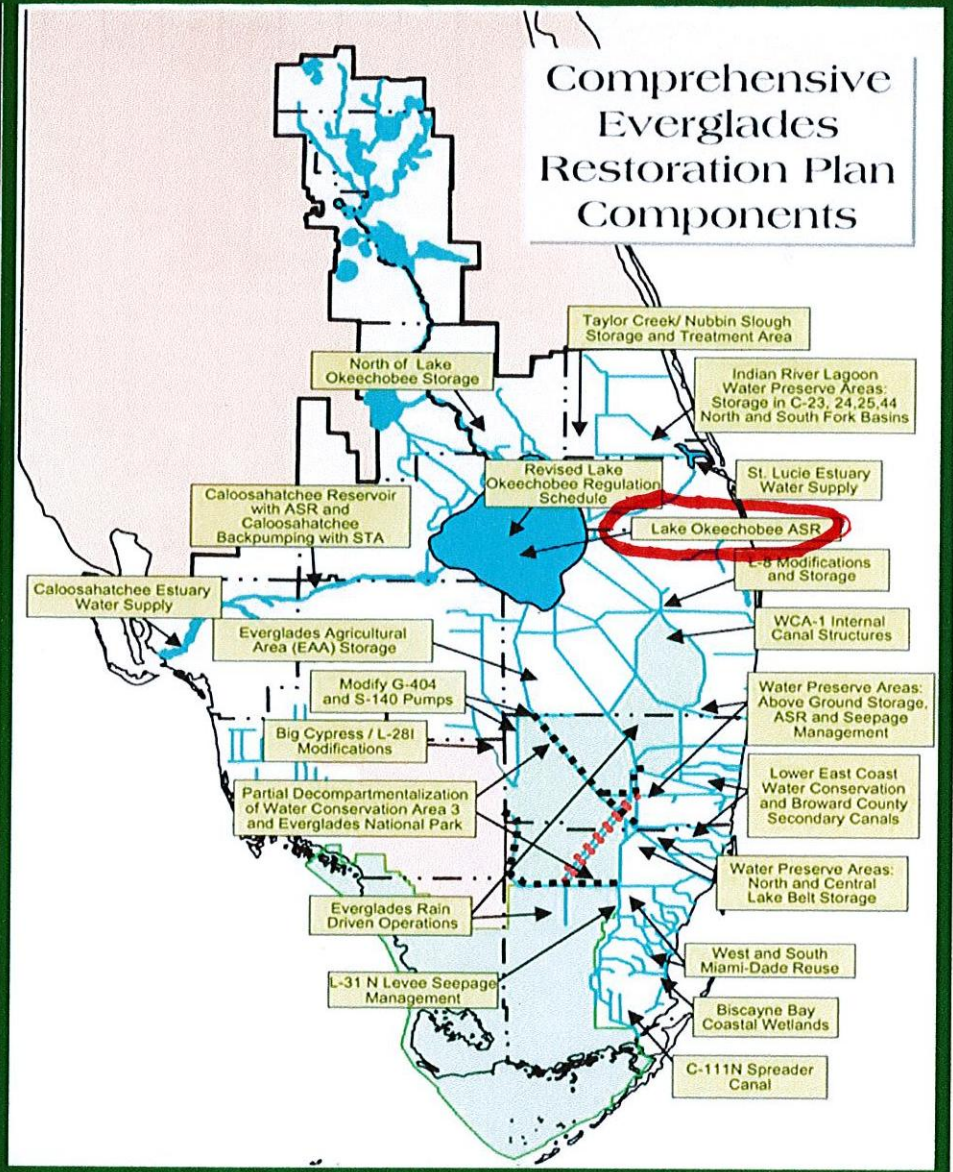


1. Becomes THE primary outflow for water from Lake Okeechobee
2. Stops destructive discharge releases from Lake Okeechobee to the Northern Estuaries
3. Replaces the Lake Okeechobee ASR Project of CERP with a project of greater flow & capacity
4. Restores water flows south from the Lake to the Everglades
5. Provides for healthy water levels in Lake Okeechobee
6. Maintains Water Quantity, Quality, Timing and Distribution for Everglades Restoration

Plan 6 Project – Stop destructive discharges to the Northern Estuaries and Restore the River of Grass

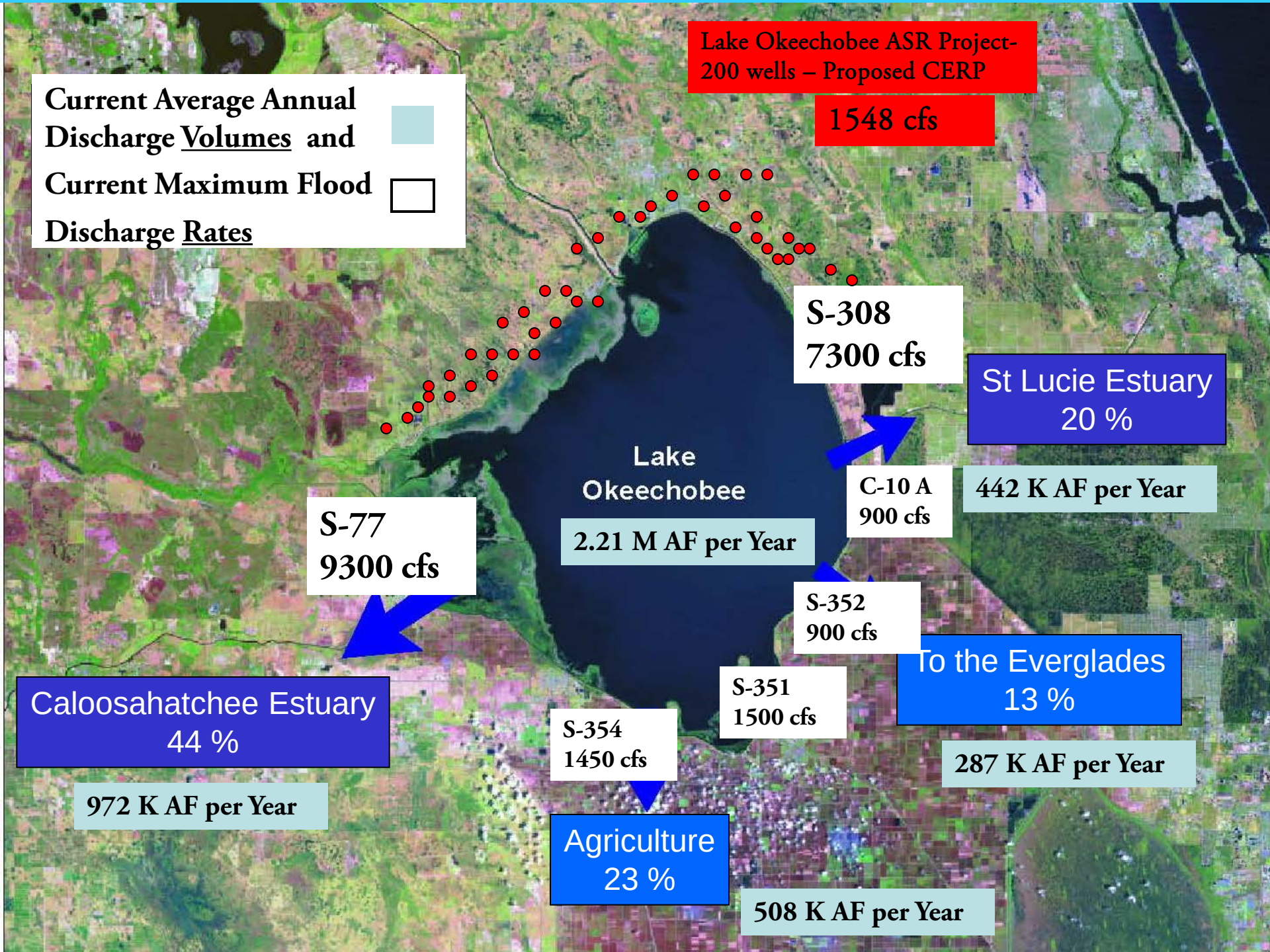
www.FloridaOcean.org

Early Conceptual Plans - Everglades Restoration



Governor's Com. For a Sustainable South FL, 1996.

C&SF Project Comprehensive Review Study, 1999.


Lake Okeechobee ASR Project-
200 wells – Proposed CERP
1548 cfs
Current Average Annual
Discharge Volumes and
Current Maximum Flood
Discharge Rates
S-308
7300 cfs
St Lucie Estuary
20 %
442 K AF per Year
Lake
Okeechobee
2.21 M AF per Year
C-10 A
900 cfs
S-77
9300 cfs
S-352
900 cfs
To the Everglades
13 %
287 K AF per Year
S-351
1500 cfs
S-354
1450 cfs
Caloosahatchee Estuary
44 %
972 K AF per Year
Agriculture
23 %
508 K AF per Year

Reviving the River of Grass

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

sfwmd.gov

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Reviving THE river of grass

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- Lake Okeechobee
- Everglades
- Coastal Areas

DISTRICT ACQUIRES 26,800 ACRES TO REVIVE THE RIVER OF GRASS

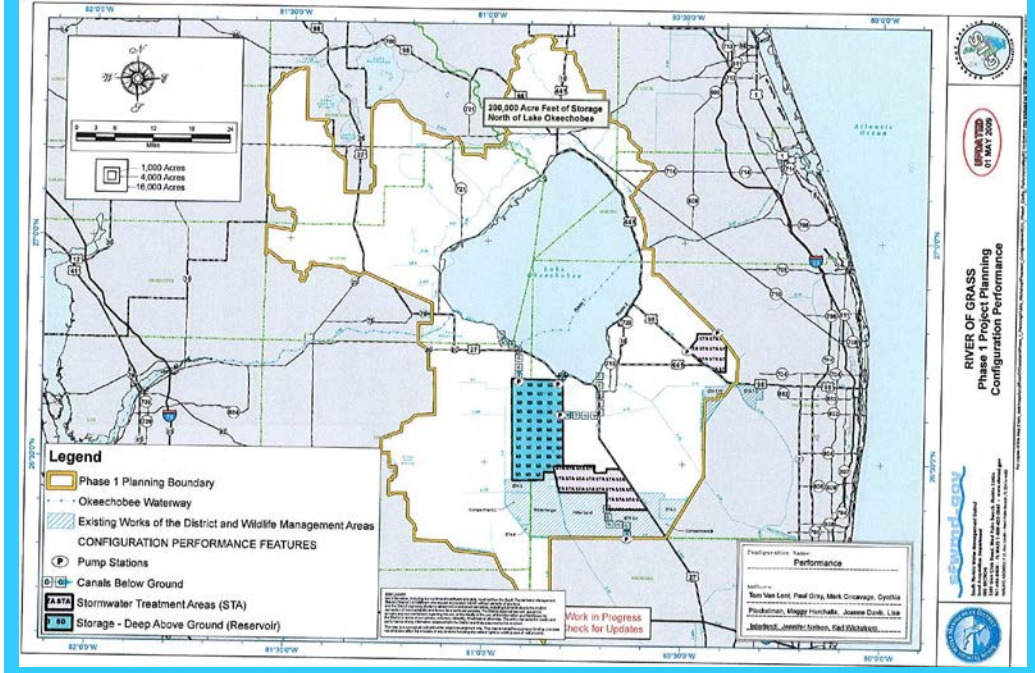
Background

June 2008: Governor Charlie Crist announced that the South Florida Water Management District would begin negotiating an agreement to acquire as much as 187,000 acres of agricultural land owned by the United States Sugar Corporation for Everglades restoration. Acquiring the enormous expanse of real estate offers water managers the opportunity and flexibility to store and clean water on a scale never before contemplated to protect Florida's coastal estuaries and to better revive, restore and preserve the fabled *River of Grass*.

December 2008: Following extensive negotiations, due diligence and public deliberation, the South Florida Water Management District's Governing Board voted to accept the negotiated proposal to acquire more than 180,000 of agricultural land for $1.34 billion, contingent upon financing and affordability.

May 2009: After gathering key input from the public, legislators and South Florida's communities and recognizing the nation's current economic climate, the South Florida Water Management District and U.S. Sugar Corporation amended the agreement providing for an initial purchase of close to 73,000 acres for $536 million, with options to purchase the remaining 107,000 acres during the next ten years when economic and financial conditions improve.

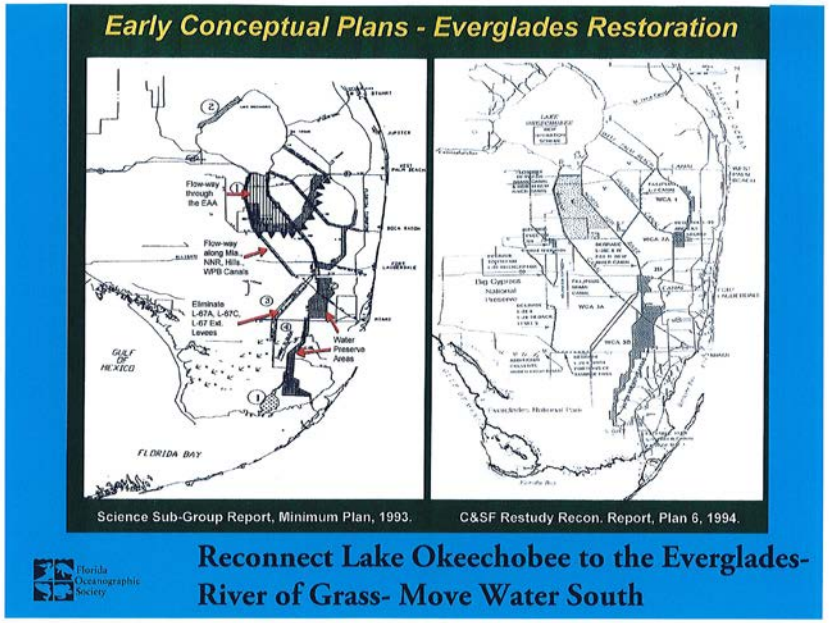
August 2010: In light of continued economic impacts, a decline in District revenues and the need to address recent federal court orders related to Everglades restoration, the Governing Board approved on August 12, 2010, a second amended and restated agreement for purchase and sale of land from the U.S. Sugar Corporation. Under the modified purchase, the District will utilize $197 million in cash on-hand to take ownership of 26,800 acres of strategically located land with high restoration potential while preserving the option to acquire 153,200 acres of additional lands, if future economic conditions allow.



Department of the Interior - DOI
Everglades Restoration Initiatives

A Conceptual Discussion to Integrate Water Flow and Water Quality in Everglades Restoration

Shannon Estenoz and Robert Johnson
NRC/CISRERP IV Meeting,
August 23, 2011



Greater Everglades Restoration

1 – Stop the destructive discharges to the Northern Estuaries and reconnect the “River of Grass” between Lake Okeechobee and the Everglades.

2- Restore the Kissimmee River, its valley and flood plain.

3 - Manage Lake Okeechobee as a “lake” between 12.5 ft and 15.5 ft.

4 - Enforce treating water pollution at the source of the problem, not downstream.

Florida Oceanographic Society

What about our Future?

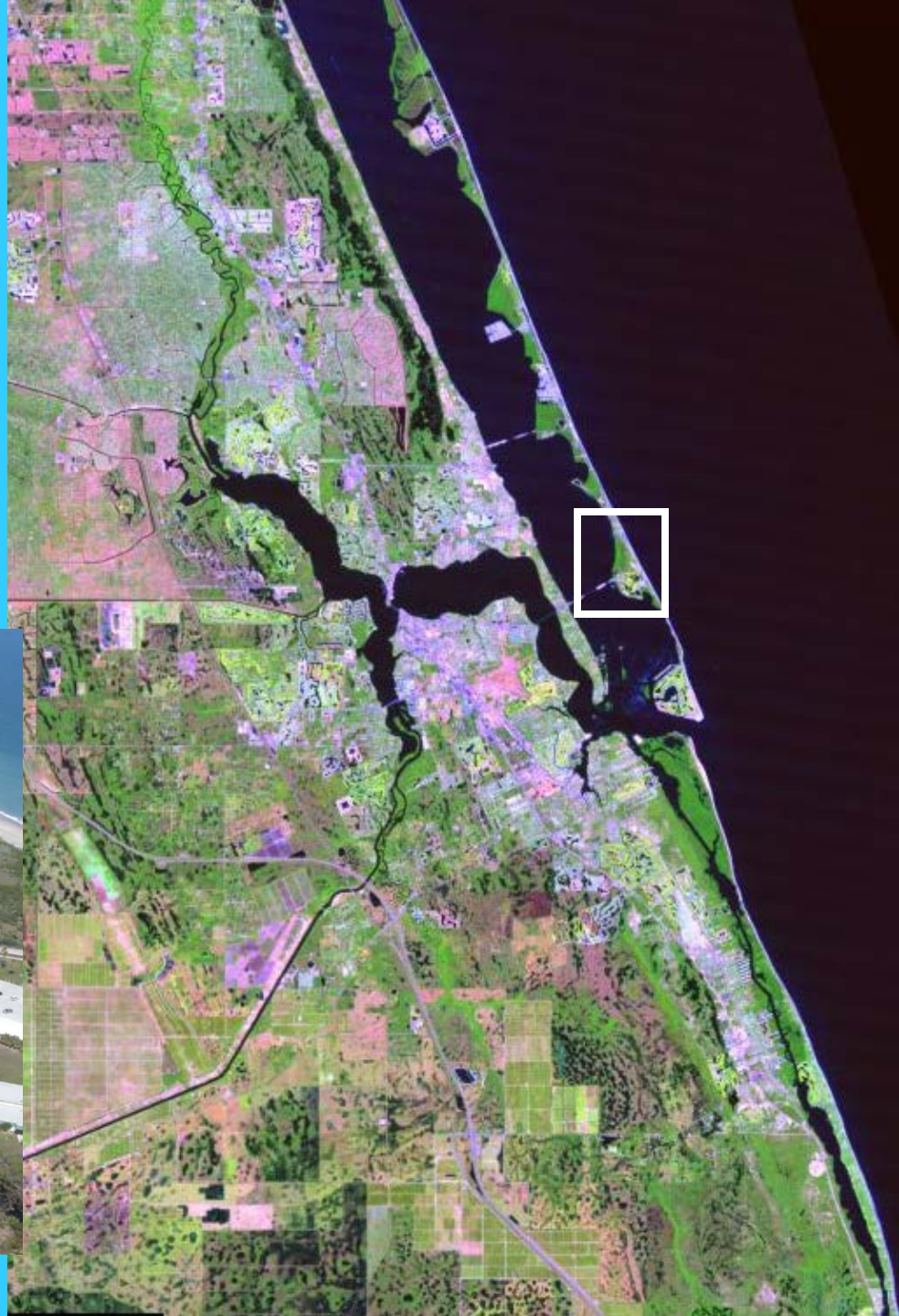
Our Mission:

To inspire environmental stewardship of Florida's coastal ecosystems through education and research.

Florida Oceanographic Society

Florida Oceanographic Coastal Center

Florida Oceanographic Coastal Center located on Hutchinson Island in Stuart, Florida.



Florida Oceanographic Coastal Center

750,000 gallon Game Fish Lagoon

Florida
Oceanographic
Coastal Center

Education & Programs

Hands-on learning for children and adults

- *Ray Feeding Programs*
- *Sea Turtle Programs*
- *Game Fish Lagoon Feeding Programs*
- *Guided Nature Trail Walks*

Research & Conservation

- *Water Quality Monitoring*
- *Oyster Reef Restoration*
- *Native Plant Restoration*
- *St. Lucie Estuary/Indian River Lagoon & Everglades Conservation Efforts*

www.FloridaOcean.org

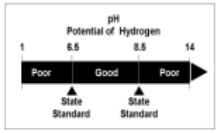
St. Lucie River Estuary Water Quality Outlook

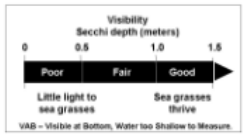
This information is provided by the Florida Oceanographic Society with support of the Marine Resources Council. It is collected by the Citizen Volunteer Water Quality Monitoring Network. For complete data go to our website at:
http://www.floridaoceanographic.org/water.htm

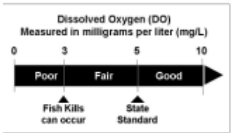
Posted: 06/17/10

Overall Grade:	67.9%	D+	POOR

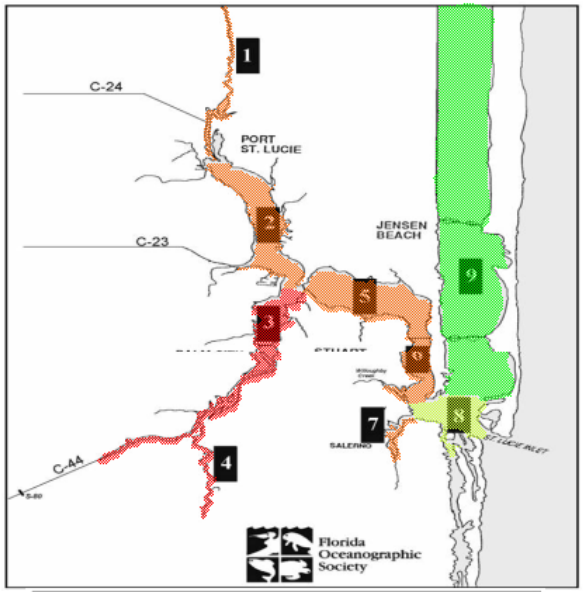
Zone/ Location	Water Temp. Deg. F	pH	Visibility (Secchi) Meters	Salinity ppt	Dissolved Oxygen mg/L	Location Score	Grade
1. Winding North Fork	87	7.7	0.70 Fair	0.0 Poor	4.8 Fair	61%	D Poor
2. North Fork	88	7.7	0.79 Fair	0.0 Poor	4.5 Fair	61%	D Poor
3. South Fork	89	8.0	0.35 Poor	0.7 Poor	6.4 Good	56%	F Destructive
4. Winding South Fork	85	7.3	0.55 Fair	0.0 Poor	2.0 Poor	56%	F Destructive
5. Wide Middle River	89	8.0	0.60 Fair	2.0 Poor	5.8 Good	66%	D Poor
6. Narrow Middle River	86	8.3	0.95 Fair	13.0 Poor	6.9 Good	66%	D Poor
7. Manatee Pocket	90	8.1	0.90 Fair	18.0 Poor	7.1 Good	66%	D Poor
8. Inlet Area	86	8.4	1.15 Good	27.5 Fair	4.9 Fair	81%	B Good
9. IRL	88	8.5	1.45 Good	30.0 Good	6.8 Good	97%	A Ideal







Comment: The data above may indicate areas of concern in the St. Lucie Estuary. Citizens should call the Florida Department of Environmental Protection (DEP) at 871-7662 or the South Florida Water Management District (SFWMD) 223-2600 to ask about the quality of a specific area and report observations of pollution.



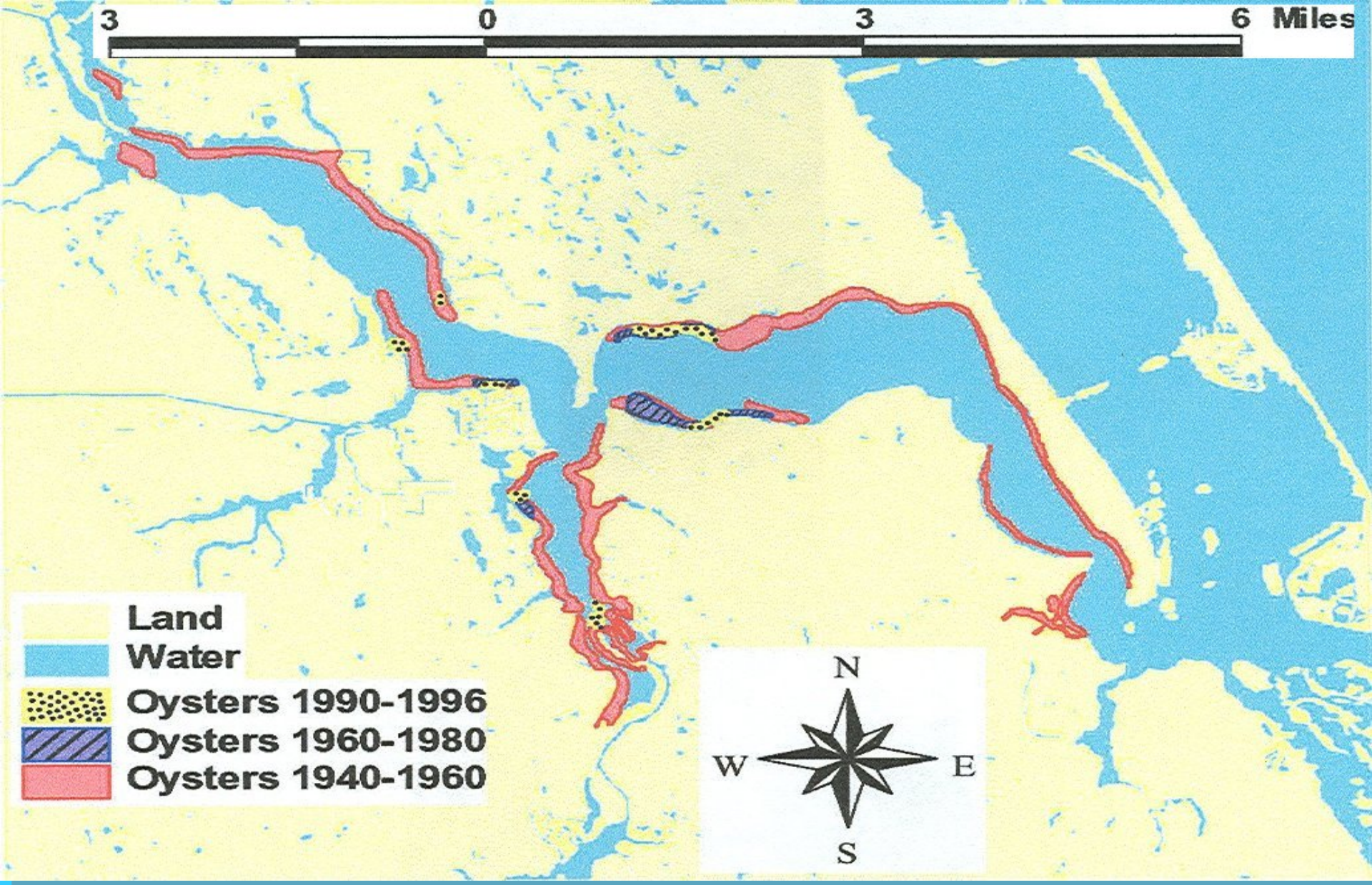
Grading				
A	B	C	D	F
90-100	80-89	70-79	60-69	0-59
IDEAL	GOOD	SATISFACTORY	POOR	DESTRUCTIVE

Salinity (Parts per Thousand)				
Zones	Description	Good	Fair	Poor
1 & 4	Winding North & South Forks	2 to 8	1 to 2 or 8 to 15	< 1 or > 15
2 & 3	Inner St. Lucie Estuary (North & South Fork)	15 to 25	10 to 15 or > 25	< 10
5	Wide Middle St. Lucie River	> 20	1	
6	Narrow Middle St. Lucie River	> 25	2	
7	Manatee Pocket	> 27.5		
8 & 9	Inlet and Indian River Lagoon (to Jensen Beach Causeway)	>30	2	

Water Quality Monitoring preformed weekly by volunteers throughout Martin County.

Results published weekly in The Stuart News.

Florida Oceanographic Society



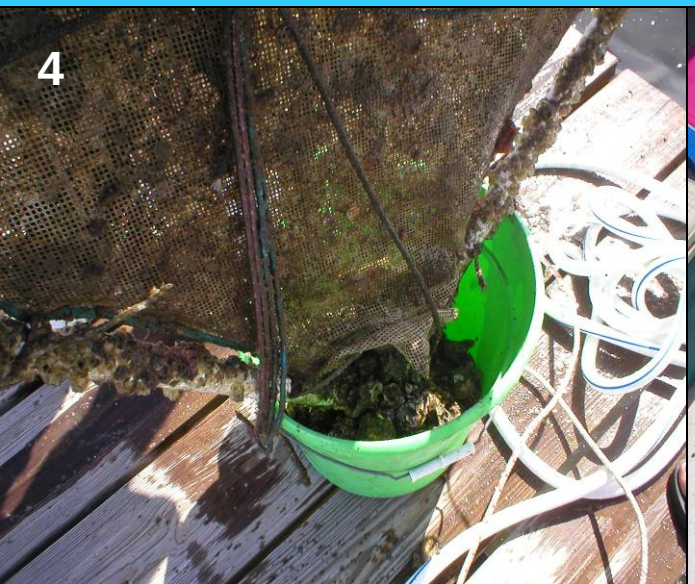
St. Lucie River Estuary Oyster Reef Habitat

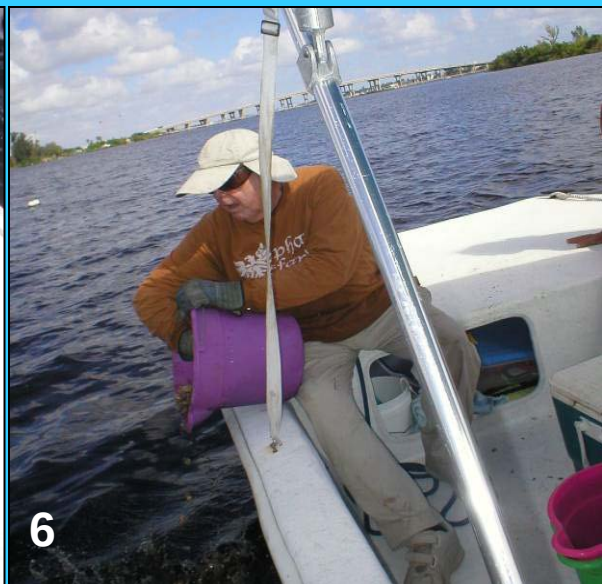
Florida Oceanographic Society

1940s – 470 acres 1996 – 260 acres 2003 – 116 acres

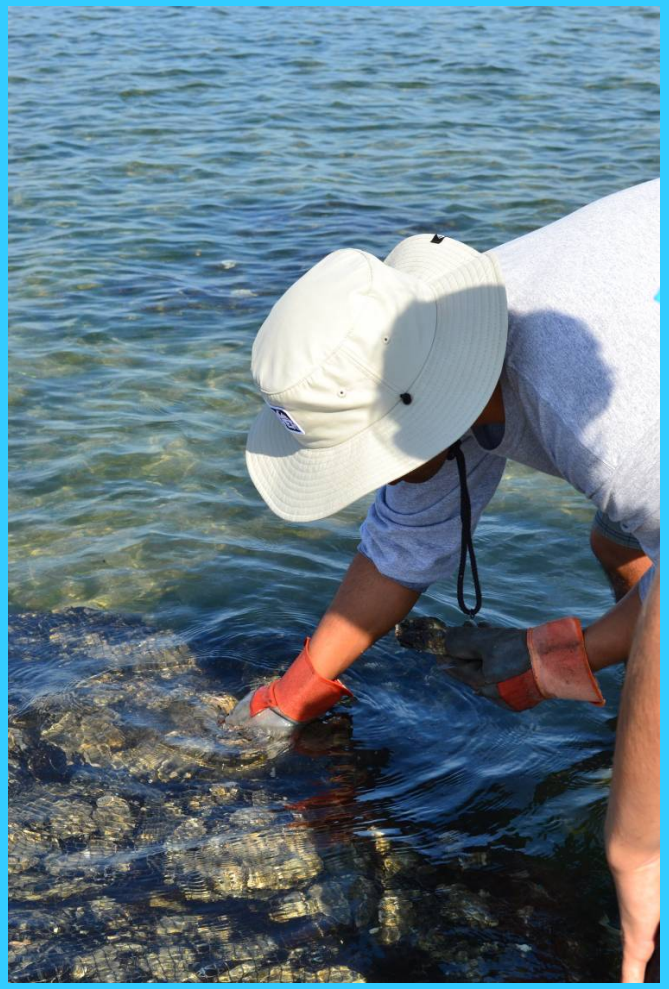
Oyster Gardening Habitat Restoration Program – Started 2005

Florida Oceanographic Society





Oyster Reef Restoration



Oyster Shells collected from local restaurants are bagged and deployed to designated reef restoration sites by staff and volunteers.
New oyster growth is monitored by staff

1 adult oyster can filter ***50 gallons per day,*** *and oyster reefs provide shoreline stabilization and habitat to* ***over 300 estuarine species***

Florida Oceanographic Society

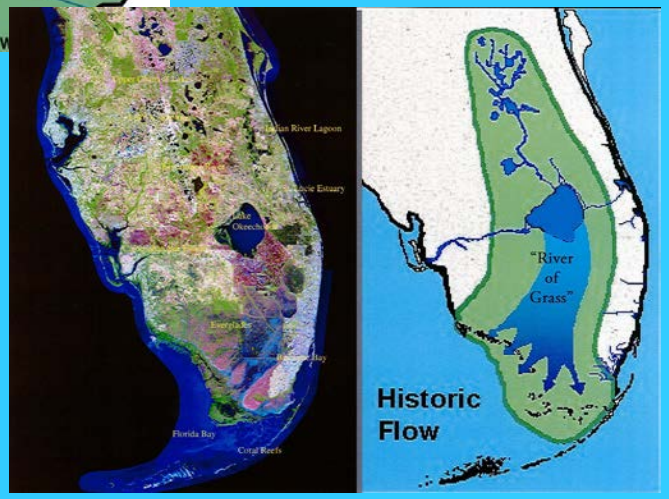
In partnership with Martin County Oyster Reef Restoration Project

Oyster Reef Restoration


N
0
0.5
1
2 Miles
North Fork
Middle Estuary
Lower Estuary
South Fork
Florida Oceanographic Coastal Center
Martin Co./NOAA Reefs
Historic Oyster Reefs
OYSTER REEF RESTORATION
FLORIDA
YES24
INDIAN RIVER LAGOON

Mark Perry
Executive Director
Conservation Advocacy

- *Member of the Everglades Coalition*
- *Member of the State Water Resource Advisory Commission*
- *Member of the Rivers Coalition*
- *Testified to U.S. Senate Committee and in Federal Courts as to value of the Everglades and Florida's coastal ecosystems*



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Learn More at www.FloridaOcean.org


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