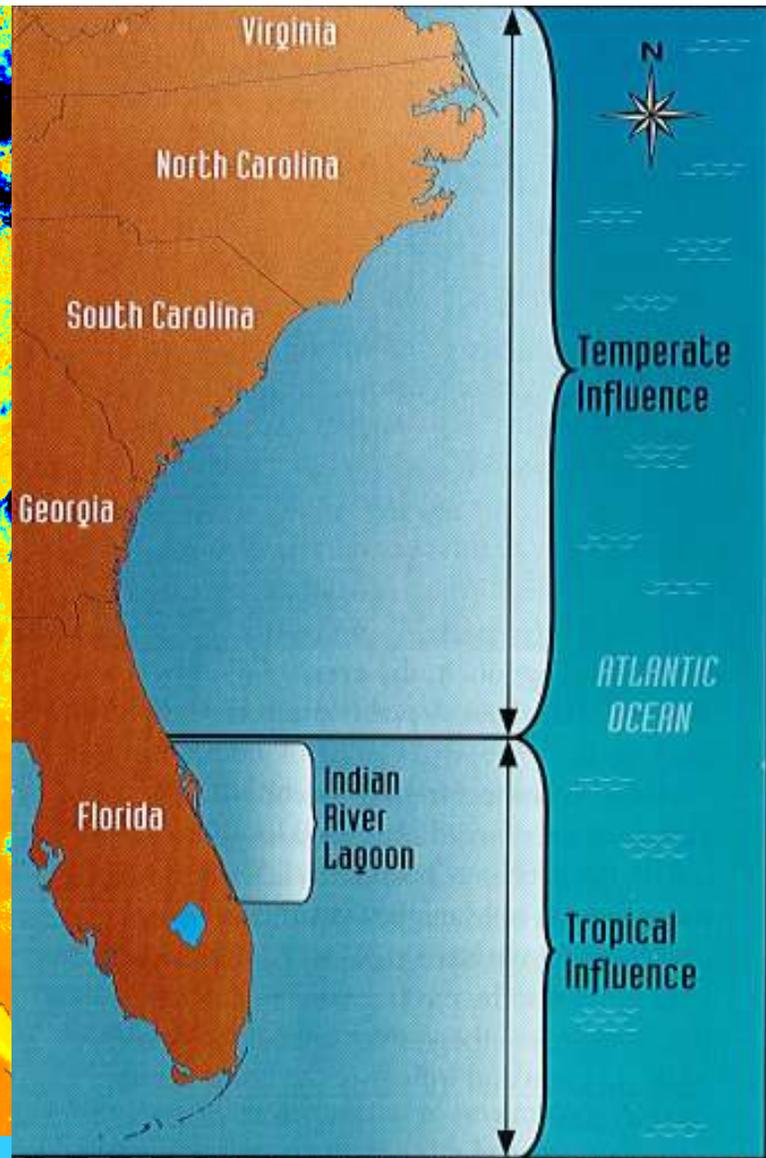
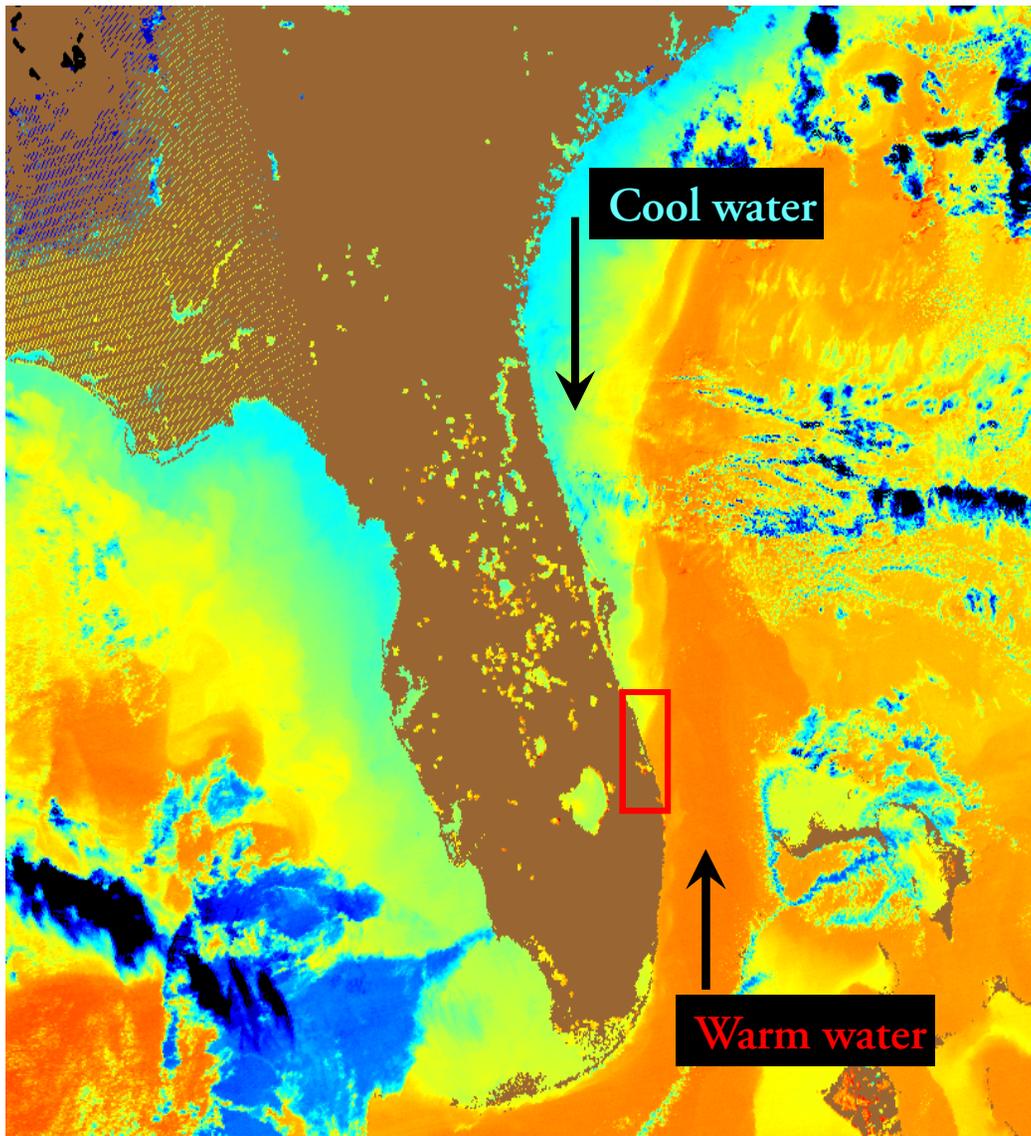


# Indian River Lagoon: Lessons, Challenges and Opportunities

Mark Perry, Executive Director  
Florida Oceanographic Society  
February 5, 2015



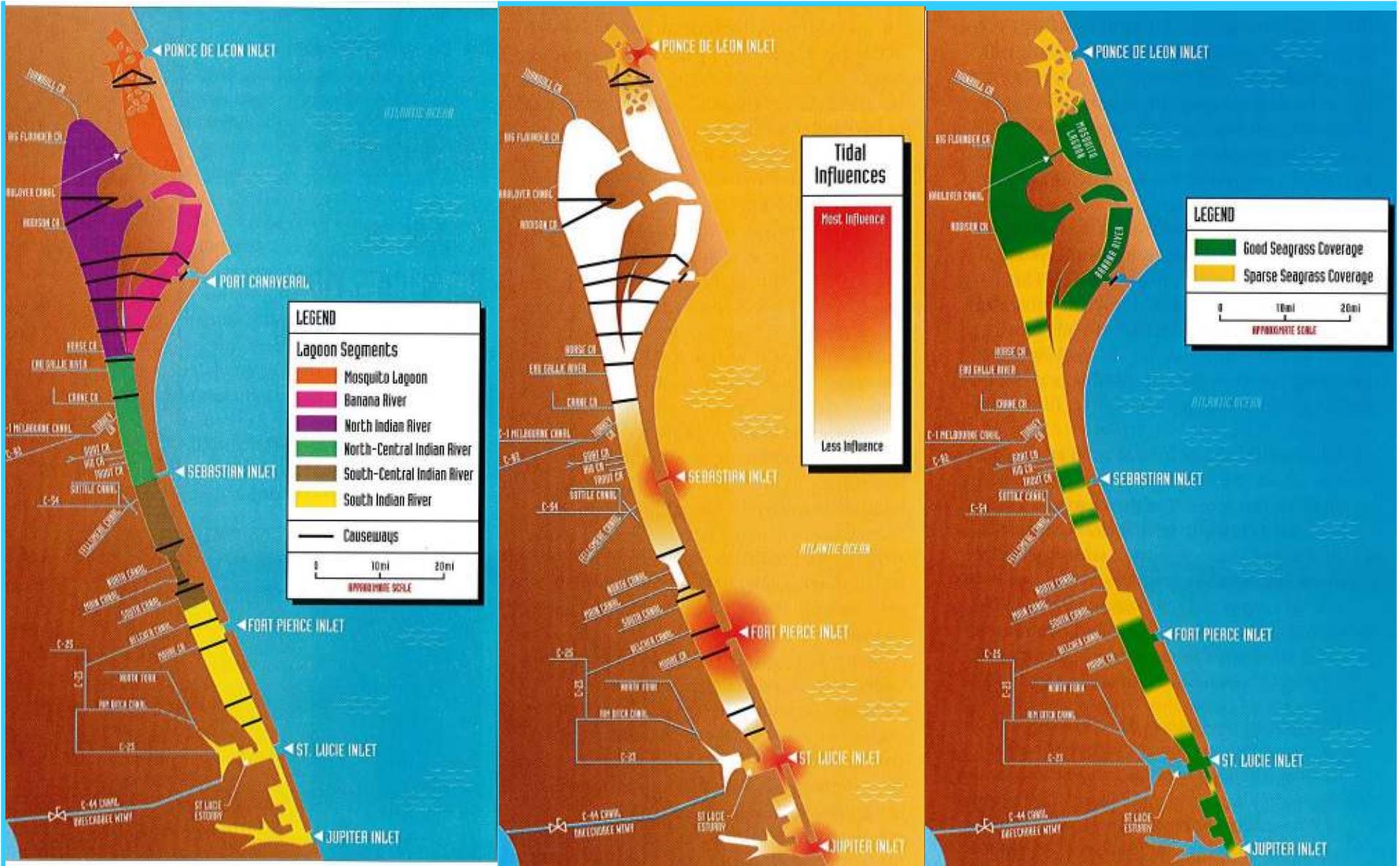


## Indian River Lagoon

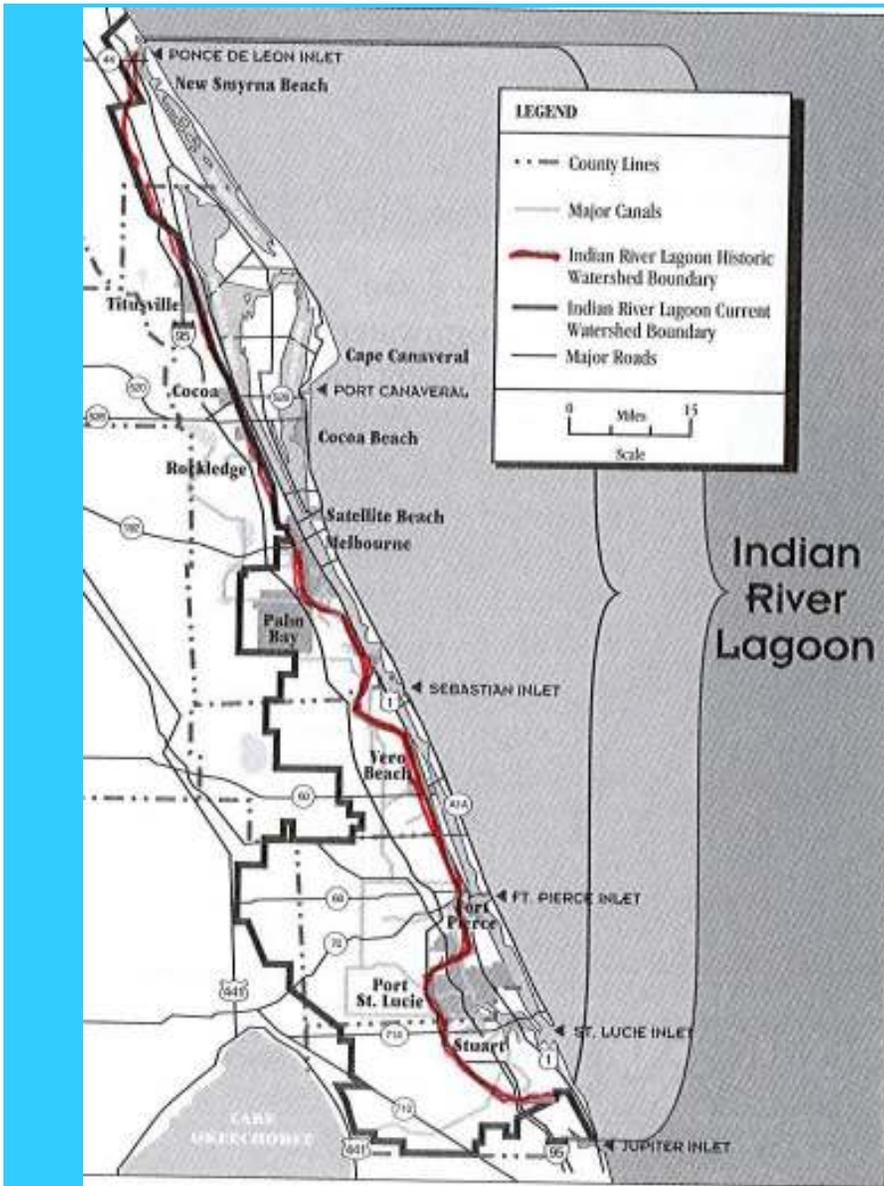
- 2100 plant species
- 2200 animal species (700 fish, 310 birds)



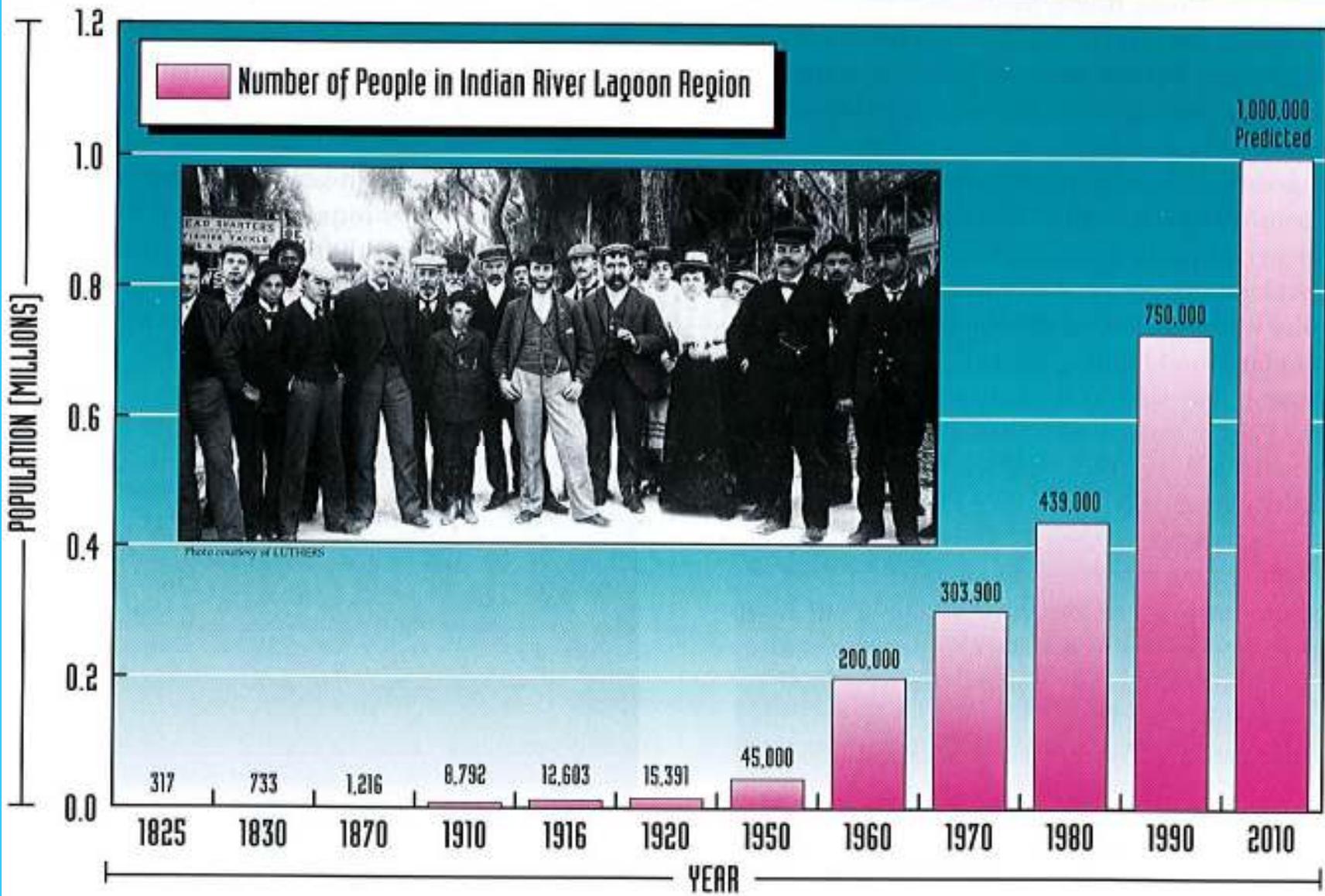
**Most Biodiverse Estuary in North America**



## Six Lagoon Segments – Six Inlets – Seagrass, major habitat



**Historic Watershed-572,800 acres    Current Watershed- 1,216,640 acres**  
**24 Major Drainage Canals – C-44 (St. Lucie Canal) the largest in the watershed**



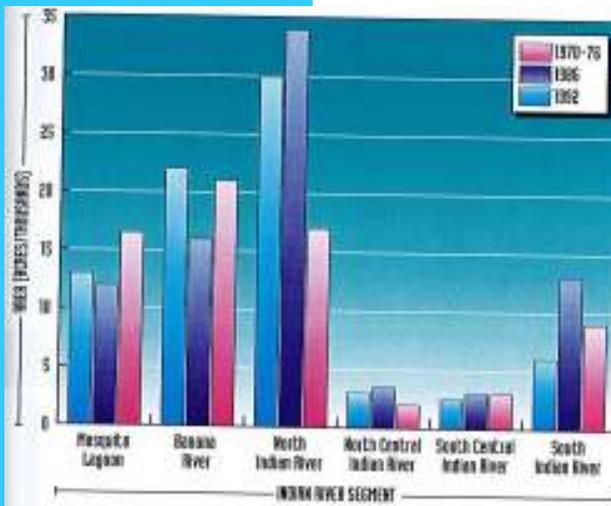
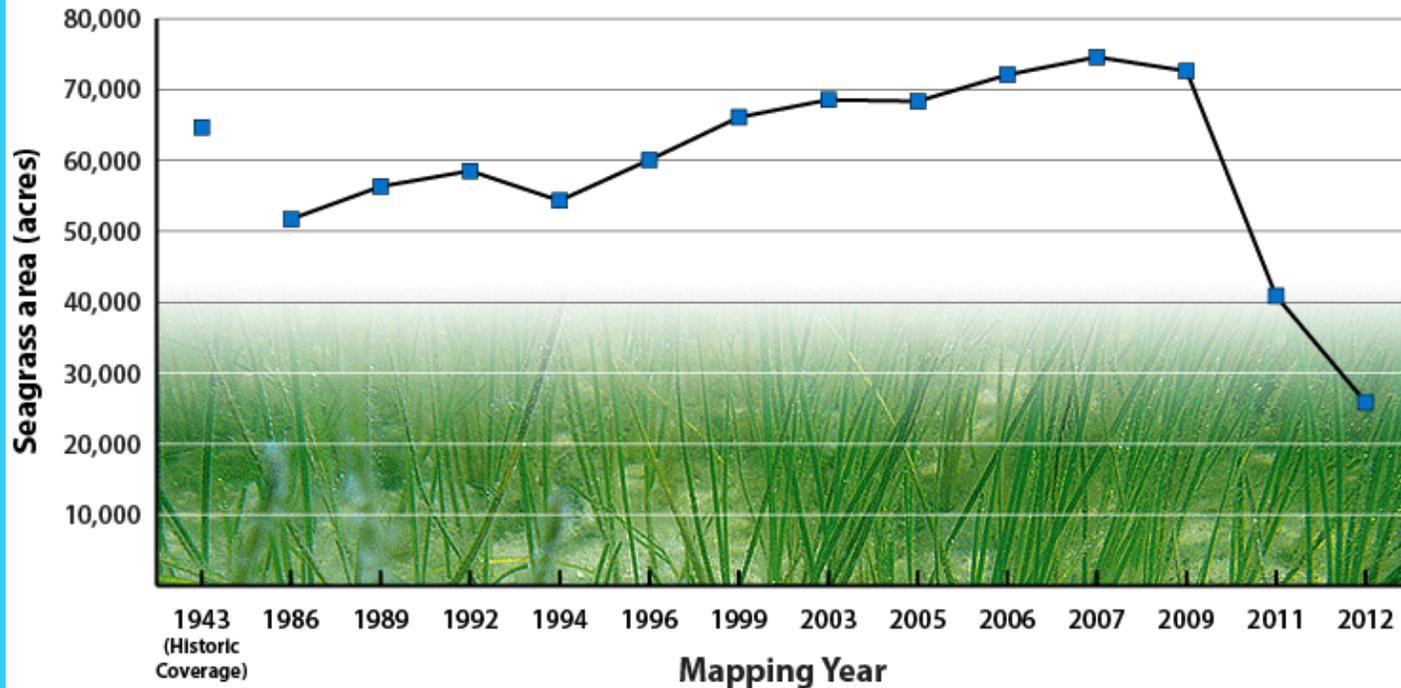
## Major Population Increase 1960 to Present

# **Major Problems in the Indian River Lagoon**

- Loss of Seagrass Beds**
- Loss of Mangrove Wetlands & Shorelines**
- Mosquito Impoundments – Disconnected Habitat**
- Major Alteration and Expansion Drainage System in Watershed**
- Changes in Circulation and Tidal Influences**
- Major Increase in Nutrient Levels and Sediment Loads**
- Major Increase in Boating, Fishing, Marina & Waterfront activity**
- Increase in Invasive & Exotic Plants and Animals**

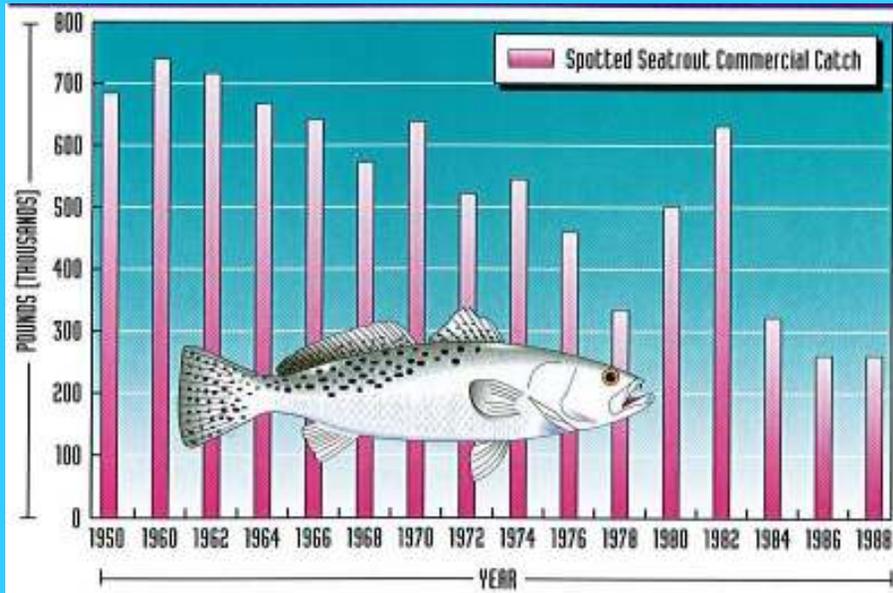
# Indian River Lagoon Seagrass Coverage

(within SJRWMD to Fort Pierce Inlet)



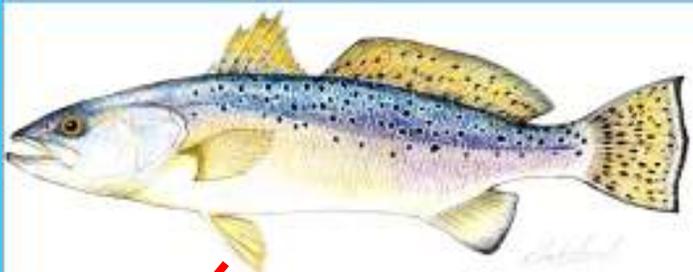
**The 'perfect storm' , 2011 superbloom, 2012 brown tide bloom ???**

**170,000 acres of Lagoon bottom appropriate for seagrass habitat. Less than 84,000 acres support seagrass. More than 50% of the seagrass beds have been lost from the Lagoon.**



## Direct Effects on Fisheries

Economically important Spotted Seatrout fishery decline from overfishing and inhibited reproduction by low salinity levels in the estuary.





**Bottlenose Dolphins in Indian River Lagoon have Skin Disorders such as Dolphin Pox and Lobomycosis- (FAU HBOI)**

**Sea Turtles in the Indian River Lagoon have Skin Disorders such as Fibropapilloma**



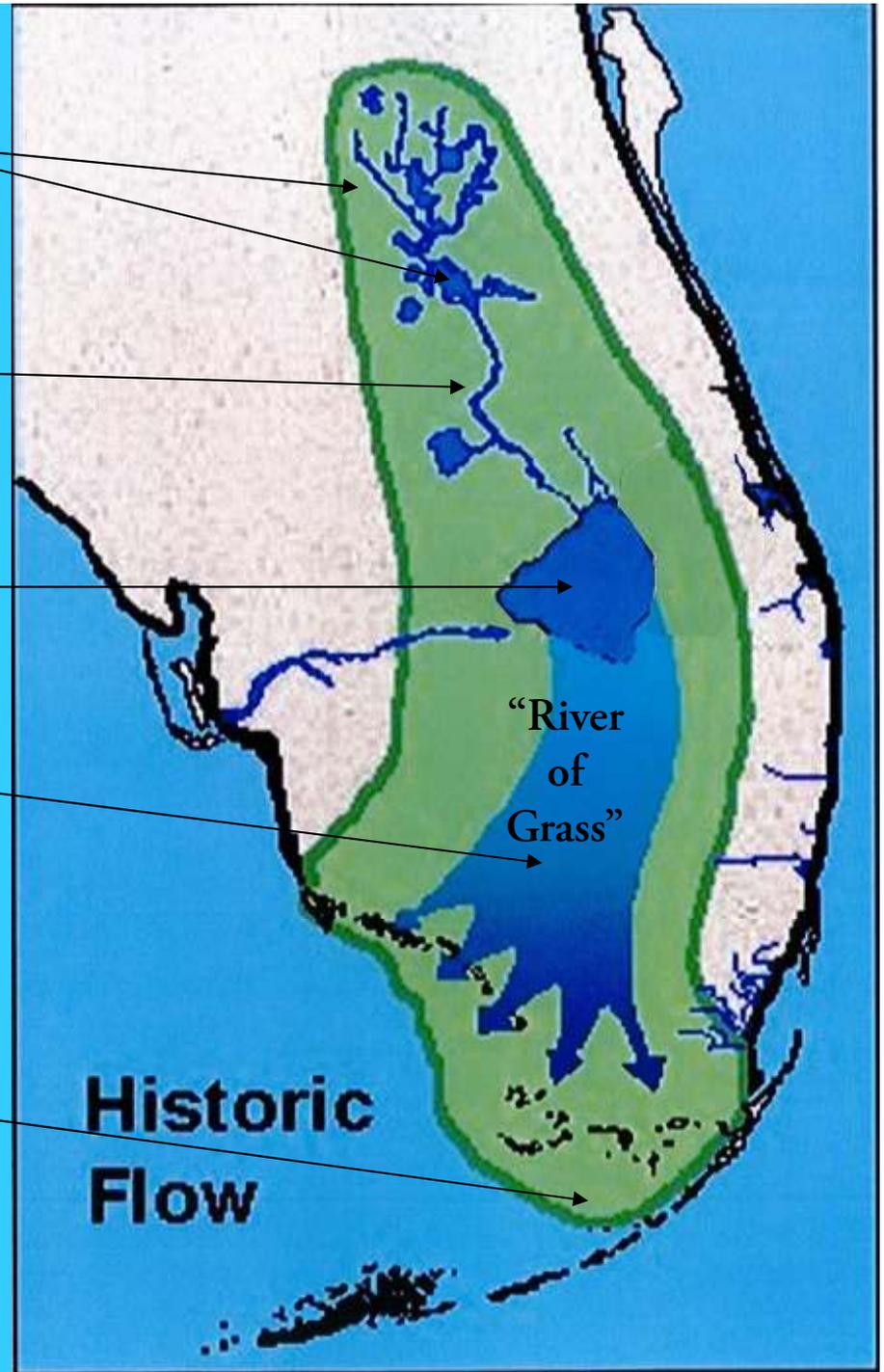
Upper Chain of Lakes flow south  
into Lake Kissimmee

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

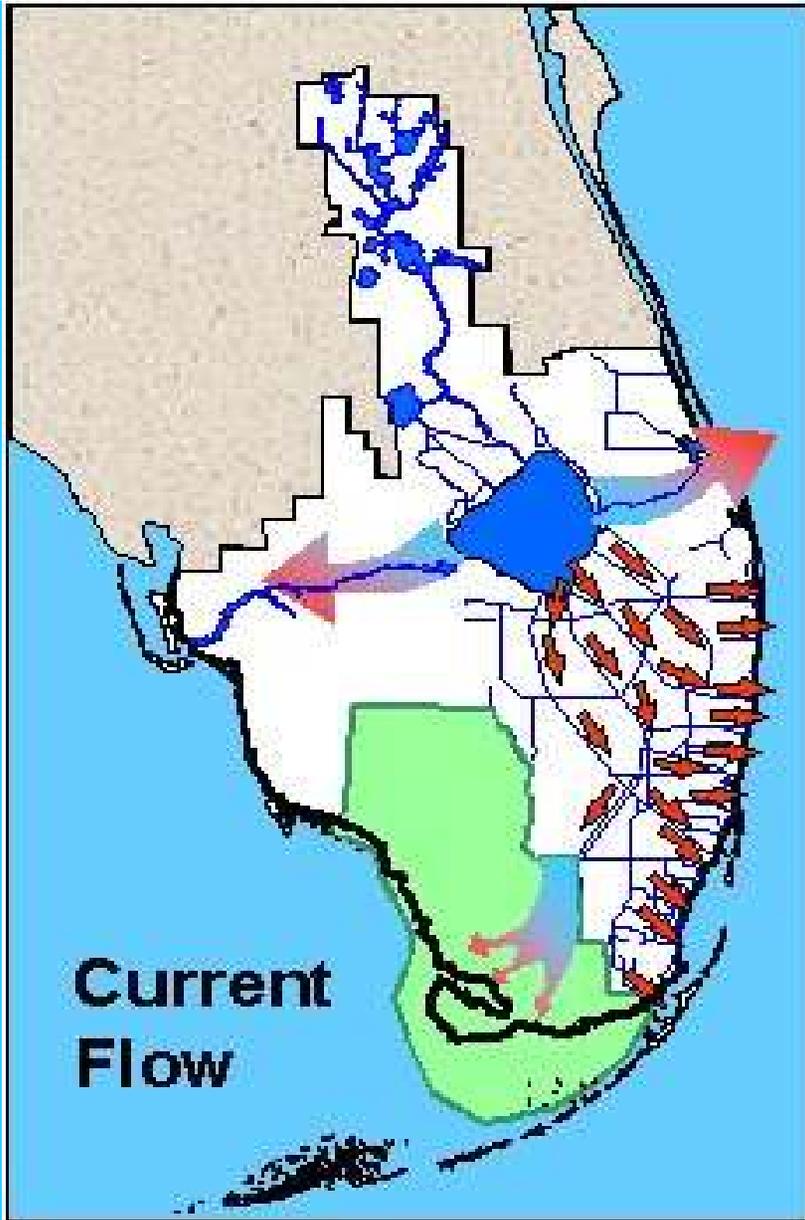
Water takes 6-8 Months to reach  
Lake Okeechobee

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

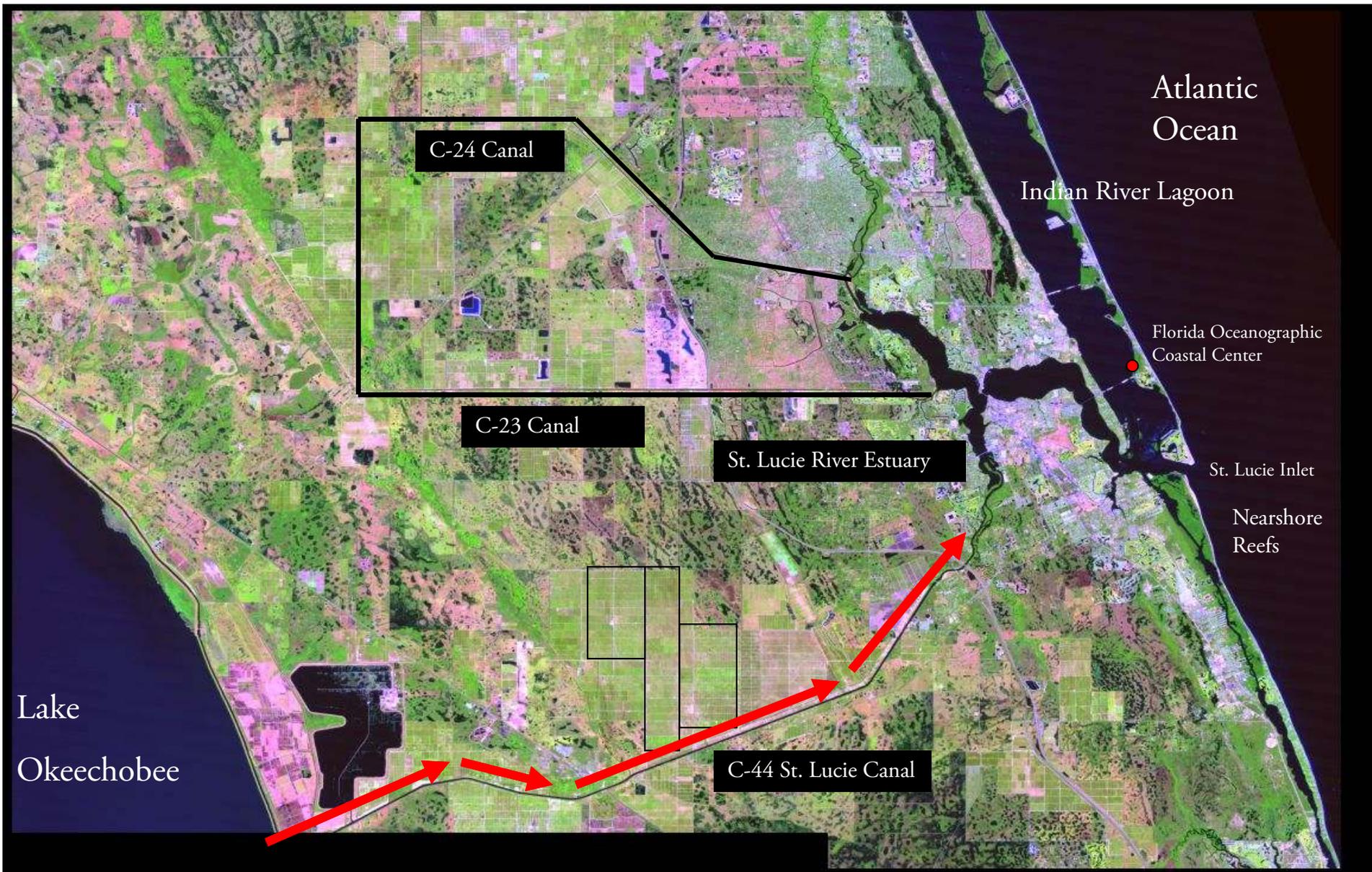
Water takes 16 Months to reach  
Florida Bay







**1.7 Billion Gallons per Day of freshwater is wasted to the Atlantic Ocean and Gulf of Mexico! (\$ 2.2 Billion/year)**



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

# May-October 2013 Discharges

Average Annual Discharges (1996-2005)

From Lake Okeechobee  
to St. Lucie Estuary

418 K AF (136 BG)

Phosphorus - 78 MT

Nitrogen - 953 MT

TSS - 6,800 MT

418 K af (136 BG)

St Lucie Estuary  
20 %

977 K af (318 BG)

Lake  
Okeechobee

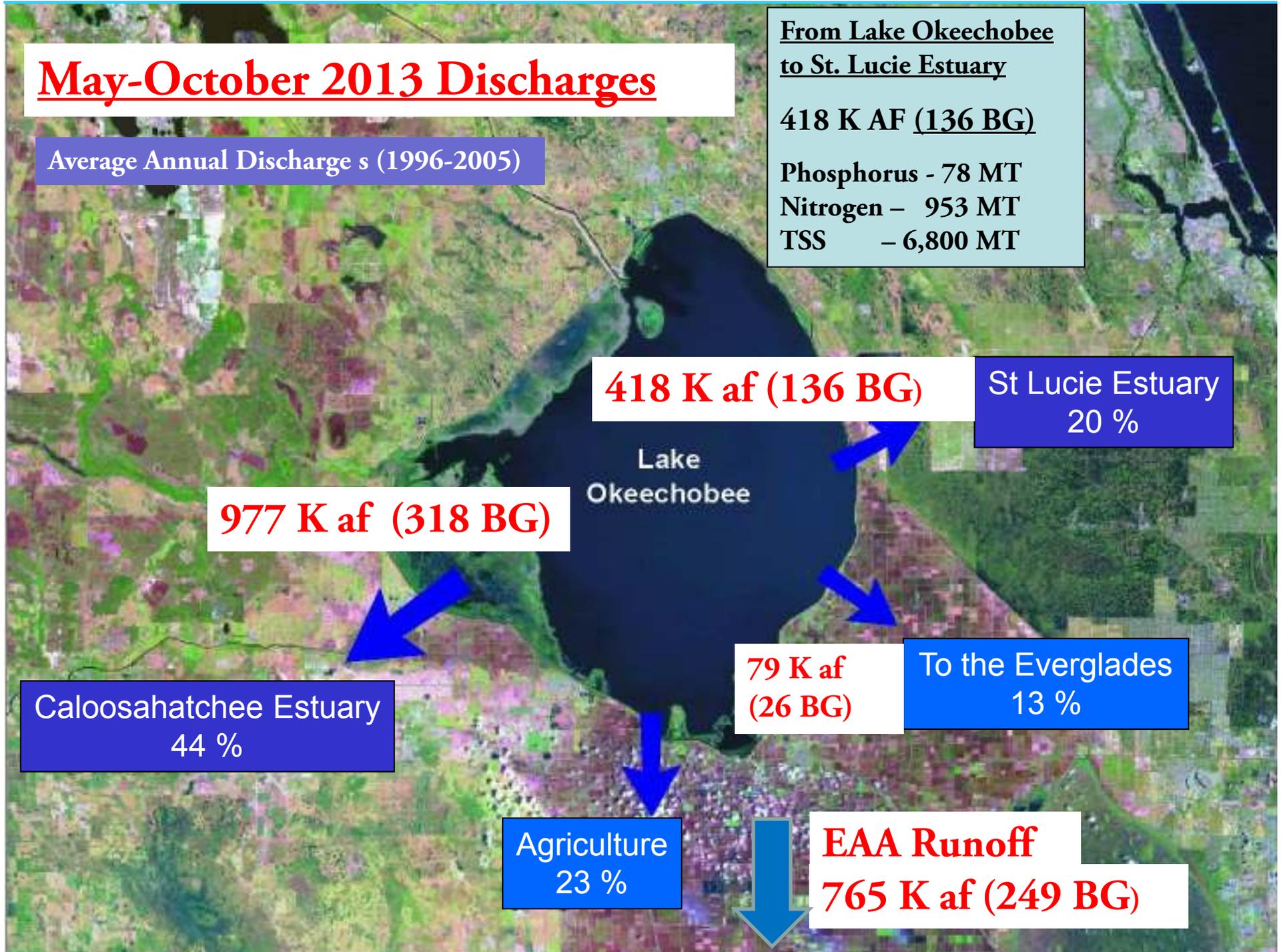
Caloosahatchee Estuary  
44 %

79 K af  
(26 BG)

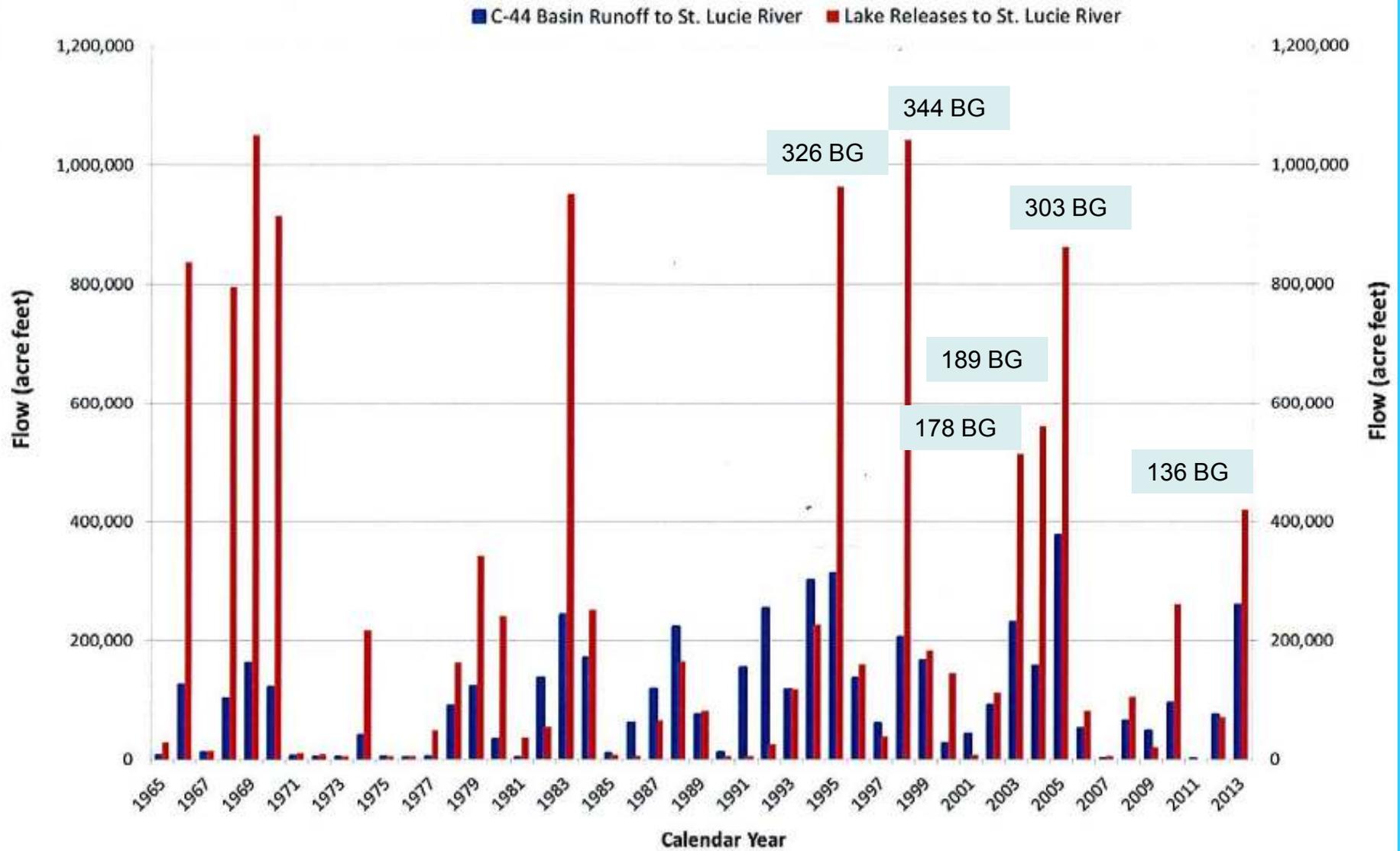
To the Everglades  
13 %

Agriculture  
23 %

EAA Runoff  
765 K af (249 BG)



## Estimated Flows to St. Lucie River at S-80 (1/1/1965 - 10/22/2013)



**Lake Okeechobee releases to the St. Lucie River >400,000 AF 4.3 years**  
**1965 – 2013 >200,000 AF 2.8 years**

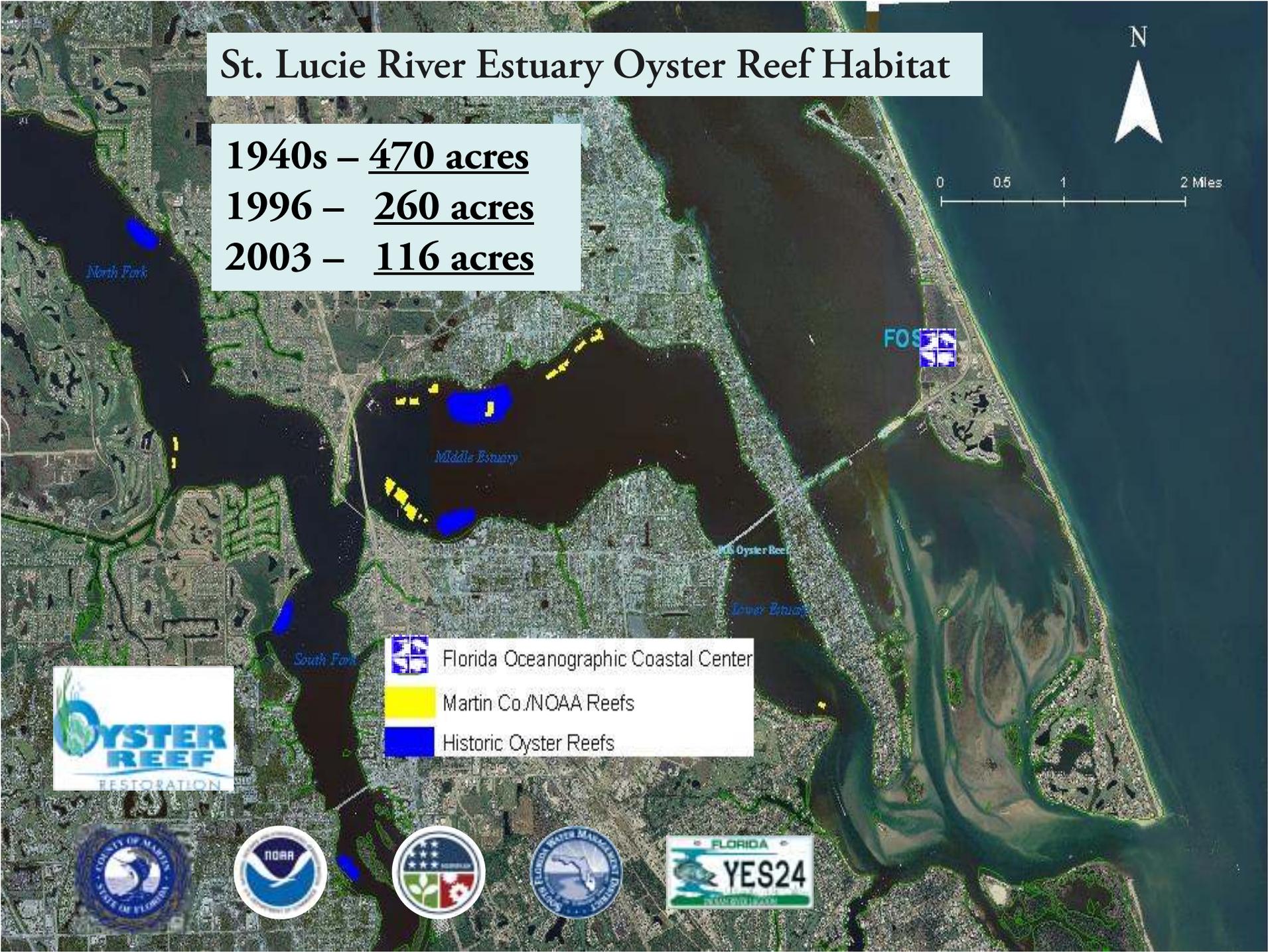


# St. Lucie River Estuary Oyster Reef Habitat

1940s – 470 acres

1996 – 260 acres

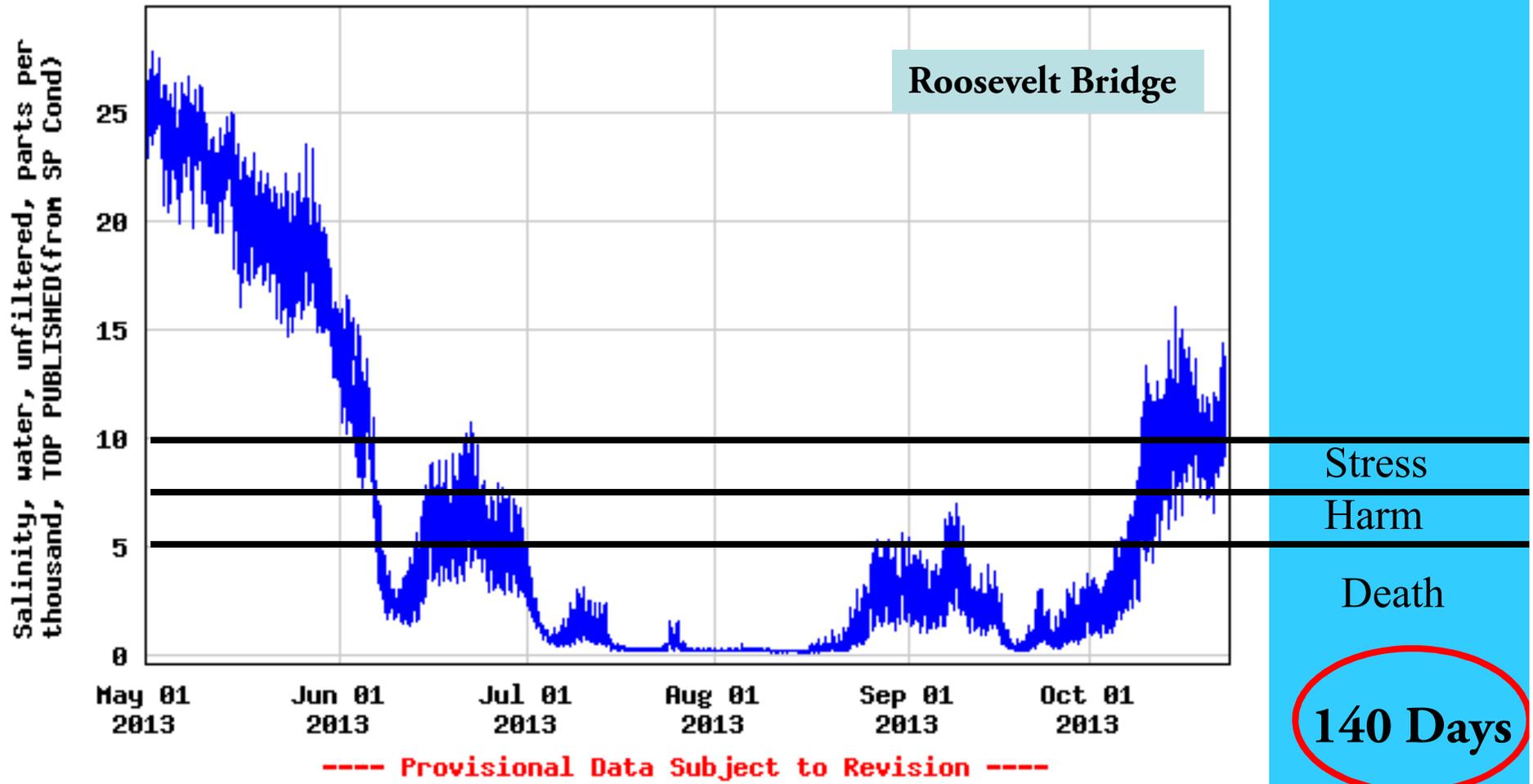
2003 – 116 acres



-  Florida Oceanographic Coastal Center
-  Martin Co./NOAA Reefs
-  Historic Oyster Reefs



USGS 02277100 ST LUCIE RIVER AT SPEEDY POINT, STUART FL



## Salinity Tolerance for Oysters

2013 Results: 100% loss of living Oysters



### Death

7 Days For Spat & Juveniles

14 – 28 Days For Adults

# Indian River Lagoon Seagrass Beds



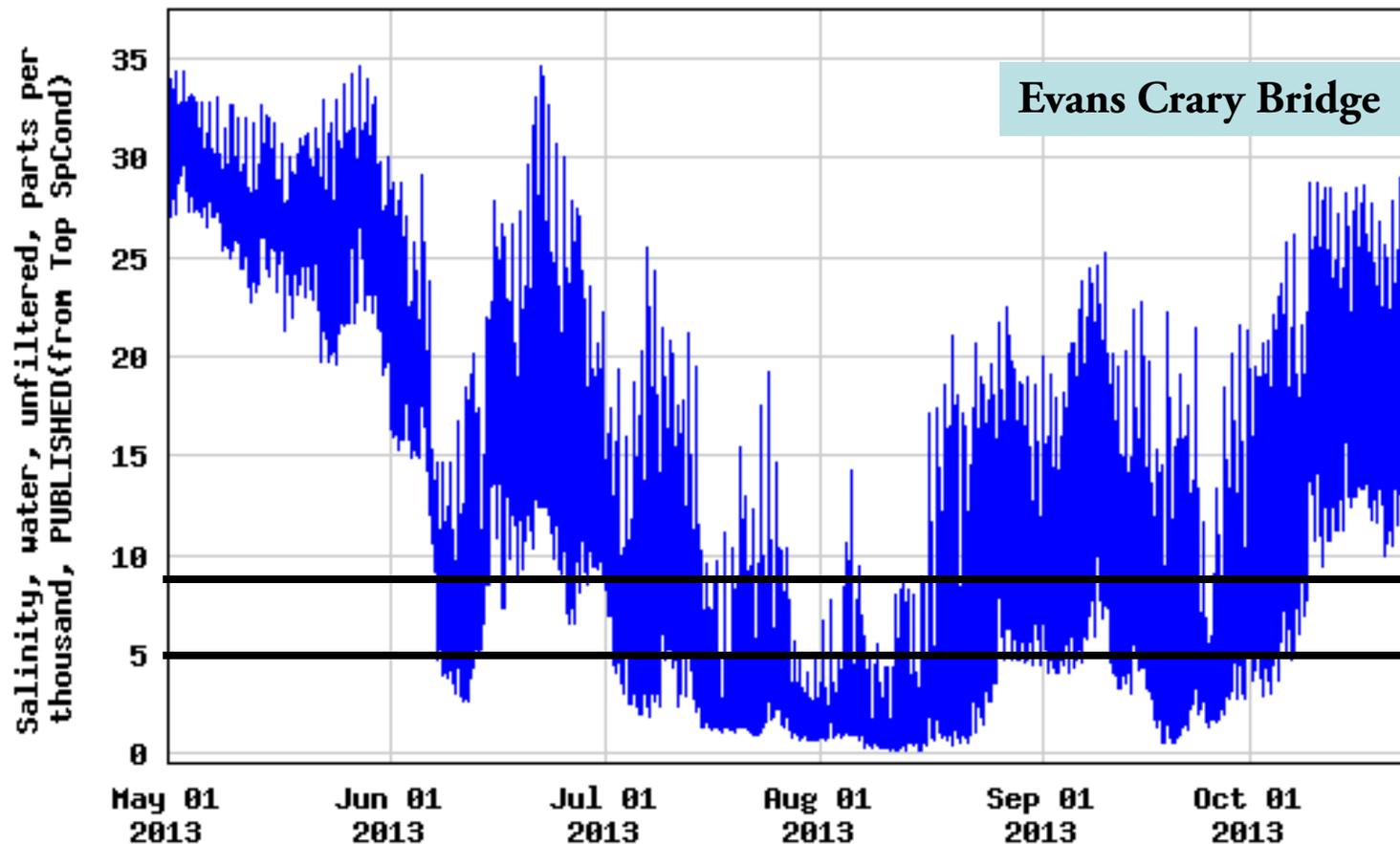
**Before Discharges**



**During Discharges**

**Effects of Freshwater Discharges on Seagrasses - St. Lucie River Estuary & Indian River Lagoon- State Aquatic Preserves - 700 acres of Seagrass Habitat – Johnson's Seagrass - a Threatened Species under the ESA**

USGS 02277110 ST LUCIE ESTUARY AT A1A (STEELE PT)STUART FL



----- Provisional Data Subject to Revision -----

Death

Death

95 Days

## Salinity Tolerance for Seagrass

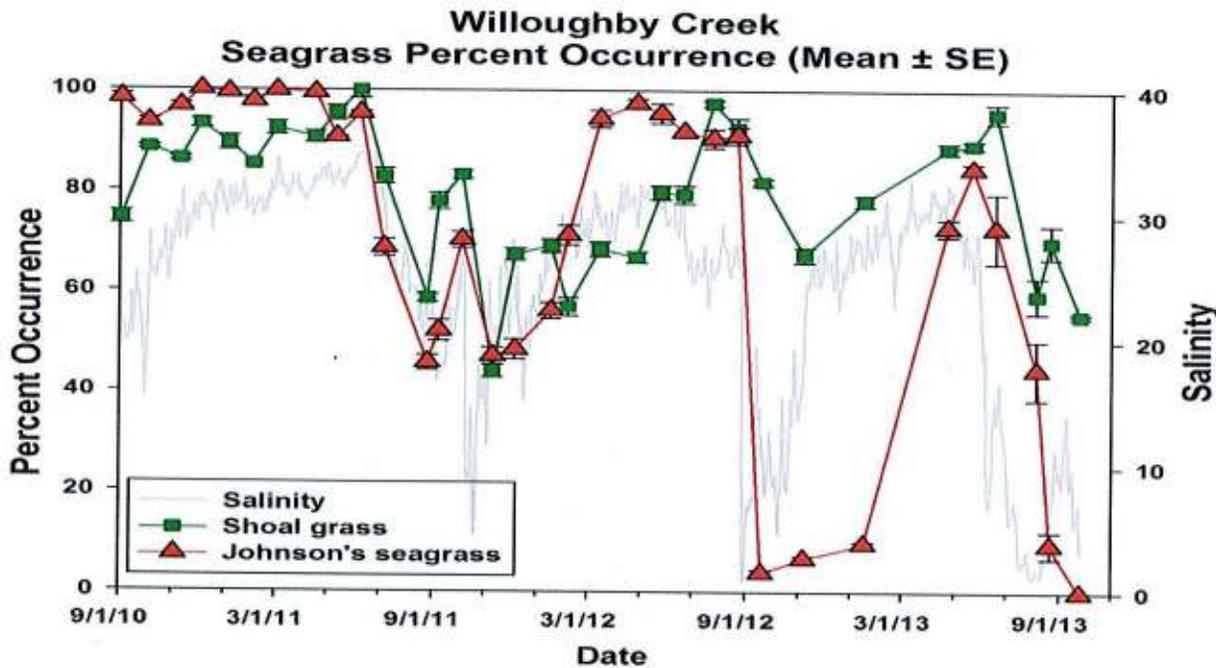
**2013 Results: 75% loss of Seagrass cover**



Death

14 days < 9 ppt

3 days < 5ppt



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

# St. Lucie Inlet Nearshore Reefs

Before Discharges



Sediment Plume 6-8 miles offshore



During Discharges

Silt & Sediment –  
Freshwater & Pollutants



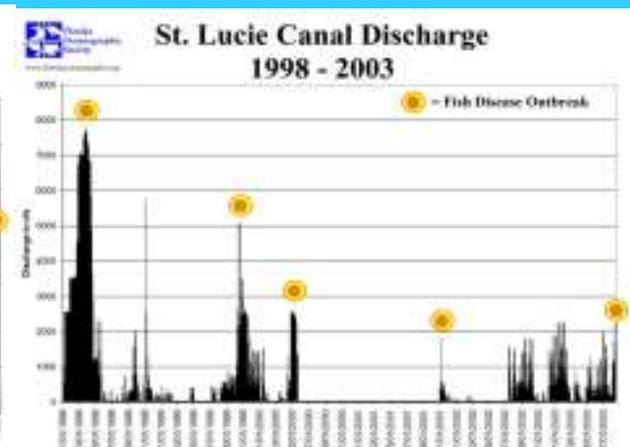
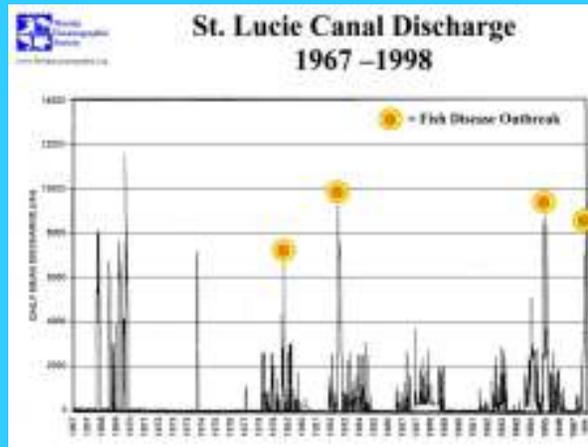
St. Lucie Inlet State Preserve Reef south and Sabellariid Reef north –  
both nominated for National Marine Sanctuary (1995)

# St. Lucie River Estuary Muck

4-8 ft. thick on bottom - 12 million cubic yards



## Fish Lesions and Abnormalities



33 Species of Fish - 6% of the population



## Toxic Algae - Microcystis



### Have you been "slimed"?

Contact with blue-green algae can make you sick.

When blue-green algae (cyanobacteria) form "blooms" in lakes, ponds or rivers, these organisms can release toxins which can make people and animals sick. These large mats of algae can form underwater, rising to the surface overnight, and they sometimes have a bad smell. These "blue-green" algae also can be brown or red in color and can sometimes look like thick paint spilled in the water.

**Swimming** in water with a toxic blue-green algae bloom can cause:

- skin rash
- runny nose
- irritated eyes

**Swallowing** such water can:

- cause vomiting or diarrhea
- affect your liver
- poison pets

**How To Protect Yourself From Blue-Green Algae Toxins:**

- Avoid contact with large mats of blue-green algae.
- NEVER allow children or pets to play in or drink scummy water.
- Do not waterski or jet ski over algae mats.
- Do not use scummy water for cleaning or irrigation.
- If you accidentally come into contact with a blue-green algae bloom, wash thoroughly, paying special attention to the swimsuit area and pets' fur.

If you think you have symptoms that may be related to contact with blue-green algae, contact your doctor or the Poison Information Hotline at (888)252-8635.

This poster was developed by the Florida Harmful Algal Bloom Task Force in cooperation with the Florida Fish and Wildlife Conservation Commission.

For more information about blue-green algae visit the Florida Marine Research Institute at [www.flmri.com](http://www.flmri.com)

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



## 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)***





## 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	\$702,000,000
(3) Non-Use Value of Lagoon	\$3,400,000
(4) Real Estate Value, annualized	\$834,000,000
(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
<b>Total Annual Value</b>	<b>\$3,725,800,000</b>

## Indian River Lagoon Economic Assessment and Analysis Update

Contract No. 24705

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



HAZEN AND SAWYER  
INCORPORATED



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

## 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**

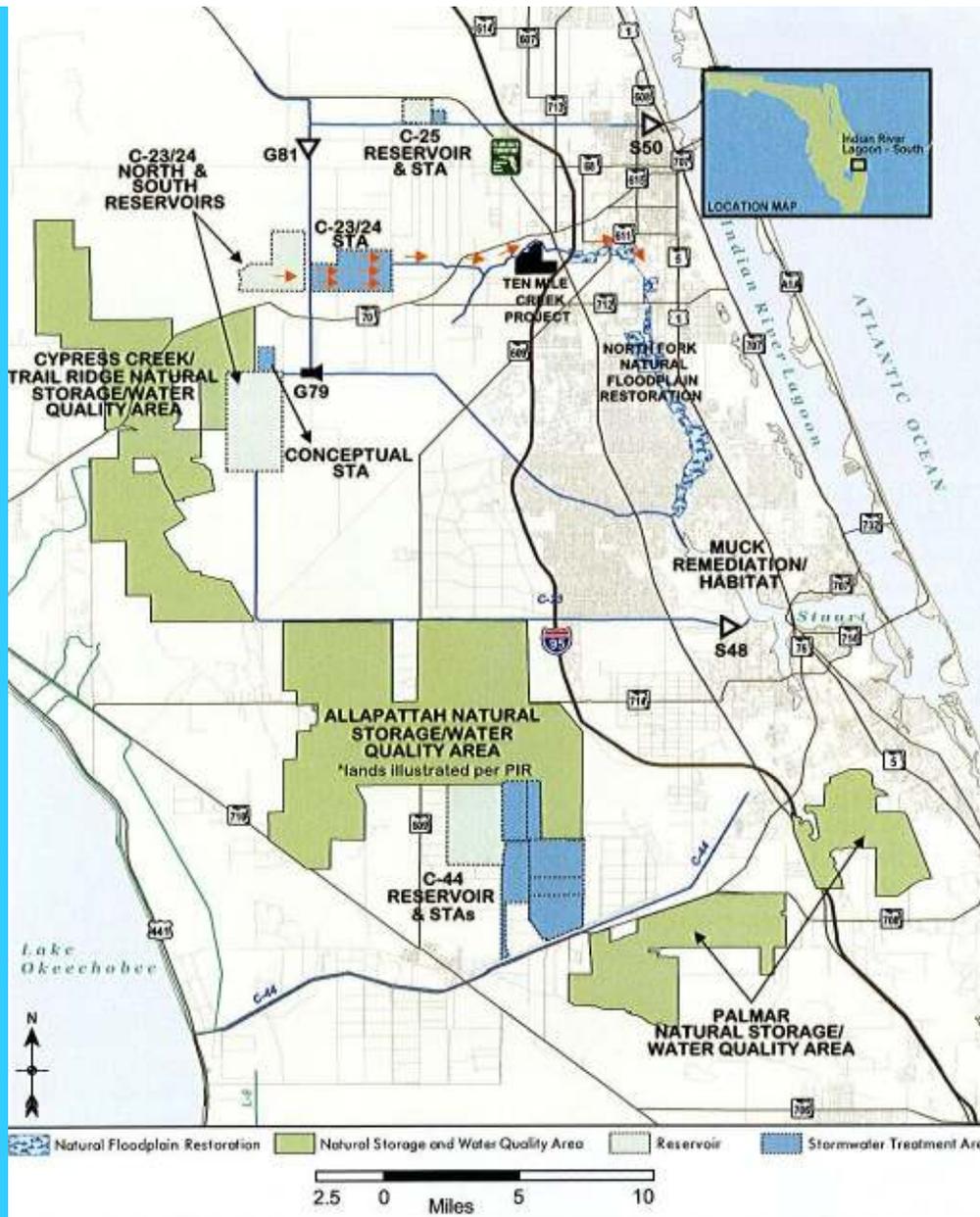
-  C-44 - Reservoir
-  C-44 - Stormwater Treatment Area
-  Palmar Complex - Natural Storage and Water Quality Area

### **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



**Part of Comprehensive Everglades Restoration Plan**

# Oyster Gardening Habitat Restoration Program – Started 2005



# 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***



In partnership with  
Martin County Oyster  
Reef Restoration Project







# 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>

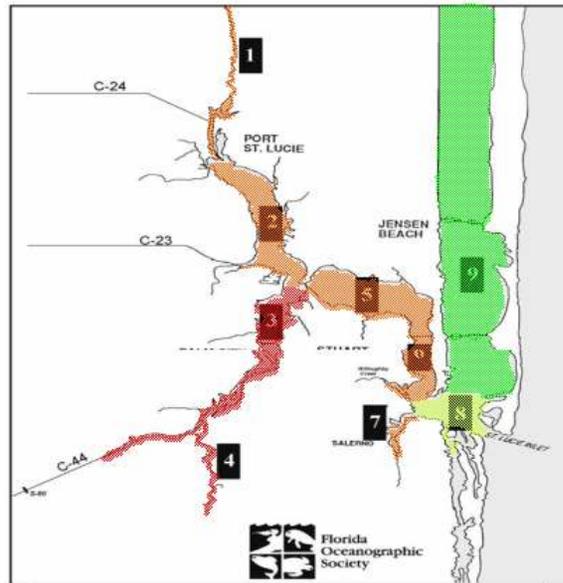
Posted: **06/17/10**

Overall Grade:	<b>67.9%</b>	<b>D+</b>	<b>POOR</b>
----------------	--------------	-----------	-------------

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	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 27.5	< 20
7	Manatee Pocket	> 27.5	20 to 27.5	< 20
8 & 9	Inlet and Indian River Lagoon (to Jensen Beach Causeway)	>30	25 to 30	< 25

Water Quality Monitoring performed weekly by volunteers. Results published in The Stuart News.

Weekly Water Quality Monitoring since 1998 – Citizen Science





## Education & Programs

*Hands-on learning for children and adults*

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

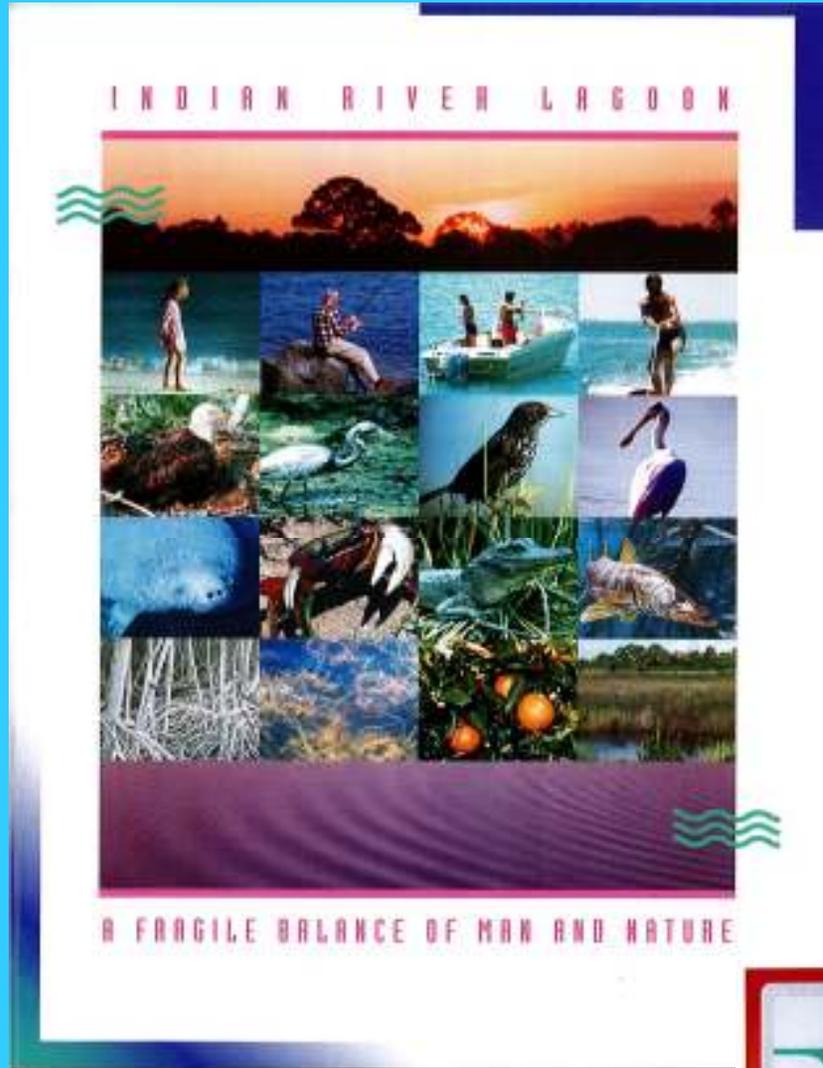


## Research & Conservation

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

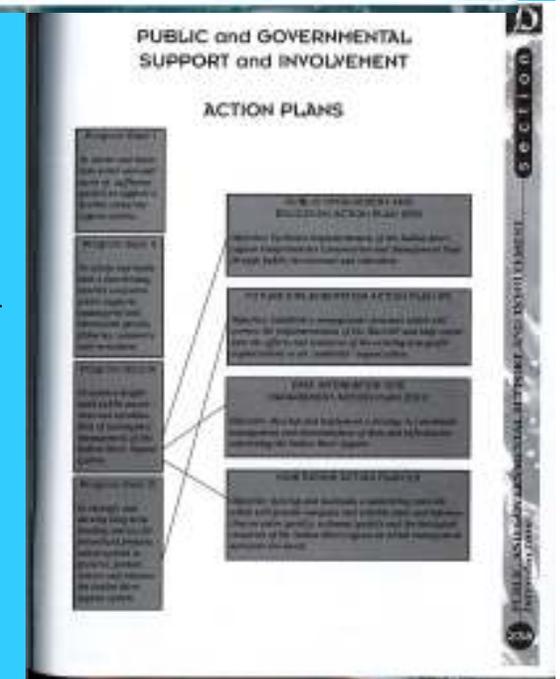
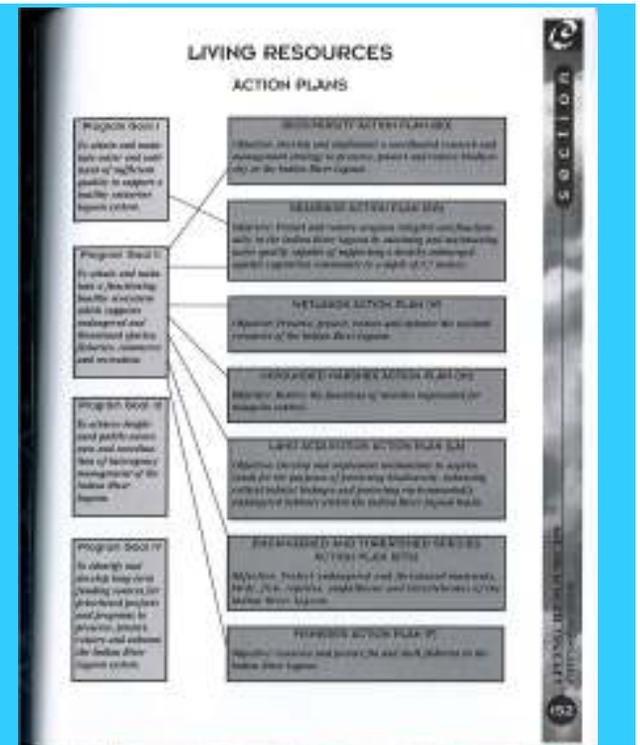
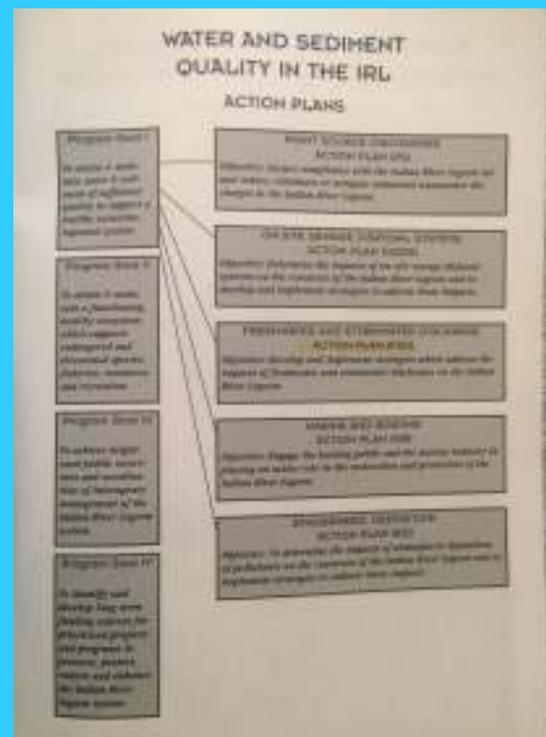
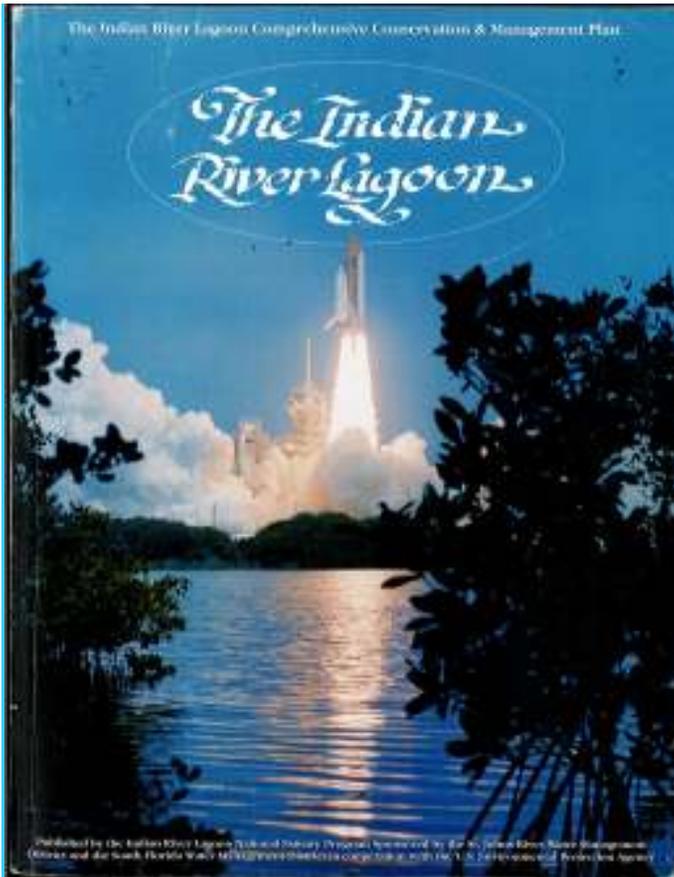


[www.Floridaocean.org](http://www.Floridaocean.org)



## Public Information - Understanding the IRL





# The Indian River Lagoon Comprehensive Conservation & Management Plan (CCMP) - November 1996 - 353 pp

4 - Program Goals 16 - Action Plans  
How are we doing ??



**INDIAN RIVER LAGOON COUNTIES COLLABORATIVE**  
 Friday, January 23, 2015 1:00 to 4:00 PM  
 Indian River County Commission Chambers  
 1801 27<sup>th</sup> Street, Building A (South) Vero Beach, FL

**THE LAGOON MAKES US ALL NEIGHBORS**

**AGENDA**

- 1:00 PM Call to Order, Pledge of Allegiance
- 1:05 PM Review / Adoption of Agenda and Minutes from Previous Meeting
- 1:10 PM Public Comment – Please complete a Speaker's Card; public comment is limited to 3 minutes to each person wishing to address the Collaborative on general issues. Public comment will also be allowed following noon when members of the public complete a speaker's card (if available).
- 1:20 PM Update on County Activities
- 1:35 PM Update on IRL NEP restructuring & financing sources
- 1:45 PM Select a Chairperson/Establish a 2015 Meeting Calendar
- 2:00 PM Engaging Cities
- 2:00 PM Development of State MSTU – Septic to Sewer
- 2:45 PM All Aboard Florida
- 3:15 PM Unfinished Business
- 4:00 PM Public Comment / Adjourn

**COUNTY REPRESENTATIVES:**

- Martin County Commissioner Ed Fielding
- Brevard County Commissioner Jim Barfield
- Indian River County Commissioner Peter D. O'Bryan
- St. Lucie County Commissioner Chris D'Addario
- Volusia County Council Member Deb Demps

Next Meeting – March 27, 2015 at 1 PM  
 Indian River County Commission Chambers, Vero Beach

**INDIAN RIVER LAGOON NATIONAL ESTUARY PROGRAM INTERLOCAL AGREEMENT**

1/13/15  
 MC

This Indian River Lagoon National Estuary Program Interlocal Agreement (the "Agreement") is made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 2015, by and between the following governmental entities: 1) Volusia County, a Florida political subdivision, 2) Brevard County, a Florida political subdivision, 3) Indian River County, a Florida political subdivision, 4) St. Lucie County, a Florida political subdivision, 5) Martin County, a Florida political subdivision, 6) Florida Department of Environmental Protection, 7) St. Johns River Water Management District, 8) South Florida Water Management District (collectively the "Parties" and each singularly a "Party").



...ing recitation of facts are provided in support of this Agreement:  
 The Indian River Lagoon National Estuary Program was designated in 1990 and in 1991 to assist the Indian River Lagoon region located along the eastern coastal area of Florida in developing a comprehensive plan to restore the Indian River Lagoon. The Indian River Lagoon National Estuary Program is part of a network of twenty-eight (28) estuary programs established under the Federal Clean Water Act and administered nationally by the United States Environmental Protection Agency.

**SOUTH FLORIDA WATER MANAGEMENT DISTRICT**  
**NEWS RELEASE**  
 January 16, 2015

**MEDIA CONTACT:**  
 Randy Smith  
 South Florida Water Management District  
 Office: (561) 682-3800 or Cellular: (561) 388-5306

[www.sfwmd.gov](http://www.sfwmd.gov)  
 Twitter: @sfwmd  
 Facebook: sfwmd

**SFWMD to Join and Support Indian River Lagoon Council**  
 The council will direct an expanded National Estuary Program to protect IRL waters.

West Palm Beach, FL – The South Florida Water Management District (SFWMD) Governing Board this week approved entering into an interlocal agreement that expands protection efforts and opportunities under the Indian River Lagoon National Estuary Program (IRL NEP) and creates the Indian River Lagoon Council to lead the work.

In the coming weeks, the agreement is set to go before each of the partners anticipated to comprise the new IRL Council: Volusia, Brevard, Indian River and St. Lucie counties; Florida Department of Environmental Protection (DEP); and the St. Johns River Water Management District. Martin County, also a partner, approved the agreement at its January 13 Board of County Commissioners meeting.

"This reintegrated effort promises to expand protection for a unique and incredibly important waterway," said SFWMD Governing Board Vice Chair Kevin Powers, a long-time resident of Martin County. "It is confident that the dedicated partners on the new IRL Council will help direct the increased resources in the most beneficial manner for the lagoon."

The action follows a 2014 funding commitment of \$500,000 by the South Florida and the St. Johns River water management districts, plus \$250,000 from DEP, to expand the IRL NEP program and its projects. Pending their approval, the five counties along the lagoon will each invest \$50,000 toward the program.

The IRL NEP was established in 1990 through the U.S. Environmental Protection Agency's (EPA) designation of the IRL as an "estuary of national significance." The program provides a non-regulatory, stakeholder-driven, collaborative approach to coastal watershed restoration and protection. Prior to this expansion, the St. Johns River Water Management District provided funding and administrative oversight for the program. EPA reviewed the interlocal agreement and has expressed support for its adoption.

Stuart News 1.7.15  
**Let's make this happen!**

**County commissions should OK Indian River Lagoon Council**

An opportunity is at hand for Treasure Coast counties to gain more control over money that will benefit the Indian River Lagoon.  
 And time is of the essence.  
 During the next few weeks, the county commissions in Indian River, Martin, St. Lucie, Brevard and Volusia counties will vote on a plan to restructure the Indian River Lagoon National Estuary Program.



The program's advisory panel approved a draft agreement in December to take the program out from under the purview of the St. Johns River Water Management District and create something new: the Indian River Lagoon Council.  
 If adopted by the respective county commissions, the council would oversee spending about \$70 million a year for lagoon restoration projects.

Each of the county commissions should endorse the draft agreement.  
 In addition to approving the reorganization, individual county commissions also will decide whether to spend \$50,000 a year to seat a representative on the council. This is a wise expenditure of taxpayer money.

One of the biggest frustrations for local governments and residents with respect to the lagoon is the sagging reality that too many decisions about the waterway are made by individuals elsewhere in Tallahassee or Washington, D.C.

However, the proposed reorganization would be a dedication-making to an eight-member council: one commissioner from each of the five counties, as well as one representative each from the St. Johns River and South Florida water management districts, and the Florida Department of Environmental Protection.

That translates into more local control over an issue dear to Treasure Coast residents: the restoration, preservation and protection of the lagoon.

Too often, local governments attempt to tackle problems on their own. By banding together on this important issue, the five counties represented on the council would have the opportunity to increase their clout.

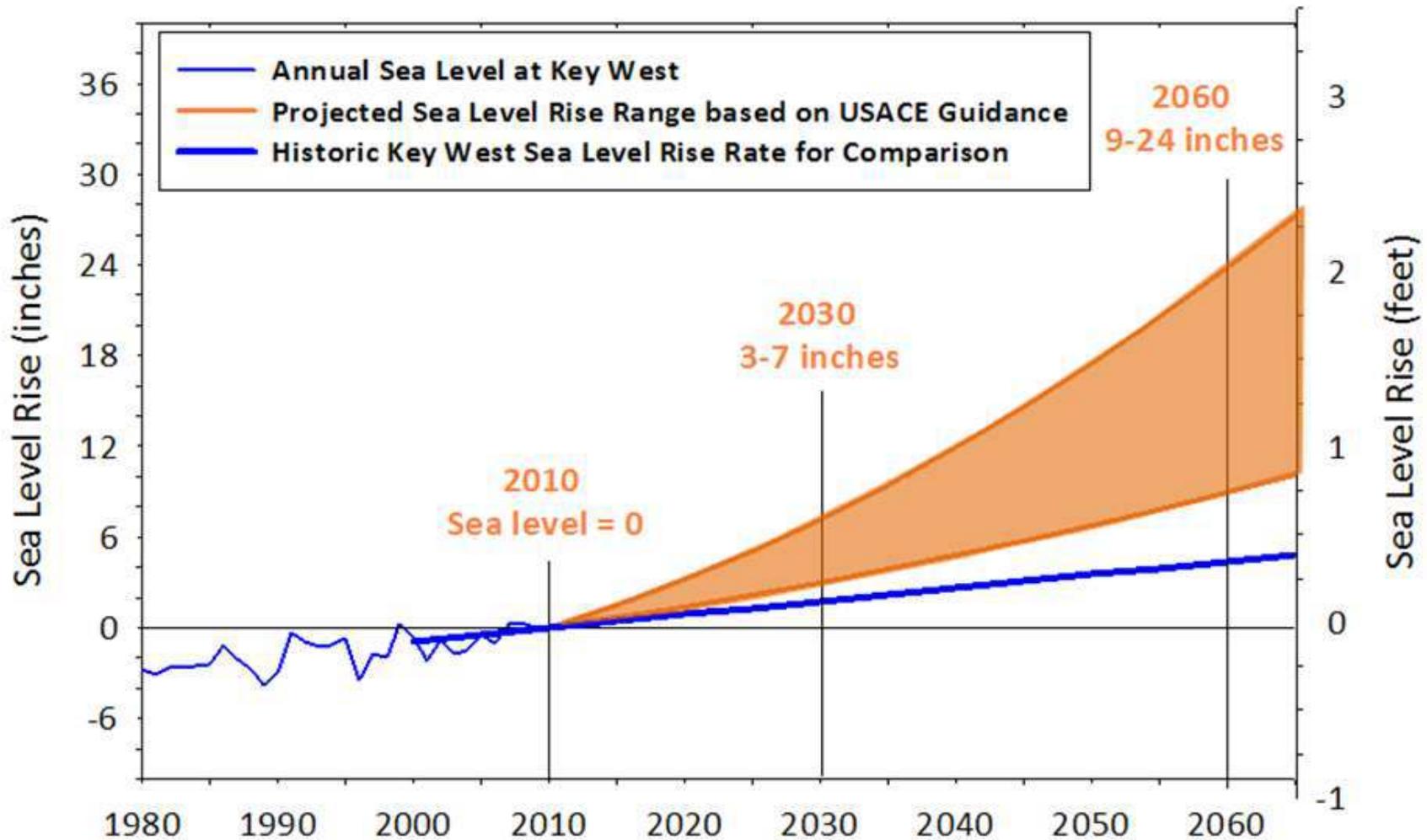
There's a reason approval of the draft agreement needs to be completed in short order.

"We want to be able to approach the upcoming legislative session in March with some projects to fund and we need an official entity to do it," said St. Lucie County Commissioner and advisory panel member Chris D'Addario.

Let's make this happen!

- Indian River Lagoon Counties Collaborative
- IRL-National Estuary Program – New Proposed Interlocal Agreement





## Climate Change – Sea Level Rise BIG Challenge for the Indian River Lagoon and south Florida

# The Indian River Lagoon

A sunset over the Indian River Lagoon. The sun is low on the horizon, creating a bright orange glow and a long, shimmering reflection on the water. In the distance, a bridge spans across the water. In the foreground on the right, a dark wooden post with a pointed top is visible. The sky transitions from a deep blue at the top to a lighter orange near the horizon.

## Lessons

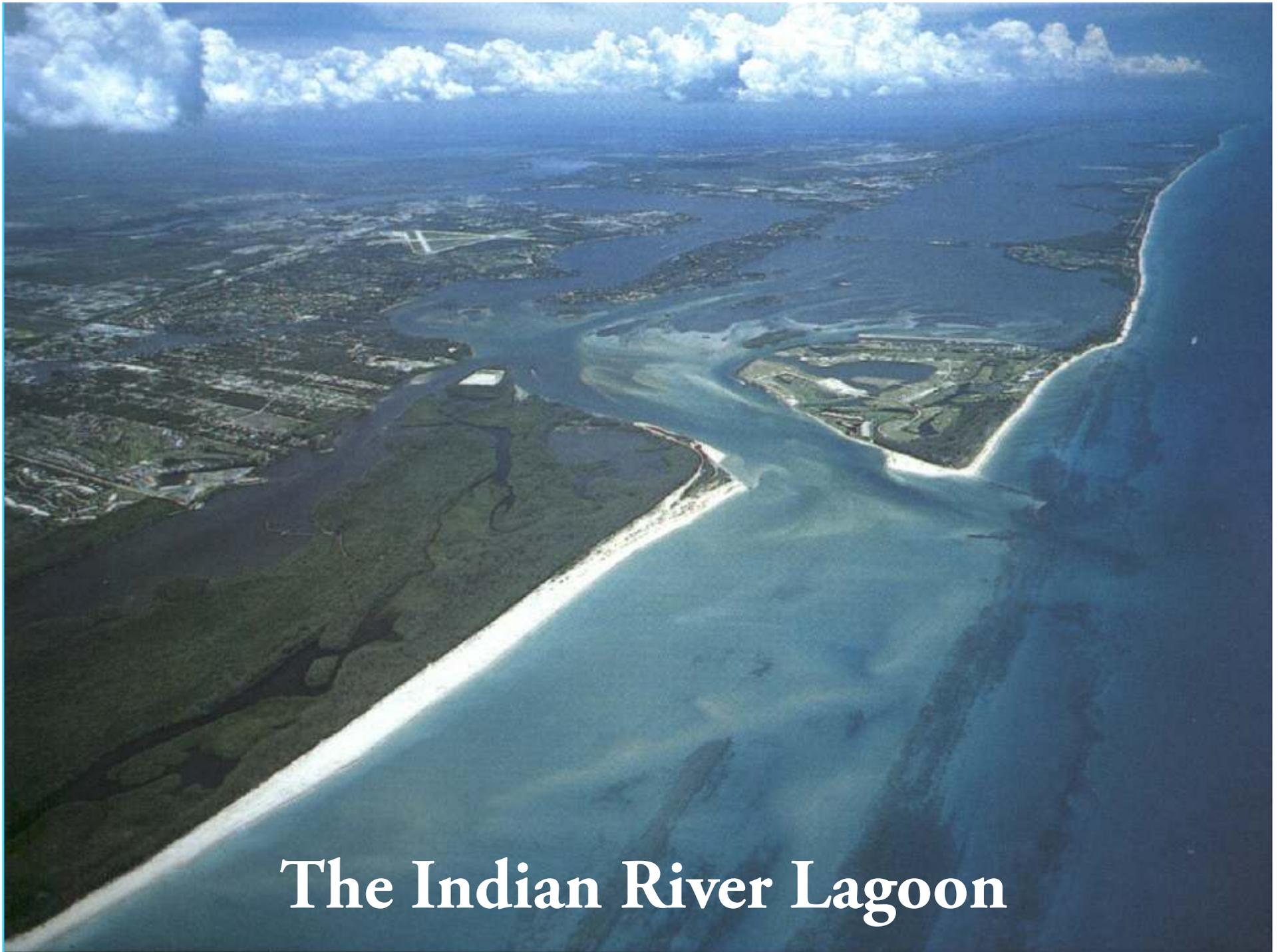
Learn together - Collaborate  
Technology should make lessons easier  
Listen to the Lagoon & Learn

## Challenges

Increasing in number and complexity  
Meet them head on  
You're not alone – solidarity to the cause

## Opportunities

Big and Little – all are important  
Do what you can with what you have  
Today is the Day – Take Action Now



**The Indian River Lagoon**

A photograph of a sunset over a large body of water. The sun is a bright orange orb on the horizon, casting a long, shimmering reflection on the water's surface. To the right, a small island with dark, silhouetted trees is visible. The sky transitions from a deep blue at the top to a lighter orange near the horizon. The water in the foreground is dark with some small, dark objects floating on it.

“Unless someone like you cares a whole awful lot, nothing is going to get better. It’s not.” (The Lorax)