An Overview of the Indian River Lagoon

And the work being done to help keep it healthy

Troy Rice, Director
Indian River Lagoon National Estuary Program
Indian River Lagoon Project Office – Palm Bay Service Center

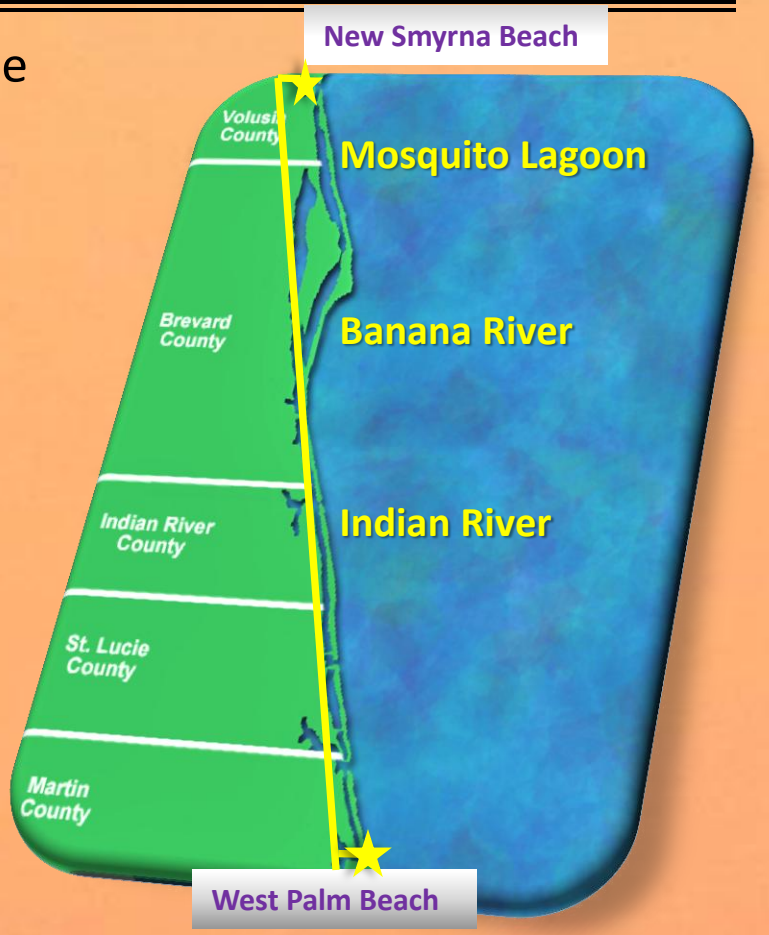
The Indian River Lagoon:

Stretches 156 miles, from Ponce de Leon Inlet at New Smyrna Beach in the north, to Jupiter Inlet near West Palm Beach in the south.

Is one of the most biologically diverse estuaries in the United States, supporting over 4,000 species of plants and animals.

Includes 3 water bodies.

Brings an annual economic benefit in excess of $3.7 billion to the 5 counties it borders.



Recreation Expenditures: $1.3 billion/yr

Real Estate Value: $934 million/yr.

Jobs: 15,000 full and part-time jobs/yr

It's Your Lagoon

History of the Indian River Lagoon Program:

The Indian River Lagoon (IRL) is one of 28 "Estuaries of National Significance" and joined the National Estuary Program (NEP) in 1991.

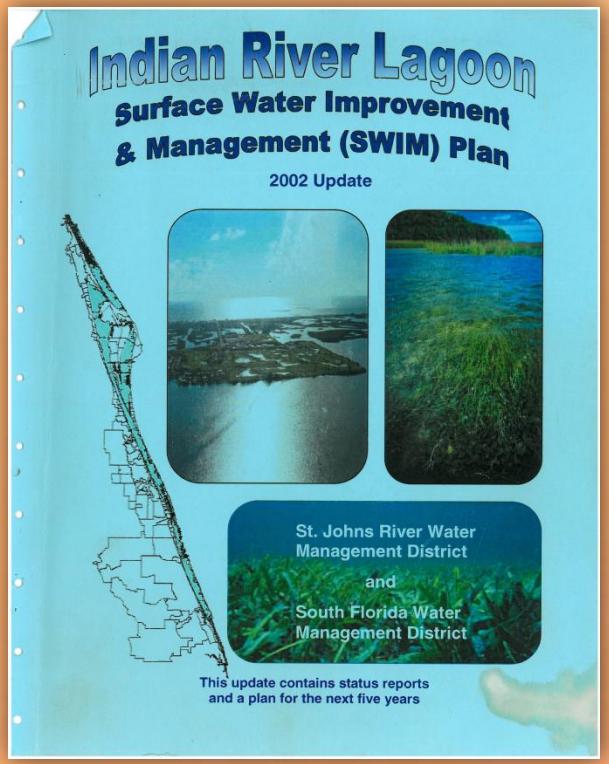
The U.S. Environmental Protection Agency oversees and funds the 28 NEPs.

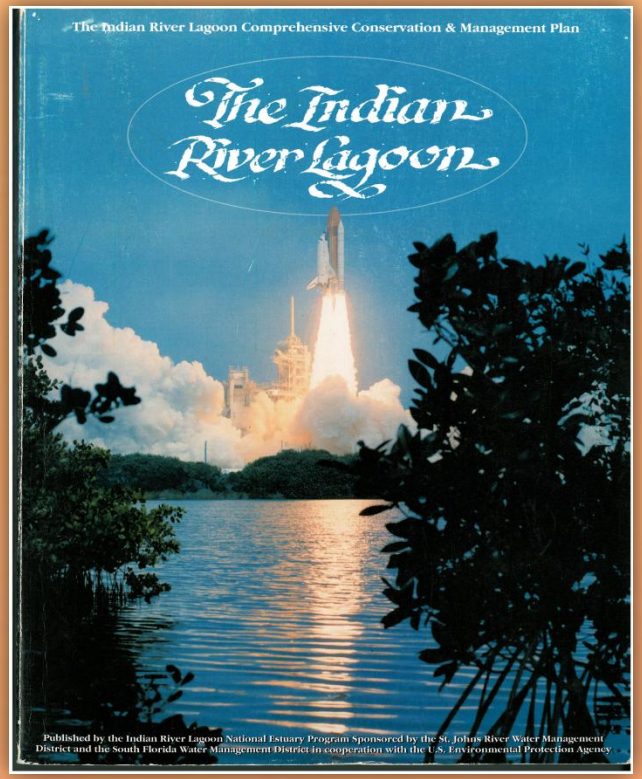
The NEP is non-regulatory and assists in protecting significant estuaries threatened by pollution, development, or overexploitation.

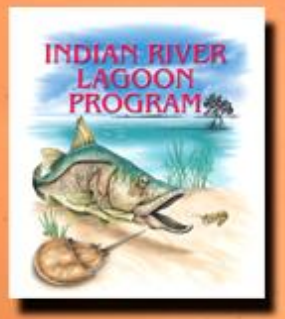
The IRLNEP works to coordinate efforts among federal, state, local governments, Non-governmental organizations, and the public to protect and restore the Indian River Lagoon.

It's Your Lagoon

YES We Have A Plan !
Lagoon Management Plans







Volusia County FLORIDA

Seal of Brevard County Florida

Indian River County Florida

St. Lucie County Florida

County of Martin State of Florida

US Army Corps of Engineers

U.S. Fish & Wildlife Service

NASA

Department of Environmental Protection Florida

Florida Fish and Wildlife Conservation Commission

Fresh from Florida

Atlantic Florida Inland Navigation District Intracoastal

NRCS

The Nature Conservancy
Protecting nature. Preserving life.

It's Your Lagoon

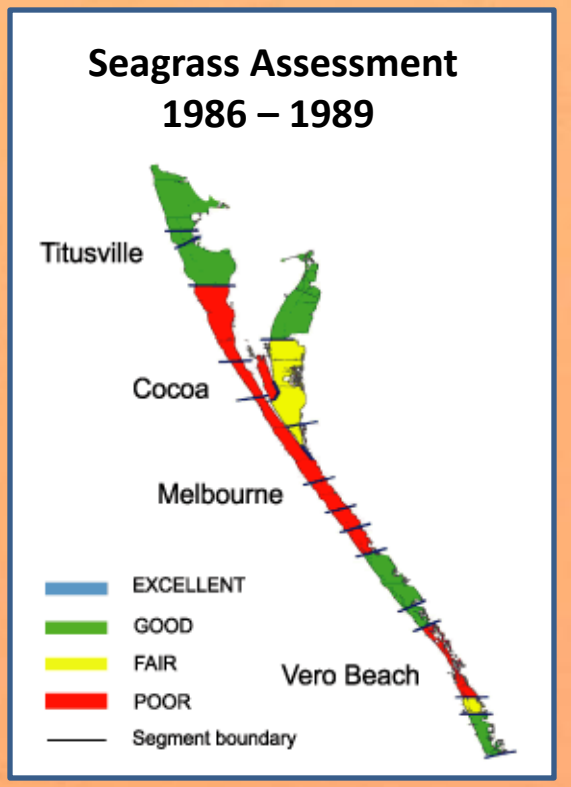
INDIAN RIVER LAGOON PROGRAM

Seagrasses Define Lagoon Ecology:

The lagoon is described as a seagrass-based ecosystem because seagrass provides the most food and habitat for the lagoon's aquatic animals.

Seagrass health is used as the primary indicator of the overall health of the lagoon because seagrass growth requires both high water quality and clarity.

Most of the lagoon is less than 6 feet deep – an ideal environment for sea grasses; but by the 1980s, less than half the lagoon had adequate levels of seagrass coverage.



It's Your Lagoon

Decline of Seagrasses in the Lagoon:

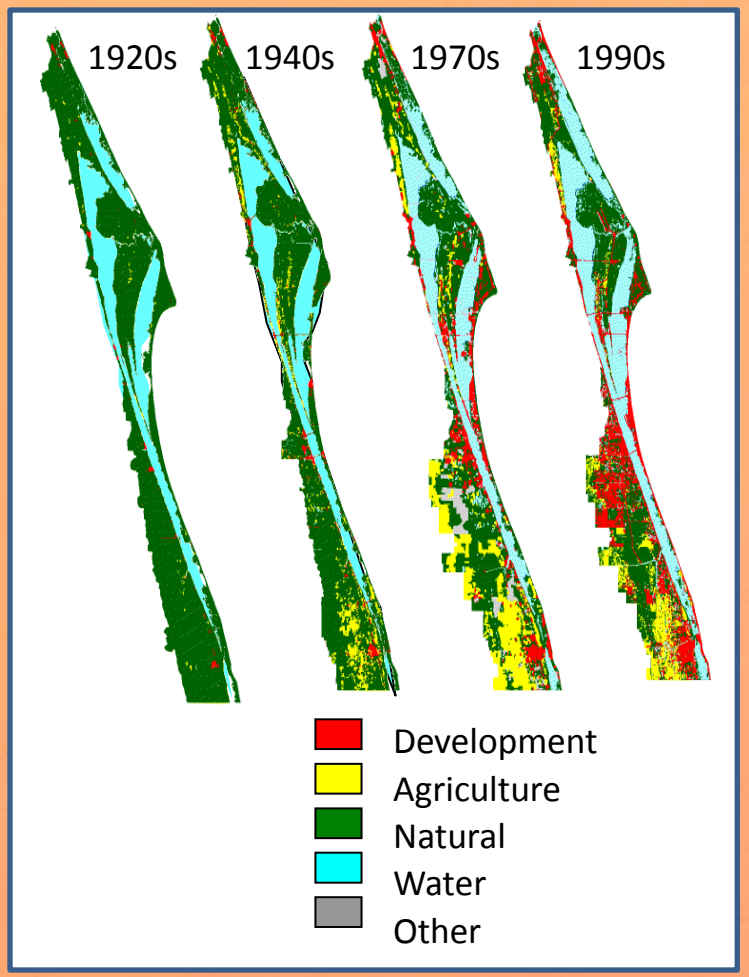
What explains this historic decline? Land use changes.

From the 1920s onward, wetlands were drained to support agriculture and development.

In lagoon counties, canal systems converted wetlands by diverting water to the lagoon.

During the 1980s, 45 waste water treatment plants discharged over 39 mgd to lagoon.

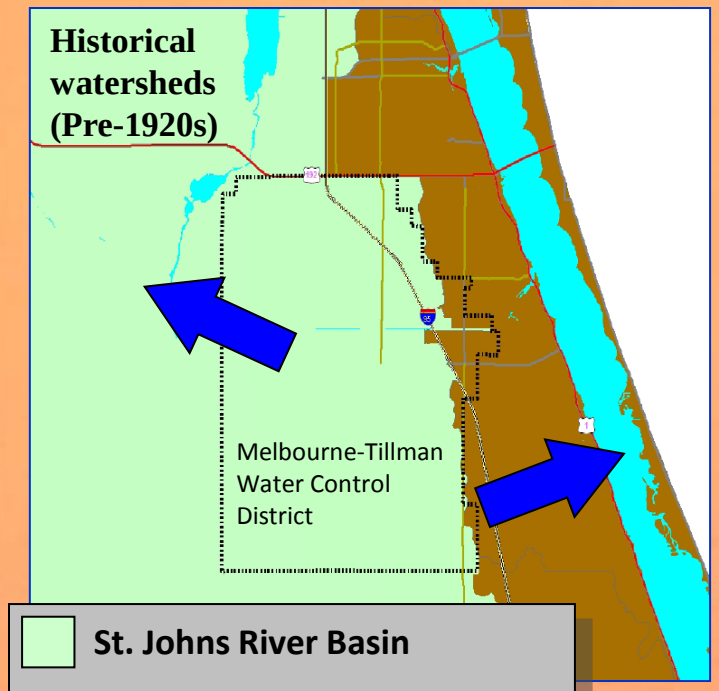
As impervious surfaces increased, progressively more stormwater ran off into the lagoon.

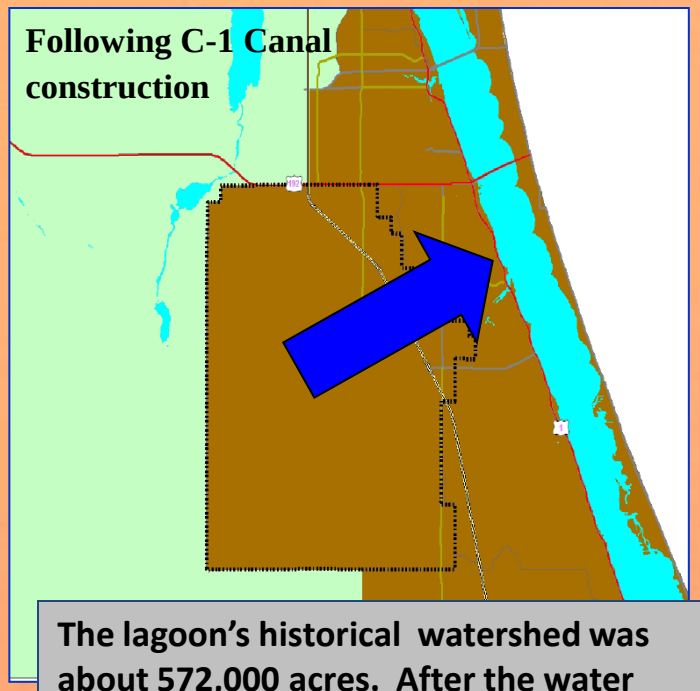


It's Your Lagoon

Canals Altered Natural Watersheds:

East Central Florida's canal system drained wetlands and altered natural watersheds. Locally, this increased the amounts of fresh water, sediments, and pollutants discharged to the lagoon in stormwater runoff.





The lagoon's historical watershed was about 572,000 acres. After the water control district's canal systems were completed, watershed size increased to 1.4 million acres – a 146% increase!

It's Your Lagoon

Stormwater Effects on the Lagoon:

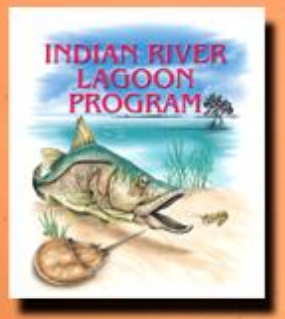
Today, stormwater is the largest source of pollution in the lagoon.

Stormwater harms sea grass and shellfish beds by:

Clouding water with eroded soils and other suspended solids,

Introducing excessive nutrients from fertilizers, pet wastes and other sources that cause algae blooms.

Polluting the lagoon with sediments, chemicals, oils and fuels.



It's Your Lagoon

Impacts of Poor Water Quality:

- Seagrass beds decline
- Shellfish harvests decline
- Fish kills increase
- Harmful algae blooms increase
- Many commercial and recreational fish species become less plentiful

It's Your Lagoon

How We Address These Issues:

The IRLNEP supports :

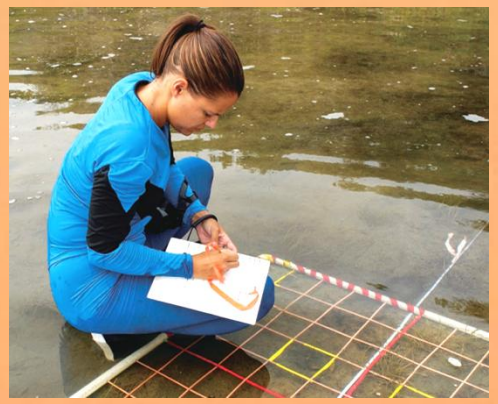
District monitoring in water quality, seagrass coverage, and overall health of the lagoon.

Cost-Sharing infrastructure retrofits & BMPs such as stormwater treatment structures and facilities.

Partnering on habitat rehabilitation projects involving thousands of community volunteers each year.

Supporting the implementation of the Basin Management Action Plan (BMAP) and Total Maximum Daily Loads (TMDLs) of freshwater and pollutants allowed into the lagoon under federal and state FDEP permits.

Promoting public outreach and education to raise awareness of issues affecting the health of the lagoon.



TMDL Required Reductions - FDEP

	Nutrients	
	Total Nitrogen	Total Phosphorus
N-IRL	22%	44%
Banana River Lagoon	40%	62%
Central IRL	51%	47%

Lagoon TMDL adopted by FDEP 2009

15 Year Basin Management Action Plan (BMAP) Implementation Period

Divided into three 5 Year Assessment Periods

It's Your Lagoon

What does this add up to?

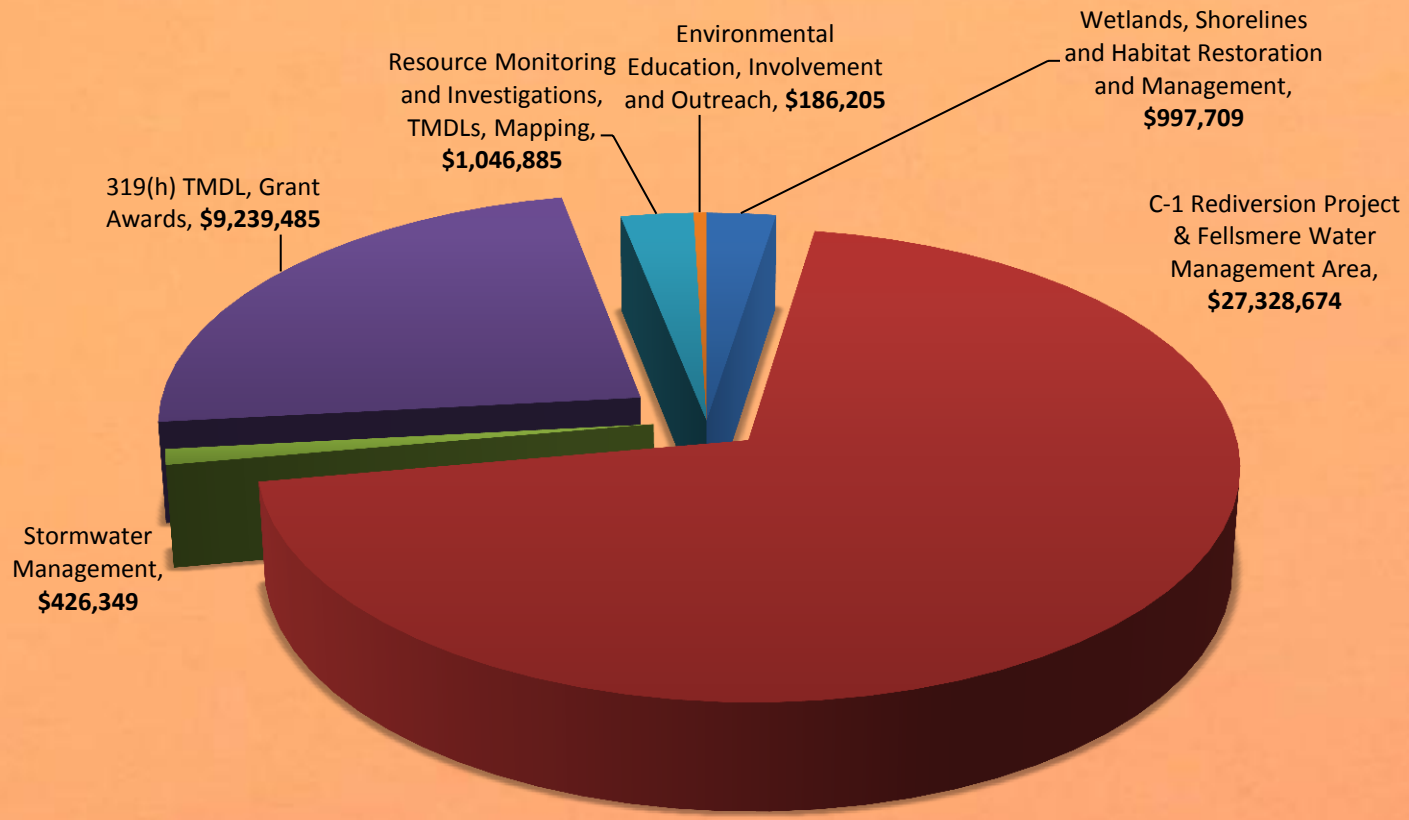
The IRLNEP, in cooperation with our network of partners, has implemented over $80 million in projects to improve water quality in the lagoon including:

- 70 construction projects
- 25 planning projects
- 20 environmental education projects

Since 1999, the IRL NEP has also funded a grants writer to aide local governments in securing grants for lagoon restoration efforts. This program has brought an additional $200 million in capital improvements and preservation dollars.

It's Your Lagoon

Indian River Lagoon Spending in 2011-2012



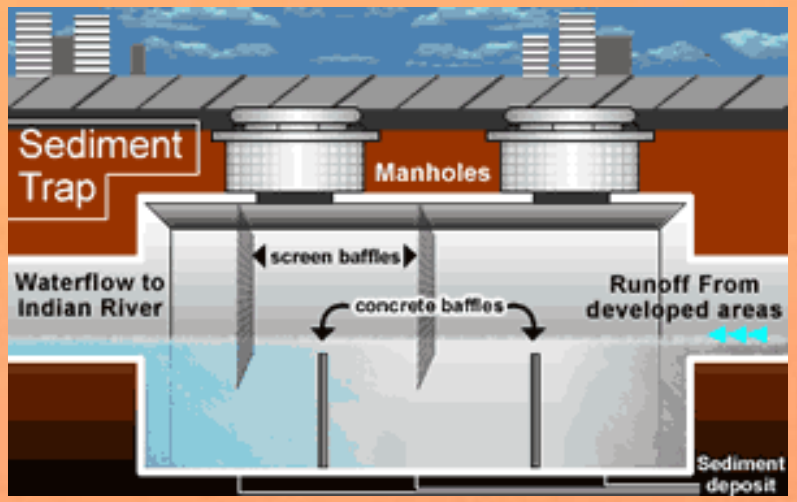
It's Your Lagoon

Infrastructure Improvements:

Baffleboxes:

Baffleboxes are structures containing a series of sediment settling chambers separated by partitions that slow the flow of water through the box so that trash, sediments, and any suspended particles can settle out to the bottom of the box.

While stormwater treated in a baffleboxes is significantly cleaner than untreated stormwater, baffleboxes were not designed for removing most nutrients that run off in stormwater. For this, stormwater retention and detention methods are used.



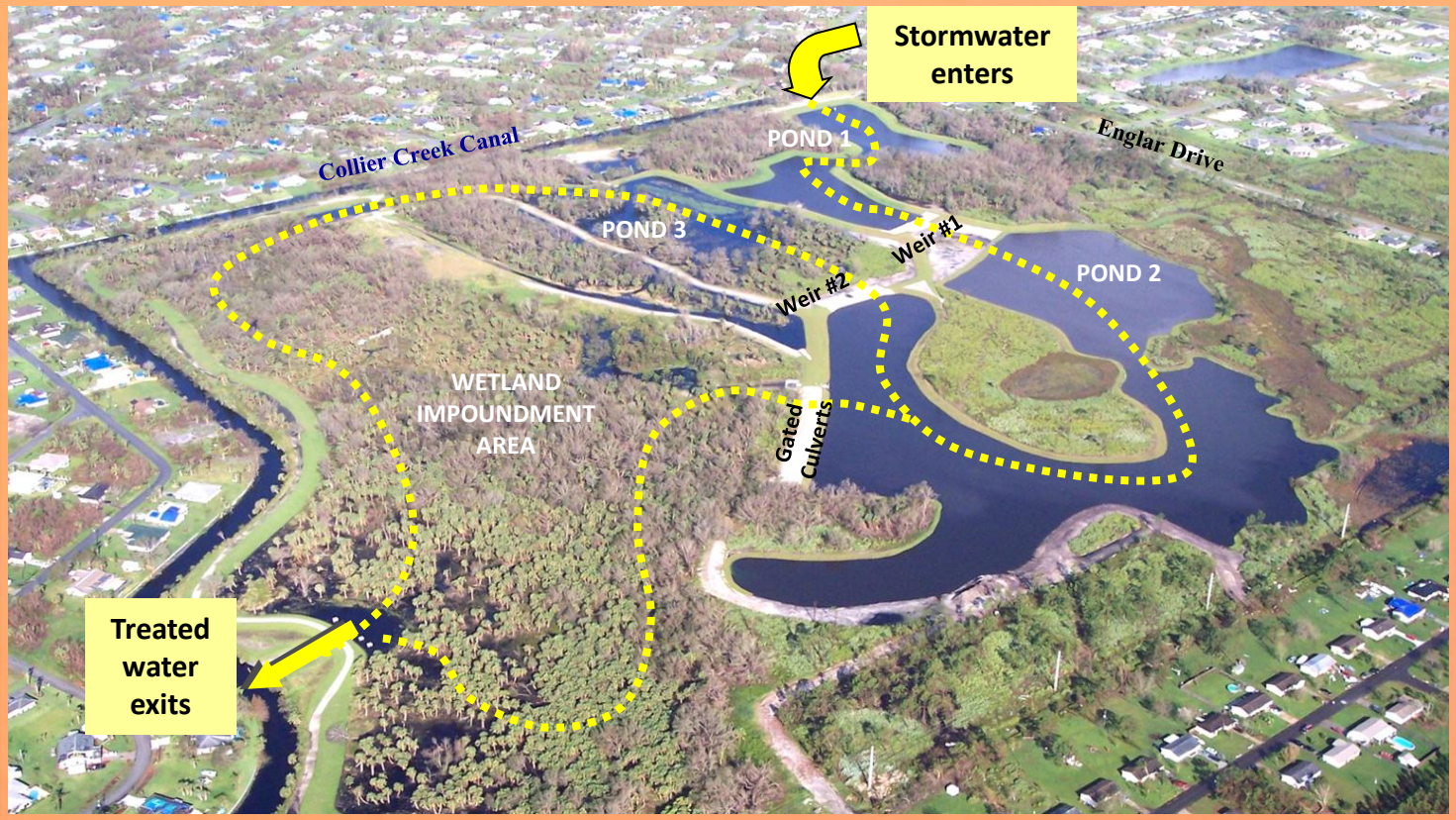
INDIAN RIVER LAGOON PROGRAM

It's Your Lagoon

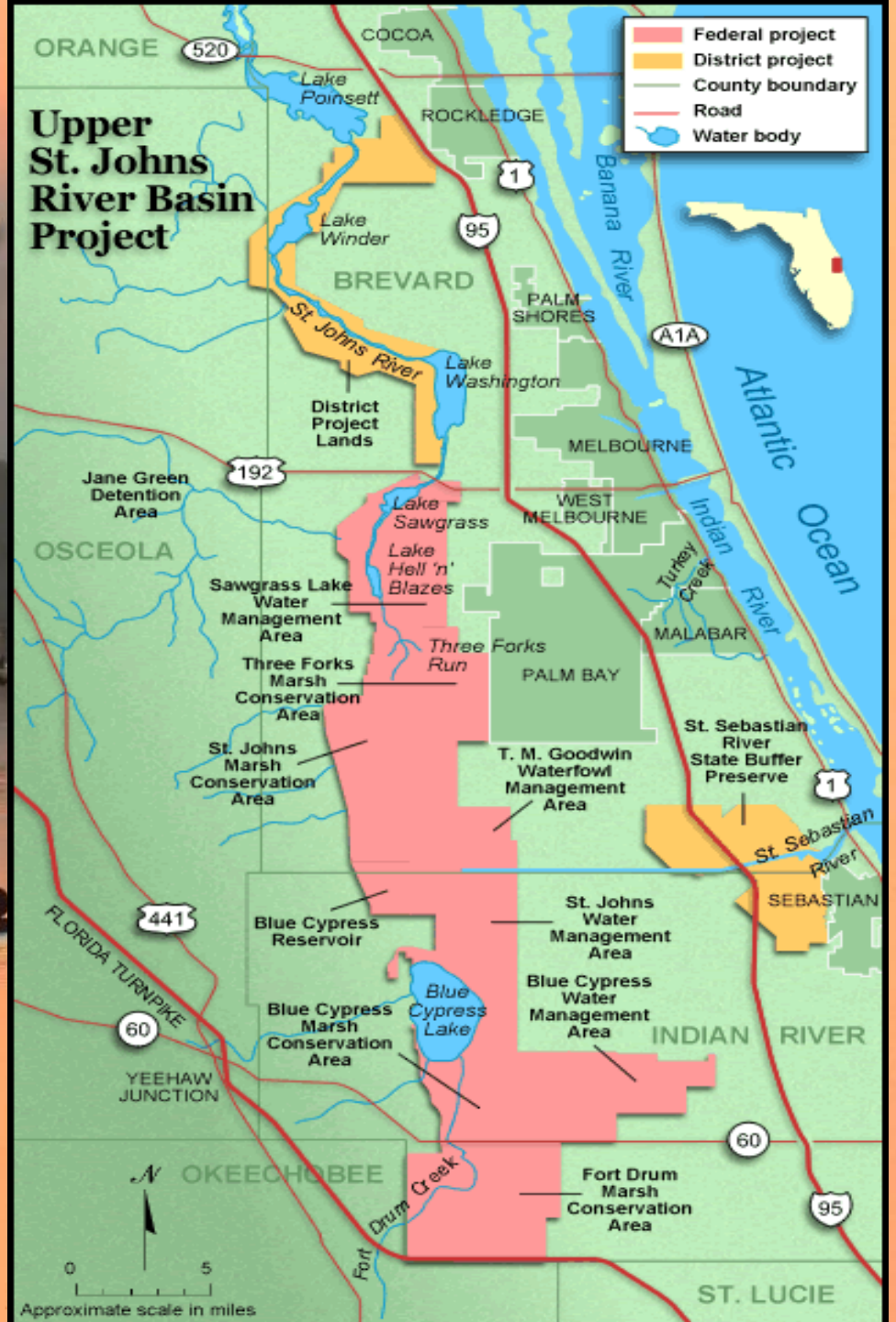
Infrastructure Improvements:

Stormwater Parks:

Stormwater parks like this 166 acre park in Sebastian use a treatment train approach to treating stormwater. Untreated stormwater enters and gradually moves between ponds, detaining water for about 3 weeks as sediments settle out, and plants take up nutrients. Water that exits is significantly cleaner.



It's Your Lagoon



SJRWMD Upper Basin Project:

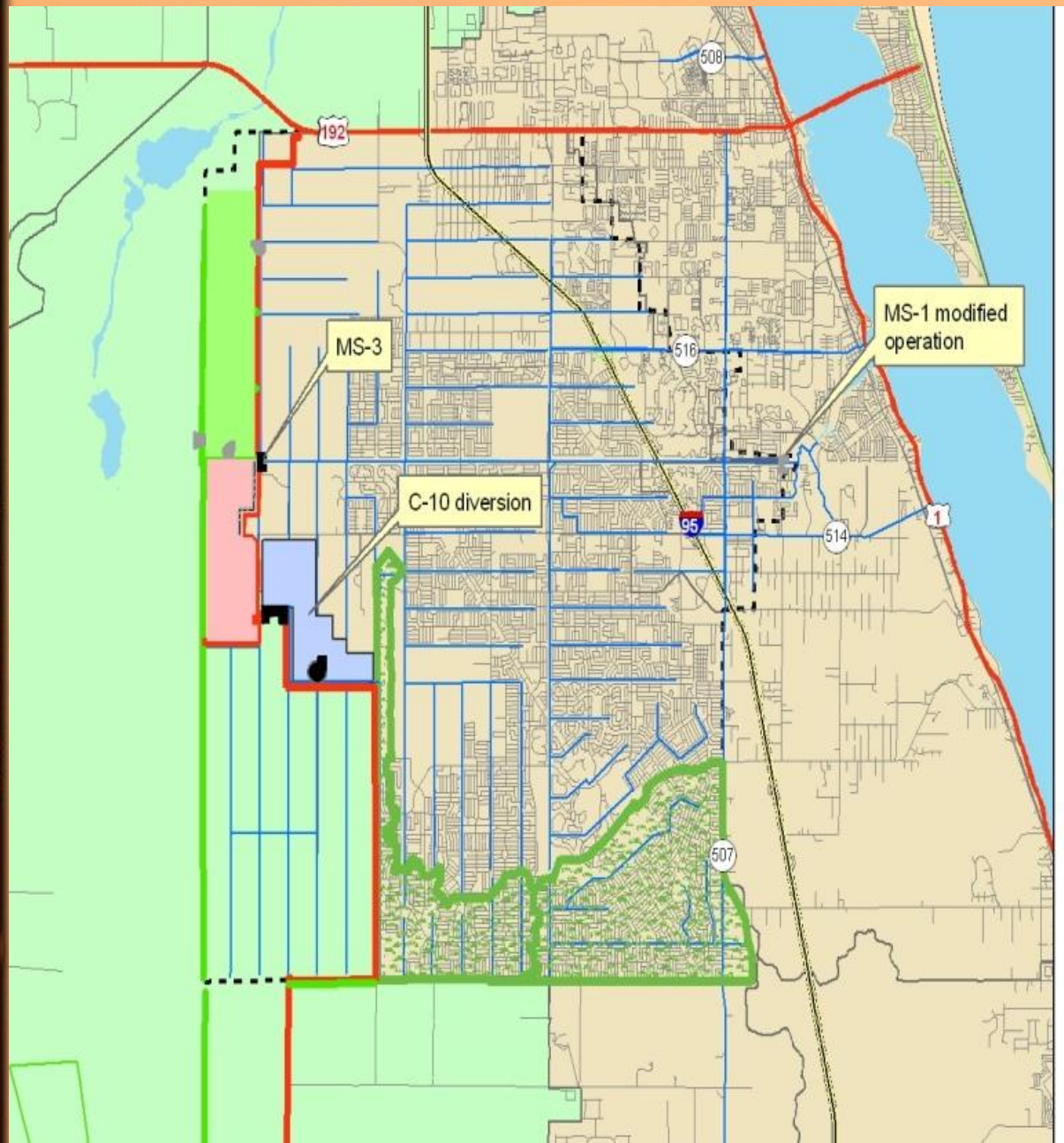
The Upper St. Johns River Basin Project benefits the Indian River Lagoon by restoring the historic flood plain

This greatly reduces the frequency and duration of discharges out of the C-54 Canal to the lagoon.

It's Your Lagoon

INDIAN RIVER LAGOON PROGRAM

Infrastructure Improvements:

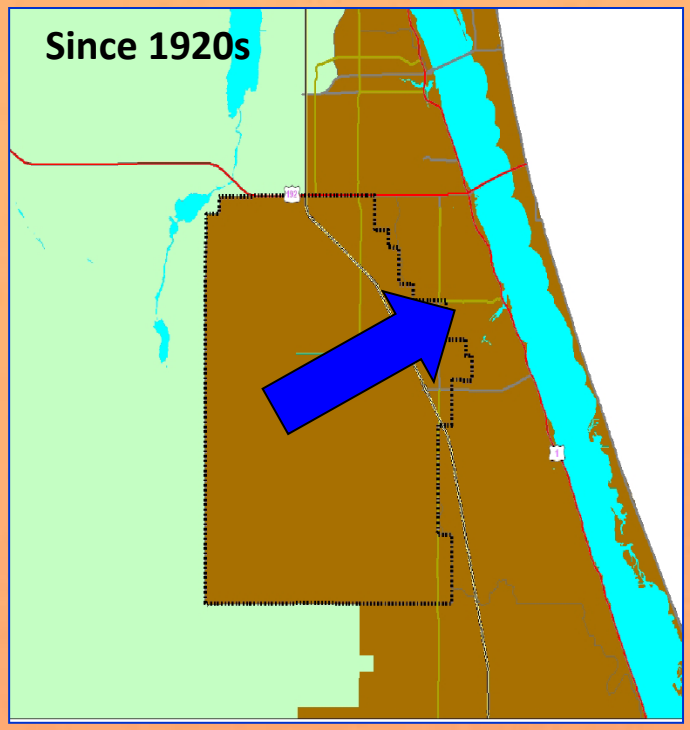


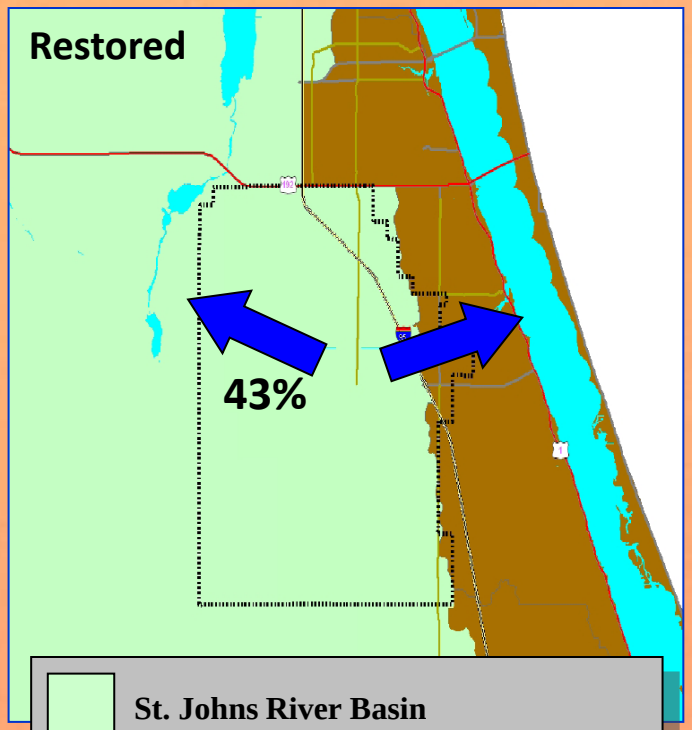
It's Your Lagoon

Infrastructure Improvements:

When fully implemented, 43% of drainage will return to the St. Johns River Marsh.

More importantly, this water will not be released into the IRL.





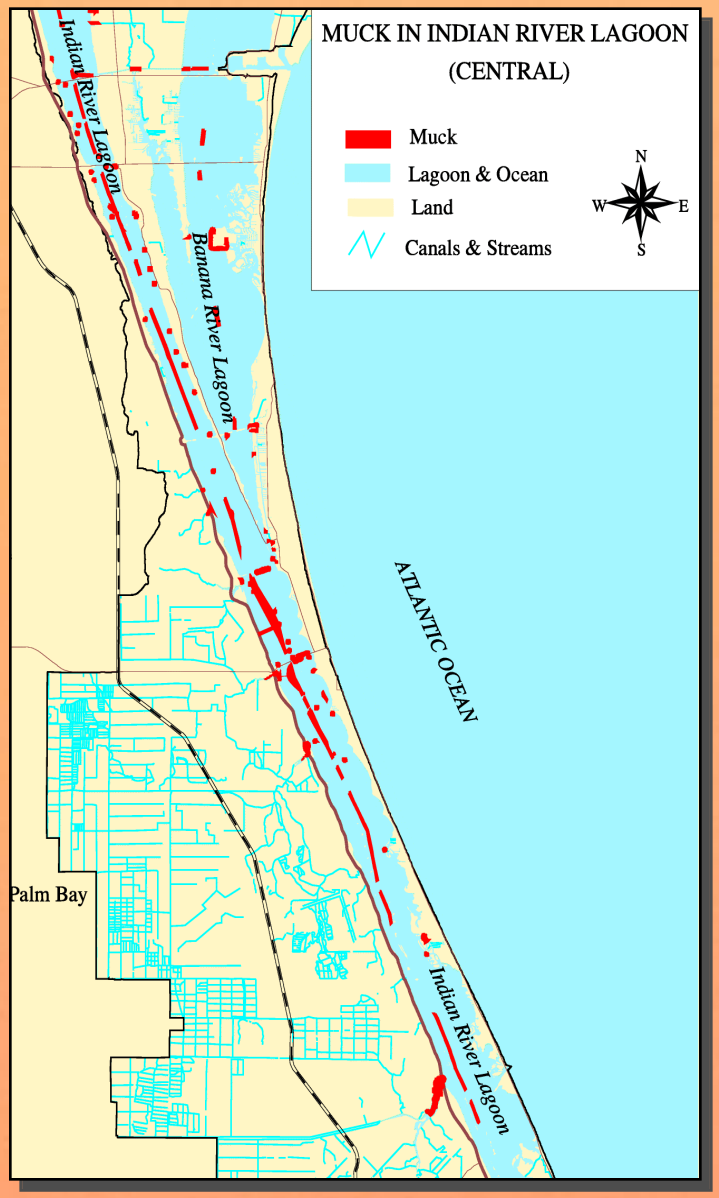
It's Your Lagoon

Infrastructure Improvements:

Muck Removal:

Muck is a mixture of silt, clay, decayed organic materials, sand and shell found at creek mouths and in deeper portions of the lagoon.

Muck is a problem in the lagoon because it is easily resuspended to reduce water quality and clarity. As the organic materials in muck decay, they consume oxygen, so fish and many species of invertebrates can be affected.



It's Your Lagoon

Infrastructure Improvements:

St. Sebastian River Dredging project:

One of the District's largest projects, the St. Sebastian River dredging project removed 2 million cubic yards of muck over 3 years at a cost of $12 million, or about $6 per cubic yard of muck.

INDIAN RIVER LAGOON PROGRAM

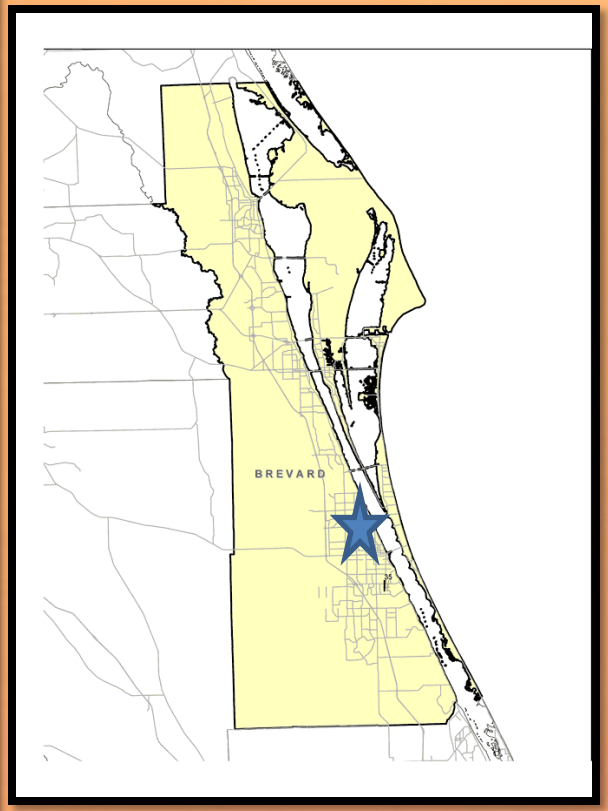
It's Your Lagoon

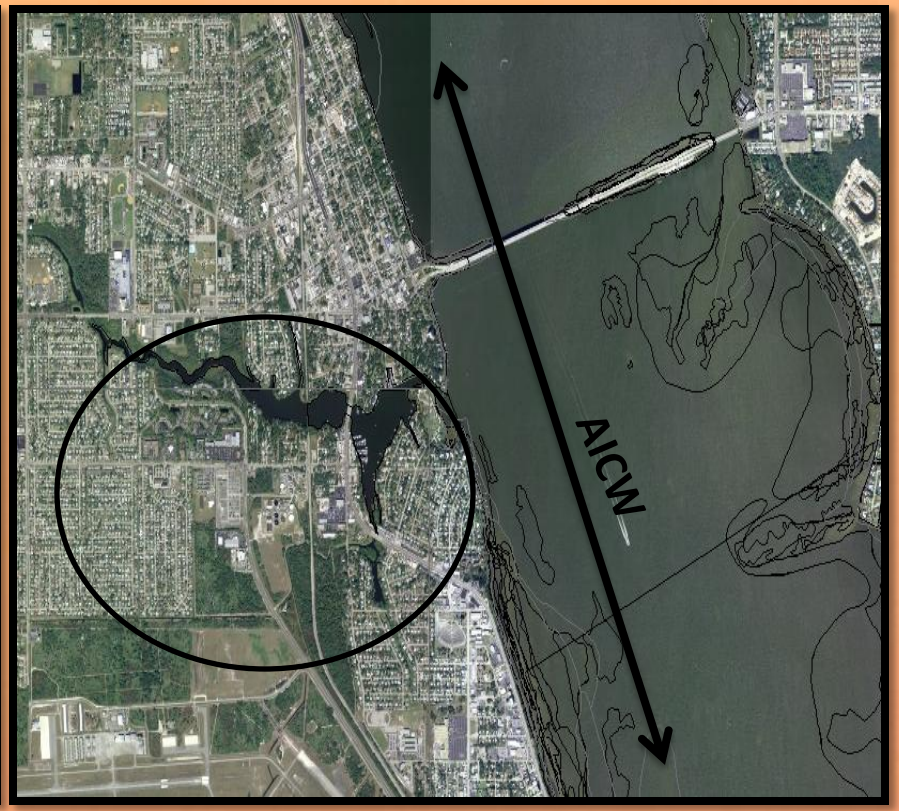
Infrastructure Improvements:

Eau Gallie River Dredging Project: Phase 1

Feasibility Study & Cost / Benefit Analysis

District $100,000 Melbourne $50,000 FIND $150,000





INDIAN RIVER LAGOON PROGRAM

ATLANTIC FLORIDA INTRACOASTAL NAVIGATION INLAND DISTRICT

City of Melbourne The Harbor City

It's Your Lagoon

Wetland Reconnection:

More than 31,000 acres of formerly isolated wetlands impounded for mosquito control have been reconnected.

Early impoundment design cut off mangrove marshes from the lagoon and decreased habitat available to juvenile fishes and invertebrates. It also eliminated or altered vegetation in impounded areas.

Our long-term goal is to reconnect all impoundments to the lagoon through water control structures which flood impoundments during mosquito breeding season, but keep them open to the lagoon at other times so natural flow patterns are maintained.

INDIAN RIVER LAGOON PROGRAM

It's Your Lagoon

Habitat Restoration and Protection:

Oyster restoration in Mosquito Lagoon:

A public participation program that has restored over 50 dead or damaged reefs in southern Mosquito Lagoon.

It's Your Lagoon

Habitat Restoration and Protection:

Bird Island Protection in Martin County

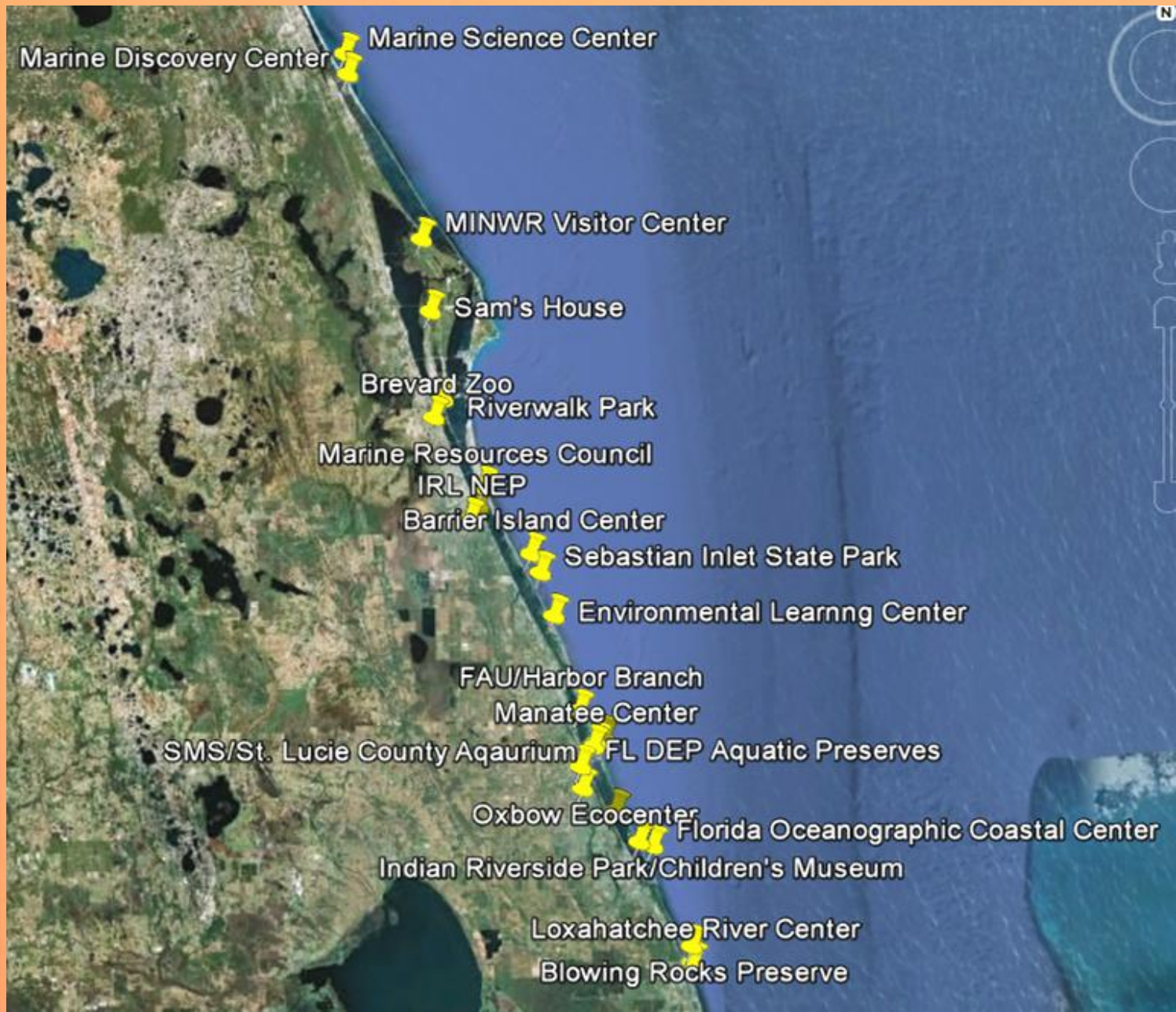
It's Your Lagoon

Habitat Restoration and Protection:

St. Lucie County SL-3 Spoil Island Exotics Removal & Hydrologic Restoration of an isolated wetland:

It's Your Lagoon

Public Outreach and Education:



It's Your Lagoon

Public Outreach and Education:

Education Partners :

Martin County School Board:
Camp WET

Brevard Zoo Lagoon Quest:
A lagoon education program for fourth graders in Brevard County.

Marine Discovery Center:
Adopt and Estuary Program

Smithsonian Marine Station:
Marine Ecosystems Exhibit
IRL Species Inventory Project

It's Your Lagoon

Indian River Lagoon License Plate:

Florida drivers may purchase a lagoon specialty license plate for an additional $15.

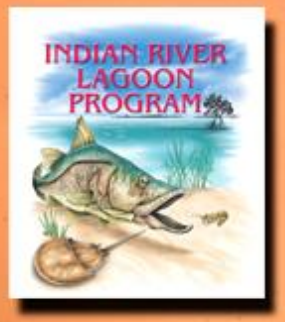
Every purchase directly funds projects that restore and protect the lagoon.

Tag receipts are matched by other funding to at least double the value of every purchase.

By statute, all money collected in a lagoon county must be used within that county.

No salaries or research projects may be paid for with tag money – 80% goes toward restoration, and up to 20% can be used for lagoon-focused outreach and education efforts.

Tag purchases have funded more than $6 million in lagoon restoration projects so far!

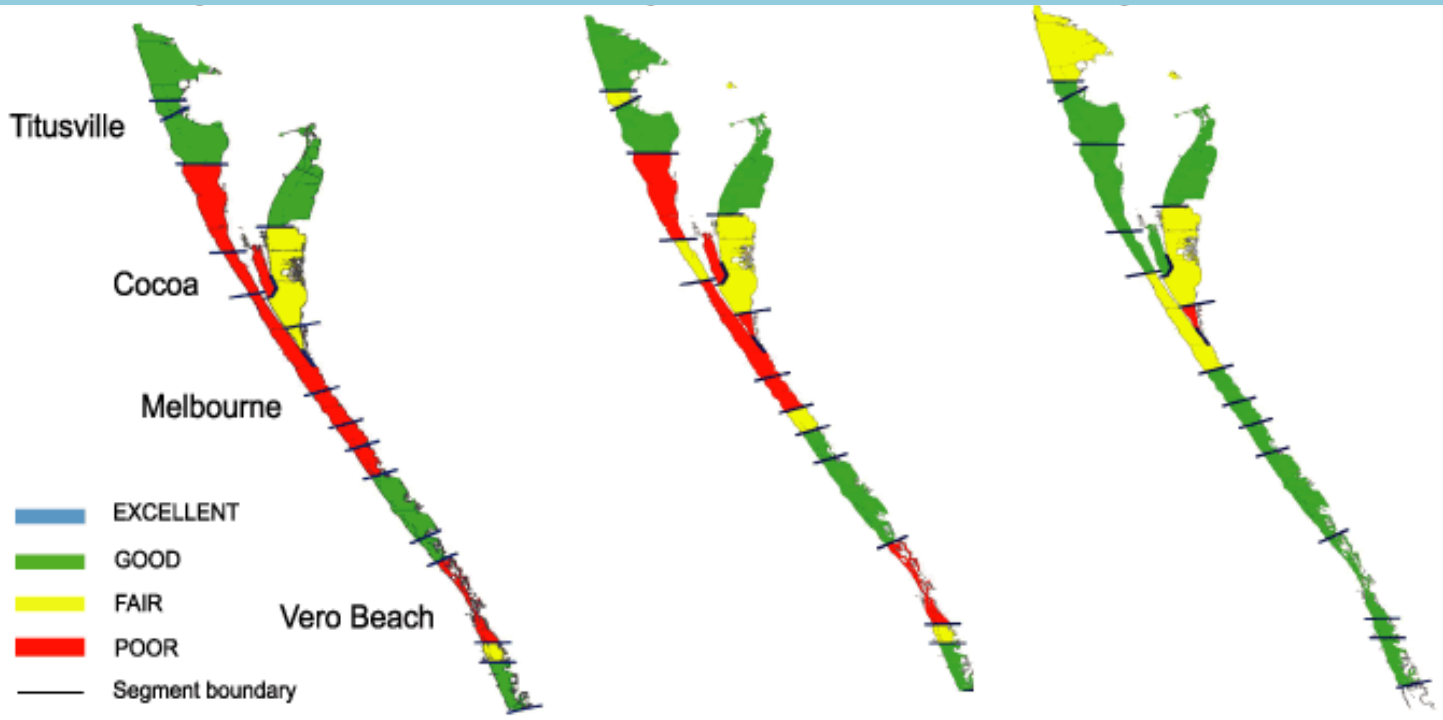


It's Your Lagoon

Has Water Quality in the Lagoon Improved?

Key Indicator: Seagrass Coverage

1986 – 1989	1991- 1996	1998 – 2003
Coverage 39,300	Coverage 44,000	Coverage 46,000



2009 -2010 = Coverage 70,104 acres 85% of total seagrass target

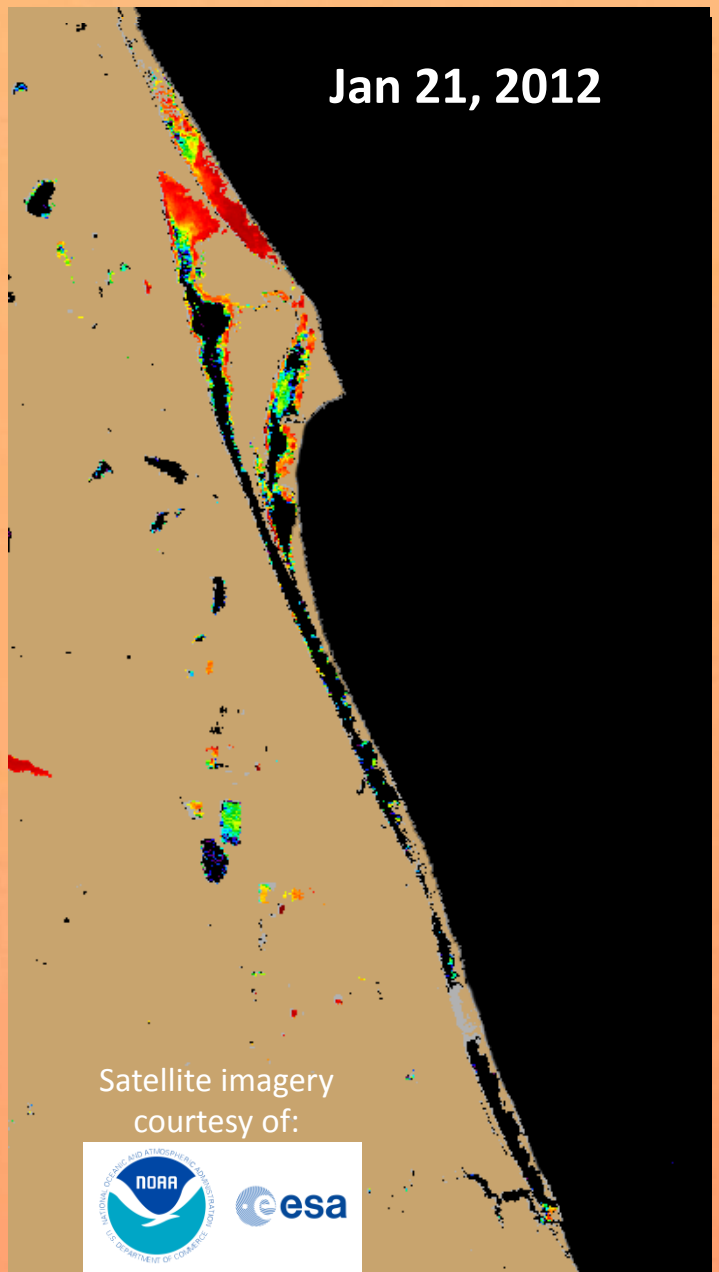
Target = 83,410 acres

It's Your Lagoon

2011 Superbloom:

The IRL Superbloom likely began in March 2011 in Banana River Lagoon.

- It spread to Northern IRL and Mosquito Lagoon.
- It was unprecedented in magnitude and duration, lasting almost 8 months.
- During the peak of the bloom, cell counts reached over 2 billion cells per liter.



INDIAN RIVER LAGOON PROGRAM

2011 Algae Blooms: Bad Year for Seagrasses

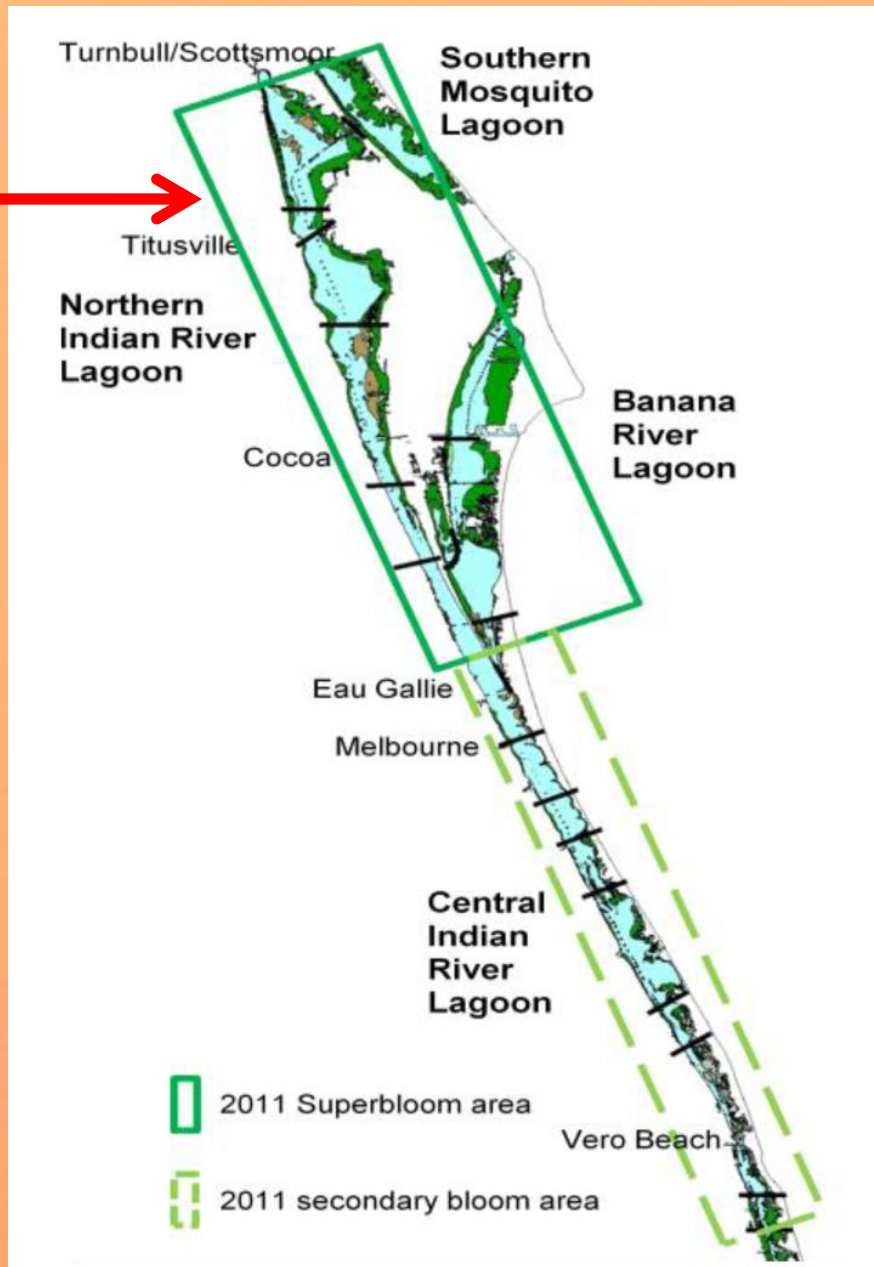
'Superbloom' region:

Banana and N. IRL and southern Mosquito Lagoon

Surpassed all previous blooms in terms of intensity and duration.

Chlorophyll *a* concentrations were greater than 100 ug/L for almost 8 months in duration.

Dominant species in the bloom were 2 pico-planktonic groups: cyanobacteria and green micro-flagellates.



It's Your Lagoon

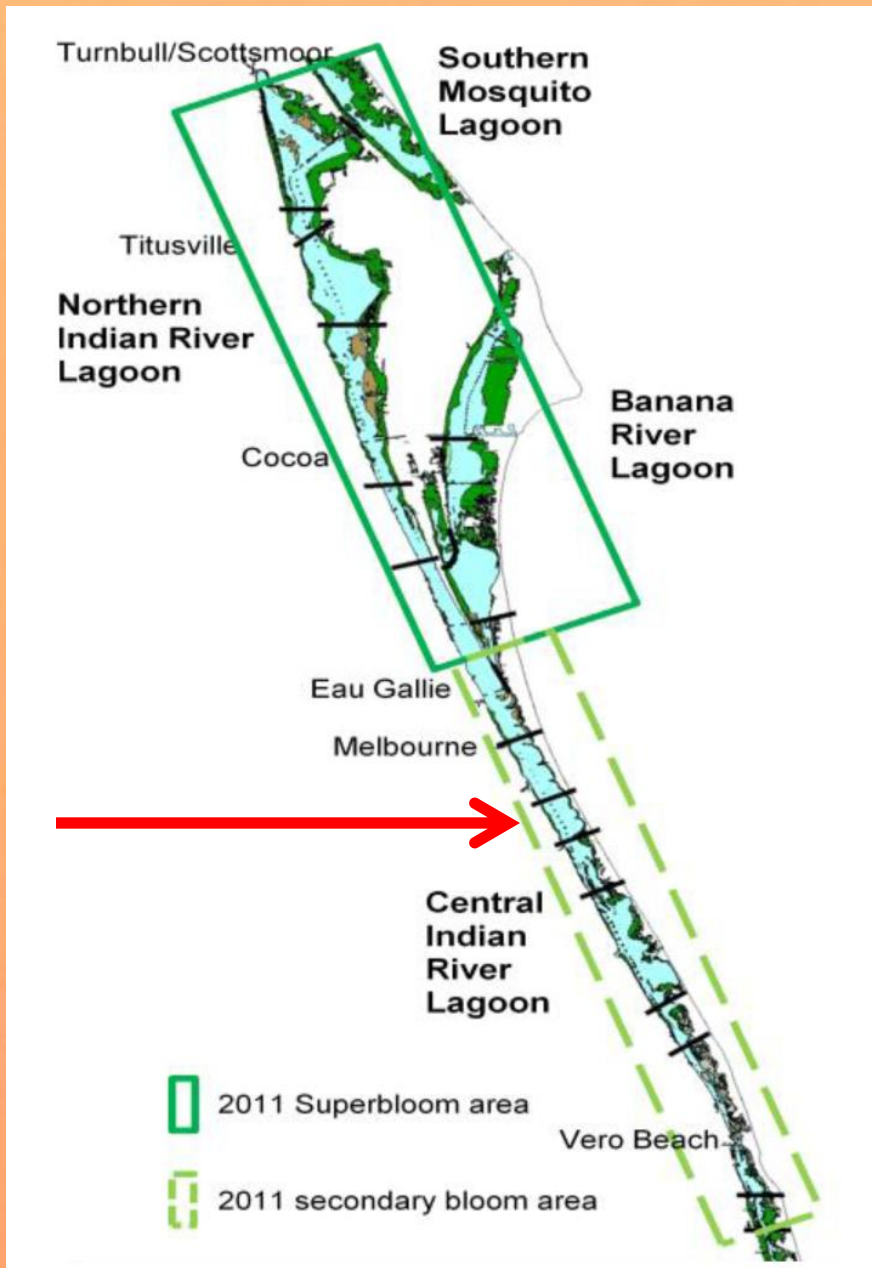
2011 Algae Blooms: Bad Year for Seagrasses

Secondary bloom region:
Eau Gallie to Ft. Pierce

Moderately intense bloom with Chlorophyll *a* concentrations averaging 20 – 30 ug/L. Levels near Sebastian Inlet reached 50 ug/L during the peak of the bloom.

Composed of a mix of dominant species:

- Cyanobacteria, followed by diatoms & dinoflagellates in the Melbourne area.
- Co-dominance of diatoms and dinoflagellates in the Vero Beach area.



What Caused the Superbloom?

No single factor explains the Superbloom, but several things stand out:

1. **Long-term drought conditions: Salinities Increased**

- In 8 of the past 12 years, rainfall in the region was below the 30-year average of 50".
- Low rainfall typically means less runoff and reduced nutrient loadings.
- But, drought also means increased salinity as water evaporates.

2. **Two extreme winters : Dec. 2009 – Jan. 2010 and Dec. 2010 – Jan. 2011. Macro Algae affected by low water temperatures**

- Winter 2009/10 was the coldest since 1937 when records were first kept.
- Extreme low water temperatures lasted over 2 weeks in January.

3. **Possible internal nutrient loadings in the IRL Ecosystem.**

- Crash of macroalgae population in the IRL in Mid-2010.
- Decay of this material added nutrients to system.

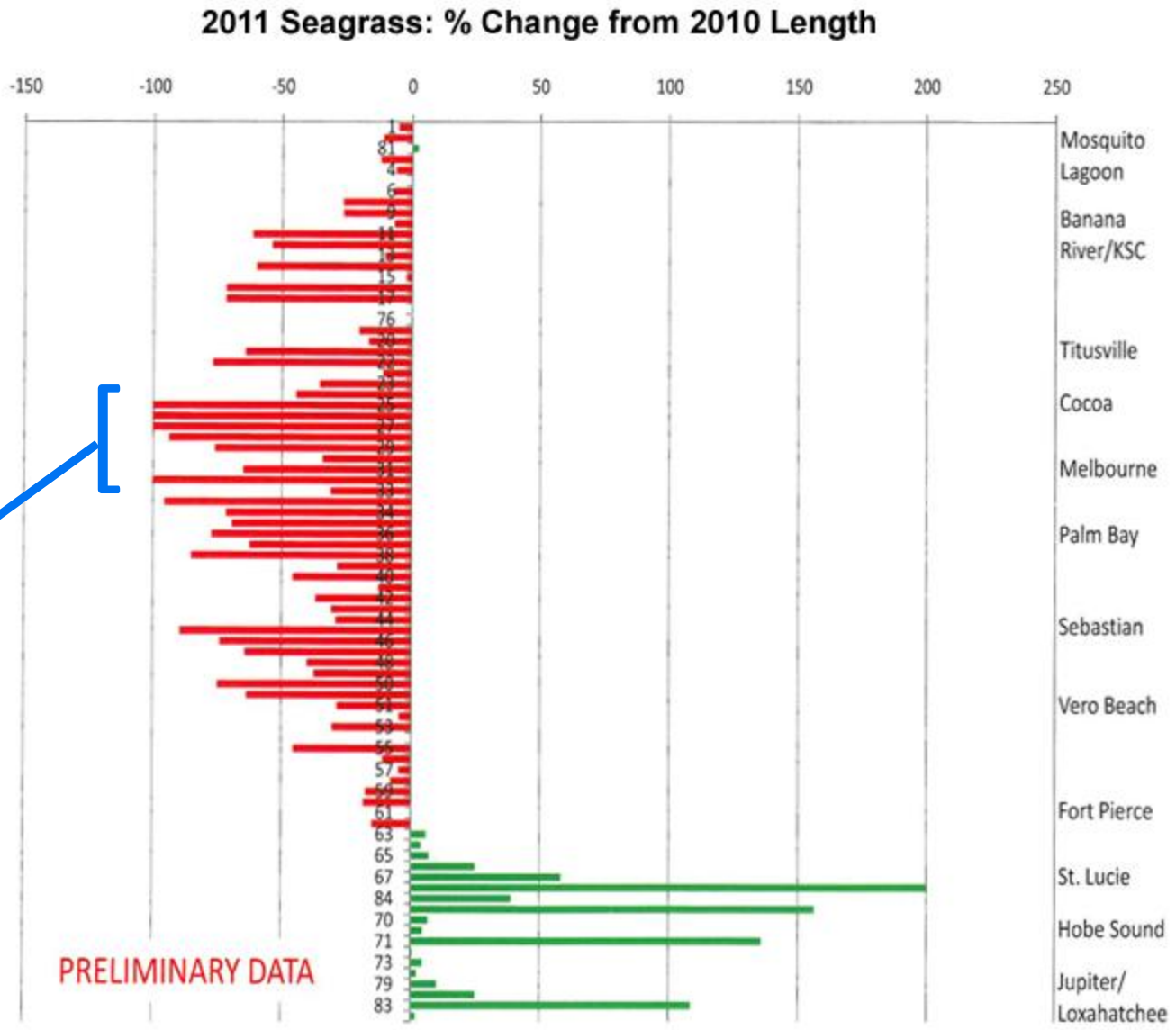
4. **The lagoon may have reached a tipping point in terms of nutrient loadings**

- Seagrass stress may account for decreased trends in density of beds.

2011 Percent Change in Measured Transect Lengths:

45% overall reduction in Banana River, North and Central IRL

In some place 100% losses occurred



It's Your Lagoon

Brown Tide Bloom of 2012:

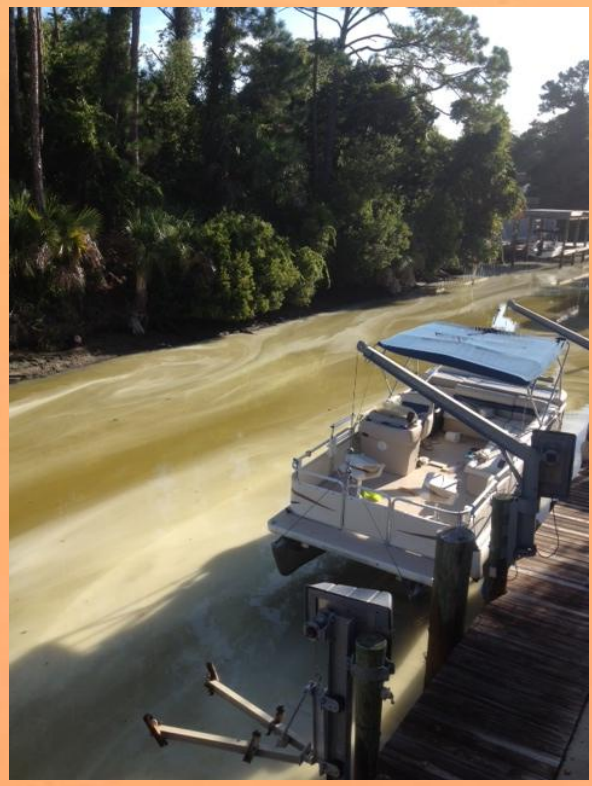
Daytona Beach News Journal, 2012

It's Your Lagoon

Brown Tide Bloom of 2012:

Summer of 2012:

- Bloom began in southern Mosquito Lagoon in July, then spread into the northern IRL.
- Bloom concentrations reached highs of up to 3 billion cells per liter in August (196 ug/L in Chlorophyll *a)* in Mosquito Lagoon
- Northern IRL concentrations were ⅓ to ⅔ as high
- The dominant species is *Aureoumbra lagunensis,* a brown tide pelagophyte.



K. Young, Volusia Co.

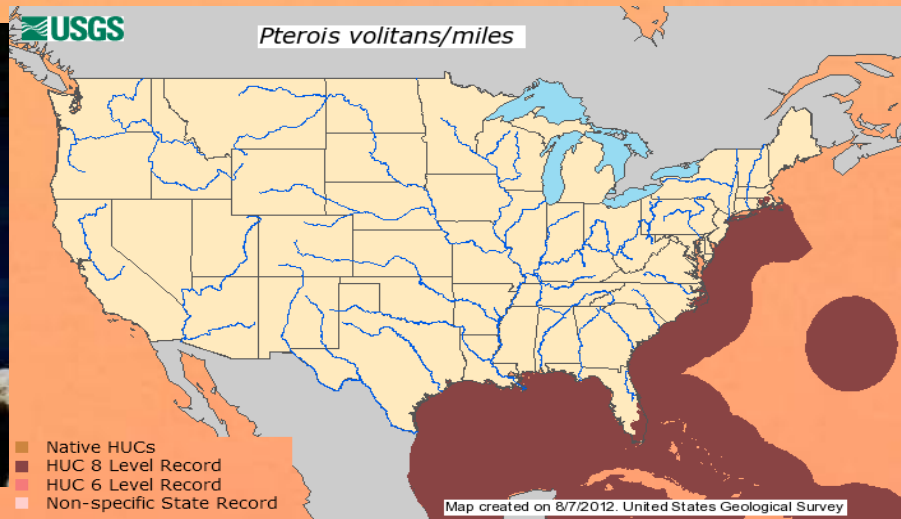
The bloom did not spread any farther south than Titusville in North IRL.

It's Your Lagoon

INDIAN RIVER LAGOON PROGRAM

Lionfish Invasion: Threat to Native Species

Be the Top Predator!




THANK YOU
Questions?