

# State of the River Report for the Lower St. Johns River Basin *Water Quality, Fisheries, Aquatic Life, Contaminants* 2014



Lower Basin of the St. Johns River Jacksonville, FL

Radha Pyati, Ph.D.  
Lucy Sonnenberg, Ph.D.

# About the Report

- Funded primarily by COJ EPB
- Purpose
  - Inform the public about the LSJRB health
  - Provide independent assessments of status and trends
- First annual report in 2008
- Authors

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# About the Report

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- Reviewers and Advisors:

- SJRWMD
- City of Jacksonville
- FL Dept. of Health
- JEA
- St. Johns Riverkeeper
- Middlebrook Company
- The Nature Conservancy
- FWRI
- FL Sea Grant
- National Park Service
- Wildwood Consulting
- UNF
- JU
- Valdosta State

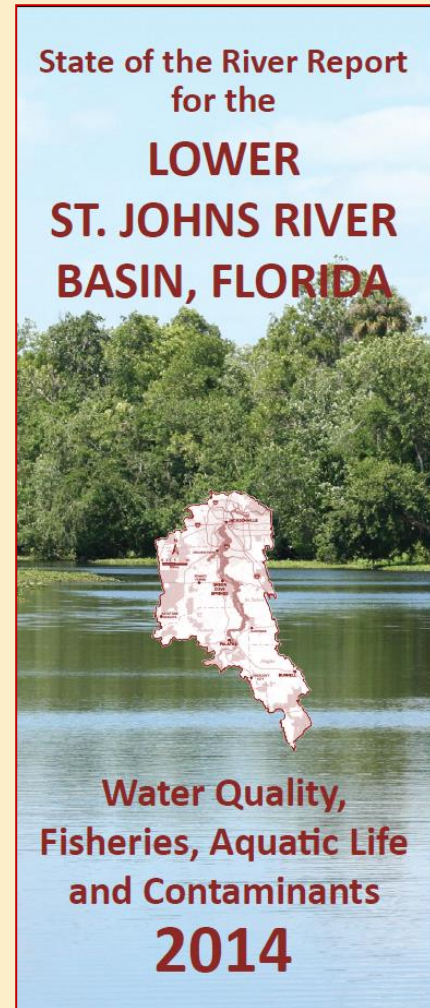
- Special thanks to:

- Dr. Ray Bowman
- Dr. Quinton White
- Dr. Dan McCarthy
- Ms. Heather McCarthy
- Dr. Pat Welsh

# About the Report

- Topics
  - Background
  - Water Quality
  - Fisheries
  - Aquatic Life
  - Contaminants
- Full Report
- Appendices
- Digital archive of references
- Website
- Brochure
- Interactive tributaries

***SJRreport.com***



# Brochure



## Water Quality

## Fisheries

## Aquatic Life

## Contaminants

DISSOLVED OXYGEN

TRIBUTARIES

MAINSTEM

NUTRIENTS

NITROGEN

PHOSPHORUS

TURBIDITY

ALGAL BLOOMS

BACTERIA  
(fecal coliform)

SALINITY

RED DRUM

SPOTTED SEATROUT

LARGEMOUTH BASS

FRESHWATER CATFISH

SHEEPSHEAD

STRIPED MULLET

SOUTHERN FLOUNDER

ATLANTIC CROAKER

BAITFISH

BLUE CRAB

SHRIMP

STONE CRAB

A red box indicated the status or trend has changed from last year's River Report. For detailed explanations and statistical analyses of status and trend ratings, please see the full technical report at [www.sjrreport.com](http://www.sjrreport.com).

SUBMERGED AQUATIC VEGETATION

WETLANDS

MACROINVERTEBRATES

FLORIDA MANATEE  
(endangered)

BALD EAGLE  
(delisted 2007)

WOOD STORK  
(endangered)

NONNATIVE AQUATIC SPECIES

TOXICS RELEASE INVENTORY: Point sources of contaminants in the Lower St. Johns River region.

AIR EMISSIONS

WATER DISCHARGES

SEDIMENT POLYAROMATIC HYDROCARBONS (PAHs)

NORTHERN LSJRB

SOUTHERN LSJRB

SEDIMENT POLYCHLORINATED BIPHENYLS (PCBs)

SEDIMENT PESTICIDES

SEDIMENT METALS

METALS IN THE WATER COLUMN

arsenic, cadmium, nickel, zinc

copper, lead, silver

# Interactive Tributary Page

File Edit View History Bookmarks Tools Help

Durbin Creek x +

sjrreport.com/dur

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**TU UNF STATE OF THE RIVER REPORT FOR THE LOWER ST. JOHNS RIVER BASIN**  
 WATER QUALITY, FISHERIES, AQUATIC LIFE, & CONTAMINANTS

Home Research Team Brochure Technical Report Bloom Photos Previous Reports Digital Archive Interactive Tribs Contacts

**Durbin Creek Tributary (2365)**

Below is some general information about this tributary, including impairments (contamination problems), and TMDL (Total Maximum Daily Load) documents that discuss how much the watershed can contain and still be considered healthy.

**General Information**

- Location: East of the St. Johns River, South of I-295
- Land Use: Forested
- Current TMDLs: Fecal Coliform
- Impairments: Fecal Coliform (High)
- Beneficial Use: Class III F (Recreational - Freshwater)
- Area: 26.2 sq. miles

**Sampling Stations**

Click the markers on the map to show the data for that specific station at the bottom of the page. (Note: Some stations may not be accurately located due to the GPS data taken when first sampled)

- Durbin Cr @ Race Track Rd
- Durbin Creek At Us Hwy 1
- Durbin Creek @ Swamp Trail Road
- Durbin Creek @ RaceTrack Rd.
- Durbin Creek At RaceTrack Road

**More About This Tributary**

- From the Report Archive

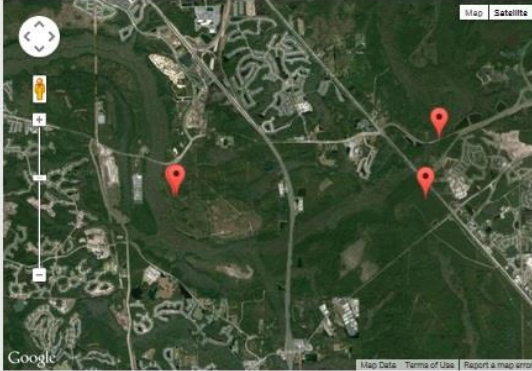
**More About The River**

- SJRWMD
- Florida DEP

**Give Us Feedback**

Please let us know what you think about this interactive tributary page. Your feedback will help us improve this feature over time. Send feedback to Stuart Chalk

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**Water Quality Data for this Tributary**

Parameter	Water Quality Criteria	Low	Avg	High	Count	Years
Arsenic (µg/L)	≤50 in FW; ≤50 in SW	0.001	0.51	6.11	74	1997-2013
BOD, Biochemical oxygen demand (mg/L)	None	0.900	1.82	4.80	26	2001-2008
Cadmium (µg/L)	≤0.3 in FW; ≤8 in SW	0.001	0.77	50.0	108	1997-2013
Chlorophyll a, corrected for pheophytin (µg/L)	≤20 in FW; ≤11 in SW	0.010	1.55	32.6	90	1997-2013
Copper (µg/L)	≤9.3 in FW; ≤3.7 in SW	0.000	1.88	50.0	136	1997-2013
Dissolved oxygen (DO) (mg/L)	≥5.0 in FW; ≥5.0 in SW	0.000	4.09	9.60	204	1997-2013
Fecal Coliform (log #/100 mL)	<2.6 in FW; <2.6 in SW	<-3.01	2.04	3.67	128	1999-2012
Lead (µg/L)	≤3.2 FW; ≤8.5 SW	0.000	3.82	50.0	133	1997-2013
Nickel (µg/L)	≤82 in FW; ≤3.3 in SW	0.000	3.16	50.0	128	1997-2013
Silver (µg/L)	≤0.07 in FW; ≤0.92 in SW	0.002	0.13	0.72	32	2004-2013
Total Nitrogen (mg/L)	<1.54 in FW; <1.54 in SW	0.281	1.15	3.84	144	1997-2013
Total Phosphorus (mg/L)	<0.12 in FW; <0.12 in SW	0.010	0.09	0.48	169	1997-2013
Turbidity (NTU)	<29 in FW; <29 in SW	0.460	3.85	28.0	164	1997-2013
Zinc (µg/L)	≤120 in FW; ≤86 in SW	0.000	6.95	50.0	146	1997-2013

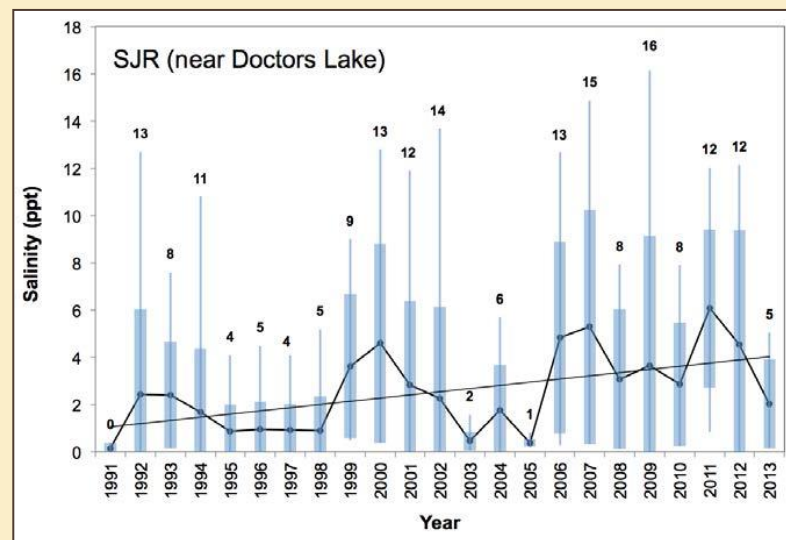
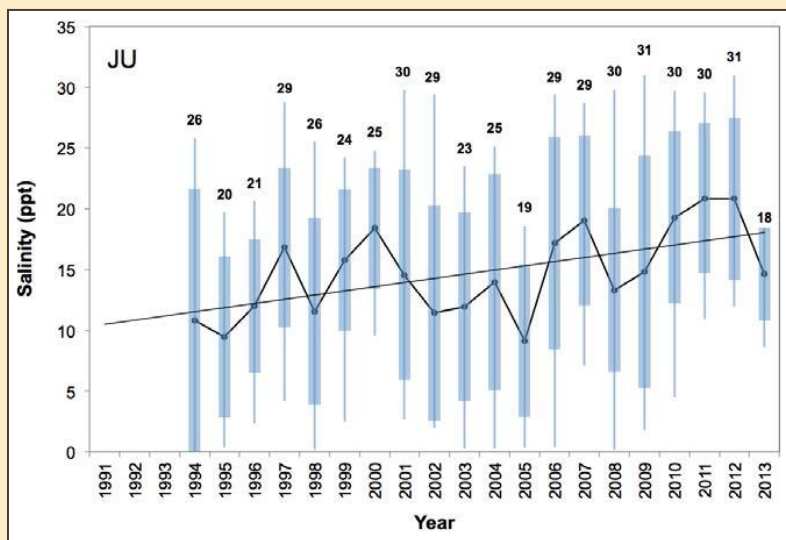
FW = Freshwater (River or Stream Water); SW = Saltwater (Marine or Ocean Water)

# Water Quality

Indicator	Status	Trends
Salinity	Uncertain	Worsening
Fecal Coliform	Unsatisfactory	Uncertain
Turbidity	Satisfactory	Improving
Dissolved Oxygen	Unsatisfactory	Tributaries: Worsening Mainstem: Unchanged
Algal Blooms	Unsatisfactory	Unchanged
Nutrients	Nitrogen: Unsatisfactory Phosphorus: Unsatisfactory	Nitrogen: Improving Phosphorus: Unchanged

# Salinity

- Episodic fluctuations with weather
  - Drought, hurricanes
- Daily fluctuations with tide up to Shands Bridge
- Increasing mean salinity in transition areas





# Salinity

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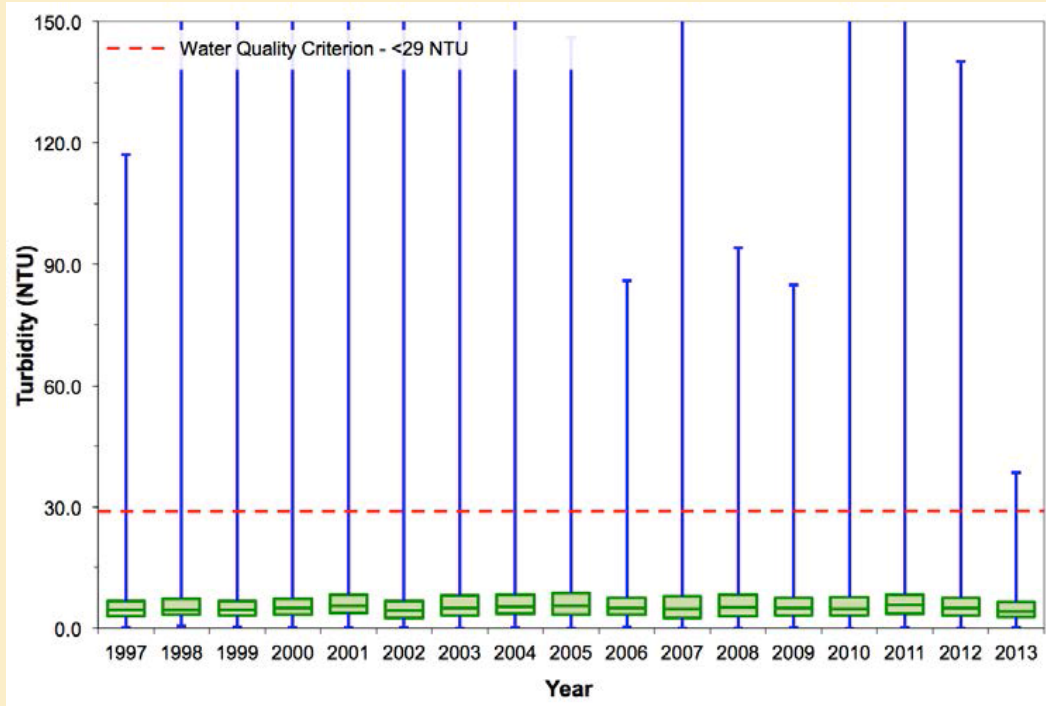
- Potential impacts in the Lower basin
  - Movement south of transition zones between fresh and saltwater
  - Redistribution of salt and freshwater fish
  - Life-cycle disruption of organisms that need marine and freshwater habitats (e.g., crabs, shrimp)
  - Shifts in macroinvertebrate populations
  - Less SAV in the north, therefore less food and habitat
  - Loss of freshwater hardwood swamps in some areas

# Fecal Coliform

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- LSJRB tributaries impaired for fecal coliform: 57 total. Of those, 25 have final BMAPs.
- Of those 25, 17 have shown 50% or greater reduction in median FC value observed at time of TMDL determination.
  - Deer, Goodby's ,Hogan, Miramar, Newcastle, Blockhouse, Cormorant, Deep Bottom, Fishing, Greenfield, Lower Trout, McCoy, Middle Trout, Moncrief, Pottsburg, Sherman, Wills
- Eight have shown less than 50% reduction in median: Big Fishweir, Butcher Pen, Miller, Open, Terrapin, Craig, Hopkins, Williamson Creeks
- Despite reductions, FC levels in many tributaries exceed water quality criteria.

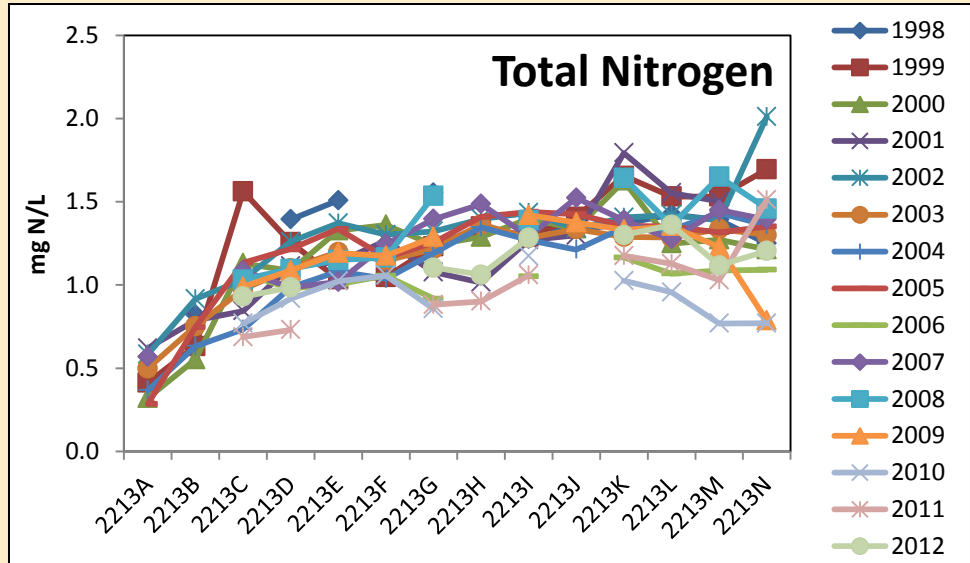
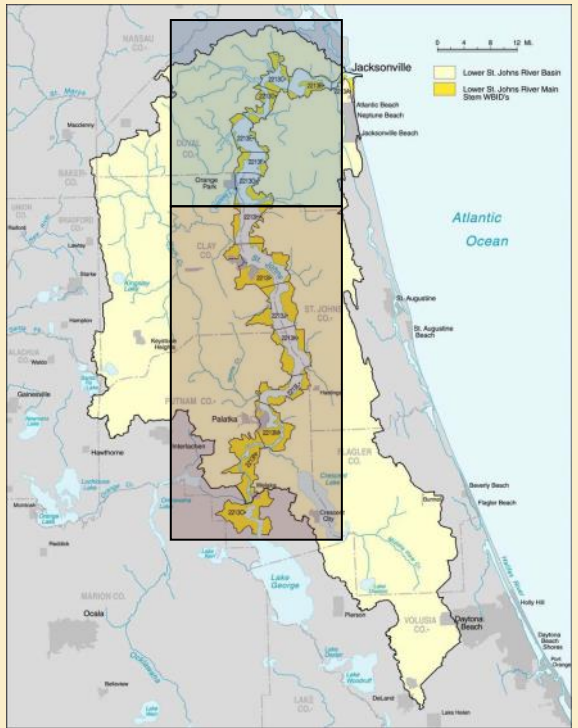
# Turbidity



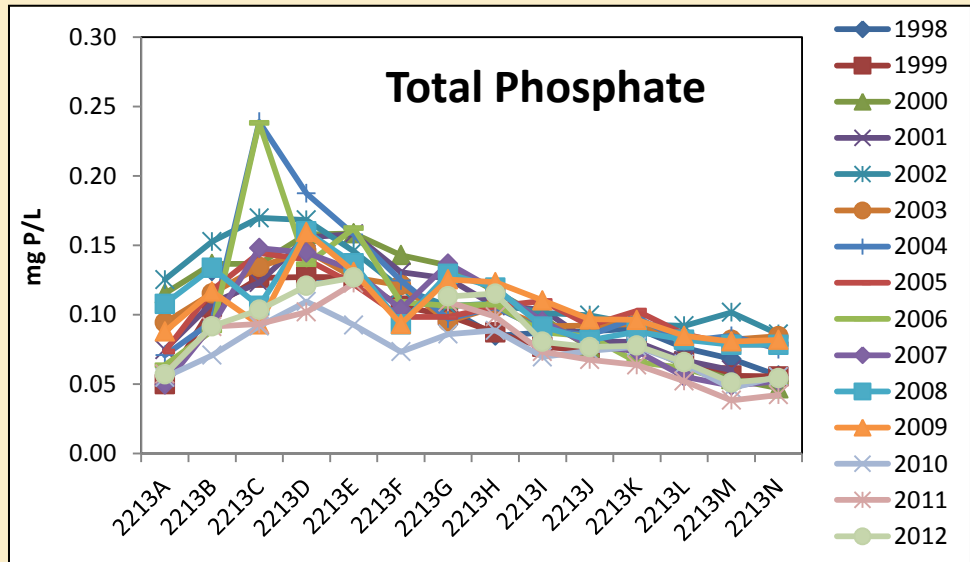
- Mean, maximum value, and minimum value are declining. In particular, minimum values are declining significantly.

# Nutrients

- Nutrients vary with distance to mouth
- Data divided into marine/estuarine and freshwater regions

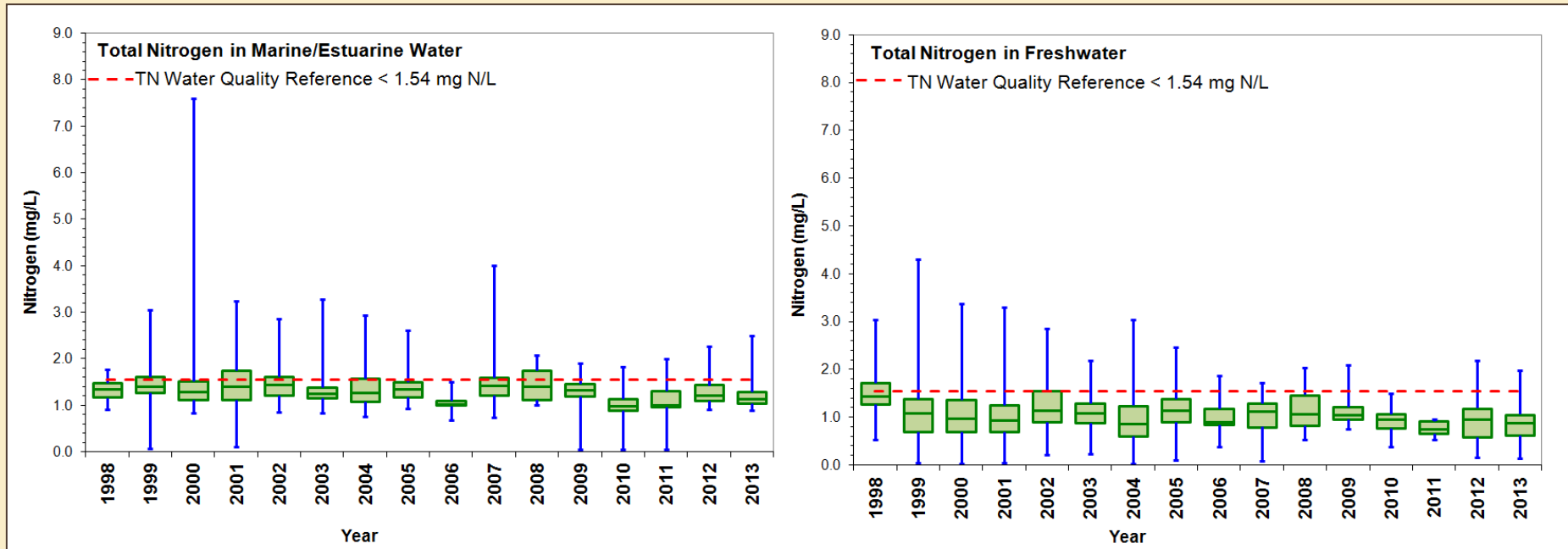


Marine → Freshwater



# Nutrients

- Total Nitrogen Status



– Medians < WQR but maxima > WQR\*

\* WQR = Water Quality Criteria for Peninsular Florida

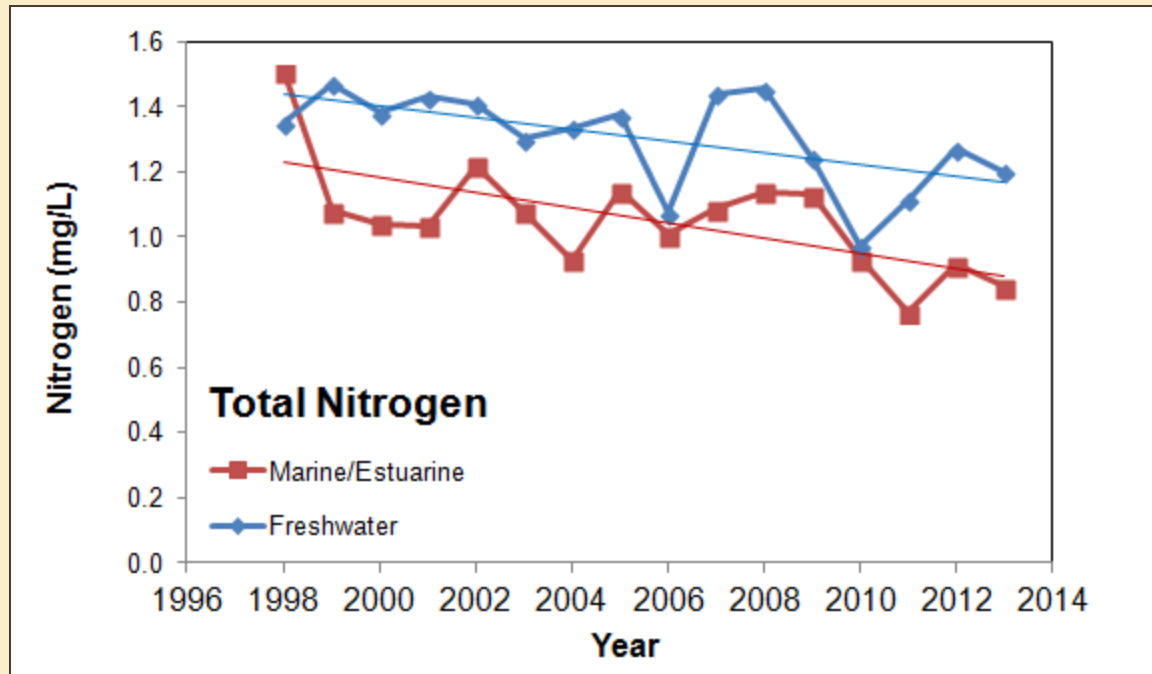
Based on reference streams

Total Nitrogen < **1.54** mg TN/L



“Implementation of Florida's Numeric Nutrient Standard”, FDEP, September 2013

# Nutrients

- Total Nitrogen Trend

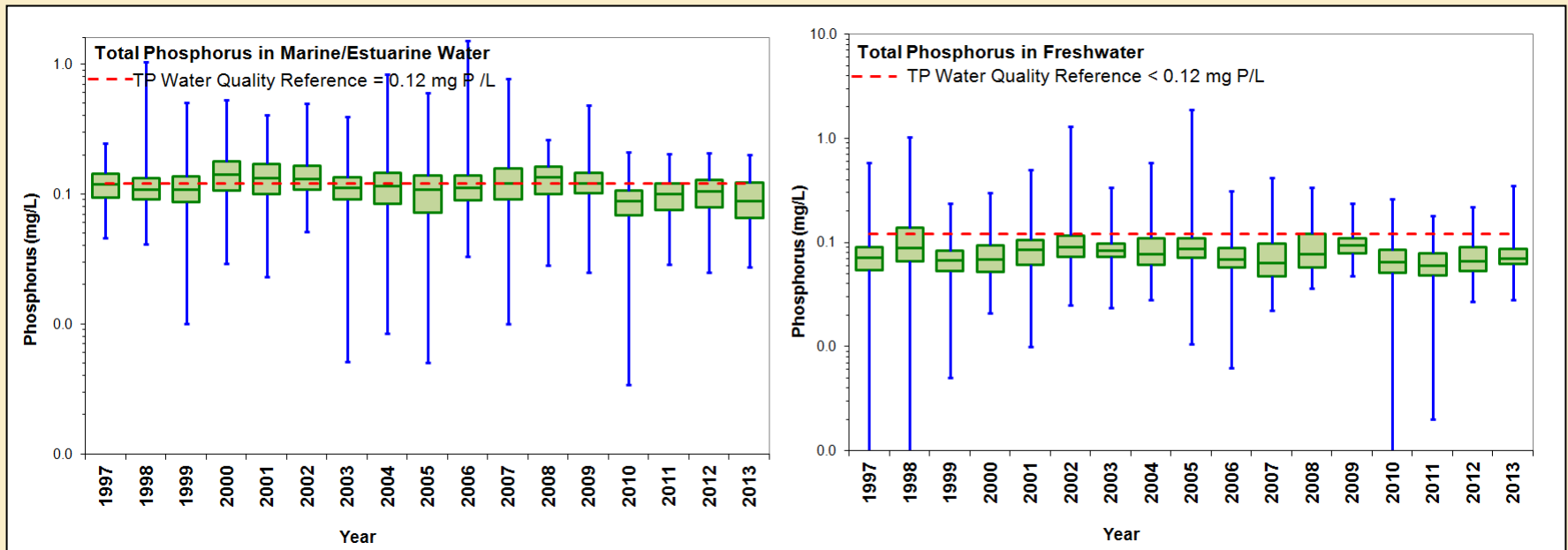


– Annual average declining in fresh to marine water (*Spearman Rank*  $p < 0.05$ )

INDICATOR	STATUS	TREND
Nitrogen	 Unsatisfactory	 Improving

# Nutrients

- Total Phosphorus Status



– Medians < WQR but maxima > WQR\*

\* WQR = Water Quality Criteria for Peninsular Florida

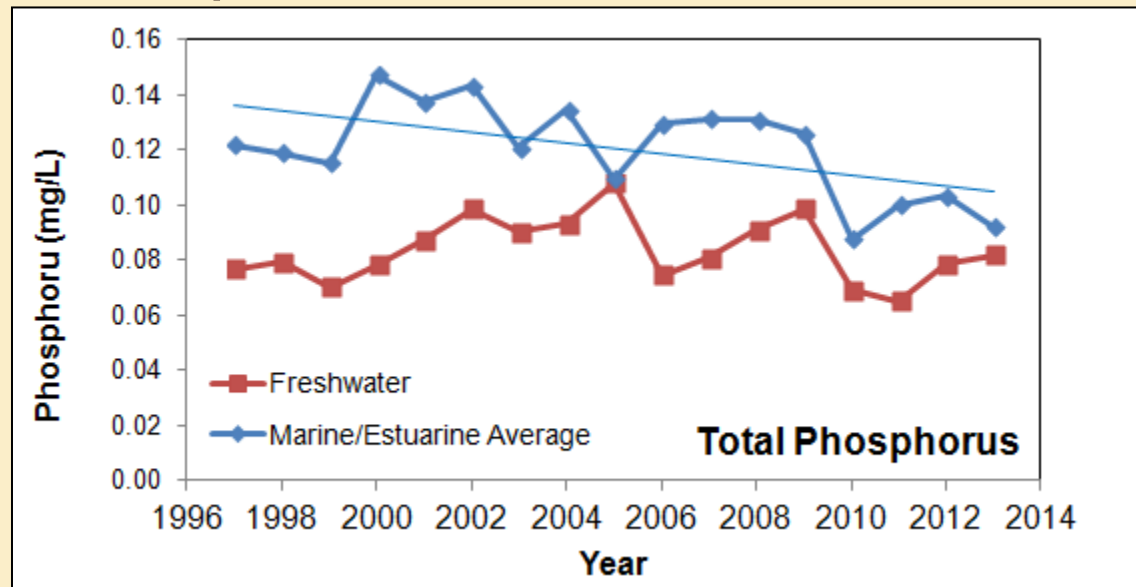
Based on reference streams

Total Phosphorus < 0.12 mg TP/L



“Implementation of Florida's Numeric Nutrient Standard”, FDEP, September 2013

# Nutrients

- Total Phosphorus Trend



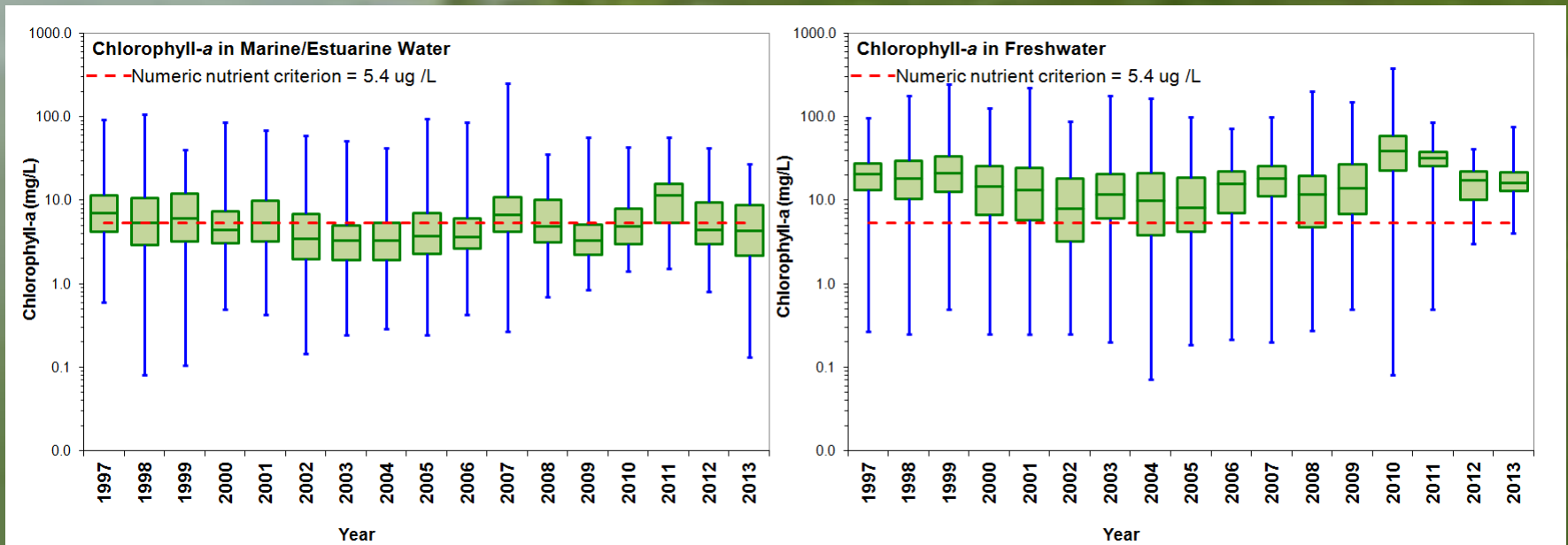
- Annual averages not decreasing freshwater, decreasing marine/estuarine (*Spearman Rank*  $p > 0.05$ )

INDICATOR	STATUS	TREND
Phosphorus	 Unsatisfactory	 Unchanged



# Chlorophyll-*a*

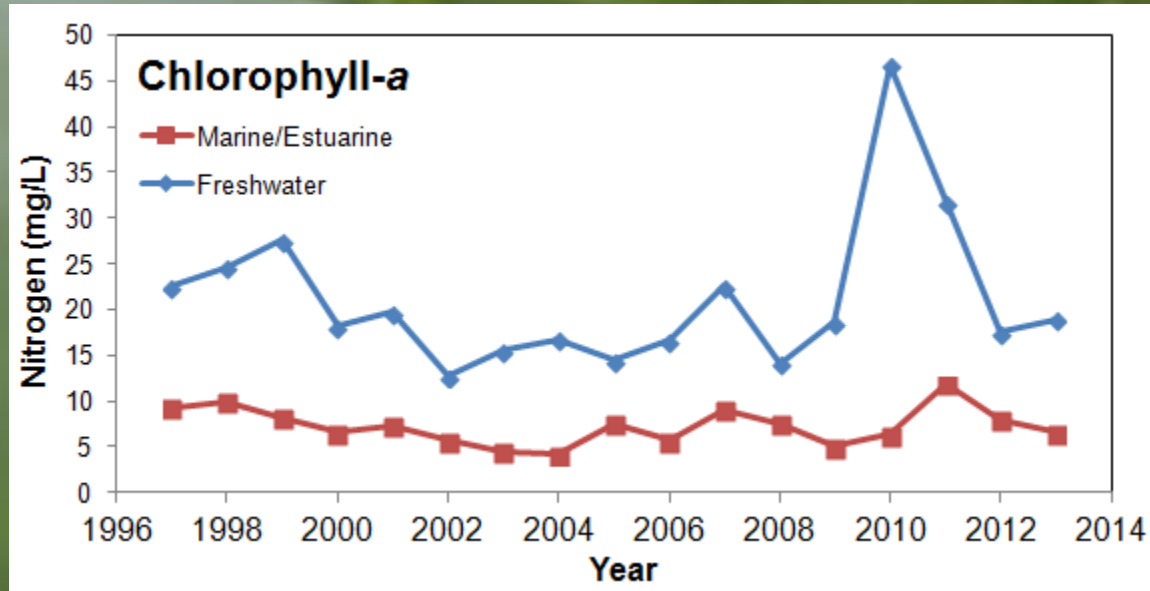
- Phytoplankton indicator used to assess blooms
- Pheophytin-corrected to indicate live organisms



- Stream impairment thresholds exceeded in 2013, especially in fresh water
- New 5.4 ug/L NNC will be exceeded by most samples

# Chlorophyll-*a*

- Trend



- No trend in annual average (*Spearman Rank*  $p > 0.05$ )
- Reports of elevated cyanotoxin levels in 2013
- Better assessments needed

INDICATOR	STATUS	TREND
Algal Blooms	 Unsatisfactory	 Unchanged

# Fisheries

## Fisheries

		RED DRUM
		SPOTTED SEATROUT
		LARGEMOUTH BASS
		FRESHWATER CATFISH
		SHEEPSHEAD
		STRIPED MULLET
		SOUTHERN FLOUNDER
		ATLANTIC CROAKER
		BAITFISH
		BLUE CRAB
		SHRIMP
		STONE CRAB

## Spotted Seatrout *Cynoscion nebulosus*



[www.floridasportfishing.com/magazine/images](http://www.floridasportfishing.com/magazine/images)



## Atlantic Croaker *Micropogonias undulatus*

[www.floridafishandhunt.com/.../atlcroaker.jpg](http://www.floridafishandhunt.com/.../atlcroaker.jpg)



Photo: A.Q. White

# Aquatic Life

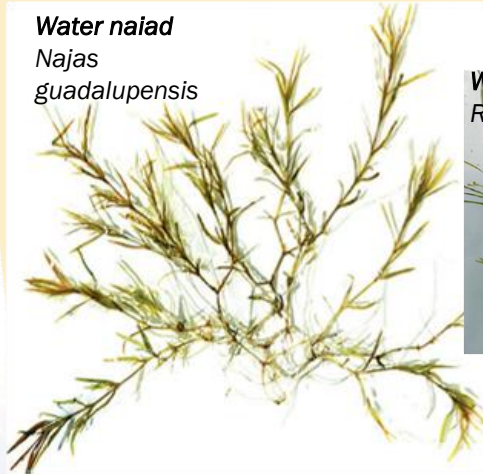
Indicator	Status	Trends
Submerged Aquatic Vegetation	Unsatisfactory	Uncertain
Wetlands	Unsatisfactory	Uncertain
Macroinvertebrates	Uncertain	Uncertain
Threatened and Endangered Species	Satisfactory	Improving, Unchanged
Nonnative Aquatic Species	Unsatisfactory	Worsening

# SAV

**Tape grass**  
*Vallisneria*  
*americana*



**Water naiad**  
*Najas*  
*guadalupensis*



**Widgeon grass**  
*Ruppia*  
*maritima*



**Horned pondweed**  
*Zannichellia*  
*palustris*



**Awl-leaf arrowhead**  
*Sagittaria*  
*subulata*



## Significance

- Nurseries
- Food for manatees, fish, invertebrates
- Improves water quality
- Reduces erosion

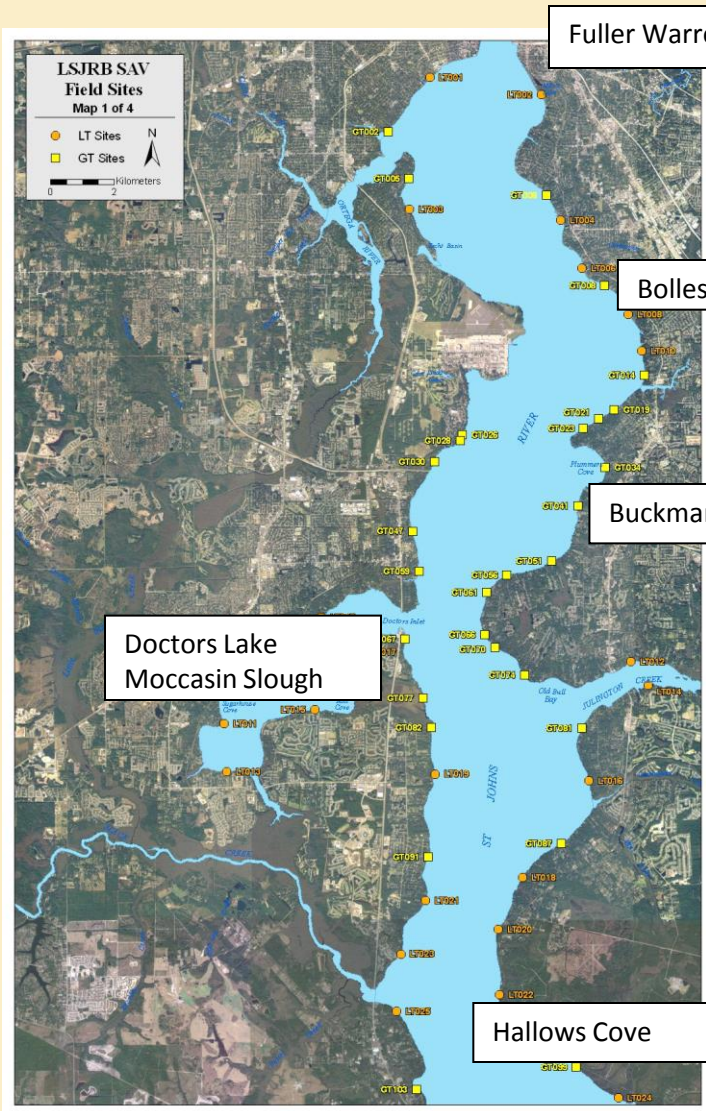
## Critical Conditions

- Salinity
- Water clarity
- Shoreline condition
- Epiphytes

## Data

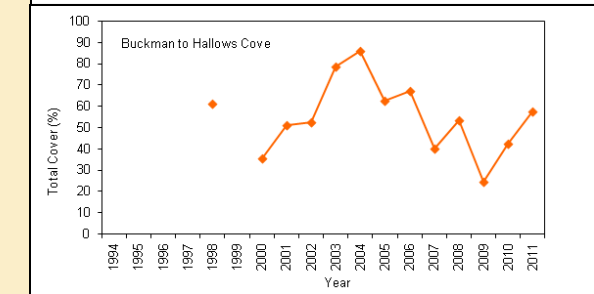
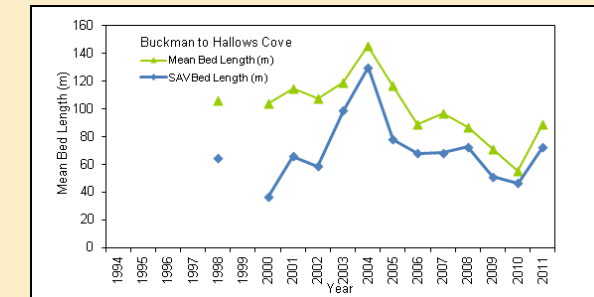
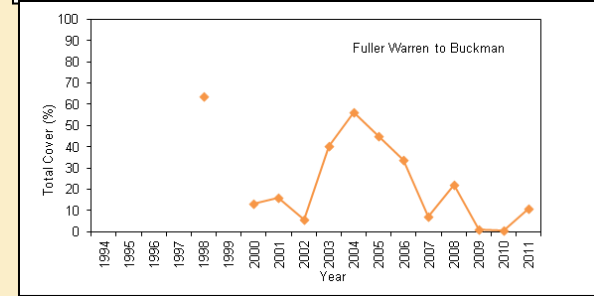
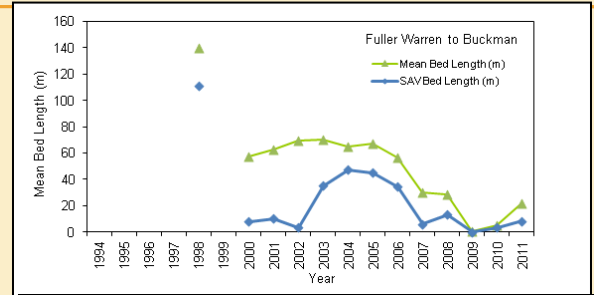
- SJRWMD, 2000-2011
- Transects in 6 sections of LSJR
- Aerial observations 2008-2013

# SAV

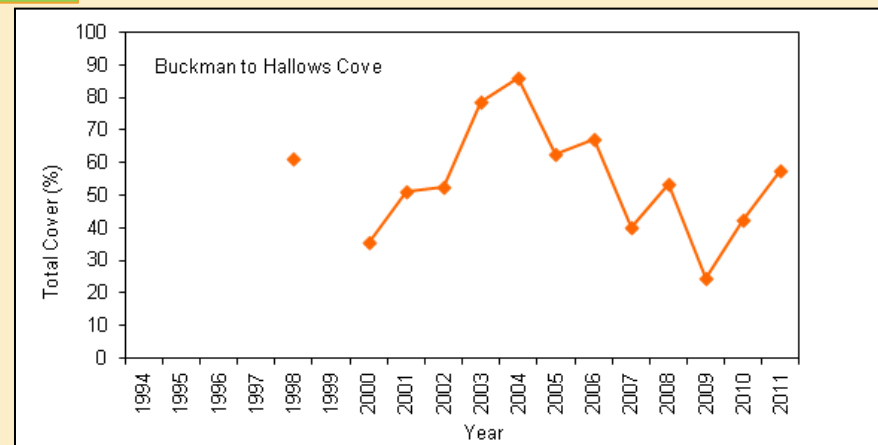
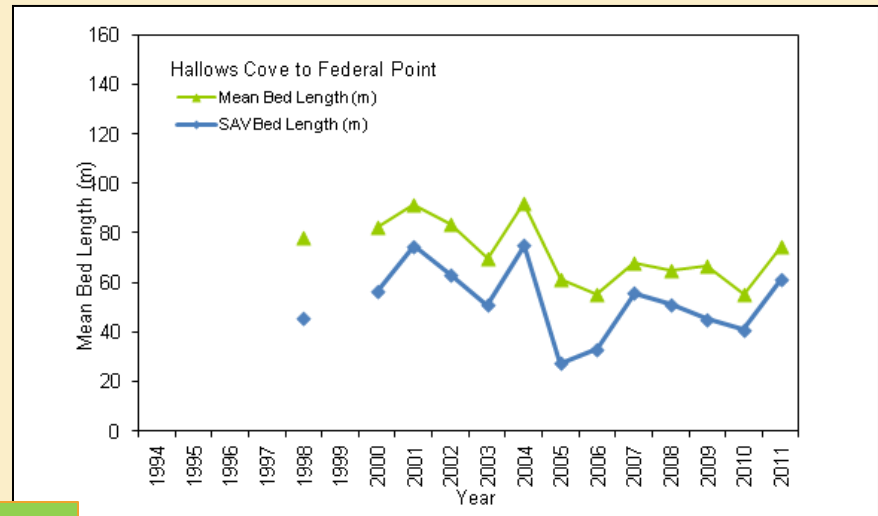
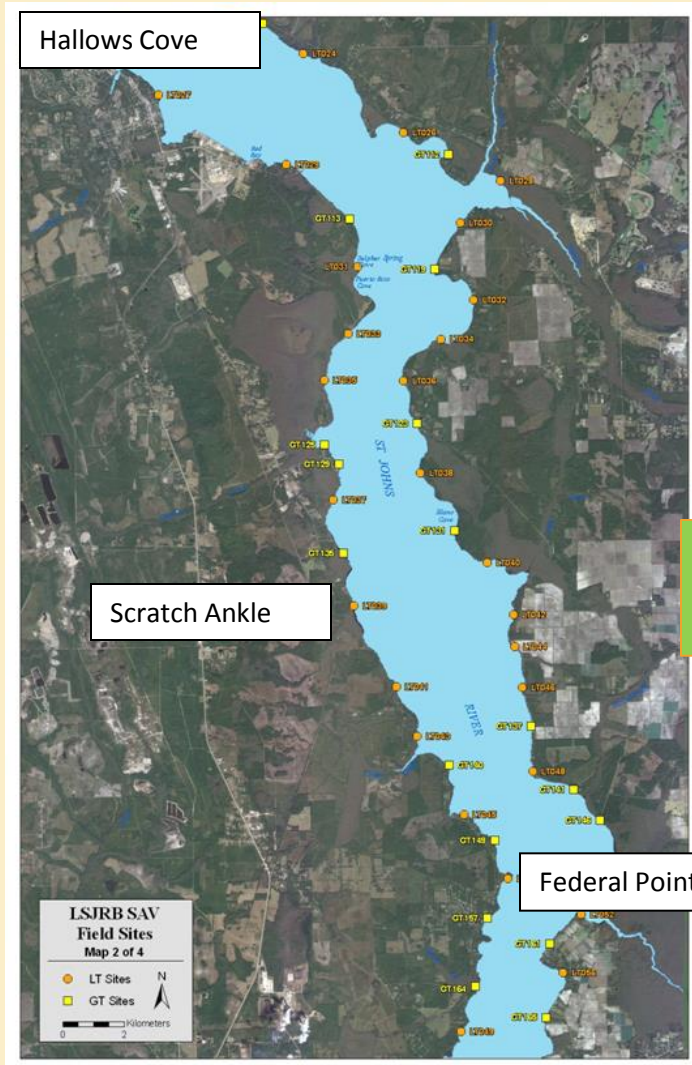


*Tape grass*  
*Widgeon grass*  
*Horned pondweed*  
*Water naiad*

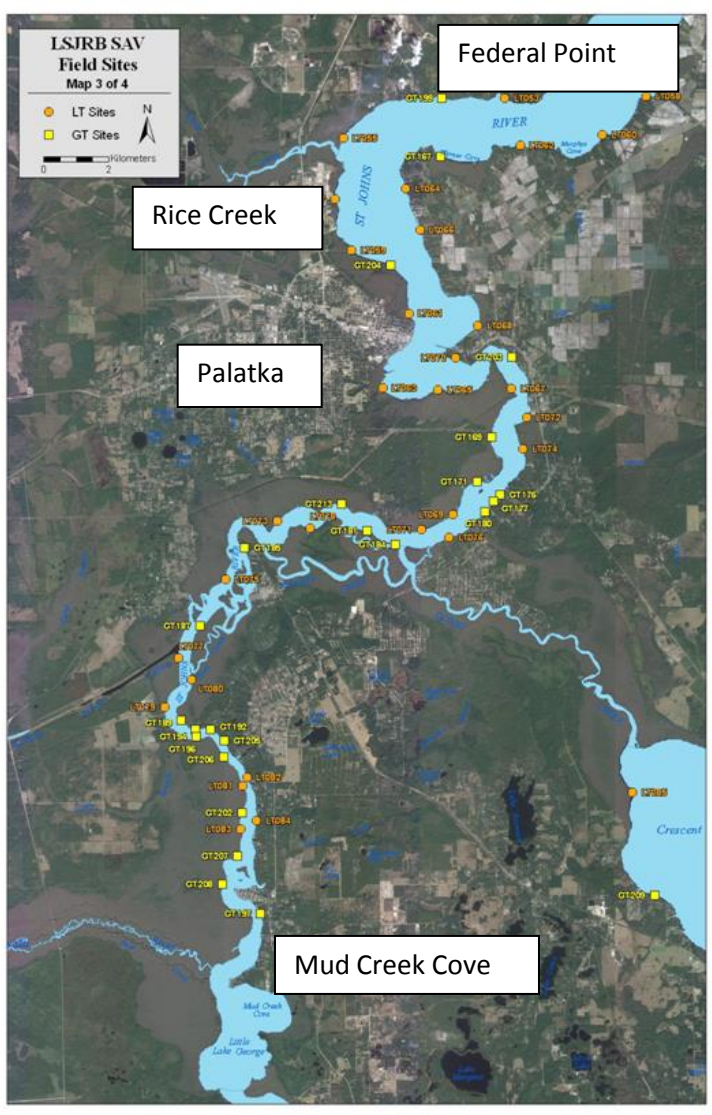
*Tape grass*  
*Widgeon grass*  
*Water naiad*



# SAV

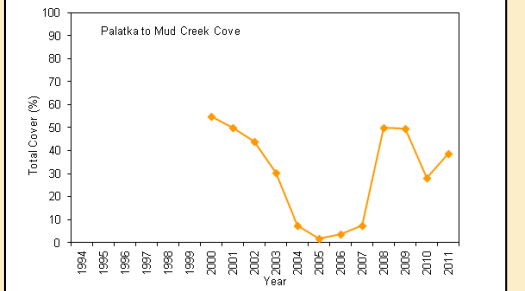
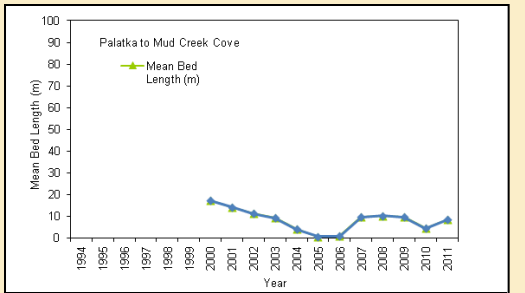
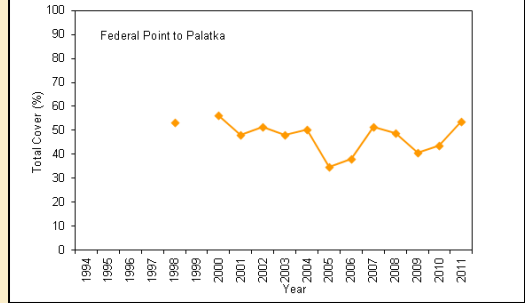
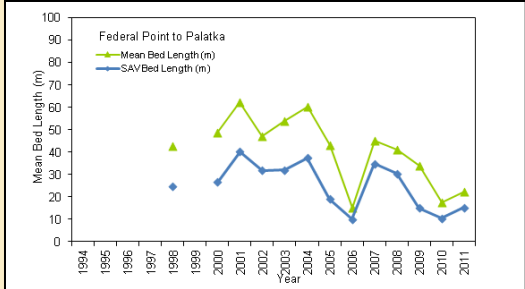


# SAV



*Tape grass*  
*Water naiad*

*Tape grass*  
*Water naiad*  
*Awl-leaf arrowhead*  
*Horned pondweed*





# SAV

- Summary
  - Highly variable over time due to weather and other factors
  - Decline in grass bed coverage
  - Higher salinity, lower % total cover and % tape grass
  - End of monitoring in 2011 limits understanding of SAV dynamics at a critical time

INDICATOR	STATUS	TREND
Submerged Aquatic Vegetation	Unsatisfactory	Conditions worsening

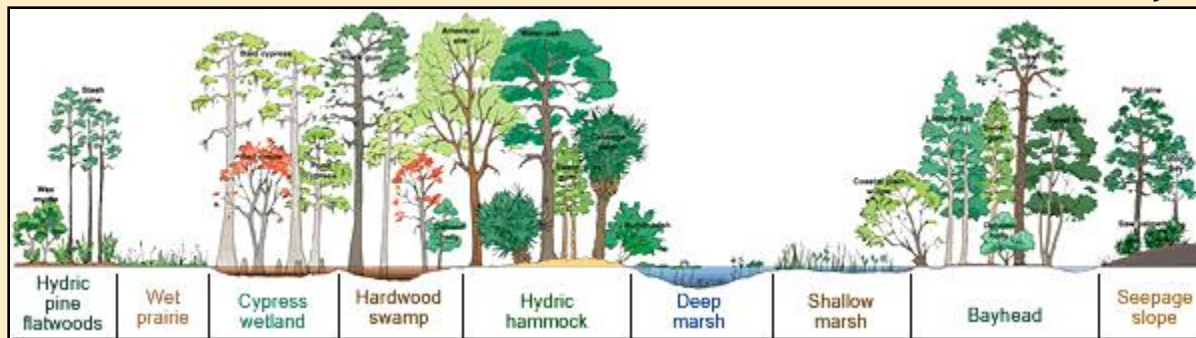
# Wetlands

- Significance

- Nurseries
- Habitat
- Food for manatees, fish, invertebrates, etc.
- Improves water quality
- Provide flood control
- Stabilize banks



Photos by Heather McCarthy



# Wetlands

- Multiple stressors

Pollutants



Sea level rise



Hydrology

Fragmentation



Development

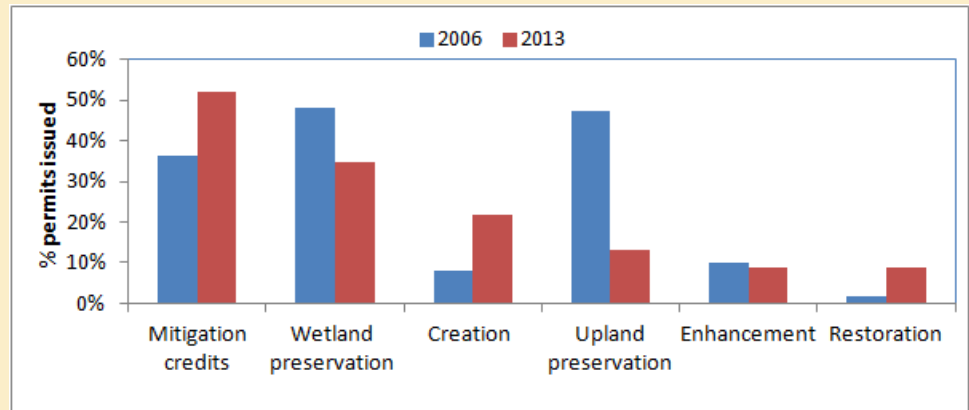
Invasive species



[http://www.nwrc.usgs.gov/topics/invasive\\_species/index.htm](http://www.nwrc.usgs.gov/topics/invasive_species/index.htm)  
www.water.ncsu.edu  
Sjrwmd permitting site

# Wetlands

- Mitigation for destruction
  - Credits from banks, among other means
  - In 2013, credits were used in half the SJRWMD permits
    - Increased ~ 15% since 2006

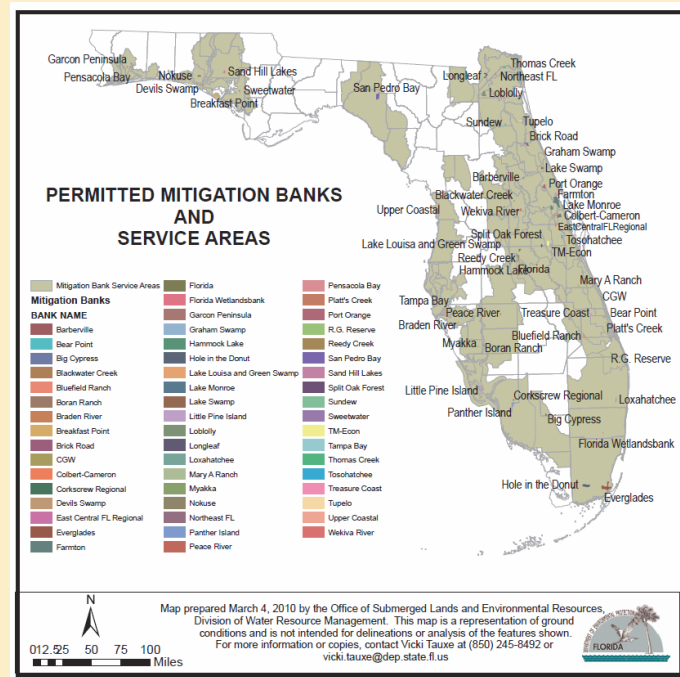


- Mitigation Banks

- 15 banks - USACE
  - ~ 50,000 acres
  - Most forested freshwater
- 11 banks - SJRWMD
  - ~ 25,000 acres
  - Most palustrine forested
- Serve areas with different wetland locales

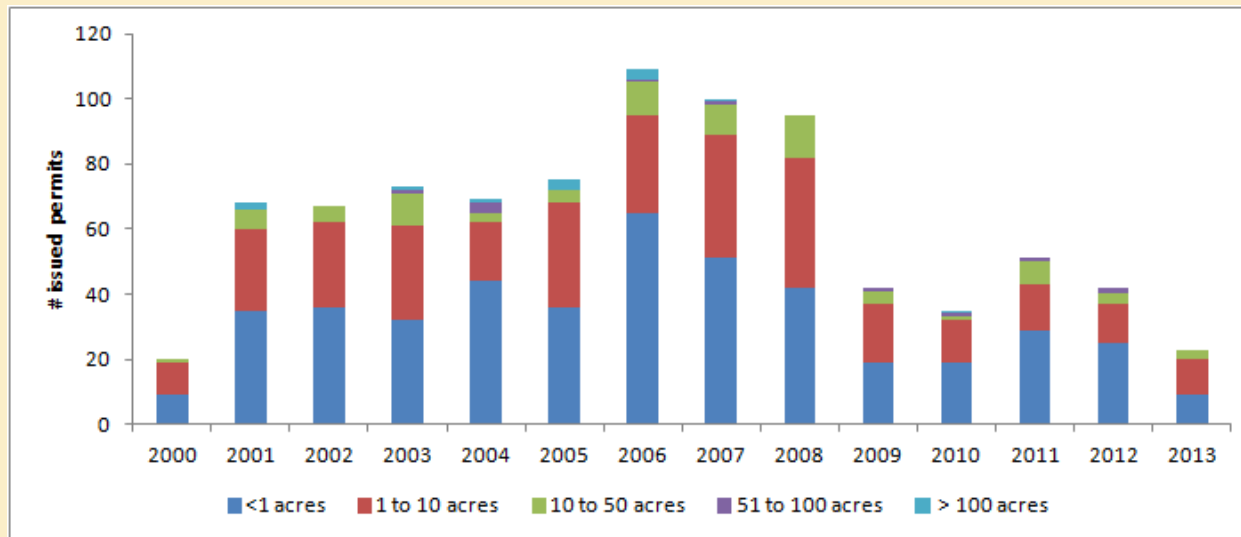
- Concerns

- Shift in wetland types in LSJRB
- Banks may not function as intended (Reiss 2013)



# Wetlands

- Fragmentation
  - Continuity of wetlands essential
  - Small wetlands connect, including intermittent ones
  - Small altered wetlands may be unmitigated
  - Most SJRWMD permits for less than 10 acres



# Wetlands

- **Summary**

- Difficult to assess LSJRB wetlands status

- Concerns:

- Shifts in wetlands types from mitigation and salinity increases
- Loss of coastal wetlands
- Loss of function by connectivity disruptions

During 2004-2009, over one third of a million acres of US coastal wetlands were lost, a rate 25% higher than the prior 5 years  
(Dahl and Stedman 2013)

INDICATOR	STATUS	TREND
Wetlands	Unsatisfactory	Uncertain

# Nonnative Aquatic Species

- ~68 disparate species
  - Plants to mammals
- >65% of the species-freshwater
- Vectors
  - Ballast water
  - Aquarium trade
  - Escapees or release
- Climate change range expansions from southern Florida invasives



INDICATOR	STATUS	TREND
Non-native Aquatic Species	Unsatisfactory	Conditions worsening

# Contaminants

INDICATOR	STATUS	TREND
Chemical Releases (TRI)	Air – Satisfactory Water - Satisfactory	Air – Improving Water - Unchanged
Water Metals	Mixed	Conditions Unchanged
Sediment Metals	Unsatisfactory	Conditions Unchanged
Sediment Polyaromatic Hydrocarbons (PAHs)	Unsatisfactory	NORTHERN LSJRB – Improving SOUTHERN LSJRB - Uncertain
Sediment Polychlorinated Biphenyls (PCBs)	Unsatisfactory	Conditions Unchanged
Sediment Pesticides with Chlorine	Unsatisfactory	Conditions Unchanged

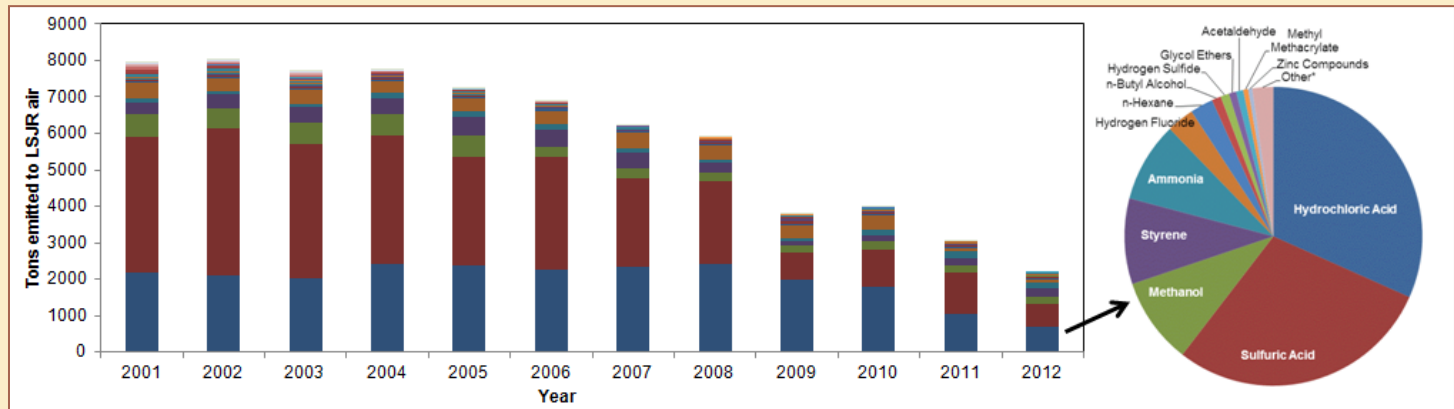


# Contaminants

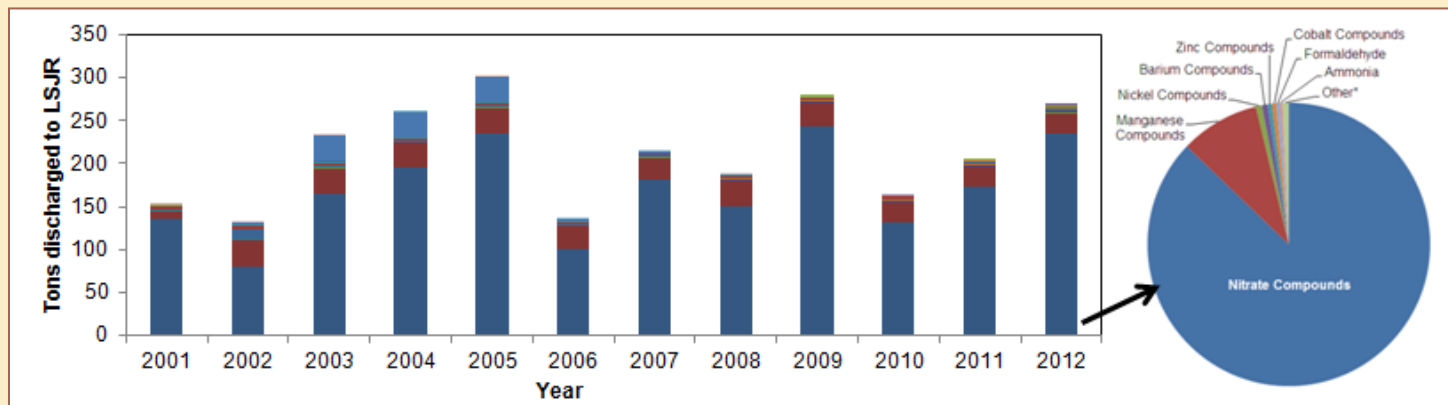
- Toxics Release Inventory

Point sources of chemicals from permitted industries

- Total chemical releases to air



- Total Chemical releases to water

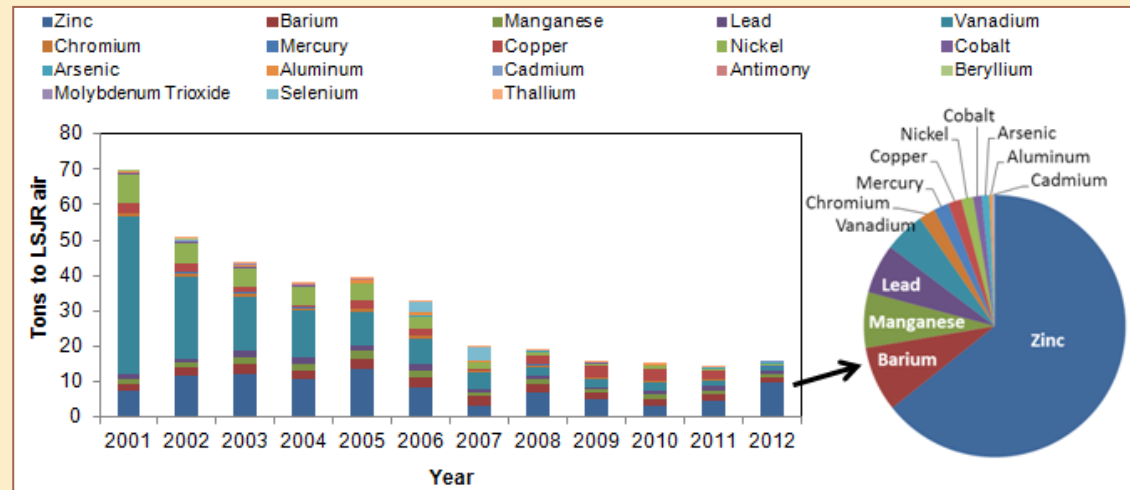


# Contaminants

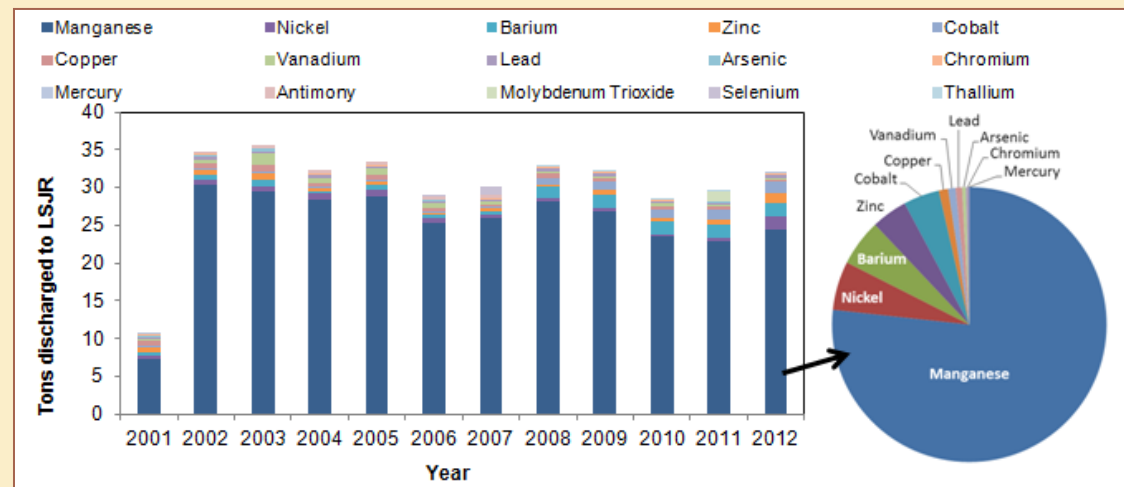
- Toxics Release Inventory

Point sources of chemicals from permitted industries

— Total metals released to air



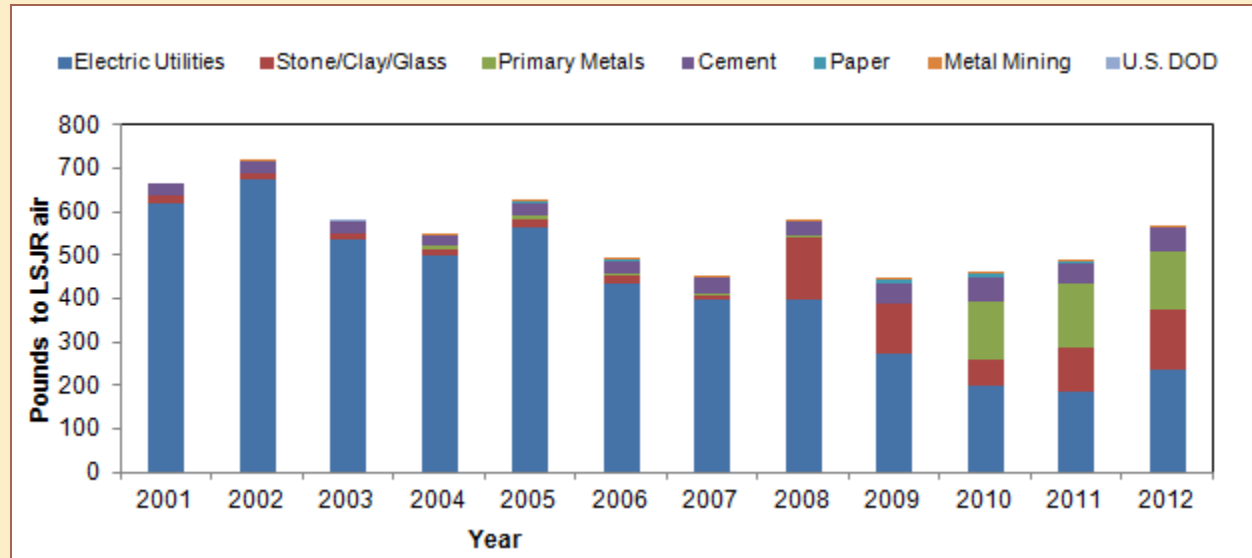
— Total metals released to water



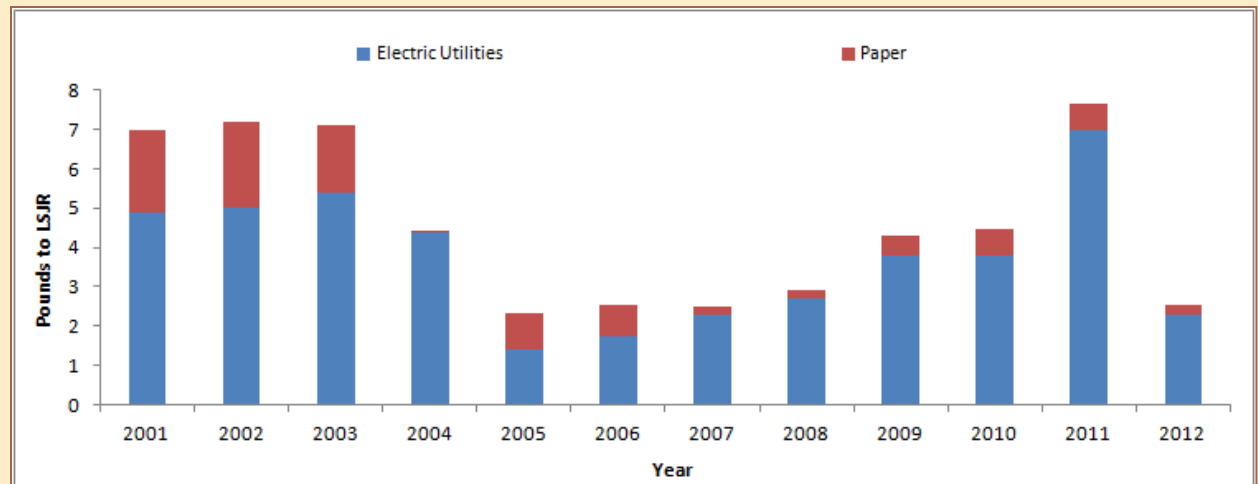
# Contaminants

- Mercury in LSJRB

- Total mercury released to air

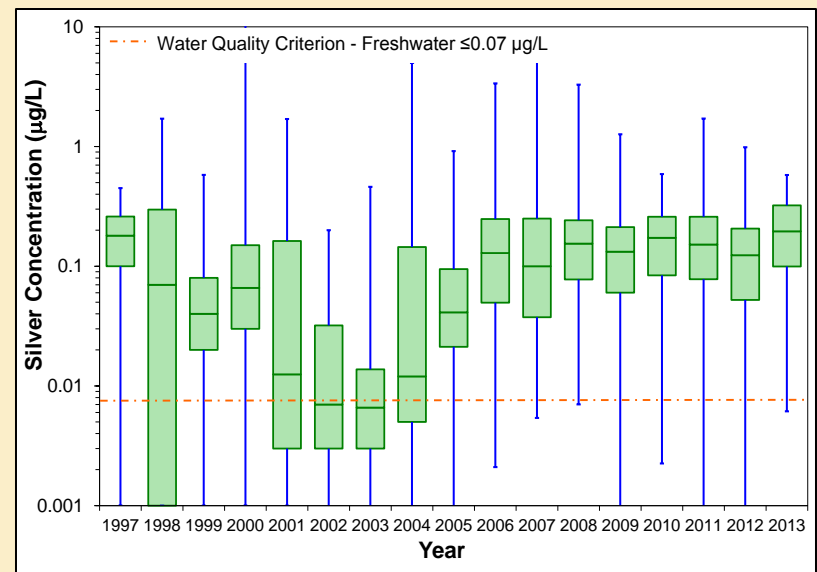
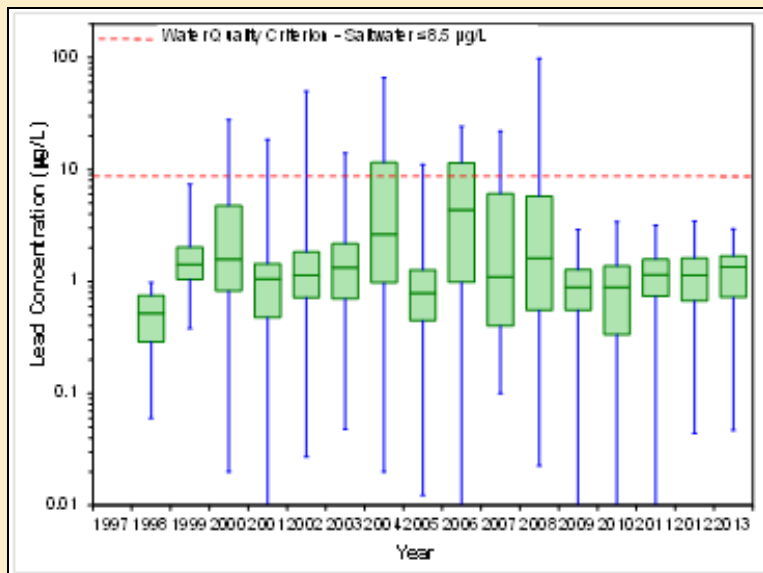


- Total mercury released to water



# Contaminants

- Water column metals
  - Mainstem metals down since 2009
  - Most maxima below AWQ criteria
  - Silver in freshwater mainstem an exception
    - Low criterion
  - Some tribs have high levels of silver, lead and copper



# ways you can help the St. Johns River



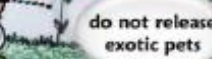
do not sweep leaves down storm drain



wash cars on lawn, not driveway



collect dog droppings



do not release exotic pets

limit use of weed killers and pesticides

- do not discard monofilament fishing line
- practice proper catch-and-release techniques
- use circle and corrodible fishing hooks



limit footprint of docks and bulkheads



protect wetlands



do not harm or harass protected species

reduce, reuse, recycle

conserve energy



install a rain barrel

conserve water



apply fertilizers responsibly



monitor & maintain septic tank and drainfield



- place garbage in proper receptacles
- discard hazardous materials (gas, oil, paint) at waste pick-up sites

By Heather McCarthy

Thank you! Questions?