14th State of the River Report for the Lower St. Johns River Basin

Water Quality, Fisheries, Aquatic Life, Contaminants

2021

Gerry Pinto, Ph.D.

About the Report

- Funded 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

- Reviewers and Advisors:
  - SJRWMD
  - City of Jacksonville
  - FL Dept. of Health
  - FDEP
  - JEA
  - St. Johns Riverkeeper
  - Middlebrook Company
  - The Nature Conservancy
  - FWRI
  - FL Sea Grant
  - National Park Service
  - Wildwood Consulting
  - UNF
  - JU
  - Valdosta State
  - Teachers from DCPS/Broward Schools
  - Beaches Watch

- Special thanks to:
  - Dr. Andy Ouellette
  - Dr. Peter Bacopoulos
  - Dr. Stuart Chalk
  - Dr. Lucy Sonnenberg
  - Dr. Dan McCarthy
  - Ms. Heather McCarthy
  - Dr. Pat Welsh
  - Ms. April Moore
  - Dr. Ray Bowman
  - Dr. Quinton White

The River Report is an independent assessment. Reviewing this Report does not imply agreement with opinions and conclusions reached by the Report's authors.

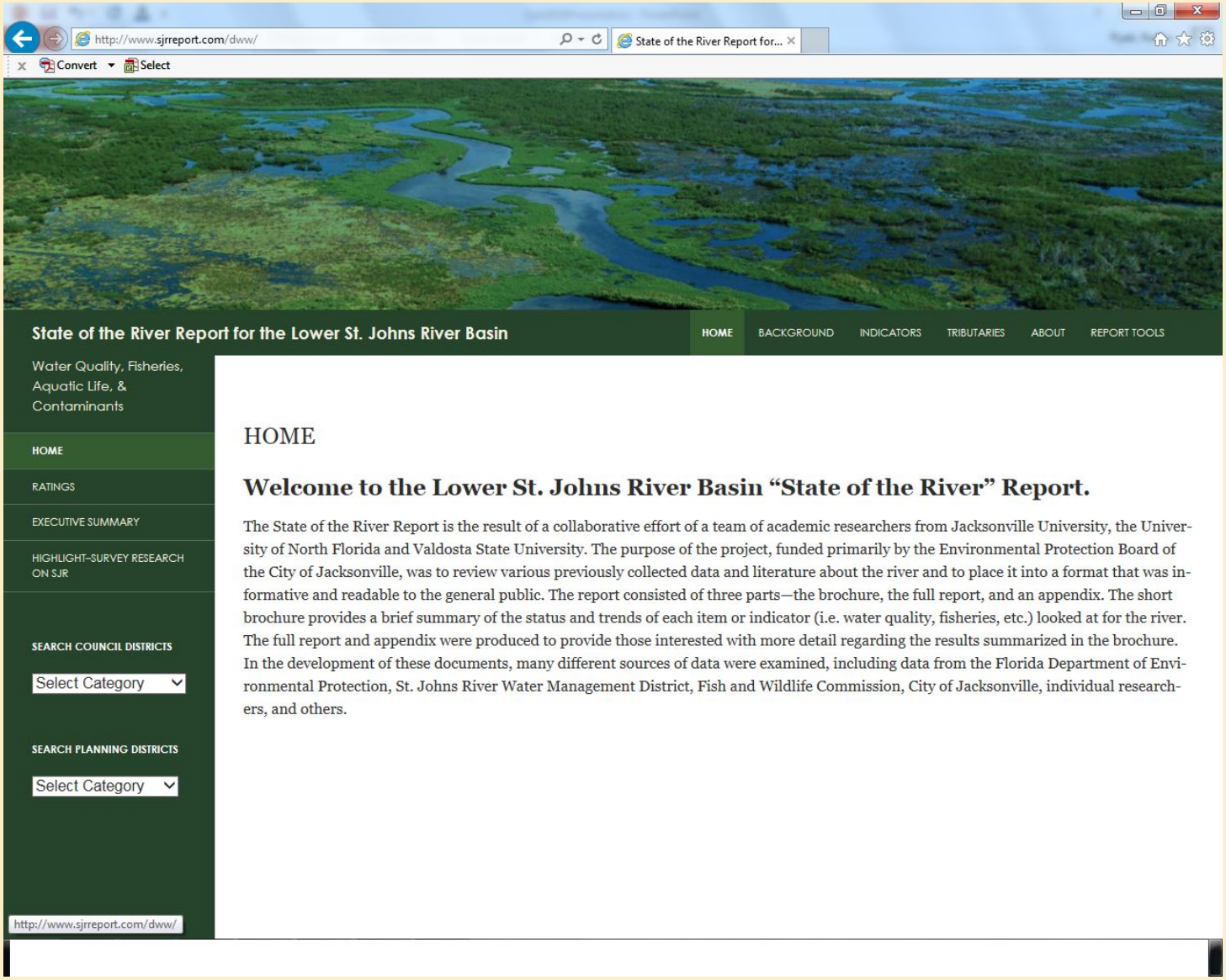
About the Report

- Topics
  - Highlight – PFAS – emerging contaminant, by Dr. Gretchen Bielmyer-Fraser
  - Background, Guide for the General Public, by Dr. Charles Closmann
    - Water Quality
    - Fisheries
    - Aquatic Life
    - Contaminants

SJRreport.com

- Full Report, Appendices, and Brochure
- Digital archive of references
- Web Site is interactive – searchable by COJ council district/planning district
- Maps and data that visualize vulnerabilities along the St. Johns River, by Dr. Ashley Johnson (SSOs, Impaired Waters, Septic Tanks, Aquifer Vulnerability, Soil Drainage Classifications, and JEA's owned properties).
- Lesson Plans and educational resources for teachers (video clips on a wide range of topics, including algae blooms, manatees, and oral histories of people who live, work, and recreate on the St. Johns River) by Drs. Zoellner, Ouellette, Closmann, Goldberg and Pinto

Website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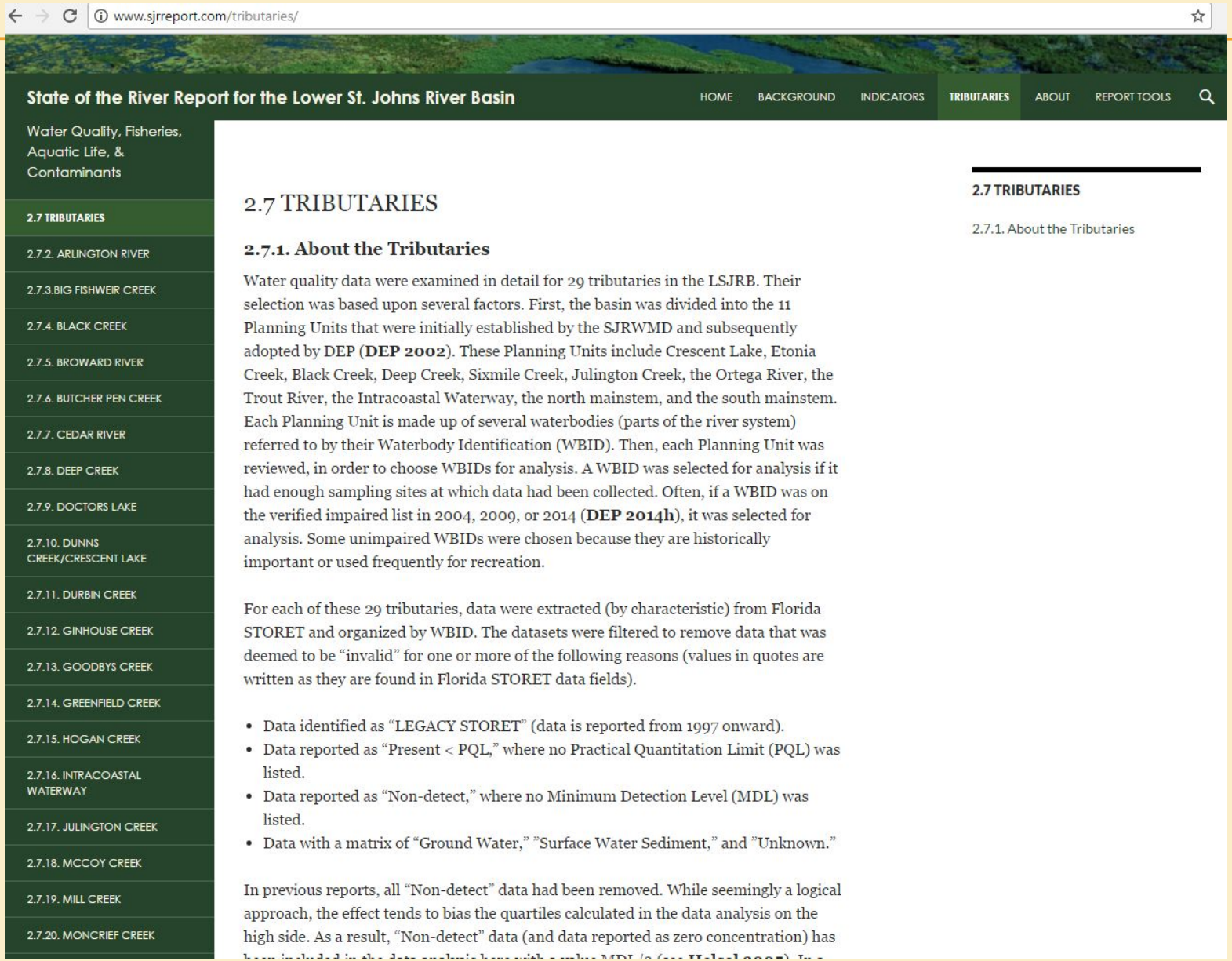
Welcome to the Lower St. Johns River Basin "State of the River" Report.
The State of the River Report is the result of a collaborative effort of a team of academic researchers from Jacksonville University, the University of North Florida and Valdosta State University. The purpose of the project, funded primarily by the Environmental Protection Board of the City of Jacksonville, was to review various previously collected data and literature about the river and to place it into a format that was informative and readable to the general public. The report consisted of three parts—the brochure, the full report, and an appendix. The short brochure provides a brief summary of the status and trends of each item or indicator (i.e. water quality, fisheries, etc.) looked at for the river. The full report and appendix were produced to provide those interested with more detail regarding the results summarized in the brochure. In the development of these documents, many different sources of data were examined, including data from the Florida Department of Environmental Protection, St. Johns River Water Management District, Fish and Wildlife Commission, City of Jacksonville, individual researchers, and others.

Tributaries



www.sjrreport.com/tributaries/

State of the River Report for the Lower St. Johns River Basin

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Water Quality, Fisheries, Aquatic Life, & Contaminants

- 2.7 TRIBUTARIES
- 2.7.2. ARLINGTON RIVER
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- 2.7.4. BLACK CREEK
- 2.7.5. BROWARD RIVER
- 2.7.6. BUTCHER PEN CREEK
- 2.7.7. CEDAR RIVER
- 2.7.8. DEEP CREEK
- 2.7.9. DOCTORS LAKE
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- 2.7.11. DURBIN CREEK
- 2.7.12. GINHOUSE CREEK
- 2.7.13. GOODBYS CREEK
- 2.7.14. GREENFIELD CREEK
- 2.7.15. HOGAN CREEK
- 2.7.16. INTRACOASTAL WATERWAY
- 2.7.17. JULINGTON CREEK
- 2.7.18. MCCOY CREEK
- 2.7.19. MILL CREEK
- 2.7.20. MONCRIEF CREEK

2.7 TRIBUTARIES

2.7.1. About the Tributaries

Water quality data were examined in detail for 29 tributaries in the LSJRB. Their selection was based upon several factors. First, the basin was divided into the 11 Planning Units that were initially established by the SJRWMD and subsequently adopted by DEP (**DEP 2002**). These Planning Units include Crescent Lake, Etonia Creek, Black Creek, Deep Creek, Sixmile Creek, Julington Creek, the Ortega River, the Trout River, the Intracoastal Waterway, the north mainstem, and the south mainstem. Each Planning Unit is made up of several waterbodies (parts of the river system) referred to by their Waterbody Identification (WBID). Then, each Planning Unit was reviewed, in order to choose WBIDs for analysis. A WBID was selected for analysis if it had enough sampling sites at which data had been collected. Often, if a WBID was on the verified impaired list in 2004, 2009, or 2014 (**DEP 2014h**), it was selected for analysis. Some unimpaired WBIDs were chosen because they are historically important or used frequently for recreation.

For each of these 29 tributaries, data were extracted (by characteristic) from Florida STORET and organized by WBID. The datasets were filtered to remove data that was deemed to be "invalid" for one or more of the following reasons (values in quotes are written as they are found in Florida STORET data fields).

- Data identified as "LEGACY STORET" (data is reported from 1997 onward).
- Data reported as "Present < PQL," where no Practical Quantitation Limit (PQL) was listed.
- Data reported as "Non-detect," where no Minimum Detection Level (MDL) was listed.
- Data with a matrix of "Ground Water," "Surface Water Sediment," and "Unknown."

In previous reports, all "Non-detect" data had been removed. While seemingly a logical approach, the effect tends to bias the quartiles calculated in the data analysis on the high side. As a result, "Non-detect" data (and data reported as zero concentration) has

2.7 TRIBUTARIES

2.7.1. About the Tributaries

Water Quality

Indicator	Status	Trends
Salinity	Unsatisfactory Impacts increasing	Worsening
Fecal Bacteria (FIB)	Mainstem: Uncertain Tributaries: Unsatisfactory	Mainstem: Uncertain Tributaries: Uncertain
Turbidity	Satisfactory	Unchanged
Dissolved Oxygen	Mainstem: Satisfactory Tributaries: Unsatisfactory	Mainstem: Unchanged Tributaries: Unchanged
Algal Blooms	Freshwater: Unsatisfactory Estuarine: Satisfactory	Freshwater: Uncertain Estuarine: Unchanged
Nitrogen	Mainstem: Satisfactory Tributaries: Unsatisfactory	Mainstem: Improving Tributaries: Unchanged
Phosphorus	Mainstem: Marine/Estuarine Unsatisfactory Mainstem: Freshwater Satisfactory Tributaries: Unsatisfactory	Mainstem: Marine/Estuarine Worsening Mainstem: Freshwater Worsening Tributaries: Worsening

Fecal Indicator Bacteria

- LSJRB has 52 tributaries impaired for fecal indicator bacteria: Of those, 29 have final BMAPs in place.

Bennett Branch	Cowhead Creek	Greenfield Creek (Freshwater Segment)	Mill Log Creek	Oldfield Creek	Sherman Creek	West Branch Blockhouse Creek
Big Fishweir Creek (Freshwater Segment)	Craig Creek (Marine Segment)	Hogan Creek	Miller Creek (Freshwater Segment)	Open Creek (Freshwater Segment)	Silversmith Creek	Williamson Creek
Big Fishweir Creek (Marine Segment)	Deep Bottom Creek	Hopkins Creek	Miller Creek (Marine Segment)	Open Creek (Marine Segment)	Strawberry Creek	Wills Branch (North Prong)
Blockhouse Creek (Freshwater Segment)	Deer Creek	Jones Creek	Miramar Creek	Ortega River	Terrapin Creek	Wills Branch (South Prong)
Butcher Pen Creek	Dunn Creek (Marine Segment)	Julington Creek	Moncrief Creek (Freshwater Portion)	Pottsburg Creek (Freshwater Segment)	Trout River (Middle Reach Marine Segment)	
Cedar River	Eagle Run	Little Pottsburg Creek (Freshwater Portion)	Moncrief Creek (Marine Portion)	Red Bay Branch	Trout River (Upper Reach)	
Cedar Swamp Creek	Fishing Creek	McCoy Creek	New Rose Creek	Ribault River (Marine Segment)	Unnamed Branch	
Cormorant Branch	Goodbys Creek (Freshwater Segment)	McGirts Creek	Newcastle Creek	Ribault River (Tidal Segment)	Unnamed Creek	

FIB Criteria

- Freshwater *E. coli*
- Not to exceed a geometric mean of 126 CFU/100ml
  (min. 10 samples/30 day period)
- Not to exceed 410 CFU/100ml
  (10% threshold value in 10% or more samples/30 day period)

- Marine *Enterococci*
- Not to exceed a geometric mean of 35 CFU/100ml
  (min. 10 samples/30 day period)
- Not to exceed 130 CFU/100ml
  (10% threshold value in 10% or more samples/30 day period)

Fecal Indicator Bacteria

- No tributary has reached compliance targets, with 22% exceedance as the lowest value and 100% as the highest value of 7.5-year rolling average period 2013-2020 (freshwater/marine).

  - Lowest: Big Fishweir Creek (22%).
  - Highest: ≥ 90% exceedances in Miller, Deer, Deep Bottom, Craig, and Butcher Pen creeks.
  - No change: 20 tributaries.
  - Increased 15%: 13 tributaries. Blockhouse segments, Deer, Goodbys, Greenfield, Moncrief, Open, Pottsburg, Sherman, Trout segments.
  - Improvement 15% decrease: 2 tributaries. Greenfield, Wills Branch.

E. coli, and Enterococci

Tributary[1]	Percent Exceedances[2] (# Samples exceeding criteria / total number of samples)			
	E. coli or Enterococci			Fecal Coliform[3]
	1/1/2011 - 6/30/2018	1/1/2012 - 6/30/2019	1/1/2013 - 6/30/2020	1/1/2011-6/30/2018
Big Fishweir Creek (Freshwater)	67%	71%	**78%**	67%
Big Fishweir Creek (Marine)	25%	38%	**22%**	25%
Blockhouse Creek (Freshwater)	60%	71%	**100%**	N/A
Blockhouse Creek (Marine)	No Data	38%	**64%**	
Butcher Pen Creek	76%	79%	76%	78%
Cormorant Branch	69%	64%	67%	69%
Craig Creek (Freshwater Segment)	94%	No Data	**No Data**	N/A
Craig Creek Marine Segment)	No Data	100%	**90%**	
Deep Bottom Creek	92%	86%	90%	73%
Deer Creek	75%	81%	92%	56%
Fishing Creek	50%	48%	51%	50%
Goodbys Creek (Freshwater)	56%	50%	**77%**	62%
Goodbys Creek (Marine)	30%	27%	**43%**	48%
Greenfield Creek (Freshwater)	63%	55%	**30%**	N/A
Greenfield Creek Marine)	0%	6%	**43%**	
Hogan Creek	69%	51%	55%	77%
Hopkins Creek**	77%	81%	70%	70%
McCoy Creek	66%	68%	66%	63%
Miller Creek (Freshwater)	100%	100%	**100%**	N/A
Miller Creek (Marine)	No Data	79%	**81%**	
Miramar Creek	74%	80%	84%	76%
Moncrief Creek (Freshwater)	40%	36%	**31%**	58%
Moncrief Creek (Marine)	36%	48%	**61%**	80%
Newcastle Creek	62%	67%	67%	74%
Open Creek (Freshwater)	57%	44%	**69%**	66%
Open Creek (Marine)	67%	70%	**67%**	59%
Pottsburg Creek (Freshwater)	29%	36%	**44%**	37%
Pottsburg Creek (Marine)	30%	22%	**25%**	47%
Sherman Creek**	37%	52%	60%	45%
Terrapin Creek	70%	63%	88%	73%
Trout River (Middle Freshwater)	29%	17%	**46%**	33%
Trout River (Middle Marine)	38%	43%	**65%**	46%
Trout River (Lower)**	0%	6%	25%	22%
Williamson Creek	58%	53%	66%	84%
Wills Branch	100%	91%	77%	54%

What's new

New Biennial Assessment FDEP – all waterbody segments every two years.

More current and recent data, making the verification, TMDL, BMAP, source tracking, and restoration more timely and efficient.

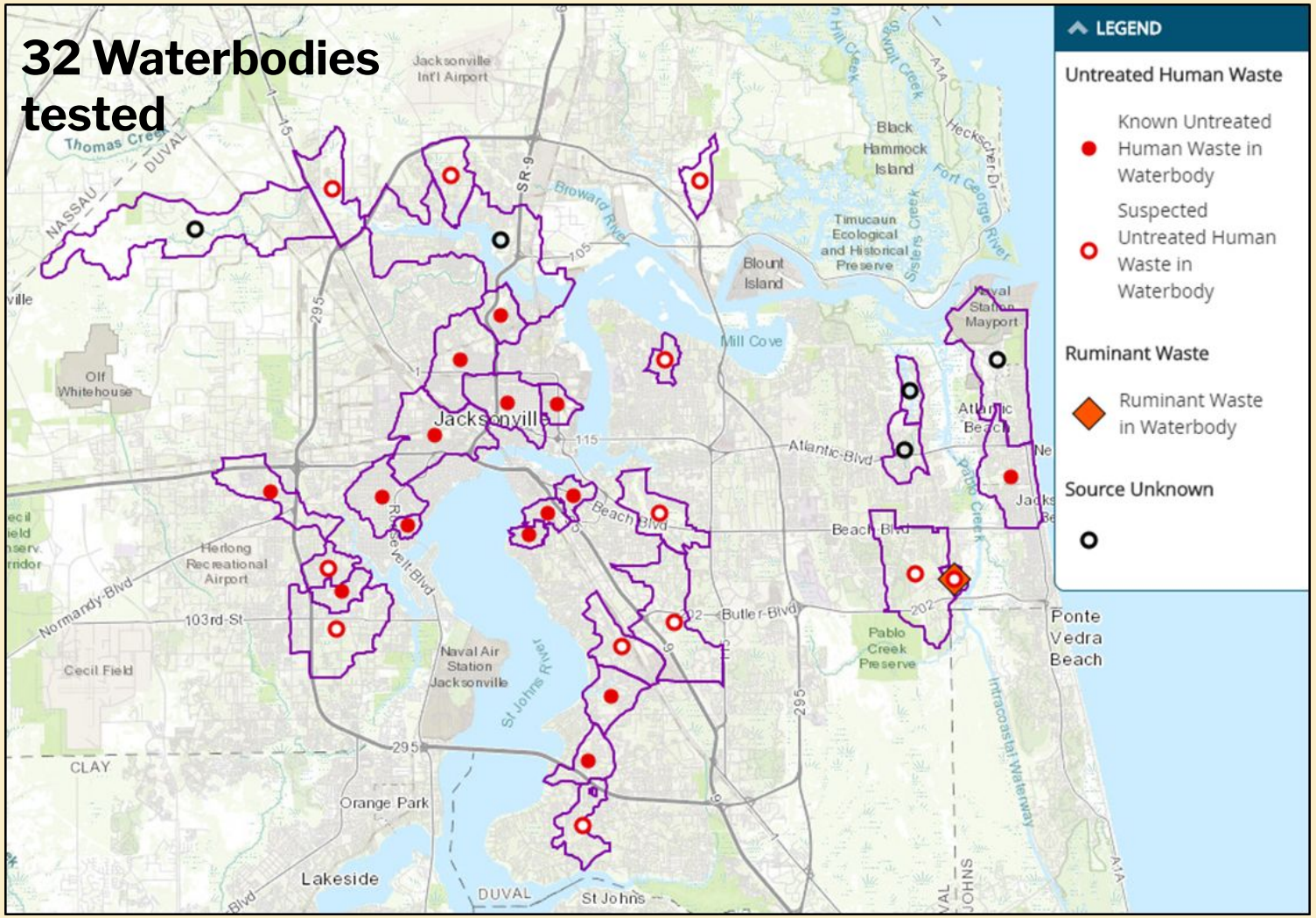
Replaces testing 20% of waterbodies/yr. in 5 year cycles.

Responsible parties are COJ, JEA, the FDOT, FDOH, NAS Mayport, and others including the Cities of Atlantic Beach, Jacksonville Beach, and Neptune Beach. FDEP also plays a role in implementation of BMAP projects. Coordination by the Tributaries Assessment Team.

FDACS for livestock and agriculture sources - BMPs

2020, 580 projects were completed, and 168 activities were ongoing DEP2021.

Source tracking FDEP 2018



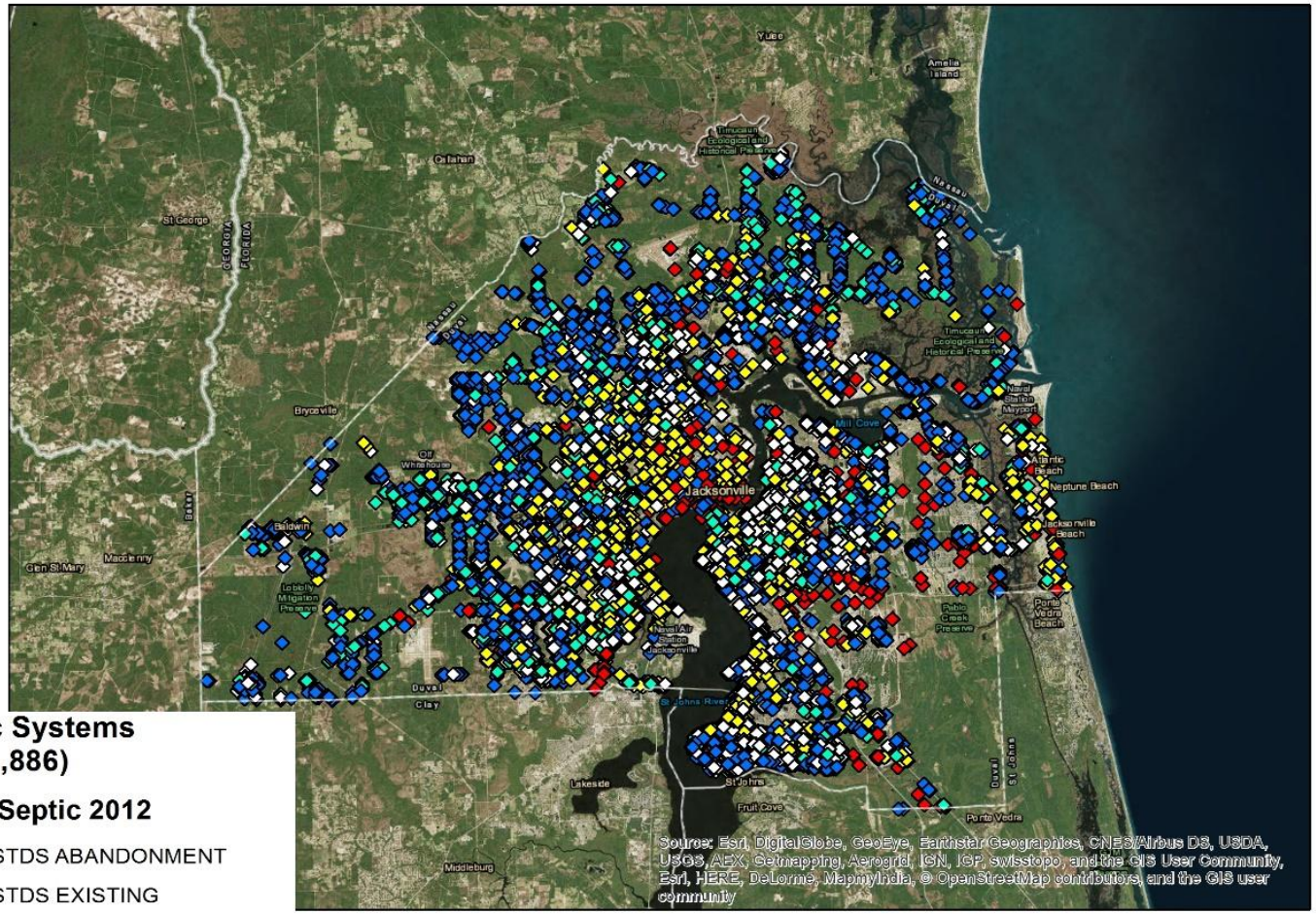
15 Confirmed

12 Suspected, w/one also having ruminant waste

5 Unknown

All Septic Tanks 1992-2012

Data source: Florida Geographic Data Library, GeoPlan, University of Florida (www.fgdl.org).

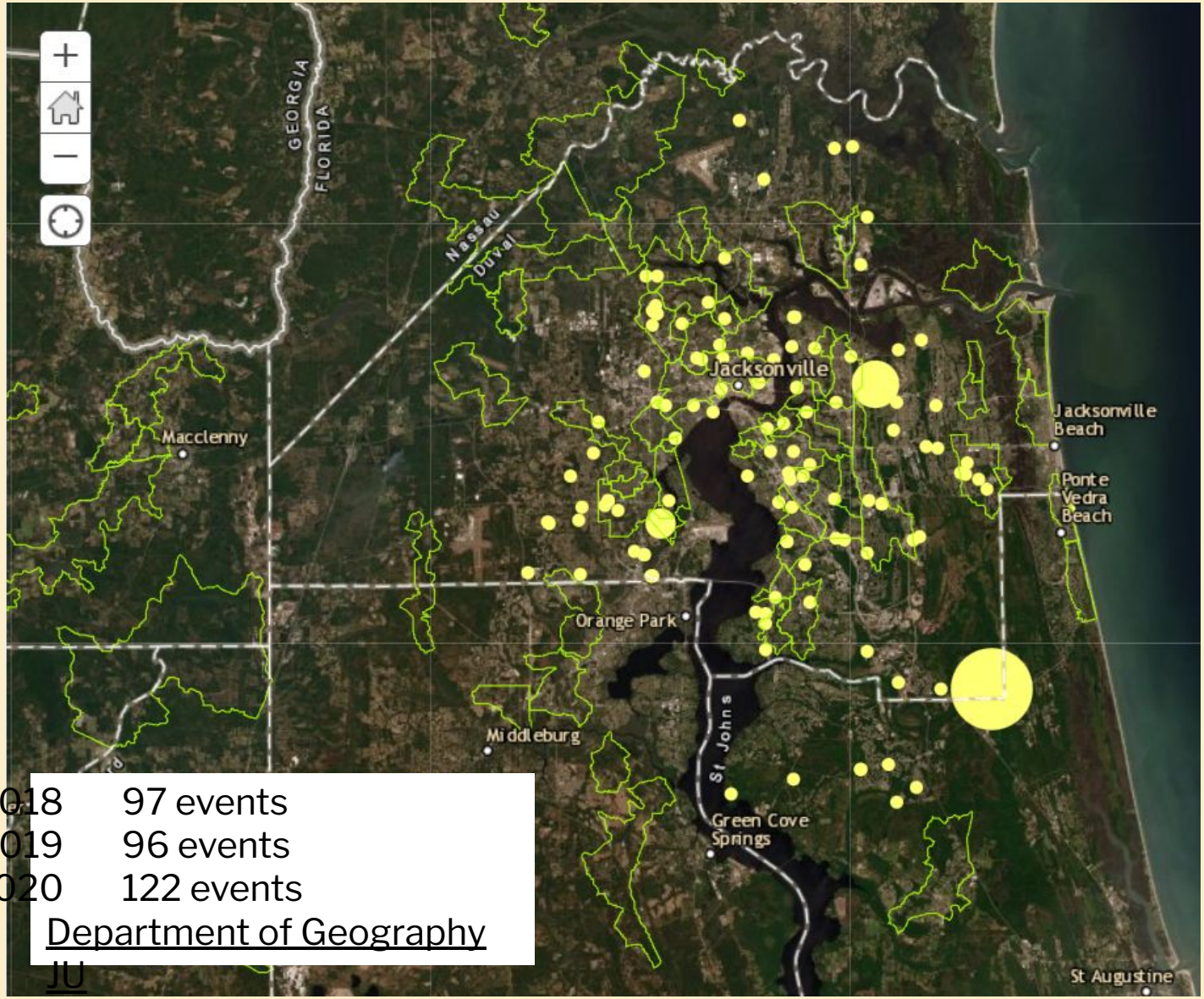


Septic Systems
(n =31,886)

Duval Septic 2012

- OSTDS ABANDONMENT
- OSTDS EXISTING
- OSTDS HOLDING TANK
- OSTDS NEW
- OSTDS REPAIR

SSOs



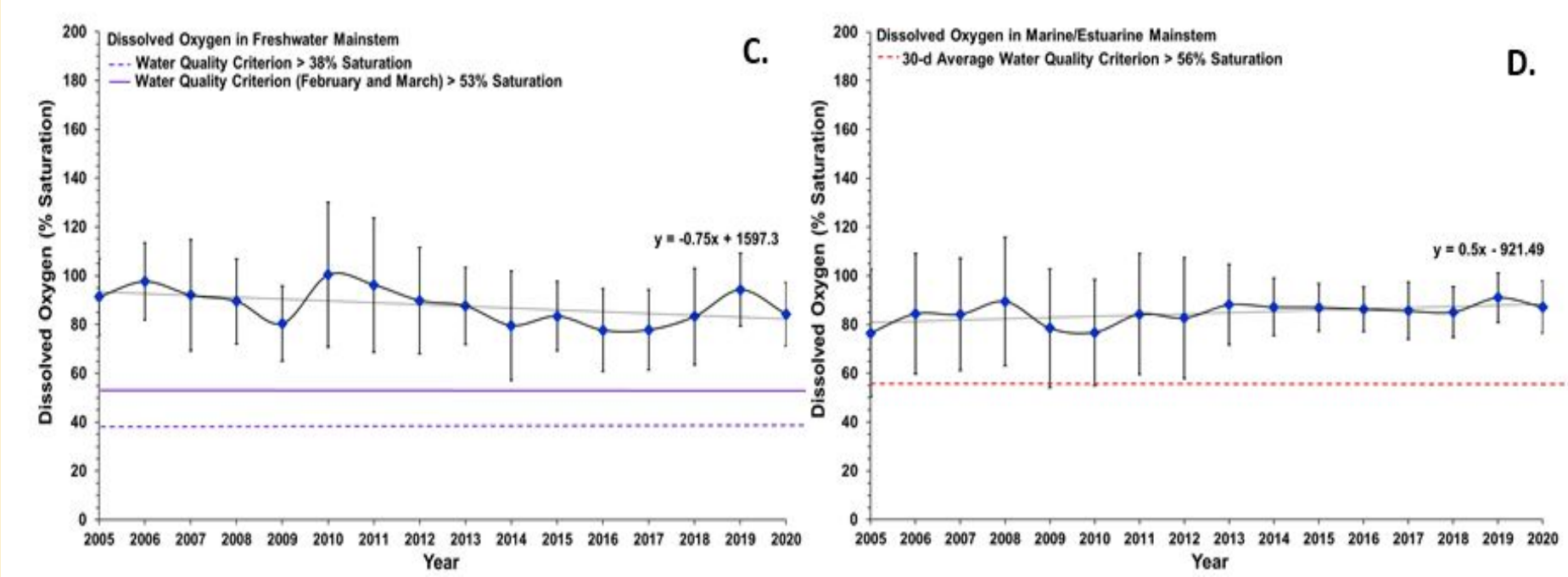
2018 97 events
2019 96 events
2020 122 events

Department of Geography
JU

Dissolved Oxygen – Mainstem

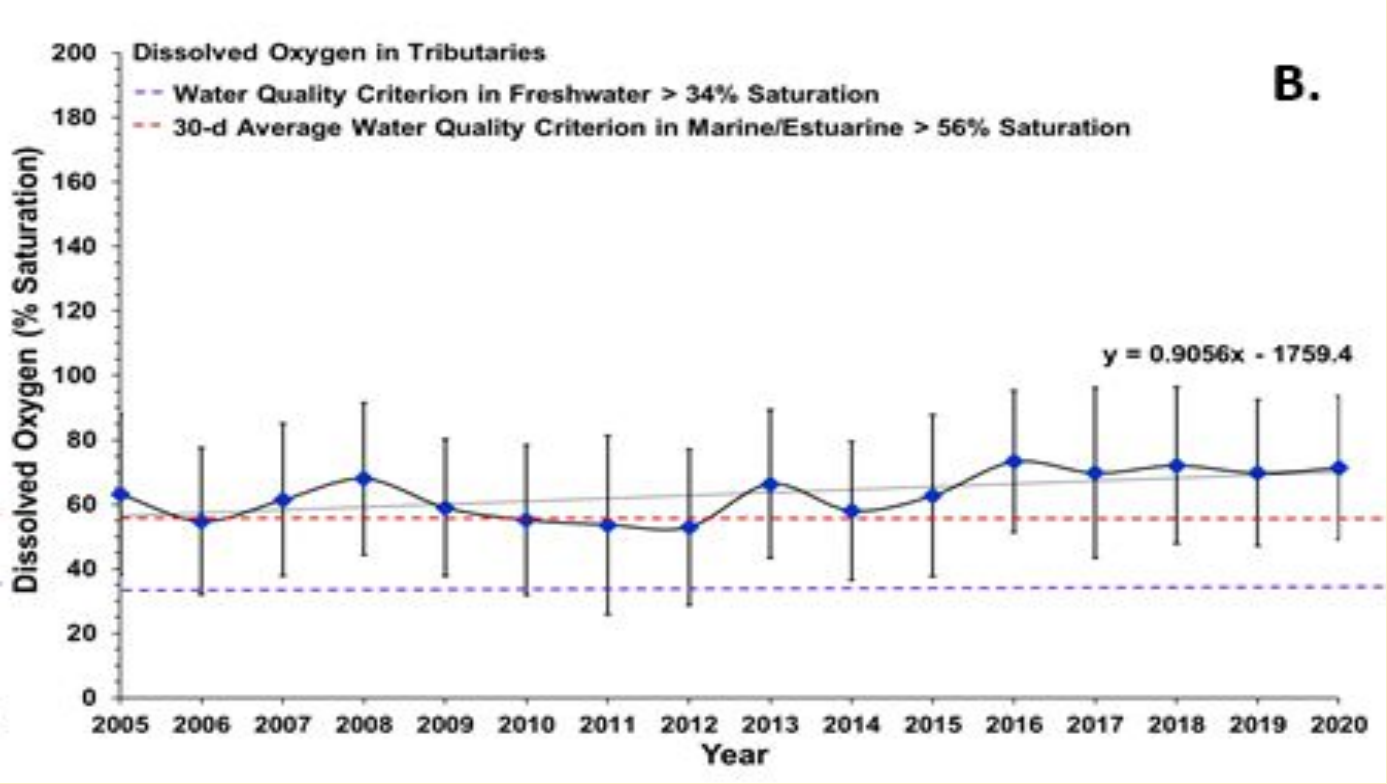
Freshwater

Marine/Estuarin



- Values above line meet criteria. Mainstem medians exceed criteria in both freshwater and marine reaches.

Dissolved Oxygen – Tributaries



- DO in tributaries dependent upon location, time of day, and season.
- Medians in the tributaries exceeded the criterion, many low values.

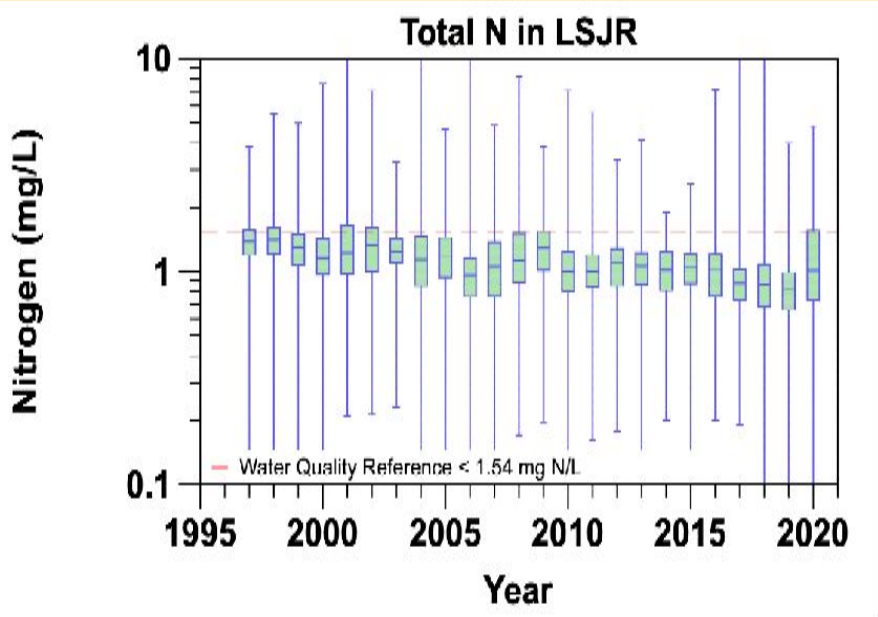
WQC > 38% Saturation
3.5 mg/L at 20°C and 2.9 mg/L at 30°C.

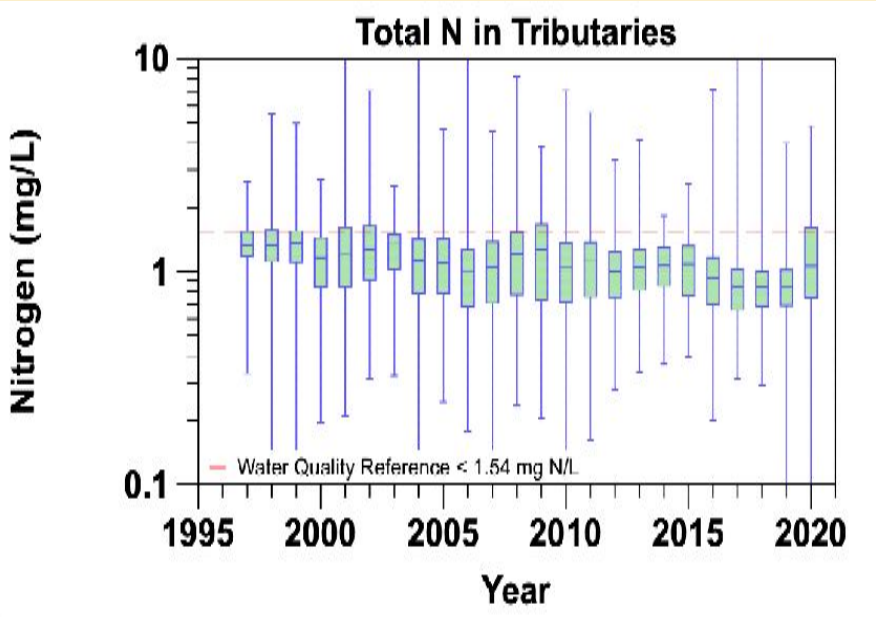
WQC > 56% Saturation
5.09 mg/L at 20°C and 4.28 mg/L at 30°C.

Nutrients

Numeric Standard, peninsular Florida 1.54 mg TN/L (DEP 2013f)

- Total Nitrogen Trend – Mainstem &Tributaries



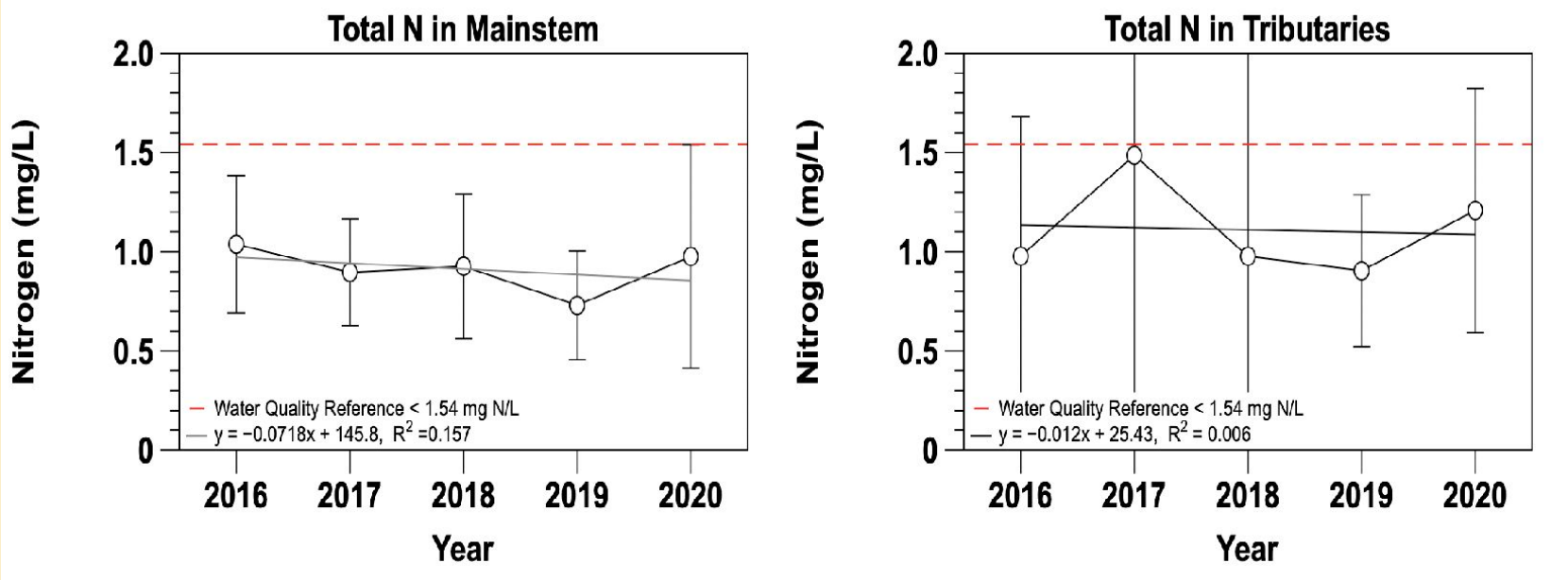


- Total nitrogen levels decreasing, however, unevenly distributed with some areas higher particularly – Tributaries, and salt water mainstem recent uptick.
- Maximum values regularly exceed peninsular FL numeric standard, not adopted WQC, which is in terms of nutrient loading rates (~1.3M Kg TN/Yr.) cannot be compared to actual water concentrations.

Nutrients

Numeric Standard, peninsular Florida 1.54 mg TN/L (DEP 2013f)

- Total Nitrogen Trend – Mainstem &Tributaries 2014-2018

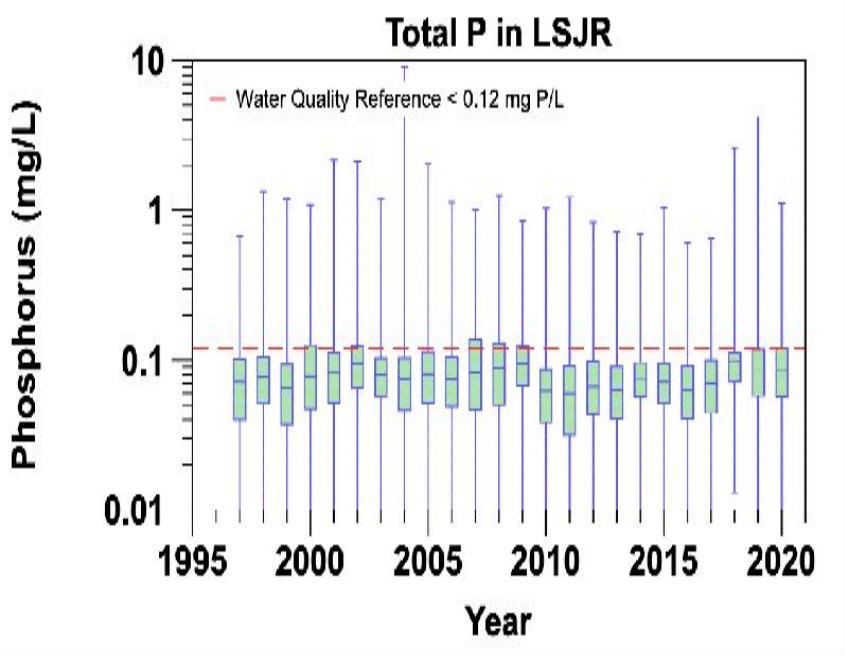


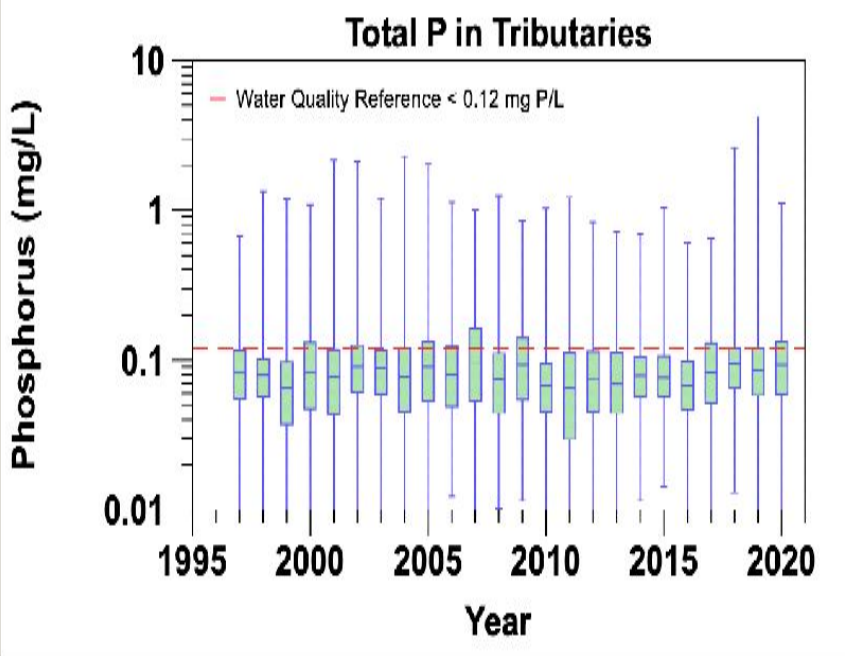
- TN levels in the mainstem trended downwards.
- TN levels in the tributaries spiked in 2017, uptick in 2020.
- Excluding 2017, TN in the tributaries was decreasing slightly.

Nutrients

Numeric standard, peninsular Florida
0.12 mg TP/L (DEP 2013f)

- Total Phosphorus Trend – Mainstem &Tributaries



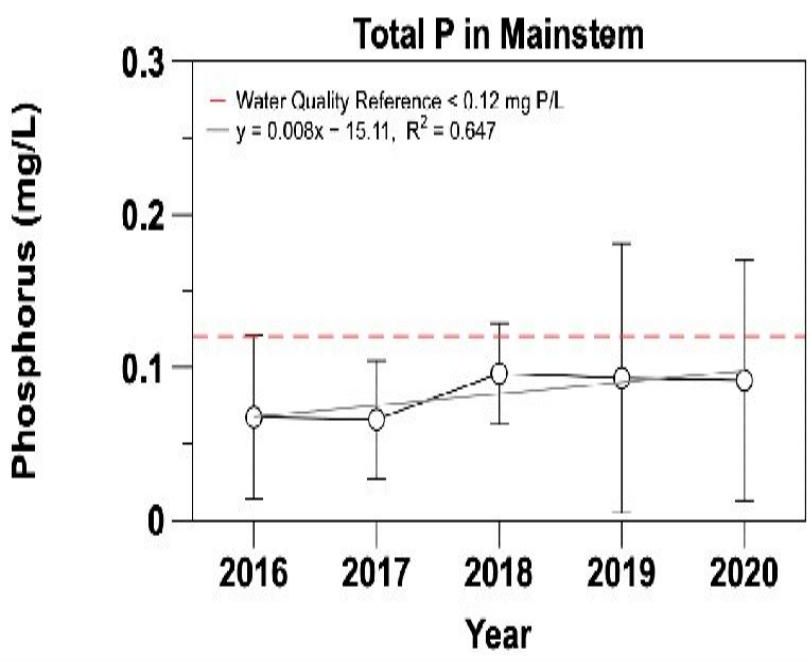


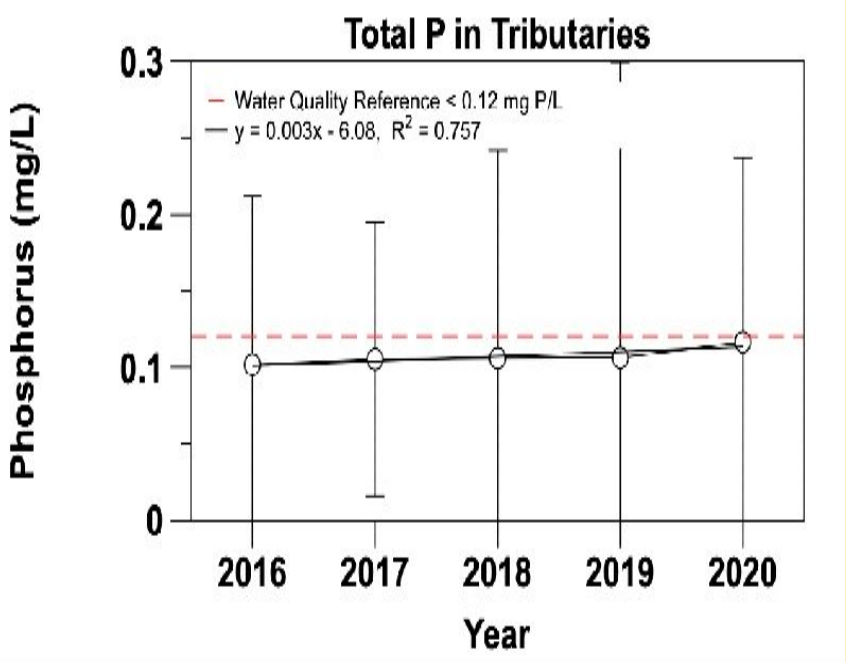
- TP means below reference mainstem; near reference tributaries.
- TP maxima above reference both mainstem & tributaries - unsatisfactory.
- Maximum values exceed the peninsular FL numeric standard, not adopted WQC, which is in terms of nutrient loading (~0.4 M Kg TP/Yr.) cannot be compared to actual water concentrations.

Nutrients

Numeric Standard, peninsular Florida 1.54 mg TN/L (DEP 2013f)

- Total Phosphorus Trend – Mainstem &Tributaries 2014-2018



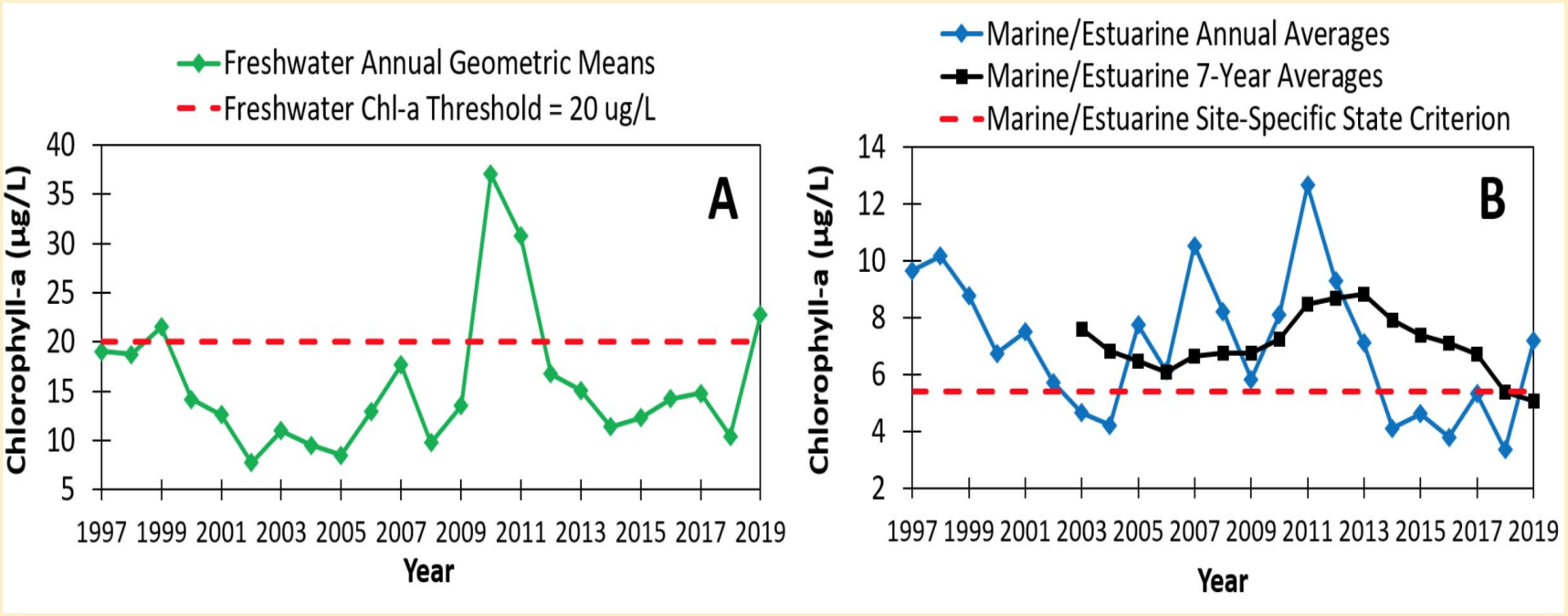


- TP mainstem trending upwards. TP tributaries unchanged.
- TP Freshwater mainstem decreasing since 2014, but jumped up in 2018.
- TP marine/estuarine mainstem increasing over the past 5 yrs.

Chlorophyll-*a*

Freshwater criterion 20 µg/L
Marine criterion 5.4 µg/L

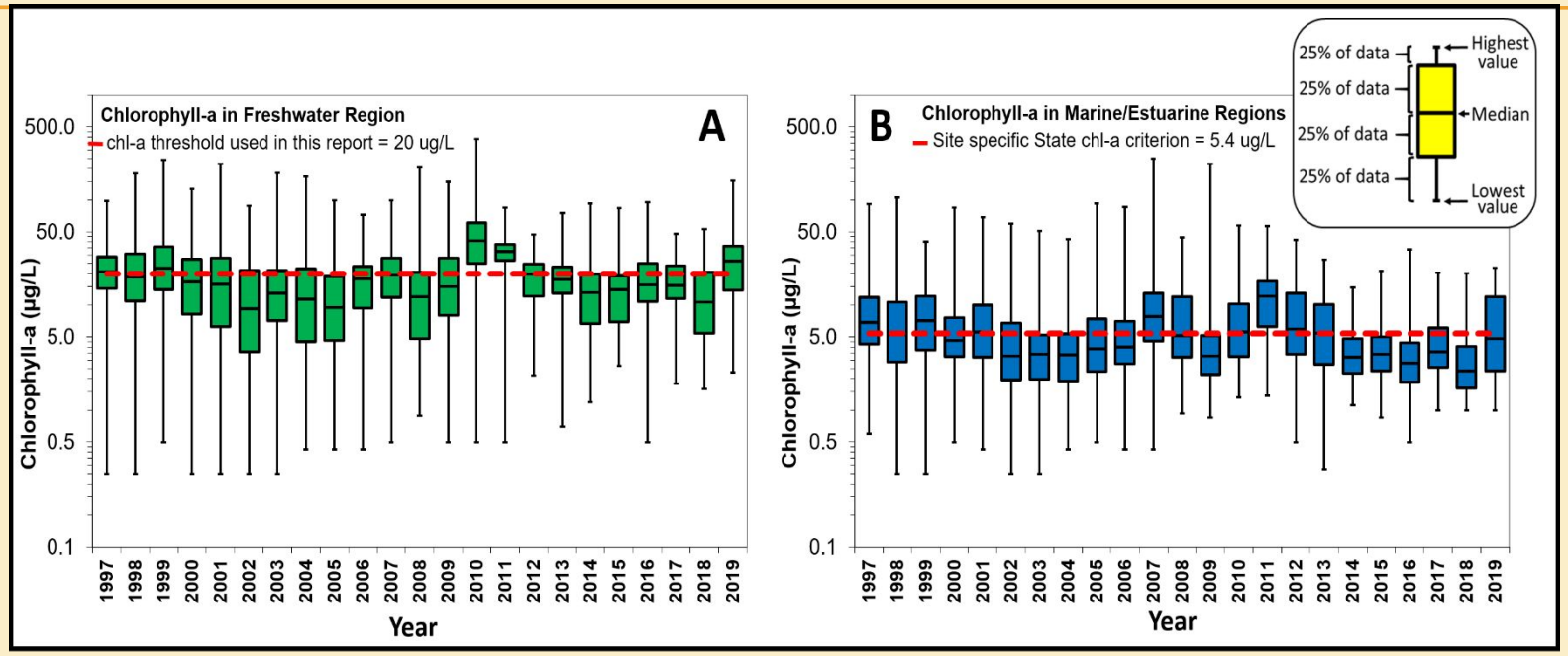
- Phytoplankton indicator used to assess blooms
- Pheophytin-corrected to indicate live organisms



— **Not all blooms are sampled, miss reported toxic events**

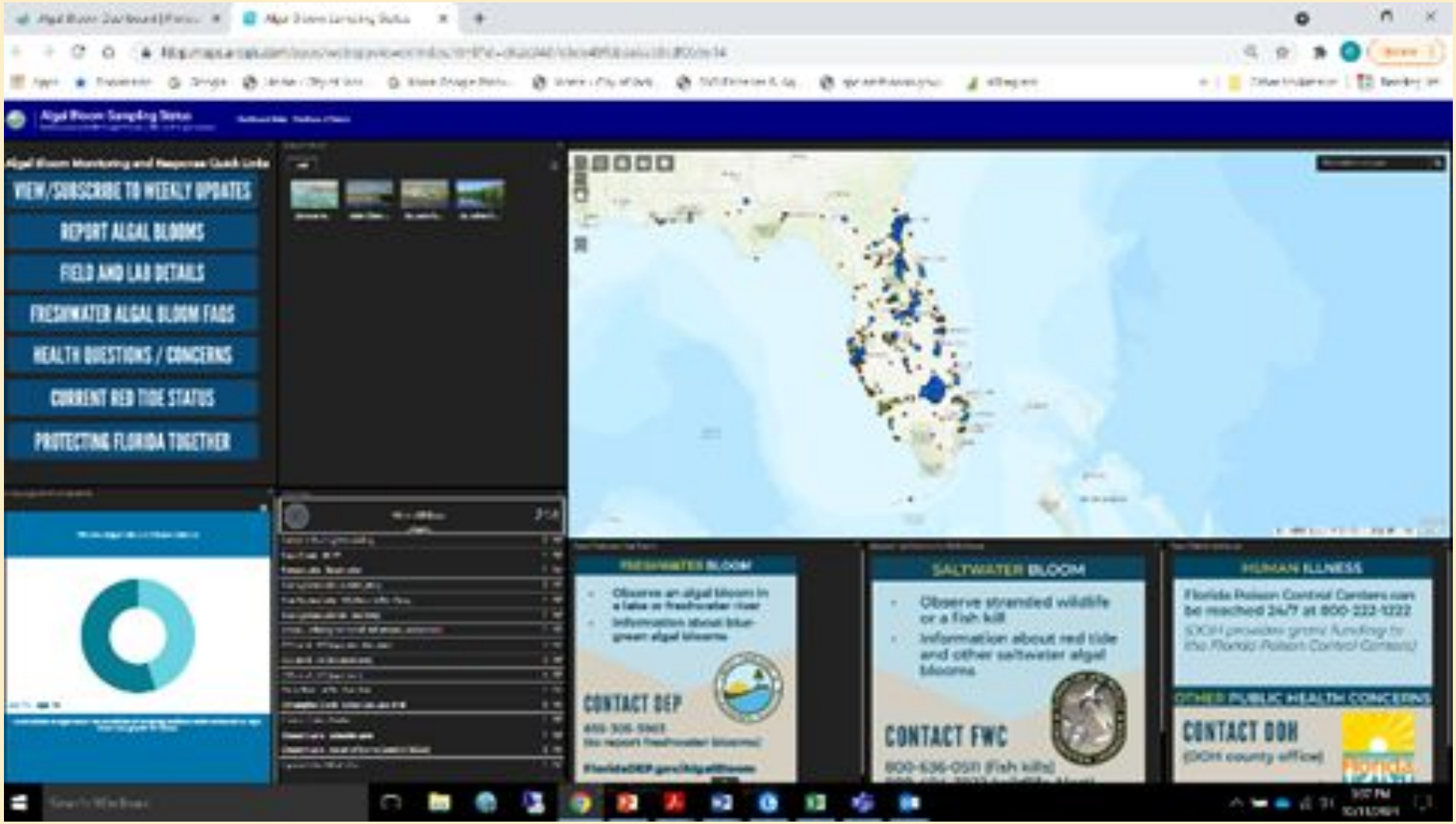
Chlorophyll-*a*

Freshwater criterion 20 µg/L
Marine criterion 5.4 µg/L



- More data than past years, missing data, no data for critical months, sampling location/depth/area – data set limited in scope.
- Some bloom events are not represented in the FDEP WIN/STORET database, so our understanding of frequency, duration, and locations of blooms is not comprehensive.
- Still larger policy issues affecting algae/nutrients –Local, State.

Algae Bloom Network



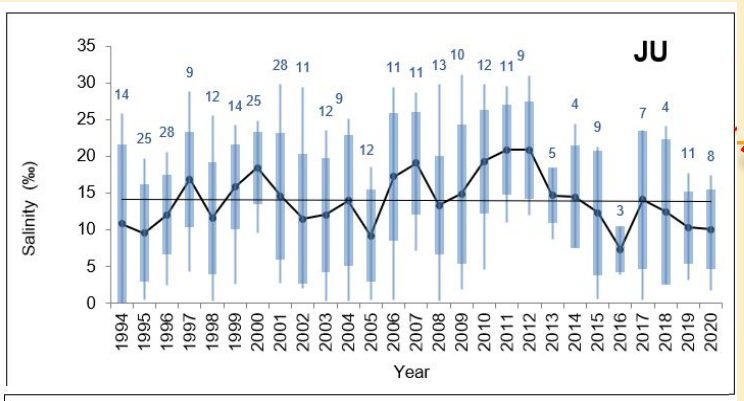
Algae Blooms

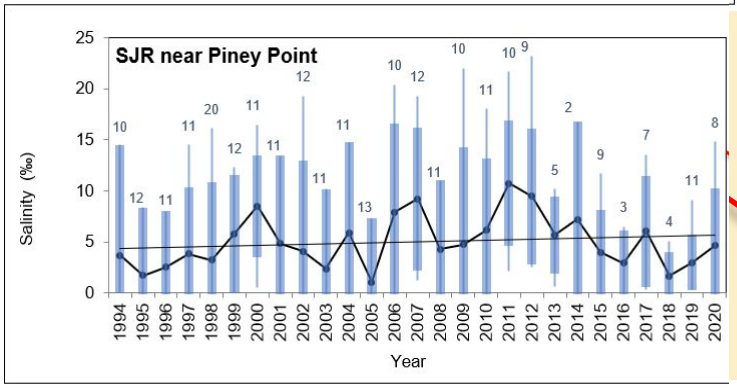
Freshwater criterion 20 µg/L
Marine criterion 5.4 µg/L

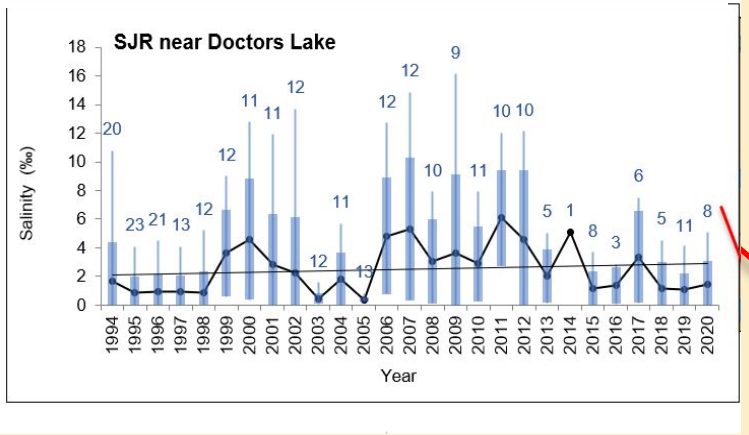
"algal blooms are on the rise, likely due to anthropogenic influence (e.g., increased nutrient levels, climate change [especially elevated temperatures], alterations to physical environments, etc.), and without ameliorative strategies will likely continue to become more problematic as time progresses" Dr. Dale Casamatta (UNF).

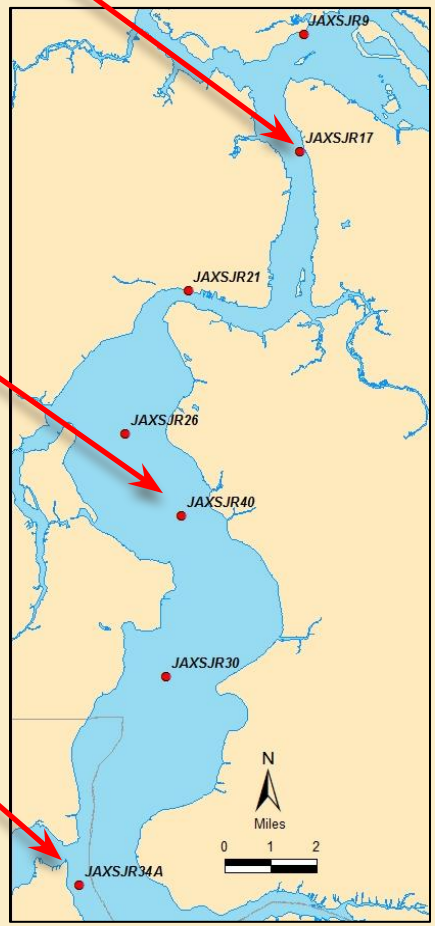
Salinity

- Fluctuations with weather
  - Drought
  - Hurricanes
- Daily fluctuations with tide up to Shands Bridge
- Increasing mean salinity





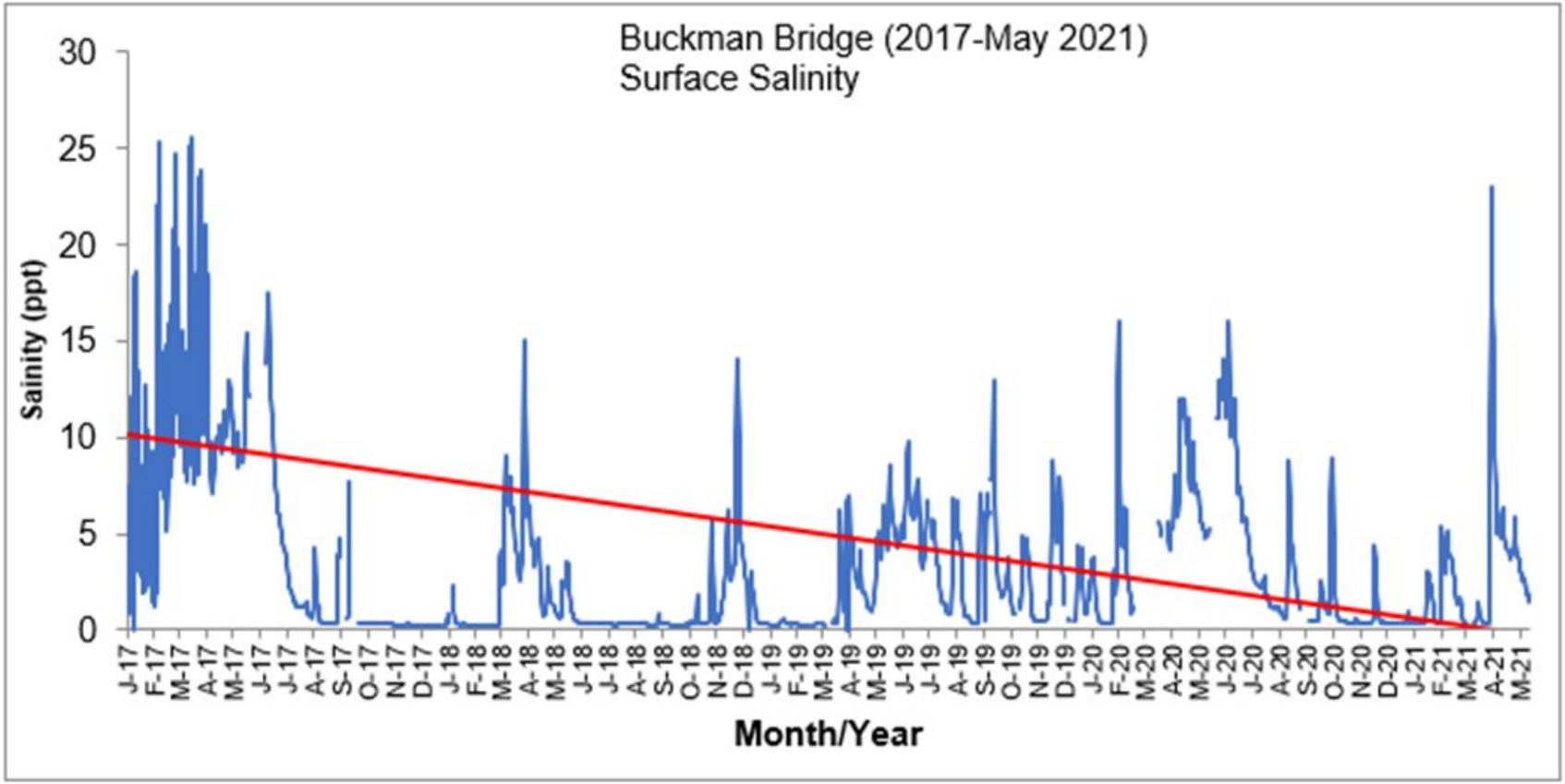




Salinity

- Potential impacts in the Lower Basin
  - Movement south of transition zones
  - Redistribution of salt and freshwater fish
  - Life-cycle disruption of organisms that need marine and freshwater habitats (e.g., crabs, shrimp, fish)
  - Shifts in macroinvertebrate populations
  - Less SAV
  - Less freshwater hardwood swamps in some areas

Salinity


Buckman Bridge (2017-May 2021)
Surface Salinity
Sainity (ppt)
30
25
20
15
10
5
0
J-17
F-17
M-17
A-17
M-17
J-17
J-17
A-17
S-17
O-17
N-17
D-17
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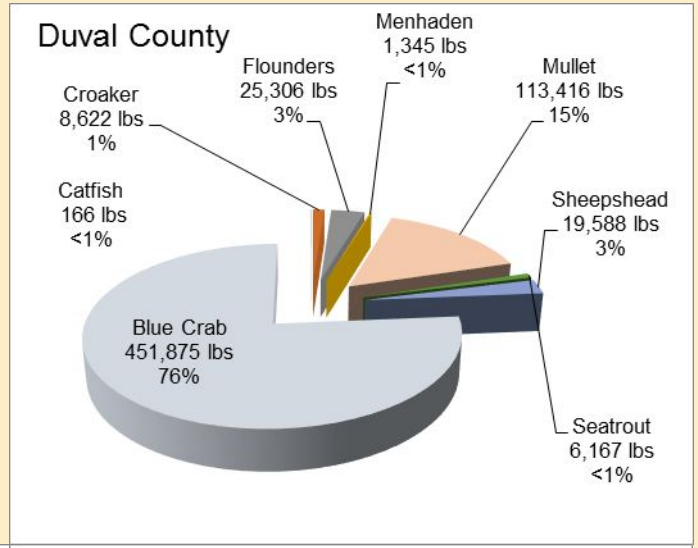
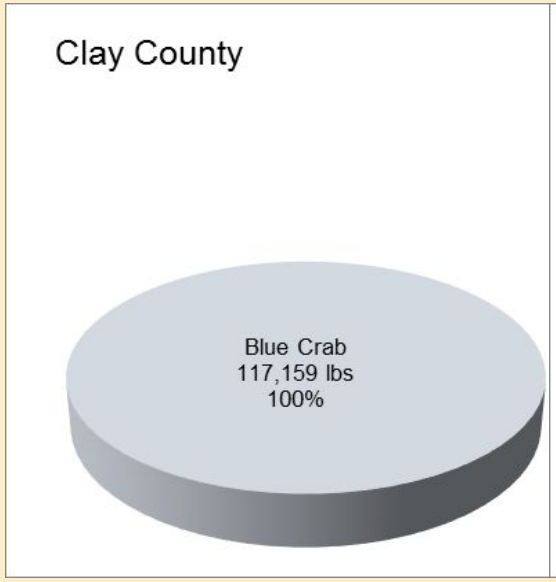
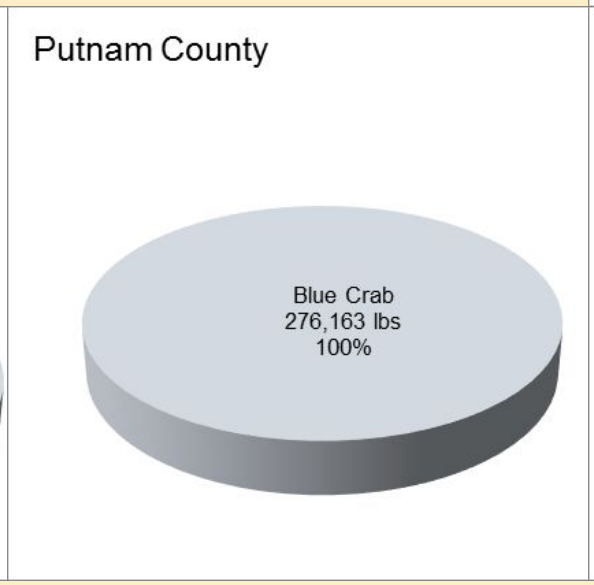
M-20
A-20
M-20
J-20
J-20
A-20
S-20
O-20
N-20
D-20
J-21
F-21
M-21
A-21
M-21
Month/Year

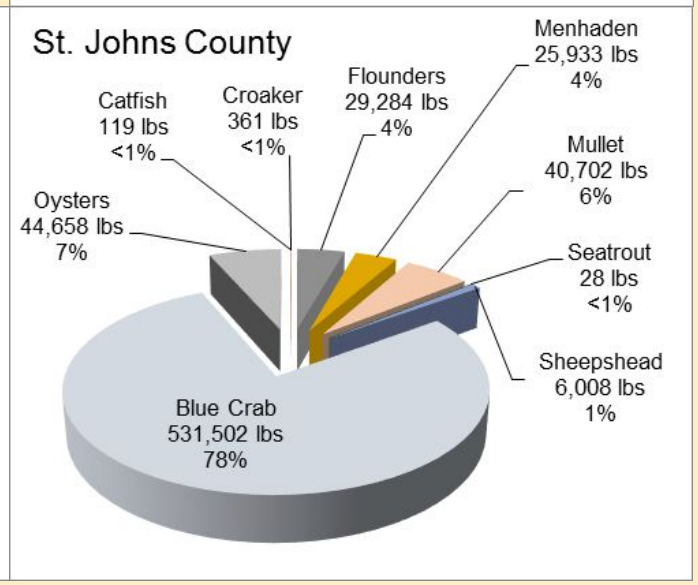
Fisheries

- Blue crabs ~75% (1,352,970 lbs) 2019
- Finfish ~22% (403,735 lbs) 2019.
- Mullet ~18% 2019, and ~25% 2016.
- Flounders and sheepshead (1-3%).
- Menhaden, croakers, seatrout, and catfish (<1%) unchanged.

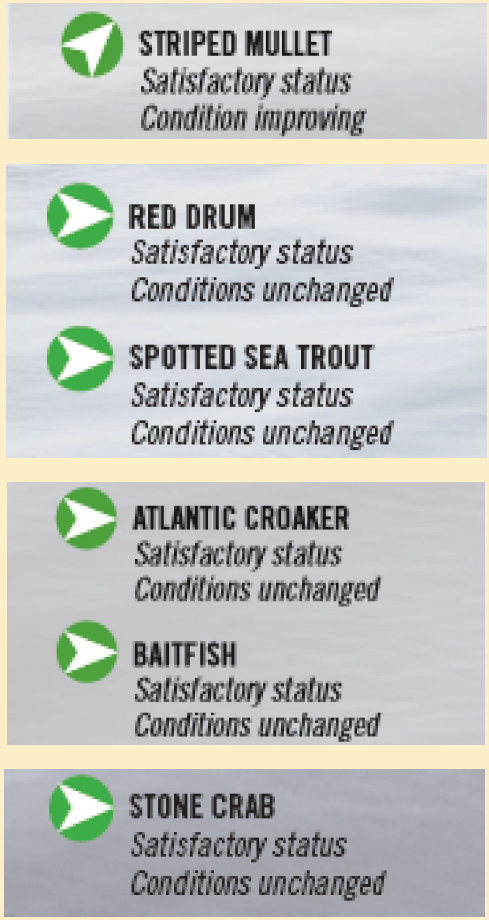








Fisheries



- Most finfish and invertebrate species are not in danger of being overfished.

Aquatic Life

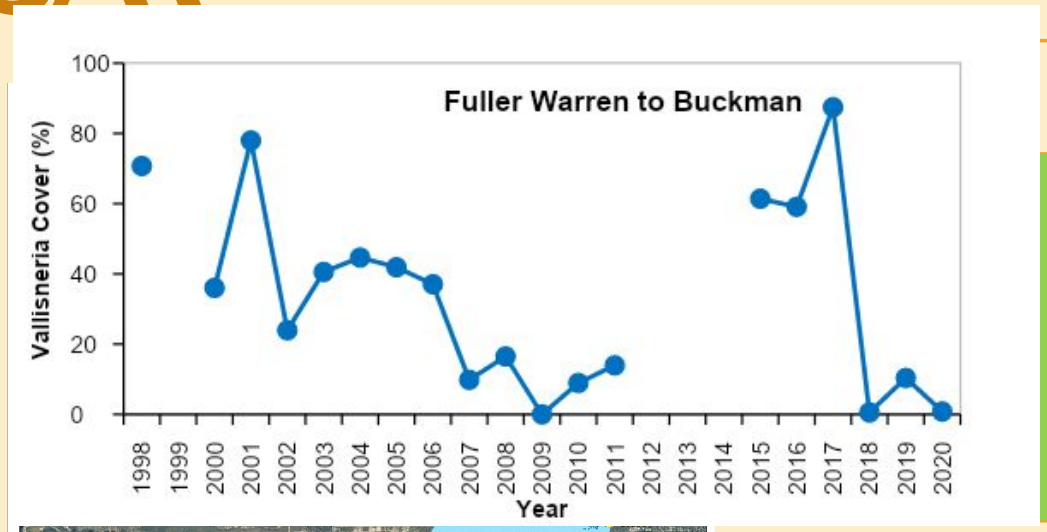
Indicator	Status	Trends
Submerged Aquatic Vegetation	Unsatisfactory	Uncertain
Wetlands	Unsatisfactory	Worsening
Macroinvertebrates	Uncertain	Uncertain
Threatened and Endangered Species	Satisfactory	Unchanged
Nonnative Aquatic Species	Unsatisfactory	Worsening

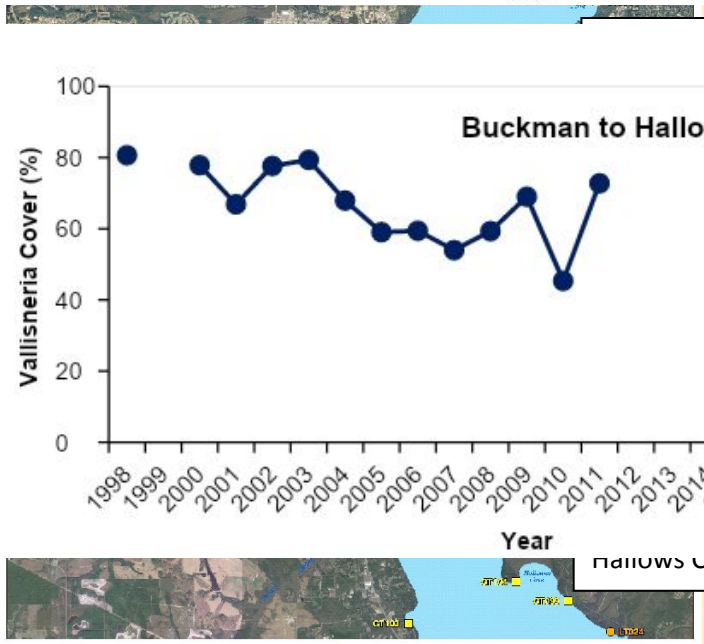
SAV Submerged Aquatic Vegetation

- **Significance**
  - Nurseries
  - Food
  - Improves water quality
  - Reduces erosion
- **Critical Conditions**
  - Salinity
  - Water clarity
  - Shoreline condition
  - Epiphytes
- **Data**
  - SJRWMD
  - Transects in LSJR: 152 stations (2000-11) 56-81 stations (2015-2018)
  - Aerial observations 2008-2021

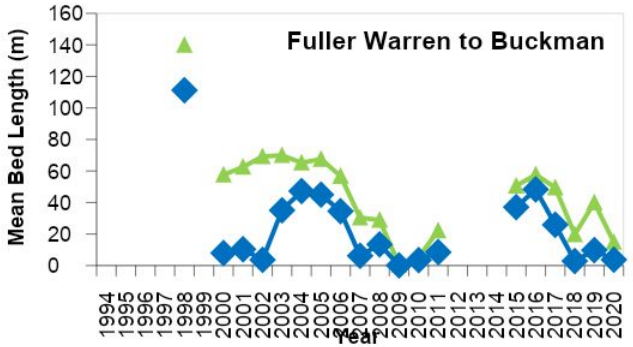
Photos by permission: SJRWMD 1998 Volunteer guide to aquatic plants in the

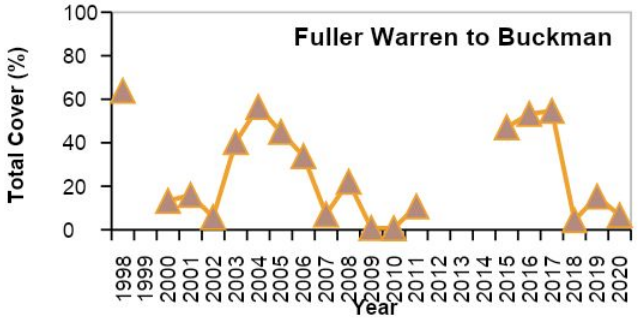
SAV

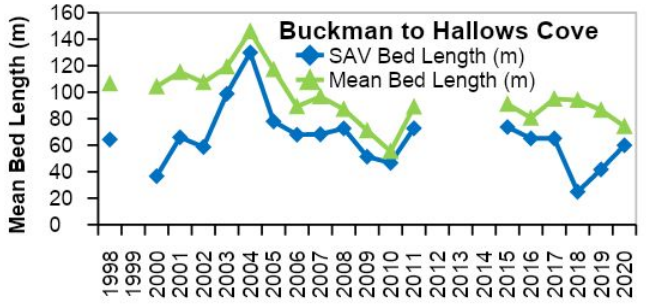


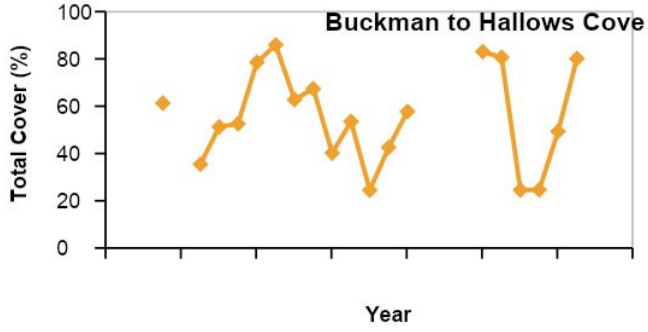


Micranthemum 0-92%
Chara sp. 0-18%





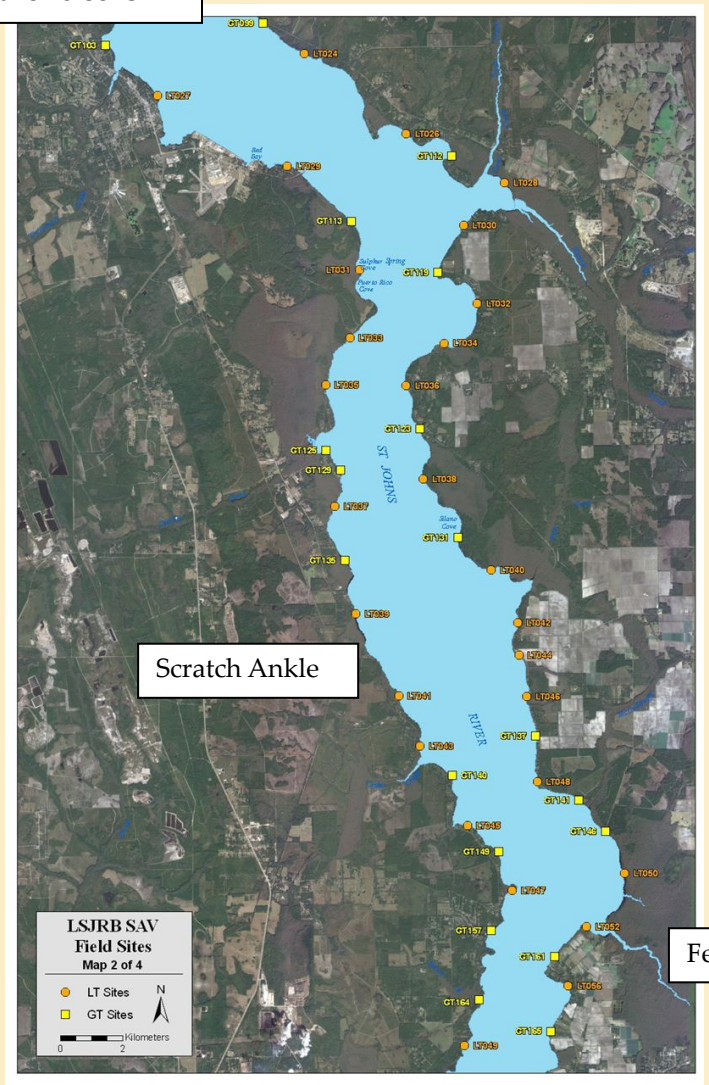




SAV

2020
5 sites

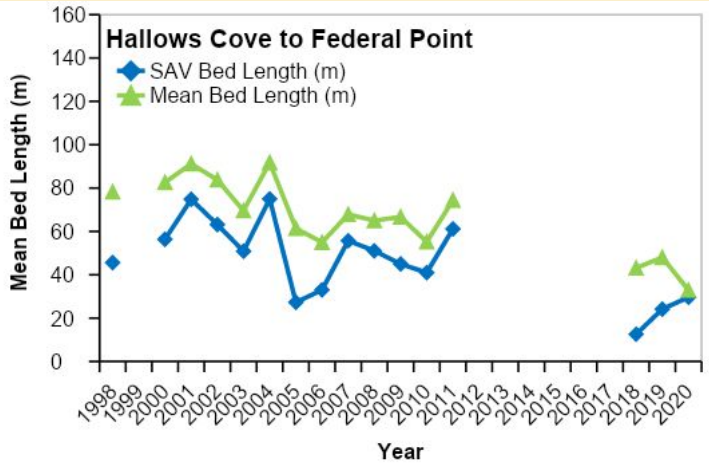
Hallows Cove

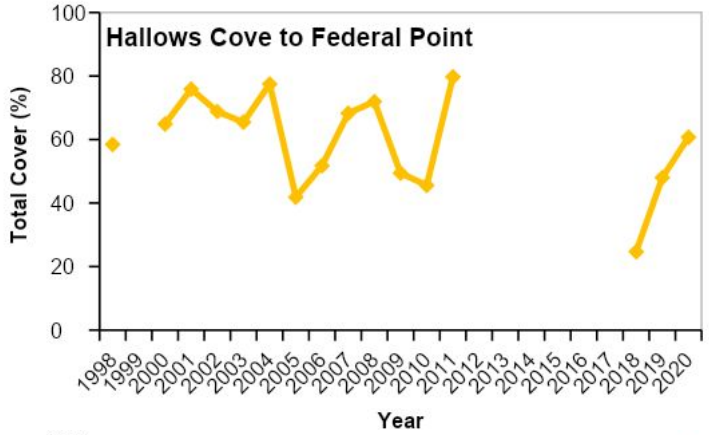


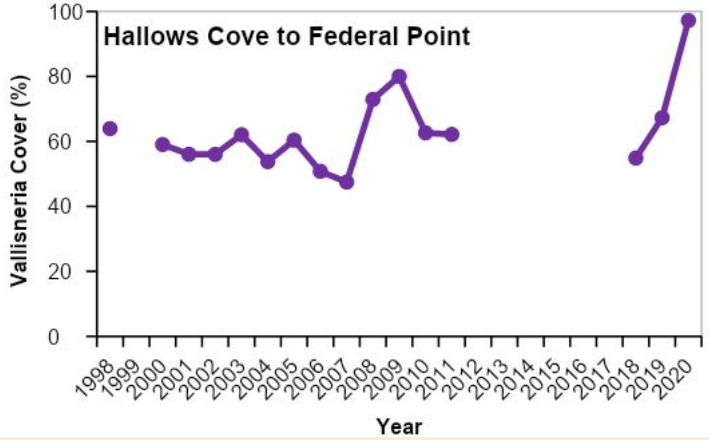
Scratch Ankle

Federal Point

Vallisneria
Chara sp.
Najas
Hydrilla
Sagitaria
Ceratophyllum
Elrocharis sp.
Ruppia







SAV

- Summary
  - Highly variable over time due to weather and other factors
  - Decline in grass bed coverage

Table 4.2 Summary of SAV sampling sites in LSJRB 2015-2020.

All Sites:

Year	No. bare no grasses	Not sampled	Total sampling sites	% Bare
2015	6	2	56	11
2016	7	2	56	13
2017	12		61	20
2018	16		81	20
2019	30	6	112	27
2020	11	4	44	25

Note: Sampling was reduced in 2020 due to COVID-19 restrictions. Not included above are 6 sites in Doctors Lake (2 or 33% were bare compared to 50% in 2019); and Julington Creek 2 sites (1 or 50% were bare, both had SAV in 2019) (five sites between Hallows Cove and the Shands Bridge in Clay County (Appendix 4.1.7.1.A-E).

Source: (Trent 2020)

Wetlands

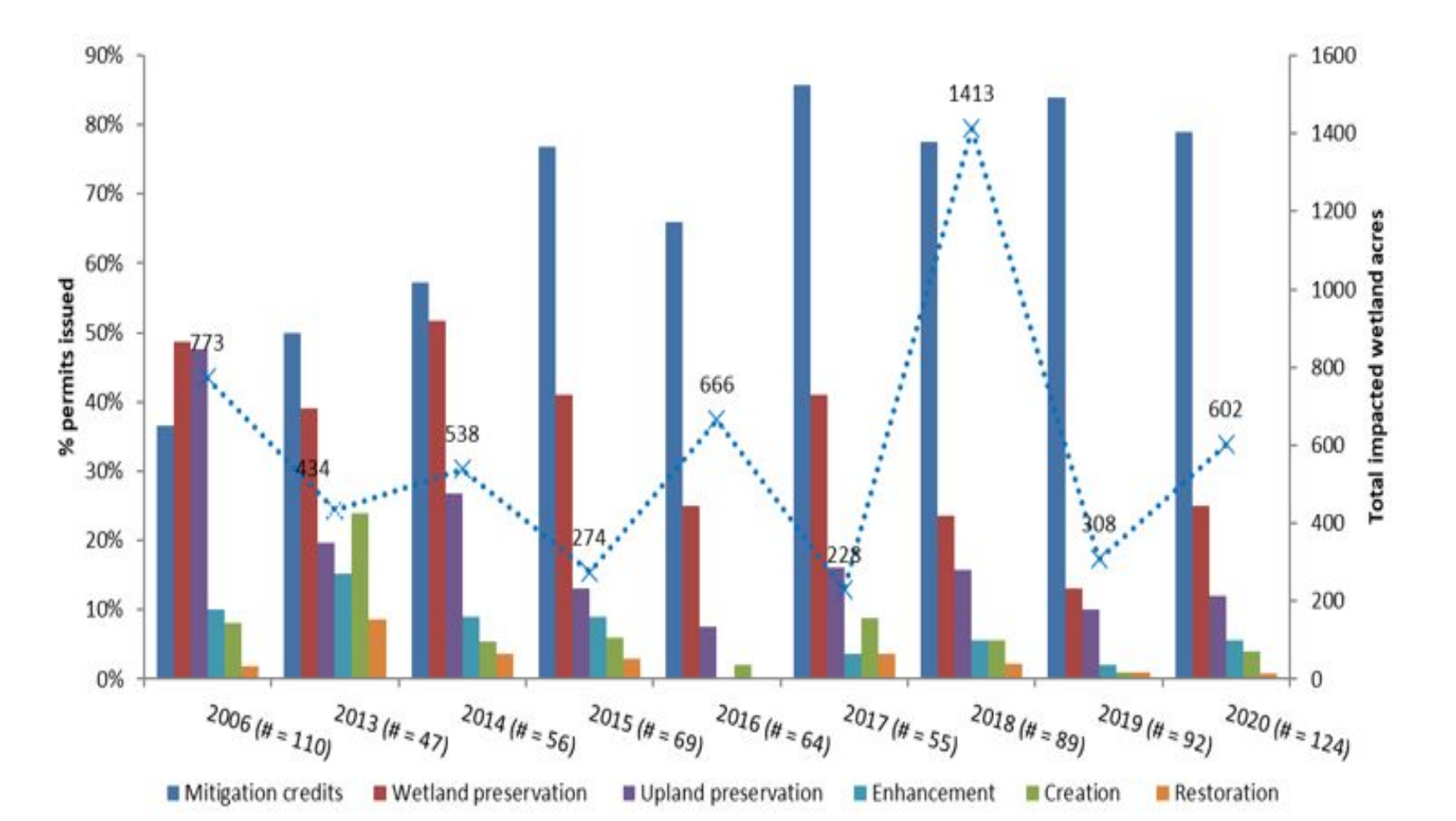
83% freshwater, ~44% freshwater forested.

- **Significance**
  - Nurseries
  - Habitat
  - Food
  - Improve water quality
  - Stabilize banks
  - Provide flood control
- **Stressors**
  - Pollutants
  - Sea Level Rise
  - Hydrology changes
  - Invasive Species
  - Fragmentation

http://www.nwrc.usgs.gov/topics/invasive_species/index.htmwww.water.ncsu.edu
Sjrwmd permitting site

Wetlands

wetlands represent 23.8% of total LSJRWMD area



Wetlands

- **Summary**
  - Increased development pressure
  - Swapping wetlands types/places
  - Less upland preservation, enhancement, creation, and restoration

Concerns:

- Shifts in wetlands types from mitigation and salinity changes
- Loss of coastal wetlands
- Loss of function by connectivity disruptions
- Flooding
- Loss of nutrient retention/habitat

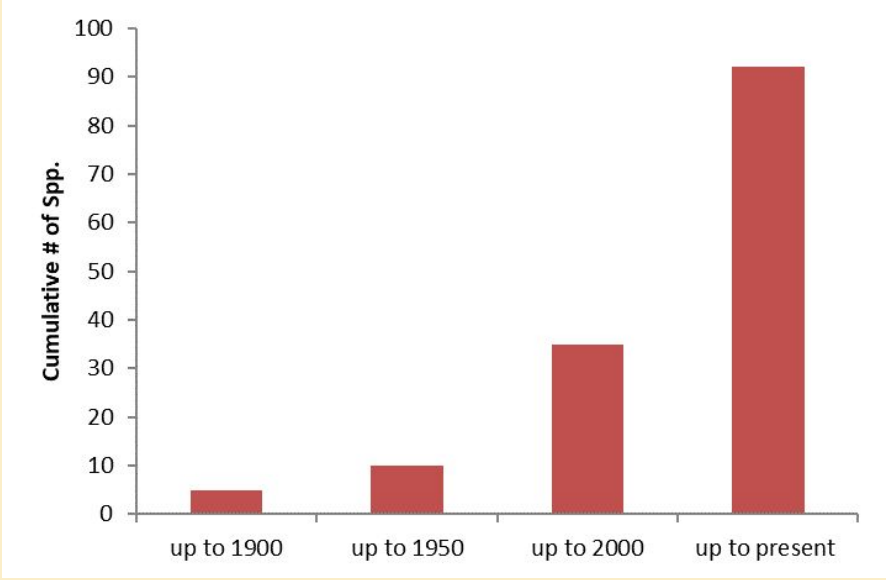
Photos by Heather McCarthy

INDICATOR	STATUS	TREND
Wetlands	Unsatisfactory	Worsening

Non-native species

Non-native species

- 92 mostly freshwater
- Shipping, aquarium trade, releases/escaps
- 1500-2000+ vessels/cruise ships
- Most from Med/Suez passage
- Climate



Photos by Heather McCarthy

INDICATOR	STATUS	TREND
Wetlands	Unsatisfactory	Worsening

Endangered & Threatened

FLORIDA MANATEE
(threatened)
Satisfactory status
Conditions unchanged

BALD EAGLE
Satisfactory status
Conditions improving

WOOD STORK
Satisfactory status
Conditions improving

Photo: Dave Menken, USFWS.

Chelsea Bohaty, JU MSRI

Photo by Wayne Lasch (PBS&J)

Contaminants

Metals in the water

INDICATOR	STATUS	TREND
Metals in FW mainstem (aluminum, arsenic, copper, cadmium, lead, nickel, vanadium, zinc) (Silver)	Satisfactory Unsatisfactory	Unchanged Unchanged
Metals in SW mainstem (aluminum, arsenic, copper, cadmium, lead, nickel, silver, vanadium, zinc)	Unsatisfactory	Unchanged
Metals in the tributaries (arsenic, copper, cadmium, lead, nickel, silver, zinc)	Unsatisfactory	Unchanged

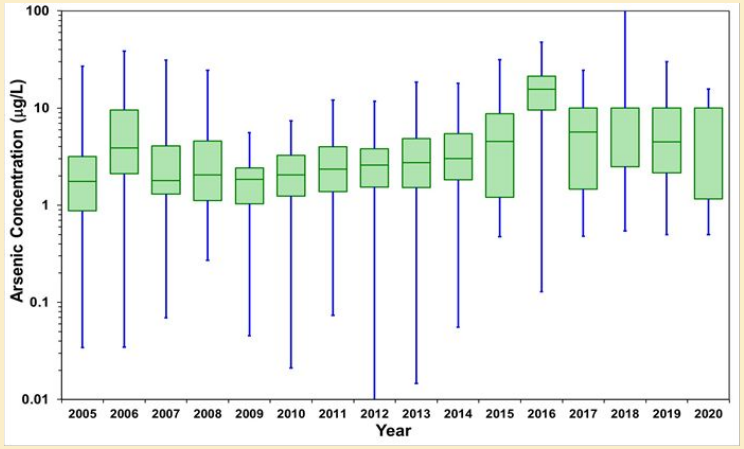
tributaries

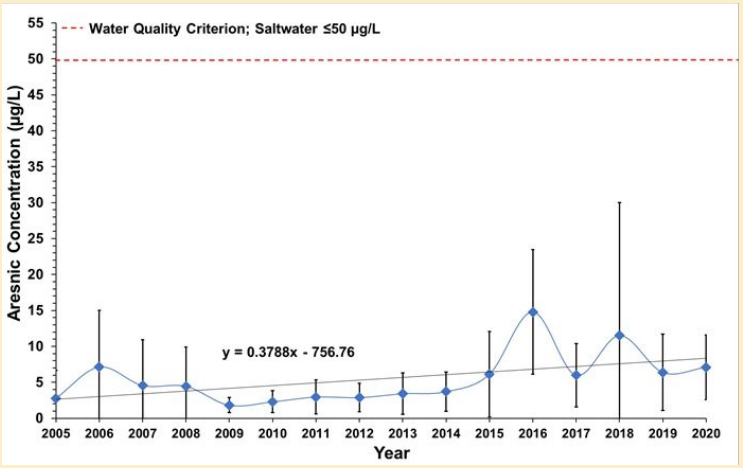
-Many tributaries do not have enough data for trend analysis

Contaminants

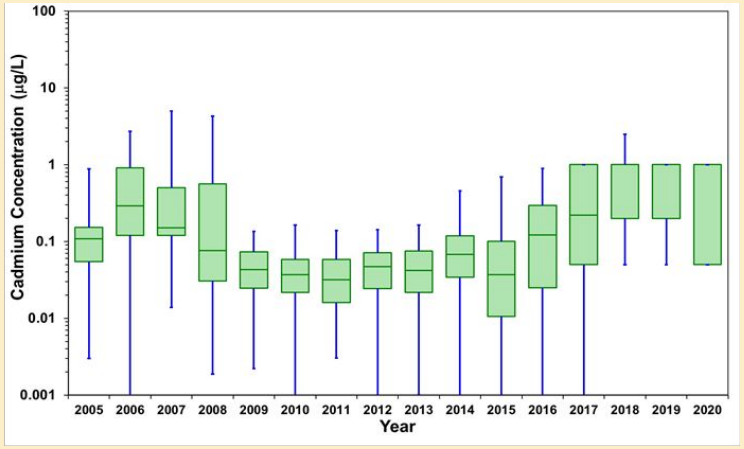
Metals in the water

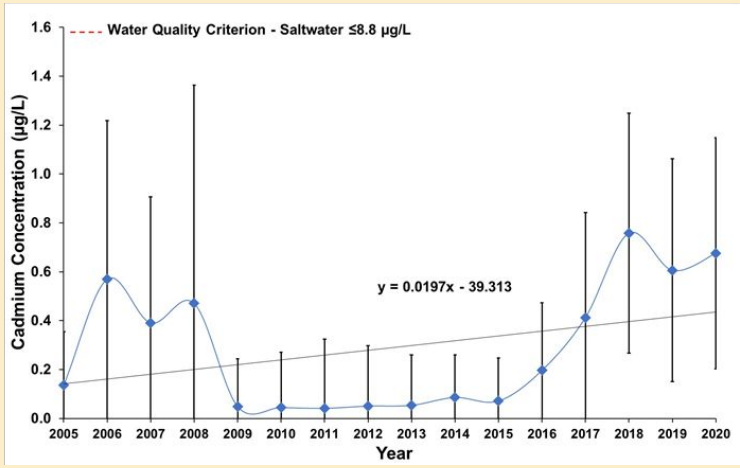
- Maxima, medians down 2009-2014 for many, but elevated 2016-2020 SW Mainstem and tributaries.
  - *Arsenic*





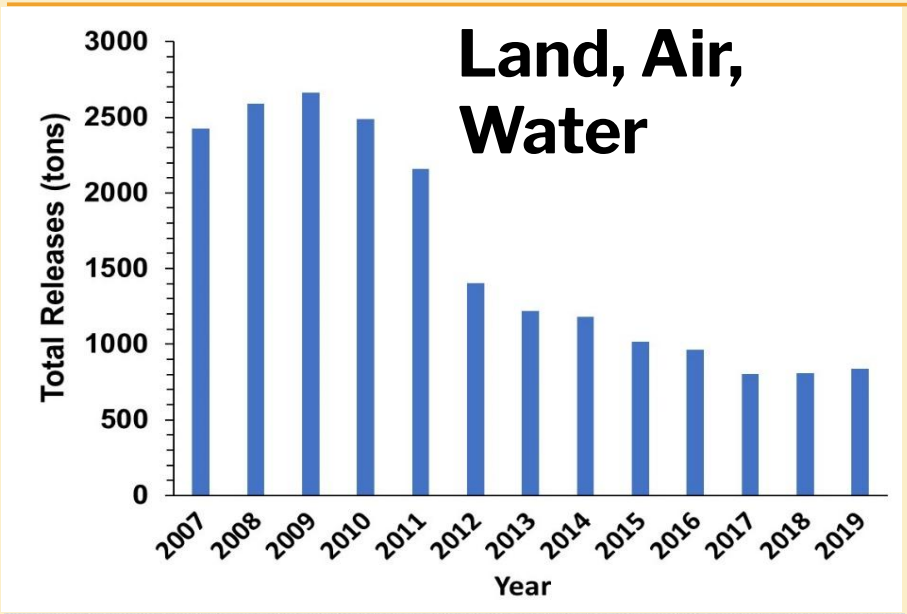
  - *Cadmium*

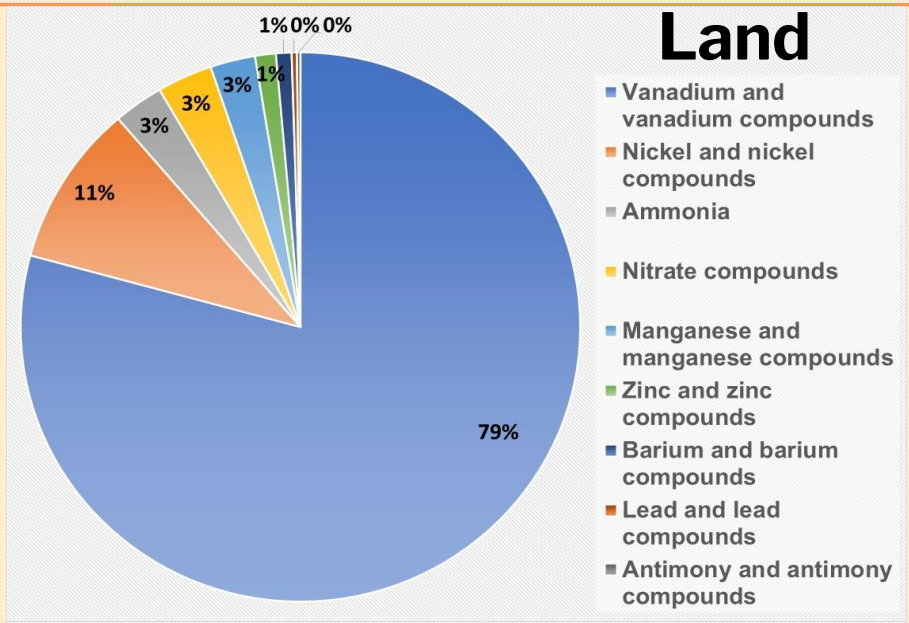


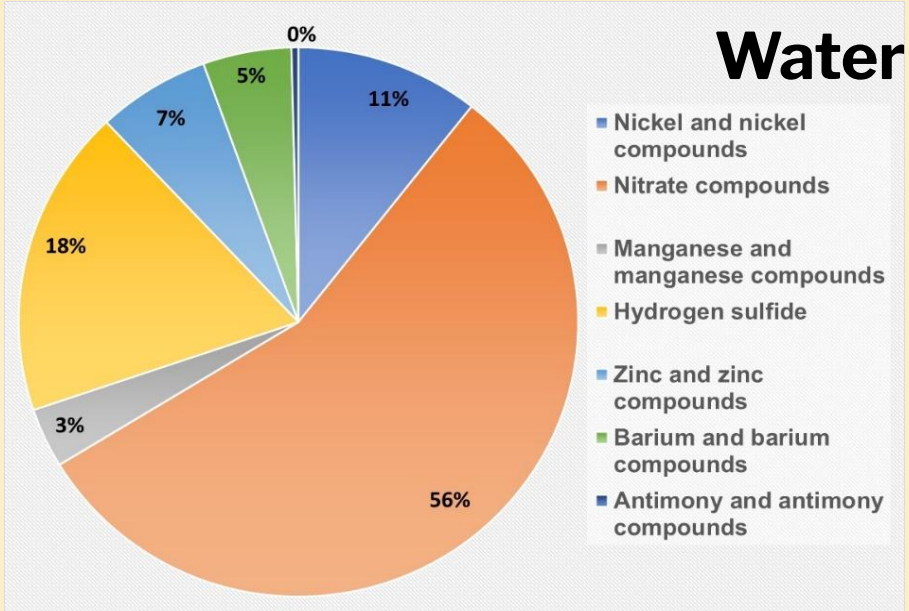


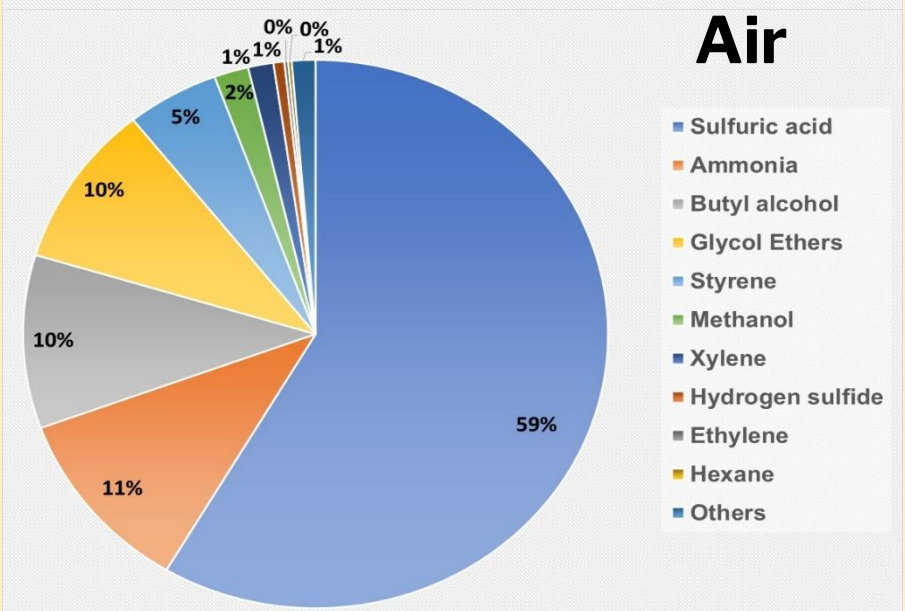
Contaminants

Release of Metals into the Environment









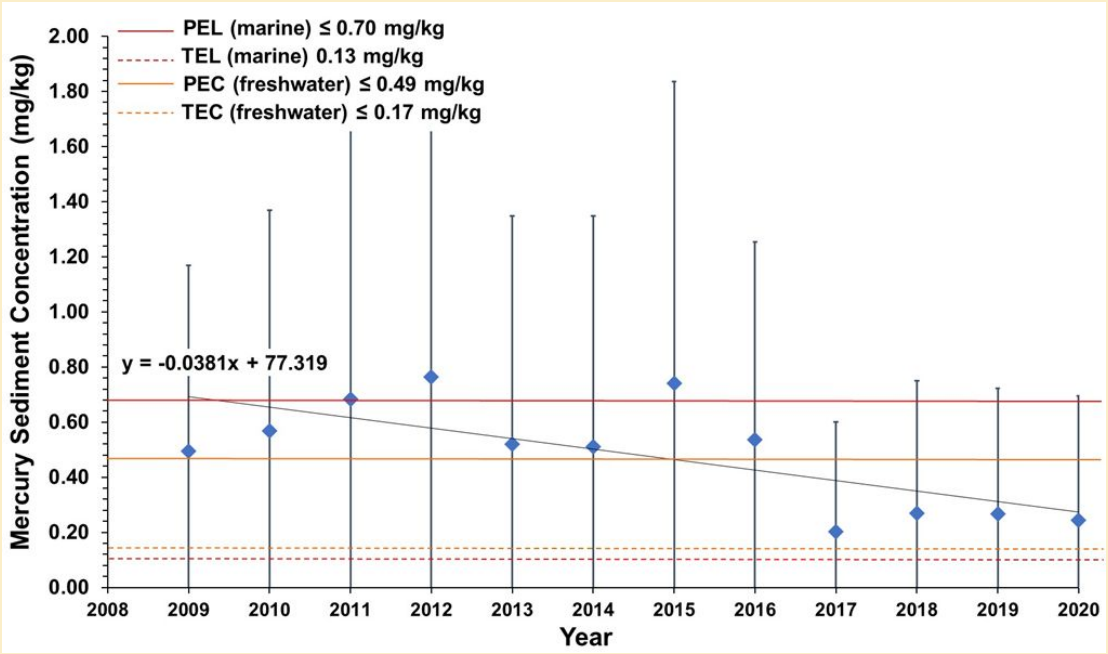
Contaminants

Metals in the sediments

INDICATOR	STATUS	TREND
Metals in sediments (arsenic, copper, cadmium, lead, nickel, silver, zinc) (mercury)	Unsatisfactory	Unchanged

maxima, medians down recently, but many exceedances.

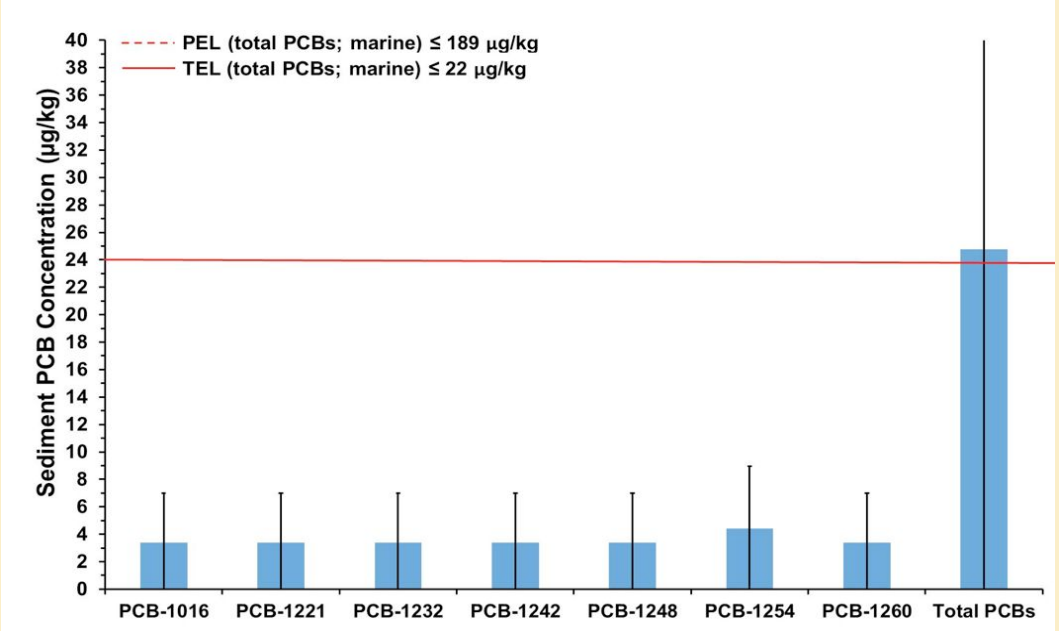
Mercury



Contaminants

PCBs in the sediments

INDICATOR	STATUS	TREND
PCBs in sediments	Unsatisfactory	Uncertain, lacking data



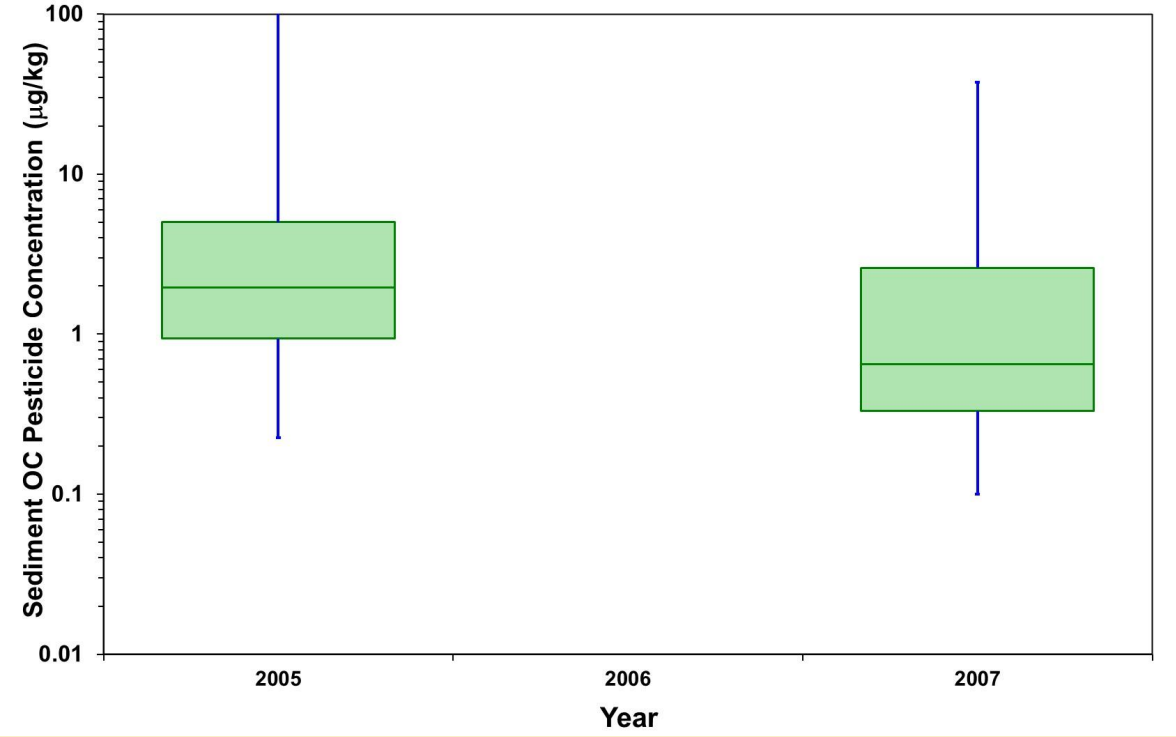
Mean concentrations of individual PCB congeners and total PCBs in sediments collected in 2017. Probable Effect Level (PEL) is indicated by the dotted red line. Threshold Effect Level (TEL) is indicated by the solid red line.

Contaminants

Pesticides

INDICATOR	STATUS	TREND
Organochlorine (OC) pesticides in sediments	Unsatisfactory	Uncertain, lacking data

Total OC pesticide concentration in sediments

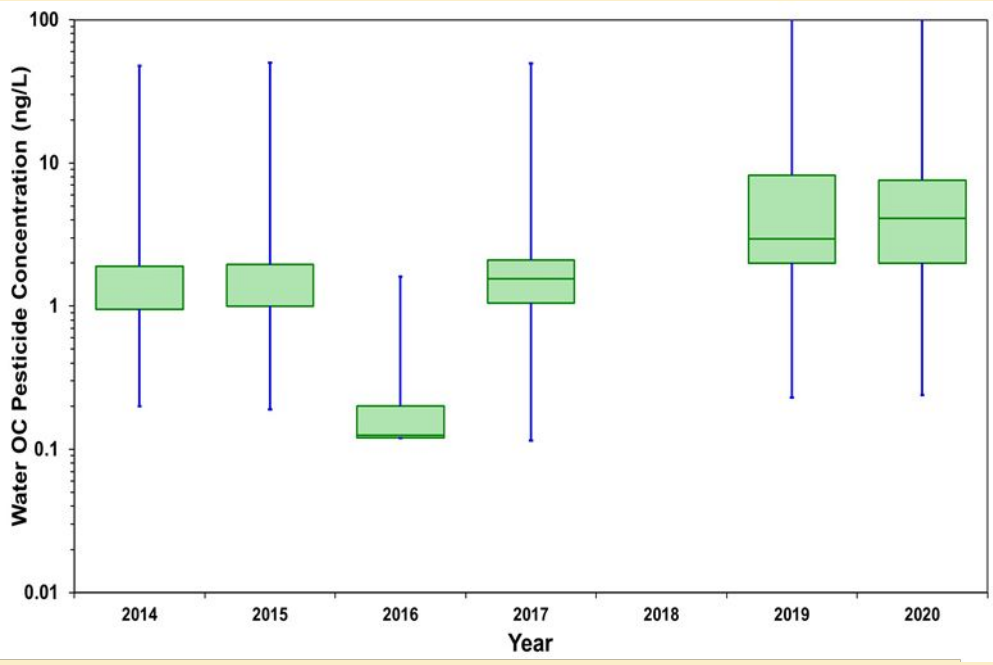


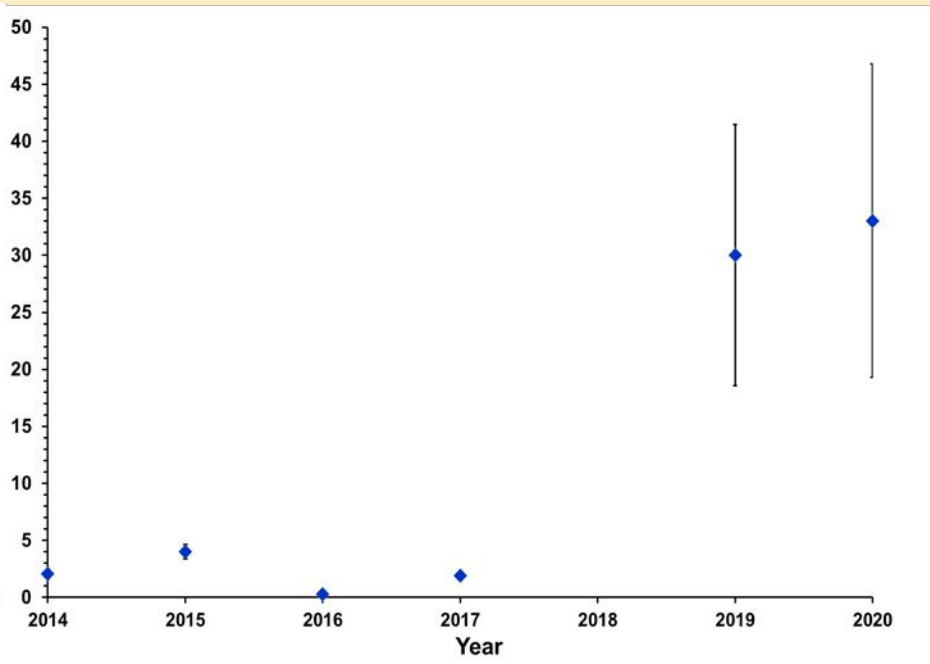
DATA LACKING !

Contaminants

Pesticides

INDICATOR	STATUS	TREND
Organochlorine (OC) pesticides in water column	Unsatisfactory	Worsening





Mean total OC pesticide concentration in water column increasing, 2018 no data available

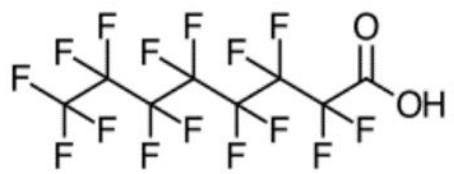
Highlights

Per-and polyfluoroalkyl substances (PFAS)

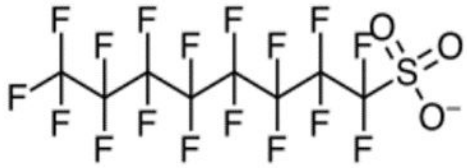
INDICATOR	STATUS	TREND
PFAS in water column and sediments	Uncertain	Uncertain, lacking data

DATA LACKING!

Chemical structure of two well-studied PFAS



Perfluorooctanoic acid (PFOA)



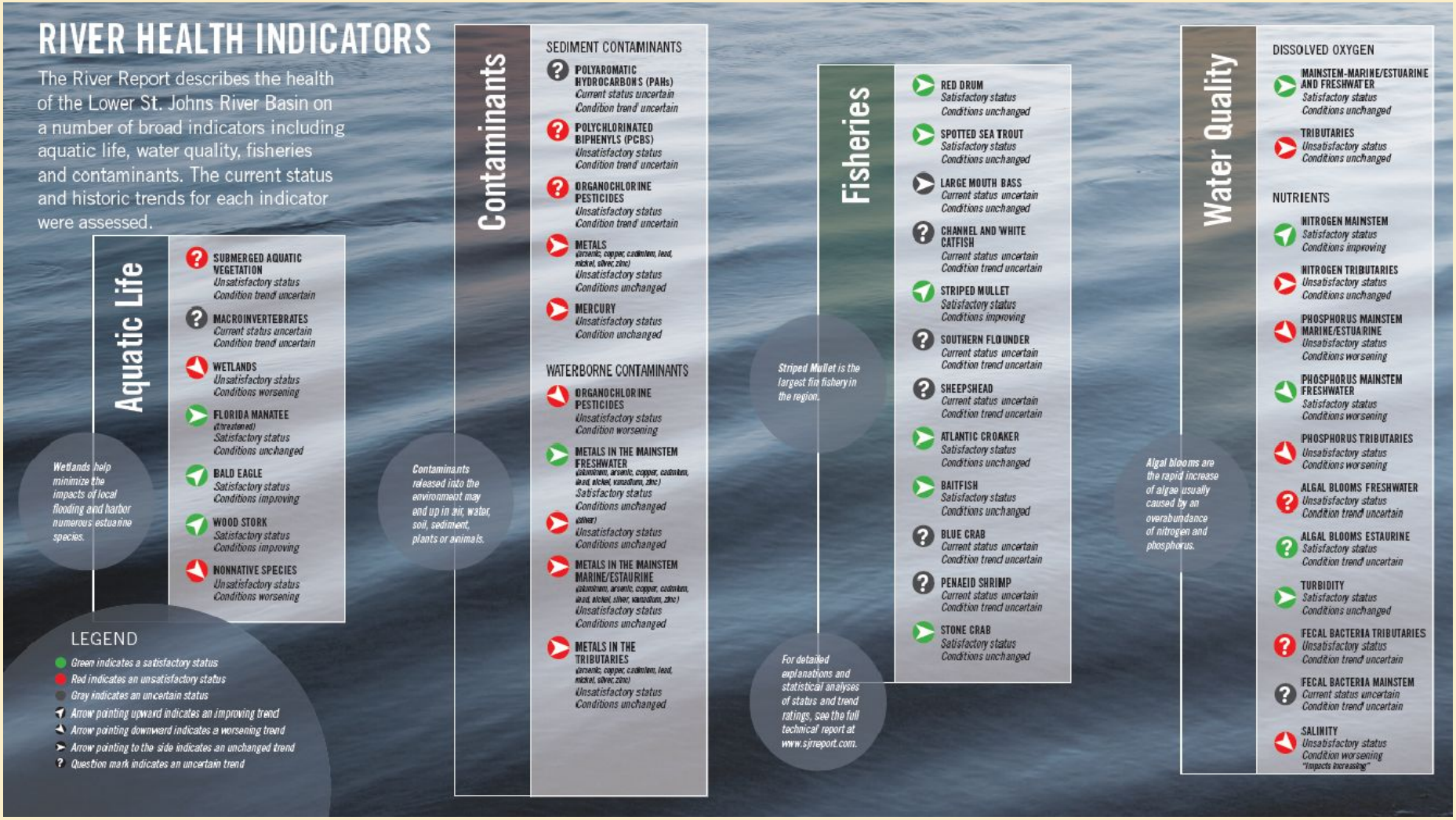
Perfluorooctane sulfonate (PFOS)

PFAS-treated and PFAS containing compounds

By Heather McCarthy

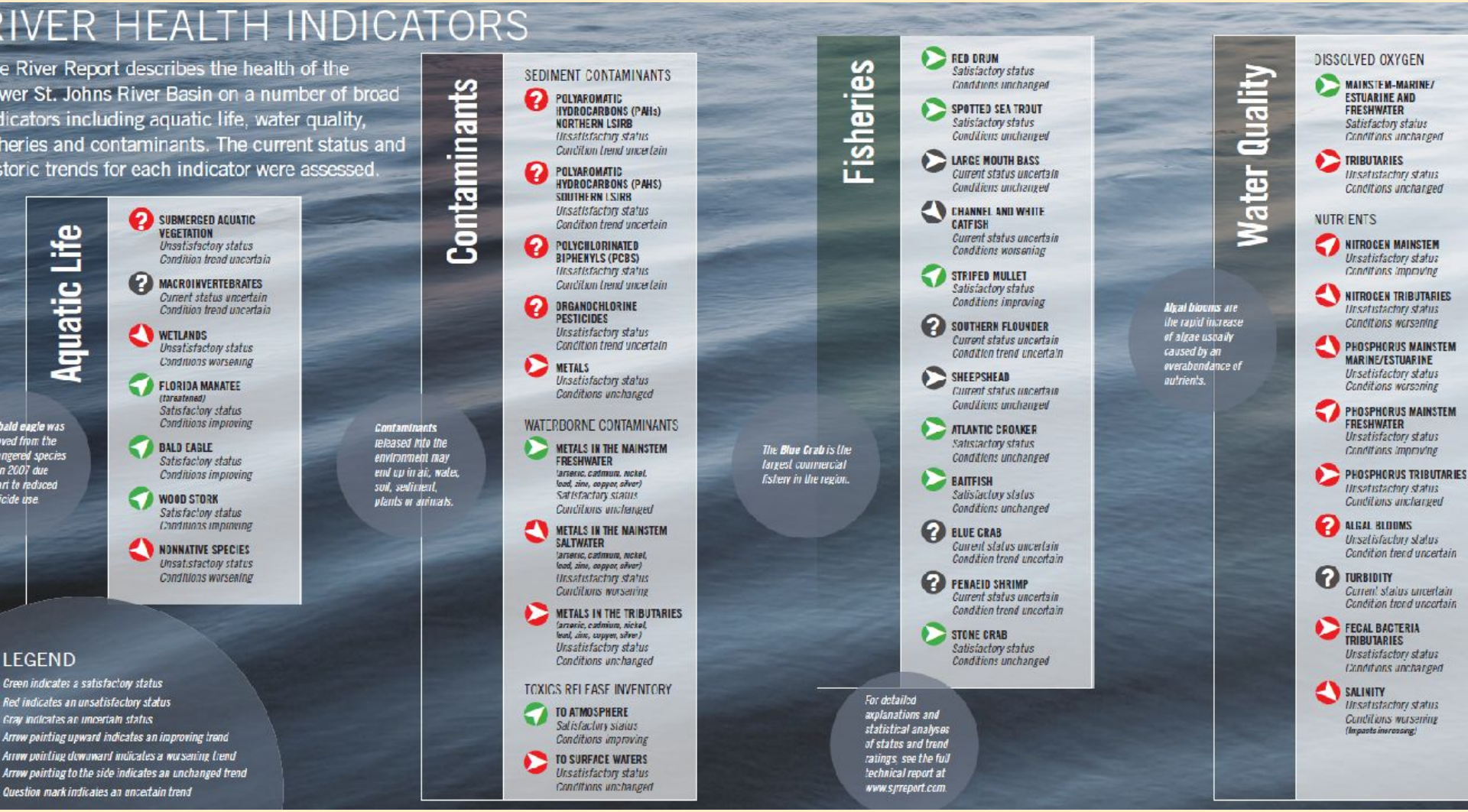
Thank you! Questions?

2021


RIVER HEALTH INDICATORS
The River Report describes the health of the Lower St. Johns River Basin on a number of broad indicators including aquatic life, water quality, fisheries and contaminants. The current status and historic trends for each indicator were assessed.
Aquatic Life
SUBMERGED AQUATIC VEGETATION
Unsatisfactory status
Condition trend uncertain
MACROINVERTEBRATES
Current status uncertain
Condition trend uncertain
WETLANDS
Unsatisfactory status
Conditions worsening
FLORIDA MANATEE
(threatened)
Satisfactory status
Conditions unchanged
BALD EAGLE
Satisfactory status
Conditions improving
WOOD STORK
Satisfactory status
Conditions improving
NONNATIVE SPECIES
Unsatisfactory status
Conditions worsening
Wetlands help minimize the impacts of local flooding and harbor numerous estuarine species.
LEGEND
Green indicates a satisfactory status
Red indicates an unsatisfactory status
Gray indicates an uncertain status
Arrow pointing upward indicates an improving trend
Arrow pointing downward indicates a worsening trend
Arrow pointing to the side indicates an unchanged trend
? Question mark indicates an uncertain trend
Contaminants
SEDIMENT CONTAMINANTS
POLYAROMATIC HYDROCARBONS (PAHs)
Current status uncertain
Condition trend uncertain
POLYCHLORINATED BIPHENYLS (PCBS)
Unsatisfactory status
Condition trend uncertain
ORGANOCHLORINE PESTICIDES
Unsatisfactory status
Condition trend uncertain
METALS
(arsenic, copper, cadmium, lead, nickel, silver, zinc)
Unsatisfactory status
Conditions unchanged
MERCURY
Unsatisfactory status
Condition unchanged
WATERBORNE CONTAMINANTS
ORGANOCHLORINE PESTICIDES
Unsatisfactory status
Condition worsening
METALS IN THE MAINSTEM FRESHWATER
(aluminum, arsenic, copper, cadmium, lead, nickel, vanadium, zinc)
Satisfactory status
Conditions unchanged
(other)
Unsatisfactory status
Conditions unchanged
METALS IN THE MAINSTEM MARINE/ESTAURINE
(aluminum, arsenic, copper, cadmium, lead, nickel, silver, vanadium, zinc)
Unsatisfactory status
Conditions unchanged
METALS IN THE TRIBUTARIES
(arsenic, copper, cadmium, lead, nickel, silver, zinc)
Unsatisfactory status
Conditions unchanged
Contaminants released into the environment may end up in air, water, soil, sediment, plants or animals.
Fisheries
RED DRUM
Satisfactory status
Conditions unchanged
SPOTTED SEA TROUT
Satisfactory status
Conditions unchanged
LARGE MOUTH BASS
Current status uncertain
Conditions unchanged
CHANNEL AND WHITE CATFISH
Current status uncertain
Condition trend uncertain
STRIPED MULLET
Satisfactory status
Conditions improving
SOUTHERN FLOUNDER
Current status uncertain
Condition trend uncertain
SHEEPSHEAD
Current status uncertain
Condition trend uncertain
ATLANTIC CROAKER
Satisfactory status
Conditions unchanged
BAITFISH
Satisfactory status
Conditions unchanged
BLUE CRAB
Current status uncertain
Condition trend uncertain
PENAEID SHRIMP
Current status uncertain
Condition trend uncertain
STONE CRAB
Satisfactory status
Conditions unchanged
Striped Mullet is the largest fin fishery in the region.
For detailed explanations and statistical analyses of status and trend ratings, see the full technical report at www.sjrreport.com.
Water Quality
DISSOLVED OXYGEN
MAINSTEM-MARINE/ESTUARINE AND FRESHWATER
Satisfactory status
Conditions unchanged
TRIBUTARIES
Unsatisfactory status
Conditions unchanged
NUTRIENTS
NITROGEN MAINSTEM
Satisfactory status
Conditions improving
NITROGEN TRIBUTARIES
Unsatisfactory status
Conditions unchanged
PHOSPHORUS MAINSTEM MARINE/ESTUARINE
Unsatisfactory status
Conditions worsening
PHOSPHORUS MAINSTEM FRESHWATER
Satisfactory status
Conditions worsening
PHOSPHORUS TRIBUTARIES
Unsatisfactory status
Conditions worsening
ALGAL BLOOMS FRESHWATER
Unsatisfactory status
Condition trend uncertain
ALGAL BLOOMS ESTAURINE
Satisfactory status
Condition trend uncertain
TURBIDITY
Satisfactory status
Conditions unchanged
FECAL BACTERIA TRIBUTARIES
Unsatisfactory status
Condition trend uncertain
FECAL BACTERIA MAINSTEM
Current status uncertain
Condition trend uncertain
SALINITY
Unsatisfactory status
Condition worsening
"Impacts increasing"
Algal blooms are the rapid increase of algae usually caused by an overabundance of nitrogen and phosphorus.

2020

2019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Unsatisfactory status
Condition trend uncertain
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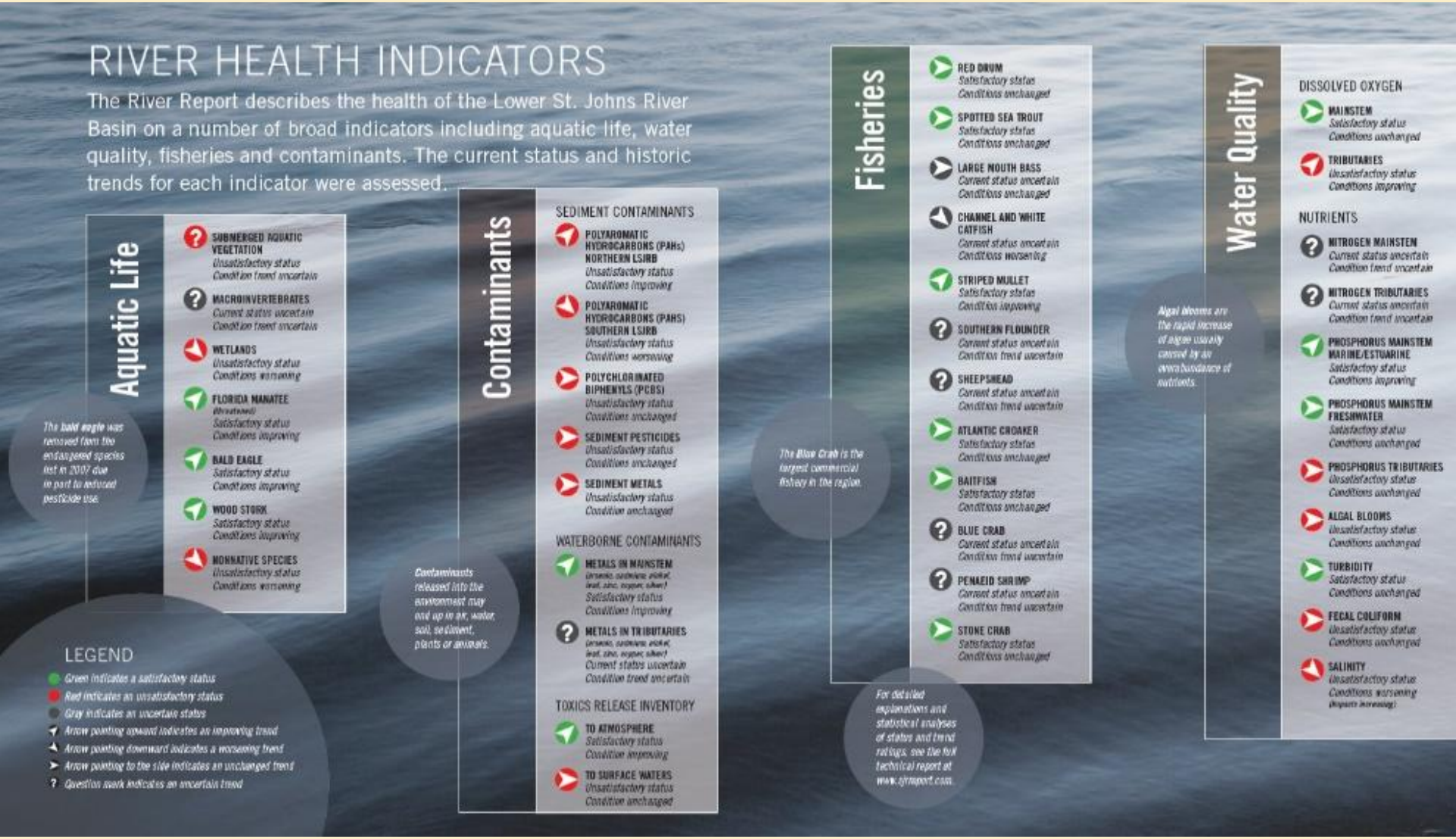
WETLANDS
Unsatisfactory status
Conditions worsening
FLORIDA MANATEE
(threatened)
Satisfactory status
Conditions improving
BALD EAGLE
Satisfactory status
Conditions improving
WOOD STORK
Satisfactory status
Conditions improving
NONNATIVE SPECIES
Unsatisfactory status
Conditions worsening
bald eagle was
oved from the
ngered species
n 2007 due
rt to reduced
icide use.
LEGEND
Green indicates a satisfactory status
Red indicates an unsatisfactory status
Gray indicates an uncertain status
Arrow pointing upward indicates an improving trend
Arrow pointing downward indicates a worsening trend
Arrow pointing to the side indicates an unchanged trend
Question mark indicates an uncertain trend
Contaminants
SEDIMENT CONTAMINANTS
POLYAROMATIC HYDROCARBONS (PAHs) NORTHERN LSIRB
Unsatisfactory status
Condition trend uncertain
POLYAROMATIC HYDROCARBONS (PAHs) SOUTHERN LSIRB
Unsatisfactory status
Condition trend uncertain
POLYCHLORINATED BIPHENYLS (PCBS)
Unsatisfactory status
Condition trend uncertain
ORGANOCHLORINE PESTICIDES
Unsatisfactory status
Condition trend uncertain
METALS
Unsatisfactory status
Conditions unchanged
WATERBORNE CONTAMINANTS
METALS IN THE MAINSTEM FRESHWATER
(arsenic, cadmium, nickel, lead, zinc, copper, silver)
Satisfactory status
Conditions unchanged
METALS IN THE MAINSTEM SALTWATER
(arsenic, cadmium, nickel, lead, zinc, copper, silver)
Unsatisfactory status
Conditions worsening
METALS IN THE TRIBUTARIES
(arsenic, cadmium, nickel, lead, zinc, copper, silver)
Unsatisfactory status
Conditions unchanged
TOXICS RELEASE INVENTORY
TO ATMOSPHERE
Satisfactory status
Conditions improving
TO SURFACE WATERS
Unsatisfactory status
Conditions unchanged
Contaminants released into the environment may end up in air, water, soil, sediment, plants or animals.
Fisheries
RED DRUM
Satisfactory status
Conditions unchanged
SPOTTED SEA TROUT
Satisfactory status
Conditions unchanged
LARGE MOUTH BASS
Current status uncertain
Conditions unchanged
CHANNEL AND WHITE CATFISH
Current status uncertain
Conditions worsening
STRIPED MULLET
Satisfactory status
Conditions improving
SOUTHERN FLOUNDER
Current status uncertain
Condition trend uncertain
SHEEPSHEAD
Current status uncertain
Conditions unchanged
ATLANTIC CROAKER
Satisfactory status
Conditions unchanged
BAITFISH
Satisfactory status
Conditions unchanged
BLUE CRAB
Current status uncertain
Condition trend uncertain
PENAEID SHRIMP
Current status uncertain
Condition trend uncertain
STONE CRAB
Satisfactory status
Conditions unchanged
The Blue Crab is the largest commercial fishery in the region.
For detailed explanations and statistical analyses of status and trend ratings, see the full technical report at www.sjrreport.com.
Water Quality
DISSOLVED OXYGEN
MAINSTEM-MARINE/ESTUARINE AND FRESHWATER
Satisfactory status
Conditions uncharged
TRIBUTARIES
Unsatisfactory status
Conditions uncharged
NUTRIENTS
NITROGEN MAINSTEM
Unsatisfactory status
Conditions improving
NITROGEN TRIBUTARIES
Unsatisfactory status
Conditions worsening
PHOSPHORUS MAINSTEM MARINE/ESTUARINE
Unsatisfactory status
Conditions worsening
PHOSPHORUS MAINSTEM FRESHWATER
Unsatisfactory status
Conditions improving
PHOSPHORUS TRIBUTARIES
Unsatisfactory status
Conditions uncharged
ALGAL BLOOMS
Unsatisfactory status
Condition trend uncertain
TURBIDITY
Current status uncertain
Condition trend uncertain
FECAL BACTERIA TRIBUTARIES
Unsatisfactory status
Conditions uncharged
SALINITY
Unsatisfactory status
Conditions worsening
(Impacts increasing)
Algal blooms are the rapid increase of algae usually caused by an overabundance of nutrients.

2018


RIVER HEALTH INDICATORS
The River Report describes the health of the Lower St. Johns River Basin on a number of broad indicators including aquatic life, water quality, fisheries and contaminants. The current status and historic trends for each indicator were assessed.
Aquatic Life
SUBMERGED AQUATIC VEGETATION
Unsatisfactory status
Condition trend uncertain
MACROINVERTEBRATES
Current status uncertain
Condition trend uncertain
WETLANDS
Unsatisfactory status
Conditions worsening
FLORIDA MANATEE
(Threatened)
Satisfactory status
Conditions improving
BALD EAGLE
Satisfactory status
Conditions improving
WOOD STORK
Satisfactory status
Conditions improving
NONNATIVE SPECIES
Unsatisfactory status
Conditions worsening
The bald eagle was removed from the endangered species list in 2007 due in part to reduced pesticide use.
Contaminants
SEDIMENT CONTAMINANTS
POLYAROMATIC HYDROCARBONS (PAHs) NORTHERN LSJRB
Unsatisfactory status
Conditions improving
POLYAROMATIC HYDROCARBONS (PAHS) SOUTHERN LSJRB
Unsatisfactory status
Conditions worsening
POLYCHLORINATED BIPHENYLS (PCBS)
Unsatisfactory status
Conditions unchanged
SEDIMENT PESTICIDES
Unsatisfactory status
Conditions unchanged
SEDIMENT METALS
Unsatisfactory status
Condition unchanged
WATERBORNE CONTAMINANTS
METALS IN MAINSTEM
(arsenic, cadmium, nickel, lead, zinc, copper, silver)
Satisfactory status
Conditions improving
METALS IN TRIBUTARIES
(arsenic, cadmium, nickel, lead, zinc, copper, silver)
Current status uncertain
Condition trend uncertain
TOXICS RELEASE INVENTORY
TO ATMOSPHERE
Satisfactory status
Condition improving
TO SURFACE WATERS
Unsatisfactory status
Condition unchanged
Contaminants released into the environment may end up in air, water, soil, sediment, plants or animals.
LEGEND
Green indicates a satisfactory status
Red indicates an unsatisfactory status
Gray indicates an uncertain status
Arrow pointing upward indicates an improving trend
Arrow pointing downward indicates a worsening trend
Arrow pointing to the side indicates an unchanged trend
? Question mark indicates an uncertain trend
Fisheries
RED DRUM
Satisfactory status
Conditions unchanged
SPOTTED SEA TROUT
Satisfactory status
Conditions unchanged
LARGE MOUTH BASS
Current status uncertain
Conditions unchanged
CHANNEL AND WHITE CATFISH
Current status uncertain
Conditions worsening
STRIPED MULLET
Satisfactory status
Condition improving
SOUTHERN FLOUNDER
Current status uncertain
Condition trend uncertain
SHEEPSHEAD
Current status uncertain
Condition trend uncertain
ATLANTIC CROAKER
Satisfactory status
Conditions unchanged
BAITFISH
Satisfactory status
Conditions unchanged
BLUE CRAB
Current status uncertain
Condition trend uncertain
PENAEID SHRIMP
Current status uncertain
Condition trend uncertain
STONE CRAB
Satisfactory status
Conditions unchanged
The Blue Crab is the largest commercial fishery in the region.
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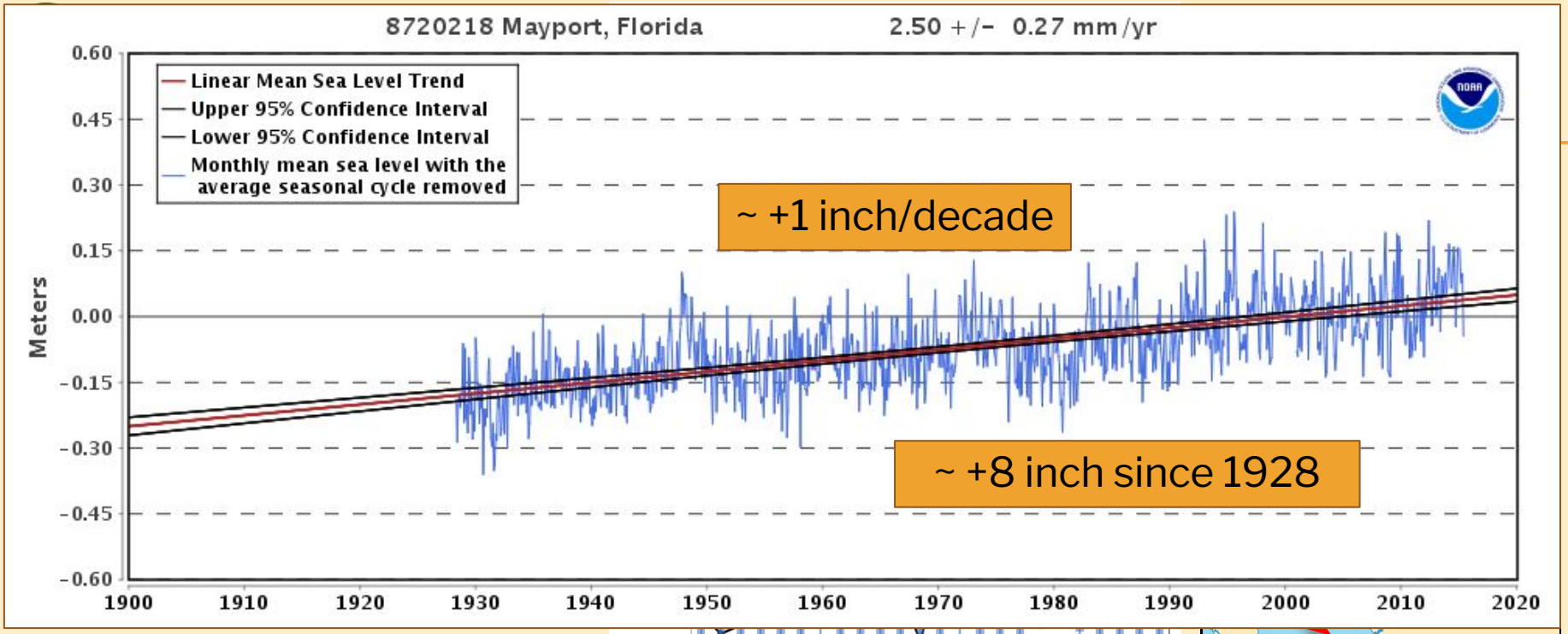
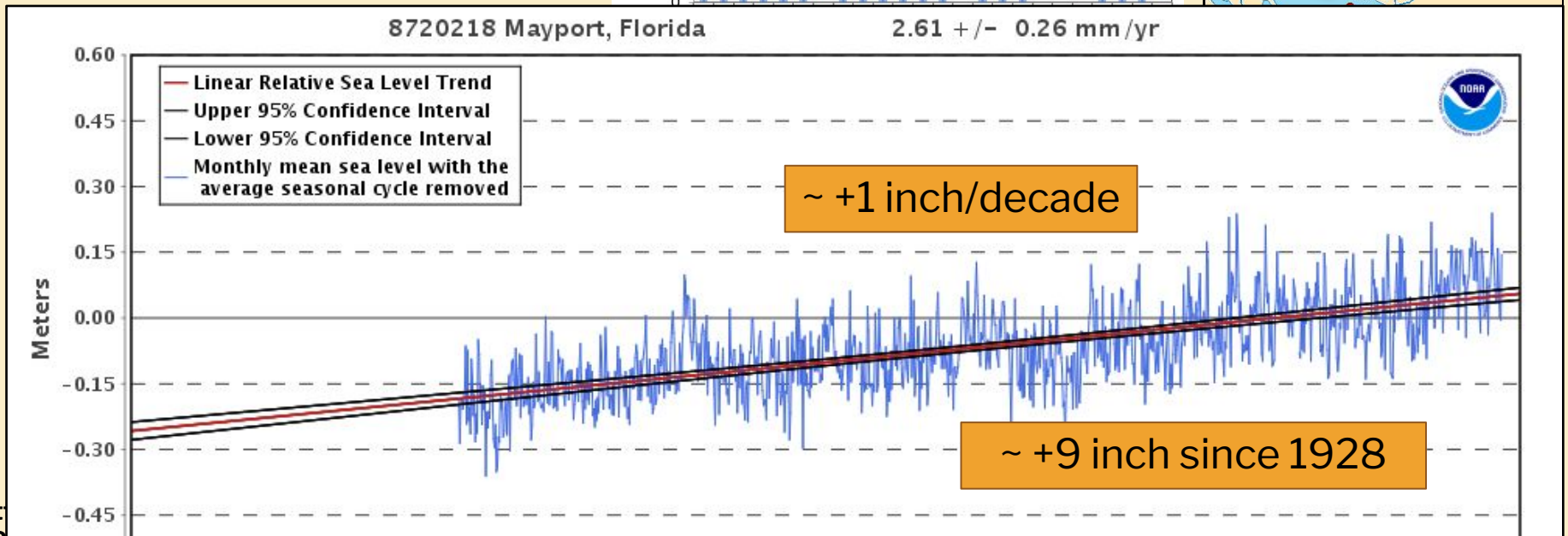
Water Quality
DISSOLVED OXYGEN
MAINSTEM
Satisfactory status
Conditions unchanged
TRIBUTARIES
Unsatisfactory status
Conditions improving
NUTRIENTS
NITROGEN MAINSTEM
Current status uncertain
Condition trend uncertain
NITROGEN TRIBUTARIES
Current status uncertain
Condition trend uncertain
PHOSPHORUS MAINSTEM MARINE/ESTUARINE
Satisfactory status
Conditions improving
PHOSPHORUS MAINSTEM FRESHWATER
Satisfactory status
Conditions unchanged
PHOSPHORUS TRIBUTARIES
Unsatisfactory status
Conditions unchanged
ALGAL BLOOMS
Unsatisfactory status
Conditions unchanged
TURBIDITY
Satisfactory status
Conditions unchanged
FECAL COLIFORM
Unsatisfactory status
Conditions unchanged
SALINITY
Unsatisfactory status
Conditions worsening
(Impacts increasing)
Algal blooms are the rapid increase of algae usually caused by an overabundance of nutrients.

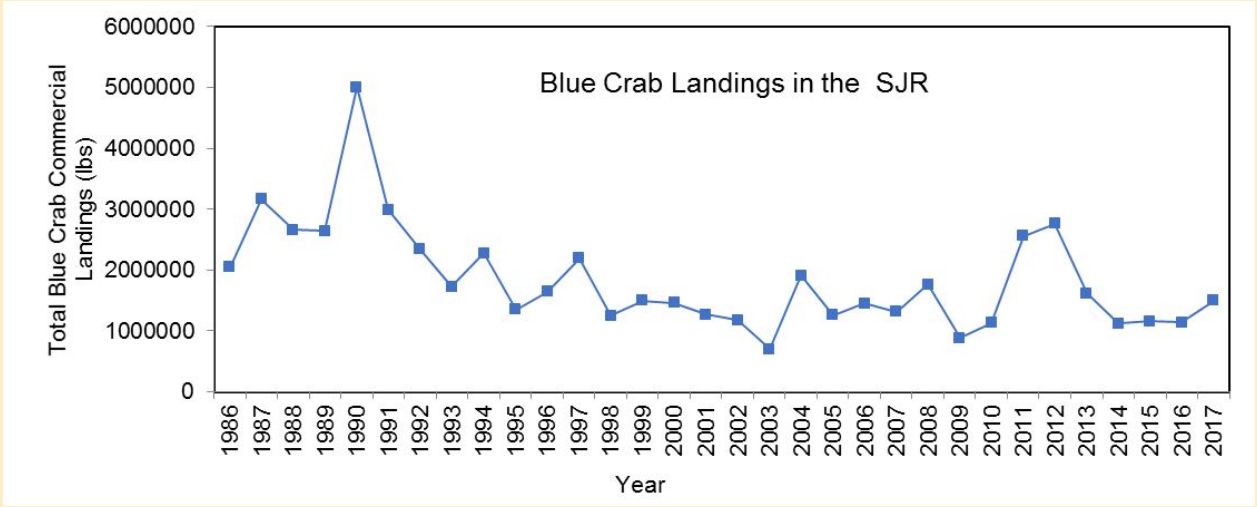

8720218 Mayport, Florida
2.50 +/- 0.27 mm/yr
Linear Mean Sea Level Trend
Upper 95% Confidence Interval
Lower 95% Confidence Interval
Monthly mean sea level with the average seasonal cycle removed
~ +1 inch/decade
~ +8 inch since 1928
Meters
0.60
0.45
0.30
0.15
0.00
-0.15
-0.30
-0.45
-0.60
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020


8720218 Mayport, Florida
2.61 +/- 0.26 mm/yr
Linear Relative Sea Level Trend
Upper 95% Confidence Interval
Lower 95% Confidence Interval
Monthly mean sea level with the average seasonal cycle removed
~ +1 inch/decade
~ +9 inch since 1928
Meters
0.60
0.45
0.30
0.15
0.00
-0.15
-0.30
-0.45

Blue Crabs

- Final Age ?
- No trend in the southern section where most crabs are caught
- Recreational Fishery ?
- Status: Uncertain
- Trend: Uncertain

- Male crabs can reproduce many times, females only mate once when mature and can store sperm for several months before actually spawning eggs.



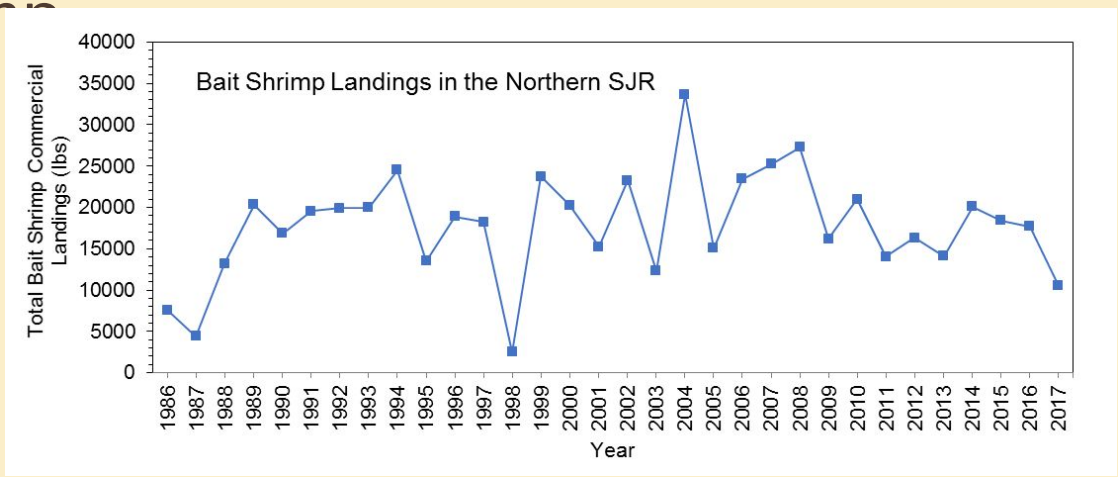
http://www.jacqueauger.com/.../natural/blue_crab.jpg

White Shrimp

- Commercial data: no trend overall and high annual variability.
- Most shrimp caught in the northern part of the river, trend increasing.
- Southern section of the river trend decreasing.
- Increasing trend in Young of Year shrimp

- Status: Uncertain
- Trend: Uncertain

- Brown, pink, white shrimp.
- Season closed: April-May: Nassau, Duval, St. Johns, Putnam, Flagler, and Clay Counties.



SAV

- Summary
  - Highly variable over time due to weather and other factors
  - Decline in grass bed coverage
  - SAV sampling north of Buckman

Sites north of Buckman Bridge:

Year	Total GT Sites	Bare no grasses	Not samples		Total LT Sites	Bare no grasses	Not sampled	Total sampling sites	% Bare
2015	12	3			7	3	2	19	32
2016	12		2		7	4		19	21
2017	11	9			6	3		17	71
2018	12	5			4	4		16	56