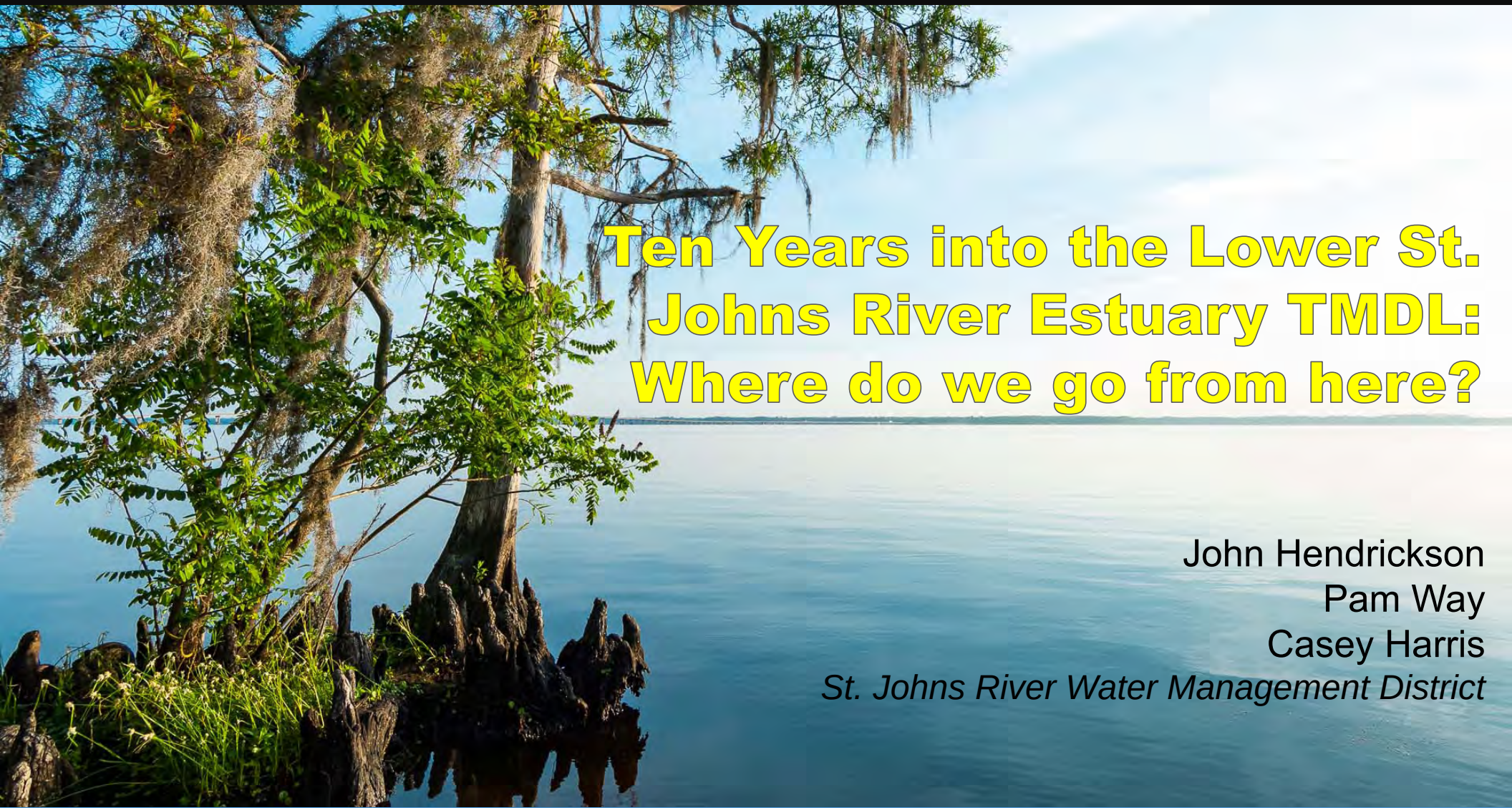
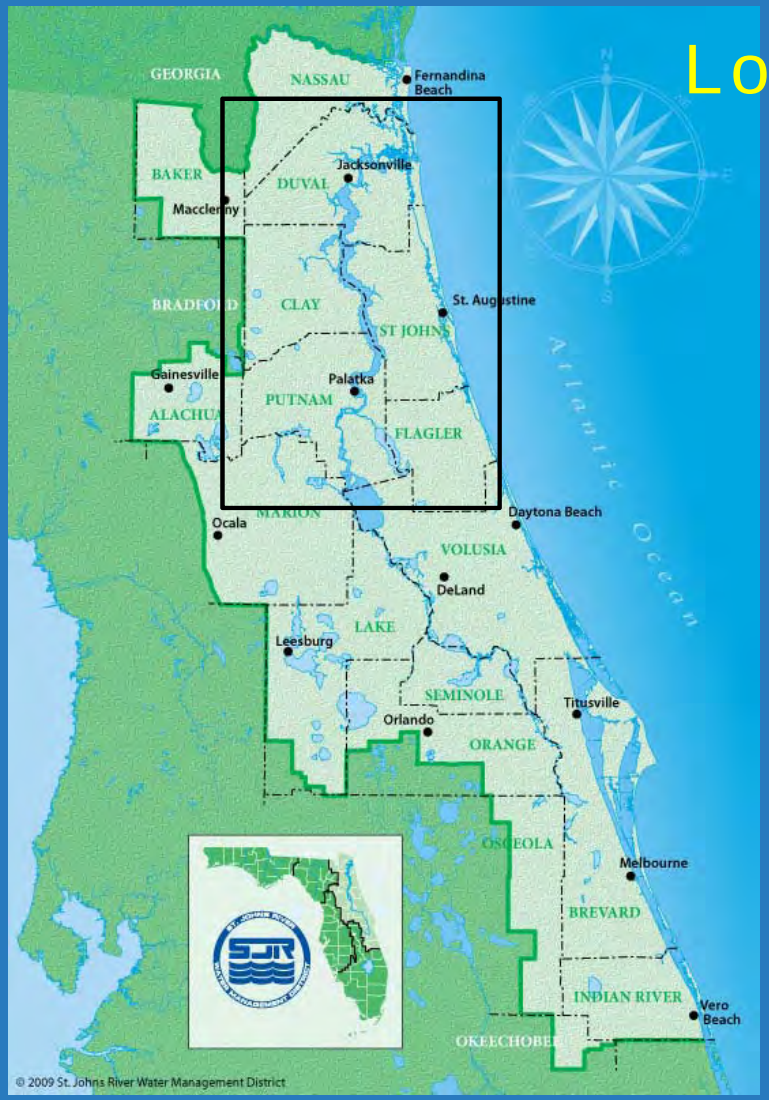
St. Johns River Water Management District



Ten Years into the Lower St. Johns River Estuary TMDL: Where do we go from here?

John Hendrickson
Pam Way
Casey Harris
St. Johns River Water Management District

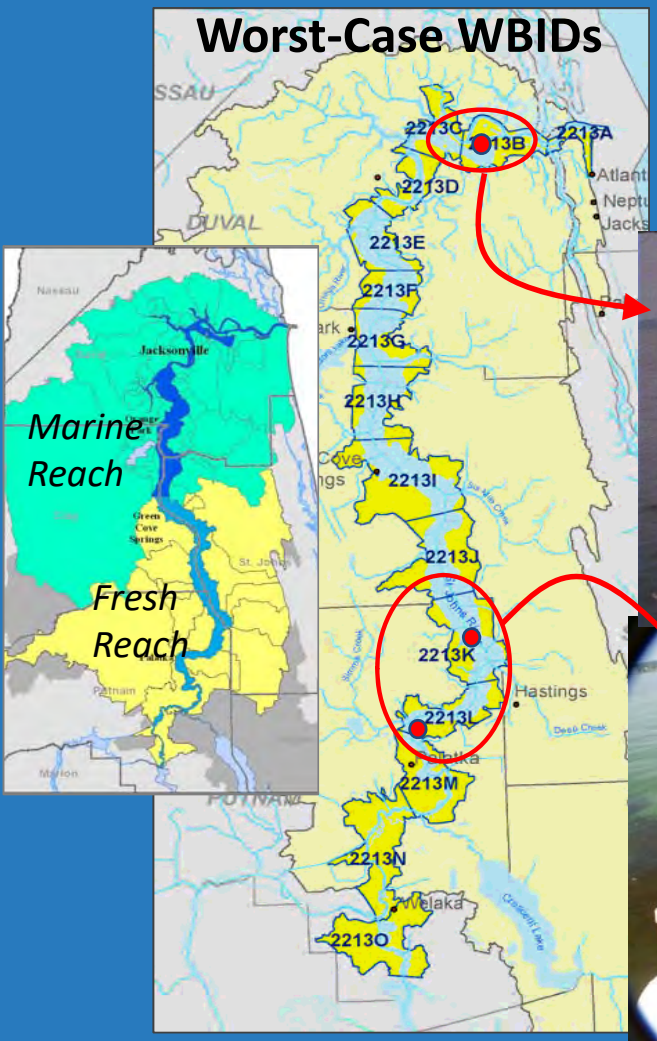


Lower St. Johns River Estuary TMDL

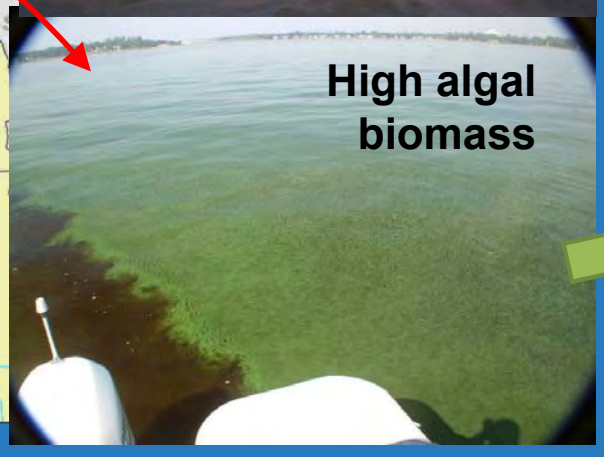
10-year process (1999 – 2008)

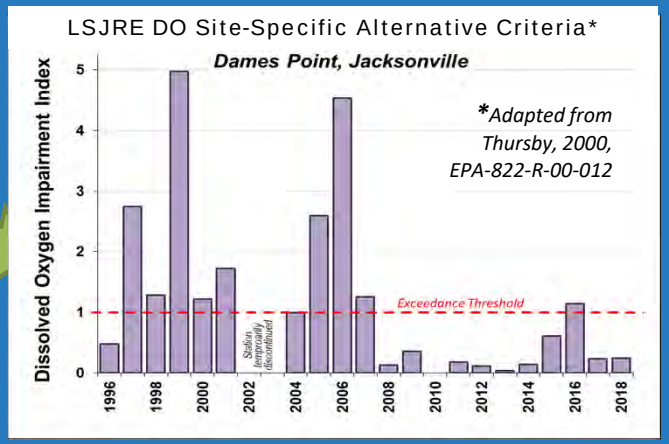
- **Setting**
  - **Identified in EPA/Earthjustice consent decree**
  - **Pilot for the Impaired Waters Rule and the recommendations of the policy advisory committee**
- **Reasons for successful adoption**
  - **Stakeholder consensus of a problem**
  - **Solid data and monitoring foundation**
  - **Quality, objective research facilitated buy-in**
  - **Unique aspects**
    - **Application of Chesapeake Bay Model (CE-QUAL-ICM)**
    - **Separation of anthropogenic and natural background**
    - **Consideration of nutrient form lability**
    - **Anthropogenic load evenly split point/nonpoint**

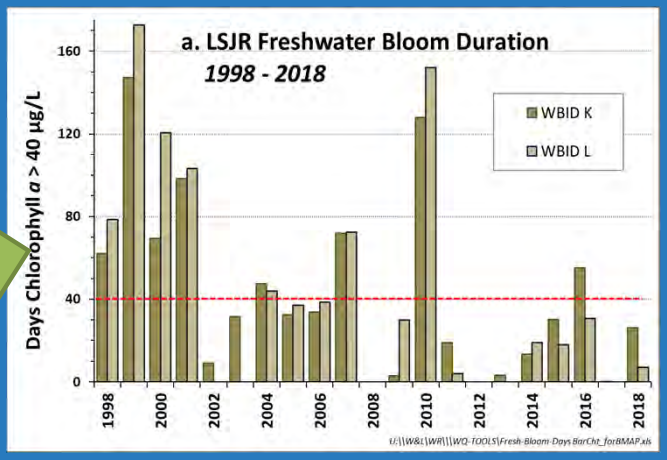
LSJRE TMDL Numeric Interpretations of the Narrative Nutrient Criteria



Symptoms

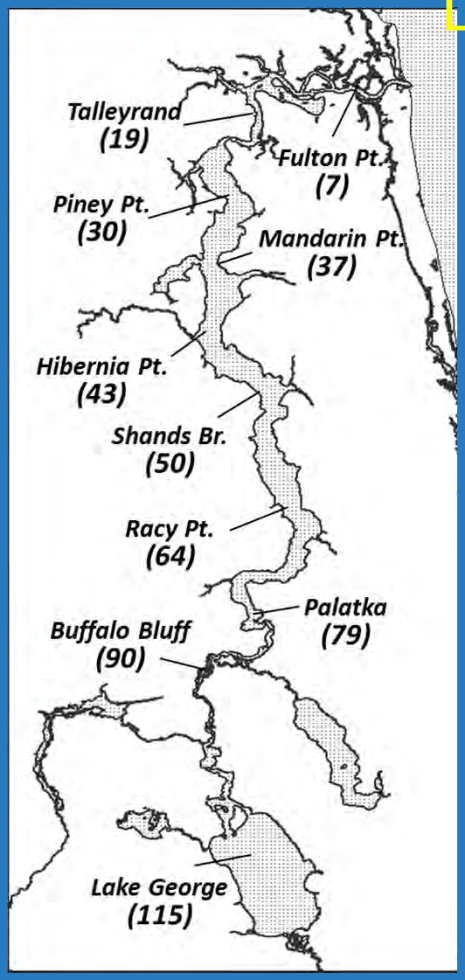


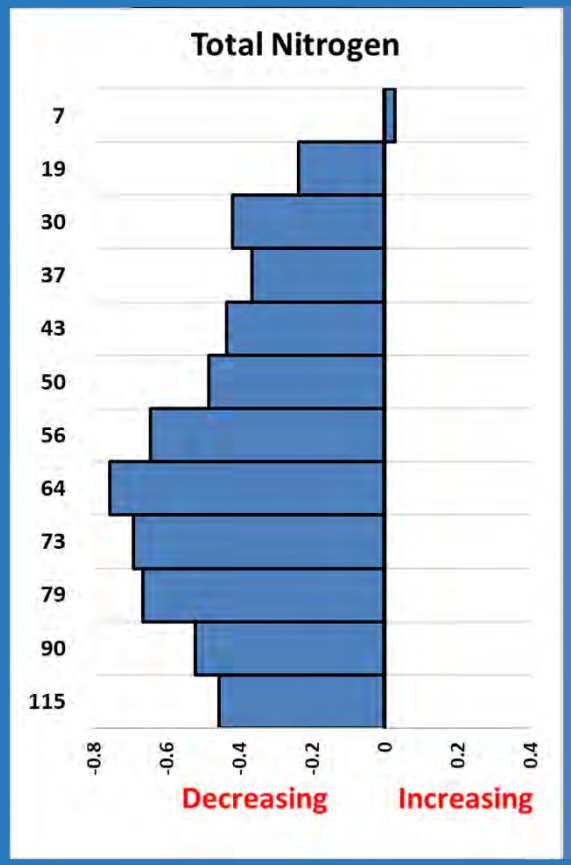


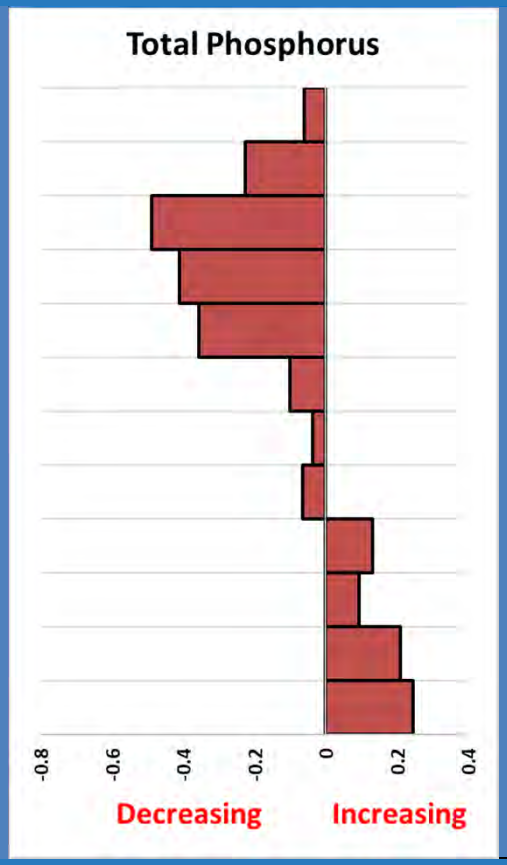


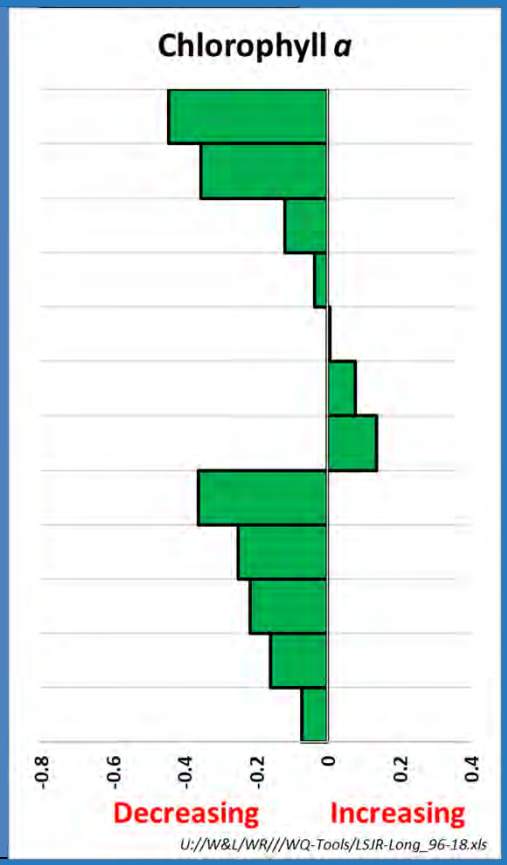
LSJRE 20-Year Trends Annual Geometric Means

Correlation coefficients Year x Annual Geomean

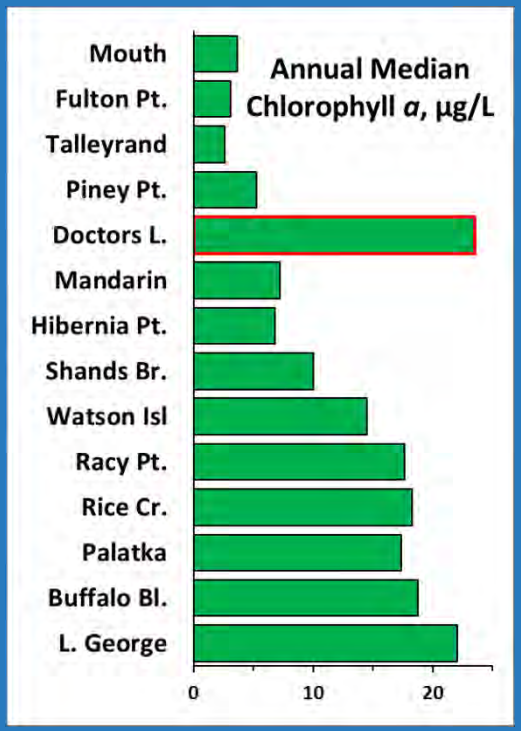






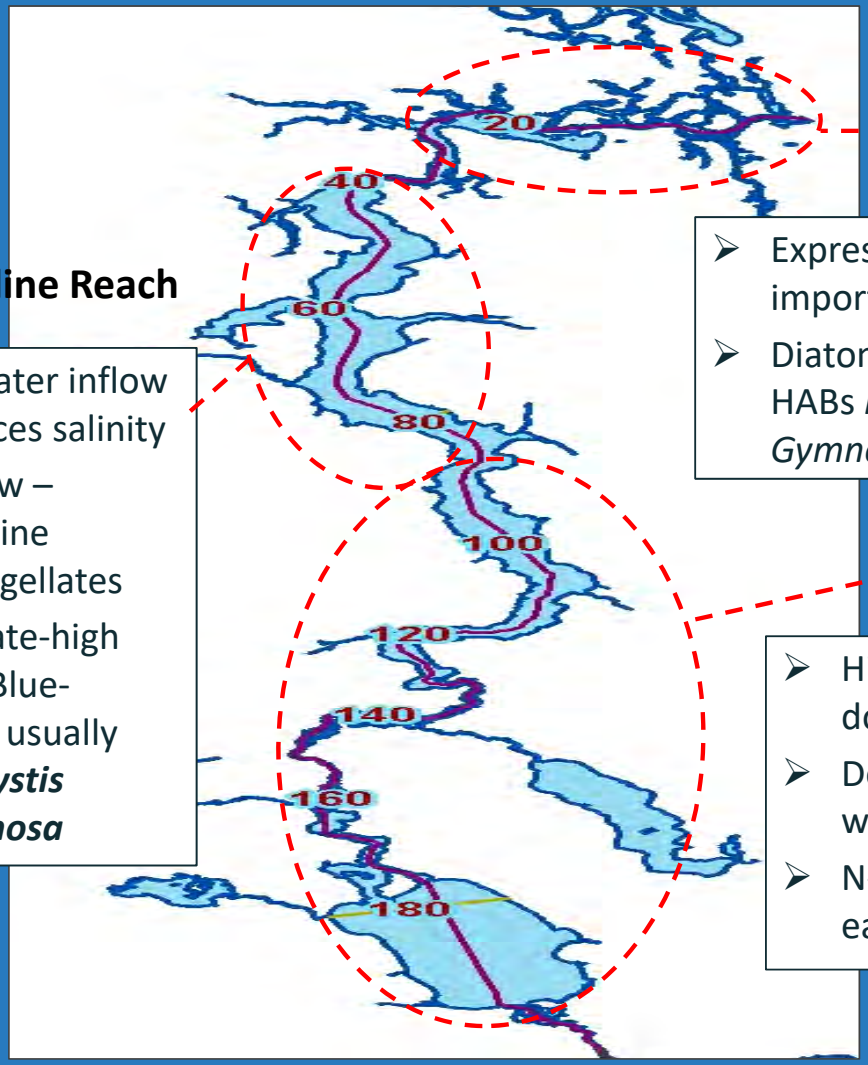


Algal Community Zonation of the St. Johns River Estuary



Oligohaline Reach

- Freshwater inflow influences salinity
- Low flow – euryhaline dinolflagellates
- Moderate-high flow – Blue-greens, usually ***Microcystis aeruginosa***



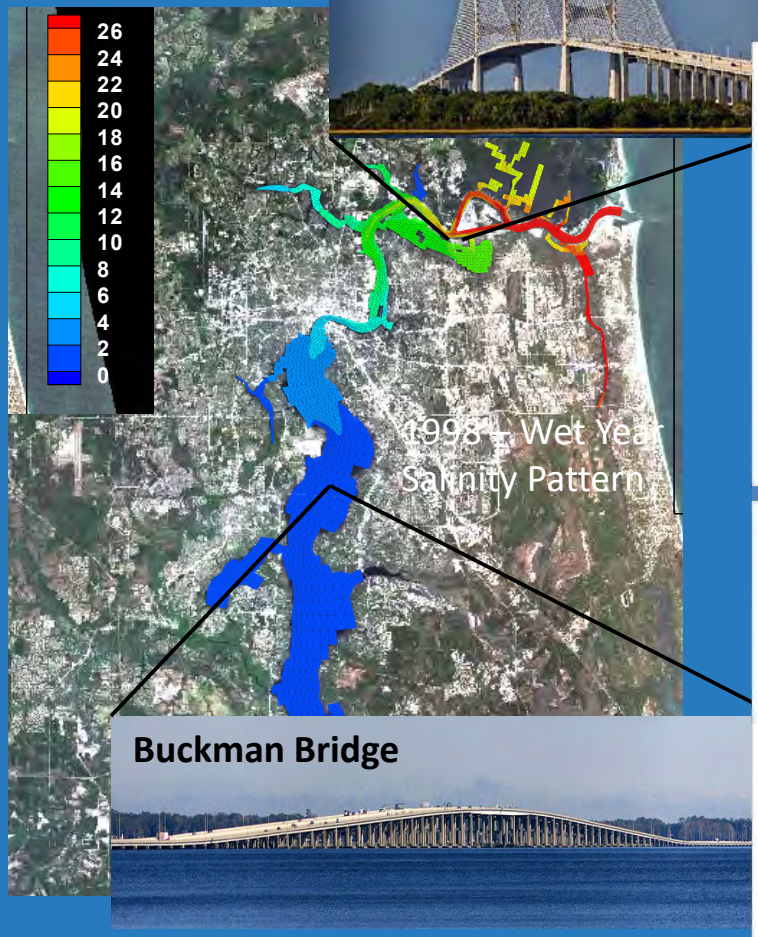
Marine Reach and Atlantic Inner Shelf

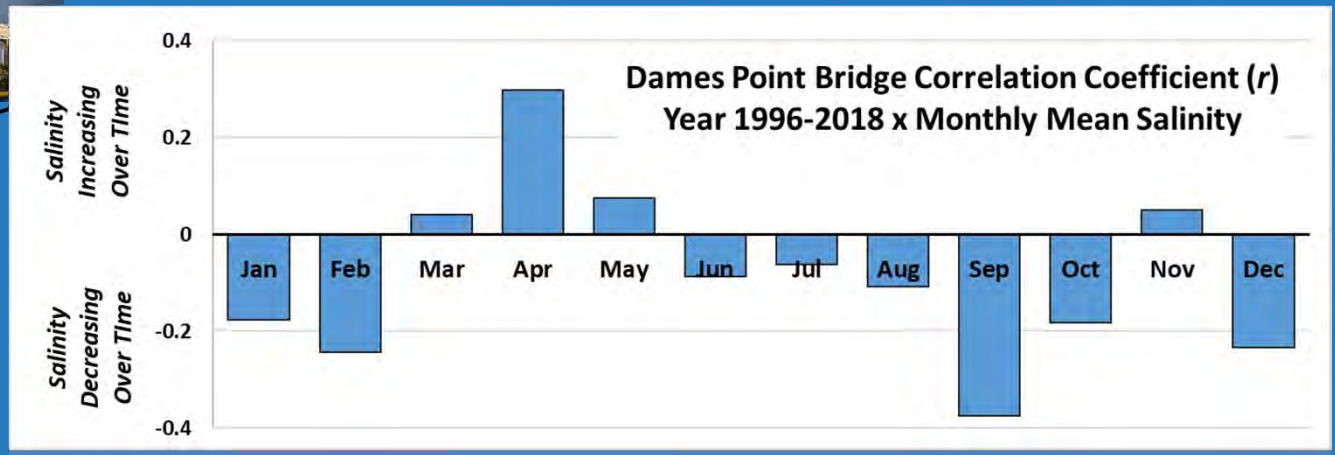
- Expresses productivity on shelf, imported to river in tide
- Diatom dominated; occasional HABs *Karenia, Pseudo-nitzschia, Gymnodinium, Akashiwo*

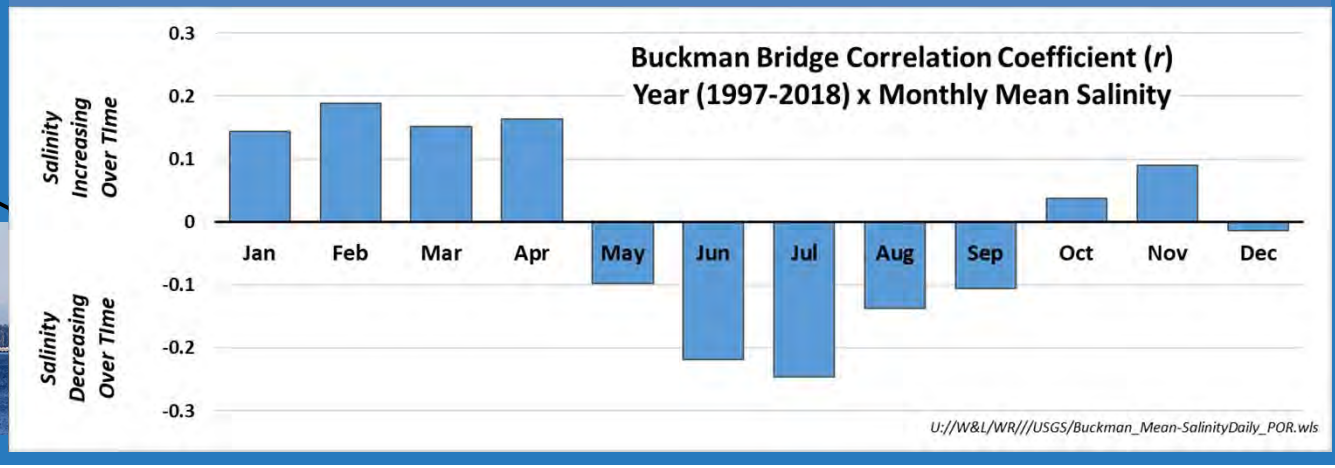
Fresh Tidal Reach

- Highest algal biomass of SJRE, dominated by cyanobacteria
- Density positively correlated with residence time
- N-Fixing cyanobacteria typical early bloom-formers

Salinity Trends in the LSJRE Marine Reach

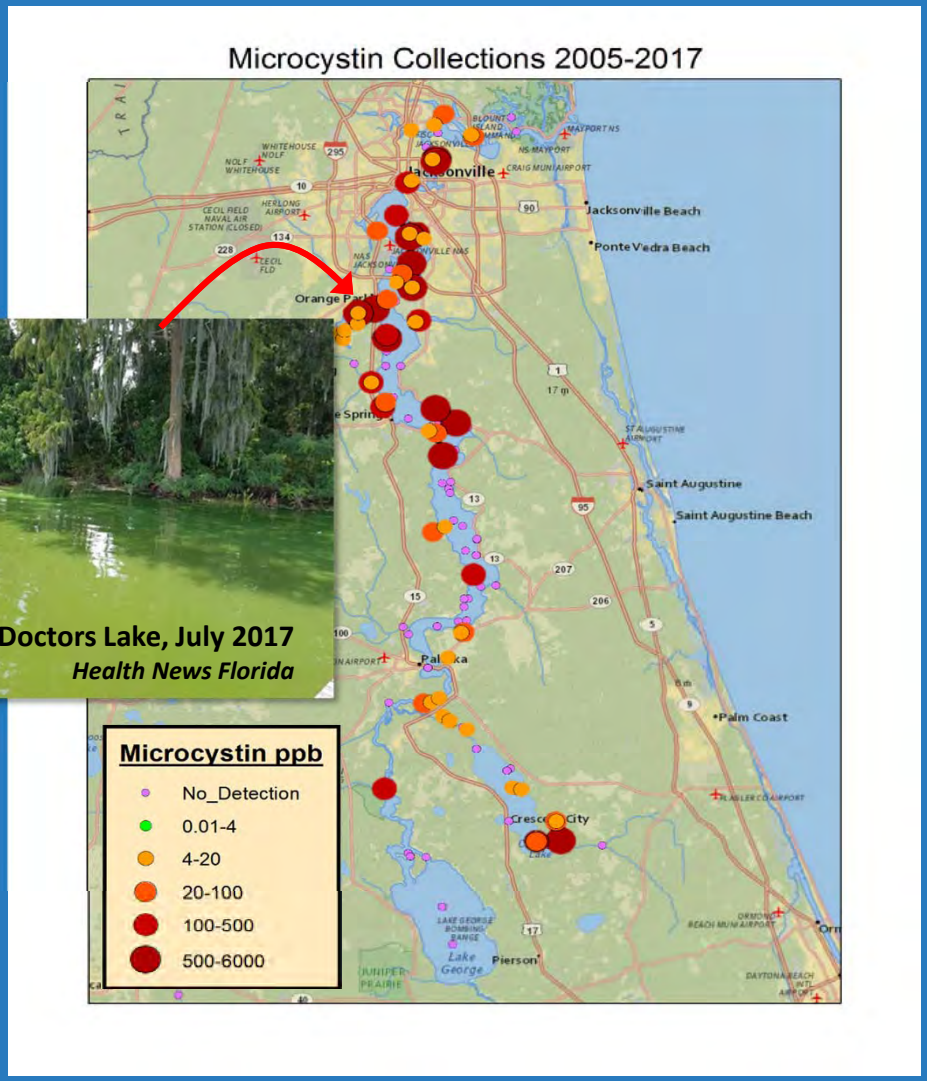




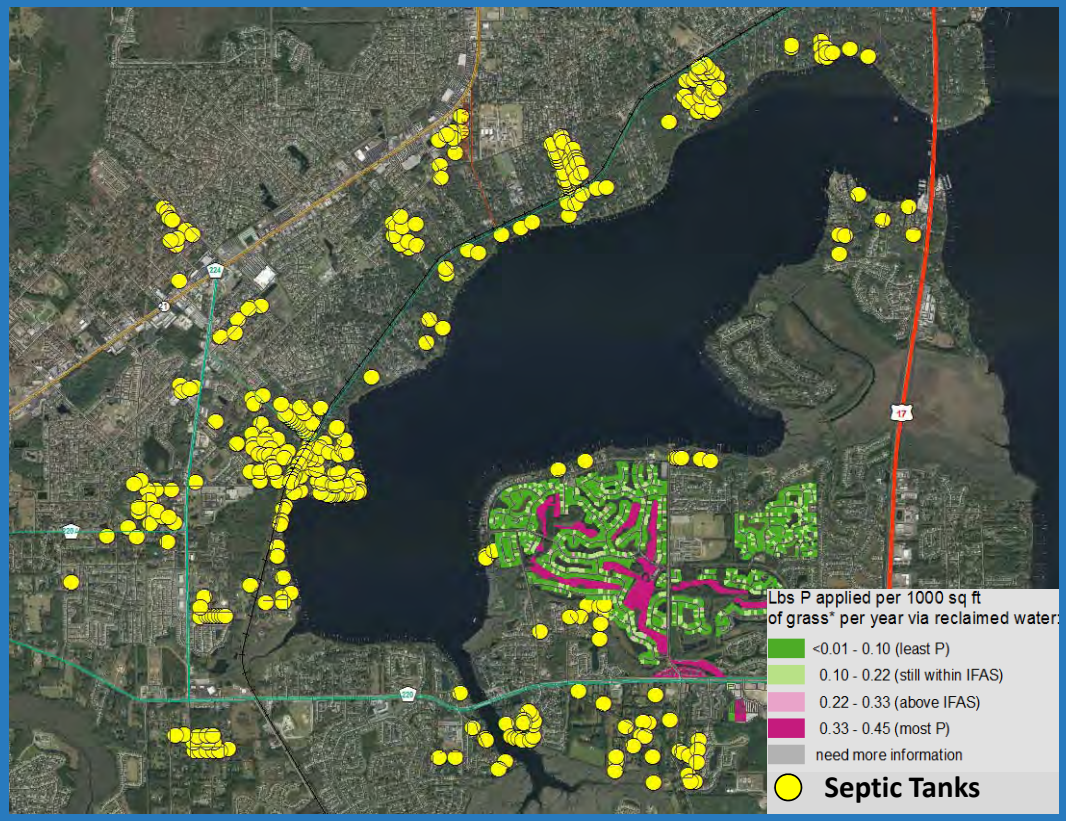


Challenges of Wetter Algal Bloom Seasons

- **Freshwater extends into oligohaline reach, favoring cyanobacteria**
  - ***Microcystis* frequent dominant**
  - **Higher population = more citizen encounters**
- **Nonpoint source a larger proportion of external load**
- **Irrigation demand lower, increasing wet-weather discharge**



District Cost-Share Projects
Emphasis on Nonpoint Source Reduction



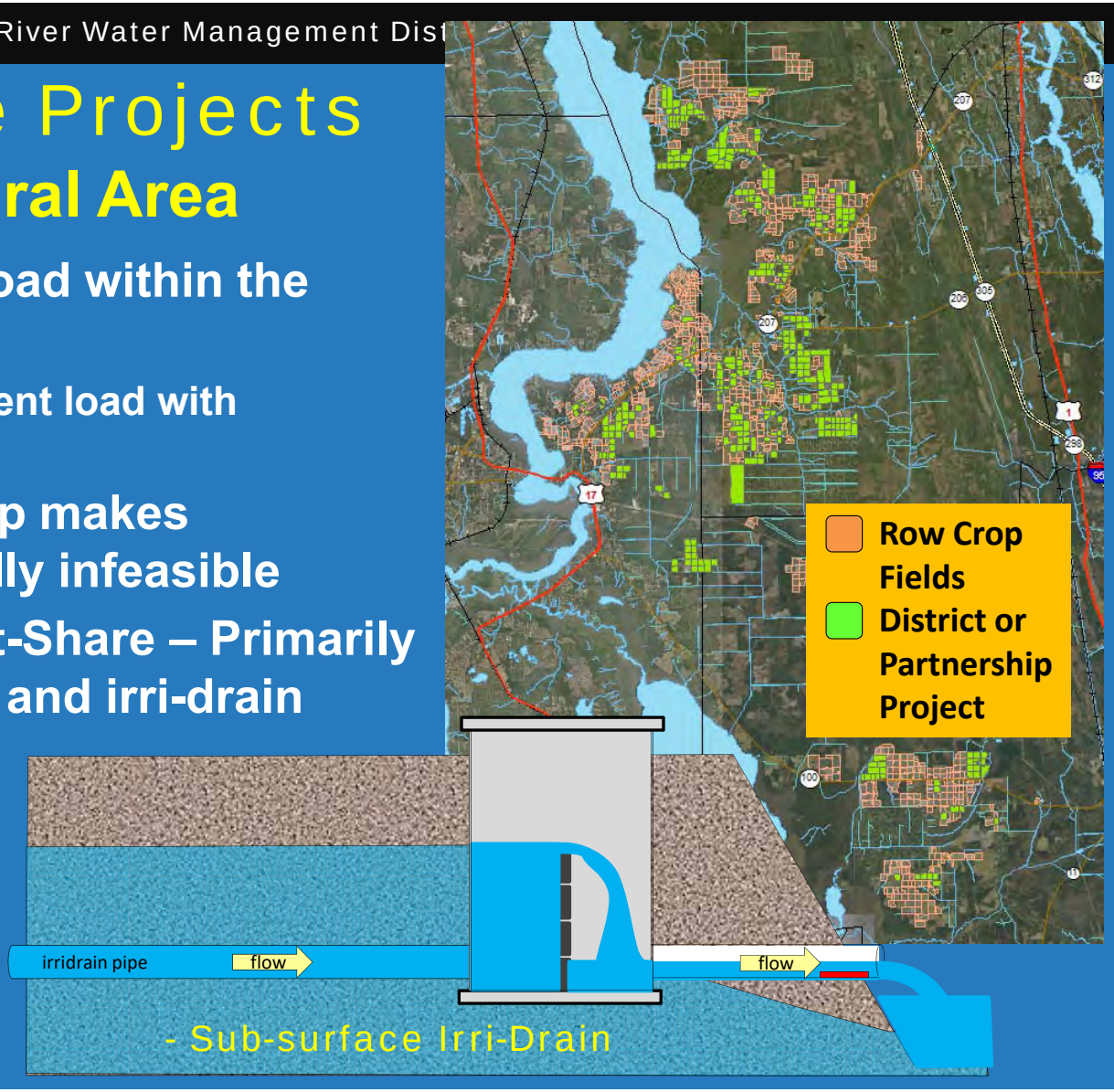
Doctors Lake

- **Ultra-advanced treatment for reclaimed**
  - **Bioretention absorptive media filtration between outfall and reclaimed storage**
- **Septic tank phase-out**
  - **Sewer service extension**
  - **Individually distributed wastewater treatment systems**

District Cost-Share Projects

Tri-County Agricultural Area

- **Largest contributor of nutrient load within the LSJR freshwater reach**
  - **Spring rains synchronize high nutrient load with freshwater inflow to oligohaline**
- **Distributed small farm ownership makes reductions onerous, economically infeasible**
- **District and Partnership Ag Cost-Share – Primarily banded phosphorus application and irri-drain**
- **Four pond-wetland regional stormwater treatment systems constructed and operating**
- **Options under consideration for incentivized land conservation**



The LSJRE TMDL
Looking back, looking forward

- **BMAP reductions have led to demonstrable improvement in eutrophication symptoms, as initially manifested**
- **Direction for the next decade:**
  - **Greater emphasis on nonpoint source reductions of phosphorus to control nutrient enrichment of the oligohaline reach during higher runoff**
  - **Cognizance of terrestrial nutrient budgets to balance landscape loading**
  - **Expansion of nutrient trading sphere to reduce upstream loads**
- **Progress verification imperatives:**
  - **Tributary sampling emphasizing stormflow to document nonpoint source load reductions and projects efficacy**
  - **Cost-effective spatial and temporal monitoring intensification**
  - **Continuation of public, private and research institution information exchange forums**


ST. JOHNS RIVER
SJR
WATER MANAGEMENT DISTRICT