

St. Johns River Quality, Algae Status and Action Plan

by the

Jacksonville Waterways Commission St. Johns River Algae Task Force

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Doctors Lake (News4Jax photo)

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Table of Contents

I.	Moving the Needle: Recommendations in Brief	3
A.	Executive Summary:	3
II.	Introduction.....	5
III.	Status of the River	6
A.	Summary.....	6
B.	Current Conditions Related to Algal Blooms and Associated Water Quality in the LSJR	7
C.	Cyanobacteria (Bluegreen Algae) Protocol for the Florida Department of Health (FDOH)	8
IV.	Water Quality Standards.....	11
A.	Lower St. Johns River Basin Management Action Plan (BMAP)	11
B.	MSJR BMAP	15
C.	USJR BMAP	18
D.	Doctor’s Lake Algae Remediation Projects.....	22
E.	Enforcement.....	23
F.	Wastewater System Resiliency.....	23
G.	Draft EPA Guidelines for Cyanotoxins	26
	Anthony Ouellette, JU	26
V.	What Do We Need to Do To Move The Needle?	27
A.	Continue to implement point source and nonpoint source basin management action plans (BMAPs) BMAPs and agricultural best management practices (BMPs):.....	27
B.	Re-establish public education campaigns to increase public awareness of the State and EPA goals:	27
C.	Create one centralized, statewide surveillance system to monitor cyanobacteria events.	36
D.	Promote and encourage the Florida Friendly programs, reduce the need for fertilizer and pesticide application basinwide.....	36
E.	Support the Waterkeeper proposed initiatives, Statewide 1999 Task Force Activation (Riverkeeper Resolution), and other legislative priorities.	37
F.	Implement riverwide assemblies such as the River Caucus, St. Johns County Waterways Task Force, and the St. Johns River Technical Advisory Committee.	39
G.	Promote re-establishing oyster reefs to promote improved water quality and possible harvesting.....	39
VI.	APPENDIX A:	42
A.	Waterkeepers Task Force Resolution.....	42
B.	Doctors Lake Restoration	45

Preface-

I. Moving the Needle: Recommendations in Brief

Action Plan Recap

Michelle Tappouni, Quint White, Melissa Long, John Flowe

Several meetings were held with all of the various agencies to discuss algae in the St. Johns River and potential solutions that could be implemented now. The following recommendations are derived from the detailed technical reports and Task Force discussions:

1. Continue to implement point source and nonpoint source basin management action plans (BMAPs) and agricultural best management practices (BMPs):
 - a. In the Lower Basin where indicated by total maximum daily loads (TMDLs) already adopted but where BMAPs have not been adopted;
 - b. In the Middle Basin; and
 - c. In the Upper Basin where there are TMDLs and the Upper Basin Restoration Project, but BMAPs have not been promulgated in all areas where the water quality is impaired.
2. Re-establish public education campaigns to increase public awareness of the State and EPA goals:
 - a. Via media using the *It's Your River* model;
 - b. Within K-12 programs to continue knowledge and responsibility into next generations; and
 - c. Via networking with Citizen Planning Advisory Committees (CPACs), Home Owners Associations (HOAs) and Condominium Owners Associations (COAs).
3. Create one centralized, statewide surveillance system to monitor cyanobacteria events.
4. Promote and encourage the Florida Friendly programs and reduce the need for fertilizer and pesticide application basinwide.
5. Support the Waterkeeper proposed statewide initiatives and Statewide 1999 Task Force Activation (Riverkeeper Resolution).
6. Implement riverwide assemblies such as the River Caucus, St. Johns County Waterways Task Force, and the St. Johns River Technical Advisory Committee.
7. Promote re-establishing oyster reefs to promote improved water quality and possible harvesting.

A. Executive Summary:

The Lower St. Johns River (LSJR) TMDLs have been effective in reducing the maximum concentrations of algae in the fresh, tidal, and marine reaches of the estuary. However, there are areas that still need further improvement, especially with regards to phosphorus. The current phosphorus targets for the LSJR marine section do not require any reduction in phosphorus, and Doctors Lake currently lacks a phosphorus TMDL.

The timing and amount of rainfall in recent years is partly responsible for producing conditions more favorable for the growth of cyanobacteria in this portion of the estuary. Also, because some species of cyanobacteria can obtain nitrogen from the atmosphere, reduction of nitrogen alone will not

effectively reduce bloom events, as long as phosphorus is in excess supply. A dual approach (reducing nitrogen and phosphorus) is more effective at reducing blooms.

It should be noted that approximately two-thirds of the nutrients contained in the river as it passes through the Jacksonville area originate from upstream sources (Upper and Middle Basins) and involve primarily non-point sources such as stormwater discharges. As such, future efforts to control nutrients and associated algae blooms in the Jacksonville area will increasingly involve non-point source improvement projects well upstream of Jacksonville.

The LSJR freshwater TMDL has achieved 70% of the total nitrogen (TN) reductions required and 89% of the total phosphorus (TP) reductions. In the marine reach of the LSJR, the total nitrogen reductions are at 119% of the requirement. As mentioned, there is not a current requirement to reduce phosphorus in the marine section of the LSJR. For the Middle SJR basin, a TMDL and BMAP have been adopted, and the required reductions are spread out over a 15 year period with the first 50% of the reductions being achieved within the first 5 years (by 2017). The 2017 Statewide Annual BMAP Report lists 91 projects as either complete or ongoing in the MSJR basin. The projects completed to date are estimated to achieve total reductions of 96,177 lbs./yr. of TN and 18,585 lbs./yr. of TP, or 110% and 136% of the reductions needed to meet the portion of the TN and TP TMDLs, respectively. The Upper St. Johns River has an adopted TMDL but not a BMAP. The City of Jacksonville's (COJ) Environmental Quality Division (EQD) is now aware of reductions currently achieved for this portion of the river. However, in May 2016, the district and United States Army Corps of Engineers (USACE) celebrated the completion of the upper basin project, one of the largest and most ambitious flood control and wetland restoration projects in the world. The project has now moved into a long-term maintenance phase.

While stakeholders ranging from the Lower, Middle, and Upper St. Johns River continue to work towards improving nutrients in their respective areas, more will need to be done. The recommendations mentioned above are meant to be initiatives and/or ideas that can be implemented now in order to further improve the nutrients entering into the River. For more details about BMAPs, Status of the River, and further details about the recommendations, refer to specific sections within this report.

St. Johns River Quality, Algae Status and Action Plan

II. Introduction

During the July 20, 2017, Jacksonville Waterways Commission meeting, the routine discussion of St. Johns River water quality occurred, and the algae blooms of the past were noted as approaching Jacksonville, now that conditions were right. Chairperson Lori Boyer appointed a Task Force on the St. Johns River, with members Michelle Tapouni (EPB Chair) and Dr. Quint White (JU) to address this issue. The Task Force enlisted the support of agencies listed on the cover of this report.

The July Waterways meeting video is available at:

<http://player.theplatform.com/p/IfSiAC/bcvO7ry5GnGV/select/media/t2fXYAIEvuDG?form=html>

The discussion occurs on the video in the 17:45-23:05 time period of the recording.

Mrs. Boyer requested a report back at the next Waterways Commission meeting on August 9, 2017.

The charge to the Task Force is to provide a report on:

- Status of the St. Johns River under the current standards.
- Whether the standards are appropriate.
- Whether we are enforcing them.
- Do other counties upstream have different standards?
- If we want to move the needle on this problem, specify what we need to do.
- Things we tried in the past but were rejected.

Interim reports were given on August 9, 2017 and February 14, 2018. The final report is scheduled for April 10, 2019.

Task Force Approach

At the first Task Force meeting, participants discussed a two-part response:

1. Status of the River using available resources:
 - a. 2016 or 2017 Jacksonville University/University of North Florida (JU/UNF) River Report
 - b. 2016 River Accord Report
 - c. 2017 BMAP Annual Report
2. Next Step on addressing the remedies.

Outcomes

The final document needs to address and summarize the answers to the 6 questions:

1. Status of the St. Johns River under the current standards?
2. Whether the standards are appropriate?
3. Are we enforcing them?
4. Do other counties upstream have different standards?
5. If we want to move the needle on this problem what do we need to do?
6. Things we tried in the past but were rejected?

III. Status of the River

A. Summary

John Hendrickson, SES, SJRWMD

By most water quality measures, the LSJR is greatly improved from where it was 15 years ago, due in large part to the nutrient TMDLs and implementation of National Pollutant Discharge Elimination System (NPDES) stormwater improvements. We are also striving to hold more water in the Upper SJR and the Ocklawaha basins, which increases baseflow, also reducing the severity of algal blooms.

The LSJR nutrient TMDLs have been effective in reducing the maximum concentrations of algae in the fresh, tidal, and marine reaches of the estuary and mitigating the water quality problems that were related to these blooms. Nutrient pollution control efforts thus far have been less effective in mitigating the adverse effects of blooms that occur in the river's oligohaline reach, located between the Shands Bridge and downtown Jacksonville. Factors relevant to this condition include:

- The adverse water quality condition that arises from nuisance blooms in the LSJR oligohaline reach is visible algal scum formation and cyanotoxin production. Challenges to developing a reliable target for TMDL designated use achievement include:
 - Increased discharge and nutrient load conditions that favor the occurrence of these toxin-producing species are dynamic and intermittent; and
 - Because of the patchy nature of the principal toxin-producing algal species, traditional water quality monitoring approaches provide an incomplete assessment of the levels of impact and relationship to nutrient loads.
- Growth of the nuisance blooms that occur in this reach is controlled by both nitrogen and phosphorus. The recently adopted phosphorus TMDL for the LSJR Main Stem marine section is insufficient to reduce these blooms, and Doctors Lake currently lacks a phosphorus TMDL.
- Regarding the origin of nutrients that contribute to nuisance blooms in the LSJR oligohaline reach:
 - The highest concentrations of phosphorus occur in and just downstream of the oligohaline reach;
 - The highest net phosphorus loading rates to the entire St. Johns River occur in the lower basin between Palatka and Jacksonville;
 - Nonpoint source runoff delivers a larger proportion of the nutrient load under the higher discharge conditions that also render the oligohaline reach favorable for cyanobacteria. Hence effective control may require proportionally larger nutrient load reduction through nonpoint source reduction.
 - Diminished reclaimed water demand during high precipitation and runoff conditions increases wet-weather discharge, adding to the nutrient load when the oligohaline reach is suitable for cyanobacteria blooms.
- Doctors Lake exhibits the most frequent and severe nuisance bloom conditions in the LSJR. The factors that drive bloom conditions in the lake are largely separate than those of the river and will require a tailored and intensive approach, possibly including landscape fertilizer management, greater sewer service connection, and addressing the influence of legacy loads present in the sediments.

B. Current Conditions Related to Algal Blooms and Associated Water Quality in the LSJR

John Hendrickson, SES, SJRWMD

The nutrient reductions achieved through the LSJR TMDL have been effective in mitigating the adverse effects stemming from high levels of algal biomass within the fresh, tidal, and downstream marine reaches of the river. Throughout the freshwater reach of the LSJR, the mean of the annual maximum concentrations of chlorophyll *a* from 2008 to 2017 has decreased by 21 percent (to 55 versus 71 micrograms per liter [$\mu\text{g/L}$]) when compared to 1998 to 2007. Annual maximum chlorophyll *a* concentrations have also decreased for the river's oligohaline sites by 12 percent and by 26 percent in Doctors Lake. When the Lake George and Crescent Lake TMDLs are implemented, with attendant BMAPs, further water quality improvements are expected for the LSJR.

Nuisance bloom conditions persist in Doctors Lake and to a lesser degree in the downstream freshwater and oligohaline reaches of the estuary between Picolata and southern Jacksonville. In these reaches of the LSJR, these blooms or scums are invariably cyanobacteria species. The severity of these cyanobacteria blooms, particularly in the river's oligohaline reach, are not necessarily evident from water quality monitoring data because cyanobacteria are rarely the dominant species at the established mid-river sites, nor are they usually dominant when chlorophyll *a* values are high.

Nevertheless, cyanobacteria earn the distinction as the dominant "harmful algal bloom" (HAB) primarily due to one ubiquitous species, *Microcystis aeruginosa*. *M. aeruginosa* has strong buoyancy control capability, which allows it to maintain productivity in the deeper oligohaline reach. It is not a nitrogen fixing species, so is more likely to appear after other nitrogen-fixing species have provided nitrogen for growth. As the bloom senesces, it tends to float, become wind-rowed and aggregated in thick scums on shorelines. Add to this the fact that the microcystin (cyanotoxin produced by *M. aeruginosa*) production per unit of algal biomass tends to be high within this reach, and the result is that blooms of this species and its cohorts constitute the primary adverse water quality condition that continues to persist in the LSJR.

The timing and amount of rainfall and runoff in recent years is partly responsible for producing conditions more favorable for the growth of cyanobacteria in this downstream portion of the estuary. More relevant, however, is that while phosphorus concentrations are declining throughout the LSJR, levels within the oligohaline reach still remain at levels that can support significant algal biomass. Because the cyanobacteria assemblage contains species that can acquire nitrogen from the atmosphere, reduction of nitrogen alone will not effectively reduce bloom events, as long as phosphorus is in excess supply. Limitation of nuisance cyanobacteria growth usually requires a dual nutrient reduction approach including phosphorus.

A nuance to the downward trend in phosphorus concentrations is apparent when river discharge and runoff are considered. Downward phosphorus trends are highly significant in low-flow years, presumably because point source contributions, which constituted a large fraction of the freshwater reach external load when runoff was low, have achieved proportionally greater amounts of load reduction. Under high flow conditions, as more of the load originates from nonpoint sources, and, correspondingly, more of the oligohaline reach is fresh and hence favorable to cyanobacteria growth, the significance of phosphorus decline over time diminishes.

C. Cyanobacteria (Bluegreen Algae) Protocol for the Florida Department of Health (FDOH)

Rob Burks & Andrew Reich, FDOH

Introduction

Marine, brackish, and fresh water bodies are home to microorganisms that produce natural toxins. When these organisms are present in large amounts, they are known as HABs. Exact causes of these blooms and what initiates toxin production is not known. HAB species are both non-toxic and toxic; some HAB species can turn on and off toxin production. However, they can negatively affect the environment, aquatic life, and human and animal health. Since HABs occur in the ocean, brackish water, and freshwater, people may experience symptoms from the toxins when they are near or in the water, inhale toxins on marine aerosols, or ingest contaminated shellfish or other edible species.

FDOH provides health guidance and consultation in response to HABs including those events involving blue green algae or cyanobacteria. Response strategies are designed to be used and implemented by FDOH county facilities in consultation with Central Office subject matter experts and the Office of Communications. Expertise on the impacts of HABs on public health resides in the Bureau of Environmental Health, under the Division of Disease Control and Health Protection. The Bureau works to ensure that Florida waters are safe for recreation, the health of people living in coastal and waterfront communities is protected, and Florida seafood is safe to eat.

Cyanotoxins are produced by cyanobacteria such as *Microcystis*, *Anabaena*, *Cylindrospermopsis* and other types of blue-green algae. They can be found in surface fresh water bodies and drinking water reservoirs during blooms. Ingestion of affected raw water has been associated with human illness and animal deaths (e.g., livestock or pets). In addition, instances of dermatitis and skin irritation have been reported in people exposed while swimming or contacting cyanobacteria blooms.

Methods

Most often, the initial contact about a potential cyanobacteria event and/or related illness comes from one of the following sources:

- Citizen complaint/contact with public health authorities including FDOH, Florida Poison Control Information Centers (FPIC), media reports, public officials, or environmental protection entities;
- Ill person seeking advice at FPICP;
- Reports of animal morbidity or mortality detected through sentinel animal surveillance systems (monitoring of birds or other susceptible animals/aquatic life); and
- Environmental monitoring systems, including satellite imagery and water quality assessments.

Presently, Florida does not have one centralized, statewide surveillance system to monitor cyanobacteria events and their effects on the environment and animal and human health. As a result, information is gathered from several sources to detect cyanobacteria events and human illness resulting from exposures to cyanotoxins. The Bureau of Environmental Health within FDOH is a partner on several collaborative interdisciplinary initiatives with other programs, both within the FDOH

and outside organizations, to facilitate data sharing and integrate response efforts. Brief descriptions of some of these initiatives are provided below.

- a. Merlin Reportable Disease Surveillance: Routine public health surveillance provides continuous monitoring of cases and outbreaks of human illness from various causes, including those resulting from contaminated food and water.
 - Of the four important HABs in Florida, exposure to toxins from three of the species may cause illnesses considered “reportable” conditions in Florida. Cyanobacteria is the only HAB not included as a reportable illness. However, a reporting module is within Merlin to facilitate data collection in a consistent and meaningful format for cyanobacteria related illness.
 - Variables include personal identifiers, exposure histories, and clinical information which are stored within this Health Insurance Portability and Accountability Act- (HIPAA-) protected, confidential database. Public health epidemiologists in Florida access this shared module and enter new suspected and confirmed case reports of human illnesses attributed to cyanobacteria events.
- b. Florida Poison Control Information Centers (FPIC): People who become ill after potential exposures to cyanobacteria, concerned citizens/general public, and health care professionals use the toll-free Florida Poison Information Center Hotline (800.222.1222) to obtain information on HAB-related illness, symptoms, treatment options and diagnoses. Records of all calls received by the centers are maintained in a statewide database. FDOH has access to this web-based secure database for poisoning information including personal identifiers, contact information and treatment hospital.
- c. NOAA National Coastal Data Development Center: Data from satellite imagery are available to environmental resource scientists that assess chlorophyll levels and indicate potential and/or actual bloom events. More information on their data is available here: <https://products.coastalscience.noaa.gov/hab/>.
- d. Caspio Cyanobacteria Bloom Tracking Module: FDOH has developed a simple cloud-based, cyanobacteria tracking module, hosted by Caspio Bridge, Inc.
 - The module collects information on location of bloom events, environmental conditions, site visit observations, and laboratory results.
 - Registered members have the capability for uploading photographs, laboratory reports, and other documents to be viewed by other users upon secure log-in.
 - In addition, there are fields for human and animal illness (or death, such as fish kills) complaints, following confidentiality protocols.
 - This system has over 120 subscribers representing 15 different local, state and federal agencies, private laboratories, universities and external state government partners.
 - Email notification alerts are sent to subscribers so they can stay informed of recent bloom activity.
 - There is also a public access portal that provides redacted information to interested people sans personal identifiers. Over 546 reports have been entered into this system, representing blooms in 38 counties in Florida.

Discussion

Stakeholder Communication

Through weekly coordination calls during cyanobacteria bloom season, led by the Florida Department of Environmental Protection (FDEP), partners share information, identify roles and responsibilities and

allocate resources in accordance with the conditions of the event (e.g., geographical location, extent of bloom, environmental and economic impacts, etc.), regulatory authority and technical expertise. For FDOH, this includes developing/modifying communication materials to inform the public, and if deemed appropriate, ingress/egress signage and press releases.

A similar weekly coordination conference call is facilitated by the Florida Fish and Wildlife Conservation Commission's (FWC) Research Institute related to *Karenia brevis* red tide blooms. Multiple local, state and federal entities participate to facilitate data sharing, event response coordination and data interpretation.

Corrective action may include recommendations to limit recreational use of a water body and other methods to reduce exposures to humans and animals.

FDOH Communication

FDOH relies on public health experts in each of its 67 county facilities to evaluate local conditions and work with the Bureau of Environmental Health, which provides subject matter expertise in aquatic toxins, to help develop community appropriate response strategies. Outreach material has been developed by the Bureau. These outreach materials are available to local FDOH counties for distribution. When county-specific information is required, county staff work with the FDOH Bureau of Environmental Health to customize for local needs.

When community concern becomes significant, a press release announcing health concerns may be necessary. The FDOH Office of Communication and the local public information officer will coordinate messaging. In situations where bloom conditions are evident near points of egress and ingress to the water body, such as boat launches and popular swimming areas, signage may also be posted. When bloom impacts affect public health, water quality and aquatic resources together, multiple agencies may collaborate on joint press releases to facilitate and highlight collaborations between governmental organizations.

Health Concerns/Messaging

Potentially, an individual will have health problems when substantial amounts of water containing high toxin amounts is swallowed such as when people drink untreated surface water. However, in the United States, drinking untreated, surface water is discouraged. Surface water used for public consumption is filtered and treated before it enters the distribution systems. Besides drinking affected surface water, it is difficult to get cyanotoxins into the body as they do not become easily airborne and do not pass through the skin readily.

FDOH relies on environmental sampling expertise and partner agency analytical capacities to provide information on the scope of blooms, types of organisms, and presence of cyanotoxins. The most common cyanobacteria blooms are highly visible and most people avoid a blue-green algae bloom because they tend to be icky-looking and smelly. Because bloom conditions change rapidly, including in composition, density, distribution and location, FDOH does not rely exclusively on laboratory identification and toxin analyses to provide guidance to residents and visitors when cyanobacteria blooms are present. FDOH recommends a common-sense approach:

- Do not swim in cyanobacteria/blue-green algae blooms.
- If someone comes into contact with the bloom, wash with soap and water.
- Do not eat fish that are harvested from areas near or in the blooms.
- Untreated water from the bloom area should not be used for irrigation when people could come into contact with the spray.
- As always, if someone experiences an illness, they should consult their health care provider.
- Do not allow pets to swim in the bloom, drink surface water of the bloom or near the bloom, or eat the scum of the bloom.
- If the pet goes in the water near or in a bloom, do not let them lick their fur and make sure the animal is rinsed off with clean fresh water to remove any remnants of the algal bloom or mat.

IV. Water Quality Standards

It should be noted that approximately two-thirds of the nutrients contained in the river as it passes through the Jacksonville area originate from upstream sources (Upper and Middle Basins) and involve primarily non-point sources such as stormwater discharges. As such, future efforts to control nutrients and associated algae blooms in the Jacksonville area will increasingly involve non-point source improvement projects well upstream of Jacksonville.

The BMAPs are the plans for achieving water quality standards. Text is provided in this report body on the LSJR, Middle St. Johns River (MSJR) and Upper St. Johns River (USJR) BMAPs.

A. Lower St. Johns River Basin Management Action Plan (BMAP)

1. Lower Basin BMAP Status

Kevin Coyne, FDEP, July 2018

The LSJR Main Stem BMAP addresses three TMDLs—there are TN and TP TMDLs in the freshwater section and a TN TMDL in the marine section. The freshwater TMDLs are designed to meet chlorophyll-*a* targets and the marine TMDL creates healthy dissolved oxygen conditions for aquatic plants and animals. Through December 31, 2017, 294 projects have been completed in the LSJR Main Stem BMAP area. During 2017, an additional 52 projects were added to the BMAP, which are underway or planned. In the freshwater section, the projects completed to date are estimated to achieve total reductions of 400,990 lb./yr. of TN and 102,211 lb./yr. of TP, or 70% of the TN reductions and 89% of the TP reductions needed to meet the freshwater TN and TP TMDLs, respectively. In the marine section, the projects completed to date are estimated to achieve total reductions of 2,816,993 lb./yr. of TN, or 119% of the TN reductions needed to meet the marine TN TMDL.

This BMAP includes allocations to individual entities with compliance schedules. These include industrial operations, domestic wastewater facilities, transportation facilities, urban stormwater sources, aquaculture operations, and agricultural sources. Each project has a due date--which is its compliance date--and each entity must meet its own reductions and compliance schedule. In general, wastewater facilities were given shorter timeframes to meet their reductions while stormwater sources were given more time in their compliance schedule. The last compliance date for any BMAP project is December 31, 2023. Most projects had much earlier completion dates and therefore many projects are complete, hence the substantial load reductions achieved through 2017.

While the estimated load reductions to meet the TMDLs have been achieved, not all of the entities have completed their required reductions and need to conduct additional efforts. Since many entities exceeded their requirements, the total reductions have surpassed the total requirements. Individual entities must still meet their own compliance schedule and cannot rely on other entities exceeding their obligations to meet their own requirements. It is especially important that stormwater sources meet their reduction requirements as rainfall levels vary their influence from year to year. During wet years, stormwater sources become especially important loads because the runoff loads increase substantially. In dry years, wastewater sources are important because their loads are more constant even when river volumes are low. Therefore, all sources are responsible for reducing their impact so the water quality targets will be met in both wet and dry conditions.

In the freshwater section where agriculture is an important source of both TN and TP, the state agencies have worked with individual commercial growers to fund and implement advanced BMPs as well as to enroll all commercial operations in owner-implemented BMPs. Additionally, FDEP conducted an enforcement effort to enroll commercial operations that had not responded to enrollment outreach. The active participation of the agricultural community in BMP implementation as well as the agency outreach and enforcement efforts have resulted in a very high level of enrollment in the freshwater section and the Tri-County Agricultural Area (TCAA).

Since the BMAP was adopted in 2008, chlorophyll-*a* and dissolved oxygen conditions have improved and, in many years, the water quality standards were met. However, there have been observances where water quality conditions were not met and therefore work continues on projects and reducing loads. Scientific work continues to monitor water quality and trends in the Main Stem and its tributaries. The goal of the BMAP is to see the Lower St. Johns River meeting its chlorophyll-*a* and dissolved oxygen conditions each year, in both wet and dry years, and to continue to do so even when activities change or intensify in the watershed.

2. JEA Treatment Improvements

Ed Cordova, JEA

JEA's efforts have been a critical component of the campaign to address the issue of algae blooms in the St. Johns River. Historically, the Jacksonville metropolitan area developed without a highly centralized wastewater treatment system, and with large portions of the City served by private wastewater treatment systems. At its peak, the number of private package plants in Duval County exceeded 600. Many were not well conceived or operated and generally were not capable of effective treatment of wastewater, especially with respect to nutrient removal. In addition, although a significant portion of Jacksonville was served by City of Jacksonville municipal treatment plants, the system in the 1990s was in need of significant investment and was not optimized for nutrient removal. In 1997, JEA was given responsibility for the City's water and sewer system and initiated an infrastructure investment plan to improve the system.

As part of that plan, JEA and the COJ have facilitated a consolidation of wastewater treatment in Duval County. From a high of over 600 plants, there are now only 6 JEA wastewater treatment plants (all of which are capable of advanced nutrient removal) and 4 remaining private domestic package plants

serving Duval County. In addition, since 1997, JEA has invested over \$3 billion in the water and sewer systems, with approximately \$700 million in projects designed to reduce nutrient impacts to the River. These projects included improvements to wastewater treatment, development and expansion of the reclaimed water system, and improvements to the sewage collection and transmission system.

In 1999, JEA embarked on a voluntary initiative to reduce the discharge of nitrogen from the sewer treatment process to the river by 50 percent, before any regulatory requirement mandated it. JEA met the 50% reduction goal in 2010 and has continued to achieve further reductions in the years following.

JEA focused its efforts to minimize nutrient discharge on three main categories: concentrating treatment improvements at five large regional treatment plants to maximize economies, phasing out five smaller and older technology plants while redirecting their flows to large regional plants, and expanding the reclaimed water system in areas of new growth. These priorities were memorialized in the 2006 River Accord, for which JEA was an original signatory party along with FDEP, St. Johns River Water Management District (SJRWMD), and COJ. JEA completed its last major capital project under this effort, a \$22 million treatment upgrade to the Buckman Water Reclamation Facility in 2013. That same year, JEA completed the phase out of the five older technology plants.

JEA has continued its efforts to expand its reclaimed water system in areas of new growth and has invested over \$85 million in this expansion to date. The system currently serves about 19 million gallons per day and has a capacity of more than 30 million gallons per day. JEA's reuse system expansion provides a dual benefit by reducing discharge to the river while offsetting additional groundwater withdrawals and saving precious potable water for drinking and personal use.

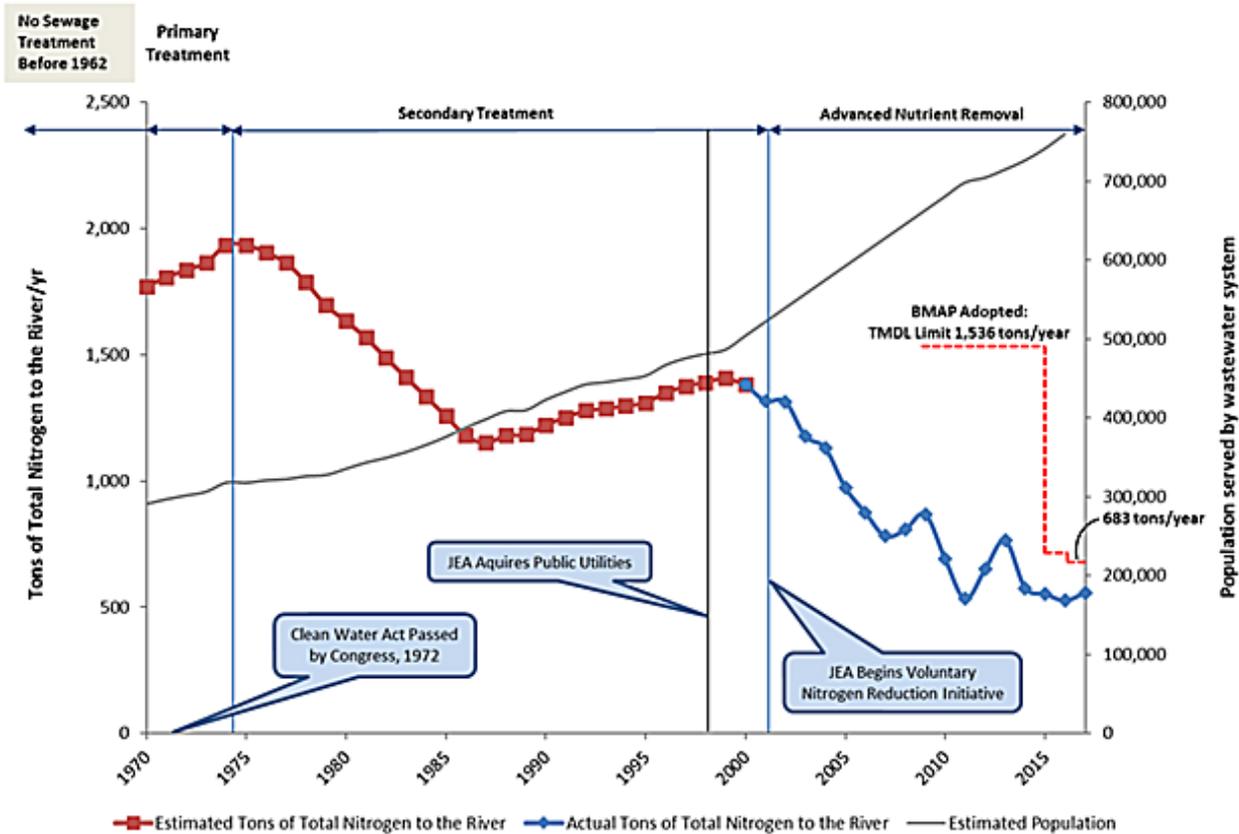
The total discharge to the St. Johns River from JEA facilities was 550 tons of total nitrogen per year (tons TN/yr.) in fiscal year 2018 which represents a 60 percent reduction from the 1999 total. The amount varies some from year to year based on changes in temperature, rainfall, and operational issues at facilities. For example, approximately 600 tons TN/yr. is projected for FY18. JEA's permitted discharge limit under the TMDL program is 683 tons TN/yr. This includes a reduction in the original permit limit of 33.4 tons TN/yr. in a partnership agreement with COJ towards meeting a portion of COJ's TMDL reduction obligations for its Municipal Separate Storm Sewer System (MS4) stormwater program.

In regards to TP, the LSJR Nutrient TMDL adopted in 2008 determined that a 30% reduction of nitrogen was required but that existing levels of TP were acceptable for the marine section of the River. By 2014, FDEP determined that a "hold the line" TP limit was appropriate for marine point source discharges to ensure those existing levels of TP would not be exceeded. Accordingly, a new TP limit of 463 tons TP/yr., based on JEA historical TP loadings, was enacted for JEA in 2014. Due to JEA's ongoing efforts, JEA's TP discharge to the River as of June 2018 was 263 tons TP/yr. This represents a 43% reduction from the historical limit.

The JEA system has been upgraded to advanced nutrient removal levels, so although some additional reductions remain possible, additional gains will be more costly (i.e. have reached a point of diminishing returns).

It should also be noted that approximately 2/3 of the nutrients contained in the River as it passes through the Jacksonville area originate from the middle basin of the St. Johns in the Central Florida region, and involve primarily non-point sources such as stormwater discharges. As such, future efforts to control nutrients and associated algae blooms in the Jacksonville area will increasingly involve non-point source improvement projects well upstream of Jacksonville.

The following chart shows the results of JEA’s efforts to reduce the loading of nutrients (specifically nitrogen to the St. Johns River):



3. COJ Public Works Project Improvements

Melissa Long, EQD

The following is a list of City of Jacksonville Stormwater Utility projects which contribute to the reduction of nutrients in the St. Johns River.

Project	Drainage Basin
Melba/Green Street	LSJR Trout River
Smith Broward Pond	LSJR Trout River
Woodland Acres/Oakwood Villa Area Drainage Phase I	Arlington River
Hugh Edwards Road Drainage	Ortega River
Pine Forest/Larsen Acres	LSJR Trout River
Upper Deer Creek Phase 3	LSJR Trout River
Venetia Terrace Drainage	Ortega River
Newtown Drainage main trunk-line improvement (Myrtle & Beaver)	LSJR Trout River
McCoys Creek Pond C	LSJR Trout River
Air Liquide Pond Retrofit	LSJR Trout River
Mireulo Circle	LSJR Trout River
Paul Avenue Outfall	LSJR Trout River
Hamilton Jersey Outfall	LSJR Trout River
Pinedale Area	Ortega River
Country Creek Area Drainage Improvements	Ortega River
Avenue "B"/Zinia Outfall	Trout River
Crystal Springs Area	Ortega River
Bunche Rd. Drainage	Trout River
Noroad/Lambing Drainage	Ortega River Basin
Old Plank Rd. Drainage	Ortega River Basin
Mandarin Area Drainage (Grand Crique)	LSJR Upstream of Trout River
County Creek Area	Ortega River
Messer Area Drainage	LSJR
Septic Tank Phase-Out Program	LSJR
City-Wide Drainage System Rehabilitation	LSJR - Countywide

B. MSJR BMAP

Pam Way, Wood Consulting, via John Hendrickson

The MSJR extends from the outlet of the USJR through Lakes Harney and Monroe to the confluence of the St. Johns and Wekiva Rivers at the Lake George Basin. The MSJR Basin encompasses portions of Seminole and Volusia counties and areas within several incorporated cities including DeLand, Deltona, DeBary, Orange City, Lake Helen, Lake Mary and Sanford. The MSJR receives surface discharges from contributing waterbodies including Econlockhatchee River, Lake Jesup, Lake Ashby via Deep Creek and

the Upper St. Johns River. Their TMDLs are water quality targets established by FDEP for specific pollutants and waterbodies. A TMDL was established for the Lakes Harney and Monroe and segments of the MSJR in 2009. Target concentrations of 1.18 mg/L for TN and 0.07 mg/L for TP are expected to be achieved when target loads (the TMDLs) are met. The nutrient TMDLs for Lakes Harney and Monroe and the MSJR segments are reported below.

¹Target concentrations expected to be achieved when load-based TMDL (tons/yr.) are achieved. Included for informational purposes only.

TMDL Location	WBID	¹ TN TMDL (mg/L)	TN TMDL (tons/yr.)	¹ TP TMDL (mg/L)	TP TMDL (tons/yr.)
SJR above Wekiva to Lake Monroe	2893C	1.18	1,906	0.07	144
Lake Monroe	2893D, 2893E	1.18	1,892	0.07	143
SJR downstream of Harney, upstream of Monroe	2893F, 2964	1.18	1,697	0.07	125
Lake Harney	2964A	1.18	1,522	0.07	109

A BMAP was adopted in 2012 to establish a pathway for achieving the TMDL nutrient goals. The BMAP provides a phased approach to implementing projects over time to achieve incremental reductions while monitoring the changes in water quality as projects are completed. While this BMAP (phase 1) addresses 50% of the allocated reduction over a five-year period, the total required reductions are spread over a 15-year period. This phased approach is critical to the BMAP process as additional reductions are needed from upstream sources to achieve the MSJR TMDL. Because the majority of the TN and TP loading are delivered to the MSJR from the Upper St. Johns River, Econlockhatchee River and Lake Jesup basins, and the phase 1 BMAP only addresses 50% of the allocated reduction for Lakes Harney and Monroe, the TMDL goals are not expected to be achieved during the first 5-year period.

Numerous projects were identified by both city and county stakeholders within the MSJR Basin. Accounting of completed projects is conducted annually through the FDEP BMAP Reports. Stakeholder projects are submitted annually to provide reasonable assurance to FDEP that each entity/stakeholder has a plan on how they will meet their individual allocation; however, the list of projects is meant to be flexible enough to allow for changes that may occur over time, provided that the reduction is still met within the specified timeframe.

The 2017 Statewide Annual BMAP Report lists 91 projects as either complete or ongoing in the MSJR basin. The projects completed to date are estimated to achieve total reductions of 96,177 lbs./yr. of TN and 18,585 lbs./yr. of TP, or 110% and 136% of the reductions needed to meet the portion of the TN and TP TMDLs, respectively.

In addition to tracking BMAP progress through project reporting, FDEP also evaluates project effectiveness using water quality trend analysis. In 2017, FDEP contracted with Wood (formerly Amec Foster Wheeler) to conduct the five-year water quality review of Lakes Harney and Monroe and the MSJR. The Lakes Harney and Monroe and MSJR BMAP monitoring plan is designed to enhance the understanding of basin loads, identify areas with high nutrient concentrations, and measure progress.

The overall concentrations and loads were calculated and compared to the TMDLs to assess progress toward meeting the TMDL goals. The flow and concentration values were calculated as the upper 95%

confidence interval of the mean value from 2012 to present, mainly because the BMAP was implemented in 2012. For the five-year period following BMAP implementation, both loads and concentrations exceeded the TN and TP TMDL values for both loads and concentration established for the MSJR.

Although both loads and concentrations exceed the TMDL goals for the MSJR and lakes, the total required reductions are spread over a 15-year period and not expected to be achieved until 2028. As aforementioned, additional reductions are needed from upstream sources to achieve the MSJR TMDL as it is estimated that 96.4% of TN and 95% of TP loading are conveyed to the MSJR from the USJR, Econlockhatchee River and Lake Jesup basins. Also, while some MSJRB entities have completed their required reductions there are others that have not.

Albeit the other inputs to the MSJR, progress has been made toward achieving the MSJRB TMDL since implementing the BMAP. Statistical analysis using the Seasonal Kendal trend analysis suggest significant ($p < 0.05$) decreasing TN trends at river segments downstream of Lake Harney and upstream and downstream of Lake Monroe. While most segments of the MSJR show no significant up or down trends in TP, the inlet to Lake Harney reveals an increasing trend ($p < 0.05$), suggesting upstream contributions from the Upper Basin and the Econlockhatchee River basin.

The goal of the MSJR and Lake Harney and Monroe BMAP is to implement both TN and TP reductions to achieve designated nutrient load allocations established in the TMDL. Continued monitoring of water quality conditions will continue to evaluate the effectiveness of projects to achieve nutrient load reductions to protect both lake and river segments of the MSJR.

Note: The USGS flow gage for SJR-415 only had flow data available from 2005 to 2012.

Values shown in bold indicate exceedance of TMDL concentration or load value.

¹Daily flows retrieved from nearby USGS gages, POR 2012-2017, upper 95% confidence interval value

²Monthly concentrations calculated from SJRWMD/Volusia Co. water quality stations, POR 2012-2017, upper 95% confidence interval value

TMDL Waterbody	SJRWMD Stations	¹ Flow (cfs)	TN TMDL vs. ² Observed TN (mg/L)	TN TMDL vs. ² Observed TN (tons/yr.)	TP TMDL vs. ² Observed TP (mg/L)	TP TMDL vs. ² Observed TP (tons/yr.)
SJR above Wekiva to Lake Monroe	SJR-DPP	1,941	1.18/ 1.49	1,906/ 2,846	0.070/ 0.085	144/ 180
Lake Monroe	LMAC, LM-OW-NE, LM-OW-S	2,162	1.18/ 1.62	1,892/ 3,446	0.070/ 0.091	143/ 198
SJR downstream of Harney, upstream of Monroe	SJR-415	1,977	1.18/ 1.68	1,697/ 3,262	0.070/ 0.095	125/ 207
Lake Harney	CLH, LH-OW-NE, LH-OW-SW	1,811	1.18/ 1.53	1,522/ 2,721	0.070/ 0.091	109/ 159

References:

- *Draft 5-Year Water Quality Review for the Lakes Harney and Monroe, Middle St. Johns River and Smith Canal Basin Management Action Plan*; Division of Environmental Assessment and Restoration, Florida Department of Environmental Protection, January 2018. Authored and prepared by Wood
- *Middle St. Johns River Basin for Lake Harney, Lake Monroe, Middle St. Johns River, and Smith Canal*; Lakes Harney and Monroe and Middle St. Johns River Basin Technical Stakeholders, Florida Department of Environmental Protection, August 2012
- *Final TMDL Report, Nutrient and Dissolved Oxygen TMDLS for the Six Middle St. Johns River Segments between the Inlet of Lake Harney (WBID 2964A0 and St. Johns River above Wekiva River (WBID 2893C)*; Xueqing Gao, December 7, 2009

C. USJR BMAP

Compiled by John Flowe from internet research

USJR TMDLs

Not all of the environmental improvements are linked to point source and nonpoint source with TMDLs and BMAPs. For decades, portions of the USJR were drained and diverted for agriculture and flood control.

On August 2, 2006, FDEP adopted by rule 62-304.510 F.A.C. containing the TMDLs for the upper section of the St. Johns River as listed below continuing to the next page.

(1) St. Johns River Above Lake Poinsett.

(a) The TMDL for TP is 89 tons per year and is allocated as follows:

1. The wasteload allocation for wastewater point sources is 0.023 tons per year of TP;
2. The wasteload allocation for discharges subject to FDEP's NPDES MS4 Permitting Program is a 37 percent reduction of current TP loading;
3. The load allocation for nonpoint sources is a 37 percent reduction of current TP loading; and
4. The margin of safety is implicit.

(b) The TMDL for Biochemical Oxygen Demand (BOD) is 1,970 tons per year and is allocated as follows:

1. The wasteload allocation for wastewater point sources is 1.0 tons per year of BOD;
2. The wasteload allocation for discharges subject to FDEP NPDES MS4 Permitting Program is a 34 percent reduction of current BOD loading;
3. The load allocation for nonpoint sources is a 34 percent reduction of current BOD loading; and
4. The margin of safety is implicit.

(2) Lake Hell n' Blazes. (aka Lake Helen Blazes) The TMDL for TP is 44 tons per year and is allocated as follows:

(a) The wasteload allocation for wastewater point sources is not applicable;

(b) The wasteload allocation for discharges subject to FDEP NPDES MS4 Permitting Program is a 52 percent reduction of current TP loading;

(c) The load allocation for nonpoint sources is a 52 percent reduction of current TP loading; and

(d) The margin of safety is implicit.

(3) St. Johns River Above Sawgrass Lake.

(a) The TP is 57 tons per year and is allocated as follows:

1. The wasteload allocation for wastewater point sources is not applicable;
2. The wasteload allocation for discharges subject to FDEP NDPES MS4 Permitting Program is a 32 percent reduction of current TP loading;
3. The load allocation for nonpoint sources is a 32 percent reduction of current TP loading; and
4. The margin of safety is implicit.

(b) The TMDL for BOD is 1,264 tons per year and is allocated as follows:

1. The wasteload allocation for wastewater point sources is not applicable,;
2. The wasteload allocation for discharges subject to FDEP NPDES MS4 Permitting Program is a 37 percent reduction of current BOD loading;
3. The load allocation for nonpoint sources is a 37 percent reduction of current BOD loading; and
4. The margin of safety is implicit.

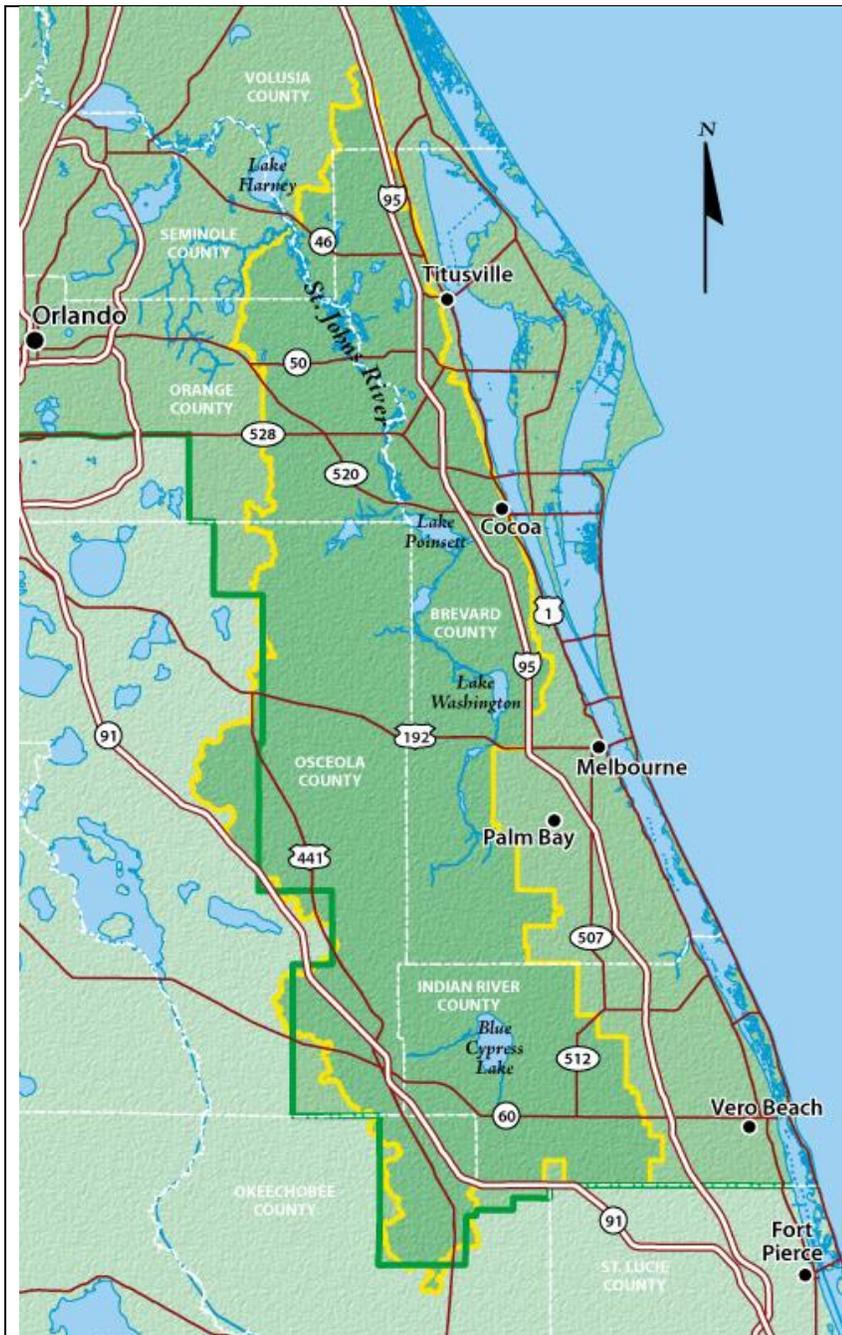
(4) Unless specifically stated, “current TP loading” and “current BOD loading” shall be the average loading for the year the Secretary adopted the verified list that first listed waterbody as impaired for the parameter of concern.

Rulemaking Authority 403.061, 403.067 FS. Law Implemented 403.061, 403.062, 403.067 FS. History—New 8-3-06.

USACE Upper Basin Project

<https://www.sjrwmd.com/waterways/st-johns-river/upper/>

In the early 1900s, the upper basin was diked and drained for agricultural purposes. By the early 1970s, 62 percent of the marsh was gone. Canals were constructed to divert floodwaters from the basin east to the Indian River Lagoon. The alterations diminished water quality in the lagoon and degraded the upper basin’s remaining marshes.



Not all of the environmental improvements are linked to point source and nonpoint source with TMDLs and BMAPs. For decades, portions of the USJR were drained and diverted for agriculture and flood control.

Florida's longest river begins its 310-mile northerly journey to the Atlantic Ocean from a drainage basin west of Vero Beach in Indian River County. The 2,000-square-mile basin — the headwaters of the St. Johns River — is perhaps the most distinctive portion of river. Known as the USJR Basin, the area features a mosaic of marsh, sawgrass and cypress domes, and is visually similar to the Florida Everglades.

The basin extends from the headwaters of the St. Johns River in Indian River and Brevard counties to the confluence of the St. Johns and Econlockhatchee rivers in Seminole County and originally contained more than 400,000 acres of floodplain marsh.

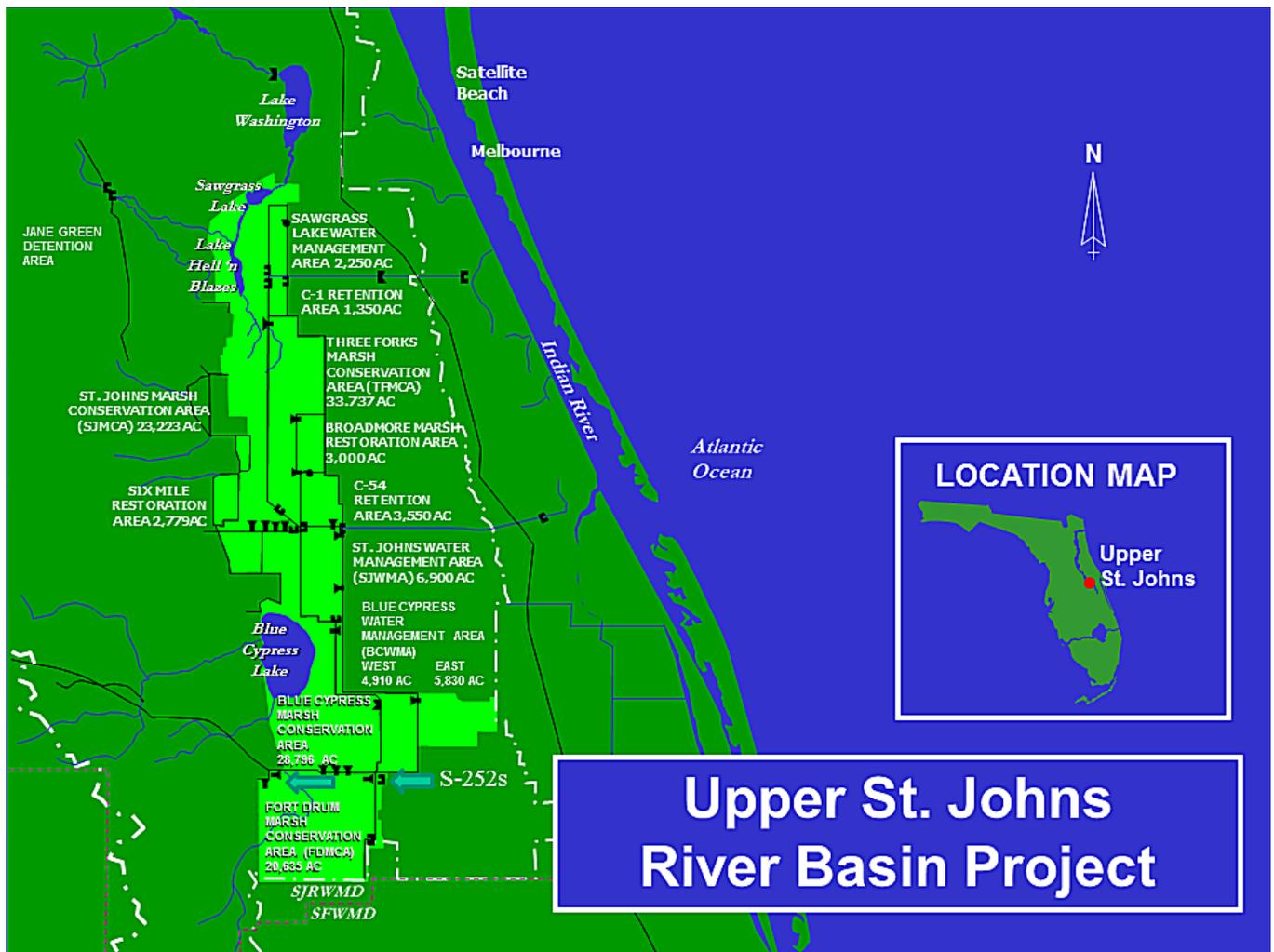
In 1977, the SJRWMD and the USACE embarked on an ambitious, long-term flood control project that would revitalize the upper basin. The Upper St. Johns River Basin Project reclaimed drained marshlands by creating reservoirs and re-plumbing existing canals. The goals were numerous: to improve water quality, reduce freshwater discharges to the Indian River Lagoon, provide for water supply, and restore or enhance wetland habitat.

In May 2016, the district and USACE celebrated the completion of the upper basin project, one of the largest and most ambitious flood control and wetland restoration projects in the world. The project has now moved into a long-term maintenance phase.

The upper basin project is a semi-structural system of four water management areas, four marsh conservation areas and two marsh restoration areas covering approximately 166,500 acres in Indian River and Brevard counties.

Throughout the project area, water control structures and new construction have been kept to a minimum. Dikes have been fortified and agricultural drainage routes have been re-directed to improve water quality and enhance the marsh system. The result is a flood protection strategy that relies on a more natural approach. Under maximum storm conditions, the project is designed to hold 500,000 acre-feet of water — enough water to cover the 200,000-acre project with an average of 2.5 feet of water. More information is available in the Surface Water Improvement and Management (SWIM) Plan for the basin.

The upper basin project has given new life to the river’s headwaters. The design of the project is on the cutting edge of environmental restoration technology and demonstrates a new level of compatibility between flood control and environmental protection.



D. Doctor's Lake Algae Remediation Projects

<https://www.sjrwm.com/facts/doctors-lake/>

Geoff Sample, SJRWMD

During the 2018 legislative session, the Florida Legislature appropriated funds to the water management district for projects that will benefit the St. Johns River and its tributaries. The reduction of nutrient loading to Doctors Lake will help to reduce the amount of algal blooms in the lake.

The District, Clay County Utility Authority (CCUA), and Clay County met to discuss project options that would best achieve the goal of nutrient load reduction to the lake. Three projects were identified that would provide the most benefit.

These three projects are:

- 1) additional advanced treatment of the effluent from a local treatment facility;
- 2) expansion of the existing wastewater collection system that will allow for the phase-out of the existing septic tanks via connection of homes with existing septic tanks to sewer lines; and
- 3) replacement of existing septic systems with individual nutrient reducing treatment systems in areas where sewer systems expansion is not readily available or feasible.

The additional advanced treatment of the effluent (Project 1) is currently under negotiation to contract for construction of that project.

The details for Projects 2 and 3 that will involve phasing out replacement of existing septic systems are still being worked out by CCUA. The intent is to identify areas where these two projects would likely be most successful, and then survey homeowners to gauge their willingness to participate. Under this proposed program, no homeowner will be forced to participate.

To be clear, under this program, no one will be forced to replace their system. CCUA is developing an outreach effort with project partners to allow for ample public input and to inform area residents.

CCUA has developed a draft resident survey to determine the interest of individual homeowners regarding connection to CCUA's wastewater collection system in Project 2. Beyond the initial resident survey, CCUA has also commenced work on a conceptual level design effort on this project. CCUA will be sending the resident survey to homeowners in the coming weeks. No one anticipates making connection to CCUA's waste water collection system compulsory with this project.

CCUA has held a meeting with the St. Johns River Water Management District (SJRWMD) and FDEP staff regarding the use and implementation of individual nutrient reducing treatment systems, Project 3. The discussion in the meeting so far has been conceptual in nature with a number of technical and legal issues being evaluated. Once a path forward has progressed on Project 3, a residential and interested stakeholder outreach program will be developed to communicate information to all of the interested parties. Like Project 2, no one anticipates making the use of individual nutrient reducing treatment systems compulsory with this project.

E. Enforcement

EQD performs enforcement against any non-stormwater discharge going into the City's stormwater sewer system. Over the past 3 years, EQD has either sent a Notice of Violation letter or taken formal enforcement on 195 cases, which include illicit discharges and construction site activities.

As previously mentioned, the best return on investment (zero cost, all benefits) is from revising daily practices of the public regarding fertilization, not to mention irrigation and using Florida-Friendly landscaping and avoiding exotic plants.

F. Wastewater System Resiliency

John Flowe, EQD

Environmental Protection Board (EPB) Efforts

While there were numerous hurricane/tropical storm related sanitary sewer discharges the past two years, the chronic events due to aging infrastructure occur even without superstorms. These, like septic tanks, contribute nutrients throughout the lower St. Johns River Basin.

For Hurricane Matthew, the most common cause of sanitary sewer overflows (SSOs) was loss of power, not flooding or even inflow and infiltration. In several cases, the breaker failed to actuate generator startup even where there were standby generators. For Irma, JEA had taken extra precautions.

For the 50 years EQD has been involved in permitting, we have addressed each facility, lift station, and collections system on a case by case basis (permit application). For example, smaller stations do not require onsite standby power, but a receptacle for portable generator or a gas pumpout fitting are accepted for power failures. Hurricanes provide two problems with that approach:

1. There are not enough portable devices to handle 4,000 lift stations in Jacksonville.
2. There is not enough staff with the ability to deliver and operate those devices during 140 mph winds.

Evacuation can pose an additional operator shortage. While in some cases, evacuation reduces the amount of sewage, the inflow and infiltration (I&I) may continue to pour into manholes and lift stations and overflow contaminated water. During Irma, Jacksonville had sewer flooded neighborhoods with first floor elevations and streets under water for extended periods, i.e. in San Marco, Lasalle Street has a history of flooding with a collections system impact.

As a result of numerous sanitary sewer overflows, EPB has asked EQD and stakeholders to look into ways of reducing the causes of these overflows. On February 21, 2019, the EPB held a stakeholder meeting to discuss some of the fundamental issues with SSO related enforcement as well as resiliency. The meeting was meant to be an open meeting to share information and ideas. The ideas that were discussed at this meeting are being summarized, and a list of potential remedies is expected by May 2019.



Summary of Research:

Miami Sewer Overflow Response Plan (SORP)

Miami utilities developed a 148 page SORP which contains recommendations applicable to JEA as well as to individual private lift stations/collection systems. Several recommendations to be considered for Jacksonville include:

1. Develop a response plan including control, diversion/bypass, cleanup, and water quality monitoring as a result of SSO events. (Identify path to Class III water or MS4 infrastructure and have measures to divert or block.)
2. SSO volume estimations.
3. Cause determination.
4. Corrective Action Plan.
5. Assess vulnerabilities which could lead to an event: top elevation vs. adjacent flood plain elevation; historic flood elevations at the site during Irma. Age and condition of collections system. (Backup power or emergency pump.)
6. Notification to regulatory agencies when SSO occurs.

Parenthesis above added by EQD.

ASCE Resiliency Recommendations

The case for global warming and sea level rise is compelling, with an 8" rise since the 1880s already documented and another foot likely by 2100. Atlantic tropical storm/hurricane frequency and intensity has increased.

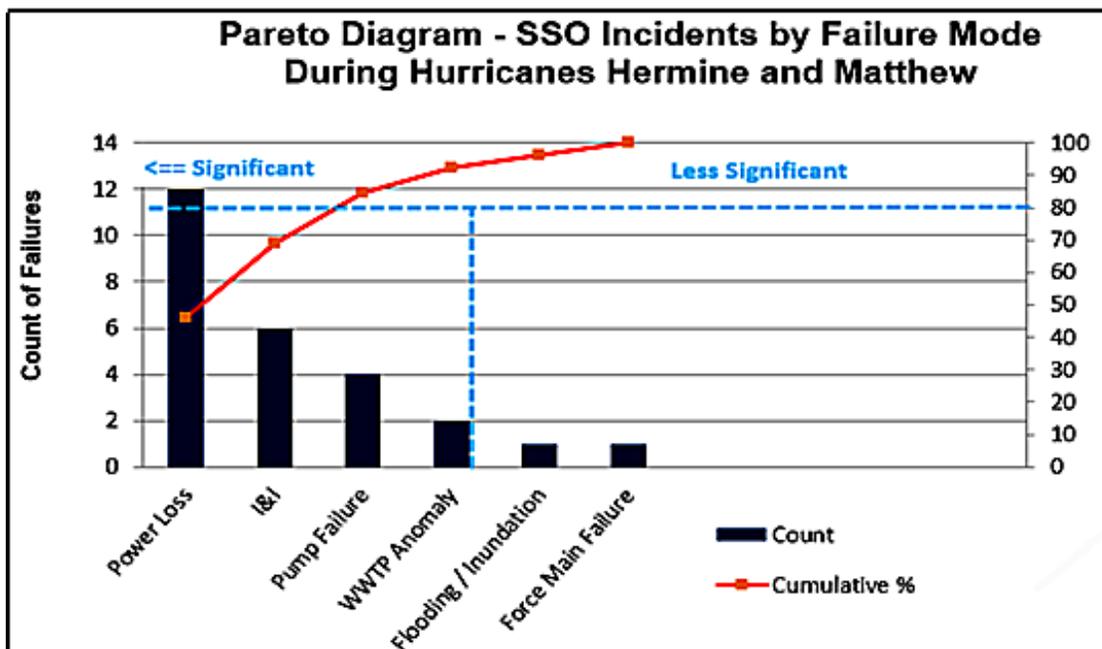
Engineers build long-lived infrastructure. Those designs need to consider climate change. Risk assessment is an appropriate component of design As well as vulnerability assessment.

1. Develop "low-regret strategies and robust design."
2. Flexible, adaptive engineering.
3. Risk communication.
4. Engineering standards for floods of return periods. This is commonly applied in highway construction, but in Florida, with lift stations at the bottom of the hill (near the top of bank for streams) flooding should be considered in lift station top elevations and ability to withstand periods of inundation without leakage.
5. Flood hazard maps should be included with the design plans.
6. Life-cycle approach should be applied. Right structure, tight place, above flood levels.

Assessment of storm related issues:

- Governor-mandated FDEP assessment of Hermine and Matthew SSO causes and remedies, summarized by RS&H below:

Strategy	BMP	Utility
Identify Maintenance Needs	Utilize CCTV and smoke testing to identify leaks and maintenance needs.	NO
Identify Maintenance Needs	Conduct annual cathodic protection survey of sewage collection systems to identify leaks or needed maintenance.	NO
Increase Capacity	Increase capacity of mains to handle high flow events by replacing force mains or use cured- in-place pipe lining approach (CIPPL).	H; P
Leverage GIS Technology	Utilize GIS for asset management and to ID drainage problem areas and prioritize improvements.	H
Identify Maintenance Needs	Implement monthly testing of generators and automatic transfer switches (ATFs) to ensure designed performance.	P
Reduce Infiltration	Promote Green Infrastructure (GI) approaches to manage stormwater runoff and reduce I&I.	NY; NO
Reduce Infiltration	Improve drainage of low-lying areas to reduce I&I.	NO
Reduce Infiltration	Revise land development codes to reduce runoff and I&I.	P



JEA Wastewater System Resiliency Efforts

In response to the challenges JEA experienced during Hurricane Matthew and Hurricane Irma, a Resiliency Program was developed by the utility to better understand system vulnerabilities and proactively improve system reliability and operational continuity of JEA’s wastewater system.

JEA signed a contract with CH2M/Jacobs on May 7, 2018 to provide resiliency assessment, program management and engineering services. A large portion of this contract will look to identify system vulnerabilities and provide recommendations to address these issues. New standards will be developed based on the findings from these assessments as well as projected future climate conditions.

JEA has initiated system hardening projects like converting the primary and secondary electric lines serving critical pump stations from overhead to underground. At the end of FY18, 26 secondary electric lines and 19 primary electric lines were converted from overhead to underground.

Having backup generation is essential to maintaining operational continuity, especially during extreme weather conditions. To that end, JEA has purchased multiple types of assets for backup generation. JEA has also entered into a lease agreement to rent backup generation during the storm season. By the end of FY18, JEA had procured the following assets under the Resiliency Program:

Fixed Generators	Fixed Pumps	Portable Pumps	Rental Generators (lease)	Rental Pumps (lease)
100	33	12	100	50

G. Draft EPA Guidelines for Cyanotoxins

Anthony Ouellette, JU

Currently there are no water quality criteria for cyanotoxins at the federal level nor for the state of Florida, although other states do have criteria. In December 2016, the U.S. EPA published [draft recommendations](#) for national water quality criteria for microcystins and cylindrospermopsin with the goal of protecting swimmers and others engaged in recreational activities in natural waters (EPA 2016a; EPA 2017). The swimming advisory levels, which are *not to be exceeded on any day*, are 4 µg/L for microcystins, and 8 µg/L for cylindrospermopsins. For assessment purposes, both toxins also have a waterbody impairment recommendation of not to exceed the above values “more than 10% of days per recreational season up to one calendar year.” The comment period for the draft recommendations ended March 2017 with no published timeline for finalizing the recommendations. These guidelines should be considered for Florida since samples have exceeded the criteria for microcystins.

V. What Do We Need to Do To Move The Needle?

A. Continue to implement point source and nonpoint source basin management action plans (BMAPs) BMAPs and agricultural best management practices (BMPs):

Each year, stakeholders report on projects that have been completed and update the Florida Department of Environmental Protection on upcoming planned projects. The report on all State waters is completed by July 1 of each year. The Lower St. Johns River Executive Committee meets each year in late February to discuss updates since the last meeting. At the February 27, 2019 meeting, it was voted on to have updates from the Middle and Upper St. Johns River TMDL and BMAPs as a standing agenda item. This meeting is an annual meeting but is occasionally cancelled if updates have not been significant for that reporting year. The meetings have never been more than two years apart.

B. Re-establish public education campaigns to increase public awareness of the State and EPA goals:

1. Overview

A consolidated Public Engagement Program is needed to coordinate the efforts of all of the Task Force agencies.

The program should be designed to do the following:

- Extend farther south, i.e. upstream.
- Keep it up with one generation passing it on to the next.

The program should embrace and incorporate:

- EPB Education and Outreach Committee
- SJRWMD's historically successful *It's Your River* (aka My River) campaign.
 - EPB has expressed an interest in funding a portion of that but needs some program cost information to be developed.
 - SJRWMD has the following resources available currently:
 - Information on the website at: <https://www.sjrwmd.com/education/water-pollution/>
 - The following videos on our YouTube channel might be of interest.
 - Water pollution video: <https://www.youtube.com/watch?v=7vTIRGfvT4o>
 - Watersheds (demo of Enviroscope model) video: <https://www.youtube.com/watch?v=37ow5I2YXxM>
 - Macro video: <https://www.youtube.com/watch?v=22k8LNdTGOg>
 - Shorter macro video: <https://www.youtube.com/watch?v=SyyvaL4D1V4>
- UNF, JU
 - River questionnaire-survey (Ray Oldakowski)
 - River reef angler interaction
- FDEP website for reporting algal blooms: <https://floridadep.gov/AlgalBloom>

A consolidated public education program should include the following topics:

- Fertilizer use
- Lawn irrigation
- Florida-Friendly Yards

A public education program should also address, as audiences:

- CPACs
- HOAs and COAs
- Media
- Schools

2. Public Vision and Public Perceptions of the River

Since 1972 the EPA vision for the water of the United States, adopted in the Clean Water Act, is “fishable, swimmable waters.” The (FDEP) classification for the St. Johns River is “Class III: Fish Consumption, Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife.”

Professor Ray Oldakowski at JU conducted a poll of public perceptions about the health of the St. Johns River in 2012 and again in 2016. He presented the comparison at the 2017 University of North Florida/Environmental Protection Board Symposium.

COJ EQD staff offer the following extrapolations/interpretations of the professor’s data:

1. In four years, the number of people that has not fished in the St. Johns River in the previous year increased from 71% to 74% (not significant.)
2. The number who had not boated, canoed, kayaked or jet skied on the St. Johns River in the past year increased from 63% to 71%.
3. About 90% had not swum in the river in the past year for both polls.
4. Just under half had hunted, observed wildlife or walked on or along the river in the past year, declining 8% from 2012 to 2016.
5. Half of the respondents categorized the river as degraded, needing major cleanup with a 7% increase for 2016.
6. One-third attributed the pollution to industrial and commercial activity and about 40% to littering and dumping in both polls.
7. Only 1/3 felt knowledgeable about what they could do to improve the river in 2016 while just 4 years earlier, nearly half thought they knew.
8. More than 55% felt a direct connection between their actions and the river health.
9. About half did not try very hard and only 1/8 or so tried very hard to protect the river.

The changes between 2012 and 2016 did not uniformly degrade. There is a general attitude that the river is too dirty to swim, fish or play on it. It should be noted that the “It’s Your River” campaign funding ended in 2008.

As previously stated, the BMAPs are the implementation strategy to reduce point sources of nutrient and bacteria pollution and to improve stormwater facilities. However, the public responsibility for nutrient management is not covered therein. It is far cheaper to have minimalistic personal

contributions than to spend a billion dollars on stormwater ponds that only remove a portion of those personal contributions.

3. Public Activation

Anthony Ouellette, JU

Outreach and education are cornerstones for altering behavior as it relates to decreasing nutrient loading from yard fertilizer. A step above these more passive efforts is to develop a robust, coordinated citizen science program that encompasses the MSJR and LSJR with goals of the following:

- 1) Obtain more data to develop a better understanding of the extent of algal blooms since the current government datasets miss key toxic algal bloom events,
- 2) Involve and empower non-scientists to engage in scientific process for a relevant topic that impacts their community,
- 3) Develop these citizen-scientist “ambassadors” that will spread the word about their involvement in this scientific endeavor, which will ideally
- 4) Help change behavior of a larger number of people as compared to more passive outreach activities.

This type of program could involve community groups in not only water sampling, but also sample processing and data acquisition at various hubs throughout the region along the St. Johns River. In one model that was proposed by JU in collaboration with the City of Palatka, the local Boy Scouts of America, the St. Johns Riverkeeper, and Greenwood School, Algal Bloom Citizen Science labs and experiences would be offered at RiverBase (Boy Scout camp on Doctors Lake – including during Boy Scout day camps resulting in earning badges), St. Johns River Center (downtown Palatka on the St. Johns River, to include the school system and activities during community days), and a mobile lab that could be set up in a number of places.

This idea could be expanded to include locations along the MSJR. In this model, community groups, day camps, middle and high school students, and volunteers would take water quality measurements, obtain water samples and filter them for chlorophyll analysis, and obtain photos of the blooms as well as microscope photos of the phytoplankton. The filters and preserved water samples would then be brought back to JU’s Marine Science Research Institute (MSRI) for chlorophyll-*a* analysis and toxin analysis if the chlorophyll meets a certain threshold.

The citizen scientists would have identifier codes for their samples so that they could go to a website that then has all of the results for the sample they obtained. In this way, the involved public have intimate involvement in the process and would be better educated.

This is one example; there are other modes of delivery and levels of involvement that could be explored for such a program. The point is for the public to help with the problem from a scientific standpoint, which ideally will translate into a larger group of the public that will actively educate their neighbors, families, and friends.

4. Schools: St. Johns River Report As K-12 Education Effort

Brian Zoellner, UNF

Introduction:

The Lower St. Johns River Report (LSJRR) offers a resource for background information (for teachers and their students) about content, such as biological and chemical measures of water body health, and the use of these data as evidence to support assessments. Examples of these indicators include dissolved oxygen, nutrients, turbidity, and biological assays.

Teachers can use this information to help their students understand how phenomena are described and generated through empirical observation and evidence collection and used as indicators of watershed health. As an example, data in the report are presented and, based on defined water quality criteria, an assessment made for the tributaries within the SJR watershed. Students can see how data are represented to make a case of the health indicators of these tributaries. They can also use these data in to make their own calculations, representations, and conclusions.

The report offers a potential resource related to the “Nature of Science” components of the state and national standards. These components are central for students to understand how science is practiced. As a specific example of how the LSJRR can provide a resource in this area, discussion of limitations of water quality assessments are found throughout the report. These descriptions provide students an authentic example of scientific uncertainty and the limits of available data. The authors provide students a clear rationale for their uncertainty (e.g., due to differences in sampling methods, changes in definitions due to public policy, and ongoing questions of causation). These examples could provide useful points for teachers when discussing their students’ own empirical work or current topics like global climate change or natural selection.

Connections to Standards

The LSJRR can support teaching approaches advocated by the authors of major policy documents including the National Science Education Standards (NRC 1996a), Science for All Americans (Rutheford and Ahgren 1990), the Florida Sunshine State Standards (FDOE 2010), Common Core Standards (CCSSI 2012), and the Next Generation Science Standards (NRC 2013).

The LSJRR provides a resource to support real-world curricular connections and critical thinking — areas that are central components of the Next Generation Science Standards (NRC 2013) and connected to the Common Core Standards (CCSSI 2012). To build relevance and real-world connections within the curriculum, cross-curricular materials should focus on tributaries and social components (i.e., Aldo Leopold’s “sense of place”) of the students’ surroundings. This development could allow teachers to develop broader connections with the content of the report. This broadening of the curriculum scope to connect to neighborhoods near schools is intended to build awareness of the watershed and that inter-connectedness of the components in the ecosystem. Through these materials, students will hopefully find science and nature in their everyday environments.

In addition to connecting to the tributaries in neighborhoods to meet the interests of students, the report can be modified to meet the needs of students with varying reading levels. Educators can modify the text of the report for grade level appropriate reading and science content. As the district

advances in its use of technology (i.e., e-readers), teachers can modify text to meet the needs and interests of students.

Current Impact

To broaden the impact of the LSJRR, we evaluated its current use and gathered information to determine the best route forward. Up to this point, the report has been used as a background information (e.g., definitions of terms, descriptions of the watershed) source. Broadening the focus to use the LSJRR as a data source is a logical next step. Based on feedback from school personnel, the best route to data collection and sharing are ready-made materials like the World Water Monitoring Challenge kits.

Using input from both UNF Biology and Chemistry departments' faculty, we determined the World Water Monitoring Challenge kits were a good option to use to proceed; balancing cost, simplicity, and durability of the tests. These tests correspond to some indicators within the LSJRR, providing a connection between the report and testing completed by secondary students.

Additionally, school administrators indicated an interest in students being able to share data with other students (either across schools or districts). The World Water Monitoring Challenge kit coordinators allow students to upload their data into a worldwide database.

From earlier discussions with school science education personnel, Jacksonville's schools were discussed as possible targets for this use. With the proximity of these schools and their locations within the watershed, students could get a better understanding of the community surrounding their school, while making a more concrete, real-world connection to environmental science concepts. While there are important science topic areas to address, there is also an important, more general focus that has been an issue. Students struggle with engagement at the secondary level, which impacts motivation and achievement. By providing more relevant topics and real-world connections students are more apt to connect to science curriculum and instruction. The water sampling from the watershed and examining the LSJRR provides students with a real world case that helps them connect. not only to the curriculum, but to their community.

To date, the Ribault River and Trout River have been identified as sample sites, as they are tributaries that are in close proximity to the urban core schools. These tributaries also have boat landings that are accessible for sampling. Additional sites in the Jacksonville area may also be suitable for student sampling.

In the summer of 2015 and spring of 2016, 11 pre-service teachers were trained on the use and relevance of these kits in meeting required curriculum standards. The sessions were designed to build relevance and real world connections within the curriculum. Materials focused on tributaries and social components (e.g., Aldo Leopold's "sense of place," Emdin's "reality pedagogy") of the students' surroundings. This curriculum scope, through connections to community near schools, was intended to build awareness of the watershed and that inter-connectedness of the components in the ecosystem. The training with these materials was designed to help pre-service teachers show their students that science and nature are in their everyday environments.

Feedback from the summer session was used to modify materials. This modification included adapting the directions to be able to change font sizes and vocabulary to meet the needs of students in the targeted high schools.

In the summer of 2016, 12 graduate pre-service teachers were trained on the use of the World Water Monitoring Challenge kits. Modified procedure and data collection sheets were used during the session and made available to the pre-service teachers for use in their own classrooms.

Pre-service teacher feedback from the work with the kit has reflected a greater connection between the curriculum, community and the watershed. Reflective assessments indicated that they considered the watershed to be part of their community to a greater extent.

In the summer of 2017, these kits continued to be used with the addition of lab equipment from the UNF Department of Biology at a sampling site at Harbor View Boat Landing on the Ribault River in the urban core of Jacksonville. This was the first time pre-service teachers completed on-site sampling and testing.

The intent of this session was to show multiple, low-cost testing methods for use in secondary classrooms. Additionally, it is intended that having the pre-service teachers at a sampling site will demonstrate the feasibility of using St. Johns River tributaries for field trips or teacher-collected samples.

Two additional professional development sessions were added to build relevance in the curriculum of the pre-service teachers' students. The concept was to build upon the pre-service teachers' understandings of the neighborhood surrounding their schools to, not only include the social and economic assets, but to also include the natural. As part of these new sessions, students read "Dumping in Dixie: Race, Class, and Environmental Quality" (Bullard, 1990) and wrote reflections.

A pre- and post-session short-answer survey was administered to 11 of the 12 graduate pre-service teachers. Prior to the sessions, 9 out of the 11 had not connected ecological communities, like the St. Johns River Watershed, into their conception of the community surrounding their schools. Multiple participants saw the Jacksonville urban core as "city" and devoid of natural resources. After completion of the sessions, 11 of 11 reported seeing a connection between the ecosystem and the community. This is an important finding, as one of the goals of the training was to help the graduate pre-service teachers see relevance between ecological concepts and their students' environment. In the survey, the graduate pre-service teachers reported learning about methods of building real-world, ecological connections for students within the curriculum, bringing water samples to the classroom, developing independent science fair projects using the watershed, and developing student statistical capabilities within the context of water sampling.

As reported in 2016, a Ribault teacher (part of an earlier cohort of graduate pre-service teachers who completed training with the World Water Monitoring Challenge kits) has been using the kit supplemented with materials provided by the St. Johns Riverkeepers. She continues to report higher engagement and higher student performance on aquatic ecosystem benchmark assessments when compared to other environmental science classes at Ribault High School. For her students, the ecosystem section of these exams showed the highest scores.

Conclusion

The LSJRR provides an important resource for teachers to make important connections between science and the students' environment. This helps make science more concrete and engages them in real-world problem solving. Additionally, materials can be modified to support science learning at multiple curricular levels. The LSJRR team hopes to help teachers in these endeavors. Please contact UNF if anyone is interested in seeking guidance and support.

5. Multi-Agency Outreach Plan

a. FDACS

Angela Chelette, P.G.

The Department of Agriculture and Consumer Services (FDACS) has outreach programs for production agriculture to improve water quality in the form of best management practices (<https://www.freshfromflorida.com/Business-Services/Water/Agricultural-Best-Management-Practices>).

Agricultural BMPs are practical measures that producers can take to reduce the amount of fertilizers, pesticides, animal waste, and other pollutants entering our water resources. They are designed to improve water quality while maintaining agricultural production. FDACS has adopted BMPs for most commodities in the state. Each BMP manual covers key aspects of water quality and water conservation. Typical practices include:

- Nutrient Management to determine nutrient needs and sources and manage nutrient applications (including manure) to minimize impacts to water resources.
- Irrigation Management to address the method and scheduling of irrigation to reduce water and nutrient losses to the environment.
- Water Resource Protection using buffers, setbacks, and swales to reduce or prevent the transport of sediments and nutrients from production areas to waterbodies.

Why Implement BMPs

- Implementing (and maintaining) verified FDACS-adopted BMPs provides a presumption of compliance with state water quality standards for the pollutants addressed by the BMPs.
- Some BMPs can help you operate more efficiently and reduce costs, while you help protect the environment.
- Producers who implement FDACS-adopted BMPs might satisfy some water management district (WMD) permitting requirements. Check with your WMD.
- With some exceptions, the Florida Right to Farm Act prohibits local governments from regulating an agricultural activity that is addressed through rule-adopted BMPs.
- FDEP is developing BMAPs to meet adopted water quality targets or TMDLs. Where FDEP adopts a BMAP that includes agriculture, producers must either implement FDACS-adopted BMPs or conduct monitoring (prescribed by FDEP or the WMD) to show they are not violating water quality standards.
- Water quality monitoring is extremely expensive.

FDACS BMPs for various commodities can be found at: <http://www.freshfromflorida.com/>

Water/BMPs Enrollment Process

Site Evaluation

FDACS staff are available to assist producers with on-site assessment and BMP selection. During the BMP assessment and enrollment process, they will help you evaluate the characteristics of your property and your operation, identify the BMPs you currently implement, and determine whether there are additional FDACS BMPs applicable to your operation. The presumption of compliance is based on the expectation that producers understand and address the water quality and conservation issues on their operations, within economic and technical constraints.

FDACS staff will record your current BMPs and any applicable new BMPs on a checklist, which will be submitted to FDACS with a signed Notice of Intent to implement the BMPs. The assessment will take from two to four hours, depending on the size of the operation, the commodity, and other factors.

Things to Have on Hand

It would be helpful to have the following on hand during the enrollment visit:

- Copy of tax bill – to ensure having the correct parcel ID numbers
- Management Records such as soil test results
- A map of the farm
- Personnel who are knowledgeable about the operation

After Enrolling in BMPs

- An important part of BMP implementation is record keeping, as specified in FDACS rules and BMP manuals. This is sometimes the only way to confirm BMP implementation.
- BMP records should be accurate, clear, and well-organized. You may develop your own record-keeping forms or use the ones provided in the manuals. FDACS staff, UF-IFAS BMP Implementation Teams, Soil and Water Conservation Districts, USDA-NRCS and/or county Extension staff can assist producers with BMP implementation and record-keeping methods.

Contact Information

For assistance with BMP enrollment, call (850) 617-1727 or email AgBmpHelp@FreshFromFlorida.com. To identify and directly contact field staff in other areas, please visit <http://www.freshfromflorida.com/Divisions-Offices/Agricultural-WaterPolicy/Organization-Staff>

Homeowner (non-agricultural) practices are addressed by UF/IFAS County Extensions, FDEP, and local water management districts. If FDACS can assist in any way to provide materials or outreach for farmers, nurserymen, aquaculturists, ranchers, or other agricultural producers in your area, please do not hesitate to contact us. Angela Chelette, P.G. 850-617-1719 Office Direct

b. COJ EPB Education and Outreach Action Plan

James Richardson, EPB Administrator

The St. Johns River is recognized by residents of Duval County as their greatest natural resource. It serves the community in many important ways, from recreation to economic development. In spite of its importance to the county and the region, residents are often unaware of the potential impact they may have on the health of the river. In addition to that, some of the negative impacts occur upstream and are out of the control of residents and regulatory agencies. That said, it is widely accepted that whatever can be done to educate residents of the impact of their actions can influence the health and vitality of the St. Johns River.

The Jacksonville EPB and the COJ's EQD have recognized that they have a critical role in educating residents how they can contribute to the river's health by behavioral changes. To that end, several steps have been taken, or are planned, to increase citizen awareness around this critical issue. This includes, but is not limited to, the organizations below and their plans.

Jacksonville EPB will be reviewing their current rules to update current standards and consider new technologies in an effort to reduce sanitary sewer overflows and other issues that have potential direct impact to water quality and the release of nutrients to waterbodies.

- The Education and Outreach Committee has identified irrigation and fertilizer as major topics to focus their efforts and funding.
- Approved funding to support the Lower St. Johns River Technical Advisory Committee.
- Supported the State of the River Report since its inception and is anticipated to continue the funding. The committee has met with the team and provided input on areas of concern and focus, with education being one of the main items they want to be enhanced.
- Approved funding for education and outreach efforts. Staff has been working with the City's Public Affairs Office to develop a communications campaign around irrigation and fertilizer. This has resulted in the production of updated brochures, rack cards, and other printed materials. A social media campaign has been developed and implemented. Digital billboards have been developed and are scheduled to be utilized throughout the county. Enhancements to media relations are being developed as well.
- As the SJRWMD does not currently have plans to revive the "It's My River" campaign, the EPB is contemplating how they may take the lead in a similar community wide campaign.
- Considered establishing a new festival or other community event associated with pollution prevention with water as a primary focus.

EQD

- Print materials have been updated and are being distributed to residents by inspectors and other staff responding to resident issues, well permit inquiries, and other areas.
- EQD webpages have been revised to provide more information around irrigation and fertilizer and their impacts to water quality.
- EQD has enhanced a partnership with the St. Johns Riverkeeper to increase identification of potential issues such as illicit discharges and erosion and sediment control infractions.
- EQD/EPB staff is developing BMPs and fact sheets to help communicate methods to reduce personal pollution.

The location of the EQD within the COJ's Neighborhoods Department helps to provide a direct pipeline to residents and other organizations. Staff is working with the Office of Neighborhood Services to improve communications to CPACs, HOAs and other community groups. Information on various topics is provided to them for electronic distribution and at meetings. EPB staff has met with the Keep Jacksonville Beautiful Coordinator to determine ways to collectively reach more students and citizens with presentations. EPB staff works closely with the Duval County Public Schools Green Champions Program participants. This is a dedicated group of schools that focus on environmental issues.

There are other efforts underway, or under consideration, that could have a substantial impact on reaching residents and educating them on the impacts that they have to the river's health. Artificial reefs deployed in the main stem are being studied by students from JU. Although not a required portion of the study's scope, any immediately observed impacts to water quality are being recorded and will be communicated. The interaction and communication to anglers in the area provide direct access to a sensitive population.

There is much activity currently happening around waterfront activation. As those efforts are deployed, an educational component could be included in order to encourage those engaging the river to take steps to help ensure it is clean and healthy.

Although funding and staff levels impact their capacities to do so, most of the regulatory agencies all have some form of education and outreach efforts. Thought should be given to periodically convening a roundtable or some other opportunity for them to come together. Methods and means to coordinate efforts and share resources will only serve to educate more residents.

C. Create one centralized, statewide surveillance system to monitor cyanobacteria events.

Presently, Florida does not have one centralized, statewide surveillance system to monitor cyanobacteria events and their effects on the environment and animal and human health. As a result, information is gathered from several sources to detect cyanobacteria events and human illness resulting from exposures to cyanotoxins. In executive order 19-12, Governor DeSantis calls for the establishment of a Blue-Green Algae Task Force, charged with focusing on expediting progress toward reducing the adverse impacts of blue-green algae blooms now and over the next five years.

D. Promote and encourage the Florida Friendly programs, reduce the need for fertilizer and pesticide application basinwide.

The conservation and protection of Florida's water resources starts at home. Homeowners' landscaping choices can affect the health of ground and surface waters and the natural environment.

The Florida Yards & Neighborhoods Homeowner program educates homeowners about how to design, install, and maintain healthy landscapes that use a minimum of water, fertilizer, and pesticides. The result is low-cost, low-maintenance, attractive landscapes that add value to the community and reduce the chance of polluting the water supply.

E. Support the Waterkeeper proposed initiatives, Statewide 1999 Task Force Activation (Riverkeeper Resolution), and other legislative priorities.

1. In March 1999, the Harmful Algal Bloom Task Force Technical Advisory Group submitted a 68 page report on harmful algae blooms which addressed problems and suggested remedies for the following:
 - Red Tide.
 - Pfiesteria-like species (fish sore cause).
 - Ciguatera.
 - Cyanobacteria.
 - Microalgae as tumor promoters.

The cyanobacteria recommendations included:

- Determine distribution of toxic and nontoxic strains in Florida waters via special state appropriation funds.
 - Develop epidemiological studies to determine what public health risks are involved.
 - Develop economic impact studies to properly evaluate losses by locale or industry.
 - Determine the roles of nutrient enrichment and managed freshwater flow in bloom development.
 - Determine the fate and effect of toxins in the food web.
 - Determine the relationship between blue-green toxins and alligator deaths.
 - Investigate the applicability and efficacy of control and mitigation methods.
2. In July 2018, fourteen Florida waterkeeper organizations (including the St. Johns Riverkeeper) met jointly with FDEP to express serious concern and a sense of urgency to protect and restore Florida's rivers, coast, bays, estuaries, lakes, springs, and aquifer. Their position is posted at <https://oursantaferiver.org/florida-waterkeepers-request-protection-for-florida-waters/> and in summary, they state:
 - Florida Waterkeepers submitted a joint request strongly urging FDEP to fully protect our waterways and our community by increasing Florida's ability to withstand future storms. Recommendations include comprehensive audit of infrastructure vulnerability and storm risk to accurately price the cost of inaction, prioritization of green infrastructure, and enhanced protection of wetlands and mangroves.
 - Another ongoing threat is excess nutrient pollution from sewage sludge, failing septic tanks, aging infrastructure, stormwater runoff, and agricultural runoff. This pollution fuels toxic green algae, brown slime, and red tide. Inadequate monitoring and lack of timely health advisories puts Floridians in harm's way. Absent a comprehensive strategy to target the root causes and to stop this pollution at its source is a recipe for environmental, human health, and economic disaster.
 - Waterkeepers requested the activation of the Harmful Algal Bloom Task Force; prioritize testing the actual algal bloom and publicize health advisories of toxic outbreaks quickly, a statewide moratorium against sewage sludge disposal near waterways; septic tank phase out strategies and the development and enforcement of truly restorative Basin Management Action Plans. The entire group presented a resolution against phosphate mining. In addition, the water

advocates further voiced their joint opposition to FDEP's efforts to assume the dredge and fill permits regulated by Section 404 of the Clean Water Act.

3. The St. Johns Riverkeeper recently drafted a resolution in support of activating that 1999 Task Force with full appropriations. The two Waterways members of the Waterways Algae Task Force fully endorse and support that strategy and recommend Waterways Commission enact a resolution in support. The resolution included 4 action item requests:
 - Identify and authorize adequate funding of not less than four million dollars to implement Ch. 379-2271, F.S., Harmful Algal Bloom Task Force during the 2019 Florida Legislative Session for FY 2019-2020;
 - Authorize the Florida Harmful Algal Bloom Task Force to develop a report addressing the original four specific tasks of the Florida Harmful Algal Bloom Task Force in a current context and identify additional information gaps by October 1, 2019;
The original four tasks were:
 1. Determine the status and adequacy of existing information,
 2. Develop research and monitoring priorities including detection, prediction, mitigation, and control,
 3. Develop recommendations for government whereby they can create response/contingency plans fitting their specific needs and resources, and
 4. Make recommendations to the Florida Marine Research Institute.
 - Expand research priorities and recommendations to include prevention of harmful algal blooms;
 - Require the Florida Harmful Algal Bloom Task Force to make fiscal recommendations to the Florida Legislature for future funding cycles that address the recommendations of the report and for administering federal funds and or grants by October 1, 2019.
4. In September 2018, a Florida Senate Commerce Committee meeting included discussion of the impact of the algae problem. A record of the discussion is not available at this time.
5. On January 10, 2019 Governor Ron DeSantis issued Executive Order Number 19-12 titled, *Achieving More Now for Florida's Environment*. Among other important water restoration action items, it includes "the establishment of a Blue-Green Algae Task Force, charged with focusing on expediting progress toward reducing adverse impacts of blue-green algae blooms now and over the next five years." <https://www.flgov.com/wp-content/uploads/2019/01/EO-19-12-.pdf>

F. Implement riverwide assemblies such as the River Caucus, St. Johns County Waterways Task Force, and the St. Johns River Technical Advisory Committee.

Riverwide Assemblies

The following is listing of multijurisdictional Riverwide Assemblies in activism history, not a completed set of recommendations.

1. St. Johns County Waterways Task Force (ongoing).
2. Technical Advisory Committee and Executive Committee (ongoing BMAP function).
3. River Caucus.
4. River Accord (10-years ended in 2016 with last annual report).
5. Lower SJR SWIM Plan (1980s, last updated in 2009).
6. Water Quality Attainment Plan for Duval County (1986).

G. Promote re-establishing oyster reefs to promote improved water quality and possible harvesting.

Bill Karlavige, EQD

One of the Task Force recommendations is: *Get the oyster project going for environment and economics (river activation).*

River Reef and Shellfish Synergy

During the EQD exploration of Coastal Conservation Alliance recommended third river reef candidate sites, EQD discussed one site (between River Reef sites 4 & 5) as a potential oyster farming area. Dr. Quinton White noted that the oysters may grow but will be too small due to freshness of water. Indeed, Hurricane Irma's prolonged freshwater outflow reduced the shellfish at the existing two river reefs.

Class II Water Shellfish Summary

Oysters have been an important component of the diet of coastal inhabitants of Northeast Florida for over 5,000 years. In 1924, major outbreaks of typhoid occurred in northern U.S. cities due to consumption of raw shellfish from polluted waters. In this outbreak, 1,500 people were sickened by the contaminated shellfish and 150 of them had died. This was "the deadliest outbreak of a foodborne illness in US history." The typhoid outbreak almost caused a near collapse of the shellfish industry. As a result, the U.S. Food and Drug Administration (FDA) and the Interstate Shellfish Sanitation Conference (ISSC) created the National Shellfish Sanitation Program (NSSP) to regulate the shellfish industry more strictly.

In the 1960s, certain areas in Duval County were officially approved for harvesting, including waters in the Timucuan Ecological and Historic Preserve. A 1979 report stated that many of the monitoring stations did not meet the NSSP's recommended criteria for approved waters. In 1986, the Florida Department of Natural Resources (DNR) planned to completely close the local beds, even though high

bacteria levels could be predicted by monitoring salinity levels, but the equipment needed was deemed too expensive. This closure plan was successfully fought by local commercial harvesters and fishermen. In 1987, a \$75,000 remote salinity monitor was installed. The area was reclassified as "Conditionally Approved," with temporary closures occurring during reduced salinities.

In 1994, after a barge destroyed the remote salinity monitor, the shellfish beds were temporarily closed. The monitoring equipment was never replaced. So in January 1996, the Duval County shellfish harvesting areas were classified as "Prohibited" and remain closed to the present day.

In recent years, EQD and many others wanted to know what changes have occurred since 1996. Has the water quality in the harvesting area improved or declined? In 2013, EQD researched what it would cost to hire a contractor to monitor the oyster beds for the two year study that is required by FDACS. It was estimated that it would cost over \$235,000 for the contractor to sample the Timucuan area twice a month for two years.

With limited funds, EQD and the National Park Service (NPS) decided to perform a preliminary study on the bacteria levels in the Timucuan area to see if a larger effort was feasible. The Preliminary Water Quality Assessment was performed by Betsy Deuerling (COJ, EQD) along with volunteers and existing resources. All samples were analyzed at EQD's in-house laboratory. EQD completed 24 months of water quality samples in all adverse environmental conditions including: rainfall events, high and low water levels, warm and cold weather, and various tidal conditions.

Thirty stations were established in the Timucuan Preserve to be sampled for the 2013 to 2015 study (the 1987 Comprehensive Shellfish Harvesting Area Survey only used 22 stations). From the two year preliminary study, almost all of the sampling events, besides the January 2014 event, fell below the fecal coliform geometric mean of 14 colony forming units (CFU)/100 milliliters. This was a very positive sign that the water quality has improved throughout the Timucuan area.

In March 2015, after over one year of data collection, EQD sent the results to FDACS to discuss the progress and the possibility of reopening the oyster beds. FDACS is the lead agency in Florida when it comes to classifying and managing shellfish harvesting areas. Since the water quality has improved, sampling effort by EQD helped FDACS to reconsider reopening the shellfish beds within Duval County.

For areas to be classified "Approved" or "Conditionally Approved," the level of fecal coliform in subsurface water samples must meet the NSSP 14/31 standard. This standard is a geometric mean of 30 samples not to exceed 14 CFU per 100 milliliters (ml) of water. A second part of this standard addresses the variability of the data and requires that the 90th percentile not exceed 31 CFU/100 ml.

At the August 9, 2017 Waterways Commission meeting, Chairperson Lori Boyer requested a status memo on the shellfish harvesting efforts, identifying key contact staff at the State regulatory agencies. Jill Fleiger (Environmental Administrator) from FDACS's Division of Aquaculture is the key personnel in considering the possibility of reopening the oyster beds in Duval County for harvesting. In October 2017, Ms. Fleiger gave a presentation to the Waterways Commission on the steps that are required before the shellfish beds can be reclassified as Approved or Conditionally Approved. Ms. Fleiger noted that since the samples were not analyzed by one of the two U.S. (FDA) approved labs in the State of Florida, FDACS will be required to perform 30 rounds of water quality testing.

In December 2017, FDACS started to test the water quality in the Timucuan area for the first of the 30 sampling events required before approval. FDACS selected to evaluate the same 30 sites EQD sampled for their research. FDACS was planning on performing two sampling events per month but so far has only sampled once per month. As of September 2018, only 10 sampling events have been completed.

During the October 10, 2018 Waterways Commission meeting, Ex-Officio Waterways Commissioner Marshall Adkison (Planning Commission) provided the board with an update on the progress of reopening the shellfish harvesting areas within Duval County. According to the results collected, the water quality has improved since 1996, and samples have been within the NSSP 14/31 water quality criteria.

In order to reopen the oyster beds, FDACS is required to create a reliable method to determine the effects rainfall and water levels have on the harvesting area. Currently, FDACS is working with NOAA to create a reliable method using SAS® software. The software will be used to help determine a correlation between hydrological data (precipitation, stream stages, and point and nonpoint discharges) and fecal coliform bacteria levels.

VI. APPENDIX A:

A. Waterkeepers Task Force Resolution

In July 2018, fourteen Florida waterkeeper organizations (including the St. Johns Riverkeeper) met jointly with FDEP to express serious concern and a sense of urgency to protect and restore Florida's rivers, coast, bays, estuaries, lakes, springs, and aquifers. Their position is posted at <https://oursantaferiver.org/florida-waterkeepers-request-protection-for-florida-waters/> and on the next two pages.

Resolution to Restore Funding for the Florida Harmful-Algal-Bloom Task Force

Whereas harmful algal blooms (HABs) occur in fresh and marine waters throughout the state of Florida;

Whereas HABs produce a diverse array of potent toxins that have severe impacts on human health, and aquatic ecosystems;

Whereas HABs have significant economic impacts related to public health, tourism and property values;

Whereas the original Harmful-Algal-Bloom Task Force, after becoming legislatively created in 1999 with a mandate in Ch. 370.06092, F.S. (now Ch. 379.2271, F.S.) was an advisory body to the Director of the Florida Marine Research Institute (FMRI), now the Fish and Wildlife Research Institute (FWRI) and had four specific tasks: 1) determine the status and adequacy of existing information, 2) develop research and monitoring priorities including detection, prediction, mitigation, and control, 3) develop recommendations for government whereby they can create response/contingency plans fitting their specific needs and resources, and 4) make recommendations to FMRI;

Whereas States of Emergencies were declared by the governor of Florida for multiple Florida counties with respect to adverse impacts on the environment, health, the business sector and real property values from severe and widespread harmful algal blooms in 2016 and 2018;

Whereas independent research since 2001, when funding ceased for the Florida Harmful-Algal-Task Force, has provided significant new information on various aspects of HAB problems pertinent to Florida including improved methods for prevention, detection, monitoring, predicting and public health notification; now therefore, be it

Resolved, the undersigned organizations formally request that the Florida Legislature:

1. Identify and authorize adequate funding of not less than four million dollars to implement Ch. 379.2271, F.S., Harmful-Algal-Bloom Task Force during the 2019 Florida Legislative Session for FY 2019-2020;
2. Authorize the Florida Harmful-Algal-Bloom Task Force to develop a report addressing the original four specific tasks of the Florida Harmful-Algal-Bloom Task Force in a current context and identify additional information gaps by October 1, 2019;
3. Expand research priorities and recommendations to include prevention of harmful algal blooms;

4. Require the Florida Harmful-Algal-Bloom Task Force to make fiscal recommendations to the Florida Legislature for future funding cycles that address the recommendations of the report and for administering federal funds and or grants by October 1, 2019.



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Miami Waterkeeper
Miami, FL



Jen Lomberg
Matanzas Riverkeeper
St. Augustine, FL



Laurie Murphy
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Harrison Langley
Collier County Waterkeeper
Naples, FL



John Cassani
Calusa Waterkeeper
Fort Myers, FL



Andy Hayslip
Tampa Bay Waterkeeper
St. Petersburg, FL



Reinaldo Diaz
Lake Worth Waterkeeper
Lake Worth, FL



John S. Quarterman
Suwannee Riverkeeper
WWALS Watershed Coalition
Hahira, GA

B. Doctors Lake Restoration

Web information appears on the next two pages.



Doctors Lake Restoration Project

Located in Clay County connected to the west bank of the St. Johns River, the Doctors Lake Basin covers approximately 23 square miles. The basin's former agricultural and forested lands now support medium and high density residential areas, commercial properties and golf courses.

Doctors Lake has experienced water quality issues due to "legacy loads" of excess nutrients, ongoing loading of chemicals and nutrients through runoff from nearby residential neighborhoods, and nutrients received from the St. Johns River. Because of its narrow connection with the St. Johns River, the 3,400-acre lake has poor circulation, and lake water is not adequately able to naturally filter pollutants.

Contributing factors include:

- Basin population of 35,000 (2000 Census)
- 12,000-plus housing units
- 847 units on septic tanks (as of 2008)
- Mixture of development prior to and after environmental resource permitting established

During the 2018 legislative session, Sen. Rob Bradley, R-Fleming Island, Senate Budget Chairman, and Rep. Travis Cummings, R-Orange Park, secured specific funding during the budget process for the St. Johns River to implement projects that will help restore the river, its tributaries and the Keystone Heights Lake Region, as well as improving public access and recreation projects within the St. Johns River Water Management District.

With Governor Scott's support and approval of the budget, the St. Johns River Water Management District, Clay County and Clay County Utility Authority (CCUA) partnered to identify potential projects in the area.



Three potential projects identified are:

- Septic-to-sewer projects extending the CCUA infrastructure to serve lakeside neighborhoods currently on septic systems. An estimated 100 homes converted to central sewer would reduce total nitrogen entering Doctors Lake by 1,881 pounds per year.
- Replacing old or failing septic tanks with Individual Distributed Sewer Systems in areas where conventional sewer service is not available or feasible, which will provide treatment that is comparable to that of wastewater treatment facilities. Utilizing this new technology may provide onsite nitrogen reduction up to an estimated 1,125 pounds per year.
- The Doctors Lake Enhanced Effluent Treatment Project, which will provide innovative technology to remove phosphorus from wastewater effluent. The proposed project will treat a minimum 2 million gallons per day on an annual average basis. This project will remove an estimated 6,500 pounds per year of total phosphorus.

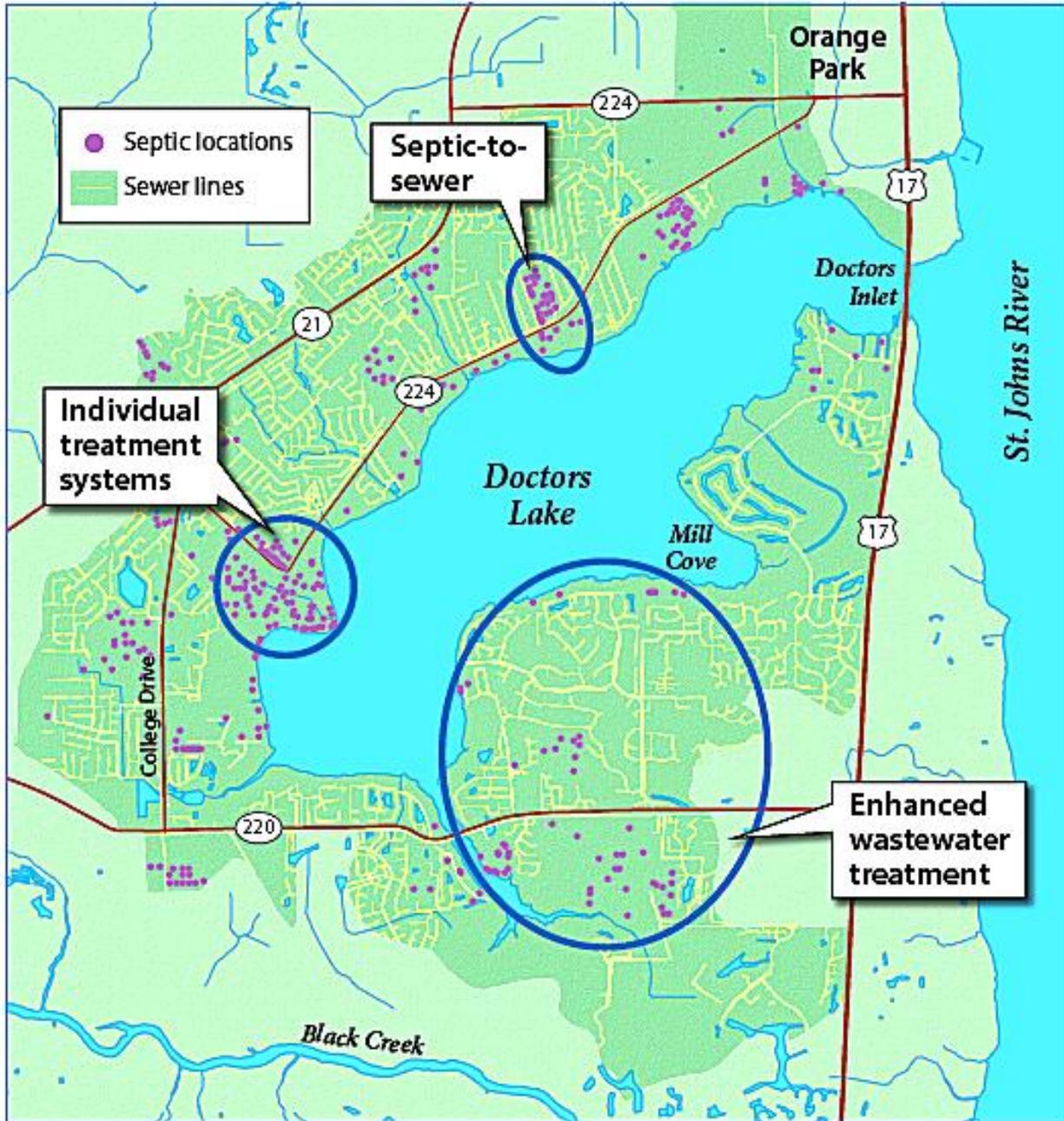
Estimated total nitrogen reduction is between 2,200 and 3,000 pounds per year and estimated total phosphorus reduction is 6,500 pounds per year. Total cost for the projects is \$4.5 million.





St. Johns River Water Management District

Doctors Lake Restoration Project



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