**LOWER ST. JOHNS RIVER (LSJR) TECHNICAL ADVISORY COMMITTEE (TAC) MEETING**
**Thursday, October 17, 2019**
**2:00 PM – 4:00 PM**
***St. Johns County Utility Department***
***1205 State Road 16***
***St. Augustine, FL 32084***

## MEETING SUMMARY

**Attendees**

Shannon Blankinship, St. Johns Riverkeeper
Derek Busby, SJRWMD
Tiffany Busby, Wildwood Consulting
Ed Cordova, JEA
Brian Davis, DEP
Dean Dobberfuhl, SJRWMD
Alan Foley, Jones Edmunds
Tina Gordon, Wildwood Consulting
Vickie Hoge, SJRWMD
Mike Hollingsworth, USACE
Adam Hoyles, Onsite Environmental
Tom Kallemeyn, DEP
Bill Karlavige, COJ
Kerry Kates, FFVS
Jody Lee, FDACS
Melissa Long, COJ
Alan Obaigbena, FDOT
Jeremy Parrish, DEP
Lisa Rinaman, St. Johns Riverkeeper
Russ Brodie, FWC
Jennifer Sagan, Wood
Geoff Sample, SJRWMD
Scott Schultz, Green Cove Springs
Teri Shoemaker, St. Johns County Utilities
Kelly Smith, UNF
Jason Sparks, St. Johns County Public Works
Steve Swann, Atlantic Beach
Tiffany Trent, SJRWMD
Pam Way, SJRWMD

**Welcome and Introductions**

Tiffany Busby, Wildwood Consulting, welcomed participants and thanked them for attending. She also thanked St. Johns County Utilities and Teri Shoemaker for the use of the meeting room. Tiffany Busby thanked the City of Jacksonville (COJ), the Environmental Protection Board, and Lucy Sonnenberg, Jacksonville University, for their support and the restoration of the funding which supports the TAC. Tiffany Busby asked that participants sign in and update their contact information. She stated that this meeting was not a part of the Lower St. Johns River Basin Management Action Plan (BMAP). Tiffany Busby asked that participants send any feedback, questions, or suggestions on speakers for future meetings to her. She also informed attendees that the TAC can provide technical expertise and advice to members or organizations and has, in the past, provided feedback on priorities and funding.

Tiffany Busby introduced Lucy. Lucy welcomed participants and stated that the LSJR TAC has been working together for the common good of the river for a long time. She thanked Melissa Long, COJ, for working with her to support the funding for the TAC. Tiffany Busby informed the group that the next meeting of the TAC would be focused on biosolids and that this meeting is focused on cyanotoxins, algal blooms, and water quality. Tiffany Busby introduced Tiffany Trent, St. Johns River Water Management District (SJRWMD).



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**Cyanotoxin Patterns in the Lower St. Johns River**

Tiffany Trent presented on cyanotoxin patterns in the LSJR. Tiffany Trent reviewed the common species of cyanobacteria known to form blooms in the LSJR. She presented the bloom causing cyanobacteria and stated the one we are most familiar with is *Microcystis aeruginosa* adding that this cyanobacteria forms scum on the surface of the water. Tiffany Trent stated that the *Aphanizomenon flos-aquae* is the type they have found this summer, which appears as clumps in the water. Tiffany Trent reviewed the tools utilized to monitor for the presence and status of blooms including in-field observation and sampling (which she indicated is best monitoring approach), continuous measurements at autonomous monitoring sites, and satellite imagery. She added that, as a part of in-field observations and sampling, samples are analyzed for standard chemistry, algal identification, and algal toxins.

Tiffany Trent showed a map of the National Oceanic and Atmospheric Administration (NOAA) chlorophyll-a satellite imagery from the last bloom that occurred in the St. Johns River. She explained that algal blooms of the LSJR can be categorized into three types, based on the dominant species assemblages determined from plankton sample identification. She stated that near the mouth of the river where salinity is high, blooms are dominated by marine algae, in the shallow freshwater reach, blooms are dominated by nitrogen-fixing blue-green algae and in the transitional zone between Green Cove Springs and Jacksonville, bloom dominants are determined by the salinity conditions. She added that under mildly salty conditions, flagellated autotrophic and mixotrophic species dominate and in more fresh conditions, blooms are frequently dominated by the non-nitrogen fixing *Microcystis*. Tiffany Trent explained that *Microcystis* is dominant because of its ability to tolerate salinity changes and is a concern due to is capability to form the cyanotoxin microcystin.

Tiffany Trent explained that there can be many causes of algal blooms including storms, rain runoff, or pulses from agriculture of higher concentrations of nutrients. She explained that the river can have low flow, leading to longer residence time right before large rain event. She added that once the rain event happens, the nutrients get flushed down river and cause an increase in chlorophyll-a. Tiffany Trent stated that this produces favorable conditions for blooms of *Microcystis*, which produces visible scum in areas with higher human uses and often produces the algal toxin microcystin.

Tiffany Trent demonstrated to participants some of the algal blooms that have happened in the river. She stated that in 2009 the St. Johns River at San Marco experienced a bloom went all the way to the shore. Next, she explained that in the spring of 2019 there was an Aphanizomenon outbreak that caused concerns because of how it looked, however the microcystin was low because Aphanizomenon is not a big producer of microcystin. Tiffany Trent reviewed the U.S. Environmental Protection Agency (EPA) criteria for recreational use as 8 parts per billion (ppb) of microcystin and 15 ppb for *Cylindrospermopsin*. She then showed the toxin occurrences from 2005 through 2017 indicated that many hot spots for algal blooms occur north of the oligohaline reach and near Doctors Lake for *Microcystis.* She added that the opposite pattern – mostly in freshwater reach and lakes – is true for *Cylindrospermopsin* which does not exceed EPA criteria during the reference period. She stated that microcystin is the primary toxin they come across and she provided graphs showing the exceedances over the EPA criteria during the referenced time frame. She added that the oligohaline section has the most hits over exceedance, but Doctors Lake has most microcystin hits by area.

Tiffany Trent explained that, with regard to seasonality, quarter 3 has the most hits and highest hits on average because with all other factors equalized, temperature would be the driving factor, and this is during the warmest months. She also reviewed the mean toxin concentration by month and explained that when warmer months happen, there is a larger difference between ambient samples and bloom samples.

Tiffany Trent reviewed the data examining the presence and absence of cyanobacteria genera and toxins. She stated that quantile regressions were performed which focused on the 90$^{th}$ percentile where slope estimates were given for the minimum and maximum. She reviewed the results by species highlighting that Oscillatoria is present all the time, whether microcystin is present whereas there was a positive correlation between microcystin concentrations and *Chroococcus*, *Merismopedia*, *Microcystis,* and *Raphidiopsis* within at least one segment of the river. She added the regression revealed multiple relationships between genus biovolume and cyanotoxins in estuary segments. Tiffany Trent added that the limitations of her study were that it did not include genetic testing or culture bioassays which would give a definitive species identification and that more complex relationships exist between toxins, plankton, and chemical variables. She added that all three elements can be collected during a bloom, but without ambient stations taking continuous water quality measurements we will not know what happens before the bloom. She stated that hopefully future funding requests will include enhanced monitoring for harmful algal blooms (HABs), such as ambient stations, continuous water quality sonde deployments to take continuous phosphorus readings, and genetic testing for taxonomy.

Tiffany Trent took questions from the audience.

Lucy asked why you wouldn't also ask for nitrogen sensors and Tiffany Trent responded that in most of the literature microcystin is not nitrogen-fixing and that in waters supporting the blooms there is typically excess phosphorus, so blooms are considered phosphorus limited.

Tiffany Busby stated that in some of the data from other areas in the state it has been seen that identification of taxa is difficult. She asked how you deal with correcting for the taxa. Tiffany Trent responded that a lot of that error can be due to multiple people identifying taxa and the water management district has used the same taxonomist through 2016 in hopes this would limit identification errors.

Kelly Smith asked if there was any indication that they can laterally transfer genes for the toxin. Tiffany Trent responded that they do not know if it is laterally transferable in the natural environment, but it has been demonstrated in the lab.

Lisa Rinaman asked why chlorophyll-a was not quantified in all samples and Tiffany Trent responded that they check chlorophyll-a in all grab samples and are hoping for that at all autonomous stations. Lisa also asked about monitoring for other toxins like saxitoxin. Tiffany Trent responded that the district previously sampled for saxitoxin, but it was not usually present.

Kelly asked if the added continuously monitoring sondes would have publicly available data and Tiffany Trent responded that ues, there would likely be a mechanism for providing that by request. Kelly suggested that real time sampling would be great.

**Quantifying Enhanced Best Management Practices (BMPs) and Overview of Ranking Process for Tri-County Agricultural Area (TCAA)-Water Management Partnership Cost Share Projects**

Mark Clark provided attendees with an overview of the topics to cover. Mark reviewed the total maximum daily load (TMDL) requirements for agricultural enrollment or monitoring adding that if BMPs are followed, the presumption of compliance is there. Mark stated that implementing BMPs in a TMDL watershed is often not enough leaving a gap that needs to be covered between the agricultural allocated loads and the reductions produced by BMPs. He added that the gap can be covered by society with the implementation things like regional treatment systems or cost share programs.

Mark stated that the Florida Department of Environmental Protection (DEP), Florida Department of Agricultural and Consumer Services (FDACS), and water management districts (WMDs) provide funding to implement advanced BMP practices on the agricultural areas within TMDL watersheds. He added that most advanced BMP practices relate to irrigation alternatives with the logic being if you can control that irrigation, you can minimize runoff and control nutrients.

He stated that one practice that was implemented early on was to use drop spreaders instead of broadcast spreaders to apply fertilizer. Options for cost share projects included things like drip irrigation, irrigation tail water recovery and use, overhead irrigation, and wet detention, among others.

Mark stated that the one that came of interest to growers was the irrigation drainage tiles. He added that these systems had cause issues in the mid-west so there was concern over whether they would work in Florida. Mark explained the difference between conventional seepage irrigation and drainage tiles is that in seepage the water runs down the furrow and infiltrates, hits hard pan, and then stacks and raises the water table between the furrows. He added that the furrow does not go across the bed and when it rains the water goes across furrows and then into the ditch carrying with it the nutrients from the soils. He explained that in using traditional seepage irrigation is inefficient use of water, provides uneven moisture regimes, and can cause loss of crops due to flooding, in addition to significant runoff of nitrogen and phosphorus. Mark explained that for drainage tiles, there is a perforated pipe that is laid in the field and then laterals that transport the water throughout the field so there are no furrows because there is no sheet flow. He added that in this system, pipes are subsurface so water ponds at the hard pan which raises ground water up towards the plant roots. Mark explained that tiles can be placed to hold back more water prior to entering the drainage pipe and the controlled drainage allows for water to stay in the anaerobic soil where nitrate is denitrified. He added that with these structures you can backwater through the field and keep raising the groundwater.

Mark stated that the study conducted was meant to examine the nutrient reductions and water conservation between cooperating farms through a paired field set-up using whole fields measuring 20 acres, not plots, for a realistic scale. He explained that in the study conventional seepage irrigation fields were paired fields implementing the drainage tiles. He added that for seepage fields water quality monitoring at the drainpipe and discharge point were conducted

including measured flow where samples were taken based on flow weight. Mark stated that for irrigation drainage tiles there was monitoring of surface water and the pipe coming out of the irrigation drain tile control box as well as monitoring of flow at the discharge of the field. Mark added that the study was conducted over the course of two year.

Mark showed the water use and comparison data and stated that most, but not all farms, had reductions in irrigation and runoff relative to their control field. He added that the variability in the reductions was mostly due to management. Mark explained that overall average reductions for irrigation use was 30% and for field runoff was approximately 40% relative to the control fields. He added that these reductions can go as high as 60% during various times of year. Mark added that what factors into the runoff reduction is the board management in the tank, explaining that growers need to maintain a higher board than the water in the field to produce storage and that they must factor in free boards (one or more boards higher than needed) where storm events can be captured. He explained that as long as the free board is high, there is not a lot of runoff, but once the board gets lowered a rain event can increase runoff making it imperative for growers to be properly trained in using the system and to anticipate rain and bring in free boards. He added that if there was a feedback mechanism, runoff could be further reduced.

Mark explained that the actual concentration change and reductions in nutrients, relative to conventional seepage field, varied by farm and commodity pointing out that Tater farms is a sod production field and the others are farms are potato fields. He stated that concentration is lowered most of the time and when you couple that with volume, almost 50% reduction can be achieved. Mark explained that phosphorus reductions are lower because it is moved by particulate transport and since the water is groundwater and surface soil is phosphorus rich, there is removal of phosphorus. Mark stated that they also took soil samples to look at phosphorus soil storage capacity at various depths to see if phosphorus removal could be increased. He stated that if the storage capacity value is negative, then you cannot hold any more phosphorus leading to more running off and if it is positive, there is room to absorb more. Mark stated that this value was based on the ration of extractable phosphorus to iron and aluminum in the soil as they bind to phosphorus. He added that much of the soil was at capacity for phosphorus retention.

Mark stated that for nitrogen, the concentration was almost net neutral between the control and treatment fields, however when flow is added in to calculate the reduction there tends to be a net improvement of load average showing a 31% decrease in loading. Mark added that this is a significant load reduction for nitrogen. Mark stated that when boards are high and water is stored and ponding, any nitrogen must go through a pool of anerobic water where denitrification occurs. He explained that once boards are pulled out and there is free drainage, the nitrogen goes straight out so there is a fluctuation between board height and concentration. Mark stated that in order to reduce nitrogen concentrations, board heights must be held at 32 inches or more which would cause flooding for growers.

He explained that although denitrification can occur in this scenario, it is not realistic and therefore growers should focus on reducing their flow to create a nitrogen load reduction. He added that when you add in the volume reduction you can move to a 24-inch board height and still have a load reduction. Mark stated that irrigation drainage tiles are in high demand because the growers want to adopt it, however with phosphorus, the available iron and aluminum to

provide absorption may be limited and finite so load reductions for phosphorus will not be available forever which should be accounted for when considering load reductions.

Jennifer Sagan asked if iron and copper could be tilled into the surface to create more absorption and store phosphorus for when it is needed by plants. Mark stated that flipping soils will not help and growers do not believe there is enough phosphorus retained in soil that could be released for use by crops.

Someone asked to what the 24-inch board height was relative and Mark responded to bottom of the structure.

Kelly asked if it was correct that phosphorus is redox sensitive when bound to iron. Mark responded that some may, but not all phosphorus that is iron bound redox sensitive and there is also aluminum storing phosphorus in the soil. Kelly also asked if the water running off the field is anerobic and if we are contributing to anerobic conditions in tributaries with the addition of this water. Mark stated that yes, if there is free board, however oxidized irons in the ditches combined with ditch residence time would allow for most of the water to be aerobic by the time it reaches the natural waters.

**Technical Updates and Announcements**

- City of Jacksonville – Last year the city expanded nutrient data collection on tributaries to quarterly. Environmental Protection Board (EPB), Florida Department of Transportation (FDOT), DEP, and the WMD are funding a microbe study in stormwater ponds.
- St. Johns River Water Management District Update – The WMD is funding several projects in the Doctors Lake, Crescent Lake, and Lake George areas. Funding has been dedicated to enhancing septic systems in Doctors Lake and working on innovative technology with Clay County Utility Authority (CCUA). In Crescent Lake a wetland treatment system is planned for Bull Creek and Dead Lake, dependent on negotiations with the landowner for conservation easements or purchase. The WMD is also on year 3 shad harvesting to remove phosphorus from the lake. Someone asked what happens to the shad and Derek Busby responded that they go to crab traps and shrimp farms.
- DEP Update – The blue-green algae task force is working on a document to go to legislation and will continue through next year. The draft document is available on the website. Draft 62-340 is being reviewed but it is uncertain when that will be implemented. The legislature increased funding to DEP and wastewater treatment facility sampling is increasing with about 400 new inspections expected to try to get every facility inspected this year. Lucy asked if DEP will have an impact of transferring septic tanks and DEP staff responded that it has been suggested, but it has not moved yet.
- U.S. Army Corps of Engineers (USACE) Update – The harbor deepening is ongoing and halfway through 2$^{nd}$ contract. The next contract will be June of next year. Monitoring efforts ongoing. Wood is doing submerged aquatic vegetation monitoring and (Florida Fish and Wildlife Conservation Commission (FWC) is doing fisheries monitoring. USGS produced the 2017 and 2018 monitoring reports on salinity. Turbidity is monitored by contractors. Steve Swann recommended USACE look at the turbidity as his results have been high. The next part of this project will be planting and vegetation restoration. Light



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Detecting and Ranging (LIDAR) assessment of current condition has been ongoing. Big Fish Weir Creek ecosystem restoration is funded for design and permitting with a neighborhood meeting scheduled for next Tuesday.

- Fisheries Independent Monitoring –FWC is doing monthly monitoring of fisheries in the river. Starting in 2005 and through 2016 the WMD funded increased sampling, however the funding ran out in 2016. In support of the dredge project there is monitoring from the U.S. Army Corps of Engineers (USACE) for monthly monitoring in some tributaries.
- Other Member Updates – The American Water Resource Association (AWRA) is having a meeting on November 15th at Guana on resiliency.
- Northeast Florida Regional Council (NEFRC) award nominations are open. DEP sent out information on National Park Service section §319 funding cycle and TMDL/water quality grants are open and due November 15th.
- Next Meeting Date: December 18th, 2019, 10 am – 12 pm, Ed Ball Building, 1st Floor, City of Jacksonville.

**Adjournment**

The meeting adjourned at 4:10 pm.



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