

**LOWER ST. JOHNS RIVER TECHNICAL ADVISORY COMMITTEE (TAC) MEETING**  
**University of North Florida, Science and Engineering Building – FEEDS Room**  
**Jacksonville, FL**  
**September 25, 2013**

**Participants**

Eesa Ali, FDEP	Mike Hollingsworth, USACE
Shauna Allen, NPS	Matt Kershner, FDEP
Russ Brodie, FWC	Tom Mallett, COJ
Robert Burks, SJRWMD	Grazyna Pawlowicz, FDOH – Duval County
Tiffany Busby, Wildwood Consulting	Marcy Policastro, Wildwood Consulting
Stuart Chalk, UNF	Cicely Pontiflet, NPS
Ivan Chou, IBC Consulting	Radha Pyati, UNF
Ed Cordova, JEA	Katie Roark, JEA
Barry Cotter, COJ	Nicholas Sanzone, NPS/SCA
Betsy Deuerling, COJ	Andrew Sears, JEA
David Evans, Water and Air Research	Lucy Sonnenberg, JU
Quincy Gibson, UNF	Joel Steward, SJRWMD
John Hendrickson, SJRWMD	

**Welcome and Introductions**

Stuart Chalk welcomed everyone to the Lower St. Johns River (LSJR) Technical Advisory Committee (TAC) meeting. Tiffany Busby thanked Stuart and the University of North Florida (UNF) for hosting the meeting. The participants introduced themselves and the entity they represent.

**Behavioral Ecology of St. Johns River Bottlenose Dolphins**

Quincy Gibson stated that she has been studying bottlenose dolphins in estuarine environments. Bottlenose dolphins are long-lived and can live up to 60 years old, and possibly even longer, in the wild. These dolphins have a prolonged development period in which they nurse for three to six years, then they have a long juvenile period, and they reach sexual maturity in their early teens. Dolphins have very large brains, which are second only to humans for brain size to body size. Dolphins are also very similar to humans in terms of social strategies, which follow a fission-fusion organization in which they join and leave groups at will. Dolphins do not form stable pods and they are typically sexually segregated (females with other females and calves, and males with other males). The males do work together to gain access to mates and to prevent other males from getting to preferred mates. Males typically form pairs or trios of alliances, and they sometimes have teams of alliances to create a second order alliance. Females do not form stable alliances like the males, and their sociability depends on their foraging demands. When they have low foraging demands, females are highly social but if they have high foraging demands, females are relatively solitary.

For the Florida estuarine dolphins, there are two populations recognized by National Oceanic and Atmospheric Administration’s National Marine Fisheries Service (NOAA Fisheries): one in the Indian River Lagoon (IRL) and one in Jacksonville. The Jacksonville stock has not been researched as extensively as the IRL stock. The last study done on the Jacksonville dolphins was

conducted from 1994 to 1997, and identified three distinct communities (St. Johns River, Intracoastal Waterway [ICWW], and coastal). In September 2010, there was an unusual dolphin mortality event, so NOAA Fisheries formed a group to study the cause of the event and gather more baseline data on the population. The cause of the mortality event was not determined because of a lack of data on this population; however, the Talleyrand dredging operation was ongoing at this time, so that was a possible explanation for the event. UNF started their dolphin research center after this event to collect baseline data on the river's dolphin population to better understand them before the channel dredging begins. Starting in March 2011, UNF has been conducting weekly photographic identification of the dolphins and a behavioral survey. This information will be used to learn about the abundance and distribution, site fidelity and residency periods, and life expectancies for this dolphin population.

Quincy noted that the St. Johns River is an urban environment with a lot of threats to dolphins, mostly problems with entanglement from fishing gear. There are also issues with habitat degradation from coastal development and boat traffic. The dolphins in the LSJR do not rest like other dolphin populations do, which leads to increased stress. In addition, there are issues with pollution, both chemical and noise. The UNF researchers have noticed an increase in skin lesions on the dolphins. They recently collected biopsy samples, which should provide more information about these lesions.

The study area extends from the mouth of the river to downtown, which is about 40 miles of river. In this area, they have observed 293 unique individuals, and 96 of these are females with calves. Quincy noted that they can call tell each of the dolphins apart based on their dorsal fins. They have also started to examine family relationships in the dolphin group. Any dolphin that is spotted in the river in all four seasons is considered a year-round resident. Approximately 73 dolphins (26.1%) are residents, and 21 of these are females with calves. The summer has the greatest number of individuals, with similar amounts of dolphins in spring, fall, and winter.

Quincy stated that they have mapped where there were group sightings in the river, and the dolphins are distributed throughout the survey area. To date, the UNF researchers have conducted 117 surveys with 1,124 group sightings. There is also evidence of a possible range extension when compared to the historical data from late 1990s. There are some of the same dolphins using the river in the 1990s as today. It was historically rare to see dolphins past the Dames Point Bridge, but today they have extended their range further upstream. The dolphins have a much larger range in the summer months than in the winter months when they tend to stay closer to the mouth of the river.

Nursery groups, which have four or more calves, are typically found in clusters at the entrance to Mill Cove (near Jax Port) and also at the exit of Mill Cove. There is also a cluster at the intersection with the ICWW. The dolphins typically forage throughout much of the river. Quincy noted that they have observed an unusual behavior with the dolphins in the river, in which they toss flounder. In terms of socializing, dolphins are typically found at Chicopit Bay the entrance to Mill Cove at Jax Port. They have also mapped the male alliances based on how often two males are seen together. The pairs that spend the most time together have a first order alliance. Sometimes second order alliances are formed in which two first order alliances team up to compete with a third alliance. Other than Shark Bay in Australia, the LSJR is the only place

this second order alliance has been observed. Quincy stated that they will continue to expand on the social behavior study and tracking residency from year to year. The researchers also wanted to gather information on ranging patterns to determine where the dolphins go when they are not in the river. To do this, they formed the Northeast Florida Dolphin Research Consortium, which tracks dolphins from the state line to Brevard County. To date, 15 synoptic surveys have been conducted, and some dolphins they thought were resident to the LSJR have been found in Mosquito Lagoon.

Tiffany asked since it appears that the dolphins' range has increased further upstream, if the past study encompassed the same research area. Quincy responded that the first year of the 1990s study used the same extent as the current study area. However, dolphins were not found further upstream than the Dames Point Bridge, so the area was truncated at the bridge in the remaining years due to funding limitations. Robert Burks asked how many dolphin mortalities have occurred this year. Quincy responded that there have been at least four, one of which was fisheries related and one of which was a dolphin that choked on a fish.

Lucy Sonnenberg asked if the researchers have a conjecture on why the dolphins' range in the river changes by the season. Quincy responded that this is something one of her graduate students is working on now. The change in range could be due to changes in temperature, salinity, and/or social characteristics. Stuart asked if this change could be due to something that affects the fish populations, which would impact the dolphins' feeding habits. Quincy responded the movement of fish populations could be affecting where the dolphins are going. This is something they want to look into but, at this time, they are not sure what the dolphins are feeding on because they have not seen much dolphin foraging in the river.

Robert asked if skin lesions have been observed on dolphins in other areas or just the LSJR. Quincy responded that one of her students looked into this over the summer. There were a few reports of skin lesions on dolphins in Brunswick, Georgia near a Superfund site. However, the dolphins in the LSJR had a higher number of lesions. Quincy has been in contact with NOAA Fisheries about this issue, and they have found that the lesions are seen most often in year round residents of the river. Lucy asked if the lesions are connected to the virus that is affecting the mid-Atlantic dolphins. Quincy responded that the virus affecting the mid-Atlantic dolphins is *Morbillivirus*. The lesions on the LSJR dolphins are likely from a pox or herpes strain, which seems to be affecting them because their immune systems are compromised due to contaminant levels in the river.

Tiffany stated that she attended an IRL National Estuary Program meeting several years ago where it was discussed that a dolphin that was typically found in the lagoon had made it to Lake Monroe. It appeared that the only way for the dolphin to have made it to the lake would have been to swim along the coast to the mouth of the river, and then down the river to Lake Monroe. Quincy responded that they are still trying to determine if the dolphins travel along the coast or if they are using the ICWW. Dolphins have been seen in the ICWW but there is a "dead zone" where dolphins have not been spotted. The dead zone extends from about the Wonderwood Bridge in Jacksonville Beach to about St. Augustine.

Nicholas Sanzone stated that he has seen dolphins in the IRL playing with mullet, using the same tossing behavior as the LSJR dolphins with the flounder. Lucy asked what types of social behavior this study is quantifying. Quincy responded that they are looking at mating behavior, dominance interactions among alliances, and calves playing with each other and their moms. Most of the activities are socio-sexual behavior, typically between male alliances to establish dominance and to determine the best alliance partners.

### **The State of the LSJR Report: Water Quality, Fisheries, Aquatic Life, and Contaminants**

Radha Pyati stated that the report is intended for the public, not just the scientific community. The first report was prepared in 2008, and the 2013 report is the sixth report. The report is funded by the City of Jacksonville (COJ) Environmental Protection Board (EPB), and has been funded in the past by the River Branch Foundation. The report includes information on water quality, fisheries, aquatic life, and contaminants (including aquatic toxicology), and discusses the current status and trends over time for each of these categories.

The report has seven components. There is the full report with a glossary, an appendix, website ([www.sjrreport.com](http://www.sjrreport.com)), brochure (released on August 23<sup>rd</sup> at the EPB Environmental Symposium), and a digital archive of all references in PDF. All of these components will be available on the website on September 30<sup>th</sup>. There are also two new components this year: an online interactive format for selected tributaries, and the development of a K-12 curriculum with a UNF faculty member in the education school. The report team includes members from Jacksonville University (JU), UNF, and Valdosta State. There are also a wide variety of external reviewers of the report.

Radha stated that several team members provided input on the aquatic life section of the report. One portion of the aquatic life section is submerged aquatic vegetation (SAV), which is an important component of the system. The status for SAV is unsatisfactory and the trend is now uncertain instead of conditions worsening, as it was in last year's report. SAV in the river have been highly variable, and there was a decline in the grass bed coverage north of the Buckman Bridge. There has also been higher salinity in the river, which led to a lower percent total cover and percent tape grass. There was an increase in rainfall in 2011-2012 that seemed to slow the decline in SAV loss, which is the basis for the change in the trend.

For the threatened and endangered species included in the report, most have a satisfactory status with some improving trends. For the fisheries, they analyzed 12 species using two long term data sets from the Fish and Wildlife Research Institute (FWRI): Fisheries Independent Monitoring (FIM) and commercial landings. Blue crab is the predominate part of the catch for commercial landings in Duval County and St. Johns County. Radha noted that as part of the report, they been trying to make connection between the river and fisheries for the public because, even if they do not use the river for recreation, they may eat seafood that comes from the river. Radha stated that she is trying to figure out the fate for the local blue crab catch. She found that most of the larger food purveyors buy frozen blue crab caught from another location, so most of the local catch is sold in local seafood shops and restaurants. The trends for many of the fish species were determined to be satisfactory, and some are uncertain because there are not enough data available.

Macroinvertebrates are included in the report and they live on or in the sediment, and they are good indicators of river pollution. The report preparers found that much is uncertain about both the status and trend of macroinvertebrates, although the pollution tolerant species dominate and salinity affects their distribution. They will explore new data sources for macroinvertebrates for next year's report. The non-native species in the river were also evaluated, and a total of 68 non-native species were observed, so the trend was determined to be worsening. The non-native species are introduced through the release of exotic pets, ship ballasts, and interconnected waterbodies.

Lucy stated that a different approach was used to evaluate wetlands this year. The land uses within 50 meters of the shoreline were evaluated and it was determined that 29% of the land uses were residential, which is considered high impact based on the landscape development index. A total of 15 wetland mitigation banks serve the LSJR, and most are away from tidal wetlands. Over time, there has been a shift to forested wetlands in the basin. In evaluating the St. Johns River Water Management District (SJRWMD) development permits, they found that most of the permits were for sites under 100 acres, which led to the concern that wetland fragmentation is occurring. Based on this information, wetlands were assigned an unsatisfactory status.

Lucy noted that one of the changes in the report this year was to evaluate water quality based on the location in the river. Information was presented on the concentrations from the freshwater to marine sections to show the public why one concentration for each water quality parameter could not be assigned. Based on this evaluation, they found that total phosphorus (TP) concentrations increase from the freshwater to marine sections. Total nitrogen (TN) concentrations decrease from the freshwater to marine sections. Both orthophosphate and nitrate/nitrite peak in the marine section, and chlorophyll-*a* is elevated in the freshwater section. For the water quality evaluation, they compared the TN and TP values for the river to the numeric nutrient criteria (NNC) for streams in peninsular Florida. The TN concentrations are all below the NNC. TN has been declining since the late 1990s in both the marine and freshwater sections. There are still some TP concentrations that are elevated above the NNC, especially in the marine section. There is no trend in the TP concentrations since the 1990s in either section of the river.

There were peaks in ammonia concentrations in 2004 that occurred in the marine section, which then plummeted down. Lucy noted that the report preparers were unsure about the cause of this ammonia spike. They are seeing an increase in annual average total ammonia at all sites in more recent years. The nitrate levels decreased in 2010 and 2011 but are now increasing. In the freshwater section, there are still chlorophyll-*a* samples that exceed the peninsula NNC. The report team anticipates using better chlorophyll-*a* data from other techniques for next year's report.

Radha stated that to evaluate fecal coliforms, they used the tributaries monitoring data from COJ. The report team evaluated six tributaries that had sufficient data. For Cedar River, fecal coliform data were available from 1990 through 2012. In analyzing these data, they found that in the 1990s, more than 75% of the samples exceeded the state's water quality standard for a single sample limit. However, in more recent years, 75% of the samples have been below the single sample limit.

Lucy stated that for the contaminants evaluation, they looked at atmospheric emissions, direct discharges to the river and tributaries, water column metals concentrations, and sediment concentrations and toxicity. It has been difficult to determine a trend for contaminants in the sediments because many of the contaminants are expected to stay in the sediments for a while. There has been a dramatic decrease in toxic chemicals from atmospheric emissions, primarily due to emissions controls at power plants. There is no clear trend for contaminants in discharges to the river and tributaries. While there has been a decline in mercury in air emissions, there is an increase in mercury in direct discharges to water. This is likely occurring because the technologies used to remove the mercury from the air result in more mercury entering the wastewater facilities, which discharge to the river and tributaries. Very few data were available on dissolved metals in water, so the report compared the total metals data to the dissolved metals standard. Lucy stated that going forward, the report is funded for a few more years, they will continue to develop the K-12 program and the online interactive format, and they will likely add a salinity section to next year's report.

Ed Cordova noted that some of the water quality standards are changing, including the dissolved oxygen (DO) standard going from a set number to a saturation level. This change would not affect the trends, but the report language should be updated to reflect the new standard. Lucy responded that she believes the DO standards language was updated in the final report. The reason that DO was considered unsatisfactory in both the marine and freshwater sections was that there were samples below the absolute minimum DO requirement. Tiffany asked the TAC members if they had any thoughts about the high ammonia concentrations in 2004. John Hendrickson responded that since the data are from several sources, the report preparers should be careful with how they evaluate the data. Lucy responded that the data go through extensive review before they are used. They ensure that all the data were collected using the same methods and method detection limits. Betsy Deuerling noted that the station with the high ammonia concentrations is located at Fulton Point.

### **The Blooms of 2011: A Reversal of a Decade of Oligotrophication in the IRL System**

Joel Steward stated that the IRL system experienced a decade of oligotrophication, although the system is not oligotrophic naturally. Joel stated that he is using the term "oligotrophic" meaning that the lagoon moved away from being eutrophic. There are data for the lagoon going back to the 1980s, which show that the system had fairly high chlorophyll-*a*, turbidity, and color levels. Over the last few decades, there has been a lot of urban development and agriculture in the area. Canals were built to help this development by draining portions of the Upper St. Johns River Basin to the IRL. During this time of development, there was an increase in eutrophication in the lagoon. Then, starting around 1998/1999, there was a decline in chlorophyll-*a*, turbidity, and color in the lagoon, which lasted for about a decade. This led to an increase in water clarity with more light reaching the lagoon bottom, allowing increased seagrass depths and coverage. In the North IRL near Port St John and Eau Gallie and in the Banana River Lagoon (BRL) near Cocoa Beach and Satellite Beach, there was an increase in seagrass cover during this time.

In the south central IRL in Indian River County, there was a dramatic increase in the seagrass, in which the coverage exceeded the 1943 levels and the seagrass depth limit targets in several years. Joel noted that this improvement in the Central IRL appeared to be due to a major shift in meteorological conditions in which there were drier years with frequent droughts. There was

also an improvement in the anthropogenic loading due to wastewater treatment facility upgrades and regional treatment projects. The largest change in annual rainfall amounts occurred in Indian River County, where there was a 12-inch decrease in rainfall from the previous decade. This reduction in rainfall equates to about a 20% reduction in watershed TN and TP loadings to the lagoon, which is likely the cause of much of the seagrass gains in the Central IRL. When evaluating only spring rainfall, there was more rain in the previous decade than the last decade. Spring is the onset of the seagrass growth season so there is a need for good water clarity conditions; therefore, the drier springs resulted in less external loading and color. More recently, there has been an increase in rain during the spring. For the lagoon segment near Vero Beach, the TN total maximum daily load (TMDL) was almost achieved with the load reductions from the drought-reduced runoff, with some smaller reductions from wastewater and stormwater projects.

Joel stated that the major algae blooms occurred in 2011. There was the “superbloom” in the North IRL, BRL, and Mosquito Lagoon, which started in February/March and lasted for at least seven months and up to ten months in some areas. There was also a secondary bloom that occurred south of Eau Gallie, which lasted longer than the superbloom. The superbloom was first observed in BRL. By July, the bloom migrated into the North IRL. By August, the bloom had also moved into Mosquito Lagoon. The superbloom was made up of chloro-microflagellates and pedinophyceae, which were both new to the IRL in terms of blooms, with some cyanobacteria. As part of the superbloom, chlorophyll-*a* reached unprecedented concentrations for an unprecedented amount of time. The secondary bloom was mainly cyanobacteria with some diatoms and dinoflagellates. The secondary bloom lasted about one and a half years.

The North IRL had a history of blooms, but these were much shorter lived than the superbloom. Before the bloom, increases in chlorophyll-*a* were observed in some areas, especially in BRL near Cocoa Beach and North IRL near Cocoa. Evidence of light extinction was first observed in BRL and then North IRL, and both of these areas had evidence of limited light starting in mid-2010. There were also impacts to light in the Central IRL due to the high levels of bloom species. These factors all led to an impact on seagrass because of light limitation. BRL lost 86.7% of its seagrass between 2009 and 2011. Mosquito Lagoon gained some seagrass in 2011 since the superbloom did not reach there until August, which is after the seagrass growth period. SJRWMD also evaluated seagrass transect lengths, which measure the seagrass bed length from the shoreline to the deepest point. From 2010 to 2011, there was a 44% loss of seagrass based on the transects. From 2010 to 2012, there was a 65% loss of seagrass or 47,000 acres.

Joel stated that SJRWMD looked at all the components that could have an effect on seagrass to determine how they impact one another and seagrass. If these components are effecting each other in the way that SJRWMD staff believe, then the blooms were due to an increase in the nutrient pool. One of these factors is drift macroalgae, which is a free floating algae found in the lagoon. Drift macroalgae serve as habitat for deeper areas of the lagoon, and are also an effective nutrient sponge. In mid-2010, there was a collapse in drift macroalgae, and the cause of this of collapse is unknown. However, this collapse could have released a lot of nutrients into the lagoon and removed a mechanism for taking up nutrients. Leading up to the superbloom, the IRL system was eutrophic, there was long-term moderate drought conditions, there was an

increase in salinity, and the water temperatures were much colder than they had been. The high salinity, cold temperatures, and low light levels may have impacted the drift algae.

Joel stated that if the negative feedback keeps occurring in the IRL system, there will be no or little seagrass left in the lagoon. If there is positive feedback, then the drift macroalgae should come back, which would help the system and may bring back seagrass. There are areas in the lagoon with high stability seagrass and other areas with low stability seagrass. In 2013, there was a slight rebound in the length (the depth evaluation has not been completed yet) of the high stability seagrass. There is no evidence yet for recovery in low stability areas. The drift algae saw an almost two-year period of collapse, but it is starting to come back. Joel stated that there is some recovery of seagrass being observed, but it will be a bumpy road to get back to the reference end point.

Robert asked what the dominate genre of cyanobacteria were during the bloom. Joel responded that he could not remember, but it was a species that had been documented in the lagoon before. John stated that these events are nothing short of an environmental catastrophe, and he asked if there is an interagency group to look into this. Joel responded an IRL consortium of scientists was formed with academics from a variety of institutions. These experts evaluated the different components in the IRL system to determine what might have cause the blooms. During this investigation, the brown tide bloom started, which was caused by the microbial loop in the system. This type of bloom had only been observed in Texas and the Long Island Sound. The bloom in Texas lasted for eight continuous years, and the experts were unsure if the IRL would be in the same situation. Nutrient reductions are still a major requirement for improving the system. The experts will also consider top down controls to try and increase grazers in the lagoon. Another option is to decrease residence time, especially in BRL. Increasing residence time could be accomplished through opening or enhancing an inlet, but this could have unintended consequences.

Lucy asked if the impetus of the bloom was an increase in nutrients. Joel responded that the IRL system has an underlying chronic nutrient loading issue. In addition, there was the drift algae collapse, the effect of the cold on the fauna, and a suppression of the zooplankton population. All of these factors contributed to the blooms. Eesa Ali asked if there have been any studies about the buildup of legacy loads in the lagoon. Joel responded that there have been studies, and over the last 50-60 years there has been a buildup and increase in distribution of muck in the lagoon. The North IRL and BRL have a lot of muck and this could have contributed to the bloom. The muck constantly pumps out nutrients, so this is another source to the system.

## **Technical Updates and Announcements**

### **SJRWMD**

John stated that SJRWMD reorganized at the end of 2011, and they are still building on this new organization. The Executive Director has initiated a continuous improvement process, which is evaluating the District's structure. There will now be a LSJR and Middle St. Johns River initiative, similar to the previous LSJR program, which will be led by Derek Busby. This new structure will go into place in October.

## **U.S. Army Corps**

Mike Hollingsworth stated that the harbor deepening feasibility study and Environmental Impact Statement (EIS) process is wrapping up, and he appreciates the comments received from the TAC. The public and agency comment period on the report is open until October 4<sup>th</sup>. New information was released within the last month on the modeling for the tributaries and sea level rise. They are still working on some additional sea level rise modeling. Once the modeling and report are complete, they will send this information to Corps headquarters in Atlanta and Washington, D.C. for review. Mike noted that the modeling results had less of an impact occurring from river mile 0 to 13 than was expected. Because of this, the Corps reevaluated the model and assumptions, and the tweaks made to the model showed even less of an impact. The Corps feels they are obtaining accurate results from this modeling effort, which is based on the work that SJRWMD did for the LSJR TMDL and the water supply impact study. The Corps is currently evaluating salinity for pre- and post-project conditions. There have been recent shifts in salinity in the river, and the increase in rainfall lately may also have an effect on salinity.

Mike stated that the Corps received some funding to work on the design for the disposal site and environmental improvement for Big Fishweir Creek. Additional information on this project should be available soon. The Mile Point project is included in the most recent Water Resources Development Act (WRDA). Once the act is passed by Congress, the Corps will have the authority and hopefully the funding for this project. If the project is not funded, then the state and Jax Port will pay for the project. If the project does not receive authorization, Jax Port will move forward with the project themselves, although they prefer not to go this route. If the WRDA bill passes, the project should start in the next year or two.

## **Fisheries Independent Monitoring**

Russ Brodie stated that he sent Tiffany the reports for the offshore and inshore monitoring, as well as the reports for the work they did for the Corps for the harbor deepening and the SJRWMD for the water supply impact study. Russ stated that they are preparing the report for SJRWMD on the fisheries monitoring. Tiffany stated that there is a section on the TAC website that includes the reports Russ mentioned.

## **Other Member Updates**

Shauna Allen stated that the Timucuan Symposium will now be held on January 31<sup>st</sup>, which is a different date than was reported at the last TAC meeting.

## **Next Meeting Date**

Tiffany stated that for the next meeting, John will give his presentation on the causes of microcystis blooms. If any of the TAC members have ideas for other presentations, they should let Tiffany and John know. The next meeting will be held during the week of December 9<sup>th</sup> and will be hosted by the Florida Department of Environmental Protection (FDEP).

## **Adjourn**

The meeting was adjourned at 4:30 PM.