LOWER ST. JOHNS RIVER TECHNICAL ADVISORY COMMITTEE MEETING
City of Jacksonville Ed Ball Building
First Floor Training Room
214 N. Hogan Street
October 28, 2015

Participants

Gary Bowers, EPB	Tom Kallemeyn, FDEP
Russ Brodie, FWC	Jay Kamys, SJC
Derek Busby, SJRWMD	Pam Livingston Way, SJRWMD
Tiffany Busby, Wildwood Consulting	Steve Lopez, ERC
Chelsea Coleman, UNF student	Jim Maher, FDEP
Ed Cordova, JEA	Rick Rachal, FDEP
Barry Cotter, COJ	Lisa Rinaman, St. Johns Riverkeeper
Wendy Dauberman, USACOE	Laura Savage, Wildwood Consulting
Betsy Deuerling, COJ	Russell Simpson, FDEP
Mike Fitzsimmons, FDEP	Charles Sohm, Clay County Utility Authority
Alan Foley, Jones Edmunds	Lucy Sonnenberg, JU
Mike Getchell, JMTX	Peter Sucsy, SJRWMD
Tim Gross, ERC	Eric Summa, USACOE
Mike Halprin, FDEP	Greg Strong, FDEP
John Hendrickson, SJRWMD	Heather Webber, FDEP
Mike Hollingsworth, USACOE	Madelyn Woods, SJR

Welcome and Introductions

Betsy Deuerling welcomed everyone to the Lower St. Johns River (LSJR) Technical Advisory Committee (TAC) and provided a brief history of the Ed Ball Building. The participants then introduced themselves and the entity they represent. Tiffany Busby reminded the group that meeting materials and other documents relating to the Lower Basin are posted on the LSJR TAC website. The website provides the history of the TAC and is a great resource for information on the Lower Basin. Tiffany noted that it has been over a year since the last meeting. The contract to facilitate the TAC meetings ended last fiscal year but was recently renewed thanks to the support of the St. Johns River Water Management District (SJRWMD) and the Florida Department of Environmental Protection (DEP). Betsy then introduced Dr. Tim Gross, the first guest speaker.

Biological Community Monitoring and the St. Johns River: Georgia-Pacific Palatka Discharge Relocation and Other Issues

Tim provided a presentation on the biological community assessment that was conducted from 2008 to 2014 on the Georgia Pacific (GP) Palatka Pulp and Paper Mill discharge. The assessment was performed by Environmental Resource Consultants (ERC). Tim is the owner/president of ERC and has been performing biological assessments on GP's discharge since 1997. These studies include *Gambusia* performed annually from 1999 through 2009, largemouth bass from 1997-2013, fish dioxin from 1999 to present, and biological community monitoring from 2008 to 2014. Many of the studies were performed to meet GP's permit requirements, but some were voluntarily conducted. Today's presentation focuses on the biological community monitoring. Towns Burgess, former employee of ERC and doctorate student at the University of Florida (UF), wrote a dissertation on the research and findings based on this

monitoring. The dissertation was published and is available for review. Steve Lopez, employee of ERC, was also involved in the assessment and is available to help answer questions.

Tim noted that GP's discharge pipe was relocated in 2012 from Rice Creek to the St. Johns River. An administrative order issued by the department authorized relocation of the pipeline if water quality standards for color and conductivity could not be met in Rice Creek. GP's National Pollutant Discharge Elimination System (NPDES) permit required biological community monitoring to determine the potential effects of the discharge to the St. Johns River. The monitoring plan was approved by the DEP in 2006, was significantly modified and received re-approval in 2008, and was finalized in 2010.

The focus of the study was unusual for toxicology assessments relative to biological responses. Efforts previously focused on carcinogenesis or disease issues. The focus in the last 20 years has been on physiological responses that were at the organism level. More recently, the focus has been on the molecular to cellular level. This level looks at reproduction functions and stress/exposure. Analyzing on the molecular to cellular level allows for a quick response time, is more cost effective, and does not require long-term field studies. Unfortunately, it was found out over the years that the results do not have ecological relevance. Regulatory requirements have shifted from requiring monitoring at the molecular to cellular level. Regulatory compliance is now mostly determined by looking at the effects on the population to community level. The typical response parameters include diversity, abundance, and reproduction. The down side to looking at this level is the response time, which can take days to years.

GP's NPDES permit required biological community monitoring. The trophic levels that the permit required monitoring of included phytoplankton and zooplankton, epiphytic algae and periphyton, submerged aquatic vegetation, macroinvertebrates (used as a benchmark), and small and large fish. Co-factors including water chemistry, climatic factors, and photosynthetic pigments (chlorophyll a and cyanobacteria pigments) were also evaluated.

The monitoring was set at distance zones of 0 to 2, 3 to 5, and 7 to10 kilometers north and south of the discharge relocation. Establishing zones rather than discrete locations allowed for interchange of water and biology and differential exposure to the discharge. The monitoring design also included looking at two habitat types: littoral (near shore) and channel. The littoral areas were monitored within two distinct secondary habitats: snag and mast. Snag habitats include natural wooden banks, fallen trees, muck substrate, and have minimal anthropogenic influence. Mast habitats include manmade structures such as docks, seawalls, and altered riparian habitat.

Preliminary assessments were performed from 2008-2010, pre-discharge relocation assessments were performed from 2010-2012 and post discharge relocation assessments were performed from 2013-2014. The first two years (2008-2010) of the assessment were spent characterizing habitats, selecting the monitoring sites which were inclusive of habitat and distances, validating technique selection, developing standard operating procedures, and performing statistical robustness evaluations. The permit required an assessment of the post discharge within 30 days of initial exposure. The results showed that the discharge did not have any acute effects on the waterbody. A report of this assessment is available as well. The assessment looked at exposure pre- and post-relocation. Most assessments in toxicology have a control site versus exposure site, but this was difficult to find with this assessment. For the pre/post assessment to be conclusive, the pre- and post-conditions must be very similar.

The response to the discharge relocation was measured by comparing the variance between the pre and post years. The variance was determined by looking at the data within distance zones, littoral and channel habitat, and other variances such as seasonal, rainfall, and temperature.

The two primary metrics evaluated for population included abundance and diversity. Abundance is the count of organisms or taxa and diversity accounts for richness and evenness. The permit required that the statistical differences from pre and post discharge be extrapolated to look at potential future adverse impacts. The permit included one benchmark that limited the decline of the diversity in macroinvertebrates to 25 percent. An evaluation of the certainty of the data was performed to determine the accuracy of the conclusions. Areas of low certainty were flagged and the need for additional work was evaluated.

Many reports have been generated and submitted to the DEP as part of the assessment. Annual progress reports have been submitted from 2008 to 2014. A final study plan was submitted in 2010. The pre-discharge data report was submitted in 2012. An initial post-discharge acute exposure report was submitted in 2012. A final report was submitted in 2015. Largemouth bass reports were submitted pre- versus post-discharge through 2013 and fish tissue dioxin reports have been submitted annually. The reports are available to the public and are on file with the department.

The primary focus of the assessment was to determine the impacts or adverse effects of the discharge relocation on the LSJR as required by the NPDES permit. The assessment also looked at the effects of discharge removal on Rice Creek. This was not a permit requirement, but was requested voluntarily by GP to determine if removal of the discharge helped towards restoration of Rice Creek.

Two important environmental observations were made between and pre- and post-discharge years. The water temperature and mean monthly precipitation during the pre-discharge years were generally colder and drier than post-discharge years. There were record rainfalls as the assessment transition from pre- and post-discharge evaluations. There were periods of record cold weather in the pre-discharge period as compared to the post-discharge period, and the pre-discharge period experienced periods of drought that lead to drier conditions. The climatic differences complicated the interpretations of the data. Water chemistry data showed that there were no effects as far as total dissolved solids (TDS), specific conductance, and percent dissolved oxygen saturation in the LSJR. Rice Creek showed a significant decrease in TDS and a large increase in water clarity. Although these parameters are not a direct indicator of color, it does suggest improvement in color and transparency in the creek. Rice Creek showed a significant reduction in specific conductance and in post-discharge is meeting the water quality criterion for specific conductance. Percent dissolved oxygen (DO) saturation remains low in Rice Creek, which may suggest that the oxygen supplementation is not necessary. Rice Creek showed a decrease in phytoplankton abundance and diversity, no change in zooplankton, and an increase in macroinvertebrate diversity and decrease in abundance. Looking at fish, there was no change in diversity but a large decrease in abundance. A low abundance of fish in small black water streams is normal. The data suggest that the creek is returning to the status of a small black water stream. In conclusion, the discharge removal from Rice Creek had its intended goal of meeting water quality criteria for conductance and likely color (measured by water clarity). The low abundance and diversity found in Rice Creek is common for black water streams and should not be mistaken for adverse impacts. Oxygen supplementation in the creek may be unnecessary.

Effects of the discharge relocation to the LSRJ were measured by looking at the diversity and abundance of phytoplankton and zooplankton, submerged aquatic vegetation (SAV), macroinvertebrates (littoral and channel habitats), and large-bodied fish (littoral and channel habitats) pre- and post-relocation. The phytoplankton taxa were analyzed with the help of the fisheries department at the UF. The data revealed a dominance of cyanobacteria in the river, which is not ideal. Cyanobacteria can lead to algal toxins and blooms in the river. The data showed a decrease in phytoplankton abundance and an increase in diversity. There were no effects on the diversity and abundance of zooplankton. SAV was rarely found in snag habitats; only one snag site had significant SAV. The mast sites almost always had good SAV. So although SAV is meant to be an indicator of good environmental quality, it was almost always seen in degraded mast sites. More than 95 percent of the SAV was eel grass. Because of this, abundance was measured by the change in the size of the bed over time. Based on this measurement, there was an increase in abundance for SAV. Macroinvertebrate taxa were separated into pollutant tolerant, pollutant intolerant, and moderate pollutant tolerant. Data showed a decrease in pollutant tolerant species and a slight increase in moderate pollutant tolerant in post discharge. There was an increase in abundance and decrease in diversity for macroinvertebrates in littoral habitat sites and a decrease in abundance and no change in diversity for macroinvertebrates in channel habitat sites. There was a decrease in abundance and no change in diversity for small-bodied fish in channel habitat sites and no change in abundance and an increase in diversity for small-bodied fish in littoral habitat sites. There was increase diversity and no effect on abundance for large-bodied fish in littoral habitat sites.

The differences in pre- and post-data demonstrates a fundamental shift in biological integrity. Potential effects were detected across all trophic levels and were generally across all distance zones. Effects could be due to discharge relocation, may also be due to climatic differences (i.e., wetter and warmer years post discharge relocation), or could be transient in nature (need to evaluate the long-term biological cycle of the taxa). Effects may also have a threshold response rather than a dose-dependent response similar to the effects in the largemouth bass studies. Additional monitoring will be required to determine the actual cause.

The NPDES permit requires additional monitoring if the relocated discharge caused adverse effects to the river. The permit defines adverse effects as a 25 percent reduction in macroinvertebrate diversity. The permit also specifies that if the conditions of the river are lake-like, then the data from channel habitat sites must be used but if the conditions are riverine-like, then the data from littoral habitat sites must be used. Lake-like conditions showed no adverse effects, but riverine conditions show adverse effects with the average reduction in diversity at 33 percent. It was not determined if this portion of the LSJR is riverine or lake-like. This is something that will need to be determined by DEP. Application of the 25 percent benchmark across all trophic levels shows that phytoplankton, SAV, and large-bodied fish in channel and littoral habitats also exceed the benchmark.

Tim concluded that the effects on biological diversity and abundance were observed across all trophic levels (phytoplankton, SAV, macroinvertebrates, and fish) post-discharge relocation. While it is possible that these potential effects are likely due, at least in part, to natural causes of variance such as climatic variances (i.e. rainfall and temperature differences between pre and post years), it is possible that discharge relocation is also the cause of these effects. The experimental design and analysis did not clearly demonstrate "cause-and-effect" relationships. Continued monitoring will either demonstrate that the shift is simply transient and therefore due to the climate changes and other factors, or is due to the discharge relocation.

Tim noted that the data from this final report are only valid for the current river flow and discharge volume and chemistry. The pipeline was designed to dilute the discharge rapidly, to not exceed seven percent of total water flow, and to minimize resident time of discharge components. Any change in river flow and discharge volume or concentration would invalidate the current plan of study and the detection of effects and adverse impacts which are limited to the current conditions. With this in mind, there are several concerns related to future proposed changes that may impact the LSJR and which have implications to these data and to GP. Significant water withdrawals from the upper portions of the river will occur in the coming years, significant dredging to deepen the river for increased shipping traffic in the LSJR will occur near Jacksonville in the coming years, and possible increase in production at the GP. These potential changes could effectively alter flow and could result in discharge exceeding 10 to 20 percent of total flow or greater. The bass studies showed adverse effects at a threshold discharge concentration of between 10 and 20 percent. The changes in flow could result in an increased risk for adverse biological responses in response to discharge.

Tim ended the presentation by stating that the critical issues in the LSJR are not limited to, or primarily, caused by GP. GP, for the past 20 years, has conducted significant research and monitoring above that required by permit and much more than any other pulp-and-paper mills in Florida. The long-term implications of the river are not limited to a single discharger or events. There is a strong need for long-term, sustained, biological monitoring across the LSJR supported by permit requirements across dischargers and users and agencies

Tiffany asked the group if there were any questions or comments. Jim Maher asked Tim why he stated that he always knew that the study would not give a cause and effect. Tim responded that originally he was hopeful that they would have a stronger relationship. Tim went on to say that there is always some level of uncertainty with these type of assessments and with this particular assessment; the correlations did not clearly identify the cause. A true cause and effect will be open to interpretation and it would have been better if the study showed a stronger relationship. There were some more discussions on the climatic variances between pre- and post-pipe relocation and how those may have affected the cause and effect outcome. Jim noted that the table showing the adverse effects of macroinvertebrates in the channel habitats (slide 37) should show an increase for year one instead of a decrease. Eric Summa asked if the pipeline was relocated just as the precipitation went up and Tim responded yes. Eric asked if the discharge of seven percent was a regulated flow. Tim responded it was not a regulatory requirement; it was the percentage used in the model so GP wanted to stay at or below this percentage. Eric asked if the 250 million gallon per day (MGD) withdrawal occurs, will the corresponding discharge from the pipeline be required to decrease to make up for the loss of flow to the river. Jim responded that GP will only be held to the water quality requirements in the permit. Tim noted that the mill is conserving water by about 20 percent and even with expanded production the total volume might decrease. There was a question if the pollutant concentrations decreased in the discharge. Tim responded that there were not any process improvements made during the assessment, so concentrations should not have changed during the assessment time-period. John Hendrickson noted that during the wetter period post-relocation, you would also expect less tidal influence that would also decrease the number of species you would expect to find; the marine water influence tends to bring additional species into the river. John noted that the proposed withdrawals from the river are 155 MGD, not 250 MGD. Dr. Lucy Sonnenberg asked if the certainty analysis had anything noteworthy, and Tim responded that the dissertation includes this information. Lisa Rinaman asked if the increased rainfall right at the time of the pipeline relocation might have masked

some of the effects of the discharge. Tim responded that was possible. Lisa asked, so even with the additional rainfall the littoral zone benchmark was exceeded, which should give more concern requiring additional monitoring. Tim responded that it might, and noted that the DEP ultimately needs to decide if the river is lake-like or riverine. Lake-like conditions showed no adverse effects, but riverine conditions showed adverse effects.

Scoping Out the Lake George Total Maximum Daily Load (TMDL): The Nutrient Budget

John provided a presentation on the Lake George TMDL. LSJR receives one-third of its flow from upstream. Correcting the water quality Lake George is imperative to the health of the LSJR. Lake George is the second largest lake in Florida (46,000 acres). It has a mean depth of 10 feet and a mean residence time of four months. The lake is the head of tide of the river system. The tide is attenuated in Lake George. The lake contains freshwater, but with sufficient salinity to support estuarine-dependent species. Lake George is in Group 2, Cycle 3 of the TMDL process and is subject to the nutrient numeric criteria (NNC). The lake was placed on the impaired waters list once the NNC was adopted. The annual geometric mean for chlorophyll a data needed to be below 20 micrograms per liter (ug/L) to be considered unimpaired, but the chlorophyll a levels have been above or at 20 ug/L since 2007. There was already a substantial amount of water quality data and tools in place when it was time to develop a TMDL for the lake.

Because there is less flow coming into Lake George, there is a longer residence time which allows a greater amount of time for phytoplankton to utilize the nutrient supply. The LSJR is a facultative system, sometimes is lake-like and sometimes is riverine, so it is usual that the phytoplankton cannot fully utilize the phosphorus supply in the river. A significant correlation between chlorophyll a and total phosphorus (TP) exist in Lake George; this is because of the long residence time that allows for utilization of phosphorus.

Lake George is a perfectly constrained system unlike the LSJR. Lake George has had long-term water quality monitoring since 2004. Monitoring is conducted in the lake and in the contributing springs, which are a significant source of flow into the lake. There are no direct data on the tributaries water quality, but there is inflow monitoring into the lake and outlet calculated flows. Long-term time series for chlorophyll a, TP, and total nitrogen (TN) shows no trend just high concentrations. The nutrient budget shows the tributary basins and springs provide flow, rainfall and evaporation counter balance each other, and 95 percent of the TN is coming from the Upper and Middle St. Johns River. Inflow and outflow cumulative flows and chloride were measured over time. The data were superimposed, which demonstrates that the budgets were good. Nutrients were then evaluated. It turned out with TP, what goes in the lake comes out of the lake. For TN, the curves diverged which indicates the outflow TN is much greater than the inflow. The cause of the high TN loads was found to be cyanobacteria. Cyanobacteria will decrease if TP decreases. The mass load comes into Lake George around late summer to early fall. A dye study was performed on Lake George that showed that the lake is strongly stratified.

John concluded that the hypotheses generated from Lake George exploratory data analysis relevant to water quality modeling shows that the Middle and Upper St. Johns River are a large proportion of the external nutrient load to Lake George. Across Lake George, the net TN gain is through cyanobacteria nitrogen-fixation and the net TP loss is through sedimentation. There is a strong annual and inter-annual temporal pattern to load and phytoplankton blooms. Sediment resupply, enhanced by transient temperature density stratification, contributes to spring bloom formation.

Tiffany asked the group if they any had questions or comments for John. Lucy asked if the difference in TN loading was due to nitrogen fixation and John responded that he presumed that was the reason.

Technical Updates and Announcements

DEP

Jim shared with the group that there has been an increase in mangroves in Northeast Florida, mainly in St. Johns and Flagler Counties, over the past several years. Homeowners, as well as others, are often not aware they have mangroves and are not familiar with the regulations that protect them. As a result, mangroves are being trimmed and/or removed without the proper authorization. Jim noted that DEP would like reduce non-compliance with mangrove alterations by offering outreach to any constituents that may benefit.

City of Jacksonville (COJ)

Betsy stated that the city is completing their shellfish water study that began two years ago. The study focuses on fecal coliform bacteria and whether the water quality criteria for fecal coliform has improved since the shellfish beds were closed 20 years ago. So far, the study shows positive results. Betsy noted that the city is unsure at this point if the beds will be re-opened, but a report will be submitted to the state soon. Jim asked if the city plans to certify the shellfish beds for harvesting. Betsy responded that they may but have not looked into certification at this time. Betsy noted that the city has been working on the annual report for their municipal separate storm sewer system (MS4) NPDES permit as well as a stormwater demonstration project with a bioremediation product. The product may be able to reduce nutrients and fecal coliform in waterbodies. The results so far are mixed; the city is looking for funding to conduct a larger study. Betsy also mentioned that the city is starting a mercury study with Lucy (Jacksonville University). The city and Lucy are working jointly to do some monitoring of sediments and fish tissues to look at hot spots for mercury concentrations. The funding for the mercury project is through the Environmental Quality Division.

SJRWMD

John stated that the SJRWMD has a new executive director, Dr. Ann Shortelle. The agency has gone through a reorganization. The district is working on a new technique for phytoplankton analysis which should have a cost savings associated with it.

Derek Busby mentioned that the district has a cost share program and the board approved additional aspects of the program during their last meeting, so there is now a "ready community" aspect component. This component dedicates five million dollars to support disadvantaged community projects, where those communities do not have to provide a cost share match. The first cost share workshop on will be held on November 6th in Palatka.

U.S. Army Corps of Engineers (ACOE)

Mike Hollingsworth stated that the USACOE is in the later phase of permitting for the harbor deepening project. The project has not been funded for construction, but is fully funded for the engineering design and installation of water quality monitoring instrumentation. The platforms for the water quality monitoring devices have been constructed in 14 tributaries. Flow devices have been installed on the platforms and salinity and specific conductance instrumentation will be installed soon. The results from

the monitoring will be incorporated into the model for the LSJR tributaries and main stem. Monitoring will be conducted pre- and post-construction, as well as during the six-year construction period. Tiffany asked if DO will be collected at any of the monitoring stations. Mike Hollingsworth responded that DO may be monitored in the main stem in some of the littoral zones. The monitoring is mainly salinity-driven since the model is set-up to measure salinity.

Mike noted that construction of the Mile Point Training Wall project will begin next month. The project includes relocation of training wall structures and restoration of the breakthrough in Great Marsh Island. The island will be restored with dredging material, creating 53 acres of salt marsh. Public meetings will be held to inform the public on the new navigation channel.

Eric noted that the USACOE would like to provide the water quality monitoring data to the public as quickly as possible in a user-friendly format and was open to suggestions on how to do this from the group. Eric stated that the USACOE would like to enhance transparency of the data and would prefer the data be available immediately, rather than waiting for the information to be presented in a report. Greg stated that there may be a good connection with the State of the River Report. Lucy noted that she is no longer involved in this project, but that it would be a great way to connect the data.

Eric reported that the federal cost-share program will now pay for the studies to determine if non-federal entity projects have federal benefits. Previously, the non-federal entities had to pay for the cost of the study and if the project was found to have a federal benefit, the project would then receive cost share funding for the project. The program was modified to help energize local work.

Florida Fish and Wildlife Conservation Commission (FWC)
Russ Brodie stated that FWC continues its monthly monitoring. Offshore reef fish sampling was expanded due to the BP oil spill. FWC received two grants to evaluate juvenile red snapper off the east coast of Florida. The study found 144 juveniles on the east coast as compared to 1,000 on the west coast. The FWC is trying to find where the juvenile fish on the east coast are coming from. The next project undertaken will look at size selectivity. Video cameras will be used to study the fish rather than fishing them out of the water. Russ noted that he will send the recently completed annual fisheries reports to Tiffany to post on the TAC website.

Next Meeting Date
Tiffany stated that the next meeting will be held in early January. Ideas for future meetings or presentation can be sent to Tiffany. Members can also send Tiffany information they want emailed to the distribution list. Tiffany ended the meeting by informing the group that Pam Livingston Way is the new SJRWMD co-chair and contract manager for the TAC. Tiffany thanked John for his long-term leadership as TAC co-chair and for the support he provided as contract administrator.

Adjourn
The meeting was adjourned at 12:05 PM.

Action Items
Russ- Send annual reports to Tiffany.
Tiffany- Post FWC reports to TAC website.
Tiffany- Plan for next TAC meeting (~January 2016).