St. Lucie River and Estuary Basin Management Action Plan (BMAP)
Preliminary Watershed (WaSh) Model Results Technical Meeting Summary

Tuesday, January 16, 2018 at 2:00 PM
Martin County Administrative Center
Commission Chambers (1st Floor)
2401 SE Monterey Road, Stuart, FL 34996

Attendees

Brad Beckett, FRD
Vanessa Bessey, FDACS
Joe Capra, Captec Engineering
Teresa Coley, SFWMD
Audra Colgan, FDACS
Breanna Crowell, DEP
Sara Davis, DEP
Patrick Dayan, St. Lucie County
Amanda Dickens, SFWMD
Amy Eason, AECOM
Marcy Frick, Tetra Tech
Stan Ganthier, DEP
Lawrence Glenn, SFWMD
Kathleen Greenwood, FDACS
A. Griffin, St. Lucie County
Boyd Gunsalus, SFWMD
Alan Hall, Higgins Engineering
Dianne Hughes, Martin County
Kerry Kates, Florida Fruit and Vegetable Assoc.
David Korenfeld, FDOH St. Lucie
Kathy LaMartina, SFWMD
Paul Laura, Dem. Environmental Caucus FL
Milton Leggett, City of Stuart
Dale Majewski, City of Port St. Lucie
Ansley Marr, SFWMD
Susan McNamee, Hydro Int.
Stephanie Nevadunsky, E Sciences
Greg Nolte, Martin County
Jon Perry, Janicki Environmental
Raulie Raulerson, FDACS
Todd Reinhold, FDOH Martin County
Gayle Ryan, River Warriors
Katherine Schmidt, AECOM
Nirjhar Shah, Amec
Mary Szafraniec, Amec
Cassondra Thomas, SFWMD
Rachel (Espinosa) Vitek, E Sciences
Don West, St. Lucie County
Fawen Zheng, SFWMD

Welcome and Opening Remarks

Sara Davis, Environmental Manager with the Florida Department of Environmental Protection (DEP) welcomed everyone to the St. Lucie River and Estuary (St. Lucie) BMAP technical meeting to discuss the WaSh water quality model that the South Florida Water Management District (SFWMD) has been modifying. The participants introduced themselves and the entity they represent.

Status of the St. Lucie BMAP 5-Year Review

Breanna Crowell, DEP Basin Coordinator, stated that stakeholders with BMAP projects should have received an email from her at the end of November with requests for project updates and any new projects. The revisions to the project lists are due January 31, 2018 to help DEP track BMAP progress through 5-years after BMAP adoption. DEP is working to determine a methodology for the water quality trends analysis with support from SFWMD. DEP is also evaluating the current monitoring network to determine how it can be improved to better capture water quality trends. DEP has already worked with the City of Port St. Lucie to modify their monitoring network. Streamlining the BMAP monitoring network will also assist with the transition from the Florida Storage and Retrieval (STORET) Database to the Florida Watershed Information Network (WIN) Database.

Purpose of Modeling Revisions

Breanna stated that during the BMAP process, stakeholders identified the need for improved modeling. SFWMD has been modifying the WaSh model to provide information needed for the BMAP, and SFWMD will provide details about the model during this meeting. DEP will use the model output to calculate new BMAP allocations, which will be presented to the stakeholders this spring. The WaSh modeling effort is currently about halfway through its timeline. Once the model setup is complete, the model will be used to evaluate scenarios, including implementation of larger-scale BMAP projects and septic system removal. The results from these scenarios will be available in the spring.

Dianne Hughes asked if the BMAP projects scenario will be run with the current BMAP projects or the projects that the stakeholders will be submitting. Breanna responded that DEP took the full BMAP project list and specified certain criteria, such as acres treated and nutrients removed, and the scenario will be run with a subset of projects that met the criteria. Dianne asked how DEP will determine how many septic systems need to be removed. Martin County previously had a 20-year plan for septic system projects but they are now focusing on a five-year plan. Breanna responded that the purpose of the septic system scenario is to evaluate the water quality changes from removing septic systems.

Baseline Scenario WaSh Set-Up and Results

Cassondra Thomas stated that she is working with Fawen Zheng on the WaSh model. The WaSh model was originally developed as a joint effort between consultant URS (now AECOM) and SFWMD. SFWMD began work in October 2014 to further upgrade and enhance the model and, in 2017, continued to provide technical support to DEP by updating the model to support the BMAP. DEP and SFWMD determined what information was key for the model inputs and outputs, and DEP provided the scope and assumptions for updating the model. The objective of the project was to develop a baseline watershed water quality model that was calibrated with data from 2001-2006 and verified with data from 1995-2000. Cassondra stated that the watershed is divided into several basins. Dianne asked if the model now includes the South Coastal sub-basin. Sara responded that this sub-basin is included.

Cassondra stated that modeling is being conducted for three periods of record: (1) 1995-2006 with 2004 land use, (2) 2007-2011 with 2008 land use, and (3) 2012-2016 with 2012 land use. Three scenarios are being evaluated: (1) baseline conditions for 1995-2016 with septic systems, (2) large-scale regional projects benefits for the period of 2007-2016, and (3) septic system removal impacts for the period of 2007-2016. Cassondra noted that today's presentation focuses on the 1995-2006 baseline period as this is the model that was used for calibration and verification. The other scenarios will be run using the calibrated and verified parameters.

The WaSh model is a coupled watershed hydrologic and water quality model. The model uses a cell-based representation of the watershed in the Hydrological Simulation Program – FORTRAN (HSPF) model that uses PWATER for pervious areas and IWATER for impervious areas. Infiltrated water is routed to a diffusive wave groundwater model, and surface runoff is simulated through a wave drainage network model. The model is capable of simulating the hydrological inputs and outputs. The model specifies how water moves in each cell, and how each cell is connected and interacts with other cells. Each data point goes through a series of steps starting with hydrology then cell discharge routing then to component interactions (between cells, lakes, reservoirs, groundwater) and finally to individual component dynamics (output and load for nutrients).

The water quality component has two options: basic and advanced. SFWMD used the advanced water quality model, which includes dissolved oxygen (DO), carbonaceous biological oxygen demand (CBOD), ammonia, nitrate, organic nitrogen, organic phosphorus, inorganic phosphorus, and phytoplankton carbon. An event mean concentration (EMC) approach was used for all of these parameters except for DO. Transport was modeled using conservation of mass including settling, and instream modeling was conducted in a non-linear manner based on the Water Quality Analysis Simulation Program (WASP) model. The model uses an ArcGIS graphical user interface that allows for the inclusion of best management practices (BMPs) and land use changes. Each grid cell is 2,000 feet by 2,000 feet with more than 6,100 cells. The rivers and canals are divided into 2,000-foot segments with a total of 943 segments. The data sources include GRIDIO and Next Generation Radar (NEXRAD) for rainfall, Savannas Preserve and STA 1 West weather stations for potential evapotranspiration (PET), Savannas Preserve and Clewiston weather stations for solar radiation, DBHYDRO for water temperature, and SFWMD for land uses. Most of these stations are within or close to the St. Lucie Basin.

Boyd Gunsalus asked if the land use coverage differentiates between the fallow and non-fallow agriculture. Fawen responded that the level 2 land use information provides more detail and the model is detailed to this level. The model report includes more information about the land uses. Cassondra added that DEP has posted this report to the FTP site. Gayle Ryan asked if the model includes the 2016 land use coverage. Cassondra responded that the model uses land uses through the 2012 coverage (the latest coverage available). Sara added that the model is run for a period of time with one land use and then another period with another land use coverage. Most models are not capable of incorporating more than one land use coverage so this is a benefit of the WaSh model. Fawen noted that the model report compares land use changes for each coverage.

Cassondra stated that other data used in the model include hydrography from SFWMD, soils from DEP, topography from SFWMD, bathymetry from SFWMD, and flow from DBHYDRO. The EMCs came from the University of Florida-Institute of Food and Agricultural Sciences (IFAS), DEP, SFWMD urban runoff study, DEP BMP study, and Grassy Waters Preserve Sampling project. The water quality data came from DBHYDRO. Septic system information came from a Martin County study conducted by Florida State University, and septic system contributions were processed by DEP and input to the model as point sources.

Once all of the data were added to the model, SFWMD calibrated the model parameters within reasonable ranges using data from 2001-2006. Then, once all parameters were calibrated, SFWMD checked the model results against measured data from the period of 1995-2000. The monitoring stations used for calibration and verification are listed in the model report. The model performance was evaluated using the R^2, bias, percent bias, root mean square error (RMSE), and relative RMSE. The model statistics were then classified as very good, good, fair, or poor. Cassondra presented the results for the S-49 flow and noted that the model results were very close to the measured flows. For the flows at the structures, the statistics were mostly very good for the calibration, and mostly good and very good for the verification. The water quality results were continuous from the model and compared to grab sample data so the results will not exactly match up. The water quality statistics were mostly very good and good, with ammonia and nitrate results mostly fair and poor. These parameters are quickly taken up by phytoplankton so they are difficult to model. The nutrient loadings from the model also match well with the measured loads.

SFWMD also conducted a sensitivity analysis for the model by changing one parameter by a certain amount to see how it affected the model function. The diffusion rate had a very minor impact, which means it is fairly stable. The model was also not sensitive to algal self-shading attenuation. The respiration rate was very sensitive for phytoplankton dynamics. The phytoplankton growth rate and non-algal light attenuation are critical for phytoplankton and nitrogen but not phosphorus.

Dianne asked about the DEP plan to remove water quality stations. Breanna responded that DEP is just looking at the original BMAP monitoring network to determine where it can be tweaked to best evaluate the water quality trends. Sara added that some of the monitoring also changed since the BMAP was adopted so the network needs to be modified. Dianne stated that Martin County is using the tributary monitoring data that Boyd collected to determine hotspots for projects. It is important not to lose the historical data.

Next Steps

Breanna stated that the modeling report is posted on the FTP site and she will also be posting today's presentations. The stakeholders should provide comments on the report using track changes by January 31, 2018. This is also the deadline for project updates and any planned or future projects, which will help DEP to develop milestones for the 5-Year Review and to look at funding moving forward. DEP added new columns in the project tables for funding amount, which the Florida Legislature wants to see especially for statewide funds, such as total maximum daily load (TMDL) and 319 grants. The project information will also be used for the statewide annual report for all BMAPs that will be finalized in July 2018. The statewide report is a new requirement from the Florida Legislature to report on all BMAP projects in one condensed document. The statewide report will include progress through December 31, 2017. The St. Lucie BMAP annual meetings will still be held in late summer to discuss project highlights for this area and water quality trends.

Breanna stated that stakeholders should upload data through December 31, 2017 into the new WIN database by March 1, 2018. The WIN coordinator for this area is Justin Nelson and he can help with data upload questions. The next BMAP technical meeting will be held in late February to review the draft allocations, which will be calculated using the WaSh model output. In April, DEP will present the draft 5-Year Review for comments and the final report will be submitted to the Governor by June 30, 2018.

Dianne asked if the draft model report has a comparison of the old EMCs to the new EMCs. Fawen responded that this is not included, but he can provide information on the EMCs used in the model. EMC data from various sources were processed for the model. Dianne stated that it would be helpful to have a comparison of the old model inputs to the new model inputs for EMCs, rainfall, and runoff coefficients (ROCs). Martin County is looking at this information for the Loxahatchee River Reasonable Assurance Plan. Sara responded that DEP and the County can coordinate a teleconference to discuss this. Rachel Vitek asked if a transportation EMC was used in the WaSh model. Fawen responded that he will have to check because they used the categories from the original model. Sara added that she does not think this was discussed for the St. Lucie BMAP but DEP will coordinate on whether a transportation EMC can be added.

Public Comments and Wrap Up
There were no additional public comments.

Adjourn
The meeting was adjourned at 2:49 pm.

Action Items
- Stakeholders should provide BMAP project updates and new projects to Breanna by January 31, 2018.
- Stakeholders should provide edits to the model report in track changes to Breanna by January 31, 2018.
- DEP will coordinate with Martin County on a comparison of the old model to new model inputs for rainfall, EMCs, and ROCs.
- DEP and SFWMD will look into whether the model does include or can include a transportation EMC.
- Breanna will post today's presentations to the FTP site.