Kings Bay and Crystal River Basin Management Action Plan

Technical Meeting Summary
Wednesday, May 28, 2014
10:00 AM – 12:00 PM
Crystal River City Hall – City of Crystal River Conference Room
123 North West Highway 19, Crystal River, FL 34428

Attendees

Beth Alvi, FDEP	Andy Houston, Crystal River
Jimmy Brooks, Citizen	Kelsey Jennings, Save the Manatee Club
Jonathan Brucker, St. Martins Marsh Aquatic Preserve	Art Jones, Citizen
David Burnell, Crystal River	Jamie Letendre, St. Martins Marsh Aquatic Preserve
Tiffany Busby, Wildwood Consulting	Claudia Listopad, Applied Ecology
Pete Butt, Karst Environmental Services	Jan Mandrup-Poulsen, Dynamic Solutions
Mike Czerwinski, Citizen	David Matthews, Citizen
Bill Colona, URS	Leon McClellen, Citrus County Agriculture Alliance
Jason Davison, Florida Farm Bureau	Mary Morgan, Crystal River Waterfront Advisory Board
Scott Deitche, GPI	
Dave DeWitt, SWFWMD	Sky Notestein, UF Fisheries
Kirstin Eller, FDEP	Marcy Policastro, Wildwood Consulting
Yesenia Escribano, FDEP	Jennifer Sagan, AMEC
Pat Faherty, Citrus County Chronicle	Bill Stevens, Citrus County
Terry Hansen, FDEP	Mary Szafraniec, AMEC
Janet Hearn, ATM	William Tucker, AMEC
Rick Hicks, FDEP	Barry Vance, Water & Air Research
Robert Holmes, Crystal River	Quincy Wylupek, Citrus County

Presentations

Meeting presentations are located at:
http://publicfiles.dep.state.fl.us/DEAR/BMAP/Springs%20Coast/BMAPs/CR_KB_BMAP/ in the appropriate month folder.

Introduction

Terry Hansen welcomed everyone to the second meeting for the Kings Bay and Crystal River Basin Management Action Plan (BMAP), and thanked the City of Crystal River for the use of their room. The participants introduced themselves and the entity they represent.

Terry provided a quick overview of the BMAP. There are six impaired waterbody identification (WBID) numbers in the basin. The springs are impaired for total nitrogen (TN) and total phosphorus (TP) or orthophosphate, and the amount of reductions needed vary by spring. In the Clean Water Act/total maximum daily load (TMDL) process, the BMAP is the restoration plan to implement the TMDLs to bring the waterbodies back to their intended uses. The BMAP is part of a larger effort in the Springs Coast. The Southwest Florida Water Management District (SWFWMD) is creating a Springs Coast steering committee to unify efforts for water quality and quantity throughout the basin. This process will allow the counties and communities to see how their efforts fit into a bigger picture, and to create a unified effort to move forward with springs restoration. Terry asked the stakeholders to provide contact information for other people who would benefit from attending the BMAP meetings.

SWFWMD has a website, www.watermetters.org/springs, which has information on the major springs in the area. This site includes nutrient source inventories that will be updated with the inventories the Florida Department of Environmental Protection is preparing.

Hydrology of Kings Bay and Springs

Dave DeWitt stated that he has a lot of detailed information about the hydrology in the area that he can provide at future meetings, if needed. There are several restoration projects ongoing through SWFWMD to help improve the water quality and ecology of the bay. SWFWMD conducted an inventory in the late 2000s of the springs in the bay. Historically, there were thought to be about 30 spring vents in the bay, and the inventory identified more than 70 vents. Some of the spring vents are grouped along the same fracture. SWFWMD has about 20 years of sampling data for several of the springs, so there are good data to evaluate water quality trends.

Ground water discharge at the springs flows through the Upper Floridan aquifer, and the ground water flow moves towards Kings Bay and Crystal River. The statewide aquifer vulnerability assessment (AVA) found that the central part of the state has the most vulnerable areas, and this includes the Springs Coast. In this area, the aquifer is close to the land surface and typically has less than 100 feet of overlying sediments with near surface limestone. The Citrus County AVA shows that the most vulnerable area follows the Brooksville Ridge, which goes through the center of the county. Most of the karst features in the county are also in this area. Dave noted that protecting the area near the bay is equally important, even though it is not in the most vulnerable portion of the county.

The Kings Bay and Crystal River area is located in the northern part of Citrus County. Based on the 2009 SWFWMD land use coverage, the majority of the area is urban land uses with some agriculture and natural lands. In this basin, there are a lot of dispersed residential areas that contribute to nutrient enrichment in the aquifer. Urban land uses are about 45% of the basin and agriculture is about 10%.

SWFWMD samples several of the major springs, and they added additional sampling after the springs inventory was completed. When looking at the recent nitrate data for 2012-2013, the springs in the southern part of the bay have lower nitrate concentrations and are more brackish. Around Hunters Cove, the springs are fresher and have higher nitrate concentrations. SWFWMD selected wells for sampling in northwest Citrus County, and these are mostly domestic supply wells. The nitrate concentration in these wells range from about 0.01 milligrams per liter (mg/L) to about 0.5 mg/L. Hunters Spring has an increasing nitrate trend from 1991 to the present. Tarpon Hole Spring also has an increasing nitrate trend. Bill Colona asked what caused the two low data points in Tarpon Hole Spring. Dave responded that these results are likely due to tidal influence and the timing of sampling. Tarpon Hole and some of the springs to the south are sampled at low tide to better measure the freshwater sources to the springs. However, there are lags between surface tidal changes and the ground water changes in response to the tide, so sampling at low tide does not necessarily mean that the sample is taken at the optimal time.

Dave stated that there are no trends in phosphorus in the ground water and spring vents, but phosphorus is a nutrient of concern for the TMDL. Dave noted that he could provide more detail on the monitoring during a future meeting, including updates on the isotope sampling that SWFWMD is completing. A stakeholder asked if SWFWMD samples for sodium. Dave responded that they sample for conductivity or chloride. Jan Mandrup-Poulsen asked if SWFWMD has calculated loading estimates over time. Dave responded that they have some rough estimates of changes in loading, but this is difficult to

determine because of changes in spring discharge due to changes in tide. Jan noted that at the Weeki Wachee meeting, there was a graph comparing population change to nitrate concentration, and a similar graph would be helpful to see for the Kings Bay area.

Terry noted that SWFWMD is adding a wetland treatment project in the Three Sisters area. Dave stated that SWFWMD has several ongoing and new projects in the basin, such as the Hunters Cove improvements. The nutrient loading from land uses to the bay is something that needs to be evaluated. Terry noted that there are more than 70 vents in the bay, which makes this system more complex than Weeki Wachee Spring or Rainbow Spring where there is only one vent. Dave added that there is also diffuse discharge through the sediments. There is ground water discharge all along the Springs Coast, and the water quality needs to be improved to keep the estuary vital.

Introduction to Nutrient Source Inventory Process

Kirstin Eller stated that the nutrient source inventory has been a group effort with Rick Hicks, Yesenia Escribano, and Brian Katz (Department). There are a lot of springs in this area so the discharge area includes the entire bay. The contributing area boundary was extended north to the Withlacoochee River to include all sources to the springs. This area has mostly urban land uses with some agriculture. Combined, urban and agriculture make up about 53% of the land use, and these uses are the focus for targeting nitrogen sources.

The first step in the inventory is to estimate the TN that hits the ground. The environment will take up some of the TN so the inventory includes attenuation factors to estimate the amount of nitrogen absorbed by the environment that does not go to ground water. The attenuation factor varies by source. A weighted recharge factor is then applied, based on the location in the basin. For the Kings Bay and Crystal River area, the recharge categories are medium and high. The Department has completed the first iteration of the inventory. Kirstin stated that they would like feedback from the stakeholders including comments, suggestions, and data to improve the results.

The source categories included in the inventory are atmospheric deposition, wastewater treatment facilities (WWTFs), septic tanks, livestock, crop fertilizer, and urban fertilizer. As these sources move through the environment, they go through the nitrogen cycle and some of the nitrogen is removed. The recharge amount varies based on the geology of an area. Kirstin noted that the inventory estimates are for the amount of TN that gets into the ground water, and this is different than the amount of TN coming out of the springs. The rate of recharge in the high recharge area is greater than 12 inches per year and it is 4 – 12 inches per year in the medium recharge areas. There are some wetlands in the western part of the basin that are not contributing to the ground water.

Kirstin stated that that for atmospheric deposition, the Department evaluated both wet and dry deposition. Wet deposition occurs with rainfall, and dry deposition is what falls onto the ground or water surface when it is not raining. South of the BMAP area is a National Atmospheric Deposition Program (NADP) wet deposition station at the Chassahowitzha Nation Wildlife Refuge, which was used in this inventory. For the dry deposition, the Clean Air Status and Trend Network (CASTNET) station in Sumatra was used. There are only two dry deposition stations in the Florida, and Sumatra is the closest to the BMAP area. However, the majority of TN loading is from wet deposition, so the distance from the dry deposition station is not an issue. The annual average TN deposition was used to determine the loading rate of 3.11 pounds per acre throughout the basin.

There are 31 permitted WWTFs in the basin, and the Department was looking for information on the flow and TN in the effluent for each facility. Kirstin noted that most of the facilities are not required to report TN, only nitrate, so they used study information to convert the nitrate measurements to TN. If there were no data available, the Department used a TN of 8.97 mg/L in the inventory. If the current facility flow information was unavailable, they used 50% of the design capacity in the inventory. Jan asked if all the WWTFs have surface water discharges. Rick responded that none of the facilities have surface water discharges; these facilities all have land application of the effluent.

Kirstin stated that for the septic tanks, the Department used the Florida Department of Health (FDOH) model to determine the tank locations. Based on U.S. Census data, there are 2.23 people per household in Citrus County. There are 41,504 tanks in the BMAP boundary, with an average annual input of 9.92 pounds of nitrogen per person. Scott Deitche asked what year is the septic tank coverage because there have been several projects to take septic tanks offline. Kirstin responded that the coverage is from the 2009 FDOH study, and the Department would appreciate information on projects. Rick added that the septic tank contribution in this inventory is more of an estimate than was done for other areas. The Department is looking for local septic tank information or information on sewered areas.

Kirstin stated that for the livestock populations, the Department used the 2012 Census of Agriculture. This census is based on full county data so they had to project the information to the livestock in the basin. Each animal has a different livestock waste value in pounds of nitrogen per animal per day. The Department identified the livestock land uses in the basin using the SWFWMD land use coverage. There are about 28,860 acres of livestock land uses in Citrus County, of which 10,790 acres are in the BMAP boundary. This is 37% of the acreage, and 32% is located in the high recharge area and 5% in the medium recharge area. These percentages were applied to the county livestock numbers to determine the livestock contribution in the basin.

For the farm fertilizer estimate, the Department contacted the local property appraiser's office to obtain the necessary Geographic Information System (GIS) data to evaluate the land uses in the county. The Department also obtained information on farm practices in this area, which was applied to the geospatial data. University of Florida – Institute of Food and Agricultural Sciences (UF–IFAS) recommended application rates, as well as application rate information from Rainbow and Silver springs, were used in the Kings Bay and Crystal River inventory. Terry added that the Department will be talking with the Citrus County Agriculture Alliance to verify these application numbers.

Kirstin stated that for the urban fertilizer, the Department used FDACS fertilizer sales information, which includes the total amount of fertilizer sold in the county and the nitrogen content. The Department used the non-farm fertilizer information. Since the fertilizer data were for the entire county, they used an approach similar to what was done for the livestock to determine the portion of fertilizer in the basin. The fertilizer sales are reported by category, and the Department pulled out the golf course information and estimated the amount of fertilizer using a rate of 150 pounds of nitrogen per acre over 72% of the golf course acreage (amount of green area).

Mike Czerwinski asked if the sales include the amount of fertilizer used by lawn care companies. Kirstin responded that these companies are included, and the assumption is made that companies are buying fertilizer from the county they are located within; however, they could be buying fertilizer from a

different county. Bill Stevens stated that the Department will need to widen the fertilizer sales to other counties. They could ask the companies to provide their database for where they purchased fertilizers. Kirstin responded that the Department has had problems obtaining detailed information from the lawn care companies in the past, but she can contact them to see what they will provide. Scott suggested asking the companies for their application rates and the number of customers. Rick responded that the Department can look into these options, but they may not be able to better quantify the fertilizer use in the basin. These kinds of estimation issues may need to be included in the uncertainties. Bill Tucker suggested comparing the estimates to the actual application rate because not everyone follows UF–IFAS recommendations. Kirstin responded that the Department is going through the property appraiser information to try and refine the fertilizer estimate. Quincy Wylupek suggested contacting the homeowners associations to determine whether they require people to fertilize their lawns. Mary Szafraniec noted that the Department could speak with Robin Morgan at SWFWMD because the district has looked into a lot of this information.

Mike noted that while most of the urban land uses are residential, and the Citrus Springs and Pine Ridge areas are mostly vacant land. Using a broad range for urban fertilizer application is probably not representative of the land uses in this basin, so it would be good if the Department broke out true residential areas from the urban land uses that may be undeveloped. Rick responded that the inventory estimates are based on fertilizer sales, not land uses. Kirstin added that the Department reviews the property appraiser's information and aerial images to identify vacant lands.

Kirstin stated that once the TN loading to the land from the different sources was calculated, the Department applied the attenuation factors, which were determined from literature values. For atmospheric deposition, the attenuation factor is 90%, which means that 90% of the TN that hits the ground is taken up by the environment. Jan stated that because of the large volume of surface water in the basin, the direct atmospheric deposition on the bay should be considered. Kirstin responded that the Department is currently focused on ground water inputs, and then they will evaluate the surface water contributions. Quincy asked what the atmospheric deposition of 3.11 pounds per acre equates to in a concentration because it seems small. Kirstin responded that it is small, but it contributes over a large area. Bill Stevens asked if loading from domestic animals is included. Kirstin responded that this source is not included and she was unsure if the necessary data on the number domestic animals is available. Bill responded that the veterinarians should have information based on the number of rabies tags issued.

Kirstin stated that the next step is to apply the recharge factors. Most of the nitrate sources reaching the ground water are in the high recharge area (95% of the load). In the medium recharge area, 56% of the load is from septic tanks and 13% is from golf courses. In the high recharge area, 61% of the load is from septic tanks and 14% is from golf courses. The Department also evaluated the loading in a five-mile buffer around the spring vents. In the buffer area, 40% of the load to ground water is from the medium recharge area and 60% is from the high recharge area. In the medium recharge area, 79% of the load is from septic tanks and 10% is from golf courses. In the high recharge area, 46% of the load is from septic tanks and there is a relatively even distribution from the rest of the source categories. Approximately 18% of load to ground water in the BMAP area comes from within the five-mile buffer.

Kirstin noted that the next steps for the inventory include making the necessary updates based on stakeholder feedback; updating the WWTFs loading to identify contributions from rapid infiltration

basins (RIBs), reuse, and other disposal methods; updating the septic tank information, if better data are available; meeting with golf course managers to better represent the fertilizer application; and evaluating the direct loading to Kings Bay.

Bill Stevens noted that at the last Citrus County board meeting, they discussed adopting a fertilizer ordinance and they will meet on this topic again in July. They are proposing to use the Department's model ordinance but they are deciding whether to include more stringent standards. He asked if Kirstin could provide information to help with this decision. Kirstin responded that she could provide Bill with the fertilizer information she has but the Department was hoping to update the data with local input to make them more accurate. Rick added that Bill may want to contact SWFWMD for their data.

Quincy suggested contacting the companies that pump out septic tanks to determine what information they have on septic tank distribution. Kelsey Jennings noted that a lot of people do not have their tanks pumped. Rick responded that the inventory assumes a TN load from the drainfield, and the ground water loading from a functioning tank compared to a failing tank is about the same. Mary asked if sludge application is considered in the inventory. Rick responded that the Department needs to include a better accounting in the inventory of the residuals facilities. The Department is aware that there are projects coming online that will drastically change wastewater application in the basin, and the inventory can evaluate the change in loading from different sources from these future projects. Bill asked if there is a model that could be used to determine what happens when septic tanks are removed. Rick responded that the inventory can be used to show the change in loads to the ground water.

Jamie Letendre asked if there has been any modeling of the legacy loads. Kirstin responded that although the legacy load is part of what comes out in the springs, the purpose of this tool is to evaluate current sources since these are loads that can be changed. Terry added that the average age of water in the springs is 15 years, so there is a legacy load issue in the basin. Jimmy Brooks asked if the loads coming from lakes Rousseau and Tsala Apopka have been evaluated. Rick responded that there is seepage from these lakes to the ground water that will need to be considered. This is similar to the sinking streams in the Wakulla Springs basin. Jimmy noted that SWFWMD has a study on the Tsala Apopka area. Dave suggested referencing the more recent U.S. Geological Survey (USGS) study on recharge in Lake Tsala Apopka. Lake Rousseau is a nutrient loading concern for what is coming out of Rainbow Springs to the Withlacoochee River.

Terry stated that this inventory is the first draft, and the Department is looking for feedback. The inventory will be used as a tool to focus resources, because everyone has a limited amount of money. The goal is to get the best bang for the buck in the right place. Kirstin stated that she will provide Terry with the presentation to post to the website for the stakeholders' review. Terry noted that the Department will be talking with the growers association and golf course managers to gather more information, and they are looking for ideas on other groups that they should talk with to improve the inventory.

Mary stated that she is concerned about the 90% attenuation factor for livestock. She asked if this is a Florida-specific information for this part of the state. Kirstin responded that the Department met with producers in the Silver and Rainbow springs area, in addition to gathering literature values. They found that pasture grasses are very efficient in taking up nitrogen. Mary asked if the focus is on TN, not organic versus inorganic forms of nitrogen. Kirstin responded that the literature results depended on the

study. Mike asked if the data are for ground water. Kirstin responded that it again depends on the study. Some studies evaluated ground water and others looked at soils. The Department evaluated each study to determine its applicability to the nutrient source inventory. Terry added that the Department went through a process with Marion County on the Silver and Rainbow springs inventories, and the Department learned a lot from that process, which included direct input from producers. There might be room for improvement in the numbers, but the Department believes they have good information on the real world estimates.

Mary Morgan stated that there were studies in Wakulla County where dye was introduced into sinkholes to see where the water flows, and the studies had some surprising results. She asked if any dye studies have been conducted in the Kings Bay and Crystal River area. Dave responded that he does not know of any dye trace studies for Citrus County springs, and this type of study would be difficult to do. Overall, there is a good understanding of the hydrogeology and flow paths, although there are uncertainties once water gets underground and out of sight.

Jan suggested that it would be helpful to see a comparison of the anthropogenic loads to the natural loads in the basin, to get a sense of the scale of the natural loads.

Questions

Terry stated that the next meeting will be held on Thursday, July 10th starting at 11:00 AM in the Crystal River City Hall conference room. The Weeki Wachee BMAP meeting will be held the day before.

Mike noted that there are only a few monitoring locations, which show that there is high nitrate near the ridge and lower levels closer to the springs. Dave responded that a few of the wells west of Highway 19 have lower nitrate. These wells are shallower because the deeper water is brackish. Mike asked if information is known about how water is flowing in the basin. Dave responded that the nutrient study in the 1990s included a hypothesis that the northeastern area had a plume of nutrients going to the aquifer. The current nitrate concentrations are increasing at Hunters Spring and other freshwater springs, which may be this plume. Dave noted that he thinks using the five-mile buffer to focus on sources is a good idea. Quincy noted that M&B Dairy conducts some ground water monitoring. Dave responded that this dairy is located in the Homosassa basin. SWFWMD has done studies using residential wells for sampling. It has been difficult to interpret the distribution and nitrate concentrations in the wells.

Adjourn

The meeting was adjourned at 11:31 AM.

Action Items

- The stakeholders should send Terry Hansen contact information for other people who should be attending the BMAP meetings.
- Dave DeWitt can provide a more detailed presentation on hydrology and monitoring, if the stakeholders are interested.
- The Department will consider comparing population growth in the area to changes in nitrate concentration over time.
- Stakeholders should provide the Department with local septic tank or central sewer information to help refine the nutrient source inventory.

- The Department will meet with the Citrus County Agriculture Alliance to verify the farm fertilizer application numbers used in the inventory.
- The Department will try to meet with the area's golf course supervisors to seek their input on the inventory.
- The Department will contact Robin Morgan at SWFWMD about the district's fertilizer survey to refine the urban fertilizer estimates in the inventory. If needed, the Department may contact the lawn care companies and/or homeowner's associations to learn about fertilizer application rates.
- The Department will consider including contributions from domestic animals in the inventory.
- The Department will also create a future inventory that accounts for the changes in wastewater application from planned projects in the basin.
- The Department will work on gathering information on sludge spreading and residual applications for the inventory.
- The Department will look into the USGS study on recharge in the Lake Tsala Apopka area to improve the inventory.
- The stakeholders should review the draft inventory, which is posted on the Department's website, and provide comments and ideas for where to obtain information.
- The Department will consider providing a comparison of natural versus anthropogenic loads for a better understanding of the area's sources.