

2014 INVITED SPEAKER:
Agricultural Water Resources Issues in Southwest Florida
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I am a bureau chief at the Southwest Florida Water Management District (SWFWMD). My typical job is to work with restoration projects, some of you might have heard of the SWIM program—Surface Water Improvement and Management—that does restoration in Tampa Bay. Another factor that I work with is springs with minimum flows and levels. We try to set proper levels and flows that should be coming out of springs. The last part of what I do in the district is something that I know some of you here in this room are familiar with is our farms program, which is cost share BMPs (best management practices) for agricultural producers within our water management district. So I am fairly familiar with agriculture water issues within our water management district area.

I want to talk to you about a number of issues that I am familiar with regarding agricultural water use within the SWFWMD. There are a number of things we can talk about. There are areas in our district that have too much water from agricultural use and there are areas in our district that have too little water from agricultural use. There are also areas that have contributed to water quality issues; namely the springs. I want to focus a little bit on the BMPs that we're doing to try to correct all those issues; especially different sources of water besides those traditional Floridan aquifer sources. So, the water management district just briefly, I think most of you are aware of our district; there are five within Florida. We're all a part of 16 counties here in

southwest Florida, population about 5 million. Our four areas of responsibility are water supply, water quality, natural systems, and flood protection. I'll be touching on three of those items today; I won't get into flood protection too much. I start my presentation focusing on water supply.

Water Supply/Water Usage

First of all, water use in the district, is about 1.2 billion gallons of use within the water management district. Public supply is the major portion of water use within our water management district, but agriculture is close behind. It is also important to note that agriculture within the southern area of our district is by far the greatest user of water within that region. You can also see the numbers for the other sectors. When you spread that around a little bit around the counties in our district (including those portions of the counties that are within our district), you'll see that Hillsborough and Polk are the two biggest users. When you really look at some of the lumping, you can tell that the counties within our southern district by far use much more water than the northern district and the central portion; Pinellas, Polk, and Hillsborough are really focused on public supply use. The southern is really focused on agricultural use. The north is spread among all different use categories. When you start focusing on agriculture and the different sectors of agriculture and different crop types, you see that citrus is by far the biggest user of water within the

water management district followed by tomatoes. These are in the million gallons per day and you can see this is updated as of 2012 that there are some crop types that are relatively new—like blueberries—and we’re seeing additional crops start to come in. We actually have a project with IFAS (Institute of Food and Agricultural Sciences) now to understand water requirements in peaches. When you look at agricultural use over time, and this is over the last ten years or so, you can see it fluctuates very much by year. Certain years that really is dependent on rainfall more than anything else. So, in certain years you can see that there is much less use than others.

RECLAIMED WATER. Ed Etexberria asked me to talk a bit about reclaimed water. I’ll start off with what we call alternative water sources. There has been a big push for a number of years in Florida to wean people off the typical source of water (the upper Floridan aquifer) within our district. To do this, we’ve tried to use reuse water, use surface water, and use desalination. In Hillsborough County (for example), they have a big desalination plant—in fact the largest in North America. It really focuses on water conservation, and that is one of the big things where you can get a lot of bang for your buck. Also look at different sources of ground water besides the upper Floridan, such as the intermedian.

Reuse has been around for a while, it’s a very safe source of water, and it’s one that we’ve promoted for a number of years. The first system that was ever seen in the United States was back in 1912 in San Francisco. In Florida the first system that appeared was in Tallahassee in 1966, and today there are more than 425 water reclaim systems around the state. They supply about 650 million gallons per day. When you look at certain areas of the state (like Orlando), they have close to 100% utilization of their available reclaimed water. That’s primarily because of the theme parks; they take all they can get. For ag (agriculture) use, California is probably the leader in the nation for using reclaimed water for agriculture. One of my co-workers in the district tells me that 70% of the artichokes are irrigated with reclaimed water out in California.

In the SWFWMD we’ve compiled these facts over the years, and you can see numbers for residences, golf courses, parks, schools, and power plants. We have about 8,000 acres of ag lands that are in reclaim water use. The majority of that is in hay production. When you look at the projects of our water management district that are funded; 342 projects have been funded, some of the statistics here; 940 miles of reclaim water pipelines have been created within the SWFWMD. That is about as far as from here to Washington, D.C., We’ve got about 238 million gallons per day reuse capacity, and as of right now we’re seeing as much as 124 million gallons of benefits. So again, when you take that 124 million gallons of benefits, that’s about 10% of our total water use. Then go back to the original graph that shows 1.2 billion being used. This is reclaimed water use over time. In 1980 the green bar is the wastewater treatment plant flow—that is the amount of water that is available out of the wastewater treatment plant. The purple bar is the amount of reclaimed water that’s actually being used. So in 1980, about 4% of the available reclaimed water was actually used, and today we’re up to about 44%, (I think that number is actually 46%) as we stand here today in 2014. We projected what we plan to do with reclaimed water use over time, so as the available reclaimed water is there from population growth we fully anticipate being able to capture that and reuse it and continue to increase the percentage of actual use. When we look at agriculture statewide, about 80 million or 70 million gallons of reuse is occurring and the majority of

that is on your hay crops and your non-edible food crops. There is a significant portion of it being used on food crops and that’s primarily citrus. Florida is difficult to break into the reclaimed water use on crops because of state legislation. There’s actually a statute that prohibits reclaimed water from being used on edible crops and we’ve been delicately trying to change that over the years because we feel reclaimed water can be a very effective source of water for crop use.

WATER USE CAUTION AREAS. I want to set the stage for the issues that we see around the state, around the water management district at least. This graphic summarizes some of the biggest impacts we have in the SWFWMD. You see areas that the Water Management District calls water use caution areas. These are areas that are adopted by rule and they have separate permitting rules; basically permitting is very stringent, so when you try to get a water use permit for any type of use, be it agriculture, public supply, or industrial/recreational you are going to have to go through special permitting in these areas. The first area that we call water use caution area is northern Tampa Bay. The northern Tampa Bay was declared a water use caution area primarily because of public supply. This is the area where Tampa Bay has all of their well fields. You’ll remember in the 80s and early 90s the water wars in the central part of the state. That was predominantly because of well field impacts to existing wetlands and rivers and lakes within this region. It was declared a water use caution area in 1989 and actually spanned the area of what you see on the map in 2007. The next area is the southern water use caution area, and I think many of you from the counties in the DeSoto, Charlotte, Hardee, Polk area, Manatee, and Sarasota are very familiar with the southern water use caution area. It was first listed as a water use caution area in 1992 and I’ll talk about this one in much more detail because this is directly pertinent to agricultural water use. The last area is this small area (the box right here), which is the Dover Plant City water caution area. Again those of you from Hillsborough are very familiar with what happened in the freezes of 2010—we had something like 700 dry wells and 150 sinkholes that opened up as a result of agriculture use for crop protection during those freezes in January of that year. So that was declared a water use caution area predominantly for just frost/freeze protection.

To start with each of these water use caution areas, this is our southern water use caution area and this is estimated groundwater use over time, it’s from 1950 to 2010. What you see really is the rising water use from the 60s into the 70s, this was prior to the water management district really existing. We began issuing water use permits right here so much of this occurred long before there was any permitting of water use within the state of Florida.

What you see though since that time is that water use has levelled off rather well in the southern water use caution area (SWACA). What our actual goal is, the number here is 600 million gallons per day, our actual goal is to bring use within the SWACA to 600 million gallons per day. That’s all use types. Right now our average is somewhere between 650 and 680 million gallons per day dependent on the year and climatic conditions. The majority of that use is for agriculture, there is some mining in there; obviously mosaics are in that region. There are obviously some developments that have occurred in the Sarasota and Manatee County areas that are part of that. But again, the primary use in this area for water is for agriculture. What we did is establish a southern water area cautionary recovery strategy.

The goal of this strategy and the impacts that we really saw from the SWACA pumping was the upper Peace River we had lower flows that we were supposed to. There were times when the upper Peace was dry and we needed to return those flows. It wasn't supposed to be like that. We wanted to restore minimum lake levels on priority lakes, especially the Lake Wales ridge. Those of you out in Polk County understand that those ridge lakes have been depressed for years. That's predominantly because of the overall pumping in the SWACA. We are also seeing a lot of salt water intrusion and "a lot" is a relative term. It's very difficult to measure salt water intrusion, but there was movement of the salt water interface on the shore and the goals of this plan is to really stop that movement and try to reduce the rate of it to something more manageable that hopefully, future technologies will be able to address a little bit more. We had to do all of that while still making sure that everybody had enough water. It's very difficult to stop growth within Florida. You can't do that in this political climate, so you have to be able to achieve your goals and still allow for continued progression and use of water. We did a number of projects; we spent about almost close to \$200 million up in the upper Peace Basin trying to bring more water into the Peace River by raising Lake Hancock a foot and a half. So we actually raise the lake, treat the water for water quality as it came out, discharge it to Saddle Creek and try to be able to achieve our minimum flows in the Peace River during the dry times of the year.

There has been a lot of effort focused on SWUCA, SWUCA recovery strategy, trying to improve conditions. The next water use cautionary is the Dover/Plant City water use cautionary, and again that one is very ag based. What we saw in January 2010 was basically 11 days of consecutive freezes. That was a record; we've never seen that before. I think our records indicate that the most number of consecutive days prior to that was six. So all of these freeze events resulted in multiple days of frost/freeze pumping, it lowered the water table in some areas from about almost 50 feet down to below sea level. You're basically lowering the Floridan aquifer in this area below the area of the gulf right here. That led to all the sinkholes we saw and the dry wells that we saw. We had to take appropriate management actions to try and reduce those impacts of frost/freeze. This is actually what you've seen over time, this is from 1996 to 2011; this is water level of Floridan aquifer at one of our water monitor well sites. You can see every freeze event that occurred, we actually had dry wells and sinkholes, this one didn't have sinkholes reported but as each level got a little bit deeper we reported more sinkholes. What we really saw is once we kind of tripped the threshold of a 10-foot drop in water level we really saw a lot of these impacts. Interstate 4 was shut down for a number of days; it was a substantial financial impact to the region. So obviously we need to do something about that. We established an action plan that included establishing our water use caution area, there's really no new frost/freeze permitted within that box that I showed Dover/Plant City. So existing ag has frost/freeze quantities, if you're a new ag operation you're going to have to get your frost/freeze by some other method which is one of the things we co-fund which is freeze cloth.

Surface water is another possibility in this area. But we also said we needed to try roll back frost/freeze in this area by 20% and that's where we're trying to use our cautionary dollars to go out work with the farmer to try and see if they can get a different source like freeze cloth to reduce their impact. Also all new private wells that are put in place have to go deeper so we won't

let the new wells go into such a shallow depth that they might be impacted. We figured out how to deal with all the complaints we got from local residents in the area and try and referee between the agriculture entities that were causing the issue and the homeowners that were experiencing the issue. We also tried to enhance our data collection there.

One of the cool things we've got going out there right now is everyone who has frost/freeze capability is now metered in this area. They'll have a water use meter put on their pipeline and we also have established automatic meter reading reporting. So that thing will report every day the amount of water being used by that withdrawal point and we'll be able to understand very well how much water was pumped, where it was pumped from who needs to be responsible for adjacent property owners. That's now that all works out there, if you are a farmer and you impact the aquifer level and it causes a private well to go dry, you must mitigate for that. So it's a big problem for the farmer, obviously that is an unknown expense they might get hit with. So we're trying to make it much more equitable so those impacts can be dispersed around amongst the community.

Other issues

A couple other issues that I'll touch on regarding water use in agriculture, this is a water use issue that I've worked on for a long time. I saw Steve Futch in the audience today, he knows very well about the Shell Prairie Creek reasonable assurance plan we developed. What we saw in this area, which is down in the Charlotte/DeSoto area, Shell Creek actually feeds the city of Punta Gorda in stream drinking water reservoir. They're permitted for about 6.5 million gallons of water to use for their residents and about 50,000 people they supply water to. What we saw was in the drought conditions in the early 2000s the water quality in Shell Prairie Creek got so bad that we could barely use the water for a supply source anymore. We traced back that the source of that poor water quality was actually citrus in the area and it was using relatively deep wells that were tapping mineralized zone pumping that water to the surface the water runoff was getting into Shell Prairie and hence we have our water quality problem.

So we've been working with the growers in this area for ten years, trying to get them on different sources of water, trying to shallow up their wells; do a number of things where we provide our cost share dollars in order to get them to take a little different approach to how they irrigate and how they use water. And the beauty thing about this program is the farmers receiving impact to their crop. The farmers are actually seeing poor production, fruit quality issues. So now they're getting a better water quality that enables them to improve their economic conditions. We've got about 37 projects in place, 26 are operational at this point with about 5.2 million gallons. When you look at Shell Prairie Creek there was about 80 million gallons of water use, 189 different permittees that we can work with to try and improve quality of water and these are the actual projects that we've done. This is Prairie coming down here, this is Shell and the reservoir is located right there. When you actually go and look in the surface water systems you can see the percent reduction of total dissolved solids in certain stations has dropped over half. So we've really done some good improvement and Punta Gorda has remarked their water quality is much better than it's been.

Another area I'd like to talk about, this is an area of too much water. I've talked to you a lot about areas where there's not enough

water, we have the opposite as well. This is Flatford Swamp up in Myakka. What we've seen in the upper Myakka region which is really right in this region of Manatee County flowing down into Sarasota; we've seen excess flows over 10 million of water per day in excess of what should be in the system rising up to over 30 million gallons per day of excess water in the system. This water is coming up off of row crops in the area. Flatford Swamp is a closed basin, everything drains into the swamp. What this has all resulted in is abnormal tree die-off. We've got about a thousand acres of dead trees where the trees have been over inundated, the hydro period has been changed and now what we've been trying to do is use our farms program to go in and do projects again to try and re-use that water instead of letting it run off into the swamp, try to capture it and pull it back up. There are several farms that have been successful with that. We've had to tread very lightly out there because these are tomatoes and it is surface water use and there are issues with surface water, bacteria in the water as well as crop damage that can occur from things like *Phytophthora* so we've had to be very careful with how the system is set up but the farmers have had good success using it. But ultimately what we've seen is we've only had about 2% impact of reducing water out of the swamp. What we're currently working on is a larger scale effort basically trying to get the water out of the swamp and move it up to a user; perhaps Manatee County or Mosaic so they can use the water and try to get it out for once and for all. It's not really an option to go in there and use your permitting authority just to try to shut it down and say you can't use all that because obviously these are businesses; you have to try and piece it all together and come up with a management plan that works well.

Citrus greening—that's a new one that has impacted us and we're not quite sure yet, I know there are probably researchers in here that are working on citrus greening. How our concern with greening works is basically there have been about 4% of our citrus water use permits that have actually gone into an over pumpage state as a result of greening impacts. I think early on one of the thoughts was greater water was needed to try and combat greening and so we saw over-allocations occurring. I think as time goes on and IFAS develops research and answers, over usage issues will go away as people understand it's just more frequent irrigation that's needed, not necessarily more water. We've worked very closely with a number of the citrus permittees, performing outreach and trying to understand how they use their water in response to greening. We're also trying to put some of our district dollars to the green issue, especially in regard to water use and how water use is impacted by greening.

Water Quality: Springs

One of the last things I'll talk about is springs, this is really more of a water quality issue and a relatively hot issue in the last two years. You read newspaper articles all the time about spring improvement, problems with spring both quantity and quality. I'm going to focus on the quality aspect today and really focus on the springs within the Southwest Florida District. Rainbow Springs—these are nutrient concentrations that you see in our major springs within the Southwest District. Rainbow has the highest concentration of nitrate 2.34 mg per liter. It goes down as low as—these are 0.2 or 0.17 down in Kings Bay. The source of this loading of nitrate to the springs system is the watershed. You look at where the watershed is and you look at the land use and then you look at how nutrients are associated with that land

use. We've determined that a lot of the fertilized pasture especially used for horse farms in this region is probably the primary culprit for the nutrient levels that we've seen. There are others, the horse farms directly are some source of it. There's still a big struggle trying to understand the sourcing of nutrients. In some cases it is difficult for me to understand how manure over a large area can supply that much nitrogen to Rainbow Springs. There is still research needed to be done to understand the sourcing of the nutrients, I believe. But when you look at Rainbow through time (this is the DEP numeric nutrient criteria for Rainbow right now 0.35 mg), that's the target we'd like Rainbow to be at. This is where we're at today (just under 2.5), so you can see through time it's really ramped up. This corresponds with a lot of the growth we've seen in the basin, not only by ag but by all the different land uses.

We should probably include a slide I didn't use today of Weeki Wachee that shows population growth, mimicking right with the nitrogen trends going up. Now this is kind of the test for the day and the point of this slide is try and emphasize how complicated springs systems can be. The graphic at the top shows the spring system with visibility of 250 feet, which is just what you'd expect in a spring system, the one at the bottom; 30 feet. When you look at the nitrate/nitrogen concentrations they are exactly opposite of what you would expect. This tells you that nitrogen is not the full story in our springs systems, there are so many impacts going on with our springs. It's water quality from nitrogen, its spring flow, obviously; residents' time in these systems. It's our own impacts to springs, how much loading can a spring stand, especially from a recreational standpoint. The top is Rainbow, that's our highest nitrogen concentration; the bottom is Kings Bay; one of our lowest. We're working on a multi-faceted approach to try and address trends. The DEP is taking lead on trying to fix the water quality and get it down to the level we'd like to see it at. We're also working with them on the water quality but we're also focusing on a lot of in system restoration. We're focusing on the quantity issue, trying to make sure groundwater use is not overly impacting springs. The springs within our region we don't believe have been overly impacted by groundwater withdrawal. The maximum we've seen is about a 6% of an impact in any of the springs in our areas. Within St. Johns and Suwannee they've seen much bigger impacts. So the BMPs we're putting in place with the springs coast region to address both quality and quantity are precision fertilizer application associated with some of the row crops in the region, trying to put swales and control structures to try and keep water from directly getting into sinkholes.

One of the biggest things I think we can do is work with wastewater treatment plants and try to get those to advanced treatment status. Most of the ones in the northern district are not advanced treatment. But we're also working with ag on things like exclusion fencing. One of ideas we'd like to see probably IFAS do research on are de-nitrification walls and beds. Can we add a soil supplement up there to try and take up whatever nitrogen might get below the root zone, and maybe possibly reuse that. The graphic over here basically shows the spring, they call them springsteads; I like to call them spring recharge areas for Rainbow and then it shows the water use permits that are ag related. Obviously Rainbow is the one that we feel has the biggest ag impact. These others are much more of a mixed system, in fact Kings Bay we think is a much more septic with wastewater treatment and a little bit of ag in there as well.

The Role of Research

This is my last slide I have for you today, what I'd just like to touch on with how much research and what you all do plays a role in where we're going today. The district has supported IFAS over the years; we've had a very productive relationship. Some of the things that have been most important to us is understanding how to permit water use. For years, many of you know Ron Cohen, he used to work for the water management district; for years we've been doing projects with IFAS trying to understand what is the water requirements of a crop. If we go to a different type of irrigation system, how will that improve water use? There have been countless studies that we've worked with IFAS over the years to try and understand that sort of information. This shows you where we've been and where we're going right now. As a result in the down turn in the economy and a result or reduction in our budget we're trying to level off our IFAS budget with about a half million dollars of research support per year for focus projects. Some of the focus projects we're working on right now are water use for peaches; we don't understand how much water a peach tree needs, a peach grove/orchard, I'm not sure how it goes, how much water is necessary/supplemental for irrigation.

We're also working with IFAS on a project to look at row crops; specifically potatoes. We're not familiar with an arch district or their center pivot systems; I know they're used heavily up in Suwannee and northwest so we want to understand more how the center pivot systems work with our soil types especially our evapo-transportation rates of the southern part of the district. So there are a number of projects we're working on with IFAS and we hope to continue to work. I really think one of the best places to look for research for IFAS right now too is the new round of BMPs that might need to be employed especially to address springs type issues; water quality & nutrients. How can we go beyond the older BMPs to achieve the next level of BMPs that ag will buy into as well, that will show that ag can actually utilize without overly impacting their economic conditions.

That's what I really had to share with you all today, I hope I enlightened you a little bit with regard to some of the water resource issues we face and give you some large scale perspective of water use within the district, how reclaim fits into it. Again I really appreciate Ed letting me talk today and hope you have a great end to your conference.