

## Our Citizen Scientists

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Welcome to the first in a series of articles spotlighting volunteer water quality monitors in Mobile and Baldwin counties. These unsung champions of their local waterways collect water chemistry and/or bacteriological data on a monthly basis at one or more sites within their local watershed. The data that monitors collect is publicly available on the Alabama Water Watch (AWW) website



Figure 1. Map showing location of Holladay AWW site 06005027

[www.alabamawaterwatch.org](http://www.alabamawaterwatch.org) and can be used to alert state and local agencies to water quality issues. This article focuses on one of 24 sites monitored by Dog River Clearwater Revival (DRCR) in Mobile, Alabama.

### Meet the Site

Located on Dog River, just upstream from the confluence of Halls Mill and Rabbit Creeks, is Alabama Water Watch site 06005027 (Figure 1). This site was first monitored in 2000 by Valerie Blankenship, a former president of Dog River Clearwater Revival. After Valerie, Rob Nygren, Tom Weinacker, and Ben Tyler collected water quality data here. In 2011, Eric and Marcy Holladay took over this monitoring site and have not missed a single month since. Cumulatively, these dedicated water monitors have posted a total of 114 data records for this site, giving us an interesting picture of water quality in this part of Dog River over time.

### Meet the Monitor

Eric Holladay (Figure 2) and his wife Marcy have lived on Dog River since 2008. They were certified as Alabama Water Watch basic water chemistry monitors in 2011, and they have monitored their site for six years. Over half of the 114 data records are theirs. Recently, Eric also completed his bacteriological certification and added it to his monthly testing protocol. Below is an interview with Eric from March 15, 2017:

#### Why are you interested in monitoring Dog River?

*"It is a privilege to be able to live on the river, once you are here you need to try to take care of the environment and the river the best you can. I regularly cleanup three to four times a week on my shoreline. It is important to me to keep the water pristine and useable for recreation for our family and friends who visit and to make it enjoyable for fishing and crabbing."*



Figure 2. Eric Holladay testing water chemistry.

How has monitoring changed your relationship with the river?

*“When my wife, Marcy and I were in high school, we played in the river a lot, swimming and boating. Since then, we have moved around the world and seen a lot of different places where they have great access to water resources. When we actually started living on the river, it changed our attitude. I think when we were younger we didn’t realize how important it was, we just enjoyed the river and didn’t do much else. Now we realize that we need to take care of the resource to make sure it is maintained for future generations. We are getting ready to celebrate our 50<sup>th</sup> high school anniversary, so we have been using Dog River for over 50 years. It really has changed. Back then there wasn’t much concern about the river or runoff, and now we have the attention of the city fathers and environmental groups.”*

What unusual or interesting memory do you have about monitoring?

*“One event occurred just last month. It was a cold day with a howling north wind. I had my folder with all my paperwork for the last three years and the wind picked it up and threw it out in the river. So, I ran down the pier and hopped in a kayak and retrieved the documents. Another incident is from a couple of years ago. I was on the edge of the pier and some manatees came right past while I was testing.”*

What would you say to someone that may be interested in water monitoring?

*“You have to look to future generations. Point out the fact that somebody needs to do this so you have a good track record of what’s in the ecosystem and how it is behaving with all the influences of living in a modern world. You have got to convince people that it is important enough to participate for the sake of their children and grandchildren. When we were out here 50 years ago we just enjoyed it. Now we are trying to be more responsible. That is the key: responsibility. The fact that you have the available resources and you go out and try to do something that is positive for everybody.”*

What word of advice would you give to a new monitor?

*“The key word is perseverance. You sort of become one with the process, it becomes second nature to you once you begin monitoring. You have to absorb yourself in the process and realize what there is to gain from it. I hope to do this another ten years. Maybe that will provide impetus to others to do it with me. It doesn’t take long once you get used to it.”*

**What’s the Story?**

An important test performed by AWW monitors measures dissolved oxygen concentrations. Just like humans need oxygen in the air to breathe, fish need oxygen dissolved in the water to survive. Oxygen in water comes primarily from the air, so water that flows or has waves gets more air mixed into it and likely has more oxygen than stagnant, calm water. Some oxygen is added to water by aquatic plants and algae through photosynthesis. As a rule, more oxygen can dissolve into cold water than into warm water. In the summer, oxygen levels can get dangerously low (for fish) when water temperatures are warm. Some things remove oxygen from the water. When organic material, like leaves, grass clippings, sewage, pet waste, food waste, etc., is present in water, decomposers like bacteria and fungi break down the waste and consume oxygen in the decomposition process. An abundance of this oxygen-consuming waste can quickly deplete the dissolved oxygen in a stream. Dissolved oxygen is a good indicator of stream health, because when levels fall below 5 mg/liter, fish are stressed. Only two of the 114 dissolved

oxygen observations at Eric’s site were as low as 5 mg/liter, suggesting that this part of the river is relatively healthy.

However, Dog River at Eric’s site does not always meet the requirements for its designated use of supporting fish and wildlife. Dog River’s water resources have been challenged over the last 50 years by increasing pressure from urban expansion. In 1996, this segment of Dog River was formally listed as “impaired” (or polluted) under the Clean Water Act Section 303(d) for organic enrichment/low dissolved oxygen. The law requires that states establish priority rankings for waters listed as impaired and develop Total Maximum Daily Loads (TMDLs) to improve water quality. A TMDL was completed for this segment of Dog River in 2005. Unfortunately, TMDLs do not “fix” the problem. For this segment of Dog River the two primary sources of oxygen-consuming waste identified by the Alabama Department of Environmental Management (ADEM) are illegal sanitary sewer overflows and storm water runoff. Sewer overflows from aging sewer lines and grease blockages are accidental non-point sources of oxygen-consuming waste; the sewage treatment plant actually discharges into Mobile Bay, not Dog River. A significant portion of the organic material that ends up in Dog River comes from what washes off the impermeable roads and parking lots that comprise over 16% of the Dog River Watershed. The City of Mobile’s stormwater management plan addresses this issue.

In addition to measuring the absolute concentration of oxygen, Alabama Water Watch monitors calculate dissolved oxygen saturation, which compares the amount of oxygen actually in the water to the amount it could potentially contain based on water temperature. This method compensates for seasonal changes in temperature when comparing oxygen levels. A graph of dissolved oxygen saturation for Eric’s site shows a decreasing trend in dissolved oxygen saturation (Fig. 3). This analysis indicates that Dog River’s overall dissolved oxygen situation is getting worse over time. Dissolved oxygen saturation less than 60% is considered problematic.

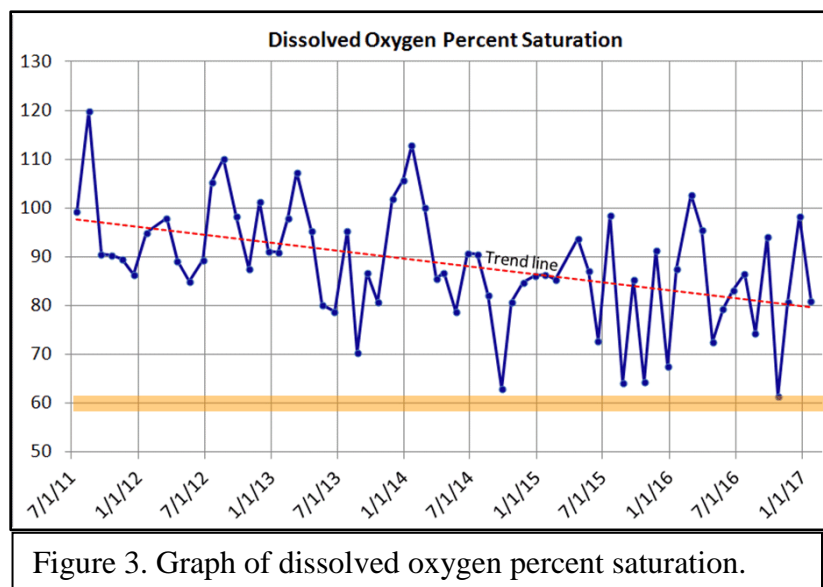


Figure 3. Graph of dissolved oxygen percent saturation.

Assuming that mixing has remained constant, what is removing the oxygen from Dog River? In the same way that a fire needs oxygen to burn, the breakdown of organic material in the water also requires oxygen. The litter trap on Eslava Creek confirms that leaves and grass clippings are a serious problem (Figure 4). Coupled with high water temperatures in the summer that accelerate decomposition, the breakdown of this material can contribute greatly to low dissolved oxygen. Low oxygen events are also caused by “boom and bust” algal growth associated with fertilizer (or sewage). Once nutrients are depleted, microscopic plants die and decompose,



Figure 4. Leaves and grass in the Eslava Creek litter trap on March 15, 2017

rapidly consuming oxygen. If dissolved oxygen saturation continues getting worse in Dog River, a likely culprit is a steadily increasing load of oxygen-consuming waste coming from the watershed itself over time.

### What's Next?

Clearly, a need exists to educate Mobile's citizens concerning oxygen-consuming waste in Dog River and to enlist their aid in reducing that waste. Mobile Area Water and Sewer System's (MAWSS) "It's Easy to be Ungreasy" campaign seeks to reduce the amount of sewer clogging grease that people put down their drains, helping reduce the number of accidental sewage spills. An early effort by Dog River Clearwater Revival involved installing markers on storm drains throughout the watershed to inform people that storm drains lead directly to the river (Figure 5). Leaves and grass clippings blown or left on the street are washed into the river every time it rains. The City of Mobile's Storm Water Management website, [www.stormwatermobile.org](http://www.stormwatermobile.org), contains useful information on ways to reduce stormwater impact on Dog River, including a brochure to educate citizens on the negative impacts of blowing leaves and clippings onto the streets where they can be easily washed into storm drains. Since leaf blowers are major culprits in this problem, a brochure that provides information on the impact of organic material in stormwater could accompany every purchased leaf blower. Leaf blower manufacturers could be encouraged to include this information on their packaging. Homeowners could be encouraged to go to the Clean Water Future website ([www.cleanwaterfuture.com](http://www.cleanwaterfuture.com)) and "take the pledge" to rake the leaves up from in front of their house and use or dispose of them properly. Eric's story reminds us that when people make poor choices, like dumping leaves and/or grass clippings down a storm drain, those cumulative impacts can be just as detrimental as a large development or service provider acting irresponsibly.



Figure 5. Storm drain markers installed by DRCR