

Quittapahilla Watershed

Water-Quality Monitoring Overview

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This note is written to explain the current thinking for the water-quality monitoring program for the Quittapahilla Creek Watershed. The note will address: (1) how the water-quality monitoring fits in with other monitoring-program components, (2) my vision for the monitoring program, (3) the current plans for our water-quality monitoring program, and (4) the duties and responsibilities of the volunteers who will execute the program. This note is intended primarily for those who have expressed an interest in volunteering to support the monitoring program. We thank you for your interest and hope that this information will encourage you to join our monitoring effort.

1. **Overall Monitoring Program**: We have received, and hopefully will continue to receive, funds from government agencies and private entities to implement stream restoration projects, streambank fencing, riparian buffers, and other best management practices (BMPs) in the Quittapahilla Creek Watershed. When we accept these public funds, we incur a responsibility to demonstrate that the money provided to us is making an improvement in the waters of the watershed. Thus, monitoring is required.

Further, if we can demonstrate that our efforts are worthwhile, then we stand a better chance to win additional funding for future improvement projects. Again, monitoring is the key to demonstrating the positive impacts of our work. So, the monitoring that we are planning is vitally important.

The big picture monitoring program for the Quittapahilla Creek Watershed includes four components:

- a) Geomorphic measurements
- b) Habitat evaluations
- c) Biological sampling
- d) Water-quality monitoring

Geomorphic and Habitat Evaluations: For each of the last three summers, we have been able to hire or recruit student interns to conduct the geomorphic and habitat work. This has worked out well for us, and we are hopeful that we can continue to attract summer students for this component. But, we need funding to sustain this activity and so each year brings new challenges to support the summer interns. In the next few weeks, we will be working on applications for internship funding for the summer of 2020.

Biological Sampling: Dr. Rebecca Urban and her students at Lebanon Valley College have agreed to conduct the necessary biological monitoring for the Watershed. We will evaluate only the macroinvertebrate community of the streams, not the fish. This involves an annual sample of macroinvertebrates at each of the six identified monitoring sites in the Quittapahilla Creek Watershed. Four of the monitoring sites are on tributaries to the Quittapahilla Creek and two are on the mainstem of the Quittie. Samples were collected at five of the six monitoring locations during the fall of 2019, so this monitoring component is well underway. Dr. Urban and her students are in the process of identifying the inverts and analyzing the data from these samples.

Water-Quality Monitoring: Volunteers will collect water-quality samples at the same six sites that are targeted for the biological samples. The samples will be delivered to the Pennsylvania Department of Environmental Protection laboratory on Interstate Drive (just off Progress Avenue) just north of Harrisburg. This lab will conduct the chemical analyses for the samples. More details below.

2. **Vision:** We are hoping for a program that will be able to detect differences in water quality resulting from the installation of our BMP projects. I feel confident that our biological sampling and the habitat and geomorphic work will be able to show improvements. But, I am not so sure that the water-quality sampling will be able to capture the subtle differences that we expect in the chemistry of the streams. This is a tall order because let's suppose we install 1,200 feet of streambank fencing. There is no doubt that this project would keep cattle out of the stream and would result in less bank erosion and therefore less suspended

sediment in the stream. But, repairing 1,200 feet of streambank for a stream that is 6 miles long is a relatively minimal percentage of the stream. Thus, the reduction in stream sediment concentrations would be small. And, suppose three years following the fencing installation, there is a major storm. We know that the high flows during a storm will create more erosion (from areas that are not protected) than a non-storm period. So, there would likely be more suspended sediment in the stream during this storm event, even though we had successfully installed our fencing project. Because of the storm, our monitoring would likely show an increase in the suspended sediment load, exactly opposite of what we were expecting. So, detecting water-quality trends is tricky. Thus, our water-quality sampling needs to be well-planned with special emphasis on the quality of our work. As part of the water quality sampling, we will measure streamflow at each time a water-quality sample is collected. Then, when analyzing our data, we can then apply statistical techniques to account for the variations in streamflow.

Further, sometimes volunteer monitoring efforts are inadequate to meet the objectives of the project. But, we are planning for and working to implement a volunteer program that stands out as an exemplary program. To that end, we will:

- Develop a comprehensive Quality Assurance Project Plan (QAPP).
- Train our volunteers in proper procedures and techniques.
- Have written protocols for each activity.
- Insure that samples are collected in accordance with the protocols.
- Collect streamflow measurements with each water-quality sample.
- Support our work with ample quality-control samples.
- Use quality field instruments, calibrated each day they are in use, not inexpensive models targeted for the typical volunteer work.

3. Plans for the Water-Quality Monitoring: As stated above, we will collect water-quality samples from six sampling locations throughout the watershed. Here is a list of our sampling sites:

- S1 Snitz Creek at Walnut Street
- BK1 Beck Creek at Bricker Lane
- BM1 Bachman Run at Louser Road
- K1 Killinger Creek at Killinger Road
- Q1 Quittapahilla Creek at Garfield Street
- Q2 Quittapahilla Creek at Palmyra-Belleville Road

Periodically, (perhaps six times per year, maybe more frequently) our volunteers will visit each of these sites to collect a water-quality sample. Measurements of pH, dissolved oxygen, specific conductance, and temperature using field instruments will be made in the field. Each sample will be analyzed at the lab for nutrients, sediment, and major ions. We will not ask our volunteers to sample for bacteria because of the difficulty of collecting a sterile sample.

We will attempt to collect our samples under different streamflow conditions (high flow, medium flow, low flow). High flow is when most of the contaminants are transported and is therefore most important. But high flow events are fleeting so that will be a challenge. There is also an increased safety issue associated with high-flow sampling.

We will implement safety precautions (such as working in teams of two) for the benefit of our volunteers.

We will use the water-quality data for preparing reports of water-quality in the Watershed, and these reports will be used to support additional funding applications.

4. Duties and Responsibilities of Volunteers: In a nutshell, the volunteer monitors will go periodically to the pre-selected sampling sites, take some field measurements, collect a water-quality sample, conduct a measurement of the volume of water flowing in the stream, record the gage height at the time of sampling, document their activities in a notebook, and deliver the sample to the DEP laboratory.

A sampling trip will start out with calibration of the field instruments that will be in use for that day. This means that you will evaluate the performance of your field instrument using standard water solutions that we will purchase from a chemical supply house. This activity will take about half an hour and could be conducted in the field or in a laboratory (or at your kitchen sink).

Then the volunteer(s) will go to the creek and use these freshly-calibrated instruments to measure pH, specific conductance, temperature, and dissolved oxygen in the stream. These water-chemistry components change rapidly, so we

can't leave these measurements up to the lab – we must collect this information in the field.

To collect the water-quality sample, we could dip a bottle in the creek, cap it, and be done – but we will not. Instead, we will use special sampling equipment to collect a width-integrated and depth-integrated sample which will better reflect the true nature of the water in the stream. The sample will be preserved and/or placed on ice in a cooler so that the chemistry in the sample will not change prior to laboratory analysis. This activity (collecting the sample) will take about a half hour at each site.

In addition, our volunteers will make a streamflow measurement and record the gauge height at the time the sample was collected. This also will take about half an hour.

It is critical to document all of your actions. The volunteers will be provided field note sheets and/or field note books for recording your observations.

Then the samples will be transported to the DEP lab for analysis. A trip to the DEP lab and back will take about an hour.

Overall, we are talking about a three-hour effort for one complete sample. But, if we sample at a couple of locations (or more) in one sampling trip we can make better use of our time. That would mean only one calibration exercise and one trip to the lab. So, with a little planning and some teamwork, we can economize the time spent per sample and visit multiple sites in one sampling trip.

The Quittapahilla Watershed Association will provide training for each of these activities. The training session itself will take about an hour and a half and will be conducted most likely in Annville at a time agreeable to all our volunteers.

As with most volunteer monitoring efforts, we are challenged financially to get the equipment and supplies required to implement this monitoring program. But, we have assurance from the Pennsylvania DEP that they will analyze our samples for free. Also, I am hoping that DEP will provide a long-term loan of three water-quality monitoring field instruments (one instrument for each of three sampling

teams). We have funds from the Lebanon County Stormwater Consortium for stream gage equipment and installations and we have a small amount of funding from Trout Unlimited for a field water-quality instrument. We still need funds for sampling equipment and for routine supplies (rubber gloves, buffers, standards, plastic ware, replacement parts, ice chests, and so forth). We will be seeking funding for these needs and I will call on DEP for support here as well.

Our monitoring program has not surged ahead as quickly as I had hoped. Much of this should have already been in place. But, here is a realistic (but still flexible) schedule for your planning purposes.

- Jan. 15, 2020 Final meeting with C-SAW professionals to consult on stream gage installations.
- Jan. 31, 2020 Order equipment for stream gage installations.
- Jan. 31, 2020 Meeting with DEP staff to finalize their involvement and support.
- Feb. 28, 2020 Funding arrangements for field equipment is complete.
- Mid-March, 2020 Classroom training for water-quality monitoring volunteers.
- Mar. 15, 2020 Field equipment is purchased.
- Mar. 15, 2020 Stream gauge installations begin.
- Apr. 1, 2020 All six stream gauges are installed.
- Apr. 2, 2020 Water-quality sampling begins and continues long-term (hopefully years).

This plan has not had the benefit of review and input from the QWA and the DFTU. Therefore, please consider it to be a draft. No doubt, the plan can be improved and we will welcome comments and suggestions from our many partners.