Technical Paper

Pike River Water Quality Analysis

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Introduction

Water quality in the Pike-Root River and other watersheds around the world is directly related to human activity such as creating impervious surfaces and contributing to point source pollution. This alters stream flow and greatly affects water quality. We need to take care of our watersheds because they a trivial role in our lives. My paper explains and evaluates the many tests we performed on the Pike-Root River.

Developing land and creating areas with too many impervious surfaces can damage water quality. Having too much concrete leaves no areas for the water to drain into the ground. As stated on the USGS website," As watersheds are urbanized, much of vegetation is replaced by impervious surfaces, thus reducing the area where infiltration to ground water can occur." When watersheds get built on, the water can no longer naturally seep into the ground. It instead runs along all of the impervious surfaces and picks up everything lying around which is then carried into the local river or stream. This damages the quality of the water and causes a rapid spike in stream flow and even flooding.

Point source pollution can drastically change the water quality whether a sewage treatment plant is polluting it or if it is thermal pollution from a power plant. In a excerpt on Utah State University's website it states," Excess nutrients (such as nitrogen and phosphorus) from sewage treatment plants can overstimulate growth of aquatic plants like algae." When these algae blooms occur they are fine until they start to decompose and the microorganisms use up the waters' precious dissolved oxygen. All fish and most water borne insects need some amount of DO to survive and thrive. Another section on the USU website stated,"…some power plants use water to cool overheating equipment. If this water is not cooled properly before being

released into the natural waterways it can alter the temperature of that waterway.” When warm water is dumped into a cold-water river or stream it can potentially kill off certain species of insects or fish that simply can’t survive in such a drastic temperature change situation.

Here in Kenosha we live in the Pike-Root River watershed. It is important that we take care of our watershed because it could negatively impact us and the plants and animals we share the area with. If we aren’t careful with how we affect our waterways we will end up regretting it. When we pollute our Pike-Root River, whether we realize it or not, that contaminated water can harm plants, animals, and even us humans. The Pike-Root River flows into Lake Michigan, which is where we get our drinking water. And even though we clean that water to drink we don’t clean it to go swimming in or go on a boat ride on the lake. We need to preserve and keep as much water as clean as we can.

In conclusion watersheds are extremely essential to human, plant, and animal life. In order to keep our watershed healthy we must monitor our activity as members of a community. It is everyone’s responsibility to keep our waterways clean and clear for the safety of every living organism.

Methods

On September 25th, 2014 Harborside Academy Sophomores tested the water quality of the Pike river where it runs through Petrifying Springs Park. The air temperature was 75.74 degrees fahrenheit and it was mostly sunny with some clouds. During this field work students were able to perform many tests such as temperature, dissolved oxygen (DO), pH, turbidity, biotic index, habitat, and streamflow.

Students in one group tested the temperature of the water by wading into the water and placing a thermometer in the middle of the stream about 4 inches below the surface. They then

attempted to read the temperature while the thermometer was submerged but if they couldn't they collected the water in a clear plastic cup and just read it that way. Students then recorded their measurement. This protocol came from the temperature section of the Water Action Volunteer website. It is important to test water temperature because we can determine about how much oxygen there is based off of how warm or cool the water is. Cold water has the most oxygen and higher plant growth. Most fish prefer cooler temperatures. Warm water on the other hand has very low oxygen levels which can cause the death of plants and animals and those decaying plants use up the little oxygen there is to decay.

In another group students tested for DO saturation percentages. Using the standard protocol for a Hach kit, students added the various powders and sodium thiosulfate drops to find the saturation percentage of DO. Students then recorded their findings. This protocol came from the DO section of the Water Action Volunteer website. Dissolved oxygen is important to test for because plants and animals need it to live and a low DO level can be a strong indicator of lots of dead matter. This dead matter is dead because of lack of oxygen and now, to decay, it has to use even more DO.

pH levels were yet another thing students tested for. They did this by using 3 pH strips and placing about ⅔ of the strip into the water on the left bank, right bank, and middle of the river. Once the color reading on the strip showed up they were able to compare it to a key to see how acidic or basic the water was. They then recorded their results. This protocol was explained to me by Mark and Ellie; two students who performed the test. It is important to test pH levels because depending on how acidic or basic the water is, some plants and animals won't be able to live there. Every species has a different ideal pH level because every species can tolerate a different level of acidity or basicness.

Yet another test students performed was a test of Turbidity or how clear the water is. Students first collected water in a bucket and then took out any large objects from the sample. They then suspended the particles by stirring up the sample and then poured the water directly into the turbidity tube. When doing the next step they had to stay out of direct sunlight because of glare. Students next had to let out water from the bottom until they could just barely see the black and white marker on the bottom of the tube. Whatever height the water is when you can see the marker is the height they recorded. They then averaged the results. This protocol came from the turbidity section of the Water Action Volunteers website. Turbidity is important to test because it can indicate runoff or discharges from nearby pipes or other sources. This runoff could potentially harm fish and plants and that is why you should test for it.

Another group of students conducted a biotic index test where they found and identified many different species of macroinvertebrates using a rubric with pictures of said organisms. Students first collected a net full of material by placing the net in the middle of the river and letting water flow in as well as kicking up some of the dirt into the net. They then took out any rocks from the sample and placed small organisms in an ice cube tray. Larger macroinvertebrates went into a plastic basin. Students then compared what the had to the rubric in front of them and recorded what they saw. This protocol was from Mari, a student in the biotic index group as well as the biotic index section of the Water Action Volunteers website. Biotic index is important to record because the absence or presence of aquatic macroinvertebrates reflect the general condition of the river. Different macroinvertebrates have varying tolerance levels with pollution but most can’t survive in it.

Harborside Sophomores of another group tested habitat which consists of using a scoring rubric to determine what conditions the land in and around the river is in. They tested within a 300 ft. length along the river and tested for vegetation, bank stability, channel alteration,

channel flow status, stream velocity, in-stream habitat, sediment deposition, embeddedness, and attachment sites. For most of these they had to make observations except for the stream velocity. They tested stream velocity by placing a stick in the water and letting it flow for 20 ft and then they recorded the time it took for it to go the 20 ft. Students did this three times and took the average.This protocol was explained to me by Emily Vallis, a student in the habitat group as well as the habitat section of the Water Action Volunteer website. Habitat is important to assess because it shows how the natural land and man made structures contribute or affect habitat for the plants and animals that live there.

One last group of students tested streamflow which they did by first measuring the depth at intervals to determine the average depth and then setting up two stakes 20 ft. apart. They then timed how long it would take for an orange to float down 20 ft. of the river. They did this multiple times and then found an average. Students then plugged in their data to a stream flow formula sheet taken from the Water Action Volunteer website and got the measure of stream flow. This protocol was taken from the streamflow section of the Water Action Volunteer website as well as from the students who tested streamflow. Stream flow is important to test because if streamflow drastically changes the wildlife in the stream are affected badly or even killed off. Students testing for only one day won't really be able to get a good read on streamflow though because to study the patterns of the river you would have to test for at least 3 or 4 years. This way you would be able to tell whether or not the streamflow is following its usual patterns.

In conclusion, water testing is extremely important in understanding how our actions affect our surrounding. It puts a precise measurement on a habitat and the water in it. Understanding how to correctly perform the tests is important because the results tell us a lot.

Results

On September 25, 2014 Harborside sophomores performed many tests. For the turbidity test the average was 17.3 (repeating decimal) ntu's . The water temperature was 17.46 degrees C. The air temperature was 24.3 degrees C. The weather was partly sunny with some clouds. The dissolved oxygen saturation level was 75%. The habitat score was 34 out of 52 on the scoring rubric.Biotic index was 3.36 out of the scoring rubric. The pH level 9was 8 out of 14 levels. Streamflow was 7.663 cubic feet per second. These are the results of the sophomore water testing at the Pike River.

Test	**Results from Block 2**
Turbidity	17.3 (repeating decimal) ntu's
Water Temperature (in C)	17.46 degrees C
Air Temperature (In C)	24.3 degrees C
Weather	partly sunny, some clouds
Dissolved Oxygen	75% saturation level
Habitat	34 out of 52 on the rubric
Biotic Index	3.36 out of the scoring rubric
pH level	level 8
Streamflow	7.663 cubic feet per second

Discussion Section

This next section of the paper will explain whether or not the Pike River is in good health. It will also explain why the results of the water testing were good or bad and reasons for being good or bad.

The result of the temperature test was 17.46 degrees C or 63.428 degrees F. At about 63 degrees F the water is still considered cold water. Cold water has more oxygen which promotes plant growth which is good for the animals that need to eat that vegetation. Warm water isn't good unless the plants and animals are used to surviving in a low oxygen area. Students at Harborside aren't sure if this is a good or a bad reading. To know this they would have to keep track of temperature patterns for a few years to know whether or not this reading is good.

The result of the dissolved oxygen test was 7.0 mg/l or a 75% saturation level. 7-10 mg/l is healthy so our results were on the low end of healthy. Since there is a good amount of dissolved oxygen in the Pike River it means that there isn't a ton of dead matter that needs to use up the oxygen to decay. The dissolved oxygen can go mainly to the plants and animals that need it to survive.

The result of the pH test was an 8.0 on the pH level scale. 7.0 on the scale is neutral so 8.0 is just slightly acidic. 6.5 to 8.0 is a good range for trout which are common in the area. Even though 8.0 is the very highest on that range it is still a relatively healthy environment for them and other freshwater fish.

The result of the turbidity test was 17.33 ntu's. This was not such good news for the Pike River considering what range is healthy. 10 or less ntu's is considered healthy and 5 to 1 ntu's is considered drinkable. Luckily we do not need to drink this water but plants and animals do need to live in it and 17.33 ntu's is just too high.

The result of the biotic index test was a 3.36 out of the scoring rubric. 2.6 to 3.5 is a good score so the Pike River did very well with this test. The scoring rubric arranged pictures of different macroinvertebrates into 4 groups with group one being very sensitive to pollution and group 4 being tolerant of pollution. The data collection sheet had a calculation area that made it so if you had more macroinvertebrates that were sensitive to pollution then the river would get a better score which is what the Pike River got.

The result of the habitat test was 34 out of a possible 52. 52 is the best score possible and would've meant absolutely perfect conditions for everything which is very hard to achieve. 34 however is just a little better than okay which isn't what we want to say the overall state of the river is.

The result of the stream flow test was 7.663 cubic feet per second. At this point we really can't say whether or not this is good or bad. To accurately assess the stream flow we would have to study patterns for at least three years. Only then would we be able to come to an accurate conclusion. Even with the data for three years we would still have to compare our data with the data from before to see whether or not the stream flow is normal or if it has spiked or drastically declined.

Conclusion

Water quality is important to assess because good or bad water can make or break a watershed and it's surrounding ecosystems and communities. Testing water quality is important to animals, plants and even humans because we all affect one another. The tests performed were to assess temperature, dissolved oxygen, pH, turbidity, biotic index, habitat, and stream

flow. These all tested different elements of the Pike River and contributed to the overall assessment. The overall quality of the Pike River is a pretty good. Based on the tests, the Pike River did very good with most of the tests and some we don't have enough data to accurately assess yet. One of the only areas the Pike River scored bad in was turbidity. Since there were many impermeable surfaces near where we were testing I believe there was most likely runoff from those roads in the river. A solution would be to have drainage areas besides just running down the hill. If the water could sink into the ground it would have a better chance at being naturally filtered before reaching the river. Testing the water quality frequently is essential because it points out problems and from there we find solutions to continually improve our watersheds.

Citations (In APA format)

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