A Long-Term Stream Monitoring Project of the Lisha Kill, Niskayuna, New York;

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Abstract/Summary

The Niskayuna Environmental Study Team of Niskayuna High School is continuing their long-term stream monitoring of the Lisha Kill in the Lisha Kill Preserve in Niskayuna, New York. The goal of the study is to make sure that the stream remains unaffected by pollutants. Physical, chemical, and biological tests were performed at one site on the Lisha Kill. All results fell within the DEC acceptable ranges.

Background

The Niskayuna Environmental Study Team is conducting a long-term stream monitoring project on the Lisha Kill within the Lisha Kill Preserve in Niskayuna, NY. The stream begins in a pond two and a half miles south of the Mohawk River. It runs through a 112-acre nature preserve called Lisha Kill Preserve managed by The Nature Conservancy. And eventually flows into a swamp along the Mohawk River, just south of Erie Canal Lock 7. The level of pollution in the Lisha Kill is affected by run-off from nearby roads and lawns. The road run-off brings road salts and oil into the stream water. The lawn run-off contains fertilizers, herbicides, and pesticides used to manage residential lawns.

Results

Physical Parameters

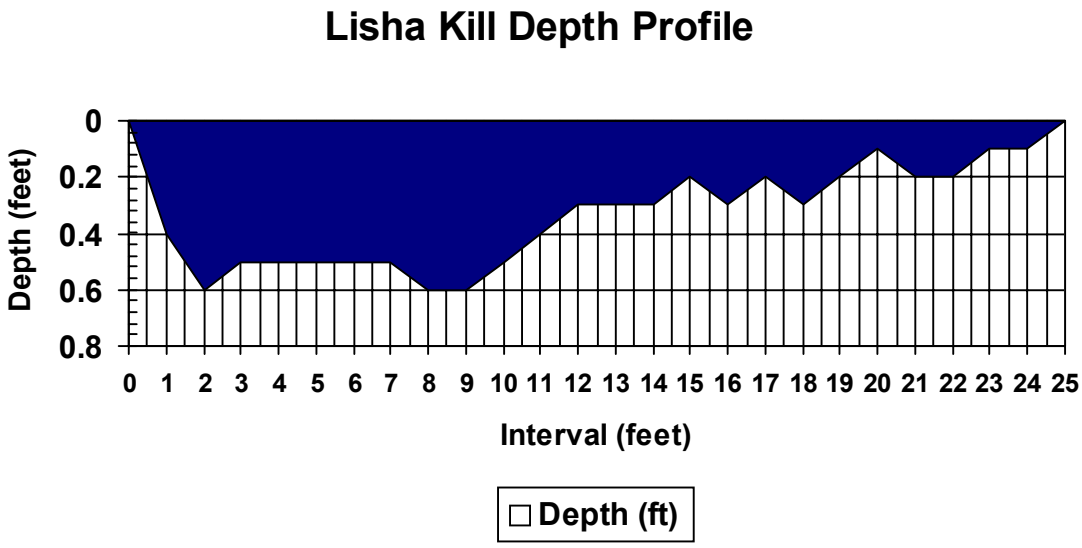
The Lisha Kill, our monitoring site, is located at 42º 47.485' N, 73º 51.315' W. It is situated at 256 feet above sea level and is a tributary of the Mohawk River. The stream is located in a nature preserve and is surrounded on both sides by overhanging trees and plants. Hiking trails also come to the waters edge in some spots. However, there is no blockage, like dams or artificial embankments.

The stream bed consists of flat shale. In between each level of flat shale, there is a layering of fine mud. This embeds the rocks. Embedding of the rocks is an unsuitable habitat for macroinvertebrates. Macroinvertebrates live on the underside of rocks. When the underside of the rocks become covered with this fine mud, the macroinvertebrates can no longer live on the underside of rock. We believe this is the reason our site has very low levels of stoneflies.

At the site measured, the stream was 20-25 feet wide and had an average depth of 0.35 feet. The greatest depth in the stream was 0.6 feet. The average velocity was 1.19 ft/sec with the discharge being 10.0 ft^3/sec. The discharge this year was similar to previous years. With this amount of discharge, there are riffles when the water flows over rocks. With riffles, the water receives more oxygen and allows more life to live on the stream bottom.

Physical Data:

Interval (ft)	Depth (ft)	Flow Velocity (ft/sec)
0	0	
1	0.4	
2	0.6	
3	0.5	
4	0.5	
5	0.5	1.30
6	0.5	
7	0.5	
8	0.6	1.18
9	0.6	
10	0.5	
11	0.4	1.10
12	0.3	
13	0.3	
14	0.3	
15	0.2	
16	0.3	
17	0.2	
18	0.3	
19	0.2	
20	0.1	
21	0.2	
22	0.2	
23	0.1	
24	0.1	
25	0	



Chemical Parameters

pH: The pH test indicates the hydrogen ion concentration of the solution. It is the measure of the stream's 'acidity'. If the pH is not balanced (if it is too acidic or too basic), the ecosystem will suffer. Our test indicated that the pH of the stream was 8.0, which is slightly basic, and within the range of accepted pH values.

Alkalinity: The alkalinity of the stream is a measure of how much acid the water can neutralize. High alkalinity helps protect the stream against sudden ecological changes. According to our results, the alkalinity of the Lisha Kill was 242 ppm, which is within the accepted range.

Phosphates: Phosphates are the generally found in phosphate rock. They are the basic chemical unit of tetrahedral PO4. Phosphates come from detergent, fertilizers, erosion of the said phosphate rocks, and human sewage. Excessive phosphate levels result in algae blooms and oxygen depletion. No phosphates were detected in the stream, which is an indication of a healthy water body with minimal pollution from agricultural runoff.

Nitrates: Nitrates are a form of nitrogen combined with oxygen. Excessive nitrates are an indication of farm wastes and fertilizers deposits in the stream. No nitrates were detected in the Lisha Kill stream, which is also an indication of a healthy water body with minimal pollution from agricultural runoff.

Dissolved Oxygen: An acceptable dissolved oxygen level is crucial to the health of the inhabitants of a water body, since the fish and macroinvertebrates obtain their oxygen from the dissolved oxygen molecules in the water. Dissolved O_2 is decreased by the presence of decomposers, and increased by photosynthesis. Anoxia, the condition of decreased dissolved oxygen, is a result of an algae bloom, which increases $C0_2$, long winter, and long winters, which would decrease photosynthesis. Agricultural runoff in a stream would result in an algae bloom. Therefore, the acceptable level of dissolved O2 in the Lisha Kill stream, at 8.75 ppm, is another indication of minimal agricultural runoff and other pollutants.

Temperature: The temperature of the Lisha Kill stream was slightly below the accepted value at 18 degrees C, but not significantly so. This is additional evidence that the Lisha Kill stream is a healthy one.

Chemical Data

Test	Our Results	Accepted Values
pH	8.0	6.5-8.5
Alkalinity	242 ppm	100-250 ppm
Phosphates	0 ppm	<0.1 ppm
Nitrates	0 ppm	<1 ppm
Dissolved Oxygen	8.75ppm	<4→pollution
Temperature	18 degrees C	18.3 – 23.9 degrees C

Biological Parameters

A Tier 2 assessment was made from our studies of the Lisha Kill. Through our analysis of percent composition it was determined that the Lisha Kill is a moderately affected body of water. In the first of our two samples it was found that the stream contained a percent composition of 44.4%. This percent composition was derived from a macroinvertebrate population of 14.4% Ephemeroptera, 37.8% Trichoptera and 0% Plecoptera as well as several other groups. Similarly, our second sample contained a percent composition of 46.6%. This percent composition was derived from a macroinvertebrate population of 12.87% Ephemeroptera, 55.04% Trichoptera, 0% Plecoptera as well as several other groups. Ephemeroptera and Plecoptera are macroinvertebrates known for their sensitivity to pollution and changing conditions; their presence signifies a healthy environment. Therefore the low percentage of Ephemeroptera and Plecoptera as well as the high percentage of Trichoptera suggests that the Lisha Kill has been affected by some means of pollution.

During our studies, we determined the EPT richness for each of our two samples. Our first sample had an EPT richness of two. An EPT richness of two means that two different taxa of Ephemeroptera, Plecoptera or Trichoptera were observed. We found our second sample to have an EPT richness of 3 (three taxa were observed). These numbers fell within the range of "moderately impacted." This would lead us to believe that some form of pollution has impacted the Lisha Kill.

For each of our two samples a biotic index was determined. For our first sample, we observed a biotic index of 3.2 while our second sample yielded a biotic index of 3.0.

Unlike the rest of our data, these numbers fall well within the range of "non impacted," leading us to believe that this body of water is a healthy and unaffected environment. Most of our biological data would lead us to believe that the Lisha Kill has been affected by changing conditions or pollution. However, this may not be the case. The absence of Ephemeroptera and Plecoptera might be due to the physical attributes of the Lisha Kill. The bed of the Lisha Kill is composed of mud and flat fragments of shale. When compared to the favorable bed of rounded cobbles, mud and shale is not ideal for most macroinvertebrates. Also the Lisha Kill experiences a significant change in discharge throughout the seasons. The discharge of the Lisha Kill may range anywhere from 12-5 cubic feet per second. If the discharge happens to drop to 5 cubic feet there will not be as much turbulence in the water. Without turbulence it is much harder for oxygen to dissolve into the water. These two factors, an unfavorable streambed and an insufficient discharge may be the cause of the absence of Ephemeroptera and Plecoptera witnessed in our studies.

Benthic Macroinvertebrate Data (2003-2004)

	Biotic Index	Taxa Richness	EPT Richness	Major Group Percent Composition	Level of Impact
2003	N/A	11	1	N/A	None to moderate
2004 Sample 1	3.2	8	2	44.4%	None to moderate
2004 Sample 2	3.0	12	3	46.6%	None to moderate

Discussion

Based on the chemical, biological, and physical data that was collected, the Lisha Kill is not severely impacted by human pollutants. If there are any pollutants in the water, it is due to the run-off from roadways and nearby lawns. We think the surrounding nature preserve acts as a buffer, absorbing any pollutants before they reach the stream. The major negative aspect of the Lisha Kill is the fluctuations in discharge. These fluctuations can impact the macro invertebrate population.

Conclusion

The data shows that the Lisha Kill is a moderately healthy stream. Our plans are to continue to monitor the stream every year. This annual monitoring will allow us to detect any changes that may negatively impact the health of the stream and investigate them. There is some discussion within the group to add another test site along the stream to improve our monitoring capability.