A Long-Term Stream Analysis of the Lisha Kill, Niskayuna, New York

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Abstract: There are many reasons as to why The Environmental Studies Team continues its study of the Lisha Kill each year. One of the primary reasons is because of its location. The Lisha Kill is close to our school and therefore easy to study. Another reason is because it is located in the Lisha Kill preserve, an environmental preserve located on Rosendale Road in the heart of Niskayuna, which we would like to see remain unchanged and unharmed. Physical, chemical, and biological tests were performed at one site on the Lisha Kill. All results fell within the DEC acceptable ranges.

Background: The Lisha Kill is a stream in the Lisha Kill Preserve in Niskayuna, New York. It is a one hundred twelve-acre nature preserve managed by The Nature Conservatory and beginning in a pond two and a half miles south of the Mohawk River. The stream itself eventually flows into a swamp along the Mohawk River just south of Lock Seven on the Erie Canal and it is classified as a Class B(T) stream by the New York State Department of Environmental Conservation. The level of pollution is affected by runoff from nearby roads and lawns. The runoff from the road brings road salts and oil into the stream water, where as the lawn runoff contains fertilizers, herbicides, and pesticides used to manage residential lawns.

Results:

Physical Parameters-

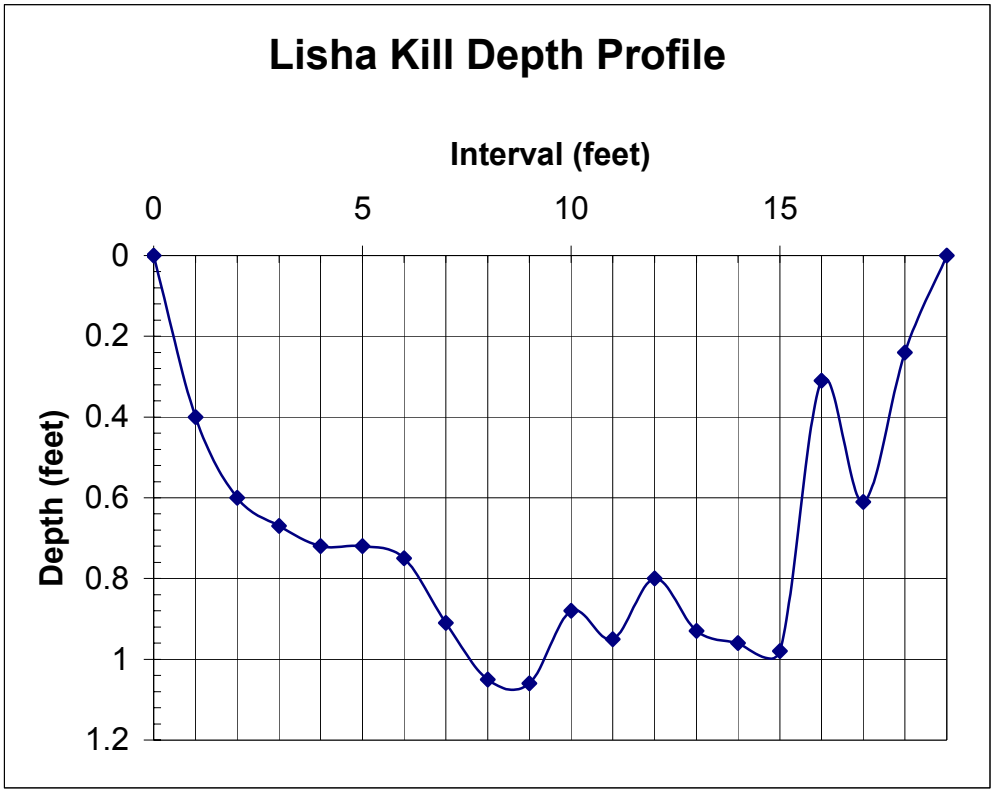
Our monitoring site, The Lisha Kill, is located at 42° 47.485'N, 73° 51.315'W. Situated two hundred fifty six feet above sea level, it is a tributary of the Mohawk River. Since it is situated in a nature preserve, there are many trees and over hangs above the stream as well as hiking trails that meet the waters edge. There is no blockage of the stream, such as dams or artificial embankments.

The stream bed consists of flat shale, and in between each layer of shale is a layer of fine mud. This leads to the embedding of rocks which is a very poor habitat for macroinvertabrates as they prefer to live on the underside of the rocks. When the underside of the rocks become covered with mud the macroinvertebrates can no longer use that as their habitant which is what accounts for, we believe, a low population of stoneflies in the Lisha Kill.

When measured at the site, the stream was 19 feet wide and had an average depth of 0.68 feet; the greatest depth in the stream was 1.06 feet. The average velocity of the stream was 0.39 ft/sec with a discharge of 5.3 ft^3/sec. The discharge this year was similar to that of years previous; this amount of discharge creates riffles when the water flows over the rocks. With riffles, the water receives more air and allows for more life on the bottom of the stream.

Physical Data-

Interval (ft)	Depth (ft)	Flow Velocity (ft/sec)
0	0	
1	0.4	
2	0.6	
3	0.67	
4	0.72	
5	0.72	
6	0.75	
7	0.91	0.02
8	1.05	
9	1.06	
10	0.88	
11	0.95	
12	0.80	0.72
13	0.93	
14	0.96	
15	0.98	
16	0.31	
17	0.61	
18	0.24	0.43
19	0	



Chemical Parameters-

pH: The pH test indicates the hydrogen ion concentration of the sample. It measures the acidity of the stream and therefore, if the pH of the stream is unbalanced (too basic or too acidic) the ecosystem subsequently suffers. Our test recorded a pH of 8.3 which is a little on the high side, but still within the accepted values for pH.

Alkalinity: Alkalinity is a measure of how much acid the water can neutralize; a high alkalinity helps to protect the stream from abrupt ecological changes. The alkalinity of the Lisha Kill was recorded to be 174 parts per million which is within the accepted range of values.

Phosphates: Phosphates normally come from phosphate rock. They are a break-up of tetrahedral PO_4. They can enter streams in the form of fertilizers, detergents, erosion of phosphate rock, and/or human sewage. An excess of phosphates results in oxygen depletion due to algae blossoms. Our phosphate level was found to be around .05 to .1 parts per million which is the high side, yet still within the range of accepted values.

Nitrates: Nitrates are a form of combined nitrogen and oxygen. A measure of nitrates signifies that there are farm wastes and/or fertilizer deposits in the stream. We calculated 1 parts per million of nitrates in the Lisha Kill which is high, but acceptable.

Dissolved Oxygen: An acceptable measure of Dissolved Oxygen is crucial to the health of the inhabitants of a stream because the macroinvertebrates and fish life thrive on the oxygen found in the water. Dissolved Oxygen levels are decreased by the presence of decomposers and increased by the process of photosynthesis. Anoxia, the condition of decreased dissolved oxygen, is a result of an algae bloom, which increases carbon dioxide. Long winters, which would decrease photosynthesis, contribute to low levels of Dissolved Oxygen. Agricultural runoffs also result in algae blooms and low levels of Dissolved Oxygen. Our measure of Dissolved Oxygen, at 8.6 parts per million is acceptable and exhibits that there is minimal agricultural runoff affecting the stream.

Temperature: The temperature of the Lisha Kill was on the low side of the accepted range at 18.3 degrees Celsius. The temperature reflects the time of year in which we sample.

Chemical Data-

Test	Our Results	Duplicate	Accepted Values
pH	8.3	8.2	6.5-8.5
Alkalinity (ppm)	174	170	100-250
Phosphates (ppm)	0.1	0.05	<0.1
Nitrates (ppm)	1	1	<1
Dissolved Oxygen (ppm)	8.6	8.4	>4
Temperature (ºC)	18.3	18.1	18.3 – 23.9

Biological Parameters-

A Tier 2 assessment of the stream was conducted for our studies of the Lisha Kill. We determined the EPT Richness for each of our two samples. Our first sample had an EPT Richness of 2. An EPT Richness of 2, means that two different taxa of Ephemeroptera, Plecoptera, or Trichoptera were observed. We found our second sample to have an EPT Richness of 1 (one taxa was 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 2.6 while our second sample yielded a biotic index of 4.6. These numbers fall within the range of "non impacted" to "slightly impacted".

Through our analysis of Percent Model Affinity it was determined that the Lisha Kill falls within the range of "moderately to severely impacted". In the first of our two samples the Percent Model Affinity was 33.3%. This percent composition was derived from a macroinvertebrate population of 8.4% Ephemeroptera, 64.9% Trichoptera, 7.6% Beetle, 2.3% Midge, and 16.8% Other. The Percent Model Affinity of our second sample was 30.5%. This percent composition was derived from a macroinvertebrate population of 54.0% Trichoptera, 35% Beetle, 1% Midge, and 10% Other.

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. 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 5 to 12 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 (2003-2005)

	Biotic Index	Taxa Richness	EPT Richness	Percent Model Affinity	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
2005 Sample 1	2.6	10	2	33.3%	None to moderate
2005 Sample 2	4.6	9	1	30.5%	Slightly to moderate

Discussion: Based on the physical, chemical, and biological tests run on the Lisha Kill, the Environmental Studies Team has concluded that the monitoring site is slightly impacted by human pollutants. Any pollutants found in the stream are due to runoff from roadways and nearby lawns. We feel that the surrounding nature preserve acts a buffer absorbing pollutants before they reach the stream. One negative aspect of the Lisha Kill however, is the fluctuation in discharge which greatly effects the macroinvertebrate population.

Conclusions: The data shows that the Lisha Kill is a moderately healthy stream. We, the Environmental Studies Team at Niskayuna High School are resolved to continue our annual monitoring of the stream in order to detect and investigate any changes or negative impacts on the stream. There is discussion on whether or not we should scout locations further downstream to locate sites that may have a more favorable macroinvertebrate habitat.