The Physical, Biological, and Chemical Aspects of the Lisha Kill

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Environmental Study Team

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Abstract/Summary

The Environmental Study Team of Niskayuna High School has begun a long term monitoring project of the Lisha Kill in Niskayuna, New York. The goal of the study is to make sure that the stream remains unaffected by pollutants. Physical, biological and chemical tests were performed at this site and all results fell within the DEC acceptable ranges. Based on our results, this stream was proven to be very healthy and unaffected by pollutants. We plan on monitoring the Lisha Kill biannually and hope to test and monitor another site upstream of the original, so information about the stream's overall health could be gathered.

I. Background

We are conducting a long term monitoring project of the Lisha Kill, located within the Lisha Kill Preserve. The Preserve is a pristine forest located in the town of Niskayuna. Our sampling site is in close proximity to an old growth forest and located 1.5 miles from its confluence with the Mohawk River. The Lisha Kill maybe affected by non-point source pollution such as runoff from residential properties and heavily-trafficked roadways. Residential runoff likely contains fertilizers whereas roadway runoff includes salts, oils, and other automobile discharge. These are the initial results of our study of the Lisha Kill.

II. Results

Physical Parameters

Our study site is located at 42° 47.485' N, 73° 51.315' W, 256 feet above sea level. The stream is a headwater tributary in which the discharge is less then 20 cubic feet-per-second. It flows throughout the year and contains various pools and riffles. The riffles in and around our study area are approximately 8 m wide and 8-10 m long. There are also pools up- and downstream from our study site with maximum depths of 0.30-0.40 m.

At our site the stream is 6.1 meters wide with an average depth of 0.095 meters. We measured the average velocity with a flow meter to be 1.7 ft/s (0.5 m/s). We calculated the discharge to be 11.3ft^3/s (0.33 m^3/s). The maximum depth of the stream across our transect is 0.21 m.

The stream substrate is mainly gravel and cobbles that are 25-50% embedded. However, there are many regions of the stream that have a bedrock bottom. One of our concerns is the possible lack of habitat for macroinvertebrates.

There is no channel alteration. Stream straightening, dredging, artificial embankments, dams or bridge abutments are absent. Trees, woody plants, and soft green plants dominate the stream banks. There is some disruption of the riparian zone due to hiking trails, but not affecting full plant growth potential.

Chemical Parameters

Test	Our Results	Accepted Values
pH	**8.2**	**6.5-8.5**
Alkalinity	**> 200 ppm**	**20-200 ppm**
Phosphates	**0.0 ppm**	**< 0.1 ppm**
Nitrates	**0 ppm**	**< 1 ppm**
Dissolved Oxygen	**12.4 ppm**	**>4 →pollution >7→no fish**

pH**:** The pH test measures the acidity of the water body. In order to sustain and promote life in the stream, the pH value must be between 6.5 and 8.5 (if it is too low, it is too acidic; if it is too high, it is too basic). Our results show a pH of 8.2, which fits comfortably into the accepted range.

Alkalinity**:** Alkalinity is a measure of how well the water body is buffered. Essentially, the better buffered a stream is, the less the pH values will fluctuate. This means that a stream with a high alkalinity is better protected against sudden ecological changes, such as the dumping of sewage into the stream. Our results show that the Lisha Kill has an alkalinity of greater than 200 parts per million, which signifies that the stream is well buffered.

Phosphates/Nitrates**:** These tests measure the levels of nitrogen and phosphorous in the water body. Excessive amounts of these elements leads to eutrophication, which is characterized by excessive algal blooms, causing large changes in the dissolved oxygen levels and biological imbalances of fish and invertebrates. For both these tests, the values measured in the Lisha Kill are zero parts per million, showing that the Lisha Kill is not affected by agricultural runoff, which is the leading cause of elevated levels of phosphates and nitrates.

Dissolved Oxygen**:** Fish and macroinvertebrates do not obtain their oxygen from the air, but rather the dissolved oxygen molecules in the water they live in. D. O. is affected by the temperature, becoming larger when the water temperature is cooler, and vice versa. The D.O. value of the Lisha Kill when we tested it was 12.4 ppm, which is in the accepted range, and indicates that the stream is healthy.

Biological Parameters

We conducted a Tier 1 assessment of our study site. In our collection of specimens, there was a strong presence of ephemeroptera. However, we could not confirm the presence of at least three different species. We also identified in lesser numbers plecoptera, trichoptera, and coleoptera. Oligochaeta was absent in our specimen collection. This shows that the water body could not possibly be impacted would require further testing.

Benthic Macroinvertebrates

BMI Order	Criteria		Comments
Ephemeroptera (mayflies)	Must be numerous; at least 3 species present		Numerous Ephemeroptera were collected but our findings do not confirm the presence of at least three species.
Plecoptera (stoneflies)	Must be present	**X**	
Trichoptera (caddisflies)	Must be present but less abundant than mayflies	**X**	Not as abundant as mayflies and were predominantly fingernet caddisflies.
Coleoptera (beetles)	Must be present	**X**	
Oligochaeta (worms)	Must be absent or sparse	**X**	

***All five areas checked → non-impacted stream

***One or more unchecked → possible impact

III. Discussion:

The excellent state of the Lisha Kill, as shown by the physical, chemical, and biological data found, is well-explained by the fact that the stream runs through the Lisha Kill Preserve, and is essentially pristine and untouched. The results were somewhat better than expected, as the large residential developments and the small number of farms that are along the Lisha Kill would be expected to cause some runoff pollution. This was obviously not the case, as the both the nitrate and phosphate levels were zero parts per million. This may be because the residential developments are relatively new (within the last 10-15 years), and that any chemicals used on lawns have not had time enough to have a significant impact. Generally, the good condition of the stream can be attributed to its protection in the Lisha Kill Preserve.

IV. Conclusions/Suggestions:

The data we found about the Lisha Kill allows us to conclude that the stream is in good condition, and is not impacted by pollution. We suggest continuing testing at the same site as this study was based on, so that the health of the stream can be monitored throughout the year. We also propose finding another site upstream of the original, where testing could be conducted closer to the residential developments, so that more information about the stream's overall health could be gathered. Eventually, we would like to have even more sites, both upstream and downstream, so that the well being of the Lisha Kill could be more accurate assessed.