

The Study of the Possible Impact of Highway and Landfill Runoff on the Sandseakill

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Abstract/Summary:

The study of the health of the Sandseakill will help us better understand if the dump and highway runoff is affecting the stream. Each year this experiment is done to check up on the health of the stream. The study is used to make sure the stream remains stable. Three different tests are conducted. These include a macro invertebrate analysis, a chemical analysis, and a stream-flow analysis. The results proved that the Sandseakill was non-impacted or slightly impacted by the dump and highway runoff. This means that the health of the stream is not being impacted by runoff from the dump or highway.

Background:

All of the tests conducted during this experiment were conducted in the Sandseakill. The actual test site was in the town Princetown on the corner of Rt. 5S and Rynex Corners Rd. The stream bed is fairly rocky the banks of the stream are either wooded or grassy. The forest on either side causes the stream to be partially shaded. At this site there are two potential causes for pollution in the Sandseakill. One is the Thruway (I-90) that passes over the stream at this location. Litter, oil, salt and gasoline could find its way into the stream and affect the health of it. The other possible cause is the closed dump that is located upstream. People fear that possible leachate is making its way into the stream just below the Thruway overpass. To test whether either of these is affecting the health of the Sandseakill, there are two macro tests sites: one above the potential causes of pollution and one below the potential causes of pollution. There were also tests taken on two different days to make sure the data was accurate. This site was chosen because it is only a quarter of a mile away from where the Sandseakill empties into the Mohawk River. The Mohawk River is located in the Mohawk watershed which is part of the Hudson watershed.

Results:

September 28, 2006

On September 28, 2006 one group went to the Sandseakill and tested the health of the stream by conducting a macro invertebrate analysis, a chemical analysis and a stream-flow analysis.

For the macro invertebrate analysis on September 28, one group of students went upstream and two went downstream. The upstream group conducted one kick. From this kick the following results were found: EPT Richness- 5 (slightly impacted), Biotic Index- 4.5 (slightly impacted), and Percent Model Affinity- 37.05% (moderately impacted). Each downstream group conducted one kick each. The following results were found for downstream kick one: EPT Richness- 2 (moderately impacted), Biotic Index- 4.14 (non-impacted), and Percent Model Affinity- 31.9% (severely impacted). The following results were found for downstream kick two: EPT Richness- 4 (slightly impacted), Biotic index- 4.56 (slightly impacted), and Percent Model Affinity- 21.0% (severely impacted).

The chemistry test on September 28 consisted of measuring the alkalinity, pH, orthophosphate, and nitrates in the stream. The stream was found to have an alkalinity of 200 ppm of CaCo₃ and a pH of 8.5. The stream was found to have .2ppm of orthophosphates (PO₄) and 0 ppm of nitrates (NO₃).

The stream-flow test on September 28 showed that the average velocity of the stream was .164 m/s and an average discharge of .128 m/s.

October 5, 2006

The other group went to the Sandseakill on October 5, 2006 and conducted the same tests as the week before.

For the macro invertebrate analysis on October 5, one group went upstream and two went downstream. The upstream group conducted two kicks. On the first kick the data found was as follows: EPT Richness- 5 (slightly impacted), Biotic Index- 2.88 (non-impacted), and Percent Model Affinity- 66% (non-impacted). The second kick results are as followed: EPT Richness- 3 (slightly impacted), Biotic Index- 3.9 (slightly impacted), and Percent Model Affinity- 61% (slightly impacted). The two downstream groups conducted one kick each. The first kick found the following results: EPT Richness- 3 (slightly impacted), Biotic Index- 3.5 (non-impacted), and Percent Model Affinity- 53% (slightly impacted). The second kick found the following results: EPT Richness- 5 (slightly impacted), Biotic Index- 3.7 (non-impacted), and Percent Model Affinity- 54% (slightly impacted).

On October 5 the pH of the stream was the same as on September 28 with a reading of 8.5 but the alkalinity measured 110 ppm of CaCo₃. The tests conducted showed that the stream had 0 ppm of orthophosphates (PO₄); however, there were still 0 ppm of nitrates (NO₃).

The Sandseakill was flowing a little faster on October 5 at an average velocity of .287 m/s, but there was a decrease in average discharge with a reading of .075 m/s.

Results:

September 28, 2006

Chemistry:

Alkalinity	pH	Orthophosphate	Nitrates
200 ppm of CaCo3	8.5	.2 ppm of PO4	0 ppm NO3

Stream-flow:

Average Velocity	Average Discharge
.164 m/s	.128 cubic meters/second

Macro Invertebrate Analysis:

Replicate #	EPT Richness	Biotic Index	Percent Model Affinity
Upstream 1	5- Slightly Impacted	4.5- Slightly Impacted	37.05%- Moderately Impacted
Downstream 1	2- Moderately Impacted	4.14 Non-impacted	31.9%- Severely Impacted
Downstream 2	4- Slightly Impacted	4.56- Slightly Impacted	21.0%- Severely Impacted

October 5, 2006

Chemistry:

Alkalinity	pH	Orthophosphate	Nitrates
110 ppm of CaCo3	8.5	0 ppm of PO4	0 ppm NO3

Stream-flow:

Average Velocity	Average Discharge
.287 m/s	.073 cubic meters/second

Macro Invertebrate Analysis:

Replicate #	EPT Richness	Biotic Index	Percent Model Affinity
Upstream 1	5- Slightly Impacted	2.88 Non-impacted	66%- Non-impacted
Upstream 2	3- Slightly Impacted	3.90 Non-impacted	61%- Slightly Impacted
Downstream 1	3- Slightly Impacted	3.50 Non-impacted	53%- Slightly Impacted
Downstream 2	5- Slightly Impacted	3.70 Non-impacted	54%- Slightly Impacted

Conclusion:

According to all the data collected between the two days and all the tests, one can conclude that the Sandseakill is slightly impacted by either that dump runoff or the Thruway runoff. Nearly all the macro tests showed a non-impact or slightly impacted reading. The chemistry tests showed that the Sandseakill was very close to having the optimal levels for a healthy stream. When comparing the results from the upstream tests and the downstream tests one can conclude that the health of the stream is not impacted by the dump or highway runoff. The results for both the upstream tests and downstream tests found that both had the same level of impact.

There are three macro invertebrate analyses' that were conducted. Each macro tests some different aspect of the streams health. The EPT Richness test measures the number of Ephemeroptera, Plecoptera and Trichoptera there are in the stream. Since six out of the seven tests showed only a slight impact, it can be assumed that the stream is only slightly impacted. Another test is the Biotic Index. This takes the total biotic value of all the macro invertebrates collected and divides that by the total number of organisms collected. All of the collected results showed either a non-impact or slight impact. The Percent Model Affinity test tests how the stream being tested matches up to an ideal stream in New York. In September, the results implied that the stream was moderately or severely impacted while in October the results showed that the stream was slightly or non-impacted.

The results found from the chemical test also prove that the stream is healthy. The optimal pH for a stream is between 6.5 and 8.2. The test results found a pH of 8.5. This means that the water is unlikely to be directly harmful to fish, but indirect effects occur at this level due to chemical changes in the water. Alkalinity is the measure of a streams ability to resist a pH change. The test results found an alkalinity between 110 and 200 ppm. A total alkalinity of 100 to 200 ppm will stabilize the pH of a stream. The nitrate level of the stream was found to be 0 ppm. This is very good for the health of the stream. Unpolluted waters generally have a nitrate-nitrogen level below 1 ppm. The orthophosphate level was .2 ppm in September which is at a level that may stimulate plant growth sufficiently to surpass natural eutrophication rates. In October the level was 0 ppm which wouldn't contribute to increased plant growth.

The stream-flow data for both tests days were below the optimal levels. The optimal velocity for the BMI collection is between .45-.75 m/s. However, the average velocities that were measured were .128m/s and .287 m/s. This could have affected the data we collected through the BMI tests.

There may be some discrepancies in the results that were found. Throughout the analysis of the Sandseakill there were many sources of error. For example, when collecting and sorting the macro invertebrates, some may have been missed or misidentified. Many are so small that the students may have not seen them or have been counted as the wrong kind of organism. There is also the possibility of mathematical errors throughout the analysis. Finally, the depth and velocity of the stream may have not been ideal for macro invertebrate collection.

Overall the whole experiment is well set up. I would; however, suggest that the tests should be conducted in the same place each time the tests are conducted. I would mark where each macro invertebrate collection group started each kick, where the water was taken for the chemical analysis, and where the stream-flow data was taken from and when the tests were conducted again I would make sure the sites were very similar.

All of the data collected during the analysis of the Sandseakill can lead one to conclude that the stream is in good health. Nearly 85% of the macro invertebrate analyses' found that the Sandseakill was slightly or non-impacted by dump and Thruway runoff. The data from the chemical and stream flow analyses' also prove that the stream healthy. Based on all the data and observations one can conclude that the dump and Thruway runoff has little effect on the Sandseakill.