The Stream Analysis of the Impact Of A Closed Landfill on the Sandseakill Stream

Schalmont High School
By: Charlotte Regula, Christine Eisenhower, Alicia DeRusso

Abstract / Summary:

This stream study was designed to determine the effects, if any, of a closed landfill on its surrounding water shed, including the Sandseakill stream. This original study was asked for by the residents of Pattersonville, New York, almost 10 years ago when the dump was first closed. The Sandseakill stream is a Class 3 stream and stretches many miles within two different towns- Rotterdam and Pattersonville. Along this stream, there are two test sites that were chosen to test at; one above the potential landfill runoff and one below the potential landfill runoff.

Before starting this study, it was hypothesized that the closed landfill would indeed leak chemicals into the surrounding water shed and into this stream. At the conclusion of this study the hypothesis was neither proven nor disproved. This was because there was only a slight variation in the percent of dominant species (showing a less diverse population of macro invertebrates in the below site), and due to fluctuations in the D.O. reading and the alkalinity readings. With only slight fluctuations in these readings there was not enough data to prove nor disprove this hypothesis. It was shown that there was no drastic effect on the water shed from the potential dump runoff or from any other source of pollution. This was shown by the relative consistency between the two sites readings.

Background:

The Sandseakill stream test site is located in Pattersonville, New York. This stream stretches over several miles, and has a water shed covering two towns. The Sandseakill stream has a classification of a 3. Within this watershed this stream consists of various environments including commercial businesses, residential housing, woodlands, and farming communities. In these environments there are many potential sources of pollution. The most direct source of pollution is hypothesized to be the Rotterdam landfill, which is located about a mile from the stream.

This stream study was designed to determine the effects, if any, of a closed landfill on its surrounding water shed, and the Sandseakill Stream. This landfill has been closed for about 10 years, but the residents of Pattersonville have asked Schalmont High School Riverwatch to maintain monitoring the stream. Schalmont High School Riverwatch continues to monitor this site by testing in two locations along the stream. One site is located above the potential landfill runoff and the other is located below it.

There are three kinds of tests that are conducted at each site. One variety of tests conducted are chemistry sampling; this consists of dissolved oxygen testing, pH testing, temperature readings, alkalinity testing, and nitrate and phosphate testing. Chemistry sampling provides a "snap shot in time", or a chemical analysis of the water quality at that exact moment.

Another variety of tests conducted are macro invertebrate sampling; this consists of species

richness calculations, Ephemeroptera Plecoperta Trichoptera (EPT) Index testing, and percent dominant species calculations. Macro invertebrate sampling provides a long term analysis of how water quality in that season is doing through analyzing and studying the macro invertebrates in that area.

The last variety of tests conducted are Stream Flow. This line of testing involves taking site descriptions, velocity measurements, and finding stream discharge. These tests provide the data on velocity and volume of water in the given stream.

Results:

After conducting a complete analysis of the Sandseakill stream site located in Pattersonville, New York, it was found that for the site located above the potential landfill runoff, the overall water quality was a 24 or "Good" (slightly impacted) for the biotic integrity. Also, it was found that for the site located below the potential landfill runoff, the overall water quality was a 20 or "Fair" (moderately impacted) for the biotic integrity.

These findings were compiled using the following three tests: Species Richness, Percent Dominant Species and EPT Index. For above the potential landfill runoff test site, the tests resulted in a 3 for the Species Richness, a 12 for the Percent Dominant Species, and a 9 for the EPT Index. For below the potential landfill runoff test site, the tests resulted in a 3 for the Species Richness, an 8 for the Percent Dominant Species, and a 9 for the EPT Index.

Also, there were several chemistry tests conducted: dissolved oxygen, pH, alkalinity, and nitrates and phosphates. For above the potential landfill runoff test site, the tests resulted in a 11.0 ppm for D.O., an 8.0 for pH, a 158 ppm for alkalinity, a 0.5 ppm for nitrates, and a 0.5 ppm for phosphates. For below the potential landfill runoff test site, the tests resulted in a 11.7 ppm for D.O., an 8.0 for pH, a 148 ppm for alkalinity, a 0.5 ppm for nitrates, and a 0.5 ppm for phosphates.

The stream flow data concluded a total stream discharge of 6.278 ft3/sec.

Discussion:

The findings show that there was a less diverse ecosystem in below the potential landfill runoff site than in above. This displays that in the quarter mile stretch between these two sites, something has contaminated the water or the environments were just different enough that it caused this change in the ecosystem and the percent dominant species. This shows that in the down stream site there was less variety in the species of macro invertebrates.

Within this quarter mile gap there are many potential sourse of pollution, not excluding the potential landfill runoff. One possible source was the highway overpass that runs over a section of the stream. This overpass may contaminate the stream beneath it through oil spills, antifreeze spills, and road salt runoff. Also, the landfill itself may have caused the slight fluctuation in this test by leaking chemicals into the stream.

Another source for this change in the variation of species may lie within the slight differences of the environments of the two sites. The site description data displayed that the widths and depths of the two sites were indeed different. These differences could possibly cause various species of macro invertebrates in different stages of development to not be able to live in such environmental conditions.

Conclusions / Suggestions:

According to the compilation of all tests and procedures, no data was produced that could show exactly why there was a drop in the variation of species. There were many possible explanations for this change including the 0.7 ppm D.O. and a change of 10 ppm in alkalinity. Another explanation could be the slight change in the environment. It could be concluded that the study's findings were inclusive, although it did prove that there was no large impact on the stream due to the potential landfill runoff or any other source of pollution. This was shown by the fact that there was no large fluctuation in the data when analyzing the two sites.

When reviewing the study, there were a few suggestions that could be made for improving its effectiveness. One such suggestion would be to increase the number of test dates so there could be more samples of data to compare. Currently, there are two sites that are tested only twice a year, once in the fall and once in the spring. If two more test dates were to be created at the same test sites (one in the winter and one in the summer), this would give two more sets of data to analyze and compare against the others. Hopefully, it would ultimately show if there is in fact a constant change in the two stream sites and that there is contamination.

Appendix Data: *Data = Above the Potential Landfill runoff*

"Species" Richness

Number of "Species"	Value	Score
10	greater than 11	3

EPT Index (*Number of "Species"*)

Ephmeroptera	Plecoptera	Tricoptra	Value	Score
3	3	3	6-10	9

% Dominant "Species"

Name of Most Abundant Organisms	Number of Individuals	/ Total Individuals = % Dominance	Value	Score
Stone Fly Nymph	28	28%	Less than 30%	12

Biotic Index

Kick 1	988/10	99%	Excellent
Kick 2	990/10	99%	Excellent
Kick 3	962/10	96%	Excellent

(98% Excellent for above the potential landfill runoff)

Appendix Data: *Data = Below the Potential Landfill runoff*

"Species" Richness

Number of "Species"	Value	Score
10	greater than 11	3

EPT Index (*Number of "Species"*)

Ephmeroptera	Plecoptera	Tricoptra	Value	Score
3	3	3	6-10	9

% Dominant "Species"

Name of Most Abundant Organisms	Number of Individuals	/Total Individuals = % Dominance	Value	Score
Stone Fly Nymph	28	32%	30-50%	8

Biotic Index

Kick 1	610/10	61%	Good
Kick 2	888/10	88%	Excellent
Kick 3	990/10	99%	Excellent

(83% Excellent for below the potential landfill runoff)