Water Quality

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Abstract

Our project is about water quality because we find it to be important since water is fundamental for many things we depend on like drinking, fishing, vegetation, transportation, ecological processes and aquatic animal life. Boston is an urban area which means almost every stream is near bikeways, highways, houses, public areas and constructions. These factors daily affect the quality of streams. We worked with two streams, Millcreek located in Chelsea and Alebrook located in Cambridge. Once in the fields, we tested the stream's velocity, Ph, and flow rate. We also completed a habitat assessment and a general site assessment for each stream. Three water samples are collected on frozen bottles every time we visit each stream and are then stored on ice during transportation to the EPSCoR lab at Saint Michael's College and are refrigerated or frozen until analyzed. Once we receive results back from phosphorus, nitrogen and TSS levels, the results SS levels were within normal limits, but the phosphorous levels were too high

Introduction/ Background

-Water quality is the measure of chemical, physical, biological, and radiological characteristics in water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose.
-Total Suspended Solids (TSS) are solids in water that can be trapped by a filter. TSS can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage. High concentrations of suspended solids can cause many problems for stream health and aquatic life.
-High TSS can block light from reaching submerged vegetation.
-High TSS in a water body can often mean higher concentrations of bacteria, nutrients, pesticides, and metals in the water. These pollutants may attach to sediment particles on the land and be carried into water bodies with storm water. In the water, the pollutants may be released from the sediment or travel farther downstream
-High TSS can cause problems for industrial use, because the solids may clog or scour pipes and machinery.
TSS (mg/L) = ([A-B]*1000)/C
Where A = End weight of the filter
B = Initial weight of the filter
C = Volume of water filtered
-Phosphorus in water streams
Phosphorus gets into water in both urban and agricultural settings. Phosphorus is an essential element for plant life, but when there is too much of it in water, it can speed up eutrophication (a reduction in dissolved oxygen in water bodies caused by an increase of mineral and organic nutrients) of rivers and lakes.

Nitrate or Nitrogen:
-Is a nutrient needed for plant growth. Plants use nitrate to build protein. Nitrate enters streams from natural sources like decomposing plants and animals waste as well as human sources like sewage or fertilizer.
-A regular amount of Nitrate there should be in water is less than 1 mg/L
-A regular amount of Phosphorus there should be in water is 0.01 mg/L anything over 0.05 mg/L will have an impact.
-A regular amount of TSS there should be in water is 20 mg/L anything 40 mg/L and above may begin to appear cloudy

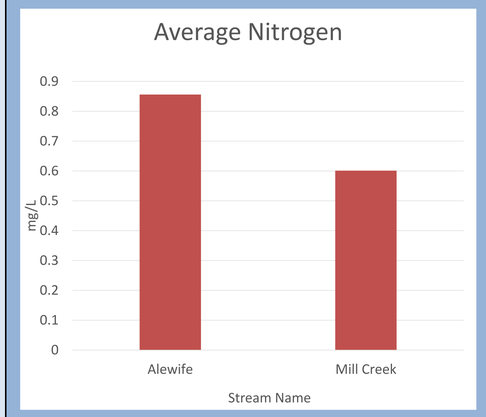
Materials

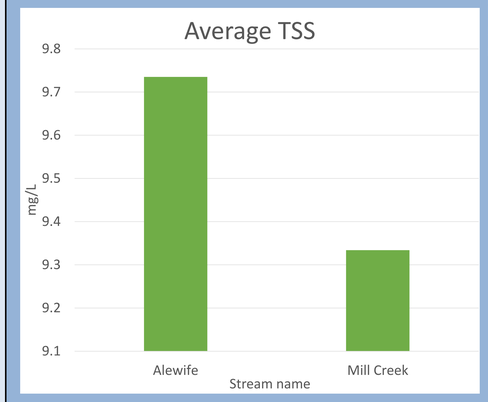
The materials we used were:
-Lake Alebrook
-Lake Millcreek
-6 Bottles
-Tennis ball
-Time watch
-PH meter
-Measuring tape
-Waiters
-Gloves
-Ice packs
-A cooler

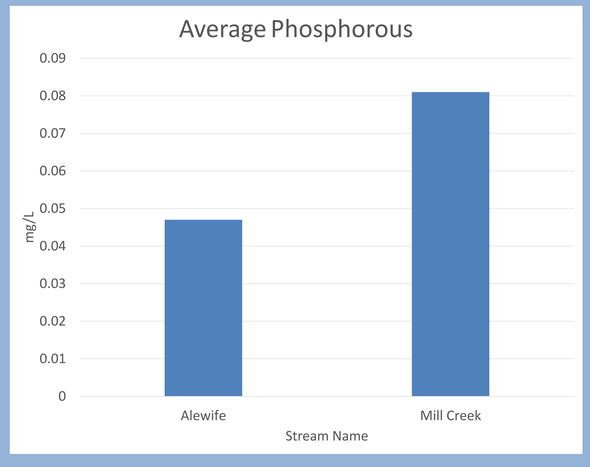
Procedure

1.Go to the assigned stream
2.Put on a wader
3.Once in the field, complete a Habitat Assessment and General Stream Site Assessment
4.Draw a brief sketch of the stream
5.Measure the pH of the stream with the pH meter
6.Take 3 samples of water each one going 3 feet apart upstream leaving an inch from the frozen bottle top empty.
7.Measure the length and width of the stream with a measuring tape
8.Measure the speed of the stream using a time watch by gently setting a tennis ball on the stream and measuring how long it takes for the tennis ball to get from destination A to destination B. Then, repeat this procedure 3 more times and find average.
9.Send 3 samples of water in the frozen bottles to EPSCoR labs.
10.Analyze Data

Data







Results/Conclusions

According to the regular amount of nitrogen which is 1 mg/L our nitrogen average for Alebrook and Millcreek is 856.1358 mg/L and 0.601451 mg/L which means that the nitrogen level in our urban streams are under the regular nitrogen level.
This also goes for the amount of TSS we have in our streams as well. The regular amount of TSS is 20 mg/L and we have 9.735mg/L and 9.3344 mg/L in Alebrook and Millcreek.
As for the amount of Phosphorus we have in our streams they are both above the regular amount which is 0.01 mg/L. In Alebrook the average amount of Phosphorus is 0.0472054mg/L and in Millcreek the average is 0.0817893333 mg/L.

In conclusion, Our hypothesis was proven wrong because we had predicted the streams to have poor water quality when in fact the streams had two out of the three elements below average, which is not bad at all, judging from where the two streams are located.

References

http://www.fondriest.com/environmental-measurements/parameters/water-quality/turbidity-total-suspended-solids-water-clarity/

http://www.fosc.org/WQData/WQParameters.htm

http://www.ecy.wa.gov/programs/wq/plants/management/joysmanual/4tss.html

TSS machinery.http://bcn.boulder.co.us/basin/data/NEW/info/TSS.html

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