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Goosefare Brook is Cleaner than it was in 2013

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Abstract

We wanted to make sure that the Goosefare Brook was healthy because the brook leads into the ocean which is a big tourist attraction and if the water is dirty, people going in the water could get sick. We went to three different places and tested the water, looked for macroinvertebrates, and counted biodiversity. All the water tested “good”. We found lots of macroinvertebrates in one place, not as many in another, and no macroinvertebrates in the last place. In one place we found a patch of phragmites with a biodiversity count of 4, in another place they found a small patch of phragmites with a biodiversity of 7, and in the last place they didn't find any phragmites they had a biodiversity count of 7+.

Introduction

Our investigation started with a Question: Is Goosefare Brook a Healthy Ecosystem? This question is important because the Goosefare Brook is a important watershed in Saco and Old Orchard Beach. The Goosefare Brook leads into our ocean and could cause people to get sick and not come to the beach and that can damage our economy.

We read an article from 2013 that states Goosefare Brook has been known to have dangerous levels of fecal matter bacteria in it. We know that it starts in Saco Heath, which is a pretty healthy ecosystem, and has endangered butterflies that live there. We know it empties into the ocean near Ocean Park. There used to be a huge salt water pool at Ocean Park, and today there are some phragmites there.

We know phragmites are a super invasive plant which takes over. We know phragmites makes a wall, its stem is hollow and round, and it has long sword like alternately placed leaves. We know Megan from the DEP continues to test the water because it has been “listed” as an “impaired” stream, and they are trying to figure out where the pollution comes from.

The purpose of our investigation is to see if the Goosefare Brook is healthier now than it was in 2013. We want to look at three different factors that will tell us if the Goosefare Brook is healthy or not. We will be testing the water, searching for macroinvertebrates, and looking to see if there is any phragmites. Testing the water will tell us if there is still fecal matter in it, the macroinvertebrates will tell us how healthy the water is, and if there are phragmites there is less biodiversity and places without phragmites have more biodiversity.

I think we will discover that Goosefare Brook is a healthy-ish ecosystem, because once people found out the problems in 2013 they would find a way to fix it. If there's still fecal matter in the water it's probably not a very healthy ecosystem.

Methods

The group that tested the water used a LaMotte Water Monitoring kit, test tubes, testing tablets, and a thermometer. They used a digital meter from the Department of Environmental Protection that measured conductivity and a refractometer for testing salinity. They collected data on a sheet called Water Testing: Goosefare Brook.

The group that investigated phragmites and biodiversity used a GPS, quadrats, and a science notebook with species identification pages. They had an iPad to take photos. They wore waders and boots so they could go in the water. They collected data on a sheet called Species & Habitat Survey: Freshwater Habitats.

The group that looked for macroinvertebrates used a Macroinvertebrate Identification sheet from Vital Signs, a Macroinvertebrate Data sheet from Vital Signs, a Macroinvertebrate Stream Health Index from Vital Signs, an iPad for taking photos, a pencil for recording data with, and a clipboard for recording data.

The group that tested the water used the LaMotte Water Monitoring kit tablets for testing the dissolved oxygen, nitrates, phosphates, pH levels, and coliform bacteria. We also tested the water for salinity using a refractometer from the DEP, and we used a digital meter from the DEP to test for conductivity.

The group that looked for macroinvertebrates scooped up muck from the bottom of the water body in a pie pan and watched until they saw something moving. Then they would scoop the moving thing into a different or smaller dish with a spoon and observe it with a magnifying glass and identify it using a Guide to Macroinvertebrate Pollution Tolerance Chart, and they used the Macroinvertebrate Stream Health Index

The group that searched for phragmites looked near small water bodies. Once they found a place to put their quadrat and counted the biodiversity in a square meter they were looking how many different species there were and then if there was phragmites they also estimated the percentage of the area covered.



The photo on the left shows students identifying phragmites near Trout Brook. The photo on the right shows a quadrat with phragmites at Old Salt Tributary.

Results

Trout Brook

Macroinvertebrates	Water Testers	Plants
The macroinvertebrate team found a cadice fly case, caddis fly larva, riffle beetles, gilled snails, dragonfly nymph, water bugs and yellow spotted salamander.	The water testing team found out that the water was pretty healthy the ph level was 7 = good, the dissolved oxygen was 11 = good, and the nitrates and phosphates were low.	The plant team found phragmites, butterflies, mosquitoes, songbird, oil in the water, and cattails.

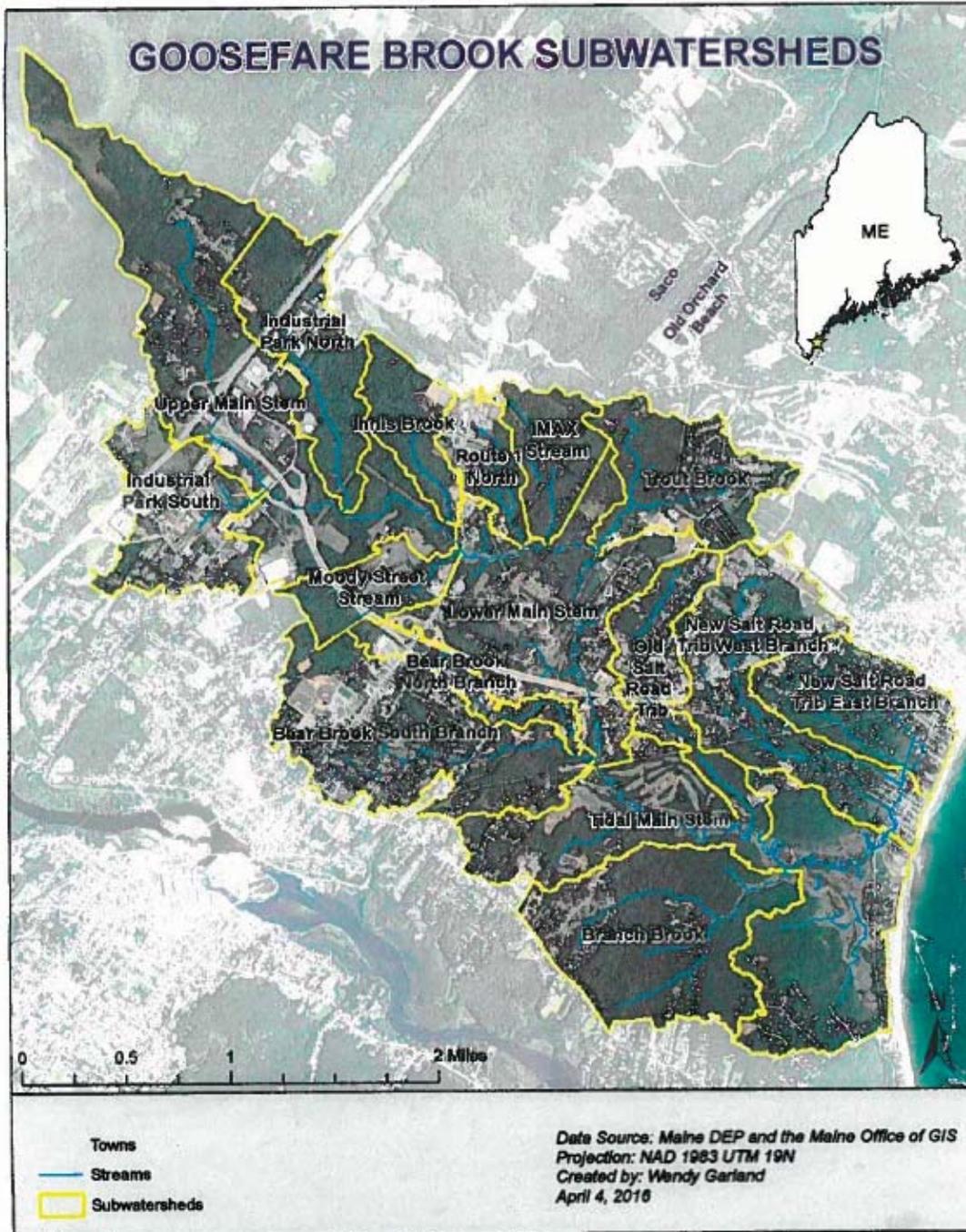
Goosefare Pond

Macroinvertebrates	Water Testing	Plants
The macroinvertebrate team only a few level 2 macroinvertebrates it could be good or somewhat polluted.	Ph level 7 = good Dissolved oxygen 7 = decent Nitrates= less than 5 ppm/low Phosphate= less than 2 ppm/low	No phragmites

Old Salt Tributary

Macroinvertebrates	Water Testing	Plants
Not many not sure if dirty water or just hard to find	Ph levels 7= good Dissolved oxygen 9= good Nitrates = less than 5 ppm/low	Phragmites found only small patch Lots of other plants and animals = pretty good biodiversity

All the information in the table above tells about our results from the three different places.

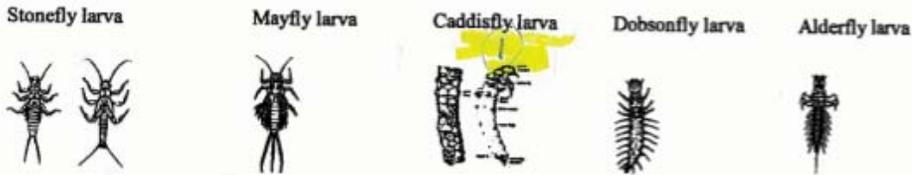


This map shows the source of Goosefare Brook and the sub watersheds. We investigated three of the sub watersheds: Innsbrook in Saco, Trout Brook and Old Salt Tributary both on the Old Orchard Beach side.

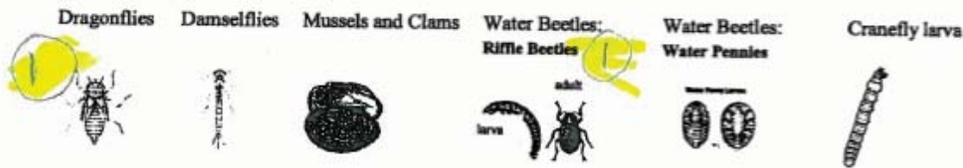
Trout Brook

Guide to Macroinvertebrate Pollution Tolerance Groups

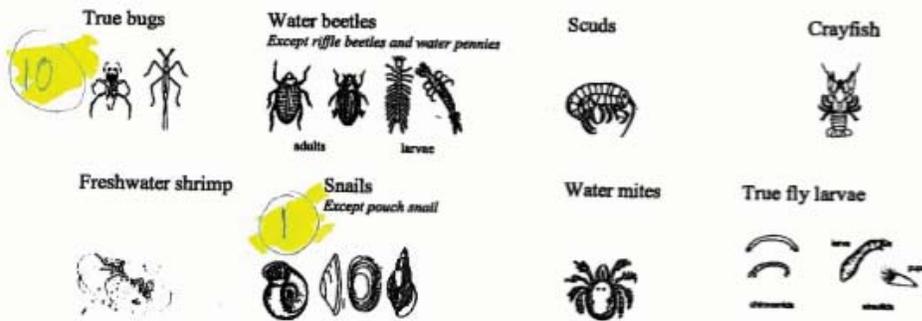
Group 1: Sensitive. Most animals in Group 1 are quite sensitive to pollution. They live in clean water with plenty of oxygen, and indicate healthy stream conditions when common or abundant. In very polluted waters, few (if any) animals in this group will be able to survive.



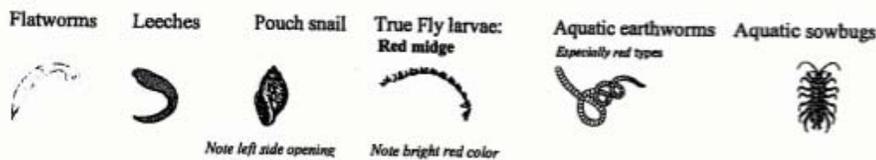
Group 2: Somewhat Sensitive. Most Group 2 animals are relatively sensitive, but can tolerate some pollution and slightly reduced levels of oxygen in the water.



Group 3: Facultative (wide range of tolerance to pollution): Facultative animals typically can live in a wide range of different habitats, and are found in both healthy water bodies and somewhat polluted sites. Within this group, certain species are more sensitive while others are more tolerant.



Group 4: Tolerant. In general, animals in Group 4 are tolerant to pollution, although some types are more sensitive than others. They are often found in healthy water bodies in low numbers, however the presence of large numbers of Group 4 animals typically indicates poor water quality. This is especially true if animals from Groups 1 and 2 are absent.



This chart shows the macroinvertebrates that we found at Trout Brook and their pollution tolerance.

9/27/17 Trout Brook

Maddy + Kailee

Macroinvertebrate Stream Health Index¹

Aquatic macroinvertebrates are animals without backbones (insects, worms, snails, etc.) living in the water that are big enough to see without using a microscope. We can determine the health of a stream or other water body by looking at the number and types of macroinvertebrates living there, along with information about how sensitive or tolerant each animal is to pollution. Use the *Guide to Macroinvertebrate Tolerance Groups* to calculate the Stream Health Index score based on your macroinvertebrate community sample.

Step 1. For each pollution tolerance group, record the total number of animals in the spaces below.

Step 2. Multiply the number of animals in each group by the factor shown and record the results.

Step 3. Add the number of animals for all groups and record the total where indicated.

Step 4. Add the values from Step 2 for all groups and record the total where indicated.

Step 5. Divide the total value from Step 4 by the total number of animals from Step 3 to obtain the Stream Health Index score. Use the chart at the bottom of the page to determine the Stream Health Category.

Number of Group 1 animals	<u>1</u>	x	4	=	<u>4</u>
Number of Group 2 animals	<u>2</u>	x	3	=	<u>6</u>
Number of Group 3 animals	<u>11</u>	x	2	=	<u>22</u>
Number of Group 4 animals	<u>0</u>	x	1	=	<u>0</u>
Total animals (all groups)	<u>14</u>				
			Total value (all groups)		<u>32</u>

Total value 32 ÷ Total animals 14 = Index Score 2.28

Stream Health Category (Excellent, good, fair or poor): Fair

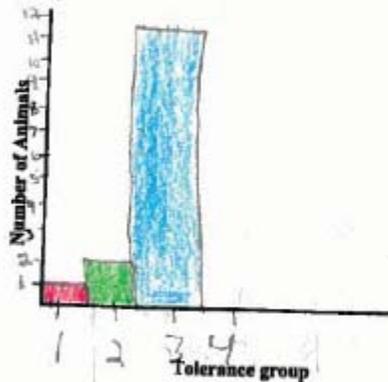
Stream Health Index

Excellent.....3.6 and higher

Good.....2.6 - 3.5

Fair.....2.1 - 2.5

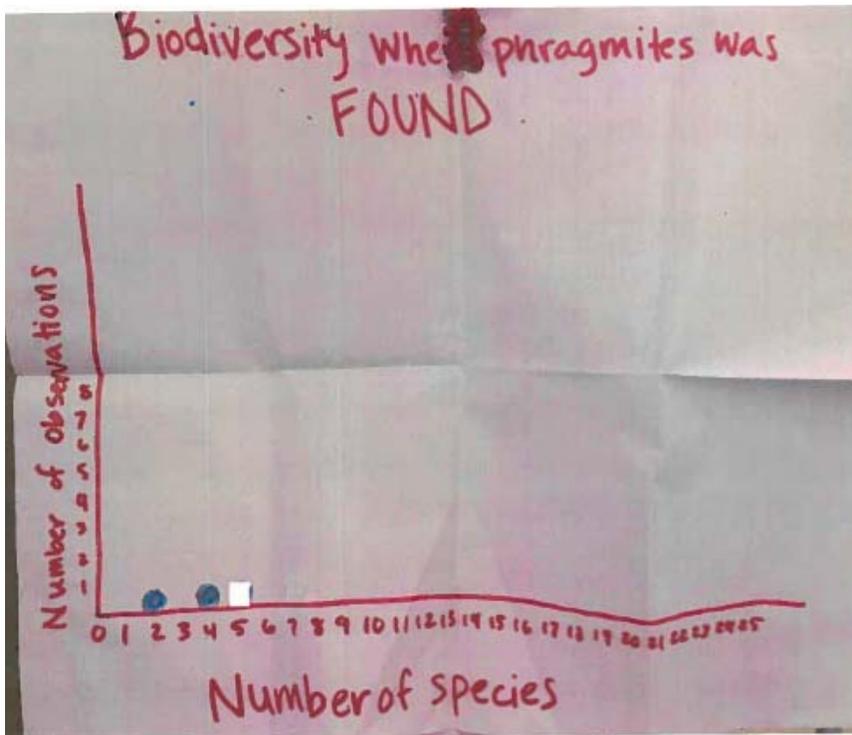
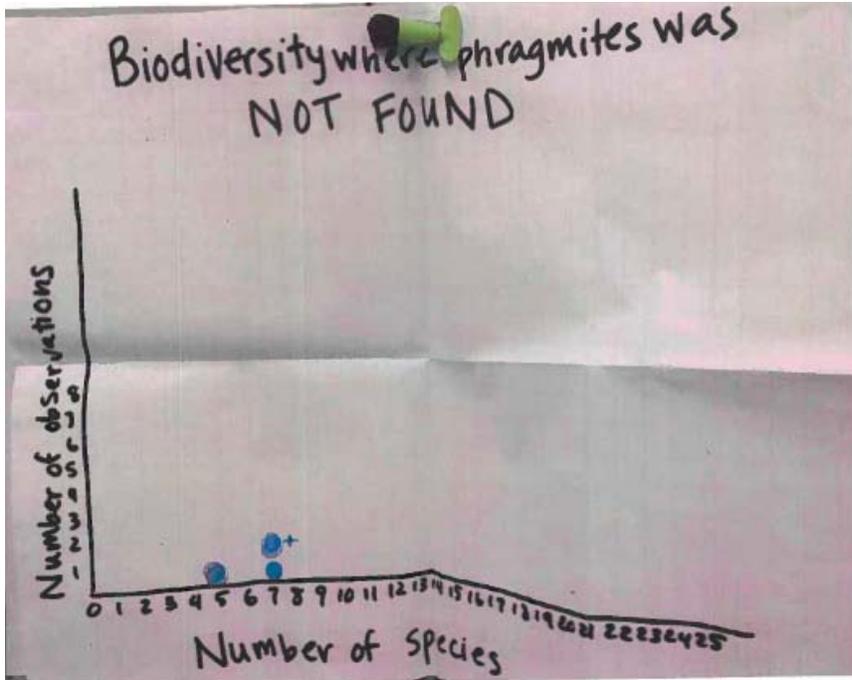
Poor.....1.0 - 2.0



Challenge: Create a graph of the number of animals in each tolerance group in the space provided above.

¹ Adapted from Citizen Monitoring Biotic Index, University of Wisconsin 2014, Water Action Volunteers - Volunteer Monitoring Factsheet Series, watermonitoring.uwex.edu/web/monitoring/sheets.html

This is the Macroinvertebrate Stream Health Index we completed for Trout Brook. It shows the number of animals in different groups and says that Trout Brook stream health is fair.



The chart with two dots shows the biodiversity where phragmites were found at Trout Brook and Old Salt Tributary. The chart with three dots shows the biodiversity where there was no phragmites at Trout Brook, Old Salt Tributary, and Goosefare Pond. There are more species where phragmites was not found.

Conclusions

Is Goosefare Brook a healthy ecosystem? I believe, from all the data we collected, Goosefare Brook is a pretty healthy ecosystem. I believe that the water quality is the most important part because that's the water going into the ocean, and people and animals in or near the water could get sick if the water is dirty. In all three places that we tested, the water quality was "good". When we went to Trout Brook, Old Salt Tributary, and Goosefare Pond, we did some water tests and we found that the water was pretty healthy. When we went to Trout Brook, Old Salt Tributary, and Goosefare Pond we did a biodiversity count in a square meter. It's important to do a biodiversity count where there is phragmites to see how many species are living near phragmites. When we went to Trout Brook we found lots of macroinvertebrates that are sensitive to pollution. When we went to Old Salt Tributary we didn't find many. When we went to Goosefare Pond we found some level two macroinvertebrates which means it could be clean or could be somewhat polluted. That's why I still believe that Goosefare Brook is a healthy ecosystem. Other people could think that it's still dirty because we didn't find any macroinvertebrates when we went to Old Salt Tributary. We could go search again and might and find some. Two of the sites we visited had phragmites and we can help get rid of them by cutting off the plume, which contains the seeds. The DEP will keep testing the water to see if it gets any better or worse, especially if it gets high levels of dangerous bacteria so the beach gets shut down. Hopefully the water will stay as clean as it has been in 2016.

Sources

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