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A Closer Look: Second Herring Brook

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Brought to you by

Norwell High School's Watershed Class

Who We Are:

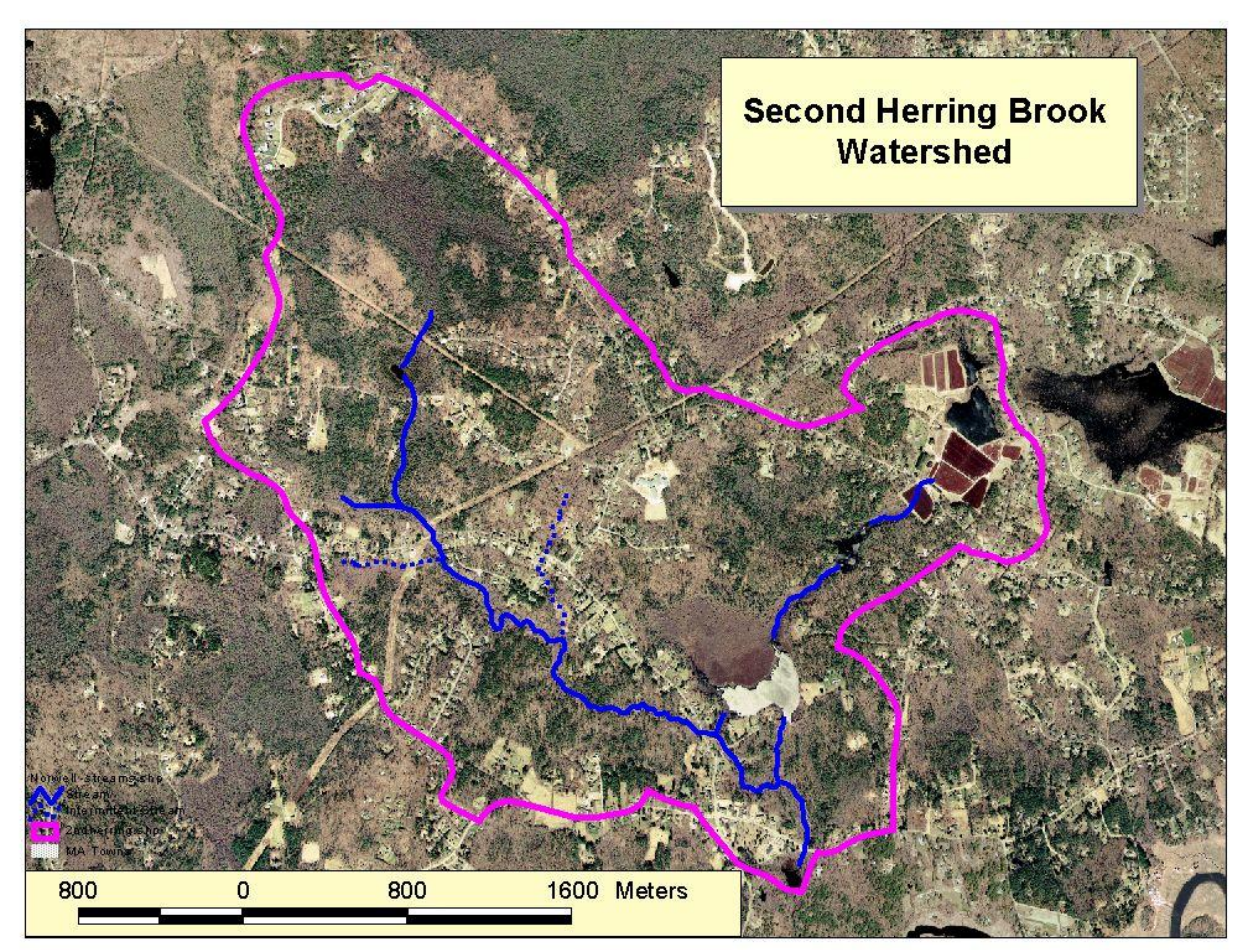
Norwell High School Watershed

Watershed is a class that you can take once you are either a Sophomore, Junior, or Senior.

This is the first time that our school has run this course, and it has become a very popular alternative to many “lab” science classes.

We are very excited to be the very first Watershed class in Norwell High School history!

Where is our Watershed located?



- Second Herring Brook Watershed is in the town of Norwell, MA.
- Our testing site was located in Norris reservation, a piece of land once used by Native Americans for fishing.
- The Watershed Boundaries are shown by the pink outline, the Brook shown in blue.

What is our Watershed area used for?

Dark green = Forestry.

Lime green = Open land.

Light Green = Pasture

Light Yellow = Residential areas.

Green Spots = Non-Forested wetlands.

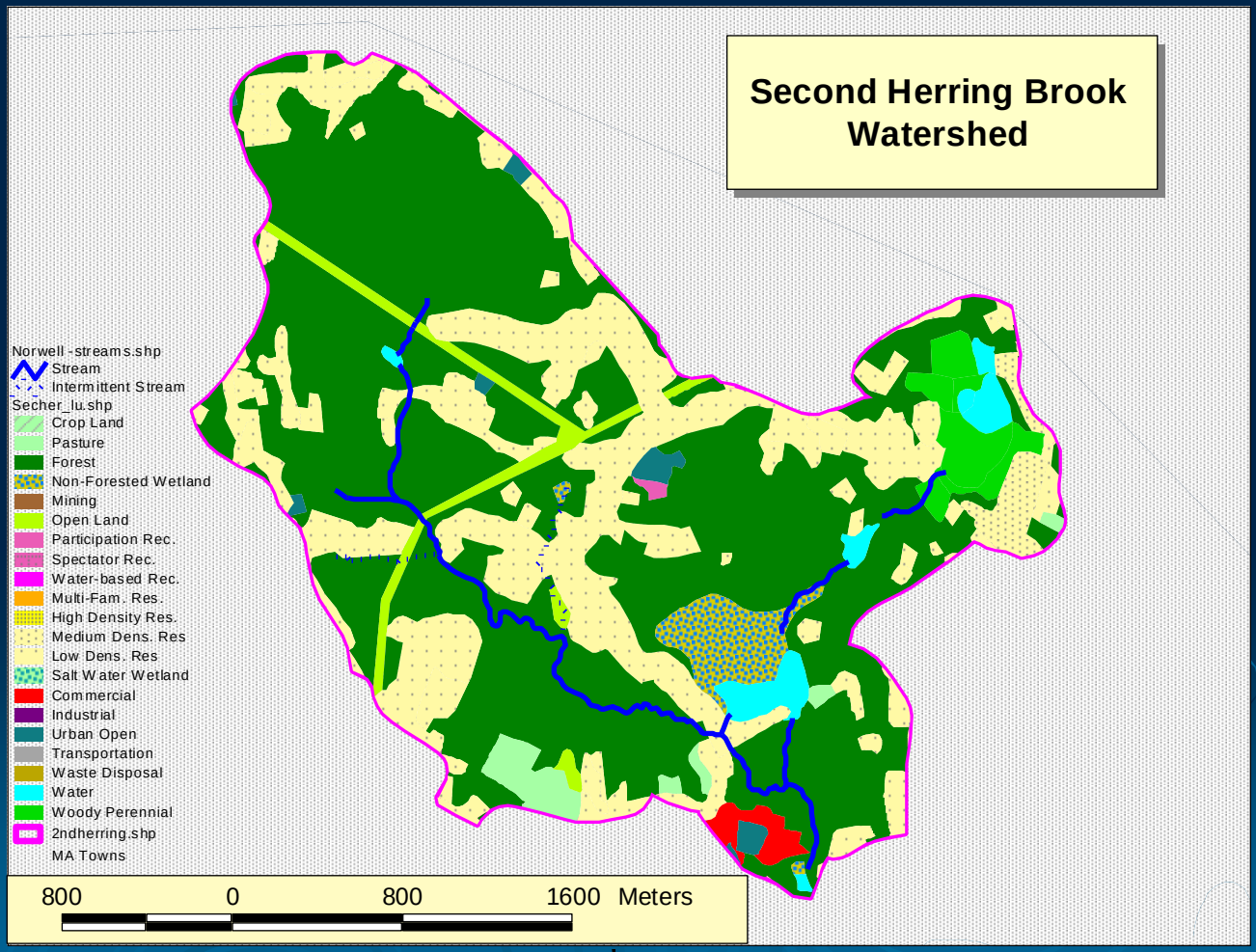
Magenta = Recreation

Teal = Urban open area

Turquoise = Water body

Blue = Stream

Red = Commercial Area



Our Resource:

Second Herring Brook

We'll Show You What We've Learned...

Step...

By Step....

Starting now...

OUR FIRST TEST

Dissolved Oxygen

What *IS* Dissolved Oxygen?

Dissolved oxygen is one of the best indicators of the health of a water ecosystem.

Dissolved oxygen can range from 0-18 parts per million (ppm).

Most natural water systems require 5-6 ppm to support a diverse population.

What did we find out?

Over a period of 24 Hours, our body of water averaged a nine ppm. dissolved oxygen level.

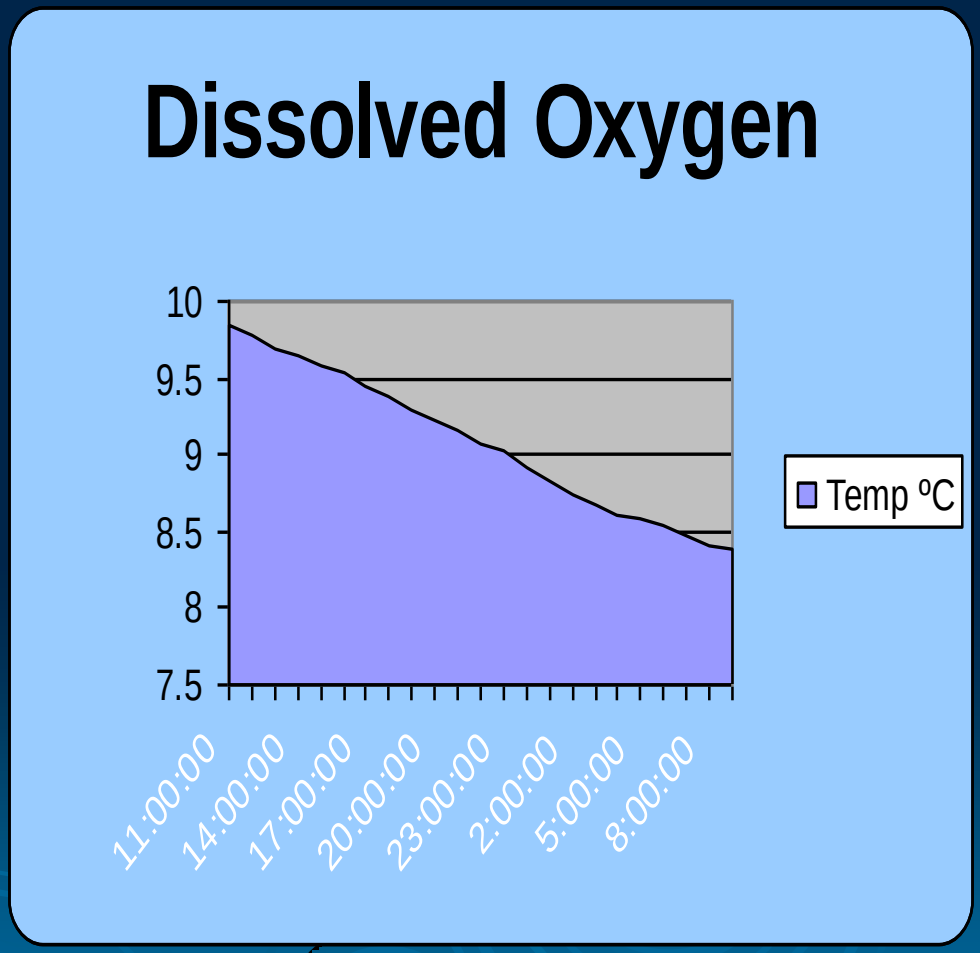
This level is considered healthy, and we were able to conclude that our water is not at a dangerous level at all.

Did you know...

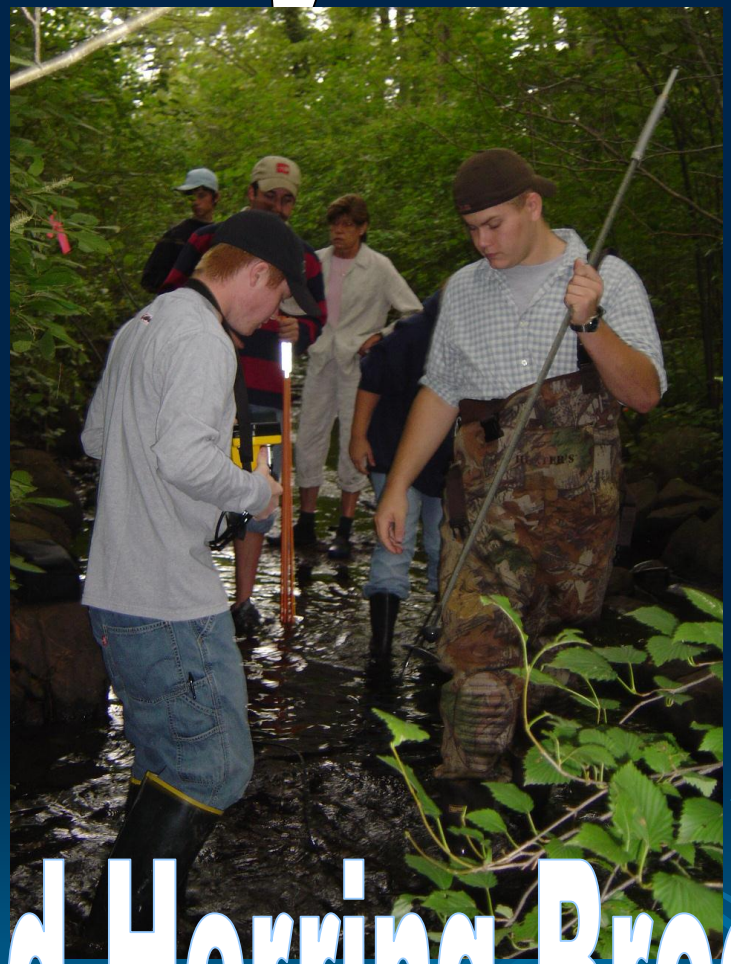
- The temperature of the water can affect the dissolved oxygen levels.
- We measured the temperature of the water every hour for 24 hours, using the "Sigma 900," on loan from Bridgewater State.
- As water temperature decreases, so do the dissolved oxygen levels.

We can see here…

- As the day goes on, the temperature of the water constantly decreases.
- Our data shows that temperature and D.O. are directly related;
  - As the temperature decreases, the Dissolved Oxygen level also decreases



What did we study next?



The Flow of Second Herring Brook

Flow can be defined as:

An amount of water traveling past a fixed point in feet per second..

If we calculate the flow of a river, we can find out how many gallons of water travel down the stream in any given time frame.

With this information, we can calculate how many chemicals and fertilizers are running through our brook <u>every day</u>!

The Faster the water current, the faster the chemicals are carried through the water.

A member of the class, marking off sections to accurately measure the flow

What tools did we use to find the flow?

- A flow-meter, marked off in different segments (measurements), enabled us to collect accurate flow data.

- At the end of the flow meter, there is a device which measures how much water is flowing down the stream per second.

- In order to do this, we had to place the meter %60 down from the surface of the water.

Flow can teach us many things about the health of a body of water:

- We can learn how many nitrates and phosphates travel through the stream, and at what rate.

Fact: The Faster the water current, the faster the chemicals are being carried through the water.

We call this "Calculating the Load"

With our flow meters, we were able to learn how much water flows through Second Herring Brook (in Liters per Second)

We found that our brook pumps out 126 liters of water per second!

We used the Sigma 900 in order to calculate how many different chemicals flowed through our brook everyday.

These are the things we were able to find and calculate the load of in Second Herring Brook:

- Nitrates
- Phosphates

What are Nitrates?

- Nitrates are a bi-product of animal waste.
- They can also originate from Chemical fertilizers, which provide nitrogen for plants in the form of nitrates.
- Having too many nitrates means you have too much human and or animal waste in your water supply, which is not a good thing.

We Found That:

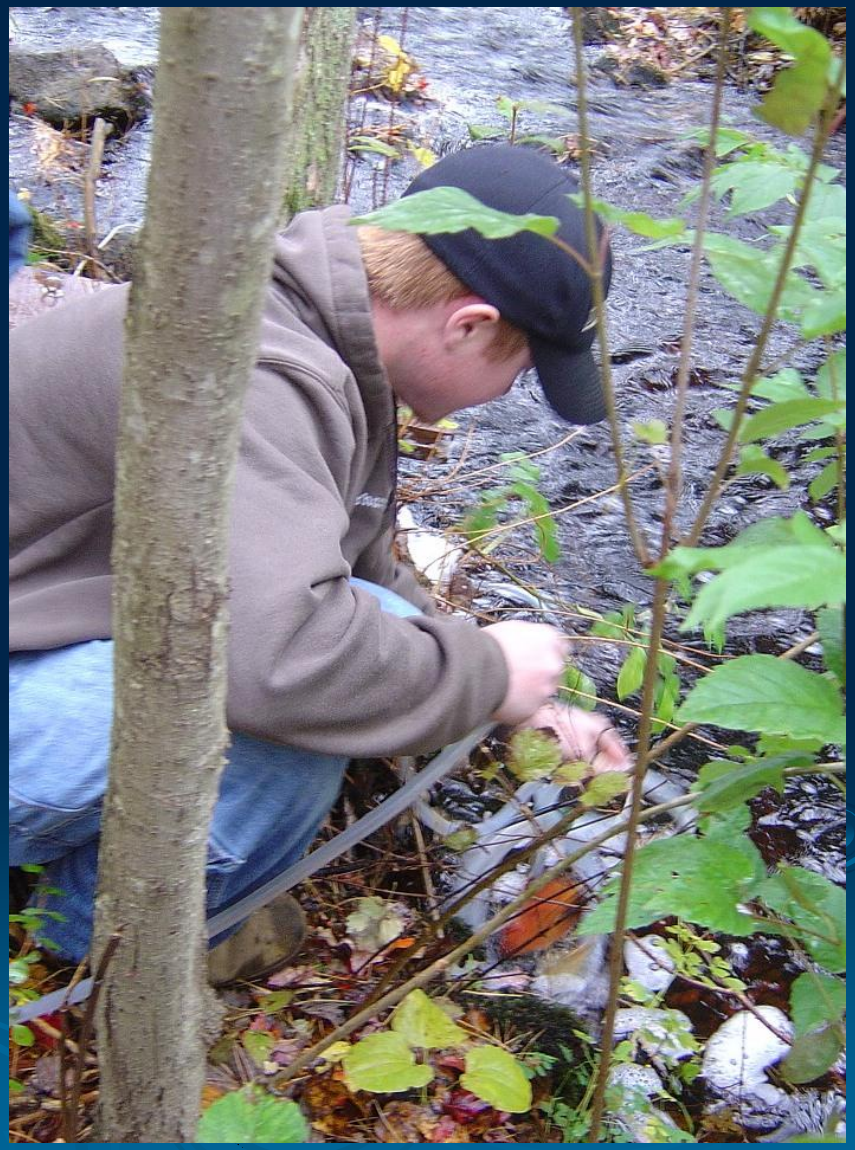
- For every liter of water that travels through our brook, there are .076 milligrams of Nitrate materials.
- The standard level of nitrates for clean water is less than 1.0 parts per million (ppm)
- From this, we found that Second Herring Brook does not have a problem with Nitrates.

What are Phosphates?

- Phosphates are plant nutrients that naturally occur in low levels in nature.
- Phosphates can originate from many different sources, including detergents, potato processing, cattle feedlot runoff, and human sewage.
- 84% of the phosphates entering the nations surface water are from non-point sources.
  - This means that we do not know where the source of these phosphates originates from.

What were our findings?

- In order for water to be considered clean, the water must have less than .1 ppm phosphate material.
- There were only .0073 mg per liter (ppm) in our watershed.
- We are fortunate to not have to worry about phosphates in our water.



Our Next test:

Fecal Coliform Bacteria

Fecal Coliform Bacteria

- The presence of fecal coliform bacteria indicates that the water has been contaminated with the fecal material of man or other animals.
- This presence is an indicator that a potential health risk exists for individuals exposed to this water.

What are the current standards for fecal coliform bacteria?

- For body contact recreation, there must be fewer than 200 colonies per 100mL
- The fishing and boating standard is 1000 colonies per 100 mL
- Domestic water supply standards (for treatment) is 2000 colonies per 100 mL
- The drinking water standard is less than 1 colony per 100 mL of water.

Information from www.switzerland.k12in.us/watershed/fecal.html

We used a wet incubator in order to find out how much bacteria is in our watershed

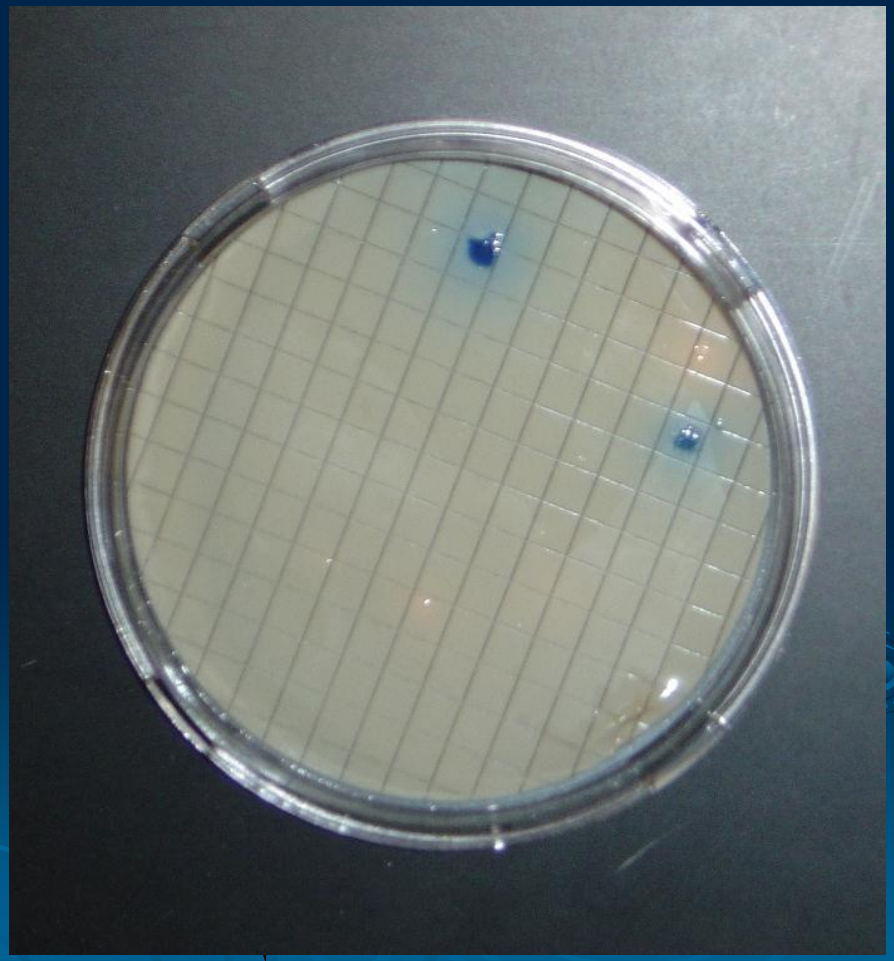
We filled individual plastic bags with samples of the water from our brook.

We then took the bags back to the wet incubator in the lab at our school to test the water.

After A Series of Tests...

In one plate, we found that there were 30 fecal colonies per 100 mL of stream water.

In the another plate, we found that there were 20 colonies per 100mL of water.



According to our data:

- The amount of fecal coliform bacteria in our water exceeds the drinking water standard.
  - With treatment, our water would be safe to drink.
- It would be safe to fish and boat in our brook.
- It would be okay to swim in our brook.

Macroinvertebrates

What can we learn from Macroinvertebrates in our water?

- We were able to find out how healthy our body of water was through the types of bugs that we found.
- Certain types of bugs can tell us things about our water that we were unable to find out through other tests.

How were be able to collect our bugs?

Tools: Bucket, Net, Hands, Feet

Our Method:

A person would stand upstream with and rub rocks with their hands and feet in order to loosen the bugs from the rocks.

Then, a person below them would be waiting with a net, ready to catch the bugs that are freed.

Next, we would sort through the bugs in the classroom into their different categories, putting them inside jars.

In a single day, we would collect anywhere from 10 to 100 bugs!

Macroinvertebrates we found in Second Herring Brook:

Order:	Number:
Isopoda	24
Coleoptera	2
Amphipoda	65
Hirudinea	7
Diptera	103
Odonata	11
Megaloptera	11
Pelecypoda	35
Gastropoda	2
Hemiptera	1
Trichoptera	186

In all, how many bugs did we find?

- We were able to collect a total of 447 macro-invertebrates in our brook.
- There were 11 different species of bugs.
- The most commonly found was the diptera.

We did not find any bugs that did not belong, which tells us that we have a healthy brook.

What did the bugs we found tell us?

As organic Pollution increases, organisms with low tolerance may disappear from the brook.

Organisms with high tolerance may increase in number as the pollution increases.

According to our total calculations of macroinvertebrates, second herring brook is *moderately impaired* as far as organic pollution is concerned.

Hopefully what we have learned and shared with you inspires you to go out there and learn about the watershed in your own home town!

...Watershed was and still is one of the best classes available at Norwell High, all thanks to the hard work that everyone involved put into it.

Members of our Class:

THANK YOU

We wouldn't have been able to do any of this without the help of these people and more:

Dr. Curry

Jack Browne

Michael Murray

Bridgewater State

Without you, this never would have ever happened, and we'd probably have just taken astronomy class...