A Stream Water Quality Report For The Town Of Shutesbury

Prepared By the
Shutesbury Elementary School
5/6 Grade - Mr. Berger's Class

Based on the research done by
the 5/6 Grade East

October 1998

Introduction and Summary of Results

The 5/6th East class in Shutesbury Elementary School of 1998/1999 is studying water. We're doing two service projects. One, we're testing the water quality of streams in Shutesbury. Two, we're testing sample wells throughout the town for mineral content. This report explains our findings from the stream study.

We chose nine streams, which were most of the main streams in town. The streams we sampled were: Nurse Brook, Camel Brook, Atherton Brook, Swift River West Fork, Saw Mill River, South Brook, Dean Brook, Adams Brook, and Roaring Brook. We tested them for:

1. Temperature
2. potency of Hydrogen (pH)
3. Dissolved Oxygen (D.O.)
4. Biochemical Oxygen Demand (B.O.D)
5. Nitrates
6. Salinity
7. Turbidity
8. Total Coliform Bacteria

Our testing took place in October 1998.

We got a lot of help from water experts. We would like to thank Mr. Clif Read from the Metropolitan District Commission at the Quabbin. He provided us with the test kits, and accompanied us for some of the tests. We would also like to thank Ms. Jessica Harris, and Mr. Jon Kidder of Hampshire College who helped us with our testing. We would also like to thank Mr. Philip Lamoth of the M.D.C. for making us three G.I.S. maps of the town of Shutesbury which allowed us to analyze our data.

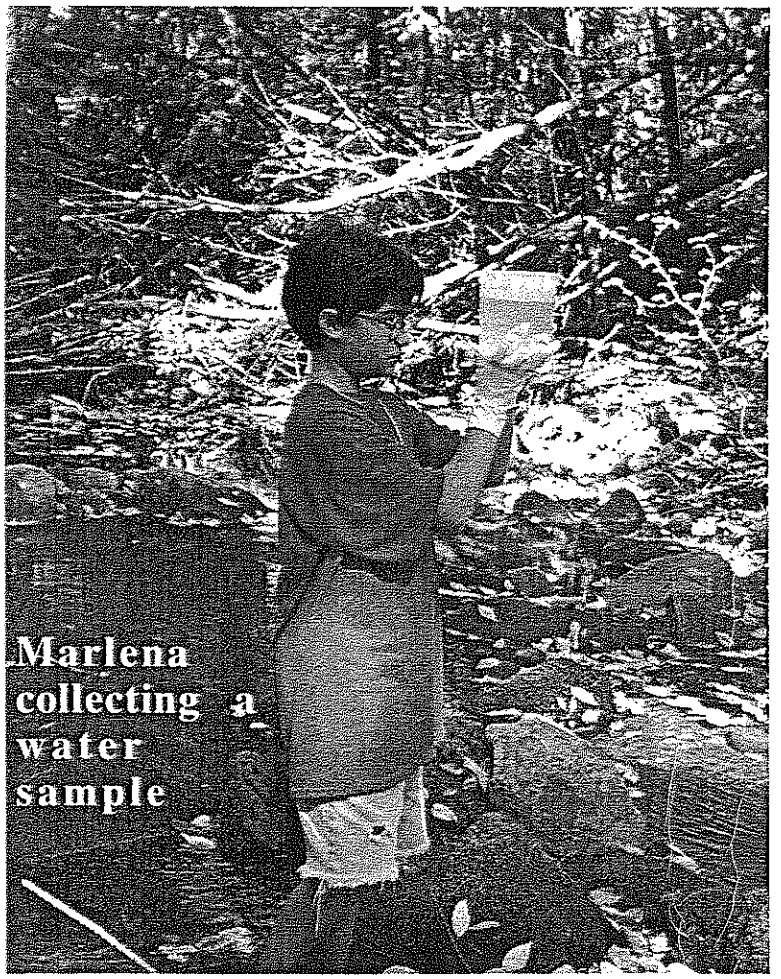
To summarize our findings, we would like to say we have good news to share. None of our tests displeased us.

We found no major pollution. Every stream seemed safe for wildlife. Dissolved oxygen was good in all. Nitrates were low in all. pH was healthy in all. We did find coliform bacteria in all streams in all different amounts, but we are not worried about it. We expected to find some because mammals and birds live there.

If you have any questions about our results, please feel free to contact us at:

Shutesbury Elementary School
23 West Pelham Rd.
Shutesbury MA.01072
FAX 413-259-1531
PHONE 413-259-1212

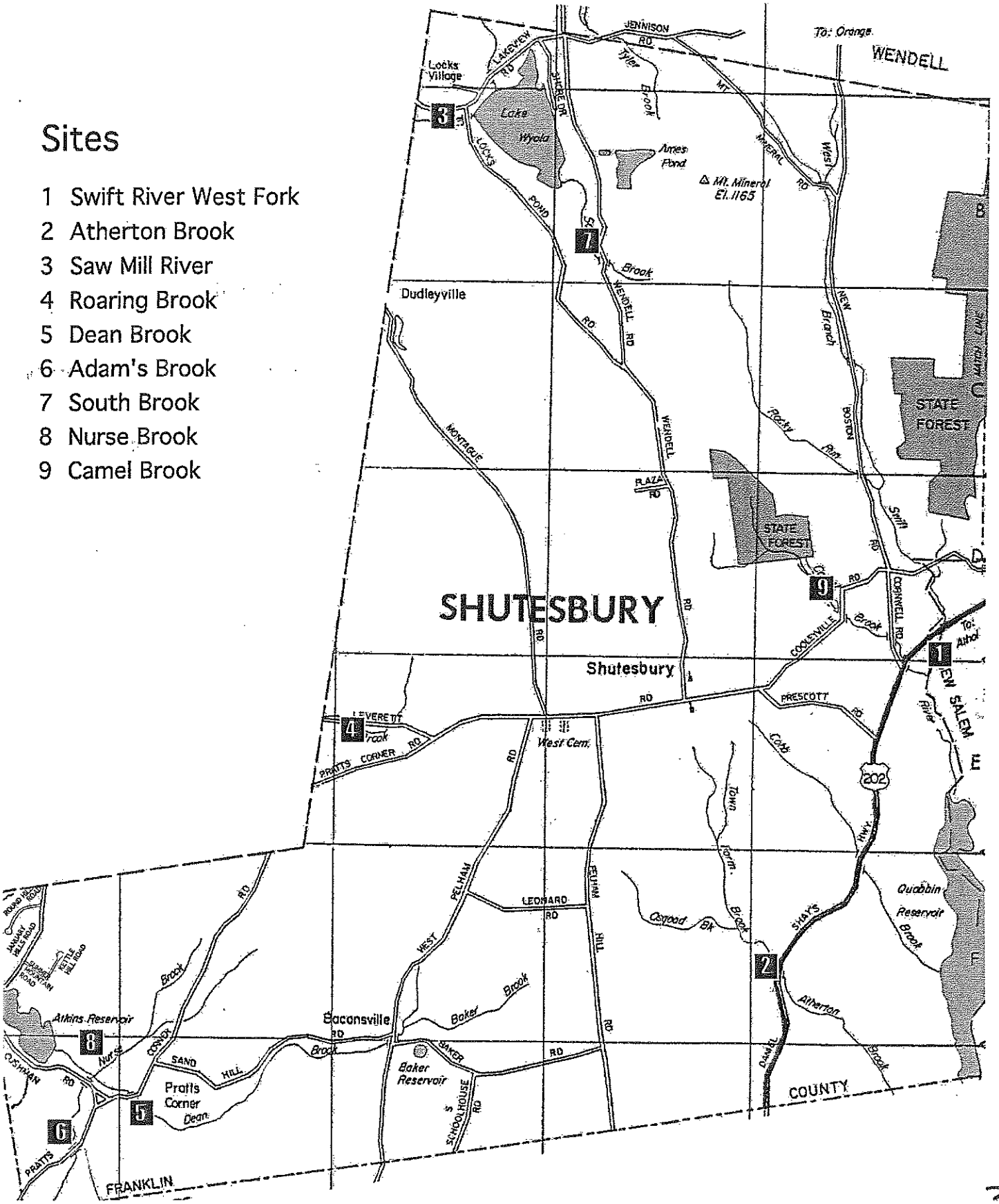
Section by: Rebecca and Elena



Marlena collecting a water sample

Sites

1 Swift River West Fork
2 Atherton Brook
3 Saw Mill River
4 Roaring Brook
5 Dean Brook
6 Adam's Brook
7 South Brook
8 Nurse Brook
9 Camel Brook



Temperature

Why is this factor important in the health of the stream?

Temperature is important because some fish, insects and amphibians need a certain temperature to live in the water. Native brook trout live where water is below 13 degrees Celsius(55.4F°). Rainbow trout and salmon need water temperatures of 13 degrees Celsius(55.4F°) - 20 degrees Celsius(68F°).

Also, colder water holds more oxygen. Warm water sometimes grows too much bacteria or plant life.

How was the test done?

We used a simple mercury thermometer that read temperature in degrees Celsius, and then converted the temperature to Fahrenheit.

Equation:

$[(Cx9)\div5]+32=F$ $[(F-32)x5]\div9=C$

C = Celsius \ F = Fahrenheit

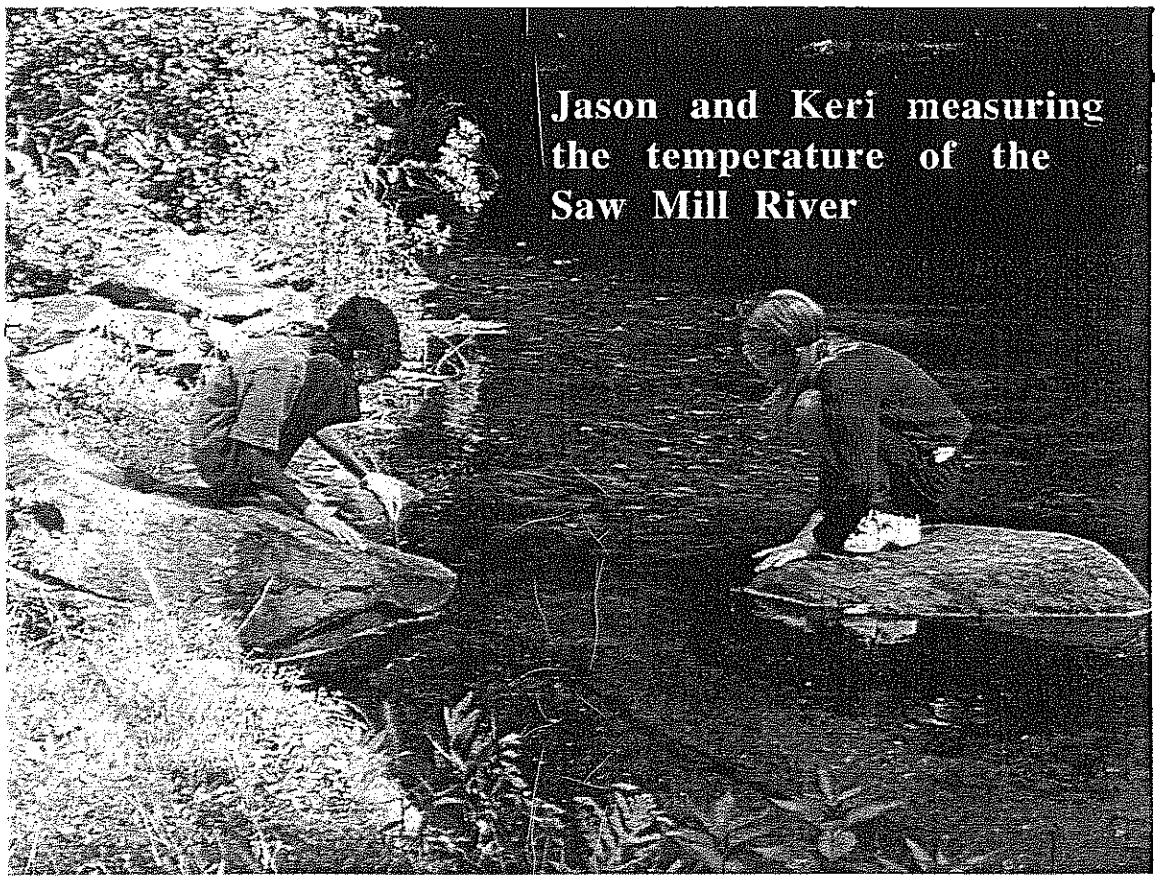
What did we hope to find?

We hoped to find temperatures below 70 Fahrenheit or 21 Celsius.

Our findings

Stream name	Fahrenheit	Celsius
Swift River West Fork	59°	15°
Atherton Brook	59.9°	15.5°
Saw Mill River	68°	20°
Roaring Brook	57.2°	14°
Dean Brook	59°	15°
Adams Brook	62.6°	17°
South Brook	53.15°	11.75°
Nurse Brook	51.8°	11°
Camel Brook	51.8°	11°

-Section by Danica and Chenoa



Jason and Keri measuring the temperature of the Saw Mill River

pH

Why is this factor important in the health of the stream?

pH stands for potency of hydrogen. It shows if the water is acidic, basic, or neutral. It is on a scale from 0 to 14, 0 being the most acidic and 14 being the most basic; both would fry your skin. Around 7, perfectly neutral, is the most healthy for water.

For people's drinking, levels as low as 3 are not harmful. Some sodas, vinegar and lemon juice are around that pH. But for animals who live in the water and breathe the water, levels need to be above 5.5 and below 8.

How was the test done?

1. We filled one test tube with sample water from the stream to the (5 ml) line.
2. We carefully added 10 drops of the wide range indicator to the test tube.
3. We capped the test tube with a small blue plastic cap and shook the solution gently until the color is uniform.
4. We compared our solution to other colored solutions which told us what the pH was.

What did we hope to find?

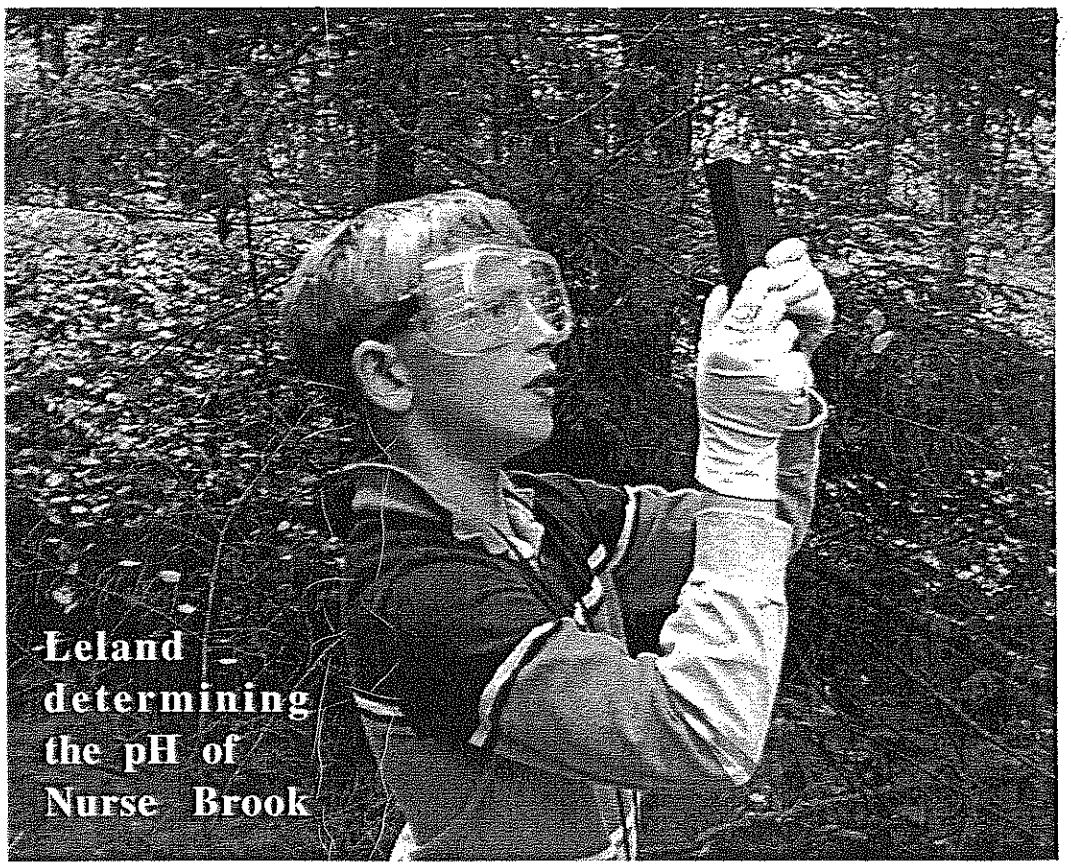
We hoped find pH levels of 5.5 - 8. Above 6 would be best.

Our findings:

We found pH levels from 6 to 7, which is good news for the animals. Our findings are as follows:

South Brook 6
Swift River West Fork 6.3
Saw Mill River 6.5
Dean Brook 6.5
Nurse Brook 6.5
Camel Brook 6.5
Atherton Brook 6
Adam's Brook 6
Roaring Brook 7

Section by Jeremiah & Leland



-Leland determining the pH of Nurse Brook

Dissolved Oxygen

Why is this factor important in the health of the stream?

Dissolved Oxygen means how much oxygen is trapped in the water. Dissolved Oxygen is important because fish and salamanders and any animal with gills needs the oxygen to breathe. There are two ways oxygen enters the water. One way is by splashing around; another way is by plants giving the water oxygen by Photosynthesis. Cold water holds more oxygen.

Most water that has low dissolved oxygen usually means that the water is very still or has lots of bacteria that is eating the oxygen.

How was the test done?

When we tested for Dissolved oxygen there was a lot of steps. We filled a sample bottle with stream water. We were very careful not to shake the bottle because that would alter our results.

Using chemicals such as Alkaline Potassium Iodide Azide, Sulfuric Acid and Starch Indicator solution we were able to complete the test.

What did we hope to find?

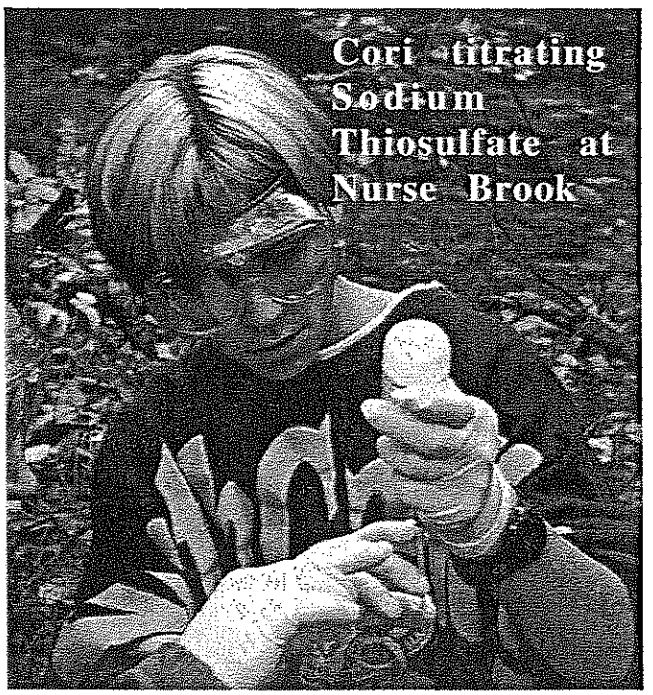
In our test we measured the results in parts per million. Below 2.0 ppm, fish die. Below 3.0 ppm , few fish can survive for extended periods. Below 5.0 ppm, fish grow and develop slowly. 6.0 ppm, healthy for most fish.

Our findings

Overall the streams the class tested had good dissolved oxygen levels. We tested eleven bodies of water including nine streams and two lakes. Below are our results:

Date	Site	D.O.
9/28/98	Swift River West Fork	9.7 ppm
9/28/98	Atherton Brook	6.7 ppm
9/28/98	Saw Mill River	6.5 ppm
9/28/98	Roaring Brook	7 ppm
9/28/98	Dean Brook	6.5 ppm
9/28/98	Adam's Brook	5 ppm
10/13/98	South Brook	11.75 ppm
10/13/98	Nurse Brook	Experimental Error
10/13/98	Camel Brook	11 ppm
9/28/98	Lake Wyola	8 ppm
9/28/98	Atkins Reservoir	6.5 ppm

Section by Noah and Noah



Nitrates

Why is this factor important in the health of the stream?

If too much nitrogen is in the stream it is bad for animals and people. Some of the ways nitrogen gets in the stream is fertilizer from lawns and decaying plants. Sewage can also raise nitrate levels in rivers and lakes. High nitrates are often a sign of pollution.

How was the test done?

We carefully filled a water bottle to the 2.5 ml line with a sample of water from the stream. Then we continued to fill up the test tube with mixed acids to the 5ml line. Then we carefully shook the test tube (with the cap on) for 2 minutes. Then we added a spoonful of nitrate reducing agent. Then we shook again 50-60 times a minute(with the cap on) then waited for 10 minutes. We put the tube in the color comparator and matched the color on the color comparator.

What did we hope to find?

We hoped to find levels <1.0 parts per million (ppm)
Levels below 1.0 are considered high quality.
Levels from 1.0 - 1.8 are considered fair quality.
Levels from 1.8 - 2.8 are considered fair - poor.
Levels > 2.8 are poor quality.

Our Findings:

Less than .25 parts per million is good. Every stream was .25 ppm's or less, which is good.

section by Julian and Cade

Salinity

Why is the factor important in health of the stream?

Some solids in water are essential to maintain health. Salinity means how much salt is in the water. Sea water contains 35 ppt (part per thousand) or 35,000 ppm (part per million.). Protected bays and harbors that are fed by rivers often have salinity levels lower than 35 ppt. Brackish water contains 1-35 ppt. Fresh water contains levels below 1ppt or 1,000 ppm.

Fresh water fish and animals need water that is safely below 1ppt (or 1,000 ppm.)

How was the test done?

You put the tds (total dissolved solids) tester in the water until you reach the brown line. Then you press the white button and turn it on. Multiply the reading by .5 (half). The results are the total dissolved solids (tds) in ppm, (parts per million.) Then record your results on the data recording form.

What did we hope to find?

We hoped we wouldn't find too much salt in the water. Just a little is okay (below 1,000 ppm.)

Our findings:

Swift River West Fork	35 ppm
Atherton Brook	15 ppm
Saw Mill River	20 ppm
Roaring Brook	65 ppm
Deans Brook	20 ppm
Adam's Brook	25 ppm
Atkins Reservoir	20 ppm
Lake Wyola	20 ppm
Nurse Brook	30 ppm
South Brook	20 ppm
Camel Brook	15 ppm

Section By: *Cori & Keri*

Turbidity

Why is this factor important in the health of the stream?

Turbidity measures the water's cloudiness. This means how many dissolved particles are in the water. If there are too many dissolved particles floating in the water it could clog the gills of the fish, insects or amphibians. If the water gets too dark, it will absorb more light, which will make it too hot for fish, insects, and amphibians.

How was the test done?

The test was done with a Turbidity meter. The Turbidity meter sends a beam of light through the water, and it gets reflected by particles in the water. It is measured in N.T.U.s (Nepheometric Turbidity Units).

What did we hope to find?

We were not looking for levels of 0, because with some plants and animals in the water we knew there would have to be some particles in the water. We knew we wanted to find levels below 1.0. For drinking water, levels must be under 1.0 to be accepted. We were hoping to find levels under .50.

Our findings:

We are pleased with most of our findings. All of our streams were under .50.

We also did **LAKE WYOLA** and **ATKINS RESERVOIR.** **LAKE WYOLA** was 1.03. **ATKINS RESERVOIR** was .53.

For interest we did **CONNECTICUT RIVER.** We used a sample from Rainbow Beach in Northampton. It was 1.60.

SWIFT RIVER WEST FORK:	**0.36**
ATHERTON BROOK:	**0.19**
SAW MILL RIVER:	**0.33**
ROARING BROOK:	**0.49**
DEAN BROOK:	**0.36**
ADAM'S BROOK:	**0.38**
SOUTH BROOK:	**EXPERIMENTAL ERROR**
NURSE BROOK:	**0.30**
CAMEL BROOK:	**EXPERIMENTAL ERROR**

ARTICLE BY: CORY
&
MATT

Biochemical Oxygen Demand

Why is this factor important in the heath of the stream?

What is (B.O.D.) Biochemical Oxygen Demand? B.O.D. means how much bacteria is in the water, eating the oxygen. Why is that a problem in the environment? If the bacteria is eating the oxygen too quickly it suffocates the animals, then it starts to break down the food-chain.

How is the test done?

You fill a sample bottle with the stream water you want to test, then test to see how much dissolved oxygen is in the water. Fill a second bottle with water then store the bottle in a dark place, by wrapping it in tin foil. Wait five days and test the water again for Dissolved Oxygen. If the Dissolved Oxygen has gone down a little, it's OK, but if it gone down a lot, then it's bad.

What did we hope to find?

We hoped to find 1-2 PPM change in D.O. over five days. But knew we might find higher levels. Streams and lakes are healthy up to 6 PPM.

1-2 PPM very clean water with very little organic decay.

3-5 PPM fairly clean water, some organic decay (probably from plant life.)

6-9 PPM water to start o being nervous about, much organic decay(possibly from algae blooms.)

10+ PPM dangerous water, very unhealthy levels of organic decay (probably from untreated sewage.)

Our Findings

We are happy to tell you that all the steams and lakes we tested were healthy. All of them have a difference in dissolved oxygen under 2.0 PPM; that means all our streams we tested are healthy. We tested ten different streams and lakes.

Swift River West Fork was: 1.1 PPM.
Atherton Brook was: 2.0 PPM.
Saw Mill River was: 0.5 PPM.
Roaring Brook was: 0 PPM
Deans Brook was: Experimental error
Adams Brook was: 0.4 PPM
South Brook was: Experimental error
Nurse Brook was: 0 PPM.
Camel Brook was: 0.5 PPM.
Lake Wyola was: 0.2 PPM.

Section By

Erika Ouellette

Coliform Bacteria

Why is this factor important in the health of the stream?

Coliform is a type of bacteria. One type of coliform, fecal coliform, lives in the stomachs of warm blooded animals and helps digest food. If you find coliform bacteria in your water it means you have animal or human sewage in the water. This water may not be healthy to drink.

How was the test done?

We got a test-tube half filled with lactose broth indicator from the Connecticut Valley Biological Supply. We mixed the solution with the water we were testing. The color in the test tube started purple. If it turned yellow it had coliform bacteria. Then depending on how long it took to change color (purple to yellow) is how much coliform bacteria was in the water. We hoped that it would not change in less than 48 hrs. The longer it was purple the less coliform bacteria in the water.

What did we hope to find?

We knew it was normal to have a little coliform bacteria in the stream, because we knew that there were animals living in the stream. But we hoped that the sample would not change from purple to yellow in less than 48 hours.

Our Findings.

We were pleased with almost all of our results. Most of our

samples took about three days to turn, West Fork, South Brook, Nurse Brook, and Camel Brook were those tests. We also tested a local lake, Lake Wyola which also took just three days. Deans Brook, Sawmill River, and Adams Brook took two days to turn. And surprisingly enough Atherton Brook took only one day. We also tested Atkins Reservoir which took five days to turn. We managed to get a sample from the Connecticut River which took less than one day. Yuck! Overall we were pleased with our results.

Section by Julia D. & Marlena A.

Shutesbury Surface Water: Water Quality Testing

Date	Sites (Streams)	Temp.	Temp.	pH	D.O.	Nitrates	Salinity	Turbidity	B.O.D.	Coliform
		C	F		ppm	ppm	ppm		ppm	days
9/28/98	Swift River West Fork	15	59	6.3	9.7	0.25	35	0.36	1.1	3
9/28/98	Atherton Brook	15.5	60	6.7	10	<0.25	15	0.19	2	1
9/28/98	Saw Mill River	20	68	6.5	8.3	<0.25	20	0.33	0.5	2
9/28/98	Roaring Brook	14	57	7	7.8	<0.25	65	0.49	0	3
9/28/98	Dean Brook	15	59	6.5	6	<0.25	20	0.36	***	2
9/28/98	Adam's Brook	17	63	6.7	8	<0.25	25	0.38	0.4	2
10/13/98	South Brook	11.75	54	6	7.6	<0.25	30	***	***	3
10/13/98	Nurse Brook	11	52	6.5		<0.25	20	0.3	***	3
10/13/98	Camel Brook	11	52	6.5	9.5	<0.25	15	***	0.5	3
	Average	14.5	58.2	6.5	8.35	<0.25	27.2	0.34	0.75	2.5
Date	Sites (Lakes)	Temp.	Temp.	pH	D.O.	Nitrates	Salinity	Turbidity	B.O.D.	Coliform
		C	F		ppm	ppm	ppm		ppm	days
9/28/98	Lake Wyola			6.5	8		20	1.03	0.2	3
9/28/98	Atkins Reservoir			6.5	6.5		20	0.53		6

*** Experimental Error

section by Jason, Tommy, Dan


Maia
Jenna
Elena
Noah K.
Becca
Danica
Chenoa
Jeremiah
Cori
Marlena
Tommy
Jason
Leland
Cory
Matthio
Dan
Julio
Noah
Cade