

What Is a Healthy Stream?

Activity 8: Portrait of Our Stream

This activity includes a series of tasks to enable you to record measurements and observations about the stream. Select the tasks you would like to include in your stream portrait.

Task A: How Our Stream Measures Up

Task B: The Temperature of the Stream

Task C: The pH of the Stream

Task D: Stream Banks and Bottoms

Task E: The Bug Test

Task F: Who Lives in the Stream?



You can organize the activity in two ways:

- a) If your stream visit is short, divide the group into teams and assign each team one or two tasks.
- b) If you have more time, have each team complete all of the tasks you have selected for your stream portrait.

Goal

- ❖ To identify potential water quality problems of the stream.

Voluntary State Curriculum

1.0 Skill and Processes

- A Scientific Inquiry: 1, 2, 4, 5, 6, 9
- B Critical Thinking: 1, 5

Time 2 hours streamside

Motivation

- ❖ Review “What’s a Healthy Stream”
- ❖ Review “Stream Macroinvertebrates” Fact Sheet
- ❖ Read “The Bug Test”
- ❖ Read “Testing the Stream”
- ❖ Prep for on-site stream sampling

Modifications

- ❖ Work with a partner

Assessment

- ❖ Completion of worksheets
- ❖ Participation

Optional Challenges/Extensions

- ❖ Journal.
- ❖ Project Wet Activities: Back to the Future, Macroinvertebrate Mayhem, Water Address
- ❖ Healthy Water, Healthy People Activities: Benthic Bugs and Bioassessment, Invertebrates as Indicators, Water Quality Windows



Vocabulary

pH – a measurement of the acidity of the water.

Macroinvertebrates - animals without backbones that are larger than a pencil dot. These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life. They include crayfish, clams and snails, aquatic worms and the immature forms of aquatic insects such as stoneflies and mayflies .

Fish barrier – any place where there is a section of the stream where fish cannot swim or jump (a dam, water too shallow to swim, etc).

Sedimentation – soil deposited on the bottom of a stream

Riffle – a shallow area in a stream where water flows swiftly over gravel or larger stones

Pool – an area of stream where the water is fairly deep and flowing softly.

Stream Width – width of stream at the widest part

Stream Depth – depth of stream at the deepest or shallowest point

Velocity – speed of water

Task A: How Our Stream Measures Up



Goal

- ❖ To determine the width, depth and velocity of the stream

Materials

- ✓ Handmade Tape Measure - 30 foot lengths of string or twine marked off by feet
- ✓ Stop watch or watch with second hand
- ✓ 2 markers or pencils
- ✓ Floating objects: cork, twig, etc.
- ✓ Portrait of Our Stream Data Sheet
- ✓ Rock
- ✓ Clipboard

Procedure

- 1) Take the following measurements in a 30 ft length section of stream:
 - a. The width of the stream at the widest point.
 - b. The width of the stream at the narrowest point.
 - c. The depth of the stream at its deepest point.
(Tie rock or weight to end of knotted string)
 - d. The depth of the stream at its most shallow point.
- 2) Measure the velocity in a section of stream that has easy access and where the water is fast moving.
 - a. Measure off a 30 foot section of the stream with knotted string.
 - b. Place markers in the beginning and end of the section.
 - c. Place the floater in the center of the stream at the upstream end of the section. Time it from release until it crosses the other end of the section. Record the time. Retrieve your floater and repeat the process several times. Take an average of the results. Always retrieve your floater so you are not polluting your stream. Compute the velocity in feet per second.

Task B: Stream Temperature

Goal

- ❖ To determine the average stream temperature.
- ❖ To discover the effects of shade on stream temperature.

Materials

- ✓ Thermometers with a range of 35 degrees fahrenheit to 85 degrees fahrenheit (can be obtained from a biological supply company or pet store)
- ✓ String in 2 ½ foot lengths; securely tie one on each thermometer
- ✓ Portrait of Our Stream Data Form
- ✓ Clipboard
- ✓ 2 markers or pencils

Procedure

- 1) Teach students the proper use of thermometers.
 - a) Hold the thermometers firmly in hand. Do not swing them around.
 - b) Place the thermometer in the water until covered by water. Do not drop them in.
 - c) Do not let go of the thermometer or string attached to it.
 - d) Read the temperature as soon as it is removed from the water since air will alter the reading.
 - e) Teach students to read the scale. "How many degrees does each line represent?" Have them take a reading and check the scale.

- 2) Choose an area of the stream for each team to measure and record the temperature. Make sure some areas are in shade, others in sun. Measure spots where the stream is shallow and deep, where water is slow-moving and fast-moving. Measure the air temperature over each site before measuring the water temperature.

- 3) Record the temperature for each site on the Portrait of Our Stream Data Sheet



Task C: Stream pH

Goal

- ❖ Understand the importance of pH to plant and animal life of a stream.
- ❖ Learn to measure pH.

Materials

- ✓ pH paper (litmus paper) with a broad range color chart (obtain from a biological supply company or pet store; range should cover 3.0 to 8.5)
- ✓ Portrait of Our Stream Data Form
- ✓ Clipboard
- ✓ 2 markers or pencils

Procedure

- 1) Demonstrate how to use pH test materials using liquids that show a strong difference such as vinegar, baking soda water, and lemon juice.
- 2) Ask each team to sample pH in three different places; in a pool area; in a riffle area, and in one other place—perhaps where another stream joins the stream or where run-off enters the stream.
- 3) Record the pH for each site on the Portrait of Our Stream Data Form.



Task D: Stream Banks and Bottoms

Goal

- ❖ Identify signs of run-off and erosion.
- ❖ Identify signs of sedimentation and excess algae.
- ❖ Identify fish barriers.
- ❖ Examine relationship between condition of stream and the surrounding land.

Materials

- ✓ Portrait of Our Stream Data Form
- ✓ Clipboard
- ✓ 2 markers or pencils

Procedure

- 1) Describe the signs of run-off and erosion on the stream bank (gullies, trails of trash, exposed soil, steep “carved out” slopes).
- 2) Have students sketch a cross section of the stream to show what the banks and bottoms look like.
- 3) Ask students to look carefully at the streambed and surrounding land. Are there any visible sewer lines or pipes? Is the land farmland, residential, or industrial?
- 4) Ask students to look for fish barriers. Draw them in on their sketch of the stream.
- 5) Ask students to note any unusual odors or any signs of foam, oil, or other contaminants.
- 6) Ask students to look at the bottom of the stream. Look for sedimentation, excess algae, gravel and stones.



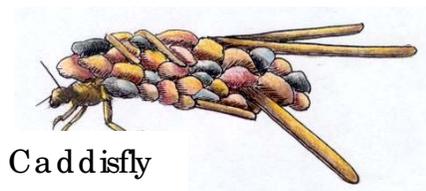
Task E: The Bug Test

Goal

- ❖ To rate the general health of the stream.

Materials

- ✓ Portrait of Our Stream Data Form
- ✓ Clipboard
- ✓ 2 markers or pencils
- ✓ A bucket for rinsing rocks
- ✓ Stream Sampling Kits (see Design Your Own Stream Study Kit)
- ✓ “How Clean is the Stream?”
- ✓ “Stream Macroinvertebrates” Fact Sheet



Procedure



Stone fly



Mayfly

- 1) Decide ahead of time what part of the stream will provide a good and safe sampling site.
- 2) Review the sensitive organisms on the “Stream Macroinvertebrates” Fact Sheet. Talk about how to tell them apart (mayfly three tails; stonefly two tails; caddisfly curved body; etc.).
- 3) Choose riffle areas to test. Fill a bucket with water from the stream and set it in a stable place.
- 4) Select three stones from the riffle area. The stones should be two to six inches in diameter, bathed in rapidly flowing water, and lying loose upon the streambed.
- 5) Using your fingers, rub all the insects, casings and debris into the bucket of water. Replace the rocks after scraping them thoroughly.
- 6) Pour the water through the strainer. Being careful not to lose any material still in the bottom of the bucket, scoop up more water and pour it again through the strainer.
- 7) Use tweezers to move around the material on the strainer and to look for insects. Count and record all aquatic organisms on the Task E portion of the “Portrait of our Stream”. According to the directions on the data sheet rate the overall condition).
- 8) If you have time, do a second test in another riffle.

Task F: Who Lives in This Stream?

Goal

- ❖ To realize the variety of animal life in a stream.
- ❖ Study one specimen in depth.

Materials

- ✓ Portrait of Our Stream Data Form
- ✓ Clipboard
- ✓ 2 markers or pencils
- ✓ Stream Sampling Kits (see Design Your Own Stream Study Kit)
- ✓ “Stream Macroinvertebrates” Fact Sheet

Procedure

Have students choose one aquatic specimen that they have found to study carefully. Have students complete the data sheet section Task F, including drawing the animal.

Wrap Up

- ❖ Ask students to share data from their site.
- ❖ Discuss how the pH of the stream affects the animals and plants that live there.
- ❖ Discuss the temperature results by determining if the data support the following:
 - More water movement = Lower water temperature
 - Sunny areas = Warmer water
- ❖ What were the measurements of width, depth, and velocity of your stream? What did they tell you about the stream?
- ❖ Was there evidence of run-off or erosion in your stream?
- ❖ What was the bottom of the stream like?
- ❖ Were there fish barriers in the stream?
- ❖ What kind of land surrounds the stream?
- ❖ What were the results of the bug test? How did you rate the overall health of the stream?
- ❖ What kinds of animals were found in the stream? How many different kinds were found?

Student Page

What is a Healthy Stream?



A truly healthy stream is a stream in its natural condition. The waters of a healthy stream are clear, cool and odorless. The stream is safe for people to swim, fish and wade. We judge how healthy a stream is by comparing it to a stream in its natural condition. What is a natural stream like?

A natural stream has just the right chemical balance. There is enough oxygen for the fish and other aquatic life in the stream. There are enough nutrients from decaying plants and animal waste for stream life to feed on but no more than a healthy stream needs. The water in the stream is neither too acid nor too alkaline. Most of the substances that come into the stream are carried in by groundwater; they don't rush in with runoff. There are no toxic chemicals from factories, farms, and lawns washing into the stream.

The amount of water flowing into the stream changes according to natural cycles determined by the season of the year and the amount of rainfall.

Rain soaks into the forest floor, travels through the earth, and emerges in the stream. Now and then heavy rains cause floods, but the natural stream is able to adjust to the changes.

Groundwater emerging from the earth is cool and warms up slowly as it flows downstream. Shade from the trees and shrubs keep the temperature of the water stable, making it a good home for fish.

Many different kinds of creatures live in the natural stream. They are well adapted to the range of temperature, water level, and chemical balance. The trees and shrubs around the stream provide plenty of food for the plant-eating insects. The insects become food for the fish.

The natural stream is like a town. It provides different kinds of living quarters for different needs. Insects live in the shallow, fast flowing areas called *riffles* where they can attach to rocks and collect food from the flowing waters. Baby fish, called *larval fish*, also seek out riffles as good hiding places from larger fish. Deep pools in the stream provide cruising spots for schools of fish. Some fish hide under logs, boulders or undercut banks waiting for prey.

In the natural stream the amount of eroded soil washing into the stream from the watershed is not harmful to the stream. The stream digs soil from the banks and bottom of its bed and carries it downstream. The soil washed in from the watershed replaces the soil carried away. Balance is the key to a healthy stream.



What happens when the balance of a natural stream is disturbed?

When an area of land in a watershed gets developed, it usually brings many changes to the natural stream. The changes can harm the stream in several ways.

Sediment running into a stream from exposed soil settles on the bottom of a stream. Too much sediment is very bad for a stream's health. It can kill fish eggs and clog the gills of small fish. Fish have to see their food. Sediment ruins the fishes' homes by filling in the pools where they like to stay.

Fish barriers stop fish from traveling up and down the stream. Culverts and dams across streams are major problems. Dumping and runoff can lead to large objects blocking the stream. Maryland fish are not like salmon. Salmon can leap several feet into the air. For Maryland fish, any barrier that is more than a few inches high will make it impossible for fish to pass. Water that is too shallow for fish to swim through is also a barrier. Barriers keep fish from getting to areas where they can find food and safe places for laying eggs.

When trees and shrubs in the watershed are cut down and replaced with structures and pavement, the rain can't soak in and runoff water flows into the stream too quickly. The water hits the stream banks and carves out big chunks of soil. Too much soil in the water leads to excess sediment and the

natural shape of the stream is changed too quickly.

The pH of a stream is a measure of how acidic the water is. Most creatures that live in water can only survive when the pH is within a certain range (pH 5 to pH 7). Some cannot live in water that has any acid in it. Many of the chemicals and nutrients that enter the stream through runoff change the pH of the water.

Development also changes the **temperature** of a stream. When people build houses or have farms along a stream, they often cut down the trees and shrubs, so there is no longer shade. The water gets warmer faster. Runoff from hot concrete and pavement brings warm water into the stream. The warmer the stream water gets the fewer kinds of fish that can live there.

Our goal is to restore polluted streams to the point where people can safely wade, fish and swim in them. Making streams safe for people, fish and other animals will mean our whole environment will be much better off. And think of all the fun we can have around our streams!





C. Ronald Franks, Secretary

Stream Macroinvertebrates

Maryland Department of Natural Resources

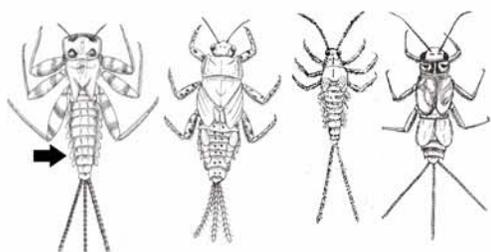


Robert L. Ehrlich Jr., Governor

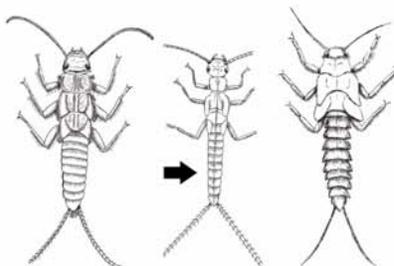
Relative abundances in Maryland are indicated by "rare", "common", or "abundant". The number of families in Maryland for higher taxonomic levels are also listed (if applicable). Sizes are for "full grown" animals. To learn more about these fascinating creatures, go to <http://www.dnr.maryland.gov/bay/cblife/insects/index.html>. To learn about DNR's volunteer stream monitoring program, Maryland Stream Waders, send an inquiry to streamwaders@dnr.state.md.us.

SENSITIVE ORGANISMS

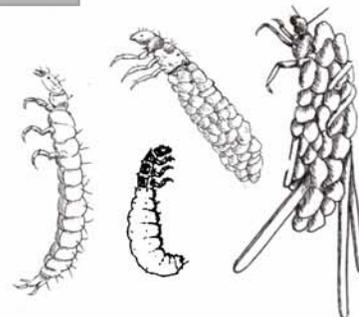
POLLUTION-SENSITIVE ORGANISMS TYPICALLY FOUND IN HEALTHY STREAMS



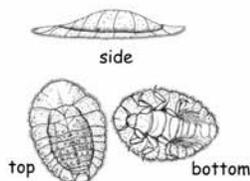
Mayfly: Order Ephemeroptera- Plate-like or feathery gills on sides of lower body (arrow); three (sometimes 2) long, hair-like tails; 1"; abundant; 11 families.



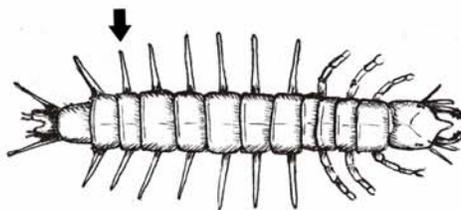
Stonefly: Order Plecoptera- Two hair-like tails; six jointed legs with two hooked tips each; big antennae; no gills on lower half of body (arrow); 1½"; abundant; 9 families.



Caddisfly: Order Trichoptera- Six jointed, hooked legs just behind head; 2 hooks at back end; may be in a case made of stones, leaves or sticks; non-net-spinning caddisflies have no bushy gills along bottom; 1"; abundant; 20 families.



Water Penny: Order Coleoptera- shaped like a tiny, grey, oblong frisbee; 6 tiny legs on bottom; slow crawler; ½"; common.



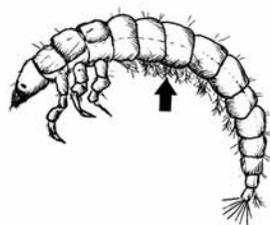
Hellgrammite and Fishfly: Order Megaloptera- dark body; six jointed legs; large, pinching jaws; many pointed feelers along edge of body (arrow); two small hooks at back end; hellgrammites have feathery tufts of gills along side of body; 4"; rare.



Gilled Snail: Class Gastropoda- shell opens on the right and is covered by a hard shield-like operculum; 1"; rare; 4 families.

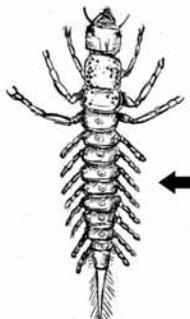
MODERATELY-SENSITIVE ORGANISMS

MODERATELY POLLUTION-SENSITIVE ORGANISMS FOUND IN HEALTHY OR FAIR QUALITY STREAMS



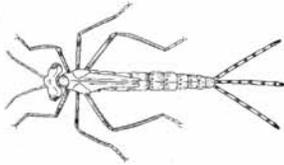
Net-spinning Caddisfly: Order Trichoptera- six jointed, hooked legs just behind head; 2 hooks at back end; bushy gills along lower half (arrow); 1"; abundant.

Alderfly: Order Megaloptera- six jointed legs; pinching jaws; many pointed feelers along edge of body (arrow); long tail at the end; 1"; rare.

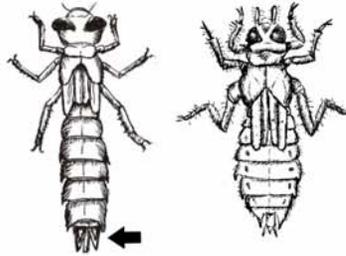


Crane Fly: Order Diptera- worm-like; no jointed legs; head hidden inside the light brown body; 4 finger-like lobes at back end (arrow); 2"; abundant.

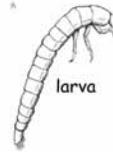
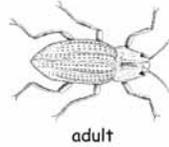
MODERATELY-SENSITIVE ORGANISMS (continued)



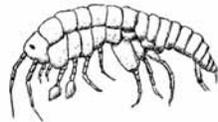
Damselfly: Order Odonata - 6 long, thin legs; 3 broad oval tails at end (arrow); may have wing pads; no gills along sides of body; 2"; common; 3 families.



Dragonfly: Order Odonata - large eyes; bullet-shaped, round or leaf-like body; 6 long legs; 3 short-spike-like tails (arrow); may have wing pads; 2"; common; 6 families.

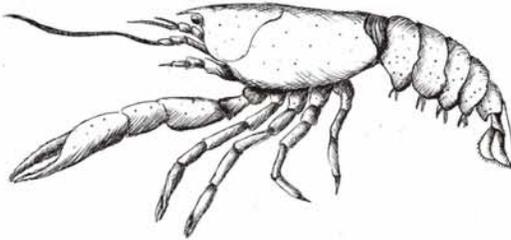


Riffle Beetle: Order Coleoptera - 6 jointed legs; brown or black; adults have hard covering over the wings, body with fairly hard covering; 3/8"; abundant.



Scud: Order Amphipoda - white to gray; more than six legs; swims on its side; looks like a small shrimp; 1/4"; abundant; 3 families.

Crayfish: Order Decapoda - 8 walking legs and 2 pinching claws; 6"; abundant.



Clams and mussels: Class Bivalvia - two hinged hard shells; 5"; rare; 2 families.



TOLERANT ORGANISMS

POLLUTION-TOLERANT ORGANISMS FOUND IN HEALTHY, FAIR OR POOR QUALITY STREAMS



Black Fly: Order Diptera - shaped like a little bowling pin; black head with tiny bristles for filtering food (arrow); suction pad on end; no jointed legs; 1/2"; abundant.



Non-biting Midge: Order Diptera - dark head; body white, gray or reddish; worm-like segmented body; 2 tiny unjointed legs on both ends (arrow); 1/2"; abundant.



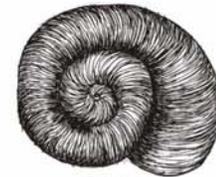
Leech: Order Hirudinea - brown or grey, slimy, suction pads on both ends (arrow); 2"; rare; 3 families.



Aquatic worm: Class Oligochaeta - thin and hairlike or thicker like an earthworm; 2 1/2"; common; 8



Pouch Snail: Class Gastropoda - shell opens on the left; no hard covering over shell opening; 3/4"; common.



Ramshorn Snails: Class Gastropoda - No hard cover over opening; shell coiled in one plane; 1/2"; common.



Maryland Department of Natural Resources; Resource Assessment Service; 580 Taylor Avenue; Annapolis, Maryland 21401
www.dnr.maryland.gov; toll free in MD 1-877-620-8DNR (dial 9 then extension 8623)
TTY users call via MD Relay

Published September 2004

Student Page

Testing the Stream



KNOW THE MEANING....

pH – a measurement of how much acid is in the water.

Macroinvertebrates - animals without backbones that are larger than a pencil dot. These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life. They include crayfish, clams and snails, aquatic worms and the immature forms of aquatic insects such as stoneflies and mayflies.

Erosion – the wearing away of soil by water, wind or other forces.

Fish barrier – any place where there is a section of the stream where fish cannot swim or jump (a dam, water too shallow to swim, etc).

Sedimentation – soil deposited on the bottom of a stream.

Riffle – a shallow area in a stream where water flows swiftly over gravel or larger stones.

Pool – an area of stream where the water is fairly deep and flowing softly.

Stream Width – the width of stream at the widest part.

Stream Depth – the depth of stream at the deepest or shallowest point.

Velocity – speed of water.

Specimen - sample

Larval fish - baby fish.

WHAT TO DO

Temperature of the Stream

Measure the temperature of the stream in three different places. Make sure you get variety: shady area, sunny areas, deep water, and shallow water. Record your temperature measurements on your data sheet.

The pH of the Stream

Make sure you understand how to use a pH kit. Follow the instructions in the test kit. Test the pH of the stream water in three different places; in a pool, in a riffle, and one other place – perhaps where another stream comes into the stream or a place where the street runoff enters the stream.

Record your pH measurements on your data form.

Stream Banks and Bottoms

You can tell a lot about what's wrong with a stream just by using your eyes and nose.

Look at the banks of the stream. Are there signs of erosion? Runoff? Look at the bottom of the stream? Is there sedimentation? Excess algae? Do you see any fish barriers in the stream? Are there any unusual odors? Describe them. Do you see foam, oil, or any other unusual substance in the water? What is the color of the water? Look around at the surrounding land. What is it used for? Draw a sketch of the stream to show what the banks and bottom look like. Answer the questions on your data sheet.

The Bug Test

Before restoring a stream, you need to know how healthy the stream is now. The kind of insects that live in the stream can tell you a lot about the general quality of the water in the stream. By doing the “bug test” you can give your stream a “grade” of excellent, good, fair or poor. The test is easy and fun!

Portrait of Our Stream: How the Stream Measures Up

You will need a partner for this activity.

WHAT YOU WILL NEED

- A watch with a second hand
- 2 markers
- Corks or other objects that float
- Your measuring string
- pH kit Thermometer



KNOW THE MEANING...

pH – a measurement of how much acid is in the water

Riffle – a shallow area in a stream where water flows swiftly over gravel or larger stones

Pool – an area of stream where the water is fairly deep and flowing softly

Velocity – speed of water

WHAT TO DO

Using the measuring equipment in your kit:

- 1) Measure the stream at its widest point and narrowest points (You will be able to do this only if it is possible for one person to get to the other side).
- 2) Measure the deepest point and the shallowest point.
- 3) Measure the velocity of the stream. Mark off the beginning and end of a 30-foot section of the fast moving portion of the stream with your markers.

To measure speed, throw a cork in the center of the stream up from the first marker. Record the number of seconds it takes to float between the markers on your activity sheet. Repeat the process several times and take an average. Divide the 30-foot distance by the average number of seconds to get the velocity in feet per second.

EXAMPLE: Seconds recorded for 5 tests: 8, 7, 14, 9, and 12.
Average the number of seconds:
 $(8+7+14+9+12) \div 5 = 10$
seconds. Velocity: 30 feet \div 30 seconds = 3 feet per second.

Student Page

Stream Temperature

KNOW THE MEANING...

Erosion – the wearing away of soil by water, wind or other forces

Fish barrier – any place where there is a section of the stream where fish cannot swim or jump (a dam, water too shallow to swim, etc)

Sedimentation – soil deposited on the bottom of a stream



WHAT TO DO

1. Hold the thermometers firmly in hand. Do not swing them around.
2. Place the thermometer in the water until covered by water. Do not drop them in.
3. Read the temperature as soon as it is removed from the water since the air temperature will change the reading.
4. Measure the temperature of the

WHAT YOU WILL NEED

- Thermometers
- String in 2 ½ foot lengths; securely tied on each thermometer
- Portrait of Our Stream Data Form
- Clipboard
- 2 markers or pencils

stream in three different places. Make sure you get variety: some shade, some sunny spots, deep water, shallow water.

5. Record temperature measurements on the data form. Do not let go of the thermometer or string attached to it.
6. Record the temperature for each site on the Portrait of Our Stream Data Sheet

Student Page

The pH of the Stream

WHAT YOU WILL NEED

- pH paper (Litmus paper) with a broad range color chart (obtain from a biological supply company or pet store; range should cover 3.0 to 8.5.)
- Portrait of Our Stream Data Form
- Clipboard
- 2 markers or pencils

WHAT TO DO

1. Make sure you understand how to use the pH paper.
2. Test the stream in three different areas; in a riffle area, and in one other place—perhaps where another stream joins the stream or where run-off enters the stream.
3. Record the pH for each site on the Portrait of Our Stream Data Form

KNOW THE MEANING....

pH – a measurement of how much acid is in the water



Stream Banks and Bottoms

WHAT YOU WILL NEED

- Portrait of Our Stream Data Form
- Clipboard
- 2 markers or pencils



KNOW THE MEANING...

Erosion – the wearing away of soil by water, wind or other forces

Fish barrier – any place where there is a section of the stream where fish cannot swim or jump (a dam, water too shallow to swim, etc)

Sedimentation – soil deposited on the bottom of a stream

WHAT TO DO

You can tell a lot by what's wrong with a stream by just using your eyes and nose.

1. Describe the signs of run-off and erosion on the stream bank (gullies, trails of trash,

exposed soil, steep “carved out” slopes).

2. Sketch a cross section of the stream to show what the banks and bottoms look like.

3. Look carefully at the streambed and surrounding land. Are there any visible

sewer lines or pipes? Is the land farmland, residential, or industrial?

4. Look for fish barriers. Draw them in on your sketch of the stream.

5. On your data form, note any unusual odors or any signs of foam, oil, or other contaminants.

6. Look at the bottom of the stream. Look for sedimentation, excess algae, gravel and stones. Record these signs on your data form.

The Bug Test:

A+

Giving your stream a grade!

WHAT YOU WILL NEED

- Portrait of Our Stream Data Form
- Clipboard
- 2 markers or pencils
- A bucket for rinsing rocks
- Stream Sampling Kit
- Person with rubber boots who can wade in the stream
- "Stream Macroinvertebrates" Fact Sheet
- "How Clean is the Stream?"

KNOW THE MEANING...

Macroinvertebrates - animals without backbones that are larger than a pencil dot. These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life. They include crayfish, clams, snails, aquatic worms and the immature forms of aquatic insects such as stoneflies and mayflies.

Riffle – a shallow area in a stream where water flows swiftly over gravel or larger stones

Pool – an area of stream where the water is fairly deep and flowing softly

WHAT TO DO

1. Review the sensitive organisms on the "Stream Macroinvertebrates" Fact Sheet. Notice how to tell them apart (mayfly

three tails; stonefly two tails; caddisfly curved body; etc.)

2. Fill a bucket with water from the stream and set it in a stable place.
3. Select three stones from the riffle area. The stones should be four to eight inches in diameter, bathed in rapidly flowing water, and lying loose upon the streambed.
4. Using your fingers, rub all the insects, casings and debris into the bucket of water. Replace the rocks after scraping them thoroughly.
5. Pour the water through the strainer. Being careful not to lose any material still in the bottom of the bucket, scoop up more water and pour it again through the strainer.
6. Use tweezers to move around the material on the strainer and to look for insects. Count and record all stoneflies, mayflies, caddisflies and other insects. Rate the overall condition of the stream according to the directions on "How Clean is the Stream" (excellent, good, fair or poor).
7. If you have time, do a second test in another riffle.



8. Using the Stream Macro invertebrates fact sheet, tally the number of aquatic organisms you found.

9. Record the estimated numbers with the following code:

A = 1 to 9

B = 10 to 99

C = 100 or more

10. Total the number of letters.
(Example: If you had two A's, the answer would be 2 or if you had one A and one C the answer would also be 2.)

11. Multiply the total by the number given below which is weighted based on the importance of that group of organisms.

12. Add the answers from each letter code column.

13. Using that total, look for the box that indicates the range that includes that number. This will tell you the health of your stream.



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Who Lives in This Stream?

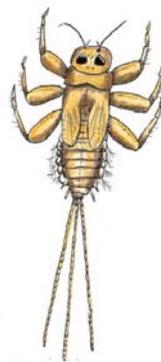
WHAT YOU WILL NEED

- Portrait of Our Stream Data Form
- Clipboard
- 2 markers or pencils
- Stream Sampling Kit
- "Stream Macroinvertebrates" Fact Sheet

WHAT TO DO

1. Pick out one aquatic specimen that you found to study carefully.
2. Complete the "Portrait of Our Stream Data Form", section F, including drawing the animal.
3. Share data from your site.
4. How does the pH of the stream affect the animals and plants that live there?
5. Discuss the temperature results. Is the temperature of the water in the riffles lower or higher than the other temperatures?
6. What were the measurements of width, depth, and velocity of the stream? What do they tell you about the stream?
7. Was there evidence of run-off or erosion in the stream?

8. What was the bottom of the stream like?
9. Were there fish barriers in the stream?
10. What kind of land surrounds the stream? How is it used?
11. What were the results of the bug test? How did you rate the overall health of the stream?
12. What kind of animals were found in the stream? How many different kinds were found?



Mayfly



Stonefly



Caddisfly

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PORTRAIT OF OUR STREAM

TASK A: HOW OUR STREAM MEASURES UP

WIDTH - Measure the stream at its

Widest Point: ____ feet Narrowest Point: ____ feet

DEPTH (tie a rock or weight to the end of your string to measure depth)

Deepest Point: ____ feet Shallowest Point: ____ feet

VELOCITY

Number of seconds for each measurement

--	--	--	--

Average number of seconds (Total divided by number of tests): _____

Velocity in feet per second (30 feet divided by average number of seconds):
_____ feet per second

TASK B: STREAM TEMPERATURE

Record the temperature for each site. Put an "X" in the boxes that describe the place where you took the temperature.

Site	Temperature	THE SITE WAS		THE WATER WAS			
		Sunny	Shady	Shallow	Deep	Fast	Slow
1							
2							
3							

TASK C: THE pH OF THE STREAM

The pH of the water in each site was:

Pool: _____ Riffle: _____ Other: _____

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TASK D: STREAM BANKS AND BOTTOMS

Describe the signs of erosion or runoff and what you think may be causing it:

Draw a cross section of the stream to show what the banks and bottom looks like.

The stream flows through land that is used for: (Check appropriate boxes)

Homes	Woods	Factories	Parks	Farms	Fields	Stores	School/Hospital

People have done the following to the stream: _____

Fish barriers in the stream are:

Culvert	Dam	Water Too Shallow	Object in Water	Other

The stream smells like: _____

Water Color: _____ (Check one) Patches of: Foam ___ Oil ___ Other _____

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TASK E: THE BUG TEST: GIVING YOUR STREAM A GRADE!

- 1) Using the Stream Macro invertebrates fact sheet, tally the number of aquatic organisms you found.
- 2) Record the estimated numbers with the following code:
A = 1 to 9 B = 10 to 99 C = 100 or more.
- 3) Total the number of letters. (Example: If you had two A's, the answer would be 2 or if you had one A and one C the answer would also be 2.)
- 4) Multiply the total by the number given below which is weighted based on the importance of that group of organisms.
- 5) Add the answers from each letter code column.
- 6) Using that total look for the box that indicates the range that includes that number. This will tell you the health of your stream.

Pollution Sensitive Organisms	Letter Code	Pollution Moderately Sensitive	Letter Code	Pollution Tolerant	Letter Code				
Mayfly		Net Spinning Caddisfly		Blackfly					
Stonefly		Alderfly		Aquatic Worms					
Caddisfly		Crane fly		Midge					
Water Penny		Damselfly		Leech					
Hellgramite/ Fishfly		Dragonfly		Ramshorn Snail					
Gilled Snails		Riffle beetle		Pouch Snail					
		Scud							
		Crayfish							
		Clams and Mussels							
Add the Number of Letters		Add the Number of Letters		Add the Number of Letters					
Multiply by 3		Multiply by 2		Multiply by 1					
Total of the three letter code columns: _____									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Excellent (more than 22)</td> <td style="width: 25%;">Fair (11-16)</td> <td style="width: 25%;">Good (17-22)</td> <td style="width: 25%;">Poor (under 11)</td> </tr> </table>						Excellent (more than 22)	Fair (11-16)	Good (17-22)	Poor (under 11)
Excellent (more than 22)	Fair (11-16)	Good (17-22)	Poor (under 11)						

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TASK F: WHO LIVES IN THIS STREAM?

Carefully study a stream animal. Answer these questions about it and draw its picture.

- 1) Where did I observe it? _____
- 2) What did it seem to be doing when I observed it? _____
- 3) How many legs did it have? _____
- 4) What kind of eyes? _____
- 5) What kind of wings, if any, did it have? _____
- 6) How did it move around? _____
- 7) What body part did it use to move? _____
- 8) What color was it? _____
- 9) Draw a line here to show how long it was.

Draw the animal on the back of this data form. Draw it bigger than life-size so you can show details. Return the animal to the location where you found it.

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