

▶ SECTION 2: FIELD TRIP

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Section 2 of six curriculum sections

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For more information about volunteer stream monitoring opportunities in Wisconsin, and for printable pdfs of this curriculum visit:

watermonitoring.uwex.edu/wav

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FIELD TRIP

Learning Objectives:

- Students will use equipment to monitor six (or more) aspects of stream water quality.
- Students will gather data and record their information on data sheets.

Standards:

Environmental Education B.8.8, B.8.15, C.8.2, E.12.3;
Mathematics: Measurement D.8.3, D.8.4, D.12.2, D.12.3;
Mathematics: Statistics and Probability E.8.1, E.12.1;
Science Inquiry C.8.1, C.8.2, C.8.3, C.12.4; Social Studies
A.8.1, A.12.2

Time:

If the stream is close to the school, half a school day should be enough time. If bus travel is necessary, a full school day may be required for the field trip.

Materials:

- Materials needed for each station are included for each activity in this section, and also collectively (for easy photocopying) in Section 6 (page 6-2). Quantities of equipment listed are for a group size of 8-12 students working in pairs or groups of three. Laminated copies of these materials lists should be placed in or attached to each station bin.
- Teachers should encourage any student with access to hip boots, chest waders or tall rubber boots to bring them on the field trip day. Alternatively, the teacher should contact a local Watershed Education Resource Center to arrange to borrow hip boots or chest waders for the field trip (see page 5-15).
- Laminated copies of procedures should be placed in each station bin. Procedures that can be photocopied are included in Section 6 (see pages 6-4 to 6-16).
- Two types of data sheets will be used during the field trip: Student data sheets and Station Leader data sheets. These are included in Section 6 (see pages 6-17 and 6-23).
- Students and Station Leaders will need pencils to record the data.
- A first aid kit, cell phone and emergency contact information are also important to bring along.
- Have the students dress appropriately for the weather, and bring sunscreen, water, baseball hats, bug dope, etc.
- It's also a good idea to bring a whistle or horn for indicating station changes.

Note:

You should know the general condition of the stream you will visit prior to your field trip. Contamination from agricultural, industrial, commercial and/or residential sources (such as pesticides, sewage or industrial wastes) can be hazardous. If you suspect contamination, use precautions to protect students and facilitators. Boots, gloves and safety glasses should be worn when needed or if conditions warrant their use. Contact the Wisconsin Department of Natural Resources hotline 1-800-TIP-WDNR (847-9367), or #367 by cellular phone, or text TIPWDNR [space] followed by the tip to 847411 (tip411) if you find serious problems at the monitoring site.

PROCEDURE:

As Soon as Possible Prior to the Field Trip

1. Pick a date and location for the field trip, along with a rain date. You will need to select a site that is both accessible and safe to enter. You should think about the following when choosing your site: Is there access to a wadable stream, a sheltered location in case of inclement weather, and bathroom facilities at the site? Can a school bus access the site? Will students be safe from traffic or other hazards while they are participating in the field trip? Is there a cost associated with using the site? Is there a minimum or maximum number of people who can attend the training based on site constraints? Do you need landowner permission to use the site (you should get written permission to have a field trip on private lands)? If needed, your local UW-Extension Natural Resource Educators, County Land Conservation Staff or DNR Biologists may be able to assist with locating a suitable site.
2. You should also determine who will be leading stations during the field trip and make contact with those people as soon as possible to ask for their help. Remember, like you, these people have busy schedules, so the earlier you can request their assistance and fill them in on details about the field trip location, times and date, the more successful the trip will be. Volunteer field trip leaders could include other teachers or staff from your school, local college students, Water Action Volunteers' citizen monitors, parents or others (e.g., advanced placement biology or chemistry high school students). See Section 5 (page 5-16) for information about connecting with and organizing volunteer station leaders for your field trip.
3. If needed, arrange to borrow equipment from one of the Watershed Education Resource Centers (see page 5-15). The earlier you can arrange to borrow the equipment, the better off you will be to hold the field trip on the day you hope to carry it out.
4. As needed, arrange for student transportation to the field location and for substitute teachers. Distribute permission slips for parental permission for students to attend the field trip, and address other logistical details that will enable you to bring your students to the stream for the field trip.
5. Review this section and Section 6 of this curriculum to better understand how the field trip will run, and to educate your station leaders about their roles.

During the Field Trip

6. Students should be divided into six groups.* At each station, students will work in pairs or groups of three.

* If only a few volunteers are available to lead station activities, the stations could be condensed as follows:

1. Water sample/Dissolved Oxygen/Temperature
2. Macroinvertebrate Collection and Identification/Transparency
3. Habitat/Stream Flow

If this option is chosen, each station will take approximately one hour to complete.

In this situation, neither the Magic Spots Language Arts Activity nor the Topographical Maps activity would be part of a set station. These could be offered as an additional station or used by a Station Leader if they had extra time after completing regular station activities.

Note:

If students and teachers/station leaders will arrive at the site simultaneously, to facilitate station set-up, teachers may choose to carry out the Magic Spot language arts exercise with all students immediately upon arrival (see Station 2 description). However, if this is done, another optional activity should be used in place of the Magic Spots activity at Station 2.

7. Student groups will rotate through the following stations:

Station 1: Transparency/Topographical Maps (most upstream station)

Station 2: Water Sample Collection/Temperature/Language Arts

Station 3: Dissolved Oxygen

Station 4: Stream flow

Station 5: Habitat

Station 6: Macroinvertebrate Collection

Station 7: Macroinvertebrate Identification

General notes to teachers regarding field trip stations:

- Teachers may also opt to offer additional stations from the suggested list of optional activities (see page 2-25) to reduce group size if there is a large number of students to accommodate.
- No students should initiate the field trip at Station 7, as macroinvertebrates need to be collected prior to a group working at that station.
- It is recommended that the transparency station be located most upstream at your field location if possible, to avoid students upstream from contaminating the transparency samples.
- The temperature and dissolved oxygen stations should be located near the transparency station to facilitate sharing of hip boots and delivering the water sample, respectively.
- If *E. coli* bacteria are to be monitored, a classroom component of that monitoring is required the same day.
- Methods for each station should be used as a guideline for station leaders, but since students have prepared in advance, in general, methods are not designed to be handed out to the students (except for dissolved oxygen).

8. Each station will take approximately 30 minutes to complete. An additional 10 minutes should be allowed for students to move between stations and to act as a time buffer for stations that may need a few extra minutes to have students complete their tasks. It's a good idea to assign one teacher, parent or volunteer to blow a whistle or horn when there are five minutes left in the session, so station facilitators are aware of the time.

9. The lead teacher should collect student data sheets at the end of the field trip. However, for Middle School students or students who require more guidance; after students have completed the data collection at a station, station leaders can record student data on a station leader data sheet for the appropriate parameter (page 6-23). Station leaders should provide this completed data sheet to the lead teacher at the end of the field trip. There is no data sheet to complete at the macroinvertebrate collection station.

Station 1: FINDING YOUR WATERSHED AND TRANSPARENCY

Finding Your Watershed activity based in part on Georgia Adopt-a-Stream's Educator's Guide "How Big is the River – Really?" activity.

Learning Objectives for Finding Your Watershed activity:

- Students will use topographical maps to locate the stream they are studying.
- Students will learn to read topographical maps (including symbols, scale and the legend).

Find Your Watershed Materials:

- Copy of Major Watersheds of Wisconsin map (See page 5-15)
- Copies of a topographical map(s) showing the stream being studied and the school (See Other Resources in Section 5)
- Copies of a topographical map of a different location (See Other Resources in Section 5)
- Copies of USGS brochure "Topographic Map Symbols" (See Other Resources in Section 5)
- 1 box pencils
- Clipboards
- Rulers (1 per group of three students)

Time:

20 minutes

Background:

By studying a map of the watershed within which they are monitoring while streamside, students can look out onto the landscape to see what is depicted on the map by contours, shading, etc. Taking time to think about the entire watershed while at the stream monitoring site will also help students develop theories to explain results of their monitoring – they will have a better understanding of land use and the landscape within the watershed.

PROCEDURE:

1. Ask students to gather around a topographical map (not the one they'll use for their activity) for a general explanation of what the map shows and how to read it.
 2. Explain what a topographical map shows (i.e., topography or a graphical representation of the earth's surface including elevation) and what that means in terms of watersheds and water flowing downhill to form streams, rivers and lakes.
 3. Explain to students how to find the scale, legend and contour lines on the map. Talk through how to determine contour interval and steepness of slope based on the contour lines (the closer together the contour lines are, the steeper the slope).
 4. Observe a watershed on the map with them, outlining (with your finger) watershed edges, and viewing streams and their direction of flow down gradients.
 5. Explain that students will now be given topographical map(s) of the location of the field trip. They will be asked to answer several questions about the stream and the surrounding landscape.
 6. Have students break into groups of three to complete the activity.
 7. Students should study the map/images and locate their stream.
 8. Students should complete the Finding Your Watershed worksheet.
-

Optional Activity:

- Map Your Watershed (See page 2-26)
- River Profiles (See page 2-26)
- Where is My Watershed? (See page 2-26)

Name: _____

Date: _____

Period: _____

Finding Your Watershed Student Worksheet

Refer to your map to answer the following questions. Leave this paper with the station teacher before rotating to the next station.

1. What is the scale on this map?
2. Locate the stream you are studying. Now locate your school. How far is the straight-line distance from the stream to your school? (Estimate the distance if your school and the stream site are not located on the same map.)
3. What body (or bodies) of water flows into the stream you are studying?
4. Are the contour lines close together or far apart near the stream at your monitoring site? (circle one)
5. What does this tell you about the slope of the land alongside the stream?
6. Describe the watershed surrounding this stream (e.g., Is the land open, forested, urban? What is the topography like?)
7. What body of water does this stream empty into?
8. What else can you say about this stream and the land nearby it by studying this map?

Learning Objectives for transparency monitoring:

- Students will assess transparency of the stream and record information on their data sheets.

Transparency bin contents:

- 4 pairs hip boots (share with temperature monitoring station)
- 4 transparency tubes
- 1 box pencils
- Student data sheets
- Station Leader data sheet
- Nylon stocking (optional)
- Bucket (optional)
- Stirring stick (optional)

TRANSPARENCY PROCEDURES

Collecting the sample:

1. Collect the sample away from the river bank in the main flow area upstream from where you are standing. Enter the water downstream from the sampling location. Be careful not to stir up the bottom sediment upstream of your sampling location.
2. Face upstream (into the current).
3. Collect your water sample by holding your transparency tube horizontally and plunging it 8-12 inches beneath the surface or halfway down from the surface. Scoop away from your body and into the current.
4. Scoop water into the tube so it is filled to the top, or use a bucket to collect additional water from the stream at the site to fill the tube to the top.
5. Be careful not to collect water that has sediment from bottom disturbances (toss out the sample and try again if you get bottom sediment in your sample).
6. Return to shore with the sample.

Assessing transparency:

7. Remove large objects from the water sample. (Filter through nylon stocking if necessary.)
 8. If the sample has settled, use a stirring stick to stir the sample, or pour the sample into a clean bucket and back into the transparency tube to suspend all materials.
 9. Stand out of direct sunlight. If you cannot get to a shady place, use your body to cast a shadow on the tube.
 10. If you are wearing sunglasses, remove them. Then look for the target (black and white) disc on the bottom of the tube. If the disc is visible, record the length of the tube (e.g., 120 cm) on the data sheet.
 11. If the target disc is not visible, have your partner let water out a little at a time using the valve at the bottom until the disc is just visible. Have them stop letting water out immediately when you can just see the contrast between black and white on the disc.
 12. Read the height of water in the tube using the measuring tape on its side.
 13. Record the measurement on your data sheet in cm.
 14. Dump contents of the tube on the ground.
 15. Repeat steps 1 through 14. Record the second measurement in cm on your data sheet.
 16. Add both of the readings, divide by 2, and record the average transparency on your data sheet.
 17. Tell your results to your station leader.
-

Station 2: TEMPERATURE/WATER SAMPLES/MAGIC SPOTS

Learning Objectives for water sampling and temperature monitoring:

- Students will collect water sample(s).
- Students will monitor water and air temperature and record information on their data sheets.

Temperature/Water Sampling bin contents:

- 4 pairs hip boots (share with transparency monitoring station)
- 4 thermometers
- 4 stopwatches or digital watches
- 4 Hach dissolved oxygen sampling bottles
- 1 box pencils
- 4 clear plastic cups
- Student data sheets
- Station Leader data sheet
- Optional – only if doing *E. coli* monitoring
 - Antibacterial hand wipes
 - Sharpie permanent marker
 - Sterile 30 mL collection bottle
 - Nitrile or latex gloves
 - Cooler with ice

WATER SAMPLING PROCEDURE FOR DISSOLVED OXYGEN (for each pair or group of students):

1. One person per group should put on a pair of hip boots (or tall rubber boots).
 2. Use a Hach dissolved oxygen sampling bottle (glass bottle with the stopper) to collect a sample in normally moving water.
 3. Facing upstream, slowly lower the bottle so the opening of the bottle faces away from you, and water current is entering the bottle.
 4. Allow the bottle to fill with water gradually, turning it to allow air bubbles to float out.
 5. Cap the bottle while still submerged, and leave extra water in the neck of the bottle.
 6. When lifting out of water, look for bubbles. If you see any, pour out the sample and collect another using the same procedure.
 7. Immediately pass this sample on to the dissolved oxygen station for analysis.
-

TEMPERATURE MONITORING PROCEDURE (for each pair or group of students):

1. Use the thermometer to measure the air temperature. Record the temperature on your data sheet. Be careful to hold the thermometer away from its base, as that is where the sensor is located.
2. To measure water temperature, test in the middle of the stream where the water is moving, not in pools or backwater areas. Test near where the water samples were gathered.
3. Lower the thermometer about four inches below the surface, as close as possible to the middle of the stream.
4. Leave the thermometer immersed until the reading has stabilized. This usually takes about two minutes. Try to take the reading with the base of the thermometer still immersed. You can fill a clear plastic cup with water and raise it to eye level to read the temperature.
5. Record your measurement on your data sheet. If you measured in ° F, use the chart on the front to convert and record your measurement in ° C.
6. Tell your air and water temperature results to your station leader.

(Optional) *E. COLI* BACTERIA WATER SAMPLE COLLECTION PROCEDURE (for each pair or group of students):

1. One person should put on a pair hip boots (or tall rubber boots).
2. Wash hands with antibacterial hand wipes.
3. Put on nitrile or latex gloves.
4. Obtain a 30 mL collection bottle.
5. Label the sample bottle with student group number or names, location and date with a permanent marker.
6. With the bottle in hand, gently wade into the stream to the main area of flow. Walk slowly to avoid suspending sediments at the sampling site which could lead to false high *E. coli* counts.
7. Remove the bottle cap carefully so as to avoid touching the inside of the cap or bottle.
8. Sampling upstream from your location, face the open mouth of the bottle downward and immerse it 6-12 inches below the surface (or about midway down through the water column if the water depth does not allow sampling at this depth). While keeping it the same distance under the surface, turn and sweep the bottle in the direction of its opening, then turn it upright and remove it from the water.
9. After bringing the bottle above the surface, pour out a few centimeters of water so that there is a little bit of air space that will allow the sample to be mixed, then replace the lid on the bottle.
10. Place the sample in a cooler with ice packs to be transported back to your school.

CLASSROOM PROCEDURE FOR *E. COLI* BACTERIA MONITORING:

You will use 3M™ Petrifilm™ to monitor *E. coli*. It is essential that you maintain sterile conditions while plating your sample, since this is the time with the greatest potential for external contamination of the samples. Follow these steps to process the sample:

1. Remove 3M™ Petrifilm™ from refrigerator and allow the package to come to room temperature before opening. This will take at least 10-15 minutes.
2. Sanitize your working surface by spraying or wiping it with a dilute bleach solution.
3. Wash your hands thoroughly with soap and water.
4. Label the back side of three 3M™ Petrifilm™ plates with the date, time, sampling site and replicate number (1 to 3).
5. Always shake your sample bottle before extracting a sample with a pipette.
6. Place a 3M™ Petrifilm™ plate on a level surface.
7. Lift the top film and dispense 1 ml of sample in the upper portion of the pink portion of the plate.
8. Slowly roll the top film down onto the sample to prevent trapping air bubbles.
9. If needed, with the smooth side down, place the plastic spreader over the closed plate and distribute the sample evenly across the pink area of the plate by gently tapping with one finger on the center of the plastic spreader.
10. If used, remove the spreader and leave plate undisturbed for at least one minute to permit the gel to solidify.
11. Repeat this process for your other two replicate samples.
12. Incubate the plates in a horizontal position, with the clear side up, in stacks of up to 20 plates.
13. Incubate for 24 hours at 35°C.

Note to teachers:

- Do not use plates that show orange or brown discoloration.
- Ensure plates to be used for field monitoring have not expired. The expiration date and lot number are noted on each package. (Example expiration date: 2012-10, would expire in the 10th month (October) of the year 2012.)

Note to teachers:

The incubator should be humidified with distilled water. Set up the incubator several hours in advance to allow it to get to temperature prior to plates being placed within it. For first-time use, allow a few days to manipulate the temperature to adjust it to 35°C.

Learning Objectives for Magic Spots: A Language Arts Activity:

- Students will use their senses to make observations about their surroundings.
- Students will record their observations in their student workbook.
- Students will share one observation with other students orally.

Materials:

- Magic Spot data sheet
- Clipboard
- Pencil

Time:

20 minutes

PROCEDURE:

1. Explain to students that they will be making observations of their surroundings and recording those on their data sheet.
 2. Explain that they will have about five minutes to sit quietly in a location on their own and assess what they see, hear, smell and feel in that area.
 3. Also explain that they will have the opportunity to write a paragraph or a poem (Haiku) about the spot where they will sit.
 4. Have students move to locations at least 10 feet from any other student. (If the teacher feels comfortable, and the group is mature enough, students can be asked to find a location out of sight of all other students. This can also be done in pairs.)
 5. Begin timing this quiet activity and assisting students having difficulties with the assignment.
 6. After the allotted time has passed, have the students come back to a central area and form a circle.
 7. Ask each student to share something they observed during the activity. They can read a Haiku or a paragraph they wrote about their location, or they can share something they remember that was special or unique about the place where they sat.
-

Optional Activity:

- Stream Sense (see page 2-25)

Name: _____

Date: _____

Period: _____

Magic Spot Student Worksheet

First take a few moments to observe your surroundings. Use all of your senses and list descriptive words for each below:

Sight	Hearing	Smell	Touch
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Now use some of the words you have listed to write about this location/experience/habitat, etc. You might choose to write a few Haikus (three lines consisting of 5, 7 then 5 syllables respectively) or a descriptive paragraph.

Station 3: DISSOLVED OXYGEN

Learning Objectives:

- Students will monitor dissolved oxygen content of a water sample and record information on their data sheets.

Dissolved Oxygen bin contents:

- 4 Hach test kits
- 8 pairs safety goggles
- 1 box gloves
- 1 box pencils
- Student data sheets
- Station Leader data sheet

PROCEDURE:

Fixing the Dissolved Oxygen Sample

*These directions, with some minor modifications, are written for the Hach water testing kit for dissolved oxygen. Remember that photosynthesis and respiration will continue after a sample is collected, so water can gain or lose oxygen while sitting in the sample bottle. Therefore, you should **BEGIN D.O. TESTING IMMEDIATELY UPON RECEIVING THE WATER SAMPLE.***

1. Put on protective gloves and safety goggles. If your skin comes in contact with any powder or titrant, rinse the area liberally with water.
2. Remove the stopper and add the contents of D.O. powder pillow #1 (manganous sulfate powder) and D.O. powder pillow #2 (alkaline iodide azide powder) to the sample.
3. Insert the stopper, being careful not to trap an air bubble and shake vigorously, holding on to the top. If oxygen is present, a brownish-orange floc will form.
4. Allow the sample to stand until the floc settles halfway. Shake the bottle a second time and allow the floc to settle halfway again.
5. Remove the stopper and slowly add the contents of D.O. powder pillow #3 (sulfamic acid), taking care not to displace any floc.
6. Stopper and shake vigorously to dissolve the floc. Wait until all the floc is dissolved. The yellow color is from iodine. This is called the prepared sample. Prepared samples can be stored in the dark for a short time if it is more convenient or comfortable to return to your home/school to complete the analysis. Check with you teacher, if time enough remains at this station you may continue with the dissolved oxygen test.

Note:

If you see any air bubbles trapped in the sample bottle during steps 2 and 3, discard the sample and start over.

Determining Dissolved Oxygen

7. Transfer two plastic measuring tubes full of prepared sample to the square glass mixing bottle. Using two measuring tubes allows you to determine D.O. to the nearest 0.5 mg/L.
 - a.) Holding the dropper vertically, add one drop at a time of sodium thiosulfate standard solution titrant to the square mixing bottle, and count each drop.
 - b.) Swirl the solution after each drop.
 - c.) Continue adding sodium thiosulfate drops until the sample is a very light yellow.
 - d.) Add 3 to 4 drops of starch solution. The prepared sample will turn blue from the added starch solution.
 - e.) Continue adding drops of sodium thiosulfate, mixing and counting until the prepared sample turns from blue to colorless (the end point). Often this is just one or two more drops, so be careful.
 8. The dissolved oxygen content of the water in mg/L is the total number of drops of titrant used to get to the endpoint divided by two if two measuring tubes of prepared sample were used. If only one measuring tube of prepared sample was used, the dissolved oxygen content is equal to the number of drops of titrant. Example: If you used two tubes of sample, you need to divide by two (13 drops divided by two tubes = 6.5 mg/L). If you only used one tube of sample, it's the actual number of drops of titrant used (6 drops with one tube = 6 mg/L).
 9. Report the number of measuring tubes and the number of drops you used, and the calculated mg/L on your data sheet.
 10. Tell your results to your station leader.
-

Station 4: STREAM FLOW

Learning Objectives:

- Students will assess the volume of water flowing by a point in time (i.e., stream flow) of the stream and record information on their data sheets.

Stream flow bin contents:

- 6 pairs hip boots
- 2 tape measures
- 2 yardsticks or marked poles
- 12 surveying flags
- 2 tennis balls
- 2 stopwatches or digital watches
- 2 calculators
- 1 box pencils
- string (optional)
- stakes (optional)

PROCEDURE:

Safety considerations

You will need to enter the stream channel to make width and depth measurements and to calculate velocity. Be aware of stream velocity, water depth and bottom conditions at your stream-monitoring site. Do not attempt to measure stream flow if water velocity appears to be fast enough to knock you down when you are working in the stream. If you are unsure of water depth across the width of the stream, be sure to proceed with caution as you move across the stream, or choose an alternate point from which to measure stream flow.

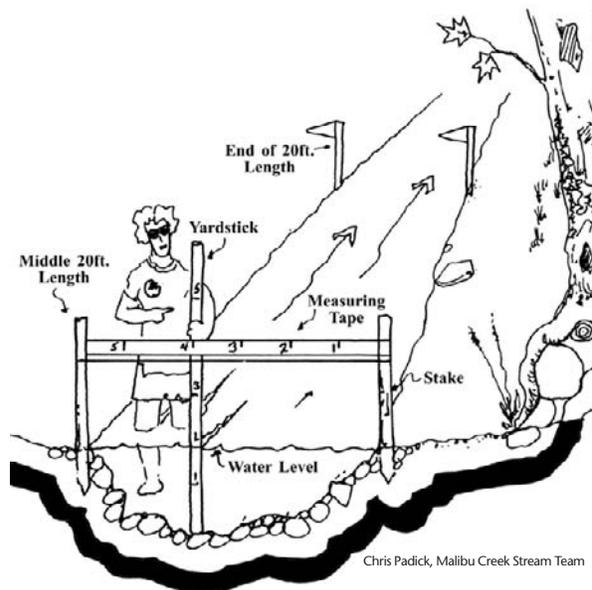
Site location

1. At your monitoring site, locate a straight section of stream that is at least 20 feet in length and has a uniform width. The water should be at least 6 inches deep, and have some movement. Try to avoid areas with undercut banks. Unobstructed runs or riffles are ideal sites to choose.
2. Measure 20 feet along the length of your chosen stream segment with your measuring tape and mark both the up and downstream ends of the section with flagging. Record this length on your data sheet.

Width and depth measurements

3. Working with a partner, measure stream width (from water's edge to water's edge) by extending a measuring tape across the stream at the midway point of your marked stream segment. Record the width in feet on your data sheet. (Using a tape measure graduated in tenths of feet will make calculations easier.)

4. Hold or secure the measuring tape to both shores so that the tape is taut and above the surface of the water. You might choose to secure the tape using shoreline vegetation or to attach the tape or a length of string to two stakes secured on opposite banks to create a transect line across the stream if it is impractical to hold the tape.
5. Using your engineer's ruler or pre-marked (in tenths of feet) pole, measure the water depth (ft) at one-foot intervals across the stream where you measured width (and secured the measuring tape). Be sure to measure depth in tenths of feet, not in inches. Record depth measurements (ft) on the data sheet. If your stream is greater than 20 feet wide, measure the depth in 20 equal intervals across the stream.



Velocity measurement

6. Velocity will be measured by tracking the time it takes a floating object to move the marked 20-foot length of stream. You will time the floating object (in seconds) a total of four times, at different locations across the stream. Repeating your measurements across the stream, in both slower and faster areas, will help to ensure the closest approximation to the stream's true velocity. This in turn will make your flow calculations more accurate. However, be sure your float travels freely downstream (during every float trial) without catching in slack water areas of the stream. For narrower streams (less than 10 feet), you can conduct only three float trials to assess velocity.
7. Position the person who will release the float upstream from the upper flag. Position the timekeeper with the stopwatch on the streambank (or out of the main flow path) at the downstream flag. Position the person who will catch the float downstream from the timekeeper. (Note: Unless velocity is very fast, the timekeeper should be able to catch the float with a net after they have finished timing its run down the stream.)
8. The float-releaser will gently drop the float into the stream a few feet upstream from the upper flag, and will alert the timekeeper to begin timing as the float passes the upstream flag (the float should have time to get up to speed by the time it passes the upper flag into the marked length of stream). If the float gets stuck on a log, rock or other obstruction, it should be released from the starting point again.
9. The timekeeper should stop the stopwatch as the float passes the downstream flag and retrieve the float using the net.
10. Record the float time for the first trial on the data sheet.
11. Repeat steps 8 and 9 for each of the remaining float time trials in different sections of the stream. Record the float time (seconds) for each trial on your data sheet.

Station 5: HABITAT ASSESSMENT

Habitat Bin Contents:

- 4 measuring tapes
- 8 surveying flags
- 4 stopwatches or digital watch
- 1 box pencils
- 4 clipboards

Safety:

Water appearance and odor can indicate water pollution. However, it can also indicate a possible safety hazard. If you notice any unusual water characteristics, **DO NOT ENTER THE WATER** and contact your local DNR office to report it. Your safety is important to us.

Here is a list of normal and possibly hazardous characteristics of water:

Clear – Colorless, transparent.

Turbid – Cloudy brown. May be due to suspended silt or organic materials suspended in the water.

Milky – Cloudy-white or gray, not transparent. May be natural or due to pollution.

Foamy – May be natural or caused by excessive nutrients or detergents from pollution. (Foam that is several inches high and does not brush apart easily is generally due to some sort of pollution.)

Dark brown – Tea-colored. May indicate that a naturally occurring, harmless acid is being released into the stream.

Oily sheen – A multicolored reflection. Can occur naturally or it may indicate oil or other petro chemicals floating in the stream.

Orange/Reddish – May indicate acids draining into the water or iron bacteria.

Green – Caused by algae. May indicate excess nutrients are being released into the stream. No smell or a natural odor.

Sewage – May indicate the release of human waste material, livestock manure flow from an upstream feed lot. If you smell sewage/manure or rotten eggs come from the stream, please do not enter the water. Notify the nearest DNR Service Center.

Chlorine – May indicate that a sewage treatment plant is over-chlorinating its effluent or may be from swimming pool discharge. Also component of milk house cleaning.

Fishy – May indicate the presence of excessive algae growth or dead fish.

Rotten eggs – A sulfurous smell may indicate muck soils or sewage/manure pollution, as hydrogen sulfide gas is a product of organic decomposition.

Petroleum – May indicate an oil spill from boats, land or storm drains.

PROCEDURE:

1. Determine if your stream is a rocky-bottom or soft-bottom stream.
 2. Measure and mark a 300 ft. section of the stream.
 3. Obtain the appropriate Habitat Checklist (i.e., rocky-bottom or soft-bottom stream) and answer the questions on that sheet.
 4. Total the habitat score for your stream.
 5. Provide your results to your station leader.
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Station 6: MACROINVERTEBRATE COLLECTION

Macroinvertebrate Collection Bin Contents

- 8 pairs hip boots
- 4 D-frame kick nets
- 4 stopwatches or digital watches
- 4 white dishpans

PROCEDURE:

1. At least two people in each group should put on hip boots. (It's great if everyone is able to wear them if possible.)
2. Follow the procedures below to select sampling sites and to collect macroinvertebrates properly in the type of habitat you are sampling.
3. Collect three sub-samples within the 300-foot stream section where you are monitoring. Combine them into one bin for a complete biotic index sample.

Selecting Sampling Sites

Rocky-bottom and soft-bottom streams support different kinds of organisms, so be sure to choose sites based on your stream type. Your goal is to collect as many different kinds of aquatic macroinvertebrates from different habitats to ensure an accurate site assessment. Be aware that different habitat types may have different sampling protocols and some have a greater diversity of organisms than others. If you have many habitats from which to choose, first collect two sub-samples from the habitat with the most diversity, then choose one other habitat from which to sample (see chart below). For example, if your stream has a rocky bottom, sample at two separate riffle areas and at one other habitat. If your stream has a soft bottom or does not have riffles, collect samples at undercut banks, submerged logs or snags before considering sampling from a leaf pack.

Habitat Type	Stream Type	Habitat
Riffles	Rocky bottom	Most diverse
Undercut banks	Rocky, soft bottoms	Diverse
Snag areas, tree roots	Rocky, soft bottoms	Less diverse
Leaf packs	Rocky, soft bottoms	Least diverse

MACROINVERTEBRATE RIFFLE SAMPLING PROCEDURE

1. Rinse the net and check to make certain it doesn't contain any debris from the last time it was used.
2. Fill your basins or buckets with about one inch of clean stream water.
3. Place the net firmly on the bottom of the stream so that the water flows into the net. Stand next to the net.
4. Have your partner position themselves upstream of the net as the kicker. They should not begin kicking until the timer tells them to begin.
5. The third student in the group (or one of the two if working in pairs), will need a stopwatch and will time the sample collection.
6. When the timer starts the stopwatch, the kicker will disturb the bottom substrate and dislodge macroinvertebrates by kicking for two minutes. Alternately, they can use their hands to pick up each rock immediately above to about 18 inches upstream of the net and rub each of them thoroughly to remove all critters clinging to it. They should gently replace the rocks in the stream after rubbing them. They should continue to pick up, rub and remove rocks for two minutes.
7. When sampling, if you find you have too much water in your bucket or if the water is too muddy, pour the excess/muddy water through your net. Then allow stream water to flow through the net to rinse the sample within it, being careful not to lose anything from within the net. Add some clean water to the basin and empty the contents of the net into it.
8. Carry the net to shore and dump the contents into one basin or bucket with water and/or organisms and debris from other habitats' sub-samples.
9. All organisms clinging to the net should be removed and placed in the basin.
10. When you have added three sub-samples to your basin, you have collected a complete biotic index sample. Return to shore with your basin.

MACROINVERTEBRATE SNAG SAMPLING PROCEDURE

(Snag areas are accumulations of debris caught on logs, stumps or other obstruction in the water.)

1. Rinse the net and check to make certain it doesn't contain any debris from the last time it was used.
2. Fill your basins or buckets with about one inch of clean stream water.
3. Select about a three-foot by three-foot area (for uniform comparisons) around the snag, tree roots, logs or other debris.
4. Scrape the surface of the tree roots, logs or other debris with your net. You can also disturb the surfaces by scraping them with the net, your hands or your foot, or you can pull off some of the bark to get at organisms hiding underneath.
5. Twenty jabs equals one sample.
6. To remove sediment, allow water to flow through the net while holding it in the stream. Be careful to keep the opening facing upstream so you don't lose any organisms.
7. Carry the net to shore and dump the contents into one basin or bucket with water and/or organisms and debris from other habitats' sub-samples.

8. All organisms clinging to the net should be removed and placed in the basin.
9. When you have added three sub-samples to your basin, you have collected a complete biotic index sample. Return to shore with your basin.

MACROINVERTEBRATE UNDERCUT BANK SAMPLING PROCEDURE

(Undercut banks have scooped-out areas just below the surface of the water. This creates a bank that slightly overhangs on the surface of the water, and provides habitat for many kinds of organisms underneath).

1. Rinse the net and check to make certain it doesn't contain any debris from the last time it was used.
2. Fill your basins or buckets with about one inch of clean stream water.
3. Facing the bank, move the net in a bottom-to-surface motion along the undercut bank to dislodge organisms. Jabbing the net about 20 times should provide enough organisms for your sample.
4. Carry the net to shore and dump the contents into one basin or bucket with water and/or organisms and debris from other habitats' sub-samples.
5. All organisms clinging to the net should be removed and placed in the basin.
6. When you have added three sub-samples to your basin, you have collected a complete biotic index sample. Return to shore with your basin.

MACROINVERTEBRATE LEAF PACK SAMPLING PROCEDURE

1. Rinse the net and check to make certain it doesn't contain any debris from the last time it was used.
 2. Fill your basins or buckets with about one inch of clean stream water.
 3. Look for old leaf packs that are dark brown, slimy and slightly decomposed.
 4. Working in pairs, position the dip net downstream from the leaf pack. Use your feet or hands to (or have your partner) gently move the leaf pack into the net.
 5. Carry the net to shore and dump the contents into one basin or bucket with water and/or organisms and debris from other habitats' sub-samples.
 6. All organisms clinging to the net should be removed and placed in the basin.
 7. When you have added three sub-samples to your basin, you have collected a complete biotic index sample. Return to shore with your basin.
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Station 7: MACROINVERTEBRATE IDENTIFICATION

Macroinvertebrate Identification Bin contents

- 4 white ice cube trays
 - 12 white plastic spoons
 - 4 tweezers
 - 4 magnifying glasses
 - 4 plastic cups
 - 1 box pencils
 - 1 box gloves
 - 4 laminated Keys to Macroinvertebrate Life in the River
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MACROINVERTEBRATE IDENTIFICATION PROCEDURE:

1. You will be assigned a dishpan to examine.
 2. Examine leaves, sticks and other large objects in the sample for any macroinvertebrates that might be hiding.
 3. After examining this debris, place it in another container to check later for organisms that may crawl out.
 4. Fill the ice cube tray half-full of water.
 5. Use plastic spoons to sort out the macroinvertebrates and place macroinvertebrates that look alike together in their own ice cube tray compartments. Sorting and placing similar looking macroinvertebrates together will help insure that you find all varieties of species in the sample.
 6. Refer to the *Key to Macroinvertebrate Life in the River*, the macroinvertebrate wild cards and the citizen monitoring biotic index data sheet to identify the aquatic macroinvertebrates.
 7. On the citizen monitoring biotic index data sheet, circle the animals on the data sheet that match those found in your sample.
 8. Count the number of types of animals that are checked in each group and write that number in the box for each group on your data sheet. (Note: Do not count individual animals that you collected. Only count the number of types of animals found in each group.)
 9. Report the number you circled for each group to your station leader for his/her data sheet.
 10. Safely return all macroinvertebrates to the stream after sorting and identifying them.
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OPTIONAL ACTIVITIES FROM OTHER SOURCES

Suggested Optional Activities from Project Wild Aquatic

- ▶ Water Canaries (This is like Stations 6 and 7 regarding macroinvertebrates) – “Students will investigate stream or pond using sampling techniques.”
- ▶ Watershed (This is an alternative to the Finding Your Watershed Station) – “Students will measure the area of a small watershed, calculate the amount of water it receives each year, and discuss the varied roles the watershed plays in human and wildlife habitat.”
- ▶ Suggestions within Shrinking Habitat (another topographical map exercise) – Students will compare old and new maps in the area to compare historic wetlands to present-day wetlands, and formulate ideas about human activities that may have played a role in changing the landscape.

Suggested Optional Activities from Project WET

- ▶ Restoration Nation – Students will work in small teams to develop a creek restoration plan and present their results to the class.
- ▶ Stream Sense – Students will use multiple senses to observe a stream.

Suggested Optional Activities from Hook, Line & Thinker

- ▶ Which Fish is This – Students will use morphological characteristics to group unlabeled fish from the order Perciformes into families and present their groupings to the class. Students will check their work using a fish identification website and dichotomous key.
- ▶ Water of Life – Students will watch a demonstration of summer lake stratification. Students will discuss oxygen and temperature changes in lakes during other seasons and work in partners to design an experiment.
- ▶ Home Sweet Home – Students will create a “travel brochure” for a particular fish species’ spawning habitat and present it to the class. The travel brochure will include a detailed description of the environment, a description of the amenities that the fish requires for spawning, and graphics from the internet or another source.
- ▶ Shared Interests – Students will read a scenario and take on the roles of characters in the story as they develop a land use proposal, argue the merits of their proposal and attempt to compromise on a decision.
- ▶ Taking Stock – Students will study and take part in a model of the factors affecting fishery populations in Lake Michigan. Through a game, they will investigate how decisions by commercial fishermen, recreational anglers, fisheries biologists and lawmakers influence and are influenced by economics and by the abundance and scarcity of fish.

Suggested Optional Activity from Give Water A Hand Action Guide

- ▶ Map Your Watershed – Students will learn that we all live in watersheds, and all water in a watershed drains to the same location. They will discover where water goes and how it gets there by working with a watershed map.

Suggested Optional Activities from Holding onto the GREEN Zone

- ▶ River Profiles – Students will locate the major landforms in a photo and a diagram of a river valley.
- ▶ Where is My Watershed? – Students will locate the riparian areas in their community watershed on street or topographical maps and will identify how people and animals use these areas.