

## 4.1 Stream Habitat Walk

The Stream Habitat Walk is an easy-to-use approach for identifying and assessing the elements of a stream's habitat. It is based on a simple protocol known as *Streamwalk*, developed by EPA's Regional Office in Seattle, Washington and consists primarily of visual observation of stream habitat characteristics, wildlife present, and gross physical attributes. A simple in-stream macroinvertebrate evaluation can also be performed. This approach requires little in the way of equipment and training.

The Stream Habitat Walk is most useful as:

- A screening tool to identify severe water quality problems
- A vehicle for learning about stream ecosystems and environmental stewardship

Because the Stream Habitat Walk is not scientifically rigorous, data from this approach are less likely to be used by state and local water quality management agencies than are data from other biological monitoring approaches. However, the Stream Habitat Walk's ease of use, adaptability, and low cost make it a highly attractive approach for many programs whose primary focus is public awareness and citizen involvement.

### ***Step 1--Prepare for the Walk***

#### **TASK 1 Schedule your Habitat Walk**

To provide data that accurately characterize your stream and can be used to document general trends in your area, you should walk the same site at least three times a year, during different seasons. It is usually best to visit your site in early spring, late summer, and fall if you live in a part of the country that experiences seasonal variations in leaf cover, vegetation growth, and water flow. It is a good idea to check with a local aquatic biologist for assistance in determining the best times to schedule monitoring. For purposes of accuracy and consistency, it is best to monitor the same site from year to year and at the same time of the year (e.g., in the spring and, more specifically, in the same month).

#### **TASK 2 Obtain a U.S. Geological Survey (USGS) topographic map of your area**

One of the most valuable tools for conducting stream monitoring work is a U.S. Geological Survey (USGS) topographic map. These "topo" maps display many important features of the landscape including elevations, waterways, roads, and buildings. They are critical tools for defining the watershed of your study stream. (See [Chapter 3](#) for a discussion of topographic maps.)

#### **TASK 3 Select and mark the Habitat Walk location(s)**

Choosing the location for stream monitoring is a task defined by the goals of your individual program. Program managers may select sites themselves or in collaboration with local or state water quality personnel. Other programs allow their volunteers to choose the site based on their personal interests. (See [Chapter 2](#) for a discussion on choosing monitoring locations.) If a Watershed Survey is conducted (see [Chapter 3](#)), this information should play a role in deciding which areas are the best candidates for the Stream Habitat Walk.

Once a monitoring site is chosen, it should be marked on the topo map. This will document the location and serve as a record in case future volunteers or data users need to find the site.

#### **TASK 4 Become familiar with safety procedures**

Volunteers must always keep safety in mind while conducting any stream monitoring activity. Provide all Stream Habitat Walk participants with a list of safety do's and don'ts and have them review this list thoroughly. **Chapter 3 covers several important safety concerns that should be incorporated into a stream monitoring program.** Remember, volunteer safety is more important than the data. Some reminders include:

- Let someone know where you're going and when you expect to return. Make sure you have an "in case of emergency" phone number with you before leaving for the field.
- Do not cross streams in high flows.
- Never go into the field alone; always work in teams of at least two people.

- If for any reason you feel unsafe, do not attempt to monitor on that day.

## **TASK 5 Gather equipment and tools for the Habitat Walk**

There is nothing more frustrating than arriving at a field monitoring site and not having all your equipment and supplies. Providing volunteers with a checklist of necessary items will help keep them organized. In addition to the basic equipment listed in Chapter 2, you will need the following for the Stream Habitat Walk. For locating the site

- U.S. Geological Survey (USGS) topographic map of the stream area (supplemented by regular street map if needed)

For recording observations

- Stream Habitat Walk field data sheet

For marking-off the stream stretch of study

- Tape measure, string, or twine (25 yards)

For working in and around the stream

- Thermometer for measuring water temperature (Scientific supply houses sell armored thermometers that are best suited for this purpose, although you can obtain a good thermometer from an aquarium store. Some thermometers need to be calibrated before use. See [Chapter 5](#) for instruction on calibrating and using thermometers.)
- Watch with a second hand or a stopwatch

For observing macroinvertebrates (optional)

- A bucket
- A shallow white pan. (Alternatives: white plastic plate or the bottom of a white plastic detergent jug)
- Tweezers or soft brush
- Ice cube trays (for sorting macroinvertebrates)
- Magnifying glass

## **TASK 6 Become familiar with the Stream Habitat Walk field data sheet and the definitions of its elements**

It is important to become familiar with the Stream Habitat Walk field data sheet and its instructions before you begin your Stream Habitat Walk. If you are unclear about any instructions when you are conducting your Walk, just leave that space blank and keep going. You might wish to contact your volunteer program coordinator for further explanation after you have completed your Walk.

At the end of this section is a sample field data sheet. You might find it necessary to modify this sheet slightly to better meet the needs of your volunteers, your ecological region, and your program. When you fill out your field data sheet, base your responses on your best judgment of conditions in a stretch of stream that includes about 50 yards both upstream and downstream of the place where you are standing. If you identify features and problems beyond your chosen 100-yard length, feel free to note them on your map and form. You might want to conduct additional Walks in the area where those features are found.

Instructions on how to fill out the field data sheet are included right on the form. They are also covered in an expanded format, with illustrations, in this text. Although many of the required measures are relatively self-explanatory, it might be a good idea to make copies of these instructions for all volunteer teams to take into the field as an additional training tool.

### ***Step 2--Delineate and sketch your site***

## **TASK 1 Delineate the site**



Even though you will only be completing the data forms for the 25 yard reach, it is important to sketch the full 100-yard section so that you can document the stream features surrounding the evaluated reach.

### **TASK 3 Complete the top portion of your field data sheet**

Include stream name, date, and county (or appropriate local designation) of your site, and describe its location as precisely as possible. It is best to stand at or near a permanent marker such as a bridge, abutment, or road. Remember, you or another volunteer will be coming back to the same spot again and again, so be as specific as you can. Some programs might ask you for the latitude and longitude of your location; others might ask for a map reference number or other site identifier.

Latitude and longitude information is critical for mapping and for many data management programs. It is also required if the data is to be entered in USEPA's STORAGE and RETRIEVAL System (STORET) or used in a Geographical Information System (GIS).

An easy way to determine latitude and longitude is to use a global positioning system (GPS), a hand-held tool that looks like a calculator. GPS units receive signals from orbiting satellites and then use the information from the satellites to calculate the lat/long coordinates of the user. In general, these tools are accurate up to 15 meters. GPS units are relatively inexpensive and can be purchased from scientific supply houses and many camping or outdoor stores. Many government agencies are using GPS and might be able to loan a system to your program. Latitude and longitude can also be calculated manually using a USGS topographical map and a ruler (See [Appendix C](#)).

### **Step 3--Conduct the Stream Habitat Walk**

Detailed instructions for performing the Stream Habitat Walk begin on page 48 of this section.

### **TASK 1 Complete the habitat characterization components of the walk for the 25-yard section of stream: the "In-Stream Characteristics," "Stream Bank and Channel Characteristics," and "Local Watershed Characteristics" sections of the field data sheet**

These elements involve making observations about the stream itself as well as the riparian zone and immediate watershed.

### **TASK 2 Complete the "Visual Biological Survey" section of the field data sheet**

This involves simple visual observations of the presence or absence of wildlife and obvious aquatic life in the stream, including fish, aquatic plants, and algae.

### **TASK 3 Complete the "Macroinvertebrate Survey" section of the field data sheet**

This is optional and serves as an introduction to the types of life that inhabit some of the microhabitats of the stream the spaces under and on rocks and in and on twigs and leaves. To conduct this survey, you will need to select the method(s) that best suits your stream. Use the rock-rubbing method in streams with riffles, or use the stick-picking method if your stream does not have riffles. Clumps of submerged leaves may be present in either type of stream and are often an important microhabitat for macroinvertebrates. You may choose to sort through these leaf packs in addition to rock-rubbing or stick-picking.

You will also need some specific equipment (a bucket, tweezers, picnic plate, etc.). Be sure to dress appropriately because you'll probably get wet.

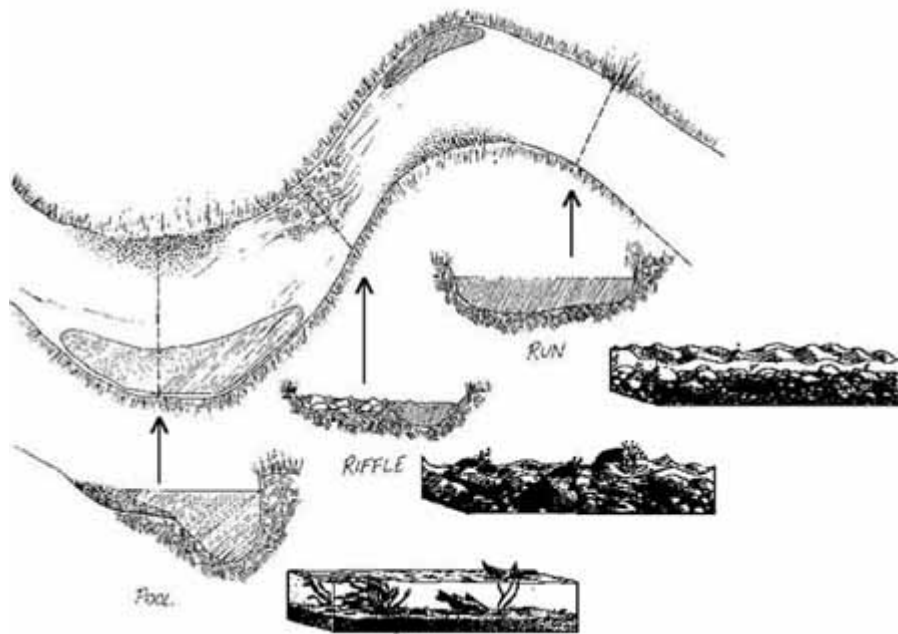
Remember to return the organisms to the stream when you finish the macroinvertebrate survey. Then, check to make sure your field data sheet has been completed as fully as possible.

## **Step 4--Check data forms for completeness and return forms to program coordinator**

After completing the habitat characterization and biological survey, make sure you have completed the field data sheet to the extent possible and that the recorded data are legible. If you are not able to determine how to answer a question on the field data sheet, just leave the space blank. If you leave a space blank, indicate that it is because you are not able to answer the question (e.g., write "not able to answer" or "does not apply" in the space).

Upon completion of the Stream Habitat Walk, present a copy of the field data sheet to your volunteer program coordinator. You may want to keep a copy of the field data sheet, and other appropriate data, for your own records and to evaluate any future discrepancies in the data. **If you have identified an urgent problem, such as leaking drums of chemicals, foul odors, or fish kills, contact your program coordinator or the agency with whom you are working as soon as possible.**

## **Instructions for completing the Stream Habitat Walk data sheet**



**Figure 4.4**

### **Overview and cross sections of a pool, riffle, and run**

*Varying flows and depths create a variety of habitats for macroinvertebrates.*

For ease of use, the following numbered instructions correspond to the numbers on the field data sheet.

### **In-stream Characteristics**

1. *Pools, riffles, and runs.* A mixture of flows and depth and provide a variety of habitats to support fish and invertebrate life. Pools are deep with slow water. Riffles are shallow with fast, turbulent water running over rocks. Runs are deep with fast water and little or no turbulence.
2. *Stream bottom (substrate)* is the material on the stream bottom. Identify what substrate types are present. Substrate types include:
  - *Silt/clay/mud.* This substrate has a sticky, cohesive feeling. The particles are fine. The spaces between the particles hold a lot of water, making the sediments behave like ooze.

- *Sand (up to 0.1 inch)*. A sandy bottom is made up of tiny, gritty particles of rock that are smaller than gravel but coarser than silt (gritty, up to ladybug size).
- *Gravel (0.1-2 inches)*. A gravel bottom is made up of stones ranging from tiny quarter-inch pebbles to rocks of about 2 inches (fine gravel - pea size to marble size; coarse gravel - marble to tennis ball size).
- *Cobbles (2-10 inches)*. Most rocks on this type of stream bottom are between 2 and 10 inches (between a tennis ball and a basketball).
- *Boulders (greater than 10 inches)*. Most of the rocks on the bottom are greater than 10 inches (between a basketball and a car in size).
- *Bedrock*. This kind of stream bottom is solid rock (or rocks bigger than a car).

3. *Embeddedness* is the extent to which rocks (gravel, cobbles, and boulders) are sunken into the silt, sand, or mud of the stream bottom (Fig. 4.5). Generally, the more rocks are embedded, the less rock surface or space between rocks is available as habitat for aquatic macroinvertebrates and for fish spawning. Excessive silty runoff from erosion can increase a stream's embeddedness. To estimate embeddedness, observe the amount of silt or finer sediments overlying, in between, and surrounding the rocks.

4. *Presence of logs or woody debris (not twigs and leaves) in stream* can slow or divert water to provide important fish habitat such as pools and hiding places. Mark the box that describes the general amount of woody debris in the stream.

5. *Naturally occurring organic material in stream*. This material includes leaves and twigs. Mark the box that describes the general amount of organic matter in the stream.

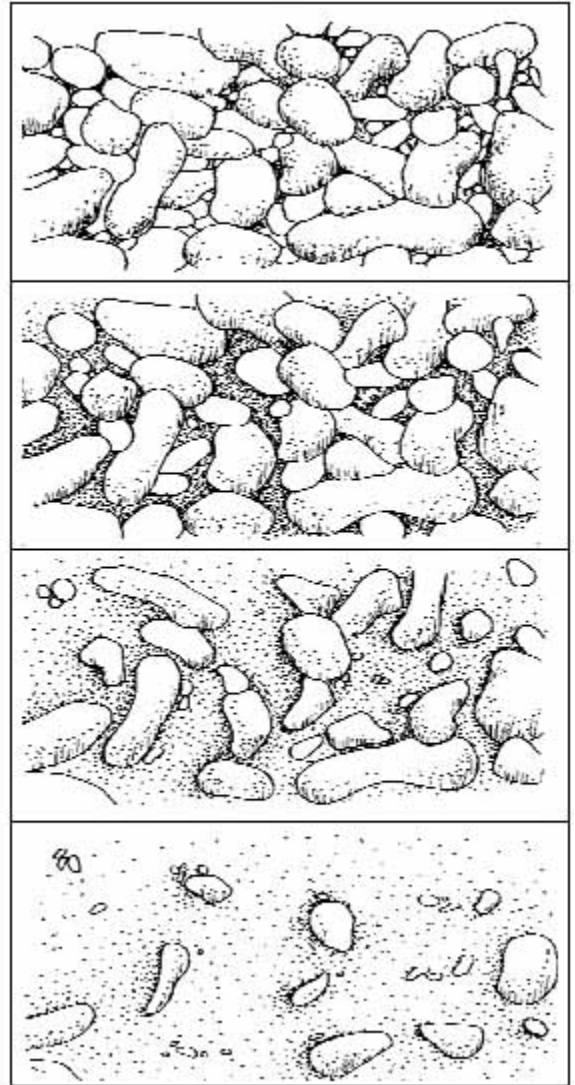
6. *Water appearance* can be a physical indicator of water pollution.

- *Clear* - colorless, transparent
- *Milky* - cloudy-white or grey, not transparent; might be natural or due to pollution
- *Foamy* - might be natural or due to pollution, generally detergents or nutrients (foam that is several inches high and does not brush apart easily is generally due to some sort of pollution)
- *Turbid* - cloudy brown due to suspended silt or organic material
- *Dark brown* - might indicate that acids are being released into the stream due to decaying plants
- *Oily sheen* - multicolored reflection might indicate oil floating in the stream, although some sheens are natural
- *Orange* - might indicate acid drainage
- *Green* - might indicate excess nutrients being released into the stream

7. *Water odor* can be a physical indicator of water pollution

- No smell or a natural odor
- *Sewage* - might indicate the release of human waste material
- *Chlorine* - might indicate over-chlorinated sewage treatment/water treatment plant or swimming pool discharges
- *Fishy* - might indicate excessive algal growth or dead fish
- *Rotten eggs* - might indicate sewage pollution (the presence of methane from anaerobic conditions)

8. *Water temperature* can be particularly important for determining the suitability of the stream as aquatic habitat for some species of fish and macroinvertebrates that have distinct temperature requirements. Temperature also has a direct effect on the amount of dissolved oxygen available to the aquatic organisms. Measure temperature by submerging a thermometer for at least 2 minutes in a typical stream run. Repeat once and average the results.



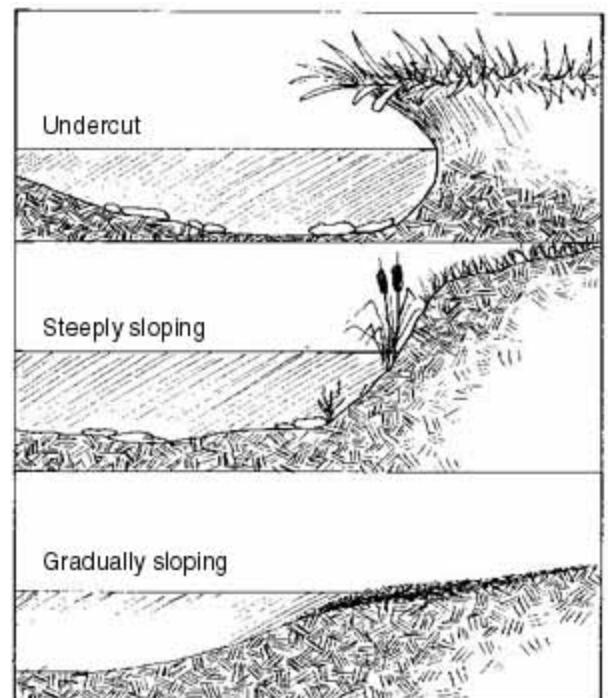
**Figure 4.5**

**A representation of a rocky-bottom stream becoming embedded with sand and silt**  
As silt settles on the streambed, spaces between the rocks are filled in and the stream becomes more embedded.

## Stream Bank and Channel Characteristics

9. *Depth of runs and pools* should be determined by estimating the vertical distance from the surface to the stream bottom at a representative depth at each of the two habitats.
10. *The width of the stream channel* can be determined by estimating the width of the streambed that is covered by water from bank to bank. If it varies widely, estimate an average width.
11. *Stream velocity* can have a direct influence on the health, variety, and abundance of aquatic communities. If water flows too quickly, organisms might be unable to maintain their hold on rocks and vegetation and be washed downstream; if water flows too slowly, it might provide insufficient aeration for species needing high levels of dissolved oxygen. Stream velocity can be affected by dams, channelization, terrain, runoff, and other factors. To measure stream velocity, mark off a 20-foot section of stream run and measure the time it takes a stick, leaf, or other floating biodegradable object to float the 20 feet. Repeat 3 times and pick the average time. Divide the distance (20 feet) by the average time (seconds) to determine the velocity in feet per second. (See [Chapter 5, section 5.1](#) on flow for a more in-depth discussion of using a float to estimate velocity.)
12. *The shape of the stream bank, the extent of artificial modifications, and the shape of the stream channel* are determined by standing at the downstream end of the 25-yard section and looking upstream.

- a. The shape of the stream bank (Fig. 4.6) may include.
  - *Vertical or undercut bank* - a bank that rises vertically or overhangs the stream. This type of bank generally provides good cover for macroinvertebrates and fish and is resistant to erosion. However, if seriously undercut, it might be vulnerable to collapse.
  - *Steeply sloping* - a bank that slopes at more than a 30 degree angle. This type of bank is very vulnerable to erosion.
  - *Gradual sloping* - a bank that has a slope of 30 degrees or less. This type of stream bank is highly resistant to erosion, but does not provide much streamside cover.



**Figure 4.6**

### **Types of streambank shapes**

*Undercut banks provide good cover for fish and macroinvertebrates.*

- b. *Artificial bank modifications* include all artificial structural changes to the stream bank such as riprap (broken rock, cobbles, or boulders placed on earth surfaces such as the face of a dam or the bank of a stream, for protection against the action of the water) and bulkheads. Determine the approximate percentage of each bank (both the left and right) that is artificially covered by the placement of rocks, wood, or concrete.
  - c. *The shape of the stream channel* can be described as narrow (less than 6 feet wide from bank to bank), wide (more than 6 feet from bank to bank), shallow (less than 3 feet deep from the stream substrate to the top of the banks) or deep (more than 3 feet from the stream substrate to the top of the banks). Choose the category that best describes the channel.
  - d. Narrow, deep
  - e. Narrow, shallow
  - f. Wide, deep
  - g. Wide, shallow
13. *Streamside cover* information helps determine the quality and extent of the stream's riparian zone. This information is important at the stream bank itself and for a distance away from the stream bank. For

example, trees, bushes, and tall grass can contribute shade and cover for fish and wildlife and can provide the stream with needed organic material such as leaves and twigs. Lawns indicate that the stream's riparian zone has been altered, that pesticides and grass clippings are a possible problem, and that little habitat and shading are available. Bare soil and pavement might indicate problems with erosion and runoff. Looking upstream, provide this information for the left and right banks of the stream.

- *Evergreen trees (conifers)* - cone-bearing trees that do not lose their leaves in winter.
- *Hardwood trees (deciduous)* - in general, trees that shed their leaves at the end of the growing season.
- *Bushes, shrubs* - conifers or deciduous bushes less than 15 feet high.
- *Tall grass, ferns, etc.* - includes tall natural grasses, ferns, vines, and mosses.
- *Lawn* - cultivated and maintained short grass.
- *Boulders* - rocks larger than 10 inches.
- *Gravel/cobbles/sand* - rocks smaller than 10 inches; sand.
- *Bare soil*
- *Pavement, structure* - any structures or paved areas, including paths, roads, bridges, houses, etc.

14. *Stream shading* is a measurement of the extent to which the stream itself is overhung and shaded by the cover identified in 13 above. This shade (or overhead canopy) provides several important functions in the stream habitat. The canopy cools the water; offers habitat, protection, and refuge for aquatic organisms; and provides a direct source of beneficial organic matter and insects to the stream. Determine the extent to which vegetation shades the stream at your site.

15. *General conditions of the stream bank and stream channel, and other conditions* that might be affecting the stream are determined by standing at the downstream end of the 25-yard site and looking upstream. Provide observations for the right and left banks of the stream.

m. *Stream bank conditions* that might be affecting the stream.

- *Natural plant cover degraded.* Note whether streamside vegetation is trampled or missing or has been replaced by landscaping, cultivation, or pavement. (These conditions could lead to erosion.)
- *Banks collapsed/eroded.* Note whether banks or parts of banks have been washed away or worn down. (These conditions could limit habitats in the area.)
- *Garbage/junk adjacent to the stream.* Note the presence of litter, tires, appliances, car bodies, shopping carts, and garbage dumps.
- *Foam or sheen on bank.* Note whether there is foam or an oily sheen on the stream bank. Sheen may indicate an oil spill or leak, and foam may indicate the presence of detergent.

n. *Stream channel conditions* that might be affecting the stream.

- *Mud/silt/sand on bottom/entering stream.* Excessive mud or silt can interfere with the ability of fish to sight potential prey. It can clog fish gills and smother fish eggs in spawning areas in the stream bottom. It can be an indication of poor construction practices, urban area runoff, silviculture (forestry-related activities), or agriculture in the watershed. It can also be a normal condition, especially in a slow-moving, muddy-bottom stream.
- *Garbage or junk in stream.* Note the presence of litter, tires, appliances, car bodies, shopping carts, and garbage.

o. Other general conditions that might be affecting the stream.

- *Yard waste* (e.g., grass clippings) - is there evidence that grass clippings, cut branches, and other types of yard waste have been dumped into the stream?
- *Livestock in or with unrestricted access to stream* - are livestock present, or is there an obvious path that livestock use to get to the water from adjacent fields? Is there streamside degradation caused by livestock?
- *Actively discharging pipes* - are there pipes with visible openings discharging fluids or water into the stream? Note such pipes even though you may not be able to tell where they come from or what they are discharging.
- *Other pipes* - are there pipes near or entering the stream? Note such pipes even if you cannot find an opening or see matter being discharged.
- *Ditches* - are there ditches, draining the surrounding land and leading into the stream?

## **Local watershed characteristics**

16. *Adjacent land uses* can potentially have a great impact on the quality and state of the stream and riparian areas. Determine the land uses, based on your own judgment of the activities in the watershed surrounding your site within a quarter of a mile. Enter a "1" if a land use is present and a "2" if it is clearly having a negative impact on the stream.



## Visual biological survey

17. *Wildlife* in the stream area might indicate it is of sufficient quality to support animals with food, water, and habitat. Look for signs of frogs, turtles, snakes, ducks, deer, beaver, etc.
18. Are *fish* present in the stream? Fish can indicate that the stream is of sufficient quality for other organisms. Indicate the average size and note any visible barriers to the movement of fish in the stream obstructions that would keep fish from moving freely upstream or downstream.
19. *Aquatic plants* provide food and cover for aquatic organisms. Plants also might provide very general indications of stream quality. For example, streams that are overgrown with plants could be over enriched by nutrients. Streams devoid of plants could be affected by extreme acidity or toxic pollutants. Aquatic plants may also be an indicator of stream velocity because plants cannot take root in fast-flowing streams.
20. *Algae* are simple plants that do not grow true roots, stems, or leaves and that mainly live in water, providing food for the food chain. Algae may grow on rocks, twigs, or other submerged materials, or float on the surface of the water. The algae naturally occurs in green and brown colors. Excessive algal growth may indicate excessive nutrients (organic matter or a pollutant such as fertilizer) in the stream.

## Macroinvertebrate survey (optional)

21. *Macroinvertebrates* are organisms that lack a backbone and can be seen with the naked eye such as clams, mussels, snails, worms, crayfish, and larval insects. To locate macroinvertebrates in the stream, use one or more of the following methods.
  - a. *Rock-rubbing method.* (Use this method in streams with riffle areas and rocky bottoms.)
    - Remove several rocks from within a riffle area of your stream site (e.g., randomly pick 1 rock from each side of the stream, 1 rock from the middle, and 1 rock from in between). Try to choose rocks that are submerged during normal flow conditions. Each rock should be about 4-6 inches in diameter and should be easily moved (not embedded).
    - Either inspect the rock's surface for any living organisms or place the rock in a light-colored bucket or shallow pan, add some stream water, and brush the rock with a soft brush or your hands. Try to dislodge the foreign particles from the rock's surface. Also look for clumps of gravel or leaves stuck to the rock. These clumps may be caddisfly houses and should be dislodged as well.
  - b. *Stick-picking method.* (Use this method in streams without riffles or without a rock bottom.)
    - Collect several sticks (approximately 1 inch in diameter and relatively short) from inside the stream site, and place them in a bucket filled with stream water. Select partially decomposed objects that have soft, pulpy wood and a lot of crevices and are found in the flowing water, not buried in the bottom. Pick the loose bark from the sticks to find organisms.
    - Fill the shallow pan with water from the stream and remove one of the sticks from the bucket. Examine the stick making sure you hold it over the pan so no organisms are lost. Remember that the organisms will have sought shelter, and they could be hiding in loose bark or crevices. After examining the sticks, it might be helpful to break up the woody material. Examine each stick carefully. Using tweezers or a soft brush, carefully remove anything that resembles a living organism and place it in the pan. Also examine the bucket contents for anything that has fallen off the sticks.
  - c. *Leaf pack-sorting method.* (This method can be used in streams with or without a rock bottom.)
    - Remove several handfuls of submerged leaves from the stream and place them into a bucket. Remove the leaves one at a time and look closely for the presence of insects. Using tweezers or soft brush, carefully remove anything that resembles a living organism and place it in a pan containing stream water. Also examine the bucket contents to see if anything has fallen off the leaves.
22. Note whether you have found any macroinvertebrates using one of the above methods.
23. After collecting macroinvertebrates using any of the above methods, examine the types of organisms by gross morphological features (e.g., snails or worm-like). Use a magnifying glass to observe the organisms in water so you can clearly see the legs, gills, and tails. Note the relative abundance of each type on the field data sheet. When finished, return all the organisms to the stream.

Many types of *macroinvertebrates* can be found in a healthy stream. Because different species can tolerate different levels of pollution, observing the variety and abundance of macroinvertebrates can give you a sense of the stream's health. For example, if pollution tolerant organisms are plentiful and pollution intolerant ones are found only occasionally, this might indicate a problem in the stream. Types of organisms you find may include:

- *Worm-like organisms* (like worms and leeches) either adhere to rocks or sticks or move slowly. They are generally tolerant of pollution.
- *Crayfish* look like lobsters or shrimp. They are generally somewhat tolerant of pollution.
- *Snail-like organisms* include snails and clam-like organisms. They range from somewhat tolerant of pollution to somewhat intolerant.
- *Insects* include a wide variety of organisms that generally have distinct legs, head, bodies, and tails and often move quickly over rocks or sticks. They come in many sizes and shapes as well as a wide range of pollution-tolerance levels.

When finished, return all organisms to the stream.