

Recommended list of items to take along:

Photocopies of topographic map of stream to be walked
Comfortable rubber boots or waders
Snag and thorn-proof clothing that is appropriate for the weather
Clip board with waterproof cover
Watershed walk data forms
Two pencils
Tape measure (30' preferable) or string marked in 1-meter increments
Meter stick
An orange or other float
Stopwatch
Camera and film in waterproof bag
Leather gloves
Whistle
First Aid Kit
Cell Phone

Monitoring Survey Tips

Please consider the following precautionary tips:

- Get the permission of landowners to cross any private land, posted or not. **Do Not Enter Areas Without Permission.** It is recommended that you use public access points (such as city/county/state parks and campgrounds).
- Only record what you see, not what you have previously seen. For example if you think fish are present but you can't see them, mark your sheet "no fish present."
- Always work with someone.
- Do not put yourself in danger to gather survey information.
- Be careful of ticks, poison oak, nettles, and insects. Bring repellent. Wear long pants and boots: windbreakers help to block nettles.
- Watch out for dogs.
- Do not drink the water -- it is unsafe.
- Do not walk on unstable banks; your footsteps could speed erosion.
- Be alert for spawning areas (redds) in the stream. Do not walk on them. They will look like a round or elliptical area of clean gravel about 1-3 feet long. During fall through spring, when redds are evident, try not to walk in the stream. In the summer, if you are careful, the streambed might be the easiest route for conducting your Watershed walk. Be aware that the streambed can be very slippery, uneven, and unpredictable.
- **Do not attempt to walk across streams that are swift and above the knee in depth. You can be swept away in an instant!**
- Be careful of streamside vegetation - disturb it as little as possible.
- **If for any reason you feel uncomfortable about the stream conditions or surroundings, please stop your Survey. You and your safety are much more valuable than the Survey!**



Instructions for Filling out Survey Data Sheets

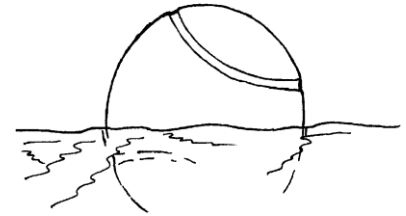
Water Level

Look at where the vegetation starts. This is usually where the water level is during high flows after spring snow melt or after a heavy rain.

Velocity:

Use the stream velocity worksheet below to measure water velocity. You will need to get in the water, but do not complete this if the water looks like it's going too fast, or if it is higher than your knees.

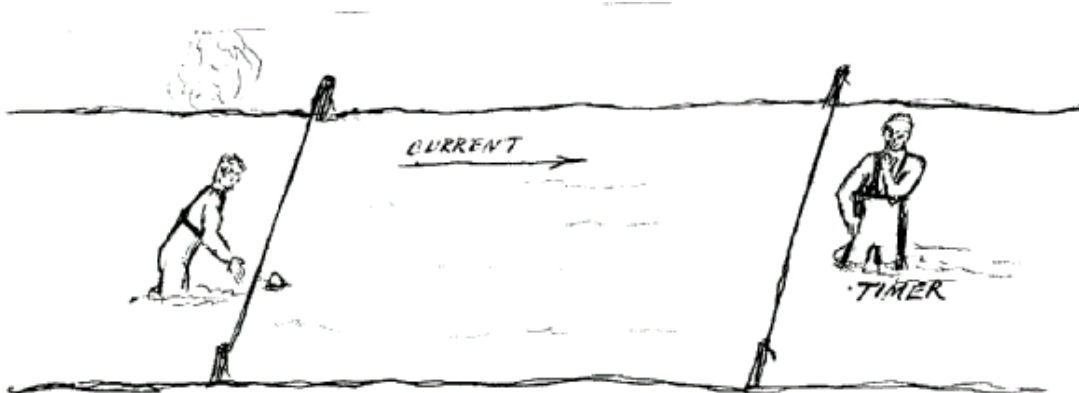
Select a length of stream about 3 meters long that has a uniform flow pattern. Place stakes on each side of the stream at the beginning and end of the course. Tie a rope between the stakes on either side of the stream so that you have a distinct starting and finish line.



1. The partner with the stopwatch should stand where he or she can see the finish line. Using a tennis ball or an orange as a float, place it in the water at the starting line. Yell, "Go" when you let it go. Your partner should immediately turn on the stopwatch and then stop it when the float crosses the finish line. If your float is caught in an eddy or along the bank, start over.
2. Repeat this twice and record the time. Fill in the number sentences to find the average time and velocity.

$$\frac{\text{Time 1}}{\text{Time 1}} + \frac{\text{Time 2}}{\text{Time 2}} \div 2 = \text{Average Time}$$

$$\frac{\text{Distance}}{\text{Distance}} \div \frac{\text{Average Time}}{\text{Average Time}} = \text{Velocity m/sec.}$$



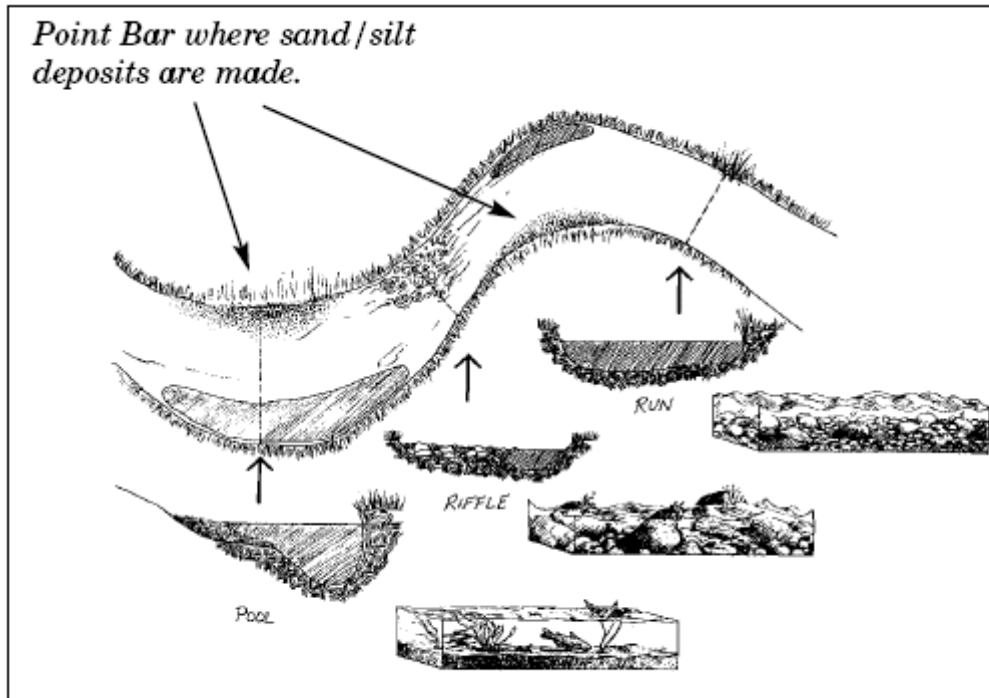
*Instructions for Filling out Survey Data Sheets (continued)***Habitat Features: riffles, runs, pools, glides**

Diagram of a stream with a mixture of pools, riffles, and runs. Varying flows and depths create a variety of habitats for macroinvertebrates.

Substrate Size and Cobble Embeddedness:

This part of the survey looks at two important things that are part of the macroinvertebrate habitat: substrate size and cobble embeddedness.

- **Substrate** is the materials on the stream bottom. The sizes of stream bottom materials at a site are where macroinvertebrates live, and will determine what types of macroinvertebrates live there. For example, crayfish prefer to hide beneath large boulders and aquatic worms burrow in fine silt.
- **Cobbles**, the rocks between 2 and 10 inches in diameter, provide the best habitat for benthic macroinvertebrates. When cobbles on the stream bottom are covered up with silt and sand, they are **embedded**.
- The more cobbles are embedded, the less habitat is available to the macroinvertebrates that live in the spaces beneath the cobbles. Embeddedness also is bad for fish eggs and their survival.

Human Impacts and Land Uses:

Different land uses have different possible impacts on stream health. Examples follow in the chart.

POSSIBLE POLLUTION SOURCES BY LAND USE**CITIES AND TOWNS**

- When rain runs off rooftops, roads and parking lots or any surface that water can not go through, it washes off the pollutants that may be on these surfaces, such as:
 - Salt and sand used on the roads in winter to melt the ice
 - Spilled gas, oil or antifreeze
 - Lead and other substances from car and truck exhaust
 - Chemicals in tar that can be washed away by water
- Air pollution from smoke stacks, cars and trucks and home chimneys settle out onto the land. This is washed into streams by the rain.
- Fertilizers, weed killers and pesticides, which are used on lawns and gardens, are washed into streams and ponds.
- Litter left by careless people will be washed or blown into the water. It will stay there until someone picks it up.
- Sewage pollution comes from septic systems that are not working correctly. It is the gray to black, bad smelling liquid which you may see flowing from lawns or trickling from a pipe into a gutter.

FARMS

- Soil washes into streams from plowed fields and from pastures that have too many animals eating too much of the grass. The grass and plants hold the dirt in place. Without the plants, the dirt can wash away.
- Pesticides and weed killers wash off the fields into the water.
- Fertilizers and animal manure can wash into the water.
- Thermal pollution occurs when the trees and brush are removed from along a stream's banks. The stream will no longer be in the shade, so the water heats up.

CONSTRUCTION AND MINING

- Any time dirt is dug up, as in mining or construction, erosion can occur. **Erosion** is when dirt is washed into a stream, pond or lake. Government laws require that man-made ponds be dug to hold the muddy water so that it does not drain into a natural body of water.
- There are chemicals called sulfides in coalmines and some other types of mines. When sulfide gets wet, it reacts to form an acid. This acid can pollute streams and ponds.

GARBAGE DUMPS AND LANDFILLS

- Water can become polluted when it trickles through garbage. Water polluted in this way is called **leachate**. Leachate may contain dangerous wastes, such as weed killer, pesticides, paint stripper, antifreeze or oil, which end up in landfills because there is no widely used way to remove them from trash.
- Soil erosion occurs when the soil is dug up to cover over the garbage heaps.

INDUSTRIES

- Air pollution comes from smoke stacks.
- Industries produce many dangerous wastes. They are supposed to get rid of these at special dumps. Unfortunately some dump their waste in other areas. These areas need to be cleaned up or the waste blocked from entering the waterways.

OIL STORAGE SITES

- Oil spills



Tier 1 Physical Survey Form

Survey a 200-foot segment up and downstream from your sample site.

School/Group _____ River/Stream _____

Survey Site _____ Survey Date & Time _____

Name of person(s) completing survey _____

Weather: Today _____

Past 2 days _____

Temperature: Air _____ °C

Water _____ °C

Stream Width: The stream is on average _____ meters wide and _____ meters deep.

Water Level: Compared to the height of the stream channel, the water level seems:

_____ high _____ medium _____ low

Water Appearance/Odor

- clear
- foam
- tea-brown
- multi-color
- milky
- muddy
- other
(Describe): _____
- unusual odor
(Describe): _____

Velocity: Average time it takes to flow 3 meters:

AVERAGE: _____ m/sec

Natural Vegetation (if the 2 banks are different, evaluate the worst side)

Extends beyond the banks for: _____ < 6 yards _____ 6-12 yards _____ 12-35 yards _____ > 35 yards

Tier 1 Physical Survey For

Habitat Features:

The site has:	Many	Some	Few or None
Riffles (fast areas, <2' deep)			
Runs (fast areas, >2' deep)			
Pools (slow areas, >2' deep)			
Glides (slow areas, <2' deep)			
Shelter for fish (logs, stumps, and/or undercut banks)			
Patches of aquatic plants			

Substrate Size: (look at the riffle area where you will collect your Bugs)

Rank the substrate sized from most common (1) to least common (6)

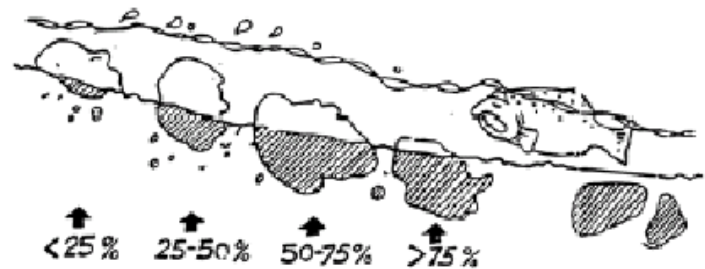
Silt/Clay/Mud (makes the water cloudy if disturbed)	Sand (up to 0.1")	Gravel (0.1-2")	Cobbles (2-10")	Boulders (>10")	Bedrock (solid rock covering the stream bottom)

Cobble Embeddedness: (evaluate the

riffle area where you will collect your bugs)

Pick up several cobbles (if present)

To estimate the average embeddedness of your site:



Average Embeddedness: _____%

(50% embeddedness indicates doubtful

Habitat for many macroinvertebrates, trout and egg survival)

Stream Banks:

They are:	In no or few areas	In some areas	In many areas
Covered with vegetation			
Eroding			
Mowed			
Artificially protected			

Human Impacts and Land Uses: (check what applies)

- | | | | |
|---|--------------------------------------|--|-----------------------------------|
| <input type="checkbox"/> Stream channel altered | <input type="checkbox"/> Dam(s) | <input type="checkbox"/> Store(s) | <input type="checkbox"/> Road(s) |
| <input type="checkbox"/> Storm drain pipe(s) | <input type="checkbox"/> Farm(s) | <input type="checkbox"/> School(s) | <input type="checkbox"/> Industry |
| <input type="checkbox"/> Sewage treatment plant pipe(s) | <input type="checkbox"/> Recreation | <input type="checkbox"/> Parking lot(s) | <input type="checkbox"/> Logging |
| <input type="checkbox"/> Culverts | <input type="checkbox"/> Golf course | <input type="checkbox"/> House(s) | |
| | <input type="checkbox"/> Garbage | <input type="checkbox"/> Lawn(s)/garden(s) | |

Tier 1 Site Drawing:

Draw a “bird’s-eye” sketch of your 200’ long river segment up and downstream from your sampling site, recording:

1. Your sampling sites—include where you collected chemical and BMI samples, and measured velocity and cross section area.
2. Direction of water flow—indicate with arrows.
3. Location and orientation of any photos taken.
4. In-stream habitat—riffles, pools, runs, large woody debris, boulders, organic material, aquatic plants, overhanging vegetation, etc.
5. Streambanks—steep & gently sloping areas, naturally vegetated, bare, eroding, clear-cut, or mowed areas, artificially protected areas, etc.
6. Channel—wide & narrow areas, meanders, shaded & exposed areas, unnatural alterations, dams, culverts, etc.
7. Human land uses—roads, houses, driveways, parking lots, storm drain pipes, sewage pipes, factories, farms, livestock crossings, recreational use, logging, etc

Other notes about the site: