Module 11 Physical Habitat Assessment — Streams

Introduction

How healthy is your stream, pond or lake? By conducting a physical assessment you can learn much about the key components of stream health. These documented observations are tools needed to identify solutions and concerns related to water quality issues. The purpose of this module is to identify the important physical indicators of surface water quality, identify the standards for each, and examine how they are measured.

Recording basic observations about each monitoring site will put the data you collect into context. You will be producing a record of conditions over time, through changes in seasons and weather, as well as, varying human, domestic livestock, and wildlife activity. This will help draw a more complete picture of environmental health of a water resource or watershed. Gathering this information requires using your senses to observe conditions at each monitoring site.

In this module participants will examine approaches and conditions that impact water quality: *Field observations; air temperature; wind and weather; transect measurements; physical characteristics of a stream, pond, or lake; and photos or sketches*.

Field Observations

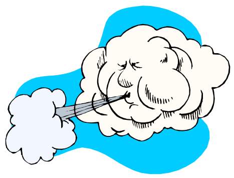
Despite being the least quantitative of the parameters, visual assessment of the monitoring site can provide valuable information and assist in interpretation of other physical, chemical, and biological data. Visual assessment is simply observing the environmental conditions at the site and recording those that are noteworthy.

Visual information can also provide an account of events or conditions that may help explain the monitoring data collected. For example, if dead fish are floating on the water surface, they may signal a sudden drop in dissolved oxygen levels, the influx of some toxic substance, or a disease infestation of the fish.

In addition to visual assessment you will also use your ears and your nose to monitor your site. Listen for birds and other wildlife as well as sounds of human activity such as engines. Check for unusual odors. Though quite subjective, water odor can reveal water quality problems that may not be visually apparent. Industrial and municipal effluents, rotting organic matter, and bacteria can produce distinctive odors. Raw sewage, for example, has an unmistakable aroma.

Air temperature

Air temperature is a standard measurement taken by most environmental monitoring programs. Recording air temperature helps to create a complete picture of conditions at the sampling site at the time of monitoring and to document climatic conditions over an extended period.



Wind and Weather

Weather conditions (whether raining or sunny, windy or calm) can have an impact on physical, chemical, and biological activity in the water. Wind speed and direction can be an indication of certain air borne pollutants. It can also affect turbidity, dissolved oxygen, and surface water temperature. In water monitoring programs you can reference the Beaufort Scale (http://www.marinedata.co.uk/ref/beaufort.html) to estimate wind speed.

Rainfall can affect the rate of runoff pollution from land as well as the temperature, pH, and turbidity of surface water. Monitors often record current weather conditions and the number of consecutive days prior to sampling that have had similar weather. Monitors also record the type and amount of precipitation at each site for the past 24 hours. You can use a range gauge or, if you live in the same watershed as your site, you may want to find a neighbor, community group, business, or government agency that is already tracking rainfall and is willing to share the information.

Whether calm, rippled, or with waves and whitecaps, surface water conditions indicate how much mixing is occurring in the top layer of the water body. When the surface is placid, very little wind-induced mixing occurs. Waves whipped up by the wind, however indicates substantial mixing and the introduction of oxygen to the water. If you are sampling in a stream segment where wind does not have a major impact on surface water conditions it is still important to note whether your site is located near rapids, riffle, smooth flowing water, or calm eddies. This information may assist in interpreting dissolved oxygen data.

Physical Characteristics of the Streams

This guide provides step by step instructions for conducting a *Steamwalk* activity. Read through the entire guide prior to the walk to become familiar with all the measurements which must be taken. If, during your *Streamwalk*, you are unable to determine the response to a question, simply leave it blank and continue with the walk. Remember that *Streamwalk* is not a test and that there are no right or wrong answers — only your observations.

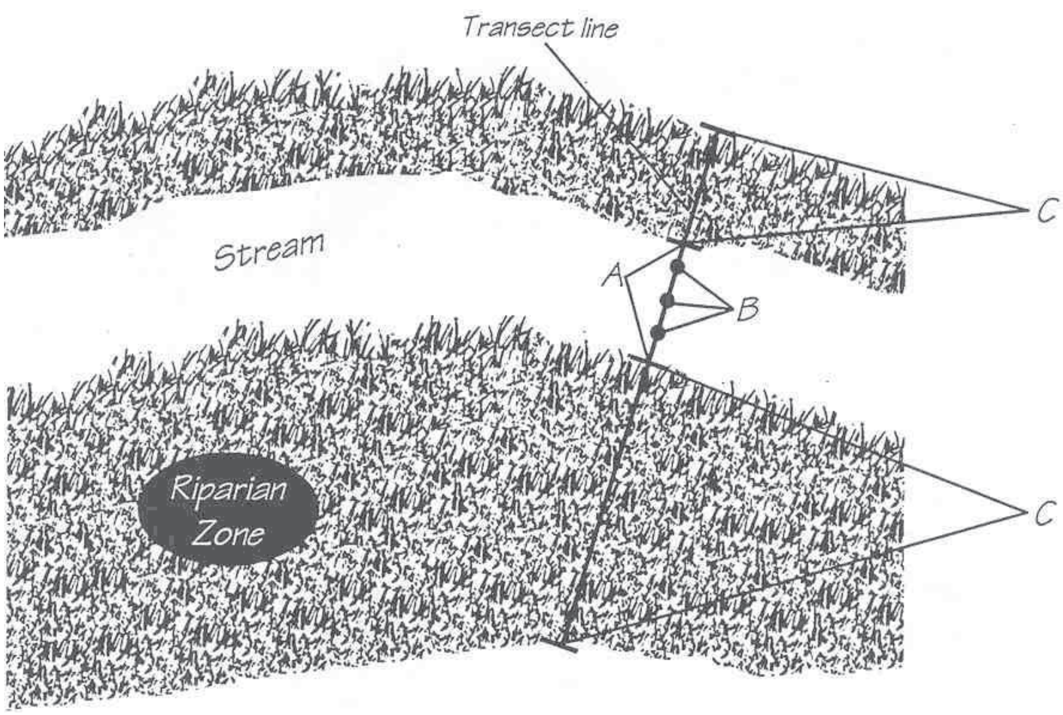
Documentation is an important part of *Streamwalk*. Your group will be collecting the same type of information that biologists collect and use to track a stream's health over time. By conducting a *Streamwalk* activity, you can learn much about the key components of stream health. These documented observations are the tools needed to identify problems and take appropriate action. Remember to take your time, make accurate measurements, and record only items you actually observe.

So What Are We Doing?

Each team will conduct several stream measurements at two transect sites and along the entire length of their designated 100-foot (or 50 meter) section of stream. To determine the first transect site, randomly select a number between one and 25. Measure that distance along the streambank from your section starting point (see illustration). The first transect begins at that location. The second transect begins 50 feet (measured along the streambank) from the first.

Example (feet): Team 1 selects the random number 17. Measuring 17 feet from the section starting point, the team locates its first transect site. Once all measurements are complete, team 1 measures another 50 feet from the first transect site to determine the second transect site.

Example (metric): Team 2 selects the random number 15. Measuring 15 meters from the section starting point, the team locates its first transect site. Once all measurements are complete, team 2 measures another 25 meters from the first transect site to determine the second transect site.



Transect measurements:

- At each transect site, stretch a measuring tape across the stream (water's edge to water's edge) perpendicular to the bank and record this measurement as **stream width** (A above).

- Divide the stream width into quarters and make three **stream depth** measurements at one-fourth, one-half, and three-fourths of the stream width (B above). Use color graded sticks, marked waders, or graduated rods to measure stream depth.

- While measuring stream depth, also note the type of **substrate** on the stream bottom. Substrate types are silt, sand, gravel, cobble, boulders, and bedrock.

- Once the in-stream measurements are complete, use the same transect lines to measure the width of **riparian vegetation** on both sides of the stream (C above). Measure from water's edge to the terminal edge of the riparian zone, and record this information.

Evaluations along the Entire Stream Reach:

- Evaluate the physical characteristics of the stream. Pools, riffles, runs, and pocket water are all important features of fish habitat. **Pools** are the deeper, slower areas of the stream important for rearing fish. **Riffles** are shallower, faster areas of water important for producing food for aquatic insects and fish. **Runs** are steady flowing stream sections without pools or riffles. **Pocket water** is a stream section containing exposed rocks and/or boulders. Visually estimate the percentage of each habitat type within your stream reach.

- Evaluate the condition of the **riparian zone** by estimating the percentage of bank length along your surveyed reach that is covered by riparian vegetation and the percentage that is not covered. Riparian vegetation has dense, deep rooting systems which bind and hold soil, resist stream erosion, and maintain streambank stability. Channels with abundant streamside vegetation and stable banks develop narrow, deep cross sections which are excellent aquatic habitat. Streambanks not covered by riparian vegetation are unstable and vulnerable to erosion in the form of slumping or sloughing. Unstable banks eventually add sediment to the stream channel, causing it to become wider and shallower and lose much of its ability to support aquatic life.

- Estimate the percentage of **stable** and **unstable bank** based upon the percentage of bank covered by riparian vegetation.

- Estimate the relative abundance of various **riparian vegetation types**. Riparian vegetation types include:

  - woody plants – willows, shrubs, trees, etc.
  - grasses – sedges, rushes, blue grass, etc.
  - broad-leafed plants (forbs) – thistle, horsetail, bluebells, meadowrue, etc.

- Estimate **canopy cover** by observing how much of the water's surface is shaded by overhanging vegetation. Shading may be provided by grasses close to the water surface, willow shrubs, or tall trees with branches extending out over the stream.

- Record the extent of **artificial bank materials** and make a note as to the type of artificial material used. Artificial materials might include rock or concrete, rip-rap, logs, or other materials placed in the past on banks to slow or prevent erosion.

- Estimate the amount of naturally-occurring **large woody debris** (logs or whole trees greater than four inches in diameter) in the stream section. These structures are part of the stream environment and are very beneficial, providing habitat complexity and benefitting aquatic life. In forested areas, logs often provide substantial stream channel stability.

- Observe and note if **mud**, **silt**, or **sand** is entering the stream and clouding the water. These items can be an indication of poor land management or construction practices in the watershed. It can also be a normal occurrence.

- Note any evidence of stream **damming**, **dredging**, **filling**, or **channelizing** through culverts or whether other large scale activities such as log removal are apparent.

- Look for **algae** or **scum** floating or covering rocks. Algae (very tiny plants which resemble seaweed and can color the water green) or scum in the water can point to a problem such as an upstream source adding too much nutrient (fertilizer) to the water.

- Look for **foam** or **oil** on the water surface. The residue may be naturally occurring or a man-caused problem. For example, an iridescent sheen on the water might be from rotting leaves or an upstream pollutant. If you are not sure, mark it on the checklist and comment.

- Look for **garbage** in the stream or along its banks, and note by type such as trash, tires, car bodies, grass clippings, etc.

- If **livestock** are in the area, observe whether they have unrestricted access to stream. Also look for evidence of streamside damage caused by livestock.

- Look for **discharge pipes** entering the stream and note from where the pipes might be coming. Note if the pipes are discharging fluids into the stream and what those fluids might be.

- Determine if the stream segment has been impacted by **adjacent land uses**. Adjacent land uses can have great impact on the quality and state of a stream and its riparian areas. If some type of use impact is evident but not in your defined stream reach, make a note. Enter a "1" if the land use is present and a "2" if it is present and clearly impacting the stream. If neither is the case, leave this space blank. If you cannot determine the type of land use (housing, industry, or other development), make your best estimate.

- After recording these stream measurements, measure **water quality** by collecting and cataloging aquatic insects (Module 12—Biological Habitat Assessment of Streams, Lakes, and Ponds).

Data points, photos, and sketches

A picture can be taken prior to the first round of sampling at each site. Additionally, it is a good practice to take routine pictures of sites at least four times a year, in order to get a sense of its seasonal and other variations over time. If a site is subjected to either long term or sudden environmental impact your photos will help document the effects of these changes.

Regardless of your level of artistic ability, a rough sketch of your site can be a valuable tool for physically locating your observations during each sampling event.

Discussion Points

- How have air, temperature, and weather impacted water bodies in your community in the last six months?
- Which aspects of riparian ecology did you already know by other means or observations?
- Why is it important to know the type of substrate and debris that accumulate in lakes, ponds, and streams?
- When and how have pictures, drawings, and collected data provided useful planning information for community water resource action?

Major Points to Remember

- Visual assessment is simply observing the environmental conditions at the site and recording those that are noteworthy.
- Air temperature, wind, and weather information are important to collect at monitoring sites.
- *Streamwalk* activities document conditions of stream health over time and include transects of a stream. It also includes measurement of stream depth and descriptions of: substrate; riparian conditions; stream characteristics; bank stability; canopy cover; artificial bank materials; organic and inorganic waste products; and adjacent land use.
- A picture should be taken prior to the first round of sampling at each site. Regardless of your level of artistic ability, a rough sketch of a monitoring site can be a valuable tool for physically locating your observations during each sampling event.

Journal and Evaluation

Record what physical parameter you are most interested in investigating in a local stream, pond, or lake and why. For each of the three key pond eutrophication conditions describe or draw a personal experience that reflects this aspect of water quality.

Short-course Presenters

Using string and/or measuring devices role play for 15 minutes in groups of two or three setting up a stream transect using the information on pages 240-41. Have participants do this in the room where the short-course is being presented or a nearby hallway. Have them imagine a stream and measure items A, B, and C (page 241). Then go over the *Streamwalk* data sheets (pages 158-163) and remind participants that they will want to bring plant, animal, and insect identification resources to help their groups complete the data sheets in the field portion of the program.