# Habitat Assessment Procedure

Assessing the stream habitat at the monitoring site provides more information that can be used in determining the health of the stream. Diverse habitats in the stream provide food, shelter, and spawning/breeding areas for aquatic organisms. A healthy native plant community along both banks of the stream not only provide shelter and food for terrestrial animals, but it also protects water quality in the stream and enhances channel diversity. Stream Stewards complete the habitat assessment for their stream site once a year during late summer or early fall. This is a time when water in the stream tends to be at its lowest level and the stream banks and bottom can be easily seen for the assessment. The habitat assessment is based on features of the stream and riparian area extending from 100' upstream to 100' downstream of the monitoring site. Stream Stewards use a Streamwalk form similar to the one developed by the EPA. There are two versions of the KCD Stream Steward Habitat Assessment form: one for Rocky Bottom streams and one for Muddy Bottom streams. You will choose the version that most closely matches the type of streambed at your site. The following information will assist you in completing the annual habitat assessment for your site.

## General Characteristics

### Water appearance can be a physical indicator of water pollution.

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

### Water odor can be a physical indicator of water pollution.

1. **No smell or natural odor**
2. **Sewage** - might indicate the release of human waste material
3. **Chlorine** - might indicate that a sewage treatment plant is over-chlorinating its effluent
4. **Fishy** - might indicate the presence of excessive algal growth or dead fish
5. **Rotten eggs** - might indicate sewage pollution (the presence of a natural gas)

### Water temperature

This can be particularly important for determining whether the stream is suitable as 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 aquatic organisms. Measure temperature by submerging a thermometer for at least 2 minutes in a typical stream run. Repeat once and average the results.

### The width of the stream channel

This can be determined by estimating the width of the streambed that is covered by water from bank to bank. If it varies widely along the stream, estimate an average width.

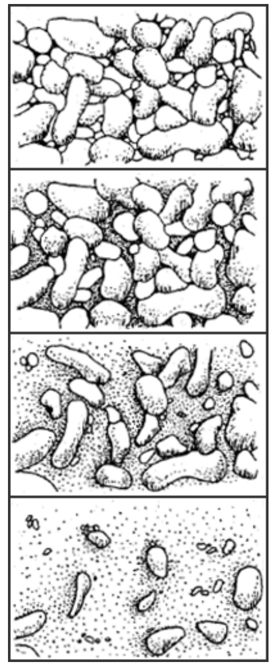
# Assessment (Rocky Bottom)

## 1. Attachment sites for macroinvertebrates

These are essentially the amount of living space or hard substrates (rocks, snags) available for aquatic insects and snails. Many insects begin their life underwater in streams and need to attach themselves to rocks, logs, branches, or other submerged substrates. The greater the variety and number of available living spaces or attachment sites, the greater the variety of insects in the stream. Optimally, cobble should predominate and boulders and gravel should be common. The availability of suitable living spaces for macroinvertebrates decreases as cobble becomes less abundant and boulders, gravel, or bedrock become more prevalent.

## 2. Embeddedness

This refers to the extent to which rocks (gravel, cobble, and boulders) are surrounded by, covered, or sunken into the silt, sand, or mud of the stream bottom. Generally, as rocks become embedded, fewer living spaces are available to macroinvertebrates and fish for shelter, spawning and egg incubation. To estimate the percent of embeddedness, observe the amount of silt or finer sediments overlying and surrounding the rocks. If kicking does not dislodge the rocks or cobbles, they might be greatly embedded.



**An illustration of a rocky bottom stream embedded with sand and silt**. As silt settles, the rocks are filled in and becomes more embedded.

## 3. Shelter for fish

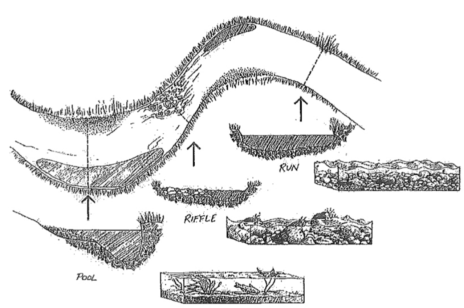
This includes the relative quantity and variety of natural structures in the stream, such as fallen trees, logs, and branches; cobble and large rocks; and undercut banks that are available to fish for hiding, sleeping, or feeding. A wide variety of submerged structures in the stream provide fish with many living spaces; the more living spaces in a stream, the more types of fish the stream can support.

## 4. Channel alteration

This is basically a measure of large-scale changes in the shape of the stream channel. Many streams in urban and agricultural areas have been straightened, deepened (e.g., dredged), or diverted into concrete channels, often for flood control purposes. Such streams have far fewer natural habitats for fish, macroinvertebrates, and plants than do naturally meandering streams. Channel alteration is present when the stream runs through a concrete channel; when artificial embankments, riprap, and other forms of artificial bank stabilization or structures are present; when the stream is very straight for significant distances; when dams, bridges, and flow-altering structures such as combined sewer overflow (CSO) pipes are present; when the stream is of uniform depth due to dredging; and when other such changes have occurred. Signs that indicate the occurrence of dredging include straightened, deepened, and otherwise uniform stream channels, as well as the removal of streamside vegetation to provide dredging equipment access to the stream.

## 5. Sediment deposition

This is a measure of the amount of sediment that has been deposited in the stream channel and the changes to the stream bottom that have occurred as a result of the deposition. High levels of sediment deposition create an unstable and continually changing environment that is unsuitable for many aquatic organisms. Sediments are naturally deposited in areas where the stream flow is reduced, such as pools and bends, or where flow is obstructed. These deposits can lead to the formation of islands, shoals, or point bars (sediments that build up in the stream, usually at the beginning of a meander) or can result in the complete filling of pools. To determine whether these sediment deposits are new, look for vegetation growing on them: new sediments will not yet have been colonized by vegetation.



## 6. Stream velocity and depth combinations

These are important to the maintenance of healthy aquatic communities. Fast water increases the amount of dissolved oxygen in the water; keeps pools from being filled with sediment; and helps food items like leaves, twigs, and algae move more quickly through the aquatic system. Slow water provides spawning areas for fish and shelters macroinvertebrates that might be washed downstream in higher stream velocities. Similarly, shallow water tends to be more easily aerated (i.e., it holds more oxygen), but deeper water stays cooler longer. Thus the best stream habitat includes all of the following velocity/depth combinations and can maintain a wide variety of organisms.

slow (<1 ft/sec), shallow (<1.5 ft) slow, deep fast, deep fast, shallow

## 7. Channel flow status

This is the percent of the existing channel that is filled with water. The flow status changes as the channel enlarges or as flow decreases as a result of dams and other obstructions, diversions for irrigation, or drought. When water does not cover much of the streambed, the living area for aquatic organisms is limited.

**For the last three parameters, evaluate the condition of the right and left stream banks separately. Define the " left" and "right" banks by facing downstream. Each bank is evaluated on a scale of 0–10.**

## 8. Bank vegetative protection

This measures the amount of the stream bank that is covered by natural (i.e., growing wild and not obviously planted) vegetation. The root systems of plants growing on stream banks help hold soil in place, reducing erosion. Vegetation on banks provides shade for fish and macroinvertebrates and serves as a food source by dropping leaves and other organic matter into the stream. Ideally, a variety of vegetation should be present, including trees, shrubs, and grasses. Vegetative disruption can occur when the grasses and plants on the stream banks are mowed or grazed, or when the trees and shrubs are cut back or cleared.

**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** – trees (*conifers* or *deciduous*) less than 15 feet high, plants

**Tall grass, ferns, etc.** – includes tall natural grasses, ferns, vines and mosses

**Lawn** – cultivated and maintained 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.

## 9. Condition of banks

This measures erosion potential and whether the stream banks are eroded. Steep banks are more likely to collapse and suffer from erosion than are gently sloping banks and are therefore considered to have a high erosion potential. Signs of erosion include crumbling, unvegetated banks, exposed tree roots, and exposed soil.

## 10. The riparian vegetative zone width

This is defined here as the width of natural vegetation from the edge of the stream bank. The riparian vegetative zone is a buffer zone to prevent pollutants from entering a stream from runoff. It also controls erosion and provides stream habitat and nutrient input into the stream. A wide, relatively undisturbed riparian vegetative zone reflects a healthy stream system; narrow, far less useful riparian zones occur when roads, parking lots, fields, lawns, and other artificially cultivated areas, bare soil, rocks, or buildings are near the stream bank. The presence of "old fields" (i.e., previously developed agricultural fields allowed to revert to natural conditions) should rate higher than fields in continuous or periodic use. In arid areas, the riparian vegetative zone can be measured by observing the width of the area dominated by riparian or water-loving plants, such as willows, marsh grasses, and cottonwood trees.

# Assessment (Muddy Bottom)

## 1. Shelter for fish and attachment sites for macroinvertebrates

These are essentially the amount of living space and shelter (rocks, snags, and undercut banks) available for fish, insects, and snails. Many insects attach themselves to rocks, logs, branches, or other submerged substrates. Fish can hide or feed in these areas. The greater the variety and number of available shelter sites or attachment sites, the greater the variety of fish and insects in the stream.

Many of the attachment sites result from debris falling into the stream from the surrounding vegetation. When debris first falls into the water, it is termed new fall and it has not yet been "broken down" by microbes (conditioned) for macroinvertebrate colonization. Leaf material or debris that is conditioned is called old fall. Leaves that have been in the stream for some time lose their color, turn brown or dull yellow, become soft and supple with age, and might be slimy to the touch. Woody debris becomes blackened or dark in color; smooth bark becomes coarse and partially disintegrated, creating holes and crevices. It might also be slimy to the touch.

## 2. Pool substrate characterization

This evaluates the type and condition of bottom substrates found in pools. Pools with firmer sediment types (e.g., gravel, sand) and rooted aquatic plants support a wider variety of organisms than do pools with substrates dominated by mud or bedrock and no plants. In addition, a pool with one uniform substrate type will support far fewer types of organisms than will a pool with a wide variety of substrate types.

## 3. Pool variability

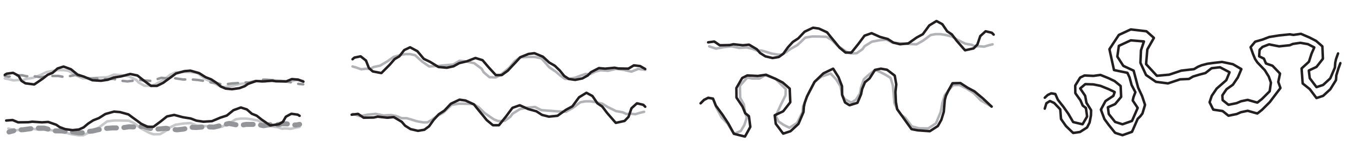
This rates the overall mixture of pool types found in the stream according to size and depth. The four basic types of pools are large-shallow, large-deep, small-shallow, and small-deep. A stream with many pool types will support a wide variety of aquatic species. Rivers with low sinuosity (few bends) and monotonous pool characteristics do not have sufficient quantities and types of habitats to support a diverse aquatic community.

## 4. Channel alteration (See description in habitat assessment for rocky-bottom streams.)

## 5. Sediment deposition (See description for rocky-bottom streams.)

## 6. Channel sinuosity

This evaluates the sinuosity or meandering of the stream. Streams that meander provide a variety of habitats (such as pools and runs) and stream velocities and reduce the energy from current surges during storm events. Straight stream segments are characterized by even stream depth and unvarying velocity, and they are prone to flooding. To evaluate this parameter, imagine how much longer the stream would be if it were straightened out.



Straight (Sinousity: 1.00–1.05) | Sinous (Sinousity: 1.05–1.25) | Meandering (Sinousity: 1.25–2.00) | Highly Meandering (Sinousity: >2.00)

## 7. Channel flow status (See description in habitat assessment for rocky-bottom streams.)

## 8. Bank vegetative protection (See description for rocky-bottom streams.)

## 9. Condition of banks (See description for rocky-bottom streams.)

## 10. The riparian vegetative zone width (See description for rocky-bottom streams.)

# Calculating the score

Add together the scores of all ten habitat parameters. This sum is the habitat index score for the study stretch.

Divide the habitat index score by 2. This number is the percent similarity to the reference score.

Compare the percent similarity of your result with the range of percent similarity numbers in the stream habitat rating table to obtain the habitat quality category for you site. Enter the appropriate descriptive rating (excellent, good, fair, poor) on the field data sheet.

# EPA Streamwalk Notes

EPA Streamwalk was initially conducted quarterly, but since the summer of 1999 it has been completed once a year in the late summer or early fall. Below are listed the attributes for each score:

| % Score | Habitat Quality Category | General Attributes |
|---|---|---|
| >90% | Excellent | Comparable to the best situation to be expected within and ecoregion. Excellent overall habitat structure conducive to supporting healthy biological community. |
| 75-88% | Good | Habitat structure slightly impaired. Diverse instream habitat generally well developed. Some degradation of riparian zone and banks. A small amount of channel alteration may be present. |
| 60-73% | Fair | Loss of habitat compared to reference. Habitat is a major limiting factor to supporting a healthy biological community. |
| <58% | Poor | Severe habitat alteration at all levels. |