

Habitat Assessment: The Parts Equal the Whole

Why are we concerned?

- The habitat functions holistically, so any changes to a part may affect the entire habitat.
- Certain land uses affect habitat quality and stream health.
- The Habitat Check-List uses visual measurements of land and water conditions to help pinpoint land uses affecting water quality.

Overview of Stream Habitat

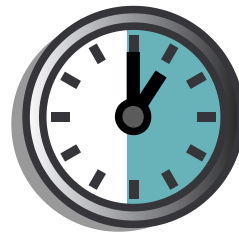
A healthy stream is a busy place. Wildlife find shelter and food near and in its waters. Vegetation grows along its banks, shading the stream and filtering pollutants before they enter the stream. Within the stream itself are fish, insects and other tiny creatures with specific needs: dissolved oxygen to breathe; rocks, overhanging tree limbs, logs and roots for shelter; vegetation and other tiny animals to eat; and special places to breed and hatch their young. For any of these activities, they might also need water of specific velocity, depth and temperature. Many land-use activities can alter these characteristics, causing problems within the entire habitat.



A stream with a healthy riparian zone.

Time Needed: Equipment Needed:

30-60 minutes



- measuring tape
- markers/flags/ties for trees
- Habitat Check List
- watch with second hand/stopwatch
- pen or pencil, clipboard

When to Measure: Usually twice each year in the spring and fall.

DEFINITION OF TERMS

Riparian Zone: The land between the water's edge and the upper edge of the flood plain; transition zone between water and land.

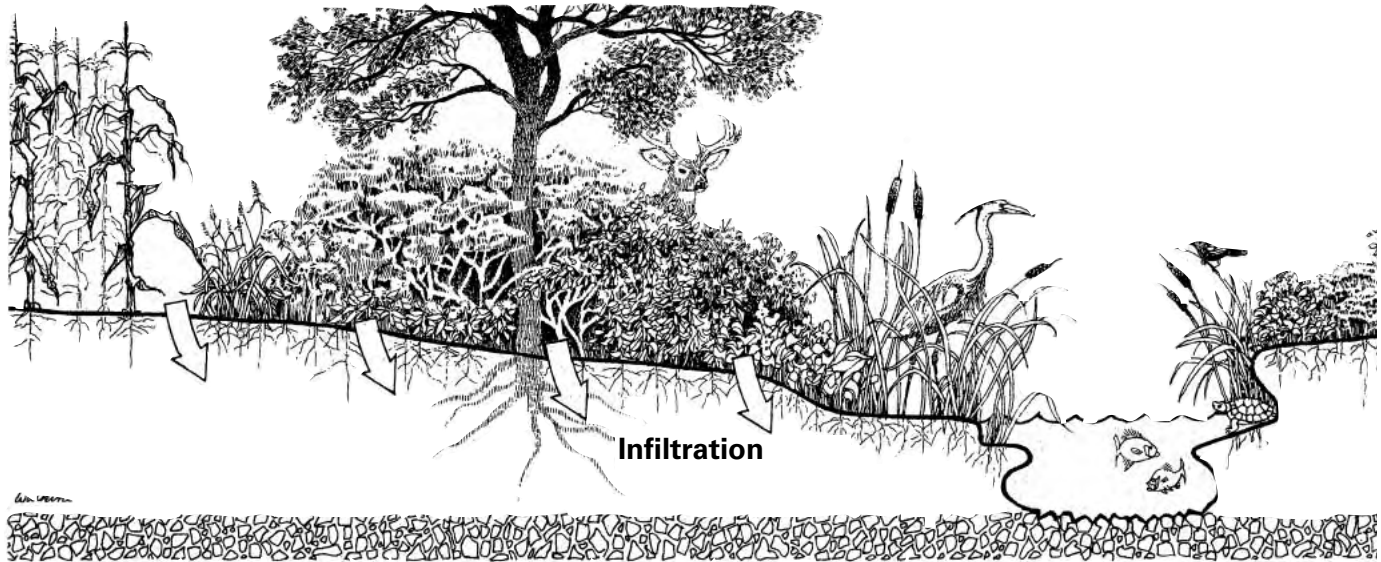
Embeddedness: The extent to which rocks are buried by silt, sand or mud on the stream bottom.

Substrate: The stream bottom surface on which plants and animals attach or live.

Lower Bank: The intermittently submerged portion of the bank from the normal water line to the high water line, or beginning of the upper bank (see page 3 diagram).

Upper Bank: The portion of the bank from the beginning of the high water line to the extreme high water line (see page 3 diagram).

Concepts in the Habitat Assessment



This diagram shows a healthy vegetated buffer in the riparian zone. The buffer allows runoff water to infiltrate into the ground instead of rushing into the stream unfiltered. Note the vegetated undercut bank on the right, which provides animal habitat and is resistant to erosion.

The Habitat Assessment is an easy-to-use approach for identifying and assessing the elements of a stream's habitat. It is based on a simple protocol developed by the Environmental Protection Agency, using observations of stream habitat characteristics and major physical attributes. Conducting an assessment is usually an annual event, best performed in spring when leaves haven't emerged and topography is more visible. This assessment is useful as: 1) a screening tool to identify habitat stressors and 2) a method for learning about stream ecosystems and environmental stewardship.

Taking stock of the habitat's characteristics may begin at the riparian zone where land is making a transition into water. Within healthy stream corridors, this area generally has certain kinds of vegetation that acts as a buffer between land and water, soaking up many runoff pollutants. Moving on, the stream assessment will then focus on the condition of the upper and lower banks and finally the stream channel and stream itself. In order to help prepare you to fill out the Habitat Check List, certain stream and river characteristics and concepts are defined on the following pages.

Riparian Zone

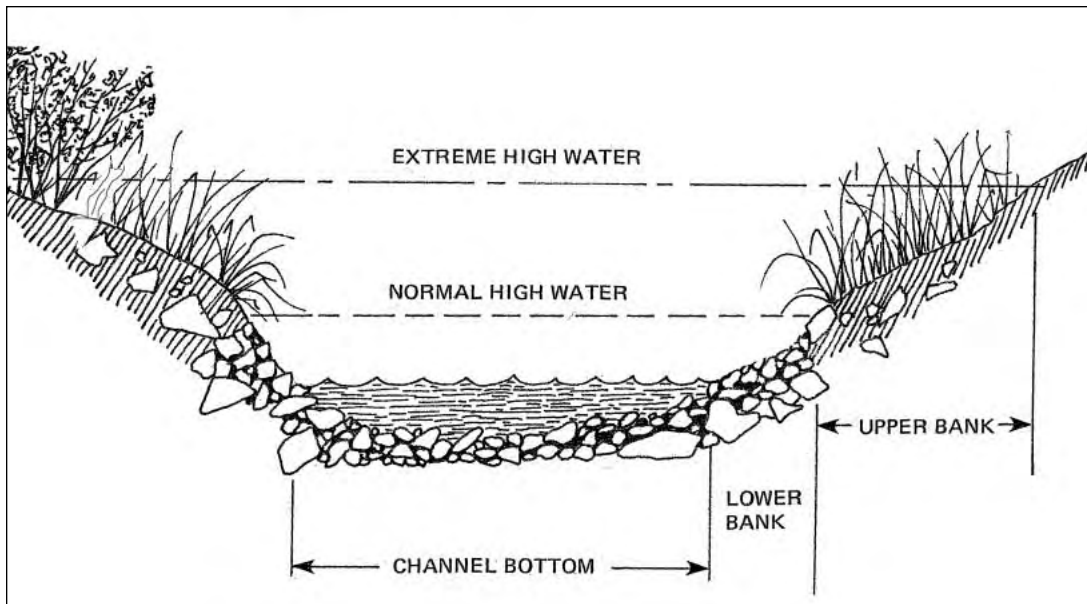
The healthy riparian zone is characterized by trees, bushes, shrubs and tall grasses that help to buffer the

stream from polluted runoff and create habitat for fish and wildlife. These plants also provide stream shading (or overhead canopy) and serve several important functions in the stream habitat. The canopy helps keep water temperatures cool by shading it from the sun, while offering protection and refuge for animals.

Certain conditions in the riparian zone can negatively affect the stream's habitat. Lawns maintained to the water's edge are abrupt transitions from land to water, offering very little or no buffering protection for the stream. In these cases, lawn care products and grass clippings could be entering the stream. Short-grassed stream banks also provide poor habitat for animals. Bare soil and pavement provide no buffering action from runoff.

Features to note in riparian zones:

- 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 - short conifers or deciduous shrubs less than 15 feet high.
- Tall grass, ferns, etc. - includes tall, natural grasses, ferns, vines, and mosses.



This diagram shows a cross section of a typical streambank, demarcating the upper and lower banks.

- Lawn - cultivated and maintained short grass.
- Boulders - rocks larger than 10 inches.
- Gravel/cobbles/sand - rocks smaller than 10 inches in diameter; sand.
- Bare soil
- Pavement or structures - any structures or paved areas, including paths, roads, bridges, houses, etc.
- Garbage or junk adjacent to the stream - Note the presence of litter, tires, appliances, car bodies or other large objects.

Stream Bank Characteristics

The stream bank consists of the upper and lower bank. The shape and condition of the stream bank can give many clues to the types of land uses in the adjacent watershed. For example, sometimes the channel may be altered by too much water flooding the stream in a short time. This may indicate a nearby urban area with many impervious surfaces, so the rain or melting snow cannot naturally soak into the ground. Large volumes of runoff then flood the nearest stream with too much water, which erodes and distorts the stream channel. Sometimes it is obvious that the banks have been eroded by excessive water because the normal flow does not reach the new shoreline which has been pushed back.



This stream has a gradually sloping bank.

A **vertical or undercut bank** rises vertically (at an approximate 90-degree angle) or overhangs the stream. This type of bank generally provides good cover for aquatic invertebrates (small animals without backbones) and fish and is resistant to



This steeply sloping bank has obvious and severe erosion.

erosion. This bank usually has a good vegetative cover that helps to stabilize the bank. If seriously undercut, however, the bank could collapse.

A **steeply sloping bank** slopes at more than a 45-degree angle. This type of bank is very vulnerable to erosion.

A **gradually sloping bank** has a slope of about 30 degrees or less. Although this type of stream bank is highly resistant to erosion, it does not provide much streamside cover.



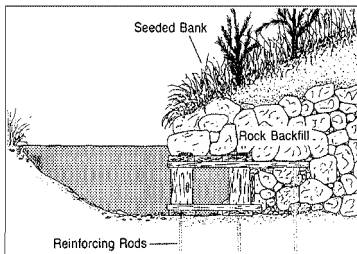
Artificial bank modifications include ditching and other changes such as concrete embankments and gabions to stem further erosion from the action of the water. Also included are LUNKER structures

Note the presence of any artificial embankments. This stream has a fortified concrete embankment.



which are wooden underwater habitats set into the bank and designed for trout and other game fish. Rock rip rap placed at bends and other areas subject to

erosion serve to improve fish habitat and stabilize stream meanders.



A LUNKER structure.

Poor stream bank conditions can include the loss of natural plant cover. Erosion can occur when streamside vegetation is trampled or missing or has been replaced by poorly designed landscaping or pavement. More severe cases of stream bank erosion include washed away banks or banks that have collapsed. Excessive mud or silt entering the stream from erosion can distort the stream channel, interfere with beneficial plant growth, dissolved oxygen levels and the ability of fish to sight prey. It can clog fish gills and smother fish eggs in spawning areas. Often it is the result of eroding stream banks, poor construction site practices, urban area runoff, silviculture (forestry practices) or ditches that drain the surrounding landscape.

In-stream Characteristics

Stream bottoms (substrate) are classified according to the comprising material. Rocky bottom streams are defined as those made up of gravel, cobbles and boulders in any combination. They usually have definite riffle areas. Soft bottom streams have naturally muddy, silty or sandy bottoms that lack riffles. Usually, these are slow-moving, low-gradient streams (i.e., streams that flow along flat terrain). A different set of parameters for each type of stream bottom has been designed for you to use.



This rocky bottom stream has lots of riffles — fast, turbulent, shallow water. Note the size of the boulders.

Substrate types include:

Silt / clay / mud—This substrate has a sticky feeling. The particles are fine. The spaces between the particles hold a lot of water, making the sediments feel 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, less than a grain of rice).

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 - rice size to marble size; coarse gravel - marble to ping pong ball size).

Cobbles (2-10 inches)—Most rocks on this type of stream bottom are between two and 10 inches (between a ping pong 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).

Embeddedness is the extent to which rocks (gravel, cobbles, and boulders) are buried by silt, sand, or mud on the stream bottom. Generally, the more embedded rocks, the less rock surface or space between rocks available for aquatic macroinvertebrate habitat and for fish spawning. Excessive silty runoff from erosion

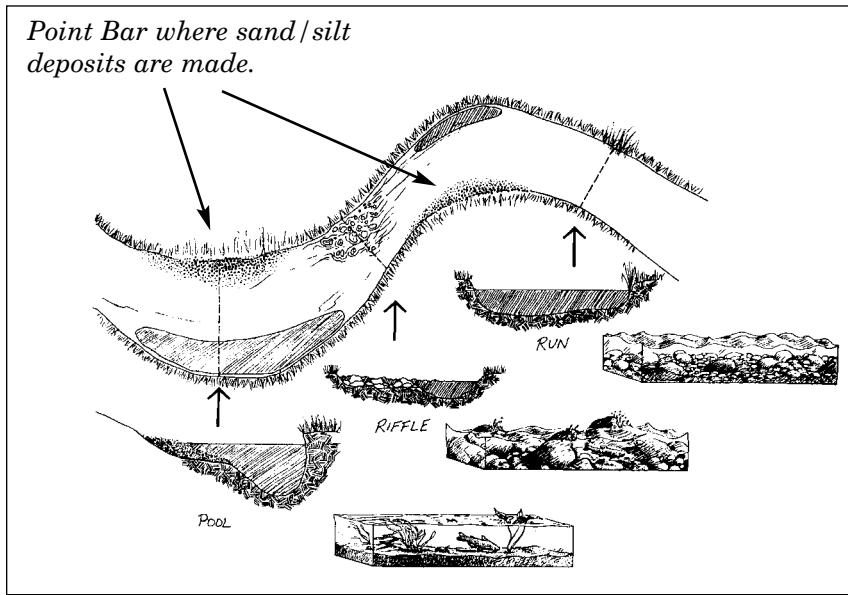


Diagram of a stream with a mixture of pools, riffles, and runs. Varying flows and depths create a variety of habitats for macroinvertebrates.

can increase a stream's embeddedness. To calculate embeddedness, estimate the amount of silt or finer sediments overlying, in between, and surrounding the rocks (see diagram).

Presence of logs or woody debris in streams can provide important fish habitat. Be sure to differentiate between logs or woody debris and naturally occurring or moderate amounts of organic material in streams, which includes leaves and twigs.

(sinuosity), certain kinds of terrain, runoff, and other factors can affect stream velocity.

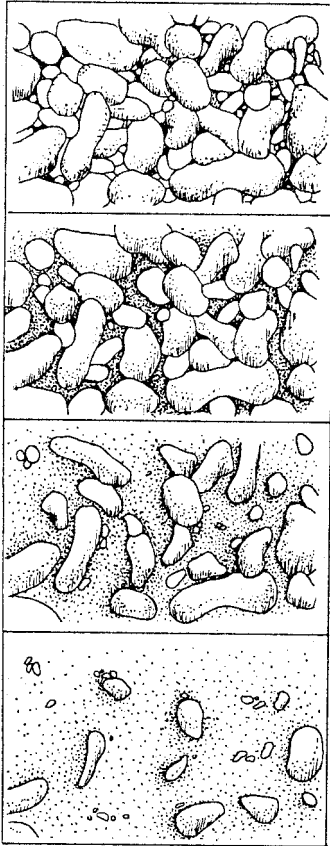
Rooted aquatic plants provide food and cover for aquatic organisms. They can also indicate water quality problems. Sometimes, excess nutrients may flush into the stream to stimulate unnatural aquatic plant growth. Compare the amount of plants in your stream to other streams in the area when deciding if there are too many plants.

Water Characteristics

Pools, riffles, and runs. A mixture of flows and depths creates 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-moving water with little or no turbulence.

Stream velocity influences the health, variety, and abundance of aquatic animals. If water flows too quickly, some organisms might be unable to maintain their hold on rocks and vegetation and be flushed downstream; if water flows too slowly, oxygen diffusion is insufficient for species needing high levels of dissolved oxygen. Dams, channelization or straightening out the stream's natural bends



Algae are simple plants that do not grow true roots, stems, or leaves and that mainly live in water, providing food for animals low on the food chain. Algae may be green or brown, grow on rocks, twigs, or other submerged materials, or float in the water. Excessive algal growth may indicate excessive nutrients (organic matter or a pollutant such as fertilizer) in the stream.

This diagram represents a rocky bottom stream becoming embedded with sand. As sand settles on the streambed, spaces between the rocks fill up.

When to be Wary of Water:

Water appearance 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

Milky - cloudy-white or gray, not transparent; might be natural or due to pollution

Foamy - might be natural or due to pollution such as 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 - tea-colored water might indicate that a naturally occurring, harmless acid is being released into the stream (normal for some streams)

Oily sheen - multicolored reflection might indicate oil floating in the stream, although some sheens are natural

Orange - might indicate unnatural acid drainage

Green - might indicate excess nutrients being released into the stream



Soft Bottom Streams: *These slow-moving streams have natural mud, sand or silt bottoms. Check with your monitoring coordinator to find out if your stream has a soft bottom or rocky bottom and the proper check-list to use.*

Water odor can also be an indicator of possibly hazardous water pollution. If you detect any unusual odors, DO NOT ENTER THE WATER and contact your local DNR office. Your safety is important to us.

No smell or a natural odor

Sewage - might indicate the release of human waste

Chlorine - might indicate over-chlorinated sewage treatment from water treatment plant or swimming pool discharges

Fishy - might indicate the presence of excessive algae growth or dead fish

Rotten eggs - might indicate sewage pollution (the presence of methane from anaerobic conditions)

Before you go into the field:

You will need to determine from your local Monitoring Coordinator whether your stream has a rocky bottom or a soft bottom, because the two types require different monitoring procedures. You are now ready to learn more about your stream's habitat. Follow steps outlined on Habitat Assessment Checklist to determine a score for your stream site.

What do Habitat Assessments Mean?

Each stream will have a unique habitat assessment value. This value is an important baseline measure for future comparisons. By comparing specific habitat parameter scores, the connection between land use and aquatic habitat may be better understood.



Rocky Bottom Streams: *These streams have different-sized rocks in the stream bed and frequently have riffle sections and rapid stream flow.*

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