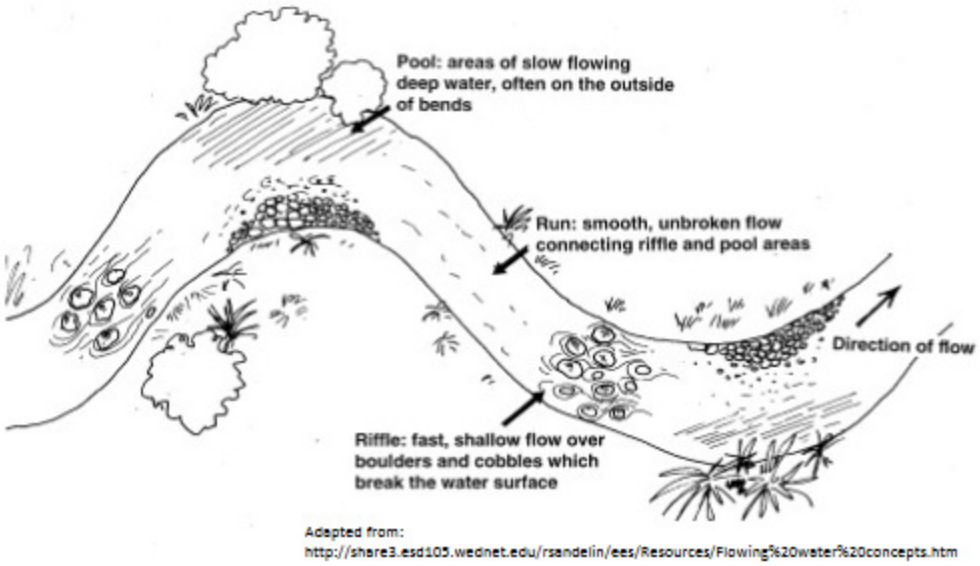
Stream Habitat Assessment Rocky Bottom

Section 1 Attachment sites for Macro-invertebrates

Pools, Riffles, and Runs



Pools: An area of the stream characterized by deep depths and slow current. Pools are typically created by the vertical force of water falling down over logs or boulders. The movement of the water carves a deeper indentation in the stream bed. Pools are important because they can provide depth and still water.
The depths of pools provide refuge during dry conditions, protection from predators or shelter. The water flows a little slower which allows the organic debris to settle out and provides a food source. Another advantage is that you don't have to relocate to another area if the stream level starts to lower.

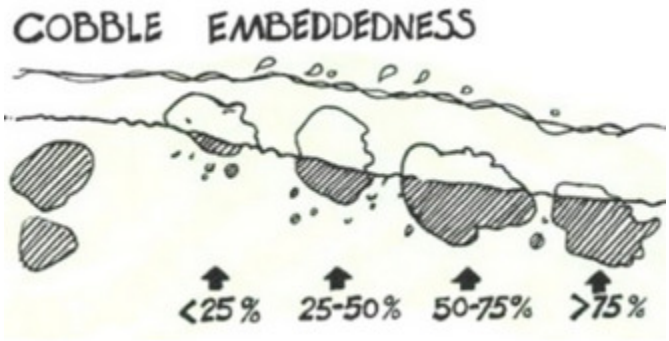
Riffles: An area of stream characterized by shallow depths with fast, turbulent water. The riffles are short segments of the stream where water flow is agitated by rocks. The rocky bottom provides protection from predators, food deposition and shelter. Riffle depths vary depending upon stream size, but can be as shallow as 1 inch or deep as 1 meter. The turbulence and stream flow results in high dissolved oxygen concentration. Riffles are at once a shelter from predators, and a conveyor belt that brings food to the animals. Many species of invertebrates reproduce or grow to maturity in riffles. Riffles also hold larger prey items and only animals that cling very well, such as net-winged midges, caddisflies, stoneflies, some mayflies, dace, and sculpins can spend much time here, and plant life is restricted to diatoms and small algae. Riffles are a good place for mayflies, stoneflies, and caddisflies to live because the riffles offer plenty of cobble gravel to hide in.

Run: An area of stream characterized by moderate current, continuous surface and depths greater than riffles. Runs are stretches of the stream downstream of pools and riffles where stream flow and current are moderate. The smooth surface allows for light to penetrate. Runs are preferred by fishes that are too small to compete in polls such as minnows.

The microhabitats of stream provide by riffles and pools can result in different communities of macroinvertebrates:

Feeding Group	Food Source	Habitat Found	Major Groups/Taxa Found
Predators	Other animals	Pool, Riffles and Runs	Stoneflies, Dragonflies and Damselflies, Dobsonflies and Alderflies, Caddisflies, Crayfish, Leeches, Planaria
Scrapers	Algae, bacteria, anything they can scrape off	Pool	Water beetles, Snails
Shredders	Bacteria and fungi on leaf surfaces. They tear up leaves into smaller pieces (detritus).	Riffles	Crane Flies, Caddisflies, Stoneflies, Scuds,
Collectors – Gathering	Small pieces of food and organic matter, like broken up leaves along the stream bed.	Pools, Riffles	True Flies, Mayflies, Sowbugs, Crayfish, Clams and Mussels, Aquatic Earthworms
Collectors – Filtering	Catch small pieces of food and organic matter, like broken up leaves floating in water.	Runs/Pools	Net Spinning Caddisflies, Blackflies

Section 2 Embeddedness



Embeddedness is the extent to which rocks (cobble, and boulders) are buried by silt, sand, or mud.

Substrate types include:

Silt/clay/mud:—These substrate have a sticky feeling. The particles are fine. The spaces between the particles hold a lot of water, making the sediments feel like ooze.

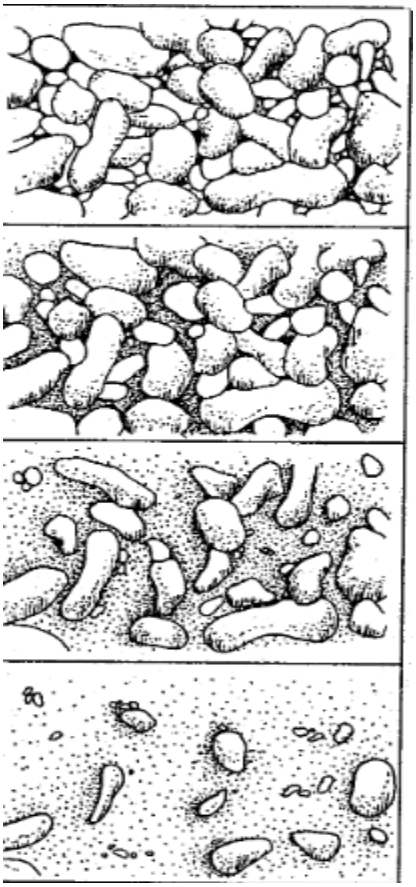
Sand (up to 0.1 inch):—A sandy bottom is made up of tiny, gritty particles of rock that are smaller than gravel but coarser than silt (gritty, less than a grain of rice).

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).



Not embedded: Very little silt/clay/mud, sand or small gravel fill the spaces between the large gravel and cobble. (< 25%) [score 20 – 16]

Cobble can be moved easily

Slightly embedded: Silt/clay/mud, sand, or small gravel fill 25% to 50% of the cobble/bolder space [score 15 -11].

Cobble can be moved with some effort.

Moderately embedded: Silt/clay/mud, sand, or small gravel fill 50% to 75% of the cobble/bolder space. Cobble and boulders are difficult or impossible to dislodge from the bottom [score 10 – 6].

Completely embedded: Silt/clay/mud, sand, or small gravel fill more than 75% of the cobble/bolder space. Cobble and boulders are impossible to dislodge from the bottom and only small portions are visible. [score 5 – 1].

Section 3: Shelter for Fish and Macro-invertebrates

Submerged logs, trees that fall into streams, and larger rocks provide places where macro-invertebrates and small fish can find food and places to hide. Undercut banks provide deep shaded pools where animals can find protection and cooler water. Riffles which are only slightly embedded provide good habitat for many macro-invertebrates.

Section 4: Channel Alteration

Channel alteration refers to changes in the stream bed/bank that are the result of human activity. Streams are straightened to accommodate roads and buildings. To prevent the stream from returning to a normal channel additional alterations are typically needed such as cement walls, large rock rip-rap, and dredging. Dams and bridge abutments also alter the normal flow of a stream. Some artificial structures such as bridge piers can act a habitat for mussels and other organisms. Most channel alterations, however, are a detriment to the normal life of a stream.

Section 5: Sediment Deposition

Sediment deposition is an estimate of the amount of sediment that has accumulated and the changes that have occurred to the stream channel as a result of deposition. Deposition occurs from large-scale movement of sediment. Sediment deposition may cause the formation of islands, point bars (areas of increased deposition usually at the beginning of a meander that increase in size as the channel is diverted toward the outer bank) or shoals, or result in the filling of runs and pools. Usually deposition is evident in areas that are obstructed by natural or manmade debris and areas where the stream flow decreases, such as bends. High levels of sediment deposition are symptoms of an unstable and continually changing environment that becomes unsuitable for many organisms. Sediment deposition should be rated throughout your reach and should not be confused with embeddedness. Sediment deposition is probably the most difficult condition to assess. It is a natural process and bars often form in streams that are very stable and have little sediment from the surrounding land or few problems with erosion. When assessing this condition look for indicators that are unusual or beyond what is expected to be normal for the stream. The most effective way to learn is to view many different stream types representing both degraded and natural conditions. In most cases island formation, especially in small streams (1st through 3rd order), is an indication of excessive deposition. The most common cause for unusual or un-natural deposition in most streams is human encroachment (i.e. structures such as bridges, roads, culverts etc., which are to close to the stream or built so that the stream is narrowed) and bank erosion. Steep sloping banks with exposed surfaces are more likely to erode. Undercut banks can often erode but are sometimes very stable if covered with vegetation, tree roots and rocks. Look for deposition around eroding banks, especially if they show bare soils consisting mostly of fine materials (fine gravel, sand and silt). Hard surfaces no matter how steep or undercut are less likely to erode

Section 6: Velocity and Depth Combination

A typical meandering stream has four (4) velocity and depth combinations.
Fast = > 1 foot/ sec., Deep = > 3 feet, Slow < 1 foot / sec., Shallow = <1.5 feet

1. Slow and Deep: Pools typically have slow deep water. Slow/deep water is typically found in areas where the channel bends outward against a higher, steep bank.

2. Slow and Shallow : Water along the inside edge of a bend typically has slow/shallow water. As the water slows down sediments will deposit on the stream bottom in these areas. They can be identified by herbaceous vegetation in the stream bed. The bank is typically shallow (less than 45 degree angle).

3. Fast and Deep: Water in a run is typically fast and may be deep as it leaves a pool and before it enters a riffle.

4. Fast and Shallow: Riffle areas have fast water at the beginning of the riffle but water tends to slow as it continues through the riffle. Depth in a riffle may be between 1 inch and 3 feet.

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 down stream; if water flows too slowly, oxygen diffusion is insufficient for species needing high levels of dissolved oxygen.

Section 7: Channel Flow Status

This parameter may be difficult to evaluate on a single visit to a stream. Water depth and width will change as a result of wet or dry periods. One way to evaluate this parameter is to look for a strand line along the stream bank. The strand line is the place where floating vegetation gets deposited along the stream bank during high water events. If flooding has occurred along the stream be careful not to confuse the strand line caused by a flood with the strand line that results from normal fluctuations in stream depth.

Another difficulty with this parameter is that normal width should not be confused with flood plain width. This problem is more common with larger streams because they have wider flood plains.

Section 8: Bank Vegetation Protection

This parameter evaluates human interaction with the stream bank's "natural" vegetation. A normal stream bank will have water loving herbs, shrubs, and trees. Grass mowed to the edge of the water is not a healthy condition and should get a very low score. Do not confuse this parameter with section 9 which is concerned with alterations to the bank that result from natural events.

Section 9: Condition of 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 may be resistant to erosion if penetrated by many roots. 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 30degrees 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 high water. Although helpful artificial structures are not natural and indicate an unstable condition and should get a low score.

Section 10: Riparian Vegetation Zone Width

This section is similar to section 8 but only applies to the width of the vegetation zone.

A 50 foot riparian buffer zone is the ideal condition recommended by DEP as a best management practice (BMP).

The above guide was developed from a variety of sources for use by stream monitors in the Venango Senior Environmental Corp.