Procedure for Performing a Habitat Assessment

1. Select the reach to be assessed. The habitat assessment is performed on the same 100 meter reach from which the biological sampling is conducted. Some parameters require an observation of a broader section of the catchment than just the sampling reach.
2. Complete the station identification of the habitat assessment form.
    a. Stream Name – Fill in the name of the stream you are monitoring
    b. Location – The nearest street or cross section
    c. Site Number – This is the site number assigned to the location. It is the same site number that you put on all other documentation
    d. Lat/Long – the GPS coordinates of the site
    e. Investigators – who contributed input for this monitoring today
    f. Form completed by – who is filling out the form
    g. Date and Time – please be sure to include the month/day/year
    h. Reason for Survey – quarterly StreamSmart monitoring
3. It is best for the investigators to obtain a close look at the habitat features to make an adequate assessment. If water quality sampling and habitat assessment are done before the biological sampling, care must be taken to avoid disturbing the sampling habitat.
4. Complete the Habitat Assessment Field Data Sheet in a team of 2 or more, if possible, to gain a consensus or determination of water quality.

1. Epifaunal Substrate/Available Cover

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

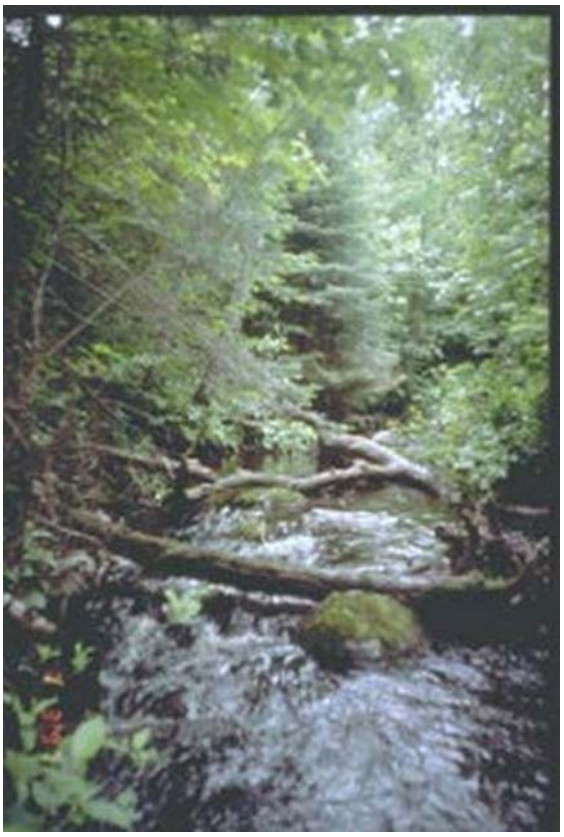
Definition

Epifaunal - "epi" means surface, and "fauna" means animals. Thus, "epifaunal substrate" is structures on the streambed that provide surfaces on which animals can live. In this case, the animals are aquatic invertebrates (such as aquatic insects and other "bugs"). These bugs live on or under cobbles, boulders, logs, and snags, and the many cracks and crevices found within these structures. In general, older decaying logs are better suited for bugs to live on/in than newly fallen "green" logs and trees.

Cover - “cover” is the general term used to describe any structure that provides refugia for fish, reptiles or amphibians. These animals seek cover to hide from predators, to avoid warm water temperatures, and to rest, by avoiding high velocity water. These animals come in all sizes, so even cobbles on the stream bottom that are not embedded with fine sands and silt can serve as cover for small fish and salamanders. Larger fish and reptiles often use large boulders, undercut banks, submerged logs, and snags for cover.

What you are evaluating

When evaluating epifaunal substrate and available cover look at the relative quantity and variety of natural structures in the stream such as cobble (riffles), large rocks, fallen trees, logs and branches, and undercut banks, available as refugia, feeding, or sites for spawning and nursery functions of aquatic macrofauna. In general, consider the entire bankfull area of the channel, but give greater weight to the area of the channel that remains wetted during lower flow conditions (such as those during late summer). A wide variety and/or abundance of submerged structures in the stream provide bugs and fish with a large number of niches, thus increasing habitat diversity. As variety and abundance of cover decreases, habitat structure becomes monotonous, diversity decreases, and the potential for fish and bug populations to recover following disturbance decreases.Look to see that there are riffles and runs with a wide variety of particle sizes (gravels to boulders). Riffles and runs are critical for maintaining a variety and abundance of invertebrates and they serve as spawning and feeding habitat for many fish. The greater the abundance and variety of structures serving as epifaunal substrate and cover, the higher the score.



Ask yourself: Would fish and bugs like to live here?

2. Embeddedness

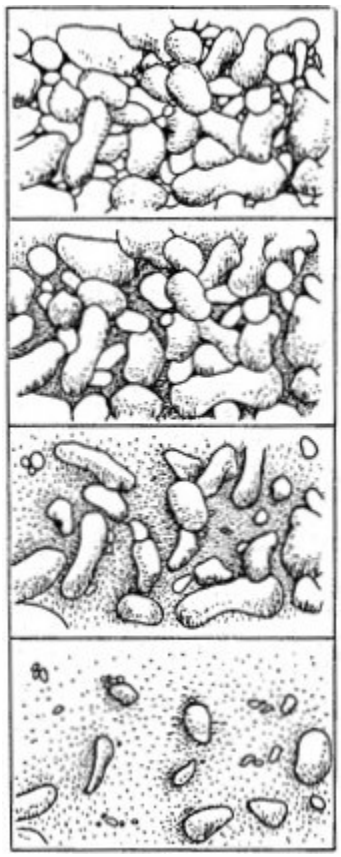
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Definition

Embeddedness - 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. Excessive silty runoff from erosion can increase a stream's embeddedness.

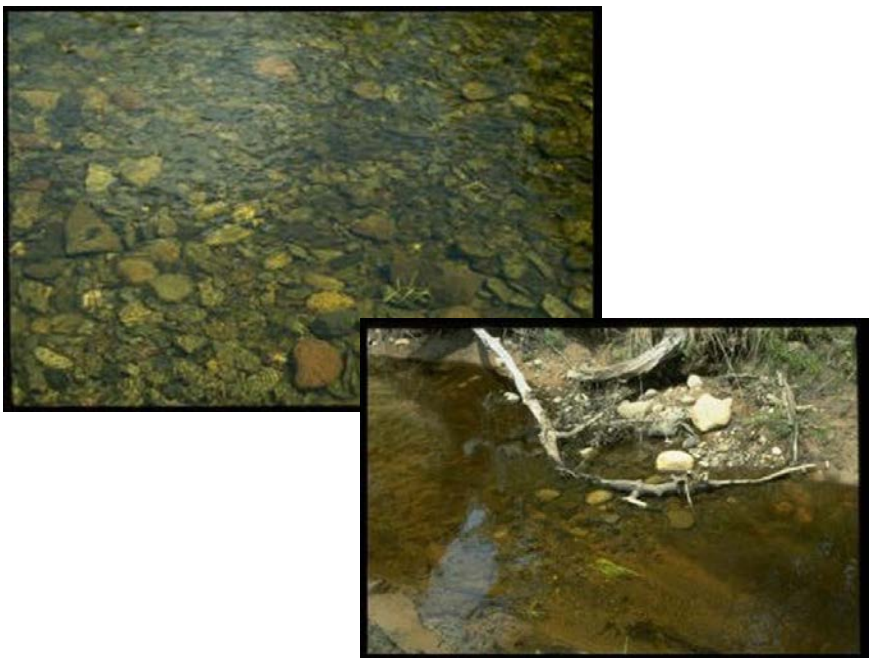
What you are evaluating

To estimate the percent of embeddedness, observe the amount of silt and sand sediments overlying and surrounding the larger gravel and cobble size particles. You should base your embeddedness assessment on the composition of the materials that you observe.



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

Source: University of Wisconsin Extension Service - http://watermonitoring.uwex.edu/pdf/level1/FactSeries-HabitatAssessment.pdf



3. Velocity/Depth Regime

3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Definition

There are basically four types of velocity/depth regimes possible in a river system;

- deep and slow moving,
- deep and fast moving,
- shallow and slow moving, and
- shallow and fast moving.

The best streams in most high-gradient regions will have all 4 patterns present. The occurrence of these 4 patterns relates to the stream's ability to provide and maintain a stable aquatic environment. The more of these velocity/depth regimes that are present in a river or stream, the more varied the habitat and the more amenable to supporting a diverse aquatic community.

What you are evaluating

In this section you are evaluating the presence of the four regimes in the stream segment you are evaluating. If you are missing fast-shallow (the segment critical for macroinvertebrate habitat) you will score lower than 11.

4. Sediment Deposition

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Definition

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 organism. Sediment deposition should be rated throughout your reach and should not be confused with embeddedness. Sediment deposition 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.

What you are evaluating

When assessing this condition look for indicators that are unusual or beyond what is expected to be normal for the stream. Look for deposition around eroding banks, especially if they show bare soils consisting mostly of fine materials (fine gravel, sand and silt).

5. Channel Flow

5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Definition

Channel Flow - The degree to which the channel is filled with water is the channel flow status. The flow status will change as the channel enlarges (e.g., aggrading stream beds with actively widening channels) 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 amount of suitable substrate for aquatic organisms is limited and riffles and cobble substrate are exposed. Channel flow is especially useful for interpreting biological condition under abnormal or lowered flow conditions. This parameter becomes important when more than one biological index period is used for surveys or the timing of sampling is inconsistent among sites or annual periodicity.

What you are evaluating

To evaluate channel flow, look at where bank full depth should be. How much of the channel substrate is exposed? The higher the percentage of substrate, the lower your score will be. The more of the exposed substrate, the less opportunity there is for aquatic macroinvertebrates and fish to use it.

6. Channel Alteration

6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Definition

Channel Alteration - Channel alteration is an assessment of the degree of diversion from the natural course of the water body by man-made structures and/or activities. This includes rip-rap stream banks, bridge abutments, dredging, concrete channelization, etc. These structures and activities often degrade habitat by increasing stream velocities and decreasing food sources and protective cover. Many streams in urban and agricultural areas have been straightened, deepened, or diverted into concrete channels, often for flood control or irrigation purposes. Such streams have far fewer natural habitats for fish, macroinvertebrates, and plants than do naturally meandering streams.

What you are evaluating

Channel alteration is present 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 and bridges are present; and when other such changes have occurred. Scouring is often associated with channel alteration. Elimination of streambank vegetation, undercutting of banks, removal of snags, and smothering or elimination of bottom substrates and detritus are all results of channel alteration.

7. Frequency of Riffles or Bends

7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Definition

<u>Riffle Frequency and riffle presence</u> - Riffle habitat is considered to be the in-stream geomorphic feature that provides the most optimal habitat conditions and reflects the balance between erosional and depositional characteristics in the water body.

What you are evaluating

Five to seven stream widths between each recurring riffle area are considered to be optimal. For example, if the stream is 20 feet wide, the optimal distance between the riffles 140 feet or less. This is derived by taking the width of the stream (20 feet) and multiplying by 7 = 140 feet. The wider the stream, the greater the distance between riffles. If you do not have any riffles, you should be evaluating lower.

8. Bank Stability

8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.			Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.			Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
SCORE ___ (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	0
SCORE ___ (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1	0

Definition

Bank Stability - Unstable banks, while naturally occurring under some conditions, usually alludes to highly fluctuating flows and the inability of the riparian habitat to recover from frequently occurring hydrologic stresses. Poor bank stability increases turbidity and depositional/erosional areas. It can also elevate in-stream water temperatures, and cause community shifts from pollutant sensitive aquatic species to pollutant tolerant ones. Poor streamside bank conditions usually coincide with poor in-stream habitat.

What you are evaluating

The bank stability parameter evaluates whether the stream banks are eroded (or have the potential for erosion). Steep banks are more likely to collapse and suffer from erosion than are gently sloping banks, and are therefore considered to be unstable. Signs of erosion include crumbling, un-vegetated banks, exposed tree roots, and exposed soil. Eroded banks indicate a problem of sediment movement and deposition, and suggest a scarcity of cover and organic input to streams.

9. Vegetative Protection

9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Definition

Stream side vegetation is one of the principal factors which protects the streambank from erosional processes, provides shade and protective cover for aquatic life, and provides a significant food source to in-stream biota. The density and types of vegetation present are indicative of the sensitivity of the water body to potential changes in streamflow and its susceptibility to erosion and sedimentation**.**

What you are evaluating

Bank vegetative protection parameter estimates the amount of vegetative protection afforded to the stream bank and the near-stream portion of the riparian zone. The root systems of plants growing on stream banks help hold soil in place, thereby reducing the amount of erosion that is likely to occur. This parameter supplies information on the ability of the bank to resist erosion as well as some additional information on the uptake of nutrients by the plants, the control of in stream scouring, and stream shading. Banks that have full, natural plant growth are better for fish and macroinvertebrates than are banks without vegetative protection or those shored up with concrete or riprap. This parameter is made more effective by defining the native vegetation for the region and stream type (i.e., shrubs, trees, etc.). In some regions, the introduction of exotics has virtually replaced all native vegetation.

10. Riparian Vegetative Zone

10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.			Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.			Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.		
SCORE ___ (LB)	Left Bank 10	9	8	7	6	5	4	3	2	1	0
SCORE ___ (RB)	Right Bank 10	9	8	7	6	5	4	3	2	1	0

Definition

Riparian Vegetative Zone - is an estimate of the width of natural vegetation from the edge of the stream bank out through the riparian zone. The vegetative zone serves as a buffer to pollutants entering a stream from runoff, controls erosion, and provides habitat and nutrient input into the stream. A relatively undisturbed riparian zone supports a robust stream system; narrow riparian zones occur when roads, parking lots, fields, lawns, bare soil, rocks, or buildings are near the stream bank. Residential developments, urban centers, golf courses, and rangeland are the common causes of anthropogenic degradation of the riparian zone. Conversely, the presence of old fields, paths, and walkways in an otherwise undisturbed riparian zone may be judged to be inconsequential to altering the riparian zone and may be given relatively high scores. Each bank is evaluated separately for this parameter. Riparian buffers are the most valuable protection a stream system has against outside influences. In most cases healthy riparian directly reflects upon the condition of the stream unless the source of the insult is a specific pollutant. Enhancement of the riparian buffer by re-planting native grasses, forbs, shrubs and trees is the first step in the recovery of the stream back to a more natural condition.

What you are evaluating

This habitat quality parameter assesses the width of naturally occurring vegetation between the water body and the area of man-made land uses in order to determine the riparian zones ability to "buffer" detrimental influxes into the water body. The wider the buffer zone, the greater the ability of the riparian zone to mitigate pollutants. A width of approximately eighteen meters is considered optimal; additional widths will in most cases not result in additional protection or attenuation of pollutants.

Riparian Vegetative Zone Continued