LECTURE 4 + 5 (L4-L5)

Habitat assessment

The evaluation of habitat in bio monitoring surveys is a vital component for fully understanding factors that are influencing the health and biological integrity of an aquatic community. The interplay between watershed physiographic features and anthropogenic land use characteristics will play a large role in determining the composition and quality of habitat that is available to resident aquatic communities. The condition of the habitat at a biomonitoring station is evaluated using different physical parameters, varying slightly for high, mid, and low gradient streams. Each of these parameters is numerically scored after visual observation of the stream reach. The numerical scores for all parameters are then summed and the value obtained places the stream within a category of one of the following categories.

Habitat Assessment :-The poor category ranges from one to five, the marginal category six through ten, suboptimal category eleven through fifteen, and the optimal category ranges from sixteen to twenty.

Each biologist in the field (minimum of four) conducts their own assessment of each individual habitat parameter. This is followed by open discussion until agreement is reached on the overall condition of the habitat. In this manner, a semi-quantitative and standardized approach to assessing the habitat is best reached through professional judgment.

By looking at individual habitat assessment parameters, one can obtain important information regarding community structure and health and often identify leading causes of degraded conditions. Habitat assessment data can also be interpreted by summing the twelve habitat parameter scores for an overall assessment value; 161-200: optimal, 101-160: suboptimal, 51-100: marginal, <51: poor. These assessment values are used when assessing a site's attainable biological condition based on a local reference station.

L4-L5

Habitat charactericts that are evaluated:-

(a) Available Cover: This evaluation includes the relative quantity of natural resources in the stream, such as cobble (riffles), large rocks, fallen trees, logs and branches, undercut banks, available refugia, feeding, or sites for spawning and nursery functions of aquatic life

(b) Embeddedness:(High Gradient Only) the degree that voids between dominant substrates found within riffle run habitats are filled with smaller sized particles is termed as
embeddedness. As these voids become filled, important microhabitats for benthic dwelling insects and fish are eliminated, and the ecological health and integrity of the
area is compromised. In addition to the loss of microhabitat, the substrates ability to entrap coarse particulates such as leaves and other riparian generated detritus is also reduced, resulting in the loss of important food resources for many locally dwelling organisms.

(c) Pool Substrate Characterization: (Low Gradient Only) Evaluates the type and condition of bottom substrates found in pools. Firmer sediment types like gravel, sand and rooted aquatic plants provide support for a more diverse group of organisms than a pool that is dominated by mud, bedrock, and no plants. Additionally, a stream that has a uniform substrate in its pool will not support as many types of organisms than a stream that has a variety of substrate types.

(d) Velocity/Depth Regimes:(High Gradient Only) 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 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. In larger river systems where only one of these regimes may be commonly present, (i.e. deep and slow moving) a different habitat assessment form is used so that the water body is not assessed negatively for naturally occurring conditions.

L4-L5

(e) Pool Variability: (Low Gradient Only) This rates the overall mixture of pool types found in streams, according to size and depth. There are 4 basic types of pools are large-shallow, large-deep, small-shallow, and small-deep. A stream will support a wide variety if aquatic species. Rivers with low sinuosity (few bends) and monotonous pool characteristics do not have sufficient quantities and types of habitat to support a diverse aquatic community.

(f) Sediment Deposition: Sediment deposition can be caused from increased stream velocities resulting from alteration of the stream channel. Increased stream velocities accelerate the erosion process, increasing suspended materials and bed load sediments (those particles that bounce along the bottom), which are then deposited in lower velocity areas of the water body. Increasing sediment loads and subsequent deposition into other reaches often results in the covering and encapsulation of coarser streambed materials or the filling of interstitial spaces between the larger substrates that previously provided important habitat for fish and aquatic insects.

(g) Channel Flow Status: This parameter represents the degree to which the channel is filled with water. It provides an assessment of the temporal variability of streamflow in the channel and can be related to the suitability of the habitat for inhabitance by fish and aquatic insects. Factors such as hydropower, drinking water diversions, flood control structures, and urban development can precipitate highly varying seasonal and non-seasonal flow regimes which can reduce the amount of available habitat, or alter its characteristics as to be unsuitable for use by the naturally occurring biological community.

(h) 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. 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. Depositional and erosional areas within the river system are often increased or decreased as a result of channel alteration, causing shifts in the structure of the naturally occurring community.

(i) (Bank Vegetative Protection) Riffle Frequency: (High Gradient Only) 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. Five to seven stream widths between each recurring riffle area are considered to be optimal.

(j) Channel Sinuosity: (Low Gradient Only) Evaluates the meandering or sinuosity of the stream. A high degree of sinuosity provides for diverse habitat and fauna, and the stream is better able to handle surges when the stream fluctuates as a result of storms. The absorption of this energy by bends protects the stream from excessive erosion and flooding and provides for refugia for benthic invertebrates and fish during storm events.
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.

LECTURE-6 (L6)

(k)Vegetative ZoneBank Vegetative Protection: 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.

(l) Riparian Vegetative Zone Width: 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.

narrow channel Habitat

L-6

open Habital

forest Habitat