Indicators of Healthy Aquatic Systems

Streams are controlled by climate, geology, topography, vegetation, and land use.

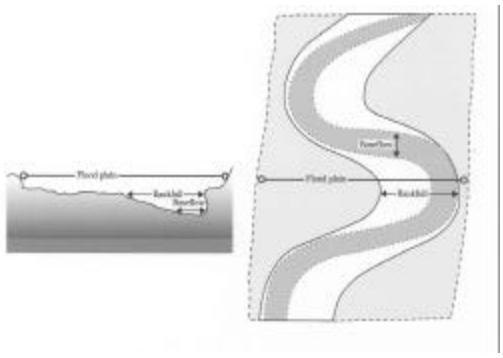
Indicators of Stream Health Include:

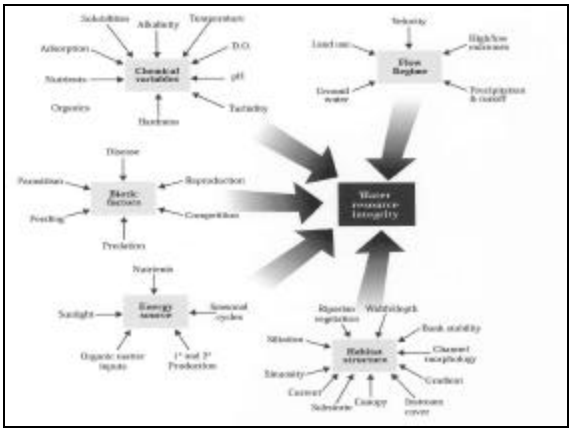
- Channel Condition
- Hydrologic Alteration
- Riparian Zone
- Bank Stability
- Water Appearance
- Nutrient Enrichment
- Barriers to Fish Movement
- Instream Fish Cover
- Pools
- Invertebrate Habitat

Other factors if applicable include:

- Canopy Cover
- Manure Presence
- Salinity
- Riffle Embeddedness
- Macroinvertebrates Observed
- Fish Species Observed
- Large Woody Debris

Baseflow, Bankfull, and Flood Plain Locations.





A healthy riparian vegetation zone is one of the most important elements for a healthy stream ecosystem. The quality of the riparian zone increases with the width and the complexity of the woody vegetation within it. This zone:

- Reduces the amount of pollutants that reach the stream in surface runoff.
- Helps control erosion.
- Provides a microclimate that is cooler during the summer providing cooler water for aquatic organisms.
- Provides habitat for terrestrial insects that drop in the stream and become food for fish, and habitat and travel corridors for terrestrial animals.

• Dissipates energy during flood events.
• Provides large woody debris from fallen trees and limbs that form instream cover, create pools, stabilize the streambed, and provide habitat for stream biota.
• Provides fish habitat in the form of undercut banks with the "ceiling" held together by roots of woody vegetation.
• Provides organic material for stream biota that, among other functions, is the base of the food chain in lower order streams.
Often provides the only refuge areas for fish during out-of-bank flows (behind trees, stumps, and logs).

Evaluation Methods

- Streambed Geology – dominant substrate or percentages of boulder, gravel, sand, silt, and mud.
- Width/Depth Ratio – the ratio of channel width to depth is optimal for fish and aquatic insects if less than 7:1.
- Pool/Riffle Ratio – optimal riffle to stream width
- Buffer Width – vegetative buffer strips are effective in filtering pollutants such as sediment and nutrients.
- Vegetation Characteristics – diversity, percent cover, and type of vegetation
- Canopy Cover – Amount of shade

Evaluation Methods Continued

- Sample and Identify Macroinvertebrates
- Sample and Identify Fish Species
- Sample plant species
- An Index of Biotic Integrity can evaluate the biological conditions of rivers and streams.

Table 1. Index of biotic integrity metrics as originally developed (modified from Karr and others, 1986).

Category	Metric
Species richness and composition	1. Total number of fish species
	2. Number and identity of darter species
	3. Number and identity of sunfish species
	4. Number and identity of sucker species
	5. Number and identity of intolerant species
	6. Proportion of individuals as green sunfish (tolerant species)
Trophic composition	7. Proportion of individuals as omnivores
	8. Proportion of individuals as insectivorous cyprinids (minnows)
	9. Proportion of individuals as top carnivores
Fish abundance and condition	10. Number of individuals in sample
	11. Proportion of individuals as hybrids
	12. Proportion of individuals with disease, tumors, fin damage, or skeletal anomalies

Sampling of Species

- Note the time of day, the weather, temperature, ecoregion, drainage area, and land use.
- Note the stream temperature, salinity, flow, and any structures within the stream.
- Select the proper gear to sample – nets, seines, kick-nets, hoop or trap nets, gill nets, and electrofishing systems.
- Need to understand fish habitats to make sure that all habitat types are sampled with equal catch per unit effort amounts.
- Have a standardized sampling method to follow.