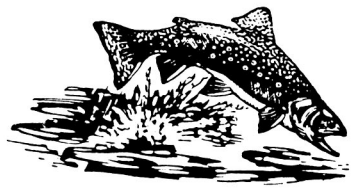
Environmental Indicator Profile Sheet



Indicator Profile No. 14

Single Species Indicator

Category: **Biological**

Tools Used to Measure Indicator:

- Electrofishing Surveys
- Physical Habitat Assessments
- Bioassays

Description:

The biological status of a carefully chosen single species is used as an assessment tool for representing the environmental health of an aquatic system. The presence, absence and/or trend in population of a particular environmentally sensitive species (such as trout, salmon or freshwater mussels) in a waterbody provides a measure of aquatic health. Single species reproduction rates and mortality rates are compiled to evaluate trends in aquatic system integrity. Species pathology, indicated by the presence of tumors, fin damage, parasite infestations, and discoloration, among other anomalies is also used to assess water body health.

Utility of Indicator to Assess Stormwater Impacts:

- Useful in identifying degradation associated with land use for the single species and/or trophic level.
- Potential to act as a focal point for aquatic system protection and restoration. Can induce public education, support and activism.
- Can solicit political pressure and support regarding planning issues.

Advantages of Method:

- Usually on a higher trophic level and therefore potentially representative of broader range of environmental quality.
- Easy to identify, sample and has low training costs.
- Single species monitoring is conducted relatively quickly.
- The general public is usually very familiar with the species being monitored (such as trout and salmon).
- The use of sensitive species as an indicator species identifies degradation in its early stages which may make remediation easier.

Indicator Useful for Assessing:

* Aquatic Integrity of:	
Lakes	◖
Streams	◖
Estuaries	◖
* Land Use Impacts	◖
* Stormwater Mgmt Programs	◖
* Whole Watershed Quality	◖
* Industrial Sites	◖
* Municipal Programs	◖

Key:

Very Useful	●
Mod. Useful	◖
Not Useful	○

Indicator Advantages

* Geographic Range	●
* Baseline Control	◖
* Reliable	○
* Accuracy	◖
* Low cost	●
* Repeatable	◖
All Watershed Scale	◖
* Familiar to Practitioners	◖
* Easy to use & Low training	●

Key

Very Advantageous	●
Mod. Advantageous	◖
Not Advantageous	○

Cost

See Table 3.3C

Disadvantages of Method:

- Management activities, such as fish stocking, can distort monitoring results.
- Habitat protection/restoration measures (based only on single species) may not adequately address other aquatic species needs.
- The natural variability and population fluctuations of the single species being measured may skew results. The advantage of multiple metrics to account for aberrations is not present.
- Species that migrate make it difficult to isolate whether the effect is occurring in the study area or somewhere else.
- If the species is not currently or historically present in the aquatic system, the method provides little useful data.

Case Study: Scott, J.B.; Steward, C.R.; Stober, Q.J.
Effects of Urban Development on Fish Population Dynamics in Kelsey Creek, Washington
Transactions of the American Fisheries Society 115:555-567, 1986

The authors presented a paper from a 30 month study comparing the relative fish dynamics for two small streams in Washington, one located within a predominately urban area and one located in a predominately rural area. Kelsey Creek is located in the City of Bellevue, Washington and has land uses consisting of mainly single-family and multi-family residential, but also has a significant commercial and industrial land use component. Nearby Bear Creek is in a predominantly rural area with only 15% of the land use occupied by single-family residential and the remaining land cover is in forest and pastureland.

According to historic studies Coho salmon *Oncorhynchus kisutch* and cutthroat trout *Salmo clarki* were the most abundant salmonids present in the early 1940's in both streams. Although there were no detailed lists of the other species inhabiting the study streams at that time, more recent investigations indicate that sculpins *Cottus* sp. were originally widely distributed in the area.

Study methods included conducting outmigrant netting and resident fish sampling. Netting of downstream migrants was conducted at the mouth of Kelsey Creek. Resident fish were sampled at five sites on Kelsey Creek and three sites on Bear Creek. Fish were sampled using a backpack electrofisher. Fork lengths of all salmonids were measured, scale samples were obtained and wet weights were determined. Nonsalmonid fish species were recorded as present or absent except for one sampling session when numbers and weights were recorded. Ages of the fish were determined, population of each species-age group at each study site was estimated by the removal method and the Seber-Jolly mark-recapture method. Population growth rates were calculated.

Impacts from urbanization appeared to have a greater affect on coho salmon and nonsalmonid fish species than on cutthroat trout. The total biomass of fish in each stream was determined to be about the same, but the composition of the fish assemblage differed substantially. The majority of fish in Kelsey Creek were cutthroat trout between age 0 and 1 year. Bear Creek had a much more diverse salmonid community of various ages and numerous non-salmonids were present.

Method References:

- Electrofishing surveys: Tennessee Valley Authority, 1993. *Survey of Brook Trout (Salvelinus Fontinalis) Population in the Upper Little Tennessee River Watershed, Macon and Swain Counties, North Carolina.* TVAWM9320.

- Physical habitat assessments: Platts, W.S.; et. al., 1989. Changes in Salmon Spawning and Rearing Habitat from Increased Delivery of Fine Sediment to the South Fork Salmon River, Idaho. In: *Trans. Am. Fish. Soc.* Vol. 118, No. 3, pp. 274-283.

- Bioassays: Dermott, R.; M. Munawar. 1992. A Simple and Sensitive Assay for Evaluation of Sediment Toxicity Using Lumbriculus Variegatus (Mueller). In: Hart, B.T.; Sly, P.G. (eds). *Sediment-Water Interactions.* Vol. 235-6, pp. 407-414.