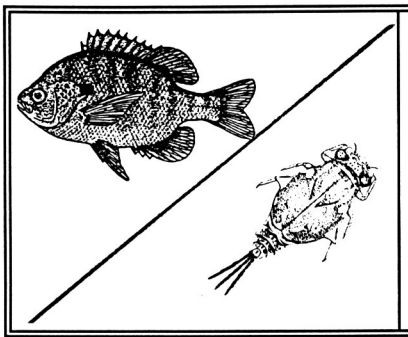
Environmental Indicator Profile Sheet



Indicator Profile 15

Composite Indicators

Biological Indicators

Tools Used to Measure Indicator:
Two or more of the following:
- Ind. of Bio. Integrity (IBI)
- Rapid Bioass. Pro. (RBP)
- Index of Well Being (I_{wb})
- Invertebrate Community
- Index (ICI)

Description:
Multiple groups of organisms and/or taxa (e.g., macroinvertebrates, fish, plankton, amphibians) are used to comprehensively portray the health of aquatic systems. A series of biological metrics, ranging from fish diversity indices, macro-invertebrate indices, algal communities, and/or other communities are evaluated to assess the effects of urban runoff on aquatic biota. Composite indicators require comparison to reference conditions as a measure of use attainability.

Utility of Indicator to Assess Stormwater Impacts:
- Provides the same utility to assess stormwater impacts as both fish and macro-invertebrate sampling but may provide a more thorough and comprehensive evaluation.
- Can be used to prioritize further and more detailed monitoring, such as chemical characterizations or toxicity testing.

Advantages of Method:
- Composite monitoring allows for both long-term trend analysis as well as short-term impact assessments.
- Composite monitoring provides more comprehensive information relative to pollutant source identification. Locations are more easily confirmed when multiple metrics are indicating degradation.
- Composite monitoring is useful for whole watershed assessments as well as site specific impact assessments.

Disadvantages of Method:
- Regional modifications of metrics will be necessary over a fairly wide range of taxa.
- Seasonal changes in species composition will require strict adherence to consistent sampling frequency.
- Major flow events will affect data validity.
- Reference condition health can skew results.
- Cannot alone characterize the precise causes of degradation, this will usually involve other tools.

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

Case Study: Pitt, R.E.
Effects of Urban Runoff on Aquatic Biota
Handbook of Ecotoxicology, Lewis Publishers, Inc. 1994; Chapter 30

This case study analyzes the effects of urban runoff on the receiving waters of Coyote Creek, near San Jose, California. The study describes the changes to the aquatic environment as the creek passes from an upstream non-urban area through an urbanized area.

The Coyote Creek is a reasonably large waterway which drains an area of approximately 200,000 acres. The urban portion of San Jose is within the downstream one-third of the approximately 45 mile long watershed. Sampling was conducted during the period of March 1977 to August 1980. Several parameters were sampled during the study period, including; basic hydrologic conditions, water quality, sediment properties, general habitat characteristics, fish, benthic organisms, attached algae, and rooted aquatic vegetation. The use of the above array of indicators provided a broad picture of the impacts of urbanization on Coyote Creek. The results of the study showed that there were distinct differences in species diversity, composition and abundance between the urban and non-urban portions of the study area. The non-urban areas supported a more diverse aquatic community, more native fishes and many more benthic macroinvertebrate taxa. The urban portions of the study area were composed of an aquatic community of mainly the most pollutant-tolerant species of fish and macroinvertebrates. There were changes in the physical habitat between the non-urban and urban portions of the creek, however it is believed that these differences could not account for the magnitude of change to the aquatic community through the urban reach.

Due to a wide variety of possible factors affecting the biological community, it is impossible to directly identify all of effects as being attributed to urban runoff alone. In a system as large as the Coyote Creek other factors such as extreme flows, drought, stream gradient, effects of impoundments, etc. may contribute to biological degradation. The evidence presented in this case study indicates that urban runoff is responsible for a large portion of the impacts to biological organisms.

Method References:

- Index of Biotic Integrity (IBI): Karr, J.R.; Fausch, P.L. Angermeier, P.R. Yant, and I.J. Schlosser., 1986. Assessing Biological Integrity in Running Waters: A Method and Its Rationale. *Special Publication 5. Illinois Natural History Survey.*

- Index of Well Being (I_{wb}): Gammon, J.R. 1980. The use of community parameters derived for electrofishing catches of river fish as indicators of environmental quality., In: *Seminar on Water Quality Management Tradeoffs.* Report No. EPA-905/9-80-009.

- Rapid Bioassessment Protocols (RBP): Plafkin, J.L.; et al. 1989. *Rapid Bioassessment Protocols for use in Streams and Rivers Benthic Macroinvertebrates and Fish.* Report No. EPA/440/4-89/001.

- Invertebrate Community Index (ICI): Ohio Environmental Protection Agency. 1987. *Biological Criteria for the Protection of Aquatic Life: Vol. II. User's Manual for Biological Assessment of Ohio Surface Waters.* Ohio Environmental Protection Agency, Columbus, OH.

- Biological Assessment: Davis, W.S., T.P. Simon (eds). 1995. Biological Assessment and Criteria-Tools for Water Resource Planning and Decision Making. Lewis Publishers. Boca Raton, FL.