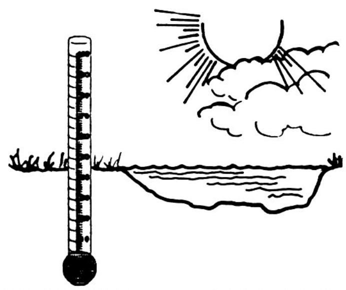
Environmental Indicator Profile Sheet



Indicator Profile No. 11

Stream Temperature Monitoring

Category: **Physical and Hydrological**

Tool Used to Measure Indicator:

- Stream Temperature Monitoring

Description:

Stream temperature is monitored over time to assess changes in response to increasing urbanization. Alternatively, stream temperatures in urban areas may be compared with stream temperatures in nearby rural areas. Monitoring includes both storm events and low flow conditions. For a comparative analysis, streams should be located in close proximity and in the same physiographic province (subject to similar weather events or weather related stressors).

Utility of Indicator to Assess Stormwater Impacts:

- Can be used to assess the effects of urbanization on stream temperature base flows and storm flows.
- Can be used to assess the effects of BMPs on stream temperatures and help in promoting practices which have less impacts.
- Can help identify stream reach lengths which may benefit from riparian buffer enhancement.
- Can be used as a watershed land use planning tool in protecting cool water stream systems.

Advantages of Method:

- Provides a direct indicator of temperature impacts as related to watershed urbanization.
- Since stream temperature changes will likely affect the most sensitive organisms, can provide an early warning indicator of environmental stress which may make remediation easier.
- Reasonably easy to monitor temperatures and report results.
- Stream thermal pollution is easily understood by the general public, public officials, and decision makers who can use the information to make appropriate land use decisions.

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 3.3B

Disadvantages of Method:

- May be of limited value in warm water systems.
- Results may be skewed due to natural conditions such as a prevalence of springs and seeps within a watershed or unusually hot summers.
- Changing climatic conditions could have more effect on stream temperatures than urbanization, over the long term.
- Provides only a single measure of the impact of urbanization on water quality.
- Once temperature increases are detected, few management measures are available to decrease them.

Case Study: Galli, J.; R. Dubose, 1990
Thermal Impacts Associated with Urbanization and Stormwater Management Best Management Practices
Produced by the Metropolitan Washington Council of Governments for The Maryland Department of the Environment.

The study consisted of a two part approach to evaluate thermal and dissolved oxygen impacts to aquatic life associated with urbanization and various stormwater management BMPs. Part one of the study involved water temperature monitoring and water quality grab sampling at six headwater streams and four stormwater management BMPs located in the Piedmont portion of the Anacostia River basin. The urban streams studied spanned the entire spectrum of watershed imperviousness from undeveloped to approximately 60% impervious cover.

The four representative BMPs monitored in the study included: an infiltration facility, an artificial wetland, an extended detention dry pond and a wet pond. The second part of the study consisted of a comprehensive literature review to evaluate potential temperature and dissolved oxygen impacts at major levels of the aquatic food chain.

The major findings of the study are as follows: (1) Air temperature and other local meteorological conditions had a greater influence on stream temperature than stormflow for 90-95% of the time. Rainfall amount and intensity was second in importance. (2) Watershed imperviousness together with local meteorological conditions had the largest influence on urban streams. (3) Riparian canopy coverage played a key role in insulating small streams from warming. (4) Stream temperature increased with increasing order in a downstream direction. (5) All four BMPs had a positive average effect in increasing stream temperatures. Temperature increases were the most severe in the wet pond and the extended detention dry pond. The artificial wetland was next and the infiltration facility had the least effects on both stormflow and baseflow.

Method Reference:

- Stream Temperature Monitoring: Pluhowski, E.J., 1970. *Urbanization and its Effect on the Temperature of the Streams on Long Island, New York*. U.S. Geological Survey, Professional Paper 627-D, 110p.