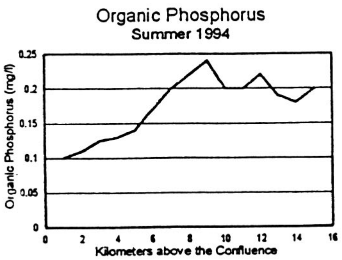
Environmental Indicator Profile Sheet



Indicator Profile No. 1

Water Quality Pollutant Constituent Monitoring

Category: **Water Quality**

Tools Used to Measure Indicator:

- Pollutant Concentrations
- Event Mean Concentrations
- Spatial and Temporal Trend Analysis

Description:

Water quality monitoring has traditionally focussed on examination of chemical parameters such as oxygen demand, nutrients, and metals, and physical parameters such as pH and temperature. Stormwater monitoring usually requires collection of water samples from stormwater detention and retention facilities, structural and non-structural conveyance channels, stormwater outfalls, and receiving waters during storm events. Evaluation of the parameters may be conducted in the laboratory (e.g. for chemical parameters) or in the field (e.g. pH).

Depending upon the geographic and temporal scope of the monitoring effort, monitoring results may be used to assess current water quality conditions at a specific location; evaluate changes in water quality throughout different seasons or over a period of years; or identify longitudinal or spatial trends in water quality along a river or within a lake. The monitoring results may also be used to identify significant sources of pollution or times of the year when water quality noticeably worsens.

Utility of Indicator to Assess Stormwater Impacts:

- Monitoring results from long-term efforts (five years or more) can be examined to identify trends in water quality conditions over time.
- Monitoring results from urban stormwater studies can be compared to pollutant concentrations in reference rural or "least impacted" watersheds to assess the relative degree of impairment.
- Trends may correlate with land use changes or watershed restoration efforts, helping watershed managers determine priorities for problem sources and pollutants.
- Monitoring results can be used to identify pollution problems and identify potential sources of degradation.
- Monitoring can be implemented on both a regional and local level.

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 3.3A

Advantages of Method:

- Reasonably well standardized, generally accepted sampling methods and protocols are already established in many jurisdictions.
- Many jurisdictions have an extensive historical database which may be examined to determine whether water quality degradation has occurred over a specified period of time.
- Monitoring results are easily presented in graphic form.
- Violations of regulatory standards may be quantified and, therefore; are more likely to be legally defensible.
- Large existing databases on urban and highway stormwater runoff quality allows comparison between local and national concentrations.

Disadvantages of Method:

- Generally, samples must be collected during representative storm event (i.e., volume and duration of rain varies by less than 50 percent from average) to provide accurate characterization of event mean concentrations.
- Multiple sampling events over an extensive period of time are usually required to identify statistically defensible trends in water quality due to the tremendous variability seen in urban runoff data.
- This method is essentially a derivation of traditional, baseflow water quality monitoring using primarily chemical parameters. The applicability of this method to stormwater characterization has been questioned by many municipal stormwater managers.
- Requires accurate measurement of storm flow and automated sampling

Case Study: Wright, R.M.; Roy Chaudhury, R.; Makam, S. 1995
Experiences from the Blackstone River Wet Weather Initiative
In: Stormwater NPDES-Related Monitoring Needs. Conference Proceedings. American Society of Civil Engineers. Mt. Crested Butte, CO. Aug. 7-12, 1994

A program, initiated by the U.S. EPA, to study the Blackstone River under dry and wet weather conditions was conducted to pinpoint and rank major sources degrading water quality. The river was monitored at 13 locations along 48 miles, in addition to, six tributaries and five point sources. Three storms were monitored for 23 constituents with at least ten samples at each of the stations. Methods of interpreting the water quality data and isolating the sources into dry and wet weather sources are presented. The wet weather component is studied to establish loadings from point sources, new materials (runoff related) and old materials (bottom sediment re-suspension). A procedure to estimate annual loading rates is presented.

Total suspended soils and lead concentrations in the river generally increased during wet weather conditions. Copper concentrations also increased. This is attributed to re-suspension of copper from the sediments on the bottom. The original source of the copper is probably dry weather discharges from a wastewater treatment plant. Calcium and magnesium concentrations decreased during wet weather due to dilution. Overall, fluctuations in wet weather concentrations are attributable to pollutant loadings from runoff and re-suspension of pollutants in the sediment.

Method References:

- Chemical Monitoring: Taylor, G.F. 1990. *Quantity and Quality of Stormwater Runoff from Western Daytona Beach, Florida, and Adjacent Areas.* USGS Water-Resources Investigations Report 90-4002.
- Stormwater Sampling: EPA. 1992. *NPDES Storm Water Sampling Guidance Document.* EPA/833/B-92-001.
- Toxicity testing: Peltier, W.H.; C.I. Weber. 1985. *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms.* EPA/600/4-85/013. Environmental Monitoring Laboratory, Cincinnati, OH.