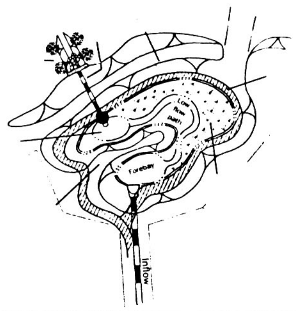
Environmental Indicator Profile Sheet



Indicator Profile No. 25

BMP Performance Monitoring

Category: **Site Indicators**

Tools Used to Measure Indicator:

- Biological Monitoring
- Chemical Monitoring
- Physical Monitoring

Description:

Stormwater BMPs are specifically designed to reduce pollutant loadings into natural water bodies. The evaluation of BMP performance can provide stormwater program managers with a more accurate assessment of pollutant removal capability.

BMP effectiveness is evaluated based on stormwater sampling of the mass and concentration of pollutants into and out of the facility. Alternatively, biological and/or physical indicators can be evaluated upstream and downstream of a facility to aid in assessing effectiveness of a specific practice or series of practices.

Controls are measured relative to design, cost, and other similar factors. Secondary characteristics which may be evaluated include habitat provisions, safety, aesthetics, groundwater recharge, and recreational opportunities.

Utility of Indicator to Assess Stormwater Impacts:

- By comparing BMP performance data, stormwater managers may be able to select BMPs that provide the best pollutant removal effectiveness in the most cost-effective manner.
- Comparison of temporal data can be used to determine the need for BMP maintenance.
- Can be used in conjuction with biological and physical/hydrological indicators, to get a more accurate representation of the total aquatic community condition.
- Can be used to identify those BMPs which are not meeting pollutant removal expectations.
- Can be used as a basis to create, update, and enforce minimum design standards to meet target pollutant removal expectations.

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 3.3F

Advantages of Method:

- Since BMPs are specifically designed to provide a particular level of performance, it is relatively easy to determine whether their functions are being achieved.
- Educational programs can be developed to involve private organizations in data collection. Such programs may serve to educate the public about BMP usage, performance, and maintenance needs.
- Increased performance monitoring increases the likelihood that BMPs will be properly maintained.

Disadvantages of Method:

- There is little standardization in place for reporting BMP performance, resulting in a wide range of effectiveness being reported.
- Many watershed managers choose BMPs based on cost, with design performance a secondary consideration. As a result, even if a BMP performs according to design, it still may not adequately protect receiving water quality.
- Extensive monitoring is required to gain sufficient understanding of BMP effectiveness.
- A large number of paired samples must be collected to establish performance.
- Method requires extensive data interpretation and management.
- The performance of a monitored BMP may reflect site specific or watershed specific conditions, and may not always be generalized.

Case Study: Martin, E.H. 1988

Effectiveness of an Urban Runoff Detention Pond-Wetlands System

Journal of Environmental Engineering, 114(4): 810-827. August 1988.

An urban detention system, composed of a detention pond and wetlands in series (approximately 800 and 3000m^2, respectively), was analyzed to determine its effectiveness in reducing stormwater runoff constituent loads. The pond inlet, pond outlet/wetlands inlet, and wetlands outlet were monitored during eleven storm events. Samples were analyzed for concentrations of major ions, selected chemical and physical characteristics, metals, and nutrients. The system's efficiency was determined using three quantifying methods: event mean concentration, summation of loads, and regression of loads. For most pollutants, the three methods yielded similar results.

The detention pond was generally effective in removing 42-66% of suspended solids and suspended metals. Nutrient removal efficiencies were more variable due to changes in species and phase during transport through the pond.

The wetlands were effective in reducing both suspended and dissolved loads of solids and metals. Removal efficiencies for total nitrogen and phosphorus were 21 and 17%, respectively.

The full system, combining the pond and wetlands treatment, achieved appreciable reductions of most pollutants. The system was particularly effective in reducing solids, lead, and zinc, with efficiencies ranging between 55 and 83%. Total nitrogen and phosphorus efficiencies were somewhat lower: 36 and 43%, respectively.

Method References:

- Biological monitoring: Plafkin, J.L.; M.T. Barbour, K.D. Porter, S.K. Gross, R.M. Hughes. 1989. *Rapid Bioassessment Protocols for use in Streams and Rivers: Benthic Macroinvertebrates and Fish.* Report No. EPA/440/4-89/001. U.S. EPA, Office of Water.

- 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.

- Physical monitoring: MacRae, C.R.; A.C. Rowney, 1992. The Role of Moderate Flow Events and Bank Structure in the Determination of Channel Response to Urbanization., In: *45th Annual Conference Resolving Conflict and Uncertainty in Water Management.* Conference Proceedings. Canadian Water Resources Association, Kingston, Ontario. June 1992.