Session I4: Monitoring for the Effectiveness of TMDLs

Room A107-109
10:00 – 11:30 am

0081
I4-1

Recommendations for Developing TMDL Effectiveness Monitoring Plans

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Section 303(d) of the federal Clean Water Act (CWA) requires states to identify waters that do not meet water quality standards (WQS). Water bodies not meeting WQS are considered impaired and are placed on a state's 303(d) list, which is submitted to EPA for review and approval. Total Maximum Daily Loads (TMDLs) must be developed for all water bodies on the approved 303(d) list. With more than 45,000 TMDLs developed nationwide, and limited successes reported, the importance of demonstrating incremental improvements in water quality cannot be overstated.

TMDL effectiveness monitoring helps to measure progress towards attainment of water quality standards and informs future management actions. Documenting improvements in water quality is important because demonstrated success, or effectiveness, is often tied to funding; further, a lack of demonstrated success can undermine the scientific credibility and hard work of the many stakeholders involved in TMDL development and implementation. Although there is often an institutional and programmatic tendency to rely on ambient monitoring networks for providing data to evaluate TMDL effectiveness, most of these ambient monitoring networks were not designed to monitor for the effectiveness of BMPs on improving water quality.

Effectiveness monitoring should not be an afterthought, but a critical component of the TMDL development process. It should form the foundation of an adaptive management approach, providing critical information on what is working where and why. Ideally, an effectiveness monitoring plan is developed during, or immediately following, TMDL development. Although the specifics of an effectiveness monitoring plan will vary from one watershed to another, the general steps involved in developing a TMDL effectiveness monitoring plan will be presented and discussed. Also, the selection of appropriate statistical and other data analysis methods will be briefly discussed during the presentation.

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I4-2

Overview of Washington State's TMDL Effectiveness Monitoring Program

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Washington State Department of Ecology (Ecology) is required, under Section 303(d) of the federal Clean Water Act (CWA) andUS Environmental Protection Agency's (EPA) implementing regulations, to evaluate the effectiveness of the clean-up plans following implementation of water quality restoration projects.

Effectiveness monitoring (EM) is a fundamental component of water quality cleanup efforts. At one level, it measures to what extent the water body has improved and whether it has been brought into compliance with the state water quality standards. At a different level, EM evaluates Total Maximum Daily Load (TMDL) implementation, watershed management plan implementation, and other watershed-based cleanup activities. Success may be measured against TMDL load allocations, water quality standards, targets correlated with baseline conditions, or other desired future conditions.

The Ecology has identified 4,671 water quality listings through the 2008 303(d) listing process that require a pollution control strategy to improve water quality. To evaluate effectiveness of these strategies, Ecology has developed an effectiveness monitoring framework that assesses both impacts from pollution and the effectiveness of management actions while providing a feedback mechanism to resource managers to make informed decisions. The success of this strategy depends on the statewide implementation of best management practices and a monitoring framework which collects data at a regional scale while providing information at multiple scales. It is intended to be integrated into any management plan or monitoring design which supports requirements of the CWA. The monitoring framework supporting this strategy should be flexible enough to address a number of water quality issues while remaining consistent enough to measure effectiveness of actions at multiple levels. It also provides information which could fulfill the needs of several state and federal reporting requirements.

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I4-3

TMDL Effectiveness Assessments for the Union River and Dungeness River Watersheds, Washington

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The Washington State Department of Ecology conducted Total Maximum Daily Load (TMDL) studies for the Union River watershed in 1999, the Dungeness River watershed in 2002, and the Dungeness Bay in 2004. These studies found that fecal coliform bacteria concentrations did not meet water quality standards (WQS) at several monitoring locations. The studies attributed the pollution to nonpoint sources including failing septic systems, stormwater runoff, and waste from livestock, pets, and wildlife. Restoration activities, including piping of irrigation ditches, pasture management, manure storage, investigation and repair of on-site septic systems, and outreach and education efforts with area residents, have been implemented to reduce fecal coliform loading. Fecal coliform monitoring continued throughout the implementation period.

This presentation will describe the processes and methods used in recently completed TMDL effectiveness monitoring assessments for the Union River Watershed and the Dungeness River Watershed and Bay. The goal of the effectiveness monitoring assessments was to evaluate the effectiveness of implementation efforts in meeting fecal coliform TMDL targets for the water bodies. The evaluation also included a determination of whether State WQS for fecal coliform are being met in the water bodies. The evaluations entailed an extensive review and analysis of monitoring data, as well as a review of implementation activities. A variety of statistical methods were employed to evaluate trends in fecal coliform concentrations over time. These include the non-parametric Kendall test for trend and a general linear model. The use and limitations of these methods for evaluating incremental improvements in water quality will be discussed.

The results of the statistical analyses were used to make a determination as to whether the watersheds meet the requirements of EPA's National Water Program Guidance Measures WQ-10 or SP-12. Additionally, recommendations were made for ways to enhance the effectiveness monitoring reporting process to better address the requirements of Measures WQ-10 and SP-12, as well as delisting requirements. Finally, specific recommendations for future monitoring efforts were made to provide additional information about likely sources of bacteria, as well as provide additional data to further assess the effectiveness of the TMDL and BMPs on improving water quality.

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I4-4

Development of a Monitoring Program for Evaluating Water Quality Improvements and TMDL Effectiveness in Bear Creek, Oregon

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Bear Creek was placed on Oregon's 303(d) list of impaired waters in 1987, spurring the development of some of the first total maximum daily loads (TMDLs) in the state. Since then, the parties responsible for implementing these TMDLs have been making a concerted effort to address the water quality impairments in the Bear Creek watershed through implementation of agricultural and stormwater best management practices (BMPs). These stakeholders are interested in determining the effectiveness of these management practices on improving water quality. With a better understanding of BMP effectiveness, stakeholders will be empowered to allocate scarce resources more efficiently. The Oregon Department of Environmental Quality and the US Environmental Protection Agency (EPA) are interested in determining overall TMDL effectiveness in the Bear Creek watershed.

One goal of the Bear Creek Watershed Effectiveness Monitoring Plan is to allow stakeholders to demonstrate the effectiveness of TMDL and BMP implementation actions within the Bear Creek watershed. A second goal of the effectiveness monitoring plan is to collect data sufficient for demonstrating incremental improvements in water quality in accordance with the requirements of EPA's National Water Program Guidance Measure SP-12. Fulfilling both of these goals is important for focusing continued funding for water quality improvement projects, demonstrating incremental improvements in water quality as a result of these projects, and ultimately for removing the water quality impairments in the watershed.

This presentation will describe the development of a TMDL effectiveness monitoring plan to evaluate for watershed-wide improvements in water quality, BMP effectiveness, and Measure SP-12. SP-12 requires that data are reported at the 6th field HUC level and that incremental improvements in water quality are statistically demonstrated at the 90% confidence level or are supported by

biological data and evidence of widespread BMP implementation. Statistical methods are critical for optimizing effectiveness monitoring strategies and ensuring that enough data of the right kind are available to identify statistically significant trends. The importance of previously collected data, clearly defined objectives, and statistical methods, such as multiple linear regression and power analysis, will be discussed in this talk.