OVERVIEW OF TMDLS: FOCUS ON THE WEST

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ABSTRACT

For the past decade, EPA and state approaches to water quality protection from nonpoint source pollution have been dominated by debates, distrust, and confusion over Total Maximum Daily Loads (Copeland, 1997). This paper looks briefly at the history of the CWA and TMDLs, then considers how nonpoint source pollution reduction and TMDL implementation has been approached in the west. The paper concludes with a brief discussion of the need for better science in developing and implementing TMDLS, and in better understanding the linkages between management practices and improved water quality.

INTRODUCTION

The Clean Water Act (CWA), which recently celebrated its 30th anniversary, has been credited with significant water quality improvements of our surface waters. Under the CWA, municipal and industrial wastewater facilities have been built or upgraded, industrial point source discharges have been regulated and controlled, and water bodies which were considered dead in 1972 have made remarkable recoveries (USEPA and USDA, 1998). Despite this progress, however, by 2002 over 20,000 waterbodies (over 40% of the assessed waters in the United States) were identified as impaired (USEPA, 2000A). Attention has turned increasingly to the need to control sources of diffuse or nonpoint source pollution if real progress is to be seen in these estimated 300,000 miles of river and lake shoreline and 5 million acres of lakes (USEPA, 2000A; USEPA, 1999A).

HISTORY OF TMDL APPROACH

Nonpoint source pollution does not fall under the CWA's National Pollution Discharge Elimination program, which regulates and permits point source dischargers. Section 303 of the CWA identifies the approach to be taken by EPA, states and territories in protecting waters from nonpoint source pollution. This section requires states and territories to set ambient water quality standards for water bodies. These standards have two components: the designated beneficial uses of each water body must be identified, and water quality criteria must be established which will protect these uses. These criteria may be numeric or narrative. Control of nonpoint source pollution is to be accomplished through the voluntary implementation of best management practices, with funding under Section 319 providing the incentive for implementing these practices.

In 1985 and 1992, EPA issued rules for implementing Section 303(d) of the CWA (USEPA, 1999A). Under these rules, states and territories are required to identify those water bodies that do not meet their designated uses (after point sources have been controlled through the regulatory permitting program.) In addition, the states must identify the pollutant(s) responsible for impairment. For each of the pollutants in each of these water bodies on this so-called 303(d) list, a Total Maximum Daily Load (TMDL) must be established and approved by EPA.

A TMDL is the maximum amount of a given pollutant that a water body can assimilate without violating its ambient water quality standard. The total allowable load is to be distributed between that entering from point sources (the wasteload allocation) and from nonpoint sources (the load allocation), with an allowance for background levels and a margin of safety (USEPA, 1999B, USEPA 2000). Under the 1992 rules, water bodies remain listed until the TMDL is approved by the EPA. The 1992 rules did not provide for implementation of the TMDL.

Since the release of the 1992 rule, approximately 45 lawsuits have been filed in 37 states and the District of Columbia concerning the 303(d) listing process and the timetables set by EPA for TMDL development. In the west, EPA is currently under court order or has agreed under a consent degree to establish TMDLs in Alaska, California, Hawaii, Montana, New Mexico, Oregon and Washington. Suits have been filed seeking that EPA establish TMDLs in California, Idaho, Nevada and Wyoming, and in Arizona, an intent to sue has been filed (USEPA, 2003).

Water quality protection through the courts is expensive, time consuming and inflexible, and the EPA and the states have spent considerable time and resources addressing these lawsuits. In response to the litigation, a federal advisory committee was convened to develop revised rules. The intent of the revisions was to achieve more consistency in EPA's approach to TMDLs, to make the process more flexible and cost effective, to streamline and improve the listing process and to provide for implementation of the TMDL itself (USEPA, 1999A). These proposed rules underwent a public comment period and review, and were released in July 2000. Since then, they have met with considerable opposition (reference). Congress immediately passed legislation prohibiting EPA from implementing the rule and the rule has been challenged in court by over 20 parties (USEPA 2003B). Point source dischargers felt that they were expected to burden too large a share of the cost and effort, agricultural groups questioned whether the CWA authorized regulation of NPS, and environmental groups did not think that the rule was stringent enough. One element of the 2000 rule that has proven particularly controversial was the requirement for an implementation plan with an associated timeline and proof of financial feasibility to be submitted with a TMDL. In response to the controversy surrounding 2000 rule, it was withdrawn on December 20, 2002 (USEPA 2003B). The EPA now plans to take recommendations made by the National Academy of Sciences' National Research Council and the thousands of public comments and is expected to release new rules in the spring of 2004 at the earliest. At this point, it is anticipated that the new rule will utilize Section 303(e) of the CWA, which provides for a watershed continuing planning process by states, to address implementation of TMDLs (Bruce Zander, USEPA, pers comm.)

TMDLs IN THE WEST

Against this backdrop of lawsuits, congressional gag rules and public outcry, the TMDL process itself moves on, continuing to use the 1992 rules. Nationwide, a total of 7,327 TMDLs have been approved since January 1996 (EPA 2003C), accounting for 17% of the 42,193 listed impaired waterbodies. The total number of TMDLs per year peaked at 2,803 in 2001, with only 1,498 approved in 2002. Many of these early TMDLs have focused on those stressors for which good data and good predictive models exist. As a result, pathogens, unionized ammonia, pH, and dissolved oxygen TMDLs are being developed and approved at about the same rate or higher rate than they are listed, while TMDLs for habitat alteration, sediment and thermal modification impairments are somewhat behind (EPA 2003C).

A survey of the 13 western states for which there are reported data indicate that 2,382 TMDLs have been approved since 1996, representing about 5% of all listed waters. (EPA

2003C). The most common source of reported impairment was due to sedimentation or habitat alteration but a disproportionate number of unionized ammonia and fecal coliform TMDLs have been approved, again suggesting that the first TMDLs to be finalized tend to be those associated with the relatively well monitored and more accurately modeled point source discharges into impaired stream segments.

Strategies for developing TMDLs have been somewhat inconsistent between states and between the EPA regions in the west. In EPA's Region 8, (Colorado, Montana, Utah, Wyoming, and North and South Dakota), many of the TMDLs, especially those for nutrient and sediment impairments, have been developed within the context of an existing or developing watershed plan. Region 10 (Pacific Northwest) has relied more heavily on modeling outcomes to predict success from target concentrations or loads and combination of these approaches have been taken in Region 9, which includes California, Arizona Nevada, and the Pacific islands (Bruce Zander, USEPA, pers comm.)

Phosphorus TMDLs are being addressed at a high rate in some states and not at all in other states. In the west, a total of 650 water bodies are listed as impaired due to nutrients, and a total of 159 TMDLs for phosphorus have been approved. Over half of these are in just three states (Idaho, Utah and Montana). Four states have reported no approved TMDLs for nutrients (USEPA, 2003C).

A NEED FOR BETTER SCIENCE IN THE TMDL PROCESS

TMDLs based on phosphorus provide a good example of the need for flexibility and improved science in establishing TMDLs. A successful TMDL must have defined targets that are measurable, and linked to success in returning the waterbody to its full beneficial uses. TMDLs were originally defined and are often developed as a target load for a water body. Many lake phosphorus models require phosphorus loads as inputs, and therefore this approach has been a good fit for lake and reservoir TMDLs (Chapra, 1997). Periphyton growth in streams, however, tends to respond to concentrations of phosphorus, rather than phosphorus loads. Phosphorus TMDLs for streams and rivers may therefore be more successful if based on concentrations rather than loads.

Another concern for phosphorus TMDLs is that phosphorus is generally assumed to be the limiting nutrient in a eutrophic water body (Elser et al, 1990). It appears, however, that nitrogen may limit productivity in some western waters (Elser et al, 1990; Stoddard, 1994; Nydick, 2002), and care should be taken to assure that the limiting nutrient in a water body is identified properly.

FUTURE NEEDS

Considerable uncertainty exists in many other aspects of TMDL development and implementation. EPA recently released an analysis of research needs to support TMDL science in the future (USEPA, 2002). Twenty potential areas of needed research were identified, ranging from the need for better information transfer to improved uncertainty analysis and statistical techniques for TMDLs.

The regional EPA staff identified five of these needs as their highest priorities:

1. Improve our understanding of the effectiveness of BMPs and other restoration and management practices. Budgets often don't provide for post-implementation monitoring. As a result, the effectiveness of BMPs, even those that are widely

applied, has not been well established, especially under different environmental conditions.

2. Improve watershed and water quality modeling. Many current TMDLs are based on modeling results, often with limited monitoring data and an imperfect understanding of the mechanisms and relationships internalized in the models. Models of low to moderate complexity are particularly desirable, because input and verification data for more complex models is expensive to collect and often not available.
3. Improve monitoring protocols to link them more effectively to TMDL listing. Monitoring programs have several objectives, from identifying impaired water bodies to determining responses following BMP implementation. Monitoring techniques should be applied that can meet these multiple objectives and identify diffuse and watershed-wide impacts.
4. Bring better science to the identification of impaired waters. There is continuing need for monitoring techniques which identify specific stressors and link these to impairment, a need for more research in biomonitoring, and for better applications of uncertainty analysis to the listing process.

The hope is that this compendium of data and information gaps will provide guidance and direction for future applied research.

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