Regulating Nonpoint Source Pollution In Surface Waters: A Proposal

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Abstract

Nonpoint source pollution is an important source of both conventional pollutants and toxic pollutants reaching the surface waters of the United States. The 1987 Clean Water Act Amendments emphasized the regulation of nonpoint source pollution through the implementation of best management practices — primarily on a voluntary basis. This paper proposes a new regulatory mechanism to control nonpoint source pollution. It utilizes a consortia of all parties potentially responsible for the nonpoint source pollution. It includes wasteland allocation and total maximum daily lead limits to the receiving waters. It provides for potential trading between point sources and nonpoint sources of pollution. Permits are issued to consortia. The regulation of nonpoint source pollution is needed to ensure achievement of state and federal water quality criteria and standards.

Introduction

Nonpoint sources of pollution to surface waters represent the dominant fraction of the remaining surface water pollution problems in the United States. Nonpoint sources (NPS) of pollution may contribute as much as 75% of the relative impact in certain surface water systems (U.S. EPA, 1989). Furthermore, NPS pollution results in non-attainment of water quality standards in six of ten U.S. EPA regions (Rogers and Rosenthal, 1988).

Section 319 of the Clean Water Act Amendment of 1987 requires states to assess and remediate NPS problems in their surface waters. The Clean Water Act requires states to identify and assess waters that cannot attain or maintain water quality standards because of NPS. The states are required to develop and submit to U.S. EPA Management Program to address these issues. More than 40 states have submitted such plans, and they have been approved by U.S. EPA (1990a). The majority of these management programs rely primarily upon the voluntary implementation of best management practices (BMPs) (EPA, 1990b). However, the U.S. EPA (1989) states that voluntary approaches alone generally are not sufficient to deal with the NPS problem. In fact, regulation that *requires* use of BMPs for nonpoint sources of pollutants is more effective in ensuring their use than BMPs installed only on a voluntary basis (Rosenthal, 1990). Accordingly, development of a regulatory framework to implement best management practices is a critical step in controlling nonpoint sources of pollutants to surface waters.

Context

The regulatory mechanism proposal follows the report from the U.S. EPA Science Advisory Board (EPA, 1990c) and is in accord with at least two (2) of the SAB recommendations:

1. Environmental protection efforts should be targeted on the basis of opportunities for the greatest risk reduction;

2. Reducing ecological risk should be treated with as much importance as reducing human health risk.

The following proposal for regulating control of NPS is presented in the context of established Clean Water Act programs and state programs on water quality standards programs used to regulate discharges of toxic pollutants from point sources to surface waters. The mechanism can be applied to many of the different types of toxic nonpoint source pollution, including combined sewer overflows (metals and organic pollutants), overland runoff from agricultural regions (pesticides), and contaminated sediments (metals, organics, pesticides and others).

Regulating Nonpoint Sources of Pollution: A Proposal

This proposal is based upon a coordinated monitoring and permit process that is similar to established mechanisms already in place for point source regulation. The process begins by determining whether or not a NPS problem exists in a particular surface water body; and if so, whether the problem has been assessed and evaluated. This problem identification process may take place through assessments under Section 319 of the Clean Water Act (CWA) or as part of a monitoring program conducted by a state regulatory agency under provisions of Section 304L of the CWA. A third means of problem identification would be through collection of water quality data under the National Pollution Discharge Elimination System (NPDES). Both chemical-specific monitoring and biomonitoring are appropriate for assessment of nonpoint source contaminant problems.

A stream segment approach would be used to quantitatively assess and regulate NPS pollution problems. One way to segment a stream would be to divide the stream into equal flow segments. For example, a river with a flow of 10,000 Ft^3/second (CFS) at the mouth may be divided into five segments where the increase in the flow of each segment

equals 2,000 CFS. The land areas draining into each stream segment would constitute separate regions for NPS control. If a small stream is the focal point of interest, pollutant quantification and regulation could be undertaken without segment division. In all cases, nonpoint source regulatory programs would be developed and implemented for stream segments on an entire system and associated watershed.

Once a NPS problem is determined, the remaining burden for problem identification and control shifts to local or regional entities, including land-owners or those responsible for land-use activities. In those situations where the source of the NPS problem lies within state or federally owned and operated lands, the state or federal government would retain full or shared responsibility for control of the NPS pollution problems.

Nonpoint sources of pollution are not usually attributable to single entities but rather to several different entities within a watershed or drainage area. The difficulty in regulating each specific source lies in coordinating the regulatory activities among sources, attributing proportional responsibility for pollutant contributions to specific entities, and enforcing control mechanisms when multiple entities share responsibility for NPS pollution. To address these problems, it is proposed that *all* parties potentially responsible for NPS pollution within a watershed, form a consortium. The consortium would include municipalities, drainage districts, industries, riparian land owners and users, and state or federal land-holding agencies who share land-use or title in the segment drainage area. The state regulatory agency would be responsible for identifying the entities potentially responsible for NPS pollution within a segment drainage area or watershed. The agency also would serve as a facilitator during consortium formation. As an incentive to form consortia, states may provide funds to finance organizational and administrative activities. The consortium would hold all further responsibility for implementing a nonpoint source regulatory program.

As stream segments are identified and consortia developed, quantification of the NPS problem would be conducted by the consortium. The consortium would determine the types and quantities of pollutants entering a receiving stream segment from specific NPS categories. The consortium would also begin a segment-specific monitoring program to determine whether nonpoint sources of pollution are contributing to violations of water quality criteria and standards. Monitoring would entail testing for specific pollutants as well as biomonitoring (e.g. fish tissue analysis, bioassessments) at the beginning and end of the section and at appropriate locations within segments (see Nimmo et al., 1990 for an example of the use of biomonitoring to identify NPS problems).

Where point sources as well as nonpoint sources of pollution exist within a stream segment, point source dischargers would be required to participate in consortium activities. However, the only activity required initially of point source discharges would be to determine the proportion of the total pollutant problem (pollutant load or concentration) contributed by those sources. Where point sources of pollutants are identified in a stream segment and those point sources are regulated under a state's NPDES program, water quality data collected under the program would be shared with the consortium to facilitate adequate documentation of the extent and nature of pollution problems in the segment.

TMDLs, Wasteload Allocations, and Permits

Once a nonpoint pollution problem has been identified and quantified within a stream segment and its associated watershed, a permit program based on total maximum daily loads (TMDL) and wasteload allocations (WLA) would be implemented to regulate the sources of pollution. The consortium would be issued a single NPS permit developed using both biological and chemical-specific criteria for its stream segment. Biocriteria (U.S. EPA, 1990d) would be incorporated into the permit wherever possible to protect designated aquatic life uses for each stream segment. Biocriteria for any stream segment, like chemical specific criteria, would be developed such that downstream segments are not adversely impacted. Where biocriteria are incorporated into the permit, biological monitoring would be required at least semi-annually (summer/winter, spring/fall), or more often depending on the nature and extent of biological impacts in the segment.

Chemical-specific limits also would be included in permits for streams where resident biota have been contaminated or where specific chemicals cause human health, aquatic biota, or terrestrial wildlife impacts not assessed or regulated through biological monitoring and biocriteria. Chemical-specific limits and monitoring requirements associated with limits would be similar to those in permits issued to point source dischargers (U.S. EPA, 1987).

Because permits limits would apply to individual stream segments rather than to discrete sources, continuous biomonitoring or chemical-specific monitoring may not be necessary throughout a stream segment. Rather, monitoring would occur at the beginning and end of a stream segment and at selected locations within the stream segment. The number of monitoring locations may be based on segment length, diversity of habitats within a segment, or other criteria determined by the consortium in consultation with the state water quality agency.

Development of biological- and chemical-specific permit limits would be the responsibility of the state water quality agency, similar to responsibilities the state agency possesses under the National Pollutant Discharge Elimination System (NPDES) for point sources. Furthermore,

permit limits would be based on state or federal water quality standards and criteria (U.S. EPA, 1985; U.S. EPA, 1983; Foran, 1990) or Biocriteria (U.S. EPA, 1990d). Permit limits would be developed using traditional wasteload allocation procedures for specific chemicals. The TMDL for individual or combinations of pollutants would be divided between all point and nonpoint dischargers to a stream segment (see Davenport, 1988 or U.S. EPA, 1990d for further descriptions of TMDL and WLA development for nonpoint sources).

The responsibility for complying with permit limits would lie with the consortium. Where a biological or chemical-specific limit is violated within a stream segment, the consortium would be responsible for implementing programs for a toxicity reduction evaluation (U.S. EPA, 1987). However, substantial flexibility would be allowed to comply with consortium permit limits. Where biological or chemical-specific criteria are violated within the stream segment, the consortium would have flexibility in determining how to bring the segment into compliance by controlling appropriate point and/or nonpoint sources with end-of-pipe treatment, best management practices or other innovative techniques.

Use of a coordinated wasteload allocation process within a stream segment would allow point source/nonpoint source pollutant trading. Pollutant trading would provide the consortium with flexibility in complying with permit limits and in bringing a stream segment into compliance with state water quality standards. For example, in-place pollutants (contaminated sediments) are a particularly difficult NPS problem in many stream segments. Past point source discharges, which may no longer exist or may not be identifiable, are often the ultimate cause of the contaminated sediments. Furthermore, in the absence of NPS contribution, some discharges of the specific chemicals may continue from point sources but at levels well below those which would violate water quality standards. In this case, a consortium would retain responsibility for achieving permit limits for the stream segment but be allowed to negotiate with the state regulatory agency and point source dischargers with existing NPDES permits (who are also members of the consortium) to relax effluent limits in the NPDES permit(s) for the point sources(s).

Relaxation of a point source NPDES permit limit is particularly sensitive. For the case of in-place pollutants (contaminated sediments), effluent limit relaxation could occur only if the point source discharger(s) contributes substantially to removing or otherwise controlling pollutant contributions from contaminated sediments. The degree of relaxation of the point source effluent limit would be based on the degree of pollution control from nonpoint sources for which the individual point source discharger takes responsibility. Relaxation of point source effluent limits for specific chemicals would occur only where concurrent NPS control is implemented *and* where the total load of the specific pollutant from all sources is reduced to a level that would achieve the stream segment permit limit.

Compliance and Enforcement

A particularly important component of a flexible permit program for NPS pollutants is compliance and enforcement. The appropriate state regulatory agencies would be charged with determining the degree of compliance by consortia having permit limits for stream segments. Because of the difficulty in controlling NPS pollutants, some non-compliance situations will exist initially. In these cases, the diligence (Michael et al. 1989) of consortia in working toward permit compliance would be an important component in determining whether stringent enforcement activities are necessary. The U.S. EPA has disallowed the diligence approach for regulation of pollutants discharged from POTWs (BNA 1989). However, regulation of nonpoint source pollution by use of permits and associated water quality criteria is so innovative that substantial flexibility is imperative, at least in the initial phases of implementation and enforcement. The showing of diligence as part of compliance assessment in NPS control provides some of this flexibility.

A consortium showing lack of diligence in controlling a nonpoint pollution problem would be considered in violation of the permit. If diligence is not shown or implementation of regulatory deadlines is not met, the state then would have authority to impose BMP requirements on specific land-use activities and assess fees for those activities. The state regulatory agency would have the authority to place fines on the consortium or individuals in the consortium until NPS permit limits are met.

Observations

1. A regulatory process to control nonpoint sources of pollutants is necessary to eliminate an important source of continuing contamination of the nation's surface waters. A portion of such a process has been proposed by the U.S. EPA, but the agency suggests that difficulty lies in forcing compliance with calculated TMDLs (EPA, 1990e). It is believed that a permit process based on TMDLs and WLAs, similar to that used under the NPDES program to regulate point sources, can serve as an important regulatory tool in controlling NPS pollution and resolve most compliance problems. However, such a program will need substantial flexibility to address the very diverse array of nonpoint pollutant sources.

2. The costs associated with permit-based monitoring and compliance would be borne by the consortium of potentially responsible parties, and

the consortium would determine how costs are to be allocated between its members. Financial responsibility could be based on land area, shoreline area, land-use activity, and level of pollutant loads from discrete sources. State and federal financial assistance available for NPs regulatory activities would be made directly available to consortia. Market incentives, tax credits and similar economic activities may also be necessary to encourage development and adoption of innovative management practices to comply with NPs permit limits.

3. Great progress has been made in reducing point sources of pollution to surface water through the use of a permit program. A similar program may provide a useful mechanism to regulate nonpoint sources, particularly since a comprehensive regulatory program has not yet been developed or implemented by the U.S. EPA or state regulatory agencies. A permit program for nonpoint sources may be useful particularly when combined with voluntary programs that work toward pollution prevention through source control, reuse, recycling, and process or product changes. These concepts are amenable to control of nonpoint sources since best management practices, the focal point of NPS pollution control, address the causes of pollution at their source rather than at the end-of-pipe (as in point of discharge control). Coordination of pollution prevention activities (BMPs) with a compliance program based on state or federal water quality standards, and implemented through a coordinated permit program may be the most effective way to address the remaining pollution problems in the nation's surface waters.

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Note

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