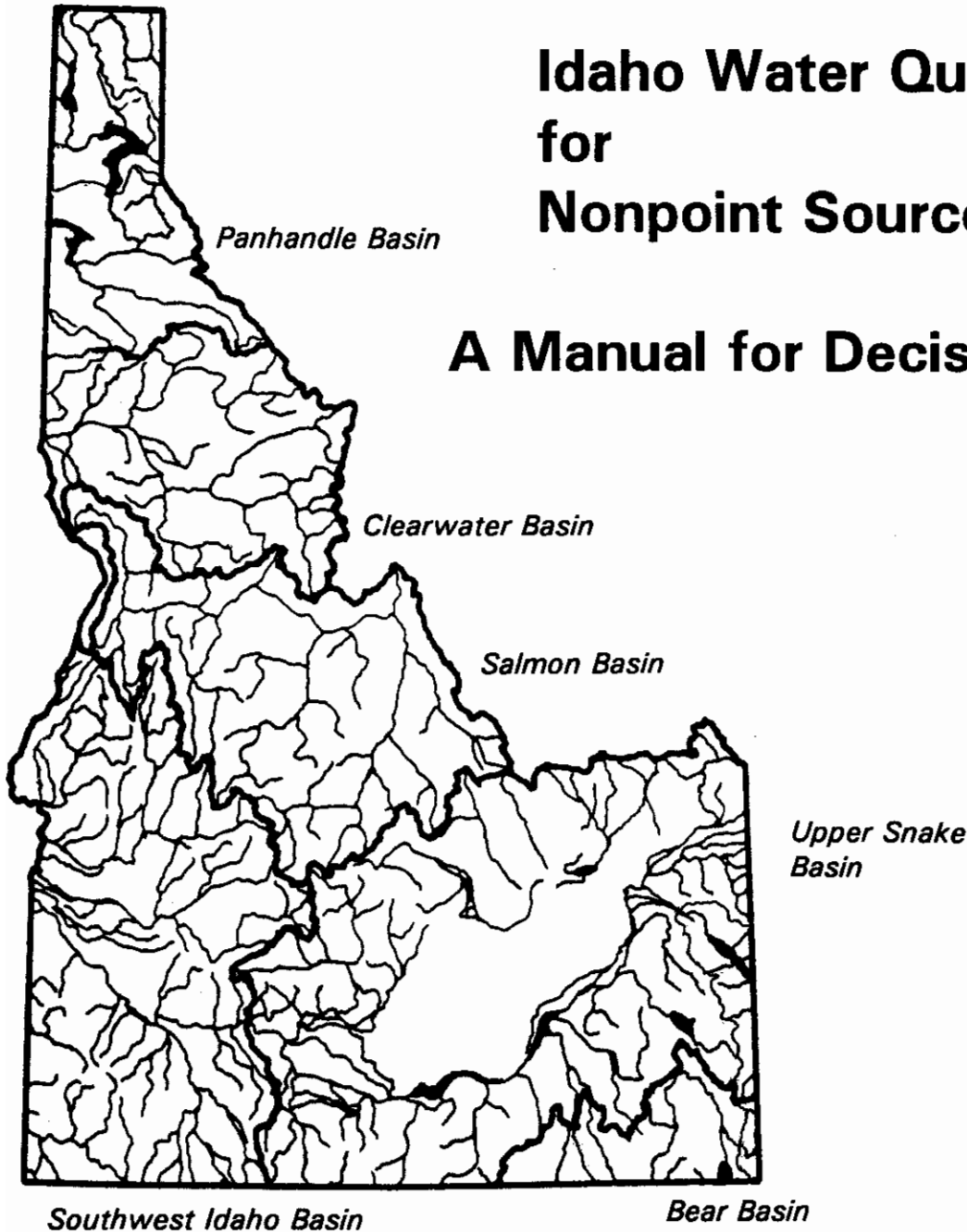




Idaho Water Quality Policy for Nonpoint Source Pollution:

A Manual for Decision-Makers

by
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ABOUT THE POLICY ANALYSIS GROUP

Role and Mission. The Idaho Legislature created the Policy Analysis Group (or "PAG") in 1989 as a way for the University of Idaho to respond quickly to requests for information and analysis about current natural resource issues. The PAG's formal mission is to provide timely, scientific and objective data and analysis, and analytical and information services, on resource and land use questions of general interest to the people of Idaho.

PAG Reports. This is the fourteenth report in the PAG publication series. The other thirteen reports are listed on the inside cover. The PAG is required by law to report the findings of all its work, whether tentative or conclusive, and make them freely available. PAG reports are primarily policy education documents, as one would expect from a state university program funded by legislative appropriation. The PAG identifies and analyzes scientific and institutional problems associated with natural resource policy issues. In keeping with the PAG's mandate, several alternative policy options are developed and their potential benefits and detrimental effects are analyzed. As an operational policy the PAG does not recommend an alternative.

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ABSTRACT.— Idaho's water quality policy is evolving, as has the federal Clean Water Act (CWA) all states must implement. Citizen-initiated lawsuits have been partly responsible for this evolution. So have developments in water quality monitoring and assessment procedures using biological communities. Fish, the food web they depend on, and the physical aspects of aquatic habitat are now used along with traditional measures of chemical contamination of waters.

More important as a change agent in state and federal water quality programs, however, is recognition in the mid-1980s that *nonpoint source pollution** is the nation's most widespread water quality problem. This is a result not of failure, but of success. The CWA has been effective in cleaning up point sources of pollution by requiring "technology-based" controls. Realizing this approach would not work as well for nonpoint source pollution, Congress amended the CWA in 1987. The U.S. Environmental Protection Agency (EPA) devised a new "water quality-based" approach for nonpoint source pollution control; it evolved to watershed protection in 1991.

Ten percent of Idaho's stream and river miles are considered to have impaired water quality, mostly from nonpoint sources. States must control nonpoint source pollution with either regulatory or nonregulatory management programs; Idaho uses both types. Forestry activities and logging roads account for approximately 17% of the adverse impact on Idaho's streams. Forestry has been regulated since 1974. Agriculture, Idaho's leading industry, impacts more stream and river miles than any other pollution source. For many reasons agricultural water pollution control programs rely on a voluntary approach. Noncompliance can reduce the overall effectiveness of program efforts. Without a regulatory enforcement procedure, noncompliance is more likely to occur.

Idaho recently developed new water quality monitoring and assessment programs. In 1995 new legislation was enacted, emphasizing the involvement of local interests in pollution control management in their watershed. Stakeholder involvement is perhaps the most important feature of watershed management, the new federal and state watershed approach to water quality-based pollution control. Idaho's new law reaffirms a nonregulatory approach to agriculture. Successful implementation of Idaho's new policies will require time, patience, funding, and coordinated efforts among resource management and regulatory agencies, private landowners and operators, and interested citizens.

USER'S GUIDE.— The above **Abstract** provides an overall summary of this analysis. The **Executive Summary** presents conclusions and explains the purpose, scope, and organization of the report. Although Figures and Tables are mentioned in the **Executive Summary**, they do not appear until later in the body of the report. Four questions related to the federal Clean Water Act (CWA) and its implementation in Idaho provide the framework for the **Executive Summary** and are the chapter titles in the report. The **Executive Summary** also analyzes two major policy issues in Idaho. Analysis in the four chapters of supports the analysis and conclusions in the **Executive Summary**. Additional questions related to the chapter titles are sub-headings. A detailed **Table of Contents** serves as an outline of the report. A **Glossary** defines the terminology used herein. An **Index** provides access to discussion and analysis of key concepts and institutions.

The manual for decision-makers promised in the report subtitle appears in two parts. Chapter 1 presents requirements states must meet under the CWA. Chapter 3 analyzes the purpose and program implications of Idaho's new legislation (Senate Bill 1284 or Idaho Code § 39-3601 *et seq.*). Chapter 2 is a digest of legal actions that affect Idaho nonpoint source programs, and concludes with a concise summary of CWA legal requirements affecting Idaho, prepared by Professor Arthur D. Smith, Jr., College of Law, University of Idaho. Chapter 4 ties together Idaho's program elements into a comprehensive program (see Figure 3) and provides some case examples of Idaho programs.

* *Nonpoint source pollution* is polluted runoff that comes not from one specific location, but is discharged over a wide land area from activities that include grazing, crop production, forestry (or silviculture), log storage or rafting, construction, mining, recreation, septic systems, runoff from storms and other weather related events. This definition and other technical terms the reader may not be familiar with are provided in a **Glossary** section at the end of this document.

EXECUTIVE SUMMARY

Water quality is difficult to define and has different meanings for different people. Water quality generally implies suitability for a particular purpose; in legal terms, a designated beneficial use. Many Idaho waters have a designated use to support various forms of aquatic life; specifically, warm water biota, cold water biota, or salmonid spawning. An important water quality problem in Idaho, as it is across the nation, is keeping sediments caused by land-based activities from entering waters in quantities that impair full support of designated uses.

Through the Clean Water Act (CWA), the U.S. Congress requires states to enact programs to restore and maintain the "integrity" of their waters. The CWA recognizes the primacy of states in managing water resources.

• *Purpose.* — The purpose of this report is to explain how Idaho water quality policy has evolved, especially in relation to Senate Bill 1284, enacted into Idaho Code (§ 39-3601 *et seq.*) in 1995. The target audience includes state legislators, state and federal agency personnel, and citizen members of the state's new Basin Advisory Groups (BAGs) and Watershed Advisory Groups (WAGs).

• *Scope.* — Water quality is an immense concern encompassing its importance to human and non-human life, its geographic extent, and its inseparability from water quantity and water resource use issues. This report focuses only on the features contained in the newest part of Idaho's policy dealing with surface water and nonpoint source pollution control. Other important water quality issues, including safe drinking water and groundwater quality, are not mentioned in this report, but this does not diminish their importance. The agriculture and forestry sectors are used throughout as examples.

• *Focus Questions and Short Replies.* — The purpose of the report is achieved by focusing on four critical questions. This **Executive Summary** poses each of the questions guiding the analysis and provides short replies to them. The body of the report is organized similarly. Each focus question is a chapter title, wherein may be found analysis supporting the replies in this **Executive Summary**. Chapter sub-headings are stated as questions, with replies providing

information needed to address the main theme of each chapter.

• *Analysis of Key Issues.* — During the process of designing the focus questions and developing replies to them, two key program issues arose: [1] what is a cost-effective approach for monitoring nonpoint source pollution, and [2] what is a cost-effective approach for controlling nonpoint source pollution? Replies conclude this **Executive Summary**.

1. What does the Clean Water Act require?

The purpose of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters" with a goal of attaining "fishable and swimmable" water conditions wherever possible. The Act requires states to develop water quality standards for each body of water, conduct assessments to determine if the standards are being met, identify sources of water pollution, and implement programs to control pollution. Monitoring is essential for determining whether standards are met and pollution control programs are effective.

During the 1970s and 1980s, CWA implementation emphasized "technology-based" controls for reducing water pollution from readily identifiable point sources such as municipal sewage treatment plants and wastewater discharge pipes from industrial facilities. The United States invested hundreds of billions of dollars to control point source pollution (Novotny and Olem 1994). Groundwork was laid for nonpoint source pollution control through section 208 of the CWA through areawide plans requiring the identification of land-use activities causing nonpoint source pollution and procedures to control such sources to the extent feasible.

By the mid-1980s nonpoint source pollution came to be recognized as the nation's "biggest water quality problem" (EPA 1991a). In 1987 Congress passed amendments adding section 319 to the CWA. This required the EPA to shift attention from nonpoint source program planning to implementing programs with actions to control polluted runoff. Unlike point source control programs regulated by the EPA, Congress allowed the states to retain the principal responsibility for the design and implementation

of nonpoint source control programs.

The "water quality-based" approach to pollution control can be illustrated (see Figure 1)* as a cyclical process consisting of eight stages. Each stage is a major CWA program involving regulatory requirements and guidance documents from the EPA. The process begins with state water quality standards (or WQS on Figure 1) in stage 1 and eventually relies on the establishment of pollution source control program actions in stage 6. The TMDL ("total maximum daily load") in stage 5 is a tool linking state water quality standards to pollution control actions. Through monitoring activities in stage 7, TMDLs may be modified in stage 8, which then cycles back to the beginning where water quality standards (WQS) may be revised (EPA 1995a, see Figure 1).

Because of their importance, additional details follow on state water quality standards and pollution control programs. Also following are summary sections on two current issues in Idaho—"outstanding resource water" (ORW) designation and the "total maximum daily load" (TMDL) process.

• **What are water quality standards?**— The principle mechanism for fulfilling the purposes of the CWA is water quality standards. Each state determines its water quality standards, consisting of designated beneficial uses for each of the state's waters, criteria indicating whether the uses are being supported, and an "antidegradation" policy statement.

Designated uses must support the "fishable/swimmable" goal of the CWA. Approximately 90% of the stream miles in Idaho do not have designated uses (Millam 1995), and fall back on a default use of "primary contact recreation" or swimming. This default designation does not address the "fishable" goal of the CWA (IDEQ 1996). The EPA's "antidegradation" policy requires that protected beneficial uses must also include "existing uses" of the waters that were attained on or after November 28, 1975, whether or not the "existing uses" are currently present.

Criteria are related to chemical, physical, or biological characteristics of the water body and

may be numeric or narrative. It is not possible to develop realistic numeric criteria for some contaminants; sediment is one example. Narrative criteria can be either general statements prohibiting certain actions or conditions—for example, Idaho's sediment criterion asks "Is the water body free from excess sediment in quantities that impair designated beneficial uses?" (IDEQ 1996)—or positive statements about what is expected to occur in the water—for example, "water quality and aquatic life shall be as it naturally occurs" (EPA 1990).

An "antidegradation" policy statement is required in the state's water quality standards not by Congress through the CWA, but through the EPA's regulatory powers. This means states must have a policy indicating an intention to protect existing water quality where it exceeds the standards. Idaho Code (§ 39-3603) makes such a statement. At least one legal commentator (Morgan 1991) and some technical commentators (Burk et al. 1995) have argued that the EPA's antidegradation regulation needs clarification and revision if it is to become a meaningful policy concept.

• **Are "outstanding resource waters" (ORWs) required?**— ORWs are closely related to Outstanding National Resource Waters (ONRWs), which are part of the EPA's "antidegradation" policy. Neither ORWs or ONRWs are explicitly required by the CWA. Although the terms ONRW and "antidegradation" are nearly invisible in the CWA, they are featured in the Water Quality Standards Regulation promulgated by the EPA (40 CFR 131.12).

• **What is a TMDL?**— "Total maximum daily load" (TMDL) is a process for gathering information about pollution sources. Table 1 outlines the key features of a TMDL. These features may change because the EPA has convened a FACA TMDL committee that may end up modifying the concept of TMDL implementation (see EPA 1996b).

• **When is a TMDL required?**— A TMDL is needed for waters that are not expected to meet water quality standards after pollution control requirements are implemented (40 CFR 130.7(b)). A TMDL allocates pollution control responsibilities among pollution sources in a watershed, and is the basis for taking the actions

* Although Figures and Tables are referenced in the Executive Summary they appear later in the body of the report.

needed to restore a water body (EPA 1996b). The TMDL concept involves identifying the type of pollution, where the pollutant comes from, how much of the pollutant the water can assimilate and be within the water quality standards, and the allocation of amounts of the pollutant each source can discharge into the water body. Application of the TMDL concept poses technical (Griffin et al. 1991) and political difficulties (Novick et al. 1994). Information produced by the TMDL process links water quality standards with pollution control programs (EPA 1995b).

• **How are sources of pollution controlled?—**

The ultimate objective of the CWA is placing enforceable restrictions on sources of pollution (Novick et al. 1994). Under the CWA, federally enforceable controls are limited to those for point sources through a permitting process (EPA 1991b). Congress reserved for the states the right to determine how polluted runoff from land use is controlled to meet the purposes of the Act. The control of nonpoint source pollution depends on effectively designed best management practices (BMPs) and their implementation by forestry, mining, grazing, and agricultural operators. Table 2 provides examples of BMPs.

In nonpoint source programs under the CWA (§ 319(b)(2)), states must identify BMPs and other control mechanisms and identify programs to implement BMPs. The EPA has sign-off approval authority over state nonpoint source control plans and programs.

Agriculture is the leading source of water quality impairment in the nation, affecting 60% of the stream miles surveyed and 50% of the lakes surveyed (EPA 1995b, see Table 3). Agricultural activities, including grazing, impacted 45% of the stream miles surveyed in Idaho in 1988, more than any other source of pollution (IDEQ 1989, see Figure 2). Forestry or silvicultural activities affected 17% of Idaho's stream miles. Hydrological or habitat modification affected 30% of the stream miles, and is a secondary effect of agriculture, grazing, and forestry activities; its portrayal on Figure 2 actually is a double-counting of the effects of these activities.

Although sedimentation is a natural process from soil erosion and runoff, it can also be a water pollutant when it is produced as a result of land-use activities. Controlling sources of

sediment pollution through the installation of BMPs is the major water quality policy issue in Idaho.

Idaho uses both regulatory and nonregulatory approaches for BMPs for nonpoint source pollution control. The Idaho Forest Practices Act (Idaho Code § 38-1301 *et seq.*) has required the use of best management practices (BMPs) to control runoff from forestry or silvicultural practices since 1974. Mining BMPs are also required. Agriculture and grazing water pollution control programs rely on voluntary installation of BMPs by farmers and ranchers. The issue of how effective these different approaches are is taken up at the end of the Executive Summary.

2. How has federal court action affected Idaho?

The court's ruling in the *Idaho TMDL* litigation (*ISC v. Browner*, C93-943WD, Seattle, WA) motivated the Idaho Legislature in 1995 to pass Senate Bill 1284, which rewrote the portion of the Idaho Code (§ 39-3601 *et seq.*) for CWA nonpoint source programs. The lawsuit also led to changes in monitoring and assessment programs.

Dissatisfied with the condition of some waters in Idaho and the pace of progress at controlling land-use activities from which nonpoint source pollution emanates, in 1993 the Idaho Sportsmen's Coalition and the Idaho Conservation League filed the *Idaho TMDL* lawsuit against the EPA in federal district court in Seattle. The plaintiff groups asked the court to require the EPA to do two things: [1] expand the list of waters in Idaho with impaired water quality, as required under section 303(d) of the CWA; and [2] develop total maximum daily loads (TMDLs) for the impaired waters, again as required by section 303(d). Similar litigation has been filed in 21 other states (L. Koenig, personal communication).

Judge William L. Dwyer ruled for the plaintiffs. In October 1994, the EPA expanded Idaho's "303(d) list" of water quality-limited waters from 36 to 962 to comply with the court's order. This includes approximately 10% of the stream and river miles in Idaho (USDA Forest Service 1996). The court has given the EPA until March 1997 to resubmit Idaho's schedule

for developing TMDLs, strongly suggesting that five years was a more reasonable time frame than the 25 years that Idaho had proposed and the EPA had accepted.

The *Idaho TMDL* litigation has focused attention on the condition of waters in Idaho and increased the workload of the Idaho Division of Environmental Quality (DEQ), the state agency responsible for CWA activities. The DEQ is implementing a new standardized assessment procedure for determining beneficial use support called the Water Body Assessment Guidance (WBAG) (IDEQ 1996) and new water quality monitoring procedures called the Beneficial Use Reconnaissance Project (BURP) (IDEQ 1995a,b).

In 1997, the Idaho Legislature will be concerned with the level of resources for the DEQ to help the EPA conform to Judge Dwyer's ruling in the *Idaho TMDL* case. Idaho is currently proceeding with the development of TMDLs. If Idaho does not prepare TMDLs for the "303(d) list" of waters the EPA created under a court order in the *Idaho TMDL* case, the EPA would be required to do so under the CWA. At risk in such a default situation would be more than \$1 million in federal grants made to Idaho each year for CWA nonpoint source programs that would likely be forfeited, and the possibility of court injunctions halting federal land and resource management activities until such time as TMDLs are completed.

3. What are the features of the new Idaho policy?

Watershed management is the key feature. New monitoring and assessment programs are also important. Watershed management is consistent with program efforts the EPA has been urging the states to undertake since 1991 (see Table 4).

An EPA official (Perciasepe 1995) stated that involving people in decisions affecting their use of resources is the key to making watershed protection work. Idaho's new law emphasizes locally based, rather than centralized, planning and program management. The DEQ cooperates with local interests in Basin Advisory Groups (BAGs) and Watershed Advisory Groups (WAGs) in identifying what actions are needed to restore and maintain water quality. Table 5 identifies the key features of a Watershed

Advisory Group (WAG).

Monitoring is an essential component of an effective water quality program. Beginning in 1993, Idaho's Beneficial Use Reconnaissance Projects (BURPs) were implemented to help determine the level at which beneficial uses are being supported (IDEQ 1995a). Many, if not most, of Idaho's waters support aquatic life as a beneficial use, whether it is a formally designated use or an "existing use." The results of the BURPs will describe aquatic communities, including fish populations that so many Idahoans care about as well as the key chemical and physical characteristics affecting their habitat. One might therefore expect public support for monitoring as it is conceived in the BURPs. In addition, the literature reviewed in this report points out the benefits of such an integrated monitoring program in meeting CWA goals. Bio-assessment is not only recommended by many scientists and water quality specialists, it also is necessary to detect water quality problems that would be missed by relying only on the more traditional chemical contaminants that have been the focus of point source pollution monitoring.

In August 1996 the DEQ finalized the Water Body Assessment Guidance (WBAG) document (IDEQ 1996). The WBAG process uses BURP and other data to determine beneficial use support. The WBAG process can also be used to identify appropriate designated beneficial uses.

4. Will the new Idaho policy be effective?

It is too early to attempt to evaluate the effectiveness of Senate Bill 1284 (Idaho Code § 39-3601 *et seq.*). BAGs are just beginning to understand their role, and few WAGs have been appointed (L. Koenig, personal communication).

Idaho's policy has been revamped to include new monitoring efforts through the BURP process that will allow meaningful designation of aquatic life beneficial uses and determination of the level of support for aquatic life through the WBAG process (Figure 3). The policy has been decentralized to the basin and watershed level to include local interests in planning water quality programs that affect them through BAGs and WAGs (Figure 3).

The two policy ingredients now necessary are [1] adequate funding for monitoring, assessment, and pollution control programs at the basin and

watershed level; and [2] patience as locally crafted solutions to water quality problems begin to emerge from the BAGs and WAGs.

• **Alphabet soup: BURP, WBAG, BAG, and WAG.**— The approach for restoring and maintaining water quality in Idaho is somewhat complex and takes some effort to understand. Figure 3 illustrates the various processes and the responsibilities of organizations and agencies involved in Idaho's approach to water pollution control.

Successful implementation of the EPA's water quality-based approach to pollution control (see Figure 1) begins with realistic water quality standards and relies on the installation and modification, as monitoring reveals is necessary, of pollution control mechanisms, including the array of BMPs by those engaged in land-use activities.

The water quality-based approach requires determining to what degree a stream or other water body supports its designated beneficial uses, and thus whether it meets state water quality standards. This evaluation is called the Water Body Assessment Guidance (WBAG) process (IDEQ 1996).

BURP process monitoring data, indicated on Figure 3, is but one source of data; Cumulative Watershed Effects (CWE) assessment data collected by the Idaho Department of Lands (see section 4.4.2 of the report, IDL 1995) would be another. If the WBAG assessment indicates that designated uses are not fully supported—that is, water quality standards are not met—the water body is placed on the "303(d) list" and its priority for TMDL development is determined.

Figure 3 identifies the responsibilities of government agencies and BAGs and WAGs. BAGs are responsible for assigning priorities for TMDL development. BAGs may recommend that designated beneficial uses be changed, which requires not only a TMDL, but also a "use attainability analysis" and legislative rulemaking. WAGs are responsible for the identification of pollution control actions that are part of a TMDL. WAGs recommend modification in BMPs or NPDES permits.

In Idaho, the EPA has responsibility for the NPDES permit process for point source controls. For nonpoint source controls, the Idaho Department of Lands is responsible for enforcing BMPs for forestry and mining operations; the

Idaho Soil Conservation Commission has responsibilities for incentives and other programs to encourage agriculture and grazing operations to implement BMPs.

• **What agencies are involved in watershed management?**— The roles of Idaho state and local agencies in water quality policy (see Table 6) have not changed since 1991, when the Policy Analysis Group reported on "State Agency Roles in Idaho Water Quality Policy" (Turner and O'Laughlin 1991).

The Idaho DEQ has the major responsibility for most pollution control activities. The Idaho Department of Lands is responsible for enforcing the mandatory BMPs for forestry and mining. The Soil Conservation Commission and its local Soil Conservation Districts encourage the installation of voluntary agricultural BMPs. The local Public Health Districts play a role in maintaining water quality in lakes; the Clean Lakes Coordinating Council also is involved in lake water quality in northern Idaho (Table 6).

Analysis of Key Issues

The intent of the Idaho Legislature with regard to water resources and the federal Clean Water Act is clear:

The legislature declares that it is the purpose of this act to enhance and preserve the quality and value of the surface water resources of the state ... [and] it is hereby declared to be the policy of the state of Idaho to protect this natural resource by *monitoring and controlling water pollution*. ... It is the intent of the legislature that the state of Idaho fully meet the goals and requirements of the federal clean water act (Idaho Code § 39-3601; emphasis added).

The state policy to monitor and control water pollution raises two key questions: [1] what is a cost-effective approach for *monitoring* nonpoint source pollution, and [2] what is a cost-effective approach for *controlling* nonpoint source pollution? Summary replies and analysis follow.

Key issue # 1: What is a cost-effective approach for monitoring nonpoint source pollution?

Two types of monitoring are necessary to determine BMP effectiveness: on-land qualitative compliance monitoring of BMP installation, and at the watershed scale, periodic quantitative

instream monitoring of the overall effectiveness of BMPs at keeping pollution out of the water. Under the CWA, this means determining if water quality standards are met.

It is not efficient to monitor everything, everywhere, all the time (Ice et al. 1996). Before large sums of money are spent on water quality monitoring, the public, as represented by the Idaho Legislature, should know what kind of information the state's monitoring program will produce, and what will be done with it (Ward 1996).

To meet CWA goals, the EPA's views on water quality monitoring have evolved to an ecological approach, including monitoring habitat condition (Dissmeyer 1994). Idaho's monitoring program has evolved similarly into the Beneficial Use Reconnaissance Project (BURP) process. BURPs are one source of information for the water body assessment process (see IDEQ 1996) used to designate aquatic life beneficial uses in water quality standards and determine the level of support of those uses (Figure 3).

For waters that are impaired—that is, beneficial uses are not fully supported—TMDLs are required (Figure 3). A TMDL can cost from \$4,000 to \$1 million or more, depending on the complexity of the pollution problem and the availability of existing data and models (EPA 1996a). Information produced by the TMDL process is useful for identifying where pollution control actions should be targeted, including the implementation of BMPs. The development of TMDLs in Idaho is currently evolving as the EPA and IDEQ respond to the court ruling in the *Idaho TMDL* lawsuit.

Key issue # 2: What is a cost-effective approach for controlling nonpoint source pollution?

The technology for controlling polluted runoff is a process termed "best management practices" (BMPs) under the CWA. The process of implementing BMPs is the recognized approach to controlling nonpoint source pollution (CWA § 319(b)(2)(A)). Sediment is a byproduct of land-use activities and affects 90% of the impaired waters in Idaho; sediment is the *only* pollutant affecting 46% of these waters (Table 7). The latest count has 960 water quality-limited segments or waters on Idaho's "303(d) list"; included are 10.1% of the stream and river miles

in the state, which is approximately the same percentage as other areas in the Interior Columbia River Basin (Table 8).

BMPs can be effective at reducing pollution at its source, but under a voluntary program approach there is no assurance BMPs will be applied. The issue involves how "cost-effective and reasonable BMPs" (40 CFR 131.12(a)(2)) will be implemented. The two basic choices are regulatory or nonregulatory programs for enforcement, technical assistance, financial assistance, education, training, technology, and demonstration projects (CWA § 319(b)(2)(B)).

In Idaho, the implementation of BMPs for forestry and mining is regulated and enforced. Audits reveal that forestry BMPs are installed 92% of the time when they should be, and are 99% effective at keeping sediment and other pollution from streams (IDEQ 1993). Sediment pollution from forestry activities nevertheless impacted 17% of the stream miles surveyed in Idaho in 1988 (IDEQ 1989, see Figure 2). Improvements in BMPs will continue to be made, requiring landowners, foresters, and loggers to modify their practices and undertake additional costs to install revised BMPs.

In Idaho, the implementation of agricultural and grazing BMPs is voluntary, as it is in most other states. The technology to control polluted runoff from farms and ranches is available through an assortment of BMPs, all involving some costs. Voluntary water quality management programs cannot be effective if farms and ranches do not use BMPs. Idaho Code § 39-3610(1) states that "nothing in this section shall be interpreted as requiring best management practices for agricultural operations which are not adopted on a voluntary basis." According to Novotny and Olem (1994), the main weakness of the CWA is its lack of enforceable programs for the implementation of BMPs.

Agricultural nonpoint source pollution has not been adequately controlled for a number of reasons (Novotny and Olem 1994). Before change will occur, individuals and institutions—that is, government, business, interest groups, etc.—must know that a problem exists, understand the significance of the problem, and have some type of incentive to change (Novotny and Olem 1994).

A combination of incentives and public

information and education is a cost-effective nonregulatory approach to encouraging compliance with BMPs, but without a regulatory enforcement program, some operators will choose to ignore BMPs. Some states have "bad actor" laws that serve as a backup approach for enforcing BMP implementation through penalties if the voluntary approach proves to be ineffective.

Agricultural pollution and its prevention and control is and will continue to be a challenge

(Novotny and Olem 1994). Current programs for agricultural and other nonpoint source pollution control are only the beginning of a lengthy process that will require a long-term commitment of time, resources, and funds from every sector. A number of experimental programs have documented varying degrees of success, and much can be accomplished once commitments have been made, including working together with diverse groups (Novotny and Olem 1994).

Chapter 1. What does the Clean Water Act require?

The Clean Water Act (CWA) makes it unlawful for anyone to discharge any pollutant into the waters of the United States, except in compliance with CWA features (Rodgers 1994, CWA § 301). Water pollution control programs generated by the CWA have changed since 1972 as experience and perceptions of water quality have changed. This chapter reviews ends and means of the CWA to provide context for analyzing Idaho's water quality policy for nonpoint source pollution.

1.1. What are the goals of the CWA?

Stated simply, the CWA has the long-term objective to "restore and maintain the chemical, physical, and biological integrity of the nation's waters" with short-term goals of attaining "fishable and swimmable" conditions in the nation's waters.

1.2. What is the difference between point sources and nonpoint sources of pollution?

The CWA recognizes two different types of pollution based on the traceability of contamination to its source. Point sources may be identified at singular locations where contaminants enter a water body, such as the end of the pipe from which they flow. The CWA (§ 502(14)) defines point sources as "any discernible, confined and discrete conveyance, including...any pipe, ditch [or] channel..., from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture."

Nonpoint source pollution may be called "polluted surface runoff" (Tarlock 1996) from agricultural lands, industrial sites, parking lots, timber operations (IDEQ 1995b), and irrigation return water. In the CWA, everything that is not a point source is a nonpoint source. The term "nonpoint" thus refers to pollution not associated with a distinct discharge point such as polluted runoff from fields, forests, mining, and construction activity.

• *How is point source pollution controlled?*—
No one may discharge a pollutant from a point

source without a permit. Point sources are treatable by limiting the discharge of contaminants, attained by modifying the technology from which contaminants emanate; the most significant contribution of the CWA is the establishment of a regulatory enforcement scheme built around the National Pollution Discharge Elimination System (NPDES), which serves as the basic mechanism for enforcing the implementation of pollution abatement of point sources (Hildreth et al. 1993, Novotny and Olem 1994).

The EPA has authority to issue discharge permits containing effluent limitations for specific industrial and municipal point sources of pollution through the NPDES permit program (Novick et al. 1994, Novotny and Olem 1994). Simply put, effluent limitations define the amount of pollution allowed under a permit based on available treatment technologies (Hildreth et al. 1993). Hundreds of billions of dollars have been spent to install and upgrade these technologies, and the CWA has provided financial assistance for municipal wastewater treatment plant construction (Novotny and Olem 1994) amounting to \$60 billion (Chafee 1991).

• *How is nonpoint source pollution controlled?*— Because nonpoint sources are much less easy to identify, and thus much less amenable to technology-based programs, different approaches are necessary (Novick et al. 1994). Instead of authorizing the EPA to promulgate uniform, national standards for nonpoint sources that would be analogous to the end-of-pipe controls applicable to point sources, Congress tried to deal with nonpoint source pollution through state planning processes, leaving the states with considerable discretion (Coggins and Glicksman 1996). Because nonpoint source control is closely related to land-use planning, nonpoint source regulation has been controversial and largely ignored (Novick et al. 1994). Because the CWA definition of point sources exempts agricultural drains and runoff canals which collect diffuse runoff, the term nonpoint source is confusing as well as controversial.

The heart of the nonpoint source control program in state water quality plans is the requirement that land-use activities contributing runoff to receiving water bodies control the pollution by the adoption of best management

practices (BMPs) (Tarlock 1996, Coggins and Glicksman 1996). Although BMP is not defined in the CWA it refers to any farming or land-use practice that slows, retains, or absorbs polluted surface runoff (Tarlock 1996). The EPA defines BMPs as “[methods], measures, or practices...to meet...nonpoint source control needs, [including] structural and nonstructural controls and operation and maintenance procedures” (Coggins and Glicksman 1996). BMPs are technology-based controls (Braun 1986, Houck 1994, Burk et al. 1995).

The pollutants generated by land-use activities may cause or contribute to violations of the water quality standards issued by the states (Coggins and Glicksman 1996). Ordinarily, private landowners may not be subject to sanctions for violating water quality standards; Coggins and Glicksman (1996) noted that some states appear to exempt logging, grazing, and other nonpoint sources from complying with state water quality standards, provided landowners comply with applicable BMPs, with the result that state water quality standards may not contribute an actual regulatory “bottom line” number for nonpoint sources. Instead, the remedy for excessive nonpoint source pollution tends to be a tightening of the BMPs, a more indirect regulatory approach (Coggins and Glicksman 1996). This is a key water quality management issue in Idaho, and is analyzed in section 1.5.7 as well as the Executive Summary of this report.

1.3. How has the CWA evolved?

Water pollution control laws have changed in focus and philosophy over the years. The CWA was a 1977 amendment to the Federal Water Pollution Control Act of 1972, but now the term Clean Water Act is widely used to refer to the 1972 Act and all subsequent amendments to it. The CWA has been amended 15 times since 1972, most significantly in 1977, 1981, and 1987.

Water pollution control laws have moved from a decentralized water quality-based program to a formalized federal program-based approach; now they appear to be moving back to a decentralized and water quality-based approach (Jaworski 1994). The driving force behind these changes is the recognition that due to successful attention to point sources, nonpoint source pollution is now

the most widespread water pollution problem (Novotny and Olem 1994, Hildreth et al. 1993). This does not mean that nonpoint source pollution is increasing. The Act and its amendments have led to many improvements in the nation's water quality (EPA 1995b). For example, between 1982 and 1992, soil erosion from agricultural lands decreased by one-third from a total of 3 billion tons per year to 2 billion tons per year (NRCS 1995).

• *The Water Quality Act Amendments of 1987 and section 319.*— In spite of the requirements incorporated in the 1972 and 1977 versions of the CWA, progress in reducing diffuse and nonpoint sources of pollution has been extremely slow in some sectors (Novotny and Olem 1994). Forestry is an exception, particularly in the western states where CWA section 208 led to state initiatives such as Idaho's to implement action programs (G. Ice, review comments). In 1987 Congress shifted from 15 years of nonpoint source pollution planning, studying, and problem identification to a new CWA action program in section 319 (Novotny and Olem 1994).

Until 1987, federal efforts to control nonpoint sources of pollution had been largely limited to funding the development of section 208 areawide management plans (Novick et al. 1994). In 1987, Congress acknowledged the need to control nonpoint sources and added, as a new national policy, the development of programs for the control of nonpoint sources of pollution “in an expeditious manner.” Today, however, federal regulatory efforts are essentially limited to funding for state and regional planning efforts (Novick et al. 1994). However, in states like Idaho with large federal land holdings, the relationship between federal land and resource management planning processes and state water quality programs is important (see section 1.6.2 of this report).

The 1987 amendments reaffirmed the responsibility states have for implementing the CWA, and in section 319 encapsulated much of what has been learned about nonpoint pollution sources and their control (IDEQ 1995a). Section 319 requires states to prepare assessment reports to identify areas with nonpoint source problems, to enumerate the categories of nonpoint source pollution, to list the processes by which states would identify the best management practices

(BMPs) needed to control nonpoint source pollution, to discuss the state and local programs available or necessary to improve water quality through nonpoint source controls, and to develop management programs to document how and when states would address their nonpoint problems (Hildreth et al. 1993). Section 319 takes a holistic approach to nonpoint source management, and requires states to develop nonpoint source controls on a watershed by watershed basis (Hildreth et al. 1993).

To facilitate state efforts to develop the reports and plans, section 319 provided states with various financial incentives; by 1993 all states had approved nonpoint source assessment reports, and most had approved management programs (Hildreth et al. 1993). However, the grants and loans program has been beset with a lack of funding, inconsistency in implementation, and general confusion (Flynn and Williams 1994).

The lack of authority on the part of the EPA to enforce section 319 goals has led to some criticism that the program is simply an extension of section 208 (Hildreth et al. 1993). Because nonpoint source controls typically require modifications in land-use activities, it can be argued that sections 208 and 319 are ineffective because Congress is wary about intruding into areas of law—such as land-use planning—that are typically reserved for state and local governments (Hildreth et al. 1993).

During 1987 debates on the amendments, Senate Majority Leader George Mitchell illustrated this congressional deference to the states when he said that section 319 “does not provide for federal intervention in state and local planning decisions,” that it does not “direct” states to adopt enforceable nonpoint regulatory programs, and that “[i]f a State decides it does not want a program to control nonpoint source pollution, that is it” (133 *Cong. Rec. S.* 1698, Feb. 4, 1987) (Hildreth et al. 1993).

• *How is the Coastal Zone Management Act reauthorization in 1990 related to the CWA?*—Congress’ approach to nonpoint source control programs has been tentative, but does show some movement to force the examination of alternative technologies that is fundamental to U.S. environmental laws (Houck 1994). In this case, Congress has “tipped up to the problem” not through the CWA but through the Coastal Zone

Management Act (CZMA)(Houck 1994). This provision of the CZMA may have made subsequent reauthorization of the CWA more difficult.

The effects of nonpoint source nutrient pollution are strongly felt in estuaries and bays along our coasts (Houck 1994). In 1990, Congress added section 6217 to the CZMA specifically to address nonpoint source pollution. At minimum, the amendment requires “management measures” that reflect “the greatest degree of pollution reduction achievable through the application of the best available nonpoint source pollution control practices, technologies, processes, siting criteria, or other alternatives” (16 U.S.C.A. § 1455(b)). Houck (1994) coined the acronym BANPCP for these measures; he might just as well have used BAMP, or best *available* management practice.

According to Houck (1994), the legislative history of this provision “makes it clear that Congress, once again, has rejected a water quality-based approach as unworkable and turned, instead, to technological alternatives” (Houck 1994).

• *Why did the EPA adopt a “watershed protection” approach in 1991?*—The EPA (1995b) recognizes that although significant strides have been made in reducing the impacts of some discrete or point source pollution, aquatic resources remain at risk from a combination of point sources and nonpoint sources. The agency therefore has promoted the watershed protection approach since 1991 as a “holistic framework” for addressing complex pollution problems (EPA 1995b). This has been done even though the EPA has yet to promulgate regulations under section 319 and the legislative history surrounding section 319 is virtually silent on the watershed approach (Hildreth et al. 1993).

The watershed approach may be incorporated into state water quality management plans to facilitate a more coordinated management scheme for addressing both point and nonpoint sources (Hildreth et al. 1993). Many states—including Idaho (see Chapter 3)—and affected interest groups have responded to the EPA’s watershed approach, and advancements in water quality understanding and management on a watershed basis are resulting in new strategies that will shape water pollution into the next century (Hildreth et al. 1993).

• **Why did Congress fail to reauthorize the CWA in 1993-1996?**— Ever since the U.S. Congress convened for its 103rd session in early 1993, U.S. lawmakers have been unable to reauthorize the CWA. This failure reflects not only the technical difficulty of controlling and abating nonpoint source pollution, but also, as Malone (1990) and Novick et al. (1994) have pointed out, the political difficulty of centralized land-use planning.

The difficulty in reauthorizing the CWA stems in part from a difference in opinion about whether the CWA requires a significant rewrite or only minor fine tuning (Jaworski 1994). Some members of Congress, as well as environmental advocacy groups, believe that new policy “tools” and regulations are needed to control nonpoint source pollution, protect wetlands, and further reduce discharges of toxic pollutants. Others, such as state and local governments and industry groups, believe that great progress has been made in cleaning the nation’s waters during the past 20 years and that only minor changes are required (Jaworski 1994).

There seems to be some consensus that the reauthorization process must address critical issues, such as watershed management, wetlands, and funding (Jaworski 1994). The long-term trend toward increased regulation is also a factor (SAF 1995).

Watershed management will be increasingly important as legislators and regulators take a more holistic approach to water quality protection (Jaworski 1994). Wetlands are still a sensitive topic; there is general agreement that they must be protected but little agreement on how to define wetlands or compensate landowners for limits on their use (Jaworski 1994). Funding issues associated with any reauthorized CWA are difficult to address, particularly in light of the increased objection to unfunded mandates (Jaworski 1994).

Although there is some agreement on what issues should be addressed, little consensus exists on what should be done (Jaworski 1994). Should a new regulatory program be established to control nonpoint source pollution, or should individual landholders be given economic incentives? Perhaps both should be considered. Should pollution prevention planning be mandated or simply encouraged? Should

watershed management be controlled by EPA, the states, or local entities? Are new enforcement authorities needed to control toxic pollutants, or is better implementation of existing authorities needed? (Jaworski 1994).

Senator John Chafee (R-Rhode Island) chairs the Senate Environment and Public Works Committee, which has jurisdiction over the CWA. In an interview with the EPA, Senator Chafee (1991) suggested that to deal with the nonpoint source pollution problem, additional federal funding and an approach that includes local interests in decisions affecting them are needed. More recently, he identified CWA areas needing minor changes as stormwater permits, combined sewer overflows, wetlands delineations, nonpoint source pollution, watershed management, and reauthorizing the State Revolving Fund (Fortner 1995).

Unless Congress radically overhauls the CWA, the core federal, state, and local water quality programs will continue forward; whether mandated by new CWA provisions or not, increasing emphasis will be placed on pollution prevention and watershed management (Jaworski 1994).

1.4. What are the federal and state responsibilities for nonpoint source control?

Through the CWA, the U.S. Congress has assigned to states the major responsibility for the design and implementation of programs for the control of nonpoint source pollution. The EPA has a supervisory role with responsibilities for approving state programs to implement the CWA. The Idaho Division of Environmental Quality (IDEQ) is the state agency responsible for implementing the CWA in Idaho. The EPA oversees Idaho's programs and certifies that IDEQ is fulfilling the requirements and responsibilities of the CWA (IDEQ 1995a,b). The EPA provides program guidance, technical support, and funding to help the states control nonpoint source pollution (EPA 1995b).

The CWA provides the basis for two different kinds of pollution control programs (EPA 1995a). State water quality standards are the basis of the water quality-based control program. The CWA also provides for technology-based limits known as “best available treatment” technology that is economically achievable for

industry, and secondary treatment for publicly owned treatment works. In some cases, application of these technology-based controls will result in attaining water quality standards. Where such is not the case, the CWA requires the development of more stringent limitations to meet the water quality standards (EPA 1995a).

States must, under section 319 of the CWA, identify the overall dimensions of the state's nonpoint source water quality problems and report them to the EPA (EPA 1995a). This includes identifying stream segments which without "additional action to control nonpoint sources of pollution" cannot reasonably be expected to attain water quality standards or the goals and requirements of the CWA (Novick et al. 1994). States must identify categories of nonpoint sources that add significant pollution to these waters and develop a process for identifying "best management practices" (BMPs) and other measures to control these pollution sources. In addition, states are required to submit to the EPA "management programs" that contain elements designed to show implementation of controls of nonpoint sources (Novick et al. 1994). States are encouraged to target subsets of waters for concerted action on a watershed-by-watershed basis (EPA 1995a).

The nonpoint source report and management program are submitted for review by and approval of the EPA (Novick et al. 1994). Unlike similar provisions relating to control of toxic pollutants from point sources, the EPA may not promulgate its own program for control of nonpoint source pollution if the state fails to act or acts inadequately. If a state fails to submit the required report, the EPA must prepare the report itself and then notify Congress (Novick et al. 1994).

States were given the option under section 319 of the CWA of developing either a regulatory or nonregulatory approach to water quality management (EPA 1995a). Although nonpoint source control programs are largely voluntary (IDEQ 1995b), states have the option of implementing regulatory enforcement programs.

• *Who pays for nonpoint source control programs?*— Like the section 208 program that preceded it, the section 319 program relies largely on the "carrot" of federal funding (Novick et al. 1994). The EPA is authorized to provide grants for up to 60 percent of the cost of

implementing approved management programs. The EPA may, in addition, award grants to states for the control of groundwater quality if the state has approved reports and management plans. These grants, however, are limited to 50 percent of total costs with an annual limitation of \$150,000. The 1987 amendments to the CWA authorized appropriations of up to \$400 million over four years for the program (Novick et al. 1994).

In Idaho, federal funds provided by section 319 of the CWA have been used for development of educational materials, installation of bank stabilization mechanisms in grazing areas, development of sediment control structures, monitoring the effectiveness of BMPs, and development and implementation of watershed management plans (IDEQ 1995a,b). In 1995, Idaho received \$1.2 million for section 319 programs (L. Koenig, review comments).

Section 319 outlines a two-step approach which states must follow to qualify for federal grant funds. First, states must identify waters requiring the control of nonpoint sources to attain or maintain applicable standards, and then must identify nonpoint sources of pollution responsible for water quality problems. Next, states develop a strategy to bring nonpoint sources under control. Working with other state agencies, DEQ completed these activities for the state of Idaho in 1995 and began to implement its nonpoint source management strategy (IDEQ 1995a,b).

According to Novick et al. (1994), if the state fails to adopt an adequate nonpoint source management program, the EPA is authorized, with the approval of the state, to provide technical assistance to a local public agency or organization "with authority to control nonpoint source pollution in an adequately large geographic area." If the local authority's management plan is acceptable, they will then be eligible for subsequent receipt of federal funding for implementation of the program (Novick et al. 1994).

1.5. What mechanisms are required to meet CWA goals?

A variety of methods and procedures associated with water quality standards, assessment, and control of sources of pollution are required by

the CWA. An overview of how these different requirements fit together can be attained by understanding the sequence of events in the water quality-based approach to pollution control. This is explained graphically and verbally in the next section. The components of this sequence of events are detailed in sections following that.

1.5.1. What is the "water quality-based" approach to pollution control?

This approach emphasizes the overall quality of water in a water body in addition to the application of technology-based controls. Water quality may be viewed as a response to various sources of potential contaminants, including natural and human-caused or cultural sources; determining what the response will be is a process involving total maximum daily loads (TMDLs) and water quality standards (Novotny and Olem 1994). The water quality-based approach provides a mechanism through which the amount of pollution entering a water body is controlled based on the intrinsic conditions of that body of water and the water quality standards set to protect it (EPA 1995a). Decision makers should be aware of the strengths and limitations as well as the implications of the water quality-based approach to pollution control.

The "TMDL" process, which is at issue in Idaho, is part of the water quality-based approach. A TMDL allocates pollution control responsibilities among pollution sources in a watershed, and is the basis for taking the actions needed to restore a water body (EPA 1996b). The water quality-based approach to pollution control programs through the TMDL process is quite difficult to implement (Hildreth et al. 1993). First, each state must identify all segments of waters for which pollution control requirements are not stringent enough to meet applicable water quality standards (40 CFR 130.7(b)). Then for each water body failing to meet its water quality standards, states must calculate a TMDL (Hildreth et al. 1993).

At this point, a picture is worth at least a thousand words. Figure 1 illustrates the water quality-based approach to pollution control. The cyclical process consists of eight stages (EPA 1995a). Each stage represents a major program of the CWA and each stage involves specific

regulatory requirements and guidance from the EPA. This section summarizes how the different programs fit into the overall water quality control scheme of the CWA. Further details of this process are provided in the EPA's (1995a) Water Quality Standards Handbook, which is summarized as follows.

The first stage, "Determining Protection Level," involves development of water quality standards by the state. This includes the designation of beneficial uses for each water body and criteria to support the uses. In the second stage, "Monitoring and Assessing Water Quality," states identify impaired waters, determine if water quality standards are being met, and detect pollution trends. The CWA requires states to compile data, assess, and report on the status of their water bodies. States generally use existing information and new data collected from ongoing monitoring programs to assess their waters (EPA 1995a).

In the third stage, "Establishing Priorities," states rank water bodies according to the severity of the pollution, the uses to be made of the waters, and other social-economic considerations, and determine how best to utilize available resources to solve problems. In the fourth stage, "Evaluating WQS for Targeted Waters," the appropriateness of the water quality standards for specific waters is evaluated. States may revise or reaffirm their water quality standards. A state may choose, for example, to develop site-specific criteria for a particular stream because a particular species needs to be protected (EPA 1995a). In Idaho that might be for bulltrout or the endangered Kootenai River white sturgeon.

The fifth stage, "Defining and Allocating Control Responsibilities," is the TMDL process. Here the level of control needed to meet water quality standards is established, and control responsibilities are defined and allocated. States use mathematical models and/or monitoring to determine total maximum daily loads (TMDLs) for water bodies; the TMDLs include waste load allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, and a margin of safety. The TMDL is the amount of a pollutant that may be discharged into a water body and still maintain water quality standards. Pollutant loadings above this amount generally will result in waters exceeding or failing to meet

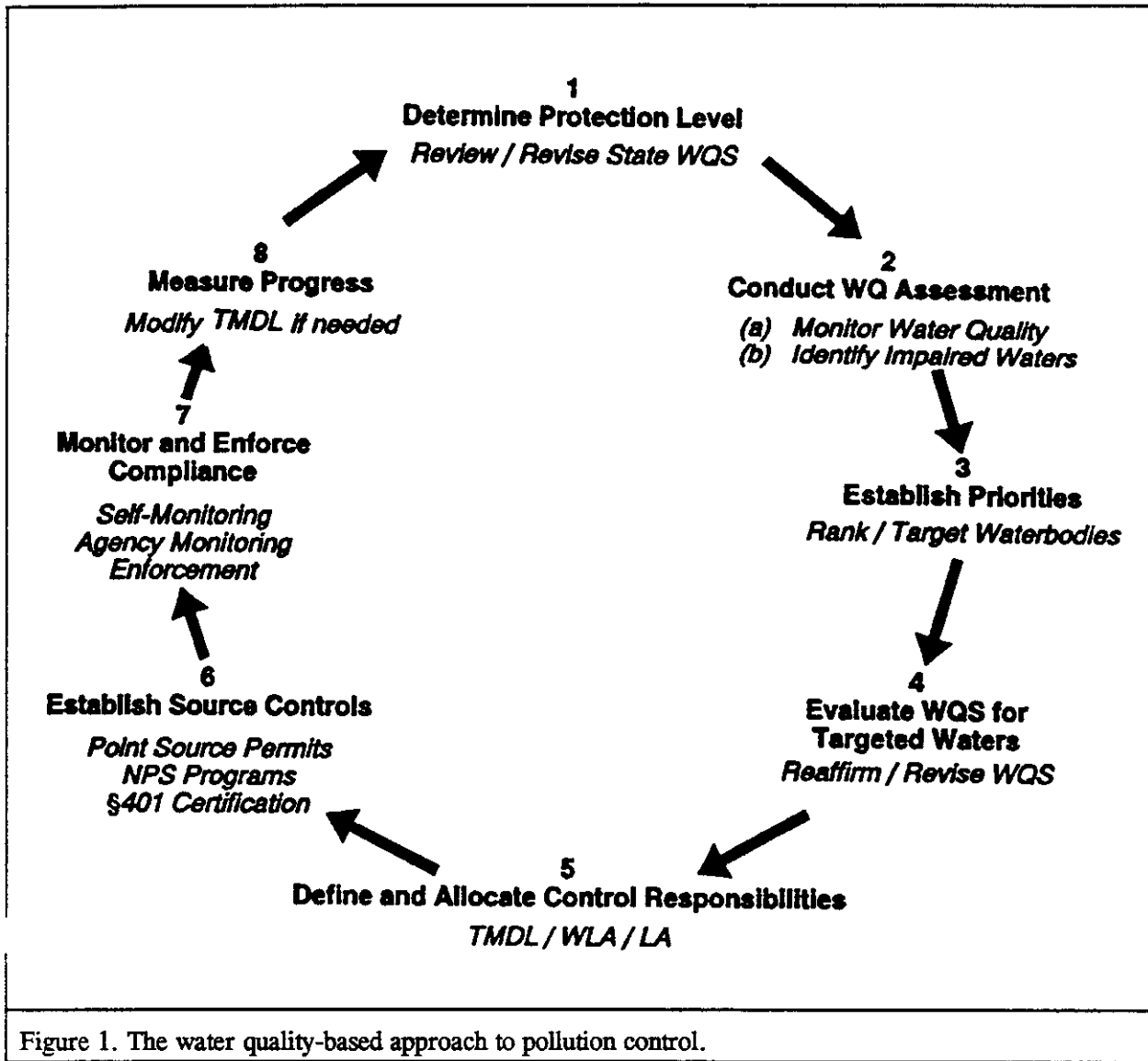


Figure 1. The water quality-based approach to pollution control.

Source: *Water Quality Standards Handbook* (EPA 1995a).

the standards. Allocations for pollution limits for point and nonpoint sources are calculated to ensure that water quality standards are not exceeded (EPA 1995a).

In the sixth stage, "Establishing Source Control," states and the EPA implement point source controls through NPDES permits, state and local governments implement nonpoint source management programs through state laws and local ordinances, and states assure attainment of water quality standards through the CWA section 401 certification process (EPA 1995a).

In the seventh stage, "Monitoring and Enforcing Compliance," states (or the EPA) evaluate self-monitoring data reported by dischargers to see that the conditions of the

NPDES permit are being met and take actions against any violators. Dischargers are monitored to determine whether or not they meet permit conditions and to ensure that expected water quality improvements are achieved. State nonpoint source programs are monitored and enforced under state law and to the extent provided by state law (EPA 1995a).

In the final stage, "Measuring Progress," the states (and the EPA) assess the effectiveness of the controls and determine whether water quality standards have been attained, water quality standards need to be revised, or more stringent controls should be applied (EPA 1995a).

1.5.2. What are water quality standards?

Water quality standards are the principal mechanism for meeting CWA goals (EPA 1995a). Water quality standards in the CWA are legally established rules consisting of two parts: [1] designated uses, which are the purposes or benefits to be derived from a water body; and [2] criteria, which are either numeric or narrative descriptions of chemical, physical, or biological characteristics of the water body and considered as the conditions presumed to support or protect the designated uses (Novick et al. 1994). Federal regulations promulgated by the EPA, and clarified in 1987 by section 303(d)(4) of the CWA, also require an antidegradation policy statement as the third part of a state's water quality standards (Novick et al. 1994, Burk et al. 1995).

Water quality, observed Moore and Flaherty (1996), is a widely used but seldom defined term. Quality implies suitability for a particular use, thus water quality standards are linked with the intended use of the water (Moore and Flaherty 1996). Among others, the CWA recognizes uses for drinking, industry, agriculture, aquatic life support, and recreation. The EPA recognizes 5 types of water bodies: streams, lakes, estuaries, coastal waters, wetlands (Novotny and Olem 1994).

Understanding how water quality standards are developed, measured, and protected is fundamental to understanding how the CWA works. The water quality-based approach to pollution control (see Figure 1) begins with water quality standards and they are central to each stage of the process.

• *Who sets water quality standards?*—

Section 303(c) of the CWA provides the statutory basis for the water quality standards program. The CWA allows states to set their own water quality standards but requires that all beneficial uses and their criteria comply with the goals of the Act (EPA 1995b). The federal regulatory requirements governing the state water quality standards program are generally referred to as the Water Quality Standards Regulation (40 CFR Part 131) (EPA 1995a). Although water quality standards are simple in concept (Hildreth et al. 1993, Novick et al. 1994), the standard setting process is quite complex (Hildreth et al. 1993). Thus EPA regional offices provide guidance as

states develop water quality standards.

Although water quality standards are set by the states, the EPA is responsible for reviewing state standards to assure that they meet the requirements of the CWA (Novick et al. 1994). States must establish, and review every three years, water quality standards for all waters within their jurisdiction; if the EPA determines that they do not meet these requirements, the agency may promulgate necessary changes to the standards which then become the applicable standards for that state (Novick et al. 1994).

• *What is a designated beneficial use?*— At a minimum, designated beneficial uses must provide for “the protection and propagation of fish, shellfish, and wildlife” and provide for “recreation in and on the water” where attainable. These are commonly referred to as the “fishable/swimmable” goals of the CWA. The Act prohibits states and other jurisdictions from designating waste transport or waste assimilation as a beneficial use, as some states did prior to 1972 (EPA 1995b).

For each body of water in the state, one or more uses must be specified and maintained (Novick et al. 1994). For example, designated uses for one stream might include “warm water fishery”; for another it might be “public drinking water supply.”

Idaho designated beneficial uses currently include agricultural water supply, domestic water supply, industrial water supply, cold water biota, warm water biota, salmonid spawning, primary contact recreation, secondary contact recreation, wildlife habitat, and aesthetics (IDEQ 1995a). The process of developing water quality standards is flexible enough that different uses than these could be designated, including subcategories of the above.

The antidegradation policy requires protection of “existing uses” as well as “designated uses.”

• *What are “criteria” in water quality standards?*— In addition to specifying designated uses, the state must also set water quality criteria, or the levels of pollutants in the water that will assure maintenance of the designated use. Criteria are “ambient”; that is, they specify the levels of pollutants in the water body itself rather than in the discharge (Novick et al. 1994). The NPDES point source permits do set limits on discharge concentrations and conditions (G. Ice, review comments).

Criteria can be numeric or narrative. Numeric criteria are statements of the acceptable concentration of a specific substance for a given use; for example, “The nitrate/nitrogen concentration of drinking water shall not exceed 10 mg/l” (Snethen 1989). Narrative criteria are used to describe a desired water quality condition when there is not enough information upon which to specify a numeric criterion; for example, “Nutrients: The discharge of concentrations or loadings of plant nutrients into surface waters from non-natural sources shall be controlled to prevent water quality deterioration that accelerates the natural succession or replacement of biota, or which produces undesirable quantities or kinds of aquatic life” (Snethen 1989).

• **Why are water quality standards important?**— When taken together, the water quality standards statute and regulation are the key components of the CWA (Novick et al. 1994). The CWA mandate to meet water quality standards is the legal basis for nonpoint source controls (Hildreth et al. 1993). Under the CWA, point sources are subject to mandatory effluent limitations that are technology-based. The CWA’s reliance on the water quality-based approach to address nonpoint source pollution will continue unless Congress or the states require certain mandatory controls such as BMPs on nonpoint sources (Hildreth et al. 1993).

Developing water quality standards for a particular body of water is the beginning, but it is merely one step in the ultimate objective of placing enforceable restrictions on sources of pollution (Novick et al. 1994). Additional steps for impaired waters that do not meet the standards include the determination of TMDLs for water bodies and the translation of such loads into specific numerical pollutant limits contained in an NPDES permit (Novick et al. 1994), and the identification and implementation of BMPs for nonpoint source pollution. The water quality standards implementation process involves a combination of complex scientific and policy issues, and is in sharp contrast with the relative simplicity of implementing technology-based limitations on point sources (Novick et al. 1994). The issuance of point source permits based on effluent limitations involves little more than applying specific numerical limitations applicable throughout the country to all sources within a

given industry (Novick et al. 1994).

1.5.3. What is the antidegradation policy?

“Antidegradation” refers to policies and procedures designed to prevent or minimize the reduction of water quality below existing levels (Burk et al. 1995). The EPA derived the antidegradation concept from the CWA goal to “restore and *maintain* the chemical, physical, and biological integrity of the nation’s waters” (Burk et al. 1995, emphasis in original). As a part of the Water Quality Standards Regulation (40 CFR Part 131), the federal government, acting through the EPA, has mandated that states adopt as part of the water quality standards a policy stating that existing water quality, including high quality waters, shall be maintained and protected. The EPA has directed states to develop and adopt statewide antidegradation policies and to identify implementation methods.

Prior to the 1987 amendments, the CWA contained no explicit reference to an antidegradation requirement; legislative history suggests that Congress intended this provision to codify the EPA’s existing antidegradation regulations (Novick et al. 1994). Now the policy of the EPA is based in part on a federal antidegradation policy that preceded the CWA and in part on the specified goals of the Act (Novick et al. 1994).

• **What does the antidegradation policy require?**— Each state is required to develop and implement a statewide antidegradation program, which Coggins and Glicksman (1996) said could impose further constraints on nonpoint sources of pollution. As a minimum, state antidegradation policy must conform to the following three standards, commonly called “tiers”: [1] existing instream uses and the level of water quality necessary to protect them must be maintained; [2] water quality exceeding levels necessary to support propagation of fish, shellfish, and wildlife and recreation must be maintained, unless the state finds that allowing lower water quality is necessary to accommodate important economic and social development; and [3] “high quality waters” constituting an outstanding national resource, such as waters of national and state parks and wildlife refuges must be maintained, as must waters of “exceptional recreational or ecological significance” (Coggins

and Glicksman 1996).

Each of these three levels, or tiers, of the federal antidegradation policy encompasses a set of waters identified by its existing water quality that provides a specified level of protection from "degradation"; the level of protection increases as the various tiers apply to more narrowly limited groups of waters (Morgan 1991). The EPA's rationale behind the antidegradation regulation statement requires implementation of all cost-effective and reasonable BMPs for nonpoint source control" (40 CFR 131.12(a)(2)). This is to assure that in "high quality waters" where there are existing point or nonpoint source control compliance problems, proposed new or expanded point sources are not allowed to contribute additional pollutants that could result in "degradation." Where such compliance problems exist, it would be inconsistent with the philosophy of the antidegradation policy to authorize the discharge of additional pollutants in the absence of adequate assurance that any existing compliance problems will be resolved (EPA 1995a).

Implementing and enforcing the three tiers of the antidegradation policy poses many questions. Idaho is currently attempting to meet Tier 1 requirements by developing TMDLs for impaired waters which will provide information to help bring them up to this minimum level of water quality. Implementing the other two tiers is problematic, and further addressed in Chapter 3.

• *Why is antidegradation controversial?*— On the surface, antidegradation would appear to be an "apple pie and motherhood" issue; after all, said Burk et al. (1995), who could argue with the concept of maintaining water quality? However, implementation of the concept is problematic, and issues arise—such as defining "degradation" to clarify the intent of the regulations—that need to be addressed so antidegradation concepts can be better applied to existing regulatory programs and new water quality initiatives (Burk et al. 1995). The existence of an antidegradation requirement in the original CWA of 1972 has been one of the more controversial aspects of the Act (Novick et al. 1994).

In some states, antidegradation has been a relatively minor, noncontroversial aspect of the water quality program (Burk et al. 1995). That is not the case in Idaho. A citizen conservation

group sued the state in 1987 for failing to implement the antidegradation policy; Idaho was the first state to attempt to devise a coherent strategy for applying water quality standards and the antidegradation requirements to nonpoint source pollution—the result was a negotiated antidegradation agreement issued in 1988 as an Executive Order (Anderson 1987). According to Idaho Rivers United, a citizen conservation group, "Antidegradation didn't work" (IRU 1995; see discussion in section 3.3 of the report). The *Idaho TMDL* lawsuit filed by two Idaho conservation groups has resulted in portions of the 1988 antidegradation agreement being modified by Idaho's new water quality legislation passed in 1995. This legislation is reviewed in Chapter 3.

• *What are "outstanding national resource waters" (ONRWs)?*— According to the EPA (1995a), ONRWs generally include the "highest quality waters" of the United States. This third tier of the EPA's antidegradation policy covers "waters for which the ordinary use classifications and water quality criteria do not suffice." Although "the thrust of the provision" is the protection of "the highest quality waters of the United States," the EPA has said it also protects other waters of "exceptional ecological significance." These are water bodies considered to be important, unique, or ecologically sensitive, but whose water quality as measured by the traditional water quality variables such as dissolved oxygen, pH, and the like, may not be particularly high or whose character cannot be adequately described by these variables (EPA 1995a). Regulations promulgated by the EPA neither define "high quality waters" nor provide guidance on when waters are of exceptional recreational or ecological significance (Coggins and Glicksman 1996).

ONRWs are not mentioned in the Clean Water Act. According to Morgan (1991), the EPA apparently adopted the idea of protecting outstanding water resources from an environmental group's proposals in the negotiations preceding promulgation of the first antidegradation regulations. The ONRW concept arises from a single sentence in the federal antidegradation regulation: "Where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of

exceptional recreational or ecological significance, that water quality shall be maintained and protected" (Morgan 1991). "Degradation" in an ONRW is permitted only on a temporary and short-term basis, which the EPA's guidance documents refer to as "a very narrow exception"; this was added to the regulations in 1983 to address the agency's fear that waters which properly could have been designated as ONRWs were not because states wanted to avoid the flat prohibition on degradation of ONRWs then in effect (Coggins and Glicksman 1996).

An ONRWs category is fundamentally different from traditional use classifications and associated criteria designated to protect the designated uses; although an ONRW may appear within a state's water quality standards and in the federal regulations for those standards, it is not tied to a specific water use (Morgan 1991). The identification of ONRWs is a crucial process because of the stringent limitations associated with the "maintain and protect" standard imposed on these waters in the federal regulation; the restrictive nature of the ONRWs maintenance and protection requirement means that the federal antidegradation policy has a significant impact on activities affecting the water quality of ONRWs (Morgan 1991).

States, according to Morgan (1991), are well-advised to keep in mind the opportunity losses associated with ONRWs status as they contemplate application of the designation on a case-by-case basis, and they may wish to consider factors similar to the cost-benefit analysis required in Florida prior to designation of Outstanding National Resource Waters and Outstanding Florida Waters as one method of building restraint and reason into the identification process (Morgan 1991).

This is a current issue in Idaho because several stream segments have been nominated for the status of "outstanding resource waters" (ORWs), which is closely related to ONRW status. Further discussion of implementing to ORW concept in Idaho is provided in Chapter 3.

• **What are the consequences of violating the antidegradation policy?**— The consequences of violating the antidegradation policy are essentially the same as for violating any other aspects of the CWA's requirements for state establishment and implementation of water

quality standards (Coggins and Glicksman 1996). The EPA has rejected state certifications that section 208 management plans would comply with water quality standards on the basis of failure to comply with the antidegradation policy. If the EPA rejects a section 319 state management program because its nonpoint source controls are considered inadequate, the state becomes ineligible for federal grants to assist in implementing the state water quality management program (Coggins and Glicksman 1996).

1.5.4. What assessments are required?

Among the many reports states are required to submit to the EPA under the CWA, the following three are particularly relevant to nonpoint source pollution. These reports communicate the findings of state assessment processes to the EPA.

• **Section 305(b) Report.**— Every two years states are required to prepare a water quality inventory to document the status of water bodies that have been assessed under section 305(b) (EPA 1995a). Information in the states' 305(b) reports is compiled into a biennial report to Congress; the latest is *The Quality of Our Nation's Waters: 1994* (EPA 1995b).

Idaho did not prepare a water quality assessment for its surface waters in the state's 1994 305(b) report because

[Idaho] was in the middle of a major overhaul of its water quality management program. Idaho is restructuring its program around the watershed protection approach. As a first step, Idaho is redesignating its waterbodies and expanding its assessment database to include smaller streams that previously were not assessed. The State postponed its water quality assessment until all surface waters are designated and classified under a consistent system (EPA 1995b).

The EPA uses information in the states' 305(b) reports for many purposes, including the following: [1] determine the status of water quality, [2] identify water quality problems and trends, [3] evaluate the causes of poor water quality and the relative contributions of pollution sources, [4] report on activities underway to assess and restore water quality, [5] determine the effectiveness of control programs, [6] ensure that pollution control programs are focused on

achieving environmental results in an efficient manner, [7] determine the workload remaining in restoring waters with poor quality and protecting threatened waters, and [8] use information from the lists of waters developed under sections 304(l) for impaired waters—a one-time only list—and 319 for the nonpoint source program; and continue to maintain and update the statutorily-required lists of waters identified under sections 303(d) for water quality-limited segments and 314 for the clean lakes program (EPA 1991b).

For each water body assessed, information is provided on the water quality-limited status, use nonattainment causes and sources, cause magnitude, and source magnitude. Much of the information from the 305(b) assessments provide useful information for developing lists of water quality-limited segments asked for in section 303(d) (EPA 1991b).

• **Section 319 Report.**— This section of the CWA was added by the 1987 Water Quality Act Amendments establishing a national program to control nonpoint source pollution. States are asked to assess their nonpoint source pollution problems and submit that assessment to the EPA. Based on these assessments, state nonpoint source management programs are prepared and presented to the EPA for approval. Once these programs are approved, grant funds are made available to implement the program.

Section 319 assessments identify waters with impairments due primarily to nonpoint sources for which TMDLs may need to be developed to establish protection of water quality. The EPA encourages the states to use TMDLs where appropriate to achieve or protect beneficial uses of the water (EPA 1991b).

• **Section 303(d) Report.**— States are required to identify waters that do not or are not expected to meet applicable water quality standards with technology-based controls alone. States are required to establish a priority ranking for these waters, taking into account the pollution severity and designated uses of the water. Then states are to develop TMDLs “at a level necessary to achieve the applicable State water quality standards” (EPA 1991b). States are required to submit to the EPA the “waters identified and loads established” for review and approval. If disapproved, the EPA will establish the TMDLs “at levels necessary to implement the applicable

water quality standards” (EPA 1991b).

States must regularly update their lists of impaired waters as assessments are made and report these lists to the EPA once every two years. In their biennial submission, states should identify the water quality-limited waters targeted for TMDL development in the next two years, and the pollutants or stressors for which the water is water quality-limited (EPA 1995a).

1.5.5. What is the “total maximum daily load” (TMDL) process?

TMDLs are the total amounts of a particular pollutant that sources can discharge without violating water quality standards (Novick et al. 1994). The TMDL process is part of the water quality-based approach to pollution control devised by the EPA to implement the CWA (see Figure 1).

The development of TMDLs establishes the link between water quality standards and point source pollution control actions such as NPDES permits and nonpoint source pollution control actions, including BMPs (EPA 1995a). A TMDL calculates allowable loadings from the contributing point and nonpoint sources to a given water body and provides the quantitative basis for pollution reduction necessary to meet water quality standards (EPA 1995b). TMDLs are subject to review and approval of their adequacy by the EPA (Novick et al. 1994).

The TMDL process demands much information gathering, analysis, and professional judgement. Water quality management has become increasingly complicated as the EPA has been promoting and enforcing the TMDL process (Novotny and Olem 1994). The process establishes the allowable pollution loadings for a body of water based on its loading capacity and thereby provides the basis for the states to establish water quality-based controls (Novotny and Olem 1994).

The TMDL process relies on being able to calculate the quantity of a specific pollutant that a water body can assimilate and be within water quality standards. When standards have numeric criteria associated with the designated uses, a permissible quantity of pollution is determined on an average daily basis and divided up among point source operators as their allocation of permissible pollutants. It is less clear how

nonpoint sources are dealt with in the TMDL process, except that in the EPA's (1995a) Water Quality Standards Handbook and guidance documents (EPA 1991b), BMPs are the only recognized control mechanism for nonpoint source pollution through the TMDL process. However, the EPA is in the process of developing a TMDL program implementation strategy which should help clarify the TMDL process for nonpoint sources (EPA 1996b).

The Idaho Division of Environmental Quality

(DEQ) is responsible for the TMDL process. Table 1 identifies the main ideas in the concept of a TMDL, the steps involved in developing a TMDL, and the output of the TMDL process. These points are all currently being reconsidered as a result of a September 26, 1996, court ruling in the *Idaho TMDL* suit (L. Koenig, review comments). This litigation is reviewed in Chapter 2.

Table 1. What is a TMDL?

▣ A TMDL or Total Daily Maximum Load is a tool used in the development of a watershed management plan which determines the amount of pollution the water body can receive from various sources in the watershed.

▣ A TMDL allocates pollution control responsibilities among pollution sources in a watershed, and is the basis for taking the actions needed to restore a water body (EPA 1996b).

▣ A TMDL is defined in federal regulations (40 CFR 130.2(I)) as the sum of individual point source and nonpoint source pollutant loads expressed as mass/time, toxicity, or other appropriate measure, with a margin of safety. The margin of safety accounts for uncertainty of calculated pollutant loads and receiving water body estimates.

Five Steps to Developing a TMDL:

- ✓ Selection of the pollutant to consider
- ✓ Estimation of the amount of pollutant the water body can receive and not become polluted
- ✓ Identification of the amount of pollution from each of the polluting sources in the watershed
- ✓ Determination of the amount of pollution the water body may receive from each source of pollution in the watershed
- ✓ Margin of safety to account for any uncertainties in the mathematical calculations used

The TMDL Process Will Provide:

- ✓ An inventory of all sources of the pollutant of concern
- ✓ An analysis of why current pollution controls are not effective
- ✓ A plan to monitor and evaluate progress toward water quality goals
- ✓ A list of pollution control strategies for reducing sources of pollution
- ✓ A prediction of the amount of time needed to restore and protect water quality

Source: Clearwater Basin Advisory Group (CBAG 1996); *Draft TMDL Program Implementation Strategy* (EPA 1996b).

Standards are required to identify and evaluate water-quality limited waters, and the general procedure to analyze impaired waters is to assess the problem, formulate a management plan, implement the plan, and monitor for compliance and effectiveness (Griffin et al. 1991). This procedure is appropriate from a project execution viewpoint; but in an attempt to organize the technical needs of the process,

water quality standards, pollutant loadings, and costs must be known (Griffin et al. 1991). Therein lie three rather substantial problems.

The following questions and their replies reveal that the TMDL process is, as Novick et al. (1994) put it, "difficult, inexact, and controversial." These legal scholars were only referring to point sources, but they recognized that nonpoint sources were even more

problematic. The EPA is currently reevaluating the TMDL implementation strategy (EPA 1996b). Nevertheless, TMDLs are required by the CWA, and according to the EPA (1991b, 1995a), the TMDL process is a rational method for weighing the competing pollution concerns and developing an integrated pollution reduction strategy for point and nonpoint sources. The TMDL process allows states to take a "holistic view" of their water quality problems from the perspective of instream conditions (EPA 1991b, 1995a).

• **Where is a TMDL required?**— Although EPA guidelines are vague on which waters must have a TMDL (see EPA 1991b, 1995a) and the agency said states are to develop and implement TMDLs for high-priority impaired or threatened waterbodies (EPA 1995b), the CWA is somewhat clearer. Under section 303(d) of the CWA, states are required to determine TMDLs for all waters that will not achieve water quality standards after technology-based effluent limits have been applied (Novick et al. 1994). States must identify waters for which pollution control requirements, including BMPs, are not stringent enough to meet applicable water quality standards (40 CFR 130.7(b)). The CWA requires that these waters be identified as "water quality-limited segments" and placed on what is generally called a "303(d) list." The term "water quality-limited waters" is commonly used to avoid definition problems with defining lake "segments."

TMDLs must be developed for all waters on the "303(d) list." More specifically, "Each state shall establish for the waters identified in paragraph (1)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load..." (CWA § 303(d)(1)(C)). What is not so clear is which waters belong on the "303(d) list" and how they get there (L. Koenig, review comments). In part, paragraph (1)(A) states, "Each state shall identify those waters within its boundaries for which the effluent limitations required by section 301(b)(1)(A) and section 301(b)(1)(B) are not stringent enough to implement any water quality standard applicable to such waters." This has been a major issue in Idaho as legal action expanded the "303(d) list" from 36 to 962 waters. Section 2.2 of this report attempts to explain why.

• **When is a TMDL required?**— There is no timeline for TMDLs specified in section 303(d) of the CWA. Once waters needing additional controls have been identified, a state prioritizes its list of waters using established ranking processes that should consider the severity of the pollution, the uses to be made of such waters, and all water pollution control activities within the state. A priority ranking should enable the State to make efficient use of its available resources while meeting CWA goals (EPA 1995a).

States are required to submit the priority rankings on their "303(d) list" to the EPA for review, and the agency expects all waters needing TMDLs to be ranked. "High" priority waters are to be targeted for initiation of TMDL development within two years following the listing process (EPA 1991b, EPA 1995a). The two year time frame in the federal regulations (40 CFR 130.7(b)(4)) only requires states to "include the identification of waters targeted for TMDL development in the next two years" in their priority ranking. This does not require all "high priority" or any other specific subset of the list be addressed in two years, it is merely a reporting requirement (L. Koenig, review comments). To effectively develop and implement TMDLs for all waters identified, states should establish multi-year schedules that take into consideration the immediate TMDL development for targeted water bodies and the long-range planning for addressing all water quality-limited waters still requiring TMDLs (EPA 1995a). The EPA plans to offer more guidance to states through its interim TMDL implementation strategy that is to be issued in Spring 1997 (EPA 1996b).

• **How are TMDLs developed?**— Until recently, the EPA has provided virtually no guidance in the development of proper methods of pollution allocation; states may allocate pollution as they wish, provided that the results protect water quality standards (Novick et al. 1994). Recent litigation in 22 states is changing the EPA's stance, as detailed in section 2.1 of this report. The EPA's interim TMDL implementation strategy that is to be issued in Spring 1997 should provide states with more guidance (EPA 1996b).

The total pollutant load into a water body is made up of three components: background (or

natural) sources, point sources, and nonpoint sources (Griffin et al. 1991, Novotny and Olem 1994). By definition, background or natural loads are not pollution and do not have to be mitigated under the CWA; point and nonpoint sources must be reduced if their quantity exceeds the waste-assimilative capacity of the water body, or what is more commonly called its loading capacity (Novotny and Olem 1994). One problem is to define what portion of the nonpoint source loads are actually natural levels and what are controllable from land use; this separation sounds easy, yet is "very elusive and controversial" (Shuyler and Grubbs 1989). Another problem is determining the timing of the load contribution. For example, in Oregon's Tualatin River, controls on phosphorous loads are designed to address critical low-flow, high temperature periods when algae blooms occur. Are winter sediment loads from rural and urban areas contributing to summer loads? Published evidence suggests that winter sediment deposition in the channel is not a factor (G. Ice, review comments).

To understand the TMDL pollution allocation process, it is necessary to know a few basic terms and concepts. Loading capacity (LC) is the maximum amount of a pollutant a body of water can receive without violating state water quality standards for that pollutant in that water body. LC has four component parts: [1] background load (BL) is the amount of the contaminant from "natural" sources; [2] waste load allocation (WLA) is the portion of the loading capacity to be allocated to point sources; [3] load allocation (LA) is the portion of the loading capacity to be allocated to nonpoint sources; and [4] a margin of safety (MOS). The TMDL is the maximum daily amount of a pollutant that can be discharged without exceeding the loading capacity of a body of water; the TMDL is equal to the sum of these four components.

The TMDL approach evaluates material and energy loadings to streams based on the loading capacity and the beneficial uses of the stream (Ice 1991). The beneficial uses dictate the water quality requirements of the stream. Streams with large water discharges likely would have large loading capacity (LC); loadings come from natural background loading (BL) contributions, waste load allocations (WLAs) from point

sources and load allocations (LAs) from nonpoint sources (Ice 1991). The basic equation is:

$$LC = BLs + WLAs + LAs + MOS$$

BLs are natural background loads and do not need to be controlled; WLAs are controlled through the National Pollution Discharge Elimination System (NPDES) permit program for point sources; and LAs are nonpoint source contributions generally controlled by best management practices, or BMPs (Ice 1991). A margin of safety (MOS) is required by the CWA, and its inclusion makes apparent the trade-off between large uncertainties and that portion of the loading capacity available for WLAs and LAs (L. Koenig, review comments).

Establishing water quality standards and TMDLs has practical and logistical problems (Hildreth et al. 1993). For example, if a stream segment does not meet water quality standards criteria for bacteria, the state must determine the loading capacity (LC); that is, how much bacteria can the stream assimilate before it exceeds the standard? Although assimilative capacity is an important concept, in practice it is almost impossible to determine because in most cases there is insufficient data or lack of understanding as to how aquatic systems process pollution (L. Koenig, review comments). Then the state must attempt to locate *all* point and nonpoint sources of bacteria that affect the stream and allocate limitations on the amount of bacteria they *individually* may discharge without violating the TMDL. Because of financial and technical restrictions, few states have established water quality standards for traditional nonpoint source pollutants, such as pesticides and nutrients, and even fewer have attempted to calculate TMDLs for nonpoint source pollutants (Hildreth et al. 1993, emphasis in original).

• *How is the TMDL process linked to pollution control mechanisms?*— The linkage is accomplished by dividing up or allocating the permissible pollution load among the sources of pollution impacting the water body in such a way that water quality standards are not violated. For sources exceeding this quantity, pollution controls necessary to reduce the load allocation for sources are identified in the TMDL process. The reply to this question is at the core of the EPA's concept of TMDLs as a way to protect designated uses. In its TMDL guidance document, the EPA (1991b) says states should

describe nonpoint source load reductions and establish a procedure for reviewing and revising BMPs in TMDL documentation. However, two links have yet to be forged between water quality standards and nonpoint source controls: [1] determining numeric criteria in water quality standards that will protect biological communities from diffuse pollution, and [2] determining load allocations for diffuse or nonpoint source pollutants. Some progress has been attained with load allocations because the CWA requires it.

The technical difficulty of determining numeric criteria for diffuse pollutants, especially sediment, is a major problem with applying the TMDL concept to nonpoint source pollution. Allocating pollution loads is analogous to using water quality standards to set point source effluent limitations (Snethen 1989). The procedure requires establishing a water quality criterion and then working backwards to an allowable load rate from the pollutant source. A major difficulty in applying this approach to nonpoint sources is establishing appropriate water quality criteria. Because numeric criteria are generally not available, application of narrative criteria in load allocations requires translating narrative to numerical criteria. For example, practical experience in Kansas is based on long-term averages; the relationships between biological assessments of quality conditions and suspended sediments and nitrate concentrations are "somewhat weak and subject to questions of credibility" (Snethen 1989).

Although the difficulty in translating narrative criteria to numeric targets is huge and subject to great criticism, perhaps an even greater problem in applying TMDLs to nonpoint sources is adequately quantifying nonpoint source contributions and distinguishing them from natural background load contributions (L. Koenig, review comments).

Once the issues concerning standards and loadings for nonpoint source pollutants have been addressed, control technologies must be selected (Griffin et al. 1991). Translating the pollution allocation into a specific numerical permit limitation is the final step in the implementation of water quality standards (Novick et al. 1994).

Perhaps the principal problem in developing TMDLs is definitively linking instream monitored values of pollutants to sources of polluted runoff. This problem has legal and

policy difficulties as well as technical difficulties. Whether or not it is technically possible to establish and measure realistic numeric values for pollutants such as sediments and nutrients, the larger degree of difficulty involves linking and allocating pollution loads to control programs, which raises political problems. Referring to political problems with TMDL allocation to point sources, Novick et al. (1994) described a scenario illustrating their point that "time and time again, the TMDL process has been shown to be [politically] impossible."

Given these difficulties, adaptive management may be an appropriate approach (T. Cundy, review comments). Action is taken to meet water quality goals, monitoring is used to determine if the goals are met, and adaptations to management actions are made incrementally. If the goal proves unattainable, then water quality standards are developed locally (T. Cundy, review comments).

In the *Idaho TMDL* case, Judge Dwyer recognized that the TMDL process by itself does not improve water quality. Instead, the TMDL is a planning device for dividing permissible amounts of a contaminant among producers of the contaminant. Control of nonpoint source pollution relies upon implementation of BMPs. Thus the TMDL process is not a substitute for BMPs, but part of a larger analytical context in which BMPs also fit. That context is the water quality-based approach to pollution control.

The design of and compliance with cost-effective and reasonable BMPs remains a problem whether or not a water body has a TMDL. The control of nonpoint source pollution will still depend on effectively designed BMPs and their implementation by forestry, mining, grazing, and agricultural interests.

• **Analysis: What are the potential benefits and disadvantages of the TMDL process?—**

This is an important question for decision makers to consider because if Idaho does not develop TMDLs, the EPA is required to.

The benefits of the TMDL process are a specification through an analytically driven process of what actions are necessary to improve water quality-limited waters. The disadvantages of the TMDL process are that it is technically difficult and requires substantial amounts of data and analysis, and thus expenditures.

In concept, load allocations for nonpoint

sources in the TMDL process are appropriate and fair because pollution control responsibility is distributed among all management activities (Ice 1991). Technical problems with this approach include difficulties in: [a] determining loading capacity, [b] separating background load contributions from those caused by impacts from land-use activities, [c] developing compliance monitoring, and [d] feedback to control mechanisms, specifically BMPs (Ice 1991). Because water quality monitoring and enforcement resources are limited, it is important to prioritize management controls and compliance monitoring based on the relative risk to water quality imposed by management activities (Ice 1991).

Some modification to the TMDL approach, consistent with EPA guidance, might be necessary to achieve water quality protection and compliance monitoring objectives (Ice 1991). Given the political difficulty of allocating pollution among competing interests in a watershed (see Novick et al. 1994), some modification seems appropriate.

Idaho is currently working with the EPA to develop a TMDL process. Case examples of TMDLs show costs can range from \$4,000 to more than \$1 million; the sediment TMDL for Idaho's South Fork of the Salmon River cost the state of Idaho less than \$20,000 (EPA 1996a). However, in-kind contributions of data, models, and analysis from federal agencies may have been more than \$1 million (Megahan and Ice 1996). Idaho's Cascade Reservoir TMDL has cost more than \$1 million.

When point sources and nonpoint sources are involved, one of the benefits to the TMDL process lies in effectively understanding the marginal costs associated with the individual control options (Griffin et al. 1991). Technology-based minimum levels of point source treatment have achieved up to 80% removal of some pollutants; consequently, further point source treatment can only achieve increments of pollutant removal at increasingly greater unit costs (Griffin et al. 1991). By contrast, nonpoint source controls are often not implemented at all or are implemented at a low level so that the marginal cost for a unit of pollutant removal is still low; initiating nonpoint source controls may be the most cost-effective method of achieving regional water quality goals

(Griffin et al. 1991). This benefit disappears if only point sources impact water quality; the benefit exists when both point and nonpoint sources affect water quality.

The TMDL concept promises the benefit of a rational comprehensive framework within which to target sources of water quality impairment for control programs. Because the TMDL process is subject to judicial review by the federal courts and BMP implementation for nonpoint source pollution control is not, the TMDL process offers an avenue for interest groups who are dissatisfied with state programs to control nonpoint source pollution to, at minimum, draw attention to the problem by forcing the state, or the EPA if the state defaults, to develop TMDLs.

The implications of Idaho defaulting to the EPA on TMDL development are unknown, because they depend on the results of litigation now underway. From the literature, only two things are clear and one is irrelevant in Idaho. First, a default decision by Idaho on TMDL development could interfere with the authority of the state to issue NPDES permits for point source activities. However, the issue is irrelevant because Idaho has not sought such authority from the EPA, which retains NPDES permit authority in Idaho. Second, the EPA can withhold CWA section 319 program implementation grants that otherwise might come to the state. In 1995, that amounted to \$1.2 million; in total, Idaho received about \$11 million in federal CWA funding (L. Koenig, personal communication).

Another implication is worth considering, although it is speculative at this point. Coggins and Glicksman (1996) analyzed nonpoint source case law and developed a rationale for arguing that watersheds are protected under federal statutes. Because case law says federal land managers must adhere to state water quality policy, if state policy is in some way deficient—and that may perhaps include the development of TMDLs—it is conceivable that federal courts may decide to enjoin federal land-use activities until such time as states develop TMDLs for water quality-limited waters. This, of course, is a significant issue in Idaho and other states with large federal land holdings.

Literature often cites the need for better data on the effectiveness of BMPs, but the TMDL process makes it more important that the *amount*

of load that is being treated is recognized (Griffin et al. 1991, emphasis added). Implementing the TMDL process depends on monitoring to determine whether the load allocation from nonpoint source pollution is being met.

Monitoring TMDL load allocations entails significant expenditures for a result that indirectly links beneficial use protection standards with pollution control measures. There would be less of a problem if numeric standards could be developed, but given the high degree of variability with sedimentation processes there is little if any support in the literature for being able to establish meaningful numeric standards for sediment. When nonpoint sources are the problem, on-land monitoring of the implementation and compliance of control actions, such as BMPs, is not only a more direct approach to supporting designated uses than monitoring TMDL load allocations, it also is less subject to the problems of attempting to determine numeric standards for sediment to support aquatic life. Determining whether or not BMPs are effective at supporting water quality standards does necessitate monitoring of instream water quality characteristics.

Attempting to allocate pollutant loads among nonpoint sources in a watershed can be difficult, depending on the relative difficulty of tracing polluted runoff to its source. To meet CWA mandates in watersheds where nonpoint sources are the primary—or, in many forested watersheds, the only—water pollution problem, a TMDL “equivalent” process is more feasible, and will provide useful information by identifying and addressing general problems in the watershed.

The dilemma state agencies and the EPA face with the TMDL process is illustrated by experience in the Tualatin watershed near Portland, Oregon (Ice 1996). The setting and review of waste load allocations for that basin have continued since 1987; millions of dollars have been spent on study and control of identified pollutants, yet the process continues (Ice 1996).

For the purpose of getting waters off the “303(d) list,” the Oregon Department of Environmental Quality has developed a “Draft Guidance on Developing Water Quality Management Plans that Will Function as Nonpoint Source TMDLs” (Ice 1996). The

guidance states:

To be acceptable as a nonpoint source TMDL, a water quality management plan must be a thorough, phased, objective-driven, well-funded, fully monitored, multi-year watershed enhancement approach with significant commitment demonstrated by local landowners and managers (Oregon Dept. of Environmental Quality, cited in Ice 1996).

Abatements of sediment and other pollutants from nonpoint sources are not controlled by TMDL allocations among the operators in the watershed, but through the application of BMPs. The TMDL process or its equivalent can be beneficial by functioning as a tool for identifying and analyzing problems. Although information from the TMDL process is valuable for identifying effective pollution control strategies, if development of TMDLs siphons water quality program resources that could otherwise be used to develop, implement, and monitor an effective BMP program, then an argument can be made that the TMDL process has a disadvantage. For example, Russell (1997) reported that the legislatively funded Clean Lakes Coordinating Council had half its funding cut this year due to cutbacks at the DEQ, “which is shifting all its resources into monitoring streams to comply with a judges’ order.” Council executives said their work will complement that monitoring effort and allow the council to continue its work and attract additional grant funding. That work involves implementing the eight lake protection plans developed for northern Idaho. Only those for Priest and Pend Oreille lakes have been funded (Russell 1997).

1.5.6. What are best management practices (BMPs)?

BMPs are methods and practices or combinations of practices for preventing or reducing nonpoint source pollution to a *level compatible with water quality goals* (Novotny and Olem 1994, emphasis in original). In the EPA’s water quality-based approach to pollution control (see Figure 1), mechanisms are required to control point source and nonpoint sources of pollution. In section 319 of the CWA, best management practices (BMPs) are recognized as the primary mechanism to enable achievement of water quality standards when nonpoint sources are involved (EPA 1995a). The antidegradation policy requires

“cost-effective and reasonable BMPs for nonpoint source control” (40 CFR 131.12(a)(2)).

The EPA has provided only the most general definition of BMPs (Novick et al. 1994) The EPA’s Water Quality Management Regulations define BMPs as

methods, measures or practices selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to structural and non-structural controls and operation and maintenance procedures. BMPs can be applied before, during and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.6(e)(4)).

The CWA and its implementing regulations thus authorize virtually any form of control technique under the umbrella of the term “best management practice” (Novick et al. 1994).

• *What are some examples of BMPs?—*

Table 2 presents a partial list of BMPs available in various sectors. Of particular note is that some BMPs are useful in several different sectors, including buffer strips. These are especially useful in riparian zones, where buffer strips are considered to be the most important factor influencing nonpoint source pollutants entering surface waters in many areas of the United States (Gilliam 1994).

Table 2. Examples of best management practices (BMPs)	
<p>AGRICULTURE</p> <ul style="list-style-type: none"> - Animal waste management - Conservation tillage - Contour farming - Contour strip cropping - Cover crops - Crop rotation - Fertilizer management - Integrated pest management - Livestock exclusion - Range and pasture management - Sod-based rotations - Terraces <p>CONSTRUCTION</p> <ul style="list-style-type: none"> - Disturbed area limits - Nonvegetative soil stabilization - Runoff detention/retention - Surface roughening <p>URBAN</p> <ul style="list-style-type: none"> - Flood storage - Porous pavements - Runoff detention/retention - Street cleaning 	<p>FORESTRY (or Silviculture)</p> <ul style="list-style-type: none"> - Ground cover maintenance - Limiting disturbed areas - Log removal techniques - Pesticide/herbicide management - Proper handling of haul roads - Removal of debris - Riparian zone management - Road and skid trail management <p>MINING</p> <ul style="list-style-type: none"> - Block-cut or haul-back - Underdrains - Water diversion <p>MULTICATEGORY</p> <ul style="list-style-type: none"> - Buffer strips - Detention/sedimentation basins - Devices to encourage infiltration - Grassed waterway - Interception/diversion - Material ground cover - Sediment traps - Streamside management zones - Vegetative stabilization/mulching

Source: *Guidance for Water Quality-Based Decisions: the TMDL Process* (EPA 1991b).

Riparian zones are the moist areas close to stream channels (Hornbeck et al. 1984). Riparian zones are the heart of an ecologically healthy watershed (Naiman et al. 1992). Leaving a strip of trees and other vegetation,

termed buffer strips, in the riparian zone so that streams are separated from roads and harvest areas is a recommended way to protect against sedimentation and temperature problems (Hornbeck et al. 1984). Buffer strips protect

stream banks and channels, provide shade, and prevent logging slash and eroding soil from entering streams (Hornbeck et al. 1984). Riparian buffers are also important as wildlife habitat and as a source of large woody debris, which provides fish habitat in the stream. Guidelines for buffer strip design are available in many sources, including Belt et al. (1992) and O'Laughlin and Belt (1995) for forested watersheds, and Dabney et al. (1993) and Novotny and Olem (1994) for agriculture.

Vegetative buffer strips can be 80-90% effective at sediment control (Asmussen et al. 1977, Lee et al. 1989, Hamlett and Epp 1994, Novotny and Olem 1994). Several studies have measured >90% reductions in sediment and nitrate concentrations in water flowing through vegetation in riparian areas, making these areas very valuable for removing nonpoint source pollution (Gilliam 1994).

Some BMPs are more effective than others in protecting water quality (Novotny and Olem 1994). Variability in BMP effectiveness can be extreme (Novotny and Olem 1994). BMPs may not have a direct measurable benefit to the land or the water immediately adjacent to the land to which they are applied; that is, water quality benefits and impacts are off-site (Novotny and Olem 1994).

The agricultural and forestry sectors are used to illustrate BMP application to nonpoint source pollution. Effective BMPs must be economically and technically feasible. Some BMPs are more effective than others, depending on a variety of factors; the selection of effective BMPs depends on knowledge of the pollutant of concern (Novotny and Olem 1994). Many programs or methods at the state and federal level are used to get BMPs installed (Novotny and Olem 1994). It should be recognized that in Idaho implementation of forestry BMPs is done through a regulatory process and agricultural BMPs take a nonregulatory approach.

• **Agricultural BMPs.**— Sediment transport, erosion, and sedimentation have been a popular subject of research for more than 80 years, but current agricultural management techniques contribute to the problem of diffuse or nonpoint source pollution (Novotny and Olem 1994). Most of the technology to control agricultural nonpoint pollution is currently available (Novotny and Olem 1994).

Each year the periodical *Water Environment Research* publishes a review of literature related to nonpoint source pollution, including policy, economics and management issues; effects and extent of pollutants in surface and ground water; pollution controls; and modeling and monitoring (Line et al. 1996, for example). The use and refinement of BMPs is an important issue that much research is devoted to, with most attention given to agricultural pollution sources (Line et al. 1996). It is beyond the scope of this report to review that literature. Suffice it to say that there is a wide and deep body of recent literature on agricultural BMPs.

Agricultural BMPs focus on vegetation management, erosion and sediment control, animal waste management, irrigation control, and on the various methods of source control for soluble agrochemicals (Roesner and Ott 1995). Table 2 provides some examples of agricultural BMPs.

Livestock grazing BMPs for riparian areas focus on nutrient management, fecal bacteria, sediments, streambanks, fish, wildlife, and vegetation in the riparian ecosystem. BMPs control the timing, frequency, and intensity of livestock use (Mosley et al. 1997). Buffer strips are also BMPs for livestock grazing in riparian areas.

• **Forestry BMPs.**— BMPs are a system and a process as much as they are individual practices. Forestry BMPs include methods, measures, and practices designed to minimize water pollution resulting from disturbance of the forest floor and soils in the conduct of forestry or silvicultural operations; BMPs also include structural and nonstructural measures, operational and maintenance procedures, and distribution and scheduling of activities (SAF 1995). These are all aimed to minimize soil erosion and stream sedimentation, and together comprise a system of interacting measures, rather than single practices, for application on a site-specific basis to reflect site-specific conditions. BMPs differ mainly with regional variations in forest vegetation, terrain, and climate (SAF 1995).

Research indicates that almost all sediment reaching waters from forest lands originate from the construction of logging roads (Haupt 1959, Beschta 1978). Researchers estimate that 80% of the deterioration in the water quality of forest streams is caused by suspended sediment from

soil erosion; logging roads and skid trails cause a disproportionate share of this problem, probably greater than 90% in most areas (Hornbeck et al. 1984). Although clearcut harvests are also a source of sediment (Beschta 1978, Cheng 1988), the chief sources of sediment in forest watersheds are roads that disturb the natural drainage channels (Novotny and Olem 1994). BMPs for road and skid trail construction and maintenance therefore deserve special attention.

The potential of forest management to adversely affect water quality is of concern and has resulted in hundreds of research projects investigating the effects of particular forestry practices on water quality (SAF 1995). Although some of the major findings are included here, a thorough summary of this large body of literature is beyond the scope of this report. The literature has been reviewed elsewhere by others, including Brown (1983), Salo and Cundy (1987), and Ellefson et al. (1995).

Beginning early in this century, research has developed the conceptual basis for protecting the water quality of forests using BMPs (SAF 1995). A solid base of knowledge from the physics, chemistry, and taxonomy of forest soils has been applied to designing upland and wetland management strategies. Recent research provides an increased understanding of how forest vegetation influences water quality and stream functions and how management can minimize negative impacts (SAF 1995).

The public, and many foresters and land managers, however, presume that relevant information does not exist (SAF 1995). The use of BMPs for nonpoint source pollution mitigation has proven effective (Lynch and Corbett 1990, Binkley and Brown 1993a,b). However, there remains considerable room for improvement in both the rate of compliance and degree to which BMPs are correctly applied (SAF 1995). In Idaho compliance rates are 92%, and where BMPs are correctly installed, they are 99% effective at pollution control (IDEQ 1993).

Developments since 1987 in state and federal agency water quality protection programs suggest that water quality protection on forest lands is being taken more seriously, and that protection on rangelands is at least beginning to receive some attention (Brown et al. 1993).

There seems to be general agreement among the state and federal agencies that specifying

BMPs is the most practical approach to meeting water quality standards on forest lands; how those BMPs will be specified is a complex matter, especially if an attempt is made to select the most cost-effective BMPs (Brown et al. 1993). Specifying BMPs to reach water quality standards in a cost-effective manner requires an understanding of the complex relations between land disturbance and downstream water quality, as well as of the costs of alternative practices. The complexity arises partly from the difficulty of distinguishing among the individual upstream causes of water quality impairment. Sorting this out is a formidable task with nonpoint source pollution (Brown et al. 1993).

Complexity also arises from the need to separate natural from management-caused water quality degradation in the context of variable weather events (Brown et al. 1993). The iterative process of BMP specification, use, monitoring, and then fine-tuning of BMP specifications for future applications is the key to cost-effective BMP use and effective water quality protection, and relies heavily on gradually improved understanding of the effect of site-specific land management controls on downstream water quality (Brown et al. 1993).

The Society of American Foresters Task Force on CWA Reauthorization (SAF 1995)—citing Lynch and Corbett (1990) and Meehan (1991)—stated that pollution can be greatly reduced by BMPs but complete elimination of all sediment is both impossible and counter-productive. The Task Force pointed out that some sediment is needed to provide nutrients for aquatic organisms as well as anchorage for plants and hiding and spawning places for fish. With conscientious application of BMPs most human-caused nonpoint source pollution resulting from silvicultural practices can be held close to natural levels (SAF 1995).

1.5.7. Why is monitoring important?

Monitoring is a crucial element of water quality-based decision making, used in many steps of the process (EPA 1991b, 1995a; see Figure 1). Monitoring consists of data collection and sample analysis performed using accepted protocols and quality control procedures. Monitoring also includes subsequent analysis of the body of data to support decisionmaking. Monitoring focuses

on a combination of chemical, physical, and biological water quality characteristics (or parameters or variables):

- *Chemical data* often measure concentrations of pollutants and other chemical conditions that influence aquatic life, such as pH (i.e., acidity) and dissolved oxygen concentrations. The chemical data may be analyzed in water samples, fish tissue samples, or sediment samples.
- *Physical data* include measurements of temperature, turbidity (i.e., light penetration through the water column), and solids in the water column.
- *Biological data* measure the health of aquatic communities. Biological data include counts of aquatic species that indicate healthy ecological conditions.
- *Habitat data*—and ancillary land-use and other types of data—help interpret the above monitoring information (EPA 1995b).

Monitoring agencies change the parameters or variables, sampling frequency, and sampling site selection to meet program objectives and funding constraints. Sampling may occur at regular monthly, quarterly, or annual intervals, irregular intervals, or during one-time intensive surveys. Sampling may be conducted at fixed sampling stations, randomly selected stations, stations near suspected water quality problems, or stations in pristine waters (EPA 1995b).

• *What are some objectives for a monitoring program?*— It is necessary to define what type of information is desired as a result of a monitoring program, and then design the monitoring system to produce that information; it is no longer acceptable for water quality managers to collect data and then “see what it says” (Ward 1996). Three objectives that are important for implementing the CWA are determining what background or natural water quality characteristics are, to what extent beneficial uses are supported, and whether pollution control programs are effective.

Monitoring provides data for assessing compliance with water quality-based controls and for evaluating whether water quality standards are protected (EPA 1995a). Monitoring water quality is essential for understanding the relationships between land disturbance in forested watersheds and water quality (Brown et al. 1993). By observing the effect of climatic, biologic, and geomorphic processes on water quality downstream of disturbed and undisturbed

areas, scientists and land managers gradually improve their understanding of these relationships. With this improved understanding, BMP guidelines can be reassessed in order to reach water quality goals more cost-effectively (Brown et al. 1993).

Ice et al. (1996) noted that because it is impossible to monitor everything, everywhere, all the time, experience and judgment are required to select the appropriate type and intensity of monitoring, which should be based on the objectives of the monitoring project. At the most basic level, monitoring programs can be described as “Good, Bad, or Ugly” (Stout 1993). Good monitoring programs answer questions effectively; the other kinds do not. Good monitoring programs are technically robust and because they provide useful information that assists in decisions, they are supportable and therefore politically robust (Ice et al. 1996).

A total quality management approach to water quality assessment requires effective goal setting and the ability to measure whether the goals have been achieved, therefore measurement of water quality must be continuous and provide a direct measure of impairment and an indication of probable cause (Markowitz 1996).

Water quality monitoring is the “contact mechanism” that resource managers and the public has with the actual condition of water resources as they exist in the environment (Ward 1996). Efforts to monitor water quality have been studied in depth since the mid-1970s in order to ensure that monitoring produces useful information about water quality conditions. Past efforts to “improve” water quality monitoring have faced two large barriers: what is water quality, and are taxpayers getting the kind of information they want relative to what is being spent? Neither question seems to have been addressed very satisfactorily, and until it is, reductions in funding for water quality programs can be expected (Ward 1996). Idaho’s funding has increased over the past five years.

Water quality is a concept that is “difficult to define and has different meanings for different people” (National Research Council 1994, quoted by Ward 1996). Although water quality managers seem comfortable with an ambiguous definition, frequent use of the term water quality by the public suggests a widely accepted understanding of its meaning. Yet water quality

monitoring and the information resulting from it is too often obscured from the public by the disciplinary focus of the specialists who monitor water quality. To be accountable to the public, more integrated information is needed, and that should drive the design of monitoring programs (Ward 1996).

● *What monitoring approach is likely to be effective for sediment?*—The high degree of variability in sediment loading and the difficulty of establishing linkages between sediment loads and sources both argue against direct monitoring of sediment for general pollution control purposes. On-land monitoring of compliance with BMPs and periodic broad-scale instream monitoring to evaluate the effectiveness of BMPs at reducing sediment in the watershed are likely to be more effective than other approaches.

Because erosion is a natural process and significant quantities of sediments are moved as a result of natural degradation of sediment from the land, it would be unrealistic to expect or require complete control or elimination of sediment loads to receiving waters (Novotny and Olem 1994). Such control measures would be technically and economically impossible. However, it is feasible to control or manage excessive amounts of sediment (“loadings”) that result from land-use activities and have a detrimental effect on the quality of the receiving bodies of water and to aquatic and terrestrial habitats (Novotny and Olem 1994).

One key to effective sediment control is effective monitoring. The EPA recognizes monitoring as a high priority activity in a state’s nonpoint source management program, and encourages states to use innovative monitoring programs, including rapid bioassessments and volunteer monitoring, to provide for adequate monitoring coverage and to ensure that effective monitoring programs are in place for evaluating nonpoint source control measures (EPA 1991b, 1995a).

Because of the regulatory approaches to controlling nonpoint source pollution from forestry activities in the western states and the program assessments that have been conducted, there is a well-developed recent body of literature on monitoring programs. Developing a functional and sustainable monitoring program in forest ecosystems of the Pacific Northwest is difficult; one reason is that the usual approach

involves adopting inflexible standards to variable and changing spatial and temporal conditions (Wissmar 1993). The challenges of a standards-based approach can be illustrated with sediment. Suspended sediment refers to that portion of the sediment load suspended in the water column; this is different than bedload, which is defined as material rolling along the bed (MacDonald et al. 1991).

One of the major water quality concerns in relation to forestry is suspended sediment, along with associated changes in channel conditions (Binkley and Brown 1993b). One such change is the proportion of fine sediments in streambottom materials. The background concentrations of suspended sediments vary across North America, as do the impacts of forest practices. From a review of research projects, it can be said that the use of BMPs generally minimizes suspended sediment concentrations, though often at a substantial cost (Binkley and Brown 1993b). A number of states have conducted program assessments to determine the effectiveness of forest nonpoint source programs and state BMPs for forest management activities, with one result being the finding that if BMPs are applied they work (Ice 1991). Assessments conducted in Oregon, Washington, California, Idaho, and Montana as well as other states all show that most water quality problems are avoided if BMPs are applied (Ice 1991). More intensive monitoring of operational impacts of forest practices on sediment concentrations would be helpful for verifying the effectiveness of BMPs in a wider range of less controlled situations (Binkley and Brown 1993a).

BMPs effectiveness refers to the overall effectiveness of a system or array of individual practices at improving water quality in a watershed. It does not refer to monitoring the effectiveness of individual BMPs, which are generally assumed to be effective at the scale of the individual practice. The only exception is evaluating innovative BMPs used on a demonstration basis, which requires a much higher level of monitoring that cannot be broadly afforded (L. Koenig, review comments).

The primary problem with using suspended sediment as a monitoring tool is its inherent variability (MacDonald et al. 1991). Turbidity is regarded by many as being the single most sensitive measure of the effects of land-use

activities on water quality in streams (MacDonald et al. 1991). This is partly because relatively small amounts of sediment can cause a large change in turbidity, and partly because the estimated accuracy of turbidity measurements. Turbidity has the virtue of being relatively quick and easy to measure (MacDonald et al. 1991). Suspended sediment usually is the primary source of turbidity in forest streams in the Pacific Northwest and Alaska.

Turbidity has two disadvantages as a water quality standard (MacDonald et al. 1991). First, the relationship between turbidity and suspended sediment must be determined for each site, even though some studies have shown that different sites with similar physical characteristics may have identical relationships. Second, turbidity is highly variable. As is the case with suspended sediment, turbidity varies according to many factors, including storm flow discharge; the occurrence of sporadic events such as debris flows, landslides, or the breakdown of log jams; the timing of the sample relative to the season of the year; the time since the last runoff event; and the timing within an individual storm's hydrographic profile. The range and nonlinear nature of these variations make it very difficult to establish and enforce a narrowly defined turbidity standard for storm events. Narrow turbidity standards are much easier to develop and apply during low flow periods when background levels are consistently low, for example, a comparison of turbidity levels upstream and downstream of a bridge construction site can be meaningful if the flow is constant. Thus turbidity measurements are particularly effective in the case of project monitoring where samples are taken upstream and downstream of a particular management activity (MacDonald et al. 1991).

The problems associated with clean and contaminated sediment are not the same. Contaminated sediment carries toxics or other chemicals for which numeric standards are available. Clean sediment can impair fish reproduction by silting-up spawning areas, and can increase turbidity (EPA 1991b). The EPA (1991b) reported Idaho's attempt to develop numeric criteria for clean sediment, including turbidity, inter-gravel dissolved oxygen and cobble embeddedness; these may have been most appropriate for salmonid streams, but the

framework may have had wide application (EPA 1991b). The efforts to establish these conditions in Idaho were discontinued due to technical problems.

• *What are the relative advantages and disadvantages of monitoring BMPs as compared to monitoring quantities of sediment?*— The components of on-land monitoring should include evaluations of the implementation of BMPs, and evaluations of the effectiveness of BMPs reducing erosion and sediment leaving the slopes (Dissmeyer 1994). This implies a need for instream monitoring. Quantitative models can be used to compare on-slope erosion between treatments or BMPs and be used to help explain in-stream responses (Dissmeyer 1994). The advantage of monitoring BMP compliance is that noncompliance is easy to detect (SAF 1995). Individual BMPs are assumed to be effective; but periodically it is necessary to monitor the overall effectiveness of BMPs at improving water quality at the watershed level. This is relatively complex, especially if sediment is a pollutant of concern. This section reviews problems with monitoring sediment in forested watersheds.

In most forests, lakes, and streams, it is impossible to distinguish sediment produced from natural background conditions from those caused by forestry activities (SAF 1995). The development of appropriate nonpoint water quality standards is also difficult because stream quality includes unique properties such as topography, bedrock, soils, and channel structure (SAF 1995). Relatively brief periods of disturbance and long growing periods between cutting cycles, coupled with general acceptance and implementation of BMPs by foresters, have resulted in relatively minor contributions from forestry to the overall problem of sedimentation (Binkley and Brown 1993, SAF 1995).

Because nonforesters often doubt the efficacy of BMPs or complain that they are not widely enough applied to adequately control nonpoint pollution in forest streams, the imposition of water quality standards is often proposed instead of BMPs (SAF 1995). For example, a New Hampshire law requires that no forest stream's sediment load exceed 10 parts of suspended materials per million parts of water above natural background levels. Proponents of such standards have little or no conception that frequent and timely sampling by uniform methods at well-

chosen sites are prerequisite to valid assessments of water quality (SAF 1995).

Consider the following naturally present influences on sediment loading: [1] though proportions vary from stream to stream, most sediment will be produced during a few days per year; [2] a single cataclysmic storm can increase sediment production to incredibly high levels; and [3] hydraulic characteristic of streamflow, inherent erodibility of bedrock and soil, topography, relief, and slope length cause large variations of sediment loading among and even within watersheds (SAF 1995). In addition to the inherent difficulty in defining excessive sediment due to episodic transport and natural occurrence, another consideration is that it may be, for example, that a 1 ton/year increase in sediment loads at low flows is more critical to fisheries than a 10 ton/year increase in loads during peak flow events (L. Koenig, review comments).

From time to time there are calls for sufficiently extensive monitoring programs in forested watersheds so that compliance with water quality standards could be judged directly in terms of meeting water quality directives rather than in terms of application of required BMPs (Brown et al. 1993). With achievement of water quality standards as the criterion, landowners would then be free to choose the most cost-effective practices on a site-by-site basis to assure meeting prescribed water quality standards for the larger watershed in which the sites are found (Brown et al. 1993).

However, this idealized approach would only be workable with sufficient water quality monitoring to isolate the specific land area sources of a problem and to determine whether the water quality impairment would have happened even in the absence of the land disturbance (Brown et al. 1993). The water quality impacts of land disturbances may not occur until extreme weather conditions develop, perhaps several years after the disturbance (Brown et al. 1993).

Providing such detailed information would require continuous, long-term monitoring of both treatment and control sites at many points along the stream network; applying a comprehensive monitoring program like this over the many areas subject to timber harvesting and heavy grazing would be very complex and costly (Brown et al. 1993).

Sediment load sampling is extremely expensive; only in a very few cases is it justified to determine loads merely as a matter of general interest (SAF 1995). The city of Portland, Oregon, is estimated to spend about half-a-million dollars annually to monitor water quality on its Bull Run watershed.

Amateur water samplers unaware of the preceding hydrologic, statistical, spatial, and temporal constraints are nearly certain to obtain misleading and hence useless data on nonpoint source pollution and sediment (SAF 1995). The occasional sample, obtained at an ill-chosen site and time by an inappropriate method, but at a time and place convenient to the sampler is, in a word, worthless. Unless a scientifically valid knowledge of sediment content over time and space can be assured, water quality standards pertaining to sediment loading in forest streams are a poor and expensive choice for evaluating compliance with the CWA (SAF 1995).

By definition, nonpoint sources are diffuse, coming from the landscape in a dispersed fashion over the surface or through subsurface flow. Although true in principal, it is often the case that the bulk of the nonpoint loads originate from a relatively small fraction of the load area—such things as poor stream crossings, failing cut slopes, trampled stream banks and poor road drainage. It is this fact that makes many BMPs workable solutions (L. Koenig, review comments). Dissmeyer (1994) explained that monitoring methods in forested watersheds therefore must determine if what is measured or observed in the stream is influenced by BMPs or management activities on the land. On-land monitoring of management activities is necessary to develop the linkage. The results of monitoring, when analyzed, should explain why in-stream conditions change or remain unchanged (Dissmeyer 1994).

● *What can monitoring biological characteristics reveal?*— Maintaining and restoring “biological integrity” is a stated purpose of the CWA. Chemical water quality criteria are not adequate to fully protect the biological integrity of water resources and to detect the cumulative effects on an aquatic community (Jackson and Davis 1994). “Biological integrity” has been defined as the condition of an aquatic community in unimpaired or good quality water bodies within a specified habitat or region, as

measured by an evaluation of the aquatic biota (Karr 1991, Markowitz 1996). Although there are different methods for doing this and healthy debate among scientists as to their relative merits, many water quality specialists agree with the merits of the idea that watershed management planning should be based on biological community assessment because it is the best indicator of water quality performance (Markowitz 1996). If the highest beneficial use for streams is fish habitat, why not base pollution control efforts on habitat indices? (B. Moore, review comments).

Methods for evaluating water quality have been debated since the CWA was passed in 1972 (Markowitz 1996). In-stream biological surveys provide a "real world" measurement of the influence of pollution and some indication of possible causes. However, these tools are not yet readily applicable to developing beneficial use attainment criteria (Markowitz 1996). These approaches must be applied before meaningful progress can be made in improving stream conditions (Moore and Flaherty 1996). Habitat suitability indices (HSIs) for various fish species can integrate physical, chemical, and biological data in a numerical index that can be tracked over time with cost-effective monitoring programs; the HSI tool is already largely in hand (B. Moore, review comments). The Idaho DEQ has developed a preliminary Habitat Index (HI) using both quantitative and qualitative habitat data for use as an analytical tool for assessing cold water biota or warm water biota beneficial uses for wadable streams in Idaho. The HI was chosen to augment the biotic condition. Data collection follows Beneficial Use Reconnaissance Project (BURP) protocols. The DEQ also has developed a preliminary Macroinvertebrate Biotic Index (MBI) and Reconnaissance Index of Biological Integrity (RIBI) for the same purpose as the HI (IDEQ 1996).

Effective instream monitoring will need to consider other biological and physical characteristics necessary to support aquatic life. To protect stream channel complexity and the diversity of aquatic plants and animals, BMPs should include measures to protect physical and biological linkages between streams, riparian zones, and upland areas (Bisson et al. 1992). Processes that deliver woody debris, coarse sediment, and organic matter to streams need to

be carefully considered because these materials are largely responsible for creating and maintaining channel complexity and a diversity of organisms. In the past, forest practice regulations in the Pacific Northwest have required attainment of individual water quality standards, such as temperature or dissolved oxygen, and have been aimed at protecting certain life history stages of single species, such as salmon eggs in spawning gravels. This approach is inadequate to achieve the goal of restoring and maintaining natural levels of complexity at the level of a stream ecosystem (Bisson et al. 1992).

The recently increased interest in using biological characteristics of aquatic systems as indicators of ecological health stems from several advantages bioassessment has over the use of physical or chemical criteria (Bilby 1993). These advantages include three key points: [1] because aquatic life is considered a beneficial use of waters, the use of organisms themselves as indicators of water quality impairment provides a more direct link between activities affecting the water and the values being protected; [2] aquatic communities integrate the effects of various impacts occurring over extended periods of time; and [3] although aquatic community structure may provide some memory of water quality impacts that are short-lived and therefore difficult to discern using standard water sampling techniques, determination of some change in the composition of an aquatic community only indicates that some aspects of that system have been altered (Bilby 1993). Some disadvantages include change in aquatic communities resulting from factors other than watershed conditions such as season, climatic variation, fishing or predation, disease or competition from exotic species, or other factors (G. Ice, review comments). Evaluations of the physical characterizations of the water body and its watershed, and an understanding of the response of the aquatic community to various impacts are necessary to delineate a cause and effect relationship (Bilby 1993).

• *What about the "cumulative effects" problem?*— This section briefly describes what the term "cumulative watershed effects" (CWE) means, and what it implies for assessment and monitoring approaches. In Chapter 4, the Idaho approach to CWE assessment is presented as a

case example.

"Cumulative effects" has often been used to mean the repeated, additive, or synergistic effects of forestry or other land use practices on various components of a stream's environment in time and space. Perhaps the most salient feature of cumulative effects is that they can only be measured in aggregate. In isolation they get lost in the background noise and become unmeasurable though none-the-less real (L. Koenig, review comments).

The cumulative effects of forest management activities on fish populations in river systems of the Pacific Northwest has been a concern for many years (Bisson et al. 1992). The term has considerable intuitive appeal because it suggests that the environmental impacts of specific management activities cannot be properly viewed without considering a broad perspective of land management at large spatial scales and long time scales. An assumption that underlies cumulative effects concerns has been that although individual management actions by themselves may not cause undue harm, taken collectively such land-use activities may result in unacceptable stream habitat degradation and long-term declines in fish abundance, particularly when accompanied by heavy fishing pressure and competition with introduced species or hatchery stocks (Bisson et al. 1992).

Establishing unambiguous relationships between abundance of fish populations and cumulative environmental change has been difficult (Bisson et al. 1992). Researchers have discussed these problems and identified trends in habitat quality that appear to be common to river basins with histories of forest management and other types of land-use activities (Bisson et al. 1992).

Attempts to regulate cumulative effects in forested watersheds have often relied on determining if water quality standards—used here to mean fixed levels of chemical constituents, temperature, water clarity, and both suspended and deposited sediment—have been exceeded as the result of land management activities (Bisson et al. 1992). Although individual water quality standards—usually expressed as potentially harmful threshold levels—may serve useful functions as measures of relative risk to individual species at certain points in their life stages, applying these standards to field situations

in forested watersheds of the Pacific Northwest has been largely unsuccessful for either the diagnosis or prevention of cumulative environmental change. Difficulties often have resulted from attempting [a] to establish baseline levels of the variable of interest, [b] to extrapolate from laboratory experiments to field situations, or [c] to extrapolate findings from one region to another (Bisson et al. 1992).

Many laboratory studies have defined negative relationships between the percentage of fine sediment in spawning gravels and the survival of salmonid eggs and alevins (Bisson et al. 1992). Extrapolation of laboratory results to natural stream conditions is not possible without better sampling techniques, and establishing thresholds is not yet feasible without more carefully controlled field experimentation (Bisson et al. 1992).

Federal and state laws have joined at the watershed level (Euphrat and Warkentin 1994). To be effective, monitoring approaches at the watershed scale require assessments of cumulative watershed effects for the benefit of fish, wildlife, vegetation, and people. With implementation and adaptive management, improved water quality and habitat quality can be attained, and watershed assessment promises to document the improvement in the environment, as well as help design management and restoration activities (Euphrat and Warkentin 1994).

• ***Analysis: What are the potential benefits and disadvantages of monitoring approaches?—***

An effective monitoring program will evaluate compliance with pollution control programs and the effectiveness of such pollution control activities relative to water quality standards.

The water quality-based approach to pollution control (see Figure 1) depends on monitoring to determine if the goals of the CWA are being met. Simply put, are the designated beneficial uses fully supported; for example, are fish and their habitat in good condition? Because it is not technically or practically possible to monitor everything, everywhere, all the time, program choices have to be made. Because of the many technical problems involved in monitoring nonpoint sources of pollution, monitoring can be expensive, and still not provide answers to the key CWA question posed above.

Excessive monitoring of water quality

standards and criteria when performance or design criteria could be used "would be wasteful and could present an administrative nightmare" (Novotny and Olem 1994). Using water quality standards as indicators results in waiting to observe a problem before taking corrective action; preventing the occurrence of problems is generally believed to be more cost effective than correcting problems (Snethen 1989).

The practical solution to forest watershed monitoring has been to prescribe BMPs that careful studies and professional judgement indicate will control nonpoint source pollution to within standards in most cases, and then to reassess BMP guidelines as new information becomes available (Brown et al. 1993). Although the goal of the water quality program is to keep water quality within the standards, the immediate objective of the program becomes the implementation of prescribed BMPs (Brown et al. 1993).

Periodic monitoring is necessary to determine if BMPs are being implemented and if they are effective. Periodic compliance monitoring to determine if beneficial uses are supported may indicate that BMPs have been installed and beneficial uses are not fully supported. In that case the Society of American Foresters Task Force on CWA Reauthorization (SAF 1995) recommends that states should either revise the BMPs or evaluate and revise the water quality standards based on the best available knowledge of the pollutant. As additional knowledge is acquired, water quality standards should be adjusted to higher or lower levels. This process of evaluating and improving BMPs and water quality standards should lead to achievement of desired water quality (SAF 1995).

Another argument favoring the monitoring of BMPs is that they are a technology-based approach to water pollution control (Braun 1986, Burk et al. 1995) rather than a water quality-based approach involving water quality standards. Houck (1994) argued that prior to the CWA, the water quality-based approach failed and was replaced by the technology-based approach of "best available technology" (BAT) requirements to limit effluents. This removed the necessity to monitor upstream and downstream of every point source; the installation of BAT was assumed to be sufficient control.

In short, monitoring provides the potential benefit of data related to CWA goal attainment; the disadvantages arise if the monitoring program is not designed to effectively answer key questions, such as are fish populations and their habitat in good condition? In forested watersheds, water quality is influenced by a number of variables including the successional stage of forest vegetation, geology, climate, and disturbance conditions; risk associated with the activity should be one of the criteria used to set the level of monitoring (Ice 1991). Forest management, which is a low-risk land use, should have a monitoring program that is "...practical and affordable"; a BMP compliance program complimented by BMP validation projects would address many of these information needs (Ice 1991).

1.5.8. What nonpoint source pollution control strategies are there?

Two EPA officials (Shuyler and Grubbs 1989) said, "it is far easier to prevent nonpoint source pollution than it is to stop or control [it]." They observed that most of the actions, regulations, and laws regarding nonpoint source control have been in a reactive mode; they said, "the cost to society could be greatly reduced" by moving away from the reactive mode and crafting programs to ensure that nonpoint source problems do not start (Shuyler and Grubbs 1989).

According to the EPA's (1995a) Water Quality Standards Handbook, federal regulations do not mandate that states establish controls on nonpoint sources (40 CFR 131.12(a)(2)). The CWA leaves it to the states to determine what, if any, controls on nonpoint sources are needed to provide for attainment of state water quality standards. Pollution abatement is less a technological that it is a social problem with political, economic, and legal dimensions (Novotny and Olem 1994). The ultimate objective of the CWA is placing enforceable restrictions on sources of pollution (Novick et al. 1994). This statement implies that controls can be adjusted until they are effective at meeting water quality standards.

Point sources and nonpoint sources are treated differently under the CWA. Point sources are regulated by the NPDES permit system under the

regulatory control of the EPA; the CWA defers nonpoint source control to the states. States may adopt enforceable requirements, or voluntary programs to address nonpoint source pollution (EPA 1995a). As more data on nonpoint source loadings and removal efficiencies become available, watershed managers will need to reduce point sources and nonpoint sources; nonpoint source controls often will be most cost-effective means to attain water quality objectives (Freedman et al. 1994). This sets the stage for pollution trading between point and nonpoint sources (see Griffin et al. 1991).

Many research reports, including Novotny's (1988) summary review, point out that abatement of diffuse and nonpoint source pollution requires regulation and enforcement. Under existing enforcement policies, pollution sources that have been legally classified as point sources have the most reasonable chance for clean-up, which leaves a large number of nonpoint sources for which chances of abatement are minimal (Novotny and Olem 1994).

When environmental pollution problems have become severe, pollution control law has bypassed the examination process and simply compelled action through regulatory prohibitions. Houck (1994) argues that experience shows prohibitions are effective at producing results by reducing pollution, and that the former producers of pollution have found alternative means available to them, sometimes with financial

savings. Viewed through the lens of experience, pollutant prohibitions are not bans of an industry or a process; instead they are simply a forceful means of compelling alternatives (Houck 1994).

The remainder of this section analyzes the regulatory/nonregulatory question in relation to the agricultural and forestry sectors. Depending on the state, forestry takes either approach; most western states have regulatory programs. In 15 states, including Idaho, forestry BMPs are regulated; other states with extensive forest resources have adopted a nonregulatory or voluntary approach (Stuart 1996). Agriculture BMPs generally rely on a voluntary approach (Novotny and Olem 1994), as is the case in Idaho.

• *Agricultural programs.* — Agriculture is the leading source of water quality impairment in the nation, impairing support of beneficial uses in 60% of the stream miles and 50% of the lakes surveyed by the states in 1994 (Table 3).

The National Water Commission's (NWC 1973) report to the President and Congress in 1973 identified the lack of regulatory authority and land-use policies as key problems with controlling nonpoint source pollution from agricultural lands. The technology to control diffuse pollution from agriculture is currently available, yet water quality data and visual inspection of many streams, rivers, and lakes indicates that diffuse or nonpoint source pollution from agriculture has not been adequately

Table 3. Leading sources of water quality impairment in rivers and lakes of the United States, 1994.

Source Rank	Source	% of Sampled Rivers Impaired by the Source	Source	% of Sampled Lakes Impaired by the Source
1	Agriculture	60%	Agriculture	50%
2	Municipal Sewage Treatment Plants	17%	Municipal Sewage Treatment Plants	19%
3	Hydrologic/Habitat Modification	17%	Urban Runoff/Storm Sewers	18%
4	Urban Runoff/Storm Sewers	12%	Unspecified Nonpoint Sources	15%
5	Resource Extraction	11%	Hydrologic/Habitat Modification	12%
6	Removal of Streamside Vegetation	10%	Industrial Point Sources	11%
7	Forestry	9%	Land Disposal	11%

Source: *The Quality of Our Nation's Waters: 1994* (EPA 1995b).

controlled (Novotny and Olem 1994). To ensure that available technology is implemented a number of changes must occur and a number of political, institutional, and financial barriers must be overcome (Novotny and Olem 1994). The most significant influences on state programs to control agricultural pollution have to come from federal assistance and land management programs, rather than from the EPA's water quality-based protection programs mandated by the CWA (Novotny and Olem 1994). The major deficiency of the CWA is that it does not provide for enforcement of the abatement of agricultural nonpoint sources, which may be the most significant cause of water quality problems in many waters (Novotny and Olem 1994). This lack of enforcement and reliance on voluntary approaches is most likely related to the perceived right of unrestricted use of land for family farming (Novotny and Olem 1994). Thus control programs for the agricultural sector are expected to be different than in other sectors (Griffen et al. 1991).

Why is agriculture different?— Pollution control on agricultural lands can turn into a private lands rights issue, quickly becoming an emotional and political "hot potato" that no one wants to touch (Novotny and Olem 1994). Dean Kleckner, president of the American Farm Bureau Federation, stated that farmers would be willing to adjust their practices to accommodate water quality goals; however, these changes need to be initiated and conducted using science, not scare tactics (Griffin et al. 1991).

Agricultural producers, in general, have a particular outlook on their profession (Novotny and Olem 1994). Basically, agriculture has an implied contract with society to provide food, fiber, fish, flowers, and forest products (Griffin et al. 1991). Agricultural producers "buy at retail and sell at wholesale"—that is, they do not set the prices—thus a large network of commodity programs has been established in most developed countries (Novotny and Olem 1994). Farmers and ranchers thus are not easily able to pass additional financial costs along to their customers, as many other businesses can.

The environmental costs are another matter. Harry Mussman, deputy secretary for science and education with the U.S. Department of Agriculture, said U.S. citizens spend the lowest percentage of their annual income (12%) on food

of any people in the world, and a single U.S. farmer produces enough food to feed 100 people. But, Mussman hedged, we never fully anticipated the environmental costs that are now important to the public. In the long run, he said, the so-called conflict between production and the environment is a myth, and to ensure the future productivity of agriculture, environmental protection is necessary. According to Mussman, the real conflict is between satisfying our short-term and our long-term goals (Nichols 1991).

Traditional erosion control policies have been based on avoidance of productivity loss, and have fallen short (Crosson and Haas 1982). It is difficult to build a strong case for public intervention to induce or require farmers to control erosion to protect productivity. The case for policies to control off-farm damage of erosion is much stronger than the case for policies to reduce productivity loss because of the realization that agricultural sediment is a principal contribution to water pollution (Crosson and Haas 1982).

The EPA and its various state agency counterparts have not yet fully addressed how the nation will clean up agricultural pollution and still maintain an economically viable agricultural base. Effective and fair policies will have polluters retaining responsibility for their actions, including appropriate remediation. However, enforcement has economic realities. Some agencies involved in pollution control remediation activities, such as the U.S. Department of Agriculture agencies, are nonregulatory in nature and have different program agendas than regulators such as the EPA. These farm service agencies will play a key role based on their understanding of agriculture and good service record working with farmers. These agencies can assist with implementing the voluntary features such as incentives in nonpoint source pollution control programs (Butcher and Fraey 1993).

Incentives, Barriers, and Regulation.— Although agriculture is the nation's largest contributor to nonpoint source pollution (EPA 1995a), the agricultural sector has eluded mandatory controls to date. There are signs, however, that this sector will be regulated in the future. Responsible management of fiscal resources requires that agricultural runoff controls produce a tangible improvement in the

quality of receiving waters, not just "a reduction in pollution" (Roesner and Ott 1995).

One example in which a governmental body has indeed enforced regulatory controls on agricultural land uses is in Olmsted County, Wisconsin (Thompson 1989), where a zoning ordinance has been used to require all farmers to reduce soil erosion by adopting and implementing an NRCS-approved conservation plan. It should be recognized, however, that the population of Olmsted County is primarily urban (Armstrong 1989).

There is a dichotomy in the way that agricultural nonpoint source programs are administered. In Arizona, Nebraska, and Wisconsin, agricultural pollution control programs are administered by the environmental agencies, and all of these programs include regulatory authority to prohibit or at least control certain agricultural practices. Other programs have been placed under agricultural agencies, and these have tended to emphasize voluntary compliance, economic incentives, cost-sharing, education, etc. Examples include the Iowa and Utah Groundwater Protection Programs, and also the U.S. Department of Agriculture's Conservation Reserve and Conservation Compliance Programs (Armstrong 1989).

The key question is whether such voluntary programs will be successful in meeting the water quality standards for downstream surface waters or for groundwater protection. If not, will the agricultural agencies then be forced into a regulatory role? Some problems result from research and extension programs taking on regulatory roles. If the agricultural agencies are to be viewed as the "technical consultants" for the agricultural community, then the added role of "regulator" presents a dilemma for their client group. For example, landowners who might otherwise welcome the advice of a friendly advisor who can help them do a better job of protecting their resource may understandably be reluctant to invite a regulator for a site visit (Armstrong 1989).

The chances for success in implementing nonpoint source programs will be enhanced if they are: focused on the primary goal of attaining compliance with water quality standards, and targeted toward solving water-body-specific and pollutant-specific water quality problems (Armstrong 1989).

Pollution control programs can be designed to accommodate targeting of programs to watershed-specific and source-specific water quality problems. The idea of not solving problems where they don't exist is consistent with the point source (NPDES) permitting practice of allowing a discharger to use the assimilative capacity of the receiving stream (see Novotny and Olem 1994), and is the essence of the term "resource management" (Armstrong 1989). From an implementation standpoint, the steps in the TMDL process might be suggested for successful targeting of nonpoint source programs.

The question of who pays for agricultural sediment control is perhaps the most difficult. Although sediment delivery models can help show who is polluting and how much, there is not necessarily a concomitant economic activity which can be regulated. Implementation of abatement strategies may not provide a perceived benefit to the polluter, and in fact may impose economic hardship. In extreme cases, requirements for BMP implementation would force some producers out of business. Therefore, sediment control programs have typically stopped short of requiring BMPs, but instead have offered economic incentives to encourage the adoption of erosion-control practices. These incentives have taken the form of cost-sharing, tax incentives, and rental payments. The success of such economic incentive programs will be directly proportional to the extent that perceived benefits exceed perceived costs (Armstrong 1989).

Perhaps a more efficient approach than strictly voluntary programs is to implement regulatory solutions when they make sense, and then provide compensation to those parties who are likely to suffer undue hardship (Armstrong 1989). On the other hand, in our haste to bring every water body and groundwater aquifer into compliance with every standard, let us not forget that water quality standards are a set of numbers or goals we, as a society, have developed in order to improve the quality of our lives and the lives of our children. "They were not brought down by Moses from Mount Sinai" (Armstrong 1989). We should expect that the total costs of compliance with one standard or other will often exceed the total benefits to be gained. At such times, we must recognize that our water quality

goals may conflict with other goals of our society, and that we must provide mechanisms to resolve such conflicts. Again, trade-offs between conflicting goals is what the term "management" is all about. It involves accepting risk (Armstrong 1989).

If our resources are to be truly managed—our land, labor, capital, and human resources as well as our environmental resources—conflicting goals will have to be accommodated, trade-offs will have to be accepted, and risk will have to be assumed (Armstrong 1989). In selecting targets for abatement efforts, selection criteria should include not only water quality standards, but also severity, risk, costs, benefits, and the probability of success (Armstrong 1989).

Barriers to implementing BMPs impede the effectiveness of nonpoint source pollution control, and three of them are important: lack of awareness, lack of understanding, and lack of incentives (Novotny and Olem 1994).

First of all, farmers, agribusiness people, agricultural agencies, agricultural advocacy groups, lawmakers, and the general public have not been made aware of the problem or its extent, and therefore many do not believe there is a problem (Novotny and Olem 1994). Agriculture is the leading source of water quality impairment in the nation, affecting 60% of the stream miles surveyed and 50% of the lakes surveyed (EPA 1995b). Agriculture impacted more of the stream miles surveyed in Idaho in 1988 than any other source of pollution (IDEQ 1989). Nationwide, and in Idaho, approaches to controlling agricultural nonpoint sources, including grazing, have been almost exclusively voluntary rather than regulatory (Novotny and Olem 1994).

Second, these individuals and institutions do not fully understand, and some of them do not believe, the potentially serious short- and long-term effects of nonpoint source pollution on human and environmental health (Novotny and Olem 1994). Because each farmer is essentially an independent business, communication and education will be required to implement agricultural BMPs (Griffin et al. 1991). This will help overcome the first two barriers.

Third, the incentives currently available are not sufficient to control the problem (Novotny and Olem 1994). A number of political, institutional, and financial hurdles exist that must

be lowered or removed before existing incentives can work effectively, and in some cases new or additional incentives are needed (Novotny and Olem 1994). After some of the hurdles have been surmounted, the new incentives and the modification of existing incentives can be used more effectively to encourage individuals to adopt BMPs. Not all incentives are equally effective, and some may not be socially acceptable in certain locations. Nevertheless all forms of incentives should be considered as potential options (Novotny and Olem 1994).

Incentive programs can include many things, including education, technical assistance, tax advantages, price supports or subsidies, cost-share to individuals, cross-compliance legislation built into existing programs, direct purchase of lands contributing the greatest problem or of riparian corridors for mitigation, "oversight/site inspections" in a nonregulatory program, and peer pressure; direct regulation of land-use and production activities, and modification of consumer demand are also options to consider (Novotny and Olem 1994).

Iowa Policy Analysis. — Findings from a study in Iowa (Contant et al. 1993) suggested that agricultural nonpoint source pollution policies can improve water quality without significant cost to farmers or state residents. Impacts differed across the four policy options studied and by location. Taxation policy would produce the greatest water quality improvements but with the greatest decline in profitability to farmers and the highest likelihood of political opposition. Regulation policy would have positive water quality effects with small positive effects on profitability; however, the state would incur large implementation costs. The integrated crop management policy may be effective in particular targeted locations, but as a supplement to other policies. A policy of research and education would produce the most consistently positive water quality and profitability results at a relatively low cost to residents statewide (Contant et al. 1993).

Excessive reliance on subsidies or incentives may not produce effective results. Subsidies may be politically attractive to lawmakers, however, it is a well-established fact that in the absence of regulation and enforcement, polluters will do nothing until they receive a full subsidy for abatement costs (Novotny and Olem 1994).

Wisconsin and "Bad Actors."— Programs for agricultural nonpoint source abatement are mostly voluntary (Novotny and Olem 1994). One reason why is that American farmers are as close to immunity as can be attained in our political system (Houck 1994). This makes regulatory control programs difficult to authorize. For example, the Wisconsin legislature passed a "bad actor" bill in 1991 that was vetoed by the Governor in 1992 (Novotny and Olem 1994, Wolf 1995).

Some states, including Wisconsin (Wolf 1995), have seriously considered regulatory approaches to polluted runoff from agriculture. A frequently mentioned approach is the "bad actors" legal doctrine under which polluters identified as critical nonparticipants in voluntary programs are mandated to participate, but at reduced subsidy rates or other punishment for failure to use state-approved BMPs (Novotny and Olem 1994, Kershen 1995). There is significant interest in the development of broad regulatory mechanisms to catch "bad actors" and to ensure everyone is subject to the same standards of environmental stewardship, as there is a small but highly visible number of producers who "refuse to change environmentally destructive practices" and will not voluntarily implement necessary BMPs. Even though few in number, they reflect poorly on all agricultural operators and in some cases attain unfair advantages (Harris et al. 1995).

Such situations deserve special attention from governmental agencies, but regulations should be carefully targeted only to specific environments that are at risk and operators who refuse to cooperate voluntarily. This site-specific "tiered and targeted" approach should be based on clearly defined standards and adequate monitoring and analyses (Harris et al. 1995). TMDLs could provide the necessary monitoring and analysis for the "tiered and targeted" approach.

Texas Dairy Regulation.— Erath County, Texas, is home to 225 dairies ranging from small farms milking fewer than two hundred head to large, industrial style operations with several thousand animals. The application of existing strategies to the Erath County dairy pollution problems—nutrient runoff, ground-water contamination, and nuisance odors—over the past several years produced much controversy over the types of control and practices actually

necessary and the ability of the dairies to pay for those added protective measures (Butcher and Frarey 1993).

Contained Animal Feeding Operations (CAFOs) are usually considered as point sources, so their discharge would be subject to NPDES permits. Dairy farms are installing waste handling facilities to store manure during periods when application to the land is not feasible, for example, during winter months in states in the Northwest. The number of dairy cows often exceeds the capacity of the land; the crops grown cannot use all the nutrients in the manure. This is a major source of nitrate in groundwater. Cattle feeding operations generate large amounts of manure in a limited area, leading to high loading of nitrates (Euphrat and Warkentin 1994).

The Texas Institute for Applied Environmental Research (TIAER) suggests major modifications in current policies, institutions, and compliance strategies to address the contemporary agricultural nonpoint source pollution problem. The Institute, under contract with the EPA, is conducting research on a national pilot project for livestock and the environment. The driving concern was a high rate of deficiencies among non-permitted dairies in addition to problems stemming from manure application fields and odor, indicating the need for an alternative to traditional enforcement approaches. More of a watershed outlook and away from an individual farm-by-farm approach seemed logical. A local watershed defines a natural geographic boundary for such an area-based effort (Butcher and Frarey 1993).

The overall regulatory effort required to solve the heretofore inadequately addressed CAFO pollution problem must integrate science, economics, technology, BMPs, and policy recommendations (Butcher and Frarey 1993). The challenge in handling CAFO pollution lies in linking voluntary and regulatory programs in all levels of government. The approaches will include systematic watershed and micro-watershed based analyses of instream water quality, recommended BMPs backed up by regulation, and local level involvement of the stakeholders. To speed implementation, a committee comprised of potentially affected parties will provide input during the policy research process (Butcher and Frarey 1993).

Arizona's Mandatory BMPs. — Arizona, unlike the experimental site-specific approach targeted at CAFOs in Texas, mandated in 1986 that BMPs for regulated agricultural activities be adopted by rule and implemented by every producer. This was found to be unworkable, and the problems were overcome when recommended BMPs were redefined as general goal statements rather than specific practices. Guidance practices, or alternative technologies, have become the specific methods used to achieve the goals. Operators using them maintain their general operating permits. The message to agricultural producers is implement BMPs to maintain your general permit, or you can be shut down and forced to reapply for a permit, a lengthy and costly process (Watson et al. 1994).

The Arizona program has some negative aspects to it, and many members of the agricultural community would not recommend it to other states because it was so divisive. The legislation is inconsistent and state funding for the program is a difficulty (Watson et al. 1994).

Florida's Targeted Approach. — Florida has adopted a targeted approach for BMP regulation to restore and enhance Lake Okeechobee and the Florida Everglades by reducing nutrient pollution. Although BMPs are improving runoff water quality, additional research is needed to obtain the best combination of BMPs at the individual farm level (Anderson and Flaig 1995).

U.S. Department of Agriculture Programs. — It may be more effective to control some nonpoint source pollution problems with external economic controls than to try to cause change through direct nonpoint source control; for example, the Conservation Reserve Program (CRP) incentives in the 1985 Farm Bill removed many acres of highly erodible land from crop production, greatly reducing the nonpoint source pollution load from these acres (Shuyler and Grubbs 1989). Some of these lands are going back into production as the 10-year CRP cost-share program comes to an end (Roy Mink, review comments).

The Conservation Compliance program in the Farm Bill Program provides that eligibility for certain U.S. Department of Agriculture programs is contingent on the implementation of erosion control plans, but this is a voluntary program (Armstrong 1989).

These two programs have resulted in substantial reductions in soil erosion, which has been reduced from 3 billion tons per year in 1982 to 2 billion tons per year in 1992. The Conservation Reserve Program and conservation compliance have contributed 700 million tons/year and 100 million tons/year, respectively, to soil erosion savings. Substantial savings of 300 million tons/year are attributed to conservation technical assistance (NRCS 1995).

• *Forestry Programs.* — There seems to be general agreement among the state and federal agencies that specifying BMPs is the most practical approach to meeting water quality standards on forest lands (Brown et al. 1993). How those BMPs will be specified is a complex matter, especially if an attempt is made to select the most cost-effective BMPs; that is, those that will be least expensive to the landowner while meeting water quality standards (Brown et al. 1993). Many states have identified nonregulatory BMP programs as the most cost-effective approach for the protection of water quality (SAF 1995).

Idaho is one of fifteen states in the nation that has a regulatory program for protecting water quality from harmful forest practices by requiring BMPs (Stuart 1996). Other states with large areas of forests have chosen voluntary means of implementing BMPs; 22 states have nonregulatory or voluntary programs, and 22 states have voluntary programs with regulatory backup if compliance levels are unsatisfactory to protect water quality. Some states take more than one approach, with voluntary BMPs in upland areas and mandatory BMPs in riparian areas (Stuart 1996). Four recent studies have examined forestry program effectiveness.

In one study, Ellefson and Cheng (1994) asked senior-level administrators of state forestry programs: How effective are alternative programs for protecting water quality? The results were that 41% of the administrators ranked regulation as a very effective means. However, 58% stated that technical assistance programs could also be very effective. Eighty percent felt that voluntary guidelines were either neutral (39%) or ineffective (41%) as a means of getting landowners to apply forestry practices that enhance water quality from forested watersheds. Given such concern, it is not surprising that Montana, New Hampshire,

Vermont, and Virginia have made their BMPs voluntary, contingent upon their widespread application (Ellefson and Cheng 1994). Montana identified riparian areas as a particularly high concern and developed a regulatory control program for these areas (G. Ice, review comments).

In another study, Hawkes et al. (1993) compared the regulatory approach used in Maryland with the voluntary approach used in Virginia. No direct evidence was available to suggest that Maryland's regulatory program was better at obtaining BMP compliance than was Virginia's voluntary program; both seemed reasonably effective. Although no direct conclusions could be made regarding which program was best at reducing pollution, inferences were drawn by focusing on the relative costs and benefits of each approach. Because there is no practical way to measure comparative regional nonpoint source pollution reduction from forest sources, indirect measures—including ease of administration and compliance—were used to compare the water quality protection programs in Maryland and Virginia, even though it would have been more useful to measure direct reductions in sediment release attributable to each program (Hawkes et al. 1993).

Using these criteria, Virginia's voluntary education and evaluation program had a significant edge over Maryland's complex regulatory approach (Hawkes et al. 1993). Compliance with Maryland's regulatory approach to water quality protection costs \$1.70 to \$3.20 per thousand board feet of harvested timber, whereas Virginia's voluntary approach cost \$0.50 to \$0.58 per thousand board feet. BMP compliance was rated reasonably effective in both states but more costly in Maryland because of a broader approach to water quality protection coupled with far less timber harvests over which to spread the costs (Hawkes et al. 1993).

A third study by Floyd and MacLeod (1993) focused on the compliance issue by comparing programs in four eastern states: [1] Ohio's 3-year old voluntary program; [2] West Virginia's 3-year old quasi-regulatory program, which emphasizes education, training, and compliance monitoring but does not require registering timber harvesting sites; complaints can result in

finer; [3] Maryland's complex regulatory scheme requiring registration of harvesting sites and penalties for water quality violations; and [4] Massachusetts' regulatory program embodied in a state forest practices act. The findings demonstrated that in these four states, regulatory approaches were positively correlated with higher perceived compliance. The researchers concluded that successful forestry nonpoint source pollution reduction plans should combine regulatory and educational program elements. Some regulation of forest practices, along with mandatory periodic inspections, may provide a mechanism that promotes rapid voluntary adoption of BMPs as well as regulatory compliance (Floyd and MacLeod 1993).

Across the United States, a fourth study by Brown et al. (1993) used state-by-state surveys and concluded that compliance with forestry BMPs is generally high and gradually improving. Nevertheless, cases of noncompliance persist, especially for road and skid trail BMPs, and water quality problems are often associated with such noncompliance (Brown et al. 1993).

Noncompliance with BMPs is easy to detect, but a coherent and consistent policy is lacking for dealing effectively with noncompliers (SAF 1995). States should document noncompliance and follow up with education programs, with the worst offenders ("bad actors") reported and penalized by appropriate authorities (SAF 1995).

Where BMPs are implemented water quality is usually within standards (Brown et al. 1993). The Tennessee Division of Forestry audited BMP implementation in 1992, and reported no sedimentation problems or adequate application of BMPs on 86% of the harvest sites checked; compliance with Ohio's voluntary BMP program generally is high and improving (SAF 1995). Results of BMP audits in Idaho in 1992 show high levels of compliance, on 92% of the sites audited, with 99% effectiveness (IDEQ 1993). Montana audits show high levels of compliance and effectiveness (MDSL 1994).

Most foresters agree that BMPs work well enough to satisfy the CWA, but they are not without cost to those who harvest timber (SAF 1995). Most of the on-site costs of BMP implementation are borne by the landowner, whereas the benefits typically accrue to aquatic organisms and downstream water users. Noncompliance may sometimes seem to private

landowners as an attractive alternative, especially in states with voluntary programs (Brown et al. 1993). Public landowners include downstream water users. Compliance and effectiveness monitoring must therefore be an ongoing activity, and replacement of voluntary with regulatory programs must remain a realistic possibility (Brown et al. 1993).

Costs to the landowner are not the only costs of BMP implementation; it is costly to employ trained professionals to develop and guide the implementation of site-specific BMPs and it is costly to make periodic adjustments of BMP guidelines, because these efforts should be based on careful water quality monitoring studies in order to more accurately attain the water quality goals (Brown et al. 1993). These costs must be compared with the opportunity costs of overconstraining land management practices in order to determine the most efficient level of professional assistance needed in carrying out a BMP program (Brown et al. 1993).

The Society of American Foresters Task Force on CWA Reauthorization (SAF 1995) concurred with the National Association of State Foresters that low levels of funding cause BMP compliance monitoring to differ greatly among states. More uniform and dependable funding to improve monitoring is essential; funds should be made available at the federal level or mandated at state levels (SAF 1995). Likewise, a greater proportion of state revolving loan funds should be made available to nonpoint source pollution control programs (SAF 1995).

New BMPs are beginning to address issues at the ecosystem level by prescribing riparian management zones with a greater range of vegetative species and structural diversity, thus providing for future sources of large woody debris, floodplain connections, and other linkages important to functional ecosystems (Bisson et al. 1992). Benefits of such new BMPs are improved habitat complexity and increased diversity of fishes on the scale of a river basin. Attaining these benefits will require coordinated planning and extensive application of BMPs. Because the effects will take years or perhaps even decades to become apparent, patience will be required (Bisson et al. 1992).

• ***Analysis: What are the potential benefits and disadvantages of regulatory and nonregulatory approaches?***— The issue of

water pollution control compliance and enforcement reduces to whether a regulatory approach or a voluntary approach is more effective. The regulatory approach implies command and control, subjecting violators to the threat of penalties if they are out of compliance with rules and regulations. To the extent that pollutant dischargers perceive that enforcers will catch them in a state of noncompliance and they will be penalized, the benefits of water quality protection will be attained. The disadvantage is that this approach requires enforcement personnel or “water quality cops” employed in public agencies, which can be expensive.

The nonregulatory approach implies voluntary action. The potential benefits are the elimination of the need for enforcement personnel. Technical personnel will be necessary, as they are under the regulatory approach, to determine if appropriate voluntary action is being taken to comply with the CWA goals. Education can stimulate the awareness of pollutant dischargers that they are creating a problem, thus is a necessary component of this approach. Incentives are even more important, because without them most pollutant dischargers will not volunteer to undertake costs to their farm or ranch operation that produce benefits for society in general and downstream operators in particular.

Whichever choice is made, resources will be necessary to support monitoring programs, personnel, and activities. The personnel and activities under the two approaches will be different.

The question of an enforcement mechanism for nonpoint source pollution programs is intricate, given historic resistance to government regulation among rural populations, the political influence of the agricultural sector, and the question of constitutionality of land-use controls (Wolf 1995).

It is especially important to build effective partnerships between the agriculture and water quality management communities (Perciasepe 1995). Due to the significance of agriculture as a source of nonpoint pollution, no control program will succeed unless pollution from farms and other agricultural activities is substantially reduced (Perciasepe 1995).

Water quality program goals should assure that agricultural and forestry production practices and

related activities improve or maintain the quality of water resources (Harris et al. 1995). Policies should provide adequate incentives and encouragement to bring about the adoption of appropriate management practices to prevent pollution, and to discourage practices causing resource deterioration; producers must be dealt with fairly and equitably (Harris et al. 1995).

1.5.9. How do TMDLs, antidegradation policy, and BMPs function in the evolution toward watershed management?

In the water quality-based approach to pollution control, TMDLs and BMPs are part of the same strategy (see Figure 1). The TMDL process identifies where point source and nonpoint source controls are necessary. The BMP process is the technology-based control mechanism for nonpoint source pollution. Tier 1 of the antidegradation policy requires that water quality standards be met, which can involve TMDLs for pollution identification and BMPs for pollution control. The EPA is currently working on new guidelines for TMDL implementation (EPA 1996b). EPA guidelines are not clear as to how the Tier 2 and Tier 3 requirements of the antidegradation policy relate to its recommended watershed protection strategy.

Renewed interest in watershed management resulted in part from section 303(d) of the CWA, which requires each state to identify waters in its boundaries for which technology-based, point-source effluent controls would not lead to compliance with water quality standards (Freedman et al. 1994). Because states then must establish the total maximum daily loads (TMDLs) of contaminants for these water bodies that would achieve compliance, the requirements of the TMDL process have forced regulatory agencies to begin viewing pollution control from a watershed perspective (Freedman et al. 1994).

The EPA and the states initially were slow to respond to these unfunded TMDL requirements because of the effort required, therefore localized approaches to wastewater controls remained the focal point of water quality protection under the CWA (Freedman et al. 1994). However, in many states—including Idaho, as Chapter 2 reports—citizen groups have successfully sued the EPA for not developing TMDLs in a timely manner, and through court

action the EPA has been ordered to prepare “303(d) lists” of water quality-limited waters and develop TMDLs when states failed to do so (Freedman et al. 1994). The calculation of TMDLs has become an important technical basis for the EPA’s ongoing watershed protection approach that was initiated in 1991 (Freedman et al. 1994).

Foran et al. (1991) proposed a regulatory program for nonpoint source control featuring TMDLs and involvement of local interests because BMP implementation is generally on a voluntary basis that alone is not sufficient to deal with the nonpoint source problem. Their proposal involves the development of consortia made up of all parties potentially responsible for polluted runoff. TMDLs would identify pollution sources and coordinate pollutant contributions from point source and nonpoint sources affecting the water body. The centerpiece of the proposal is a permit program under the control of the state regulatory agency. Nonpoint source permits would not legalize the discharge of specific types and quantities of pollutants as is done under the NPDES point source program, but would require consortium members to modify activities contributing pollutants until water quality standards criteria are met. Monitoring would be important to determine compliance with permits and attainment of standards, with costs borne by the consortium. In noncompliance situations, the diligence of the consortium in working toward permit compliance would be important in determining whether stringent enforcement would be necessary, including state authority to require BMPs and assess fees or fines. Diligence could instead demonstrate that the permit may need adjustment. This may be an effective approach to nonpoint source control (Foran et al. 1991).

As a result of the TMDL process, regulatory control efforts have gradually progressed toward watershed protection and restoration (Freedman et al. 1994). Although TMDL regulatory development initially focused primarily on point source controls, nonpoint sources were recognized as significant but unregulated. Now scientists and regulators recognize that unless nonpoint sources are part of the TMDL process, water quality goals will not be met; TMDLs are used to develop target controls for nonpoint

sources, and the TMDL process now is being broadened further to include watershed management activities (Freedman et al. 1994).

Watershed management relies on features of the TMDL process to clean up polluted waters, using BMPs in that process as pollution controls that protect the designated uses of water bodies. BMPs generally minimize rather than eliminate nonpoint source impacts on receiving water quality, and BMPs are similar to the treatment of installing technology-based limits on point source discharges (Braun 1986, Houck 1994, Burk et al. 1995).

• *What is the relationship of TMDLs and BMPs?*— Implementation of a TMDL depends on other programs and activities; a TMDL alone does not create any new or additional implementation authorities. The states and the EPA are partners within the TMDL program, and together they work with federal, state, and local authorities as well as other public and private organizations to implement TMDLs (EPA 1996b).

TMDLs that allocate pollutant loads to point sources regulated by the NPDES permit program carry the best assurance that they will be implemented. Point source dischargers are subject to direct federal and state regulatory requirements. Backed by the opportunity for citizen lawsuits, this complete enforcement authority provides strong assurance that pollution control activities will be implemented (EPA 1996b).

Implementation is more complex for TMDLs that allocate pollutant loads to nonpoint sources because it does not rely on direct federal regulation of BMPs. Instead, implementation must typically rely on state law, local ordinance, or programs administered by federal agencies that are voluntary or incentive-based in nature. The implementation of many nonpoint source controls also depends upon federal, state, or local funding sources such as cost share programs. States can use a variety of mechanisms to address nonpoint sources of pollution, including backup enforceable authorities like enforceable water quality standards, tax incentives, zoning laws, or bad actors laws, which authorize the state to take increasingly stringent steps where voluntary measures fail (EPA 1996b).

Section 6217 of the Coastal Zone Act

Reauthorization Amendments of 1990 require states to have federally approved programs to implement and enforce nonpoint source controls. This provision applies only to the coastal zones of the twenty-nine coastal States and Territories that have approved Coastal Zone Management Act (CZMA) programs.

The EPA intends to establish additional national criteria for determining whether there is reasonable assurance that TMDL load allocations for nonpoint sources will actually be implemented through BMPs in a reasonable period of time. These criteria will address the application of state and local regulatory and voluntary programs, as well as federal environmental activities apart from the CWA. In order to maximize reasonable assurance, the criteria will carefully consider the strength of potential consequences to a pollution source in the event that implementation does not occur, for example, administrative, civil or criminal penalties under existing state law or local ordinance (EPA 1996b).

The EPA will also consider establishing a national requirement to include implementation plans and schedules with individual TMDL submissions to the agency. As part of the Great Lakes Water Quality Initiative, the EPA explained that an implementation schedule for specific voluntary or non-voluntary nonpoint source controls specific to the pollutant of concern provides a reasonable assurance that a TMDL will be implemented in a reasonable time period. A national requirement for plans and schedules would provide reasonable assurance to the public and the EPA that the necessary pollution reductions would occur. The EPA will consider linking a requirement for such plans and schedules to CWA section 303(e), under which states describe their Continuing Planning Processes (EPA 1996b).

The EPA will also provide information on how to access programs and resources that can support TMDL implementation. These may include private party resources as well as CWA section 319, State Revolving Funds, and Farm Bill conservation programs. For example, the 1996 Farm Bill's Environmental Quality Incentives Program (EQIP) calls for the identification of priority areas for protecting aquatic resources and reducing water pollution from agriculture. If appropriately directed, the

more than two billion dollars available annually through the USDA for agricultural conservation and cost-sharing will be of major assistance in implementing TMDLs (EPA 1996b).

• *Where is watershed management headed?*— Water quality management is not only a good place to start applying an integrated approach to natural resource management, CWA implementation virtually demands it in order to deal effectively with nonpoint source pollution control by taking a watershed protection approach. Water quality is closely related to riparian and fish issues (Moore and Flaherty 1996). Healthy upland, riparian, and aquatic ecosystems interact to support a variety of uses; much of the past management of natural resources can be characterized by misunderstanding the interrelated nature of terrestrial and aquatic ecosystems (Moore and Flaherty 1996). This same misunderstanding has water quality, fish, wildlife, timber, and other resources considered separately, and now fuels controversies regarding the future direction of resource management strategies (Naiman 1992). Linkages must be formed between terrestrial and aquatic systems to support land management activities (Moore and Flaherty 1996).

Recent literature on nonpoint source pollution control emphasizes the importance of a watershed protection or watershed management approach to meet CWA goals (see Burk et al. 1995, EPA 1995b, Euphrat and Warkentin 1994, Flynn and Williams 1994, Freedman et al. 1994, Markowitz 1996, Novotny and Olem 1994, Perciaspe 1995). Watershed management and protection can help attain other resource management goals in addition to those of the CWA, including ecosystem-based management and endangered species conservation (see Bisson et al. 1992, Ice et al. 1993, Montgomery et al. 1995, Naiman et al. 1992, NRC 1996).

• *How does the antidegradation policy fit in?*— Antidegradation further complicates the TMDL development process, as the EPA (1995a) expects antidegradation policy to be applied. Under this policy, states must act to ensure that all “existing instream uses” must be “maintained and protected” (40 CFR 130.12). Antidegradation policy requires states to ensure that both point and nonpoint source pollution discharges will not “degrade” the uses of a waterbody below the levels for which it was

designated; the EPA has only recently begun to focus on its antidegradation policy, and states have been slow in responding (Hildreth et al. 1993). Whether or how the EPA’s antidegradation policy will be factored into watershed management plans is an unaddressed issue (Burk et al. 1995). If each plan is to be tailored to watershed conditions and water quality goals, flexible state policies will be needed that allow and even encourage watershed-specific antidegradation implementation procedures (Burk et al. 1995).

In the transition to watershed management, antidegradation implementation needs to be re-examined (Burk et al. 1995). The technology-based approach to pollution control focuses on preserving water quality through parameter-by-parameter measurements made at the end of discharge pipes. For watersheds with more potential water quality impacts from nonpoint than point sources, it seems inappropriate to focus stringent regulatory control solely on point sources (Burk et al. 1995).

Under the broad watershed approach, maintaining water quality when nonpoint sources are the problem may be possible because stakeholders involved with local land-use decisions may allow antidegradation measures that would be impractical if proposed at the federal or state level (Burk et al. 1995). For example, zoning restrictions, such as river or lakeside setbacks, may be accepted and implemented by local government agencies participating in a watershed plan, and such zoning authority is unlikely to be granted willingly to state or federal environmental authorities (Burk et al. 1995).

Antidegradation policy should have a broader meaning than just maintaining chemical-specific water quality (Burk et al. 1995). The CWA goal to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters” infers that other factors can have a marked effect on a water body’s integrity, raising the question of whether antidegradation policy should address resource impacts from any factors other than chemical contaminants (Burk et al. 1995).

Burk et al. (1995) concluded that antidegradation is an important environmental concept, but needs re-examination as water quality programs evolve from point source control to a broader watershed management

approach to deal with nonpoint sources. Federal antidegradation policy needs to remain broad to allow flexible implementation at the watershed level, but it should be directed by a clear statement of legislative intent that includes definitions of key concepts and terms (Burk et al. 1995). Implementation procedures should, among other things, provide incentives for loading reductions from existing sources (Burk et al. 1995).

1.6. How is the Clean Water Act related to other policies?

Among the most complicating factors in nonpoint source pollution abatement and water quality management is the plethora of laws affecting the decision-making process and specified in various environmental policies that sometimes conflict (Novotny and Olem 1994).

Because 62.2% of Idaho is federal land (USDI-BLM 1996), it is important to understand how state programs for water quality management are related to federal land and resource management decisions. In addition, the review of literature revealed some information relating the CWA to the Endangered Species Act. Program efficiencies may be possible if water quality management programs could be coordinated with species conservation efforts. These two concerns are discussed in this section.

1.6.1. What is the relationship of the CWA and the Endangered Species Act (ESA)?

Most of the threatened and endangered species in Idaho depend on aquatic habitat for some portion of their life cycle; 4 federally protected species of fish, 6 species of snails, and one species of plant are entirely dependent on water; 2 species of birds nest near water and feed primarily on aquatic life. That totals to 13 aquatic species out of the 18 protected species in Idaho (O'Laughlin and Cook 1995).

There have been dramatic increases in the effort and expenditure for environmental protection over the past 20 years (Montgomery et al. 1995), including but not limited to reducing water pollution. Because nonpoint source pollution has not been abated to the same extent that point source pollution has, the overall condition of natural ecosystems generally

continues to decline (Montgomery et al. 1995). Two reviewers of this report took exception to this commentary and offered personal opinions. Although more needs to be done, efforts are *much* better than they were ten years ago; water quality is generally improving and so are nonpoint source pollution control programs (D. Mabe, review comments). The overall condition of watershed ecosystems is improving, and we are addressing past practices that caused the worst impacts (G. Ice, review comments).

Attempts to link or integrate land management objectives and practices set up inevitable legal confrontations that result in pitting the survival of plant and animal species against resource use, giving a false perception that they are incompatible (Montgomery et al. 1995). A new approach to land and resource management, loosely termed ecosystem management, has been embraced by federal agencies in an attempt to reconcile the problem of species endangerment by applying an ecological perspective to land-use and environmental degradation problems (Montgomery et al. 1995). This approach is consistent with the purpose of the Endangered Species Act, which is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, ..." (16 U.S.C. § 1531).

According to the EPA (1995a), an important consideration in future development of water quality standards and criteria will be the conduct of the consultation provisions of the Endangered Species Act (ESA) and the implementation of any revisions to standards resulting from those consultations. Section 7 of the ESA requires all federal agencies, in consultation with the Fish and Wildlife Service and the National Marine Fisheries Service (the "Services") to assure that any action authorized, funded, or implemented by any federal agency (such as the U.S. Forest Service or the Bureau of Land Management) does not jeopardize the existence of endangered or threatened species or result in the destruction or adverse modification of their critical habitat (EPA 1995a). The definition of a federal action is very broad and viewed by the EPA (1995a) as encompassing virtually every water program administered by the EPA.

The EPA has the responsibility for ensuring that consultation occurs with the Services. However, in fulfilling the requirements a non-

federal representative may be designated for informal consultation. It should be noted that section 7 consultation under the ESA may be formal or informal, with the latter form being the most prevalent (EPA 1995a).

The ESA makes protection of threatened and endangered species and their habitat a national priority, and the water quality standards and criteria programs can be effective tools to meet this national priority (EPA 1995a). All aspects of standards, including aquatic life criteria, uses, antidegradation, and implementation actions related to the water quality standards are subject to consultation under section 7 of the ESA; and all future revised aquatic life criteria, sediment, wildlife, and biological criteria will be subject to the consultation requirements as will their adoption into enforceable standards (EPA 1995a).

The relationship of the CWA and the conservation of salmon and trout is an important question because many of Idaho's waters have cold-water biota as a designated beneficial use. In many such waters, salmonid fish, that is, salmon and trout, are at or near the top of the food chain. Confronting the problem of providing adequate habitat for salmon and trout, whether they are protected by the ESA or not, means confronting the requirements of the CWA to protect designated beneficial uses. If cold-water biota were a fully supported beneficial use throughout the waters of the Pacific Northwest, then spawning and rearing habitat for salmon protected by the ESA would not be an issue, nor would bull trout conservation be an issue.

The importance of the "cumulative effects" issue in water quality to support cold-water biota is a key issue here, and is related to the need to do broad-scale watershed analysis to support broad-scale watershed management. Ecosystem-based management may be viewed as another term for watershed management when the ecosystem boundaries are watershed boundaries.

The use of watershed analysis for improving salmon habitat should be directed at providing the public and managers with information that will identify a range of issues and opportunities for streams in the Pacific Northwest (NRC 1996). Because a wide range of spatial and temporal scales needs to be considered in any given watershed, watershed analysis should be expected to yield both strategic and tactical

approaches to improving habitat (NRC 1996). Several types of information should be considered in the analysis, including spatial context, temporal context and disturbance regimes, riparian vegetation and reference sites, and history of impacts (NRC 1996).

Watershed analysis might be able to provide important resource perspectives previously unavailable to land managers, but it is important to point out that watershed analysis is currently designed only for drainages with forestry operations (NRC 1996). There are no institutional or legal means yet devised for applying the watershed analysis approach to the management of non-forest lands; and it is not known whether the methods used to assess the consequences of forest management and provide recommendations for habitat restoration are fully applicable to streams and lakes surrounded by land used for purposes other than forestry (NRC 1996). The Idaho Department of Lands is the designated management agency for timber harvesting activities in Idaho (Idaho Code § 39-3602; L. Koenig, review comments). There is nothing too difficult here from a technical standpoint, and perhaps the National Research Council report was referring to political problems (T. Cundy, review comments). There is no institutionally sanctioned means of assessing habitat and identifying opportunities for restoration when multiple ownerships encompassing a variety of land uses are involved (NRC 1996). The freshwater-habitat needs of anadromous fish, however, do not stop at forest boundaries (NRC 1996). Effective ecosystem-based management will have to deal with these realities.

1.6.2. What are federal land and resource management agencies required to do to conform to Idaho state law?

Most of the water quality problems that occur on the federal public lands result from nonpoint sources, with the most important contributors nonpoint source pollution on federal lands being timber harvesting, livestock grazing, roadbuilding, and mining (Coggins and Glicksman 1996). Anderson (1987) commented that "the statutory framework designed to protect watershed resources on the national forests ... consists of two elaborate planning processes:

national forest planning and state water quality planning." Those two processes involve compliance with a variety of statutes and requirements (Coggins and Glicksman 1996).

Federal agencies must comply with watershed protection provisions of federal land management legislation and with the CWA; under the CWA, federal lands are to comply with state water quality laws and standards, to the same extent as any nongovernmental entity (Brown et al. 1993). Under section 319 of the CWA, states are to identify federal actions that are inconsistent with state water quality objectives (Brown et al. 1993). Under the CWA, states must identify "designated management agencies," which need not be state entities, to administer water quality management plans; in some states containing national forests, for example, the U.S. Forest Service has been designated as the management agency for those lands (Coggins and Glicksman 1996).

Although states may monitor BMP use and effectiveness on federal land, they typically rely on federal agencies to monitor on federal lands, thereby focusing scarce state resources on state and private lands (Brown et al. 1993). Some states have memoranda of understanding with the U.S. Forest Service and the Bureau of Land Management (BLM) requiring that they report BMP monitoring results to the states; additional states are likely to establish formal arrangements with these federal agencies (Brown et al. 1993). Idaho has a Memorandum of Agreement between the U.S. Forest Service, BLM, and the Idaho Division of Environmental Quality, signed in May 1993. In addition, Idaho Code § 39-3621 states that other agencies shall monitor BMPs and report the results to DEQ (L. Koenig, review comments).

Compliance with state pollution standards in federal land planning and management is mandatory (Coggins and Glicksman 1994). States may follow the lead of those commentators who call for more strict application of water quality standards and BMPs; recalcitrant states that consistently fail to enforce water quality standards could lose CWA grants or have their point source permitting authority revoked (Coggins and Glicksman 1994). In the absence of federal enforcement, citizens may be able to sue to invoke these remedies (Coggins and Glicksman 1994).

Cases involving federal lands will continue to be brought before the courts and promise to further influence the management of these lands (Parker 1995). These cases are viewed as necessary by some commentators because land management agencies in Parker's (1995) words, "all too often refuse, quite knowingly, to comply with the law." As a result of citizen lawsuits and litigation, however, the National Environmental Policy Act (NEPA), the National Forest Management Act (NFMA), and the ESA will increasingly guide the management of federal lands in the way Congress intended (Parker 1995).

Furthermore, Parker (1995) noted that the CWA "is also likely to play an ever more prominent role." In addition, the courts have given notice that nonpoint source pollution from activities on federal land may be a cause to curtail those activities (Coggins and Glicksman 1994).

According to Coggins and Glicksman (1996), section 319 of the CWA may affect federal land users in one important new respect, in that federal land management agencies will have to comply with state nonpoint source management plans. States are now required to identify federal financial assistance and development projects to determine whether they are consistent with their section 319 programs. The EPA has indicated that this obligation encompasses forest plans, resource area analyses, integrated resource management plans, timber sales, and watershed management by the U.S. Forest Service, and it probably covers analogous BLM activities (Coggins and Glicksman 1996). If a state finds such a proposed federal action inconsistent with its section 319 program, the federal agency probably must accommodate the states' concerns; but beyond this context, section 319 appears to add little to the preexisting CWA planning programs as applied to nonpoint sources (Coggins and Glicksman 1996).

Although efforts to abate pollution runoff from nonpoint source activities near the federal lands has not generated much litigation, the Ninth Circuit has enjoined proposed timber harvests because they posed threats of erosion and consequent watershed instability (Coggins and Glicksman 1996). Such decisions have been premised on the inadequacy of environmental impact statements, especially the failure to assess

cumulative effects, and “other implicated substantive constraints” under the Wild and Scenic Rivers Act (Coggins and Glicksman 1996).

The situation is somewhat different for nonpoint source activities occurring on federal lands; under section 313 of the CWA, all federal agencies having jurisdiction over any property or engaged in any activity resulting in the discharge or runoff of pollutants must comply with all federal, state, and local requirements for controlling pollution, including state water quality standards (Coggins and Glicksman 1996). Individual nonpoint sources operating on federal lands may therefore become the subject of enforcement actions under state law, unless the state exempts nonpoint sources causing violations of water quality standards from enforcement; furthermore, state water quality standards also provide judicially enforceable constraints on federal land management, thus making state water quality standards important considerations in the BLM and U.S. Forest Service planning processes (Coggins and Glicksman 1996).

Regulations for forest land and resource management planning require that the U.S. Forest Service insure compliance with all substantive and procedural requirements of the CWA (Coggins and Glicksman 1996). In the *Rio Grande LRMP* case, the district court enjoined the Forest Service from increasing timber harvest levels in the Rio Grande National Forest because the agency’s planning documents failed to demonstrate compliance with the CWA (Coggins and Glicksman 1996).

General requirements applicable to road construction and other similar activities also may apply to mining operations, and mining operations on federal lands may be subject to nonpoint source control requirements imposed by federal land managers, who are encouraged by the CWA to impose controls based on state programs (Barringer et al. 1995). Both the Forest Service and the BLM require persons conducting mineral operations or engaged in oil and gas leasing activities to comply with applicable state water quality standards; it can be argued that these federal agencies must include applicable BMPs as enforceable conditions in all timber harvest contracts, road building specifications, and other permits for projects on federal lands (Coggins and Glicksman 1996).

Persons causing violations of state water quality standards would thus appear to be liable as a matter of federal law for violations of the regulations, permit conditions, or contracts (Coggins and Glicksman 1996). They may not, however, be held liable for civil penalties (Novick et al. 1994).

The relationship between state water quality standards and BMPs has been the subject of considerable litigation in the Ninth Circuit Court of Appeals. The leading case is the *Blue Creek* decision. *Blue Creek* also involved defective environmental assessment, but the Ninth Circuit also found violations of the federal and state water pollution laws to be an independent ground for an injunction on timber operations (Coggins and Glicksman 1996).

The Forest Service proposed building a road to connect the two towns of Gasquet and Orleans (the “G-O road”) and provide access for logging operations (Rector 1989). California law, as embodied in a regional water quality control plan, specified numerical limits on the additional pollution burden that nonpoint source activities could add to the state’s streams, and the Forest Service could not demonstrate that the runoff from the proposed logging would stay within California’s numerical limits (Coggins and Glicksman 1996). Instead, the agency argued that requiring the timber and road contractors to adhere to BMPs would be sufficient to comply with California water pollution law. The court held that the state’s water quality standards criteria were independently enforceable and the standards must be achieved whether or not BMPs were required. BMPs, said the court, are “merely a means to achieve” the substantive, mandatory objective of keeping water quality within the levels prescribed by the water quality standards (Coggins and Glicksman 1996). The court essentially required the agency to assure that silt runoff would not exceed certain levels regardless of whether the contractor installed BMPs (Coggins and Glicksman 1996).

Together, the CWA and the federal land management statutes require the federal government and its licensees to obey substantive and procedural pollution control provisions of both state and federal law (Coggins and Glicksman 1996). The *Blue Creek* case may have ushered in a “new age” of watershed protection based on these requirements, and

whether other courts will follow the *Blue Creek* rationale could be a critical question for timber operators (Coggins and Glicksman 1996).

Following the *Blue Creek* decision, the Forest Service could be "highly vulnerable" to additional lawsuits seeking to halt road building and timber harvesting; however, in a subsequent decision, the Ninth Circuit refused to enjoin the Forest Service from offering a timber sale in the Duck Creek area of Hells Canyon National Recreation Area, despite allegations that the sale would result in violations of Oregon's water quality standards for stream turbidity (Coggins and Glicksman 1996).

The court stated that "proper implementation of state-approved BMPs will constitute compliance with [state water quality standards under] the CWA unless water quality monitoring reveals that the BMPs have permitted violations of these water quality standards" (*Hells Canyon I*). The Ninth Circuit characterized the evidence concerning the likely effect of the timber sale on turbidity as "confused and confusing" and said the district court's interpretation of this evidence was possibly incorrect; however, the Ninth Circuit refused to overturn the district court's finding that a violation would not occur (Coggins and Glicksman 1996). The kind of evidence required to satisfy courts that violations of water quality standards have occurred and are attributable to present and proposed nonpoint sources remains uncertain (Coggins and Glicksman 1996).

In *Hells Canyon I*, another Ninth Circuit panel cited *Blue Creek* but refused to enjoin a timber sale on the basis of threats to water quality in a national recreation area (Coggins and Glicksman 1996). The court determined that proper implementation of state-approved BMPs should be treated as compliance with state water quality standards, unless there was evidence that the latter have been violated; in this case the appellate court upheld the district court's finding that the plaintiffs provided no such proof (Coggins and Glicksman 1996).

The *Blue Creek* decision has obvious implications for road building and logging operations on federal lands. The court put the burden of proof on the U.S. Forest Service to

show their actions would not cause a violation in the future. The other cases seem to say no violation has occurred and none are anticipated, but if monitoring reveals a violation of water quality standards, the court is willing to reconsider these issues (T. Cundy, review comments).

Coggins and Glicksman (1996) said they saw no reason why the Ninth Circuit's holding in *Blue Creek* cannot be extended to other activities with similar consequences such as grazing, intensive recreation, or placer mining. Even if other courts confirm the strict Ninth Circuit interpretation, actual pollution abatement controls will depend on the scope, coverage, and severity of state water quality standards; when water quality standards are phrased non-numerically, as is often the case, there is considerable room for interpretation (Coggins and Glicksman 1996).

The issue thus becomes, should state water quality standards criteria be numeric or narrative (that is, non-numeric)? This is a technical question with important legal ramifications. Numeric criteria provide a quantifiable "bright line," or inviolable threshold, that can be readily challenged. Narrative criteria are less easily discernible and challengeable.

The CWA requires numeric criteria (see EPA 1995a), but recognizes that it is not always possible to develop them, in which case narrative criteria are acceptable. This seems to be the situation with "clean" sediment; that is, sediment that does not carry toxic contaminants. Sedimentation is a natural process, but human activity can add additional sediment to a water body. How much additional sediment can the water body receive before the designated beneficial use is impaired? In most cases, the reply is unknown, but the CWA requires a reply in the form of a TMDL, and BMPs to control the situation.

The *Blue Creek* and *Rio Grand LRMP* cases demonstrate that citizen groups may seek judicial review of federal agency actions for alleged violation of water quality standards, including the antidegradation policy (Coggins and Glicksman 1996).

Chapter 2. How has federal court action affected Idaho?

The reply to this question partially updates the Policy Analysis Group's 1991 report "State Agency Roles in Idaho Water Quality Policy" (Turner and O'Laughlin 1991). An update is necessary because a 1993 citizen lawsuit focused attention on Idaho's waters with impaired quality, triggering a series of judicial rulings in the *Idaho TMDL* lawsuit that have not yet been concluded. As a result of these court actions the Idaho Legislature changed relevant portions of the state law (Idaho Code § 39-3601 *et seq.*), the Idaho Division of Environmental Quality (DEQ) has had its water quality workload increased substantially, and the EPA has become more involved in its oversight role in nonpoint source pollution management in Idaho.

Two key issues are addressed in the *Idaho TMDL* lawsuit and in this chapter: [1] How many of Idaho's waters have impaired water quality? [2] When will plans be completed for these waters to attain state water quality standards?

These legal actions suggest that from some design or implementation standpoint Idaho policy in 1991 was apparently not satisfactory. What key features of Idaho policy at that time led to the *Idaho TMDL* lawsuit, judicial ruling, and subsequent rewriting of Idaho water quality law? The plaintiffs did not feel that the state had met the intent of the Clean Water Act (CWA) in cleaning up polluted waters. The most important CWA-related question is what actions will be taken to assure that all waters of the state meet state water quality standards and fully support beneficial uses. If any waters of the state are not expected to meet the standards after required limitations on pollution have been implemented, these waters are termed "water quality limited segments" in the CWA, or more commonly, water quality-limited waters. These waters must be placed on a list, often called the "303(d) list" after the pertinent section of the CWA, and then assigned a priority for action. The CWA requires the state—or the EPA if the state defaults—to determine "total maximum daily loads" (TMDLs) for all water quality-limited waters. The TMDL process is basically to gather information used in the development of a water quality management plan, with the aim being controls on the sources of pollution that

cause the water quality impairment. In 1991, the state had just begun the TMDL process.

In the context of these court actions, an important CWA-related question is, what actions will Idaho take to get water quality-limited waters off the "303(d) list"? This is an important water quality question in Idaho, but is beyond the scope of this study to develop a reply. Because agencies are currently developing a response, any reply attempted here would be speculative. As Idaho struggles with these issues, 21 other states face similar issues arising from citizen lawsuits involving the TMDL process in the CWA.

2.1. What are the citizen lawsuit provisions in the CWA?

Courts and judges have made rulings since the days of the Roman Empire that have affected many aspects of the environment (Novotny and Olem 1994). Most water quality litigations involve injunctions or specific orders from the courts restraining certain types of actions or regulating other actions, with judicial rulings based on the doctrine of nuisance and trespassing (Novotny and Olem 1994).

In section 505 the CWA authorizes any person, as long as they have an interest that may be adversely affected, to bring suit in federal district court against any person alleged to be in violation of the statute, including any agency of the federal government (Coggins and Glicksman 1996). To establish jurisdiction with the court, the plaintiff's suit must allege violation of either "an effluent standard or limitation under [the CWA]," or any order issued by the EPA or a state that relates to such a standard or limitation. A point source discharging without an NPDES permit, or in violation of a permit, would clearly be included; regarding nonpoint source pollution, the issue of whether citizen suits are available for alleged CWA violations is less easily resolved (Coggins and Glicksman 1996). Nonpoint source pollution control, specifically best management practices (BMPs), are a largely unexplored legal area under the CWA (Novick et al. 1994).

• *What does case law say about nonpoint source pollution?*— Despite some ambiguity in the court decisions cited in this section, water quality enforcement appears to be the best

avenue for legal strategies focused on controlling nonpoint source discharges, particularly on federal lands (Hildreth et al. 1993). Based on two law review commentaries (Anderson 1987, Whitman 1989) published shortly after the 1987 amendments to the CWA, it can be said that Idaho has been the focus of litigation over nonpoint source pollution in the waters within the national forest system for at least a decade.

The principal issues have been the antidegradation policy regulations (Anderson 1987) and application and effectiveness of BMPs (Anderson 1987, Whitman 1989). Anderson (1987) used the drafts of the Boise and Clearwater National Forest Land and Resources Management Plans of the mid-1980s to illustrate his commentary, the main point being that these plans, required by the National Forest Management Act of 1976, must adhere to state water quality standards.

Whitman (1989) used the "Salmon River Dispute" that occurred on the South Fork of the Salmon River in 1965 to illustrate his points. His arguments involved withdrawing environmentally sensitive national forest lands from the timber harvesting base. Whitman was concerned about the effective implementation of BMPs and pointed out that numeric criteria for sediment and turbidity are fixed and may therefore "grossly over or under-protect water-dependent uses." He also argued for a restructuring of state water quality standards to include biological standards (Whitman 1989).

Whitman (1989) was more positive about forestry BMP effectiveness than was Anderson (1987). Neither commentary seems to have encouraged subsequent litigation on nonpoint source enforcement in Idaho.

Few courts have been presented with the issue of enforcing water quality standards against nonpoint source pollution (Hildreth et al. 1993). In the 1983 *Blue Creek* case in California's Six Rivers National Forest (summarized in section 1.6.2 of this report), the Ninth Circuit Court of Appeals ruled that the planned timber harvest would violate the CWA by exceeding the turbidity and suspended solids water quality standards established by the state (Hildreth et al. 1993).

Rector (1989), a U.S. Forest Service employee, analyzed the *Blue Creek* case in a paper presented at a national symposium of

agricultural engineers. He suggested that resolving nonpoint source problems through judicial processes is not as likely to produce "consistent, well-reasoned outcomes" as is appropriate action by regulatory agencies. Courts apply a "highly variable" set of review standards in litigation on water quality issues; the plaintiff and defendant are subject to resolution that "may be of little benefit to either, difficult to understand, and without appropriate responsive actions" (Rector 1989). Because litigation involves considerable amounts of time, funds, and personnel, resource management time "would be more productive to water quality protection if spent administering nonpoint source management programs" (Rector 1989). It is therefore logical and appropriate to exhaust all administrative remedies through state agencies before burdening the courts with nonpoint source water quality management issues, and "to do otherwise is an apparent circumvention of the intent of the CWA" (Rector 1989).

Subsequent decisions by the Ninth Circuit illustrate that this area of law is not particularly well settled (Hildreth et al. 1993). In *North Roaring Devil*, a 1987 lawsuit against a logging operation in an Oregon national forest, the Ninth Circuit ruled that the Administrative Procedures Act allowed the plaintiff to seek a declaratory judgment. The issue in this case was that proposed timber practices and construction of a logging road would violate Oregon's water quality standards. The court held, however, that a citizen suit under the CWA could not be brought to enjoin an alleged violation of a state water quality standard caused by a nonpoint source (Coggins and Glicksman 1996). The court stated that "it is not the water quality standards themselves that are enforceable [under the CWA], but it is the 'limitations necessary to meet' those standards" which are enforceable (Hildreth et al. 1993).

According to commentary (Hildreth et al. 1993) the *North Roaring Devil* decision appears to be a substantial setback to groups attempting to protect water quality from nonpoint source pollution under the CWA because the Act does not contain any mandatory, technology-based standards on nonpoint sources. BMPs are strictly discretionary under sections 208 and 319 of the CWA; the court therefore ruled, in effect, that citizens could not enforce the CWA in

efforts to prevent nonpoint source discharges, even though they caused violations of water quality standards (Hildreth et al. 1993).

In *Hells Canyon I*, another Oregon case that went to the Ninth Circuit, Hildreth et al. (1993) commented that the decision contains language suggesting that nonpoint source dischargers, in this case a timber harvesting operation on a national forest, can be found in violation of state water quality standards. The appeals court refused to overturn the lower court's determination that a proposed timber sale in the Hell's Canyon National Recreation Area would not violate Oregon water quality standards. Hildreth et al. (1993) said it is important to note that the court did not reject outright the plaintiff's argument that nonpoint source discharges from timber operations could violate water quality standards, but instead focused on whether the plaintiff had proved that the violations would in fact occur. The court said "[p]roper implementation of state-approved BMPs will constitute compliance with the CWA unless water quality monitoring reveals that the BMPs have permitted violation of ... water quality standards." Because the requisite proof was lacking, the court allowed the sale, but, according to Hildreth et al. (1993), the tone of the opinion suggests that nonpoint source dischargers can be held accountable under the CWA for violations of water quality standards.

According to Coggins and Glicksman (1996), the *Blue Creek* case and others demonstrate that based on the Administrative Procedures Act, private plaintiffs should be able to seek review in federal district court of U.S. Forest Service and Bureau of Land Management activities for consistency with state water quality standards. As Anderson (1987) pointed out, the Administrative Procedures Act only applies to federal agencies. Persons seeking to challenge CWA violations by nonpoint sources not involving federal agencies will be relegated to state court (Coggins and Glicksman 1996).

• *What is a TMDL lawsuit about?*— A lawsuit pursuant to section 303(d) of the CWA involves the development of plans to clean up waters that are not expected to meet state water quality standards after pollution control requirements have been applied. Currently there are legal actions in 22 states stemming from citizen lawsuits based on section 303(d) of the CWA (L.

Koenig, personal communication). The *Idaho TMDL* case is one of these.

The EPA's regional office in Seattle and environmental groups have been pressing for implementation of the TMDL process for nonpoint sources on water quality-limited waters (Griffin et al. 1991). In principle, the TMDL approach appears fair because both point and nonpoint source activities are considered in achieving water quality protection goals (Ice 1991).

• *How have the EPA and states responded to TMDL lawsuits?*— The EPA made a strong commitment in 1992 toward helping states establish TMDLs, and as monitoring information and implementation programs improve, the importance of TMDLs as a tool for nonpoint source pollution control will continue to grow (Hildreth et al. 1993).

As of 1993, few states have attempted to calculate TMDLs for nonpoint source pollutants; one notable exception was Oregon, where to settle a citizen lawsuit the state entered a consent decree in 1987 to calculate TMDLs for phosphorous and ammonia for the Tualatin River and ten other Oregon rivers (Hildreth et al. 1993). Idaho's first TMDL was developed for sediment in the South Fork of the Salmon River (EPA 1992).

The EPA convened a TMDL Re-invention Workgroup in September 1995 in response to pending litigation, with a goal to update TMDL regulations from 1992. The workgroup was altered significantly after the *Georgia TMDL* lawsuit was decided in favor of the plaintiff Sierra Club. This landmark decision elevated TMDL concerns to high profile status. The EPA convened a Federal Advisory Committee Act (FACA) committee in 1996 to work on TMDL issues. The agency had already been authorized under FACA to convene the National Advisory Council for Environmental Policy and Technology; the FACA TMDL committee is a subcommittee. The FACA TMDL committee held its first meeting in November 1996 and for all intents and purposes has replaced the now defunct TMDL Re-invention Workgroup. Five more meetings are planned during 1997 and early 1998. The FACA committee is charged with developing recommendations to assist EPA and the states in developing a coherent and implementable TMDL policy. Membership

includes representatives from environmental groups, state water quality agencies, universities, and selected industrial sectors, including the forest products industry. Issues of concern to the FACA group are the listing of impaired waters by the states, the state de-listing process, TMDL development, and other scientific and technical issues such as how to estimate nonpoint source contributions to water impairment and how to incorporate a margin of safety (MOS) in TMDL calculations (EPA 1996b; various documents in PAG files from the American Forest & Paper Association, Washington, D.C.).

The EPA issued revised draft TMDL guidelines on November 18, 1996 (EPA 1996b).

The various states involved in TMDL litigation have been actively working on some of these issues. In early 1996, the Department of Ecology in the state of Washington prepared a discussion draft on implementation guidance for nonpoint source TMDLs, and proposed using the term "Water Quality Management Strategy" to communicate TMDL concepts to the public. In July 1996, the Oregon Department of Environmental Quality issued draft guidance on developing water quality management plans that will function as nonpoint source TMDLs. The Oregon DEQ gave a presentation on "Getting Off the 303(d) List" at a July 1996 conference titled "TMDL Issues: The Good, The Bad, and The Ugly" sponsored by the Oregon Water Resources Research Institute and the Association of Clean Water Agencies. In November 1996, the Oregon DEQ published a review draft of guidance for preparing a stream temperature management plan that may function as a "TMDL equivalent" for waters that violate stream temperature criteria (various documents in PAG files).

2.2. What is the history of the *Idaho TMDL* lawsuit?

In 1993, the Idaho Sportsmen's Coalition and the Idaho Conservation League together filed a complaint for declaratory judgment and injunctive relief in federal district court, alleging that the U.S. Environmental Protection Agency (EPA) was not fulfilling the mandates of the CWA in designating water quality-limited waters in Idaho (IDEQ 1996). The plaintiffs asked that TMDLs be established for these waters.

The *Idaho TMDL* case was filed in U.S. District Court, Seattle, in 1993. Judge William L. Dwyer currently presides over the case. He gained notoriety from rulings on the suits filed against the U.S. Forest Service and Bureau of Land Management to protect the northern spotted owl, listed as threatened under the Endangered Species Act, and the owl's preferred habitat in "old-growth" or late-successional forests west of the Cascade Range in Washington, Oregon, and northern California.

In his ruling on the *Idaho TMDL* suit, Judge Dwyer, citing the EPA (1991b) said,

TMDL development in itself does not reduce pollution. It is only a step toward bringing [water quality-limited waters] into compliance with water quality standards; TMDLs inform the design and implementation of pollution control measures. The EPA describes TMDLs as "a tool for implementing State water quality standards ... [that provides] the basis for States to establish water quality-based controls" (EPA 1991b). The TMDL process provides "[a] rational method for weighing the competing pollution concerns and developing an integrated pollution reduction strategy for point and non-point sources" (EPA 1991b).

Judge Dwyer has ordered the EPA to develop a "303(d) list" of water quality-limited waters in Idaho because the state's list was unacceptable, and to produce a schedule for developing TMDLs for all waters on the "303(d)" list. Details follow.

• **Expanded "303(d) list" of water quality-limited waters.** — In April 1994, the court ruled that the EPA decision to accept Idaho's 1992 water quality-limited segments list of 36 threatened and degraded waters was arbitrary and capricious. Judge Dwyer ordered the EPA to promulgate a list of water quality-limited segments for Idaho. The agency completed that task in October 1994, expanding the "303d list" to 962 water quality-limited segments and water bodies.

Neither the CWA nor federal regulations are very clear as to which waters belong on the "303(d) list" and how they got there; often no real analysis is made of the adequacy or degree of implementation of existing controls (L. Koenig, review comments). As a result, waters may be listed without knowing whether those controls are or are not "stringent" enough, as per federal regulations (40 CFR 130.7(b)). An

implementation problem may be mistaken for a technical problem. There is often a presumption that all other remedies short of a TMDL have been exhausted without verifying this to be the case. In Idaho this situation has been exacerbated by a paucity of hard evidence of water quality limitation and a litigation-prompted response on behalf of the EPA to place many waters on the "303(d) list" with the slimmest of evidence (L. Koenig, review comments).

● ***Expedited schedule for TMDL development.***— The court also ordered the EPA to file a complete schedule by May 1996 for developing TMDLs for all water bodies or segments identified as water quality-limited waters. The schedule was submitted to the court, and on September 26, 1996, Judge Dwyer ruled that Idaho's schedule for developing TMDLs was inadequate, and that the EPA decision to accept the schedule was arbitrary and capricious. The court ordered the EPA to work with the state of Idaho and submit a revised TMDL schedule for all water quality-limited waters by March 26, 1997. Plaintiffs had requested that these be accomplished by December 31, 2000. The court suggested that five years would be a reasonable expectation.

Neither the CWA nor federal regulations specify a timeline for TMDL development (L. Koenig, review comments).

2.3. Analysis: What are the implications of rulings in the *Idaho TMDL lawsuit*?

Decision-makers need to consider the action required by the court to meet the CWA requirements. To understand the program implications of the rulings, it is first necessary to know [a] the purpose of TMDLs as part of the broad scheme of what is generally called the "water quality-based approach" to pollution control; [b] why the lawsuit was filed; [c] what the Idaho Legislature has already done by revising the Idaho Code with Senate Bill 1284; and [d] what the Idaho Division of Environmental Quality (DEQ) has done. Summary explanations follow.

● ***What is the purpose of TMDLs?***— A TMDL is an analytical process that establishes a linkage between state water quality standards and the actions necessary to control pollution by identifying the amount of a pollutant that may be

discharged into a water body and still maintain water quality standards (EPA 1995a). The process of TMDL development has been analyzed in section 1.5.5 of this report.

Litigation in Oregon, Alaska, and other states has forced state agencies and the EPA to reconsider the way they deal with nonpoint source pollution management programs. Although citizen lawsuits can bring attention to water quality management problems and force the development of TMDLs, the CWA cannot be used by citizens to force nonfederal landowners to mitigate the discharge of nonpoint source pollution. Such regulation remains a prerogative of the state.

● ***Why was the lawsuit filed?***— If, as Judge Dwyer put it, "TMDL development in itself does not reduce pollution," then why have citizen groups filed lawsuits in 22 states to force the development of TMDLs? Based on the commentary by Coggins and Glicksman (1996) in the next paragraph, the reply in the paragraph following that seems to make sense for Idaho.

Water quality has moved to the forefront of the range of problems the U.S. Forest Service must resolve before its timber sales can proceed (Coggins and Glicksman 1996). Citizen conservation groups and other private plaintiffs may seek judicial review of federal agency actions for alleged violations of state water quality standards; thus the ***calculation of sedimentation load*** by the Forest Service, together with the terrain and harvesting methods, are the factors that will determine whether a CWA claim against a timber sale is sustainable (Coggins and Glicksman 1996, emphasis added).

The criterion for sediment in Idaho water quality standards is stated rather simply (IDEQ 1996): "Is the water body free from excess sediment in quantities that impair designated beneficial uses?" This narrative criterion gives resource managers, water quality assessors, and courts more flexibility for interpretation of the standard than numeric criteria would provide. TMDLs can be developed for narrative criteria. A sediment TMDL requires quantifying sediment loading capacity and will lead to sediment load allocations among operators in a watershed. Such quantification may encourage the development of numeric water quality standards. Whether or not such quantitative standards result, the doors to the federal courtroom and judicial

review of water quality as it is affected by federal land-use activities are opened wider by TMDLs.

• **What did the Idaho Legislature do?**— In 1995 the Idaho Legislature responded to the ruling in the *Idaho TMDL* case that resulted in the list of 962 water quality-limited segments and water bodies by changing the pertinent sections of the Idaho Code (see Chapter 3 in this report). A brief explanation of the TMDL portion of the law is in the second paragraph of the next section.

• **What did the Idaho Division of Environmental Quality (DEQ) do?**— The agency responded by establishing a technical committee to develop a non-arbitrary water body assessment method in order to determine the extent to which the 962 waters on the “303(d)” list do not support their designated beneficial uses in the state water quality standards. These efforts resulted in the Water Body Assessment Guidance document completed in August 1996 (IDEQ 1996). Under these procedures an assessor uses chemical, physical, and biological data to determine at which level beneficial uses are being supported in a particular water body. The guidance document also describes a process for determining which beneficial uses unclassified waters can support, or are attainable. The document illustrates the decision process guiding how these assessments will be made. The DEQ will be the only agency making beneficial use support status and attainability determinations. Both of these determinations can be appealed. The Water Body Assessment Guidance serves other purposes. It also outlines a process the state will use in listing water quality-limited waters and designating beneficial uses (IDEQ 1996).

Idaho Code § 39-3601 *et seq.* provides the mechanism to make this water body assessment process happen (IDEQ 1996). The legislation, enacted in 1995, focuses on watersheds as the level where water quality decisions are made, thereby providing a basis for cost-effective water quality management. Candidate water quality-limited water bodies and designated uses are submitted to Basin Advisory Groups (BAGs) and reviewed through their public involvement provisions. The BAGs will prioritize water

bodies and make recommendations to the Idaho Division of Environmental Quality (IDEQ 1996). Chapter 3 in this report analyzes the provisions of Idaho Code (§ 39-3601 *et seq.*), and program implications from this new state policy.

• **What options are currently available?**— Idaho can either attempt to develop TMDLs for the “303(d) list” of waters or decide not to attempt this, in which case the EPA must do so. As of this writing, the Idaho Division of Environmental Quality (DEQ) is working with the EPA to design methods by which TMDLs or “TMDL equivalents” can be completed within the next 5 years. The implications for the state are that significant resources will be required to pursue TMDL development. TMDLs can range in cost from a few thousand to millions of dollars, depending on the complexity of the problem watershed and the availability of existing data (EPA 1996a).

If Idaho defaults on its TMDL responsibilities, it is likely that funds the state receives in CWA section 319 grants would be lost; such funding for 1995 was \$1.2 million.

2.4. What about other current CWA litigation?

Two recent lawsuit rulings address the states’ authority to certify nonpoint source controls on federal lands through section 401 of the CWA. One was in Idaho (*ICL et al. v. Caswell*, U.S. District Court for Idaho, Case NO. 95-394-S-MHW, August 1996); the other in Oregon (*ONRC et al. v. Jack Ward Thomas*, U.S. District Court of Oregon, Civ. No. 94-522-HA, September 1996). The cases had opposite outcomes and one or both cases will almost certainly be taken to the Ninth Circuit Court of Appeals (M. Medberry, review comments).

The Idaho Conservation League brought a lawsuit under section 303(c) of the CWA. It addresses the EPA requirement for triennial review of Idaho’s water quality standards. This lawsuit may affect implementation of the antidegradation policy, default standards for designating beneficial uses, and other standards relevant to the analysis in this report (M. Medberry, review comments).

2.5. A Concise Legal Summary of CWA Provisions and Policy

Up to this point Chapters 1 and 2 have attempted to explain what the CWA requires and how court interpretations of the statutory and regulatory mandates of the CWA have affected Idaho. Professor Arthur D. Smith, Jr., of the University of Idaho's College of Law provided technical review of these sections of the report. For the most part Professor Smith's review comments consisted of a concise legal summary of the CWA's requirements. That summary is provided in this section. The only changes that have been made are the citations to cases, which follow the format used in the *Public Natural Resources Law* treatise by Coggins and Glicksman (1996) that is used in this report.

• **CWA standards applicable to sources of water pollution.** — All *point sources* must obtain a discharge permit. Permits specify the quantity of effluent which may be legally discharged into any surface water. The primary effluent standard is normally set by the federal government (EPA) based upon what is achievable by use of the *best available technology*. In addition, point sources are required to adopt any further effluent limitations which are necessary to comply with state *water quality standards*.

States are also required to define *best management practices* (BMPs) for nonpoint sources. These are practices which limit pollution from run-off "to the extent feasible" (CWA § 208(b)(1)(F)-(G)). However, states may choose to implement BMPs through incentives rather than regulation. Of course, states may go further than required by CWA, including imposition of water quality requirements directly upon nonpoint sources. However, most states regulating nonpoint sources rely principally upon compliance with BMPs, using water quality standards as a device for evaluating effectiveness of BMPs. Thus, in contrast to point sources which must be regulated to achieve state water quality standards as well as federal technology standards, nonpoint source standards need not be regulatory nor must nonpoint sources comply with discharge requirements based upon water quality standards.

Still, the CWA is designed to encourage states to do whatever is necessary to maintain and

restore the "chemical, physical and biological integrity" of U.S. water (CWA § 101(a)), including effective management of nonpoint sources. This is accomplished by a series of planning programs which must meet EPA approval. The most important are the development of state water quality standards and formulation of watershed plans and programs.

• **Water quality planning and nonpoint source programs under the CWA.** — In theory, states establish water quality standards. These standards consist of designation of particular stretches of streams and other waters for particular stretches of streams and other waters for particular uses (essentially a zoning process) and development of chemical, physical, or biological criteria designed to protect the designated uses. In practice, EPA exercises considerable authority over the development of these standards, so as to "protect the public health and welfare, enhance the quality of water and serve the purposes of this chapter" (CWA § 303(c)(2)(A)). In order to meet EPA approval, states must protect all beneficial uses which existed in 1975, achieve fishable and swimmable conditions "whenever feasible," prohibit degradation of water quality in excess of standards without a particular public process and must protect outstanding resource waters in all instances, and must develop objective criteria capable of achieving these requirements.

With respect to nonpoint sources, states were initially required to develop watershed plans which included procedures and methods of controlling nonpoint sources. In 1987 Congress required states to submit reports on waters failing to attain quality standards because of nonpoint source pollution and identify the BMPs designed to reduce such pollution, and to submit management programs specifying means of implementing BMPs (CWA § 319).

While these planning requirements lack the same teeth as regulation of nonpoint sources, BMPs for nonpoint sources have been widely specified and a number of states, including Idaho, have regulated nonagricultural sources such as logging. In addition, some states have made considerable progress in voluntary programs for application of BMPs to farming. Although EPA does not require direct application of water quality standards to nonpoint sources, planning requirements must include revision of

BMPs where necessary to achieve water quality standards.

• **The TMDL process.** — In order to force state and federal governments to address water quality on a watershed basis, the CWA requires states to identify stream segments which fail to meet water quality requirements after application of technology requirements to all point sources. For all quality limited segments, the state is required to establish the total pollution loading from all sources consistent with protection of quality standards. If states fail, EPA is required to establish TMDLs (CWA § 303(d)).

The legal significance of TMDLs is not spelled out by the CWA. However, point sources are subject to water quality effluent standards as well as technology-based standards (CWA §§ 301(b)(1)(C); 302). Thus, the CWA strongly implies TMDLs are to be translated into effluent standards applicable to point sources. Since no direct regulation of nonpoint sources is mandated by CWA, the strong implication is that TMDLs are to be used as a planning device regarding these activities.

Following Judge Dwyer's original decisions invalidating Idaho's list of quality-limited waters in the *Idaho TMDL* case, the legislature adopted a water quality statute designed to determine whether beneficial uses were being fully supported and develop TMDLs for those waters where designated uses were at serious risk. Judge Dwyer's most recent decision on September 26, 1996, requires development of TMDLs for all quality-limited segments as well as presumptively limiting the process to a period of 5 years. This will presumably have significant impacts on the process which the legislature contemplated in 1995.

• **Application of state water quality standards to federal lands.** — The CWA expressly subjects federal activities to state standards (CWA § 313(a)). In *Blue Creek*, the Ninth Circuit interpreted California's 20-percent turbidity standard for the Klamath River as a maximum permissible level directly applicable to all nonpoint sources. Although the U.S. Forest Service was in compliance with all applicable BMPs, the evidence established that logging and roadbuilding on national forest land would, on occasion, significantly exceed this level. As a result, the court enjoined these activities until compliance with state law could be assured.

Other water quality challenges to logging on national forest have reaffirmed this basic proposition, but plaintiffs in subsequent cases have failed to establish violations of water quality standards. In *North Roaring Devil* and in *Hells Canyon I* plaintiffs asserted that logging resulted in violation of an Oregon 10-percent turbidity standard. However, the Ninth Circuit did not interpret Oregon law to establish the same bright-line requirement as had California in the *Blue Creek* case. Oregon law provided that the principle means of meeting Oregon water quality standards was through application of BMPs; moreover, the Oregon turbidity standard was held to apply only in cases of sustained, rather than temporary, degradation.

The important point here is that while states can adopt numerical criteria directly applicable to nonpoint sources, they are not compelled to do so. Idaho has long provided that degradation of water quality by sources complying with BMPs is not judicially enforceable but, rather is to be dealt with as an administrative matter. Consequently, the *Blue Creek* decision has little immediate application to nonpoint sources on federal land in Idaho.

The Oregon Natural Resources Council cases—*North Roaring Devil* and *Hells Canyon I*—are also important on the issue of citizen enforcement of water quality standards against nonpoint sources. In *North Roaring Devil* the circuit court held that while state water quality standards are enforceable on federal lands by means of judicial review under the Administrative Procedures Act, state water quality standards are not "effluent limitations" subject to citizen suits under section 505 of the CWA. A consequence of this holding is that citizens cannot directly enforce even bright-line water quality requirements against state or private nonpoint sources.

• **BMPs vs. water quality standards.** — The policy question of whether to focus upon BMPs or water quality standards in dealing with nonpoint sources depends upon numerous factors including cost of regulation and monitoring, ease of enforcement, and effectiveness. Cost of regulation and ease of enforcement seem to favor emphasis on BMPs since practices for different activities are well defined and compliance is efficiently ascertained by a visual inspection.

How effective BMPs are in achieving formal

water quality standards, however, was not clear from information in the review draft of this report [see author's response in the last paragraph of this section]. Although various studies are cited as judging BMPs to be effective, the discussion indicates that what is being measured is either compliance with BMPs or avoidance of obvious erosion or sedimentation rather than the degree of impact on beneficial use or compliance with numeric criteria. Thus, while these studies do provide a basis for encouraging focus on BMPs in areas where obvious problems exist (or perhaps more generally on the grounds of efficiency), they do not really speak to water quality compliance. If designated uses and numeric criteria are a sound basis for evaluating water quality, the

effectiveness of BMPs must ultimately be appraised in relation to such criteria.

[Author's response: Other reviewers also stressed the need for instream monitoring of water quality standards, especially in relation to supporting aquatic life as a beneficial use. The draft report has been modified as Professor Smith and other reviewers suggested. As chapters 3 and 4 indicate, Idaho programs, especially the Beneficial Use Reconnaissance Project (BURP) approach and the Water Body Assessment Guidance (WBAG) procedures (IDEQ 1996), are attuned to the need to monitor and assess water quality standards in addition to BMP compliance. The lack of attention to this point in the review draft has been rectified in this report.]

Chapter 3. What are the features of the new Idaho policy?

This chapter is designed to serve as a manual or handbook for decision makers pertaining to what is necessary to implement the new Idaho policy (Senate Bill 1284) that features local involvement in water quality programs. The new policy was driven by court actions resulting in the EPA expanding the list of water quality-limited waters. The court is likely to require TMDLs for all such waters within five years.*

The key features of the new Idaho policy are BAGs and WAGs (Basin Advisory Groups and Watershed Advisory Groups, respectively). The BAG concept improves upon the former biannual basin-area meetings by meeting more frequently, and each BAG establishes its own operating procedures. BAGs are to "reflect a balanced representation of the interests in the basin" (Idaho Code § 39-3613) and, where appropriate, include a representative from agriculture, mining, nonmunicipal point source discharge permittees, forest products, local government, livestock, Indian tribes, water-based recreation, environmental interests, and a public-at-large representative. BAGs have very specific assigned duties for determining program priorities in the basin. One important function of BAGs is to suggest the formation and composition of WAGs, who are responsible for recommending specific actions needed to control point and nonpoint sources of pollution within the watershed. Unlike BAGs, WAG representatives are not statutorily defined.

Although the BURP (Beneficial Use Reconnaissance Project) process preceded Senate Bill 1284, both were prompted by the *Idaho TMDL* lawsuit. BURP is a water quality monitoring program designed and implemented by the DEQ to determine if designated beneficial

uses are attainable and supported by including assessment of biological communities along with physical and chemical characteristics of the water body (IDEQ 1996). The BURP process is an important part of the new Water Body Assessment Guidance (WBAG) (IDEQ 1996) for determining beneficial use attainability and beneficial use status. These systematic guidelines will be applied consistently across the state (IDEQ 1996).

3.1. Introduction

Several questions related to the changes in Idaho's law for nonpoint source pollution affecting surface waters are addressed in this section. Then the provisions of the law are analyzed in the remaining sections of the chapter.

• *How does the new policy address problems in the old policy that led to court action?*— As the citizen conservation group Idaho Rivers United (IRU 1995) put it, "Antidegradation didn't work." Basically this means state water quality standards were not being met in all of the state's waters. The Clean Water Act (CWA) sets "fishable and swimmable" goals for all the nation's waters, and some Idaho waters don't fully support these goals.

According to the Idaho Division of Environmental Quality (IDEQ 1995b), Idaho's new legislation is an acknowledgment that concentrating program efforts on individual stream segments, rather than on entire watersheds, has not accomplished the desired level of water quality. Idaho's 1988 antidegradation agreement featured biennial basin-area meetings in each of Idaho's six hydrologic basins, and the designation of stream segments of concern (SSOC) in forested watersheds, where local working committees were formed to develop site-specific BMPs. Idaho's new policy has replaced the SSOC portion of the 1988 antidegradation agreement with a watershed focus.

Two special provisions in the new policy are noteworthy. First, agricultural operations are exempted from any nonvoluntary requirements to implement BMPs (Idaho Code § 39-3610(1)). Second, for water bodies that do not attain applicable water quality standards due to impacts that occurred prior to 1972, no further restrictions may be placed on point source

* The reader should be aware that water quality policy involves technical terminology and otherwise unfamiliar words. Idaho Code § 39-3602 provides definitions of key terms that are fundamentally important to understanding water quality policy. These terms are included in the Glossary section at the end of this report, rather than embedded in the analysis of Idaho Code § 39-3601 *et. seq.* presented in this chapter.

discharges unless point source contribution of the pollutant under a TMDL exceeds 25% of the total load for that pollutant. According to the Idaho Conservation League, this is a loophole designed to allow mining companies to avoid cleaning up mining-related pollution that occurred before the CWA was passed (M. Medberry, review comments).

● *Is the new policy consistent with what the CWA requires?*— This is an important but difficult question. The EPA's Acting Director, Office of Water (Millam 1995), has replied:

We believe that this legislation is a positive step forward in addressing the quality of Idaho's waters. We do have some concerns related to parts of the legislation, some of which address sections of the Bill which *may not be consistent* with Clean Water Act goals and requirements. These concerns are enclosed (Millam 1995, emphasis added).

The EPA's comments about features of the new policy that *may not be consistent* with the CWA fell into five categories: designating beneficial uses, antidegradation policy, reference streams, TMDLs, and appropriate roles and representation on BAGs and WAGs

(Millam1995). It is beyond the scope of this analysis to comment on the EPA's hedged comments.

Although two reviewers of a draft of this report mentioned that PAG comments on the EPA's comments would be appreciated, such comments would be legalistic opinions about whether actions taken to conform to a state statute, some of which have not yet been determined, meet the requirements of a federal statute. That is an appropriate task for the Idaho Attorney General's office, but not the Policy Analysis Group!

● *Does the new policy adequately meet what the court required?*— Although it is possible to generate a reply, only the court can answer the question authoritatively. This analysis indicates that the new features of Idaho water quality policy are consistent with the EPA's watershed protection approach for controlling nonpoint source pollution, especially its focus on including affected interests in local watersheds in water quality planning and management programs (see Table 4).

Table 4. The EPA's watershed protection approach.

Several key principles guide the watershed protection approach:

☐ **Place-based focus.**— Resource management activities are directed within specific geographical areas, usually defined by watershed boundaries, areas overlying or recharging ground water, or a combination of both.

☐ **Stakeholder involvement and partnerships.**— Watershed initiatives involve the people most likely to be affected by management decisions in the decision making process. Stakeholder participation ensures that the objectives of the watershed initiative will include economic stability and that the people who depend on the water resources in the watershed will participate in planning and implementation activities. Watershed initiatives also establish partnerships between Federal, State, and local agencies and nongovernmental organizations with interests in the watershed.

☐ **Environmental objectives.**— The stakeholders and partners identify environmental objectives (such as "populations of striped bass will stabilize or increase") rather than programmatic objectives (such as "the State will eliminate the backlog of discharge permit renewals") to measure the success of the watershed initiative. The environmental objectives are based on the condition of the ecological resource and the needs of people in the watershed.

☐ **Problem identification and prioritization.**— The Stakeholders and partners use sound scientific data and methods to identify and prioritize the primary threats to human and ecosystem health within the watershed. Consistent with the Agency's mission, EPA views ecosystems as the interactions of complex communities that include people; thus, healthy ecosystems provide for the health and welfare of humans as well as other living things.

☐ **Integrated actions.**— The stakeholders and partners take corrective actions in a comprehensive and integrated manner, evaluate success, and refine actions if necessary. The watershed protection approach coordinates activities conducted by numerous government agencies and nongovernmental organizations to maximize efficient use of limited resources.

• **What do the features of the new law intend to accomplish?**— To reply, it is necessary to analyze Senate Bill 1284 (Idaho Code § 39-3601 *et seq.*) point-by-point. In this chapter, the text of each part of the new law is presented, followed by a brief discussion of the rationale or purpose for that section of the law, generally explained in the context of CWA mandates. Then a brief analysis and discussion of program implications is also provided.

3.2. Declaration of Policy and Legislative Intent

§ 39-3601. **Declaration of policy and legislative intent.**— The legislature, recognizing that surface water is one of the state's most valuable natural resources, has approved the adoption of water quality standards and authorized the administrator of the division of environmental quality of the department of health and welfare in accordance with the provisions of this chapter, to implement these standards. In order to maintain and achieve existing and designated beneficial uses and to conform to the expressed intent of congress to control pollution of streams, lakes and other surface waters, the legislature declares that it is the purpose of this act to enhance and preserve the quality and value of the surface water resources of the state of Idaho, and to define the responsibilities of public agencies in the control, and monitoring of water pollution, and, through implementation of this act, enhance the state's economic well-being. In consequence of the benefits resulting to the public health, welfare and economy, it is hereby declared to be the policy of the state of Idaho to protect this natural resource by monitoring and controlling water pollution; to support and aid technical and planning research leading to the control of water pollution, and to provide financial and technical assistance to municipalities, soil conservation districts and other agencies in the control of water pollution. The director, in cooperation with such other agencies as may be appropriate, shall administer this act. It is the intent of the legislature that the state of Idaho fully meet the goals of the federal clean water act and that the rules promulgated under this act not impose requirements beyond those of the federal clean water act.

• **Rationale or Purpose.**— According to the Idaho Division of Environmental Quality (IDEQ 1995b), the purpose behind the passage of Senate Bill 1284 in 1995, which amended Title 39, Chapter 36 of the Idaho Code, was to provide a modified approach to surface water quality management. In two words, that approach is

watershed management (IDEQ 1995b). This program direction is a relatively new approach to water quality management suggested by the EPA in 1991 as a way to approach nonpoint source pollution more effectively (see Table 4).

According to DEQ, Idaho's new legislation acknowledged that concentrating on individual stream segments, rather than on entire watersheds, has not accomplished the desired level of water quality. The new policy also acknowledges the role of public involvement in successful programs—specifically, those dealing with the Mid-Snake River, Cascade Lake, and the Coeur d'Alene Basin—and directs that public involvement processes be utilized statewide. The policy directs that Basin Advisory Groups (BAGs) be formed to aid in setting priorities and gaining public involvement at the basin level, and that Watershed Advisory Groups (WAGs) be formed for high priority watersheds (IDEQ 1995b).

• **Program Implications.**— Watershed management, the program direction of the new Idaho policy (IDEQ 1995b), seems to be consistent with the 1991 policy of the EPA to adopt a watershed protection approach to implementing the CWA (see Table 4).

In 1995, the Idaho Legislature appropriated \$500,000 for additional water quality monitoring and implementation. According to DEQ this will be insufficient for the agency to carry out all of the provisions of the new law (IDEQ 1995b). As stated in the agency's strategic plan (IDEQ 1995b), during FY 1996, DEQ will continue to develop a master plan for implementation of the new law.

As a part of the implementation master plan, DEQ will identify additional resource needs and the timing needs for additional resources for presentation to the Legislature (IDEQ 1995b). Specific tasks identified in DEQ's strategic plan (IDEQ 1995b) included the formation and nurturing of Basin Advisory Groups (BAGs), Watershed Advisory Groups (WAGs), and biological (or bio-assessment) monitoring through Beneficial Use Reconnaissance Projects (or BURPs). These policy features are explained in more detail under the relevant portion of Idaho Code in this chapter.

3.3. General Water Quality Standard and Antidegradation Policy

§ 39-3603. **General water quality standard and antidegradation policy.**— The existing instream beneficial uses of each water body and the level of water quality necessary to protect those uses shall be maintained and protected. Where the quality of waters exceeds levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water, that quality shall be maintained unless the department finds, after full satisfaction of the intergovernmental coordination and public participation provisions of this chapter, and the department's planning processes along with appropriate planning processes of other agencies, that lowering water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such reductions in water quality, the department shall assure water quality adequate to protect existing uses fully.

● **Rationale or Purpose.**— The CWA (§ 303(c)(2)) provides that water quality standards shall be such as to “protect public health or welfare, enhance the quality of water and serve the purposes of this Act.” The EPA interpretation is that state water quality standards must achieve the goals of the CWA that “wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water...” (Novick et al. 1994).

To conform with the CWA, the Idaho Administrative Procedures Act requires routine review of state water quality standards at least once every three years (IDEQ 1995a,b). The Idaho Division of Environmental Quality (DEQ) is required to hold public hearings to review applicable water quality standards and to modify and adopt new standards when appropriate. The state's water quality management plan must be periodically updated to reflect revised standards. This activity is funded entirely by the state (IDEQ 1995a,b).

In 1991, the EPA began discussing “place-based” rather than “program-based” water quality management, or what is generally called watershed management (Burk et al. 1995, see Table 4). Program-based efforts, which apply regardless of locale, can include technology-based effluent limits for point sources and

generic best management practices (BMPs) for nonpoint source control.

In Idaho, a 1988 agreement and subsequent executive orders set forth the state's antidegradation policy concerning forestry, agriculture, and mining practices in the state (IDEQ 1995b). One of the key provisions of the policy was the establishment of biannual basin-area meetings in each of the state's six hydrologic basins to be organized by DEQ. The meetings were held to assess water quality conditions and trends, discuss commercial activities with potential to affect in-stream uses, consider water quality monitoring, and engage in other related activities. A second key provision of the agreement was the identification of stream segments of concern (SSOCs). These were defined as stream segments upon which the public has expressed significant concern. Designated SSOCs were to receive priority status for water quality management and monitoring by state and federal agencies. Additional provisions included development of a coordinated nonpoint source water quality monitoring program, and designation of “outstanding resource waters” which are those waters whose quality cannot be lowered as a result of either point or nonpoint source activity (IDEQ 1995b).

● **Program Implications.**— A key implementation issue related to water quality standards is the designation of beneficial uses. Approximately 90% of the stream miles in Idaho do not have designated uses (Millam 1995). Instead they have a default designation of “primary contact recreation” or swimming. Because one of the goals of the CWA is that all of the nation's waters attain “fishable” conditions where possible, Idaho's default designation does conform to the CWA (IDEQ 1996). The DEQ's new Water Body Assessment Guidance (WBAG) is a systematic process for designating beneficial uses and determining if those uses are fully supported (see IDEQ 1996; also further discussion of the WBAG process in Chapter 4).

The SSOC portion of the 1988 antidegradation agreement has been superseded by the 1995 adoption of state Senate Bill 1284, which amended title 39 of the Idaho Code, and a new executive order. State funds which were allocated to the SSOC portion of antidegradation will be shifted to implementation of Senate Bill 1284 (IDEQ 1995b; also D. Mabe, review

comments).

As yet, the Idaho Legislature has not designated any water as an ORW. To do so would formally recognize that Idaho has some of the "highest quality waters of the United States" as well as some waters of "exceptional ecological significance," as stated in the EPA's regulation (40 CFR 131.12(a)(3)). If ORWs are designated in Idaho, the state would be in charge of protective measures through the implementation of state-defined BMPs and effectiveness monitoring, as is the case for all three tiers of the antidegradation policy. ORWs represent the third tier, or may actually be midway between tier 2 and 3, in a situation which the EPA accepts as "Tier 2½" because under some conditions new pollution sources may occur (EPA 1995a). Tier 2 is when water quality is protected at a level higher than necessary to support beneficial uses, unless stipulated conditions are met and a "use attainability analysis" is performed. Tier 1 is the minimum antidegradation level at which existing uses are maintained and protected. The development of TMDLs and their implementation through NPDES permits and BMPs support tier 1 requirements of the antidegradation policy but only to the extent that designated beneficial uses reflect "existing uses."

The 1988 antidegradation agreement has been modified by this legislation by moving public input from the SSOC hearings to Basin Advisory Groups (BAGs). The rest of the antidegradation agreement is still in place, and the local working committee concept has become Watershed Advisory Groups (WAGs) (D. Mabe, review comments). The program implications of these changes in the antidegradation policy are reviewed under the relevant sections later in this chapter.

3.4. Designation of Instream Beneficial Uses

§ 39-3604. Designation of instream beneficial uses.— For each surface water body, the director shall designate, pursuant to chapter 52, title 67, Idaho Code, and specifically list in the rules of the department, the beneficial use which that water body can reasonably be expected to support without regard to whether that use is fully supported at the time of such designation. In making such designations, the director shall consider the existing use of the water body and such physical, geological, chemical and biological measures as may affect the water body and

shall make such designations utilizing fully the public participation provisions set forth in this chapter. Designated uses as set forth in this chapter shall fully support existing uses and shall supersede existing uses. Designations of beneficial uses shall be reviewed as necessary and revised when such physical, chemical or biological measures indicate the need to do so. In revising a designated beneficial use, the director shall consider the economic impact of the revision and the economic costs required to fully support the revised designated beneficial use. There shall be no requirement for persons who either conduct nonpoint activities or who conduct operations on waters described in section 39-3609, Idaho Code, pursuant to a national pollution discharge elimination system permit to meet water quality criteria other than those necessary for the full support of the existing beneficial use for the water body pertinent to either the nonpoint activity or point source permit in question, except as provided in section 39-3611, Idaho Code.

• **Rationale or Purpose.**— To achieve the goals of the CWA, the EPA has issued regulations requiring that at a minimum, all designated uses must protect aquatic habitat and provide recreation ("fishable/swimmable" waters) wherever these uses are attainable (Novick et al. 1994).

• **Program Implications.**— Designated beneficial uses for aquatic life and recreation are what the CWA is designed to protect. Subcategories of these uses are designated by the DEQ and are part of the state water quality standards. This section of the Idaho Code provides that existing uses shall be designated, which is consistent with requirements of the EPA's antidegradation regulations (40 CFR 131.12). Section 39-3607 refers to the determination through monitoring of "attainable uses," as per the CWA. The difference between designated, existing, and attainable uses is explained in the **Glossary**. The Water Body Assessment Guidance (IDEQ 1996, pp. 39-40) provides further explanation.

There are provisions in the CWA for changing designated uses if they cannot be fully supported. States are required to perform a "use attainability analysis" of waters not designated for these minimum uses, and states can justify a lower designated use only if the analysis demonstrates that the uses are not attainable due to natural environmental factors or because imposition of control measures to achieve these uses would

result in “substantial and widespread economic and social impact” (Novick et al. 1994). The EPA has not specifically defined the precise designated uses necessary to meet the “fishable/swimmable” goals of the CWA nor has the agency specified the extent of the economic impact that would demonstrate widespread economic and social impact (Novick et al. 1994).

3.5. Reference Streams or Water Bodies

Reference streams (or water bodies) are featured in two sections of the new Idaho law. First, section 39-3605 deals with the identification of such water bodies; second, section 39-3606 states the use of references as being determination of support of beneficial uses. These two sections of the law are presented, followed by discussions of the rationale and program implications.

§ 39-3605. Identification of reference streams or water bodies.— The director shall, in a manner consistent with the public participation provisions set forth in this chapter and in accordance with chapter 52, title 67, Idaho Code, identify reference streams, water bodies or conditions to assist in determining when designated beneficial uses are being fully supported. Streams, water bodies or conditions shall be selected to represent the land types, land uses and geophysical features of the basins described in this chapter. Such reference streams or conditions shall be representative of each of the following:

(1) A stream or other water body reflecting natural conditions with few impacts from human activities and which is representative of the highest level of support attainable in the basin.

(2) A stream or water body reflecting the minimum conditions necessary to fully support the designated beneficial uses.

§ 39-3606. Use of reference streams or water bodies to determine full support of beneficial uses.— The director, in consultation with the basin advisory group, shall conduct monitoring to determine if designated beneficial uses are fully supported. In making such determination, the director shall compare the physical, chemical, and biological measures of the water body in question with the reference stream or condition appropriate to the land type, land uses and geophysical features of the water body in question as described in section 39-3605(2), Idaho Code. If the water body in question has such physical, chemical or biological measures as the reference water body or condition, even though such measures may be diminished from the conditions set forth in section 39-3605(1), Idaho Code, then the director shall deem the designated beneficial uses for the water in question to

be fully supported and as having achieved the objectives of the federal clean water act and of this chapter. When site-specific standards have been developed for an activity pursuant to the rules of the department, the use of reference streams as described in this section shall not be necessary.

• **Rationale or Purpose.**— It is important to consider reference streams and their role in water quality management under the CWA, including guidance from the EPA to the states on the development of biological criteria. The expression “biological integrity” is used in the Clean Water Act to define the nation’s objective for water quality. The EPA defines biological integrity as “the quality or state of being complete; unimpaired” (Dissmeyer 1994). Biological integrity is functionally defined as “the condition of the aquatic community inhabiting the unimpaired water bodies of specific habitat as measured by community structure and function.” Biological integrity includes habitat. Ecological integrity is attainable when physical, chemical, and biological integrity occur simultaneously (Dissmeyer 1994).

Guidance from the EPA for monitoring the physical, chemical, and biological integrity of water directly influences monitoring programs; this guidance includes the selection of reference sites (streams or other water bodies) that are assessed in order to determine a reference condition that will provide an attainable measure of ecological health (Dissmeyer 1994). The reference condition defines the range and variability of physical, chemical, biological, and habitat conditions; the health of other streams is then compared against the reference condition (Dissmeyer 1994).

Reference streams are essential for determining the effectiveness of management activities or BMPs in meeting the physical, chemical, and biological integrity of water. Many state water quality agencies use reference streams to define the reference condition for biological criteria for water quality standards, but reference streams are necessary whether or not biological criteria have been established by the state. If the state has not established reference streams for the ecoregion in question, then the monitoring project plan and design must include the selection and establishment of one or more reference streams and a similar number of study streams (Dissmeyer 1994).

• **Program Implications.**— Determining the reference condition is not a simple task (Dissmeyer 1994). Because experience has found that reference conditions are related to biotic and abiotic conditions, a professional biologist should work in cooperation with other specialists. For example, even with high quality physical habitat conditions, the site must be assessed and the biotic community data analyzed to determine if the site contributes to defining the reference condition (Dissmeyer 1994).

The reference condition defines the range of biotic, habitat, chemical, and physical variables in reference streams, which vary temporally and spatially (Dissmeyer 1994). Ten or more reference segments along a reference stream, or in several separate reference streams, are assessed for their physical, chemical, biological, and habitat condition. The data are analyzed to determine the variability of water quality characteristics, thus defining the reference condition (Dissmeyer 1994).

The reference condition should be established using the highest monitoring level possible (Dissmeyer 1994). The ability to define classes of water quality and ranges in water quality variables and to set water quality criteria depends on methods used, number of samples, sample locations, accuracy of measurements, metrics, and analysis procedures. High level monitoring may yield more classes of water quality, a narrowed range of reference conditions, and better water quality criteria than the use of a lower level of monitoring with simpler methods (Dissmeyer 1994).

The implication is that because Idaho Code mandates two classes of reference streams—those representative of the highest level of support attainable, and those reflecting minimum conditions necessary to maintain full support—high level monitoring is called for.

To develop values for biological criteria, states should identify unimpaired reference waterbodies to establish the reference condition and characterize the aquatic communities inhabiting reference surface waters (EPA 1988). Currently, two principal approaches are used to establish reference sites: [1] the site-specific approach, which may require upstream-downstream or near field-far field evaluations, and [2] the regional approach, which identifies similarities in the physical and chemical

characteristics of watersheds that influence aquatic ecology. The basis for choosing reference sites depends on classifying the habitat type and locating unimpaired, or minimally impacted, waters (EPA 1988).

The EPA (1988) recognizes the difficulty in finding unimpaired water to define biological integrity and to establish reference conditions. Dissmeyer (1994) stated that the structure and function of aquatic communities in high quality streams can be approximated in several ways:

First, characterize aquatic communities in the most protected waters in the ecoregion. In regions where few or no unimpaired sites are available, characterize the least impaired systems. In greatly disturbed regions, least impaired streams are those with the least-impact from human activities. Because least-impaired systems will be used as references, the limitations on biological, chemical, and physical integrity can be considered and incorporated into goals for those waters and the program to improve water quality (Dissmeyer 1994).

Once reference sites are selected, their biological integrity must be evaluated using quantifiable biological surveys (EPA 1988). The success of the survey will depend in part on the careful selection of aquatic community components; for example, fish, macroinvertebrates, or algae. These components should serve as effective indicators of high biological integrity, represent a range of pollution tolerances, provide predictable, repeatable results, and be readily identified by trained state agency personnel. Well-planned quality assurance protocols are required to reduce variability in data collection and to assess the natural variability inherent in aquatic communities. A quality survey will include multiple community components and may be measured using a variety of metrics. Since multiple approaches are available, factors to consider when choosing possible approaches for assessing biological integrity are featured in the EPA guidance document (EPA 1988).

3.6. Monitoring

Idaho Code sets out two important purposes for monitoring. First, monitoring is used to determine whether a water body is supporting beneficial uses (§§ 39-3606, 07); second,

monitoring is used to determine the effect of BMPs on water quality (§ 39-3621).

§ 39-3606. Use of reference streams or water bodies to determine full support of beneficial uses.— The director, in consultation with the basin advisory group, shall conduct monitoring to determine if designated beneficial uses are fully supported.

§ 39-3607. Monitoring to determine support of beneficial uses.—The director shall conduct a beneficial use attainability and status survey to identify appropriate designated uses and to determine the status of designated beneficial uses in each water body. Measures to determine appropriate designated uses and the status of designated beneficial uses shall include appropriate water quality standards as identified in the rules of the department in conjunction with biological or aquatic habitat measures that may include, but are not limited to: stream width, stream depth, stream shade, sediment, bank stability, water flows, physical characteristics of the stream that affect habitat for fish, macroinvertebrate species or other aquatic life, and the variety and number of fish or other aquatic life.

Previous assessments of beneficial use attainability and status which are of a quality and content acceptable to the director shall constitute the baseline data against which future assessments shall be made to determine changes in the water body and what beneficial uses can be attained in it. In addition, the director, to the extent possible, may determine whether changes in the condition of the water body are the result of past or ongoing point or nonpoint source activities. The director shall also seek information from appropriate public agencies regarding land uses and geological or other information for the watershed which may affect water quality and the ability of the water body in question to fully support or attain designated beneficial uses. In carrying out the provisions of this section, the director may contract with private enterprises or public agencies to provide the desired data.

§ 39-3621. Monitoring provisions [for BMPs].— The designated agencies, in cooperation with the appropriate land management agency and the department, shall ensure best management practices are monitored for their effect on water quality. The monitoring results shall be presented to the department on a schedule, agreed to between the designated agency and the department.

• **Rationale or Purpose.**— The first sentence of section 39-3606 was repeated above in order to emphasize that monitoring is required to determine if and to what extent the designated beneficial uses are supported. The reference stream concept serves as a standard against

which monitoring data may be compared.

The water quality-based approach to pollution control (see Figure 1) relies on the ability to assess the sources of pollution that impair water bodies. Then programs to control such pollution can be designed and implemented. Monitoring is needed throughout the water quality-based approach.

As reflected in the Idaho Code, as a minimum monitoring is needed to determine beneficial use support and the overall effectiveness of an array of BMPs in maintaining water quality in a watershed. This does not refer to monitoring the effectiveness of individual BMPs, which are generally assumed to be effective at the scale of the individual practice (L. Koenig, review comments).

• **Program Implications.**— In 1993, the DEQ embarked on a pilot program aimed at integrating chemical, physical, and biological assessments as a way of characterizing water quality and the integrity of wadable streams; the pilot program has since evolved into the Beneficial Use Reconnaissance Project (BURP) (IDEQ 1996). This series of projects constitutes a reconnaissance level monitoring program with primary focus on biological and physical habitat measures; it has the two objectives of determining beneficial use attainability and determining beneficial use status (IDEQ 1996).

As stated in DEQ's strategic plan, during the summer of 1995, the agency continued to conduct biological (bio-assessment) monitoring. The results of monitoring and the biological condition of the streams was analyzed by the target date of February 1996, and information will be provided to Basin Advisory Groups (IDEQ 1995b).

Because it is not possible to monitor everything, everywhere, all the time, some choices have to be made. Section 1.5.7 of this report provides analysis of monitoring approaches, summarized as one of the two key issues in the Executive Summary. The integrated approach undertaken by the DEQ in its BURP process seems consistent with the directions for improved water quality monitoring suggested in the literature reviewed.

3.7. Regulatory Actions

Idaho Code provides that regulatory actions may be appropriate for water bodies where beneficial uses are fully supported (§ 39-3608), and also for water bodies where beneficial uses are not fully supported (§ 39-3609).

§ 39-3608. Regulatory actions for water bodies where beneficial uses are fully supported.— For streams or other water bodies where the director has determined that designated beneficial uses are being fully supported, the director shall assure, in a manner consistent with other existing applicable statutes, and rules, that all programs deemed necessary to maintain full support of designated beneficial uses are employed. In providing such assurances, the director may enter together into an agreement with public agencies in accordance with sections 67-2326 through 67-2333, Idaho Code.

§ 39-3609. Regulatory actions for water bodies where beneficial uses are not fully supported.— In accordance with the provisions set forth in the federal clean water act and the public participation provisions set forth in this chapter, the director shall notify the appropriate public agencies of any water bodies in which the designated beneficial uses are not fully supported. For water bodies so identified, the director shall place such water bodies into one (1) of the following priority classifications for the development of total maximum daily load or equivalent processes:

(1) "High," wherein definitive and generally accepted water quality data indicate that unless remedial actions are taken in the near term there will be significant risk to designated or existing beneficial uses of a particular water body. The director in establishing this category, shall consider public involvement as set forth in this chapter.

(2) "Medium," wherein water quality data indicate that unless remedial actions are taken there will be risks to designated or existing beneficial uses.

(3) "Low," wherein limited of subjective water quality data indicate designated uses are not fully supported, but that risks to human health, aquatic life, or the recreational, economic or aesthetic importance of a particular water body are minimal.

• **Rationale or Purpose.**— The final stage in the water quality-based approach to pollution control (see Figure 1) is the implementation of regulatory or nonregulatory actions to control the sources of pollution. If a water body fully supports its designated beneficial uses, it is important that it remain in that condition because then the goals of the CWA have been met, unless

the support of those uses may be threatened. If the designated uses are not fully supported or threatened, the water quality is generally considered impaired, and the CWA requires additional controls on sources of pollution affecting the water body.

The management options in targeted or impaired watersheds are: [1] enforce more stringent effluent and performance standards; [2] improve the waste-assimilative capacity by actions such as dredging in-place sediments, or low-flow augmentation; and [3] change receiving water quality standards by proving through a "use attainability analysis" that the standards cannot be attained (Novotny and Olem 1994).

Based on these options, Novotny and Olem (1994) point out that several types of institutions are needed, including regulatory agencies. Already in place is the U.S. Environmental Protection Agency, to execute federal policies, and state pollution-control agencies for intrastate pollution control (Novotny and Olem 1994). In Idaho, these include the Division of Environmental Quality and the Department of Lands. The Soil Conservation Commission also play's a nonregulatory role in encouraging agricultural BMPs.

Regulatory agencies engage in many activities. They carry out legislative policy mandates; specify standards and criteria; provide oversight, arbitration, and research; and they provide and distribute grants for water quality remediation (Novotny and Olem 1994). These agencies also decide whether a body of water is a targeted or impaired system to be placed on the "303(d) list"; they also designate the uses of the bodies of water, specify the water quality standards criteria, and execute use attainability studies (Novotny and Olem 1994). Agency financing should come from state or federal sources, not funds obtained from polluters or users (Novotny and Olem 1994).

• **Program Implications.**— Placing water quality-limited waters into priority categories for the development of total maximum daily loads (TMDLs) seems consistent with the EPA guidelines in the Water Quality Standards Handbook (EPA 1995a). However, the court ruled in the *Idaho TMDL* case that Idaho is to develop TMDLs for all water quality-limited waters. It should be recognized that TMDLs are but one step in the water quality-based approach

to pollution control, and that point source pollution is controlled through the NPDES permit process by the EPA, and nonpoint source pollution is controlled by BMPs. The CWA gives states, not the EPA, authority for the development and implementation of BMPs, and they may be part of a regulatory or nonregulatory program (EPA 1995a).

It is peculiar that sections of the Idaho Code that by title purport to describe regulatory actions actually do not do so, and instead default to "all programs deemed necessary" language (§ 39-3608) or "the development of total maximum daily load or equivalent processes" (§ 39-3609). This analyst interprets the CWA, the EPA's (1995a) guidance for the water quality-based approach to pollution control (see Figure 1), and the EPA's guidance documents for TMDLs (EPA 1991a, 1996b) as indications that the TMDL process is not a regulatory action. The implementation of BMPs for nonpoint source control is a regulatory action, in that the purpose of BMPs is to control sources of pollution.

This confusion regarding the meaning of "regulatory" is clarified in sections 39-3610, 11, and 12 of the Idaho Code, presented and analyzed in the next section. Summary analysis of regulatory and nonregulatory approaches to control nonpoint source pollution is presented in section 1.5.7 and as one of two key issues in the Executive Summary.

3.8. General Limitations on Pollution Sources

Three sections of Idaho Code set out how the state intends to limit sources of pollution. In general, "best management practices" (BMPs) are recognized as the control mechanism (§ 39-3610), and the "total maximum daily load" (TMDL) process "or its equivalent" as the planning mechanism (§ 39-3611). Explanation is also provided as to how the TMDL process "or its equivalent" is integrated with other programs (§ 39-3612).

§ 39-3610. General limitations on point and nonpoint sources for water bodies not fully supporting beneficial uses.— The director shall assure, in a manner consistent with existing statutes or rules, that for each category of water body, as described in section 39-3609(1) through (3), Idaho Code, the following limitations shall apply:

(1) For waters in the "high" category a total

maximum daily load equivalent process as described in this chapter shall be undertaken. Provided however, that nothing in this section shall be interpreted as requiring best management practices for agricultural operations which are not adopted on a voluntary basis.

(2) For waters in the "medium" category, such changes in permitted discharges from point sources on the water body or to the best management practices for nonpoint sources within the watershed deemed necessary to prohibit further impairment of the designated or existing beneficial uses.

(3) For waters in the "low" category, such changes in permitted discharges from point sources on the water body or to the best management practices for nonpoint sources within the watershed deemed necessary to prohibit further impairment of the designated or existing beneficial uses.

§ 39-3611. Development and implementation of total maximum daily load or equivalent processes.— For water bodies described in section 39-3609, Idaho Code, the director shall, in accordance with the priorities set forth in section 39-3610, Idaho Code, and in accordance with sections 39-3614 and 39-3616, Idaho Code, and as required by the federal clean water act, initiate development of a total maximum daily load process to control point source and nonpoint sources of pollution on the water body. For water bodies where an applicable water quality standard has not been attained due to impacts that occurred prior to 1972, no further restrictions under a total maximum daily load process shall be placed on a point source discharge unless the point source contribution of a pollutant exceeds twenty-five percent (25%) of the total load for that pollutant. Existing uses shall be maintained on all such water bodies. Total maximum daily load processes developed pursuant to this section shall include, but not be limited to:

(1) An inventory of all point and nonpoint sources of the identified pollutants;

(2) An analysis of why current control strategies are not effective in assuring full support of designated beneficial uses;

(3) A plan to monitor and evaluate progress toward water quality progress and to ascertain when designated beneficial uses will be fully supported;

(4) Pollution control strategies for both point sources and nonpoint sources for reducing those sources of pollution;

(5) Identification of the period of time necessary to achieve full support of designated beneficial uses. Point source discharges for which a national pollutant discharge elimination system permit is approved after January 1, 1995, shall be deemed to have met the requirements of this section.

§ 39-3612. Integration of total maximum daily

load processes with other programs.— Upon completion of total maximum daily load processes as set forth in section 39-3611, Idaho Code, the director shall, subject to the provisions of chapter 52, title 67, Idaho Code, adopt such processes as part of the state's water quality management plan developed pursuant to the federal clean water act. Upon such adoption, the provisions of these processes shall be enforced through normal enforcement practices of designated agencies as set forth in the state's water quality management plan.

• **Rationale or Purpose.**— Section 303(d) of the CWA and federal regulations (40 CFR 130.7(b)) require the state to identify surface waters within Idaho where pollution control requirements are not stringent enough to meet water quality standards. In such cases, the DEQ is required to establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of the waters, and then to establish TMDLs for certain pollutants. TMDLs establish pollutant limits for water bodies, and provide the basis for the state to establish water quality controls (IDEQ 1995b). The DEQ also is required to have in place a continuing planning process, approved by the EPA, which results in the development of plans for effluent limitations, TMDLs, and other controls. As per the goal of the CWA, this is done to assure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife; federal and state funds are used to develop and implement TMDLs (IDEQ 1995b).

The DEQ currently has insufficient information on the quality of surface waters in the state to determine whether and where restoration is necessary (IDEQ 1995b). This information will serve as a baseline for determining the effectiveness of various environmental protection initiatives, and will be used in water quality planning efforts; during the summer of 1995, the DEQ planned to expand biological (bio-assessment) monitoring on 800 to 900 stream sites throughout the state, generally on streams on the "303(d) list" (IDEQ 1995b).

Idaho Code (§ 39-3612) requires that the TMDL process be integrated with other important state of Idaho efforts. This includes efforts to protect habitat for salmon and bull trout conservation and the Cumulative Watershed Effects assessment and control process in forested watersheds by the Idaho Department of

Lands (IDL 1995), which is featured as a case example in Chapter 4 of this report. To the extent that TMDLs establish quantitative pollutant loading targets, other programs must fit within those targets.

• **Program Implications.**— An important issue that Idaho decision makers currently face is how to meet the schedule for TMDL development suggested by Judge Dwyer in the *Idaho TMDL* case (see Chapter 2). These deliberations are ongoing, and it is beyond the scope of this project to describe and analyze available alternatives. Nevertheless, the state may choose not to develop TMDLs as required by the CWA, in which case the EPA is required to do so. As the analysis in section 1.5.5 of this report indicated, the implications of this choice are unknown, but would surely involve forfeiture of \$1 million or more per year of CWA section 319 grants from the federal government for nonpoint source programs. Also worth considering is the speculative possibility of injunctions on federal land and resource management activities.

Judge Dwyer remarked in his ruling on the *Idaho TMDL* suit that the TMDL process does not result in the control of sources of pollution. It is, instead, only one step in the EPA's water quality-based approach to pollution control (see Figure 1). The issue of enforcing compliance with controls is an important part of the water quality-based approach, but not the TMDL process.

As the Idaho Code recognizes, the CWA gives the state, not the EPA, the authority to design and enforce nonpoint source control programs. Idaho Code requires forestry and mining operations to use BMPs and the state enforces compliance. BMPs in the agriculture sector are voluntary under the Idaho Code (§ 39-3610(1)).

Because BMPs are required in some sectors and not others, this feature of Idaho water quality policy fails the fairness test posed by Novotny and Olem (1994). The implication is that something further may need to be done to encourage the agriculture sector to adopt BMPs. The analysis in section 1.5.8 of this report points out that a mix of incentives, technical assistance, and information and education can lead to implementation of cost-effective BMPs, but without some regulatory backup, some operators will resist installing BMPs and thereby reduce

pollution control program effectiveness.

3.9. Basin Advisory Groups (BAGs)

The general purpose and member composition of BAGs is described (§ 39-3613) and their duties are detailed (§ 39-3614).

§ 39-3613. Creation of basin advisory groups.—

The director, in consultation with the designated agencies, shall name, for each of the state's major river basins, no less than one (1) basin advisory group which shall generally advise the director on water quality objectives for each basin and work in a cooperative manner with the director to achieve these objectives. Each such group shall establish by majority vote, operating procedures to guide the work of the group. Members shall be compensated pursuant to section 59-509(c), Idaho Code. The membership of each basin advisory group shall be representative of the industries and interests directly affected by the implementation of water quality programs within the basin and each member of the group shall either reside within the basin or represent persons with a real property interest within the basin. Recognized groups representing those industries or interests in the basin may nominate members of the group to the director. Each basin advisory group named by the director shall reflect a balanced representation of the interests in the basin and shall, where appropriate, include a representative from each of the following: agriculture, mining, nonmunicipal point source discharge permittees, forest products, local government, livestock, Indian tribes (for areas within reservation boundaries), water-based recreation, and environmental interests. In addition, the director shall name one (1) person to represent the public at large who may reside outside the basin. Members named to the basin advisory groups shall, in the opinion of the director, have demonstrated interest or expertise which will be of benefit to the work of the basin advisory group. The director may also name as may be needed those who have expertise necessary to assist in the work of the basin advisory group who shall serve as technical nonvoting advisers to the basin advisory group.

§ 39-3614. Duties of the basin advisory group.—Each basin advisory group shall meet as necessary to conduct the group's business and to provide general coordination of the water quality programs of all public agencies pertinent to each basin. Duties of the basin advisory groups shall include, but not be limited to, providing advice to the director for:

- (1) Determining priorities for monitoring;
- (2) Revisions in the beneficial uses designated for each stream and the status and attainability of

designated or existing beneficial uses for the water bodies within the basin;

(3) Assigning water bodies to the categories described in section 39-3609, Idaho Code;

(4) Reviewing the development and implementation of total maximum daily load processes as described in section 39-3611, Idaho Code;

(5) Suggesting members of the watershed advisory groups described in section 39-3615, Idaho Code; and

(6) Establishing priorities for water quality programs within the basin based on the economic resources available to implement such programs. In carrying out the provisions of this chapter, the director and the basin advisory groups shall employ all means of public involvement deemed necessary, including the public involvement required by section 39-3603, Idaho Code, or required in chapter 52, title 67, Idaho Code, and shall cooperate fully with the public involvement or planning processes of other appropriate public agencies.

• **Rationale or Purpose.**— Nonpoint source pollution problems are ubiquitous; the dimension and origin of nonpoint source pollution is usually not well established, and often fits watershed boundaries rather than political ones (Novotny and Olem 1994). By analyzing the problems of nonpoint pollution in a regional rather than a local context, it is possible to identify more efficient options that otherwise might not be recognized or available (Novotny and Olem 1994).

One of the provisions of the state of Idaho's 1988 antidegradation policy was the establishment by DEQ of biannual basin-area meetings in each of the state's six hydrologic basins. The meetings were held to assess water quality conditions and trends, discuss commercial activities with potential to affect in-stream uses, consider water quality monitoring, and other related activities (IDEQ 1995b). BAGs build on the more traditional concept of basin-area meetings. BAGs are part of a decentralized approach to watershed management programs, which Idaho policy has recognized since 1988 may be more effective than centrally planned programs.

The state of Idaho began the new approach in 1995 by establishing a process which relies upon local communities to provide substantial input into how Idaho protects and restores water quality (CBAG 1996). The process provides monitoring and evaluation of state waters and, when needed, restoration of impaired waters.

The process incorporates public participation and community involvement by establishing two citizen advisory groups: a Basin Advisory Group (BAG) and a Watershed Advisory Group (WAG). These groups provide the state with recommendations to be used during the development of watershed management plans (CBAG 1996).

The BAG is considered to be the basin wide coordinator and, according to a handout at a Clearwater Basin Advisory Group meeting, will ensure objectivity and basin wide consistency of individual watershed plans by communities within the basin. The duties of the BAG include setting priorities, coordination of WAGs within the basin, and recommending WAG members (CBAG 1996).

Nonpoint source pollution management requires interagency cooperation and integrated approaches (Novotny and Olem 1994). In Idaho, this includes programs carried out by the EPA, the U.S. Department of Agriculture, other federal agencies, and many state and local agencies. Water quality management is heavily influenced by regulatory measures, all of which come from several directions, including the EPA and U.S. Department of the Interior programs and authorizations, the U.S. Department of Agriculture, and state agencies; water management guided by regulatory actions that only call for planning but do not provide for implementation are destined to be mediocre at best and destructive at worst (Novotny and Olem 1994). Given time, BAGs may be able to develop and coordinate effective water quality management programs in their regions.

• **Program Implications.**— Six Basin Advisory Groups (BAGs) were appointed by the target date of October 1995 (IDEQ 1995b). The six basins are identified on the cover of this report and in Table 2. On an ongoing basis, the DEQ will provide guidance and assistance to BAG members in their roles and responsibilities; subsequently the BAGs will establish priorities for development of TMDLs in the basins, establish monitoring priorities, and provide recommendations to the DEQ on the formation and composition of WAGs (IDEQ 1995b).

3.10. Watershed Advisory Groups (WAGs)

The general purpose and member composition of

WAGs is described (§ 39-3615) and their duties are detailed (§ 39-3616).

§ 39-3615. **Creation of watershed advisory groups.**— The director, with the advice of the appropriate basin advisory group, may name watershed advisory groups which will generally advise the department on those specific actions needed to control point and nonpoint sources of pollution within the watersheds of those water bodies where designated beneficial uses are not fully supported. For each such water body in the "high" category, the director shall name a watershed advisory group to provide guidance on those pollution control efforts needed to achieve, within a reasonable amount of time, full support of designated beneficial uses. For water bodies in other categories, the director may name watershed advisory groups, as economic resources and the interest of those affected by the management of the watershed in question allows. Members of each watershed advisory group shall be representative of the industries and interests affected by the management of that watershed, along with representatives of local government and the land managing or regulatory agencies with an interest in the management of that watershed and the quality of the water bodies within it. Members of each watershed advisory group shall serve and shall not be reimbursed for their expenses during their term of service.

§ 39-36316. **Duties of each watershed advisory group.**— Each watershed advisory group shall generally be responsible for recommending those specific actions needed to control point and nonpoint sources of pollution within the watershed so that, within reasonable periods of time, designated beneficial uses are fully supported. The duties of the watershed advisory group shall include those actions pertinent to total maximum daily loads as described in section 39-3611, Idaho Code. Watershed advisory groups shall, as described in this chapter, develop and recommend actions needed to effectively control sources of pollution. In carrying out the provisions of this section, the director and the watershed advisory groups shall employ all means of public involvement deemed necessary or required in chapter 52, title 67, Idaho Code, and shall cooperate fully with the public involvement or planning processes of other appropriate public agencies.

• **Rationale or Purpose.**— A provision of Idaho's 1988 antidegradation agreement was the identification of stream segments of concern (SSOCs), defined as stream segments upon which the public has expressed significant concern; designated SSOCs were to receive priority status for water quality management and

monitoring by state and federal agencies (IDEQ 1995b). For some SSOCs in forested watersheds, local working committees were created by the Idaho Department of Lands to develop site-specific BMPs for application by landowners under the Idaho Forest Practices Act. These local working committees were forerunners of WAGs. The assigned duties of WAGs, however, are much broader than the highly technical and regulatory mission of the earlier local working committees.

The WAG provides a forum to allow local interests to come together, foster communication and coordination between resource management agencies, and explore and recommend specific actions needed to manage the watershed; such recommendations will be incorporated into a watershed management plan and implemented through various federal, state and local efforts (CBAG 1996).

A positive attitude towards this effort is reflected in language from a "Clean Water" handout at a Clearwater Basin Advisory Group meeting (CBAG 1996) in reply to the question, how can I help?

With the establishment of this process through state law, we have an opportunity to bring the implementation of the federal Clean Water Act to the local communities within Idaho. We as a state need to jump into this process with both feet and utilize the process to its full benefit. If the local communities do not become involved and make sure this process will work for Idaho, the process will revert back to the system of government control from outside the community with little or no input from you. The goal is clean water for Idaho. Please help us get there! (CBAG 1996).

Public information on WAGs in the form of a handout was also distributed, and is reproduced herein as Table 5.

Table 5. What is a Watershed Advisory Group (WAG)?

☐ Watershed Advisory Groups (WAGs) advise the Idaho Division of Environmental Quality (DEQ) on actions to control sources of pollution within priority watersheds.

☐ Watershed Advisory Groups (WAGs) are made up of people who have an interest in how the watershed is managed. They are representative of communities, industries, and interested parties or individuals which effect or are affected by the management of the watershed. Along with representatives of local government and the technical staff of land managing or regulatory agencies in the watershed, each watershed advisory group will be asked to help draft a watershed management plan using the TMDL ("total maximum daily load") process. The management plan will include those specific actions needed to effectively control point and nonpoint sources of pollution within that watershed so that, within a reasonable time, designated uses can be fully supported.

The Watershed Advisory Group Will:

- ✓ Determine water quality concerns in the watershed
- ✓ Define controls to address pollutants and their sources
- ✓ Select strategies necessary to carry out the watershed management plan
- ✓ Revise the watershed management plan in consideration of public, agency Advisory Group comment
- ✓ Submit the management plan to the Basin Advisory Group (BAG) and DEQ for adoption as part of Idaho's water quality plan
- ✓ Administer the watershed management plan
- ✓ Revise the plan based on periodic evaluations

Source: Clearwater Basin Advisory Group (CBAG 1996).

The acronym WAGs—as well as BAGs and BURPs—may seem unnecessary or even silly. However, in the Tennessee Valley Authority (TVA), another acronym—RATs—was selected for groups that are comparable to WAGs in Idaho. A brief description of how RATs work

may be instructive. For the TVA, the focus traditionally has been on lake and reservoir management; in 1992 the TVA began to refocus its efforts on water quality improvement and the agency formed what are called "river action teams" (RATs) to evaluate environmental

conditions in watersheds (Flynn and Williams 1994). The TVA hopes to form partnerships with public and private interests, with TVA aquatic biologists, environmental engineers, and other experts. The RATs are comprised of specialists who look at watersheds and all sources of pollution affecting lakes and streams; they are also trained to note valuable resources that need protection in each watershed, and bring together the people and organizations to improve the water resources in each area (Flynn and Williams 1994).

● **Program Implications.**— For “high priority” water quality-limited waters on the “303(d) list” WAGs will be heavily involved in partnership with state agency technical personnel in the development and implementation of TMDLs. Perhaps the most important function of WAGs will be the recommendation of specific actions to control sources of pollution. Because representatives of local interest groups are involved with WAGs, these recommendations probably would have more influence on local land-use activities than would controls recommended by regulatory agencies acting alone. However, it may be unrealistic to expect a group of local citizens, many or even most of whom have no technical training, to otherwise be of much assistance to DEQ in the TMDL process (R. Van Kirk, review comments). The Henry’s Fork Watershed Council expressed these concerns to DEQ (Swenson and Brown 1996), and received a reply that DEQ expects to do most of the work in monitoring, modeling, and TMDL preparation, with assistance from WAGs in implementation of TMDLs on high priority waters and protection activities in other waters on the “303(d) list” (Cory 1996).

3.11. Outstanding Resource Waters (ORWs)

“Outstanding resource waters” (ORWs) represent the third tier in the antidegradation policy that the EPA has incorporated by regulation into state water quality standards (see section 1.5.3 of this report). An “outstanding resource water” means a high quality water, such as water of national and state parks and wildlife refuges and water of exceptional recreational or ecological significance, which has been so designated by the legislature. It constitutes an outstanding national or state resource that requires protection from

point source and nonpoint source activities that may lower water quality (Idaho Code § 39-3602(16)).

Five sections of Idaho Code pertain to ORWs, as follows: Designation of ORWs (§ 39-3617), restrictions for new nonpoint source activities on ORWs (§ 39-3618), continuation of existing activities on ORWs (§ 39-3619), approval for BMPs for new nonpoint source activities affecting ORWs (§ 39-3620), and enforcement provisions for ORWs (§ 39-3622(1)). The text from Idaho Code for these sections is presented, followed by a general rationale and program implications of the ORW concept.

§ 39-3617. **Designation of outstanding resource waters.**— Any person may request, in writing to the board of health and welfare, that a stream segment may be considered for designation as an outstanding resource water. The board shall recommend to the legislature those stream segments the board proposes for designation as outstanding resource waters. The legislature shall determine by law which such stream segments to designate as outstanding resource waters. Stream segments so designated shall be included in a list of outstanding resource waters to be compiled and updated by the department of health and welfare in its rules governing water quality standards. Interim status or special protection shall not be provided to streams recommended by the board prior to legislative designation as an outstanding resource water. No state agency shall delay actions, or deny or delay the processing or approval of any permit for a nonpoint source activity based on nomination of a segment for designation as an outstanding resource water, or while the legislature is considering such designation.

§ 39-3618. **Restriction provisions for new nonpoint source activities on outstanding resource waters.**— No person shall conduct a new or substantially modify an existing nonpoint source activity that can reasonably be expected to lower the water quality of an outstanding resource water, except for short-term or temporary nonpoint source activities which do not alter the essential character or special uses of a segment, issuance of water rights permits or licenses, allocation of water rights, or operation of water diversions or impoundments.

§ 39-3619. **Continuation provisions for existing activities on outstanding resource waters.**— Existing activities may continue and shall be conducted in a manner that maintains and protects the current water quality of an outstanding resource water. The provisions of this section shall not affect short-term or temporary activities that do not alter the essential character or special uses of a segment, allocation of water rights, or operations of water diversions or

impoundments, provided that such activities shall be conducted in conformance with applicable laws and regulations.

§ 39-3620. Approval provisions for best management practices for new nonpoint source activities on or affecting outstanding resource waters.— No person may conduct a new nonpoint source activity on or affecting an outstanding resource water, except for a short-term or temporary activity as set forth in section 39-3602, Idaho Code, prior to approval by the designated agency as provided in this section.

(1) Within six (6) months of designation of an outstanding resource water by the legislature, the designated agency shall develop best management practices for reasonably foreseeable nonpoint source activities. In developing best management practices the designated agencies shall:

(a) Solicit technical advice from state and federal agencies, research institutions, and universities and consult with affected landowners, land managers, operators, and the public; and

(b) Shall assure that all public participation processes required by law have been completed, but if no public participation process is required by law, will require public notification and the opportunity to comment;

(c) Recommend proposed best management practices to the board of health and welfare.

(2) The board of health and welfare and designated agencies shall adopt the proposed best management practices that are in compliance with the rules and regulations governing water quality standards, and based on the recommendations of the designated agency and the comments received during the public participation process;

(3) After adoption, these best management practices will be known as the outstanding resource water best management practices and will be published by the designated agency. Outstanding resource water approved best management practices will be reviewed and revised where needed by the designated agency every four (4) years in consultation with the department, landowners, federal managers, operators and the public to determine conformance with objectives of this act;

(4) Following adoption of best management practices, the designated agency shall require implementation of applicable outstanding resource water best management practices which will assure that water quality of an outstanding resource water is not lowered;

(5) Where outstanding resource water best management practices have not been adopted as set forth in subsections (1) through (4) of this section, the designated agency shall:

(a) Assure that all public participation processes

required by law have been completed, but if no public participation process is required by law, the designated agency shall provide for public notification of the new activity and the opportunity to comment;

(b) Determine that the site-specific best management practices selected for a new nonpoint source activity are designed to ensure that water quality of the outstanding resource water is not lowered; and

(c) Provide for review by the department that the activity is in compliance with rules and regulations governing water quality standards.

(6) When the applicable outstanding resource water best management practices are applied, the landowner, land manager, or operator applying those practices will be in compliance with the provisions of this act. In the event water quality is lowered, the outstanding resource water best management practices will be revised within a time frame established by the designated agency to ensure water quality is restored.

§ 39-3622. Enforcement provisions.— (1) The designated agency shall ensure that the approved outstanding resource water best management practices are implemented for new nonpoint source activities. If a person fails to obtain approval from a designated agency for a new nonpoint source activity as set forth in section 39-3620, Idaho Code, or if a person fails to implement approved best management practices and water quality is lowered, the designated agency may institute a civil action for an immediate injunction to halt the activity or pursue other remedies provided by law.

• *Rationale or Purpose.*— Idaho has not yet designated any ORWs. The Idaho Legislature passed these laws creating a process to designate ORWs in 1989 “after being sued by the Idaho Conservation League for delaying compliance with the Clean Water Act” (Drumheller 1996).

As the analysis in section 1.5.3 of this report indicates, ORWs represent the third tier of the EPA’s antidegradation policy that is part of the Water Quality Standards Regulation (40 CFR 131.12), thus is indirectly part of the Clean Water Act.

• *Program Implications.*— The ORW category is fundamentally different than traditional beneficial use classifications and associated criteria for protecting the designated uses (Morgan 1991). Instead of protecting the beneficial uses in water quality standards, protecting “high quality” water is focused on maintaining the difference between existing water quality characteristics and the criteria in

water quality standards. This concept seems logical and appropriate for numeric criteria, but it is difficult to conceive how this would be applied to narrative criteria.

The identification of ORWs is a crucial process because of the stringent limitations associated with the “maintain and protect” standard imposed on “high quality” or “exceptional” waters in the federal regulation, which means federal antidegradation policy can have “a significant impact on activities affecting the water quality” of ORWs (Morgan 1991).

When nonpoint sources pose the primary threats to water quality, the designation of ORWs “may often fail to provide additional protection to the water body” (Morgan 1991). It is unclear exactly what this quotation from a legal commentary was referring to, but it seems to fit if the pollutant has narrative criteria, as does sediment.

3.12. Enforcement Provisions (Other than for ORWs)

§ 39-3622. **Enforcement provisions.**— (2) Nothing in this act shall restrict the enforcement authority of one department or designated agencies as provided by law.

- **Rationale or Purpose.**— This section of the Idaho Code neither creates new enforcement authorities, nor does it limit existing enforcement authorities.

- **Program Implications.**— It should be noted that section 39-3610(1) does provide “that nothing in this section shall be interpreted as requiring best management practices for agricultural operations which are not adopted on a voluntary basis.”

Table 6 presents the program enforcement authorities of state agencies with water resource responsibilities as they were presented in 1991 (Turner and O’Laughlin 1991). At that time, we found agency roles to have been carefully considered, with little program overlap. That situation remains the same.

3.13. Summary and Conclusions

The new Idaho water quality policy for nonpoint source pollution as represented by S.B. 1284 (Idaho Code § 39-3601 *et seq.*) features regional and local involvement of interest groups—through

BAGs and WAGs, respectively—in identifying and recommending program actions to control pollution. The policy affirms in statute that agricultural BMPs will be voluntary (§ 39-3610(1)), and provides a potential escape for cleaning up old mines (§ 39-3611; M. Medberry, review comments).



The new policy somewhat erroneously refers to the TMDL process as if it will determine control actions. According to the Clean Water Act and the EPA (1995a, 1996b) the TMDL process provides the linking mechanism between state water quality standards and the control actions necessary to protect the designated beneficial uses in the state water quality standards. The TMDL process is a planning process, not a management program, however part of the TMDL process is to identify actions necessary to control pollution in order to fully support designated uses. This situation is likely to change for two reasons. First, if Idaho is to develop hundreds of TMDLs on a 5-year schedule, some new concept of TMDL or a “TMDL equivalent” will be necessary. Second, as described in Chapter 2, due to the number of states undergoing TMDL lawsuits, the EPA convened a FACA committee to deal with a variety of TMDL issues, and its first meeting was held in November 1996.

Regulatory actions and their enforcement are the weak links in the water quality-based approach designed by the EPA to more effectively lead to nonpoint source pollution controls (see Figure 1). In the Clean Water Act, Congress recognized the primacy of the states in water resource management decisions. Although the CWA requires a state water quality management program, states have the option of choosing either a regulatory or nonregulatory approach (EPA 1995a). The new Idaho water quality policy neither strengthens state regulatory programs nor does it provide for additional enforcement of compliance with state water quality management programs. However, the new policy does recognize and support the need to collect information through monitoring and TMDL development that will be useful in determining control actions to fully support beneficial uses. Furthermore, including locally based interests in the control recommendations that will affect their use of water resources is a feature of the new policy, and is expected to deal

Table 6. State and local agency authorized primary roles in watershed management.

(Management Approach) Watershed Component	State Agencies ¹							Local Agency ²			
	IDA	IDFG	IDHW DEQ	IDL	IDWR	SCC	GWQC	CLCC	SCD	PHD	
<i>(Resource Protection)</i>											
Stream Flow		*									
Stream Channels			*								
Nav. Waters--Beds & Banks		*	*								
Waterway Protection		*									
Aquifer											
Dams			*								
<i>(Pollution Control)</i>											
Water Quality Standards											
Antidegradation		*									
▶ Agriculture	*										
▶ Mining		*									
▶ Forestry		*									
Lakes		*		*							

¹ IDA = Idaho Dept. of Agriculture; IDFG = Idaho Dept. of Fish & Game; IDHW, DEQ = Idaho Dept. of Health & Welfare, Div. of Environmental Quality; IDL = Idaho Dept. of Lands; IDWR = Idaho Dept. of Water Resources; SCC = Soil Conservation Commission; GWQC = Ground Water Quality Council.
² CLCC = Clean Lakes Coordinating Council; SCD = Soil Conservation District; PHD = Public Health District.

 = legal authority for a primary role
 = consultation or review role

with nonpoint source control more effectively than a centralized command and control approach.

Chapter 4. Will the new Idaho policy be effective?

The success of a water quality management program ultimately is measured by improvements in water quality. Because of the variability in water quality characteristics over time and space, changes in programs will neither produce immediate changes in water quality, nor changes everywhere. Professor Barry Moore (review comments) warned that the definition of water quality is a real potential trap. He said,

It is very likely that there are numerous drainages in Idaho and around the U.S. where improvements according to some definitions of water quality will never be realized. For example, in the Palouse drainage of Idaho and Washington, the streams that leave the Idaho batholith and drain the loess uplands will likely always have high levels of sediments and nutrients. Water quality standards based on these criteria may never be achieved in spite of the most concerted abatement actions. I am not suggesting that we should not try to clean up these streams. Rather, I am suggesting that we should realistically decide what we want of those streams, set realistic goals for them, and use appropriate tools to monitor progress. If fish habitat is our desired use, then use a tool, such as a Habitat Suitability Index for an appropriate species, to monitor changes over time and to define our success. We do not want to come back in 10 years and find that all of our efforts and moneys have not achieved good "water quality" because we have used the wrong yardstick (B. Moore, review comments).

This concluding chapter sketches four case examples of water quality management programs in Idaho. Leading up to those brief case studies is a discussion of sediment. Idaho's leading water quality problem is sediment, and because sedimentation is also a natural process, it presents technical program management difficulties that are not easily overcome. Changes in Idaho's approach to monitoring and assessing beneficial use support have recently been modified to, it is hoped, deal with sediment problems more effectively.

With the exception of requirements that all nonpoint source contributors be regulated or required to adopt BMPs, program elements are in place to meet the intention of the Clean Water Act. Funding will be needed for monitoring and as incentives to encourage the adoption of BMPs where they are not required. The source of that

funding is likely to remain the largest obstacle in water quality management. Along with funding, patience will be needed. Reversing the cumulative effects of environmental damage will take time.

The effectiveness of Idaho water quality programs in meeting the intent of the CWA is a legal question. Believing it to be ineffective, Idaho citizen groups asked the court to rule on certain facets of the program. In reply to the *Idaho TMDL* suit, the court ordered the EPA to expand the list of water quality-limited waters, and expedite the state's proposed timetable for developing TMDLs, a part of the state water quality management plan for impaired waters (see Chapter 2). After analyzing the changes in the Idaho Code brought about by the *Idaho TMDL* suit, several difficult questions remain.

One question is to what extent have different program approaches to water pollution control worked? That is, are Idahoans getting clean water from the funds spent? Which of these approaches will deliver results in terms of water quality? Replies are elusive. This report identified cost-effective monitoring and pollution control program approaches as key program elements, and in Chapter 1 analyzed the potential benefits and disadvantages of these aspects of nonpoint source pollution control programs. The CWA relies on best management practices (BMPs) to control nonpoint source pollution, and the program for implementing BMPs may be regulatory or nonregulatory. Any water quality management program must rely on monitoring to see if BMPs are being used and whether designated beneficial uses are being supported. Idaho's water quality policy recognizes this.

Will the local involvement BAG/WAG features of Idaho's new water quality policy help address the shortcomings in the previous policy design? This locally based approach follows the grassroots watershed movement suggested by the EPA, and has the potential for helping Idaho satisfy the CWA by reducing polarization and conflict among the various groups with a stake in water quality. A local watershed approach might be more effective at protecting resources and avoiding the need for further federal control than top-down approaches originating in Boise.

Success of the BAGs and WAGs depends on their membership. The interest group affiliation approach of appointing BAG members is not as

rigid for WAG appointments. Given the success of local grassroots groups—for example, the Henry's Fork Watershed Council featured in this chapter—in addressing water quality concerns on a watershed level, flexible WAG membership appointment seems desirable. WAG leadership will be an important consideration for helping ensure that the work gets done and that the inevitable conflicts will not be disruptive.

Although the federal CWA dates back to 1972, nonpoint source pollution was not a prominent feature of the policy until the CWA amendments of 1987. States have been struggling since then under section 319 of the CWA to develop effective programs for nonpoint source control, whereas before 1987, section 208 focused on planning and reporting requirements. Using PAG Report No. 5 (Turner and O'Laughlin 1991) as a bench mark, the Idaho approach has been evolving. In this report, the replies to the focus questions in Chapters 2 and 3 are evidence of change. The EPA approach has also been evolving. The evolution of the Idaho approach is headed in the same direction as the EPA approach—watershed management.

4.1. Why is sediment Idaho's leading pollution problem?

Sedimentation results from the combination of weather and land-use activities acting upon Idaho's highly erodible soils. Sediment is the primary nonpoint source pollution problem in

Idaho. Sediment has been identified as a pollutant of concern affecting 91% of the 960 water quality-limited waters in Idaho; sediment is the *only* pollutant affecting 46% of these waters (Table 7). Efforts in Idaho and elsewhere have not determined technically effective numeric criteria for sediment that support the designated beneficial uses of aquatic life support.

It should be emphasized, but seldom is, that although water quality impairment is a serious problem in Idaho, it affects only 10.1% of the stream and river miles in the state (Table 8). Sediment impairment affects Montana streams to roughly the same extent as it does Idaho streams. It seems peculiar that sediment would be such a small factor in impacting streams in the Eastern portions of Oregon and Washington (Table 8). Temperature is the principal cause of water quality impairment in eastern Oregon and Washington (USDA Forest Service 1996).

Since 1972 considerable progress has been made in controlling point sources of water pollution under the CWA, allowing more emphasis to be placed on nonpoint source pollution (Brown et al. 1993). As Table 3 indicated, agricultural lands are the nation's leading source contributing to impaired rivers, streams, and lakes. Forest lands are also an important concern, especially in areas of the United States with valuable and sensitive fisheries (Brown et al. 1993). Idaho, of course, is one such area.

Basin	Impaired Water Bodies (Total)	Sediment is a Pollutant		Sediment is the <i>Only</i> Pollutant	
		% of Total	% of Total	% of Total	% of Total
Bear River	43	42	98%	13	30%
Upper Snake River	198	182	92%	57	29%
Southwest Idaho	187	175	93%	101	54%
Salmon River	115	102	89%	66	57%
Clearwater River	225	216	96%	138	61%
Panhandle	192	159	83%	68	35%
Total	960	876	91%	443	46%

Source: Idaho Division of Environmental Quality, compiled from "The 1996 § 303(d) list for the state of Idaho."

Table 8. Water quality impaired waters within the Interior Columbia Basin Ecosystem Management Project (ICBEMP) assessment area, 1996.

State*	Total stream miles in ICBEMP assessment area	Stream miles with any impairment	Percent of stream miles with any impairment	Stream miles with sediment impairment	Percent of impaired stream miles that are sediment-impaired
Idaho	98,984	10,024	10.1%	8,812	87.9%
Montana	31,317	3,912	12.5%	3,034	77.6%
Oregon	75,186	8,123	10.8%	948	11.7%
Washington	49,150	3,962	8.1%	no data	no data
Total	254,637	26,020	10.2%	not meaningful	not meaningful

* Portions of states in the ICBEMP assessment area are all of Idaho, Montana west of the continental divide, and the portions of Oregon and Washington east of the Cascade Range.

Source: *Status of the Interior Columbia Basin: Summary of Scientific Findings* (USDA Forest Service 1996). Idaho and Montana data are from the states' "303(d) list"; Washington data are from the "305(b) report"; the source of Oregon data was unspecified.

• *Where does sediment come from?*—

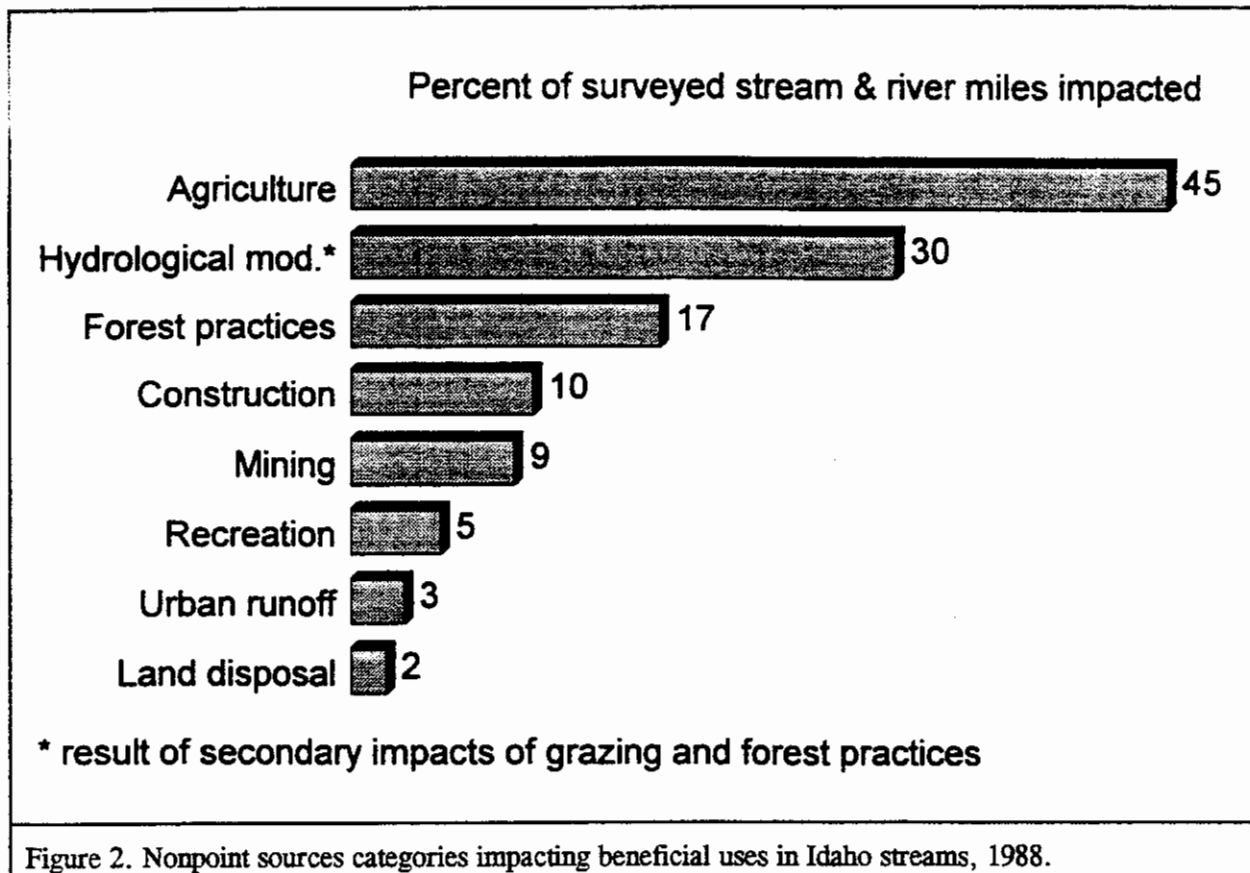
Agriculture is Idaho's leading industry, and is the leading source of pollution, impacting 45% of the stream miles in the state that were sampled in 1988 (Figure 2). More recent data of a similar nature are not available (L. Koenig, review comments). Hydrologic modification is the second leading source, impacting 30% of the stream miles. Forest practices (17%) are the third major source (Figure 2). Hydrologic modification also includes habitat modification (see the **Glossary**); this category includes some double-counting because it is a secondary effect of agriculture, grazing, forest practices, and other land-use activities (IDEQ 1989a). Hydrologic/habitat modification has a greater long-term impact on fish habitat than does suspended sediment (G. Ice, review comments).

Five ecological systems—croplands and grasslands, forests, urban, air systems, and aquatic systems—support the world economy and provide the means for sustaining biological life on the earth (Novotny and Olem 1994). These five ecological systems are not stagnant, but continuously evolve and change. These five systems are interconnected in a manner that can be disrupted by resource misuse or degradation (Novotny and Olem 1994).

Sediment is a contaminant arising from soil

loss from agricultural activities on croplands and grasslands, urban construction activities, and timber harvesting activities and road construction in forests. Soil loss diminishes the use of water resources by clogging the receiving water bodies with excessive sediments and depriving aquatic organisms of their natural habitat; sediment can also carry other pollutants, including nutrients that cause excessive growths of algae in lakes and toxic chemical contaminations (Novotny and Olem 1994).

The generation of sediment from forest roads and skid trails is influenced by the type of soil, the steepness of the road or trail, the quality of road or trail drainage, the amount of traffic, and the effectiveness of mitigation such as grass seeding, rocking, or other forms of stabilization (IDL 1995). Even though soil may be eroded from a road or skid trail, it will not impact water quality unless it is actually delivered to the stream. Eroded soil is most frequently delivered to streams by drainage ditches leading directly to stream crossings, or by ditch relief pipes that discharge close to streams. Mass failures (landslides) also generate and deliver soil to streams. Mass failures occur naturally in forested environments, but research has shown that timber harvest and road building can increase the frequency of mass failures (IDL



Source: *Idaho Water Quality Status Report and Nonpoint Source Assessment, 1988* (IDEQ 1989a).

1995).

• **Sediment and cumulative effects.**— Excess sediment in streams is harmful to fish spawning and rearing, and can adversely impact beneficial uses. Sediment deposited in streams may be evidence of cumulative watershed effects (IDL 1995). Because sediment is delivered to streams both naturally and through human activities, determining the expected natural level of sediment in the stream is essential in order to determine whether excessive sediment levels are due to cumulative watershed effects (IDL 1995).

4.2. What CWA program elements does Idaho policy emphasize?

The Idaho approach to nonpoint source pollution control is evolving from what it was in 1991. The new Idaho policy approach of Senate Bill 1284 (Idaho Code § 39-3601 *et seq.*) incorporates most of the elements expected by the EPA in a watershed management approach to nonpoint source pollution control (see Table 4). It is a distinct change from strict former reliance

on BMPs that now involves bioassessment monitoring and requires TMDLs for water quality-limited waters. The policy emphasizes a local watershed approach.

There are different program elements in the water quality-based approach to pollution control and protecting the designated uses of a water body. BMPs and TMDLs are two key items (see Figure 1).

• **BMPs.**— The BMP approach to pollution control is a system featuring the best management practices that are known to minimize nonpoint source pollution. This decentralized and non-quantitative preventative approach attempts to protect the designated beneficial uses of the water body by qualitatively focusing on the management practices of operators in the watershed. Water quality standards are thus tied to management practices through BMPs, and compliance is audited to insure that operators are using BMPs designed to reduce the quantity of human-caused pollution. For example, forestry BMPs are, in the eyes of auditors in Idaho and Montana, effective in

controlling sediment when they are correctly applied (IDEQ 1993, MDSL 1994). This is a particularly important finding in these two states because sediment is the leading cause of water quality impairment (see Table 8).

The CWA does not require that BMPs be regulated unless the state decides to do so. Idaho, like most other states, uses a voluntary BMP approach with the agricultural sector. Idaho uses a regulatory approach with the forestry sector, as do 14 other states; 22 states use a regulatory backup for voluntary forestry BMP programs (Stuart 1996).

Idaho policy emphasizes a watershed approach to water pollution control. The system of installing, monitoring, and adjusting BMPs is an adaptive approach to managing nonpoint source pollution at its source. The TMDL process identifies where the source controls are needed.

• *TMDLs.*— The TMDL process in the CWA is a centralized and quantitative "pollution allocation" approach required under the CWA for waters on the "303(d) list." These are water quality-limited segments or water bodies. The TMDL process shifts the focus from controlling activities that produce pollution to determining the amount of pollution that is acceptable. It is a theoretically acceptable process that faces formidable implementation problems when water quality standards to support beneficial uses have not been determined quantitatively.

The TMDL process does not require numeric criteria in water quality standards. Developing a TMDL does require quantifying not only the load of pollutants affecting the water body, but also a realistic quantitative estimate of the capacity of the water body to assimilate the pollution load. This requires converting narrative criteria to numeric criteria. From the literature review herein, implementing the TMDL process with numeric criteria is technically difficult (Novick et al. 1994), and is even more difficult with narrative criteria because they must be converted to numeric targets (Snethen 1989).

From the Idaho Division of Environmental Quality's point of view, the unresolved TMDL questions are when and how. The former—when?—is a legal question, but presumably priority ranking on the "303(d) list" has something to do with scheduling. The latter—how?—is a technical question and a legal/regulatory question. The technical

questions are state of knowledge, data availability, and time and resources to tackle the problem. The legal question is required content (L. Koenig, review comments).

In spite of the technical difficulties in developing TMDLs, the CWA requires them. TMDLs point out where in the watershed BMPs need to be installed or modified to meet water quality standards. TMDLs set overall pollution loading targets rather than program specific targets which may not take one another into account (L. Koenig, review comments).

4.3. Idaho's Water Quality Assessment and Monitoring Approach

The sediment criterion in Idaho water quality standards states: Is the water body free from excess sediment in quantities that impair designated beneficial uses? In Idaho, this implies a need for monitoring programs focused on aquatic life and that is a new direction in Idaho policy.

• *Assessing sediment.*— The best scientific approach to sediment assessment would be to measure the actual quantity of sediment found in streams in the watershed, and compare it to sediment levels that can be expected to occur in comparable reference streams of similar geomorphic and physical characteristics in undeveloped watersheds (IDL 1995). This would allow identification of approximate levels of fine sediment unique to the specific land type associations, streamflow energy, and stream channel characteristics in the watershed, above which beneficial uses could be negatively impacted. Measured levels of sediment that exceed expected levels might indicate that human activities in the watershed have caused excess sedimentation. Sediment sources could then be identified and prescriptions developed to mitigate these sources and improve the condition of the stream by reducing sediment (IDL 1995).

Due to the variability in watersheds and stream channels in Idaho, developing this baseline information would require the collection and analysis of an enormous amount of data (IDL 1995). Sediment levels in a sufficient number of undeveloped watersheds representing the full range of watershed and stream channel characteristics to a statistical level of certainty would have to be assembled. Unfortunately that

data is not currently available. In the absence of this information the Idaho Department of Lands has elected to use the condition of beneficial use support as an indicator of the impact of fine sediment levels in the stream (IDL 1995).

It is therefore necessary to design and implement a program for assessing beneficial use support. In 1993 the Idaho Division of Environmental Quality (DEQ) began such a program. It is designed to measure biological, chemical, and physical habitat characteristics as a way of characterizing stream health and the quality of the water and the watershed it drains; this program is referred to as the Beneficial Use Reconnaissance Project (BURP) (Clark and Steed 1994, 1995). The objectives of BURP are to determine beneficial use attainability and beneficial use support status, including characterizing reference stream conditions (Clark and Steed 1994, 1995).

• **Alphabet soup: BURP, WBAG, BAG, and WAG.** — Figure 3 illustrates the process of determining to what degree a stream or other water body supports its designated beneficial uses, and thus whether it meets state water quality standards. The process begins with monitoring data. BURP, indicated on Figure 3, is but one source of data. The Cumulative Watershed Effects (CWE) assessment data (see section 4.4.3 in this report) would be another source of data. It shows that if the assessment indicates that designated uses are not fully supported, that is, water quality standards are not met, the water body is placed on the “303(d) list” and its priority for TMDL development is determined.

Figure 3 also illustrates the responsibilities of BAGs and WAGs. BAGs are responsible for assigning priorities for TMDL development. BAGs may recommend that designated beneficial uses be changed, which requires not only a TMDL, but also a use attainability analysis and legislative rulemaking. WAGs are responsible for the identification of needed control actions that are part of a TMDL. WAGs recommend modification in BMPs or NPDES permits. For nonpoint source controls, the Idaho Department of Lands is responsible for enforcing BMPs for forestry and mining operations; the Idaho Soil Conservation Commission has responsibilities for incentives and other programs to encourage agriculture and grazing operations to implement

BMPs.

BURP measures stream discharge, width-to-depth, stream shade (canopy cover), percent surface fines (Wolman pebble count), pool-to-riffle ratio, pool complexity, large organic debris (LOD), bank stability, habitat, and the status of macroinvertebrates (insects) and fish. These measurements are analyzed and compared to reference streams or reference conditions to determine beneficial use support status and meet BURP objectives (Clark and Steed 1994). This is what BURP does in a nutshell; although the biomonitoring principle is sound, BURP has some significant problems in the way it samples and interprets results that may not accurately assess the status of the water body (R. Van Kirk, review comments). In general BURP surveys will reflect the ability of the stream to support cold water biota and salmonid spawning. Three specific areas of concern are the timing of the site visit, the inability of the survey to detect fish migration or diversion structures that may be limiting trout production, and the entire fish sampling part of the protocol (Van Kirk 1996).

The DEQ developed a Water Body Assessment Guidance (WBAG) document (IDEQ 1996) to provide a non-arbitrary water body assessment method using data collected by the BURP monitoring program and other similar sources of data. The WBAG document was designed as an analytical tool for determining if a water body was supporting or not supporting a beneficial use, and it can be used to prioritize water bodies for more stringent assessments and recommend candidate beneficial uses (IDEQ 1996).

The strength of this method is the use of ecological indicators to make water quality assessments (IDEQ 1996). Water quality is evaluated and compared to water quality levels needed for the protection and maintenance of viable communities of aquatic species. The underlying premise is that measurements of aquatic communities better reflect long term stream conditions than do the traditional water quality measurements of chemical contaminants. Biological assessment also provides a direct measure of the aquatic life beneficial uses (IDEQ 1996).

Secondarily, the WBAG water body assessment method may help identify causes and sources of beneficial use impairment (IDEQ 1996). For example, good physical indicators

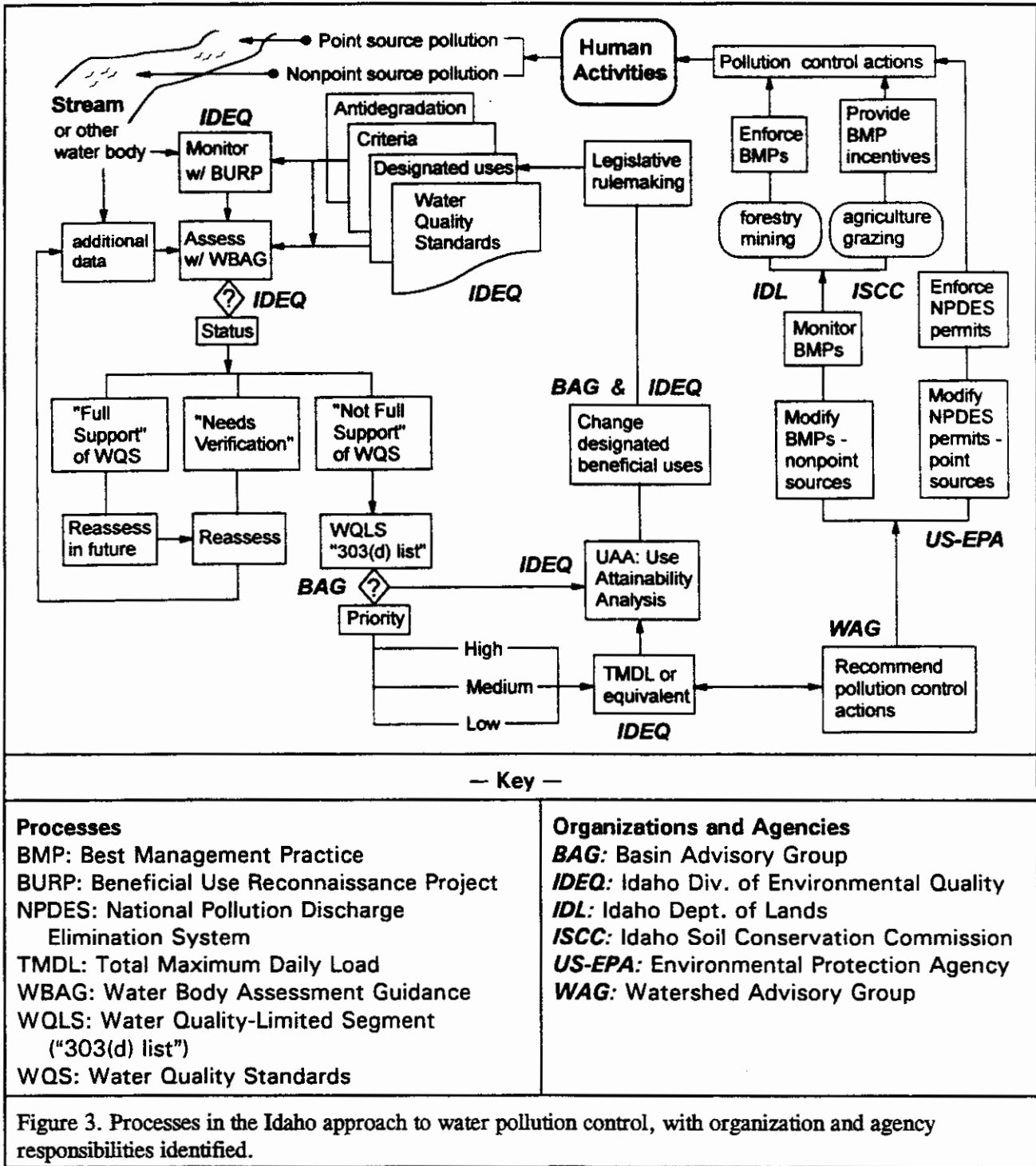


Figure 3. Processes in the Idaho approach to water pollution control, with organization and agency responsibilities identified.

and poor biological indicators may be attributed to water chemistry factors. On the other hand, poor physical indicators and good biological indicators may point to nutrient enrichment, which could artificially sustain a more diverse aquatic community than the habitat quality would indicate (IDEQ 1996). Even if aquatic

invertebrates are very abundant, dominance of the invertebrate community by sediment-tolerant species might indicate that water chemistry is good but that deposition of fine sediment may be limiting the stream's ability to support other uses such as salmonid spawning (R. Van Kirk, review comments).

Finally, DEQ's WBAG document provides state-wide consistency to water body assessment (IDEQ 1996). The document illustrates a method to assess Idaho's water bodies in a systematic, non-arbitrary manner. The method is dynamic, and will be adapted to meet new needs as better assessment methods are developed and changes to the state water quality standards occur (IDEQ 1996). The DEQ maintains a list of streams that have been selected for monitoring, and identifies the rationale for selection (IDEQ 1996).

Criteria for selecting streams to monitor must be flexible enough to address the range of conditions encountered because Idaho has many diverse environments within its borders (IDL 1995). Yet the selection process must be responsive to DEQ regional office and statewide requirements. To assist in prioritizing monitoring efforts, a technical advisory committee formed by IDL identified six categories of streams that should be considered when the regional offices select streams for monitoring: [1] water quality limited streams, that is, waters on the "303(d) list"; [2] streams with reference conditions (Plafkin et al. 1989); [3] watersheds that fall within the framework of the Watershed Approach, an emerging strategy within DEQ; [4] streams for which there is little to no monitoring information; [5] Stream Segments of Concern, from the 1988 Idaho antidegradation policy; and [6] cumulative watershed effects (CWE) process streams (IDL 1995).

The relation of BURP data to the CWE process is described in more detail in the second of four case studies presented in the next section.

4.4. Idaho Case Examples

Four examples from Idaho are presented here. The first two illustrate how knowledge is being attained in Idaho about cumulative watershed effects and used in the control of nonpoint source pollution. The first example is the South Fork of the Salmon River (SFSR), which illustrates that today's technology and BMPs would have greatly reduced the severe sedimentation damage from timber harvesting and roading that occurred in that drainage from 1940 through the mid-1960s. The second example follows from the first, and focuses on the development of a cumulative

watershed effects (CWE) assessment and control process in Idaho. The third example briefly describes Idaho's approach to agricultural nonpoint source pollution management. The fourth describes the Henry's Fork Watershed Council. This is an approach to local watershed management that predates the WAG approach in the new Idaho water quality law.

4.4.1. South Fork of the Salmon River (SFSR): BMPs and Cumulative Effects

Stream water quality is a function of a variety of characteristics, including temperature, sediment loads, inorganic chemistry, toxic metals, and organic compounds (MacDonald et al. 1991). Forest management practices, such as road construction, harvesting, and regeneration, may substantially alter the quality of water draining from forested watersheds. Degradation of water quality from forestry operations is considered a nonpoint source of pollution, controlled by an array of local, state, and federal regulations (Brown et al. 1993; Binkley and Brown 1993a).

In some cases, increased concentrations of suspended sediments have led to increases in the proportion of fine sediments in streambed materials. One of the best illustrations of the impacts of poor harvesting techniques on sensitive soils comes from the South Fork of the Salmon River (SFSR) in central Idaho (Binkley and Brown 1993a).

• *Descriptive history.* — The SFSR drainage covers 370 square miles (EPA 1996a). In the winter of 1965, heavy rains fell in the drainage and triggered a series of landslides "so destructive" (Whitman 1989) that "[a]long 25 miles of the South Fork, the soil seemed to dissolve and run like wet concrete. The forest opened to reveal swatches of naked bedrock as dislodged trees flowed away" (Wann 1987). When the slopes stabilized, the river was "virtually destroyed" as a salmon spawning ground, effectively eliminating more than half of the salmon population of the entire Columbia River system (Wann 1987).

This event followed fifteen years of intensive logging and road building in the Payette National Forest; more than 800 miles of roads were constructed in the drainage, most of them on steep slopes with highly erodible soils (Whitman 1989, citing several sources).

A forest hydrologist working for a forest products company (McGreer 1985) described the "Salmon River blowout" and asserted that it could not happen again:

The Salmon River in Idaho provides an interesting example of abusive practices resulting in damage to water and fish followed by control and responsible management. Incredibly, roads occupied 25 percent of the total ground area of highly erodible land in areas of the South Fork of the Salmon watershed. Landslides streaked the mountainsides. People still use the Salmon as an example of how terrible silviculture is, but those activities in the Salmon ended over 25 years ago. This sad experience alerted the public, and may have contributed to developing [CWA section] 208 and Idaho's Forest Practices Act. Today it is inconceivable that similar practices could be applied. Tremendous progress has been made in responsibly managing similar lands (McGreer 1985, quoted by Whitman 1989).

Road construction and logging that occurred in about 15% of the watershed raised the percent of fine materials in the streambed to 30%; after 13 years with no further logging, the fine materials declined to 8% of the streambed materials (Megahan et al. 1980). This high rate of sedimentation doesn't always happen. At the other end of the spectrum, logging of 40% of the forest in a 20,000 acre block along the Middle Santiam River in Oregon led to no measurable increase in sediment, erosion, or stream channel characteristics (Sullivan 1985).

• *Sedimentation processes.*— Sediment can enter watercourses by various mechanisms, and events can be described as chronic or episodic (NRC 1996). Mobilization of soil particles through surface and gully erosion delivers small particles, or fine sediment, to the stream network; surface erosion is normally associated with precipitation, which is episodic, but can occur chronically if human activities generate continuous runoff of sediment-rich water to streams (NRC 1996). The erosion of large volumes of material from hillslopes, through a process called mass erosion, occurs when large and often rapid upper soil movements such as landslides deliver coarse and fine sediment, large woody debris, and fine organic matter to streams (NRC 1996).

Surface erosion and mass erosion are normal processes (NRC 1996). Their frequency depends mostly on the geology and erosiveness

of soils and underlying rock as well as the intensity and duration of rainfall and snow melt (NRC 1996). Some areas have naturally high erosion rates, including sandstone-dominated coastal river basins in northern California and western Oregon, granitic sediments in northern and central Idaho, and glacial-lacustrine deposits in northwestern Washington; these types of areas are often among the most sensitive to erosion from human-caused activities such as logging and road building (NRC 1996).

Improvements in road construction and logging methods can reduce erosion rates; for example, an 80% reduction in mass erosion from forest roads and about a 40% reduction in mass erosion from logged areas in northern California has been documented from improvements in forest practices that began in the middle 1970s (NRC 1996).

Megahan et al. (1992) estimated that historical human-caused sediment yields in the SFSR could have been reduced substantially by applying current BMPs. That is part of the story in this case study.

Intensive unregulated logging from 1940 through the mid-1960s contributed to massive cumulative effects from sedimentation in the SFSR by 1965, with the sad result of severe damage to salmon and steelhead habitat (Megahan et al. 1992). A sediment yield prediction model was used by Megahan et al. (1992) to evaluate the effects of historical and alternative land management on Dollar Creek, a representative tributary watershed in the SFSR basin of 11,000 acres. Present-day management practices, properly implemented, have the potential of reducing sediment yields by about 45 to 95% compared with yields caused by the historical land-use activities in Dollar Creek (Megahan et al. 1992).

• *Cumulative effects analysis.*— Cumulative effects analysis is a useful tool for evaluating management alternatives (Megahan et al. 1992). Although some increases in sedimentation are unavoidable even using the most cautious logging and roading methods, much of the sedimentation in the SFSR and other drainages could have been avoided if logging and road construction had followed current BMPs (Megahan et al. 1992).

The sedimentation damage to the SFSR occurred long before the development of BMPs in Idaho. In 1974, two years after the CWA was

enacted, Idaho adopted a comprehensive Forest Practices Act (Idaho Code § 38-1301 *et seq.*) modeled after the Oregon Forest Practices Act. Rules and regulations were issued in 1976.

In 1979, the Idaho Forest Practices Water Quality Management Plan was completed to comply with the area-wide planning intent of section 208 of the CWA. Idaho's plan identified the rules and regulations associated with the Idaho Forest Practices Act, with recommended modifications, as approved BMPs for the state of Idaho (Megahan et al. 1992).

The Idaho Division of Environmental Quality (DEQ) established an interdisciplinary task force in 1983 to analyze nonpoint source pollution attributable to forest practices, and the adequacy of the existing BMPs and the regulatory processes for protecting water quality. The 1985 report of the task force documented varying degrees of compliance and made recommendations for changes in the Idaho Forest Practices Act and in the associated rules and regulations (Megahan et al. 1992).

• **BMP effectiveness.** — One of the provisions of the 1988 Idaho antidegradation policy was the establishment of a coordinated monitoring program with inputs to the policy revision process. Part of the monitoring program was designed to assess the effectiveness of BMPs. This includes monitoring of BMP implementation, pollutant source and transport, and beneficial uses. The monitoring program focus for forestry BMPs was the impact of sediment on cold water biota and salmonid spawning. This is consistent with the historical emphasis of Idaho forestry BMPs on control of erosion and the prevention of stream channel sedimentation (Megahan et al. 1992).

In 1988, an interdisciplinary team water quality audit (IDEQ 1989b) showed that when they were applied, BMPs were 99% effective in preventing obvious excess sediment from entering streams. When they were not applied, excess sediment was delivered to waters in 70% of the cases. Similar results were obtained during the 1992 audit, with a 92% compliance rate (IDEQ 1993). Precise quantification and an assessment of cumulative effects are not part of the BMP audit process. However, it was noted that 80% of the streams evaluated during the 1988 audit had intermediate or high levels of sedimentation from past activities (Megahan et

al. 1992).

The results of the modeling exercise by Megahan et al. (1992) demonstrated that existing cumulative effects analysis procedures provide a means of evaluating alternative forest management practices. Current developments in cumulative effects analysis are described in the next case study.

Megahan et al. (1992) estimated that the historical sediment yields in the South Fork Salmon River basin could have been reduced considerably by present-day BMPs, by amounts ranging from about 45% to 95%. Numerous other scenarios could be evaluated following similar analysis procedures. The selection of the most suitable scenario would have to be based on an evaluation of the benefits versus the costs of each alternative. All land-use alternatives evaluated by Megahan et al. (1992) caused some increase in sediment yields, ranging from 3% to 51% over natural levels. There is some sedimentation cost or risk of timber harvest in these granitic areas that must be accepted if such activities are to take place (Megahan et al. 1992).

Present-day BMPs make it possible to reduce sediment yields from forest practices; cumulative effects analysis procedures allow forest managers to compare the sediment yields caused by alternative forest disturbances (Megahan et al. 1992). Given the application of current knowledge and environmental constraints over the period of logging development, much of the sedimentation damage that occurred in the SFSR might have been avoided (Megahan et al. 1992). Cumulative effects analysis can indicate where and under what conditions land-use activities can take place.

• **Idaho's first TMDL.** — The TMDL process was undertaken in the SFSR by the Idaho DEQ working with the U.S. Forest Service, which owns approximately two-thirds of the land in the drainage. Using their professional judgement, a consensus team set numeric goals to attain the existing narrative sediment criteria and recover beneficial uses. To meet these goals, a TMDL established a reduction of 25% of the sediment loading to the river from human activities. Implementation plans for BMPs were developed along with a monitoring program to assess and revise, if necessary, the interim criteria. If monitoring indicates that salmon and steelhead spawning capacity does not increase, additional

projects to reduce sediment sources will be required. A use attainability analysis of the level of beneficial use support will be needed if further sediment reduction cannot improve the situation (EPA 1992).

Because of steep terrain and unstable soils, 85% of the sediment load is from natural sources. Almost all of the human-caused load is from roads (EPA 1992).

The EPA (1996a) estimated that this TMDL cost \$19,363 to prepare. Megahan and Ice (1996) expressed their concern to the EPA that this estimate "has unintentionally trivialized the actual cost of TMDL assessments and may lead to unwarranted optimism about our ability to extensively apply traditional TMDL assessments." They said the SFSR has been the subject of extensive monitoring, research on problem assessments, and model development by the U.S. Forest Service since 1966, and "while no precise estimates can be made, the cost of this watershed assessment was in the several million dollar range" (Megahan and Ice 1996). The estimate of \$19,363 represents only the cost to the state agency to use and apply existing resources in this watershed. The statement in the report regarding substantial assistance to the Idaho DEQ from the U.S. Forest Service and the EPA "understates the unique resources available in this watershed [and] is especially misleading in answering the question about patterns of costs associated with TMDL case studies" (Megahan and Ice 1996).

4.4.2. Cumulative Watershed Effects (CWE) Assessment and Control in Idaho

Since its enactment in 1974, the Idaho Forest Practices Act (FPA) has been an effective tool for helping forest managers minimize impacts from individual forest practices (IDL 1995). The purpose of the FPA (Idaho Code § 38-1301 *et seq.*) is to encourage timber harvest, forest fertilization, tree thinning, road building, and other forest practices that maintain and enhance the benefits provided by forest resources such as trees, soil, air, water, and wildlife and aquatic habitat. The FPA assigned responsibility for the development and enforcement of forest practice minimum standards, or BMPs, to the Idaho Department of Lands (IDL 1995).

Idaho's water quality standards identify the

FPA Rules as approved BMPs for silviculture (IDL 1995). These BMPs apply to any single instance of timber harvesting, reforestation, road construction and maintenance, chemical application, or slashing management; although BMPs have been an effective tool for helping forest managers minimize impacts from individual forest practices, the FPA had no provision for the control of the cumulative effects of multiple forest practices (IDL 1995).

• *Watershed analysis and cumulative effects.*— The National Research Council's *Upstream* report on salmon conservation (NRC 1996) pointed out that a recent development in forest management planning has been the watershed analysis procedure to evaluate resources and the potential environmental impacts of land management proposals. The general goal of watershed analysis is to combine habitat inventory information with environmental hazard assessments over a relatively large area—usually encompassing a fourth- to sixth-order stream habitat network—so that land-use prescriptions can be based on stewardship objectives and opportunities for habitat restoration can be identified on somewhat larger geographical scales than are normally used (NRC 1996).

As implied in the preceding case study of Idaho's South Fork of the Salmon River, watershed analysis in forested basins can lead to management prescriptions that provide greater environmental protection than standard forestry rules (NRC 1996).

The watershed analysis procedure was created in the Timber, Fish, and Wildlife Program in the state of Washington to address the cumulative effects of logging-related activities and has been incorporated into the state's forest practices laws (NRC 1996).

The *Upstream* report (NRC 1996) pointed out that in 1994 Idaho was developing a cumulative effects analysis and control process designed to protect water quality from forested watersheds so that beneficial uses are supported. That analysis and process was completed in 1995 and is the focus of this case example.

A comprehensive study has been under way in Oregon to identify the cumulative effects of forest practices on air, soil, water, fish, and wildlife, and recent revisions to Oregon's forest practices rules include a watershed analysis

option under certain circumstances (NRC 1996).

The U.S. Forest Service has developed procedures to predict the cumulative effects of forest practices; the Northern Region, which covers western Montana and northern Idaho, did the initial development work in the early 1970s (Megahan et al. 1992). Procedures were designed to evaluate increases in average water yield resulting from alternative levels of timber harvest. Water yield increases were estimated on the basis of the percentage of timber volume removed and the amount of hydrologic recovery based on time after cutting (Megahan et al. 1992).

Subsequent work in Idaho by both the Northern and the Intermountain Regions of the Forest Service—the latter covers southern Idaho—led to the development of published guidelines for predicting average annual sediment yields from forested watersheds under alternative patterns of land use (Megahan et al. 1992). The procedures were designed for use throughout Idaho but were considered to be best adapted to the highly erodible granitic watersheds in southern and central Idaho (Megahan et al. 1992).

Cumulative effects as a concept suggests that while impacts from any single forest practice will be minimal if BMPs are properly applied, impacts of a series of practices may accumulate (IDL 1995). This accumulation of impacts may have a significant adverse impact, and when viewed as a whole, the accumulation may exceed standards for watershed protection (IDL 1995). Cumulative effects are also more likely to be a problem when multiple forest practices occur over a relatively short period of time (IDL 1995).

• *Idaho's CWE process.*— In 1991 the Idaho FPA was amended to include provisions to minimize the impacts of the cumulative effects of multiple forest practices. The amendment (Idaho Code § 38-1303) defined cumulative watershed effects (CWE) as:

... the impact on water quality and/or beneficial uses which result from the incremental impact of two (2) or more forest practices. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

In accordance with the amended FPA, a Cumulative Effects Task Force was appointed; it is comprised of representatives of large private

forest landowners, state and federal resource management agencies, and environmental interest groups. The Task Force objective was to develop a cumulative watershed effects analysis and control process that will ensure watersheds are managed to protect water quality so that beneficial uses are supported (IDL 1995).

The process is designed to be *systematic, structured, reproducible, defensible* and *adaptive*, thereby ensuring its technical and practical integrity (IDL 1995, emphasis in original). It is also designed to give trained evaluators an understanding of the inherent hazards of the landscape within the watershed, and the current conditions within the watershed relevant to hydrologic processes and the disturbance history (IDL 1995).

Instead of using indirect indicators and model-based approaches, Idaho's watershed assessment relies on direct observations made in the stream and on the surrounding landscape (IDL 1995). These observations help the evaluator develop an understanding of the slope and stream processes at work in the watershed, and the cause-effect relationships between disturbance in the watershed and the stream itself. The current condition of the stream can be determined, effects of future activities anticipated, and management practices developed to correct adverse conditions (IDL 1995).

The process consists of an assessment of fine sediment in stream bottoms, channel stability, sediment delivery, water temperature and stream shade, nutrients, and hydrology (IDL 1995). It provides keys to determine whether CWE exist for any of the factors assessed, along with guidance to help landowners design management practices to alleviate adverse conditions and prevent CWE problems from future forest practices (IDL 1995).

The Idaho Department of Lands' CWE assessment procedure is designed to rate the relative amount and location of sediment generation in the watershed through a thorough field evaluation of mass failures, and the road and skid trail system. The road evaluation examines signs of erosion from the cut slopes and fill slopes, ditch lines, and road tread. The weights in the evaluation are based on those developed by the Washington Forest Practices Board in 1993. The CWE evaluator will also rate the relative amount of sediment delivery by

examining the delivery efficiency of the road system (relief culverts, ditches leading to streams). A similar approach is applied to skid trails and mass failures. The CWE evaluator must examine enough of the road and skid trail system to have a good understanding of the erosion processes in the watershed. This understanding is essential in developing the cause-effect relationships between activities or events in the watershed, and conditions in the stream (IDL 1995).

• *How is BURP data used?*— The DEQ uses BURP to systematically assess approximately 250 streams per year throughout the state. As a result beneficial use status is currently available for many streams in Idaho. Eventually, this information will be available for most of Idaho's streams. BURP information will be available to IDL for the CWE process (IDL 1995).

If BURP data indicates that beneficial uses are not supported the CWE process requires additional analysis to determine the cause of the lack of support. Lack of beneficial use support is evidence that fine sediment *may* be the cause; it is not conclusive evidence sediment *is* the cause (IDL 1995, emphasis in original). Beneficial uses may not be supported for a variety of reasons. Human activity such as poor mining, grazing, or logging practices, over fishing, or barriers to fish migration, may be the problem. Natural conditions such as the geomorphology or physical characteristics of the watershed may be such that beneficial uses are not naturally supported in the stream (IDL 1995).

The uncertainty as to the cause of the lack of beneficial use support in the case of sediment argues the need for a TMDL, which is required in such cases under the CWA, or a "TMDL equivalent." The CWE process will provide some basis for developing a TMDL equivalent. BURP monitoring data may identify the need for more intensive monitoring.

The CWE assessment procedure will help determine whether sediment in the stream is negatively impacting beneficial uses. Each step is designed to answer the following two questions: are beneficial uses supported? If not, what is the cause of non-support? (IDL 1995).

Rationale for the BURP monitoring is that this procedure relies on the assumption that if beneficial uses in the stream are supported, fine sediment levels are within an acceptable range of

variability. If beneficial uses are not supported, the assumption is that fine sediment may be a cause of non-support, and additional analysis is necessary to establish the actual cause or causes of non-support (IDL 1995).

A watershed committee consisting of all forest landowners within a watershed will oversee application of the process in that watershed (IDL 1995). This committee will select an evaluator to conduct the assessment and prepare a watershed analysis report. They will develop management prescriptions based on the report. IDL will review the assessment and approve the management prescriptions (IDL 1995).

• *What control actions result from the CWE process?*— The CWE process will lead to one of three courses of action: [1] allow forest practices to proceed using standard BMPs; [2] help resource managers redesign forest practices, or correct the identified watershed problems so that practices may proceed; or [3] delay forest practices until economically feasible technological solutions to adverse CWE are available (IDL 1995).

The task force recognizes that budget and personnel constraints will not allow CWE analyses of all watersheds in the state immediately after implementation of this process (IDL 1995). Analyses will need to be targeted toward those which are the most vulnerable to CWE problems. Forest practices will be allowed to proceed using standard BMPs in watersheds where no CWE analysis has been completed. Monitoring in the form of annual BMP effectiveness audits and reassessment of watersheds on a five-year basis will help ensure this process remains an effective CWE tool (IDL 1995).

4.4.3. Idaho's State Agriculture Water Quality Program (SAWQP)

Idaho's efforts to develop a BMP strategy for agriculture illustrate some difficult problems with such programs.

The Idaho Division of Environmental Quality (DEQ) administers SAWQP and the state Water Pollution Control Account funds it (IRU 1995). Under this program the DEQ makes grants to local Soil Conservation Districts to conduct voluntary pollution control projects on waters impacted by runoff from farms. The grants

provide funds to farmers who apply BMPs on their lands (IRU 1995).

Farmers who use pesticides or fertilizer consistent with generally accepted agronomic practices, product instructions, the proper equipment, and in a non-negligent manner are not liable for groundwater contamination (Tarlock 1996). Idaho's Groundwater Quality Plan sets a up two-tiered process for the adoption of site-specific technologically and economically feasible and socially acceptable BMPs. If voluntary BMPs are ineffective, noted Tarlock (1996), mandatory ones may be imposed.

Local Soil Conservation Districts in Idaho administer the Idaho Agricultural Pollution Abatement Program to address agricultural nonpoint source pollution in identified watersheds (Harkness 1992, cited in Hildreth et al. 1993). The Soil Conservation Districts enter into voluntary agreements with private landowners who agree to comply with BMPs to abate nonpoint source pollution. The state provides funding for local watershed programs through inheritance, tobacco, and sales taxes. The program relies on the feedback loop concept that is featured in the Idaho groundwater plan. Under this concept water quality resources are identified, a corresponding BMP is applied to address the protection of the resource, followed by evaluation and modification of the BMP if necessary to reach the desired benefit (Harkness 1992, cited in Hildreth et al. 1993).

Since 1979, Idaho has invested \$35 to \$40 million in this program, including funding for positions within the Idaho Soil Conservation Commission and the Idaho DEQ (IDEQ 1995b). However, it is difficult to measure program results or to say with certainty whether or not the program has been cost effective. In addition, the program requires review to determine how it will be affected by the new Idaho water quality law passed in 1995 (IDEQ 1995b; Chapter 3 of this report analyzes this law).

During Fiscal Year 1996, DEQ intended to work with the Idaho Soil Conservation Commission to reevaluate this program, and prepare recommendations as to its future composition and magnitude (IDEQ 1995b). At the November 1996 annual meeting of the Idaho Association of Soil Conservation Districts held in Moscow, it was evident that DEQ and the Soil Conservation Commission had not yet

accomplished the reevaluation (Jay O'Laughlin, personal observation).

The major flaw of the program, according to Idaho Rivers United (IRU 1995), is that farmers do not have to use BMPs; SAWQP is voluntary, unlike the mandatory provisions for logging practices in the Idaho Forest Practices Act.

4.4.4. Henry's Fork Watershed Council: A model for WAGS?

A segment of the Henry's Fork of the Snake River is on the "303(d) list" in the low priority category. In May 1996 the Henry's Fork Watershed Council (HFWC) conditionally accepted the invitation to serve as a Watershed Advisory Group (Swenson and Brown 1996), and in July 1996 the DEQ administrator formally designated the HFWC as a WAG (Cory 1996). The HFWC is currently assisting DEQ in trying to determine the beneficial use attainment status of individual streams and develop TMDLs for those that need it (R. Van Kirk, review comments).

• *Descriptive history.* — The Henry's Fork Watershed Council (HFWC 1995) is a community-based approach to watershed protection and management. The Henry's Fork Basin is located in three eastern Idaho counties and one in western Wyoming. The area has a combined population of 40,000 and encompasses 1.7 million acres and more than 3,000 miles of rivers, streams and irrigation canals. The basin includes the southwestern corner of Yellowstone National Park and the western slope of the Teton Mountains. This headwaters area of the Snake River features high mountain streams and abundant spring sources that provide nutrient-rich waters of constant flow and temperature. These conditions provide for healthy populations of fish and wildlife, including several threatened and endangered species, as well as high-quality recreational experiences for Idahoans and their guests (HFWC 1995), who come to experience the rugged scenic beauty and superb trout fishing in the area.

The basin was originally settled by Mormon and Lutheran homesteaders who built irrigation canals and storage reservoirs to augment the water supply (HFWC 1995). Canals divert water from the Henry's Fork, Fall River, Teton River and smaller tributaries; and dams built on

Henry's Lake and the Henry's Fork store irrigation water. More than 235,000 acres of farmland are irrigated from surface or groundwater sources in the basin, with potatoes and grains the primary crops. Other important sectors of the economy include recreation and tourism services, government, and wood products (HFWC 1995).

As land use and associated interests in the basin diversified over the years, the Henry's Fork sustained intense pressure to satisfy irrigation demand, hydropower requirements and instream flow needs for fisheries and recreation (HFWC 1995). These issues were the focal points of the Henry's Fork Basin Plan, passed by the 1993 Idaho Legislature. The Basin Plan prohibited new water resource developments such as dams, diversions and hydroprojects on 195 miles of the Henry's Fork and its tributaries. Recommendations in the Basin Plan also addressed water quality, fish and wildlife protection, and irrigation water conservation. In order to implement the recommendations and achieve the long-term goals in the Basin Plan, an innovative, consensus-building process was sought in order to include all parties with interests in the watershed (HFWC 1995).

At least 25 federal, state, and local agencies have management or regulatory jurisdiction in the Henry's Fork Basin, which was contributing to fragmented planning and decisionmaking (HFWC 1995). Lack of agency coordination was hindering progress in addressing soil erosion, water delivery, and water quality problems. In 1993, citizens and agency representatives began to craft a new approach to reconciling watershed issues in the Henry's Fork Basin. The various interests in the rural communities recognized the importance of working together to resolve the ecological problems in the watershed and to work towards a sustainable future for all concerned (HFWC 1995).

• **Council structure.**— During the winter of 1993-94, the Henry's Fork Watershed Council was organized and chartered by the 1994 Idaho Legislature (HFWC 1995). Its mission statement, fashioned by consensus, reads as follows:

The Henry's Fork Watershed Council is a grassroots, community forum which uses a nonadversarial, consensus-based approach to

problem solving and conflict resolution among citizens, scientists and agencies with varied perspectives. The Council is taking the initiative to better appreciate the complex watershed relationships in the Henry's Fork Basin, to restore and enhance watershed resources where needed, and to maintain a sustainable watershed resource base for future generations. In addressing social, economic and environmental concerns in the basin, Council members will respectfully cooperate and coordinate with one another and abide by federal, state and local laws and regulations (HFWC 1995).

The Council is comprised of citizens, scientists, and agency representatives who reside, recreate, make a living, or have legal responsibilities in the basin (HFWC 1995). This diversity of participants ensures a more collaborative approach to resource decision-making. The Council is not limited in the number of participants, and its members are organized into three component groups: citizens, technical specialists, and agencies, plus a facilitation team (HFWC 1995). They are described as follows.

Citizen's Group.— Members of the public with commodity, conservation, or community development interests have an integral role in Council affairs by being on equal footing with other participants. The Citizen's Group reviews agency proposals and plans for their relevance to local needs and whether all interests are equitably represented.

Technical Team.— The Team is composed of scientists and technicians from government, academia and the private sector. The Team's role is to serve as resource specialists for the Council, coordinating and monitoring research projects, launching needed studies and reviewing any ongoing work in the basin. Duplication of research will be minimized through Technical Team guidance and results of research will be integrated into Council discussions.

Agency Roundtable.— The Roundtable has representatives of all local, state, and federal entities with rights or responsibilities in the basin, including the Shoshone-Bannock Tribes. The agencies are working to align their policies and management to watershed resource concerns and needs. Discussions seek to ensure close coordination and problem-solving among agencies, as well as clarifying legal mandates of each entity.

Facilitation Team.— Two representative citizen organizations from the basin have been selected to co-facilitate the Council meetings the Fremont-Madison Irrigation District and the Henry’s Fork Foundation. The Facilitation Team is chartered to attend to administrative and logistical needs of the Council, coordinate its public information activities, and submit annual reports of its progress to the Legislature. The Henry’s Fork Watershed Fund has been established by the State of Idaho to help fund projects in the basin and to defray Council administrative expenses.

• **Council function.**— The Council Charter identifies four major duties for the Henry’s Fork Watershed Council: [1] cooperate in resource studies and planning that transcend jurisdictional boundaries, still respecting the mission, roles, water and other rights of each entity; [2] review

and critique proposed watershed projects and Basin Plan recommendations, suggesting priorities for their implementation by appropriate agencies; [3] identify and coordinate funding sources for research, planning and implementation and longterm monitoring programs, with financing derived from both public and private sectors; and [4] serve as an educational resource to the Legislature and the general public, communicating the Council’s progress through regular reports, media forums and other presentations (HFWC 1995).

The first three duties in the Council’s charter have been incorporated into a working procedures called the “WIRE process” (see Table 9). This analytical framework may be useful for WAGs to consider for project and program evaluation purposes.

Table 9. The WIRE (Watershed Integrity Review and Evaluation) process of the Henry’s Fork Watershed Council.

The first three duties of the Henry’s Fork Watershed Council have been incorporated into a working procedure called the “Watershed Integrity Review and Evaluation” (WIRE) process. The Council distilled over eighty different ideas for watershed health and vitality into ten primary criteria to ensure the integrity of the Henry’s Fork Basin. Formatted as a checklist, these criteria are used to evaluate the merits of projects or programs advanced by agencies or other Council members:

1. **Watershed Perspective:** Does the project employ or reflect a total watershed perspective?
2. **Credibility:** Is the project based upon credible research or scientific data?
3. **Problem and Solution:** Does the project clearly identify the resource problems and propose workable solutions that consider the relevant resources?
4. **Water Supply:** Does the project demonstrate an understanding of water supply?
5. **Project Management:** Does project management employ accepted or innovative practices, set realistic time frames for their implementation, and employ an effective monitoring plan?
6. **Sustainability:** Does the project emphasize sustainable ecosystems?
7. **Social and Cultural:** Does the project sufficiently address the watershed’s social and cultural concerns?
8. **Economy:** Does the project promote economic diversity within the watershed and help sustain a healthy economic base?
9. **Cooperation and Coordination:** Does the project maximize cooperation among all parties and demonstrate sufficient coordination among appropriate groups or agencies?
10. **Legality:** Is the project lawful and respectful of agencies’ legal responsibilities?

Projects receiving endorsement of the Council through the WIRE process may seek funding assistance, political support or interagency cooperation in implementation.

Source: Henry’s Fork Watershed Council (1995).

The Henry’s Fork Watershed Center was established in 1995 in the community of Ashton, in the center of the watershed, to provide a central library, database repository and working

place for those participating in the collaborative watershed program; the Center also serves as the Watershed Council office and a central location for watershed information (R. Van Kirk, review

comments).

4.5. Conclusion: BMPs and Watershed Protection

Concluding their review of the relationship between BMPs, cumulative effects, and fish abundance, Bisson et al. (1992) observed that many local fish populations are declining and there are many reasons why.

• *Protecting biological integrity.* — In the context of implementing the CWA, the EPA (1988) said that whether a state is just beginning to establish narrative biological criteria or is developing a fully integrated biological approach, the programmatic expansion from controlling the source of pollution to resource management represents a natural progression in water quality programs. Implementation of biological criteria will provide new options for expanding the scope and application of ecological perspectives (EPA 1988). Idaho is just beginning this approach.

Some of the most valuable aquatic resources in the Pacific Northwest are in jeopardy, and decisive action is needed (Bisson et al. 1992). In many instances the need to take decisive action has led management organizations to adopt restoration approaches based more on *mitigation* of losses than on *protection or restoration* of natural ecological processes that have created and maintained diverse and productive stream habitat (Bisson et al. 1992, emphasis in original). Mitigation approaches seek rapid increases in the numbers of harvestable fish rather than investments in long-term natural productivity that might yield gradual but sustained improvement. Well-intentioned though they may be, many hatchery and stream enhancement projects fall into this category. Mitigation is costly and its effectiveness is too often questionable; the results of years of cumulative environmental damage cannot easily be reversed in a short time (Bisson et al. 1992).

Recovery of habitat complexity and biological diversity in Pacific Northwest streams will not be rapid (Bisson et al. 1992). Landscape patterns and natural climatic regimes and continued pressures for economic development of resources and fishing pressure will influence the recovery rate. The restoration of naturally complex channels and unimpeded connections between streams and riparian zones is a formidable task

requiring an unprecedented level of cooperation and willingness to alter current land-use practices.

• *BMP evolution.* — BMPs are a tool with a prominent role in water quality protection, but there is a lack of knowledge about cumulative effects and BMPs (Bisson et al. 1992).

Although the term *best* management practice has been used frequently in this report, it is an elusive term because management alternatives will continue to evolve as our knowledge increases (Bisson et al. 1992). Many timber management techniques considered to be technologically advanced decades ago are viewed as outdated and environmentally destructive today. An example is the use of streams and rivers for log transport to mills. At one time, water-based log transport was the most practical means of moving very large logs from forested headwaters to downstream processing facilities. This management practice, considered the "best" in its day, caused a great deal of damage to streams and riparian zones, especially when it involved the use of splash dams (Bisson et al. 1992).

The concept of BMPs with regard to environmental protection and restoration was essentially a post-World War II phenomenon and has been applied to land management activities both in Europe and North America (Bisson et al. 1992). Public pressure to protect stream habitat in western North America was at least partly responsible for an end to splash damming and log drives in the 1950s, and for some of the first restrictions on yarding across stream channels. Bisson et al. (1992) concluded that "The BMPs of tomorrow will be better than those of today, and there is every reason to believe that there will always be room for environmental improvement."

Emphasis on the sustainable use of water resources and an ecological approach to solving the problems of nonpoint source pollution are somewhat new in the field of environmental engineering and pollution control and the situation today continues to evolve (Novotny and Olem 1994). The states have more than twenty years of experience with forest practices regulatory programs (Ellefson and Cheng 1994). Idaho was one of the first states to implement such a program. This experience could be useful in the debates concerning regulation of land-use

activities. Ecologically-based concepts emphasizing the importance of ecosystem complexity and biodiversity are starting to revolutionize forest management (Bisson et al. 1992). A similar revolution in the way streams and riparian zones are managed to protect of aquatic habitat is overdue. As Bisson et al. (1992) put it, "it is time to start thinking about BMPs as procedures to preserve stream ecosystem integrity and not individual fish populations [and it] must begin with the realization that benefits of improved practices will not be immediate, but will require *patience* and a willingness to incorporate new knowledge as it becomes available" (Bisson et al. 1992, emphasis added).

There is really only one alternative to the BMP approach to land-use management for water quality protection—prohibition of land-use activities. Distilled to its essential program components the clean water/good habitat issue is transferring technical knowledge to land-use operators, ensuring that they use the technology, and monitoring to see that the technology is effective in meeting its goal of restoring and maintaining "fishable and swimmable" conditions in our waters.

• *Professional organization involvement.* — Before the mid-1970s, diffuse pollution and the control of nonpoint sources was an unknown phenomenon to the general population; environmental engineering and science were almost exclusively oriented toward urban wastewater conveyance, treatment and disposal, and water supply (Novotny and Olem 1994). In contrast, today there are very active and quite large groups of professionals interested in solutions for urban or agricultural diffuse pollution. Their concerns are consistent with ecological principles and would lead to the protection and enhancement, rather than the destruction, of ecosystems (Novotny and Olem 1994).

Many excellent examples of such professional concerns have emerged recently, and most environmental professional associations have formed interest groups to focus on these concerns, including the International Association

on Water Quality (formerly the International Association for Water Pollution Research and Control), the Water Environment Federation (formerly the Water Pollution Control Federation), The American Water Resources Association, the American Society of Civil Engineers, the American Society of Agricultural Engineers, the Soil Science Society of America, the North American Lake Management Society, and the American Society of Agronomy (Novotny and Olem 1994). Other examples include the Society of American Foresters, whose Task Force Report on CWA Reauthorization was cited frequently in this report (SAF 1995), and the Watershed Management Council, American Institute of Hydrology. Professional journals and conference proceedings from these and other organizations are now a major source of information on topics related to the diffuse-pollution problem and its solutions; these associations and their publications play a positive role in the recognition of the diffuse pollution problems as well as their solution (Novotny and Olem 1994).

• *Watershed management and protection.* — The new watershed management approach for water quality programs is consistent ecosystem-based management. One of the dilemmas of an ecosystem-based approach to resource management is where to draw the boundary lines for analytical and management purposes. Watershed boundaries have much to recommend them for ecosystem-based management (see Ice et al. 1993, Euphrat and Warkinton 1994, Montgomery et al. 1995). One good reason is watershed management is EPA's direction for implementing the Clean Water Act.

The CWA may be the force that brings together the concerns many people have about ecological integrity and sustainable economic development. If farmland, rangeland, and woodland owners and operators are aware of best management practice (BMP) technologies and apply them to meet the goals of the CWA, other economic and ecological goals will be met. Most important is the protection of aquatic habitat.

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- Hells Canyon I*. Oregon Natural Resources Council v. Lyng, 882 F.2d 1417 (9th Cir. 1989), *modified*, 899 F.2d 1565 (9th Cir. 1990).
- Idaho TMDL*. Idaho Sportsmen's Coalition v. Browner, C93-943WD, Seattle, WA; Order on motions for summary judgment and injunction, May 19, 1995; Order on EPA's motion to dismiss and plaintiff's motion for order establishing TMDL schedule, September 26, 1996.
- North Roaring Devil*. Oregon Natural Resources Council v. United States Forest Service, 834 F.2d 842 (9th Cir. 1987).
- Rio Grande LRMP*. Citizens for Environmental Quality v. United States, 731 F.Supp. 970 (D.Or. 1989).

GLOSSARY

NOTE: In almost all cases, definitions have been taken verbatim from the source document indicated in parentheses following the definition. Terms appearing in boldface within the definitions are defined elsewhere in this Glossary. Some terms have more than one definition or slightly different meanings depending on the source.

Activity: see **agriculture, forest practices, nonpoint source activities, short-term activity.**

Agriculture: A category of **nonpoint source pollution** including but not limited to activities of irrigated or non-irrigated crop production, specialty crop production (truck farming, orchards, etc.), pasture land, rangeland, feedlots, aquaculture, and animal holding areas (IDEQ 1995b).

Ambient: The quality of physical **parameters** in the surrounding, external, or unconfined conditions (e.g., water temperature or **water pollution**); the term has no positive or negative connotations (Dunster and Dunster 1996).

Antidegradation: [1] Part of the federal air quality and **water quality** requirements prohibiting deterioration where **pollution** levels are above legal limits (IDEQ 1995b). See **degradation**. [2] For purposes of the Clean Water Act, section 303, refers to **pollution** prevention by (1) maintaining and protecting the level of **water quality** necessary to protect **existing uses**, (2) allowing **lowered water quality** where doing so would accommodate important economic or social development in the area in which the **waters** are located, but assuring that water quality is adequate to protect existing uses fully, and (3) maintaining and protecting **high quality waters** where they are an outstanding National resource (40 CFR 131.12). See **outstanding resource water**.

Applicable water quality standard: Those **water quality standards** identified in the rules of the Department (Idaho Code § 39-3602).

Aquatic: Of, or pertaining to, water (IDEQ 1996).

Attainable use: [1] A **beneficial use**, that with appropriate **point source** and **nonpoint source** controls, a **water body** could support in the future (IDEQ 1996). [2] Those uses, based on the state's system of water-use classifications, that can be achieved when **effluent limitations** under sections 301(b)(1)(A) and (B) and 306 of the CWA are implemented for **point source discharges** and when "cost-effective and

reasonable **best management practices**" (40 CFR 131.12(a)(2)) are implemented for **nonpoint sources** (Novotny and Olem 1994, p. 986).

Background: [1] The ever-present **environmental** conditions or effects above which a phenomenon must manifest itself in order to be detected. The background level may serve as a **baseline** against which changes can be judged (Dunster and Dunster 1996). [2] The biological, chemical, or physical conditions of **waters** measured at a point immediately upstream (up gradient) of the influence of an individual **discharge** from a **point source** or **nonpoint source**. If several discharges to the water exist or if an adequate upstream point of measurement is absent, the Department will determine where background conditions should be measured (IDEQ 1996).

Bad actor law: State bad actor laws authorize the state to take increasingly stringent steps where voluntary measures fail (EPA 1996b).

Baseline: The starting point for analysis, which may be the conditions at a point in time (e.g., when inventory data are collected) or it may be the average of a set of data collected over a specified period of time (Dunster and Dunster 1996).

Basin: An area having no, or very limited, outlets for surface **waters**, for example, a lake basin or a river basin (Dunster and Dunster 1996); for the purposes of the Idaho Code, there are six major river basins, listed in Table 7 and depicted on the cover of this report. See **Basin Advisory Group**.

Basin Advisory Group (BAG): A citizen advisory group named by the Idaho Division of Environmental Quality Director in consultation with the **designated agencies**, for the State's major river **basins** that shall generally advise the Director on **water quality** objectives for each basin and work in a cooperative manner with the Director to achieve these objectives (IDEQ 1996).

Bed load: Stream-transported materials, such as **sediments** and small rocks, transported along the stream bed in the lower levels of streamflow by dragging or rolling (Dunster and Dunster 1996).

Beneficial use: [1] The reasonable use of water for a purpose consistent with the laws and interests of the people of the State (Dunster and Dunster 1996). [2] Any of the various uses that may be made of water, including, but limited to, **aquatic biota**, recreation in or on the water, water supply, wildlife **habitat**, and aesthetics (IDEQ 1996). [3] Protected uses of water as described in the *Water Quality Standards and Waste Water Treatment Requirements* (IDAPA 16.01.2003) (IDL 1995).

Beneficial Use Reconnaissance Project (BURP): A process employed by the Idaho Division of Environmental Quality (DEQ) to characterize stream health or conditions through measurement of biological, chemical, and physical **habitat parameters** (IDL 1995). See **reconnaissance**.

Best management practice (BMP): [1] Methods, measures, or practices designed to reduce or prevent **water pollution**, usually applied as a system of practices rather than a single practice (Dunster and Dunster 1996). [2] Practices, techniques or measures developed, or identified, by the **designated agency** and identified in the **state water quality management plan** which are determined to be the **cost-effective**, practicable means of preventing or reducing **pollutants** generated from **nonpoint sources** to a level compatible with **water quality goals** (Idaho Code § 39-3602). [3] Procedures or controls other than **effluent limitations** to prevent or reduce **pollution** of surface water (includes **runoff control**, **spill prevention**, and operating procedures) (IDEQ 1995b).

Biological integrity: Defined by the EPA as the quality or state of being complete; unimpaired (Dissmeyer 1994).

Biota, biotic: The plants and animals of a specified area (IDEQ 1996).

BLM: Bureau of Land Management, United States Department of the Interior.

Board: The Idaho Board of Health and Welfare (Idaho Code § 39-3602).

Body of water: See **water body**.

CFR: Code of Federal Regulations.

Channel: A discernible waterway that continuously or periodically contains moving water within a defined bed or banks (Dunster and Dunster 1996).

Characteristic: A physical, chemical, or biological **parameter** or other measurable variable used to describe **water quality**.

Clean sediment: **Sediment** that is not contaminated by chemical substances.

Pollution caused by clean sediment refers to the quantity of sediment, as opposed to the presence of pollutant-contaminated sediment (EPA 1996b).

Clean Water Act (CWA): The 1977 amendments to the Federal Water Pollution Control Act of 1972; the CWA is widely used to refer to the 1972 Act and all subsequent amendments to it, including the Water Quality Act amendments of 1987.

Contaminant: Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil (IDEQ 1995b). See **pollutant**.

Cost-effectiveness: The usefulness of specific inputs (costs) to produce specific outputs (benefits). In measuring cost-effectiveness, some outputs, including **environmental**, **economic**, or **social impacts**, are assigned in physical terms (Dunster and Dunster 1996).

Criteria: [1] Elements of **water quality standards**, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, **water quality** will generally protect the **designated use** (EPA 1995a; 40 CFR 131.3). [2] Either a narrative or numerical statement of **water quality** on which to base judgement of suitability for a **beneficial use** (IDEQ 1996). [3] Criteria, unlike **standards**, are resource quality levels that have been determined by the accumulation of scientific data showing the relationship between levels of quality and damage to the resource (Dunster and Dunster 1996).

Cumulative effects: The resulting outcomes of many different effects acting together (Dunster and Dunster 1996).

Cumulative watershed effects (CWE): The impact on **water quality** and/or **beneficial uses** which result from the incremental impact of two or more **forest practices**; CWE can result from individually minor but collectively significant actions taking place over a period of time (IDL 1995).

Degradation: [1] The deterioration of air, land or **water quality** through **natural** or human-induced changes (IDEQ 1995b). [2] In the context of the EPA's **antidegradation** policy requirements, the regulations (40 CFR 131.12) have been criticized for failing to define "degradation" (Burk et al. 1995). In an Interim Draft of Advanced Notice of Proposed Rulemaking dated February 27, 1996, the EPA asked for public comments: "Should EPA add definitions of important terms to the regulation, including a definition of 'degradation' which recognizes that temporary or short-term effects on waters need not be subject to antidegradation provisions? Should definition of 'short-term' and 'significant' also be included?" (EPA 1996c).

Department: The Idaho Department of Health and Welfare (Idaho Code § 39-3602).

Designated agency: The Idaho Department of Lands for timber harvest activities, for oil and gas exploration and development and for mining activities; the Idaho Soil Conservation Commission for grazing activities and for agricultural activities; the Idaho Department of Transportation for public road construction; the Idaho Department of Agriculture for aquaculture; and the Idaho Department of Health and Welfare's Division of Environmental Quality for all other activities (Idaho Code § 39-3602).

Designated use or designated beneficial use: [1] A use specified in **water quality standards** for each **water body** or segment whether or not the use is being attained (EPA 1995a; 40 CFR 131.3). [2] Those uses assigned to **waters** as identified in the rules of the **Department** whether or not the uses are being attained; designated uses may include subcategories of **existing uses** that the **Director** determines are not fully **attainable** (Idaho Code § 39-3602). [3] A **beneficial use** assigned to identified waters in the Idaho Department of Health and Welfare Rules, Title 1, Chapter 2, *Water Quality Standards and Wastewater Treatment*

Requirements (IDEQ 1996).

Director: The Director of the Idaho Department of Health and Welfare, or his or her designee (Idaho Code § 39-3602); or the Director of the Department of Health and Welfare's Division of Environmental Quality (IDEQ 1996).

Discharge: [1] Any spilling, leaking, emitting, escaping, leaching, or disposing of a **pollutant** into the **waters of the State**; a discharge shall not include surface water **runoff** from **nonpoint sources** or **natural soil disturbing events** (Idaho Code § 39-3602). [2] The release of any waste into the **environment** from a **point source**; usually refers to the release of a liquid waste into a **water body** through an outlet such as a pipe (IDEQ 1995b). [3] The amount of water flowing in the stream **channel** at the time of measurement; usually expressed as cubic feet per second (cfs) (IDEQ 1996).

Drainage: The surface or sub-surface water derived within a clearly defined catchment area, usually bounded by ridges or other similar topographic features, encompassing part, most, or all of a **watershed** (Dunster and Dunster 1996).

Ecological indicator: An analysis, based on **metrics**, that measures a **water body's environmental integrity** (e.g. index of biotic integrity) as compared to a **reference condition** (IDEQ 1996).

Ecological integrity: Attainable when physical, chemical, and biological **integrity** occur simultaneously (Dissmeyer 1994).

Ecosystem: The interacting system of a biological community and its nonliving **environmental surroundings** (IDEQ 1995b).

Ecosystem management: A management practice and philosophy aimed at selecting, maintaining, and/or enhancing the **ecological integrity** of an **ecosystem** in order to ensure a continued **healthy ecosystem** while providing resources, products, or non-consumptive values for humans (Dunster and Dunster 1996).

Effluent: **Wastewater** discharged from a **point source** such as a pipe (IDEQ 1995b).

Effluent limitation: Any restriction established by the **State** on quantities, rates, and concentrations of chemical, physical, biological and other constituents which are **discharged from point sources** into navigable

waters (CWA § 502).

Environment, environmental: The sum of all external conditions affecting the life, development, and survival of an organism (IDEQ 1995b).

Environmental Quality Incentives Program (EQIP): The Environmental Quality Incentives Program was created as part of the Federal Agriculture Improvement and Reform (FAIR) Act of 1996. EQIP has \$130 million in 1996 and \$200 million annually thereafter for cost-sharing conservation practices. It allocates half for crop production and half for small-to medium-size livestock operations and requires that the participants implement a conservation plan to control agricultural pollution (EPA 1996b).

EPA: The United States Environmental Protection Agency.

Erosion: [1] The wearing away of the land surface by running water, wind, ice, or other geological agents; [2] detachment and movement of soil or rock fragments by water, wind, ice, or gravity (Dunster and Dunster 1996).

Existing beneficial use or existing use: [1] Those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards (40 CFR 131.3). [2] A beneficial use present in waters on or after November 28, 1975, whether or not the use is designated for those waters in the *Water Quality Standards and Wastewater Treatment Requirements* (IDEQ 1996). [3] Those surface water uses actually attained on or after November 28, 1975, whether or not they are designated uses. Existing uses that are not fully attainable may form the basis for subcategories of designated uses (Idaho Code § 39-3602).

Federal Advisory Committee Act (FACA): Provides for the establishment of an advisory committee by the President or a federal agency to obtain advice or recommendations (EPA 1996b).

Forest practices or forestry: Activities in silviculture.

Full support: An Idaho category of water quality status. A water body whose status is "full support" is in compliance with those levels of water quality criteria listed in Idaho's *Water Quality Standards and Wastewater Treatment*

Requirements, or with reference conditions approved by the Idaho Division of Environmental Quality Director in consultation with the appropriate Basin Advisory Group (IDEQ 1996, adapted from Idaho Code § 39-3602). Contrast with not full support.

Fully supporting: A federal category of water quality status. Water quality condition is good, meaning it meets criteria for designated uses (EPA 1995b).

Grazing: Is considered an agricultural activity for the purposes of the Clean Water Act.

Ground water: The water beneath the surface of the earth (IDEQ 1995b).

Guidelines: A set of recommended or suggested methods or actions that should be followed in most circumstances to assist administrative and planning decisions, and their implementation in the field; a broad framework of recommended actions to be taken and, therefore, provide some flexibility for decision-making (Dunster and Dunster 1996). Contrast with standards.

Habitat: Those parts of the environment on which an organism depends, directly or indirectly, in order to carry out its life processes (Dunster and Dunster 1996).

Health: As pointed out by Dr. Terry Cundy (review comments), six references cited in this report used the word "health" or "healthy" to refer to a watershed (Naiman et al. 1992), ecological conditions (EPA 1995b, Bilby 1993, Dissmeyer 1994), ecosystems (Moore and Flaherty 1996), and a stream (Dissmeyer 1994, Clark and Steed 1994, 1995). None of these references defined the term. Although Dr. Cundy provided substitute terms "health" or "healthy" was left in the cited passages. "Health" refers to the condition of an ecosystem (O'Laughlin et al. 1993). It is different than integrity in that "health" generally implies the effects of human activity, and integrity refers to natural conditions, or those that would exist without human activity (Stedman 1994).

Healthy ecosystem: An ecosystem in which the structure and functions permit the maintenance of the desired condition of biological diversity, biotic integrity, and ecological processes over time (Dunster and Dunster 1996).

High quality waters: An undefined term used in the EPA's antidegradation policy (Burk et al. 1995). See outstanding resource water.

- Hydrologic/habitat modification** (term used in Table 3): Hydrologic modifications alter the flow of water; examples include channelization, dewatering, damming, and dredging. **Habitat** modifications include activities in the landscape, on shore, and in **water bodies** that alter the physical structure of **aquatic ecosystems** and have adverse impacts on aquatic life; examples include removal of streamside vegetation, excavation of cobbles, stream burial, and excessive suburban sprawl (EPA 1995b).
- Impact:** When an activity has caused **pollutants** to enter surface waters (IDEQ 1989). Contrast with **impair**.
- Impair, impairment of beneficial uses, impaired waters:** [1] **Water bodies** that do not provide full support for **beneficial uses**, including **designated uses and existing uses** (EPA 1995c). [2] The sum of water bodies **partially supporting uses and not supporting uses** (EPA 1995b, 1996c). See also **Water quality-limited water**. The EPA is revisiting the definition (EPA 1996b).
- Integrity:** An **unimpaired** condition; the quality or state of being complete (IDEQ 1996). Such an assessment requires knowledge of what an unimpaired **baseline** looks like so that integrity can be judged in a defensible context (Dunster and Dunster 1996).
- Landslide:** A general term for the downslope movement of large masses of earth material and the resulting **landforms** (Dunster and Dunster 1996).
- Lower water quality:** A measurable adverse change in a chemical, physical, or biological **parameter** of water relevant to a **designated beneficial use**, and which can be expressed numerically. Measurable adverse change is determined by a statistically significant difference between sample means using standard methods for analysis and statistical interpretation appropriate to the parameter. Statistical significance is defined as the ninety-five percent (95%) confidence limit when significance is not otherwise defined for the parameter in standard methods or practices (Idaho Code § 39-3602).
- Margin of Safety (MOS):** The required component of the TMDL that accounts for the uncertainty about the relationship between pollutant loads and the quality of the receiving waterbody (CWA section 303(d)(1)(C)) (EPA 1996b).
- Mass wasting:** See **landslide**.
- Mining:** See **resource extraction**.
- Monitoring:** The process of checking, observing, and measuring outcomes for key variables against stated objectives or standards (Dunster and Dunster 1996).
- National Pollutant Discharge Elimination System (NPDES):** The **point source** permitting program established pursuant to section 402 of the federal Clean Water Act (Idaho Code § 39-3602). In Idaho, the EPA administers this program.
- Natural:** A condition without human-based disruptions (IDEQ 1996); the EPA recognizes that the term "natural" is undefined (EPA 1995c).
- Navigable waters:** Refers to **waters of the United States** (33 USC 1362).
- Needs verification:** An Idaho category of **water quality status**. A **water body** whose status is "needs verification" has not been assessed, due to need for additional information that will allow distinction between "**full support**" and "**not full support**." (IDEQ 1996)
- New nonpoint source activity:** A **new nonpoint source activity** or a substantially modified existing nonpoint source activity on or adversely affecting an **outstanding resource water** which includes, but is not limited to, new **silviculture** activities, new mining activities and substantial modifications to an existing mining permit or approved plan, new recreational activities and substantial modifications to existing recreational activities, new residential or commercial development that includes soil disturbing activities, new grazing activities and substantial modifications to existing grazing activities, except that reissuance of existing grazing permits, or grazing activities and practices authorized under an existing permit, is not considered a new activity. It does not include **naturally** occurring events such as floods, landslides, and wildfire including prescribed **natural fire** (Idaho Code § 39-3602).
- Nonpoint source:** **Pollution** that is not released through pipes but rather originates from multiple sources over a relatively large area. Nonpoint source can be divided into **nonpoint source activities** related to either land or water

use including failing septic tanks, improper animal-keeping practices, **forest practices**, and urban and rural **runoff** (EPA 1996b). Contrast with **point source**.

Nonpoint source activities: Includes grazing, crop production, **silviculture**, log storage or rafting, construction, mining, recreation, septic systems, **runoff** from storms and other weather-related events and other activities not subject to regulation under a federal NPDES permit. Nonpoint source activities on waters designated as **outstanding resource waters** do not include issuance of water rights permits or licenses, allocation of water rights, operation of diversions, or impoundments (Idaho Code § 39-3602). See **new nonpoint source activities**.

Nonpoint source pollution: [1] polluted surface **runoff** (Tarlock 1996); [2] **Pollution** that is **discharged** over a wide land area, not from one specific location (IDEQ 1996); [3] any source of **pollution** not associated with a distinct **discharge** point, including sources such as rainwater, **runoff** from **agricultural** lands, industrial sites, parking lots, and **silvicultural** operations, as well as escaping gases from pipes and fittings (IDEQ 1995b). See **nonpoint source activities**.

Nonpoint source runoff: Water which may carry **pollutants** from **nonpoint source activities** into the waters of the State (Idaho Code § 39-3602).

Not assessed: An Idaho category of **water quality status**. A **water body** whose status is "not assessed" has not been assessed, due to data limitation (IDEQ 1996).

Not attainable: A federal category of **water quality status**. **Water quality** is poor, and the state has performed a **use attainability analysis** and demonstrated that use support is not attainable due to one of the six conditions specified in 40 CFR 131.10(g) (EPA 1995b).

Not full support: An Idaho category of **water quality status**. A **water body** whose status is "not full support" is not in compliance with those levels of **water quality criteria** listed in Idaho's *Water Quality Standards and Wastewater Treatment Requirements*, or with **reference conditions** approved by the **Director** in consultation with the appropriate **Basin Advisory Group** (IDEQ 1996). Contrast with **full support**.

Not supporting: A federal category of **water quality status**. **Water quality** condition is poor (**impaired**), meaning water quality frequently fails to meet **criteria** for **designated use** (EPA 1995b).

Outstanding resource water: A **high quality water**, such as water of national and state parks and wildlife refuges and water of exceptional recreational or ecological significance, which has been so designated by the Idaho Legislature. It constitutes an outstanding national or state resource that requires protection from **point source** and **nonpoint source activities** that may **lower water quality** (Idaho Code § 39-3602).

Parameter: Any attribute, variable, or physical property in a set of variables or properties that, taken together, characterize or determine a system's behavior (Dunster and Dunster 1996). See **characteristic**.

Partially supporting: A federal category of **water quality status**. **Water quality** condition is fair (**impaired**), meaning it fails to meet **criteria** for **designated use** at times (EPA 1995b).

Person: Any individual, association, partnership, firm, joint stock company, joint venture, trust, estate, political subdivision, public or private corporation, state or federal governmental department, agency or instrumentality, or any legal entity, which is recognized by law as the subject of rights and duties (Idaho Code § 39-3602).

Point source: [1] **Pollution** that is **discharged** from any identifiable point, including pipes, ditches, **channels**, sewers, tunnels, and containers of various types (IDEQ 1996). [2] Any discernible, confined, and discrete conveyance including, but not limited to, any pipe, ditch, **channel**, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel, or other floating craft, from which **pollutants** are, or may be, **discharged**. This term does not include return flows from irrigated **agriculture** (CWA § 502; Idaho Code § 39-3602), discharges from dams and hydroelectric generating facilities or any source or activity considered a **nonpoint source** by definition (Idaho Code § 39-3602).

Pollutant: [1] Any substance introduced into the environment that adversely affects the usefulness of a resource (IDEQ 1995b). [2] Materials which, when **discharged** or released to water in excessive quantities cause or contribute to **water pollution**. Examples include dredged spoil, solid waste, incinerator residue, **sewage**, garbage, sewage sludge, munitions, chemical waste, biological materials, radioactive materials, heat, wrecked or discarded, equipment, rock, sand, **silt**, cellar dirt; and industrial, municipal and **agricultural waste**, gases entrained in water, or other materials. Provided however, biological materials shall not include live or occasional dead fish that may accidentally escape into the waters of the State from aquaculture facilities (Idaho Code § 39-3602).

Pollution: [1] The man-made or man-induced alteration of the chemical, physical, biological, and radiological **integrity** of water (CWA § 502). [2] Any alteration in the character or quality of the environment that renders it unfit or less suited for **beneficial uses** (IDEQ 1996). See **water pollution**.

Receiving waters: Waters into which a **contaminant** or a **pollutant** is introduced.

Reconnaissance: An exploratory or preliminary survey of an area (IDEQ 1996).

Reference stream or reference condition: [1] Describes the **characteristics** of **water body** segments least **impaired** by human activities. As such, reference conditions can be used to describe attainable biological or **habitat** conditions for water body segments with common **watershed/catchment** characteristics within defined geographical regions (EPA 1995a). [2] A condition that **fully supports** applicable **beneficial uses**, with little effect from human activity and representing the highest level of support attainable (IDEQ 1996). [3] A stream or other **water body** which represent the following: (a) the minimum conditions necessary to **fully support the designated beneficial uses**; (b) **natural** conditions with few impacts from human activities and which are representative of the highest level of support attainable in the basin. In highly mineralized areas or in the absence of such reference streams or water bodies, the **Director**, in consultation with the **Basin Advisory Group** and the technical

advisers to it, may define appropriate hypothetical reference conditions or may use **monitoring** data specific to the site in question to determine conditions in which the beneficial uses are fully supported (Idaho Code § 39-3602).

Resource extraction (term used in Table 3):

Mining, petroleum drilling, and **runoff** from mine tailing sites (EPA 1995b).

Riparian: Pertaining to anything connected with or immediately adjacent to the banks of a stream or other **body of water** (Dunster and Dunster 1996).

Riparian zone: The area adjacent to the stream that is covered by the type of vegetation that indicates the presence of water at or near the surface. It includes **wetlands** and those portions of floodplains and valley bottoms that support **riparian** vegetation. These areas may be narrow (<5 feet) or wide (> 100 feet) (IDL 1995).

Runoff: The part of precipitation and snowmelt that reaches streams by flowing over or through the ground; surface runoff flows away without penetrating the soils (Dunster and Dunster 1996). See **nonpoint source runoff**.

Sediment: [1] Soil particles that enter the water from **erosion** of land. Sediment consists of particles of all sizes, including fine clay particles, **silt**, sand, and gravel (EPA 1995b). [2] Fragmented material that originates from the weathering of rocks and decomposition of organic material that is transported in suspension by water, air, or ice, to be subsequently deposited at a new location (Dunster and Dunster 1996).

Sewage: The waste and **wastewater** produced by residential and commercial establishments and **discharged** into sewers (IDEQ 1995b).

Short-term or temporary activity: An activity which is limited in scope and is expected to have only minimal impact on **water quality** as determined by the **Director**. Short-term or temporary activities include, but are not limited to, maintenance of existing structures, limited road and trail reconstruction, soil stabilization measures, and **habitat** enhancement structures (Idaho Code § 39-3602).

Silt, siltation: The suspension and deposition of small **sediment** particles in **water bodies** (EPA 1995b).

Silviculture: Activities associated with the regeneration, growing and harvesting of trees and timber including, but not limited to, disposal of logging slash, preparing sites for new stands of trees to be either planted or allowed to regenerate through natural means, road construction and road maintenance, drainage of surface water which inhibits tree growth or logging operations, fertilization, application of herbicides or pesticides, all logging operations, and all forest management techniques employed to enhance the growth of stands of trees or timber (Idaho Code § 39-3602). See **forest practices**.

Soil Conservation Commission means an agency of State government as created in section 22-2718, Idaho Code (Idaho Code § 39-3602).

Soil Conservation District means an entity of State government as defined in section 22-2717, Idaho Code (Idaho Code § 39-3602).

Standards: Quantifiable and measurable thresholds that are typically defined in law or regulation, and are mandatory. Standards are typically established using a combination of best available scientific knowledge, tempered by cautious use of an established safety or caution factor (Dunster and Dunster 1996). See **guidelines and water quality standards**.

State: The state of Idaho (Idaho Code § 39-3602).

State Revolving Fund (SRF): Revolving funds are financial institutions that make loans for specific **water pollution** control purposes and use loan repayment, including interest, to make new loans for additional water pollution control activities. Under the State Revolving Fund program, States and municipalities are primarily responsible for financing, constructing, and managing wastewater treatment facilities. The SRF program is based on the 1987 amendments to the **Clean Water Act**, which called for replacement of the Construction Grants program with the SRF program (EPA 1996b).

State water quality management plan: Idaho's management plan developed and updated by the Department of Health and Welfare in accordance with the federal **Clean Water Act** (Idaho Code § 39-3602).

Stream segment: An identified section of stream segregated by **channel characteristics** and

adjacent landtype associations (IDL 1995).

Stream segment of concern (SSOC): Stream segments about which the public has expressed significant concern (IDEQ 1995b).

Suspended sediment: Sediment suspended in a fluid by the upward components of turbulent currents (Dunster and Dunster 1996).

Threatened: A federal category of **water quality status**. **Water quality** condition is good, meaning it supports **beneficial uses** now but may not in the future unless action is taken (EPA 1995b). The EPA is revisiting the definition (EPA 1996b).

Threatened waters: **Water quality** supports **beneficial uses** now but may not in the future unless action is taken CWA (§ 305(b)). Draft TMDL guidance specifies that "Where all water quality problems cannot be addressed immediately, EPA and the States will...set priorities and direct efforts and resources to maximize **environmental** benefits by dealing with the most serious water quality problems and the most valuable and *threatened* resources first" (EPA 1996b).

Total maximum daily load (TMDL): [1] the total amounts of a particular **pollutant** that sources can **discharge** into a **water body** without violating **water quality standards**. [2] A TMDL allocates **pollution control** responsibilities among pollution sources in a **watershed**, and is the basis for taking actions needed to restore a **water body** (EPA 1996b). [3] The sum of the individual wasteload allocations for **point sources**, load allocations for **nonpoint sources**, and **natural background** levels of all **pollutants**. Acceptable pollutant levels, established through TMDLs shall be at a level necessary to implement the **applicable water quality standards** for the identified pollutants with seasonal variations (Idaho Code § 39-3602). [4] The sum of the individual wasteload allocations (WLAs) for **point sources**, load allocations (LAs) for **nonpoint sources** and **natural background**, and a margin of safety (MOS). TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measure that relates to a state's **water quality standards** (EPA 1996b).

Total maximum daily load (TMDL) protocols:

TMDL protocols are under development and will provide a process and selected procedures for developing TMDLs for impaired waters. They will include the following six elements: (1) problem statement, (2) endpoints, (3) source assessment, (4) endpoint and source linkage, (5) allocation, and (6) monitoring (EPA 1996b).

Turbidity: A measure of water clarity, or the degree to which water is opaque due to suspended silt or other sediments (Dunster and Dunster 1996).

Unimpaired: See **fully supporting**.

Use attainability analysis (UAA): A structured scientific assessment of the use which may include physical, chemical, biological, and economic factors (EPA 1995a; 40 CFR 131.3). [2] Assesses the physical, chemical, biological and economic factors which affect the attainment of a **designated use**. If a UAA shows that attaining a designated use is not feasible, a state can modify it to make the use less stringent (EPA 1996b).

Waste water: The spent or used water from individual homes, a community, a farm, or an industry that contains dissolved or suspended matter (IDEQ 1995b).

Water body: [1] A homogeneous classification that can be assigned to rivers, lakes, estuaries, coastlines, or other water features (IDEQ 1996). [2] The EPA recognizes 5 types of bodies of water for the purposes of the **Clean Water Act**: streams, lakes, estuaries, coastal waters, and **wetlands** (Novotny and Olem 1994). [3] For the purposes of the Idaho Code, see **waters**.

Water pollution: [1] The man-made or human-induced alteration of the chemical, physical, biological, and radiological **integrity** of water (EPA 1995a; 33 USC 1362). [2] Such alteration of the thermal, chemical, biological or radioactive properties of any **waters** of the **State**, or such **discharge** or release of any **contaminant** into the waters of the state as will or is likely to create a nuisance or render such waters harmful or detrimental or injurious to public health, safety or welfare or to domestic, commercial, industrial, recreational, aesthetic or other legitimate uses or to livestock, wild animals, birds, fish or other **aquatic life** (Idaho Code § 39-3602).

Water quality: [1] The chemical, physical, and biological **characteristics** of water (Dunster and Dunster 1996). [2] A term used to describe the biological, chemical, and physical **characteristics** of water with respect to its suitability for a **beneficial use** (IDEQ 1996).

Water quality-limited water: [1] Refers to any [**water body**] segment where it is known that **water quality** does not meet applicable **water quality standards** and/or is not expected to meet applicable water quality standards even after application of technology-based **effluent limitations** required by the **Clean Water Act** (EPA 1995a; 40 CFR 131.3), and other pollution control requirements (e.g., best management practices) required by local, state, or federal authority (40 CFR 130.7(b)). [2] Similar in meaning to **impaired**, waters that require TMDLs when certain pollution control requirements "are not stringent enough" to implement water quality standards (EPA 1996b; 40 CFR 130.7(b)). See also **impaired waters**.

Water quality standards: [1] State-adopted and EPA-approved **ambient standards** for **water bodies**. The standards cover the use of the water body and the **water quality criteria** that must be met to protect the **designated use** or uses (EPA 1996b). [2] Provisions of state or federal law which consist of a **designated use** or uses for the **waters of the United States** and **water quality criteria** for such waters based upon such uses (EPA 1995a, 40 CFR 131.3). Minimum standards include an **antidegradation** policy consistent with 40 CFR 131.12 (40 CFR 131.6). [3] The combination of a **designated use** and the maximum concentration of a **pollutant** which will protect the use for any given **water body** (IDEQ 1995b).

Water quality status: [1] In the federal scheme there are five categories, based on levels of support of **criteria** for **designated use** of the **water body**. The categories are **fully supporting**, **threatened**, **partially supporting**, **not supporting**, and **not attainable** (EPA 1995b). [2] In Idaho's scheme there are four categories based on levels of support of **criteria** for **designated use** and available information: **full support**, **not full support**, **needs verification**, and **not assessed** (IDEQ 1996).

Waters: All the accumulations of surface water, natural and artificial, public and private, or parts thereof which are wholly or partially within, flow through or border upon this State. For the purposes of the Idaho Code, **water bodies** shall not include municipal or industrial **wastewater** treatment or storage structures or private reservoirs, the operation of which has no effect on waters of the state (Idaho Code § 39-3602).

Waters of the United States: All lakes, rivers, streams, **wetlands**, impoundments, and tributaries that may be susceptible to use in interstate or foreign commerce; and territorial seas; except **wastewater** treatment system ponds or lagoons (adapted from 40 CFR 232.2).

Watershed: [1] The land area from which water flows into a stream or other **body of water** which drains the area. For the purposes of the Idaho Code, the area of watersheds shall be recommended by the **Basin Advisory Group** (Idaho Code § 39-3602). [2] The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions (Dunster and Dunster 1996). See **drainage**.

Watershed Advisory Group (WAG): A citizen advisory group named by the Idaho Division of Environmental Quality Director in consultation with the appropriate **Basin Advisory Group** which shall generally be responsible for recommending those specific actions needed to control **point source** and **nonpoint source pollution** within the **watershed** so that, within reasonable periods of time, **designated beneficial uses** are fully supported (Idaho Code §§ 39-3615, 16).

Watershed analysis: A systematic procedure for characterizing **watershed** and **ecological** processes to meet specific management and social objectives; a stratum of **ecosystem management** planning applied to watersheds of approximately 20 to 200 square miles (Dunster and Dunster 1996).

Wetlands: Those areas that are soaked or flooded by surface or **ground water** frequently enough or for sufficient duration to support plants, birds, animals, and **aquatic** life. Wetlands generally include swamps, marshes, bogs, estuaries, and other inland and coastal areas (IDEQ 1995b).

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