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Handbook for Developing Watershed Plans to Restore and Protect Our Waters

Chapter 2. Overview of Watershed Planning Process

March 2008

Handbook Road Map

1 Introduction
2 Overview of Watershed Planning Process
3 Build Partnerships
4 Define Scope of Watershed Planning Effort
5 Gather Existing Data and Create an Inventory
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8 Estimate Pollutant Loads
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10 Identify Possible Management Strategies
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13 Implement Watershed Plan and Measure Progress

2. Overview of Watershed Planning Process

Chapter Highlights

- Using a watershed approach
- Common features in watershed planning
- Steps in the watershed planning process
- Watershed planning for impaired waters
- Common watershed impairments
- Summary of nine minimum elements to be included in a watershed plan for impaired waters

Read this chapter if...

- You are unfamiliar with watershed planning concepts
- You want to know more about water quality standards
- You don't know the most common water quality impairments in the United States
- You want a list of the nine minimum elements to be included in section 319-funded watershed plans

2.1 Why Use a Watershed Approach to Manage Water Resources?

Since the late 1980s, watershed organizations, tribes, and federal and state agencies have moved toward managing water quality through a watershed approach. A *watershed approach* is a flexible framework for managing water resource quality and quantity within specified drainage areas, or watersheds. This approach includes stakeholder involvement and management actions supported by sound science and appropriate technology. The *watershed planning process* works within this framework by using a series of cooperative, iterative steps to characterize existing conditions, identify and prioritize problems, define management objectives, develop protection or remediation strategies, and implement and adapt selected actions as necessary. The outcomes of this process are documented or referenced in a watershed plan. A *watershed plan* is a strategy that provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants, and resources related to developing and implementing the plan. The development of watershed plans requires a certain level of technical expertise and the participation of a variety of people with diverse skills and knowledge.

What Is an Impaired Waterbody?

EPA defines an impaired waterbody as a waterbody that does not meet water quality criteria that support its designated use. The criteria might be numeric and specify concentration, duration, and recurrence intervals for various parameters, or they might be narrative and describe required conditions such as the absence of scum, sludge, odors, or toxic substances.

If the waterbody is impaired, it is placed on the section 303(d) list. For each pollutant listed, the state or tribe must develop a restoration target called a Total Maximum Daily Load (TMDL).

Using a watershed approach to restore impaired waterbodies is beneficial because it addresses the problems in a holistic manner and the stakeholders in the watershed are actively involved in selecting the management strategies that will be implemented to solve the problems. Nonpoint source pollution poses the greatest threat to water quality and is the most significant source of water quality impairment in the nation. Therefore, EPA is working with states, tribes, and watershed groups to realign its programs and strengthen support for watershed-based environmental protection programs. Such programs feature local stakeholders joining forces to develop and implement watershed plans that make sense for the conditions found in local communities. Specific features of the watershed approach are explained below.

2.2 Common Features of the Watershed Planning Process

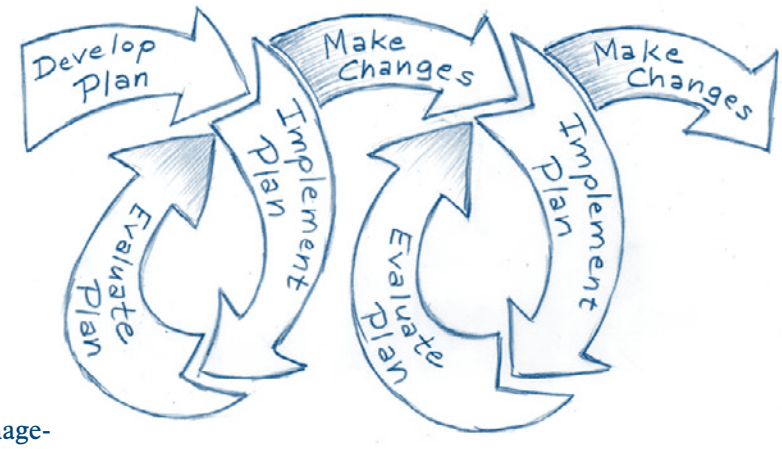
Although each watershed plan emphasizes different issues and reflects unique goals and management strategies, some common features are included in every watershed planning process. The watershed planning process is iterative, holistic, geographically defined, integrated, and collaborative.

Watershed Planning

Appendix A includes a selected list of watershed guides published by various state and federal agencies. These guides might help you to fulfill state-specific requirements or provide more in-depth information on specific issues.

States are encouraged to develop statewide watershed planning frameworks that integrate and coordinate plans for large drainage areas. Plans for larger basins should contain general or summarized quantitative analyses of current water quality problems (e.g., pollutant loads) and the load reductions or other benefits expected from the implementation of best management practices (BMPs). The level of detail for these large-basin plans will not be as refined as those for smaller watersheds, but an overview of current pollutant loads and future load reductions expected from BMPs is helpful in providing some sense of the scope

of the problem(s) in the basin and the level of effort needed to restore or protect water quality. The level of detail would be further refined for subbasins or watersheds, to provide more specific information for project work plans.



2.2.1 Watershed Planning Is an Iterative and Adaptive Process

EPA recognizes that the processes involved in watershed assessment, planning, and management are iterative and that targeted actions might not result in complete success during the first or second cycle. It is expected, however, that through adjustments made during the management cycles, water quality improvements can be documented and continuous progress toward attaining water quality standards can be achieved. Watershed plans should address all the sources and causes of waterbody impairments and threats; that is, the plans should address not only the sources of the immediate water quality impairment but also any pollutants and sources of pollutants that need to be addressed to ensure the long-term health of the watershed.

EPA recognizes the difficulty in obtaining watershed-related information with precision and acknowledges that a balanced approach is needed to address this concern. On one hand, it is absolutely critical that watershed planners make a reasonable effort to identify significant pollutant sources, specify the management measures that will most effectively address those sources, and broadly estimate the expected load reductions that will result. Without this analytic framework to provide focus and direction, it is much less likely that projects implemented under the plan can efficiently and effectively address the nonpoint sources of water quality impairments.

On the other hand, EPA recognizes that even if reasonable steps are taken to obtain and analyze relevant data, the information available during the planning stage (within reasonable time and cost constraints) might be limited. Preliminary information and loading estimates might need to be updated over time, accompanied by midcourse corrections in the watershed plan and the activities it promotes. In many cases, several years of implementation might be needed for a project to achieve its goals. EPA fully intends that the watershed planning process described in this handbook be implemented in a dynamic and adaptive manner to ensure that implementation of the plan can proceed even though some of the information in the watershed plan is imperfect and might need to be modified over time as better information becomes available.

Remember...

Although watershed plans are recommended to implement TMDLs, they should be developed holistically to consider other impairments and threats in the watershed. TMDLs might focus on specific waterbody segments, sources, or pollutants, whereas the watershed plan should incorporate the pollutant- and site-specific TMDL into the larger context of the watershed, including

- Additional water quality threats
- Additional pollutants
- Additional sources
- Threatened waterbodies
- Synergistic effects
- Water quantity issues
- Development pressures
- Habitat protection
- Wetland restoration/creation
- Source water protection

2.2.2 Watershed Planning Is a Holistic Process

EPA supports the implementation of holistic watershed plans because this approach usually provides the most technically sound and economically efficient means of addressing water quality problems and is strengthened through the involvement of stakeholders that might

have broader concerns than solely attainment of water quality standards (e.g., water supply, aesthetics). A holistic approach addresses all the beneficial uses of a waterbody, the criteria needed to protect the use, and the strategies required to restore water quality or prevent degradation. This approach will help to expedite cooperative, integrated water resource planning and successful implementation of needed management, thereby facilitating the restoration of water quality. For example, watershed plans that incorporate a full range of other resource management activities, such as source water protection for drinking water, forest or rangeland management planning, agricultural resource management systems, and parkland or greenspace management will be better able to address the various challenges and opportunities related to water resource restoration or protection.

Why Watershed Plans Fail

The Center for Watershed Protection conducted a broad assessment of the value of planning documents in protecting water resources and identified a number of reasons why some plans had failed:

- Planning activities were conducted at too great a scale.
- The plan was a one-time study rather than a long-term management process.
- Stakeholder involvement and local ownership were lacking.
- The plan skirted land use/management issues in the watershed.
- The document was too long or complex.
- The recommendations were too general.
- The plan failed to identify and address conflicts.

2.2.3 Watershed Planning Is Geographically Defined

By definition, watershed planning focuses on a watershed, a geographic area that is defined by a drainage basin. A watershed plan should address a geographic area large enough to ensure that implementing the plan will address all the major sources and causes of impairments and threats to the waterbody under review. Although there is no rigorous definition or delineation of this concept, the general intent is to avoid a focus on single waterbody segments or other narrowly defined areas that do not provide an opportunity for addressing watershed stressors in a rational, efficient, and economical manner. At the same time, the scale should not be so large that it hampers the ability to conduct detailed analyses or minimizes the probability of involvement by key stakeholders and successful implementation. If you select a scale that is too broad, you might be able only to conduct cursory assessments and will not be able to accurately link the impacts back to the sources and causes.

Plans that bundle subwatersheds with similar sets of problems or address a common stressor (e.g., sediment, nutrients) across multiple related watersheds can be particularly useful in terms of planning and implementation efficiency and the strategic use of administrative resources. ↳ Chapters 4 and 7 provide more specific guidance on defining the geographic extent of your planning effort.

Plans That You Might Want to Integrate into Your Watershed Planning Activities

- Source water assessments
- TMDL implementation plans
- Stormwater management plans
- Resource management plans
- Master plans
- Facility plans
- Wetland assessments
- Wildlife action plans
- Aquatic GAP analyses

2.2.4 Watershed Planning Should Be Integrated with Other Planning Efforts

It is likely that many federal, state, tribal, and local planning efforts are occurring simultaneously with your watershed planning effort. At a minimum, you should be aware of these programs; ideally, you should integrate them into your watershed planning effort through stakeholder participation, data sharing, and implementation of management measures. ↳ Chapter 3 provides a summary of specific programs that have a planning component or conduct related activities that you might want to integrate with your watershed planning effort. You might also want to include staff from these programs as partners in developing your watershed plan. This approach can help in gaining additional technical expertise, leveraging resources, and sharing responsibilities for implementation.

2.2.5 Watershed Planning Is a Collaborative and Participatory Process

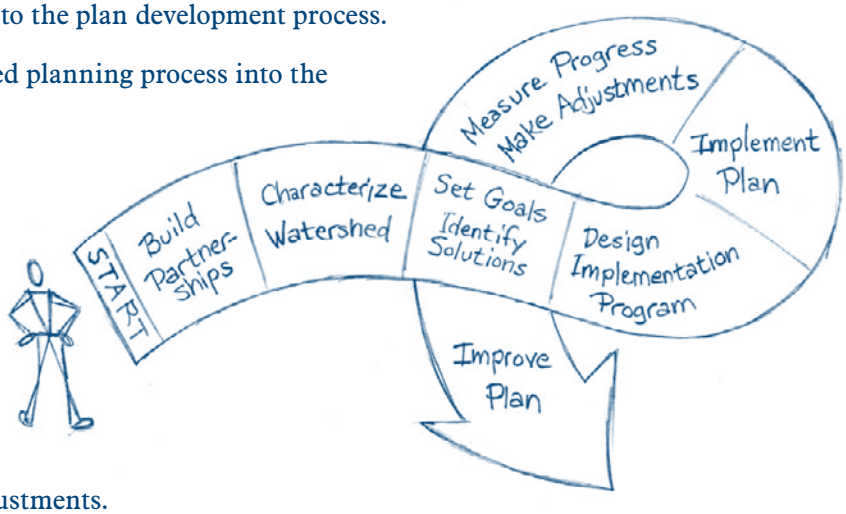
One of the key characteristics of the watershed planning process is that it is participatory. The Center for Watershed Protection conducted research that showed that implementation of a watershed plan has the greatest chance of success when stakeholders are brought into the process at the very beginning of the watershed planning effort (CWP 1996). This finding is supported by the fact that implementation of the plan usually rests with members of the community, and if they are involved up front and see that their concerns are addressed, they will be more likely to participate in developing management options and supporting plan implementation. ↳ Chapter 3 discusses how to involve stakeholders to enhance the watershed planning process and implementation of the plan.

2.3 Steps in the Watershed Planning and Implementation Process

The parts of the watershed planning process can be illustrated in a number of ways, such as steps, phases, or portions of a circle. In general, all watershed planning efforts follow a similar path from identifying the problems to, ultimately, implementing actions to achieve the established goals. Many groups find that informal scoping and information collection prior to plan development provides valuable input during the early phase of planning. Scoping activities include pre-planning data review and discussions with stakeholders that can help to define the planning area, identify other stakeholders, and help to solicit opinions and advice on how to proceed before launching into the plan development process.

This handbook organizes the watershed planning process into the following major steps:

1. Build partnerships.
2. Characterize the watershed to identify problems.
3. Set goals and identify solutions.
4. Design an implementation program.
5. Implement the watershed plan.
6. Measure progress and make adjustments.



Within each step, several activities are conducted before moving on to the next step. Many of these activities are repeated in different steps. For example, information/education (I/E) activities occur in the first step when building partnerships but also occur throughout the process, especially when implementing the plan.

It can be daunting to begin the planning process and consider the scope of work needed to implement watershed restoration and/or protection measures. Many groups have found that tackling smaller projects and tasks early in the planning process can help to engage stakeholders and demonstrate progress, creating a sense of momentum that leads to long-term success.

Figure 2-1 shows some of the activities and tools used in each step of the watershed plan development and implementation process. The figure provides a road map for the watershed planning process, as well as a road map for this document. You might want to refer back to it from time to time to find out where you are in the process and where you need to go. Note that

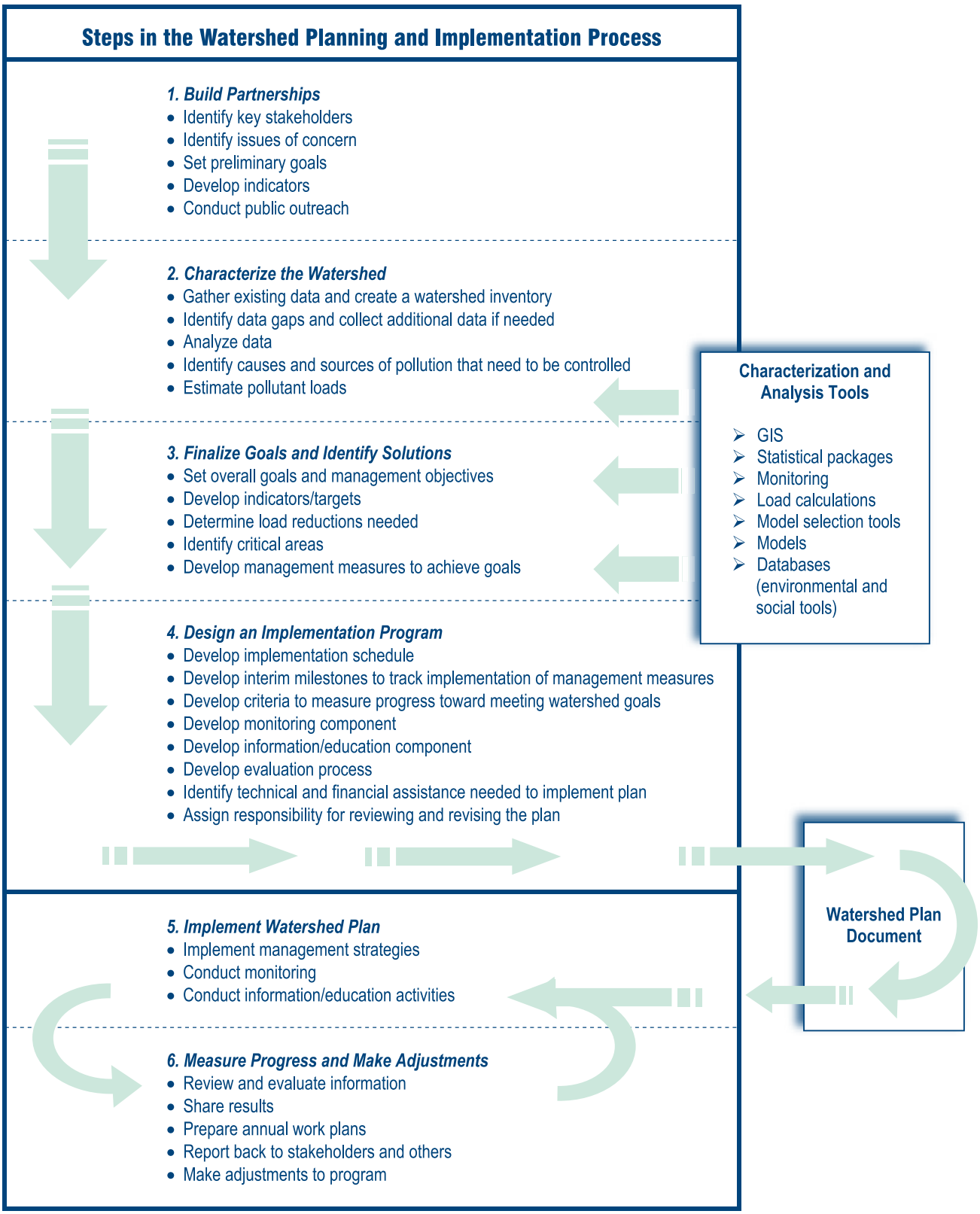


Figure 2-1. Steps in the Watershed Planning Process

steps 1 through 4 feed into the development of the plan, but the watershed planning process continues with plan implementation. Once the plan is implemented, annual work plans are prepared, monitoring activities are conducted to quantitatively measure progress toward meeting water quality goals, and plan adjustments based on evaluation information received (and other inputs, such as changes in resources or watershed conditions) are continually made.

2.4 Watershed Planning for Impaired Waters

EPA recognizes the need to focus on developing and implementing watershed plans for waters that are impaired in whole or in part by nonpoint sources. For these waterbodies it is imperative to select on-the-ground management measures and practices that will reduce pollutant loads and contribute in measurable ways to restoring of impaired waters to meet water quality standards.

What Are Loads?

Pollutant load refers to the amount of pollutants entering a waterbody. Loads are usually expressed in terms of a weight and a time frame, such as pounds per day (lb/d).

Much of this handbook focuses on how to identify pollutant loads and how to determine the load reductions needed to meet water quality goals.

2.4.1 What Are the Most Common Impairments?

Waterbodies can be impaired by one source or a combination of sources. Across the country, a wide variety of waters are listed as impaired by a range of pollutants. Based on the most recent state 303(d) lists, there are more than 38,000 impaired waters in the United States and more than 63,000 associated impairments.[1] Pathogens, metals, nutrients, and sediment are the most common pollutants included on state lists, and the top 10 listed impairments account for over 75 percent of the total listings in the nation (table 2-1). Since January 1, 1996, EPA has approved almost 25,000 TMDLs, accounting for approximately 64 percent of the nationwide listings.

Table 2-1. Top Ten 303(d) List Impairments in the United States (August 14, 2007)

General Impairment[a]	Number Reported	Percent Reported	Cumulative Percent
Pathogens	8,558	13.5	13.5%
Mercury	8,555	13.5	26.9%
Sediment	6,749	10.6	37.5%
Metals (other than mercury)	6,368	10.0	47.5%
Nutrients	5,617	8.8	56.3%
Oxygen depletion	4,540	7.1	63.5%
pH	3,376	5.3	68.8%
Cause unknown - biological integrity	2,867	4.5	73.3%
Temperature	2,852	4.5	77.8%
Habitat alteration	2,246	3.5	81.3%

[a] "General impairment" might represent several associated pollutants or impairment listings. For example, the metals category includes 30 specific pollutants or related listings (e.g., iron, lead, contaminated sediments).
Source: EPA's National Section 303(d) List Fact Sheet (**http://oaspub.epa.gov/waters/national_rept.control**).

Most watershed plans address some combination of these major pollutants: pathogens, metals, nutrients, sediment, and thermal impacts. The next several chapters of the handbook highlight various types of data and analysis tools that you can use to support watershed plan development. Knowing the major impairments might help you to focus your data collection efforts and determine what types of analyses to conduct.

[1] Data were accessed on August 14, 2007, and are based on a review of the most recent state data available. The state lists included in the national summary range from 1998 to 2002. The national summary of 303(d) listings is available at **http://oaspub.epa.gov/waters/national_rept.control**.

What Is a TMDL?

If a waterbody is impaired, it is placed on the 303(d) list. For each impaired waterbody, a state or tribe must develop an accounting of loads that would result in the waterbody's meeting water quality standards. This is called a Total Maximum Daily Load (TMDL).

A TMDL is the amount, or load, of a specific pollutant that a waterbody can assimilate and still meet the water quality standards. The load is allocated among the current pollutant sources (point, nonpoint, and background sources), a margin of safety, and sometimes future growth.

The typical steps for developing a TMDL include the following:

1. Identify linkages between water quality problems and pollutant sources.
2. Estimate total acceptable loading rate that achieves water quality standards.
3. Allocate acceptable loading rates between sources.
4. Package the TMDL for EPA approval.

To provide a better understanding of the major pollutants contributing to waterbody impairments, the typical sources of pollutants and the associated impacts on waterbodies and their designated uses are summarized in table 2-2. This summary provides a starting point for you to think about the types of data you'll collect and analyses you'll conduct to characterize watershed conditions.

When collecting and analyzing your data, it's also important to keep in mind the entire watershed and the general problems and goals. For example, some of the watershed problems might not be those officially recognized as impairments on the 303(d) lists. Broader issues like wetland degradation and adequate source water protection should also be priorities in your watershed. Source water protection is important for both sustaining good water quality and quantity and sustaining biological integrity.

Although watershed plans should be holistic and include information on the broad array of attributes, problems, and protection strategies needed in a watershed, plans that include impaired waters should also contain quantified estimates of current (and sometimes future) problem pollutant loads and reductions designed to achieve water quality standards and other watershed goals. Nonpoint source TMDLs and watershed plans that address quantifiable loading estimates and load reduction strategies provide the analytic link between actions on the ground and attainment of water quality standards. To strengthen this link, the load reductions should be separated by source category to enable you to identify the specific actions and locations of management strategies as part of your implementation efforts. In the absence of such a framework, it's difficult to develop and implement a watershed plan that can be expected to achieve water quality standards or other environmental goals, or to determine the causes of failure when nonpoint source projects do not result in expected water quality improvements.

The watershed planning process described in this handbook emphasizes the restoration (and considers protection) of nonpoint source-affected waters through the development of an analytic framework that accommodates waters with or without approved TMDLs.

2.4.2 Watershed Planning Where a TMDL Has Been Developed

States may use a portion of the funding they receive under section 319 of the Clean Water Act to develop TMDLs and to develop and implement watershed plans that are consistent with those TMDLs. In addition, states may develop and implement watershed plans in advance of TMDLs where none exist. In cases where a TMDL for affected waters has already been developed and approved or is being developed, the watershed plan should be crafted to achieve the load reductions called for in the TMDL.

2.4.3 Watershed Planning in the Absence of a TMDL

If a TMDL has not yet been developed, the plan should be designed to attain water quality standards if possible, in addition to other environmental goals. If implementation of the watershed plan successfully addresses water quality impairments, a TMDL may not be needed (see **www.epa.gov/owow/tmdl/2006IRG**). EPA encourages states to include in

Table 2-2. Summary of Common Pollutants and Sources

Pollutant	Potential Sources		Impacts on Waterbody Uses
	Point Sources	Nonpoint Sources	
Pathogens	• WWTPs • CSOs/SSOs • Permitted CAFOs • Discharges from meat-processing facilities • Landfills	• Animals (domestic, wildlife, livestock) • Malfunctioning septic systems • Pastures • Boat pumpout facilities • Land application of manure • Land application of wastewater	• Primarily human health risks • Risk of illness from ingestion or from contact with contaminated water through recreation • Increased cost of treatment of drinking water supplies • Shellfish bed closures
Metals	• Urban runoff • WWTPs • CSO/SSOs • Landfills • Industrial facilities • Mine discharges	• Abandoned mine drainage • Hazardous waste sites (unknown or partially treated sources) • Marinas • Atmospheric deposition	• Aquatic life impairments (e.g., reduced fish populations due to acute/chronic concentrations or contaminated sediment) • Drinking water supplies (elevated concentrations in source water) • Fish contamination (e.g., mercury)
Nutrients	• WWTPs • CSOs/SSOs • CAFOs • Discharge from food-processing facilities • Landfills	• Cropland (fertilizer application) • Landscaped spaces in developed areas (e.g., lawns, golf courses) • Animals (domestic, wildlife, livestock) • Malfunctioning septic systems • Pastures • Boat pumpout • Land application of manure or wastewater • Atmospheric deposition	• Aquatic life impairments (e.g., effects from excess plant growth, low DO) • Direct drinking water supply impacts (e.g., dangers to human health from high levels of nitrates) • Indirect drinking water supply impacts (e.g., effects from excess plant growth clogging drinking water facility filters) • Recreational impacts (indirect impacts from excess plant growth on fisheries, boat/swimming access, appearance, and odors) • Human health impacts
Sediment	• WWTPs • Urban stormwater systems	• Agriculture (cropland and pastureland erosion) • Silviculture and timber harvesting • Rangeland erosion • Excessive streambank erosion • Construction • Roads • Urban runoff • Landslides • Abandoned mine drainage • Stream channel modification	• Fills pools used for refuge and rearing • Fills interstitial spaces between gravel (reduces spawning habitat by trapping emerging fish and reducing oxygen exchange) • When suspended, prevents fish from seeing food and can clog gills; high levels of suspended sediment can cause fish to avoid the stream • Taste/odor problems in drinking water • Impairs swimming/boating because of physical alteration of the channel • Indirect impacts on recreational fishing
Temperature	• WWTPs • Cooling water discharges (power plants and other industrial sources) • Urban stormwater systems	• Lack of riparian shading • Shallow or wide channels (due to hydrologic modification) • Hydroelectric dams • Urban runoff (warmer runoff from impervious surfaces) • Sediment (cloudy water absorbs more heat than clear water) • Abandoned mine drainage	• Causes lethal effects when temperature exceeds tolerance limit • Increases metabolism (results in higher oxygen demand for aquatic organisms) • Increases food requirements • Decreases growth rates and DO • Influences timing of migration • Increases sensitivity to disease • Increases rates of photosynthesis (increases algal growth, depletes oxygen through plant decomposition) • Causes excess plant growth

Note: WWTP = wastewater treatment plant; CSO = combined sewer overflow; SSO = sanitary sewer overflow; CAFO = concentrated animal feeding operation; DO = dissolved oxygen.

Watershed Plans to Protect Unimpaired Waters

In some cases, stakeholders might want to protect waters that are affected by nonpoint source pollution but are not included on the 303(d) list. Of particular concern are high-quality waters that are threatened by changing land uses when unique and valuable aquatic resources (e.g., habitat for salmon migration, spawning, and rearing) are at serious risk of irreparable harm. Watershed project sponsors can use the tools presented in this handbook to develop watershed plans for waters that are not impaired by nonpoint source pollution to ensure that they remain unimpaired.

their watershed plans all the significant causes and sources of waterbody impairments and threats; i.e., watershed plans should address not only the sources of water quality impairment but also any pollutants and sources of pollution that need to be addressed to ensure the long-term health of the watershed. If a TMDL is later completed and approved, the plan might need to be modified to make it consistent with the TMDL. EPA continues to encourage the development of TMDLs or, where applicable, sets of such TMDLs on a watershed basis. Figure 2-2 illustrates the potential relationships between TMDLs and watershed plans.

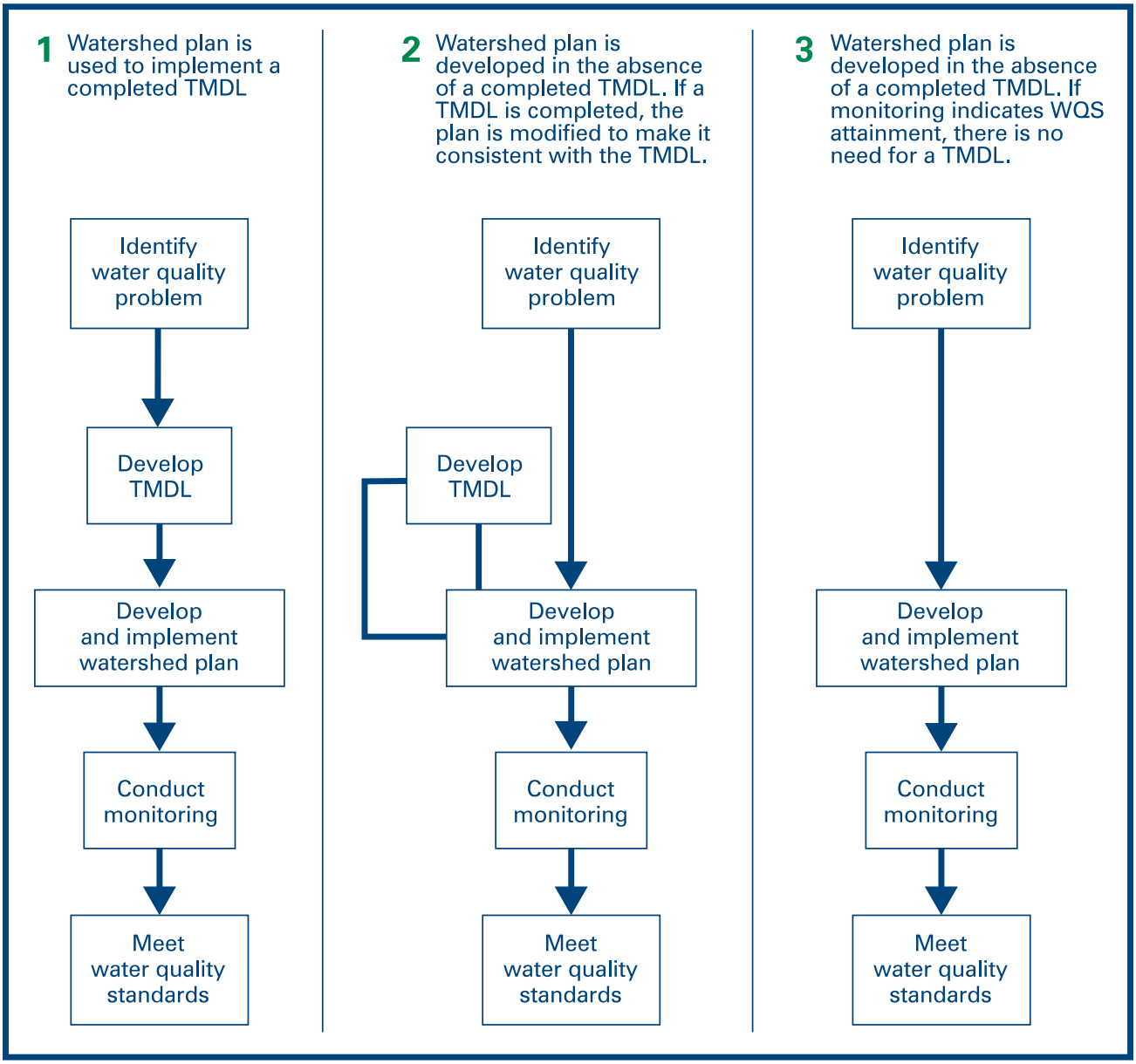
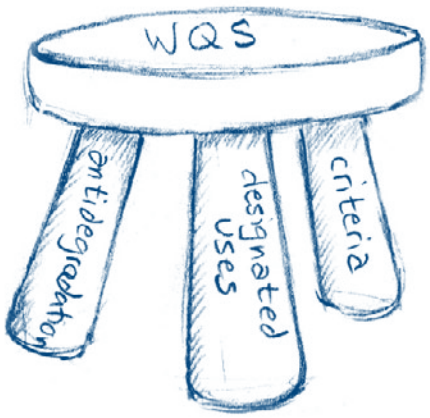


Figure 2-2. Potential Relationships Between TMDLs and Watershed Plans

2.5 Including Water Quality Standards in Goal Setting

Each watershed management plan will address different issues and include unique goals and site-specific management strategies to achieve those goals. All plans should also include attainment of water quality standards for surface waters in the management area. Because water quality standards are the foundation of EPA's water quality protection efforts, this handbook includes a brief description of what they are and how they're used in watershed management programs.



2.5.1 What Are Water Quality Standards and Why Are They Important?

An important cornerstone of the Clean Water Act is the requirement that states, tribes, and territories adopt water quality standards to protect public health, support wildlife, and enhance the quality of life within their jurisdictions. Water quality standards serve as the basis for assessing waters, establishing TMDLs, and setting attainment limits in NPDES permits. Attaining these standards helps to ensure that waters will remain useful to both humans and aquatic life. Standards also drive water quality restoration activities because they help to determine which waterbodies must be addressed, what level of restoration is necessary, and which activities need to be modified to ensure that the waterbody meets its minimum standards.

Standards are developed by designating one or more beneficial uses for each waterbody and establishing a set of criteria that protect those uses. Standards also include an antidegradation policy.

2.5.2 How Are Water Quality Standards Set?

Water quality standards are composed of three elements:

- Designated (beneficial) uses
- Numeric and narrative criteria
- Antidegradation policies

Example Designated Uses

- Growth and propagation of fish
- Water contact recreation
- Drinking water
- Agricultural water supply
- Industrial supply
- Wildlife
- Swimming

Designated Uses

Designated or beneficial uses are descriptions of water quality expectations or water quality goals. A designated use is a legally recognized description of a desired use of the waterbody, such as aquatic life support, body contact recreation, fish consumption, or public drinking water supply. These are uses that the state or authorized tribe wants the waterbody to be healthy enough to support fully.

State and tribal governments are primarily responsible for designating uses of waterbodies within their jurisdictions. Some water quality agencies have many use designations and differentiate among various categories of uses for aquatic life support, irrigation, and even cultural uses for tribal waters. Other agencies designate uses by broad categories or classes, with uses requiring similar water quality conditions grouped under each class.

Water Quality Criteria

Criteria define the levels, pollutant/constituent concentrations, or narrative statement reflecting the condition of the waterbody that supports its designated use(s). Criteria describe physical, chemical, and biological attributes or conditions as numeric (e.g., concentrations of certain chemicals) or narrative (e.g., no objectionable scum, sludge, odors) water quality components. Together, the various criteria for a particular designated use paint a picture of the water quality necessary to support the use. EPA, states, and tribes establish water quality criteria for various waterbody uses as part of their water quality standards.

Numeric Criteria

EPA, states, and tribes have set numeric criteria or limits for many common water quality parameters, such as concentrations of bacteria, suspended sediment, algae, dissolved metals, minimum/maximum temperatures, and so on. Numeric criteria for protecting aquatic life are often expressed as a concentration minimum or maximum for certain parameters and include an averaging period and a frequency or recurrence interval. For example, a criterion for a parameter of concern might state that concentrations of the parameter must not exceed 5 parts per million, averaged from five samples collected within a 30-day period, and recurring more than once in a 3-year period.

What's the Difference Between Numeric and Narrative Criteria?

It's important to note that numeric criteria are invaluable when setting specific, measurable goals for waterbody cleanup plans because they provide a very clear indication of when water quality meets the criteria. However, federal, state, and tribal numeric criteria development is complex and expensive in terms of time and resources. Narrative criteria provide a means to convey the context, conditions, and full intent of water quality protection efforts in the absence of numeric criteria development and monitoring efforts.

Criteria for protecting human health may be derived from epidemiological studies and laboratory studies of pollutant exposure involving species like rats and mice. Numeric criteria established to prevent *chronic* conditions are more strict than those focusing on *acute* exposure to parameters of concern.

Narrative Criteria

Narrative criteria are nonnumeric descriptions of desirable or undesirable water quality conditions. An example of a narrative criterion is "All waters will be free from sludge; floating debris; oil and scum; color- and odor-producing materials; substances that are harmful to human, animal, or aquatic life; and nutrients in concentrations that may cause algal blooms."

Biocriteria

A comprehensive assessment of a waterbody might include a description of its biological characteristics. Biological criteria, or "biocriteria," have been developed to quantitatively describe a waterbody with a healthy community of fish and associated aquatic organisms. Components of biocriteria include the presence and seasonality of key indicator species; the abundance, diversity, and structure of the aquatic community; and the habitat conditions these organisms require. Monitoring of these biological indicators provides a simple and often inexpensive way to screen waters that are supporting their uses without a lot of expensive chemical and other testing. In addition, biological assessments can capture the impacts of intense, short-term pollution that might go undetected under conventional chemical testing. Even if states have not yet adopted official biocriteria for their waters, biological sampling can be an important part of watershed monitoring to show progress in meeting load reductions and attaining narrative criteria.

Antidegradation Policies and Implementation Methods

The antidegradation requirements cited in federal, state, and tribal water quality standards provide an excellent and widely used approach for protecting waters threatened by human activities that might cause a lowering of water quality. Under these provisions, which are required under the Clean Water Act, a public agency designated as the federally delegated water quality authority must adopt both an antidegradation policy and identify methods for implementing the policy. The policy must protect existing waterbody uses (40 CFR 131.12(a)(1)). There are two other parts, or tiers, of the antidegradation policy. Under Tier II, waters that exceed quality levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water must be protected unless the delegated water quality agency (1) determines that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located and (2) meets relevant public participation and intergovernmental coordination provisions of the state or tribal continuing planning process. The antidegradation policy must also ensure that the quality of all outstanding national resource waters is maintained and protected (Tier III).

Implementation methods or procedures for antidegradation policies usually include antidegradation reviews for all new or expanded regulated activities that might lower water quality, such as wastewater treatment, stormwater, CAFO, and other discharges subject to National Pollutant Discharge Elimination System (NPDES) permits; activities governed by Clean Water Act section 404 "dredge and fill" permits; and other activities regulated by federal, state, tribal, or other authorities. In the past, permit approval processes for these activities focused mostly on whether they would maintain water quality to meet existing uses (40 CFR 131.12(a)(1)). However, the Tier II antidegradation provisions require that higher-quality waters be protected unless there is a demonstration of necessity and if there is important economic or social development in the area in which the waters are located, and public participation and intergovernmental coordination requirements are met. States often include, as a part of the Tier II review, requirements to examine possible alternatives to proposed activities that would lower water quality, as well as an analysis of the costs associated with the alternatives.

Full Text of the Federal Antidegradation Regulations at 40 CFR, Chapter I, Section 131.12:

(a) The State shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy pursuant to this subpart. The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following:

(1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

(2) Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.

(3) 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.

(4) In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act.

http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div5&view=text&node=40:21.0.1.1.18&idno=40#40:21.0.1.1.18.2.16.3

For more in-depth descriptions of water quality standards and criteria, go to **www.epa.gov/waterscience/standards**.

2.6 9 Nine Minimum Elements to Be Included in a Watershed Plan for Impaired Waters Funded Using Incremental Section 319 Funds

Although many different components may be included in a watershed plan, EPA has identified nine key elements that are critical for achieving improvements in water quality. (↳ Go to **www.epa.gov/owow/nps/cwact.html** for a copy of the FY 2004 *Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories*).

What Does This Mean?

9 Shows you where one or more of the nine minimum elements are specifically discussed.

EPA requires that these nine elements be addressed in watershed plans funded with incremental Clean Water Act section 319 funds and strongly recommends that they be included in all other watershed plans intended to address water quality impairments. In general, state water quality or natural resource agencies and EPA will review watershed plans that provide the basis for section 319-funded projects. Although there is no formal requirement for EPA to approve watershed plans, the plans must address the nine elements discussed below if they are developed in support of a section 319-funded project.

In many cases, state and local groups have already developed watershed plans for their rivers, lakes, streams, wetlands, estuaries, and coastal waters. If these existing plans contain the nine key elements listed below, they can be used to support section 319 work plans that contain projects extracted from the plan. If the existing plans do not address the nine elements, they can still provide a valuable framework for producing updated plans. For example, some watershed management plans contain information on hydrology, topography, soils, climate, land uses, water quality problems, and management practices needed to address water quality problems but have no quantitative analysis of current pollutant loads or load reductions that could be achieved by implementing targeted management practices. In this case, the plan could be amended by adding this information and other key elements not contained in the original plan. If separate documents support the plan and the nine elements listed below but are too lengthy to be included in the watershed plan, they can be summarized and referenced in the appropriate sections of the plan. EPA supports this overall approach—building on prior efforts and incorporating related information—as an efficient, effective response to the need for comprehensive watershed plans that address impaired and threatened waters.

Figure 2-3 highlights where the nine key elements fit into the overall watershed planning process. Once the plan has been developed, plan sponsors can select specific management actions included in the plan to develop work plans for nonpoint source section 319 support and to apply for funding to implement those actions (↳ chapter 12).

The nine elements are provided below, listed in the order in which they appear in the guidelines. Although they are listed as *a* through *i*, they do not necessarily take place sequentially. For example, element *d* asks for a description of the technical and financial assistance that will be needed to implement the watershed plan, but this can be done only after you have addressed elements *e* and *i*.

Explanations are provided with each element to show you what to include in your watershed plan. In addition, chapters where the specific element is discussed in detail are referenced.

Nine Elements of Watershed Plans

a. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. Sources that need to be controlled should be identified at the significant subcategory level along with estimates of the extent to which they are present in the watershed (e.g., X number of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).
(↳ Chapters 5, 6, and 7.)

What does this mean?

Your watershed plan should include a map of the watershed that locates the major causes and sources of impairment. To address these impairments, you will set goals that will include (at a minimum) meeting the appropriate water quality standards for pollutants that threaten or impair the physical, chemical, or biological integrity of the watershed covered in the plan.

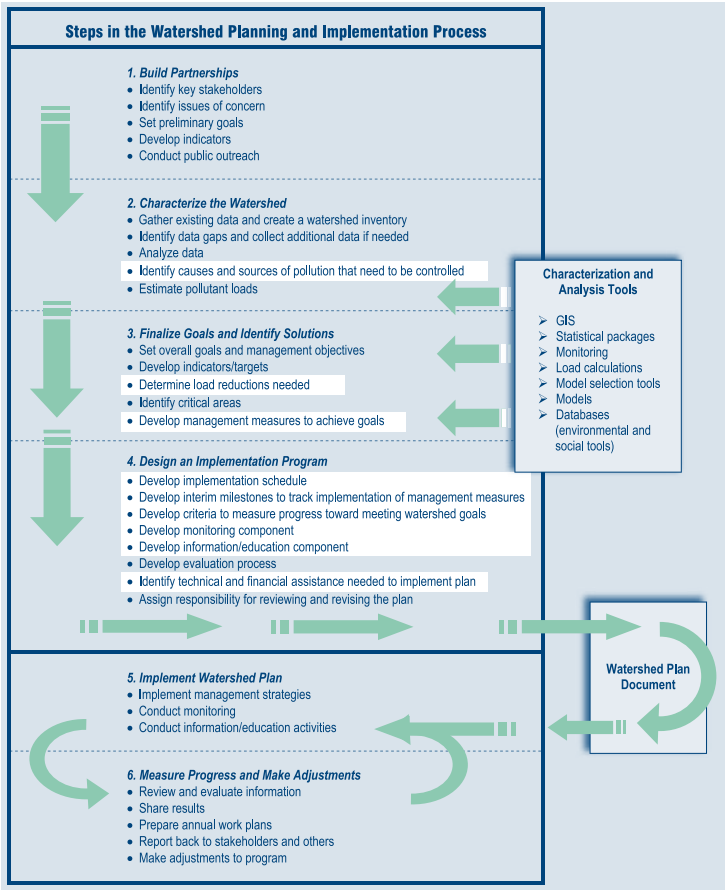


Figure 2-3. Incorporating the Nine Minimum Elements into Your Watershed Plan

This element will usually include an accounting of the significant point and nonpoint sources in addition to the natural background levels that make up the pollutant loads causing problems in the watershed. If a TMDL exists, this element may be adequately addressed. If not, you will need to conduct a similar analysis to do this. The analytical methods may include mapping, modeling, monitoring, and field assessments to make the link between the sources of pollution and the extent to which they cause the water to exceed relevant water quality standards.

b. An estimate of the load reductions expected from management measures.

What does this mean?

On the basis of the existing source loads estimated for element *a*, you will similarly determine the reductions needed to meet the water quality standards. You will then identify various management measures (see element *c* below) that will help to reduce the pollutant loads and estimate the load reductions expected as a result of these management measures to be implemented, recognizing the difficulty in precisely predicting the performance of management measures over time.

Estimates should be provided at the same level as that required in the scale and scope component in paragraph *a* (e.g., the total load reduction expected for dairy cattle feedlots, row crops, or eroded streambanks). For waters for which EPA has approved or established

TMDLs, the plan should identify and incorporate the TMDLs. Applicable loads for downstream waters should be included so that water delivered to a downstream or adjacent segment does not exceed the water quality standards for the pollutant of concern at the water segment boundary. The estimate should account for reductions in pollutant loads from point and nonpoint sources identified in the TMDL as necessary to attain the applicable water quality standards. (↳ Chapters 8 and 9.)

c. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in paragraph 2, and a description of the critical areas in which those measures will be needed to implement this plan.

What does this mean?

The plan should describe the management measures that need to be implemented to achieve the load reductions estimated under element *b*, as well as to achieve any additional pollution prevention goals called out in the watershed plan (e.g., habitat conservation and protection). Pollutant loads will vary even within land use types, so the plan should also identify the critical areas in which those measures will be needed to implement the plan. This description should be detailed enough to guide implementation activities and can be greatly enhanced by identifying on a map priority areas and practices. (↳ Chapters 7, 8, 9, 10, and 11.)

d. Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.

What does this mean?

You should estimate the financial and technical assistance needed to implement the entire plan. This includes implementation and long-term operation and maintenance of management measures, I/E activities, monitoring, and evaluation activities. You should also document which relevant authorities might play a role in implementing the plan. Plan sponsors should consider the use of federal, state, local, and private funds or resources that might be available to assist in implementing the plan. Shortfalls between needs and available resources should be identified and addressed in the plan. (↳ Chapter 12.)

e. An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.

What does this mean?

The plan should include an I/E component that identifies the education and outreach activities or actions that will be used to implement the plan. These I/E activities may support the adoption and long-term operation and maintenance of management practices and support stakeholder involvement efforts. (↳ Chapters 3 and 12.)

f. Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.

What does this mean?

You should include a schedule for implementing the management measures outlined in your watershed plan. The schedule should reflect the milestones you develop in *g*. (↳ Chapter 12.)

g. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented. (↳ Chapter 12.)

What does this mean?

You'll develop interim, measurable milestones to measure progress in implementing the management measures for your watershed plan. These milestones will measure the implementation of the management measures, such as whether they are being implemented on schedule, whereas element *h* (see below) will measure the effectiveness of the management measures, for example, by documenting improvements in water quality.

h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.

What does this mean?

As projects are implemented in the watershed, you will need water quality benchmarks to track progress. The *criteria* in element *h* (not to be confused with *water quality criteria* in state regulations) are the benchmarks or waypoints to measure against through monitoring. These interim targets can be direct measurements (e.g., fecal coliform concentrations) or indirect indicators of load reduction (e.g., number of beach closings). You should also indicate how you'll determine whether the watershed plan needs to be revised if interim targets are not met. These revisions could involve changing management practices, updating the loading analyses, and reassessing the time it takes for pollution concentrations to respond to treatment. (↳ Chapters 12 and 13.)

i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item h *immediately above.*

What does this mean?

The watershed plan should include a monitoring component to determine whether progress is being made toward attaining or maintaining the applicable water quality standards. The monitoring program should be fully integrated with the established schedule and interim milestone criteria identified above. The monitoring component should be designed to determine whether loading reductions are being achieved over time and substantial progress in meeting water quality standards is being made. Watershed-scale monitoring can be used to measure the effects of multiple programs, projects, and trends over time. Instream monitoring does not have to be conducted for individual BMPs unless that type of monitoring is particularly relevant to the project. (↳ Chapters 6, 12, and 13.)

The remainder of this handbook proceeds through the watershed planning process, addressing these elements in detail to show you how to develop and implement watershed plans that will achieve water quality and other environmental goals.

The level of detail (figure 2-4) needed to address the nine key elements of watershed management plans listed above will vary in proportion to the homogeneity or similarity of land use types and variety and complexity of pollution sources. Urban and suburban watersheds will therefore generally be planned and implemented at a smaller scale than watersheds with large areas of a similar rural character. Similarly, existing watershed plans and strategies for larger river basins often focus on flood control, navigation, recreation, and water supply but contain only summary information on existing pollutant loads. They often generally identify only source areas and types of management practices. In such cases, smaller subbasin and

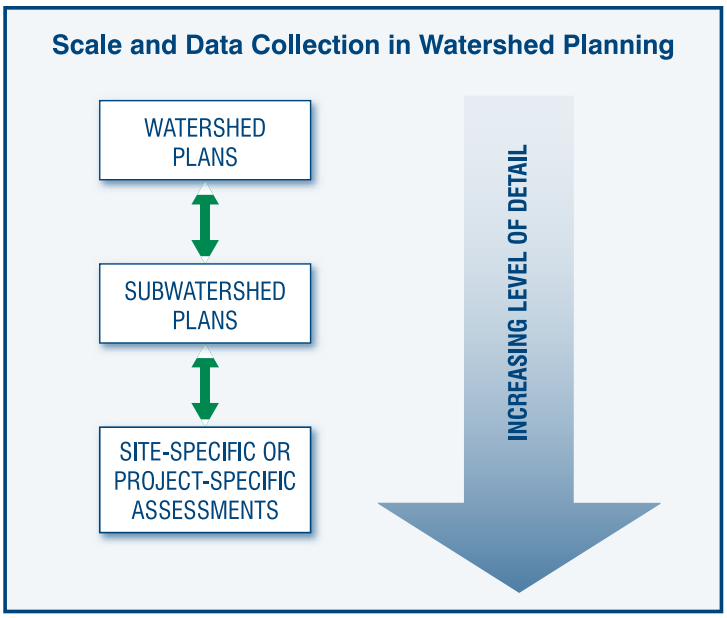


Figure 2-4. Level of Detail for Watershed Management Plans

watershed plans and work plans developed for nonpoint source management grants, point sources, and other stormwater management can be the vehicles for providing the necessary management details. A major purpose of this manual is to help watershed managers find planning tools and data for managing watersheds at an appropriate scale so that problems and solutions can be targeted effectively.