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# Chapter 1

## Goals of this Report

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### The Importance of Safe Public Drinking Water

The U.S. Congress justified passing the Safe Drinking Water Act Amendments of 1996 (SDWA) (Public Law 104–182) codified at 42 U.S.C. sec. 300j–14, by stating “safe drinking water is essential to the protection of public health.” For over 50 years, a basic axiom of public health protection has been that safe drinking water reduces infectious disease and extends life expectancy (American Water Works Association 1953). Although most U.S. residents take safe public drinking water for granted, assuring its safety remains a high national priority. Large investments are made by all levels of government to maintain and upgrade our public water systems.

To strengthen that process, the SDWA mandates that greater protection and information be provided for the 240 million Americans who are served by public water supplies. Section 1453 of the SDWA requires all States to complete source water assessments (SWA’s) of their public drinking water supplies by 2003. To meet this requirement, each State and participating tribe will delineate the boundaries of areas that serve as sources for individual public drinking water systems, identify significant potential sources of contamination, and determine how susceptible each system is to contamination. Source water assessments are required for all public drinking water supplies regardless of the ownership of the drinking water system or the land that comprises its source area. Results of SWA’s will be made public and will assist local planners, tribes, and Federal and State Governments to make more informed decisions to protect drinking water sources.

To get information about a source water assessment program (SWAP) from a particular State, go to the U.S. Environmental Protection Agency (EPA) homepage to view the SWAP contact list. This site includes names and telephone numbers of State source water contacts and hotlinks to existing State homepages for more information. The EPA homepage can be found at <http://epa.gov/OGWDW/protect.html>.

U.S. Congress chose source water protection as a strategy for ensuring safe drinking water because of its high potential to be cost-effective. A poor source of water can substantially increase the cost of treatment to make the water drinkable. When source water is so contaminated that treatment is not feasible, developing alternative water supplies can be expensive and cause delays in providing safe, affordable water. Delineating areas that supply water and inventorying potential sources of contamination will help communities know the threats to their drinking water. Communities can then more effectively and efficiently address these threats.

### Drinking Water from Forests and Grasslands

Forests and grasslands have long been relied upon as sources of clean drinking water for two reasons: (1) forests mainly grow under conditions that produce relatively reliable water runoff, and (2) properly managed forests and grasslands can yield water relatively low in contaminants when compared with many urban and agricultural land uses. We estimate that at least 3,400 towns and cities currently depend on National Forest System watersheds for their public water supplies. In addition, the national forests and grasslands have over 3,000 public water supplies for campgrounds, administrative centers, and similar facilities. Communities that draw source water from national forests and grasslands provide a public water supply to 60 million people, or one-fourth of the people served by public water supplies nationwide. Since 70 percent of the forest area in the United States is outside of the National Forest System, the number of people served by all forests and grasslands is far greater.

With the large number of public water supplies on forests and grasslands, there is a high likelihood that many forest and grassland managers will be involved in the process of planning, implementing, or reacting to public concerns related to SWA’s. The level of involvement in this process will probably vary from place to place depending on the requirements of each State, the degree of public attention that particular management activities receives, and the potential of specific land uses to affect source waters. At the time of writing this document, it is difficult to predict to

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what degree particular managers may become involved with this process. We have assembled current scientific knowledge in a useful form that will help managers protect the safety of drinking water sources and be better-informed participants in SWA's.

## **The Purpose and Scope of this Document**

This document was written to assist forest and grassland managers in their efforts to comply with the SDWA by providing them with a review and synthesis of the current scientific literature about the effects of managing these lands on public drinking water sources. This is not a decision document. Its audience includes managers of national forests and grasslands as well as managers of public and private forests and grasslands. Managers of public water supplies and community groups concerned with drinking water may also find this document useful.

This report's focus is restricted to potential contamination of source water associated with ordinary land uses in national forests and grasslands. It does not treat the delineation of source areas because the EPA and the States will decide those criteria. We chose conventional land uses on national forests and grasslands because they clearly come under the mandate of the U.S. Department of Agriculture, Forest Service (Forest Service), the principal sponsor of this document, and because a significant portion of the public depends on national forests and grasslands for water. We did include grazing and land uses that occur where urban areas border on or intermix with forests and grasslands. The report does not address large urban developments, large industrial complexes, row crop agriculture, or concentrated animal feeding operations because they come more appropriately under the oversight of other agencies. We focus on issues for public water supplies, rather than those of small, private water sources for individual families, because only public supplies are examined in SWA's.

The processes reviewed in this report occur at spatial scales ranging from a few square yards (meters) to many millions of acres (hectares). Most scientific studies, however, have been done at relatively small scales. Inferences about larger areas are drawn mostly from models or extrapolations based on those small-scale studies. Where regional differences in effects of land management were reported in the literature, the authors indicated them in this document. If not, we did not make regional distinctions. Several conventions are used by the scientific and land management communities for classifying geographic, climatic, and ecological zones with similar characteristics into ecoregions, but no standard system of classification has been endorsed across relevant

scientific disciplines or Federal Agencies. For this reason, we cited whatever ecoregions were used in the literature.

## **How to Use this Document**

This document is intended to be used by managers as a reference for assessing watersheds and planning programs to minimize the effects of land management practices on the quality of drinking water sources. When managers are concerned with the potential of a particular land management practice, they can consult the chapter summarizing what is known about the effects of that practice. Managers should note both what is known and what is not known from scientific studies. Known information may provide a means to estimate the effects of a particular practice. What is unknown is equally important because it may indicate which management actions entail risk because their effects are not well understood.

We wish to emphasize the importance of using scientific information as a basis for management. Managers often are forced by circumstances to make decisions based on incomplete knowledge. They compensate by filling information gaps with reasonable assumptions. Each such assumption carries the risk of unintended consequences. Use of scientific data in decision-making has the advantage that many of the important conditions that affect outcomes have been controlled or measured, and critical assumptions are often carefully spelled out. When decisions are based on anecdotal experience, less may be known about conditions that affect outcomes, and key assumptions about these conditions may not be explicit. Decisions that draw on scientific information, therefore, reduce the risk of unexpected outcomes.

The subjects covered are broadly and briefly summarized. When managers need to go more deeply into a topic, they should use the scientific literature that is cited in each chapter as an entry point into the larger body of knowledge that underlies each of the chapters. Wherever possible, the scientific information that is cited has been peer reviewed and published. Case studies presented are meant to illustrate the complexity of actual management situations and are not necessarily based on peer-reviewed literature.

To synthesize the scientific information into a form that answers questions relevant to managers required that the authors use their best professional judgement both to draw together diverse sources and to evaluate their validity. Exercising this judgement is necessary to make this document more useful than a mere compilation of data or annotated bibliography. We have made every effort to make

apparent the distinction between published scientific observations and logical synthesis on the part of the authors.

This document has undergone a rigorous peer review by professional scientists and managers from inside and outside government to critique the validity and currency of its sources, syntheses, and conclusions. The finished document has been revised to consider and respond to the comments of these reviewers.

Although this document is separated into chapters by types of land use, we recognize that in most practical situations effects on source waters result from the cumulative effects of multiple land uses that often overlap in space and change over time. To address this issue we direct readers to chapter 2, which covers the natural processes of watersheds that overlay all land uses, and to chapter 3, which summarizes the cumulative effects of multiple land uses distributed over space and time.

In this document we concentrate on issues that arise from the need of managers to comply with the SDWA. This is only one of the many policies and laws that currently govern the actions of national forest and grassland managers. A provision of the Organic Act of 1897 (30 Stat. 11), codified at 16 U.S.C. Subsec. 473–475, 477–482, 551, that established the national forests “for the purpose of securing favorable conditions of water flows,” has been interpreted to authorize managing this land for water resources. Administration of national forests is currently guided primarily by four laws: (1) the Multiple Use-Sustained Yield Act (Public Law 86–517), codified at 16 U.S.C. sec.525 *et seq.*; (2) the National Environmental Policy Act (Public Law 91–190), codified at 16 U.S.C. sec.4321 *et seq.*; (3) the Forest and Rangeland Renewable Resources Planning Act (Public Law 93–378), codified at 16 U.S.C. sec.1600 *et seq.*; and (4) the National Forest Management Act (Public Law 94–588). Forest and grassland managers also must comply with many environmental statutes including the Endangered Species Act (Public Law 93–205), codified at 16 U.S.C. sec.1531 *et seq.*; the Clean Water Act (Public Law 80–845), codified at 33 U.S.C. Sec.1251; and the Clean Air Act (Public Law 84–159), codified at 42 U.S.C. sec.7401 *et seq.* Activities of the Forest Service with State and private landowners were authorized by the Cooperative Forestry Assistance Act (Public Law 95–313) and amended in the 1990 Farm Bill (Public Law 101–624), codified at 16 U.S.C. Subsec. 582a, 582a–8, 1648, 1642 (note), 1647a, 2101 (note), 2106a, 2112 (note), 6601 (note). The Forest and Rangeland Renewable Resources Act (Public Law 93–378), with amendments in the 1990 Farm Bill (Public Law 101–624), provided authority for research by the Forest Service. For a more complete listing of relevant laws and the text of these laws, see U.S.

Department of Agriculture, Forest Service (1993). Over time, the laws and policies that guide public land use have evolved in response to changes in perceived public needs and will probably continue to change in the future.

A number of laws that affect forest and grassland management require the use of best management practices (BMP’s). These practices vary widely in their application and effectiveness from State to State and continually evolve in response to new environmental concerns, technology, and scientific evidence (Dissmeyer 1994). This document does not cite or endorse specific BMP’s but rather presents scientific evidence that has the potential to serve as a basis for developing practices that more effectively protect source water.

Some laws and prudent practice require that environmental monitoring be used to assess the outcomes of land management. We considered the broad topic of monitoring to be beyond the scope of our effort, but implicit throughout this document is the assumption that monitoring of outcomes should be an integral part of land management. Scientific evidence does not eliminate all risks of unforeseen outcomes, and where scientific studies are lacking, risks are likely to be higher. Monitoring land-use practices will help to protect public health and other important values.

This document focuses narrowly on protecting human health by protecting drinking water. We acknowledge that managers must consider a much wider range of values in most land-use decisions. It is not our intent to tell managers how to weigh a spectrum of values or how to decide among them. Rather we wish to inform managers about specific effects on drinking water so that they can better take these effects into consideration when they make land-use decisions.

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