

Source Water Protection Vision and Roadmap



Subject Area: Water Resources and Environmental Sustainability



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The Water Research Foundation is a member-supported, international, 501(c)3 nonprofit organization that sponsors research to enable water utilities, public health agencies, and other professionals to provide safe and affordable drinking water to consumers.

The Foundation's mission is to advance the science of water to improve the quality of life. To achieve this mission, the Foundation sponsors studies on all aspects of drinking water, including resources, treatment, distribution, and health effects. Funding for research is provided primarily by subscription payments from close to 1,000 water utilities, consulting firms, and manufacturers in North America and abroad. Additional funding comes from collaborative partnerships with other national and international organizations and the U.S. federal government, allowing for resources to be leveraged, expertise to be shared, and broad-based knowledge to be developed and disseminated.

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The results of research are disseminated through a number of channels, including reports, the Web site, Webcasts, conferences, and periodicals.

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More information about the Foundation and how to become a subscriber is available on the Web at www.WaterRF.org.

Source Water Protection Vision and Roadmap

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FOREWORD

The Water Research Foundation (Foundation) is a nonprofit corporation that is dedicated to the implementation of a research effort to help drinking water utilities respond to regulatory requirements and address high-priority concerns of the water sector. The research agenda is developed through a process of consultation with Foundation subscribers and other drinking water professionals. Under the umbrella of a Strategic Research Plan, the Board of Trustees and Board-appointed volunteer committees prioritize and select research projects for funding based upon current and future needs, applicability, and past work. The Foundation sponsors research projects through the Focus Area, Emerging Opportunities, and Tailored Collaboration programs, as well as various joint research efforts with organizations such as the U.S. Environmental Protection Agency and the U.S. Bureau of Reclamation.

This publication is a result of one of these sponsored studies, and it is hoped that its findings will be applied in communities throughout the world. The following report serves not only as a means of communicating the results of the water industry's centralized research program but also as a tool to enlist the further support of the nonmember utilities and individuals. Projects are managed closely from their inception to the final report by the foundation's staff and large cadre of volunteers who willingly contribute their time and expertise. The foundation serves a planning and management function and awards contracts to other institutions such as water utilities, universities, and engineering firms. The funding for this research effort comes primarily from the Subscription Program, through which water utilities subscribe to the research program and make an annual payment proportionate to the volume of water they deliver and consultants and manufacturers subscribe based on their annual billings. The program offers a cost-effective and fair method for funding research in the public interest.

A broad spectrum of water supply issues is addressed by the foundation's research agenda: resources, treatment and operations, distribution and storage, water quality and analysis, toxicology, economics, and management. The ultimate purpose of the coordinated effort is to assist water suppliers to provide the highest possible quality of water economically and reliably. The true benefits are realized when the results are implemented at the utility level. The foundation's trustees are pleased to offer this publication as a contribution toward that end.

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Executive Director
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San Antonio Water System, San Antonio, TX
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Washington Aqueduct, Washington, DC

To add to this impressive list, sixty additional U.S. water utilities completed the project survey questionnaire and provided a necessary reality check regarding the state of source water protection among water utilities across the U.S.

ABSTRACT

In 2007, a group of source water protection experts met, under the auspices of the Water Research Foundation and the Water Environment Research Foundation, to develop a research agenda that would ultimately provide information to help drinking water suppliers design and implement effective source water protection programs. A key result of that effort identified the need for a national vision and roadmap that would guide U.S. water utilities and supporting groups with a unified strategy for coherent, consistent, cost-effective, and socially-acceptable source water protection programs. This brief document presents the vision and roadmap and focuses on how to move forward on source water protection. The roadmap is intended to serve as a feasible, focused path toward promoting source water protection for U.S. drinking water utilities. It is not intended to serve as an official directive, but rather is a collection of observations and recommendations organized to form a path to achieving the vision.

The companion document *Developing a Vision and Roadmap for Drinking Water Source Protection* comprehensively covers the project team's findings regarding the various building blocks to make source water protection a reality. That document includes an annotated bibliography of source water protection resources, a summation of a literature review, and helpful water utility case studies. Both documents are meant to be used in concert to help water utilities move forward with their source water protection efforts and proactively improve and/or maintain the quality of their drinking water sources.

Source water protection has been discussed and promoted in an *ad hoc* fashion by different organizations at the national, regional, state, and local levels. It is essential to increase the awareness of source water protection at the national level. Education of decision makers, utility managers, stakeholders, and the general public should be the first step in moving source water protection up a path to success. Leadership is needed to make this a national priority.

In order to ensure the various actions recommended in the roadmap can be carried out, it is recommended that both a top-down and a bottom-up approach be taken. A top-down approach would establish a flexible framework to guide local entities (e.g., water systems, watershed organizations, and regional planning agencies) to work together to protect source water. Due to the variability of source waters and the areas from which they are derived, along with technical, social, political, financial, and regulatory differences across jurisdictions, it is unlikely that two source water protection programs would be the same. A bottom-up approach is therefore also needed, which would use local information and broad stakeholder involvement to produce a "tailored" source water protection program that addresses unique issues at the local level.

CHAPTER 1

INTRODUCTION AND PROJECT METHODOLOGY

OVERVIEW

Drinking water sources, whether surface water or groundwater, are subject to a variety of potential point and nonpoint sources of pollution. Maintaining and improving source water quality is a logical, prudent, and often economical approach that can provide numerous types of benefits. Since the National Source Water Protection Conference held by USEPA in June 2003 in Washington, D.C., source water protection has been discussed and promoted in an *ad hoc* fashion by different organizations at the national, regional, state, and local levels. Although its site-specific nature has made source water protection program development and implementation a bottom-up exercise, a lack of awareness and recognition at the national level has made it a low priority or even invisible to the decision makers and general public. The prospect of potentially prioritizing limited resources between treatment and protection activities, along with the sense of helplessness felt by many water utilities that do not control activities and land use in their contributing watersheds and recharge areas, have made source water protection a complex and challenging issue.

Although source water protection is a vital component of the multiple barrier approach to drinking water supply, no specific federal mandate exists for development or implementation of source water protection programs. While some water systems have implemented highly-successful source water protection programs, many others have done little or nothing in this regard. In addition, many other obstacles exist to the development and implementation of source water protection programs.

The site-specific process of source water protection reflects the inherent diversity of natural waters and the areas from which they are derived. Different water sources may require widely different protective measures. For example, different source water protection programs are appropriate for pristine mountain streams, lower reaches of highly developed rivers, and groundwater supplies. Appropriate protection measures also vary depending on the development of the contributing area. Even similar types of water supplies may require different program components due to differing characteristics of their watersheds or recharge protection areas, land uses, and potential contaminant sources, as well as the nature of the stakeholder organizations and their available resources and authority. Furthermore, obstacles to successful source water protection typically are not technical, but rather social, political, financial, or regulatory.

Nevertheless, successful source water protection programs have several fundamental



elements in common, including 1) setting a program vision, 2) characterizing the source water, 3) setting goals, 4) developing an action plan, 5) implementing the plan, and 6) periodic or continuous evaluation and revision of the program (Gullick 2003). This process is described in more detail in Chapter 5 of this report. These fundamental elements form the basis for the new AWWA Standard for Source Water Protection (ANSI/AWWA G300-07) (AWWA 2007a). While the AWWA Standard provides a good framework and guidance, it does not provide a unified nationwide strategy.

There appears to be a need for common, agreed-upon goals and objectives for source water protection among the water industry. There is also a need to facilitate the development of guidance for overcoming barriers, identify knowledge gaps and research needs, and provide a consistent framework upon which water utilities can develop and implement effective source water protection programs. While programs have been developed to support source water protection efforts, before this project none has been designed to address the need for a unified source water protection strategy for drinking water utilities across the U.S.

In 2007, the Water Research Foundation (then the American Water Works Association Research Foundation [AwwaRF]) and the Water Environment Research Foundation (WERF) held a Source Water Protection Research Planning workshop with a group of drinking water professionals to develop a research agenda for helping drinking water suppliers design and implement effective source water protection programs (Water Research Foundation, 2008). A principal recommendation from the workshop was for the development of a common vision and roadmap for source water protection for the U.S. drinking water industry. This Foundation project report addresses that recommendation. Developing a common vision and roadmap would establish common, agreed-upon goals and objectives for source water protection; facilitate the development of guidance and best practices for overcoming barriers; help identify knowledge gaps and communication needs; and provide a consistent framework from which water utilities could develop and implement effective source water protection programs.

In order to avoid confusion, the following terms are defined and described below as used in this report:

- ***Source water protection***: the overall concept of protecting or improving the quality of a water source (surface water or groundwater) used as a supply for drinking water, or a specific activity or management practice directly contributing toward achieving that goal.
- ***Source water protection activity***: a specific activity or management practice that directly contributes to the protection or improvement of the quality of a drinking water source.
- ***Source water assessment***: a process that identifies the current condition/quality of a water source, identifies the current and potential future risks to that water quality, and (usually) prioritizes those risks. Assessment activities on their own typically do not provide any direct protection function, but are a necessary step in determining what protection activities are best to implement.
- ***Source Water Assessment Program (SWAP)***: Section 1453 of the 1996 SDWA Amendments (PL 104-182) required states to develop and implement Source Water Assessment Programs that were approved by USEPA. In this program states were required to conduct (or have another party conduct) source water assessments for all public drinking water supplies within their state. These assessments included the following components: (1) identify the sources for all public drinking water supplies

(both surface water and groundwater supplies); (2) delineate the source water areas for each supply; (3) identify existing and potential sources of pollutants (a contaminant source inventory); (4) determine the susceptibility of the water supplies to contamination; and (5) disseminate the results to the public. Though no development of source water protection plans or implementing actual water quality protection activities were required, the resulting assessments were intended to provide information that can be a useful tool to help local stakeholders develop and implement voluntary programs for protecting source water quality.

- **Source water protection plan:** a plan developed that identifies activities and programs that could be taken to protect the quality of a source water. A plan on its own does not provide any actual protection of a source water (only the actual implementation of plan components can do so), but planning is a very important part of developing successful source water protection programs.
- **Source water protection program:** a program developed to identify, prioritize, implement, and evaluate activities to protect a given source water (surface water or groundwater) from deterioration. Some programs address water quantity concerns in addition to water quality issues. Typical components of a successful source water protection program include: (1) a *vision*; (2) source water *characterization*; (3) *goals*; (4) an *action plan*; (5) *implementation* of the action plan; and (6) *periodic evaluation and revision* of the entire program (Gullick 2003, and AWWA 2007a). While such a program includes both assessment and planning components, it goes beyond those to actually implementing activities that will actually protect the source water(s) in some fashion.
- **Wellhead protection program:** a program developed to identify, prioritize, and implement protection activities specifically for a groundwater source. It involves determination of an area around the well to be designated for protection, the inventory of potential contaminant sources within that area, and the implementation of activities or management practices to reduce the risk associated with those sources. The term *wellhead* is defined as the top of a well or a structure built over a well at the ground surface. The national Wellhead Protection Program was established under section 1428 of the 1986 Safe Drinking Water Act amendments. The law specified that certain program activities, such as delineation, contaminant source inventory, contingency planning and source management, be incorporated into state Wellhead Protection Programs, which were approved by USEPA prior to implementation. All states have USEPA-approved state programs, but they vary greatly. Some states have mandatory requirements for wellhead protection at the local level.

PROJECT GOALS AND METHODOLOGY

This report presents results of Water Research Foundation (from here on referred to as Foundation) Project #4176 (*Developing a Roadmap and Vision for Source Water Protection for U.S. Drinking Water Utilities*), which addresses the need to develop a common vision and roadmap that can guide U.S. water utilities and supporting groups with a unified strategy for coherent, consistent, cost-effective, and socially-acceptable source water protection programs. This project was conducted with the assumption that those engaged in source water protection efforts are united and motivated by a common interest: to improve and/or protect source water.

The information available about source water protection projects nationwide is abundant, and the diversity of experiences that are documented can lead one to think that developing a unified strategy for source water protection may be an impossible task. This research instead looked for common themes, goals, and obstacles that could be gleaned by considering seemingly-diverse source water protection experiences.

Two approaches were used to achieve this project's goal: (1) a summary was developed of the state of source water protection in the U.S., and (2) a discussion was held among representatives of the water industry and related stakeholders and a consensus developed regarding a common vision and unified strategy. Combined, these efforts were used to create a supporting vision and roadmap for source water protection which, along with supporting tools, will help to motivate, catalyze, and plan new source water protection programs as well as improve existing programs. The collective experience of current and past source water protection efforts identified during this project was especially helpful for identifying common themes, goals, and obstacles, and developing a realistic strategy for addressing each of them.

The information-gathering task was accomplished through a literature review, water utility interviews, and utility case studies. Available literature documenting the current state of source water protection practices was reviewed and summarized to provide background information and take full advantage of existing research findings and experience, thus avoiding duplication of effort. As an accompaniment to the literature review, an annotated bibliography of resources and tools for source water protection is provided (Appendix D). This annotated bibliography provides a comprehensive resource for water utilities and other supporting groups to use to handily access available source water protection information.

Telephone interviews with utility representatives were conducted to gather information on the state of source water protection among water utilities, including utility needs and source water protection shortcomings. Sixty water utilities of varying sizes and source water types were interviewed in order to obtain a broad representation of utility attitudes and beliefs about source water protection, as well as experiences the utilities have had trying to protect their sources.

A smaller number of utilities (thirteen) were consulted in greater detail about their experiences developing and implementing source water protection programs. The information gathered from this second group reflected the experiences of water utilities that have made a commitment to source water protection. These accounts are fewer and more detailed, and have been compiled into individual case studies that are each structured to address the six steps of the AWWA Standard for Source Water Protection (AWWA 2007a).

The literature review, interviews, and case study findings were used to identify utility needs and describe tools from which other utilities could benefit when they develop and implement their own source water protection programs. This information was also used to define appropriate topics for the project workshop.



The 1-½ day workshop was held in March 2010 in Boulder, Colorado. Twenty-one specialists in source water protection participated in the workshop, including the project team and representatives from 12 water utilities from across the U.S., one state source water protection program, the National Rural Water Association (NRWA), the USEPA, and the Foundation Project Advisory Committee (PAC). The workshop focused primarily on identifying critical elements of a unified source water protection roadmap and defining steps that should be taken to set this roadmap in motion. More specifically, the purpose of the workshop was to:

- Articulate a source water protection vision for water utilities in the United States;
- Define goals for attaining that source water protection vision;
- Identify benchmarks that reflect the attainment of those goals;
- Develop strategies for achieving the benchmarks identified; and
- Organize the vision, goals, benchmarks, and implementation strategies into a roadmap for source water protection for U.S. utilities.

This roadmap was developed primarily from the water industry's perspective. It is an attempt to proceed effectively with source water protection within the context of the fiscal and political challenges facing water systems today and in the foreseeable future. It is not intended to serve as an official directive. Rather, it is a collection of observations and recommendations that have been organized to form a vision and roadmap for achieving that vision.

OVERVIEW OF THIS REPORT

This report describes the findings gathered while taking the project steps described above. Since the most important products of the project are the vision and roadmap, they are provided early in the report (Chapter 2). Chapter 3 provides general preliminary suggestions for how the water utility industry can proceed with implementation of the roadmap. The ensuing four chapters provide details on workshop methodology (Chapter 4) as well as information gathered during the literature review (Chapter 5), water utility surveys (Chapter 6), and utility case studies (Chapter 7). Finally, supporting materials developed during the project and utilized for workshop preparation are provided in Appendix A, and a copy of the utility survey questions are included in Appendix B. Appendices C and D include a list of helpful websites and an Annotated Bibliography of Resources and Tools for Source Water Protection, respectively.

CHAPTER 2

SOURCE WATER PROTECTION ROADMAP FOR U.S. DRINKING WATER SYSTEMS

OVERVIEW

A principal recommendation made by the Source Water Protection Research Planning Workshop participants was for the development of a common vision and roadmap for source water protection for the U.S. drinking water industry. A team of experienced water professionals worked together under Water Research Foundation Project 4176 *Developing a Roadmap and Vision for Source Water Protection for U.S. Drinking Water Utilities* to develop a common vision and roadmap, as recommended by the participants in the earlier project. They gathered, reviewed, and discussed extensive information on source water protection efforts carried out by water utilities, input from utilities not actively engaging in source water protection efforts, and emergent themes regarding conditions either promoting or impeding source water protection efforts made by individual water systems nationwide. During a two-day workshop in Boulder, Colorado in March 2010, the team collaborated to develop the key elements of a common vision and roadmap for source water protection for U.S. drinking water utilities. This chapter's vision and roadmap are the products of that effort.

The team members for this effort are aware of the fiscal and political challenges facing water systems; many of them are implementing source water protection programs and face these challenges on a day-to-day basis. This roadmap was developed primarily from the water industry's perspective, and it attempts to address many of these challenges and proceed effectively nonetheless. It is not intended to serve as an official directive. Rather, it is a collection of observations and recommendations that have been organized to form a vision and roadmap for achieving that vision.

ROADMAP ORGANIZATION

This roadmap is intended to serve as a feasible, focused path toward promoting source water protection for U.S. drinking water utilities. First, a vision is provided to guide the path. Second, cohesive themes are explained that emerged during the path's formulation. The themes are used to describe issues identified as most needing to be addressed. The *Strategic Priorities* section of this roadmap is organized by those themes, and provides more specific suggestions for addressing the issues identified. Obstacles are explained, followed by recommended actions for addressing the obstacles.

While much background research was carried out to prepare for the March 2010 workshop, this document is written with an eye toward the future. As a result, descriptions of the many obstacles to source water protection are not provided in detail, aside from where their discussion is necessary in order to explain suggestions for how to proceed with overcoming them.

Vision

The following vision for source water protection in the U.S. is intended to guide the path of the roadmap:



“Source water protection is essential for providing a reliable supply of high-quality drinking water. By 2025, every public community water supply will be protected by an active source water protection program.”

Themes

Four themes emerged during the gathering and review of background information and discussion at the workshop:

Raise Awareness

There is the need to *raise awareness* of the importance and value of source water protection. Greater awareness is needed

- *by utilities and their management*, of the value of source water protection;
- *by consumers*, of the benefits and value of source water protection; and
- *by stakeholders*, of the importance of protecting drinking water sources and the priority that should be given to drinking water concerns related to source water protection.

Enhance Coordination

Programs, efforts, and regulations affecting source water protection for drinking water supplies can at times be conflicting, redundant, or lacking in focus. There is a need for *enhanced coordination*

- *overall (across all relevant operational and stakeholder groups)*, so that source water protection efforts and programs are better integrated and work together more synergistically; and
- *among Clean Water Act (CWA) and Safe Drinking Water Act (SDWA) regulators, both at the state and federal levels*, for more effective implementation of existing CWA regulations so that drinking water interests are more immediately and completely addressed.

Provide Support

Several water utilities interviewed as part of this effort that had not proceeded with developing source water protection programs stated they were not sure where to begin and/or how to proceed with source water protection. It became apparent they might benefit from assistance from peers who were further along in the process of developing a source water protection program for their own utilities. In addition, several utilities lamented the shortage of funding for their efforts as well as a shortage of funding for technical assistance positions. In these ways, there is a need for greater ***support***. Specifically, water utilities would benefit most from support provided by

- *experienced water industry peers*, for fellow drinking water professionals trying to plan and implement source water protection programs; and
- *state and federal funding agencies*, so that source water protection needs are sufficiently addressed (for high quality water sources as well as impaired water bodies).
- *municipal officials*, who can influence public support of regulatory and financial measures to implement source water protection; and
- *customers*, through water rates.

Increase Recognition

There are issues and efforts related to source water protection that should be acknowledged more publicly. Successful efforts being made to protect sources of drinking water should be noted and praised more frequently. Such recognition benefits a water utility and its community. Alternatively, regulatory inconsistencies that hamper source water protection should also be addressed. In these ways, there should be ***increased recognition***

- *by the public and the drinking water community*, of successful source water protection efforts made by water utilities (i.e., recognition in terms of praise and extolment); and
- *by state and federal regulators*, of the inconsistencies and shortcomings of existing regulations that should be more effectively ensuring the protection of drinking water sources (i.e. recognition in terms of awareness and acknowledgment of the need to act).

Strategic Priorities

This section provides recommendations for how to overcome obstacles to developing and implementing source water protection programs. While some obstacles may be financial or political, other challenges may exist due to attitudes, behaviors, or simply the circumstances in place when and where source water protection efforts should be made. The optimal way to overcome some of the obstacles may not necessarily be with actions taken by water utilities; in this regard, attempts have been made to identify which stakeholders would be best suited to carry out the recommended actions. These strategic priorities are organized by the themes identified above.

Raise Awareness

Obstacle: Among water utilities, there is often a lack of awareness of the need for action regarding source water protection.

- There is a lack of perceived need for action. Water utilities and others need to educate one another about the importance of making source water protection more of a priority.
- Complacency is a problem. Many water utilities have the attitude that their source water is already protected enough, there are no immediate threats (lack of long-term vision), or they assume that other entities are already protecting the source (e.g., state or local governments).
- Water utilities have consistently displayed an over-reliance on treatment processes alone to ensure safe drinking water.
- Some utilities have not considered how source water protection can mitigate future threats, including degraded water quality due to extensive land use development and also emerging contaminants such as personal care products and pharmaceuticals.
- There is some misunderstanding that assessment activities (e.g., source water assessments) constitute source water protection.

Actions:

- 1. Increase the use of regional and statewide organizations for increasing awareness of source water protection for water utilities (e.g., larger water utilities can organize coalitions with numerous neighboring utilities, including small and rural ones).***

More coalitions should be developed to promote increased collaborations and help organize water utilities into collaborative relationships (e.g., Schuylkill Action Network, Hamilton-New Baltimore Groundwater Consortium, Ohio River Valley Water Sanitation Commission [ORSANCO] Water Users Group, Upper Mississippi River Water Suppliers Coalition). Utilities that perceive this need can help themselves by forming a water users' coalition, perhaps with support from their state agencies or other key regional stakeholders. These coalitions and this networking should be promoted at state drinking water conferences. State and federal source water protection managers, American Water Works Association (AWWA) sections, and individual water utilities could all work to catalyze these efforts.

- 2. Perform knowledge gap analyses for individual water utilities and stakeholder groups.***

USEPA, states, water utilities, and AWWA volunteers should work together to develop a way to understand better what each of these groups believe to be true about source water protection. Since beliefs are based on both facts and perceptions, it is important to learn what people believe to be true before effective awareness and outreach programs can be developed.

Obstacle: There is a broad lack of awareness of the importance of source water protection among stakeholders outside of the water utilities.

- There is a need for increased education of and outreach to the general public, educators, municipal officials, planning boards, state agencies, businesses, and the media.

- There is a general lack of understanding about the full price of water and water management.
- In some cases, there is a shortage of public participation and respect for the watershed or aquifer.
- Some water utilities themselves need to be more engaged in building partnerships in order to leverage resources better and ensure that drinking water interests are represented more effectively.

Actions:

1. Develop a system for raising awareness, providing outreach, and promoting education to key decision-makers regarding the importance and benefits of source water protection.

Decision-makers need to become aware of the need for source water protection before any related outreach and educational programs can be implemented effectively. Therefore, an awareness campaign for key decision-makers regarding the need for source water protection should be developed and carried out. Individual water utilities interested in increasing or improving their source water protection efforts should develop a system for raising awareness and educating key decision makers as to the importance and benefits of source water protection. They should identify potential partners with common interests and work with them (e.g., Soil and Water Conservation Districts, storm water agencies, Rural Water Associations, special interest groups, etc.). These partners should work with the utilities, as appropriate, to raise awareness and educate other key entities such as City Councils, Planning Boards, County Commissioners, Mayors, etc. AWWA could also provide information and educational programs for utilities to use at the national level. These efforts should be made during the earliest stages of the development of a utility's source water protection program.

2. Work with local schools on educational programs.

Water utilities and individuals already working on source water protection-related activities should provide education on these activities to school children. Perhaps as an incentive, contact hours (or continuing education units) could be offered to water operators for doing this type of education. This effort should be informed by an awareness of programs that already exist and can be used for this purpose (such as Project WET [Worldwide Water Education]) and utilize effective means of engaging school-age children in learning. It should also be integrated into other state and local learning goals such as curriculum frameworks. Three presentations should promote source water protection-related activities. If programs are used that have already been prepared by other entities, they should be modified as necessary to allow them to be tailored to individual utilities or source water areas.

- The first presentation would be for 4th – 6th graders, and talk about the basics of the water cycle, where drinking water comes from and how it gets to your house.
- The second presentation would be for middle school (6th -8th grades), and talk about the basics of source water protection in the local community showing maps, pictures, and concepts involved with protecting drinking water sources.

- The third presentation would be for high school students (9th – 12th grade) and talk about source water protection, the drinking water industry, potential careers in source water protection, global water issues, research programs, and the future of drinking water.



The presentations can be brought to local schools in the watershed/aquifer area. A certain number of students should be targeted per year in each of the above categories. Local water utilities can discuss with partners in the region about sharing the cost of bussing school children to the water utility and watershed area as a field trip for a source water protection presentation followed by a water plant tour with operators.

3. A more proactive approach should be taken with the media.

Utility managers, city managers, media spokespersons, board members, and commissioners should improve media relations regarding source water protection (and drinking water in general) by becoming a proactive source of information. Currently, water utilities generally face the media only when there is a cost or supply crisis; otherwise, they are almost entirely out of the media spotlight. These leaders of their water community should consider developing a team to address this issue and a spokesperson should be identified. Water utilities should develop a protocol for managing media inquiries, even if someone employed by the utility is not the designated spokesperson for the team described above. Team members should meet with local media sources to discuss environmental or local government news before there is any story to write about. The media should be told who the contact person/spokesperson is so they can go to that person to receive factual information about drinking water-related issues. The team should decide what information can be prepared ahead of time for media-related coverage on a variety of issues, good or bad. The media should also be informed of the utility's goals (i.e., the importance of consumer confidence and understanding, why it is important that the media touch base with the utility before writing a story on water issues). Utilities need to create a setting where they have a better chance of providing their information and facts pertaining to a water-related story. The team may want to gather AWWA press releases and talking points as part of this proactive approach.

Obstacle: It is difficult to ascribe a value to source water protection.

- Before they will authorize related activities, many utility managers need to be convinced that source water protection is worth the effort and expenditures.
- There is not enough information on the costs and benefits of source water protection.

- More insight and awareness are needed as to the full costs and “true” value of water.
- Source water protection is by nature a preventative program, and as such there is usually no specific crisis or need (e.g., replacing a water supply) that can be monetized other than in a hypothetical case.

Actions:

1. Recognize and educate utility management on approaches to quantifying the monetary benefits of source water protection.

Within two to five years, State source water protection managers and mentoring utilities should educate utility managers on this topic. It should be a component of the educational mentoring approach discussed in the Provide Support section below.

2. Utilities can develop descriptions of the potential impacts and costs of not undertaking source water protection (e.g., cost of replacing a contaminated groundwater supply).

While it may not be feasible to develop a common business plan for source water protection, a value statement can be developed. It is quite possible to identify and describe qualitatively specific benefits and the stories of utilities that have experienced these benefits. Within two to five years, a case study report, or perhaps a series of vignettes, should be prepared on the subject and used for educational purposes. A list, matrix, or value statement of the benefits of source water protection (emphasizing the non-quantifiable benefits) should also be prepared as part of this effort.

3. Re-package available information on the “true value of water”.

The whole industry needs to improve its culture regarding the bargain consumers get from public water supplies and the overall benefits that water utilities provide to community health, well-being, and economic benefit. Within two to five years, it is recommended that AWWA increase efforts to make reports and educational materials available that address the value of water.

Enhance Coordination

Obstacle: The existing regulatory framework (federal, state, and local) is not effectively protecting water supplies from current and future threats.

- Studies have clearly identified that current regulatory programs have not given priority to water supplies for protection and restoration.
- At the same time, the water supply industry has not fully utilized federal and state programs to address source water issues.
- In addition, the priority of regulatory programs and funding is generally directed at impaired water bodies, but there is also an important need for protection of high quality drinking water sources.
- Programs to address the water quality impacts of land use change have not caught up with the understanding of the importance of this relationship, nor with advances in development techniques (such as low impact development).

Actions:**1. Fix gaps to improve integration of Clean Water Act (CWA) regulation and source water protection.**

AWWA should play a lead role in helping USEPA review and revise the National Pollutant Discharge Elimination System (NPDES) Stormwater program. Representatives of the water industry (AWWA, NRW, etc.) should be actively engaged and involved in USEPA's upcoming review and revision of the program. This process may involve water industry regional workshops sponsored with USEPA and/or direct involvement in the regulatory review process.

States should establish water quality standards that effectively prevent the degradation of waterbodies used as drinking water supply sources, and water suppliers should urge the states to do the same. For those waterbodies designated as drinking water supplies, water quality standards under the CWA should be as protective as national primary drinking water requirements for drinking water supplies under the SDWA. AWWA, States and USEPA should initiate a process to reconcile the CWA's water quality standards with the goals of the SDWA to adequately protect drinking water sources. This process should address current gaps in the CWA's water quality standards (e.g., *Cryptosporidium*, *Giardia*, and nutrients). A process should be developed and recommended for emerging contaminants that establishes water quality standards prior to implementing standards for water suppliers. A suggested schedule for this reconciliation effort is to have an initial meeting by 2011 and develop a process by 2012. In particular, regulators should develop a means to address the *Cryptosporidium* issue by 2015.

2. Identify ways the CWA can do a better job at protecting high quality drinking water sources.

It is recommended that a study be conducted to review the extent to which federal and state anti-degradation and other regulations under the CWA and related guidance protect high quality drinking water sources. Based on those findings, a gap analysis should be performed to identify what is needed to protect these sources. Programs such as USEPA's Healthy Watersheds Initiative address this concern, but more may be needed. One area to examine could be the reluctance and restrictions on using CWA Section 319 (nonpoint source pollution management) funding to support protection efforts in high quality watersheds.

3. The water industry needs to leverage CWA and other state and federal regulations and programs more effectively to improve protection of drinking water sources.

AWWA state sections and local rural water associations should increase the education and training of utilities on how to leverage various CWA programs for funding and regulation. In some cases, funds sit unused. Thus, there should be greater water utility participation in the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) state programs. AWWA should work with NRCS at the national level to encourage their local sections to do this.

4. *There was a general failure to build upon the federally-required Source Water Assessments, which were completed in the early 2000's. A plan needs to be developed and implemented for how to move from assessment to protection.*

As soon as possible, there should be a high level dialogue among representatives of the Association of State Drinking Water Administrators (ASDWA), Ground Water Protection Council (GWPC), AWWA and USEPA on how to proceed. The Source Water Collaborative (www.protectdrinkingwater.org) could be an appropriate venue for this discussion. As part of the dialogue, the issue of increasingly-outdated assessment information gathered for the Source Water Assessment Program (SWAP) should be addressed. While there was enthusiasm for and support of the SWAP assessments, in most cases, these assessments have rested on shelves rather than becoming guidance for actions and priorities of utilities, both staff and governing boards.

Obstacle: There is no one to coordinate or lead the charge.

Action:

1. Create a Source Water Protection Coordinator position.

A leadership position should be established where the person filling the position would be responsible for coordinating and promoting source water protection efforts for drinking water utilities nationwide. This position should be a full-time, funded position. One possibility would be for Source Water Collaborative members to create, jointly fund, and provide direction for the position.

Provide Support

Obstacle: There is no organized mechanism for water utilities to teach and support one another in their source water protection efforts.

- A voluntary program is needed that facilitates development and implementation of source water protection programs by water utilities.
- This program should both include and be more expansive than the components of the AWWA Source Water Protection Standard.

Action:

- 1. Create a two-part voluntary, on-site, individual source water protection education and training program for water utilities composed of a brief mentoring program and a more comprehensive training and audit program.**

The Roadmap envisions a two-part program for providing education and training for individual utilities. First, a *mentoring* program should be developed and coordinated by an ad hoc committee of state source water protection managers, AWWA section representatives, and utility staff (or some subset of these). The mentoring program would give utilities the opportunity to learn from other more-experienced utilities about source water protection. Experienced utilities are often willing to share their knowledge, and mentored utilities may learn and benefit from ideas they get from the mentoring utilities. In general, there is a trust factor built into utility-utility relationships that does not exist between utilities and regulating agencies or consultants. If this effort is made, organizers should be aware of the possible impediment that many AWWA sections do not have a committee specifically related to source water protection.

The second part of this program would involve a more detailed *training and audit* for a participating utility's source water protection program. In this case, an outside source water protection professional would provide substantial guidance to the participating utility on how to identify appropriate goals and how to achieve those goals. Qualified consultants or utility employees could conduct the training and audits. For utilities that are in the early stages of developing a source water protection program, this would provide a comprehensive training exercise that would provide guidance to help those utilities do so in a manner that should achieve the criteria of the AWWA Source Water Protection Standard. In this manner, it is possible that the audit component could be similar to the Source Water Protection Standard recognition process that is currently being developed by AWWA. Further, the mentoring/training/audit program could potentially be used in coordination with a tiered acknowledgment system, like the one proposed in the Recognition section below. In that way, the utilities would receive some form of visible acknowledgment of their efforts. The ultimate vision is to create a volunteer-based source water protection version of a program akin to the Partnership for Safe Water program (i.e., a unique cooperative effort between USEPA, American Water Works Association, Association of Metropolitan Water Agencies, National Association of Water Companies, and Association of State Drinking Water Administrators).

Ideally, the source water protection mentoring and training/audit programs will be operational within five years. While the mentoring program would be provided free to participating utilities, participants would pay a fee for the training/auditing process.

Obstacle: Water utility personnel do not sufficiently understand the potential impacts of several contaminants/actions on source water quality and how to protect source waters to minimize those impacts.

Action:

1. USEPA, states and ASDWA, AWWA, NRWA, NRCS and other appropriate organizations should provide more information, education and guidance on how to manage watersheds and aquifers regarding the following:

- pharmaceuticals and personal care products (including endocrine disruptors)
- other emerging contaminants
- microbial contamination from livestock activities and other sources
- intentional contamination
- disinfection byproduct precursors
- accidental spills of hazardous materials
- climate change
- invasive species

Increase Recognition

Obstacle: There is insufficient acknowledgment and recognition of the efforts being made by water utilities and their partners who are actively pursuing source water protection.

Actions:

1. A plan should be developed by 2012 for an award program to recognize and acknowledge successful, high-quality source water protection programs.

The program could include a tiered recognition system acknowledging source water protection efforts being made by individual utilities. Successful implementation of the AWWA Source Water Protection Standard and the criteria of the AWWA Exemplary Source Water Protection Award could be considered an element of the highest tier of this recognition system. As part of this planning effort, there should be a clearly defined path to its implementation. Some recommended participants in this effort are the AWWA Source Water Protection Committee, NRWA, Groundwater Foundation, and other appropriate organizations. State and regional chapters of AWWA are encouraged to promote the program.

Obstacle: There is no consistent recognition of source water protection as an important element in regional/state/local planning and land management decision-making.

- Source water protection is often not considered in state/local land use planning decisions because of a lack of connection between land use manager/professional and water quality and quantity manager/professional.
- The multi-dimensional fragmentation of land management at different jurisdictional levels, geography, and hydrology has made it difficult to take source water protection into consideration during land use planning and management.

Actions:

1. On the National Scale: Obtain nationwide awareness among key land use planning and management organizations (e.g., American Planning Association, National Association of Towns and Townships, and National Association of Counties).

- Water utilities should develop and implement their source water protection programs in a way that provides useful information to land use planning partners.
- Water utilities and appropriate organizations should engage in national meetings or summits of land use organizations to present the importance of source water protection.
- Water utility representatives and organizations should work with planning representatives to develop and provide source water protection checklists and templates, information-sharing websites, and source water quality and quantity data.
- Water utilities can publish articles on source water protection in land use planning and management professional and trade journals.
- Data sharing opportunities should be created and promoted with other governmental agencies, land use planners, and stakeholders (e.g., non-governmental organizations (NGOs), trade groups, and builders) regarding the protection of source water at the national level.
- Utilities may need to receive training on how to engage in local and regional planning effectively.

2. On a Watershed/Aquifer Scale: Develop watershed/aquifer councils of governments and/or partner with non-governmental organizations such as watershed associations to facilitate natural-system based land and source water planning efforts.

- Data sharing opportunities should be created and promoted with other governmental agencies and stakeholders (e.g., NGOs, trade groups, and builders) regarding the protection of source water at the watershed or aquifer level.
- Water utilities can prioritize importance of land to their source water at the watershed and aquifer scale.
- Water utilities should network with appropriate land use and land management organizations through social media and networking, and other mechanisms.
- State source water protection agencies should increase the depth of their programs to convey the importance of source water protection to land use planners and managers.

3. On the Interstate Scale: Develop interstate and trans-boundary waterway commissions to facilitate land and source water protection across state boundaries.

- Based on the experience gained from national and watershed/aquifer levels, water utilities should become key stakeholders in the formulation of interstate and river commissions to deal with interstate jurisdictional issues through effective communication and partnering.
- Water utilities should use lessons learned from ORSANCO, Delaware River Basin Commission, and other existing interstate river commissions.

Social media and networking (e.g., the Internet, mobile based technologies, blogs, social networks, podcasts, webcasts) should be used to promote source water protection at the various spatial scales.

4. Water utilities should encourage local and state legislative bodies to pass a resolution recognizing that source water protection is important.

This kind of legislation can be used as a building block to encourage funding and further legislative support related to source water protection. A template should be developed that water utilities can use to assist their local elected officials with developing source water protection resolution. There should be a way to promote this tool. Local AWWA sections could be a productive forum for educating water utilities and distributing information about this effort. While such legislation may not always carry with it a specific mandate to plan and act, it is a way for source water protection to be formally recognized as important and can an important hortative device to encourage greater attention and action.

CHAPTER 3

RECOMMENDATIONS FOR HOW TO PROCEED

While States continue to make progress implementing source water protection strategies, the USEPA Office of the Inspector General (OIG) has identified several obstacles that hinder State efforts to protect source water. Despite USEPA's best efforts, the program remains vulnerable (USEPA 2005d). For the Source Water Assessment Program and Source Water Protection Program to support drinking water protection over the long term, USEPA needs to develop a more secure and consistent funding source. States and local entities will also have to rely strongly on intra- and inter-agency coordination, program integration, partnerships, and collaborative efforts to leverage human and financial resources, technical assistance, and outreach to utilities and communities. The OIG report further recommended for USEPA to (1) Issue a public statement to re-affirm that the Source Water Assessment and Protection Programs are a priority for USEPA; (2) encourage States to target assessments not only to utilities, but also to local governments, councils, planners, building and zoning officials, and other stakeholders; (3) provide guidance to States on how to leverage financial and technical resources from other USEPA programs, partners, and stakeholders; (4) continue to improve cooperation and coordination between States and USEPA assistance contractors; and (5) work with Regions and



States to (a) integrate environmental programs and (b) determine how best to disseminate locally-applicable best practices for contaminant source management and motivation.

It should be pointed out that apart from the Water Research Foundation, AWWA, and WERF, various activities have been carried out by other organizations such as ASDWA and GWPC, the two organizations composed of state personnel most involved in drinking water source protection. Over the past

decade, ASDWA and GWPC have worked together to host source water protection forums during their annual meetings, have supported the Source Water Collaborative in providing state perspectives on source water protection, and have participated in source water protection projects. Given the collaborative nature of source water protection efforts, the role of the States is crucial in the success of any source water protection programs (as illustrated in Chapter 2 of this report). States can provide leadership and resources to support water utilities in the development of their source water protection plans and programs, using their intimate local knowledge and their experience obtained through the source water assessment efforts. As efforts move forward, decision-makers should bear in mind how the actions identified in the roadmap

can be carried out so they most effectively integrate with source water protection efforts being made by States and these supporting organizations.

As mentioned earlier, the result of the Source Water Protection Research Planning Workshop (Water Research Foundation 2008) was a research agenda categorized into three topic areas: Characterization and Monitoring; Tools and Control Strategies; and Planning and Program Management. The project presented in this Foundation report addresses the first two steps of the Planning and Program Management topic area group's five-year research plan, namely 1) the development of a roadmap to develop a unified strategy for source water protection and 2) development of the unified strategy for source water protection. The two remaining steps in the research plan are to develop a framework for adopting the unified strategy and formulate a decision-making process and tools for implementing that unified strategy. In this brief chapter, a few preliminary suggestions, informed by the findings of this project, are provided for consideration as these next steps are taken.

Both a top-down and a bottom-up approach are crucial in making source water protection a reality. A top-down approach would involve the establishment of a flexible roadmap or framework to guide local entities (e.g., water systems, watershed organizations, and regional planning agencies) to work together to protect source water. Again, given the variability of source water and the areas from which they are derived, along with technical, social, political, financial, and regulatory differences across jurisdictions, it is unlikely that two source water protection programs would be the same. Therefore, a bottom-up approach using the local information and with broad stakeholder involvement would produce a "tailored" source water protection program to address unique issues at the local level. In summary, it would be essential to approach source water protection from both directions.

TOP-DOWN APPROACH

It is essential to increase the awareness and recognition of source water protection at the national level. Education of decision makers, utility managers, stakeholders, and the general public should be the first step in moving source water protection on the path to success. The use of social media and networking, along with the deployment of an educational campaign on the importance of source water protection (as a preventative approach to safeguard our drinking water and public health) could increase public awareness regarding the value and importance of source water protection. Leadership is needed to make this a national priority.

With an increased level of awareness and recognition of the value of source water protection, it would be more feasible to obtain resources to set up the national coordination organization to develop and disseminate data and tools to water utilities and local organizations to develop site-specific source water protection programs. These tools would address technical, social, and media issues related to source water protection. They will also facilitate the collaboration across multiple organizations and agencies at various levels and with varying objectives.

At the national level, therefore, the following programs should be developed to increase awareness of the importance of source water protection:

- Develop a system for providing awareness, outreach and education to key decision-makers and the general public (including schools) as to the importance and values/benefits of source water protection. [Note: Similar to the ENERGY STAR and

Water Sense programs, source water protection program can benefit from a systematic and broad base outreach and education program at the national level.]

- Fix gaps to improve integration of Clean Water Act (CWA) regulation and source water protection. A number of national organizations such as USEPA, NRCS, AWWA, GWPC, WEF, and NRWA can work together to assess and revise key regulations and water quality standards to protect source water.
- Create a national source water protection coordinator position. Leadership should be established where someone would be responsible for coordinating with relevant organizations and promoting source water protection efforts for drinking water utilities nationwide, and for helping to assure that the components of this roadmap are addressed. This source water protection coordinator should be independent and report to a consortia committee.
- Achieve nationwide recognition of source water protection efforts among key land use planning and management organizations (e.g., American Planning Association and National Association of Counties).
- USEPA, states and ASDWA, AWWA, NRWA, NRCS and other appropriate organizations should provide more information, education and guidance on how to manage watersheds and aquifers regarding emerging issues and other source water protection issues.
- Develop interstate and trans-boundary waterway commissions to facilitate land and source water protection across state boundaries.

BOTTOM-UP APPROACH

At the local level, the following programs should be developed to increase awareness of the importance of source water protection:

- Create an on-site, individual source water protection mentoring and training/audit program for water utilities. The training/audit component could be used in coordination with a tiered recognition system. The ultimate vision is to create a volunteer-based source water protection version of a program akin to the Partnership for Safe Water program.
- Build upon the existing source water assessments for updating the assessments and moving forward to protection; leverage current CWA and other state and federal regulations and programs more effectively to improve protection of drinking water sources. State organizations and non-governmental organization (NGO) sections can educate and train utilities on how to leverage various CWA programs for funding and regulation.
- Water utilities should encourage local and state legislative bodies to pass a resolution recognizing that source water protection is important.
- Develop watershed/aquifer councils of governments and/or partner with NGOs such as watershed associations to facilitate natural system based land and source water planning efforts.

ABBREVIATIONS

ASDWA	Association of State Drinking Water Administrators
AWWA	American Water Works Association
CWA	Clean Water Act
GWPC	Ground Water Protection Council
NGO	non-governmental organizations
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service (part of USDA)
NRWA	National Rural Water Association
OIG	USEPA Office of the Inspector General
SDWA	Safe Drinking Water Act
SWAP	Source Water Assessment Program
USEPA	United States Environmental Protection Agency
WEF	Water Environment Federation
WERF	Water Environment Research Foundation



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