

Safe Drinking Water Hotline 1 (800) 426-4791

www.epa.gov/safewater

EPA Office of Ground Water and Drinking Water

For More Information

Consider the Source: A Pocket Guide to Protecting Your Drinking Water

Drinking Water Pocket Guide #3



United States
Environmental Protection
Agency

Cover Photo: The Kakagon Sloughs is located in northern Wisconsin, on the Bad River Chippewa Indian reservation. The Tribe depends on its waters for wild rice harvesting, fishing, and hunting. The integrity of this wetland is also important to drinking water sources in Lake Superior's Chequamegon Bay region. — USEPA Region 5, Great Lakes National Program Office.

Office of Ground Water and
Drinking Water (4606-M)
EPA 816-K-02-002
www.epa.gov/safewater
June 2002

Printed on Recycled Paper

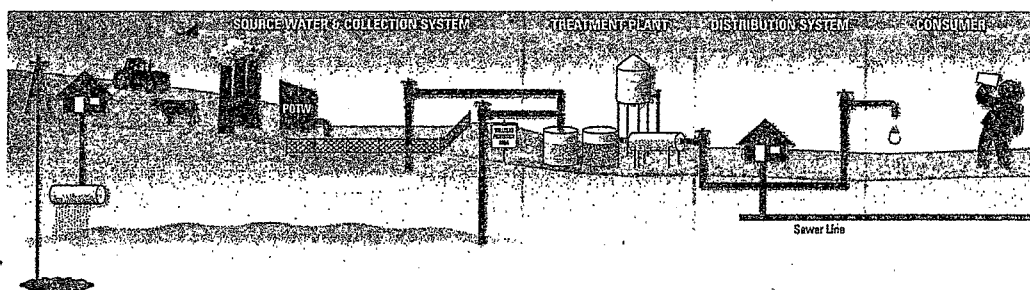
Table of Contents

I. Introduction	1
II. Ensuring Safe Drinking Water Through the Multiple-Barrier Approach	2
III. SDWA and the Source Water Assessment and Protection Program	5
IV. Tools, Resources, and Actions Useful In Protecting Your Drinking Water Supplies	17
V. Additional Resources Available Under the Clean Water Act	20
VI. Financing for Source Water Assessment and Protection Programs	23
VII. The Underground Injection Control (UIC) Program and SWAP	26
VIII. SWAP Milestones	28
IX. Best Management Practices (BMPs) Available for SWPAs	29
X. Glossary	44
XI. Contacts	46

I. Introduction

Virtually every stream, lake, river and aquifer in this country is used as a drinking water source. Protecting these source waters from contaminants is a major national priority in protecting public health through ensuring a clean, safe drinking water supply. Reducing the threat of waterborne illnesses helps save hundreds of millions of dollars annually by eliminating costly health care expenses, lost wages, work absences, decreased job productivity, and additional treatment costs incurred by Public Water Systems (PWSs) required to meet federal drinking water quality standards. The Source Water Protection Program, authorized by the 1996 Amendments to the Safe Drinking Water Act (SDWA), outlines a comprehensive plan to achieve maximum public health protection. According to the plan, it is essential that every community take these six steps:

- **DELINEATE** your drinking water source protection area
- **INVENTORY** known and potential sources of contamination within these areas
- **DETERMINE THE SUSCEPTIBILITY** of your water supply system to these contaminants
- **NOTIFY AND INVOLVE THE PUBLIC** about threats identified in the contaminant source inventory and what they mean to their PWS.
- **IMPLEMENT MANAGEMENT MEASURES** to prevent, reduce, or eliminate threats
- **DEVELOP CONTINGENCY PLANNING STRATEGIES** to deal with water supply contamination or service interruption emergencies



II. Ensuring Safe Drinking Water Through the Multiple-Barrier Approach

Whether your tap water comes from surface or ground water, all drinking water sources are vulnerable to a variety of contaminants from a variety of activities. The origin of contaminants might be in your neighborhood or many miles away. When rain falls or snow melts, it picks up and carries away pollutants, depositing them into lakes, rivers, wetlands, coastal and even underground sources of drinking water. Because we know these activities have the potential to

contaminate the source of our drinking water, we have created four major barriers to protect our source water from contamination. Preventing pollution is critical to protecting drinking water from contamination and reducing the need for costly treatment. Community involvement and individual action are key to providing a safe supply of drinking water.

Risk Prevention Barrier

The best way to protect drinking water is to keep contaminants from entering source water. Multiple federal, state, and local laws and programs and individual action help communities identify the sources of drinking water and potential threats. This work enables communities to take appropriate steps to protect the watershed.

Risk Management Barrier

The public water system is the first line of defense to reduce or eliminate contaminants in source water. The Safe Drinking Water Act, which regulates these systems, develops standards and guidance to help them reach the goal of providing safe and reliable drinking water. They must collect and treat water, hire trained and qualified operators and have an emergency response plan in case of natural disaster or terrorist attack.

Risk Monitoring and Compliance Barrier

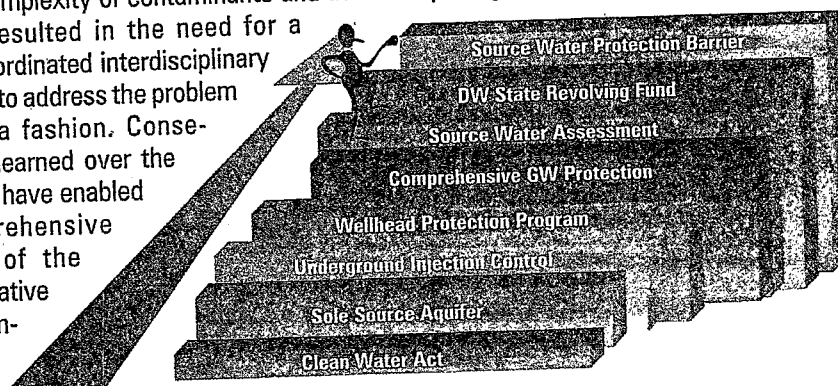
Dealing effectively with risks to drinking water requires constant evaluation of the water quality. Water is monitored at the source; at the treatment plant, after it has been treated and disinfected; at the distribution system, which delivers water through pumps and pipes to your home; and in some cases, at the consumer's tap. If systems have difficulty meeting regulations and providing safe, reliable drinking water, assistance can be provided to help them. If all this fails, enforcement action can be taken against the system.

Individual Action Barrier

Constant vigilance to protect water before it becomes your drinking water is essential and involves all of us. An informed, involved and supportive public is the foundation of drinking water protection. What we do in the watershed can directly impact the quality of water that arrives at the treatment plant. The more you know about drinking water, the better equipped you are to help protect it. See what you can do in the next section, titled, "What You Can Do to Protect Your Drinking Water."

III. SDWA and the Source Water Assessment and Protection Program

Originally created in 1970, EPA's primary mission was to address the potential risks to public health posed by a variety of sources polluting our air and water, and initial program efforts within the agency focused on individual threats from unique, discreet sources. Since then an understanding of the complexity of contaminants and activities posing threats has increased dramatically, and has resulted in the need for a combined and coordinated interdisciplinary approach in order to address the problem in a cross-media fashion. Consequently, lessons learned over the last two decades have enabled a more comprehensive understanding of the concept of cumulative risk (e.g., net impact from many



media such as air, water, and land uses) and we have modified preventive programs to meet those changing needs.

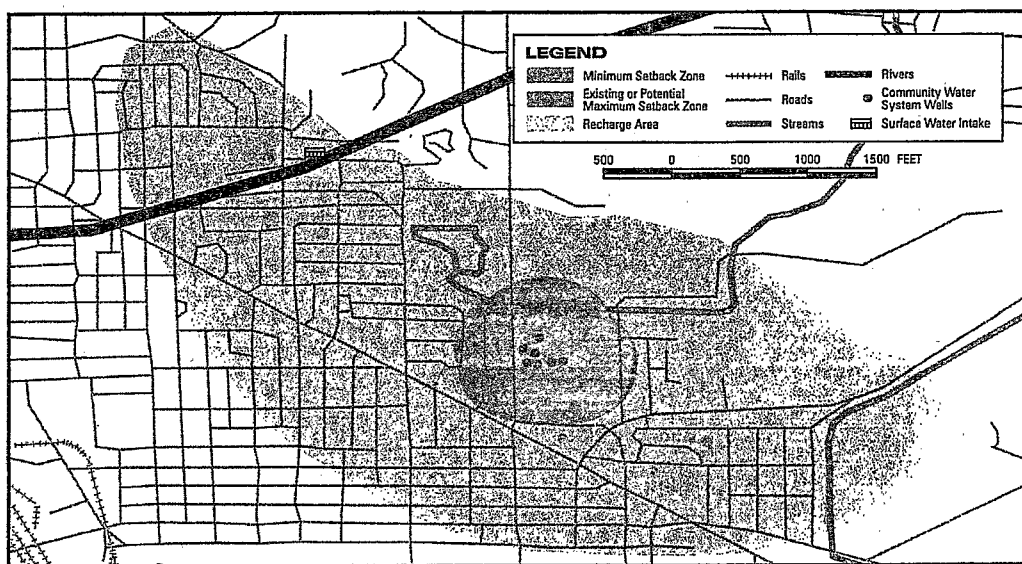
The 1996 amendments to the Safe Drinking Water Act (SDWA 1996) established EPA's Source Water Assessment and Protection Programs. They are the Agency's newest programs targeted at providing clean safe drinking water, but they build on programs developed to carry out EPA's original mission. Congress recognized the need for a more comprehensive and integrated approach to the problem of cumulative risk reduction, and SDWA 1996 mandated specific program elements to address the areas of risk identification (delineation and source inventories), risk ranking and screening (susceptibility analyses), risk management measures (prevention programs), and preparation for unexpected drinking water supply replacement emergencies (contingency planning).

The SDWA Amendments of 1996 outline six steps for prevention programs to protect and benefit public drinking water systems. Together, they form the basis of comprehensive drinking water source protection.

• **STEP 1 – DELINEATE** the Source Water Protection Area (SWPA).

PURPOSE: Delineating the SWPA shows the area to be protected and prescribes the boundaries of the area from which drinking water supplies are drawn.

This step also designates the area within which contaminant source inventories are conducted, identifying substances or activities that may pose potential risks to the drinking water supplies within that area. Delineations may be performed using a variety of accepted methods (e.g., calculated fixed radius; computer modeling, etc.), and are most protective when they include all sources of water and potential contaminants and activities affecting them within the prescribed area.



This map shows the delineation of a Source Water Protection Area.

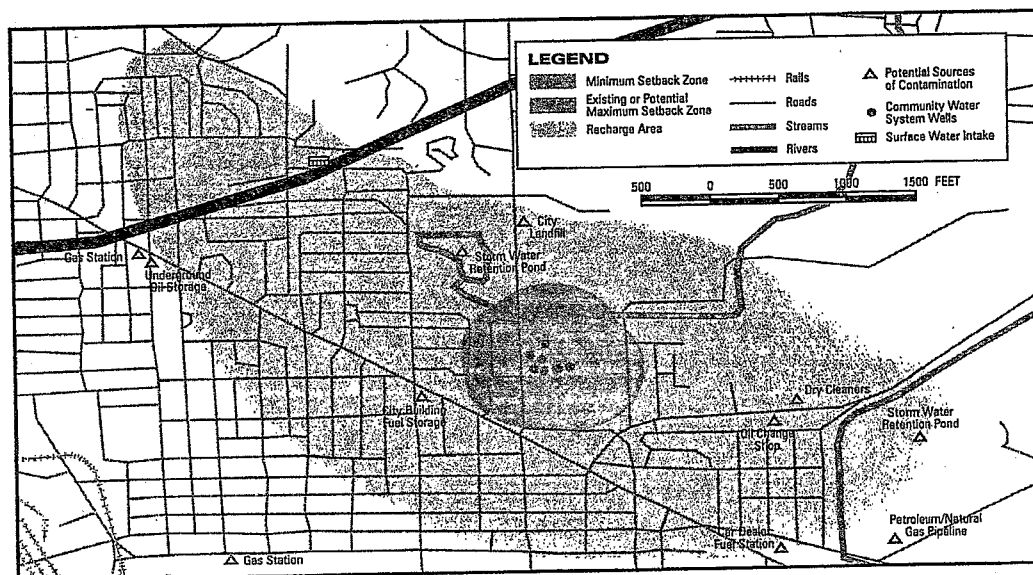
• **STEP 2 – INVENTORY** known and potential sources of contamination.

PURPOSE: The source inventory lists all documented and potential contaminant sources or activities of concern that may be potential threats to drinking water supplies.

The source inventory indicates the level of concern assigned to each potential risk by ranking, rating, or prioritizing management measures to reduce or eliminate them.

A contaminant source list may look like this:

Potential Contaminant/Activity	Threat or Risk	Level of Concern
Agricultural Crop Spraying	Excess amounts of material or improper application methods	Low to moderate, depending on proximity to source waters
Industrial Waste Disposal Wells (e.g., Class V Wells)	Introduction of chemicals directly into or above USDWs	Moderate to high, depending on surrounding hydrogeology
Storm water runoff; car washes; service stations	Introduction of contaminants into ground or surface water	Low to moderate, depending on type of surrounding facilities (e.g., parking lots) and proximity to source waters.



This map inventories known and potential sources of contamination.

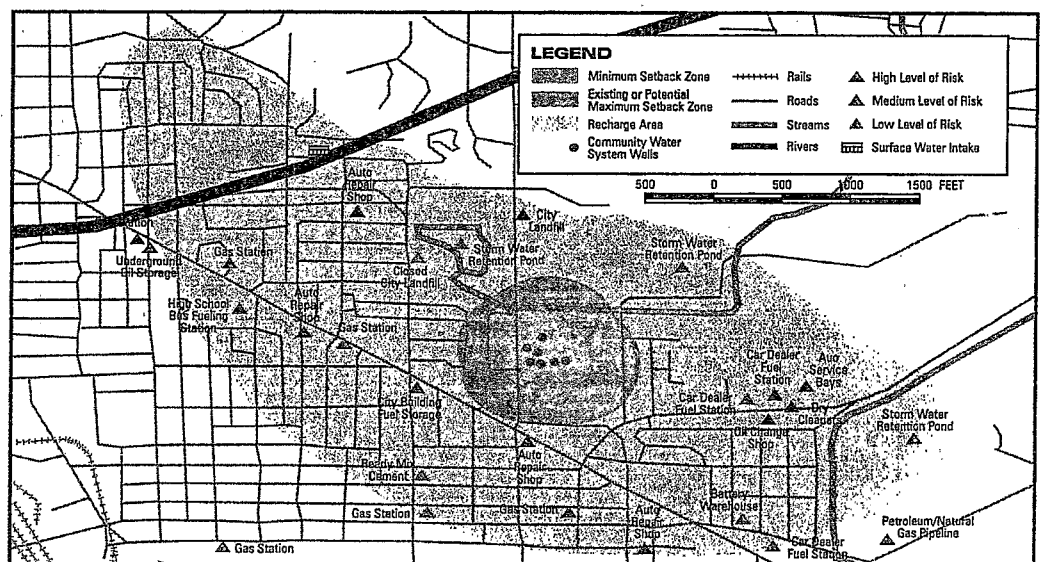
- **STEP 3 – DETERMINE THE SUSCEPTIBILITY** of the PWS to contaminant sources or activities within the SWPA.

PURPOSE: Determining susceptibility of the PWS to inventoried threats relates the nature and severity of the threat to the likelihood of source waters serving that system being contaminated.

Mitigating factors taken into account when determining susceptibility include potency or toxicity of the contaminant, volume of discharge or release, distance from wells or intakes, and the likelihood of entry of the contaminant into the source waters.

A susceptibility determination for an individual PWS may look like this:

Contaminant/ Activity	Level of Concern	Risk Reducing Factors	Susceptibility Rating
Leaking Underground Storage Tanks	High	Remove or Repair Tanks	High
Concentrated Animal Feeding Operations	Moderate	New/Upgraded Facility and Equipment	Low
Road Salt Storage Shed	Moderate	Diked facility with berms	Moderate



This map rates the susceptibility of a PWS to inventoried threats.

- **STEP 4 – NOTIFY AND INVOLVE THE PUBLIC** about threats identified in the contaminant source inventory and what they mean to their PWSs.

PURPOSE: To ensure that the public has information necessary to control and modify their own actions to prevent contamination and to participate effectively in community activities to protect drinking water.

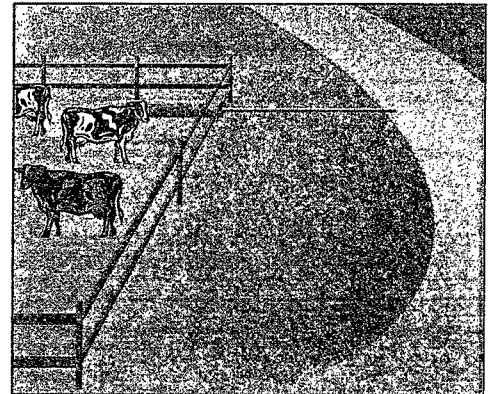
- Use plain English in reports
- Provide maps of the SWPA
- List, show or indicate potential sources/threats to the PWS identified within the SWPA
- List, rank, or otherwise prioritize importance of threats identified to the individual PWS and explains what it means to your water supply
- Reports are unique to each individual PWS
- Public meetings are effective methods of involving the community.

- **STEP 5 – IMPLEMENT MANAGEMENT MEASURES** to prevent, reduce, or eliminate risks to your drinking water supply.

PURPOSE: Using the information gathered from the assessments allows specific management measures to be formulated and put in place. By examining the results of the contaminant source inventory and the susceptibility determination for each PWS, these measures can be tailored to address each threat or array of risks specific to each PWS.

A successful drinking water contamination prevention plan is tailored to the unique concerns and circumstances of the local community. Effective involvement is a critical component to a successful public health plan.

- Every PWS's source water is unique.
- Management measures need to tailor local actions to address threats to your water supplies.



- Early involvement in the source water protection process and consensus on need for action is essential — you can help!
- Many players make for broad application and coverage of management strategies that bring the best individual programs into play.
- Some key players and tools are:
 - local business communities
 - media
 - parent-teacher associations
 - citizen activists
 - state, county, and local governments
 - sanitary surveys
 - zoning regulations
 - voluntary best management practices (BMPs)

• **STEP 6 – DEVELOP CONTINGENCY PLANNING STRATEGIES** to deal with water supply contamination or service interruption emergencies.

PURPOSE: In the event of short- or long-term water drinking water supply disruption as a result of natural causes (e.g., biological contamination or floods) or intentional destruction (e.g., vandalism or terrorism), water supply replacement strategies that coordinate all available efforts to restore service to single or multiple PWSs are an indispensable part of any drinking water protection program.

- Outline emergency plans for short or long-term drinking water supply replacement
- Direct plan towards water supply interruption due to contamination or physical damage to supply system
- Coordinate the efforts of water supply managers with those of civil defense, local emergency response, hazmat/spill cleanup, and local area disaster response networks

IV. Tools, Resources, and Actions Useful In Protecting Your Drinking Water Supplies

The Safe Drinking Water Act provides for a number of resources to help local communities protect their drinking water:

- **Source Water Assessments** — States are required to complete source water assessments for every public water supply in the U.S. Congress provided for funds under Section 1453 through the Drinking Water State Revolving Fund (DWSRF) for support.
- **Drinking Water State Revolving Fund Set Asides** — States may set aside funds under 1452(g) from the DWSRF up to 10 percent of a state's allotment for the DWSRF to administer or provide technical assistance. States must match, dollar-for-dollar, the 10 percent set aside (see Section VIII).
- **Drinking Water State Revolving Fund Set Asides** — States may set aside funds under 1452(k) from the DWSRF up to 15 percent of the state's capitalization grant for more than one of several source water protection activities (i.e., land acquisition/easements, voluntary protection and petition activities, source water assessments and well head protection).
- **Wellhead Protection** — Each state must establish a program under Section 1428 to protect the land areas around water supply wells from contaminants that may enter the ground water and adversely affect human health.
- **Source Water Petition Program** — A state may establish a source water protection partnership petition program under 1454 of the Act designed to assist in the local development of a voluntary, incentive-based partnership between water supplies and community members. States can use DWSRF funds for loans to water supplies to implement local programs.
- **Water Conservation Planning Guidelines** — EPA issued guidelines under Section 1455 for water conservation plans for public water systems. States may require systems to submit water conservation plans as a condition of receiving a DWSRF loan.
- **Sole Source Aquifer Protection** — Entities may petition EPA for protection of an aquifer that is the sole or principal source of drinking water for 50 percent or greater of the local population served (see "Petition's Guidance for Sole Source Aquifers", EPA 44016-87-003 Feb. 1987).
- **State Underground Injection Control Programs** — EPA must review applications under Section 1422 of the Act for state or tribal primacy (primary enforcement responsibility). Approved programs will be adopted by the state or tribe, which will promulgate rules to ensure non-endangerment of drinking water sources.

- **Oil and Gas Programs** — Section 1425 of the Act allows EPA approval of existing state oil and gas programs if the state can show that the program is effective in preventing endangerment of drinking water supplies.
- **More Information** — "State Source Water Assessment and Protection Program Guidance" (EPA 816-R-97-009 Aug. 1997) on www.epa.gov/safewater/Pubs/index.html discusses these and other statutes and provisions pertaining to Source Water Assessment and Protection.

V. Additional Resources Available Under the Clean Water Act

The Clean Water Act was established by Congress in 1972 and is the primary federal law that protects our nation's waters, including lakes, rivers, aquifers and coastal areas. The Clean Water Act's primary objective is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals: eliminate the discharge of pollutants into the nation's waters, and achieve water quality levels that are fishable and swimmable.

- **Federal Assistance to States** — Under Section 106 of the Act, EPA may provide money to states (including territories, the District of Columbia, tribes) and interstate agencies to establish and implement ongoing water pollution control programs, including ground water programs.
- **Water Quality Standards** — Under Section 303(C)(1) define water quality goals for a water body by designating the use of the water, setting criteria to protect those uses, and setting anti-degradation provisions for the water body. States must update their water quality standards every three years.

New and revised water quality standards "shall be submitted" to EPA for review. Under Section 303(c)(2) of the Act, water quality standards "shall consist of" designated uses and water

quality criteria. In setting water quality standards, states shall consider the use and value of public water supplies.

- **Point Source Effluent Limits, or Total Maximum Daily Loads (TMDLs)** — Under Section 303(d), States "shall identify those waters for which" the point source effluent limits [see §§301 (b)(1)(A)-(B)] are not stringent enough to implement a water quality standard, and establish a ranking of such waters taking into account the severity of pollution and the uses made of such waters.

Section 303(d)(1) provides for the establishment of TMDLs for pollutants that EPA has listed under §304(a)(2) as "suitable for such calculation." States shall set the TMDLs "at a level necessary to implement the applicable water quality standards with seasonal variation and a margin of safety taken into account."

Section 303(d)(2) requires States to submit to EPA for approval "from time to time" their list of impaired and threatened waters and the TMDLs they have established for those waters.

- **The National Water Quality Inventory Report to Congress** — Under 305(b) States must report to EPA on the quality of their waters.

- **Publishing of TMDLs** — 304(a)(2) of the Act requires EPA to publish information on, "and the identification of, pollutants suitable for maximum daily load measurement correlated with the achievement of water quality objectives."

- **NPS Program** — States must 1) conduct statewide assessments of their waters under Section 319 to identify those that were either impaired or threatened because of NPSS; 2) develop NPS management programs to address the impaired or threatened waters.

Under 212, 319, and 320, funding is provided through the Clean Water State Revolving Fund (CWSRF) — funding is provided for non point source, point source and estuary source water protection projects, depending on priorities determined by each State.

- **Dredge and Fill** — Section 404 regulates the discharge of dredged or fill material into waters of the U.S.
- **NPDES Program** — The National Pollutant Discharge Elimination System Program — regulates point source discharges to surface waters under Section 402 of the Act.

VI. Financing for Source Water Assessment and Protection Programs

There are two major avenues of funding for the drinking water source water assessment and protection programs. They are the Drinking Water State Revolving Fund (DWSRF) and the Clean Water Act State Revolving Fund (CWSRF).

Section	Description
SDWA 1452	The 1996 Amendments to the Safe Drinking Water Act authorized the DWSRF to assist public water suppliers to finance the cost of infrastructure needed to achieve or maintain compliance with SDWA requirements and to protect public health. In addition, states may use a portion of their capitalization grants to fund various state and local water systems management programs and projects including SWP activities. States may elect to use up to 31 percent of the funds available to them under Section 1452 for eligible "set-aside" activities. The DWSRF program has made available billions of dollars in assistance since 1997 to finance infrastructure improvements for drinking water utilities. States have also reserved \$575 million from the

\$3.6 billion in federal grants they have received to fund other programs and activities that support their drinking water programs through these "set-asides;"

CWA 106; 319	Subchapter VI of the CWASRF provides a powerful partnership between EPA and the states, providing states with the flexibility to fund projects that will address the highest priority water quality needs (see Sections 601-607). CWA funds may be used to fund certain source water protection activities, and cost savings can be realized through combining SWP and CWA efforts. CWASRF loans can be used for watershed protection; funds allocated under Section 106 of the Act may be set aside for state ground water programs, and Section 319 funds, which are aimed at non-point source pollution prevention, may also be used for source water protection. Nationally, the CWSRF program has more than \$37 billion in assets and has provided \$34 billion in assistance since 1988. The CWSRF program currently funds nearly \$4 billion annually in water-quality related projects, including more than \$1 billion to fund projects addressing non-point sources of pollution that can often negatively impact sources of drinking water.
---------------------	---

In addition to federal resources, these tools bolster protection at the local level.

- **Education:** Consumer awareness and citizen advocacy highlight the problem
- Voluntary **Best Management Practices (BMPs):** Once individuals understand they may be part of the problem, they also understand they can be part of the solution
- **Sanitary Setbacks** are prescribed by local health codes for the placement of individual private waste disposal systems (septic tanks) and community waste-treatment systems.
- **Zoning** has proven to be a very powerful tool in preventing siting of potential contaminant threats or activities adjacent to public drinking water supply source waters

VII. The Underground Injection Control (UIC) Program and SWAP

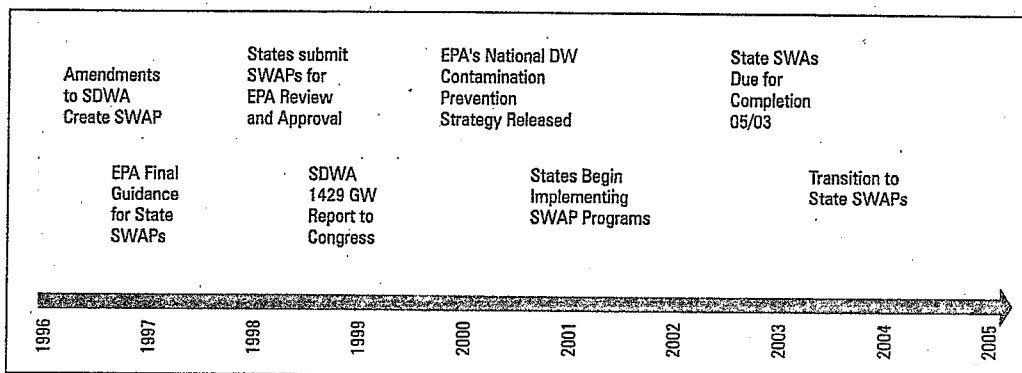
The UIC program is a crucial component of the source water assessment and protection program, because it identifies, permits, and regulates the design, siting, operation, and maintenance of injection wells that are designed to dispose of waste underground. It is the major federal and state program to control some 800,000 wells with the potential to contaminate drinking water sources if not properly managed. The program identifies, as such, these wells are considered potential contaminant sources in any source water assessment and protection program contaminant source inventory. For example, all new motor vehicle waste disposal wells (e.g., service station bay floor drains) and all new large-capacity cesspools (e.g., serving multiple dwellings or single units serving more than 20 persons per day) were banned as of April 2000. The Safe Drinking Water Act requires EPA to provide safeguards so that injection wells or other similar conveyance systems do not endanger current and future underground sources of drinking water (USDWs).

Through the UIC program, EPA has developed minimum federal standards to regulate wells that range from deep, technically-sophisticated and highly-monitored wells, to shallow on-site drainage systems such as septic systems, cesspools, and storm water drainage wells. These require-

ments also cover wells that discharge a variety of hazardous and nonhazardous fluids above, into, or below aquifers. A comprehensive description of the five different classes of UIC wells may be found in "Protecting Drinking Water Through Underground Injection Control," EPA 816-K-02-001.

EPA's main concern relative to the source water assessment and protection program is the large inventory of Class V UIC wells — typically shallow on-site drainage systems such as septic systems, cesspools, and storm water drainage wells. They are a concern because their simple construction provides little or no treatment of the injected fluids. There are more than 500,000 Class V wells in operation. Some examples are agricultural drainage wells, aquifer recharge and aquifer storage and recovery wells, industrial waste disposal wells, large capacity cesspools, large capacity septic systems, motor vehicle waste disposal wells, and storm water drainage wells. There are many other subcategories of Class V wells.

VIII. SWAP Milestones



The focus of many of EPA's efforts in the 1990s shifted from a cleanup and remediation-oriented approach to one of prevention. In the next few years, citizens, local, state, tribal, and federal officials will work together to collect information and take action to protect our precious drinking water sources. Because of the changing nature of potential threats and local needs, communities will need to periodically revise their strategies.

In addition to federal resources, these tools bolster protection at the local level.

- **Education:** Consumer awareness and citizen advocacy highlight the problem
- Voluntary **Best Management Practices (BMPs):** Once individuals understand they may be part of the problem, they also understand they can be part of the solution
- **Sanitary Setbacks** are prescribed by local health codes for the placement of individual private waste disposal systems (septic tanks) and community waste-treatment systems
- **Zoning** has proven to be a very powerful tool in preventing siting of potential contaminant threats or activities adjacent to public drinking water supply source waters

VII. The Underground Injection Control (UIC) Program and SWAP

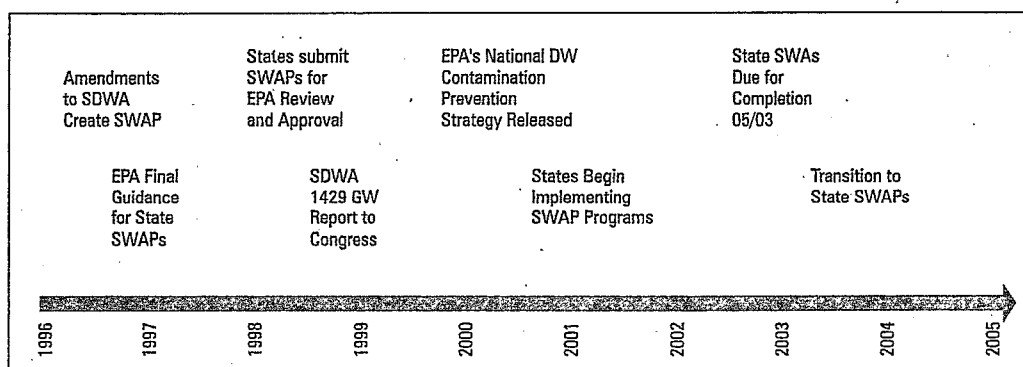
The UIC program is a crucial component of the source water assessment and protection program, because it identifies, permits, and regulates the design, siting, operation, and maintenance of injection wells that are designed to dispose of waste underground. It is the major federal and state program to control some 800,000 wells with the potential to contaminate drinking water sources if not properly managed. The program identifies, as such, these wells are considered potential contaminant sources in any source water assessment and protection program contaminant source inventory. For example, all new motor vehicle waste disposal wells (e.g., service station bay floor drains) and all new large-capacity cesspools (e.g., serving multiple dwellings or single units serving more than 20 persons per day) were banned as of April 2000. The Safe Drinking Water Act requires EPA to provide safeguards so that injection wells or other similar conveyance systems do not endanger current and future underground sources of drinking water (USDWs).

Through the UIC program, EPA has developed minimum federal standards to regulate wells that range from deep, technically-sophisticated and highly-monitored wells, to shallow on-site drainage systems such as septic systems, cesspools, and storm water drainage wells. These require-

ments also cover wells that discharge a variety of hazardous and nonhazardous fluids above, into, or below aquifers. A comprehensive description of the five different classes of UIC wells may be found in "Protecting Drinking Water Through Underground Injection Control," EPA 816-K-02-001.

EPA's main concern relative to the source water assessment and protection program is the large inventory of Class V UIC wells — typically shallow on-site drainage systems such as septic systems, cesspools, and storm water drainage wells. They are a concern because their simple construction provides little or no treatment of the injected fluids. There are more than 500,000 Class V wells in operation. Some examples are agricultural drainage wells, aquifer recharge and aquifer storage and recovery wells, industrial waste disposal wells, large capacity cesspools, large capacity septic systems, motor vehicle waste disposal wells, and storm water drainage wells. There are many other subcategories of Class V wells.

VIII. SWAP Milestones



The focus of many of EPA's efforts in the 1990s shifted from a cleanup and remediation-oriented approach to one of prevention. In the next few years, citizens, local, state, tribal, and federal officials will work together to collect information and take action to protect our precious drinking water sources. Because of the changing nature of potential threats and local needs, communities will need to periodically revise their strategies.

IX. Best Management Practices (BMPs) Available for SWPAs

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Septic Systems	<p>Improper siting, maintenance and use may contaminate both surface and ground water by percolation or runoff.</p> <p>Bacteria, protozoa, and viruses present in sanitary wastewater can cause gastrointestinal illness, cholera, hepatitis A and typhoid if consumed.</p>	<ul style="list-style-type: none"> • Establish proper siting criteria • Specify appropriate design and construction criteria • Establish operation and maintenance protocols ("Septic System Ground Water Protection" EPA, July 1986 GPO 1991-517-003-28046) • Analyze assimilative capacity of soils and receiving water to

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		<p>determine appropriate density of septic system units.</p> <ul style="list-style-type: none"> • Consider connecting to a public water system
Lawn and Garden Fertilizer	<p>Field leaching or runoff into surface and ground water.</p> <p>Nitrogen leaching into drinking water supplies at levels above MCLs may cause "blue baby syndrome" in infants under 6 months — life-threatening without immediate medical</p>	<ul style="list-style-type: none"> • Eliminate excess uses • Ensure proper application • Select appropriate fertilizer • Avoid application near wells used for drinking water, agricultural drainage wells; surface waters

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	<p>attention. Symptoms are shortness of breath and blue skin color.</p> <p>Phosphorus may affect taste and odor of drinking water and may require treatment.</p>	<ul style="list-style-type: none"> • Plant native plants and grasses requiring less fertilizer and water
Pet Waste	<p>Watershed runoff or direct contact can introduce wastes into drinking water supplies. <i>Cryptosporidium</i>; <i>Giardia lamblia</i>, <i>Salmonella</i>, and <i>E. coli</i> pose the greatest threats</p>	<ul style="list-style-type: none"> • Pick up after pets

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Pesticide Application (Large Scale)	<p>Runoff to surface waters due to rainfall or irrigation return flow. Soil injection threatens ground water sources.</p> <p>Possible health from exposure to large amounts of pesticides in drinking water over a long period of time include: effects include cancer, liver and kidney damage, reproductive difficulties, and nervous system effects.</p>	<ul style="list-style-type: none"> • Pesticide alternatives through Integrated Pest Management • Mix, load, and apply consistent with label directions • Reduce techniques such as soil incorporation, pre- and post-plant emergence applications, spot treatments; split applications • Proper storage and disposal

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		<ul style="list-style-type: none"> • Avoid application around wells used for drinking water, agricultural drainage wells, and surface water
Turfgrass/ Agricultural Fertilizer Application	<p>Field leaching or runoff into surface and ground water.</p> <p>Nitrogen leaching into drinking water supplies at levels above MCLs may cause "blue baby syndrome" in infants under 6 months — life-threatening without immediate medical</p>	<ul style="list-style-type: none"> • Utilize application rates and fertilizer types consistent with actual plant needs. • Time applications with periods of maximum crop uptake • Impede runoff by using tillage buffer strips, or filter strips

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	<p>attention. Symptoms are shortness of breath and blue skin color.</p> <p>Phosphorus may affect taste and odor of drinking water and may require treatment.</p>	<ul style="list-style-type: none"> • Store and dispose fertilizers properly • Avoid application near wells used for drinking water
Livestock and Poultry Waste	<p>High Nitrogen and pathogens (<i>Cryptosporidium</i>; <i>Giardia lamblia</i>, <i>Salmonella</i>, and <i>E. coli</i>) can enter both ground and surface water sources used for drinking water via runoff or percolation.</p>	<ul style="list-style-type: none"> • Prevent animal waste contact with water • Ensure proper land application of manure

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		<ul style="list-style-type: none"> • Avoid application near drinking water wells and surface waters • Use pasture management techniques such as fencing and planting legumes • Avoid siting animal waste lagoons near drinking water wells or flood plains • Use low-permeability lagoon liners • Aerobically compost horse manure

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		<ul style="list-style-type: none"> • Divert wildlife from sensitive areas by fencing, mowing, landscaping, tree pruning, and drainage devices
Sanitary and Combined Sewer Overflows (SSOs/CSOs)	<p>SSOs discharge untreated sewage through broken pipes, equipment failures and overloads</p> <p>CSOs discharge untreated sewage and storm water when system capacity is exceeded</p> <p>Contaminants are bacteria, molds, fungi, protozoa and helminths</p>	<ul style="list-style-type: none"> • Non-structural prevention methods such as visual inspections, monitoring and maintenance programs, employee training and public education • Consider structural prevention methods such as upgrading of collection

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	Chief threats are gastroenteritis, cholera, dysentery and infectious hepatitis	systems, wet-weather storage facilities; and new sewer collection systems
Injection Wells (UIC Program), Classes I-IV	Misuse or discharge of hazardous chemicals into Class V Wells	See companion Pocket Guide for descriptions of well classes and regulations that apply to each
Injection Wells (UIC Program), Class V	Injection of nonhazardous fluids into or above USDWs	(Available BMPs for selected representative examples below) See vehicle washing, small quantity chemical use, and underground storage tanks

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Storm Water Runoff — Rain or snow runoff carrying sediments and contaminants into surface or ground waters — Pathways include excess volume runoff from settling ponds, municipal storm drains, parking lots, truck stops, gas stations, airports (fuel and	Possible contaminants include gasoline, oil, automotive fluids, sediment, pesticides, nutrients, animal wastes, and hazardous wastes. Nationally, 77 of 127 priority pollutants have been detected in urban runoff. Potential health effects from these contaminants include gastrointestinal illness, reproductive and developmental effects and increased cancer risk.	Basic pollution prevention practices such as erosion control and sedimentation control measures; land use controls; grassed swales; buffer strips; filter strips; storm water capture and retention ponds, and constructed wetlands.

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
deicing fluids) and road chemical storage		
— Sediment and contaminants carried to surface and ground waters via infiltration through soil of drainage to subsurface wells or septic systems.		

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Vehicle Washing		
— Nationally, States estimate that there are in excess of 7,200 facilities of this type currently in operation.	<p>Contaminants include used oil, degreasers, antifreeze and synthetic oils.</p> <p>Patrons may use solvents or degreasers at unmanned washing facilities, thereby contributing to contamination of rinse waters entering Class V wells.</p> <p>Potential health effects from these contaminants include kidney damage; circulatory problems, increased cancer risk; delays in physical or mental development.</p>	<ul style="list-style-type: none"> • Use alternative cleansing agents such as phosphate-free, biodegradable detergents. • Discourage use of solvent and emulsifier-based agents • Install water-recycling systems • Train employees on spill control and response to problems • Control and manage spills

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Small Quantity Chemical Use Chemicals of concern may reach ground and surface waters through improper disposal practices via discharge to sewers, septic systems, dry wells, or through improper handling, hauling and disposal.	Includes chemicals used in cleaning, degreasing, polishing, paint preparation, rust removal, photo processing, medical practices.	<ul style="list-style-type: none"> • Avoid excess use of chemicals • Follow label directions on proper use, storage and disposal • Train employees on spill control and response protocols • Refer to manufacturer's Material Safety Data Sheets for specific hazard descriptions

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Underground Storage Tanks (USTs) National inventory shows approximately 714,000 USTs on 269,000 sites.	Releases of petroleum fuel substances through corrosion of parts, improper installation, failure of piping systems, sloppy fuel deliveries, and improper operation and maintenance	<ul style="list-style-type: none"> • Ensure compliance with federal UST requirements (see: www.epa.gov/oilspill) • Consider local registration programs for exempt tanks • Consider local land-use controls such as zoning, use restrictions, permits and setbacks

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Above Ground Storage Tanks (ASTs)	Release of petroleum fuel substances mainly through leaks or spills may enter drinking water supplies via soil accumulation or runoff in storm waters to surface	<ul style="list-style-type: none"> • Follow federal AST requirements (see: www.epa.gov/oilspill) • Periodic cleanup of containment areas • Consider local registration programs for exempt tanks • Consider local land-use controls such as zoning, use restrictions, permits and setbacks

X. Glossary

Aquifer – A natural underground layer, often of sand or gravel, that contains water.

Assessment – An analysis of the susceptibility of drinking water sources to contamination, communicated effectively to the public.

Ground Water – The water that systems pump and treat from aquifers.

Potential Contaminant Source – Specific point or nonpoint sources from which contamination of drinking water may originate; activities that may result in drinking water contamination.

Public Water System (PWS) – Any water system which provides water to at least 25 people for at least 60 days annually. There are more than 170,000 PWSs providing water from wells, rivers and other sources to about 250 million Americans. The others drink water from private wells. There are differing standards for PWSs of different sizes and types.

Risk Ranking – Rating or prioritizing levels of concern of potential contaminant sources based on susceptibility of public water systems.

Sole Source Aquifer – A drinking water supply in an area with few or no alternative sources to the ground water resource, and where if contamination occurred, using an alternative source

would be extremely expensive. If such an aquifer supplies a public water system on which at least 50 percent of the population depends, it may be designated as a sole source aquifer.

Source Water Protection Area – The area delineated by the state for a public water system, or including numerous PWSs, whether the source is ground water, surface water, or both. Delineating the source water protection area is part of the state source water assessment plan approved by EPA under section 1453 of the Safe Drinking Water Act.

Surface Water – The water that systems pump and treat from sources open to the atmosphere, such as rivers, lakes, and reservoirs.

Susceptibility – The level of risk of drinking water contamination, based on the nature and severity of contaminants, and the likelihood of the contaminants getting into a drinking water source.

Underground Injection Control Program – A program to prevent injection activities from endangering underground sources of drinking water.

Wellhead Protection Area – The surface and subsurface area surrounding a well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or field.

XI. Contacts

The following list includes regional office contacts for Source Water Assessment and Protection and Underground Injection Control. For state contacts, regional and local contacts at other federal agencies, and other partners, see www.epa.gov/safewater/protect/contacts.html. The Safe Drinking Water Hotline (bottom of page) also maintains the list of these contacts.

EPA Region 1 – Maine, New Hampshire, Vermont,
Massachusetts, Rhode Island, and Connecticut (617) 918-1578

EPA Region 2 – New York, New Jersey, Puerto Rico
and the U.S. Virgin Islands (212) 637-3822

EPA Region 3 – Pennsylvania Delaware, Maryland,
Virginia, West Virginia, and Washington, DC (215) 814-5779

EPA Region 4 – Kentucky, Tennessee, North Carolina,
South Carolina, Mississippi, Alabama, Georgia, and Florida (404) 562-9459

EPA Region 5 – Minnesota, Wisconsin, Illinois,
Michigan, Indiana, and Ohio (312) 886-9262

EPA Region 6 – New Mexico, Texas, Oklahoma, Arkansas, and Louisiana	(214) 665-7129
EPA Region 7 – Nebraska, Kansas, Iowa, and Missouri	(913) 551-7423
EPA Region 8 – Montana, North Dakota, Wyoming, South Dakota, Utah and Colorado	(303) 312-6753
EPA Region 9 – California, Nevada, Arizona, Hawaii, Guam, and American Samoa	(415) 744-1829
EPA Region 10 – Washington, Oregon, Idaho, and Alaska	(206) 553-1563
Headquarters – Office of Ground Water and Drinking Water	(202) 564-3867