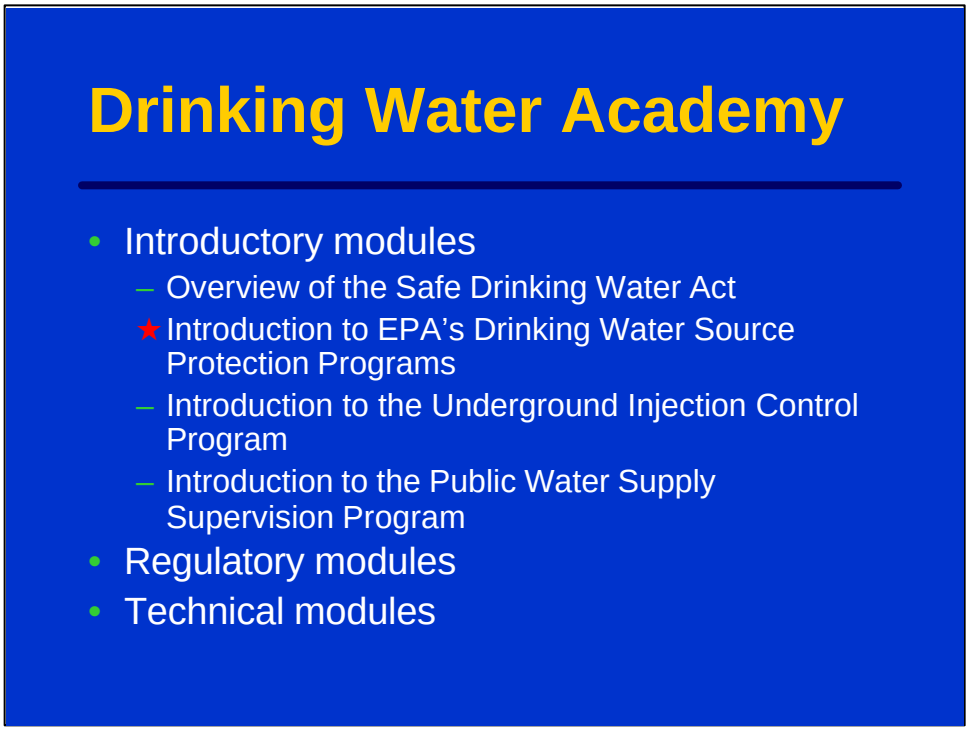
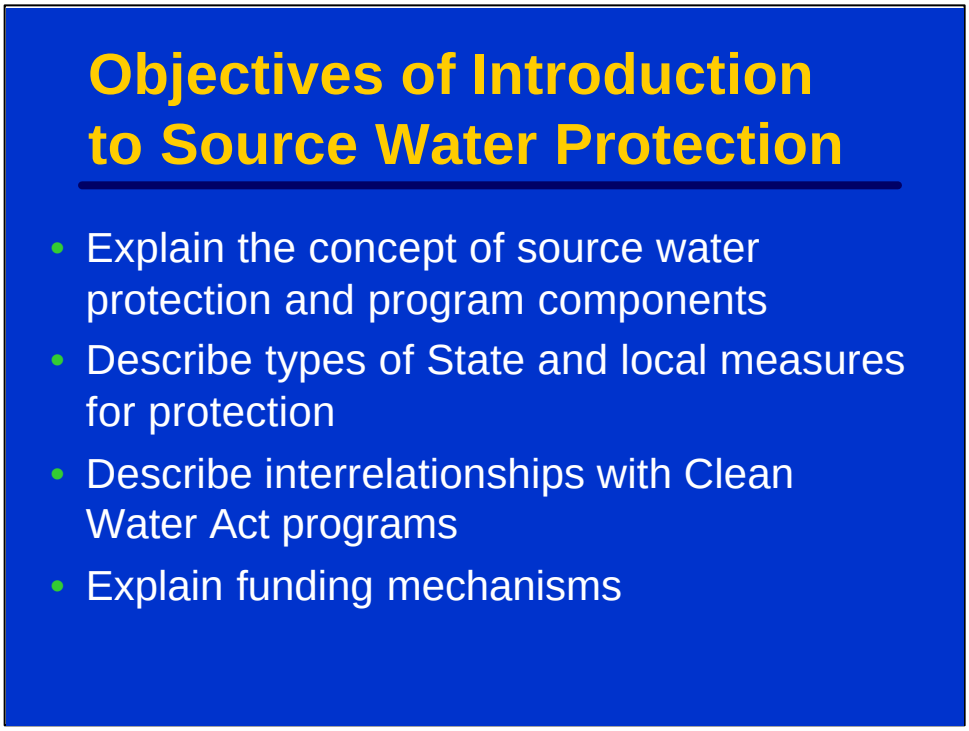
Introduction to EPA'S Drinking Water Source Protection Programs



- The Drinking Water Academy (DWA) develops and provides training to Federal, State and Tribal drinking water staff to help ensure that they will be adequately prepared to implement the provisions of the Safe Drinking Water Act (SDWA).
- This training course is a one of four introductory courses that introduce you to the Safe Drinking Water Act and its major programs:
  - Public water system supervision (PWSS);
  - Source water protection; and
  - Underground injection control (UIC).
- In addition to these introductory courses, the DWA provides training on other drinking water topics:
  - SDWA regulations;
  - Capacity development;
  - Sanitary surveys;
  - SDWIS; and
  - Technical courses on source water, UIC and public water system issues.
- The DWA also provides skills training on risk communication and training delivery.
- For a complete list of the courses the DWA offers, visit our Web site at

  http://www.epa/gov/safewater/dwa.html



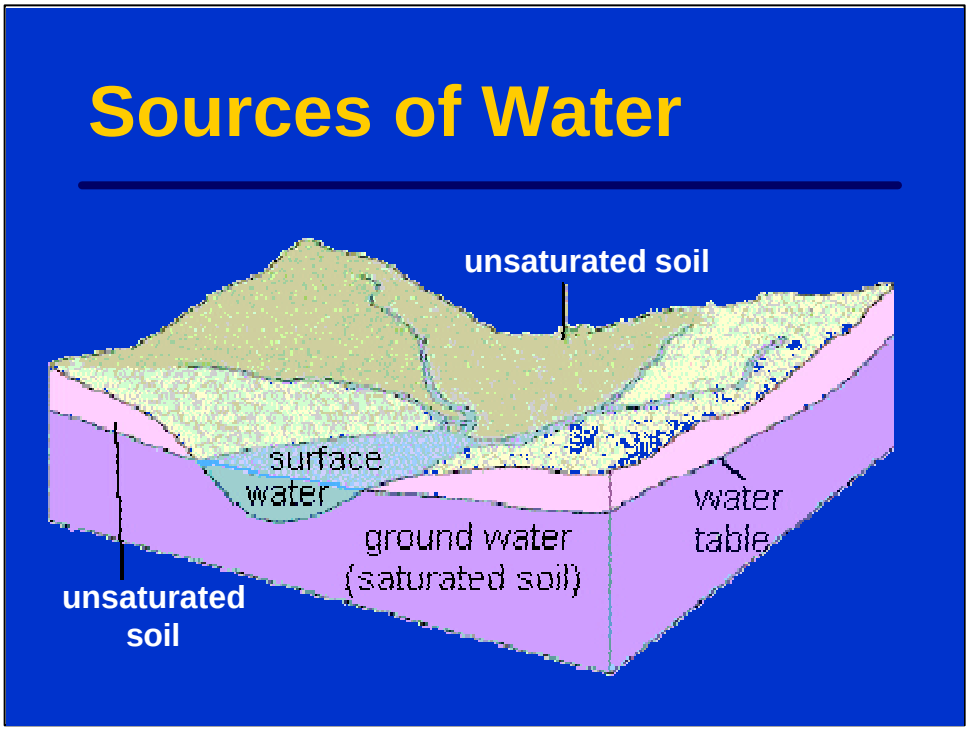
- This section of the training will introduce SDWA's source water protection program. The objectives of this section are to enable participants to:
  - Explain the concept of source water protection and program components;
  - Describe types of State and local measures for protection;
  - Describe interrelationships with Clean Water Act programs; and
  - Explain funding mechanisms for source water protection programs.

Sources of Drinking Water and the Hydrologic Cycle

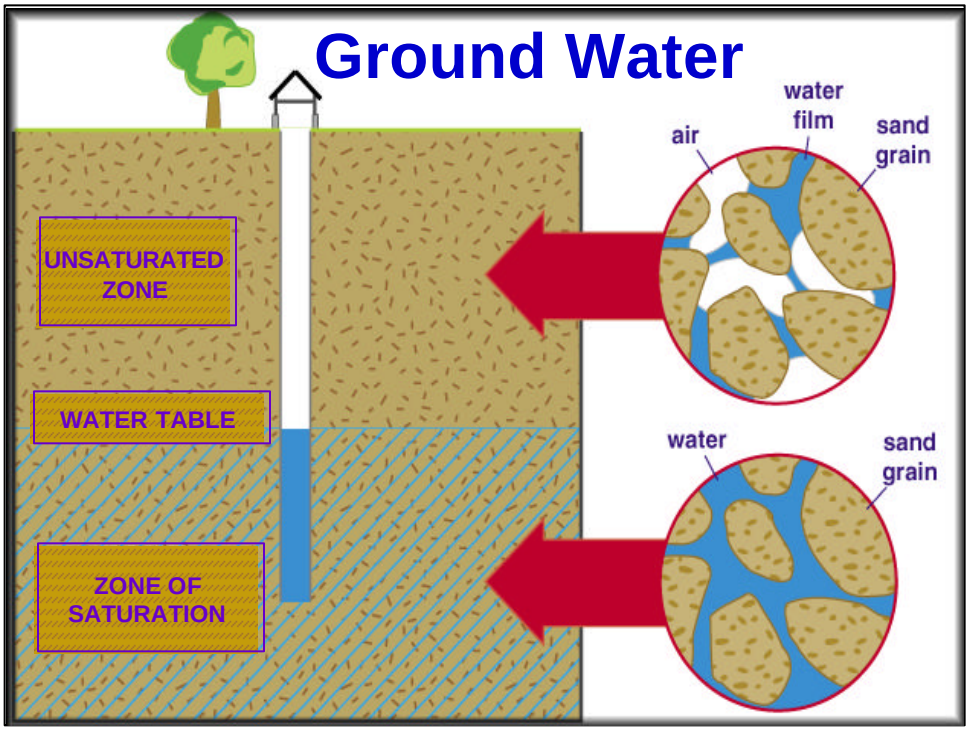
- This section will discuss sources of drinking water and how they act and interact.

Class Discussion

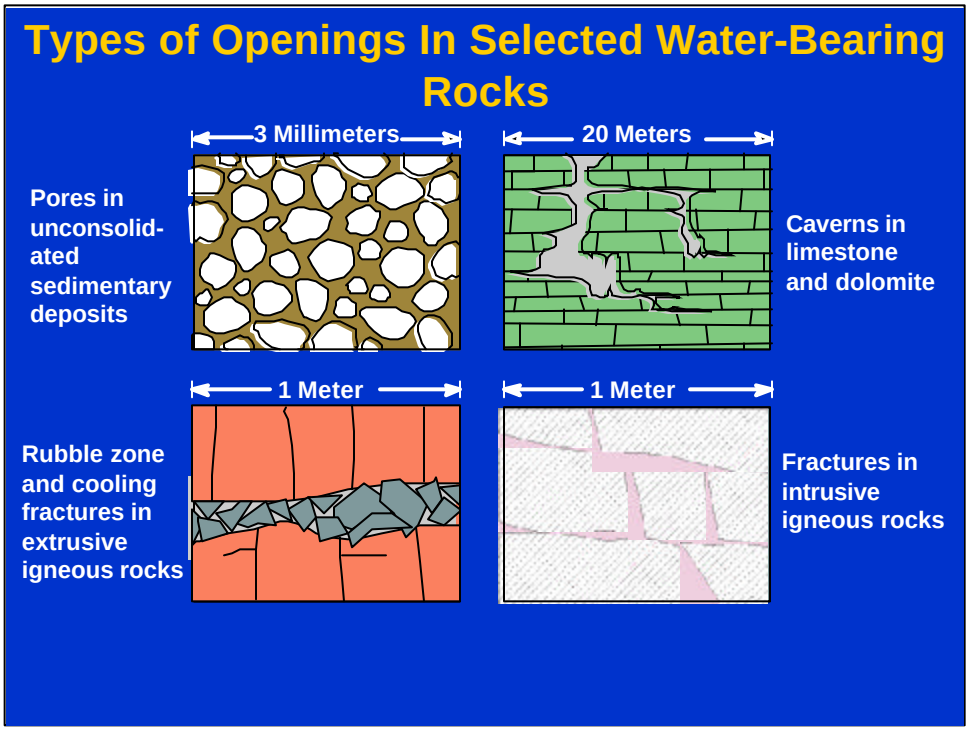
- Name as many sources of drinking water as possible



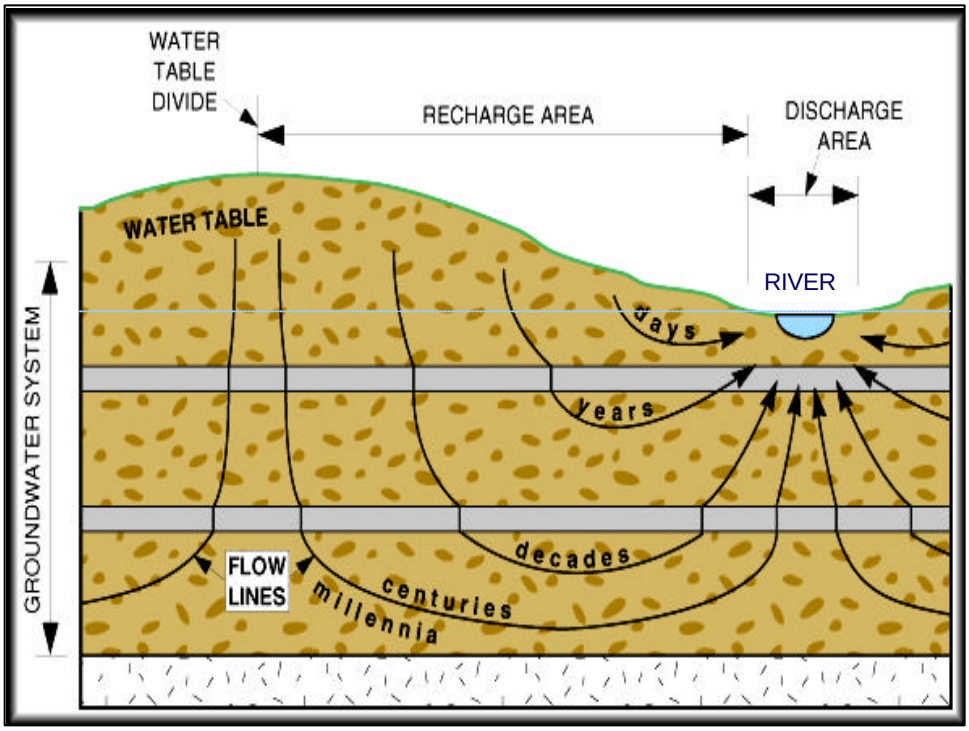
- To understand the importance of protecting water sources, we must begin with a basic understanding of where our drinking water comes from. Drinking water is either ground water or surface water.
- ***Ground water*** is water that fills the open spaces, or pore space, within the subsurface.
- ***Surface water*** is an open body of water, such as a river, stream, lake, or estuary. All of these receive water from precipitation, runoff from higher elevations, or recharge from ground water moving below the stream or lake bed.
- ***Ground water under the direct influence of surface water*** (GWUDI) is any water beneath the surface of the ground with: 1) significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia;* or 2) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH that closely correlate to climatological or surface water conditions. Direct influence must be determined for individual sources based on site-specific measures and in accordance with criteria established by the particular State. The State determination for direct influence may be based on site-specific measurements of water quality and/or documentation of well construction characteristics and geology with field evaluation. (40 CFR 141.2)



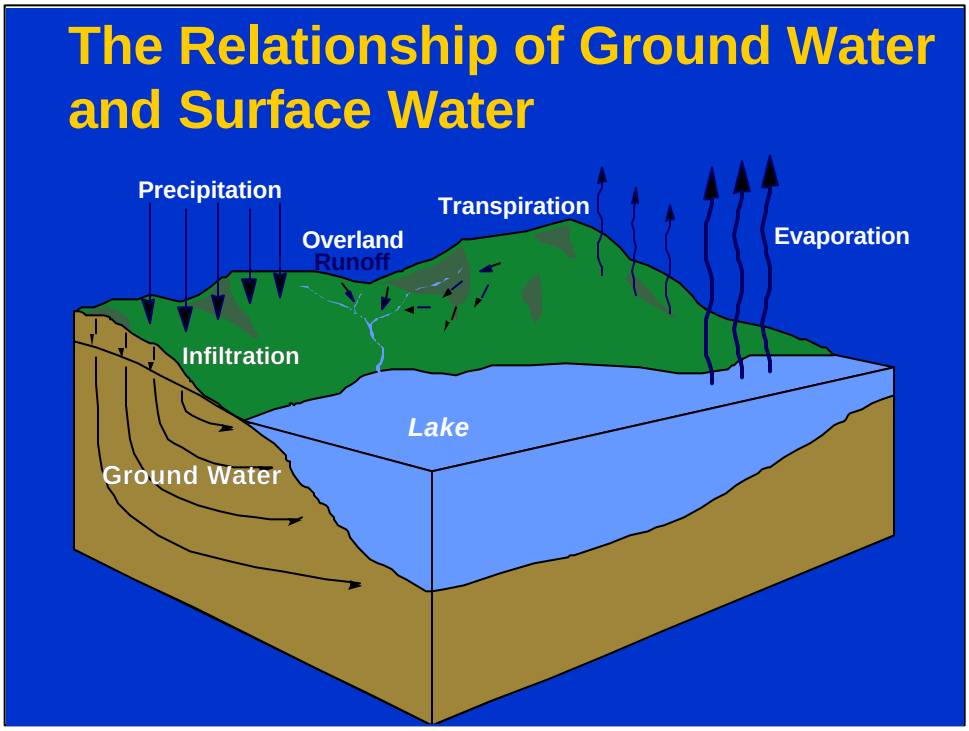
- The subsurface is divided into zones or layers based on hydrologic properties.
  - The ***vadose zone*** is part of the ***unsaturated zone***. The unsaturated zone is directly below the surface and contains some water. In the unsaturated zone, water and air fill the voids between soil or rock particles.
  - Deeper in the ground is the ***zone of saturation***. In the zone of saturation, the subsurface is completely saturated with water.
  - The point where the zone of aeration meets the zone of saturation is known as the ***water table***.
- Water table levels fluctuate naturally throughout the year based on seasonal variations. In addition, the depth to the water table varies. For example, in southern Louisiana, the water table may be as shallow as 2 inches below the surface, while in the Mojave Desert the water table may be 600 feet below the surface.
- The saturated zone may form an aquifer. An ***aquifer*** is a geologic formation that contains water in quantities sufficient to support a well or spring.



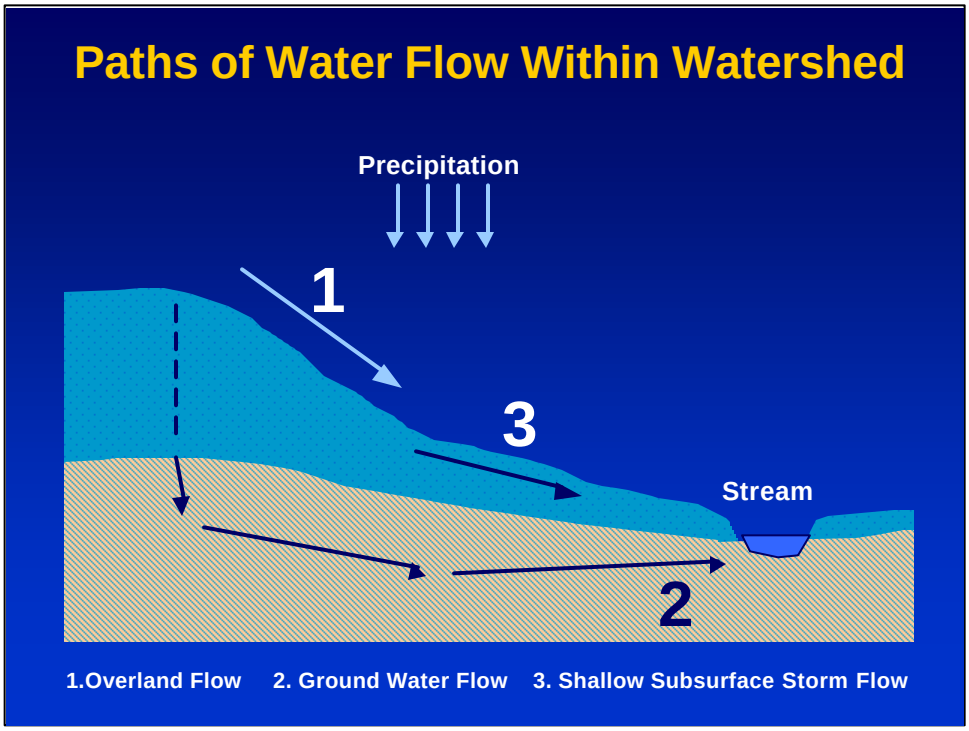
- Ground water moves through the subsurface pore spaces in clay, silt, sand, gravel or fractures in bedrock. Flow will vary due to the type of geologic formation. It is important to understand ground water movement prior to selecting appropriate tools to protect the ground water.
- The picture in the top left corner shows pore spaces in unconsolidated sedimentary deposits such as ***sand and gravel***. This type of geology is common in the Texas Gulf Coast Basin.
- The picture in the top right corner shows solution channels in ***limestone or dolomite***. This type of geology is common in Florida, Kentucky and Missouri.
- The picture in the bottom left corner shows fractures in crystalline rocks such as ***granite***. This type of geology is common in New England, the Appalachians, and the Rocky Mountains.
- The picture in the bottom right shows fractures in ***intrusive igneous rocks***. This type of geology is common in Hawaii, Washington, and Idaho.



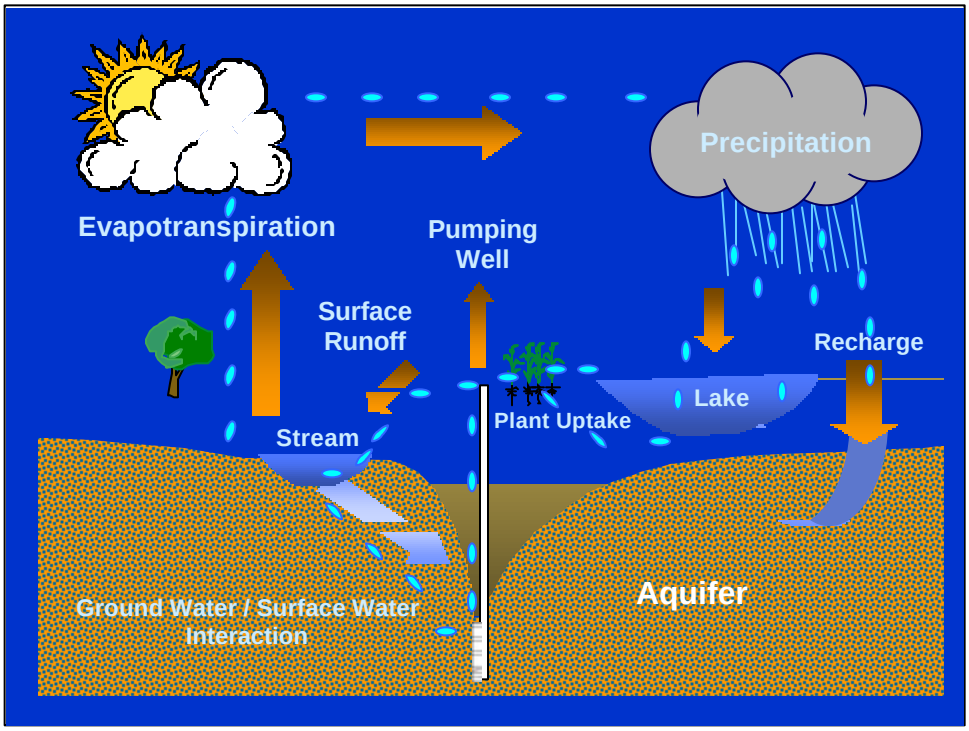
- Depending on the subsurface geology and pressure, ground water may travel at different rates. As shown in the graphic above, ground water may take days, months, or thousands of years to travel a given distance depending on the conditions in the subsurface.
- Understanding the ***"time of travel"*** is important to identifying the areas to be protected. Where ground water moves slowly there is time for contaminants or pathogens to break down or be absorbed by the surrounding soil or rock before it reaches a well. Contaminants in rapidly-moving ground water would not necessarily be broken down before reaching a well.



- Ground water and surface water are closely related. This relationship is part of the ***hydrologic cycle***.
- ***Precipitation*** that falls from the atmosphere in the form of rain or snow:
  - Reaches the land surface and recharges rivers, lakes, wetlands, and other surface water bodies directly;
  - ***Infiltrates*** (seeps into) the ground and eventually reaches the ground water; or
  - ***Evaporates*** back into the atmosphere.
- Within an aquifer, ground water flows in much the same way that surface water does, along natural contours such as pores and spaces between the soil and rocks within the subsurface. Where ground water flows intersect a stream or lake bed, the ground water can recharge that water body, or vice versa.
- A surface water body that is recharged by ground water is known as a ***gaining stream***. Where the water from the stream infiltrates to the ground water, the stream is known as a ***losing stream***. The direction in which water flows may vary throughout the year, depending on ground water and surface water levels at a given season.

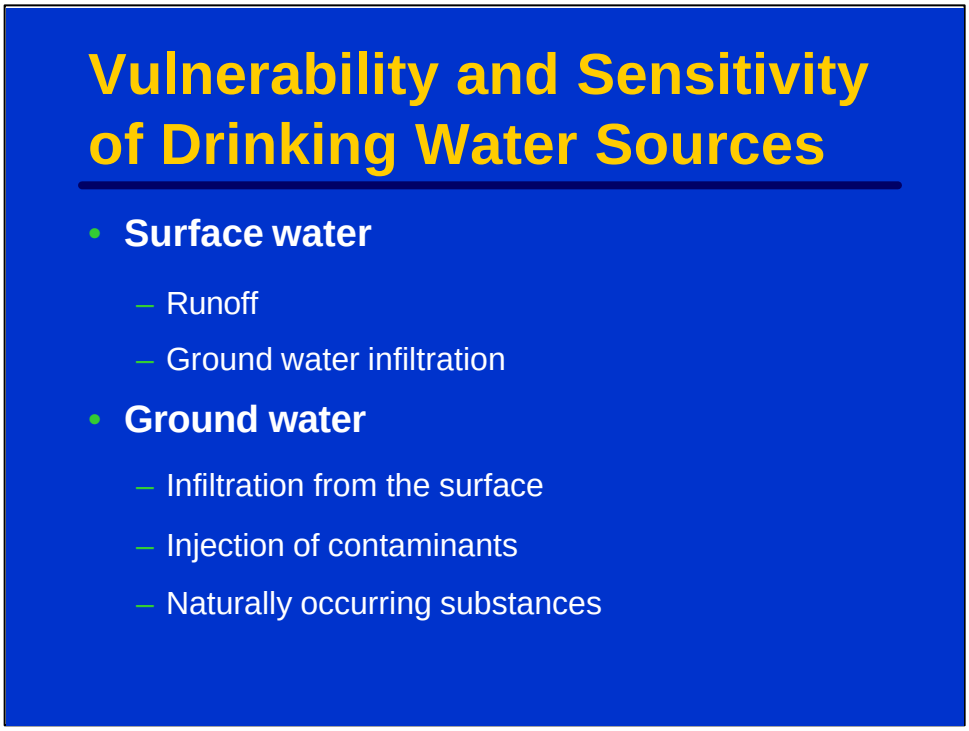


- There are two major ways that water moves within a watershed:
  - Overland flow; and
  - Ground water flow.
- In addition, there may also be shallow subsurface storm flows.
- Understanding the flow of water is critical to determine the appropriate areas to be protected through inclusion in a wellhead or watershed protection area.
- Contaminant loading that occurs through shallow subsurface flow can cause a well receiving the waters to be designated as ground water under the influence of surface water.

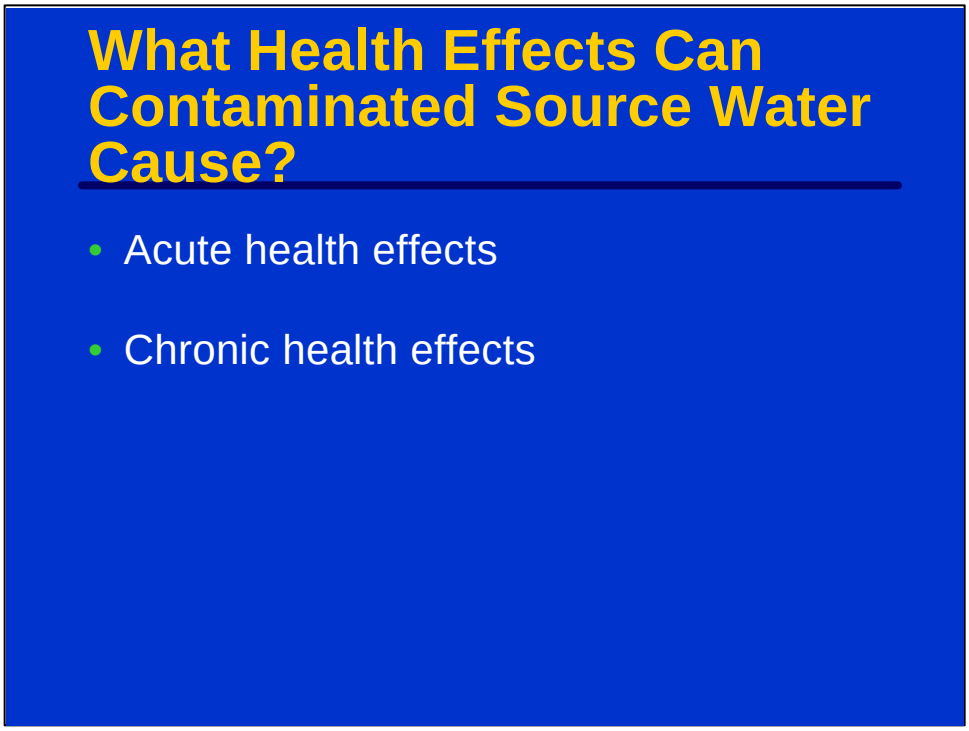


- There is a ***finite amount of water on the earth***. The water on the earth is used over and over again. The water cycle, or hydrologic cycle, is the continuous movement of water from ocean to air and land then back to the ocean in a cyclic pattern.
  - The sun heats the Earth's surface water (lakes, rivers, oceans, estuaries) which causes it to ***evaporate***.
  - The water vapor rises into the Earth's atmosphere where it cools and condenses into liquid droplets.
  - The liquid droplets combine and grow until they become too heavy and fall to the Earth as precipitation. ***Precipitation*** falls from the atmosphere in the form of rain, ice, or snow. It reaches the land surface and recharges rivers, lakes, and other surface water bodies directly; ***infiltrates*** the ground and eventually reaches the ***ground water***; or evaporates back into the atmosphere.
  - Throughout the cycle, water is temporarily stored in lakes or glaciers, underground, or in living organisms.
- Water that exists beneath the land surface is called ***ground water***, while water at the surface is called ***surface water***.
- The direction of flow between ground water and surface water may be influenced by a pumping well (drinking water well). Pumping wells are used to extract ground water for use at the surface. A pumping well near a stream or lake may draw water from the stream or lake into the ground water and subsequently into a drinking water supply well. Water may also transfer from surface water to the aquifer by direct infiltration (known as ground water under the direct influence of surface water) through the bottom of a water body. The reverse can also occur as ground water migrates toward and recharges surface water bodies.
- ***The inter-relationship between ground water and surface water means that contamination can migrate between the two.***

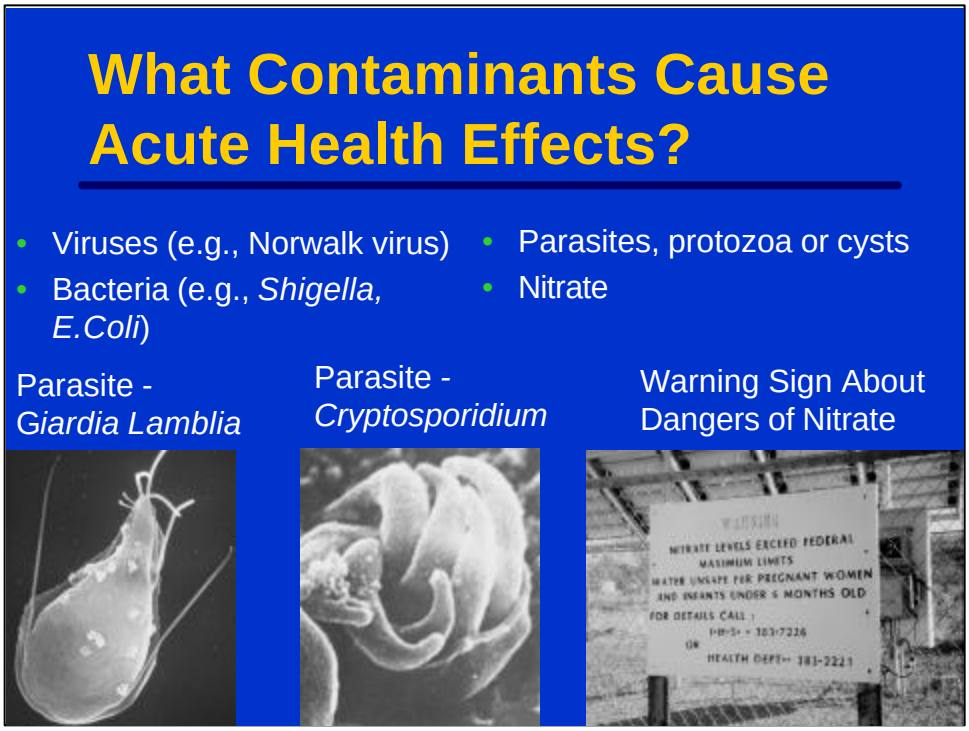
Threats to Sources of Drinking Water



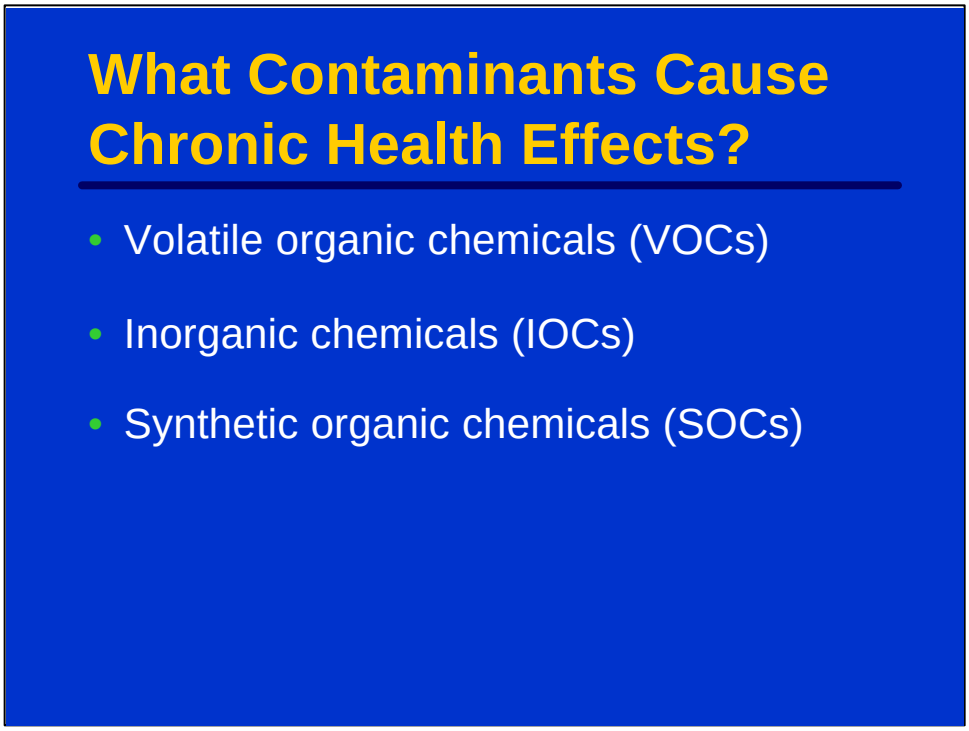
- ***Surface water*** is vulnerable to contamination from both runoff and ground water infiltration. Runoff from surface areas in a watershed, either near a drinking water supply intake or in upstream tributaries, may contain contaminants, including human or animal wastes. In addition, contaminated ground water may recharge streams or lakes spreading the contamination to a surface water source.
- ***Ground water*** can become contaminated through infiltration from the surface, injection of contaminants through injection wells (including septic systems), or by naturally occurring substances in the soil or rock through which it flows. Depending on the hydrogeologic setting, contaminants in ground water may migrate far from the source and pollute water supplies far away. The properties of the aquifer and overlying soils affect contaminant movement. For example, highly permeable aquifers conduct ground water flow quickly, allowing little time to detect a contamination plume before it reaches a drinking water supply.
- Contaminant transport in ground water may be affected by physical, chemical, or biological processes between the contaminants, the ground water, and the aquifer materials. For example, some contaminants may be adsorbed onto soil particles within the aquifer or overlying rock layers. Furthermore, different contaminants move at varying rates and persist in the subsurface for different lengths of time. Some organic and inorganic contaminants may be consumed by microbes in the soil in a process known as biodegradation.
- Wells that are improperly completed or abandoned provide a direct conduit for surface contamination to get to ground water. A properly designed and constructed well includes several features that reduce the risk of contaminating ground water. These include casing to prevent the collapse of the wall of the bore hole; grout to fill the open space left outside the well casing to prevent surface water from entering the well; screens at the intake point to hold back unstable aquifer material; and well head covers or seals at the top of the casing or pipe sleeve to prevent contaminated water from entering the well.



- There are two major types of health effects—acute and chronic.
  - ***Acute health effects*** are immediate (within hours or days) effects that may result from exposure to certain contaminants such as pathogens (disease causing organisms) or nitrate that may be in drinking water.
    - ***Pathogens*** are usually associated with gastrointestinal illness and, in extreme cases, death.
    - ***Nitrate*** in drinking water also poses an acute health threat to infants. High levels can interfere with the ability of an infant's blood to carry oxygen. This potentially fatal condition is called methemoglobinemia or "blue baby syndrome." Nitrates may also indicate the possible presence of other more serious residential or agricultural contaminants such as bacteria.
    - ***Chemical contaminants*** can also cause acute health effects. For example, accidental spills of industrial effluent.
  - ***Chronic health effects*** are the possible result of exposure over many years to a drinking water contaminant at levels above its maximum level established by EPA. Chronic health effects include birth defects, cancer, and other long-term health effects. Contaminants causing chronic health effects are mostly chemical contaminants and include, among others, byproducts of disinfection, lead and other metals, pesticides, and solvents. For example, some disinfection byproducts are toxic and some are probably carcinogens. Exposure to lead can impair the mental development of children. However, there is usually little risk from short-term exposure to these contaminants at levels below the MCLs typically found in drinking water.



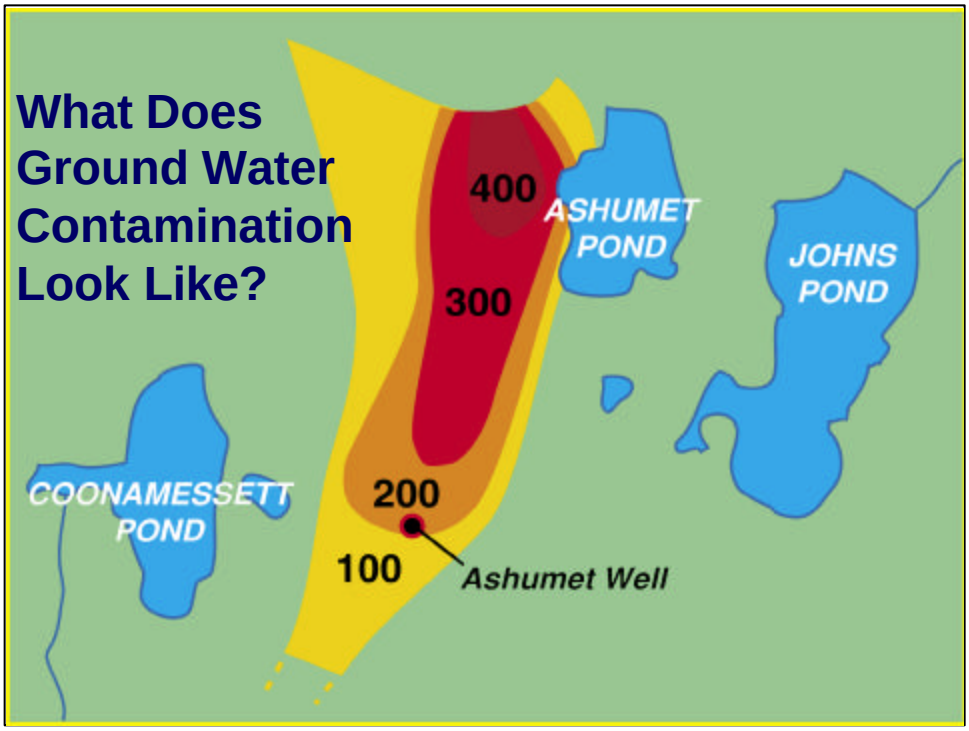
- ***Pathogens*** are microorganisms that can cause disease in other organisms or in humans, animals and plants. They may be bacteria, viruses, or parasites and are found in sewage, in runoff from animal farms or rural areas populated with domestic and/or wild animals, and in water used for swimming. Fish and shellfish contaminated by pathogens, or the contaminated water itself, can cause serious illnesses.
  - A ***virus*** is the smallest form of microorganism capable of causing disease. A virus of fecal origin is called an enterovirus and is infectious to humans by waterborne transmission; These viruses, such as the Norwalk virus and a group of Norwalk-like viruses, are of special concern for drinking water regulators. Many different waterborne viruses can cause gastroenteritis, with symptoms that include diarrhea, nausea, and/or stomach cramps. Gastroenteritis can be fatal for people with compromised immune systems. The World Health Organization counts waterborne viruses as second only to malaria in lost time and dollars in the global economy.
  - ***Bacteria*** are microscopic living organisms usually consisting of a single cell. Waterborne disease-causing bacteria include *E. Coli* and *Shigella*.
  - ***Protozoa*** or ***parasites*** are also single cell organisms. Examples include *Giardia Lamblia* and *Cryptosporidium*. *Giardia Lamblia* was only recognized as being a human pathogen capable of causing waterborne disease outbreaks in the late 1970s. During the past 15 years, *Giardia Lamblia* has become recognized as one of the most common causes of waterborne disease in humans in the United States. The protozoa for *Cryptosporidium* (often called "crypto") is commonly found in lakes and rivers and is highly resistant to disinfection. *Cryptosporidium* has caused several large outbreaks of gastrointestinal illness. ***Nitrate*** in drinking water at levels above 10 ppm is a health risk for infants less than six months old. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity.



- Contaminants that can cause chronic health effects include byproducts of disinfection, lead and other metals, pesticides, and solvents.
- ***Volatile organic chemicals*** (VOCs) include mostly industrial and chemical solvents such as benzene and toluene. Benzene has the potential to cause chromosome aberrations and cancer from a lifetime exposure at levels above the maximum contaminant level. Toluene has the potential to cause pronounced nervous disorders such as spasms, tremors, impairment of speech, hearing, vision, memory, and coordination; and liver and kidney damage from a lifetime exposure at levels above the MCL.
- ***Inorganic chemicals*** (IOCs) include metals and minerals. Some of these have the potential to cause chronic health effects. For example, lead has the potential to cause stroke, kidney disease, and cancer from a lifetime exposure at levels above the MCL.
- ***Synthetic organic chemicals*** (SOCs) include pesticides such as atrazine and alachlor. Atrazine has the potential to cause weight loss; cardiovascular damage; retinal and some muscle degeneration; and cancer from a lifetime exposure at levels above the MCL. Alachlor can cause eye, liver, kidney, or spleen problems; anemia; and an increased risk of cancer from life-time exposure.

A maximum contaminant level is the maximum permissible level of a contaminant in drinking water that can be delivered to any user of a public water system without causing adverse health effects.

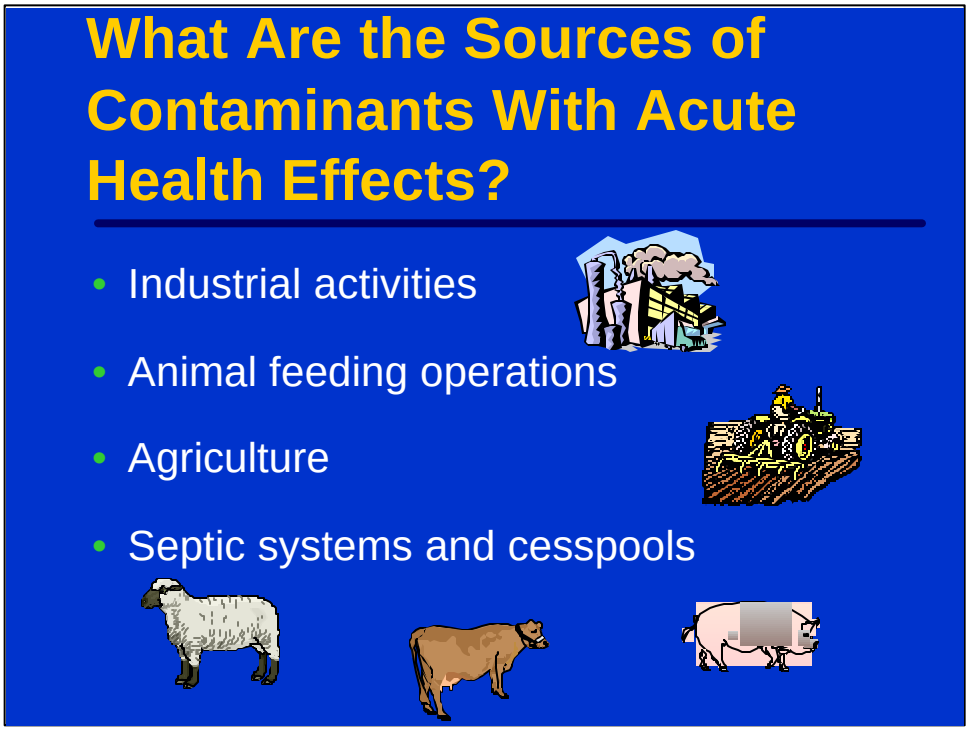
- The contaminants described on the previous slides are of concern when they contaminate sources of drinking water.
- Surface water is often susceptible to disease-causing organisms because it is vulnerable to contamination. Animal and human waste (represented by the yellow circles) within a watershed will often find its way into surface water. In addition, surface water is vulnerable to chemical contamination (represented by the red diamonds). Chemical and microbiological contaminants may enter surface water through runoff, or through direct disposal into rivers or streams; acid rain may contaminate surface water sources; and contaminated ground water may interact with surface water and spread contamination. Surface water is vulnerable to both chemical and microbiological contamination and in most cases requires filtration and disinfection before it is safe to drink.
- Ground water, which is protected by layers of soils and other subsurface materials, sometimes does not require treatment. However, ground water can become contaminated through infiltration from the surface, injection of contaminants, or by naturally occurring substances in the soil or rock through which it flows. In many cases, ground water needs to be disinfected before it is used as drinking water to reduce the risk of microbiological contamination. In addition, ground water is vulnerable to nitrate contamination, particularly in agricultural areas or areas with large numbers of septic tanks, since both agriculture and septic tanks discharge nitrate. Nitrate does not tend to accumulate in soil and therefore moves quickly through the subsurface and into ground water.
- Ground water under the influence of surface water (GWUDI) faces the same risks as surface water and the same treatment should be used before using GWUDI as a source of drinking water.



- This slide shows a model of a plume of ground water contamination. The contamination source is in the darkest red area where the concentration of contaminant X is 400 mg/L.
  - As the plume spreads, the concentration of the contaminant is diluted.
  - When the plume reaches the Ashumet drinking water well, contaminant X is at a concentration of 200 mg/L.
- The transport of contaminants in the subsurface is complicated because it is affected by many physical, chemical, and biological processes. It is not enough to understand the properties of the contaminant itself. The aquifer materials, other contaminants in the water, and pumping the water may also affect the transport.
- For example, the temperature of the water may affect the transport of microbiological contaminants in particular; some contaminants may be filtered out of water in small pore spaces in the aquifer; contaminants may biodegrade when they come in contact with microorganisms in soil; and pumping the water may affect the direction or quantity of the water flow.
- In sum, the processes occurring in the subsurface are complex and should be considered in source water protection efforts.

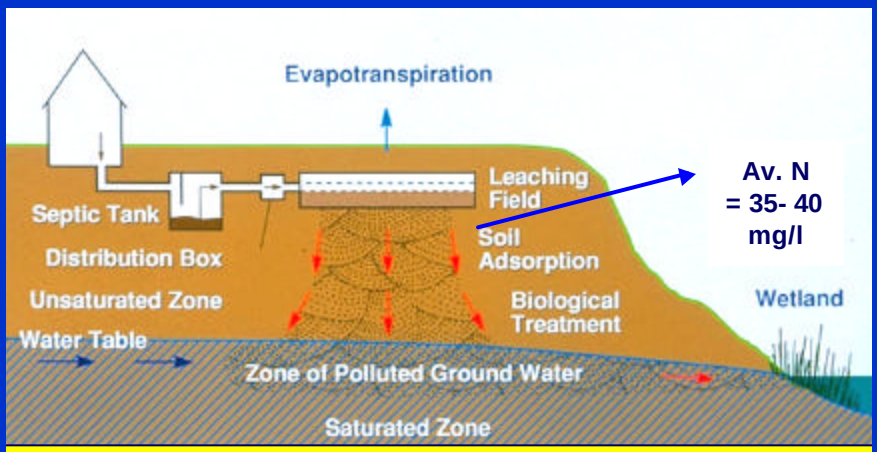
What Does Surface Water Contamination Look Like?

- Surface water is also vulnerable to contaminants causing chronic health effects. These contaminants may enter surface water through runoff or waste disposal into rivers or streams.
- Chemical contamination of water will likely be invisible to the naked eye. Chemical transport in surface water can be affected by circulation patterns, time of transport, or dilution.



- Contaminants capable of causing acute health effects can come from a variety of sources, including animal waste, septic systems, sewage, and animal feeding operations (AFOs).
  - Chemicals used in ***industrial activities*** can cause acute health effects if they contaminate drinking water sources. Examples include pesticides, arsenic, petroleum products, and radionuclides.
  - ***Animal feeding operations*** are agricultural enterprises where animals are kept and raised in confined situations. AFOs contribute about one-third to one-half of the non-point surface water pollution in the United States, primarily from the improper handling of animal wastes. Manure and wastewater from AFOs can contribute pathogens, such as *Cryptosporidium*, to drinking water sources.
  - A variety of ***agricultural activities*** can threaten drinking water supplies. Each year in the United States, millions of tons of fertilizers are applied to crops on farmland (and on residential lawns and golf courses). Fertilizers can be a significant source of nitrate and nitrite contamination.
  - ***Household septic systems*** and ***cesspools***, if not properly maintained, also may contaminate ground water supplies with nitrates or microbiological contaminants. The following slides explain more about septic systems.

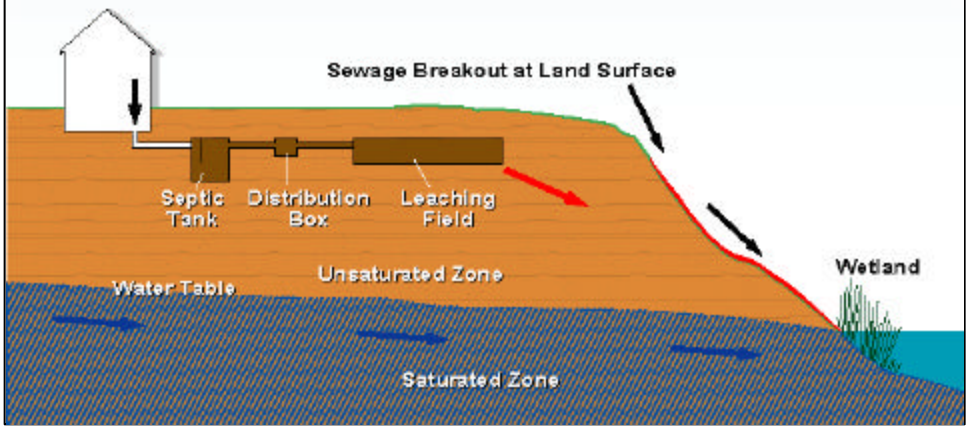
Example: Septic Systems and Nitrogen and Viral Loading



Septic Systems Do Not Treat Wastewater

- As noted on the previous slide, septic systems are a common source of ground water contamination.
- Septic systems may contribute nitrate and microbiological contaminants to ground water. Other contaminants, such as oil or solvents, may also be introduced through septic systems if homeowners use them for disposal (by pouring them down the drain).
- Septic systems used for disposal of industrial or commercial wastes may fail due to the types of substances disposed, causing not only potential nitrate and microbiological problems, but other contamination in the ground water as well.
- If septic systems are properly sited, the soil should "treat" at least some of the contaminants. In other words, certain contaminants should attenuate (i.e., weaken or be reduced) in the soil before reaching ground water.
- However, if improperly sited, the soil is unsuitable, or the system has failed, contaminants can quickly migrate directly into ground water.
- Studies show that no commercial septic additives have any beneficial effect on a properly-maintained septic system (National Small Flows Clearinghouse Study, North Carolina State University, 1999).

On-Site Septic Hydraulic Failure



- Septic systems may also contaminate surface water sources. When improperly sited on soil that is already saturated or in soil that is impermeable, the waste may pond on the surface and contaminate surface water sources.
- Improper maintenance can also lead to contamination.

What are the Sources of Contaminants with Chronic Health Effects?

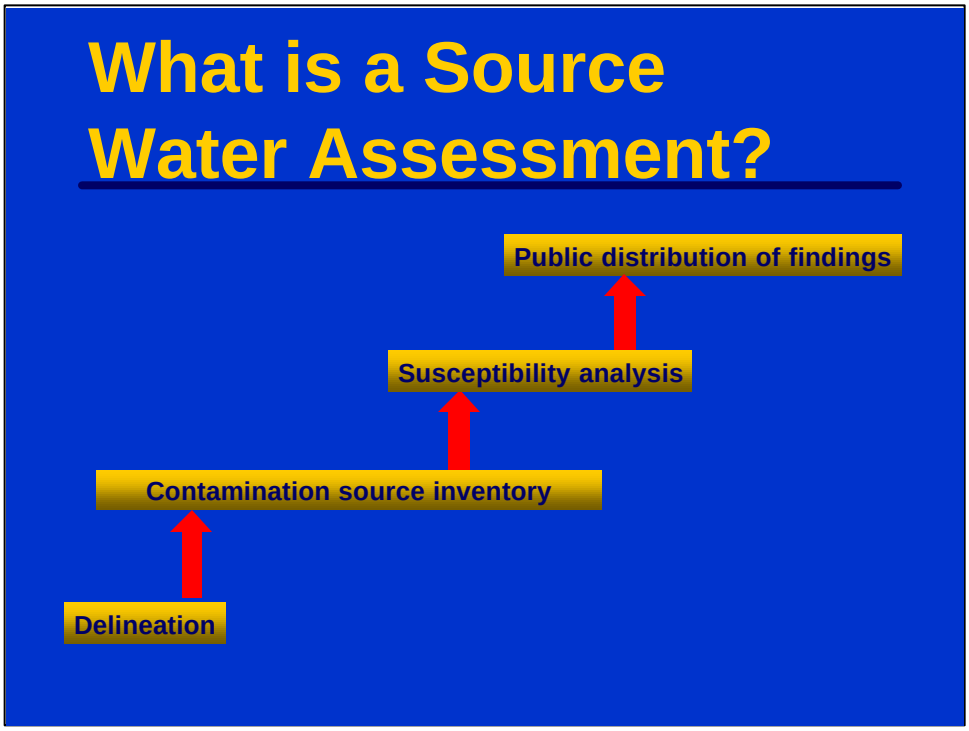
- Industrial and commercial activities
- Agriculture
- Landfills and surface impoundments
- Urban uses

- A variety of activities can threaten drinking water supplies with contaminants that may cause chronic health effects.
- Various ***commercial and industrial activities*** can affect water quality. Some of the contamination sources are small "mom-and-pop" type operations; others are large, multi-acre facilities. ***Commercial activities*** that can affect water supplies include automotive repair facilities, laundromats and dry cleaners, airports, gas stations, photographic processors, and construction sites. ***Industrial activities*** such as chemical manufacturing and storage, machine or metalworking shops, and mining operations often use substances that can contaminate drinking water supplies.
- Many industrial or commercial facilities store fuel in above-ground or underground storage tanks. ***Petroleum storage*** in underground tanks is one of the greatest threats to ground water quality. EPA estimates that approximately one-third of all such storage systems in the country are leaking.
- ***Agricultural*** activities can threaten drinking water supplies. Pesticides, herbicides, and fertilizers applied to crops on farmland may be highly toxic and can remain in soil and water for many months or years.
- ***Urban*** activities can be harmful to ground water and surface water supplies. Improper disposal or leaks of a number of substances used by homeowners, such as cleaning supplies, furniture stripping or refinishing chemicals, pesticides, fertilizers, and paint, can seep into the ground or run into storm drains and contaminate ground water.
- ***Other sources of water contamination*** include chemicals used for road de-icing and maintenance, landfills, and surface impoundments.

Example: Industrial Contamination

- Many of the chemicals used at industrial operations can contaminate large quantities of water even if only small amounts of a contaminant are present. Drinking water standards are measured in parts per million or parts per billion.

Source Water Assessments

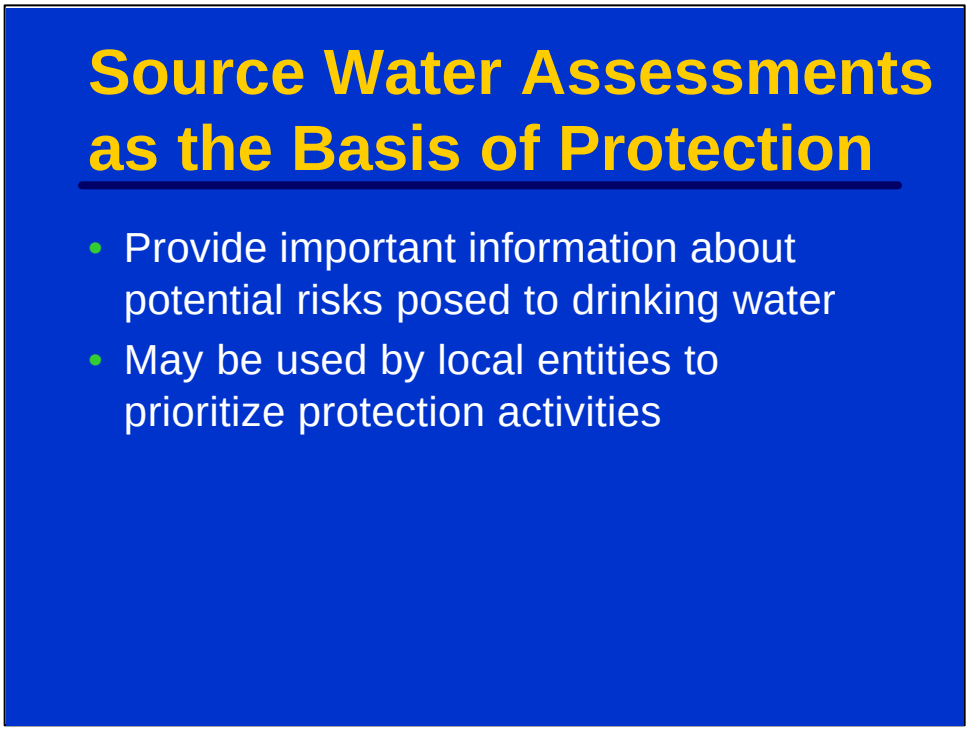


- ***PWSS primacy States are required by the SDWA Amendments of 1996, Sections 1453 and 1428(b), to complete a source water assessment for each public water system.*** These assessments can be done for each system or on an "area-wide" basis involving more than one PWS.
- A ***source water assessment*** provides important information for carrying out protection programs. This "know your resource and system susceptibility" part of protection involves identifying the land that drains to the drinking water source and the most prominent potential contaminant risks associated with it. To be considered complete, a source water assessment must include four components:
  - Delineation of the ***source water protection area*** (SWPA), the portion of a watershed or ground water area that may contribute pollution to the water supply.
  - Identification of all significant potential sources of drinking water contamination within the SWPA. The resulting ***contamination source inventory*** must describe the sources (or categories of sources) of contamination either by specific location or by area.
  - Determination of the water supply's susceptibility to contamination from identified sources. The ***susceptibility determination*** can be either an absolute measure of the potential for contamination of the PWS or a relative comparison between sources within the SWPA.
  - ***Distribution*** of the source water assessment results to the public. Assessments are not considered completed until results are communicated to the public.
- Several agencies within a State are likely to be involved in the effort to establish a plan to assess source water protection areas. Usually, environmental protection agencies or health departments take the lead; departments of agriculture or agricultural extension programs, and soil and water conservation boards may also be involved. States are also encouraged to initiate interstate or international partnerships to protect source water protection areas that cross borders.
- Local governments and water systems will be key partners in assessing source water and implementing local SWP programs. Local partners can provide input on assessments and gather local support for SWP management, especially where regulatory controls will be implemented.

SWAPs and Tribes

- By 2005, 40 percent of the population served by Tribal community water systems will receive their water from systems with source water assessments and, where needed, source water protection programs in place
- Tribes are encouraged to prepare SWAPs, but it is not required by law
- EPA will provide technical and financial support to interested Tribes

- Since no Tribe has PWSS primacy yet, the requirement to complete source water assessment programs on Tribal land will be implemented under EPA's direct implementation authority.
- EPA's objective is that "by 2005, 40 percent of the population served by Tribal community water systems will receive their water from systems with a completed source water assessment and, where needed, source water protection programs in place."
- Although Tribes are not required by law to complete source water assessment or protection programs, EPA is firmly committed to protecting drinking water sources on Tribal lands and will encourage and support Tribes' efforts to do so.



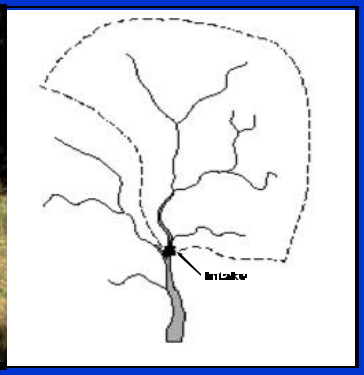
- Completed source water assessments provide important information. Typically, information collected during an assessment includes delineated protection areas, locations of wells and intakes, inventories and locations of potential contaminant sources, determinations of relative threats to drinking water sources, and hydrogeological data.
- Source water assessment information, in conjunction with other watershed assessment efforts, by identifying relative threats to water quality, can help water systems and communities determine protection priorities for addressing these threats.

Elements of State SWAPs

- Public participation in developing SWAP
- Plan to delineate areas, inventory contaminants, determine susceptibility
- Timetable for implementation, agencies involved, plan to update assessments
- Plan to make the results of assessments available to the public

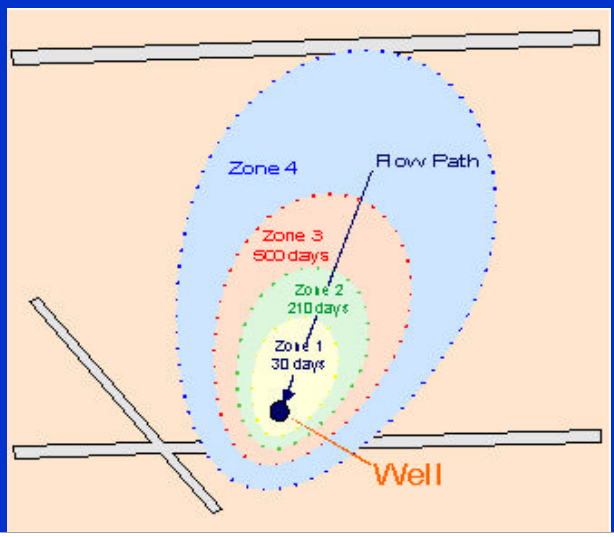
- According to SDWA Section 1453, each State must develop and submit to EPA a ***Source Water Assessment Program (SWAP)*** that includes four elements:
  - Public, technical, and citizen advisory group involvement in the development of the State-wide SWAP.
  - A plan to complete source water assessments for each public water system (PWS) to identify watersheds and ground water recharge areas that supply public drinking water systems, inventory potential contaminant sources, and determine the water system's susceptibility to contamination.
  - A plan to implement its chosen source water assessment approach, i.e., a timetable for completing assessments, roles of various State and other agencies, and plans for updating the assessments.
  - A plan to provide the public with access to the results of the susceptibility determination.
- All States were required to submit their SWAP strategies to EPA by February 6, 1999. EPA has since approved all of the States' submittals. Each State has two years, plus a possible extension of up to 18 months, to complete all of its source water assessments after EPA approval of its SWAP.
- States must implement source water assessments according to the approved program.

SWPA Delineations for Surface Water-Based Systems



- A ***source water protection area*** is the watershed or ground water area where contamination sources may contribute pollution to the water supply. The purposes of the source water protection area delineation are to:
  - Identify land areas that affects sources' water quality; and
  - Identify the areas to be addressed in the source water assessment.
- For PWSs relying on surface water, the delineated source water protection area must include the entire watershed upstream of the PWS's intake structure, up to the State border. Whenever possible, States should also include in their delineations those parts of a watershed that are outside their State boundaries.
- For surface water-based PWSs, delineations must take into account the impacts of ground water on surface water. The source water protection areas may include surface water contribution areas and zones of ground water contribution to public surface water supplies. The consideration of surface water contribution areas and zones of ground water contribution during the delineation process is known as "conjunctive delineation."

SWPA Delineations for Ground Water-Based Systems

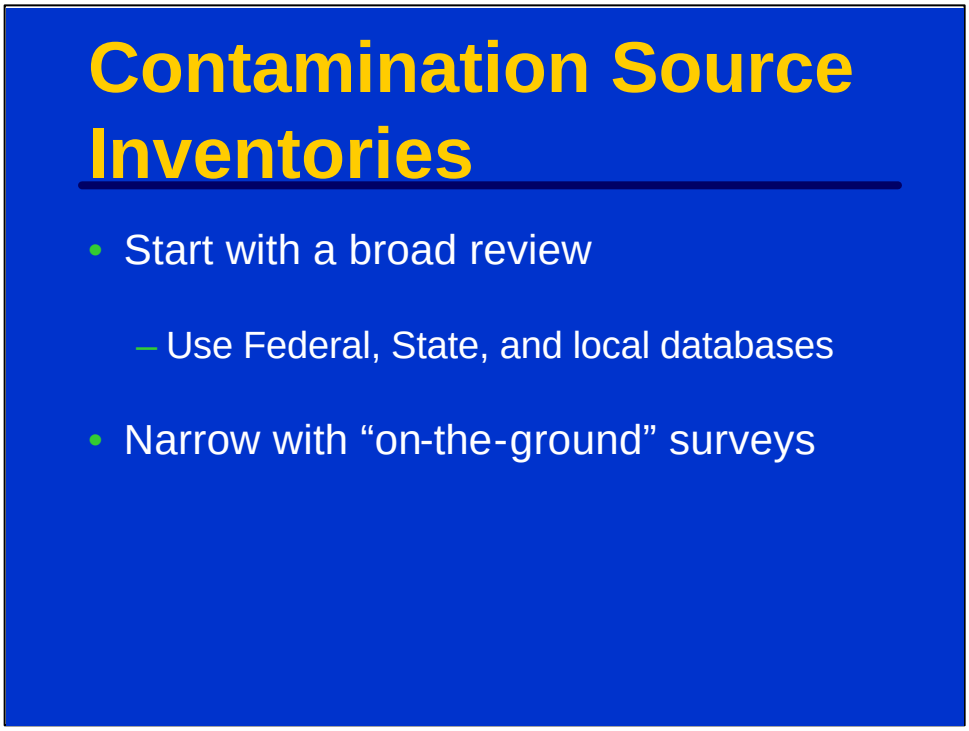


- For PWSs relying on ground water, the SWPA should be delineated in accordance with wellhead protection methods. Sometimes, it may be necessary to delineate source water protection areas either inside of or in addition to typical wellhead protection areas.
- A ***wellhead protection area*** is the surface and subsurface area surrounding a well or well field through which contaminants can reach the water supply.
- In the slide above, Palm Beach County, Florida, designates four regulation zones around each regulated well based on time of travel criteria and draw down.

Contamination Source Inventories

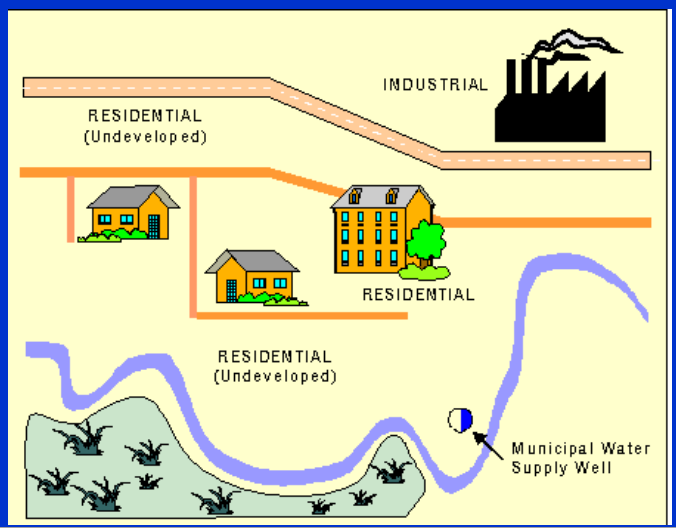
- Identify contaminants of concern
- Identify significant potential sources

- In developing a contaminant source inventory, assessors must identify all contaminants of concern and all significant potential sources of those contaminants.
- ***Contaminants of concern*** include:
  - Raw water contaminants regulated under the SDWA (contaminants with an established maximum contaminant level [MCL]);
  - Contaminants regulated under the Surface Water Treatment Rule; and
  - *Cryptosporidium*.
- In addition, States may include contaminants that are not regulated under SDWA but that may present a threat to public health, such as certain microbiological contaminants (e.g., pathogenic viruses).
- A ***significant potential source of contamination*** is any facility or activity that stores, uses, or produces, as a product or by-product, any contaminant of concern and has a sufficient likelihood of releasing such contaminant to the environment at levels that could contribute significantly to the concentration of these contaminants in source water protection areas of a public water system.
- The source inventory must include a clear description of the sources of contamination (or categories of sources) either by specific location or by area. Inventories may also include anticipated future sources of contamination.

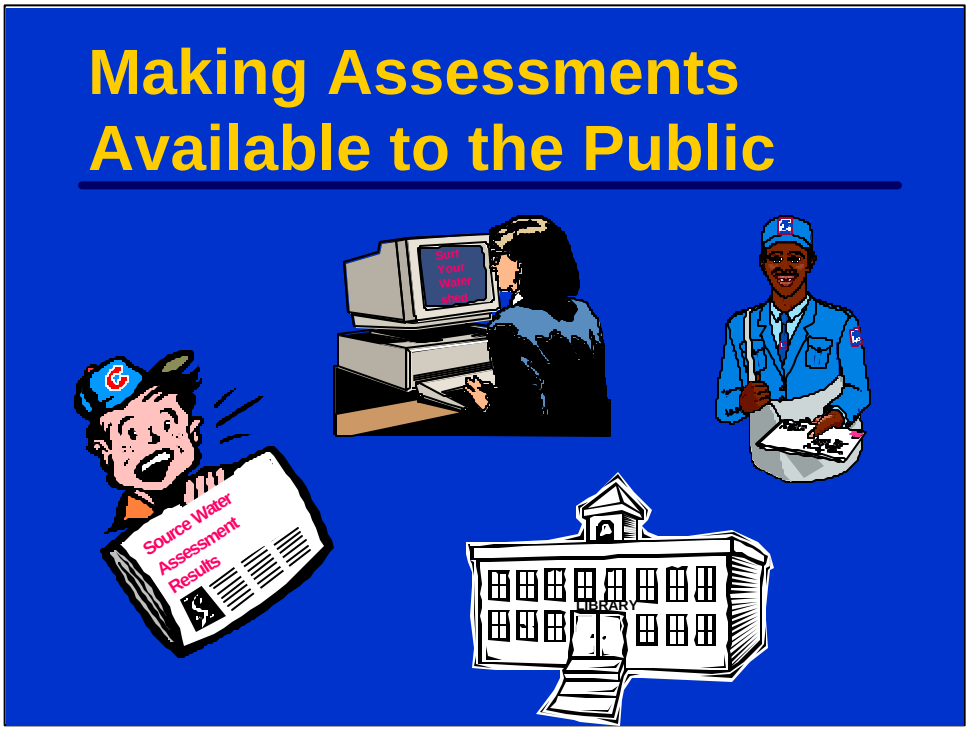


- Reviewing existing data bases can provide a "first cut" inventory at little or no cost. Many Federal, State, and local agencies maintain data on facilities that use, store, or manufacture potential contaminants. Examples include EPA's National Priorities List of Superfund sites and National Pollutant Discharge Elimination System (NPDES) permittees; SARA Title III toxic reporting inventory (TRI) lists; State records on underground storage tanks, salt storage facilities, and landfills and surface impoundments; and local land use maps or lists of commercial and industrial activities. Vulnerability assessments performed by PWSS staff can also provide information.
- Once a broad review of existing data is complete, inventories can be narrowed to focus on specific protectiveness goals or to gain more detailed information. Focused inventories can include windshield surveys (driving around the delineated area noting potential sources), mail or telephone surveys, and door-to-door surveys in which individual residents and business owners are interviewed about activities and their associated risks.
- In conducting inventories for local WHP programs, many communities have been creative in seeking the assistance of volunteers. For example, in some communities retired senior citizens with years of technical work experience conducted windshield surveys.

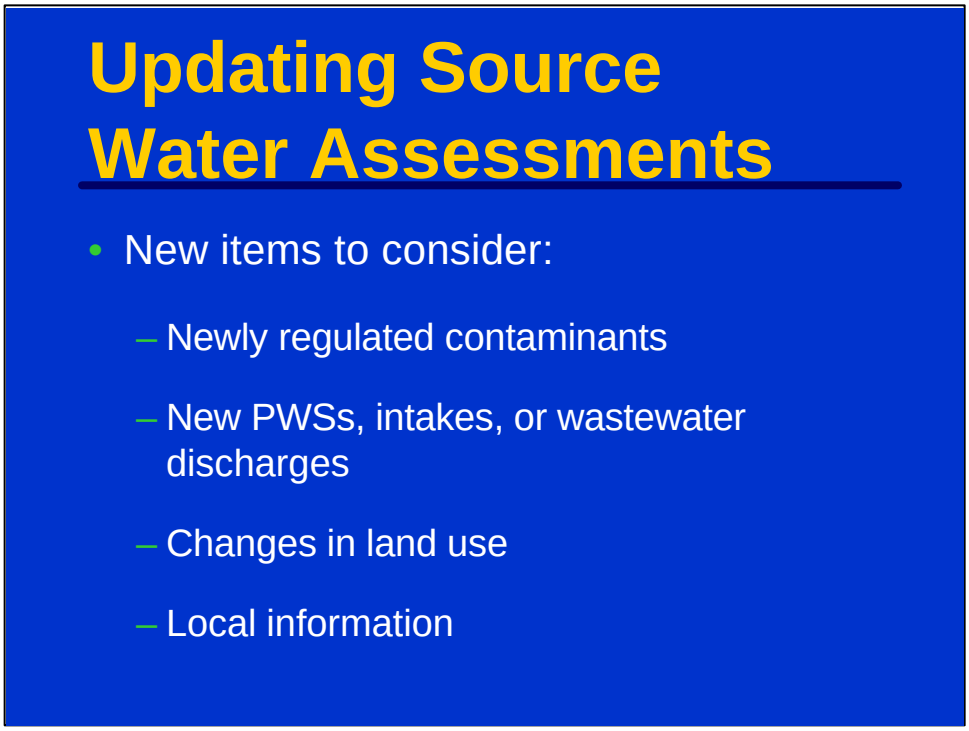
Susceptibility Determinations



- The third component of a complete SWA is the ***susceptibility determination***. This refers to a determination of the susceptibility of the water supply to contamination, based on the contamination source inventory and other relevant factors. The susceptibility determination is useful for decisions regarding management of the source water protection area and source water protection activities.
- The susceptibility determination may be based on:
  - Hydrologic and hydrogeologic factors such as ground water or surface water movement;
  - Characteristics of the contaminants (e.g., toxicity, environmental fate and transport);
  - Characteristics of the potential source of the contaminant (location, likelihood of release, effectiveness of mitigation measures); and
  - Other factors such as well intake and well integrity.
- The susceptibility determination may be an absolute measure of the potential for contamination of the public water supply, a relative comparison between sources within the source water protection area, or a relative comparison to findings by other assessments.
- In defining sources, multiple units can be considered a single source. For example, multiple septic systems in one subdivision would likely be considered one source.



- When the assessments are complete, States must make the results available to the public. The results must be understandable and should include maps of the delineated source water protection area and significant sources of contamination described in the inventory. This requirement is consistent with the 1996 Amendments' emphasis on more public notice and involvement.
- Drinking water utilities' annual consumer confidence reports (CCRs) may be the most efficient way to distribute the assessment results or announce their availability. CCRs give consumers information on their drinking water and opportunities to get involved in protecting their source water.
- EPA's "Surf Your Watershed" Internet site provides State or watershed level information about protection efforts and drinking water (http://www.epa.gov/surfnewi/watershed.html). The Index of Watershed Indicators (IWI) describes the condition and vulnerability of over 2,000 watersheds. Surf and IWI can benefit source water protection by providing key environmental data to the public.
- The Environmental Monitoring for Public Access and Community Tracking (EMPACT) Program is a new approach to collecting, managing, and presenting useful, plain-language, environmental information at the city or community level. A pilot project on the Raccoon and Des Moines Rivers in Des Moines, Iowa, will focus on drinking water monitoring to give citizens information on source water quality. This program is only available to communities that compete successfully for it.
- Assessment results could also be made available in customers' water bills, local libraries, municipal offices, or by a telephone or on-line computer system.

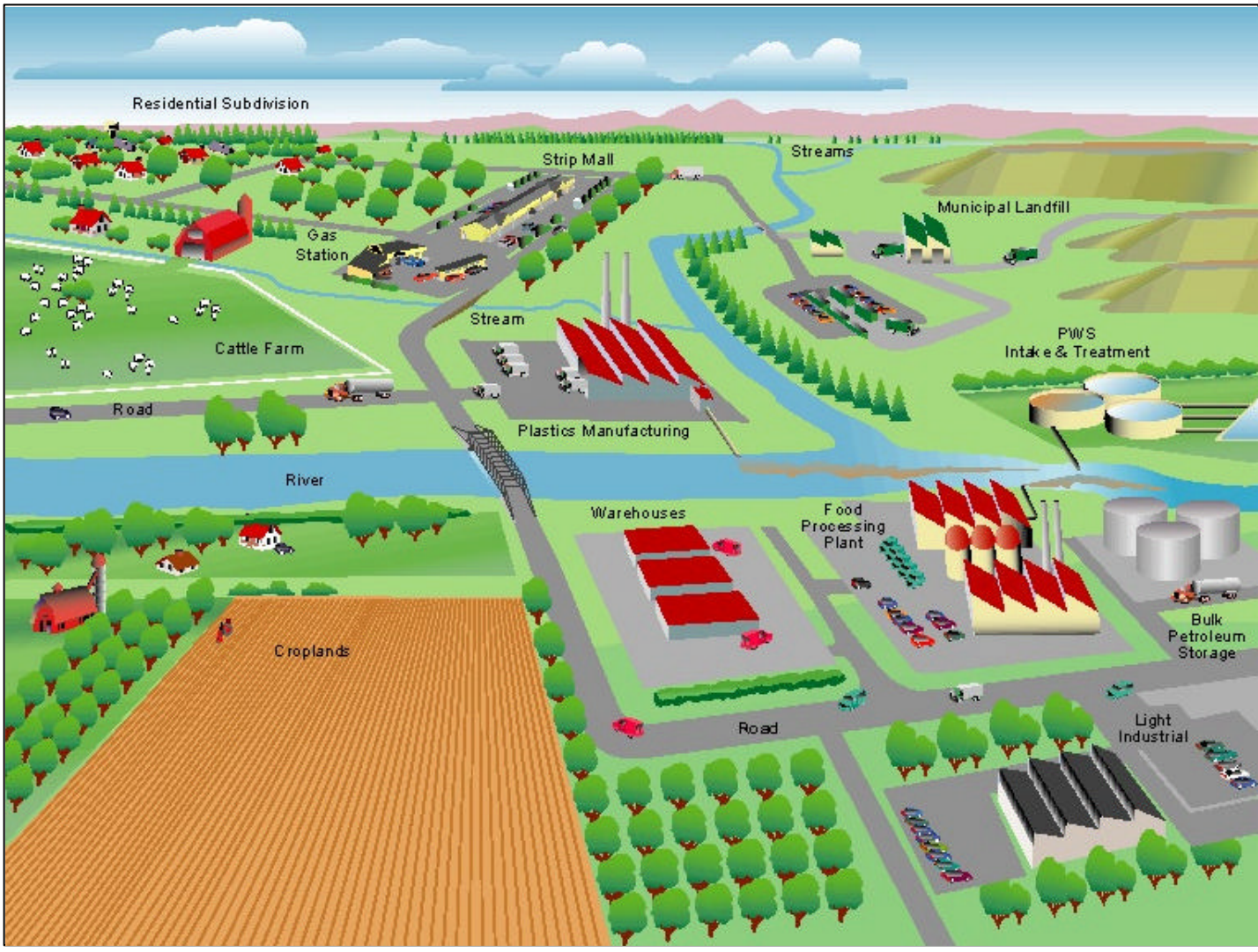


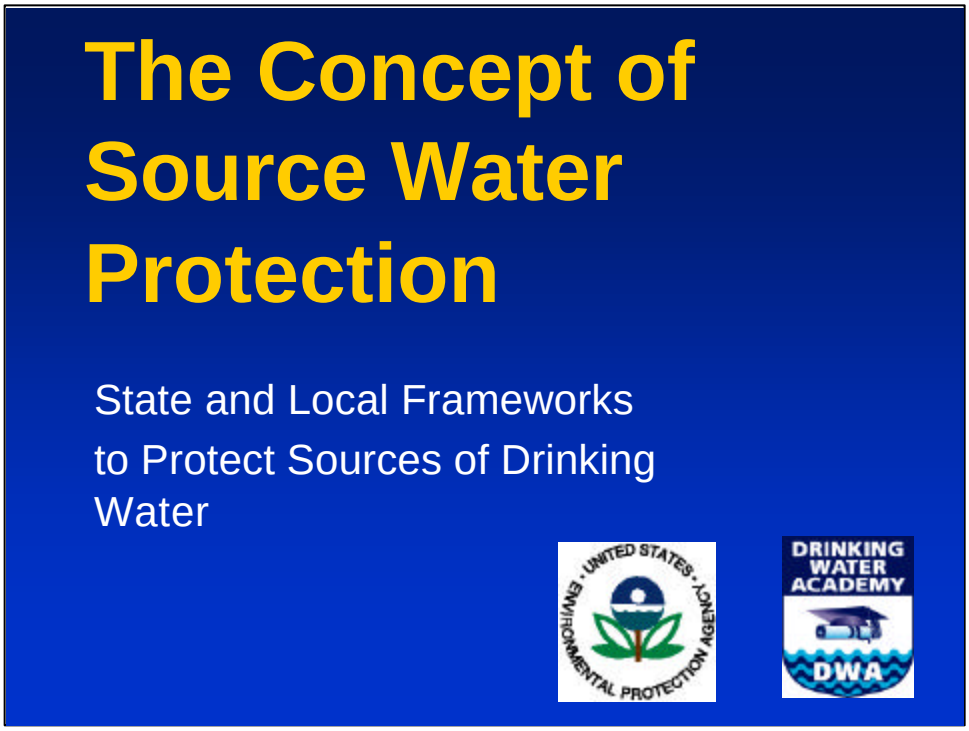
- After the initial source water assessments are complete, EPA recommends that they be reviewed and updated periodically to address regulatory changes or new activities in the source water protection area. Things to be considered in updating assessments include:
  - Contaminants to be addressed in new and future EPA rulemakings, such as the Ground Water Rule, the Chemical Monitoring Reform Rule and Alternative Monitoring Rule, and the Class V Underground Injection Control Rule;
  - New PWSs, wells or surface water intakes, or wastewater discharge permittees;
  - Changes in land use such as new industrial or agricultural activity; and
  - Additional local information that may be currently unavailable but gathered over time.

Plan a Source Water Assessment

A Group Exercise

- In small groups, take 20 minutes to discuss how you would develop a source water assessment in the community shown on the next page.
  - Roughly identify the boundaries of your source water protection area;
  - Identify potential contaminants and sources of concern; and
  - Determine what information you would collect and analyze to complete the susceptibility determination.


Residential Subdivision
Strip Mall
Streams
Municipal Landfill
Gas Station
Stream
Cattle Farm
PWS Intake & Treatment
Road
Plastics Manufacturing
River
Warehouses
Food Processing Plant
Bulk Petroleum Storage
Croplands
Road
Light Industrial



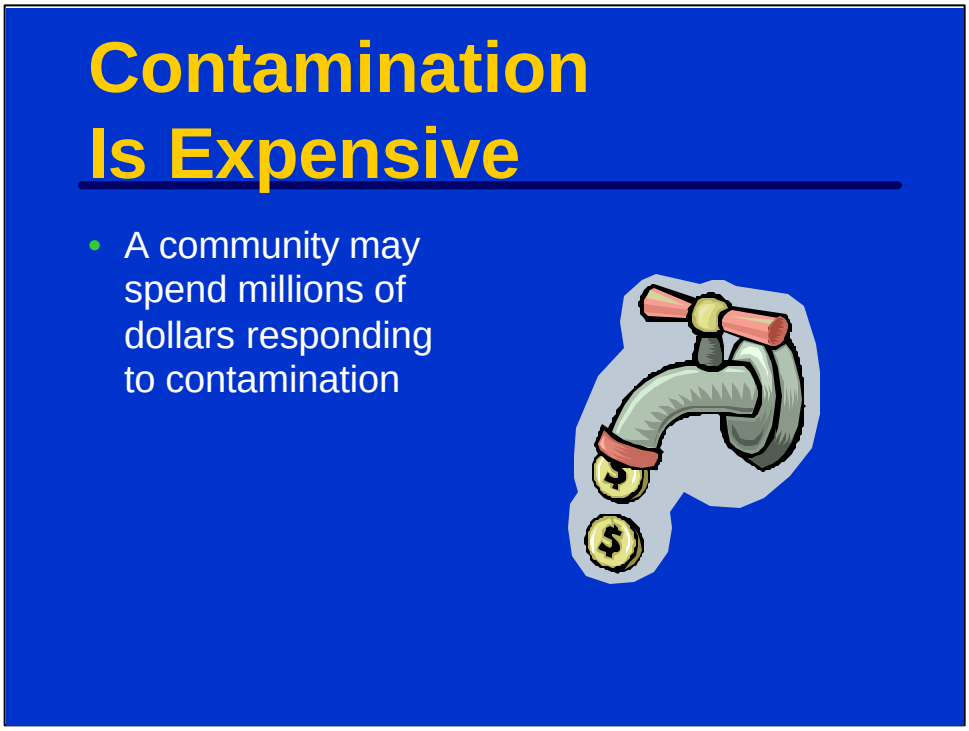
- While the assessment is an important first step to protecting a drinking water source, a protection program requires on-the-ground management strategies based on community-wide involvement.
- Local communities, working in cooperation with State agencies, can use the information gathered through the assessment process to create a broader source water protection program to address current problems and prevent future threats to the quality of their drinking water supplies. EPA will also continue to support State and local programs through guidance and funding.
- Source water protection may provide many benefits to individuals and communities. The following slides describe these benefits.
- Following the benefits discussion, specific Federal, State and local drinking water source protection programs are described.

Benefits of Source Water Protection

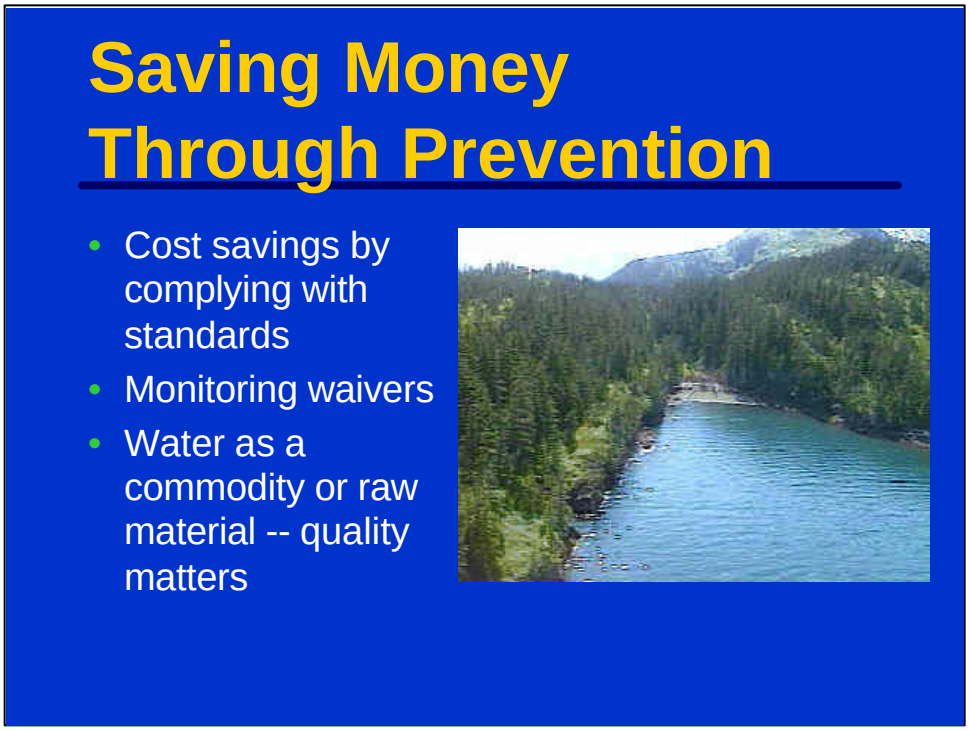
An ounce of prevention is worth a pound of cure.

- Many communities are implementing protection efforts to prevent contamination of their drinking water supplies. These communities, counties, and locally financed water districts have found that the less polluted water is before it reaches the treatment plant, the less extensive and expensive the efforts needed to safeguard the public's health.
- Studies have shown that the cost of dealing with contaminated ground water supplies for the communities studied was, on average, 30 to 40 times more (and up to 200 times greater) than preventing their contamination.
- Further, clean water and healthy ecosystems offer other unquantifiable benefits, in terms of the quality of our lives.
- This section describes the benefits of preventing drinking water contamination. It describes and compares the costs of contamination and the benefits or costs-avoided due to preventive measures.

- The benefits to communities of protecting their drinking water supplies might best be understood by describing the costs of failing to protect them. These costs include those that are relatively easy to capture in monetary or economic terms and those that are not. Easily quantifiable costs of drinking water supply contamination include:
  - Treatment and remediation;
  - Finding and developing new supplies and providing emergency replacement water;
  - Abandoning a drinking water supply due to contamination;
  - Paying for consulting services and staff time;
  - Litigating against responsible parties;
  - Conducting public information campaigns when incidents arouse public and media interest in source water pollution;
  - Meeting the regulations of the Safe Drinking Water Act, such as the disinfection byproduct and monitoring requirements;
  - Loss of property value or tax revenue; and
  - Loss of revenue from boating or fishing when a lake or reservoir is used as a drinking water supply.
- Costs that are not easily quantified include:
  - Health related costs from exposure to contaminated water;
  - Lost production of individuals and businesses, interruption of fire protection, loss of economic development opportunities; and
  - Lack of community acceptance of treated drinking water.



- One basic truth is that dealing with contamination is expensive. Consider the following communities' experiences.
  - In **Perryton, Texas**, carbon tetrachloride was detected in the ground water supply. Remediation cost this small community an estimated $250,000.
  - Pesticides and solvents in **Mililani, Hawaii,** ground water required the system to build and operate a new treatment plant. The plant cost $2.5 million, and annual operation costs are $154,000.
  - The towns of **Coeur d'Alene, Idaho,** and **Atlanta, Michigan,** have experienced contamination of their ground water supplies. Each had to replace its water supply, at costs of approximately $500,000.
  - Solvents and freon in the ground water serving **Montgomery County, Maryland,** are requiring the county to install water lines and provide free water to its customers. This has cost the County over $3 million, plus $45,000 per year for 50 years.
  - *Cryptosporidium* in **Milwaukee**'s river water sickened hundreds of people and required the city to upgrade its water system. The cost of the system improvements, along with costs to the water utility, city, and Health Department associated with the disease outbreak were $89 million.
- Preventing drinking water contamination can save communities similar response costs.



- Prevention can save communities money in other ways.
- Communities with effective drinking water contamination prevention programs may enjoy substantial **savings in the costs of complying** with SDWA or similar state regulations. For example, water purveyors that minimize algae growth by implementing programs that prevent nutrients from entering water supply reservoirs will likely minimize the cost for treating the water to remove total organic carbon in compliance with the Disinfection Byproducts Rule.
- Water suppliers with programs in place to prevent contamination of drinking water also may be eligible for **waivers** from some monitoring requirements, thereby reducing monitoring costs. Such waivers have already saved Massachusetts water systems approximately $22 million over the three-year compliance cycle, while Texas water systems saved $49 million over two and one-half years.
- In addition, **water can be thought of as a commodity** that water systems sell and farmers use as a raw material. Once it becomes contaminated, it loses value because it cannot be sold to customers, or it must be treated prior to being sold or used. Uncontaminated water has value to the PWS, determined by the price of water its customers are willing to pay.

Other Economic Benefits

- Real estate values
- Business development
  - Tax revenues
  - Jobs
- Recreation and tourism revenue

- Preventing contamination of drinking water can also help to **maintain real estate values** in areas served by protected water supplies. In regions affected by water supply contamination, declines in real estate values have been clearly documented, such as in Cape Cod, Massachusetts.
- Protecting water supplies may also **prevent the loss of existing or potential tax revenues and jobs** when businesses refuse to locate or remain near places with known or suspected problems. For example, a survey by the Freshwater Foundation found that five Minnesota cities collectively lost over $8 million in tax revenues because of real estate devaluation as a result of ground water pollution.
- Preventing contamination of a water supply that serves as a major scenic or tourist attraction can **safeguard local tourism and recreation revenues**. For example, the annual value of tourism and recreation in the Keuka Lake watershed in upstate New York was conservatively estimated at $15 million in 1996. Keuka Lake provides drinking water for the villages of Penn Yan, Hammondsport, Keuka Park, and Dresden.

> "The integrity of a town's water reflects upon the integrity of the companies within that town."
>
> *Sam Rowse, President of Veryfine Products in Westford, MA, on businesses' preference for communities with protected water supplies.*

Still More Economic Benefits

Detention pond

- BMPs are standard operating procedures that can reduce the threats that activities at homes, businesses, agriculture, and industry can pose to water supplies
- BMPs can increase the aesthetic beauty and value of residential and commercial properties

- Some best management practices, such as aesthetically designed runoff controls offer financial benefits in addition to their environmental benefits. When designed and sited correctly and safely, artificial **lakes or wetlands can increase the value of surrounding property** (and the tax revenue they generate).
- Developers often realize higher (and quicker) sales from homes adjacent to a wet pond; walking paths and fitness equipment can add to the aesthetics of the area and provide recreational uses, further increasing property values. In general, the proximity to water raises the value of a home by up to 28 percent, according to a 1993 study conducted by the National Association of Home Builders.
- A few cases illustrate this point:
  - In the Sale Lake subdivision of Boulder, Colorado, lots surrounding a constructed wetland drew a 30 percent price premium over those with no water view.
  - In the Hybernia community of Highland Park, Illinois, waterfront lots surrounding a constructed detention pond and stream system draw a 10 percent premium above those with no water view.
  - BMPs can increase rental values as well. At the Lynne Lake Arms in St. Petersburg, Florida, apartments or townhouses facing detention ponds on the property return rents of $15 to $35 more per month than those that are not. Similar trends are seen in rental fees for commercial property, such as office space in Fairfax County, Virginia.

Non-Monetary Benefits

- In addition to the monetary benefits of preventing contamination of drinking water supplies, there are benefits that are difficult (or controversial) to assign a dollar value. While difficult to quantify monetarily, they have a direct link to quality of life. Their importance may rival or exceed that of monetary benefits. For example, protection of human health is the driving force behind the nation's water supply protection programs.
- Other quality of life benefits include safeguarding resources for future generations, building confidence in the water supply, and maintaining healthy ecosystems and opportunities for recreation.

Health Benefits

- Reduce risk to human health
  - Illnesses and death
  - Productivity and wages
  - Medical expenses

- Preventing contamination of drinking water supplies should result in reduced risk to human health from both acute and chronic ailments. Overall, the U.S. is doing a good job delivering safe drinking water to the public, but challenges remain and may increase as new waterborne disease agents and chemicals are found in water supplies. Although most people experience only mild illnesses from waterborne microbes, pathogenic organisms such as *Cryptosporidium* and some strains of *E. coli* can be transmitted to people through drinking water and cause serious illness or even death.
- In addition to threats posed by microbial contaminants, other substances can contaminate water supplies. Metals, volatile organic carbons, synthetic organic chemicals, and pesticides can cause serious health problems for persons exposed to them over long periods of time at levels exceeding health-based drinking water standards. Potential health effects of long-term exposure to these pollutants include cancer, birth defects, and organ, nervous system, and blood damage.
- The health-related costs of contamination can include lost wages, hospital and doctor bills, and in extreme cases, death.

Quality of Life Benefits

- Safeguarding resources for future generations
- Building confidence in the water supply
- Healthy ecosystems and recreational benefits

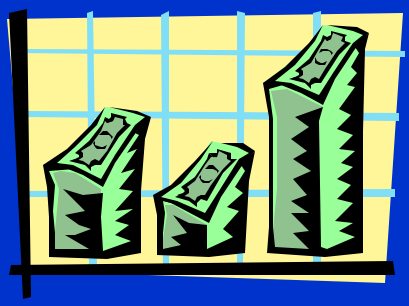
- Stewardship of water resources is an important goal for people in a community who care about the fate of their children and grandchildren. **Protecting water supplies for future generations** brings with it a sense of accomplishment and legacy, and generates an attitude of pride in the community.
- Effective communities often exhibit a prevailing attitude of **trust toward the local government** structure. If residents have a high level of confidence in the ability and commitment of the people on whom they depend for clean water, they are much more likely to be supportive of these departments on a day-to-day basis, as well as at town or city council meetings when programs and budgets are presented. This attitude is critical to continued success in providing high quality water.
- By ensuring clean water resources, a community helps to support the biological systems on which life depends. **Plant and wildlife ecosystems** benefit from clean water as much as people do. In addition to providing drinking water, clean water resources often **enhance recreational activities**, such as swimming, fishing, and boating. These and other activities, in addition to enhancing the quality of life for people who engage in them, may provide enormous tourism or other economic benefits to local economies.

The Costs of Prevention

- Vary based on the prevention measures selected
- Differ from community to community

- Of course, there are costs associated with preventing contamination of drinking water supplies.
- The cost to an individual supplier or community greatly **depends on the types of preventive measures** it chooses to implement. Protective measures can be relatively simple and inexpensive (such as public education programs) to expensive (such as purchasing land or easements). Program costs include staffing; program planning, development, and administration; land or easement purchases; and structural management measures.
    - **Constructed management devices** such as wetlands and retention basins, can cost approximately $100,000 for a 50-acre site, plus the value of the land they occupy.
    - **Housekeeping measures** such as street sweeping cost public works departments depending on the frequency at which they are performed.
- These costs may **vary greatly from community to community** and place to place, and will depend on such factors as the value of real estate in a particular area and the measures the community selects to protect its water supplies.

Comparing Costs and Benefits



- Responding to contamination can be as much as 200 times as costly as prevention

- EPA studied the contamination and prevention costs to six small- and medium-sized communities that experienced contamination of their ground water supplies and subsequently developed a wellhead protection program.
  - Costs of contamination included costs of remediation activities, replacing water supplies, and providing water.
  - Prevention costs include basic program costs for delineating a protection area, identifying potential sources of contamination, developing an initial management plan, and planning for alternative water supplies and other responses in case of an emergency.
  - The ratio of the benefits of avoiding contamination to the costs of the wellhead programs ranged from 5 to 1 to 200 to 1.

SWP Is Worth It

- Comparing the costs of contamination to the costs to prevention reveals that prevention programs are generally well worth the cost and effort as an effective “insurance” against contamination and its associated costs.
- If you add the considerable quality of life benefits that are potentially provided by a source water protection program, the program may prove to be a bargain.

Federal Source Water Protection Programs

- There are many programs administered by EPA and by other Federal agencies that can be used to protect source water, especially surface water.
- EPA-administered programs include those under the Safe Drinking Water Act and the Clean Water Act.
- Other Federal agencies that administer relevant programs include the Departments of Agriculture, Transportation, and the Interior, the Army Corps of Engineers, and the U.S. Geological Survey.
- In addition, the National Environmental Policy Act (NEPA) provides an important opportunity to point out potential drinking water impacts and recommend alternative sites or mitigative measures.

Historical EPA Ground Water and UIC Programs

- Underground Injection Control program
- Sole Source Aquifer program
- Wellhead Protection program
- Source Water Petition programs

- The Federal government began a limited role in protecting drinking water with the creation of the U.S. Public Health Service (PHS) in 1912 and the PHS's subsequent regulation of drinking water in interstate commerce (e.g., on interstate carriers). Prior to 1974, States had the primary responsibility for protecting drinking water and ground and surface water sources.
- The 1974 SDWA included provisions for the ***Underground Injection Control*** (UIC) program. This program protects Underground Sources of Drinking Water (USDWs) from contamination through injection wells. (The UIC program is described in detail in another DWA module, *Introduction to the Underground Injection Control Program*.)
- In 1974, SDWA also offered another program to protect ground water sources through the ***Sole Source Aquifer program***. This program prohibits Federal financial assistance for projects that might contaminate an aquifer that has been designated by EPA as a sole or principal source of drinking water for an area.
- The 1986 SDWA Amendments established the ***Wellhead Protection (WHP) Program*** in Section 1428. This non-regulatory program includes provisions to protect the surface and subsurface areas around public drinking water wells and offers communities a cost-effective means of protecting vulnerable ground water supplies.
- The ***Source Water Petition Program*** is authorized by SDWA Section 1454, is voluntary for States, and is intended to support locally-driven efforts designed to address a limited number of contaminants identified in SWAPs.
- Generally, EPA's ground water and source water programs are not regulatory. There are no enforceable national ground water standards. These programs typically educate, facilitate, coordinate, and assist with protection of ground water.

What Is a Sole Source Aquifer?

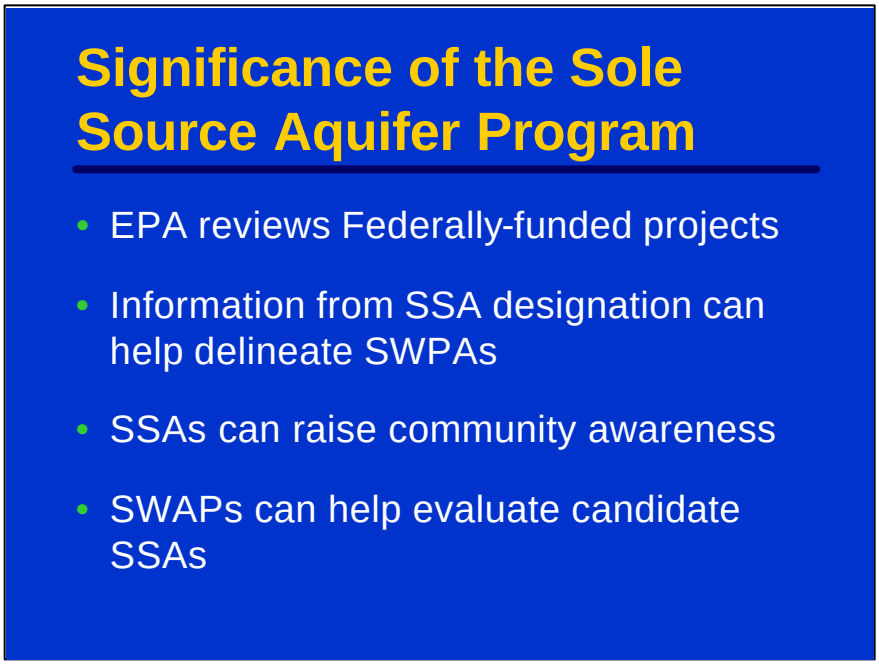
- Supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer
- No physically, legally, and economically-available alternative drinking water source exists

- The Sole Source Aquifer Protection Program is authorized by Section 1424 of the Safe Drinking Water Act of 1974. The program provides for EPA review of proposed Federal financially-assisted projects, such as highway improvements, wastewater treatment facilities, or agricultural projects that can potentially contaminate a designated sole source aquifer.
- A ***sole source aquifer***, or principal source aquifer, is one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas can have no alternative drinking water source that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water.

Sole Source Aquifer Program (continued)

- Any person or organization may petition EPA to designate an aquifer as a sole source
- 70 designated sole source aquifers as of February 2000

- Any person or organization may apply to designate an aquifer as a sole source by submitting a petition to EPA. As of February 2000, there are 70 designated sole source aquifers in the U.S.
- The 1986 Amendments re-established the Sole Source Aquifer Program and authorized a demonstration project to assist local governments that made a start in protecting their sole source aquifers. These projects were never funded or implemented.



- Proposed projects with Federal financial assistance that have the potential to contaminate SSAs are subject to EPA review by a ground water specialist. This review is coordinated with National Environmental Policy Act (NEPA) reviews and with relevant Federal, State and local agencies. Examples of projects that might be subject to review include highways, wastewater treatment facilities, construction projects that involve storm water disposal, public water supply wells and transmission lines, agricultural projects that involve the management of animal waste, and projects funded through Community Development Block Grants. Project reviews can result in:
  - EPA requirements for design improvements, ground water monitoring programs, maintenance and educational activities that would not otherwise occur; or
  - Direct technical assistance, by identifying specific activities that may lead to ground water contamination. In addition, technical assistance usually involves site-specific coordination of ground water protection activities among State and local environmental and public health protection agencies.
- The hydrogeologic and water usage information required by EPA during the process of designating a sole source aquifer can help define source water protection areas and determine the susceptibility of water supplies. Sole source aquifer project reviews can be a valuable source of information on potential contaminant sources in source water protection areas.
- A sole source aquifer designation can also increase community awareness on the use, value, and vulnerability of aquifers and build support for implementing various ground water protection efforts at the local level.
- The information from source water assessments can be used to help evaluate whether an area meets SSA designation criteria, and can provide useful information for project reviews, such as the location of delineated source water protection areas, potential or existing sources of contamination, and local variations in aquifer susceptibility.
- Some States have chosen to regulate activities in SSAs to provide additional ground water protection.

Significance of the UIC Program

- The Underground Injection Control program's mission is to **protect underground sources of drinking water** from contamination by regulating the construction and operation of injection wells

- The UIC program mission is to protect underground sources of drinking water from contamination by regulating the construction and operation of injection wells.
- Injection is defined as ***subsurface emplacement of fluids through a bored, drilled, or driven well or through a dug well where the depth of the dug well is greater than the largest surface dimension; or a dug hole whose depth is greater than the largest surface dimension; or an improved sinkhole; or a subsurface fluid distribution system***.
- Protection of ground water from this potential source of contamination is significant since there are more than 800,000 injection wells in the U.S. that dispose of a variety of wastes including hazardous waste. (Only a small portion of injection wells inject hazardous waste.)

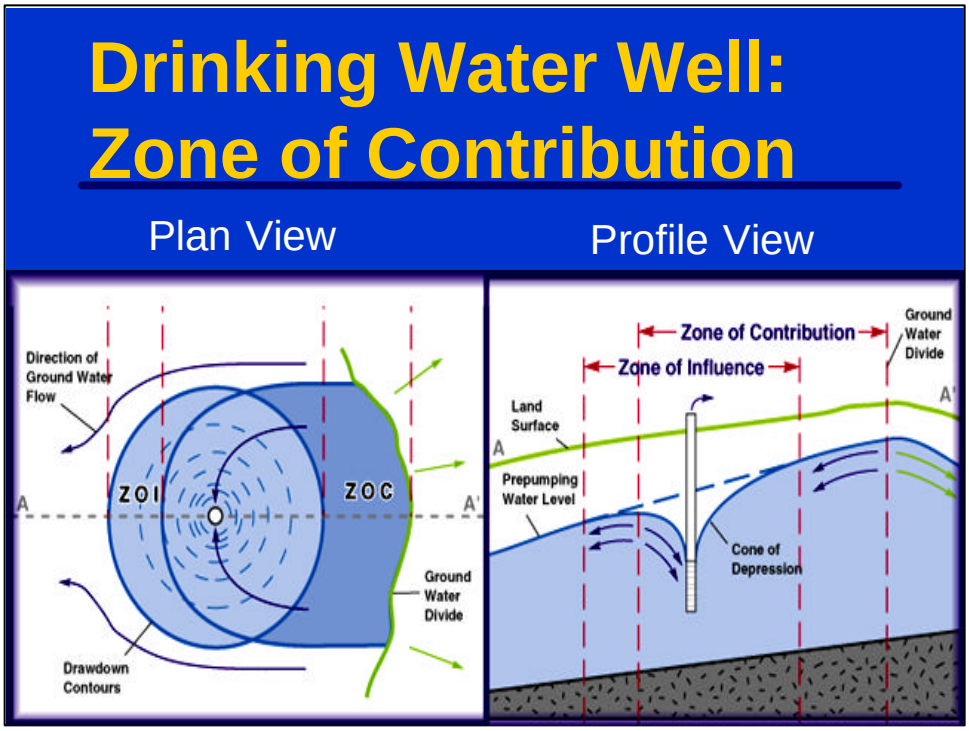
What Is Wellhead Protection?

- Protection of ground water sources
- Authorized by SDWA Section 1428 of the 1986 amendments
- EPA-approved, State-designed wellhead protection plans can receive Federal funding to protect ground water sources
- Requirements for Federal compliance

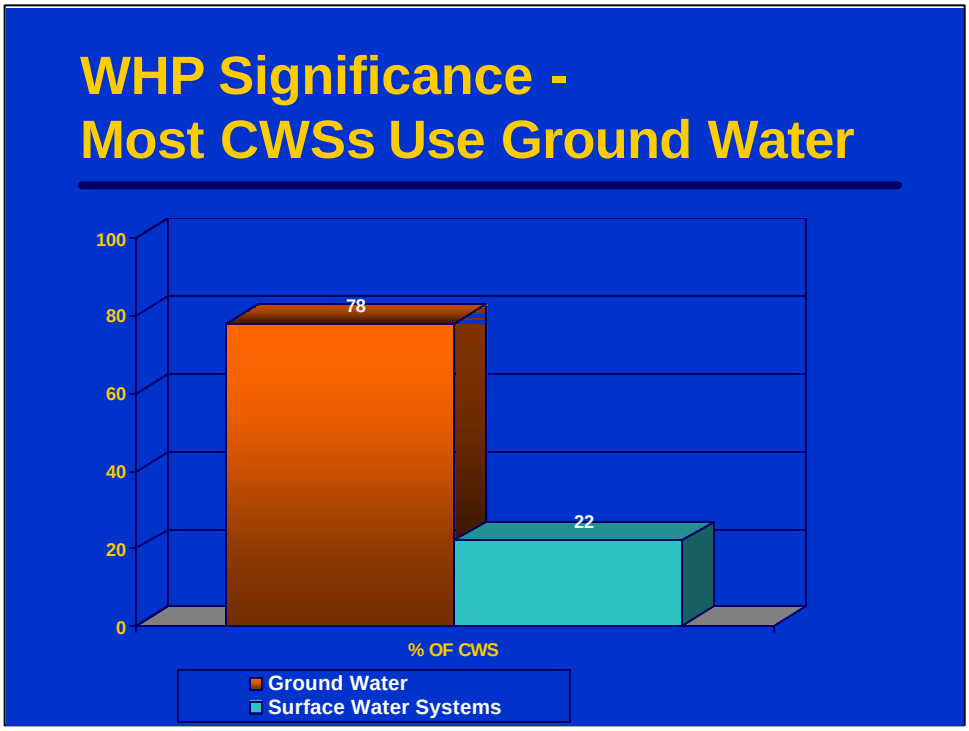
- Section 1428 of the 1986 SDWA Amendments created the Wellhead Protection (WHP) Program, which offered communities a cost-effective means of protecting vulnerable ground water supplies. This program does not address surface water supplies.
- The 1986 Amendments required each State to submit a comprehensive State wellhead protection plan to EPA within three years. EPA reviewed the State-proposed wellhead protection programs; if a program was disapproved, the State could not receive Federal funds to implement its program. Congress believed that this enabled EPA to direct the use of scarce Federal dollars in the most effective way, while letting States continue to pursue their preventative programs. Currently, 49 States and two Territories have EPA-approved WHP programs.
- To establish wellhead protection programs, communities delineate vulnerable areas and identify sources of contamination. Through regulatory or non-regulatory controls, local officials and volunteers manage contamination sources and protect their water supply, as well as plan for contamination incidents or other water supply emergencies.

- Establishing and implementing a local WHP program consists of five basic steps:
  - Forming a WHP planning team: assembling a group of knowledgeable people, including volunteers, to develop and implement the WHP program.
  - Delineating a wellhead protection area: mapping the areas that provide recharge to a drinking water well or that might lead to contamination. Wellhead protection areas are for a public drinking water source, not any area surrounding ground water. Delineations may range from simple radii around each well to complex hydrogeologic models.
  - Identifying potential sources of contamination: determining whether any potentially hazardous activities are occurring in the wellhead protection area.
  - Choosing management tools: selecting regulatory (e.g., zoning ordinances) or non-regulatory (e.g., public education) controls to protect ground water.
  - Planning for contingencies: developing ways to respond to short-term emergencies such as hazardous spills, or long-term threats, such as providing alternative water supplies.
- The public information requirements for the SWP program do not apply to the WHP program. However, throughout its development and implementation, education and outreach are essential to the success of a local WHP effort.

Drinking Water Well: Zone of Contribution



- A wellhead protection area is defined in the 1986 SDWA Amendments as "the surface and subsurface area surrounding a water well or wellfield supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield."
- Wellhead protection area boundaries can be based on the zone of contribution (ZOC) to the well or a more arbitrary consideration such as a manually drawn circle of a set radius around a well. To determine the zone of contribution, the hydrologic and hydrogeologic factors must be considered.
- A zone of influence (ZOI) is an area where the pumping well influences the water level. Notice that for a pumping water well in a sloping water table (the majority of cases), the ZOI covers only a portion of the ZOC.



- Wellhead protection efforts are significant because many water systems use ground water as their primary source of drinking water.
- Of all community water systems (a water system serving 25 people at least 60 days of the year or a system with at least 15 service connections), just under 80 percent rely on ground water as their primary source. Most of these systems are small systems. (Of community water systems, 93 percent serve fewer than 10,000 people.) Smaller water systems are more likely to choose ground water sources, which usually require less treatment and usually involve smaller capital expenditures.
- Even though small systems relying on ground water are numerous, they serve only a small fraction of the population. For example, systems that serve 3,300 people or fewer make up 84 percent of CWSs nationwide, yet serve 10 percent of the population.
- Wellhead protection efforts continue today and make up a significant part of the source water protection program.

What Is the SWP Petition Program?

- SDWA Section 1454
- State-administered, voluntary program
- Supports local SWP efforts
- May use DWSRF funds
- EPA developed guidance

- ***Section 1454 of the SDWA*** establishes a ***State-administered Source Water Petition Program***, which is ***voluntary*** for States, and ***supports locally-driven efforts*** to address a limited number of contaminants identified in local SWP assessments. Petitions may address:
  - Pathogenic organisms that are regulated (or for which regulation is required) by EPA drinking water standards; or
  - Contaminants detected in source water that are not at levels "reliably and consistently" below the MCL in the source water at the intake structure or in any collection, treatment, storage, or distribution facility.
- Under the State program, an owner or operator of a CWS, or a municipal or local government or political subdivision within the State may ***submit a source water quality protection partnership petition to the State***, requesting assistance in support of a local, voluntary, incentive-based partnership among interested parties to protect their drinking water supply.
- The central focus of the petition program is to reduce or eliminate contaminants in the water supply by addressing their origin; obtain financial or technical assistance to facilitate efforts to protect source water in order to meet national primary drinking water regulations and standards; and help develop voluntary and incentive-based strategies for the long-term protection of source water supplying a CWS. A State may choose to focus its protection efforts on educating, equipping, and funding local communities and conservation districts to undertake local source water protection initiatives.
- A State may submit for approval a plan for a Petition Program at any time; it is not necessary to wait until source water assessments are completed. To date, no States have established petition programs. The process is very time-consuming, however, as there must be consensus-building at many levels. The assessment program can continue while a State is developing a Petition Program.
- See the State Source Water Protection Programs Guidance (August 1997) at www.epa.gov/ogwdw000/swp/swp.pdf for additional information.

Source Water Protection and the NPDWRs

- Surface water treatment rule
- Interim enhanced surface water treatment rule
- Disinfectants/disinfection byproducts rule
- Class V UIC rule

- Source water assessments can help States and systems comply with Federal and State drinking water regulations. Under the ***Surface Water Treatment Rule***, surface water-based systems that are seeking a waiver from the filtration requirements must meet water quality criteria and have a SWP plan that includes delineated source water protection areas and inventoried potential sources of pathogens in their watershed.
- Assessments could also provide information on potentially-contaminating activities in the watershed, and help States and systems prepare for the ***Interim Enhanced Surface Water Treatment Rule(IESWTR)*** and ***Disinfectants/ Disinfection Byproducts Rule (D/DPB)*** requirements to conduct routine sanitary surveys at surface water systems.
- In its final ***Class V Rule*** (December 7, 1999) EPA targeted high-risk Class V UIC wells -- large-capacity cesspools and motor vehicle waste disposal wells -- and linked the requirements for existing motor vehicle wells within critical ground water areas, including some areas assessed through State drinking water source assessment and protection programs.
- Class V wells are sometimes difficult to locate. Contaminant source inventories conducted under source water assessments may yield information useful to the Class V program by locating wells and identifying the need for regulation of other types of Class V wells.
- Conversely, Class V program staff can provide location information on these wells to source water protection programs helping to identify potential sources of contamination.

Source Water Protection and the NPDWRs

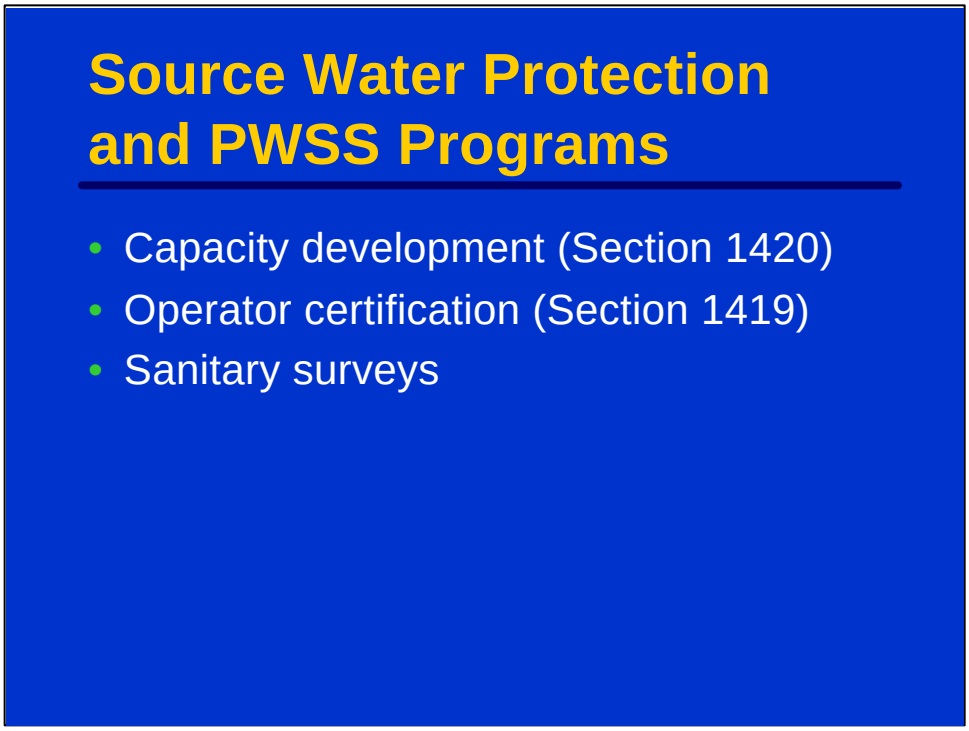
- Consumer Confidence Report rule
- Ground water rule

- The ***Consumer Confidence Report (CCR) rule*** requires all public water system operators to report annually on the status of their water systems. The reports must include information on the source and quality of the source water, and the results of a local source water assessment, when complete.
  - The CCR must specifically describe the source water (ground water, surface water, or a combination), and the commonly-used names of the water sources.
  - Information from the area's source water assessments must also be provided in the CCR, if available, including a brief summary of the system's susceptibility to potential sources of contamination and information on how consumers can obtain a copy of the assessment.
  - The system can also highlight additional efforts to protect source water or provide updated information on completed assessments.
- CCRs are a way to raise consumers' awareness of the sources of their drinking water and the importance of source water protection. By understanding where their drinking water comes from consumers can make informed decisions regarding their use of drinking water and may be motivated to join efforts to protect it.
- In developing the Ground Water Rule, EPA is considering strategies for alternatives to disinfection to control risk from microbial contamination. These strategies could include delineating microbial protection areas, inventorying potential sources of microbial contamination, and assessing hydrogeologic conditions and the effectiveness of microbial source management controls, which could draw from or support source water assessment efforts.

Source Water Protection and PWSS Programs

- Interim monitoring relief (Section 1418(a))
- Permanent monitoring relief and alternative monitoring guidelines (Section 1418(b))

- Increased ***flexibility*** built into the 1996 SDWA Amendments allows for source water assessments to serve as a basis for flexibility under drinking water regulations.
  - States can provide monitoring flexibility to systems whose sources historically have been relatively free of contamination and whose susceptibility to contamination is well understood.
  - The statute provides for waivers from certain testing or treatment requirements under Section 1418, ***interim monitoring relief***, and ***permanent monitoring relief*** and ***alternative monitoring***.
- Only public water systems that have completed assessments are eligible for alternative monitoring. However, alternative monitoring does not apply to microbiological contaminants, disinfection byproducts, or corrosion byproducts.
  - For example, a community that demonstrates that potential sources of cyanide, such as metal plating industries or mines, are not present in its source water protection area or, if present, are adequately controlled so that the water system is not susceptible to cyanide contamination, may be eligible for a monitoring waiver. Such a waiver may allow the system to reduce monitoring for cyanide, resulting in considerable cost savings.
- Regulations were proposed, but are not yet final, for chemical monitoring reform. These regulations would revise the monitoring requirements for 64 chemicals based on the risk of contamination for each water system, and establish a simple, uniform sampling schedule for those systems without an apparent or significant risk of contamination.



- A water system must have technical, managerial, and financial "capacity," according to the SDWA. Technical capacity may be generally understood in terms of three issues: source water adequacy, infrastructure adequacy and technical knowledge.
  - Source water adequacy can be defined as reliable water sources, awareness of source water issues, and may include a SWP plan.
  - Source water assessments can provide information directly relevant to determining source water adequacy, and, in turn, building of technical capacity and a capacity development strategy.
- A fully trained operator, as the on-site professional, should understand the benefits of multiple barriers to prevent contamination of drinking water supplies and should be able to provide important insights into the risks to water supplies from different, potential sources of contamination.
- States administer operator certification programs that meet the guidelines published by EPA on February 5, 1999. Beginning in 2001, EPA must withhold 20 percent of a State's Drinking Water Revolving Fund capitalization grant unless the State has adopted and is implementing a substantially equivalent operator certification program.
  - As of August 6, 2001, EPA had approved 31 State programs. See **http://www.epa.gov/safewater/opcert/approvals.html** for a list of approved State programs.
- A ***sanitary survey*** is an inspection of all components of a water system from source to tap. The inspection should identify potential sources of contamination and can provide the opportunity for States ***to conduct source water delineations and assessments***, update SWAPs, and follow up on the development of SWP activities. In addition, States could use information collected in source water assessments, whether done separately or concurrently, to enhance sanitary survey information and to identify systems of concern that should receive priority for surveys.

Emergency Powers

- Available to any SDWA program under Section 1431
- EPA may take enforcement action if a contaminant in drinking water presents an imminent and substantial endangerment to public health

- EPA may exercise this authority if State and local authorities have not acted.
- If practicable, EPA must consult with State and local authorities prior to taking action.
- EPA may issue administrative orders, including orders to provide alternative water supplies.
- EPA may also take a civil action, including requesting the court for restraining orders or permanent or temporary injunctions.
- Violators are subject to penalties up to $15,000 per day for violation of an order.

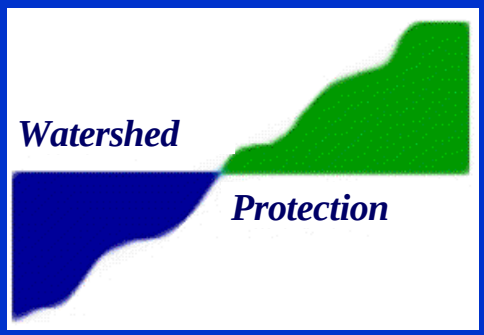
EPA Source Water Protection Initiatives

- Source Water Contamination Prevention Strategy
- National Rural Water Association
- Environmental Finance Center Network

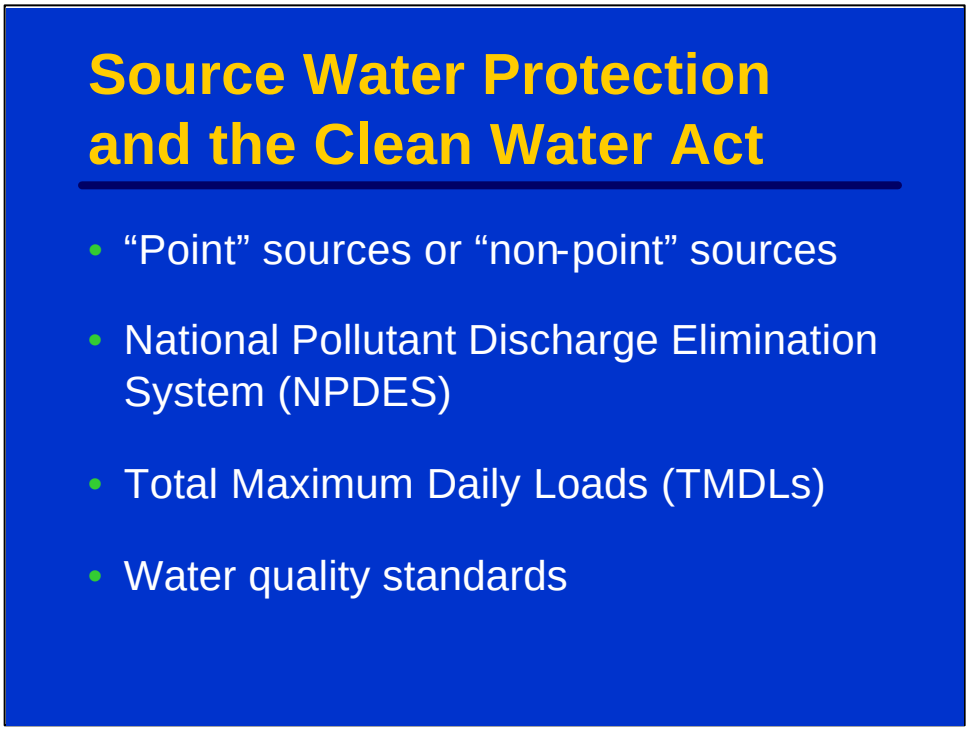
- EPA is working with the States and other partners to develop a Source Water Contamination Prevention Strategic Plan as a national framework for source water protection efforts. The **goal** of the plan is to ***protect current and potential drinking water sources and the health of those who rely on those sources***. The proposed long-term **vision** is that ***all interested stakeholders using a variety of tools in a coordinated fashion, establish barriers that significantly lower the risk of contamination entering current and potential drinking water resources***.
- The objectives of the plan will include enhancing coordination with Clean Water Act and other EPA programs and with other Federal agencies to better support local source water prevention priorities.
- The National Rural Water Association has hired new field technicians to help water systems and localities in 27 project areas in 11 States to develop and implement source water protection plans through 2001.
- The Environmental Finance Center Network is also helping water systems and localities develop and implement source water protection plans in eight project areas in eight States.

Source Water Protection and the Clean Water Act

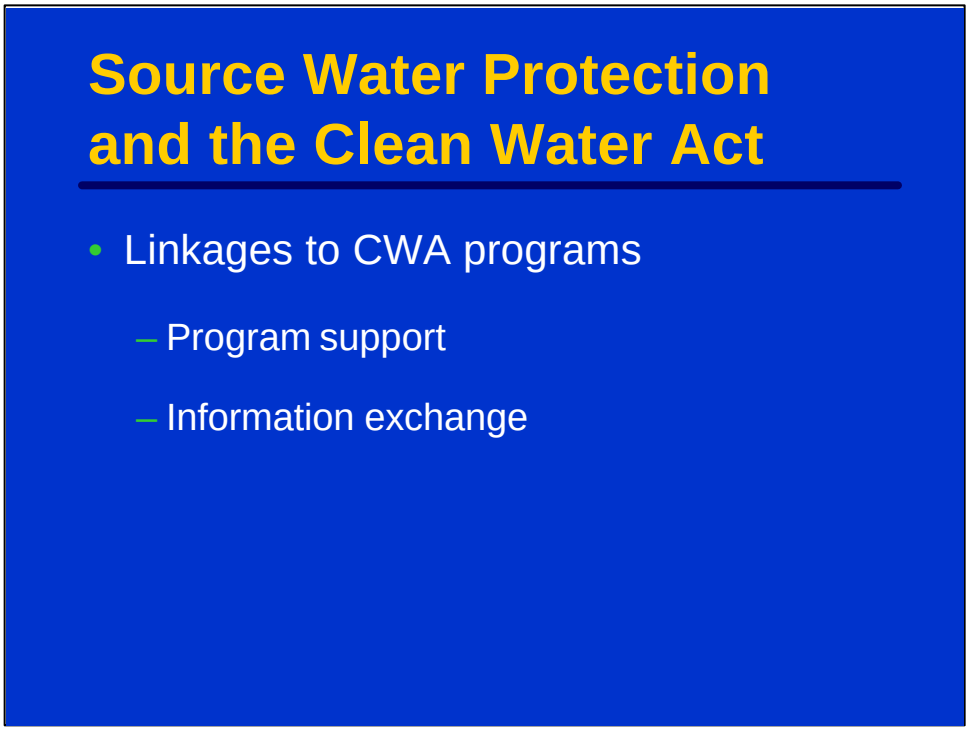
Clean Water Action Plan
RESTORING AND PROTECTING AMERICA'S WATERS



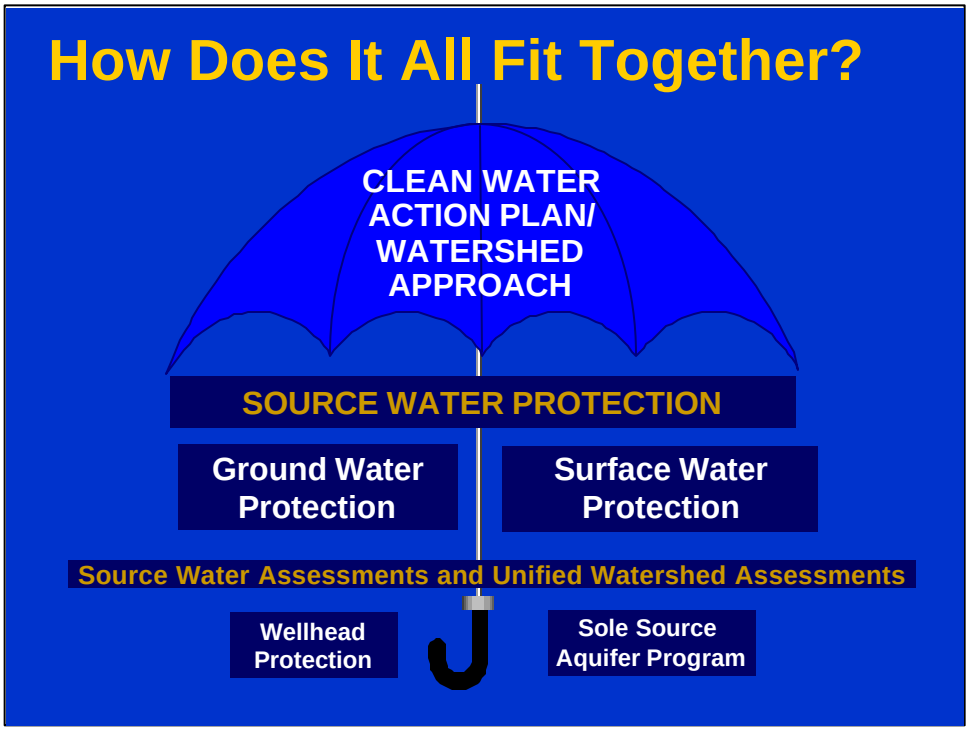
- The Safe Drinking Water Act and the Clean Water Act intersect in protecting surface water used as drinking water.
- The Clean Water Action Plan (CWAP) is a 1998 Presidential initiative. Its goal is to protect public health and restore the nation's waterways by emphasizing collaborative strategies built around all activities that affect bodies of water and the communities they sustain.
  - The CWAP provides for cooperation between State, Federal,Tribal, regional, and local governments, as well as private partners. It provides a forum to collaborate on strategies for protecting and restoring priority watersheds.
  - A key element of the Action Plan is the integration of public health and aquatic ecosystem goals when identifying priorities for watershed restoration and protection. The Action Plan assigns priority to drinking water source areas needing protection.
- Under the CWAP, States, Tribes, local governments, organizations and the public will work together to conduct unified watershed assessments. This process will assess watershed conditions; identify watersheds where aquatic systems do not meet clean water and natural resource goals; identify those that are highest priority for restoration and target a subset of that group for restoration action strategies; determine what other issues, such as protection of drinking water, need to be addressed; and ensure that all the appropriate stakeholders are involved in the process.
- Completed source water assessments can help Federal agencies direct protection programs to highest priority source waters and help guide agency decisions regarding placement and construction of new facilities.
- The signatories to the CWAP agreement include: EPA, the U.S. Postal Service, the Department of Energy, the Department of Transportation, the Department of the Interior, the Tennessee Valley Authority, the Department of Defense, the U.S. Department of Agriculture, and the Department of Commerce.



- The CWA, SDWA's partner in water legislation, designates surface water contamination sources as "point sources" or "non-point sources." Point sources are direct discharges to a single point; examples include discharges from sewage treatment plants, injection wells, and some industrial sources. Non-point sources are diffused across a broad area and their contamination cannot be traced to a single discharge point. Examples include runoff of excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas; oil, grease, and toxic chemicals from urban runoff and energy production; and sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks.
- The primary regulatory mechanism provided by the CWA is the National Pollutant Discharge Elimination System (NPDES) permit program. It requires permits for all discharges of pollutants to surface waters from pipes, outlets, or other discrete conveyances (i.e., point sources). Permits are not required, however, for non-point sources. Under the CWA, non-point source pollution is addressed through non-regulatory means.
- Under CWA Section 303(d), States are required to identify waters that do not meet water quality standards after the implementation of nationally required levels of pollution control technology, and to develop Total Maximum Daily Loads (TMDLs) for those waters. TMDLs are used to determine the maximum allowable amount of pollutants that can be discharged to impaired waters. Based on this determination, pollutant loadings are allocated among pollution sources in a water segment. TMDLs also provide a basis for identifying and establishing controls to reduce both point and non-point source pollutant loadings. State lists that identify waters needing TMDLs, and TMDLs developed for specific water bodies, are a useful source of information for the development of source water assessments.



- Many opportunities exist for combining efforts and resources to jointly implement CWA programs and source water protection programs that fall under the SDWA. CWA programs could provide funding, program support, or information to support source water assessments or promote local SWPPs, or vice versa.
- CWA programs have broad-based goals (to protect water for aquatic life, wildlife, and certain human uses, including water supply for human consumption), while SDWA programs focus on water for human consumption. However, CWA programs such as the National Estuary Program, State Clean Lakes Programs, the Great Lakes National Program, and the Wetlands Program can directly or indirectly protect sources of drinking water.
- Partnerships between the two statutes are also possible under State and local non-point source programs, the TMDL Program, and the NPDES permit program.
- EPA's Index of Watershed Indicators provides another avenue for data sharing. The Index describes the condition and vulnerability of over 2,000 watersheds in the United States. It could serve as a starting point to identify the most serious water quality problems and help determine where to focus further assessment and protection programs.



- The Clean Water Action Plan (CWAP) and Watershed Approach are the concepts that serve as the umbrella over the source water protection program and all of its components.
- Likewise, the Source Water Protection program is an umbrella over the ground water program and the new Source Water Assessment Program.
- SWAPs are not intended to replace existing programs addressing pollution sources. Instead, the assessments will act as a lens for such programs at the Federal, State and local levels to focus on safe drinking water supplies. The integration of SWAPs with wellhead protection programs, comprehensive State ground water protection programs and sole source aquifer designations, as well as watershed, nonpoint source, pesticide, waste and other established programs, will help States and localities develop the most effective source water protection plans to avoid costly contamination events.
- Rivers and streams were historically covered only by the Clean Water Act. SWP adds a component on surface water protection to the SDWA.

Other Federal Source Protection Programs

- There are many other Federal agencies that have programs that can contribute to source water protection.
- USDA's Natural Resource Conservation Service obtains advice from State Technical Committees, which may include State water agencies, on source water-related activities under the Environmental Quality Incentives Program (EQIP). State water program officials have opportunities to integrate source water assessment and protection objectives with USDA conservation program concerns. NRCS provides technical advice and some cost-share assistance to farmers on best management practices.
- USDA also sponsors the Farm*A*Syst and Home*A*Syst network of 50 State interagency programs that help farmers, ranchers and homeowners identify environmental and health risks on their property, and take voluntary actions to reduce these risks and protect drinking water. USDA has a number of other programs that foster source water protection, including the Cooperative State Research Education and Extension Service, the Forest Service, and the Rural Utilities Service.
- USGS provides scientific information on water resources, biological resources, mapping, and geology, to support wise management of our natural resources. USGS will provide water-quality and land-use data that may be useful in drinking water source assessments. In addition, on a cost-share basis, USGS can provide technical assistance on source water protection area delineation, including hydrogeological analyses, ground water age-dating and flow modeling, and delineation of ground water contributing areas using flow models.
- EPA and the Department of Transportation have a partnership to implement the Transportation Equity Act for the 21st Century (TEA-21), which includes provisions to ensure environmentally sound transportation systems.
- The Department of Transportation is also in the process of identifying drinking water unusually sensitive areas (USAs). DOT is evaluating Federal and State data sources in order to generate the drinking water USAs. This will allow transportation projects to be reviewed for potential drinking water impacts.

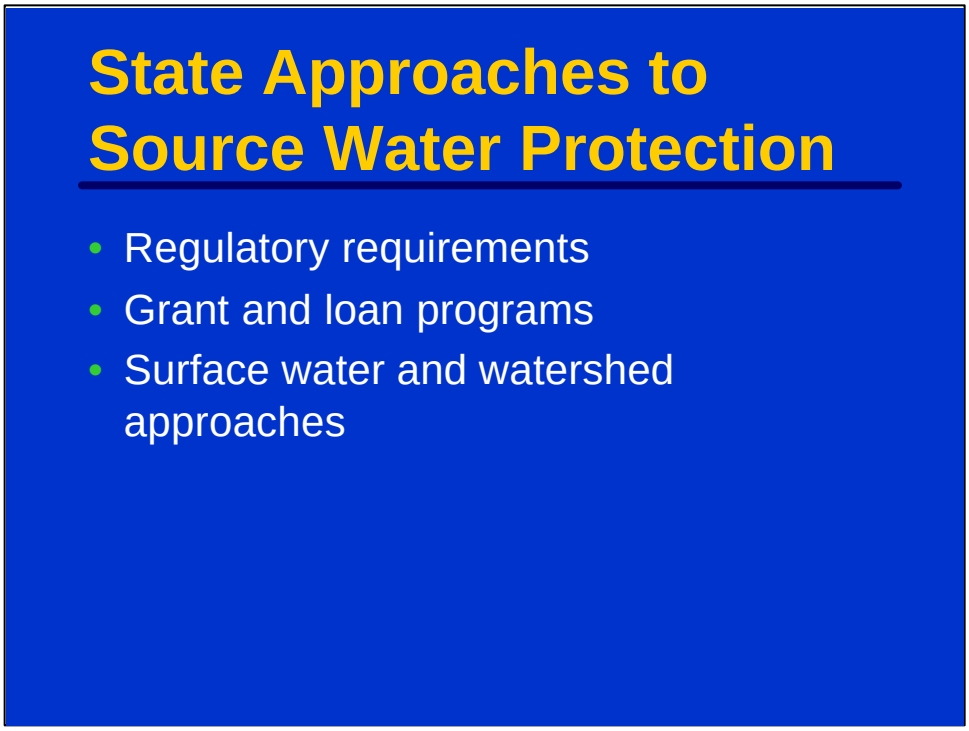
Other Federal Source Protection Programs

- See http://www.epa.gov/safewater/protect/feddata.html for a list of Federal data sources related to source water protection

- The U.S. Fish and Wildlife Service within the Department of the Interior has a National Wetlands Inventory Project that provides maps and digital wetland data with site specific classification and location information. Land management agencies at DOI, including the Bureau of Land Management, the National Park Service, the Bureau of Reclamation, and the Office of Surface Mining, can be important partners in coordinating source water assessments.
- EPA and the Army Corps of Engineers jointly administer Section 404 of the Clean Water Act, which regulates the discharge of dredged or fill material into waters of the U.S. This program can be used for watershed and special area management planning.
- The Council on Environmental Quality implements the National Environmental Policy Act (NEPA), which requires environmental assessments or environmental impact statements for Federally-funded activities. NEPA ensures that adverse environmental impacts will be avoided or mitigated through the assessment process.

State and Local Measures to Protect Source Water

- What approaches has your State used to protect source water?



- States use a variety of approaches to protect source water, including regulatory programs and grant and loan programs.
- State surface water and watershed protection activities also contribute to source water protection.
- These are discussed in more detail in the slides that follow.

State Regulatory Approaches

- Location and siting standards
- Underground storage tank requirements
- Storm water regulations
- Wetlands regulations
- State environmental protection statutes
- Spill control activities
- Water quality standards
- Pesticide management plans

- States can often regulate the location of facilities that have the potential to contaminate ground water from their activities or from spills. States sometimes prohibit siting certain kinds of facilities in source water protection areas; for example, new landfills, transfer stations, or large wastewater facilities. States can also condition the siting of certain kinds of facilities, for example, by requiring buffer zones.
- Underground storage tanks (USTs) are a significant potential source of ground water contamination. State UST programs include requirements for setbacks; design, construction, and installation; monitoring and inspection; and recordkeeping.
- State storm water programs regulate municipal separate sewer systems (MS4s) and certain industrial and construction activities. Operators or MS4s and covered construction and industrial activity are required to apply for NPDES permits and implement storm water management controls that effectively reduce or prevent the discharge of pollutants into receiving waters.
- Wetlands can provide a range of different functions and benefits to local communities, including intercepting and filtering pollutants, thereby improving source water quality and possibly reducing treatment costs. Integrating wetlands protection and restoration into source water programs can highlight the importance of targeting wetlands and source waters as high priority areas for protection and can reduce duplication of or conflicting efforts.
- States also generally have statutes that are the State-level equivalent of the National Environmental Policy Act (NEPA). Like NEPA, these statutes require environmental assessments and avoidance or mitigation of adverse impacts from defined activities.
- State water quality standards could be the core framework on which to base source water protection. Where a particular water is designated as domestic water supply, human health criteria are benchmarks to determine if the water is meeting its drinking water use, establish the basis for controls on pollutant discharges, and support management actions to ensure that the drinking water use will be attained.
- In 1996, within the context of Comprehensive State Ground Water Protection Programs, EPA proposed to restrict the use of certain pesticides through the development and use of State Management Plans that would allow the States flexibility to protect ground water in the most appropriate way for local conditions.

State Funding Options

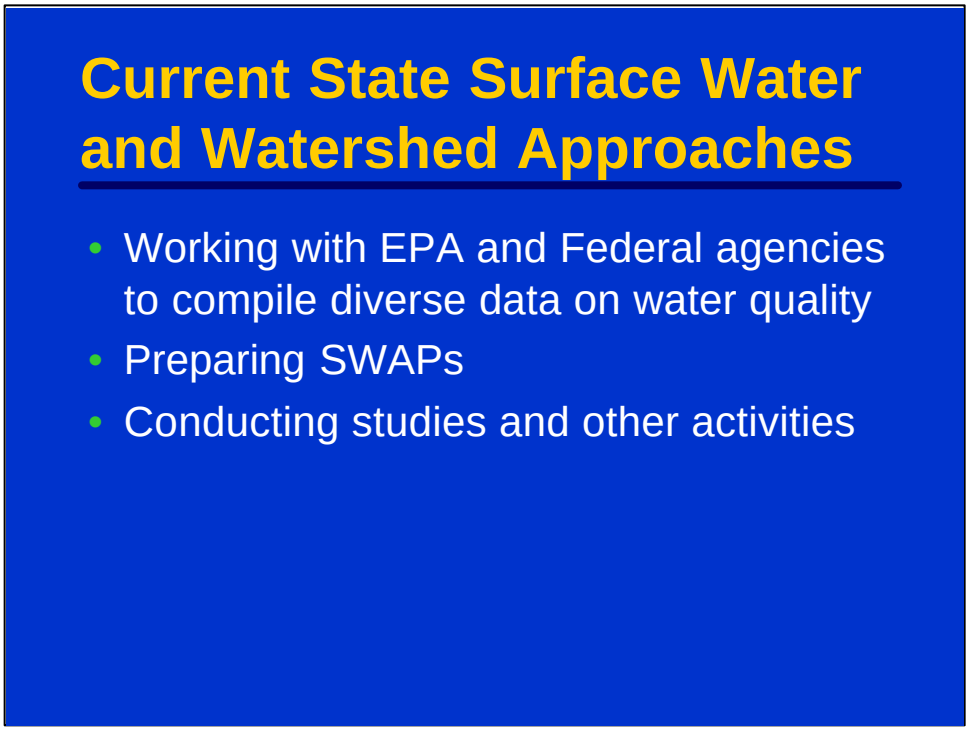
- Drinking Water State Revolving Fund
- Clean Water State Revolving Fund
  - Section 319
  - Section 604(b)
  - Section 104(b)(3)

- The Drinking Water State Revolving Fund is discussed in more detail later in this presentation.
- The Clean Water State Revolving Fund includes a number of provisions that can be used to support source water protection.
  - Under section 319 of the Clean Water Act, States and Tribes can receive grants to support a wide variety of activities, including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific nonpoint source implementation projects.
  - Under section 104(b)(3), States, Tribes and local governments can receive assistance in building wetland management programs. Since 1995, Congress has appropriated $15 million annually to support the grant program. Grant funds can be used to develop new or refine existing wetland protection, management, or restoration program, but they may not be used to support program operations.
  - Under section 604(b), each State will reserve either one percent of its allotment or $100,000, whichever is greater, to carry out planning activities defined under sections 205(j), water quality management planning, and 303(e), water quality standards and implementation.

Current State Surface Water and Watershed Approaches

- Collecting information and using data according to CWA Sections 303(d), 305(b), 319, and 320

- Unified watershed assessments are developed through a cooperative integration of existing assessment reports and processes, using existing and appropriate data and information. States, interstate commissions, and Tribes monitor water quality and identify waters and watersheds not meeting clean water goals in several ways under the Clean Water Act (CWA):
  - Using monitoring and other water quality information to develop lists of waters not meeting clean water goals and needing response actions to restore water quality (Section 303(d));
  - Collecting water quality information and reporting on the condition of waters every two years (Section 305(b));
  - Identifying water bodies that are impaired by nonpoint sources of pollution (Section 319); and
  - Collecting, characterizing and assessing data on toxics, nutrients, and natural resources to identify problems and develop Action Plans to restore and protect the 28 estuaries of national significance (Section 320).



- States also work with EPA and other Federal agencies to organize diverse information concerning watershed health, such as data on wetland loss, sediment contamination, discharge permit violations, and related factors, and to present this information for each of the over 2,000 watersheds in the country.
- States conduct source water assessments of drinking water source waters required by the SDWA.
- States also conduct studies and other activities such as:
  - Developing project priority systems for clean water and drinking water State revolving loan funds;
  - With Federal agencies, conducting flood plain studies and developing appropriate plans;
  - Identifying coastal water quality problem areas as part of efforts to reduce polluted runoff to coastal waters; or
  - Developing assessments of wetland areas that need special attention or protection.

Local Tools and Techniques for Source Water Protection

- Impose by regulation
- Encourage through non-regulatory means
- Combine approaches as appropriate given site-specific considerations

- Depending on their situation, local government officials can choose from a variety of regulatory and non-regulatory measures to address identified or potential threats to their water supplies.
- ***Regulatory controls*** include zoning ordinances and subdivision controls, construction and operating standards, health regulations (such as storage tank and septic tank requirements), and permitting or inspections.
    - Examples of local zoning ordinances to protect ground water and surface water sources of drinking water can be found at http://www.epa.gov/r5water/ordcom/ and http://www.epa.gov/owow/nps/ordinance/.
- ***Non-regulatory controls*** include purchase of property or development rights, encouraging the use of best management practices, public education, household hazardous waste collection programs, and economic incentives such as agricultural cost-share programs.
- A combination of these methods is usually necessary for an effective management plan. In addition, the same end can usually be achieved through different means. For example, setbacks can be achieved through permits or local ordinances. The range of feasible tools will depend on the local authority to regulate land uses, and the nature of the contamination threats.
- To see how communities are combining protection measures to protect their drinking water supplies, go to EPA's compilation of local case studies in source water protection at http://www.epa.gov/safewater/protect/casesty/casestudy.html. The local contacts listed at the end of each case study should be able to provide you with some tips on how to put together your own protection plan.

Selecting Management Measures

- Land use controls
- Regulations and permits
- Structural measures
- Good housekeeping practices
- Public education
- Land management
- Water conservation
- Ground water monitoring
- Emergency response planning

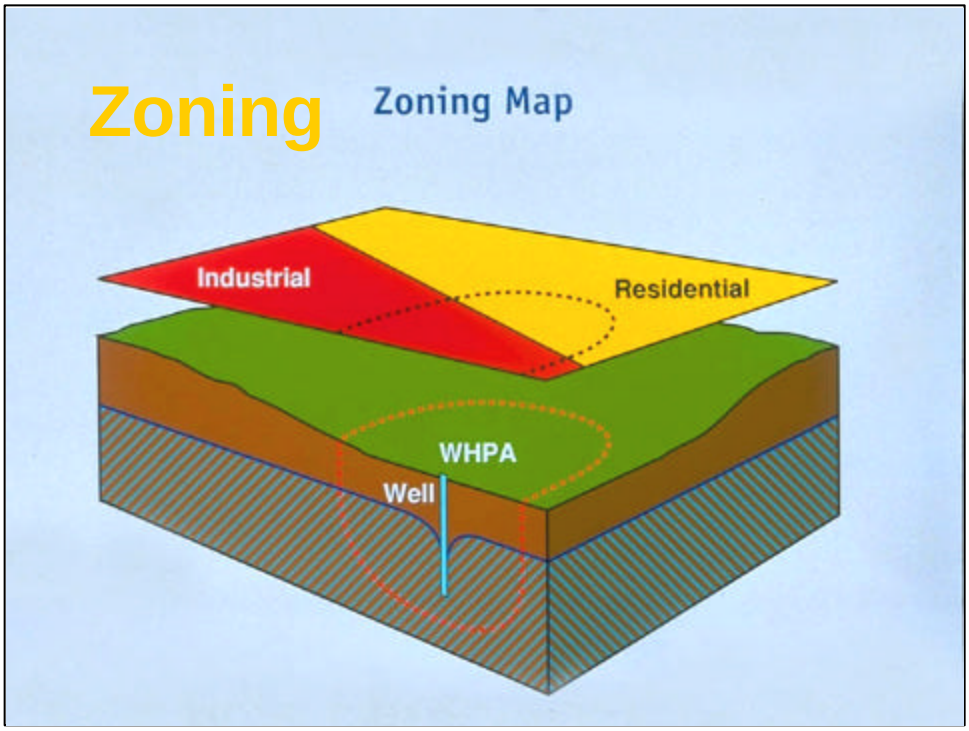
- Many management measures are available to prevent pollution, control contaminants at the source, or treat wastewater. One alone usually is not sufficient, and combinations of measures work best.
- In choosing the most appropriate measures, local government officials and water system operators should consider their situations, and may need to prioritize the implementation of specific measures to make the most of the resources available to them.
- Local government officials should look creatively at existing ordinances and regulations. They may be able to use rules passed for other reasons to address source water issues. For example, if special permits are allowed when necessary to protect public safety or health, it is possible that they could be used for source water protection.
- Selection of management measures will be based on a variety of factors, including the physical properties of the watershed (annual precipitation, soil type and drainage, ground water and surface water hydrology, and space limitations), land uses and potential contaminants, type of contamination problem (e.g., point source or non-point source), public acceptance of measures, cost, maintenance needs, and aesthetics.

Land Use Controls

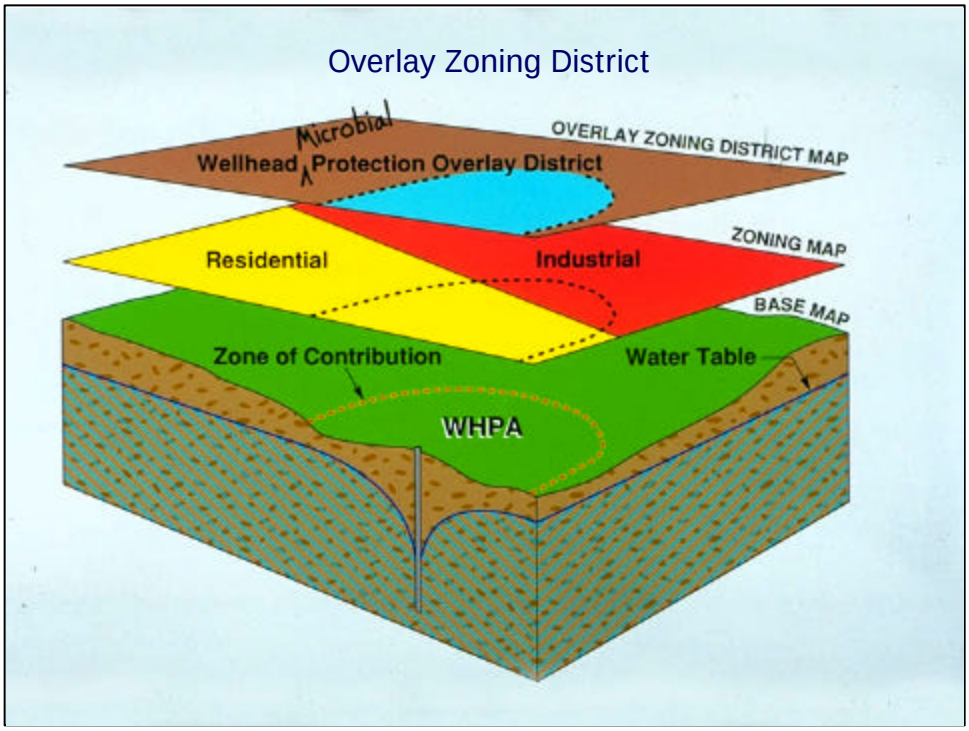
- Subdivision growth controls
- Zoning
- Acquisition of development rights
- Land purchase
- Land use prohibitions

- Land uses that pose risks to source water can be controlled or moved from sensitive areas. Local government officials can use subdivision and growth controls to reduce population density, or zoning ordinances to prohibit or restrict certain activities in SWPAs.
- By acquiring the rights to development on parcels of land through purchase or donation of the land, local government officials have complete control over the activities in critical areas.
- The high cost of purchasing property or development rights makes this impractical for many communities. Some States have grants for acquiring environmentally sensitive lands and non-profit organizations such as local or regional land trusts can assist communities by acquiring land within SWPAs. The American Farmland Trust and the Nature Conservancy are examples of non-profit organizations that focus on protection of water resources through land acquisition. USDA's Conservation Reserve Program also manages a program to obtain easements on environmentally sensitive land.
- Often, the greatest consideration in passing regulatory land use controls is the political acceptability of limiting certain activities. However, most people consider passing zoning ordinances to be the right and responsibility of local governments, and public education about the importance of protecting water supplies can increase the acceptance of land use controls.
- The next few slides describe land use controls for managing SWPAs.

- As the nation's population increases, sprawl and the proliferation of homes, businesses, and associated activities such as pesticide and fertilizer use, and septic systems, can threaten drinking water supplies.
- Subdivision regulations govern the process by which individual lots of land are created out of larger tracts. Subdivision regulations are intended to ensure that subdivisions are appropriately related to their surroundings. General site design standards, such as preservation of environmentally sensitive areas, are one example of subdivision regulations.
- Ways in which subdivision requirements can protect water supplies include:
    - Ensuring that septic systems and storm water infiltration structures do not contaminate ground water; and
    - Managing drainage (e.g., using erosion controls) to ensure that runoff does not become excessive as the area of paved surfaces increases and to provide recharge to aquifers.



- Zoning is the division of a municipality or county into districts for the purpose of regulating land use. Communities traditionally use zoning to separate potentially conflicting land uses from one another. Examples of how zoning can be used to protect drinking water sources include requirements that limit impervious surfaces, encourage open space, locate high risk activities away form drinking water sources, or encourage cluster development to reduce runoff. For example, Brunswick, Maine, adopted a threshold that no more than 5 percent of a site to be developed in its Coastal Protection Zone may be impervious area.
- Zoning is an effective regulatory tool for preventing threats to water sources from new development, and zoning ordinances are usually well-accepted as the prerogative of local governments. Unfortunately, zoning is of limited use in addressing threats from existing land uses, because they are "grandfathered" (i.e., exempt from new zoning requirements) when zoning laws take effect. Zoning ordinances may be difficult to pass where citizens want to encourage growth and economic development. The types of zoning ordinances available to source water protection planners include: overlay zoning; cluster and planned unit development; and land use prohibitions.
- These are described in the slides that follow.
- Examples of local zoning ordinances to protect ground water and surface water sources of drinking water can be found at http://www.epa.gov/r5water/ordcom/ and http://www.epa.gov/owow/nps/ordinance/.

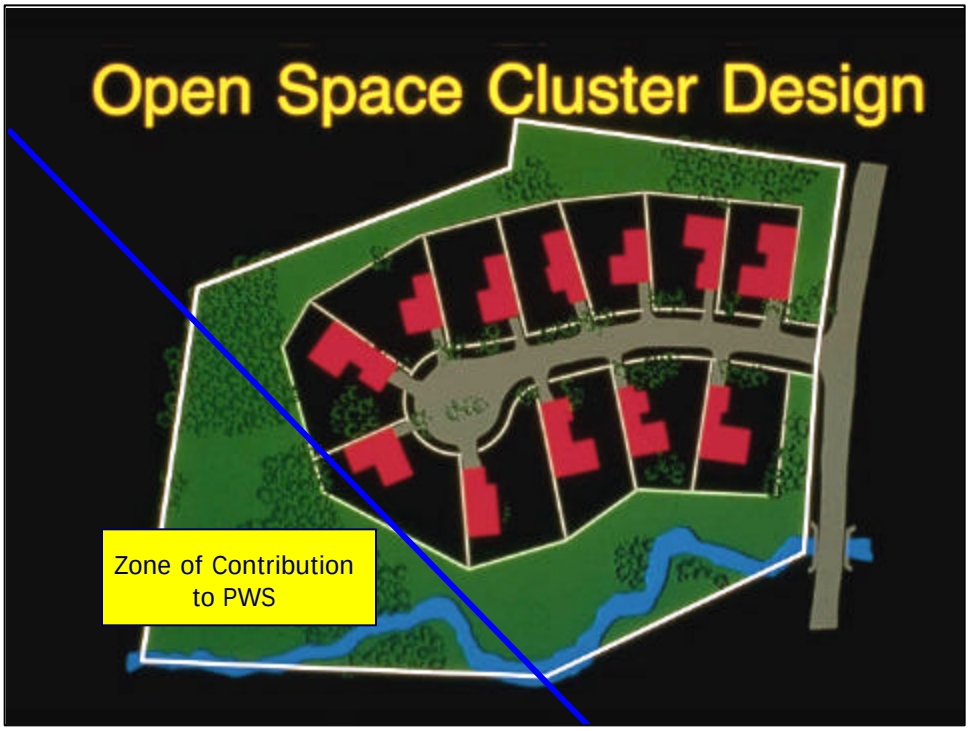


- In an overlay district, boundaries for an area are defined and local ordinances and bylaws enacted to protect or limit specific land uses with the area. Such a district "overlies" and supercedes existing zoning for an areas.
- An overlay district may cover all or part of a regular zone or zones.
- All of the provisions of the underlying zone remain the same, including use, density, and setbacks, for example.
- What changes is that there are new and additional requirements established by the overlay district to meet source water protection objectives. Overlay zoning can be particularly useful for adopting additional wellhead protection and water supply watershed zones. Creating a source water protection overlay district may involve such measures as restricting the use of septic systems or limiting development to low-density residential.
- An advantage of using an overlay zone is that it can target changes to source water protection areas alone, and allow uses outside the zone to continue.

Cluster and Planned Unit Development

- Cluster development
  - More development in less space
  - Encourages greater protected space
- Planned unit development
  - Diverse land uses in contained land area
  - Reduces infrastructure costs

- Zoning and subdivision controls can be used to determine how a lot is developed.
- A cluster development puts more buildings in a smaller space to keep development outside of the protected areas.
- A planned unit development is a planned combination of diverse land uses, such as housing, recreation and shopping, in one contained development or subdivision.
- These dense developments may result in reduced infrastructure costs. The following slides show how cluster and planned unit developments work.



- This slide shows a standard subdivision development.
- (On mouse click) Now we see the same number of units as on the previous slide. However, in this slide, the development is clustered resulting in no development in the zone of contribution.
- Note that in a cluster design, there can also be a common septic tank collection system, instead of each dwelling having its own system.

- The idea of transferring development rights is based on the concept that a land owner can separate his or her right to develop the land as permitted by zoning from other rights associated with the land.
- The transaction involves a sending parcel (a town or area within a source water protection area or some other area needing protection from development) and a receiving parcel (an area that can safely be developed at a higher density). These areas are designated by a governmental entity. The transaction goes as follows:
    - The owner of the "sending parcel" sells the right to develop his or her land. This owner receives market value for the rights associated with development of the land.
    - The owner of the "receiving parcel" buys the development rights from the sending parcel owner and thereby gains the right to develop his or her land and recapture the cost of the purchased development rights.
- This can be a win-win situation. The sending parcel owner gains market value for developing his or her land without actually doing so. The owner maintains a less intensive use of his or her land and likely maintains lower property taxes. The receiving parcel owner develops his or her land and keeps the profits associated with the development. Throughout it all, the resource remains protected.

Development Agreement: Contract between a Land Owner and Government Agency

- Benefits to the landowner
  - Freezing local regulations
  - Expediting the permitting process
  - Gaining public support
- Benefits to the local government
  - Reducing claims of a taking
  - Strengthening leverage to obtain public benefit
  - Ensuring compliance with contract law

- A development agreement is a consensual, binding contract between two or more parties, typically between a landowner or developer and a government agency. This is a regulatory tool only in that the governing body must have the legal authority to execute it.
- Development agreements can provide for certain public benefits without running afoul of prescribed rules governing regulatory takings and other local regulatory restrictions.
- The motivation for the development agreement is to extract public benefits as a quid pro quo for assisting the development project through to permit completion. They can be helpful to property owners since the contract provides protection against regulatory changes that may jeopardize a long-term project. (It cannot, however, provide protection against State or Federal regulatory changes.)

Tools for Land Acquisition and Protection

- Donations
- Sale
  - Market value
  - Bargain sale
- Conservation easements
- Other restrictions on land use

- Landowners may donate land to a local government or land trust. The benefit to the landowner is the avoidance of estate, capital gains and real estate taxes, as well as insurance and maintenance costs.
- The best way for a community to establish control over property within its SWPAs is to purchase land and/or development rights.
  - The government may pay a landowner the full or "market" value of the land, or the government may pay a price below the full market value. The difference between the market value and the reduced price may qualify as a charitable deduction for the landowner on Federal or State income taxes.
  - Local governments may also obtain conservation easements, which are voluntary arrangements that condition or restrict the use of the land. For example, an easement may provide for right of access through someone's property or require that land remain undeveloped. The easements become attached to the deed for the property, and remain in effect when it is sold or transferred.
- Restrictive covenants are similar to easements, except that they are held and enforced by property owners who are similarly restricted.
- The high cost of purchasing property or development rights makes this impractical for many communities. Some States have grants for acquiring environmentally sensitive lands and non-profit organizations such as local or regional land trusts can assist communities by acquiring land within SWPAs.

- Hundreds of nonprofit land trusts work independently or with local governments to purchase land or acquire easements. Many focus on protection of water resources. Examples of some government and land trust projects include:
  - Two families donated conservation easements to the Napa County Land Trust (California) to keep the land undeveloped and protect the water used in towns and vineyards downstream.
  - Government Canyon is the recharge zone for the Edwards Aquifer, sole source of drinking water for San Antonio, Texas. A recent proposal to build 766 homes and an 18-hole golf course sparked formation of a government-private coalition that purchased the land for $2 million. Austin, Texas, also depends on the Edwards Aquifer. Citizens voted to authorize $20 million in bonds to purchase critical watershed land for open space.
  - Six hundred water companies control much of the land in Connecticut that provides drinking water. Filtration standards have increased the cost of using reservoirs as public drinking water sources and changes in Connecticut regulations allow private water companies to distribute profits from land sales to shareholders. The result is a dramatic increase in the sale of watershed land. The Trust for Public Land is working with the State government to develop a policy for watershed management, develop a public education program, and design a State public finance program to conserve watershed lands. Already, they have purchased several large watershed areas and reservoirs (and obtained a pledge of $500,000 from Paul Newman to protect a 730-acre water company property that was on the market).

Land Use Prohibitions

What type of uses might you prohibit?

- Gas stations
- Landfills
- Industries that produce, store or dispose of hazardous chemicals
- Facilities requiring large water withdrawals

- Land use prohibitions can be aimed at controlling either activities that use dangerous substances (source-specific standards) or the materials themselves (contaminant-specific standards).
- Examples of ***source-specific standards*** include:
  - Prohibiting gas stations in sensitive areas, or requiring double-hulled or corrosion-resistant design of underground storage tanks.
  - Septic system requirements, such as minimum setbacks from surface water or separations from the water table, or mandatory maintenance and inspections schedules.
- ***Contaminant-specific standards*** may prohibit the use of heavy metals, petroleum products, solvents, or radioactive materials in source water protection areas. Regulations on the application of pesticides, fertilizer, manure, and sludge are also examples of contaminant-specific standards.

- Management measures can be imposed by regulation or through permit requirements. Local government officials can require owners of facilities that can endanger drinking water supplies to comply with standards for proper design, operation, or maintenance.
- In some communities, local government officials may encounter public resistance to regulations, and the cost to administer permitting or inspection programs can be high. However, regulations can be an effective way to control certain activities in source water protection areas. Most regulatory controls are subject to the provisions of State enabling legislation, and require careful drafting to avoid potential legal challenges.
- The next few slides describe regulatory options available to local government officials.

Construction and Operating Standards

- Construction and operating standards may be imposed to reduce threats to water supplies from some activities. For example:
  - Storage tanks may be required to have a double-hulled construction and leak detection systems.
  - Homeowners with septic systems may be required to construct them using approved designs or maintain their systems regularly.
- Construction and operating standards may require some of the constructed devices, operating and maintenance practices, or product and waste disposal procedures described later in this section.

Permit Requirements

- Local authorities can require permits
- Permit fees can help recover program costs
- Permits can be site-specific
- Inspections enforce permit requirements

- Municipalities can require owners or operators of facilities that can pose a potential risk to water supplies to obtain permits. Permits allow authorities to maintain an inventory of potential contamination sources, periodically inspect facilities for compliance with ordinances, require minimum construction or operating standards (see previous slide), and periodically reexamine the appropriateness of the source or activity to determine if revisions (or discontinuance) are necessary.
- Permitting fees can help recover the costs associated with tracking and maintaining source-specific information.
- Existing Class V motor vehicle waste disposal wells are an example of a use for which a permit may be required.
- One provision of a permit may be periodic inspections. Inspections can identify people who are not complying with standards, and can also provide an opportunity to educate them about proper procedures and make sure they are following them.
- Permits can also be site-specific, and permit requirements can be tailored to the specific location or activity.

Special or Conditional Use Permits

- Some land uses may require case-by-case scrutiny.
- For example, uses that are potentially incompatible or troublesome may be conditioned to make them suitable to the location. This might include:
  - Gas stations;
  - Residential development using on-site septic systems within an aquifer protection district, multiple dwellings in single-family districts; or
  - Any use that generates unusual amounts of traffic or uses large quantities of water.
- Communities may allow these activities within a SWPA; however permits for such facilities may require operators to employ additional measures beyond what would normally be required to protect source water.
  - Such conditions may include, for example, requirements for setbacks, open spaces, buffers, walls and fences; dedication and/or street paving and control of site access points; regulation of hours and methods of operation and development phasing; and time limits on the duration and transferability of the permit.

- Performance standards are based on the assumption that source water protection areas (or other protected areas) have certain thresholds for contaminant loading beyond which they will be overloaded.
- For example, an area can handle a certain amount of nitrogen before the nitrogen loading is excessive for the natural environment. A performance standard would specify a protection-related objective (e.g., nitrogen levels below amounts that would overload biological systems), but do not prescribe how that objective is to be met.
- Performance standards are established based on the overall risk to the area rather than on the risk from each individual source.
- For example, the Town of Falmouth, on Cape Cod, Massachusetts, used nitrogen loading performance standards to protect water quality. The coastal town is bordered to the south and west by water, and contains several coastal ponds and public supply wells. A water resource study indicated that their current zoning provided a level of development that would exceed the carrying capacity of its water supplies. The town adopted a Water Resource Protection District and a Coastal Pond Overlay District to limit development impacts on its wells and ponds. As a condition of approval, developments in those areas must meet specified nutrient loading performance standard of 5 mg/L for nitrogen in drinking water. Typical sources of nitrogen include on-site sewage disposal systems, lawn fertilizers, agricultural fertilizers, storm water runoff, and atmospheric deposition. Mitigation measures might include, for example, reducing housing density or providing public sewer service to reduce nitrogen loading from on-site sewage disposal. A limitation on lawn size would reduce nitrogen released due to lawn fertilization. Storm water could be pretreated to reduce nitrogen levels before it is discharged to nearby waters.

- Regulation by a local health department can help protect source waters. Examples of areas that health departments typically regulate are underground storage tanks, septic systems and floor drains.
  - Prohibition or registration of residential underground storage tanks, leak testing, ground water monitoring, and construction standards can help to reduce the risk from these tanks.
  - Regulations addressing the number and size of septic systems allowed in an area, construction and siting standards, bans on certain solvent cleaners, maintenance standards, and setback distances can help to ensure that septic systems do not contaminate source water.
  - Towns may implement controls prohibiting any floor drain that discharges to ground water when the drain is located in an area where pollutants may enter the drain.
- Health departments may regulate numerous other activities that could contribute to contamination of source waters. Coordination at the local level to ensure that the appropriate departments are involved in source water protection efforts is important.
- Health regulations are usually an accepted regulatory option for local governments. Although implementing a new program of inspections and enforcement may require significant resources, this infrastructure often already exists within local government. Local officials can direct or coordinate these resources to work on source water priorities.

Wetlands Ordinances

- Natural vegetated buffers
- Limits on surface water discharges
- Erosion and sedimentation control
- Restrictions on pesticides and fertilizers

- Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Two categories of wetlands are coastal (tidal) and inland (non-tidal).
- Wetlands have important filtering capabilities for intercepting surface water runoff from higher dry land before it reaches open water. The wetlands retain excess nutrients and some pollutants, and reduce sediment that would clog waterways and affect fish and amphibian egg development. In addition to improving water quality through filtering, some wetlands maintain stream flow during dry periods, and many replenish ground water on which many people depend for drinking water.
- The Federal government protects wetlands through Section 404 of the Clean Water Act, economic incentives and disincentives, and acquisition. A number of States have enacted laws to regulate activities in wetlands, and some counties and towns have adopted local wetlands ordinances or have changed the way development is permitted.
- Few States have laws specifically regulating activities in inland wetlands, although some States and local governments have non-regulatory programs to protect wetlands.

Structural Measures

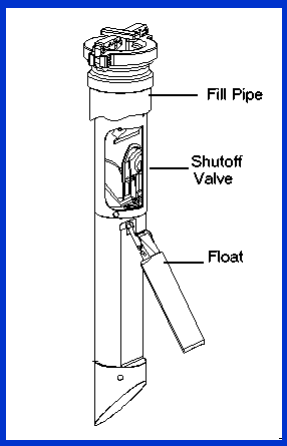
- Constructed systems or devices
- Vegetative measures

Sheltered above ground tank farm

Filter strip

- Structural BMPs refer to man-made systems or devices designed to prevent contamination. They may work by preventing leaks or contamination, or stopping them at the source; collecting or diverting hazardous or toxic components of a waste stream; or encouraging filtration or infiltration of wastewater to allow natural processes to remove contaminants.
- Where they are not imposed by local regulations or ordinances (see above), land owners should be encouraged to adopt these BMPs.

Constructed Systems or Devices



- Automatic shut-off and leak detection devices on USTS
- Secondary containment
- Drainage diversion
- Segregated floor drains
- Waste collection devices

- Constructed devices or retrofits to existing machinery or operations can detect equipment failures or leaks, contain contaminants at the source, or catch spilled chemicals. Examples include:
  - Secondary containment structures, such as oil-retaining catch basins, containment berms for above ground storage tanks, or impervious surfaces for tank placement.
  - At animal feeding operations, earthen ridges or diversion terraces to direct surface flow away from animal waste.
  - Leak detection devices on storage tanks, including automatic tank gauges, vapor monitoring, interstitial monitoring, and ground water monitoring.
  - Segregating floor drains from wastewater carrying hazardous or toxic wastes, such as photography development fluids.
  - Devices to collect and store wastewater for proper disposal.

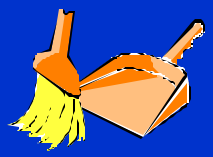
Vegetative Measures

Swales

- Natural vegetation is remarkably effective at filtering contaminants before they reach water bodies or seep into the ground water. It can also slow the speed of runoff to prevent erosion.
- Vegetative measures capitalize on these abilities to promote filtering or infiltration of waste water. They are often used to mitigate the damage caused by runoff over farm land, roads, or in urban areas.
- Examples include constructed wetlands, vegetated buffer strips along shore lines, or grassed swales or depressions that collect runoff, encourage infiltration, or reduce erosion.
- They often require little maintenance, other than proper management of runoff they collect, and can improve land values. For example, in residential areas real estate values may be higher for properties surrounding a constructed wetland. However, these vegetative measures also require proper management of runoff.

Good Housekeeping Practices

- Equipment operation and maintenance
- Product storage, use and handling
- Waste storage and disposal
- May be required by local ordinances or health regulations



- Homeowners and business owners should be made aware that careful handling of potentially dangerous substances and proper use of the equipment and chemicals they use every day can go a long way to protecting their water supply. These "good housekeeping" practices typically do not require significant expenditures or drastic changes to customary activities, and can often save money by eliminating waste of the products they buy.
- Proper maintenance of vehicles and household, farm, construction, and industrial equipment prevents accidents, leaks, and breakdown of pollution preventing design. It also extends their service lives, saving owners money.
- Properly used, most chemical products available to homeowners are safe for the environment. One of the most basic aspects of proper product storage and use is following the manufacturer's directions. Land and business owners should understand that reading and following the directions on the label of pesticides, fertilizers, and automotive products can protect their drinking water supply.
- Relatively small amounts of waste from leaking containers and dumping dangerous substances (which may be illegal) can contaminate large volumes of water. Proper storage of products and disposal of wastes is important to protecting water supplies. For example, recycling used oil and automotive fluids, batteries, pesticides and fertilizers, and household hazardous materials can be encouraged with community hazardous waste collection days.

Public Education

- Informational meetings
- Advertisements, flyers and posters
- Questionnaires
- Demonstration projects
- Community and school events
- Consumer Confidence Reports

- Public education can increase awareness of threats to source water, encourage voluntary source water protection, and build support for regulatory initiatives. The first step in a public education effort is to notify businesses and households that they are located in a SWPA. Highway signs posted at the edges of SWPAs or WHPAs represent an excellent way to help people understand where the SWPAs are.
- Public education materials can explain how each business and household can protect drinking water sources. Appropriate topics for households include care of septic systems, improper disposal of chemicals and used oil, and water conservation techniques.
- Many communities have developed public education programs designed to encourage adoption of best management practices (BMPs) and waste minimization strategies.
    - BMPs are standard operating procedures for a particular industry or commercial activity that can reduce the threat it poses to ground water supplies. BMPs have been developed for many industries that store, handle, or transport hazardous or toxic substances.
    - They can help prevent the release of these substances or control these releases in an environmentally sound manner, and encourage compliance with voluntary design standards.
- School events are especially popular with water suppliers and are used to build public support and inform future decisionmakers.
- The Consumer Confidence Report rule requires all public water system operators to report annually on the status of their water systems.

Responsible Land Management

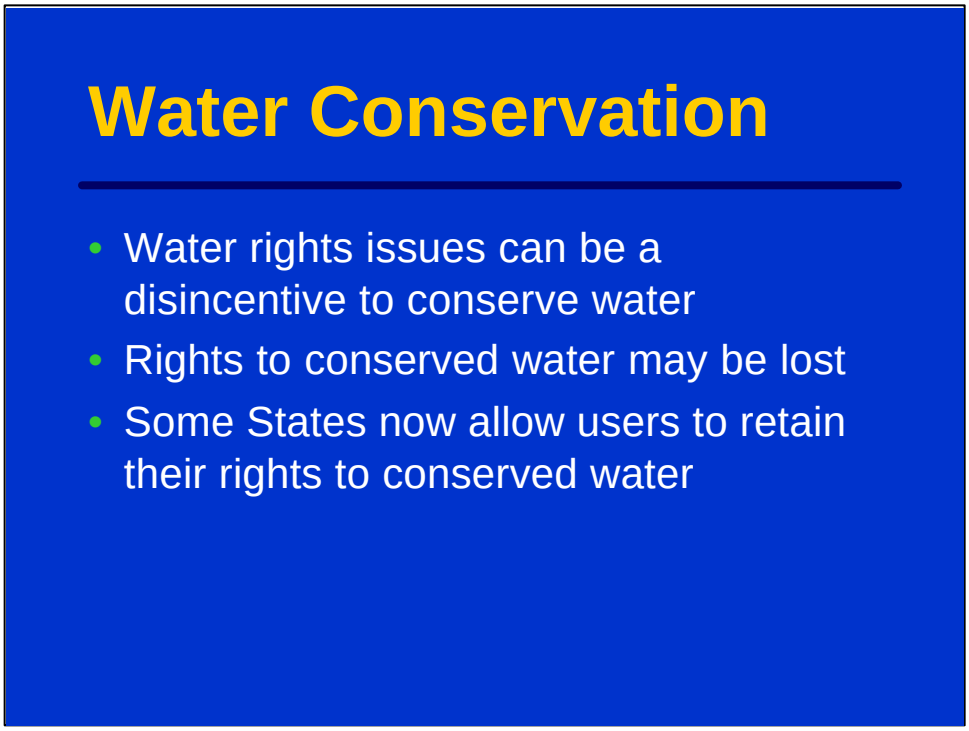
Contour strip farming

- Land owners should be encouraged to conduct activities in a manner that reduces threats to drinking water supplies. Environmentally responsible land management does not mean that people must cease certain activities or make drastic changes to their businesses, rather that they re-think the way they go about their activities. For example:
  - Environmentally sensitive landscaping relies on native plants that grow dense root systems to encourage infiltration and reduce erosion. These plants have the best chance for survival with the least amount of watering, pesticides, and fertilizers, saving the land owner money.
  - Proper lawn maintenance involves aerating soils and planting climate-appropriate species of grasses that need the least chemical assistance to thrive.
  - Conservation tillage, crop rotation, contour strip farming (shown above), and animal grazing management can protect valuable farm land and reduce loss of pesticides and nutrients to the environment and sediment.
  - Integrated pest management is the coordinated use of pest and environmental information with available pest control methods to prevent unacceptable levels of pest damage by the most economical means and with the least possible hazard to people, property, and the environment.
- Financial incentives are available from the U.S. Department of Agriculture for some of these agricultural measures.

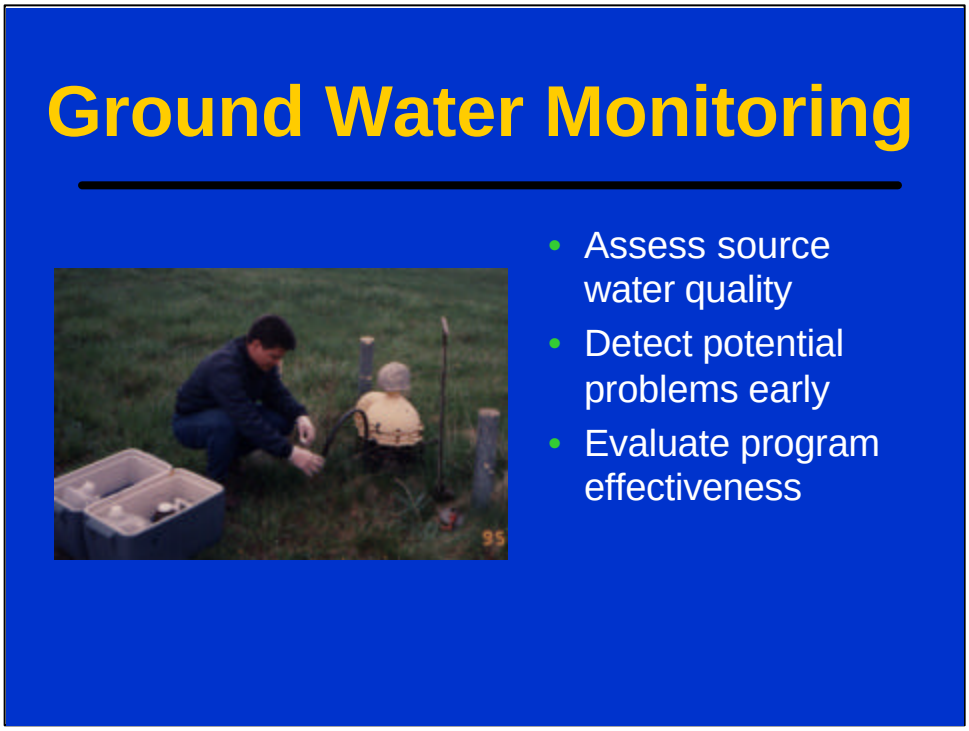
Water Conservation

- Limiting water withdrawals preserves water supplies
- Useful in reducing:
  - Salt water intrusion in coastal areas
  - Rate of contaminant transport in a contaminated plume
- Conservation can be achieved by individual effort; this is also a limitation

- Water conservation is an important SWP tool because it reduces pumping from primary ground water sources.
- Where contaminant plumes exist, conservation may reduce the rate of contaminant transport, delaying the arrival of contamination at the drinking water source, and allowing time for preventive measures.
- Conservation can reduce problems caused by salt water intrusion in coastal areas. In some cases, conservation may reduce the need for mandatory controls in the future.
- Conservation can be achieved by the combined actions of individual consumers; for example, by installing low flow showerheads and toilets and repairing leaks.
- Implementing some conservation measures may also be limited by a public water system's capabilities or jurisdiction; for example, low flow equipment in individual homes.



- Water rights are legally protected rights to take possession of water occurring in a water supply and to divert it for a beneficial use. There are several legal doctrines that govern water rights:
  - Riparian doctrine grants rights to an owner of land contiguous to a water body to take water for use on that land. Atlantic coast, southern, and Great Lakes States generally grant water rights based on this doctrine. Many States (particularly Atlantic coast States) grant regulated riparian rights.
  - Prior appropriation doctrine (or appropriative rights) grant rights based on when the water was first put to beneficial use. The first to use the water retains rights to the water. All States west of the Mississippi (except Oklahoma and California) grant rights based on prior appropriation. Oklahoma and California use mixed doctrines.
  - Federal and Tribal rights are reserved rights. They are based on the date when the land was first set aside. This right was established in a lawsuit brought by the U.S. on behalf of the Ft. Belknap Tribe, whose water was being diverted upstream by settlers. The Supreme Court established that the water right of the Tribe was prior and reserved (the decision also applied to all Federal lands). Unlike State rights under prior appropriation systems, Federal and Tribal reserved water rights may remain unused without being lost.
- State systems for managing water rights sometimes provide that rights are lost to the extent water is not used, including where water is saved through conservation. This can be a disincentive to conserve. Some State laws now authorize users to retain rights in the water they conserve if it is put to beneficial use or transferred.

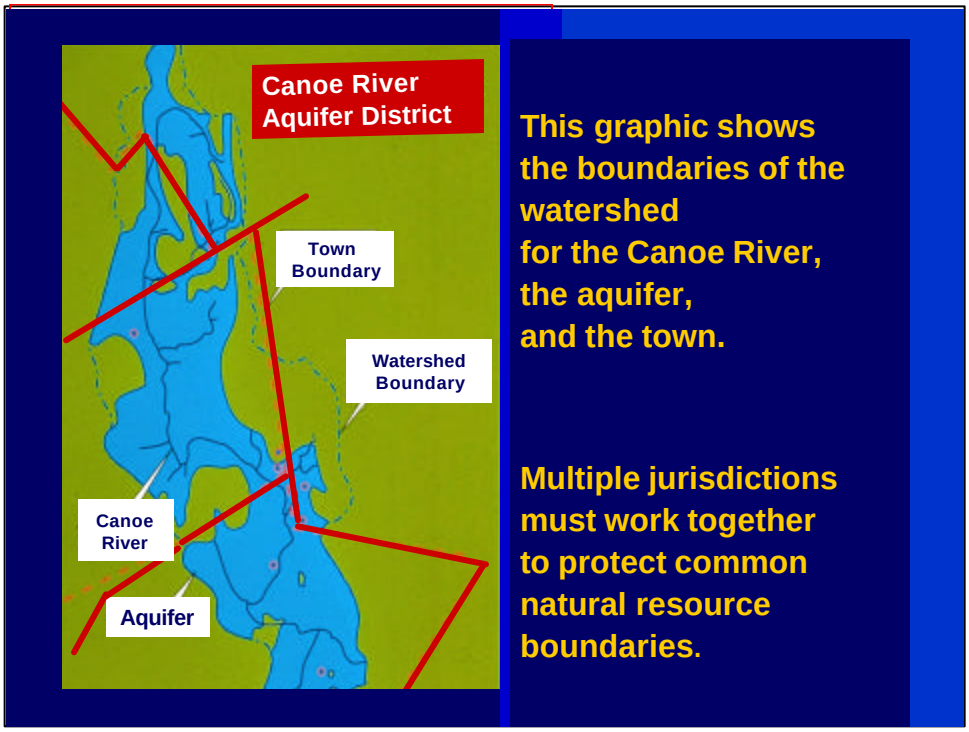


- Monitoring a drinking water source allows the community to assess the quality of its source water and the effectiveness of resource protection measures. Monitoring ground water and surface water systems quality and quantity differ.
- Monitoring the quality of a community's ground water drinking water source (as well as streams and water bodies near the sources) is fundamental to effective drinking water protection. Water quality monitoring provides an early warning of potential contamination problems so that a prompt response can be initiated. Often, with warning, communities can avoid costly water treatment or replacement of a source. The earlier a community detects water quality problems in its water source, the more time the community has to react. Monitoring can help a community evaluate the effectiveness of its SWP efforts.
- Consistent monitoring and data record keeping are essential to early detection of problems.

Emergency Response Planning

What if..?

- Despite the best management measures, accidents or disasters can happen. Local government officials should be prepared for unforseen circumstances. Emergency response planning or contingency planning is the process of identifying potential threats and formulating response scenarios.
- An emergency response plan is a set of “what ifs” about things that can adversely affect water supplies, and how local government officials would respond.
- Elements of municipal emergency response plans should include information about the water system, potential contamination sources and their locations, fire-fighting plans, needed equipment and supplies, surface spill reporting forms and names and phone numbers of emergency response contacts, and short- and long-term water supply options.
- Business owners may also be required to have emergency response plans on file if, for example, they handle or use hazardous materials and are subject to the Emergency Preparedness and Community Right-to-Know Act (EPCRA) or the Resource Conservation and Recovery Act (RCRA).
- Municipalities should have written emergency response plans on file, and responding parties such as police and fire departments, health officials, and response contractors and public water suppliers should be aware of them.

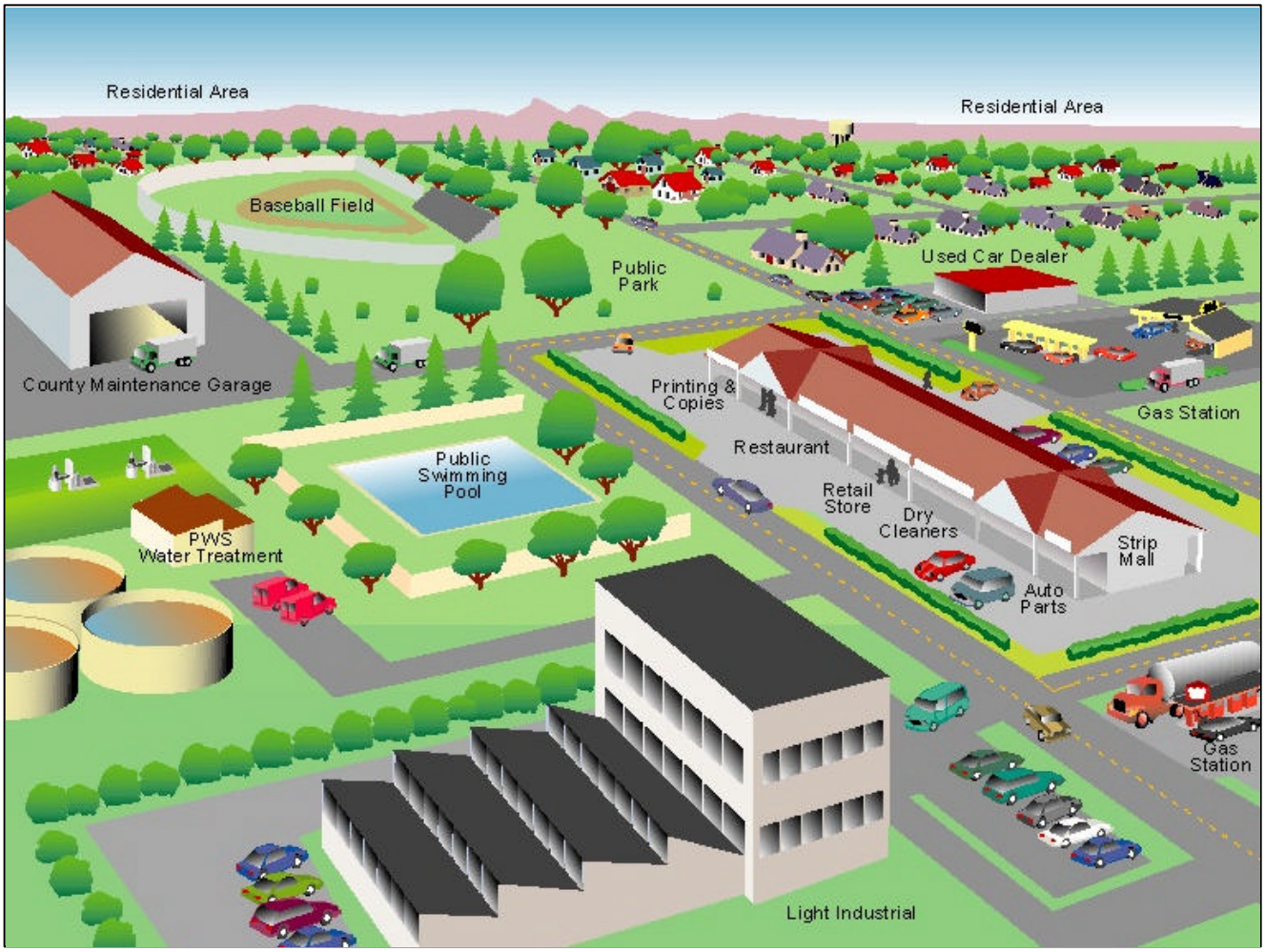


- Ground water and surface water do not respect political boundaries. Frequently, sources cross jurisdictions of communities and States. Whenever possible, States and towns or counties should include in their protection plans those parts of a watershed that are outside their boundaries.
- There are a number of ways to accomplish this. Counties may sign memoranda of agreement, memoranda of understanding, consent agreements, or other written agreements (that provide financial and other incentives) to protect the resource.

Identify Source Water Protection Measures

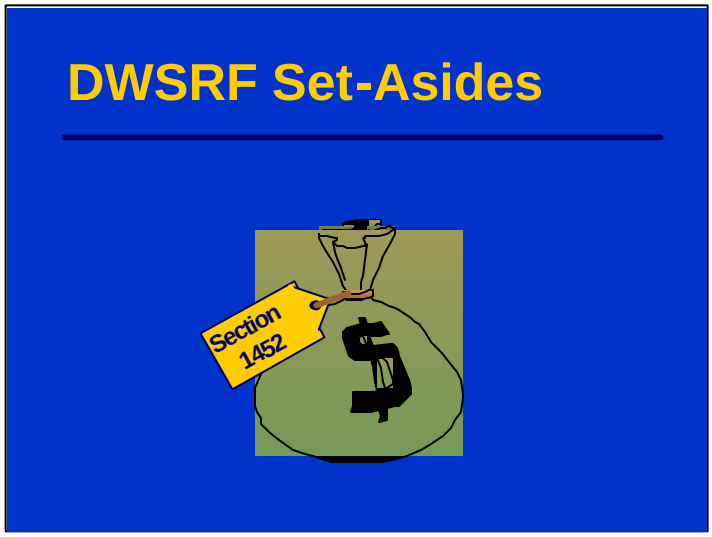
A Group Exercise

- In small groups, take 20 minutes to discuss what source water protection measures the community in the following slide may want to consider adopting to protect its source water supplies.


Residential Area
Residential Area
Baseball Field
Public Park
Used Car Dealer
County Maintenance Garage
Printing & Copies
Gas Station
Restaurant
Public Swimming Pool
Retail Store
Dry Cleaners
PWS Water Treatment
Strip Mall
Auto Parts
Gas Station
Light Industrial

Funding for Source Water Protection

How Do We Pay For These Programs?

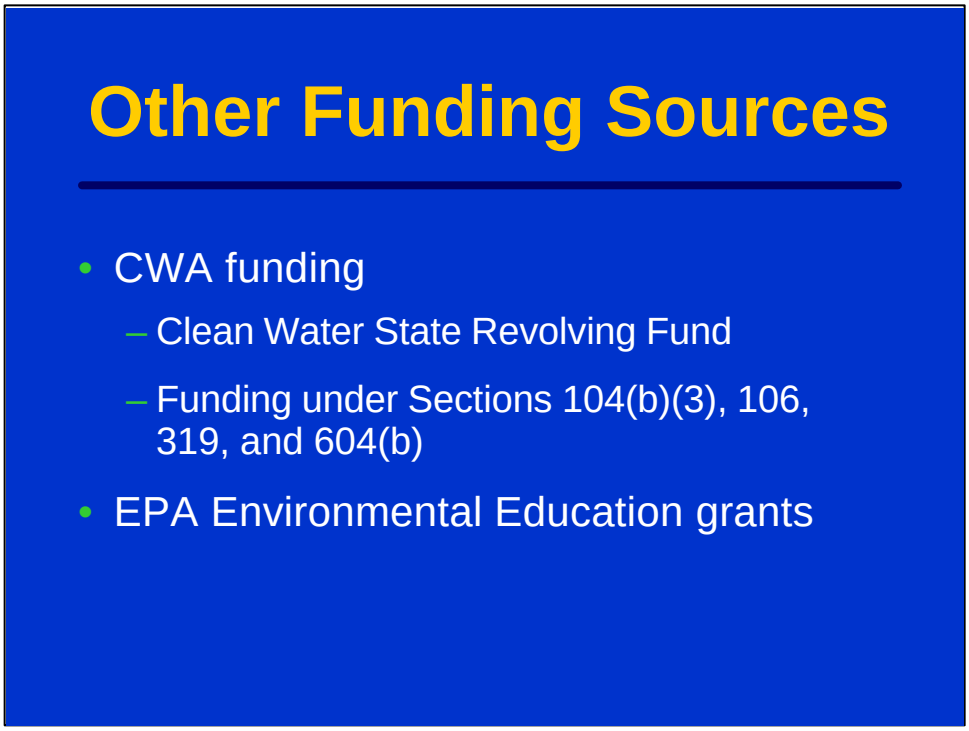


- The 1996 Amendments authorized a Drinking Water State Revolving Fund (DWSRF) program to help public water systems finance the costs of drinking water infrastructure needs. The DWSRF program encourages States to develop long-term sources of drinking water funding. Congress appropriated $9.6 billion to the DWSRF from fiscal year 1994 through fiscal year 2003. States that do not meet certain requirements are subject to withholding of their DWSRF allotment.
- The Amendments allow States to set aside funds from the new DWSRF for eligible source water assessment and protection activities, including land acquisition. The intent of this funding is to give States flexibility to shape SWP programs to fit their needs. Every State has the opportunity to use a portion of the DWSRF to accomplish source water assessments and protection efforts.
- Under SDWA Section 1452(g), States may use up to 10 percent of their DWSRF grants to administer or provide technical assistance through source water protection programs. States must provide a one-to-one match for all funds set aside for State program management under this Section. Section 1452(g) funds may be used to:
  - Administer source water protection programs;
  - Complete contamination source inventories and susceptibility determinations; and
  - Provide technical assistance.
- Under Section 1452(k), States may set aside up to 15 percent of their capitalization grants to fund several types of source water protection activities. However, no more than 10 percent of the grant can be used for a single type of source water protection activity. Section 1452(k) funds may be used for:
  - Loans to public water systems to purchase land or conservation easements;
  - Loans to CWSs for implementing voluntary, incentive-based source water protection;
  - Loans to community water systems (CWSs) for implementing source water protection partnerships;
  - A one-time set-aside from the FY 1997 grant to delineate and/or assess SWPAs. Many States took the maximum ten percent for this set-aside to pay for assessment work through 2003; and
  - Establishing and implementing wellhead protection programs.

State Ground Water Program Grants

- Authorized under Section 1429 of the 1996 SDWA Amendments
- These funds have never been appropriated
- Ground water programs currently funded under CWA Section 106

- Section 1429 of the SDWA Amendments of 1996 authorizes EPA to make ground water protection grants to help States develop and implement programs to ensure the coordinated and comprehensive protection of their ground water resources. However, Congress has never appropriated funds for these grants.
- The amount of a ground water protection grant awarded is based on the extent of ground water resources in the State and the likelihood that awarding the grant will result in sustained and reliable protection of ground water quality.
- Section 1429 also authorizes EPA to award grants for innovative State programs to prevent ground water contamination. A State may apply for a grant under Section 1429 whether or not it has an EPA-endorsed comprehensive State ground water protection program.
- State ground water programs are currently funded under Section 106 of the Clean Water Act. States are encouraged to use up to 15 percent of their grants for ground water protection.



- Clean Water Act funding may be used to fund certain SWP activities, and cost savings could be realized through combining SWP and CWA efforts.
  - CWA State Revolving Fund loans may be used for watershed protection;
  - Funds allocated under Section 106 of the CWA may be set aside for State ground water programs;
  - Section 319 funds, which are aimed toward non-point source pollution prevention, may also be used for source water protection; and
  - Under Section 104(b)(3) States, Tribes and local governments can receive assistance in building wetland management programs.
- In addition EPA provides environmental education grants to schools and organizations. Although this is not a significant source of funds, EPA has awarded grants to local school groups for monitoring and other drinking-water-related activities.

Where Do We Go From Here?

- The1996 SDWA amendments generated a lot of activity: new regulations; new programs; and new funding. This reminds us that in spite of tremendous progress, a lot of work remains to be done.
- The 25th anniversary of SDWA (1999) is a cause for re-examination of the direction of SDWA programs and rededication to the goal of providing safe drinking water for all.
- The Drinking Water Futures Forum was created by the 25th Anniversary partnership to evaluate the challenges facing the nation in ensuring a safe supply of drinking water, and to develop a plan to meet these challenges.
- Forum partners discussed issues in seven areas. For source water protection, the questions are:
    - Given the national trends of increasing population, urbanization and development, how can the drinking water program help ensure the availability and good quality of drinking water, on the source water side (e.g., institutionalizing public health and aquatic protection), the demand side (e.g., water conservation) and the treatment side (e.g., gray water systems, desalinization, etc.)?
    - How can we better focus each level of government and the private sector on better coordination in planning for the future of a safe and reliable drinking water supply?
- The goal for source water protection for the next 25 years is to have all sources of public water supply with source water protection programs in place.