Introduction To The Public Water System Supervision Program

Drinking Water Academy Modules

- **Introductory modules**
  - Overview of the Safe Drinking Water Act
  - Introduction to the EPA's Source Protection Programs
  - Introduction to the Underground Injection Control Program
  - **Introduction to the Public Water System Supervision Program**
- Regulatory modules
- Technical modules

- The Drinking Water Academy has developed a number of modules. These modules cover topics identified by the DWA Workgroup as most important in supporting SDWA implementation.
- This module is the Introduction to the Public Water System Supervision (PWSS) Program. The purpose of this module is to introduce essential terms and concepts to employees new to the PWSS program. Since this is an introductory module, some topics are not covered in detail. This module was developed in conjunction with three other one-day introductory modules that will provide you with a complete picture of SDWA and its programs.

Objectives

- By the end of this module, participants will be able to answer the following questions:
  - What is a public water system?
  - What is the PWSS program and what are its components?
  - What are the roles of EPA, States, Tribes, and public water systems under the PWSS program?
  - How are regulations developed under the PWSS program?
  - What does primacy mean in the PWSS program?
  - What are the National Primary Drinking Water Regulations?

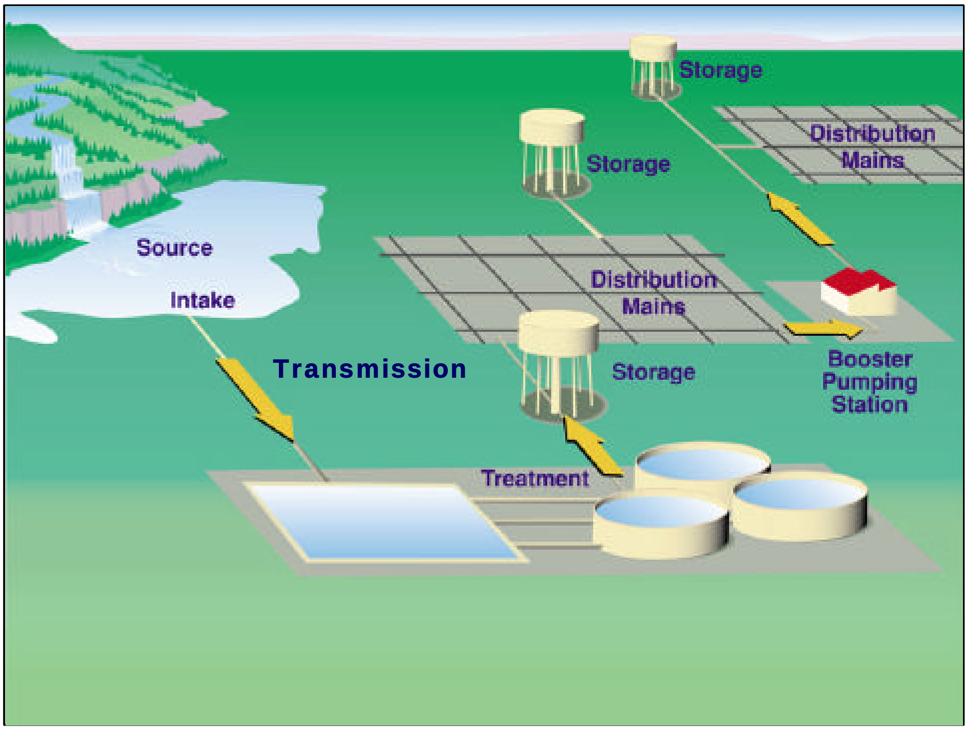
- The objective of this module is to enable participants to answer the following questions:
  - What is a public water system?
  - What is the PWSS program?
  - What does primacy mean in the PWSS program?
  - What are the roles of EPA, States, tribes, and localities?
  - How are regulations developed under the PWSS program?
  - What are the National Primary Drinking Water Regulations?
- Additional information is also included in this module. For example, descriptions of funding mechanisms, PWSS enforcement and other useful information is provided.

Water Systems

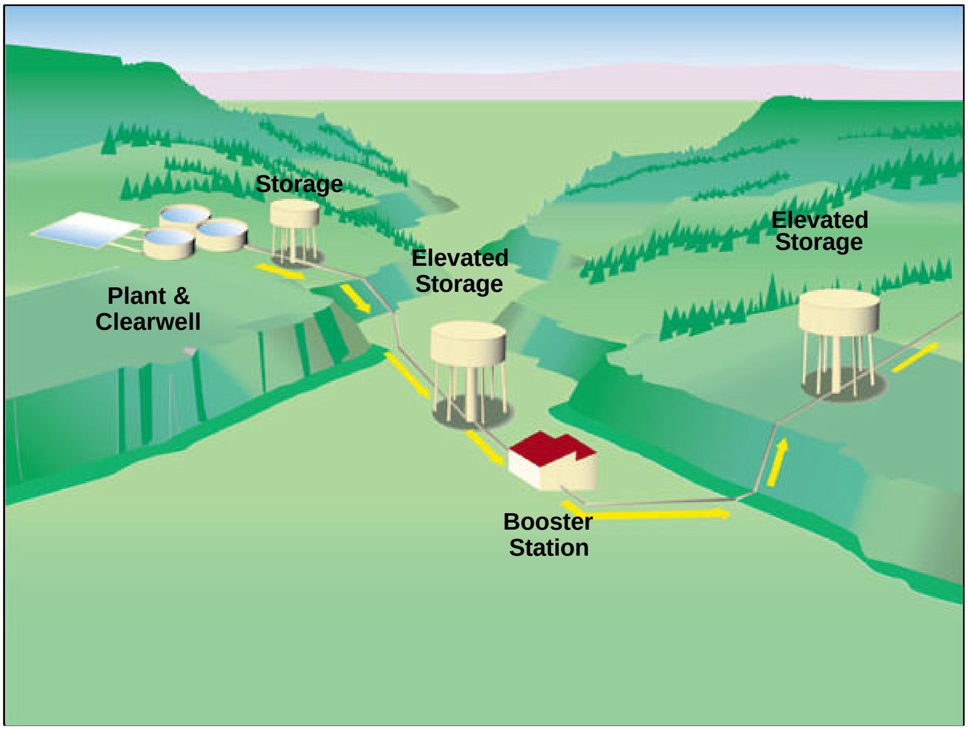
What is a Water System?

- Provides water for domestic use, fire prevention, industrial use, irrigation
- Many variations of water systems:
  - May be regulated or unregulated by Federal or State governments
  - May be very simple or very complicated
  - May use a ground water source or a surface water source or a combination
  - May be small or large

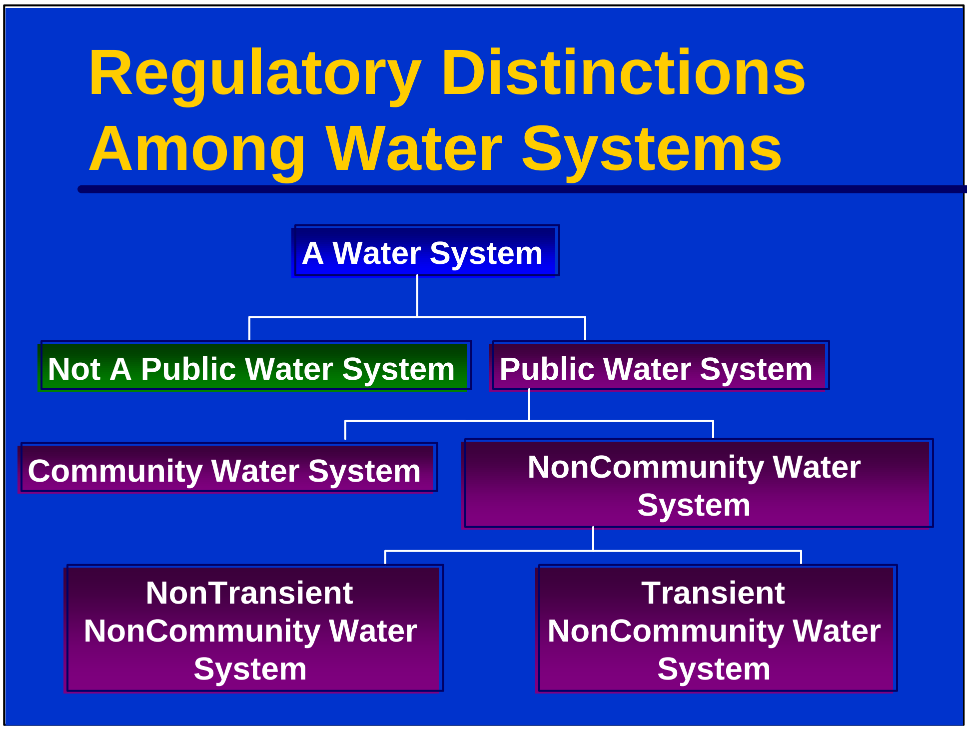
- Water systems deliver water to you. People use the water delivered from their water system for various uses.
  - Home or domestic uses include drinking, cooking, washing, and flushing toilets;
  - Industries use water for industrial purposes such as cooling equipment and rinsing; and
  - Cities use water for fire protection.
- In sum, there are many uses for the water delivered to you by a water system.
- Water systems are highly variable. They may be regulated or unregulated by Federal and State governments; they may be very simple or very complicated in construction and operation; they may use a ground water source, a surface water source, or a combination; and they may be small or large, ranging from one that serves a small trailer park to one that serves a major metropolitan area.
- This module describes water systems in greater detail to help you understand all types of water systems.



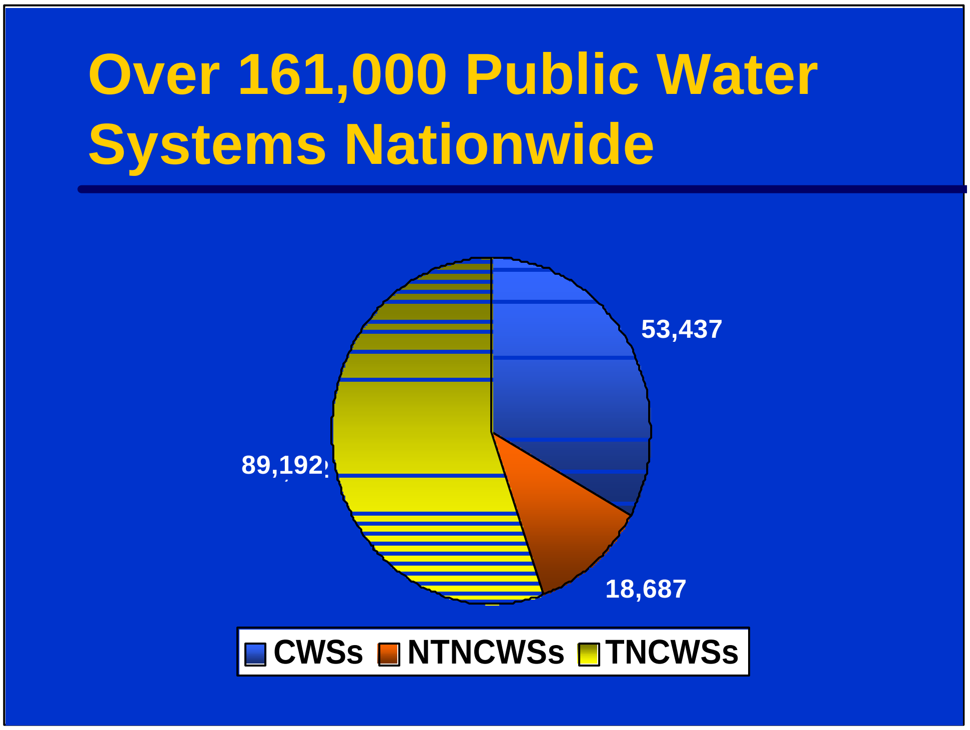
- The four major components of most water systems are:
  - Source;
  - Treatment;
  - Storage; and
  - Distribution, transmission and pumping facilities.
- These components are shown graphically above.
- It is important to note that not all water systems treat their source water prior to distribution. Later in this module, we describe the variations among water systems in greater detail, focusing on the components of a typical water system.



- The graphic above shows a profile view of the previous slide. From this slide you can see how elevation is used to create water pressure and why booster pumping stations may be needed to move water to higher elevations in the service area. Maintaining positive pressure in the distribution system is critical to keep contaminants out.



- A ***public water system (PWS)*** is defined by the ***Safe Drinking Water Act (SDWA)*** as "a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections, or regularly serves at least twenty-five individuals." [Section 1401(4)(a)]. Thus, individuals on wells and systems that serve fewer connections or people are not captured under Federal regulations, though some States regulate smaller systems. Federally regulated systems are called "public water systems" because they serve water to the public, not because they are publicly-owned. A public water system may be publicly owned (e.g., owned by a municipality) or privately owned (e.g., owned by an investor-owned utility or by the owner of a mobile home court).
- SDWA further divides public water systems into ***community water systems (CWSs)*** and ***non-community water systems (NCWSs)***.
  - o CWSs include public water systems that serve 25 people or 15 connections year-round. Examples of CWSs include municipal water systems or water systems that serve a mobile home park or other groups of residents.
  - o NCWSs are PWSs that do not serve a permanent resident population. This latter category is further defined, and includes two water system types.
    - – The first, ***non-transient, non-community (NTNCWSs)*** includes systems serving at least 25 people (the same people) at least six months of the year, such as some churches, schools, and factories.
    - – The second, ***transient non-community (TNCWSs)***, includes facilities such as roadside stops, commercial campgrounds, hotels, and restaurants that have their own water supplies and serve a transient population at least 60 days per year.
  - o Each of these types of PWSs can be publicly or privately owned.



- The majority of PWSs are transient non-community water systems. While these systems are numerous, they serve a small percentage of the population because each system serves a small number of people.
- Nearly everyone is frequently served by transient non-community water systems. Remember that TNCWSs include roadside stops, commercial campgrounds, hotels, and restaurants that have their own water supplies and serve a transient population at least 60 days per year. Therefore, it is important to regulate these systems even though each one generally serves a small population at any one time.

Public Water System Supervision Program

- PWSS program authorized by SDWA
- SDWA regulations for **public water systems** implemented through PWSS program
- Helps ensure safe and adequate supplies of drinking water
- Addresses drinking water systems that provide water to more than 90 percent of the population

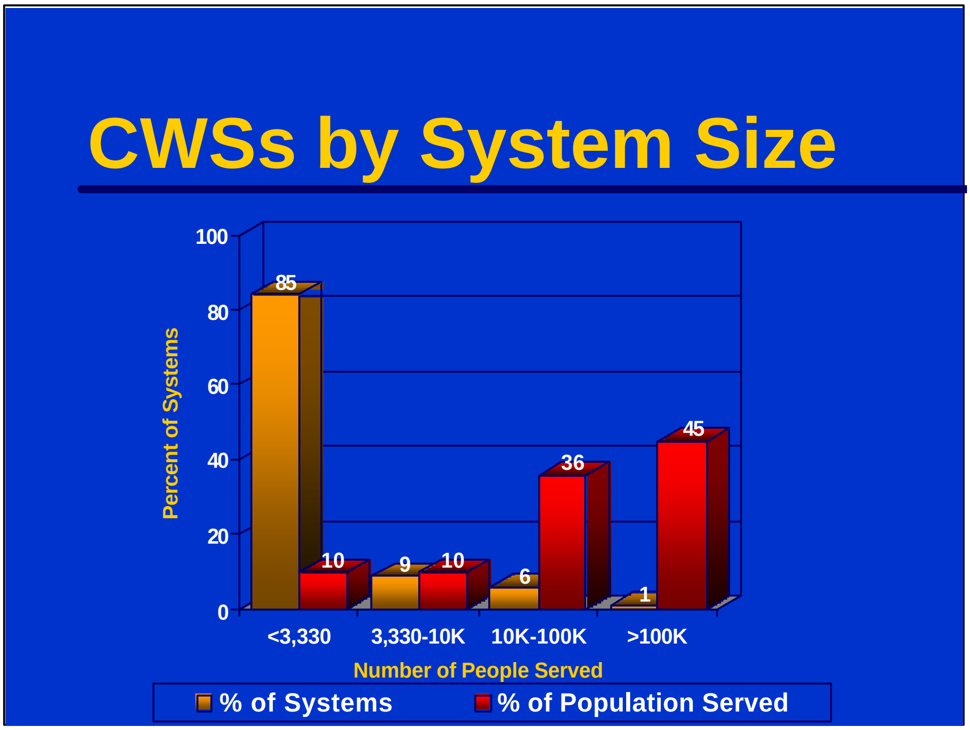
- The Public Water System Supervision program is authorized by ***SDWA***. SDWA regulatory requirements for drinking water systems are implemented through the PWSS program. These regulations ***help ensure that the public receives safe and adequate supplies of drinking water***. In this way, the program ***supervises*** public water systems as the title of the program suggests.
- EPA, along with States and Tribes, regulate approximately 162,000 public water systems.
  - Of these, community water systems provide drinking water to more than 90 percent of Americans.

- Statistics from the 1990 Census show that approximately 16 million households in the United States are not served by community water systems. [Note: This data was not collected in the 2000 Census.]
  - Of these, close to 15 million households are served by ***private drilled or dug wells*** using ground water as a source. Remember, wells that serve a single household (or that serve fewer than 15 service connections or 25 people) do not meet the definition of a public water system and are ***not regulated under the PWSS program***.
  - However, some States regulate systems smaller than those meeting the Federal PWS definition. Most of these wells produce an adequate quality and quantity of water, but some produce water that is unsafe. For example, the State of Washington regulates all systems with two or more connections.
- In addition, more than one million people ***haul water*** from central water points or ***use untreated surface water*** as their source of drinking water. Central watering points and untreated surface water sources that serve fewer than 25 people at least 60 days per year or that have fewer than 15 service connections do not meet the definition of a public water supply and are not regulated by SDWA regulations.
- In the 1970s EPA did, in fact, regulate such systems by guidance, citing Congressional intent. EPA Region 9 tried to use this logic to regulate irrigation ditches in the 1990s. That led to a court case, Imperial Irrigation District v. EPA, in which the court ruled that SDWA did not apply to an irrigation district supplying residences, schools and businesses with untreated water through open canals.
- In response, Congress included provisions in the 1996 Amendments to SDWA to regulate "constructed conveyances" that deliver water for human consumption. Ditches, culverts, waterways, flumes, mine drains, or canals may count as constructed conveyances if they are used as a source of drinking water and meet other criteria established in SDWA.

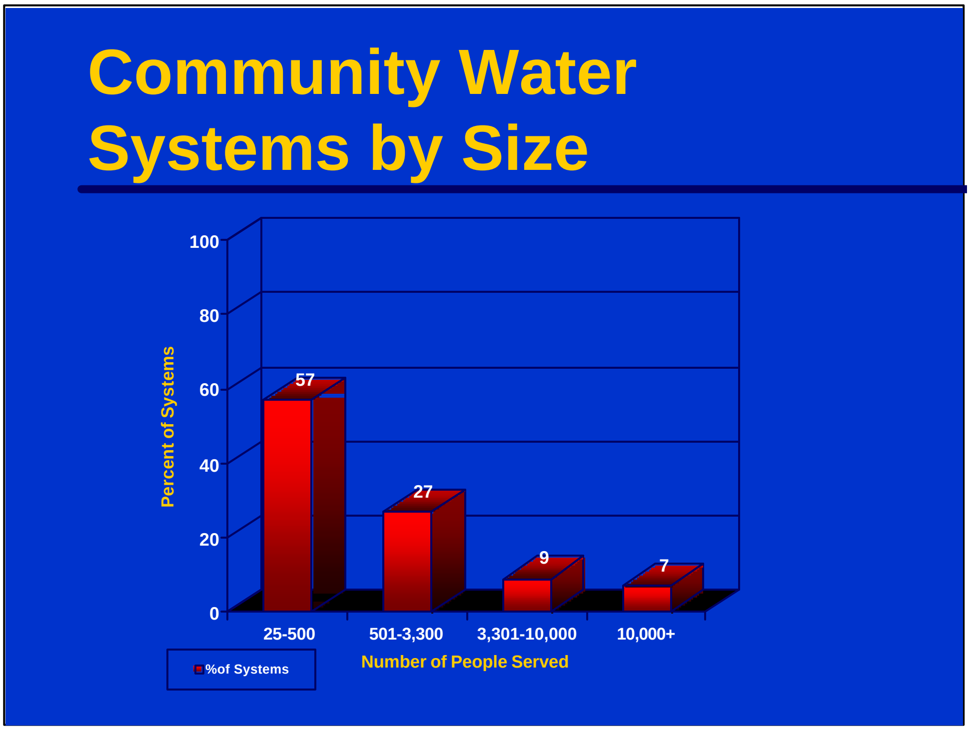
Sizes and Types of Regulated Water Systems

- Sorted by **size:**
  - Serving 25 - 500 people
  - Serving 501 - 3,300 people
  - Serving 3,301 - 10,000 people
  - Serving more than 10,000 people
- Sorted by **source:**
  - Ground water
  - Surface water
  - Ground water under the direct influence of surface water (GWUDI)

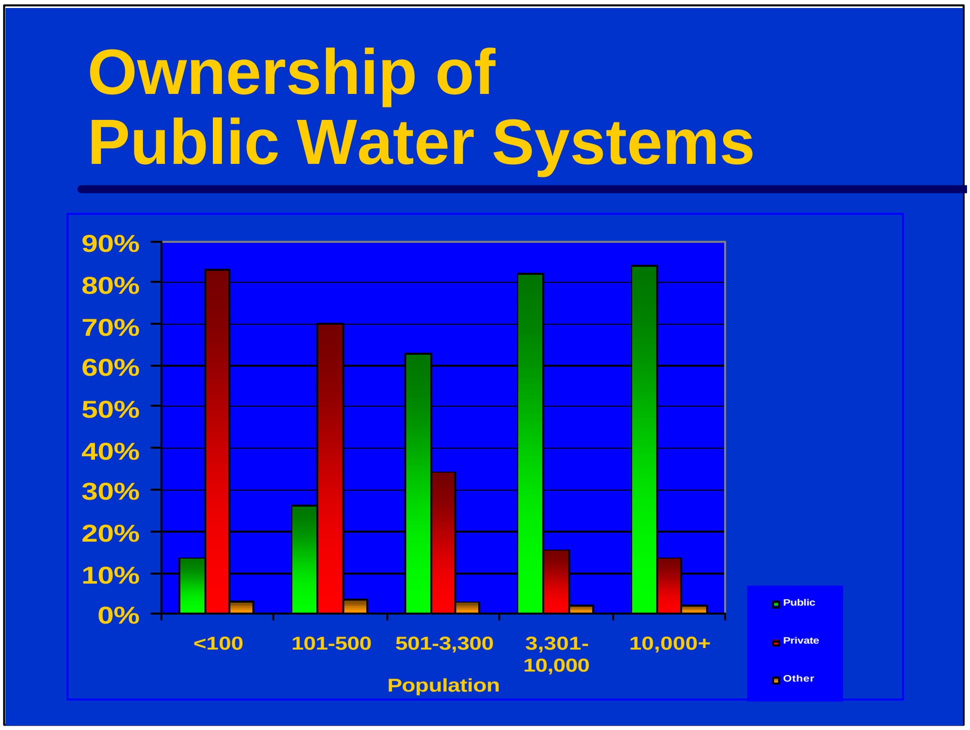
- In addition to creating the categories of community and transient and non-transient non-community systems, the PWSS program divides water systems into categories of size and source because systems of different sizes and with different sources face different challenges in providing safe drinking water, and sometimes present different risks. SDWA requirements may vary depending on the size of the PWS or the source of the water used by a PWS.
- Systems serving less than 10,000 people are generally referred to as small systems.



- The number of regulated systems is very large. Of those 53,437 systems that meet the definition of a CWS, 93 percent are considered to be small systems—serving fewer than 10,000 people. Even though these small systems 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.
  - On the other hand, the approximately 800 systems (about 1.6 percent of systems) that serve more than 50,000 people each provide water to more than 56 percent of the population served by community water systems.
- Small systems face the greatest challenges with SDWA compliance. For this reason, the 1996 SDWA Amendments include provisions that allow for additional flexibility in regulatory implementation and monitoring requirements for small water systems.



- The majority (84 percent) of CWSs serve fewer than 3,300 people.
- What challenges do small systems face?
  - ***Limited resources***. Because the customer base of small systems is by definition small, the cost per household is high. In other words, small systems lack economies of scale. Depending on how a small system designs its rates, fewer customers can mean less revenue for infrastructure improvements, repayment of debt, and salaries to attract operators and other staff with technical expertise. In addition, small systems are often in rural communities and low-income areas. These households often do not have resources to pay for expensive water. This further limits resources for those small systems. Compared to larger systems, small systems are the least able to gain access to outside capital to finance needed infrastructure improvements, according to EPA's 1999 Drinking Water Infrastructure Needs Survey.
  - ***Rising costs***. Public water systems must also bear routine costs of facility operation and maintenance, as well as any needed infrastructure improvements. Furthermore, as more regulations to enhance public health protection go into effect, the cost of providing safe drinking water will increase. This upward cycle will continue as long as water sources become more contaminated and additional regulations are required to ensure safe drinking water supplies.

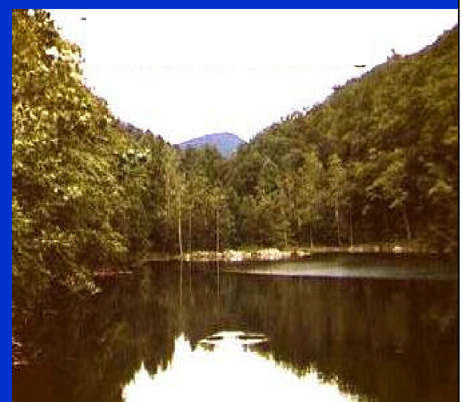


- Public ownership includes State or local governments or special districts. The chart shows that public ownership increases as the population served increases (from 14 percent to 84 percent).
- Private ownership includes investor-owned and other types of private ownership. Private ownership declines somewhat, varying from a high of 83 percent for the smallest population to 14 percent for the largest population.
- Systems in the "other" category represent those systems in the SDWIS database without classification information.

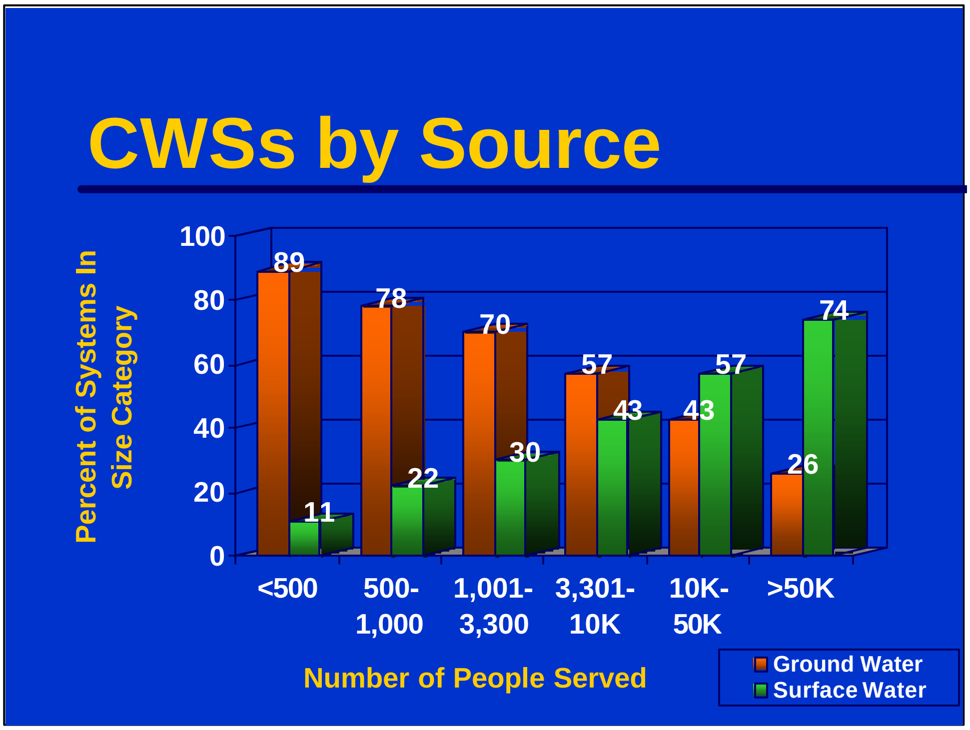
Sources of Drinking Water for Public Water Systems

Sources of Drinking Water

- Surface water
- Ground water
- Ground water under the direct influence of surface water



- Both surface water and ground water are used as drinking water sources.
  - o ***Surface water*** is taken from above-ground sources such as rivers, lakes, wetlands, or estuaries. Surface water, often a source of disease-causing organisms, is vulnerable to contamination and requires treatment before it is safe to drink.
  - o ***Ground water*** is pumped from underground aquifers through drilled wells or from springs. Ground water, which is protected by layers of soils and other subsurface materials, usually requires minimal treatment. However, ground water from shallow aquifers, from aquifers near surface water sources, or from sources not well-protected through the natural geology may be subject to influence from surface water sources. This ground water may have characteristics commonly associated with surface water (e.g., presence of large microbiological contaminants such as Giardia and cysts). Such ground water is defined as ***ground water under the influence of surface water*** and is treated like surface water.
- ***Adequate source quantity*** is also an important consideration. A source must meet demand on a hot summer day or during fire flow to prevent back-siphonage of contaminated water. Back-siphonage results from low pressure in the distribution system.



- Smaller water systems are more likely to choose ground water sources, which usually require less treatment and involve smaller capital expenditures.
- The graphic above shows the shift of the predominant source from ground water to surface water as systems serve larger populations. Large systems often opt for surface water sources, which can usually provide higher yields of water.
- For many systems, only one type of source water is available. For example, a system may be far away from surface water sources and may be limited to ground water. In other areas, ground water may be scarce or of a very low quality.

- As described on the previous slide, many small systems use ground water as a source because ground water usually requires less treatment than surface water and is therefore more affordable. This is an important consideration since many small systems without a large, rate-paying base cannot afford a full-time certified operator.
- Wellhead protection efforts are often among the most cost-effective way to ensure safe drinking water. These efforts prevent contamination from occurring rather than treating contamination after it has occurred.

Large Surface Water System

- Large surface water systems typically have complex treatment plants. In addition, operators need to be highly skilled.
- Small systems that use surface water usually have a plant every bit as complex and the one shown above. Essentially the same unit processes for treatment are used and the operators need to be just as knowledgeable and skilled as operators of large plants.
- Because of lack of economies of scale you can see why obtaining the necessary expertise is difficult for small systems.

Water Treatment, Storage and Distribution Systems

Treatment

- Water systems treat for three types of contaminants:
  - ***Microbiological contaminants,*** which can cause ***acute health effects;***
  - Contaminants that cause ***chronic health effects***; and
  - ***Secondary contaminants***.
- Microbiological contaminants are usually associated with gastrointestinal illness and, in extreme cases, death. These acute health effects can strike in a matter of hours or days. Nitrate in drinking water also poses an acute health threat. High levels can interfere with the ability of an infant's blood to carry oxygen. This potentially fatal condition is called "blue baby syndrome."
- Contaminants with chronic health effects include byproducts of disinfection, lead and other metals, pesticides, and solvents used by commercial and industrial facilities. Their health effects include birth defects, cancer, and other long-term effects. For example, some disinfection byproducts are toxic and some are probably carcinogens. Exposure to lead can impair the mental development of children.
- Contaminants with acute effects are of public health concern at transient non-community water systems, since they serve a transient population. CWSs and NTNCWSs on the other hand, serve the same people on a long term basis so contaminants causing both acute and chronic health effects are of public health concern.
- Secondary contaminants affect the taste, odor, color, and hardness of drinking water.

Acute Versus Chronic Health Effects

Acute Health Effect: An immediate (i.e., within hours or days) effect that may result from exposure to certain drinking water contaminants (e.g., pathogens).

Chronic Health Effect: A long-term effect that is the possible result of exposure over many years to a drinking water contaminant at levels above its MCL.

Treatment Options

- Treatment selected depends on:
  - Source water quality
  - System size
  - State or Federal regulatory requirements
  - System experience with specific technologies

- Water systems employ two basic strategies to ensure that drinking water is safe as it enters the distribution system: ***source protection*** and ***treatment.***

  - Source protection minimizes the effect of human activity (e.g., sewage production, farming, and industry) on surface water and ground water.

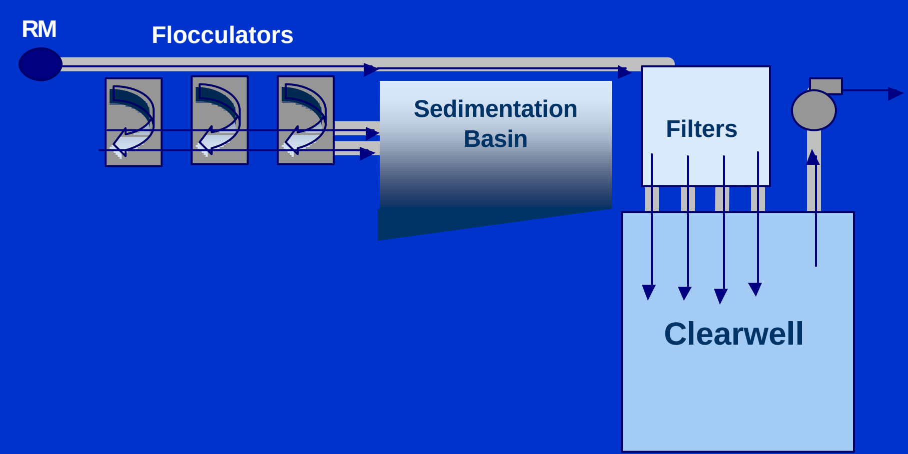
  - Treatment employs technology to remove contaminants from the water before it is delivered to customers. The specific treatment used depends on source water quality and other environmental factors, such as climate and the corrosivity of waters and soils. It also depends on a system's size and on the experience of the water system operator and engineer with the technologies. In addition, State or Federal regulatory requirements may affect technology choices.

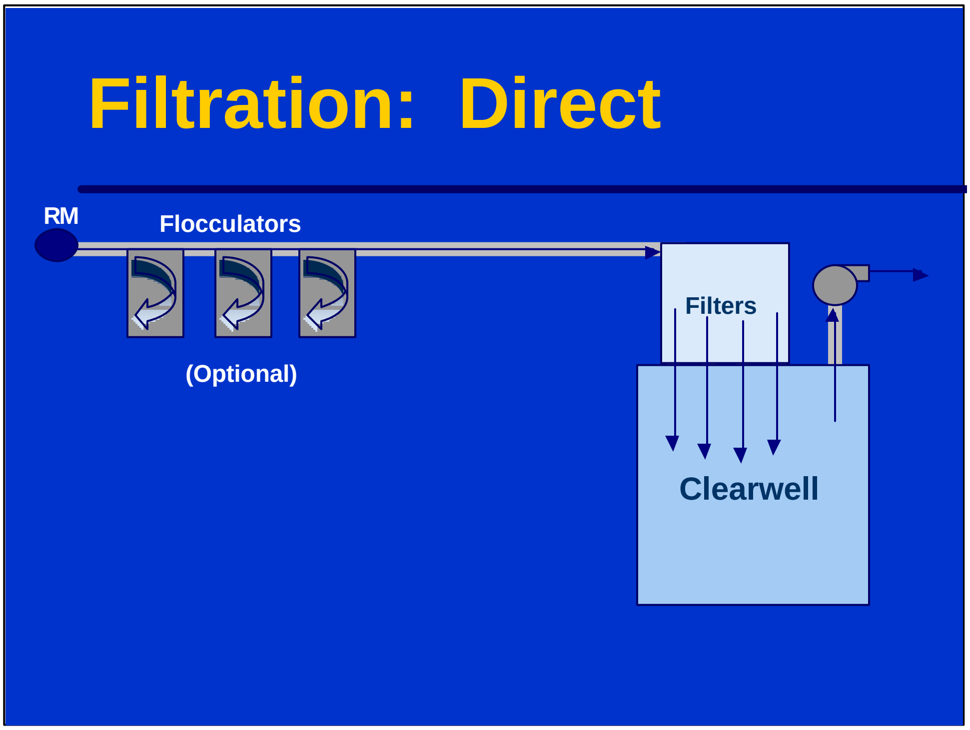
Treatment Options (continued)

- Filtration
  - Conventional
  - Direct
  - Slow sand
  - Diatomaceous earth

- ***Filtration*** - Many water treatment facilities use filtration to remove remaining particles from the water supply. Those particles include clays and silts, natural organic matter, precipitants from other treatment processes in the facility, iron and manganese, and microorganisms. Filtration clarifies water, enhances the effectiveness of disinfection, and removes pathogens.

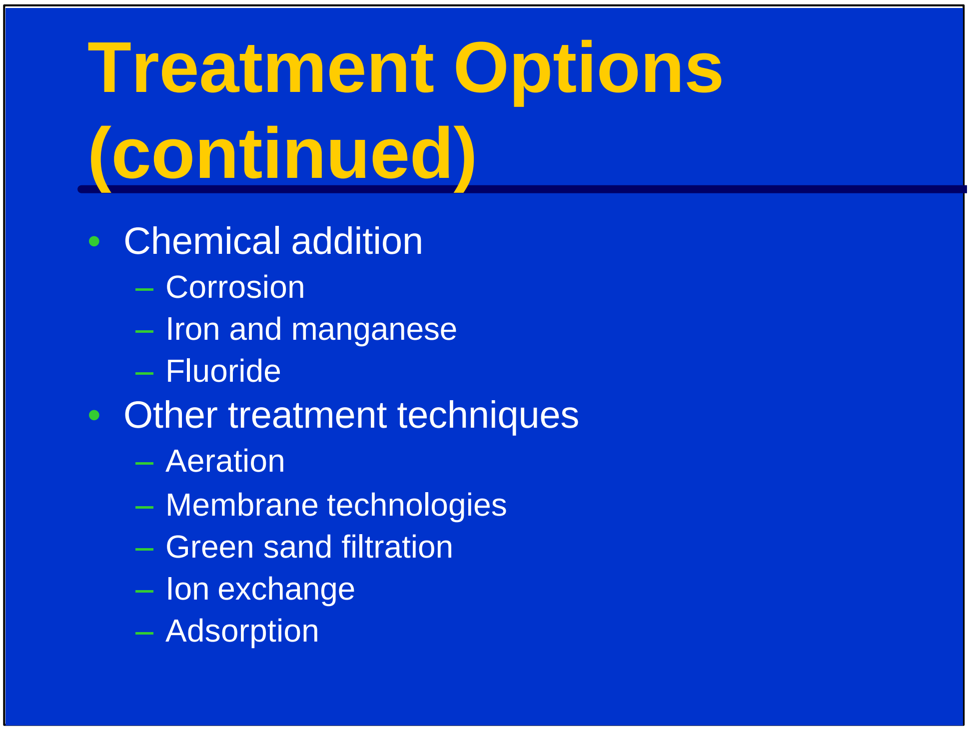
Filtration: Conventional




Filtration: Direct
RM
Flocculators
(Optional)
Filters
Clearwell

- This is a photo of a slow sand filter located in northern Idaho. This technology has been in use for over 100 years and has been shown to be very effective in removing microbial contaminants. The primary advantages include simplicity of operation and low costs. The disadvantages are that they generally have to be used on high quality (low turbidity) waters and, because of low filtration rates, they take up a large area.
- At the time of this photo, this plant had been in service for nearly forty years. It produces a high quality and safe drinking water.


Filter cleaning



- C***hemical addition*** may be used to control corrosion, remove iron or manganese, or control taste and odor.
- There are many other techniques that water systems use to treat contaminants in their source water.
  - For example, systems may choose ***aeration*** techniques that encourage contaminants to volatilize.
  - They may use ***membrane technologies*** to remove contaminants that cannot be removed through conventional filtration.
  - Many systems use ***green sand filtration*** to remove iron or manganese.
  - ***Ion exchange*** processes are used to remove inorganic constituents if they cannot be removed adequately by filtration or sedimentation. Ion exchange can be used to treat hard water. It can also be used to remove arsenic, chromium, excess fluoride, nitrates, radium, and uranium.
  - Organic contaminants, and color, taste- and odor-causing compounds can ***adsorb*** (i.e., adhere or stick) to the surface of granular or powdered activated carbon (GAC or PAC). GAC is generally more effective than PAC in removing these contaminants.

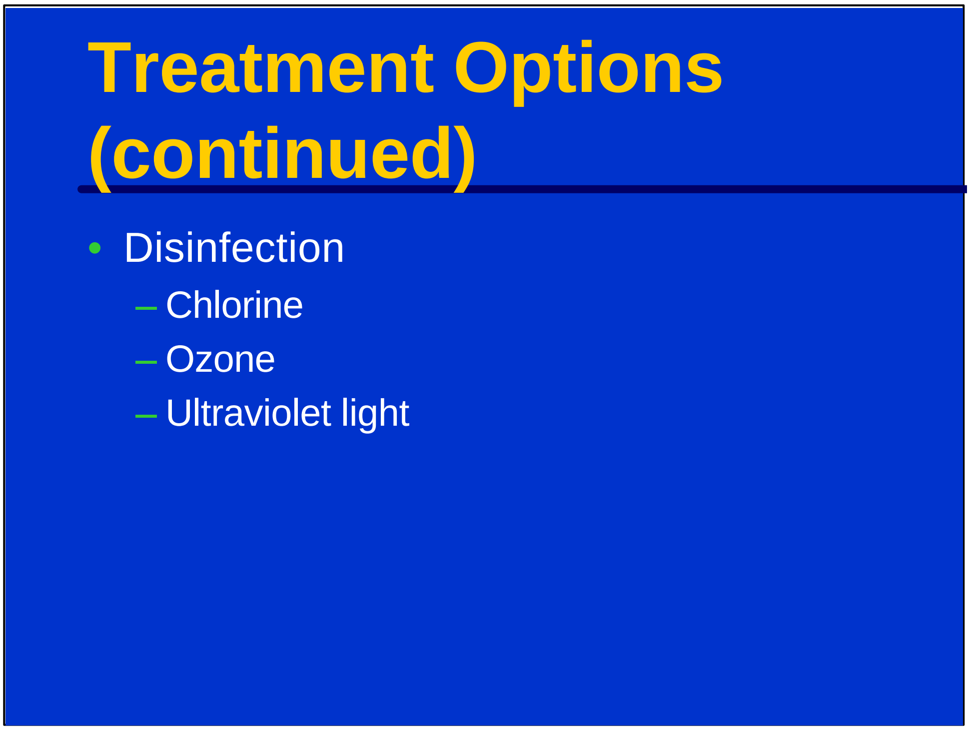
- Many ground water systems must treat for esthetic concerns. High levels of iron and/or manganese are common in some ground waters. These dissolved metals become oxidized when exposed to chlorine or the atmosphere and produce sediment and colored water. The above photo is water being flushed from a small trailer court's mains. Note the "tomato juice" color and consistency of the water. This is caused by oxidized iron.
- Some small systems cannot afford to install treatment and try to keep the objectionable water to a minimum by flushing the mains periodically. The water shown above will cause staining of laundry and fixtures.

- Water can be treated for removal of iron and/or manganese by oxidizing the metals to their insoluble forms, then removing them through filtration. This photo shows a building that contains such a plant. The tower on the far side of the building is where the raw water is aerated (i.e., oxygen is added) in order to oxidize the metals. Chlorine and, sometimes, potassium permanganate ($KMnO_4$) may be added as well to ensure oxidation.

- The water with the oxidized, insoluble metals is then routed to the plant within the building. This plant has a two step process for removing the insoluble metals.
- After treatment the water should not exhibit the problems associated with iron and manganese.
- Some systems that have iron and manganese at lower levels can add polyphosphate to the water. The polyphosphate works to keep the metals from oxidizing and prohibits them from causing the staining problems. This treatment is often effective and affordable for small water systems.

- This photo is an example of an older iron removal plant at a small rural system. Here the water is allowed to cascade through the trays on the left where the metals are oxidized. Some of the oxidized metals settle in the settling basin below the aeration trays and the rest are removed in the two pressure filters located beside the well house.
- This plant, like many others across the nation, has probably exceeded its useful life and is in need of replacement.

- This reverse osmosis (RO) plant is an example of more sophisticated and expansive water treatment. The water is forced through a semi-permeable membrane leaving dissolved solids behind. RO is often used to treat water that has dissolved solids at very high levels.



- Water is often disinfected before it enters the distribution system to ensure that dangerous microbes are killed.
  - Chlorine, chloramines, or chlorine dioxide most often are used because they are very effective disinfectants, and residual concentrations can be maintained to guard against biological contamination in the water distribution system.
  - Ozone is a powerful disinfectant, but it is not effective in controlling biological contaminants in distribution pipes.
  - Ultraviolet (UV) light can also be effective as a disinfectant.

- Treatment can be very simple or very complex. In this photograph liquid chlorine solution is injected in the water as it comes from the well. The water is then routed through the large black vertical polyethylene (PE) pipe in order to provide contact time for the chlorine to inactivate microorganisms that might be in the water.
- Note the blue pressure tank on the left hand side of the photo. This is an example of a captive air tank; one that has a flexible bladder to separate the air and water.

- Chlorine is the most commonly used disinfectant, but other oxidants are sometimes used and often have advantages over chlorine. The above photo shows ozone generators at a plant in the midwest. These particular ozonators have been in use since 1948. They are effective in removing tastes and odors as well as inactivating mircoorganisms.

Treatment at Smaller Systems

- Package plants
- Point-of-use and point-of-entry technologies

- Small drinking water systems have long faced problems affording and maintaining the treatment technology needed to protect public health. Limitations faced by small systems may include lack of expertise in operating complex treatment technologies, lack of a full-time operator, and lack of a large customer base to reduce the impact on individual water bills. The 1996 Amendments to the SDWA require EPA to focus on identifying treatment solutions for small drinking water systems. Through the process of identifying appropriate technologies, EPA will improve the informational base for making treatment decisions.

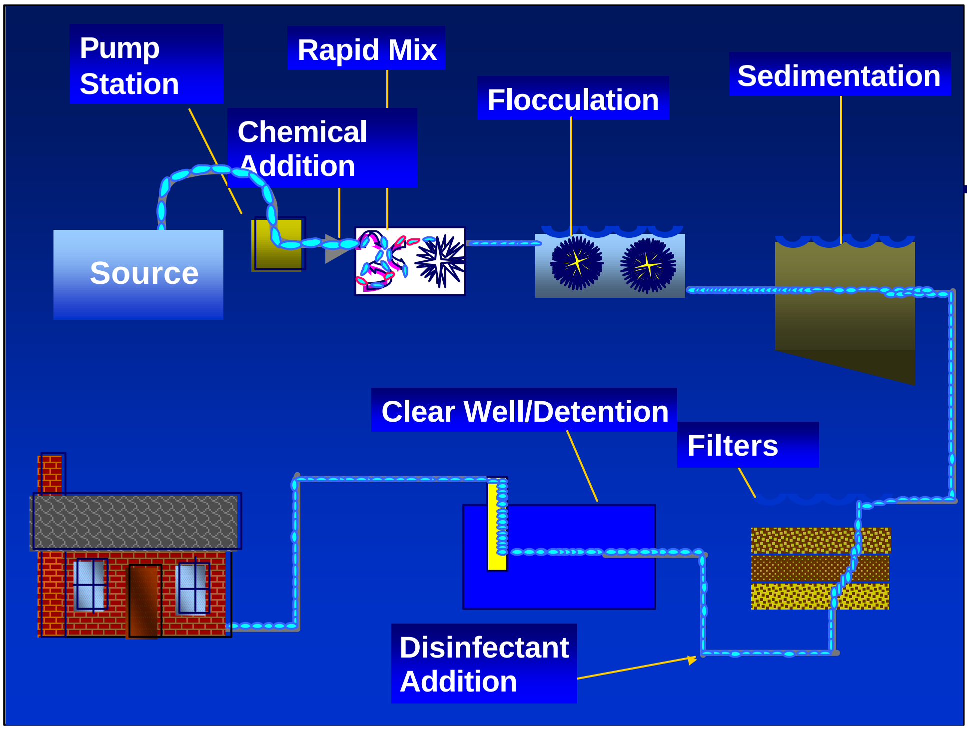
- Smaller systems that lack resources and adequate expertise may opt for a ***packaged plant*** (i.e., an "off-the-shelf" plant, rather than a custom built plant) in order to meet its water quality needs.

- In addition, the 1996 Amendments explicitly recognized centrally-managed ***point-of-use (POU)*** and ***point-of-entry (POE)*** treatment devices as potentially affordable compliance technologies for small systems. POU units are installed at the tap, and POE units are installed at the service entrance to affected homes. Under SDWA, POU and POE treatment units used to achieve compliance with standards for chemical (**not** microbiological) contaminants are eligible if they are owned, controlled, and maintained by the public water system or a person under contract to the system.

- POU and POE treatment technologies include activated alumina, activated carbon, aeration, ion exchange, reverse osmosis, and ultraviolet disinfection.

- This is an example of a package plant for use at small systems to remove hydrogen sulfide gas. Water is pumped from the well to a tray aerator on top of the plant. The aeration of the water effectively removes the gas. The water is stored in the back part of the unit, then disinfected and pumped to the distribution system.
- This plant can be moved on site as a complete unit.

- An earlier slide showed a photo of a large surface water treatment plant. Such plants are complex and require expertise for proper operation. The above photo shows a package surface water treatment plant that treats water from the Yukon River in Alaska. This plant is located inside a building and is about 10 feet wide, 25 feet long, and 8 feet high. It contains all of the functional units that the large plant has and requires the same level of operator expertise for proper operation.



- Usually, surface water is treated to remove suspended solids, organic and inorganic contaminants, pathogenic organisms, and tastes and odors. Below is a textual description of the seven steps that are shown above.
  - o ***Chemical addition***. Chemicals, usually coagulants and disinfectants, are added to untreated surface water to make contaminants easier to remove.
  - o ***Rapid mix***. Chemicals are quickly blended with untreated water to facilitate chemical reactions that destabilize charged particles.
  - o ***Flocculation***. Water is slowly mixed in flocculation basins. The slow, gentle mixing allows chemically destabilized particles to come into contact with each other so that larger, more easily removable "floc" particles are formed.
  - o ***Sedimentation***. Floc particles are allowed to settle out of the water and are subsequently removed as "sludge." Many of the contaminants from the source water and chemicals added in step 1 are removed in this process.
  - o ***Filters***. The remaining floc particles are removed as the water passes through the granular media of the filters. The clean, filtered water is collected beneath the filters.
  - o ***Disinfection Addition***. Disinfectant (usually chlorine) is added to the filtered water as it is transferred to the clear well or finished water storage.
  - o ***Clear Well Detention***. The water is held in the clear well storage basin long enough to allow the disinfectant to inactivate any remaining pathogens. A disinfectant residual is maintained in the distribution system to protect against contamination that might occur after the water has left the treatment plant.

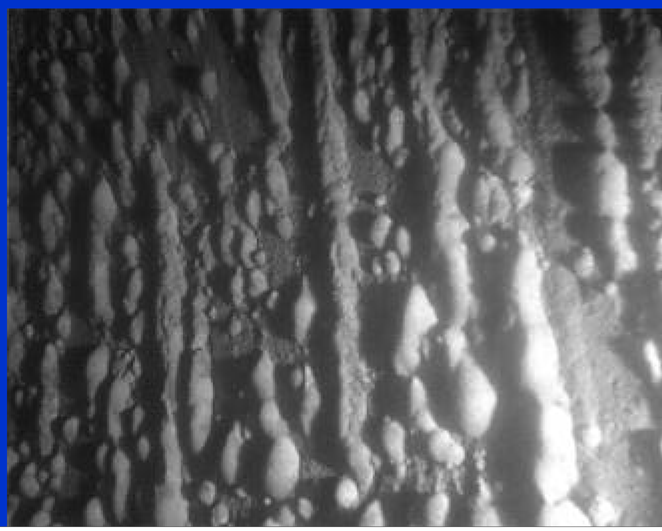
Storage

Storage

- Pressurizes the distribution system which keeps contaminants out
- Allows system to meet peak demands
- Protects pumps

- Almost all water systems include facilities to store ***finished water***, or water that is ready for delivery to the customer. ***Storage*** can be in ground level tanks or elevated tanks. Small water systems often use small pressurized tanks (***hydropneumatic tanks)*** that use electrical power rather than elevation to maintain pressure in the distribution system.
- Adequate storage capacity is important because it ensures the positive ***water pressure*** necessary to prevent contaminants from being drawn into the distribution system.
- Periodic rehabilitation of storage facilities is necessary to prevent entry and growth of microbiological contaminants in the storage facility and to maintain structural integrity.
- Storage is also necessary because it allows systems to provide water during periods of peak usage and ensure adequate pressure to meet fire flow requirements. Many small water systems do not have storage or other facilities that are adequate for fire protection purposes.

Storage Tank With Rust Deposits



- Pictured above is the inside wall of a storage tank. These are rust deposits that can harbor bacteria and lower the quality of the water.
- Storage tanks, when not properly designed or maintained, are a common entry point for microbial contaminants.
- Storage tanks have hatches for entry and inspection. These hatches must be properly designed to keep out rain water, dust, insects and other contaminants, and must be locked to prevent vandalism.
- Vents and overflows must also be designed and maintained to prevent the introduction of contaminants.

- Storage tanks are commonly found buried below ground, on the ground surface, and elevated. This is a ground level tank that is constructed of a glass-coated steel. The glass coating makes them very resistant to corrosion and this is useful because corrosion can greatly shorten the life of steel tanks. This particular tank is located on the Island of Hawaii where salt air can make corrosion a huge problem.
- Note that there is an entry hatch located on the roof of the tank just above the ladder. This is to allow entry for cleaning and inspection. It is important that all aspects of storage facilities be properly designed to prohibit the entrance of contaminants (e.g., dust, insects, rodents). The entry hatches are usually built with a 4 - 6 inch raised lip around the opening and with a locking, gasketed shoe-box type lid. Other potential entry points for contamination must also be designed properly as it has been shown that many contamination events can be tracked to storage tanks.

- This is an elevated tank. Such tanks are much more expensive than ground level or buried tanks and are used where topography doesn't allow placement of a ground level tank at an elevation that will provide adequate pressure to the system.
- These tanks usually have a single pipe from the distribution system. Thus, they "ride on the line" and water can go into the tank or come out of the tank through the same line depending on where the system demand is.
- Elevated tanks can be entry points for contamination because they often don't get the same frequency of inspection that ground level tanks do. This is obviously because not everyone is comfortable climbing them.

- Storage tanks have to be vented to allow air to come out when water is being pumped into the tanks, and to allow air in when water is leaving the tank. Atmospheric pressures have been know to collapse steel tanks when vents have become blocked.
- This photo is of an inverted-U type vent. This type of vent is required by many States' standards because the down-turned portion makes it harder for dust and other windblown materials to enter. Additionally, the vent is screened to keep out birds and insects.

- This is a photo of a battery of pressure tanks. These are commonly used in small ground water systems because of their low cost. The tanks are charged with air at a pre-determined level. Water is pumped into the tanks, compressing the air and increasing the pressure in the system. At another pre-determined pressure the pumps turn off and the system is provided water from the pressurized tanks. When enough water has been used to allow the pressure to fall to a lower level, the pumps are turned back on.
- The small box located in the center of the photo is the pressure switch. It senses the system pressure and turns the pumps on and off. These kinds of storage systems only provide enough storage to keep the pumps from cycling on and off too frequently.

- This is a photo of a small elevated tank that was found to be a source of fecal contamination. Note the birds perched on the tank.

- This is a photo taken from the top of the tank. Note the bird droppings on the tank's roof. The entry hatch cover on this tank is simply a hinged sheet of steel that closes over the opening in the roof. The hinges are on the right hand side of the photo and the lock is on the left with the padlock partially obscured by the ladder. A piece of angle iron is welded above the hatch to direct runoff away from the openings around the cover.
- Obviously fecally contaminated water can easily enter the tank through this poorly designed opening. Not shown in this photo is another opening in the tank's roof large enough to actually allow birds to enter the tank.

Transmission, Distribution, and Pumping Facilities

Transmission, Distribution, and Pumping Facilities

- Water mains
- Pumping facilities
- Appurtenances
  - Hydrants
  - Water meters
  - Valves and backflow prevention devices

Source: Carl Ambrose: New York City DEP

- For most water systems, the distribution and transmission of water requires a larger capital investment and more operating resources than other components of the water system.
  - o ***Transmission*** pipes bring water from the source to treatment or from treatment to the distribution systems.
  - o ***Distribution*** pipes deliver water to the customer. These pipes are also known as "***water mains***." Many water systems also include ***booster pumps***, which help keep the system pressurized. Structurally sound mains and pumping facilities are critical to guard against public health risks. If pressure is lost or if negative pressure is induced, contaminated water or sewage can be pulled back into the system through leaks. In addition, mains must be in good condition because failure could leave a community without water until the outage is repaired.
- Distribution systems also include ***appurtenances*** that help safeguard public health.
  - o ***Hydrants***, aside from fighting fires, are used to flush stagnant water from the system.
  - o ***Water meters*** help prevent overuse of water and provide the system with data on unaccounted water use, which may help the system identify leaks.
  - o ***Valves*** are necessary to direct the flow of water or close off a water line for maintenance or repairs. ***Backflow prevention devices*** help ensure that contaminated water that may originate at commercial establishments, residences, or interconnected distribution networks does not contaminate the water system.

Source: Carl Ambrose, New York City DEP

- The picture above shows a transmission line in New York City. This large waterline carries water from the water treatment facility to smaller distribution lines that deliver water to customers.

- This is a photograph of a large asbestos cement transmission main that was broken and taken out of service.
- Water mains, both transmission and distribution, are normally buried and, often, because they are "out of sight and out of mind," don't get proper attention until such catastrophic failures occur.

- This is a photo of a 6-inch distribution main that has just been removed in a replacement project. Note the three stainless steel leak repair bands. Replacement of the mains in this system probably should have been done decades earlier. Breaks and leaks put water systems at risk for contamination from back-siphonage.

- Small systems often have marginal facilities. This photo shows a small PE transmission main that carries surface water from a creek to a package plant. The main is insulated for freeze protection.

- Distribution system mains take on different characteristics in the Arctic. This is a photo of workers welding two pieces of water main together. The main is 4 inch PE and is surrounded by insulation and a protective metal jacket. Arctic distribution systems typically are built to allow the water to be circulated and heated to prevent freezing in the mains or storage tanks.

Pumping Facilities

- Pump applications move fluids from one point to another
  - Transport water through the system
  - Remove sludge or feed chemicals
- Types of pumps
  - Positive displacement
  - Centrifugal
  - Ejector

- In a water system, there are many applications that require a pump to move a fluid from one point to another. In addition to transporting water through the system, pump applications include chemical feed systems, sludge removal, air compression, and sampling.
- There are three types of pumps used in a water treatment plant.
  - A ***positive displacement pump*** delivers water at a constant rate regardless of the pressure it must overcome. This type of pump is typically used for online chemical application (i.e., application of chemicals into a pressurized water line).
  - ***Centrifugal pumps*** are used when an even flow rate is needed to meet the demands placed on it. The pumping rate varies with the discharge pressure of the water at discharge from the pump (i.e., as the discharge pressure increases, the rate of pumping decreases). Centrifugal pumps are used for well, raw water, backwash, transfer, finished water, booster, sludge, and backwash recycle pumping.
  - ***Ejector pumps*** are vacuum pumps in which gas is removed from a container (e.g., a chlorine cylinder) by passing water at a high velocity through a connecting chamber. The high-velocity water creates a vacuum that draws the chlorine into the water stream.

- This is a photo of a vertical turbine well pump (a centrifugal pump) for a medium-sized water system. The large valve on the right hand side of the photo is an automatic valve that opens slowly when the pump turns on, and closes slowly when the pump shuts off. This is designed to prevent "water hammer" that can cause mains to break.
- Note that the pump is mounted on a base that is at least 1 foot above the well house floor and 18 inches above the 100 year flood elevation. This protects the well and aquifer from contamination from floods and spills.

- These are large high service pumps at a large surface water systems. These “high service” pumps send treated water from the plant to the distribution system. The pumps are about five feet in diameter.

- The small yellow pump on the yellow container on the right hand side of the photo is a positive displacement chemical feed pump. They are designed to pump the same quantity of product into the water system even though the system pressures may change. They are used in small and medium sized systems to add chemicals for treatment and can be easily adjusted in order to get the correct chemical feed rate.
- This system is served by three wells that are manifolded into the single pipe shown here. The chemical feed pump injects chlorine to disinfect the water. The black box mounted on the wall takes a signal from a water meter (not shown) and either increases or decreases the rate of chlorine injection based on the amount of water being pumped. NSF* approved liquid chlorine is stored in the blue barrel on the left. The engineer is measuring the chlorine residual at the point of injection to make sure there is adequate residual for proper disinfection.

* The National Sanitation Foundation International is a nonprofit testing and certification organization that verifies the performance capabilities of commercial-ready drinking water treatment systems. It also certifies products with formally-registered marks as evidence of compliance with voluntary consensus standards, official regulations or product specifications.

- This is a small centrifugal pump that is used to boost pressures in the distribution system. The amount of water this pump will produce is inversely proportional to the pressure it is pumping against.

History of the PWSS Program

Origins of the PWSS Program

- **Early 1900s: State and local efforts to control water-borne disease (acute health effects)**
- **1914: First Federal standards, voluntarily adopted by many States**
- **1925: Filtration and chlorination used in large cities**

- In the1800s and early 1900s, States, water systems, and local governments began establishing programs to ensure safe supplies of drinking water. Early efforts focused on ***microbiological contaminants,*** such as protozoan, bacteriological, or viral contaminants. Efforts were made to prevent raw sewage from entering water bodies used as sources of drinking water and to treat water taken from lakes, rivers, and reservoirs.
- The first Federal drinking water standards were adopted in 1914 by the U.S. Public Health Service (PHS). The standards were only required for inter-State carriers, but many States voluntarily adopted them. The standards included a limit for total bacterial plate count and stipulated sampling standards for E. coli. The 1914 standards only addressed the bacteriological quality of water because the commission that drafted the standards could not agree on specific physical and chemical requirements. In 1925, PHS established standards for some physical and chemical (lead, copper, zinc, excessive soluble mineral substances) constituents.
- By 1925, large cities were using filtration and chlorination. It is likely that filtration and chlorination in combination have saved more lives than any other public health effort.
- By the mid-1900s, State public health departments were well-established regulatory agencies. The primary contaminants of concern were still those, such as pathogens and nitrate, that cause immediate or acute health problems.

Multiple Barrier Approach

- Multiple barrier approach
  - Focus on prevention
  - Comprehensive approach
- Source selection
- Source protection
- Treatment

- Prevention is the key to providing safe drinking water. We have learned through experience that protective barriers must ***always*** remain in place to guard against the occurrence of conditions that can lead to disease.
- States developed a ***multiple barrier approach*** to prevent microbial contamination of drinking water. The multiple barrier approach deals with the water system in a comprehensive manner, addressing a number of points where contamination could occur. Steps include:
  - ***Selection and protection*** of an appropriate source; and
  - Selection of ***treatment*** that is appropriate for the quality of the source water. Appropriate treatment could include coagulation and sedimentation, filtration, and disinfection with contact time.

Multiple Barrier Approach

- Sound and properly-designed distribution systems
  - Design and construction standards
  - Review of plans and specifications for water systems
- Sanitary surveys
- Operator training, technical assistance and certification

- States used several regulatory methods to implement the multiple barrier approach.
- Construction of well-engineered ***distribution systems*** promotes full circulation and avoids stagnant water conditions that might facilitate microbial contamination. State agencies also insisted on well-engineered and constructed storage facilities that reliably protected finished water (water that is ready for distribution to the customer) from contamination.
  - o States developed design and construction standards, including requirements for positive pressure and redundancy.
  - o Most required that ***plans and specifications*** for new water systems (or major alterations to existing systems) be approved prior to construction. Some States also required a post-construction inspection to ensure that "as-built" systems conformed to the approved plans and specifications.
- In addition, routine ***sanitary surveys*** were conducted by a State sanitarian or engineer who checked all components of the system from source to tap.
- States also set up programs to ensure that operators (at least larger system operators) were trained and certified to operate and maintain their facilities.

Multiple Barrier Approach

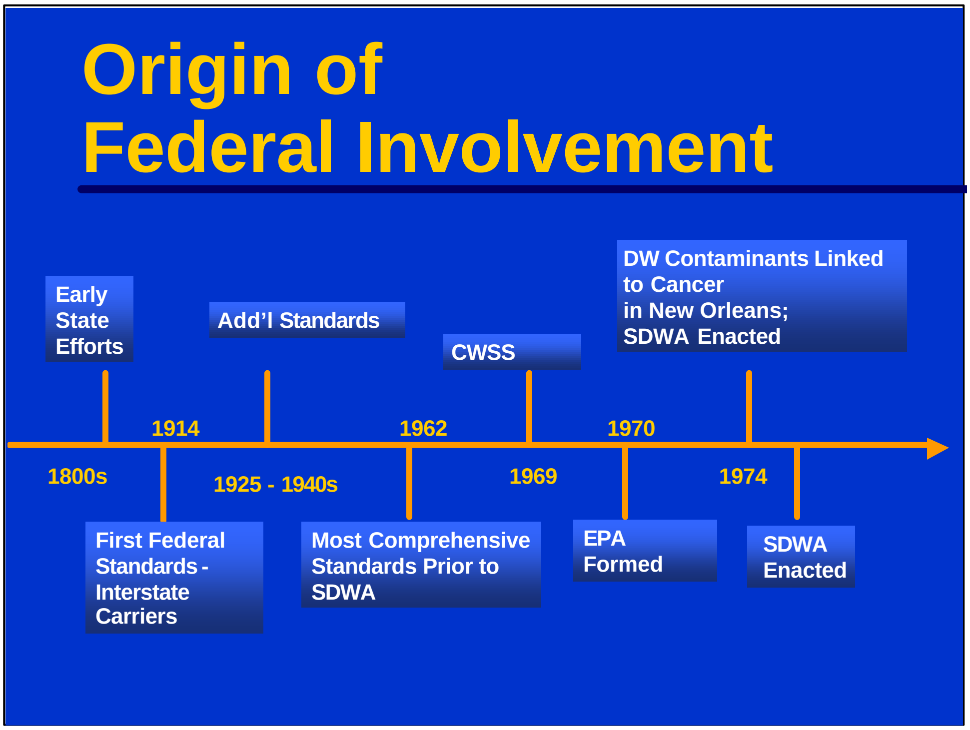
- Discharge permits
- Professional licensing
- Building codes
- Enforcement

- The multiple barrier approach also addressed activities outside the water system that could directly or indirectly affect the quality of drinking water. For example:
  - o Discharge permits ensure that discharges to ground or surface waters that could serve as a source of drinking water meet specified standards;
  - o Professional licensing requirements (e.g., for engineers and plumbers) ensure that workers are adequately trained and experienced;
  - o Building codes protect the structures that house water system equipment and finished water storage; and
  - o Enforcement of all standards acts as an incentive to comply.

State Drinking Water Programs

- Mid 1900s brought increased chemical use
  - Increased understanding of health effects
  - Source water testing
  - Addressed through treatment or alternative sources

- Between the early and mid-1900s, increased industrialization resulted in increases in discharges of chemical contaminants to surface water bodies. Chemical contaminants include compounds such as pesticides, heavy metals, and volatile organic chemicals.
- As scientists began to identify health risks associated with a number of chemical contaminants, State drinking water programs began to test source water for these contaminants. If contaminants were detected at levels that might pose health risks, engineers either designed treatment facilities to address the contaminant, or recommended alternative sources of water.



- During the mid-twentieth century, the Federal government gradually increased its emphasis on programs to increase the public's access to safe and adequate drinking water.
    - PHS ***established standards in the 1940s*** that addressed the chemical quality of water.
    - In 1962, mandatory limits (for interstate carriers) for health-related chemical and biological impurities and recommended limits for impurities affecting appearance, taste, and odor were established for 28 constituents. All 50 States accepted these standards, with minor modifications, either as regulations or as guidelines.
    - In 1969, PHS conducted the ***Community Water Supply Survey (CWSS)***. The survey indicated that several million people were being supplied inadequate quality water and that 360,000 people were being supplied potentially dangerous drinking water.
- In 1970, the ***Environmental Protection Agency (EPA)*** was established, and the Federal drinking water program moved from PHS to EPA. The newly-formed EPA faced growing public concerns about the safety of drinking water.
    - Data from the CWSS and other surveys conducted by EPA in the early 1970s showed that drinking water was widely contaminated on a national scale, particularly with synthetic organic chemicals.
    - In addition, in ***New Orleans in 1974***, high incidences of bladder cancer were associated with contaminants in drinking water.
- In response to the concerns prompted by the surveys and studies, Congress enacted the ***Safe Drinking Water Act*** in 1974. The 1974 Act established the ***Public Water System Supervision (PWSS) program.*** The purpose of the PWSS program was to establish minimum enforceable national standards for water quality and to guarantee that water suppliers would monitor water to ensure that national standards were met. This standards-based approach dominated the PWSS program for many years and remains an important part of today's program.

- The 1974 SDWA established a cooperative program among local, State and Federal agencies. The Act required the establishment of primary drinking water regulations designed to ensure safe drinking water for consumers.
- These regulations were the first to apply to a large number of public water systems across the United States, covering both chemical and microbial contaminants.
- SDWA mandated a major change in the regulation of drinking water systems by establishing specific roles for Federal and State governments and public water suppliers.
  - The Federal government, specifically EPA, was authorized to set national drinking water regulations, conduct special studies and research, and oversee State implementation of the Act.
  - States are expected to accept the major responsibility, called primary enforcement responsibility (primacy), for administering and enforcing the regulations set by EPA under the Act.
  - Public water suppliers have the day-to-day responsibility of meeting the regulations. To meet this goal, they must perform routine monitoring and report results to the State regulatory agency. Violations must be reported to the public and corrected. Failure to perform any of these functions can result in enforcement actions and penalties.

PWSS Program: Changing Focus

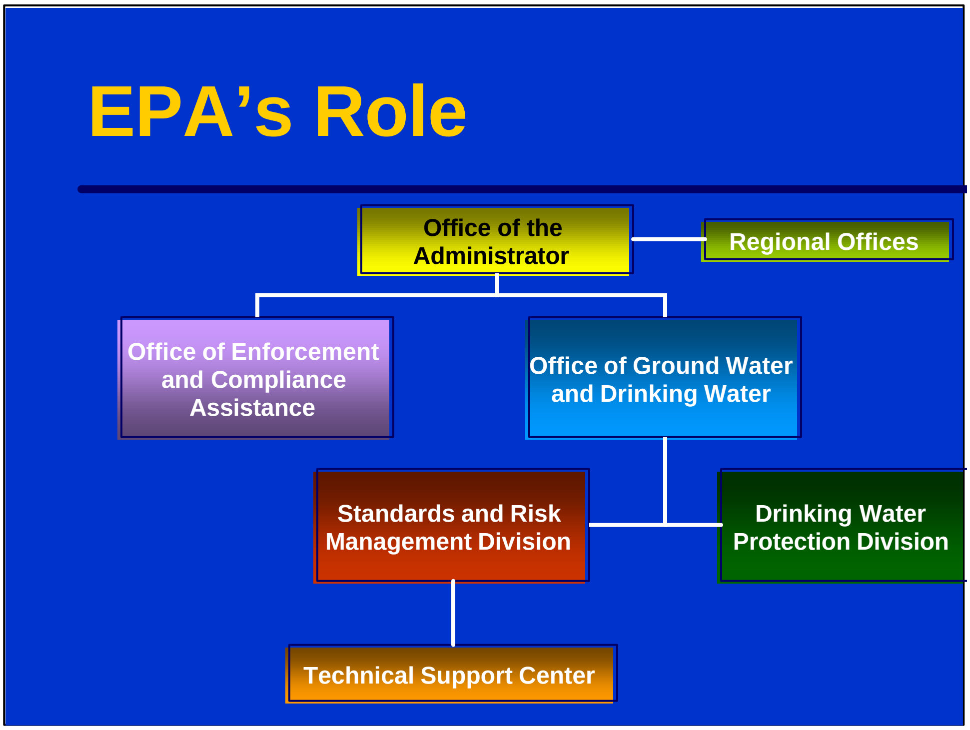
- 1974 SDWA required first national standards; defined roles for EPA, States, and PWSs
- 1986 SDWA amendments emphasized standards, monitoring, and enforcement
- 1996 SDWA amendments emphasized prevention
- Today's PWSS program mirrors States' multiple barrier approach

- Congress significantly underestimated the amount of time required for EPA to develop credible drinking water standards.
  - SDWA called for interim standards in six months of enactment, with revised standards in about 2.5 years.
  - EPA promulgated the first National Interim Primary Drinking Water Regulations one year after enactment.
- In reaction to EPA's perceived slowness, ***Congress included deadlines for standard-setting in the 1986 SDWA Amendments***. Specifically, the law required EPA to regulate 85 contaminants by 1989 and an additional 25 contaminants every three years thereafter.
- Ten years later, Congress amended SDWA again. In an effort to reduce the regulatory burden on States and to provide EPA and States the flexibility to concentrate on the greatest public health threats, Congress eliminated the requirement that the PWSS program include 25 new standards every three years.
  - The 1996 Amendments require EPA to evaluate the need to regulate five contaminants every five years and emphasized the need for sound science and public involvement in setting priorities for regulations.
  - The ***1996 Amendments also included new and stronger prevention approaches*** in the PWSS program. The comprehensive, preventive approach of the 1996 SDWA Amendments combined the multiple-barrier approach taken by early State programs with the standards, monitoring, and enforcement focus employed by the Federal program of the 1970s and 1980s.

Today's PWSS Program: Roles of EPA, States, and Public Water Systems

Today's PWSS Program

EPA's Role



- The ***Office of Ground Water and Drinking Water*** (OGWDW) has responsibility for ***national leadership*** of the PWSS program. OGWDW's Standards and Risk Management Division develops technical standards including MCLs, treatment techniques, and associated monitoring and reporting requirements, and develops the regulations that States must adopt.
- OGWDW's Drinking Water Protection Division (DWPD) implements the regulations and establishes national policies and guidance to ensure better compliance. DWPD also provides assistance to Regions and States in implementing new regulations. The assistance may take the form of training, guidance, or fact sheets and other information, including regulation implementation teams and the Drinking Water Academy.
- The ***Office of Enforcement and Compliance Assistance*** provides national leadership for PWSS enforcement issues.
- The EPA Regional Offices have the critical roles of overseeing implementation and enforcement by primacy States and implementing and enforcing the standards in non-primacy States. The Regions also oversee State administration of Drinking Water State Revolving Fund grants.

Establishing and Implementing Standards

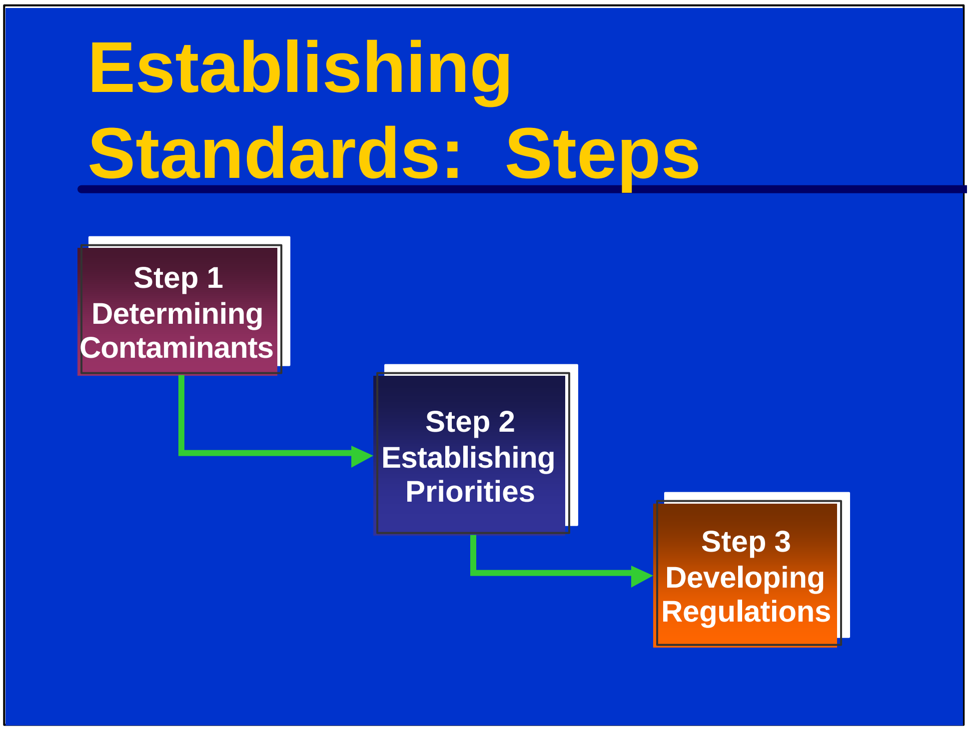
- National Primary Drinking Water Regulations
- National Secondary Drinking Water Regulations
- State primacy requirements

- EPA's Standards and Risk Management Division establishes National Primary and Secondary Drinking Water Regulations, which include concentration levels for contaminants in treated water or technology-based treatment standards.
- A ***National Primary Drinking Water Regulation*** (found in 40 CFR Part 141) is a legally-enforceable standard that applies to public water systems. Primary standards protect drinking water quality by limiting the levels of specific contaminants that are known or anticipated to occur in water and can adversely affect public health.
- ***National*** S***econdary Drinking Water Regulations*** (found in 40 CFR Part 143) are non-enforceable guidelines for contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. It is important to note that poor tasting and smelling water can often drive people to search for better tasting and smelling water which may not be as safe. However, because these standards are based on aesthetic concerns and not on health effects, EPA recommends, but does not require, that water systems meet secondary standards. States, however, may choose to adopt secondary standards as enforceable standards. Information in this module focuses on national primary standards.
- 40 CFR Part 142 contains regulations for implementing and enforcing the National Primary Drinking Water Regulations in 40 CFR Part 141. It includes requirements and procedures for States and Tribes to obtain primacy, as well as requirements for Federal enforcement, and issuance of variances and exemptions.

Standards and Regulations Under SDWA

- Regulations to control contaminants with acute health risks
  - Microbiological contaminants
- Regulations to control contaminants with chronic health risks

- Standards established under the PWSS program control contaminants that pose acute health effects (e.g., microbiological contaminants) and contaminants that pose chronic health affects.
- Standards for contaminants with acute health effects apply to all public water systems. Their purpose is to prevent the immediate health outbreaks associated with these contaminants.
- EPA also establishes standards that address contaminants that are primarily associated with chronic (long-term) health effects. Although the contaminants covered in these standards are primarily associated with chronic health effects, some of these contaminants also pose acute health effects, but not at levels typically found in drinking water.
- In general, transient noncommunity water systems — water systems that do not serve the same population on a daily basis—are exempt from standards for chronic contaminants. The purpose of these standards is to prevent health effects associated with long-term ingestion of contaminated water.

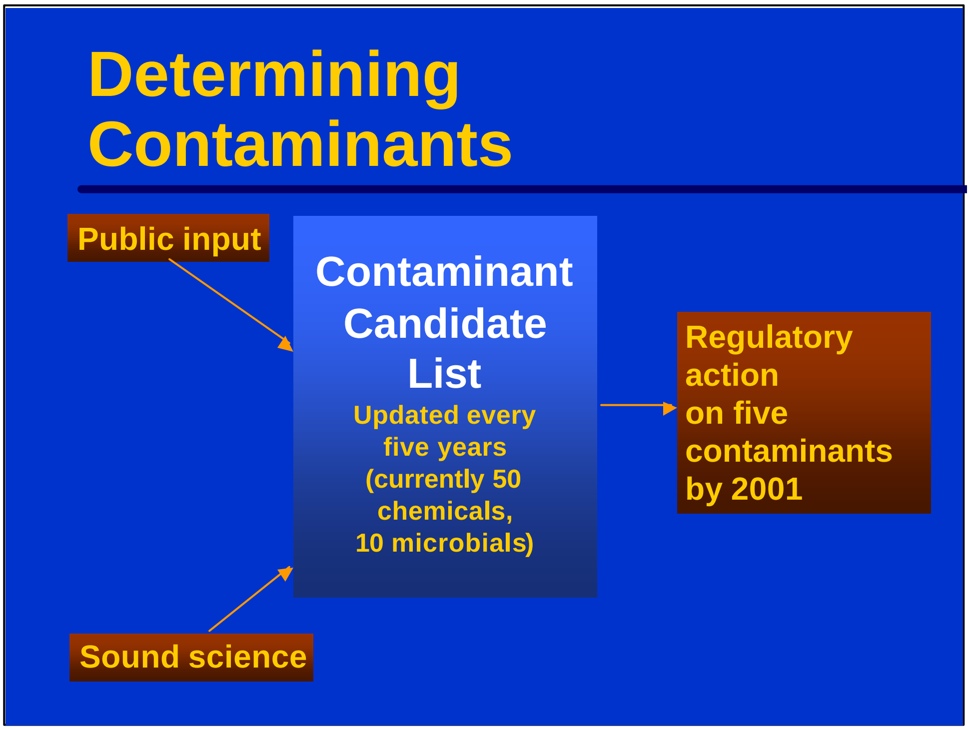


- The 1996 SDWA Amendments require EPA to follow several steps to determine, first, whether setting a standard is appropriate for a particular contaminant and, if so, what the standard should be. Public involvement and peer-reviewed science and data are key aspects of the approach for developing new regulations under the current PWSS program.
  - ***Step 1*** - EPA must first ***determine which contaminants to consider*** for regulation. This determination is based on health risks and the likelihood that the contaminant occurs in public water systems at levels of concern.
  - ***Step 2*** - Next, the Agency considers public input and available data and science to ***establish priorities for regulation***. If EPA determines that regulations are necessary, EPA must work with stakeholders to develop ***proposed regulations***, and solicit and consider public comments on the proposal.
  - ***Step 3*** - Finally, using stakeholder involvement again, EPA publishes (promulgates) ***final regulations***. The final regulations include concentration limits—Maximum Contaminant Levels (MCLs) — or treatment requirements, as well as requirements for regular monitoring. There are also requirements to inform the public if the system does not meet the standards.

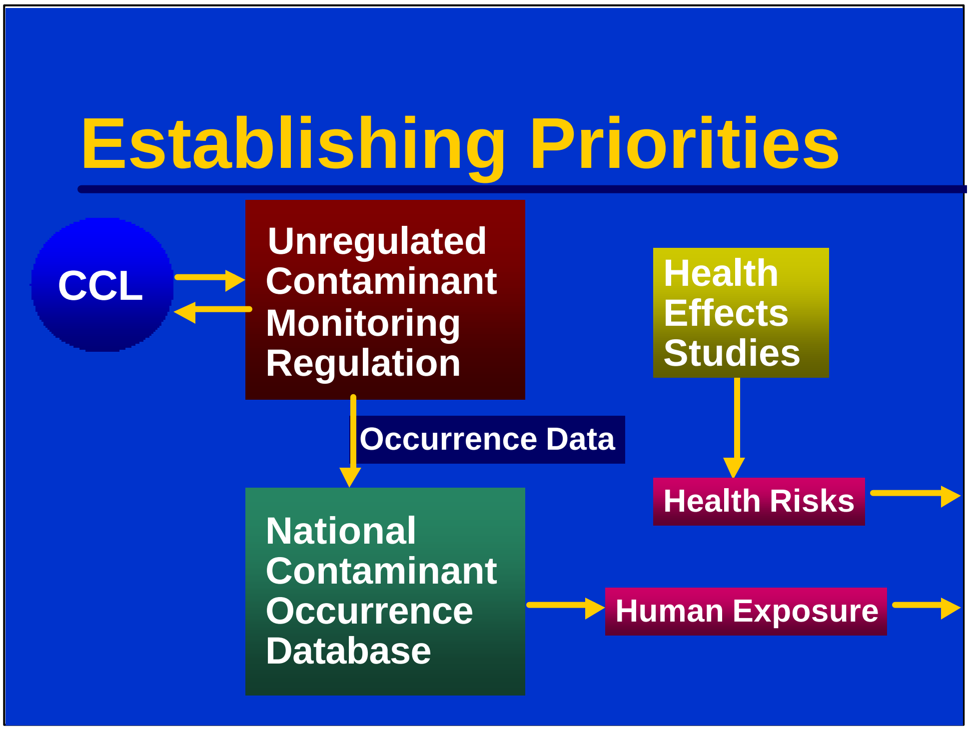
MCLs and Treatment Techniques

The ***MCL*** is the highest level of a contaminant that EPA allows in drinking water. MCLs are set at a level that will ensure that drinking water does not pose either a short-term or long-term health risk. EPA sets MCLs at levels that are economically and technologically feasible. Some States set MCLs that are stricter than EPA's.

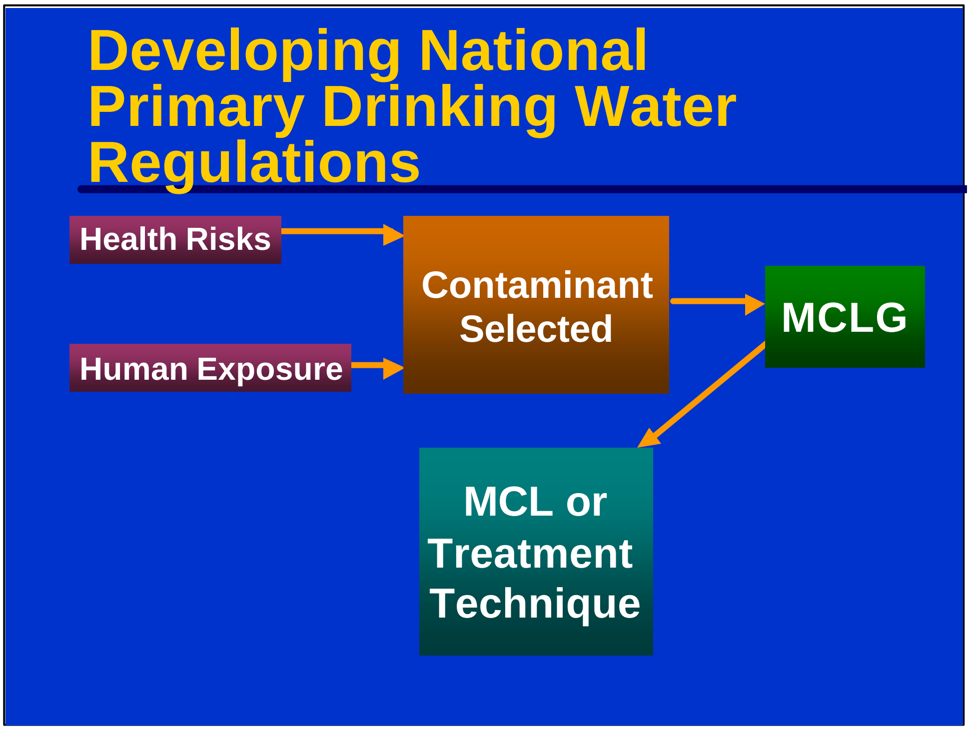
A ***treatment technique*** is a required process intended to reduce the level of a contaminant in drinking water. Treatment techniques are used when an MCL is not feasible.



- The 1986 SDWA Amendments contained tight deadlines that required EPA to regulate 83 contaminants and then to regulate an additional 25 contaminants every three years. The Amendments required EPA to draw contaminants for regulation from an existing list of contaminants with known health effects. However, the approach did not take into account how often a contaminant occurred in drinking water, and it did not provide a means to prioritize contaminants for regulation.
- The approach outlined in the 1996 Amendments for developing new standards requires ***broad public and scientific input*** to ensure that contaminants posing the greatest risk to public health will be selected for future regulation. A contaminant's presence in drinking water and public health risks associated with a contaminant must be considered in order to determine whether a public health risk is evident. In addition, the new contaminant selection approach explicitly takes into account the needs of sensitive populations such as children and pregnant women.
- Under the 1996 Amendments, the ***Contaminant Candidate List (CCL)*** will guide scientific evaluation of new contaminants. Contaminants on the CCL are prioritized for regulatory development, drinking water research (including studies of health effects, treatment effects, and analytical methods), and occurrence monitoring. EPA published the initial CCL on March 2, 1998, consisting of 50 chemicals and 10 microbials. EPA must make a ***determination for regulatory action for five contaminants by 2001***. The CCL must be ***updated every five years***, providing a continuing process to identify contaminants for future regulations or standards and prevention activities.



- To prioritize contaminants for regulation, EPA considers peer-reviewed science and data to support an "***intensive technological evaluation***," which includes many factors: occurrence in the environment; human exposure and risks of adverse health effects in the general population and sensitive subpopulations; analytical methods of detection; technical feasibility; and impacts of regulation on water systems, the economy and public health.
- EPA has developed several programs to improve the regulatory process in the drinking water program.
  - EPA promulgated the ***Unregulated Contaminant Monitoring Regulation (UCMR)*** on September 17, 1999 (64 *FR* 50555-50620). The rule contains a list of contaminants for which PWSs must monitor, requirements to submit the monitoring results to EPA and the States for including in the NCOD, and requirements to notify consumers of monitoring results. The contaminant list must be updated every five years.
  - EPA also established the ***National Drinking Water Contaminant Occurrence Database*** (NCOD). NCOD is a collection of drinking water contaminant occurrence data (non-detections and detections) representing finished, untreated and source waters associated with PWSs across the U.S. It includes data on regulated and unregulated contaminants. NCOD is accessible to the public through the Internet (http://www.epa.gov/ncod).
- The CCL occurrence priorities list is the primary source of contaminants to be selected for this monitoring. The UCMR will provide data to guide regulatory determinations and other prioritization for future CCLs. Linked with the CCL on a five-year cycle, the UCMR will provide a continuing source of needed data.
- The monitoring data from the UCMR will be stored in NCOD, along with other data on the occurrence of both regulated and unregulated contaminants. These data will provide additional information to identify contaminants for future CCLs, regulations, and review of existing regulations.



- Once EPA has selected a contaminant for regulation, it examines the contaminant's health effects and set a ***maximum contaminant level goal (MCLG)***, which is the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. MCLGs are non-enforceable public health goals. Since MCLGs consider only public health and not the limits of detection and treatment technology, they are sometimes set at a level that water systems cannot meet. For most carcinogens (contaminants that cause cancer) and microbiological contaminants, MCLGs are set at zero because a safe level often cannot be determined.
- EPA also establishes ***maximum contaminant levels (MCLs)***, which are enforceable limits that finished drinking water must meet. MCLs are set as close to the MCLG as feasible. SDWA defines "feasible" as the level that may be achieved with the use of the best available technology (BAT), treatment techniques, and other means that EPA finds are available (after examination for efficiency under field conditions and not solely under laboratory conditions), taking cost into consideration.
- For some contaminants, especially microbiological contaminants, there is no reliable method that is economically and technically feasible to measure a contaminant at particularly low concentrations. In these cases, EPA establishes treatment techniques. A ***treatment technique*** is an enforceable procedure or level of technological performance that public water systems must follow to ensure control of a contaminant.

Establishing Standards: Stakeholder Involvement

- National Drinking Water Advisory Council
- Regulatory negotiation process
- Public comments

- EPA considers input from many individuals and groups throughout the rulemaking process. One of the formal means by which EPA solicits the assistance of its stakeholders is the ***National Drinking Water Advisory Council (NDWAC)***. The 15-member committee was created by the Safe Drinking Water Act. It is comprised of five members of the general public, five representatives of State and local agencies concerned with water hygiene and public water supply, and five representatives of private organizations and groups demonstrating an active interest in water hygiene and public water supply, including two members who are associated with small rural public water systems. NDWAC advises EPA's Administrator on all of the Agency's activities relating to drinking water.
- In addition to NDWAC, representatives from water utilities, environmental groups, public interest groups, States, Tribes and the general public are encouraged to take an active role in shaping the regulations, by participating in public meetings and commenting on proposed rules. EPA's recent efforts to control microbiological contaminants such as *Cryptosporidium* and the byproducts that form as a result of disinfection included a ***regulatory negotiation ("reg neg")*** process, which formally involved such representatives. In addition, special meetings are also held to obtain input from minority and low-income communities, as well as representatives of small businesses.

Stakeholder: Any organization, governmental entity or individual that has a stake in or may be affected by a given approach to environmental regulation.

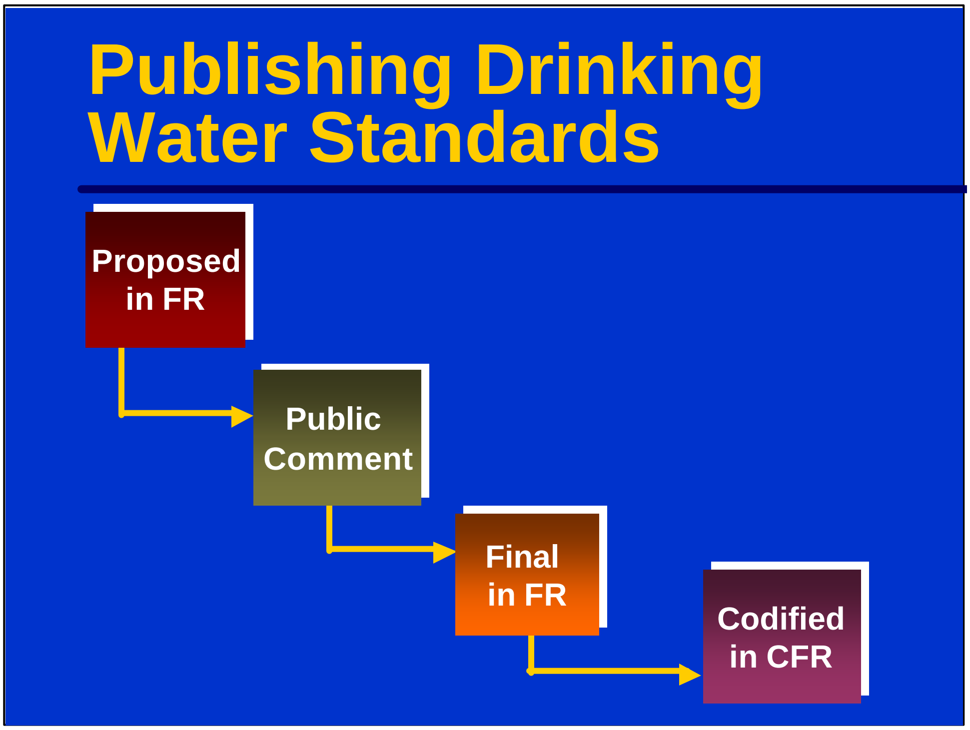
Determining Costs and Benefits of Drinking Water Standards

- Regulatory Impact Analysis
- Small Business Regulatory Enforcement Fairness Act (SBREFA) Analysis
- Information Collection Request (ICR)

- After determining a standard based on affordable technology, EPA must complete economic analyses to determine whether the benefits of that standard justify the costs. If they do not, EPA may adjust the MCL for a particular class or group of systems to a level that "maximizes health risk reduction benefits at a cost that is justified by the benefits."
- The most comprehensive analysis is the ***Regulatory Impact Analysis (RIA)***, which attempts to quantify expected costs by determining the number of affected entities, what new treatment or monitoring these systems will use, how much it will cost each affected system, how that cost affects water rates, and whether certain regions of the country are disproportionately affected. The RIA also quantifies a regulation's benefits. For example, it may estimate the number of cancer cases avoided and assign a value to that savings.
- EPA must also develop a ***Small Business Regulatory Fairness Act (SBRFA)*** analysis, which assesses impacts on smaller water systems and describe options considered for small systems.
- Finally, all regulations that contain reporting or recordkeeping requirements must be approved by the Office of Management and Budget under the Paperwork Reduction Act. This analysis, called an ***Information Collection Request***, estimates the cost and burden of recordkeeping and reporting requirements.

ICRs and the ICR

"**ICR**" has two meanings in the PWSS program. An **I**nformation **C**ollection **R**equest estimates the cost and burden of recordkeeping and reporting requirements. The **I**nformation **C**ollection **R**ule is a 1996 regulation that requires large systems to submit certain monitoring data that EPA will use to support future rulemakings.



- After EPA drafts a proposed rule, the Office of Management and Budget (OMB) must approve it. After OMB approval (which may require further EPA analysis or justifications) the Administrator signs the rule and EPA ***publishes a proposed rule*** in the *Federal Register*. The Federal Register notice includes a preamble and proposed regulations. The preamble to a proposed rule describes EPA's basis for its regulatory decision, including the information available on health effects and contaminant occurrence, the best available treatment technologies, the approach for the economic analysis and the conclusions of the analysis, and the approach EPA used to consider public input. The preamble must clearly show a sound scientific basis for the regulation.
- The publication of a proposed rule is followed by a public comment period. ***EPA is required to consider all public comments and all information submitted by the public*** as it develops a final regulation.
- ***Final regulations***, once developed, approved by OMB, and signed by the EPA Administrator, are again ***published in the Federal Register***. Publication of a final rule is referred to as "***promulgating***" the rule. The preamble to the final rule summarizes public comments and EPA's responses, and it describes any changes made in the regulations.
- ***Final regulations are codified annually in the Code of Federal Regulations (CFR)***. The National Primary Drinking Water Regulations are in 40 CFR Part 141.

Federal Implementation and Enforcement

- EPA Regions implement and enforce regulations in non-primacy States
- OECA provides national enforcement leadership
- EPA prepares annual compliance report
- Priorities:
  - Regulations affecting microbials
  - Compliance assistance for small systems

- SDWA provides that States may apply for and receive approval from EPA for primacy enforcement authority of the SDWA regulations. Thus, States conduct most enforcement activities related to water systems. However, some enforcement activities are conducted at the Federal level: in non-primacy States and in primacy States when requested by the State or when the State fails to act.
- OECA provides national enforcement leadership. Historically, each media organization (e.g., Office of Water, Office of Air and Radiation) included an enforcement office. In the early 1990s, EPA consolidated enforcement activities in the Office of Enforcement and Compliance Monitoring (later renamed the Office of Enforcement and Compliance Assurance (OECA)).
  - Federal PWSS enforcement is handled by EPA's Water Enforcement Division (WED) located in EPA's Office of Regulatory Enforcement (ORE), while compliance assistance is provided by the Office of Compliance (OC). Both Offices are located in OECA. The Water Enforcement Division is responsible for enforcing the requirements of four statutes: the Clean Water Act, ***SDWA***, the Marine Protection, Research, and Sanctuaries Act, and the Oil Pollution Act. These four statutes authorize seven major programs including Public Water System Supervision, and Underground Injection Control.
- OECA's responsibilities for the PWSS program are to:
  - Provide national direction in case selection, resolution and appeals;
  - Provide technical and legal support to the Regions in developing enforcement actions; and
  - Take the lead on certain nationally-significant cases.
- The 1996 SDWA Amendments streamlined the process for issuing Federal administrative orders and raised the amount EPA can collect in administrative penalties. The Amendments also require EPA to produce an annual national compliance report.
- OECA has established that ***compliance with regulations affecting microbials*** is an enforcement priority in 1999 and 2000. In addition, ***compliance assistance for small water systems*** is a priority.

Today’s PWSS Program - State and Tribal Roles

What is Primacy?

- **Primacy:** EPA may award States, Territories, and Indian Tribes **primary enforcement responsibility (primacy)** for public water systems if they meet certain requirements
- Primacy must be maintained

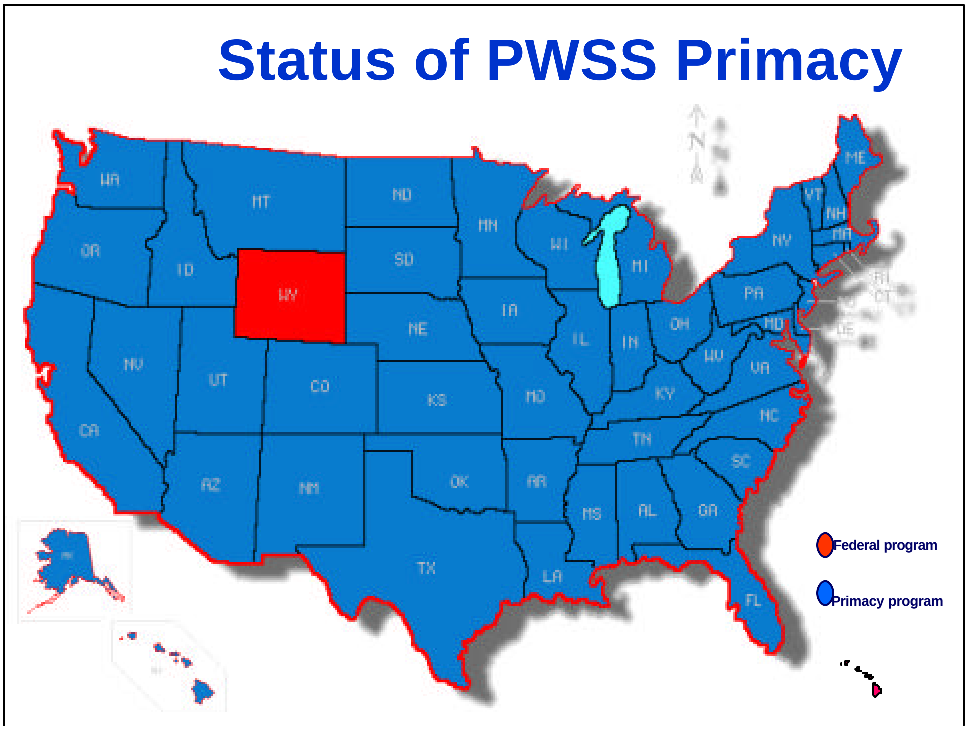
- Section 1413 of SDWA allows EPA to award ***primary enforcement responsibility*** or ***"primacy"*** for the PWSS program to States or Indian Tribes if they meet certain requirements established by EPA.
  - o SDWA defines States as the 50 States, the District of Columbia, Puerto Rico, Guam, the Northern Mariana Islands, the Virgin Islands, American Samoa, and the Trust Territory of the Pacific Islands. (All are referred to here as "States.")
  - o Most States seek primacy over their PWSS programs in part because it gives them ***the flexibility to address State-specific needs and problems***.
  - o All States currently have primacy, except Wyoming and the District of Columbia.
  - o Currently, no Tribes have primacy for the PWSS program. However, some Tribes are making efforts now to obtain PWSS primacy.
- The primacy requirements established by EPA are codified in ***Part 142 of the Code of Federal Regulations (CFR)***.
  - o Some changes to 40 CFR Part 141 require amending the primacy requirements in 40 CFR Part 142. For example, the recent promulgation of the UCMR included a revision to 40 CFR 142.16 to require States applying for primacy for this regulation to describe their procedures and criteria for revising and issuing monitoring waivers.
  - o EPA also makes changes directly to Part 142, without any corresponding changes in Part 141. For example, EPA amended 40 CFR 142.10 to require administrative penalty authority as a condition of primacy.
- Primacy is not obtained permanently--it ***must be maintained***. States and Tribes must maintain compliance with existing regulations. As new Federal regulations are promulgated, States must adopt and implement them under State law and apply for primacy for each new requirement. EPA Regions must annually review State programs to ensure that they continue to meet primacy requirements.

- As codified in 40 CFR Part 142 Subpart B, to obtain primacy the State must have regulations that are ***no less stringent than the regulations promulgated by EPA***. States have up to two years to develop regulations and apply for primacy after new regulations are released by EPA. In addition, States must:
  - Maintain an ***inventory*** of public water systems in the State;
  - Have a program to conduct ***sanitary surveys*** (explained later in this module) of the systems in the State;
  - Have a program to ***certify laboratories*** that will analyze water samples required by the regulations;
  - Have a certified laboratory available that will serve as the ***State's "principal" lab***;
  - Have a program to ensure that new or modified systems will be capable of complying with State primary drinking water regulations (***plan review***);
  - Adopt and implement procedures to ***enforce*** State regulations; and
  - Have adequate ***enforcement authority*** to compel water systems to comply with NPDWRs, including the authority to apply drinking water regulations to PWSs; sue in court to enjoin threatened or continuing violations; enter and inspect water system facilities; require systems to keep records and release them to the State; require systems to notify the public of any system violation of the State requirements; assess civil or criminal penalties for violations of the State Primary Drinking Water Regulations and Public Notification requirements; and assess administrative penalties for violations.

Primacy Requirements (continued)

- Recordkeeping and reporting
- Variances and exemptions
- Emergency plan
- Consistent definition of public water system

- As codified in 40 CFR Part 142, Subpart B, to obtain primacy, a State must also:
  - Have adequate recordkeeping and reporting requirements;
  - Have ***variance and exemption requirements*** as stringent as EPA's, if the State chooses to allow variances or exemptions;
  - Have an ***adequate plan*** to provide for safe drinking water in ***emergencies*** like natural disasters; and
  - Define a PWS to include systems that provide water for human consumption through "other constructed conveyances" for consistency with the 1996 Amendments to section 1401(4).



- Currently, all States and Territories, except Wyoming and D.C., have primacy for the PWSS program.
- In addition, several Indian Tribes are expected to request and receive primacy in the future.
- In States without primacy, EPA has primary enforcement authority. These States are called “Direct Implementation” States because EPA directly implements the PWSS program. EPA also directly implements the program for all Tribes.
- It should be noted that a separate set of requirements governs primacy in the Underground Injection Control Program.

Implement Standards

- Adopt new regulations
- Apply to maintain primacy and implement and enforce regulations under interim primacy
- Receive primacy for new regulations

- Primacy States must continue to adopt regulations that are at least as stringent as any new Federal standards. They may adopt standards that are more stringent than the Federal regulations.
- When a new Federal regulation becomes effective, ***EPA is responsible for implementing it*** until a State receives primacy for that rule.
- The 1996 Amendments ***extend the deadline*** for States to obtain primacy for new regulations from 18 months to two years with the possibility of an additional two-year extension.
- A primacy State is considered to have “interim primacy” for new regulations it adopts beginning when the State regulation becomes effective or when the State submits a complete primacy application to EPA, whichever is later. Interim primacy ends when EPA approves or disapproves the State’s application.
- New drinking water regulations become effective three years after promulgation, unless EPA determines that an earlier date is practicable.

Enforce Standards

- States have discretion in enforcement
  - Actions depend on risk to public health
- Preventive actions come first

- States with primacy implement and enforce State drinking water regulations. At all levels of government, regulatory agencies have some discretion in determining what type of enforcement action to take and when to impose penalties.
- The most successful State efforts to achieve compliance are often ***preventive efforts*** and ***informal enforcement actions***.
- Preventive efforts are aimed at notifying and educating an operator about requirements, and can result in avoiding critical problems. These activities are based on the belief that most water suppliers want to do the right thing if they understand how and why it must be done.
- Examples of preventive efforts include:
  - o Sanitary surveys;
  - o Reminder letters for monitoring;
  - o On-site meetings and technical assistance; and
  - o Operator certification and training.
- States also conduct outreach and education activities to promote understanding of and compliance with their regulations.

Enforce Standards

- Informal actions are less resource-intensive, often effective in achieving compliance
- Formality of actions escalates with continued noncompliance

- ***Informal enforcement actions*** are a continuation of the philosophy that education and assistance are the most effective means to achieve compliance from willing operators.
- Informal actions are generally taken for minor violations such as failure to monitor or failure to properly collect samples. They are often taken to respond to less serious, paperwork violations.
- Examples of informal actions include:
  - Warning letters explaining initial, minor violations;
  - Notices of violation;
  - On-site meetings and technical assistance; and
  - News releases describing failure to comply.
- Continued failure to comply will result in the State taking more formal enforcement actions.

- States and EPA generally reserve their strongest enforcement tools for owners and operators who have not been responsive to enforcement actions, facilities whose violations pose significant public health threats, or facilities with a history of noncompliance.
- EPA and State primacy agencies can issue ***Administrative Orders*** at the agency level. Administrative Orders include an opportunity for a public hearing and may include ***penalties***. (The 1996 Amendments require PWSS primacy States to be able to issue administrative penalties.)
- States may bring ***civil actions*** before a State court, which may issue Judicial Decrees and could include penalties. Civil actions require a significant agency effort and are reserved for systems that have serious noncompliance issues.
- ***Referral to EPA*** is used as a last resort when State resources cannot address the issue and previous State efforts have not been successful. EPA can bring an administrative action or can refer the case to the Department of Justice for civil (or criminal) action.
- EPA and the State may also bring joint enforcement actions.
- EPA may also bring an independent enforcement action in a primacy State, after appropriate notice, if the State fails to take enforcement action.

Enforce Standards

- Focus on Significant Noncompliers (SNCs)
- Track violations in Safe Drinking Water Information System (SDWIS)
  - Contains information on PWSs
  - EPA uses SDWIS for oversight and evaluation
- States use SDWIS/State to run their drinking water programs

- Formal enforcement actions focus on ***Significant Noncompliers (SNCs***), i.e., PWSs that have serious, frequent, or persistent violations. For each drinking water regulation, a threshold is established for becoming a SNC on that rule. EPA requires States to take ***timely and appropriate*** enforcement action to address violations.
- States enter information on health based violations and monitoring and reporting violations in the ***Safe Drinking Water Information System (SDWIS)*** database. The 1996 SDWA Amendments require that States prepare annual reports on the compliance of PWSs within their State and make summaries available to the public.
- SDWIS/FED is an EPA database that contains data submitted by States and EPA Regions in conformance with SDWA reporting requirements. States report the following information to EPA:
  - Basic information on each water system, including name, ID number, number of people served, type of system, and source of water;
  - Violation information;
  - Enforcement information; and
  - Sampling results for unregulated contaminants and for regulated contaminants when the monitoring results exceed the MCL.
- EPA uses this information to determine if and when it needs to take action against non-compliant systems, oversee State drinking water programs, track contaminant levels, respond to public inquiries, and prepare national reports. EPA also uses this information to evaluate the effectiveness of its programs and to determine whether new regulations are needed.
- The public may gain access to SDWIS/FED through a Freedom of Information request or through Envirofacts on the Web (http://www.epa.gov/enviro).
- A related version, SDWIS/State is a database designed by EPA and the States to help States and EPA Regions run their drinking water programs and fulfill EPA reporting requirements.

Sanitary Surveys

- On-site evaluation
  - Source
  - Treatment
  - Distribution system
  - Finished water storage
  - Pumps, pump facilities, and controls
  - Monitoring and reporting and data verification
  - System management and operation
  - Operator compliance with State requirements
- Re-emphasized in IESWTR

- States perform sanitary surveys to ensure water systems are operating correctly. A sanitary survey is an on-site review of the water sources, facilities, equipment, and operation and maintenance of a public water system to evaluate the adequacy of those elements for producing and distributing safe drinking water.
- During a sanitary survey, State engineers check the integrity of a system's infrastructure and review the systems operation practices. The resulting report (sometimes called a sanitary deficiencies report) itemizes actions that a water system should take to ensure safe water.
- Proper operation and maintenance of a water system is important for the prevention of microbial contamination. For this reason, the recently-promulgated Interim Enhanced Surface Water Treatment Rule includes a provision requiring States to conduct sanitary surveys at all surface water systems (including GWUDI systems) at specified minimum frequencies.

Capacity Development

- Small systems face special challenges
- States must have programs to ensure capacity of new CWSs and NTNCWSs
  - Financial
  - Managerial
  - Technical

- Studies conducted by the PHS in the 1960s and by EPA in the 1970s identified significant problems in small systems' ability to provide safe drinking water. To help small systems meet these challenges, SDWA and the 1986 Amendments built in procedures for variances and exemptions, but funding was not available to make small system assistance a priority.
- By the late 1980s and early 1990s, it was clear that small systems were having greater difficulty keeping up with the rapidly expanding SDWA-mandated regulations. A few States were implementing "viability" initiatives, which sought to promote small system compliance and otherwise address small systems problems, by ensuring that systems had the necessary underlying technical, managerial, and financial wherewithal. The concept of "viability" became known in the 1996 SDWA as "capacity development."
- SDWA section 1420 requires States to have a program to "ensure that all new community water systems and nontransient, noncommunity water systems commencing operations after October 1, 1999 demonstrate ***technical, managerial, and financial capacity*** with respect to each national primary drinking water regulation in effect, or likely to be in effect, on the date of commencement of operations."
- Under this provision, EPA must withhold a portion of DWSRF funding for States that fail to establish and implement a capacity development program. In addition, States may not provide DWSRF loan assistance to systems lacking these capabilities or to systems that are in significant noncompliance with any drinking water standard or variance.
- SDWA Section 1420 also requires States to develop and implement strategies to assist public water systems in acquiring and /or maintaining technical, financial and managerial capability for their systems.

Resources for Capacity Development

- Technical Assistance Centers
- Environmental Finance Centers
- See http://mtac.sws.uiuc.edu/about.asp for lists of TAC and EFC contacts
- See http://www.epa.gov/safewater/smallsys.html for EPA's small systems and capacity development home page

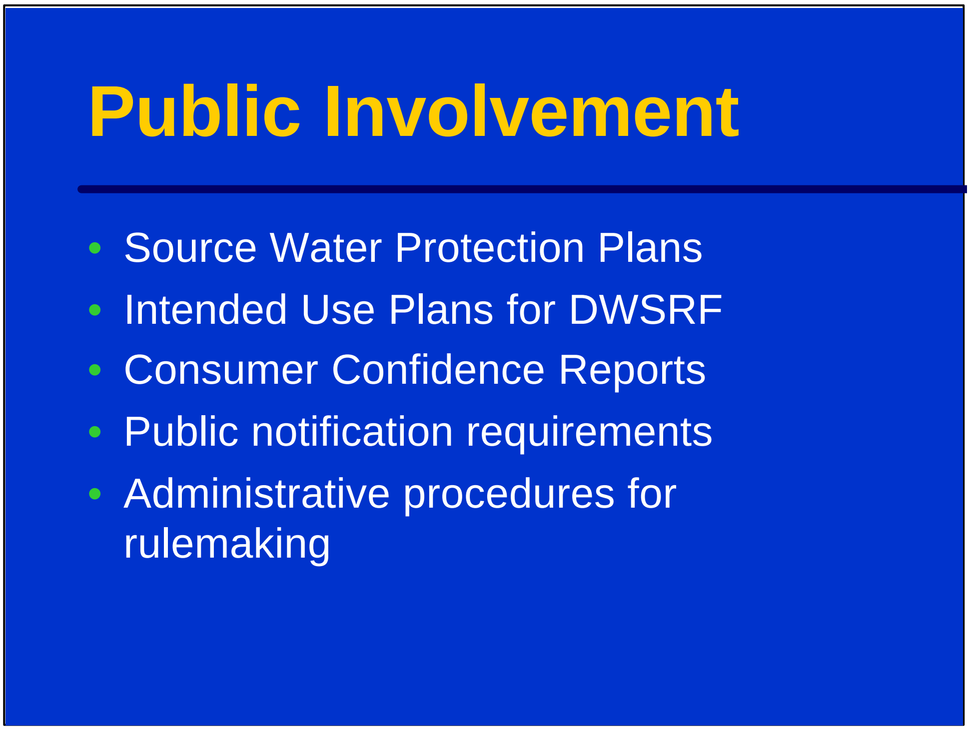
- SDWA Section 1420(f) directed EPA to establish at institutions of higher education technology assistance centers for small public water systems. The centers conduct a variety of activities, including training, conducting studies and case studies, and providing technical assistance in order to develop the technical, financial, and managerial capacity of small systems. Centers are located at the following institutions:

  - University of Alaska
  - California State University
  - University of Illinois
  - Western Kentucky University
  - Charles County (MD) Community College
  - University of Missouri
  - Montana State University
  - University of New Hampshire
  - Pennsylvania State University
  - West Virginia University

- EPA has also established Environmental Finance Centers to provide State and local officials and small businesses with advisory services; education, publications, and training; technical assistance; and analyses of financing alternatives. EFCs have been established at the following institutions:

  - California State University, Hayward
  - Boise State University
  - University of Louisville
  - University of Maryland
  - University of New Mexico
  - Syracuse University
  - University of North Carolina, Chapel Hill
  - Cleveland State University

- All States currently have operator certification programs. However, States vary as to how comprehensive their operator certification requirements are. Many States currently exempt small systems from certification requirements. This will change with the requirements in the 1996 SDWA Amendments that required EPA to:
  - Initiate a partnership with States, water systems, and the public to develop information on recommended operator certification requirements;
  - Issue guidelines specifying minimum standards for certification and recertification of the operators of community and nontransient, noncommunity public water systems. The guidelines specify different requirements depending on system size and complexity;
  - Reimburse training and certification costs (through DWSRF set-asides) for operators of systems serving 3,300 people or fewer, including per diem for unsalaried operators, who are required to undergo training as a result of the Federal requirement, through grants to the States; and
  - Publish final EPA guidelines in the Federal Register by February 6, 1999 (EPA published the guidelines on February 5, 1999 [64 FR 5916-5921]).

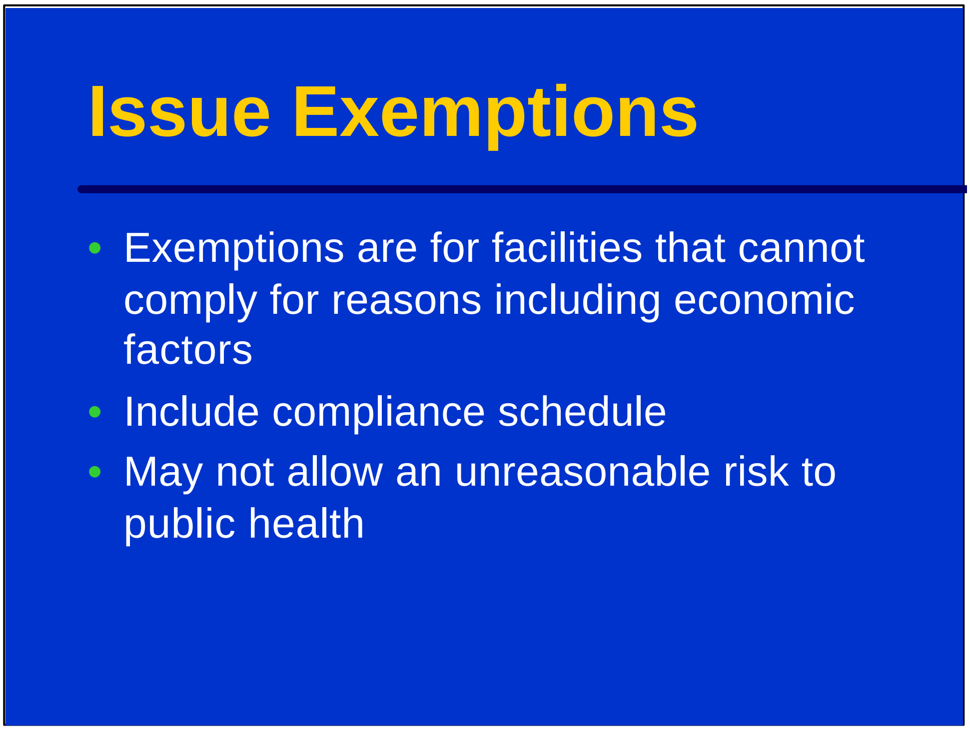


- Consumer awareness and right-to-know was a major theme of the 1996 Safe Drinking Water Act. In addition, the EPA Administrator highlighted consumer awareness as a top priority in the Agency's drinking water redirection strategy in 1995. The 1996 SDWA Amendments confirm the importance of educating consumers and add major new responsibilities for EPA, States, and water systems in this area.
- Public involvement occurs on many levels. Examples of avenues used to involve the public include:
  - ***State Source Water Protection Plans*** must include public input in order to be approved by EPA.
  - ***Intended Use Plans*** provide an opportunity for the public to comment on States' priorities for addressing infrastructure needs under the DWSRF.
  - ***Consumer Confidence Reports*** and ***public notification*** are PWS responsibilities described later.
  - ***National Drinking Water Advisory Council*** is chartered under the Federal Advisory Committee Act, and offers another opportunity for public involvement.
  - ***Negotiated Rulemakings*** involve stakeholders from industry, States, and environmental groups in the rulemaking process.

Issue Variances

- Variances are for systems that cannot comply because of source water characteristics
- Include a compliance schedule
- Issued for up to three years, with possible two-year extension
- May not allow an unreasonable risk to public health

- EPA and primacy States are authorized under SDWA to grant variances from standards to systems that cannot comply because of the characteristics of their water sources. (Primacy States do not have to offer variances.) A variance allows higher contaminant levels to be present. To receive a variance, a system must install an EPA-approved variance technology.
- Variances may be issued for up to three years, with the possibility of an additional two-year extension.
- The 1996 Amendments added a new section 1415(e), which specifically addresses variances for small systems. EPA promulgated regulations (63 *FR* 157, August 14, 1998) that address this section.
  - The revised regulations create a new affordability-based small systems variance which may be granted by a State to a public water system serving fewer than 3,300 people or, with the approval of EPA's Administrator, to a system serving 3,301-10,000 people.
  - A variance may be granted only if the State finds that the small public water system cannot afford to comply with a NPDWR through treatment; by developing an alternative source of water; or by implementing restructuring changes or consolidation.
  - The State may grant a variance on the condition that the system install,operate, and maintain a nationally listed variance technology.
- Variances must include a schedule for complying with MCLs and implementing any additional control measures the State requires.



- SDWA section 1416 authorizes EPA and primacy States to exempt a PWS from any MCL or treatment technique if there are compelling reasons (including economic factors) demonstrating that the water system is unable to comply with the standard or to implement measures to develop an alternative source of water supply. As with variances, a primacy State may choose not to offer exemptions.
- Exemptions must include a schedule for complying with MCLs, including measures to develop an alternative water source, and may require the PWS to implement additional control measures.
- Exemptions may be granted for up to three years. Systems serving fewer than 3,300 people may receive two-year renewals, not to exceed a total of six years.
- A system may not receive both an exemption and a variance.

Today's PWSS Program - Public Water Systems' Role

Monitoring

- Ensure that systems are meeting drinking water standards
- Monitoring varies based on:
  - Contaminant
  - System size
  - Previous detections or exceedances

- Water systems are required to monitor their water to ensure that it meets the standards (MCLs or treatment techniques) established by States and EPA. The frequency of monitoring varies according to system size and the contaminant being monitored.
- The level of monitoring expanded dramatically with the increased number of contaminants regulated under the 1986 SDWA Amendments. The amount of required monitoring and lack of flexibility to limit monitoring for contaminants that do not occur in a particular part of the country created controversy on how the SDWA Amendments were being implemented.
- The1996 Amendments to the SDWA attempted to alleviate these concerns by more precisely defining the amount of monitoring necessary to protect public health. The goal of c***hemical monitoring reform (CMR)*** under section 1418 is both to strengthen public health protection and provide greater flexibility. CMR reduces the cost burden for most public water systems by providing relief to low-risk systems. Thus under the CMR approach, monitoring requirements are consolidated, "at risk" systems are targeted for increased sampling, and sampling occurs when systems are most vulnerable to contamination.

Reporting and Record-keeping Requirements

- Reporting
  - Frequency
  - Content
- Recordkeeping

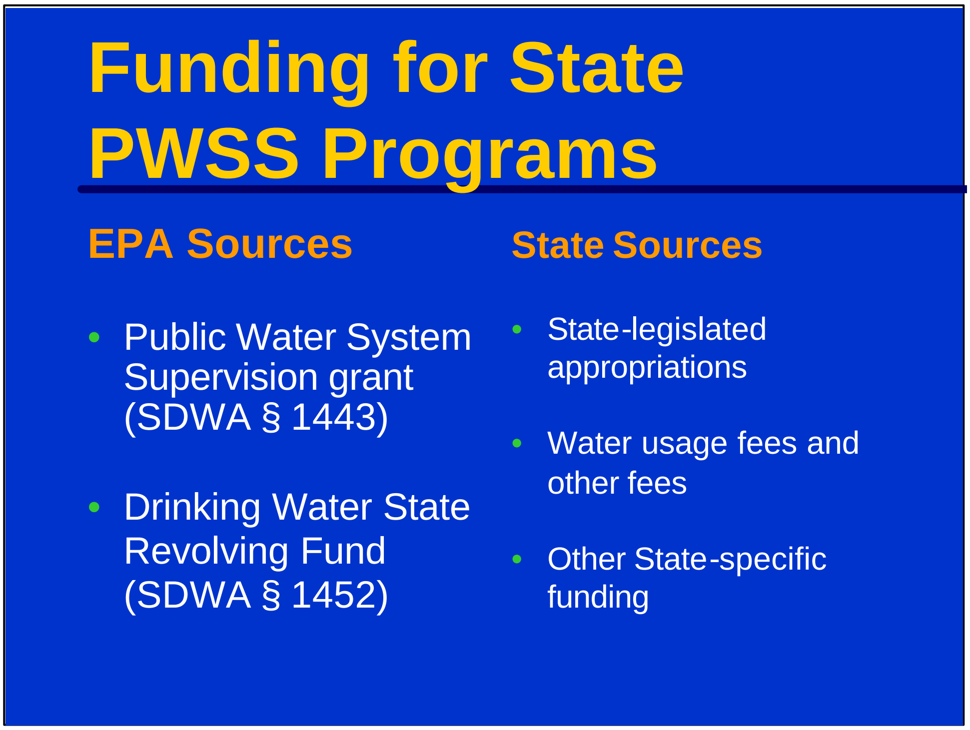
- In addition to setting an MCL or treatment technique, each regulation sets a prescribed testing schedule for each contaminant. The number of samples and the frequency of testing will vary for each contaminant and each system, according to its size.
- If a problem is detected, there are immediate retesting requirements that go into effect and strict instructions for how the system informs the public, the State and EPA about the problem.
- EPA regulations also require PWSs to maintain certain records and make them available to the public.

Consumer Confidence Reports and Public Notification

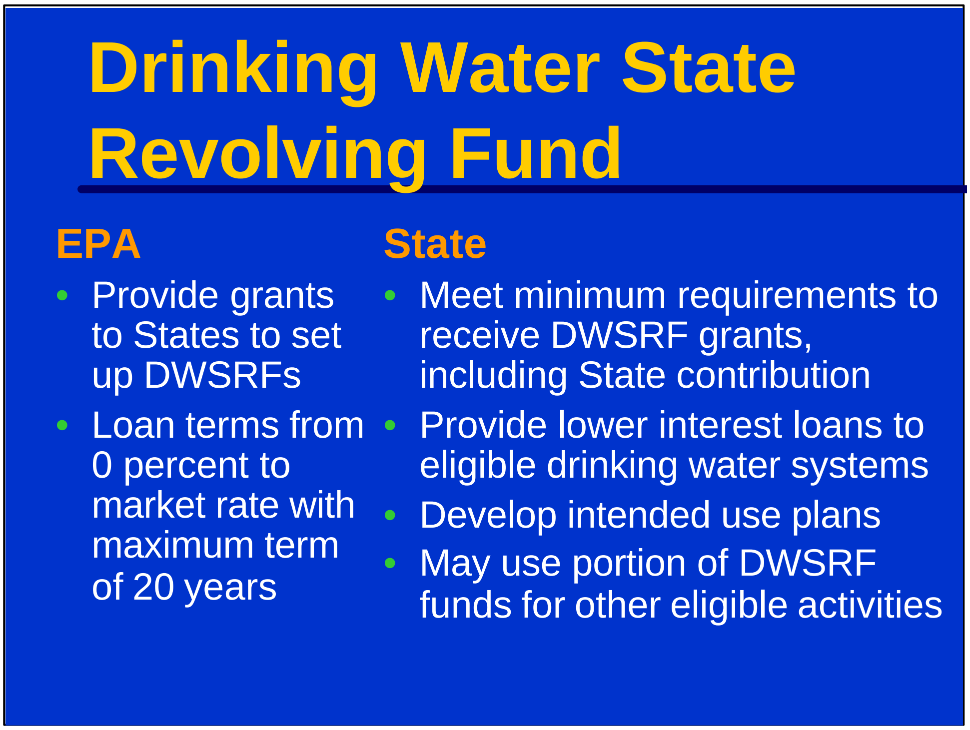
- Easy-to-understand explanations of drinking water standards and health effects
- Information on the quality of the water system's source and monitoring results
- Health effects information on any contaminant in violation of an EPA health standard
- Hotline number to address questions

- Consumer awareness and right-to-know was a major theme of the Administration's 1996 Safe Drinking Water Act reauthorization efforts. In addition, the EPA Administrator highlighted consumer awareness as a top priority in the Agency's drinking water redirection strategy in 1995. The 1996 SDWA Amendments confirm the importance of educating consumers and add major new responsibilities for EPA, States, and water systems in this area.
- Beginning in October 1999, water systems must provide their customers with the first annual reports, called ***Consumer Confidence Reports (CCRs),*** that provide information about the quality of their drinking water. Thereafter, CCRs are required to be provided by July 1 of each year starting July 2000.
    - The CCRs must provide ***easy-to-understand explanations of drinking water standards and health effects***.
    - The CCRs also provide customers with ***information on the water system's source, monitoring results*** and ***health effects of any contaminants detected***.
    - CCRs must include the ***telephone number of a Safe Drinking Water Hotline*** so that consumers have another source of information on contaminants and other issues.
- ***Public Notification*** requires PWSs to notify the public in the event of a violation of drinking water standards. Methods of notification and deadlines are the subject of a currently proposed rule. Public notification requirements pre-date the 1996 SDWA Amendments.

Funding for PWSS Programs



- The primary source of Federal funding for the PWSS program is the PWSS grant, established under section 1443 of SDWA.
    - o This grant, which totaled approximately $93 million for States in FY 1999, is apportioned to States based on a formula that considers the number of water systems, State population, and the State's geographical area.
    - o States are required to provide a 25 percent match for all Federal PWSS grant funds received. Many States provide a considerably larger amount of funding to meet program needs.
- The Drinking Water State Revolving Fund (DWSRF) under section 1452 provides grant funding to States, which, in turn, provide loan assistance for infrastructure improvements to eligible water systems. States must provide a 20 percent match to receive DWSRF capitalization grants.
- For many States, the majority of funding for both programs comes from State appropriations or State permit fees.
- States receive a majority of their funding for both programs from State-legislated appropriations and user feels levied on drinking water systems.



- A major concern addressed in the 1996 SDWA Amendments was the lack of available funds for infrastructure improvements. The Act 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 the development of long-term sources of drinking water funding at the State level. The DWSRF is authorized at $9.6 billion from fiscal year 1994 through fiscal year 2003. States that do not meet certain requirements (such as the requirement to establish a capacity development program) are subject to withholding of their DWSRF allotments.
- States must annually prepare "***intended use plans***" (IUPs) for DWSRF capitalization grants, identifying eligible projects and their priorities based primarily on three criteria: seriousness of health risk, compliance needs, and system economic need. Public involvement in the development of the IUP is mandated.

Drinking Water State Revolving Fund Set-Asides

- States may set-aside up to:
  - 4 percent for administration and technical assistance
  - 10 percent for PWSS programs, source water protection, operator certification, and capacity development
  - 15 percent for other prevention programs
  - 2 percent for technical assistance for systems serving under 10,000 population

- A State ***may*** set-aside up to 31percent of its capitalization grant for other eligible drinking water program related activities, as allowed in section 1452:
  - Up to 4 percent of the funds may be used for administering the DWSRF and/or providing technical assistance;
  - Up to 10 percent of a State's capitalization grant may be set aside for source water protection, capacity development, and operator certification programs, as well as for the State's overall drinking water program. An additional State match is required;
  - Up to 15 percent (but no more than 10 percent for any one purpose) can be set aside for prevention activities, including source water protection loans, technical and financial aid for capacity development, source water assessments, and wellhead protection; and
  - Up to 2 percent may be used for technical assistance for water systems serving fewer than 10,000 people.
- This program incorporates several central themes from the SDWA 1996 Amendments — increased funding, prevention, and public involvement.

Small Group Exercise: Prioritizing Tasks

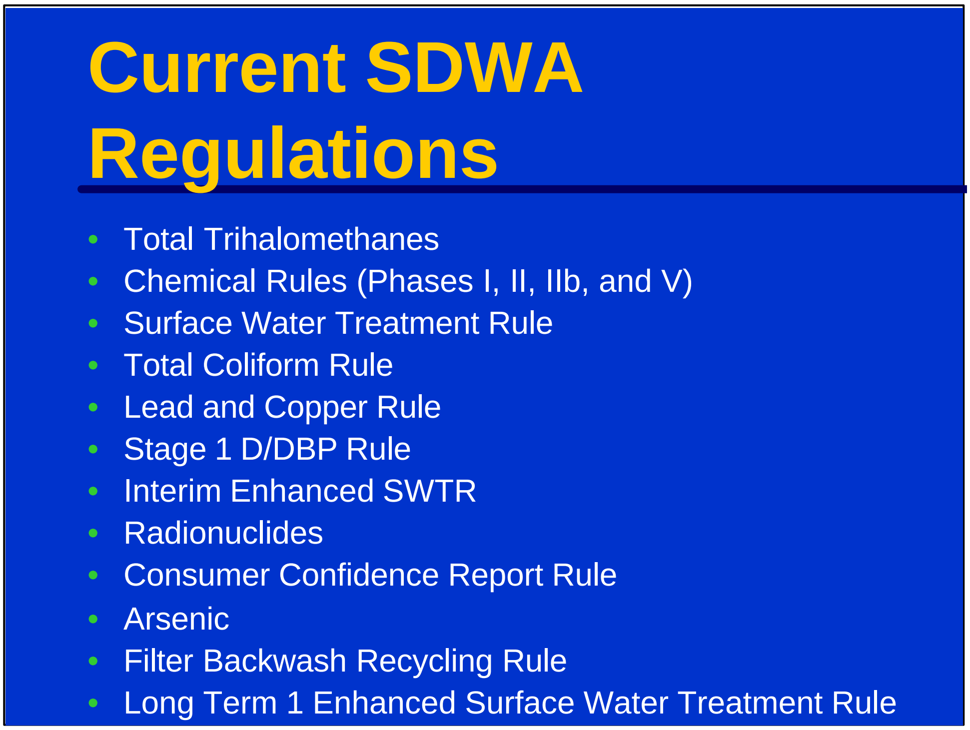
- Provide operator training and technical assistance
- Enforce NPDWR requirements (MCLs and TTs)
- Conduct sanitary surveys
- Develop IUPs for DWSRF funding
- Adopt new NPDWRs for primacy
- Issue variances
- Report to SDWIS
- Enforce monitoring requirements

- The instructor will divide the class into small groups. If possible, have at least one group of all EPA staff, one of all State staff, and one mixed group. Take 20-30 minutes to discuss the issues below within your group, then reconvene for a full class discussion.

Discussion:

- Assume you are administrator of a primacy agency facing increasing program responsibilities with decreasing staff availability.
- Given that all of the items in the above table are required of the program, consider how you might administer the program in your State.
    - Devise a system for establishing priorities and be prepared to justify the process in terms of meeting your program's mission.
    - What would you implement to get the biggest return for the effort expended?
    - Also consider, when appropriate, breaking each major program element listed above into sub-components that might also be prioritized.

Specific Rules and Regulations



- We've talked about the NPDWRs regulating microbiological and chemical contaminants. This section describes the specific regulations EPA has promulgated:
  - Total trihalomethanes (TTHMs);
  - Chemical rules (Phases I, II, IIb, and V);
  - Surface water treatment rule (SWTR);
  - Total coliform rule (TCR);
  - Lead and copper rule (LCR);
  - Stage 1 disinfectants/disinfection byproducts rule (Stage 1 DBPR);
  - Interim enhanced surface water treatment rule (IESWTR);
  - Radionuclides;
  - Consumer Confidence Report rule;
  - Arsenic;
  - Filter Backwash Recycling Rule; and
  - Long Term 1 Enhanced Surface Water Treatment Rule.
- At the end of this section, we describe OGWDW's priorities for future regulation.

Total Trihalomethanes Standard

- Trihalomethanes are by-products of chlorine
- Standard applies to CWSs that serve 10,000 or more people and use a disinfectant
- Standard is for total trihalomethanes

- Disinfection of drinking water is one of the major public health advances of the 20th century. Disinfection is a major factor in reducing the typhoid and cholera epidemics that were common 100 years ago in U.S. cities.
- However, the disinfectants can react with naturally-occurring materials in the water to form unintended byproducts that may pose health risks. ***Trihalomethanes (THMs)*** are a group of byproducts that form as a result of disinfection. Since 1979, standards and monitoring requirements have been in place for community water systems ***that serve at least 10,000 people and use disinfection in the water purification process***. The 1979 MCL for ***total trihaltomethanes*** (TTHM) is 0.10 mg/L and can be found at 40 CFR 141.12.
- In the last ten years, we have also learned that there are specific microbial pathogens, such as *Cryptosporidium*, that can cause illness and are resistant to traditional disinfection practices. The 1996 Amendments required EPA to develop rules to balance the risks between microbial pathogens and disinfection byproducts, which resulted in the ***Stage 1 Disinfectants/ Disinfection Byproducts Rule***, explained in a later slide.

Chemical Rules (Phase I, II, IIb, and V)

- Regulations cover 69 drinking water contaminants, most of which are carcinogens
- Generally apply to CWSs and NTNCWSs
- Contaminants cover three types:
  - Volatile organic chemicals
  - Synthetic organic chemicals
  - Inorganic chemicals

- EPA regulates most chemical contaminants through the rules known as ***Phase I, II, IIb, and V***. In each rule, EPA set maximum allowable limits on the contaminants, prescribed the schedule for water systems to test for the presence of the contaminants, and described the treatments that systems may use to remove a detected contaminant. These regulations are found in 40 CFR 141.61-.62.

- The ***Phase I Rule*** (published in 1987) was EPA's first response to the 1986 Amendments. The rule limits exposure to eight ***volatile organic chemicals (VOCs)*** that industries use in manufacturing rubber, pesticides, deodorants, solvents, plastics, and other chemicals. The ***Phase II and IIb Rules*** (both published in1991) updated or created MCLs for 38 contaminants. The ***Phase V Rule*** (published in 1992) set standards for 23 more contaminants. Phases II, IIb, and V included:

  - Inorganic chemicals (IOCs) such as heavy metals that are present naturally in some water, though only at trace levels. Industrial activity accounts for the potentially harmful levels of IOCs.

  - ***Synthetic organic chemicals (SOCs)*** such as pesticides. These chemicals enter water supplies through run-off from fields where farmers have applied them or by leaching through the soil into ground water.

  - Additional VOCs.

- The contaminants regulated in Phase I, II, IIb, and V pose chronic health risks. Along with their long-term effects, the inorganic chemicals ***nitrate*** and ***nitrite*** also pose acute health risks, meaning that they could cause immediate health problems for infants, even when consumed in tiny doses. Nitrate and nitrite can limit the blood's ability to carry oxygen from the lungs to the rest of the body. EPA's limit on nitrate and nitrite in drinking water specifically protects infants and pregnant mothers.

Surface Water Treatment Rule

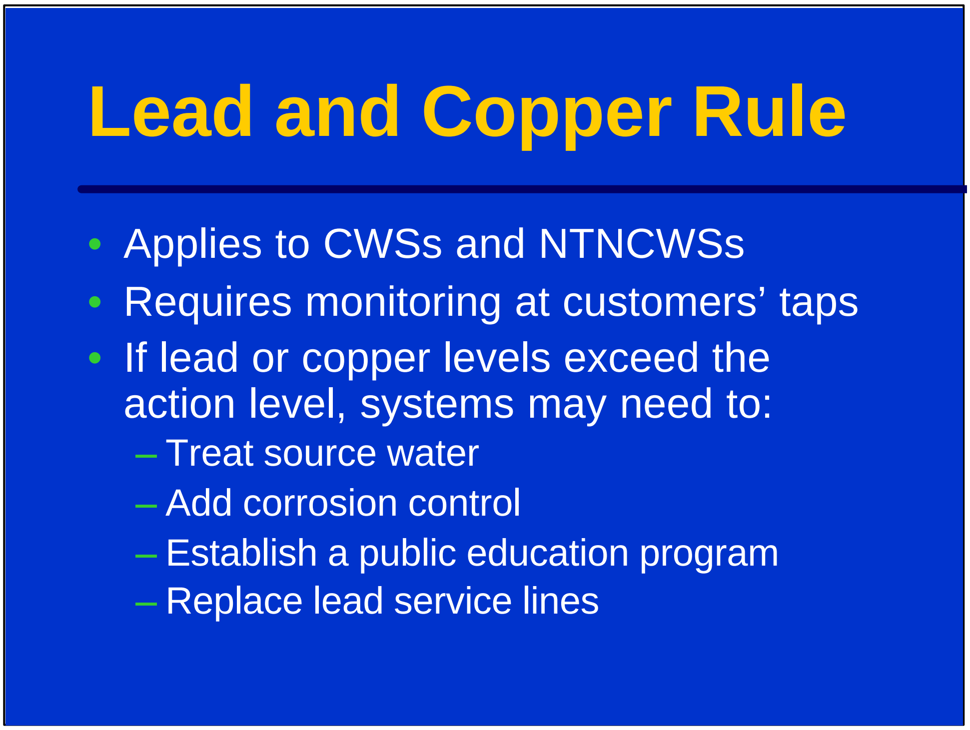
- Applies to systems that use surface water (including GWUDI)
- Establishes treatment techniques for *Giardia,* viruses, Legionella, and turbidity
  - Requires disinfection and usually filtration
- Establishes monitoring requirements for turbidity and disinfectant residual

- Promulgated in 1989, the Surface Water Treatment Rule seeks to prevent waterborne diseases caused by viruses, Legionella, and Giardia lamblia (40 CFR 141.70-.75). These disease-causing microbes are present at varying concentrations in most surface waters. As the title suggests, this rule governs water supplies whose source of drinking water is ***surface water*** which, by definition, includes ground water under direct influence (GWUDI) of surface water. GWUDI is included in the definition of surface water because it has the potential to have the same contamination risks as surface water.
- The rule sets MCLGs for Legionella, Giardia, and viruses at zero because any amount of exposure to these contaminants represents some health risk. The rule also sets ***treatment technique*** requirements to control these contaminants.
  - Under these requirements, all systems using surface water must ***filter and disinfect*** their water to provide a minimum of 99.9 percent combined removal and inactivation of Giardia and 99.99 percent of viruses. The adequacy of the filtration process is established by measuring turbidity (a measure of the clarity of water) in the treated water and determining if it meets EPA's performance standard.
  - A small number of water systems that have pristine sources and that meet designated "avoidance criteria," may be granted a waiver from the filtration requirement (but not the disinfection requirement).
- To assure adequate microbial protection in the distribution system, the Surface Water Treatment Rule also requires systems to provide ***continuous disinfection*** of the drinking water entering the distribution system and to ***maintain a detectable disinfectant level within the distribution system***.

Total Coliform Rule

- To control microbiological contaminants
- Applies to all PWSs
- Requires systems to sample for coliform in the distribution system
- Presence of coliform can indicate treatment failures or deterioration of the distribution system

- This rule, promulgated in 1990, sets the MCL for microbiological contaminants based on the presence or absence of total coliforms (40 CFR 141.63).
- ***Coliforms*** are a group of bacteria, most of which are harmless. However, the presence of any coliforms in drinking water suggests that there may be disease-causing agents in the water. Coliforms are used as "indicator organisms" for microbiological contaminants because they are found in warm-blooded animals, they are "heartier" than typhoid or cholera bacteria, and they are easy to test for.
- The presence of coliform bacteria in tap water suggests that the treatment system is not working properly or that there is a problem in the distribution system. Published in 1989 as a complement to the Surface Water Treatment Rule, the ***Total Coliform Rule*** sets both MCLGs and MCLs for total coliform levels in drinking water. The rule also details the type and frequency of testing by water systems.
- In the rule, EPA set the MCLG for total coliforms at zero. To meet the MCL for coliforms, systems must not find coliforms in more than five percent of the samples they are required to take each month (depending on the system's size). If a sample is positive for coliforms, the system must collect a set of repeat samples within 24 hours. When a routine or repeat sample tests positive for total coliforms, it must also be analyzed for ***fecal coliforms*** or ***Escherichia coli (E. coli***), which are coliforms directly associated with fresh feces. If this last test is positive, the water system is required to immediately notify the State and the public because the levels in the water represent a direct health risk.
- The number of coliform samples a system must take on a regular basis depends on the number of customers that it serves. Systems that serve fewer than 1,000 people may test once a month or less frequently, while systems with 50,000 customers test a minimum of 60 times per month and those with 2.5 million customers test at least 420 times per month. These are minimum schedules, and many water systems test more frequently.



- Promulgated in 1992 and amended on January 12, 2000 (65 *FR* 1949-2015), the ***Lead and Copper Rule*** differs substantially from the rest of the rules under the PWSS program (40 CFR 141.80-.91). Other rules require water systems to treat water so that when it leaves their facilities it is clean and safe to drink. The Lead and Copper Rule regulates two contaminants that nearly always taint drinking water after it leaves the treatment plant.
- Under the Lead and Copper Rule, EPA established ***action levels*** for lead and copper — levels of lead and copper that are well below levels that could cause health problems. An action level is different from a MCL. While an MCL is a legal limit on a contaminant, an action level, as the name suggests, is a trigger for additional prevention or removal steps.
- The rule requires water systems to collect "first draw" water samples (water that has been standing in plumbing pipes at least six hours and is collected without flushing the tap) at points throughout the distribution system that are vulnerable to lead contamination, including regularly-used bathroom or kitchen taps. When the level of lead or copper reaches the action level in ten percent of the tap water samples, the water system must take certain steps. These steps can include:
    - Source water monitoring and treatment of source water, if lead or copper are present in the source water;
    - Use of a ***corrosion control treatment*** (by increasing the water's pH or alkalinity, water systems can make their water less corrosive, and therefore less likely to dissolve the lead or copper from the pipes or fixtures);
    - Measures to educate the affected public about reducing its lead intake; or
    - Replacement of lead water mains and service lines (if source water and corrosion control treatment are not effective in lowering levels of lead and copper at the tap).

Stage 1 Disinfectants and Disinfection Byproducts

- Applies to CWSs that disinfect and TNCWSs that use chlorine dioxide
- Includes standards for disinfectants and the byproducts of disinfection
- Includes provisions to help prevent the formation of disinfection byproducts

- EPA promulgated the Stage 1 DBPR on December 16, 1998 (63 *FR* 69389-69476). It applies to all CWSs that apply a chemical disinfectant or an oxidant for either ***primary*** or ***residual disinfection*** (i.e., maintaining detectable levels of disinfectant in distribution pipes). In addition, ***certain requirements apply to transient noncommunity water systems that use chlorine dioxide***. The Stage 1 DBPR establishes:
  - o Revised MCL for total trihalomethanes (40 CFR 141.12);
  - o New MCLGs (40 CFR 141.53) and MCLs (40 CFR 141.64) for disinfection byproducts;
  - o Maximum Residual Disinfectant Goals (MRDGs) for disinfectants (40 CFR 141.54); and
  - o New Maximum Residual Disinfectant Levels (MRDLs) (40 CFR 141.65) for disinfectants.
- To limit disinfection byproducts (DBPs) without compromising microbial protection, the rule includes a ***treatment technique*** requirement that all systems using surface water or GWUDI and that use conventional treatment remove total organic carbon, a precursor of DBPs (40 CFR 141.130-.135).
- Systems will conduct monitoring based on the type of system and population served, the treatment employed, and the disinfectant used. Surface water and GWUDI systems serving at least 10,000 people must be in compliance with the rule by January 1, 2002. Surface water and GWUDI systems serving fewer than 10,000 people and all ground water systems must be in compliance by January 1, 2004.
- EPA is currently working with stakeholder workgroups to develop the ***Stage 2 Disinfectant/ Disinfection Byproducts Rule.*** The efforts will continue to focus on addressing the chronic health effects associated with DBPs, as well as acute reproductive threats that have been identified.

Interim Enhanced Surface Water Treatment Rule

- Most provisions apply to surface water and GWUDI systems serving 10,000+ people
- Strengthens surface water treatment to prevent microbial contamination
  - MCLG of zero for *cryptosporidium*
  - More stringent turbidity standards
  - Other measures to prevent contamination

- The ***Interim Enhanced Surface Water Treatment Rule (IESWTR)*** was promulgated on December 16, 1998 (63 *FR* 69477-69521). It updates the requirements of the Surface Water Treatment Rule. Specifically, EPA has learned over the past ten years that there are specific microbial pathogens, such as ***cryptosporidium***, that are highly resistant to traditional disinfection practices. In addition, a major challenge for water suppliers is how to balance the risks from microbial pathogens and ***disinfection byproducts (DBPs),*** which form when disinfectants react with organic compounds present in drinking water. It is important to provide protection from these microbial pathogens while simultaneously ensuring decreasing health risks to the population from DBPs.

- The IESWTR sets a ***MCLG of zero for cryptosporidium*** (40 CFR 141.52) and imposes new treatment techniques on systems using surface water or GWUDI that serve at least 10,000 people.

  - To ensure adequate treatment performance, IESWTR ***strengthens the Surface Water Treatment Rule's turbidity standards*** and requires continuous turbidity monitoring for individual filters.

  - IESWTR also requires systems with elevated levels of DBPs to take specific steps to ensure that protection from microbial contaminants will not be compromised when systems must simultaneously comply with the ***Stage 1 Disinfection Byproducts Rule***.

  - In addition, ***IESWTR adds other provisions to prevent microbiological contamination***. These provisions include a prohibition on the construction of new, uncovered finished water storage facilities and a requirement that States conduct sanitary surveys of all surface water or GWUDI systems regardless of the population served.

- EPA is currently working with stakeholder workgroups to develop the ***Long-Term Enhanced Surface Water Treatment Rule*** which will affect small surface water systems**.**

Radionuclides

- December 2000 rule replaces 1976 rule
  - Applies to CWSs
  - Sets new standard for uranium
  - Retains existing standards for other radionuclides
  - Increases monitoring to every entry point in distribution system

- Standards for combined radium-226/radium-228, gross alpha particle activity (not including uranium), and beta emitters have been in effect since 1977. These standards apply to ***community water systems only*** and appear in 40 CFR 141.15.

- On December 7, 2000, EPA promulgated revised (non-radon) radionuclide standards (65 *FR* 76707-76753). This rule:

  - o Includes requirements for uranium, not regulated under the 1976 rule;
  - o Revises the monitoring requirements for combined radium-226 and radium-228, gross alpha particle radioactivity, and beta particle and photon radioactivity (requires monitoring at each entry point to the distribution system);
  - o Retains the current MCL for combined radium-226/228 and gross alpha particle radioactivity; and
  - o Retains the current MCL for beta particle and photon radioactivity, but promises further review in the near future.

Arsenic

- 1975 standard replaced in January 2001
- New standard is 10 ppb
- EPA weighed costs and benefits in setting standard

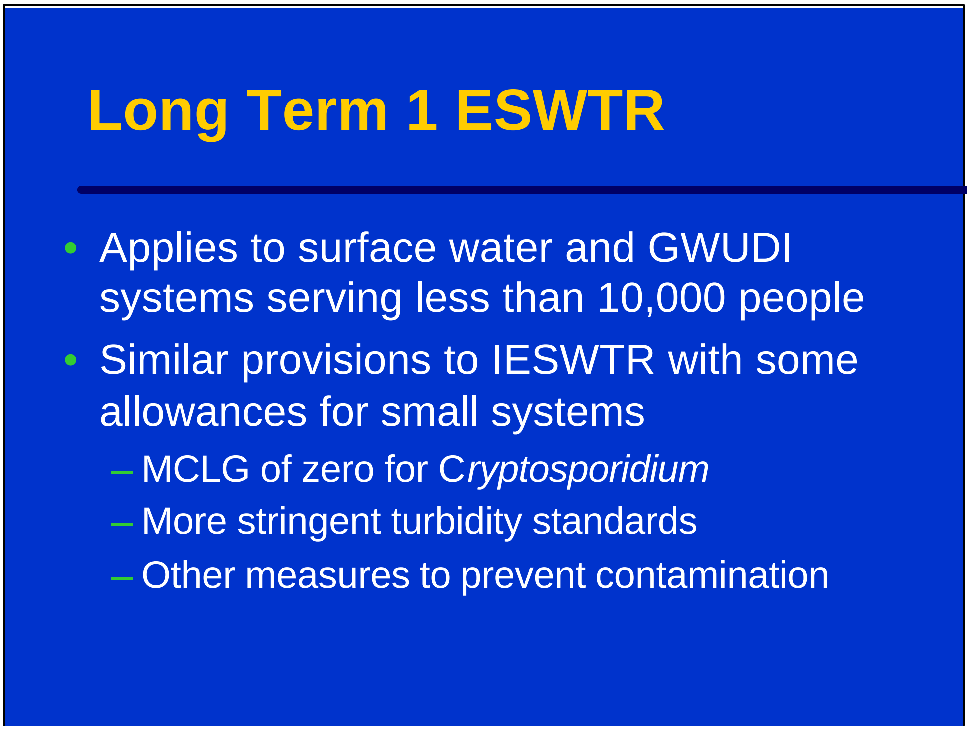
- EPA promulgated a final rule for arsenic on January 22, 2001 (66 FR 6976-7066). This rule revised the existing standard set in 1975 from 50 parts per billion (ppb) to 10 ppb.
- In setting the new standard, EPA used its discretionary authority under the 1996 SDWA Amendments to set the standard at a level that "maximizes health risk reduction benefits at a cost that is justified by the benefits." In other words, although technology will allow lower levels of arsenic to be reached, EPA determined that the potential health benefits did not justify the added cost.
- On May 22, 2001, EPA announced that it would delay the effective date of the arsenic rule until February 22, 2002, allowing time to complete a reassessment and to afford the public a full opportunity to provide further input.
- On July 19, 2001, EPA requested comment on whether the data and technical analyses associated with the January 2001 arsenic rule supported setting the standard at 3, 5, 10, or 20 ppb. EPA and others reviewed the technical analyses supporting the standard.
- In October 2001, EPA determined the promulgated arsenic standard of 10 would be the final standard.

Filter Backwash Recycling Rule

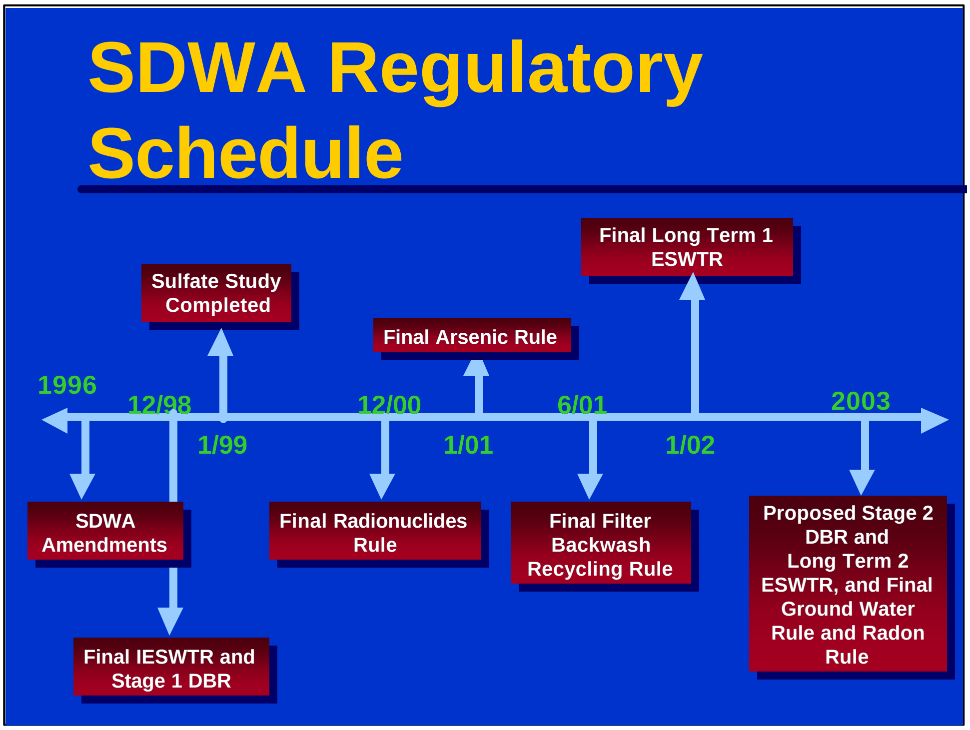
Applies to surface water and GWUDI systems that meet **all** of the following:

- Use surface water or GWUDI
- Use conventional or direct filtration
- Recycle one or more of the following:
  - Spent filter backwash
  - Sludge thickener supernatant
  - Liquids from dewatering processes

- The Filter Backwash Recycling Rule(FBRR) was promulgated on June 8, 2001 (66 FR 31085-31105). It requires all of the recycle streams mentioned above to pass through all of the processes of a system’s existing conventional or direct filtration system, or through an alternative location approved by the State.
- The rule addresses possible disruption of the treatment process by hydraulic surges through the facility, creation of a coagulation chemistry imbalance or return of concentrated amounts of disinfection–resistant pathogens (such as *Cryptosporidium*) through the plant.
- Systems must begin to comply with notification requirements in December 2003, and must meet recycle return location requirements by June 8, 2006.



- The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was promulgated on January 14, 2002 (67 FR 1811-1844). The purposes of the LT1ESWTR are to improve control of microbial pathogens, specifically the protozoan *Cryptosporidium*, in drinking water and to address risk trade-offs with disinfection byproducts.
- The rule applies to all systems using surface water or ground water under the direct influence of surface water that serve fewer than 10,000 people. It establishes a treatment technique that relies on strengthening water processes already in place. The final regulation includes several requirements:
  - All surface water and GWUDI systems serving fewer than 10,000 people must meet the requirements for achieving a 2-log removal or control of *Cryptosporidium*;
  - Conventional and direct filtration systems must comply with specific combined filter effluent turbidity requirements while alternative filtration systems (systems using filtration other than conventional filtration, direct filtration, slow sand filtration, or diatomaceous earth filtration), must demonstrate the ability to achieve 2-log removal of *Cryptosporidium* and comply with specific State-established combined filter effluent turbidity requirements;
  - Conventional and direct filtration systems must continuously monitor the turbidity of individual filters and perform follow-up activities if this monitoring indicates a potential problem;
  - Systems must develop a disinfection profile unless they can demonstrate that their TTHM and HAA5 disinfection byproduct levels are less than 0.064 mg/L and 0.048 mg/L respectively;
  - A system considering a significant change to its disinfection practice must develop a disinfection inactivation benchmark of its existing level of microbial protection and consult with the State for approval prior to implementing the disinfection change;
  - Finished water reservoirs beginning construction after the effective date of the rule must be covered; and
  - Unfiltered systems must comply with updated watershed control requirements that add *Cryptosporidium* as a pathogen of concern.



- The 1996 Amendments to SDWA provide a schedule for promulgating regulations for arsenic, radon, and microbials, disinfectants and disinfection byproducts, including *Cryptosporidium*, and mandate a schedule for the study of sulfate. We have already discussed several of these rules.
- In the future, EPA will promulgate additional rules to address microbials and disinfection byproducts: Ground Water Rule, Stage 2 Disinfection Byproduct Rule, and Long Term 2 Enhanced Surface Water Treatment Rule.
- Radon is not currently regulated by EPA. EPA proposed the radon rule on November 2, 1999, at 64 *FR* 59245-59294. EPA anticipates promulgation in 2003.
- The 1996 SDWA Amendments also mandated that EPA and the Centers for Disease Control jointly conduct a study of sulfate. SDWA specified that the study be based on the best available peer-reviewed science and supporting studies, conducted in consultation with interested States. The study was completed in January 1999.