

Drinking Water Source Protection for Groundwater Systems

Fact Sheet

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This fact sheet has been prepared to provide answers to the most frequently asked questions about drinking water source protection, as it relates to groundwater resources. If you have additional questions, please contact one of the agency representatives listed at the end of the text.

What is drinking water source protection? Drinking water source protection is a plan designed to protect groundwater resources of public water systems (PWSs) from contamination. It involves the determination of the area around the well most susceptible to contamination, the inventory of potential contaminant sources within that area, and the implementation of management strategies to reduce the risk associated with those sources. Source protection is an investment in the future. A community's source of drinking water is an extremely important resource, contributing to both the human and economic health of the area.

What is groundwater? Groundwater contributes most or all of the water that is derived from wells or springs. It occurs in the natural open spaces (e.g., fractures or pore spaces between grains) in sediments and rocks below the surface. The water table separates the shallow zone where the openings are filled with air from the deeper zone(s) where the openings are filled with water. If the openings in a geologic formation are filled with water and the water can be extracted by a well, then the formation is referred to as an aquifer. Aquifers are not underground rivers, lakes or veins, rather they are geologic materials including old river sediments and fractured volcanic rocks such as basalt.

Where does groundwater come from? Groundwater originates as precipitation that sinks into the ground. Some of this water percolates down to the water table and recharges the aquifer. For shallow wells — for example, less than 50-75 feet — the recharge area is often the immediate vicinity around the wellhead. The same is true for some deeper wells; however, others are recharged in areas that may be some distance from the well itself.

How can the groundwater from my well become contaminated? If the downward percolating precipitation encounters any source of contamination at or below the surface, the water may dissolve some of that contaminant and carry it to the aquifer. Groundwater moves from areas where the water table is high to where the water table is low. Consequently, a contaminant may enter the aquifer some distance upgradient from you and still move towards your well. When a well is pumping, it lowers the water table in the immediate vicinity of the well, increasing the tendency for water to move toward the well.

What are the potential sources of contamination? Contaminants can be lumped into three categories: microorganisms (e.g., bacteria, viruses, *Giardia*, etc.), inorganic chemicals (e.g., nitrate, arsenic, metals, etc.) and organic chemicals (e.g., solvents, fuels, pesticides, etc.). Although it is common practice to associate contamination with highly visible features such as landfills, gas stations, industry or agriculture, potential contaminants are widespread and are often associated with common everyday activities: septic systems, lawn and garden chemicals, pesticides applied to highway rights-of-way, storm water runoff, auto repair shops, beauty shops, dry cleaners, medical institutions, etc. Importantly, it takes only a very small amount of some chemicals in drinking water to raise health concerns. For example, one ounce of pure trichloroethylene, a common solvent, will contaminate approximately 2 million gallons of water to a level of possible health concern.

What are the various parts of a drinking water source protection plan? Source protection plans will vary from community to community, owing to different land uses and aquifer conditions. All plans should have the following key elements:

- Public education. The general public needs to be informed regarding the source of their drinking water and its vulnerability to contamination.
- Delineation of the drinking water source area (DWSA). The DWSA is the area on the surface that overlies the portion of the aquifer that supplies water to the well. A contaminant released within the DWSA may eventually migrate to the well.
- Potential contaminant source inventory. An inventory of potential contaminant sources within the DWSA provides an assessment of the potential threats to groundwater.
- Implement management practices within the DWSA. Develop and implement strategies to reduce contamination risk from existing and future activities within the DWSA.
- Contingency planning. Develop options to deal with both short- and long-term loss of drinking water sources. Systems should also incorporate the existing emergency response framework into their source protection plan.

- Future wells. Procedures should be adopted that address the addition of future wells to the system. These include aspects of well construction and preliminary delineations to evaluate potential sites for future wells in terms of well yield and potential contamination and to focus implementation strategies to protect the recharge areas of those sources.

How large is the DWSA? This depends on several key issues, including the pump rate and the characteristics of the aquifer. In Oregon it is recommended that an area large enough to encompass 10 years of groundwater travel time be delineated so that if the aquifer becomes contaminated upgradient, there will be sufficient time to devise a plan to deal with the contamination. Delineations may extend more than several thousand feet away from the wellhead.

Why not just protect the entire aquifer instead of having a separate drinking water source protection plan for each community? Protecting all groundwater in the state to the level recommended for source protection would be great, and in fact in areas where several communities are in proximity to one another, they might pool their resources to develop a single regional protection strategy. In most cases, however, management of the entire aquifer is not practical. The area is very large and resources are small. Consequently, the source protection plan allows water systems to focus limited resources on the critical areas of the aquifer — those that supply drinking water.

Does “managing the DWSA” mean telling people what they can and cannot do on their property? To a certain extent, yes — however, groundwater belongs to the general public in Oregon and groundwater protection is in everyone’s best interest. Everyone drinks it and the community’s economic viability may depend on having a safe drinking water supply. Further, the management strategies are not designed to necessarily preclude activities in the DWSA; rather, they are designed to take advantage of common sense and prudent practices to reduce the risk of groundwater contamination. There are certain facilities that you may not want in your DWSA, e.g., landfills or large-scale chemical storage; however, there is no reason farming cannot occur in a DWSA as long as best-management practices, developed by the agricultural community, are followed. There is no reason industry cannot be within the DWSA — again, as long as practices are in place that will minimize risk to the aquifer. Importantly, the management plan is developed locally, and is therefore tailored to the community’s own needs and risks.

Who is responsible for doing drinking water source protection? Source protection should be a community effort. In Oregon it is envisioned that the public water supply would be responsible for delineation of the DWSA and serve as the lead in the potential contaminant survey. Development of the management strategies will likely evolve from a

community planning team representing the diverse interests of the community, as well as local government officials. Implementation of the management plan will fall to the local land-use authority in the jurisdiction.

What are the costs and who pays for drinking water source protection? Estimating the entire cost of developing and implementing a source protection plan is difficult because of the diverse situations and long-term nature of the effort. The cost of delineation will vary from \$1,000 to \$50,000 for most systems. Some systems have been able to reduce the inventory costs by using volunteers. Management costs will vary depending on the staff requirements for developing new land-use regulations, conducting inspections, developing education programs, etc. Although there are limited sources of funding through [Drinking Water Source Protection Loans and Grants](#) for source protection, additional costs of protecting the drinking water supply would likely be borne by those who directly benefit from that protection, i.e., the residents served by the PWS. The cost of protection, however, is less than the costs associated with having a contaminated drinking water supply.

What is the state's role? Members of various state agencies worked with the Citizen Committee to develop Oregon's drinking water source protection program. Guidance documents have been developed that address delineation, contaminant inventory, and management strategies. Much of the background information regarding delineations, potential contaminant source inventories, and suggested management strategies have been provided to public water systems in the form of Source Water Assessment Reports co-produced by the Oregon Health Authority and the Department of Environmental Quality.

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