

What is an aquifer?

A lot of people know that aquifers are underground sources of water. However, many people picture them as giant underground lakes. Aquifers are actually made of the water that is found in the tiny little spaces (or "pores") in between the particles that make up the soils and rock under the ground (or in the "subsurface"). These particles can actually act as a natural filter to help remove impurities from the water. This makes groundwater some of the cleanest water on the planet! The aquifer portion of the subsurface is the part that is completely soaked (or "saturated") with water. This water is usually called "groundwater". The uppermost layer of water of the aquifer is called the "water table".

How do we get water out of an aquifer?

A lot of aquifers actually discharge their water naturally by emptying into streams and rivers, or by seeping out of the ground as springs. People can also get water out of aquifers by drilling a well into the subsurface down into the aquifer. These wells become unnatural access routes to the aquifer. As such it is very important to seal the outside of the well bore properly during construction. This helps prevent contaminants from entering into the subsurface. This grout can be made of many things including concrete and very fine clays. Pumps are used to pull air and then water out of the subsurface, up the well and up to the surface. Water in the pore spaces will move into the well because the pump creates differences in pressure (like a vacuum). An aquifer where water comes up to the surface without needing a pump is called an "artesian aquifer". Some aquifers are so deep that their water never makes it to the surface naturally, but people can dig wells deep enough to pump groundwater up out of these aquifers. Some giant municipal and industrial wells can be hundreds to over a thousand feet long!

What is groundwater used for?

Groundwater is used for irrigation, as a drinking water supply, as a source of all household water, for industrial operations needing water, and a whole lot more! In fact, many cities depend entirely on groundwater for all of their water needs. If they were to run out of groundwater they wouldn't have any more fresh, clean water. Unfortunately, many cities have to rely solely on groundwater because they have polluted their surface waters too badly to be used.

How does water get into an aquifer?

Water on the surface that comes from rain or snow melt soaks into the ground. This process is called "infiltration". The water slowly percolates down into the aquifer by traveling in a very windy path through the pores that are connected together. When water infiltrates into the aquifer from above it is said to have "recharged" the aquifer. Some aquifers can be recharged in a matter of hours. In others the water travels so slowly that it takes hundreds or thousands of years to make it into the aquifer.

The same holds true for the amount of time it takes for the groundwater to naturally move through and out of an aquifer!

Why are our impacts on aquifers so important?

There are a number of reasons why what we do to our aquifers is so important. In many places people are draining the aquifers faster than nature can recharge them. In some areas this rapid pumping has caused the water table to drop. This has led to many streams and springs drying up and an increase in desert-like conditions. Another reason why what we do is so important is because of how aquifers recharge. Water gets into them by draining down from the surface of the earth. So, any pollutants or toxic substances that dissolve in the water will be carried down into the aquifer too. Another way for pollution to get into the aquifer is from leaking underground storage tanks and buried wastes, such as gasoline tanks or landfill garbage. Toxins draining from these buried wastes can become mixed with the groundwater.

Why does aquifer pollution matter?

A polluted aquifer is generally a major problem! Because so much of our supply of fresh water comes from groundwater, polluted aquifers are a source of potential threat to the public health. Also, because so many aquifers naturally drain onto the surface, a polluted aquifer can lead to a polluted environment. These aren't the only reasons however why a polluted aquifer is such a problem. Remember that it can take groundwater a very long time to move through an aquifer, and those pollutants that get in the groundwater move just as slowly and stay just as long! Polluted aquifers are very hard to clean and it generally take many years to do so - unfortunately, sometimes it is not possible to get them all the way clean.

**THE BEST WAY TO CLEAN AN AQUIFER IS
TO NEVER GET IT DIRTY IN THE FIRST PLACE!**

What is a TMDL? what is a MCL?

WATER CONTAMINATION TERMS

A TMDL is a Total Maximum Daily Load. This is a legal determination of the total amount of a particular pollutant that can be discharged into a water supply/water source in one day. This sets the limit on total pollution a water body can receive from all possible sources.

TMDLs are established by the Environmental Protection Agency as well as the Division of Environmental Quality. TMDLs are used to set the limits on how much of a particular pollutant each generating source (such as a factory) may discharge.

A MCL is the Maximum Concentration Level a pollutant can attain in a given water supply/water source. MCLs are established by the EPA. Routine water quality testing by the City of Pocatello checks the concentration level of a variety of pollutants in our municipal water supply. If a pollutant exceeds its MCL the City must report the

exceedance to the DEQ and take corrective measures. Typical pollutants tested for are TCE, PCE and nitrate.

What is a USDW?

An underground source of drinking water (USDW) is any aquifer or portion of an aquifer which:

- supplies any existing public drinking water system or,
- contains enough groundwater to supply a public drinking water system in the future and,
- which contains fewer than 10,000 mg/L total dissolved solids.

USDWs are protected by law in the United States.

What can you do to conserve water?

There are a number of ways to conserve water:

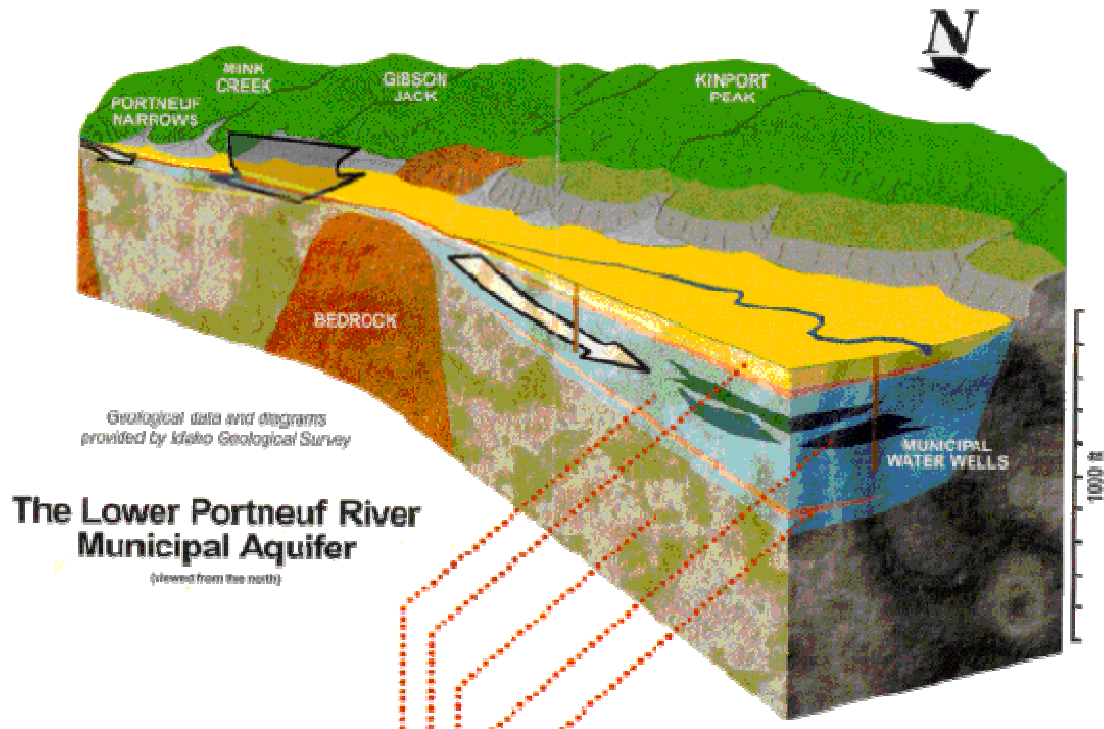
- Water only when necessary (NOT WHEN IT RAINS!)
- Water only as much as required (DON'T OVER WATER!)
- Water in the early morning or evening. This allows water to sink into the soil instead of being evaporated by the heat of the sun.
- DON'T water when it is windy
- Don't let water run into the gutters
- Don't cut your grass shorter than two inches (it stays greener when it is longer)
- Let your grass grow to at least four inches before you mow it
- Let your grass clippings lie on the lawn (they help retain moisture)
- Scatter your grass clippings around your other plants for the same reason
- Don't let your faucets run or drip

For more tips write to Outdoor Water Use, P.O. Box 4169, Pocatello, ID, 83205

CASE EXAMPLE THE POCATELLO AQUIFER

- **Name:** [The Lower Portneuf River Municipal Aquifer](#)
- **Geographic extent:** Portneuf Gap - narrows to Cubbuck
- **Surface area:** about 350 million square feet (8000 acres)
- **Volume of stored water:** about 30 billion cubic feet (220 billion gallons/year)
- **Natural throughflow** (natural volume of water flowing through aquifer): more than 0.7 billion cubic feet/year (more than 5 billion gallons/year)
- **Pumping withdrawal:** 0.75 billion cubic feet/year (5.5 billion gallons/year)
- **Average residence time** (time spent) in aquifer by a water molecule: about 40 years

- **Sources of groundwater recharge:** mountain snowpack in the Bannock Range south of kinport peak and in the Upper Portneuf River watershed



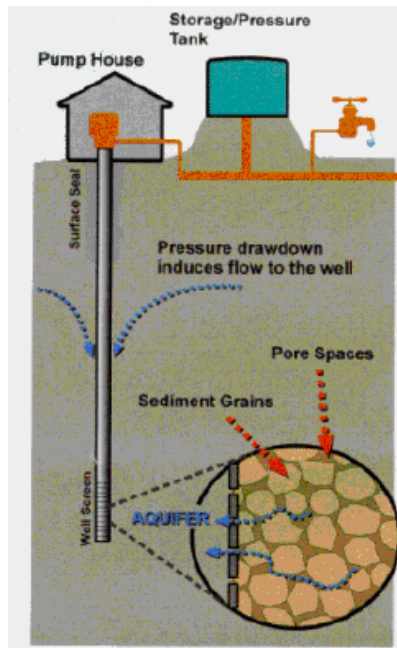
Geologic description

The upper layers of the aquifer are the most permeable (water flows through most easily), and are formed from gravels deposited during and after the catastrophic Bonneville Flood at the end of the last Ice Age (about 13,000 years ago). The deeper layers of the aquifer are formed of sediment layers with occasional layers of basalt lava, and were deposited over the previous 8 million years. Thin layers of clay and silt in the aquifer form natural barriers against groundwater flow (they form "impermeable" barriers). Although the aquifer itself is old the water in it is fairly young. A water molecule resides in the aquifer for an average of about 40 years. Water that the city does not pump eventually flows into the Snake River Plain.

Pocatello's dependence on groundwater

Pocatello is totally dependent upon the groundwater resources of our aquifer for ALL of our fresh water supplies. Our municipal wells range from 65 to 450 feet deep. Pumps deliver the water to the surface and into the city's distribution systems. This municipal water is treated with chlorine in order kill disease-causing bacteria. The water at each well is also constantly monitored and tested for a wide variety of pollutants. If the water quality becomes too poor, the well will be shut. The water in the Pocatello aquifer is the only source of fresh drinking water available to us in the foreseeable future. It is truly an irreplaceable resource that needs our care!

View schematic diagram of a well/pump set up



Is the aquifer polluted?

YES! The Pocatello aquifer is polluted by a variety of chemicals. The ones of primary concern right now are called [Trichloroethylene](#) (or TCE) and [Tetrachloroethylene](#) (also known as Perchloroethylene or PCE). TCE and PCE belong to a class of chemicals known as organic solvents. They are used to dissolve substances that won't dissolve in water. TCE and PCE are used in many different industries. A familiar example is the dry cleaning industry which uses these solvents to remove stains from clothing without getting them wet. TCE and PCE are dangerous to our health and have been shown to cause cancer. These chemicals are travelling along with a certain portion of our groundwater as it makes its way through the aquifer. This is called a "[contaminant plume](#)". Municipal and private wells in Pocatello have already been closed down due to these contaminants. Currently, it is believed that the major source of the pollutants is coming from the old, unlined Fort Hall Mine Landfill.

WHAT CAN YOU DO? Minimize your impacts.

There are a number of ways to minimize negative impacts on our aquifer. Water conservation efforts help to minimize waste of our valuable resource. Installing water efficient appliances, adding water saver devices to your faucets, and even simple things like not letting the water run while brushing your teeth all help make a difference. There are also a number of ways to minimize pollution impacts. Proper disposal of household chemicals, motor oil, paint and other toxic substances is the single most important thing you can do. It is all too easy to simply dump these pollutants down the drain or onto the ground, thus giving them an opportunity to make it into our water supply.