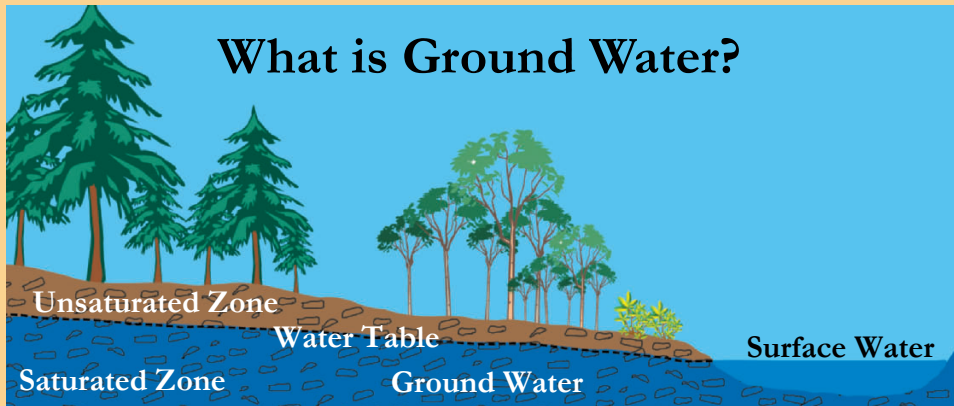


Montana's Ground Water



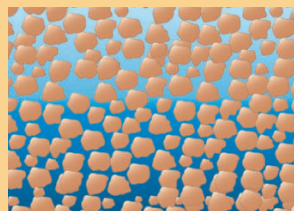
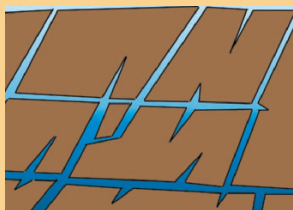
A citizen's guide
to understanding
and protecting
ground water.

What is Ground Water?

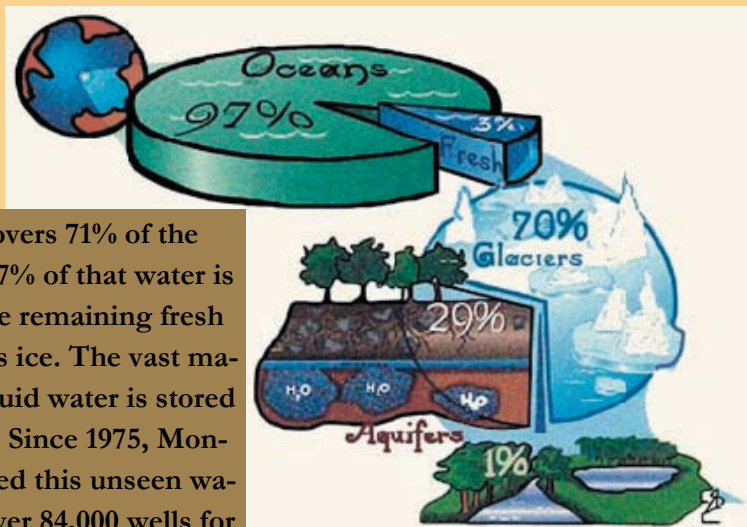
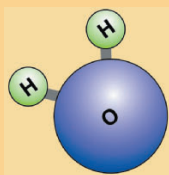


Graphics from MSU Extension Water Quality

Ground water fills the fractures in rock and the spaces between particles underground.



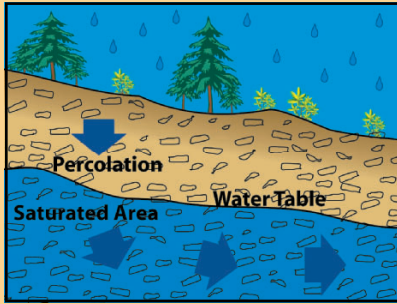
After precipitation falls on the earth's surface, it either evaporates, runs off over the surface, or soaks into the ground. The water that soaks into the ground may be used by plants or may move down through spaces between particles of rock and soil to become **ground water**. As water moves downward, eventually it reaches a depth where all pore spaces are filled with water. This line between saturated and unsaturated zones is called the water table. If the saturated zone has adequate water and geology which allows water to be produced from a well, it is called an **aquifer**.



While water covers 71% of the earth's surface, 97% of that water is salty. Most of the remaining fresh water is tied up as ice. The vast majority of fresh, liquid water is stored as ground water. Since 1975, Montanans have tapped this unseen water source with over 84,000 wells for domestic use alone.

Graphic from the US EPA

Ground Water & Surface Water Connection



How is Ground Water Recharged?

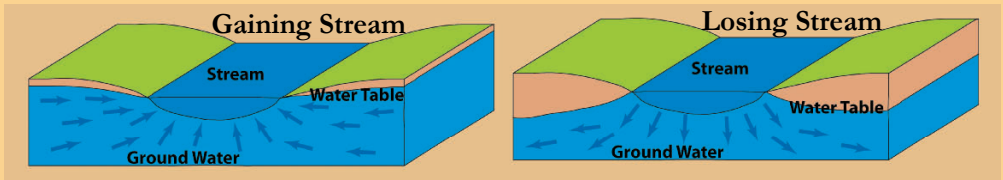
Ground water and surface water are connected. Water that percolates through the earth's surface and reaches aquifers is **recharge water**. Ground water can be recharged when **precipitation** or **irrigation** soaks into the ground or by water seeping out of **wetlands, lakes, rivers**, or **irrigation canals**.



Graphic and Photos from MSU Extension Water Quality and NRCS

Do Streams Gain or Lose Flow to Ground Water?

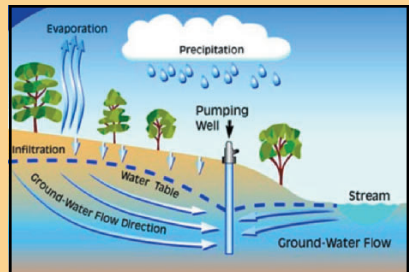
If the water table is above a stream, the stream will gain water from the aquifer and is called a **gaining stream**. If the water table is below a stream, water will flow from the stream into ground water and is called a **losing stream**. Streams may be gaining and losing in different reaches along their length and conditions can change with season, precipitation, and ground water levels. In some cases, streams are perched above the water table with an unsaturated zone between the stream and the aquifer.



Are Well Water and Stream Water Connected?

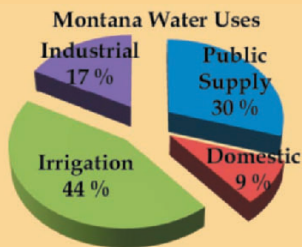
Graphics from MSU Extension Water Quality

In many streams, flow during the late summer and fall comes from ground water. Depending on geology and proximity to a stream, a well may intercept or extract water from a stream. In much of Montana, especially in dry years, there is not enough stream water for all existing water rights to be satisfied. In some cases, wells can contribute to this problem.

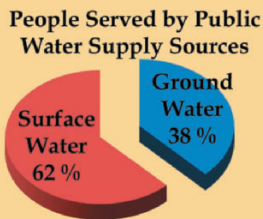


Graphic from Tapintoquality.com

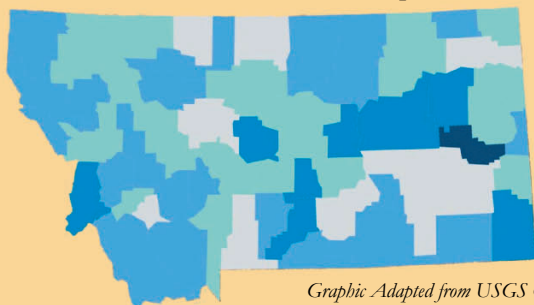
Ground Water Use in Montana



People across Montana depend on ground water for a variety of uses.



For rural homes in Montana, ground water is generally the preferred and often the only source for providing a domestic water supply. In many Montana counties, more than 40 percent of the population rely on private wells.



Population (1995) supplied by domestic wells, in percent of total county population



Graphic Adapted from USGS Circular 1332

Ground Water Availability

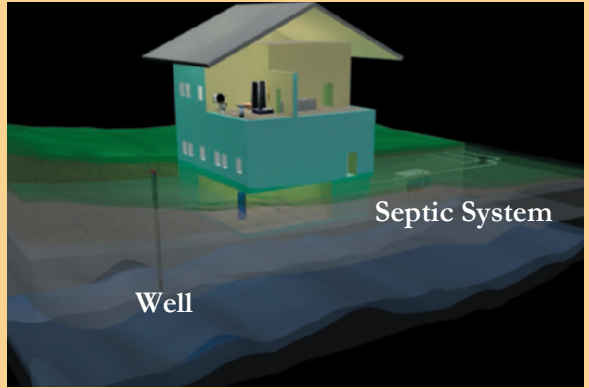
The Montana Bureau of Mines and Geology (MBMG) and local water quality districts regularly monitor ground water levels in over 900 wells across the state. Ground water levels can be affected by season, climate, increased withdrawal from wells, or changes in land use. See the MBMG website referenced at the end of this brochure for more information including ground water level conditions in your area.

Ground Water Permits and Regulations

Under Montana water law, all water belongs to the state and individuals are required to acquire a water right to legally use water for a specific beneficial use. Water rights in Montana are administered by the Department of Natural Resource Conservation (DNRC). Permits for new wells that pump more than 35 gallons per minute or more than 10 acre feet per year, require an application and review to determine that they will not compromise other existing water rights in the area. A typical individual household well is “exempt” from the permit review process because it pumps less than the noted threshold pumping rates. However, “**exempt wells**” still require a water right. The water right is acquired by filing a **Notice of Completion of Ground Water Development** (form 602) with the DNRC. It is the legal responsibility of all well owners to have a water right. The 602 form is available on the DNRC website at www.dnrc.mt.gov under water rights information.

Private Well and Septic Systems

Homeowners are responsible for protection and maintenance of private well and septic systems. These systems are directly connected to ground water and appropriate management is essential for a safe drinking water supply and ground water protection. See the *Taking Care of yOur Ground Water* DVD referenced on the back of this brochure for more information.



Typical Wellhead



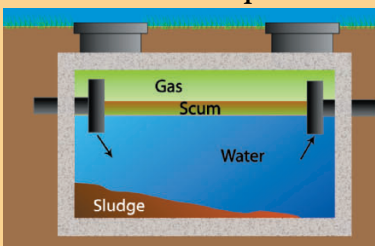
Wellhead Protection

- Inspect the wellhead to insure it is properly sealed against insects and rodents which could enter the well. Consider replacing your well cap with a **sanitary seal**.
- Ensure that the **land surface slopes away from the wellhead** so surface water will not run past or accumulate around the well during wet conditions.
- Animal waste, chemicals, and any other **contaminants should be kept away from the wellhead**.
- **Test water quality annually** for nitrate and bacteria and inquire with the local health department about other possible concerns in your area.

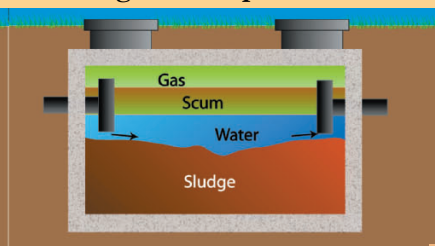
Septic System Care

- Have a licensed operator **pump the septic tank** every 3 to 5 years depending on the size of the tank and number of people in the home.
- **Don't put unused prescriptions, over the counter drugs, or other unused personal care products down the drain.**
- **Minimize waste to be treated** by avoiding use of garbage disposals and putting all food waste possible directly in the garbage or compost.
- Install water saving fixtures and appliances, **reduce water use** and fix leaks.
- **Minimize the use of harsh chemicals.** Septic tank additives are not necessary.

Maintained Septic Tank



Neglected Septic Tank



Ground Water Quality

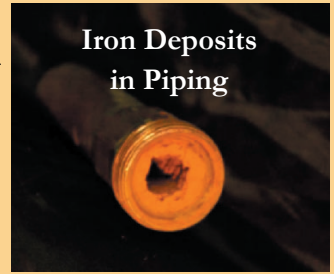
Does Ground Water in Montana typically have good quality?

Ground water in Montana is typically of good quality due to the natural filtration process which occurs as water moves from the surface down through soil and rock layers to aquifers. However, both naturally occurring constituents and human sourced products can impair the quality of ground water.

A few naturally occurring constituents of note:

Arsenic is toxic at low levels and is naturally present associated with geothermal activity and in some aquifers depending on geology. **Uranium** is carcinogenic and has been found in concentrations of concern in aquifers within the Boulder Batholith and other parts of Montana. Other metals can also be a concern in ground water. Inquire with the local health department for area specific information.

Iron and **manganese** are found in many aquifers across the state, and while they can cause aesthetic concerns due to staining, they do not pose a health concern. High iron levels are often accompanied by iron bacteria which can cause a buildup of slime or biomass on fixtures and in toilet tanks. These bacteria can be unattractive but do not typically pose a health concern.



Iron Deposits
in Piping

Photo from David Keto

Protecting Ground Water Quality

“An ounce of prevention is worth a pound of cure”

Once ground water is contaminated, cleaning it up is very expensive and time consuming if it can be cleaned up at all.

Commercial, Industrial and Contaminated Sites: The DNRC has approved seven “controlled ground water” areas in the state where ground water permits are not offered due to contamination from past mining and industrial activities. These sites are contaminated with pollutants like dry cleaner solvents, metals, and wood preservatives. In 2007 there were 108 licensed solid waste facilities in Montana. These modern facilities are designed to prevent chemicals from leaching into ground water. Thirty years ago there were more than 500 landfills and waste dumps in the state, some of which were unlined and pose risks to ground water contamination.

What you can do: Learn about existing contamination issues in your area and get involved in community **source water protection** planning. By identifying drinking water source areas and potential contaminants within those areas, communities can take a proactive approach to prevent future issues. For information, contact DEQ Source Water Protection at (406) 444-4806.

Wastewater Treatment: Human wastewater in small rural communities is often treated with lagoon systems which have, in some cases, caused ground water contamination issues. However, septic systems make the largest contribution of wastewater to soils and ground water. Common pollutants of concern include **nutrients** (nitrogen and phosphorus), **pathogens**, **household chemicals**, **personal care products**, and **pharmaceuticals**. Traditionally, septic and public wastewater treatment systems were not designed to remove many of these contaminants, which can be discharged to ground water even when a septic system is functioning as designed.

What you can do: Never put unused pharmaceuticals or other personal care products down the drain. Mix them with something undesirable, remove labels, enclose them in a water tight container and send them to a sanitary landfill. For septic system care, see page 4 and the other resources referenced on the back page of this brochure.

Landscape Chemicals and Animal Waste: **Nitrogen** and **phosphorus** in chemical fertilizers or composted animal manure are commonly applied to gardens and landscapes. **Pesticides** are commonly used to control pests and weeds. Accumulation of horse or livestock **manure** containing nutrients, pathogens and veterinary pharmaceuticals is a potential pollution source. Depending on the chemical, application rate, and water movement through the soil, landscape chemicals and animal waste products can end up in ground water.

What you can do: Make sure chemicals/fertilizers used on your property are applied strictly according to label directions. Manage animal waste as a fertilizer resource. Soil and manure nutrient tests can help determine where composted manure can be spread to improve soil health. Contact your local extension office for more information.

Storm Water: When roads, rooftops, and driveways are constructed, these surfaces shed water which runs off over the surface. Runoff carries contaminants from these areas into surface and ground water. **Petroleum** and **heavy metals** from cars, **nitrogen** from fertilizers, **pesticides**, and **bacteria** from pet waste are a few of the many contaminants that enter our water during storm events.



Photo from MSU Extension Water Quality

What you can do: Minimize storm water runoff from your property by directing water from downspouts into flowerbeds or yards. Consider using pavers or permeable surfaces rather than concrete for patios and driveways. Be cognizant of and reduce wastes that are carried away with storm water.

Ground Water Contacts & Resources

Ground Water Data & Well Logs

Montana Bureau of Mines and Geology - Ground Water Research and Information
<http://mbmggwic.mtech.edu/> and www.mbm.mtech.edu/grw/grw-main.asp

Water Rights

Montana Department of Natural Resource Conservation—Water Resources Division
www.dnrc.mt.gov/wrd/default.asp

Well and Septics, Source Water Protection & Nonpoint Source Pollution

Montana Department of Environmental Quality-Source Water Protection
www.deq.state.mt.us/wqinfo/swp/index.asp

Montana Nonpoint Source Management Plan (2007 Report)

www.deq.state.mt.us/wqinfo/nonpoint/NonpointSourceProgram.asp

Montana State University Extension Water Quality-<http://waterquality.montana.edu>

Pesticide Monitoring and Use Information

Montana Department of Agriculture-www.agr.mt.gov/

Montana Watershed Groups - Montana Watershed Coordination Council

<http://mwcc.montana.edu/groups/default.asp>

Ground Water Use, Availability, and Water Quality Research in the US

US Geological Survey - <http://water.usgs.gov/>

National Ground Water Information

American Ground Water Trust-www.agwt.org/

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Additional Copies Available from: The Montana Watercourse, (406) 994-6671

www.mtwatercourse.org/Publications/Publications.htm

Other Resources Available from MSU Extension Publications: (406) 994-3273

www.msuextension.org/publications.asp

- Taking Care of yOur Ground Water: a homeowner's guide to well and septic systems (DVD)
- Well and septic record keeping folders (folders) - contact Mike Vogel at mvogel@montana.edu
- Septic Tank and Drainfield Operation and Maintenance (Brochure)
- Household Drinking Water Protection and Treatment (Book)
- Iron and Iron Bacterial Problems in Montana Groundwater (Brochure)

