



# UTAH WATER QUALITY



## Utah Ground Water

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Ground water is important to the economic and physical well-being of the people of Utah. About 95% of Utah's fresh water is ground water. It provides more than 70% of the state's drinking water and is a major source of water for agriculture and irrigation (see table below). Like lakes and streams, ground water can be polluted by human activities. The many possible sources of contaminants include mining activities, landfills, septic systems, fertilizers, pesticides and municipal, agricultural and industrial wastes. Hazardous substances can move through the soil into ground water potentially causing health problems for humans and animals. Although, there have been a few localized incidents of ground water contamination in Utah, generally, Utah's ground water is believed to be of acceptable quality; especially if it is obtained from an approved water system or from a properly installed and maintained private well. To date most of Utah's ground water contamination problems have not been directly associated with agriculture or agricultural chemicals.

some gradually seeps downward, filling spaces and cracks in the underlying layers of soil, gravel and rock. The water in these deep, saturated layers is the ground water.

The water seeping down through the soil can carry with it contaminants such as water-soluble nutrients, minerals, and other substances in or on the soil. This process is known as leaching.

Many contaminants are minerals that may naturally occur in water and generally do not cause health problems, since they usually occur in very small amounts. More often they impart undesirable properties such as unpleasant taste, odor or hardness to the water.

### Utah Ground Water

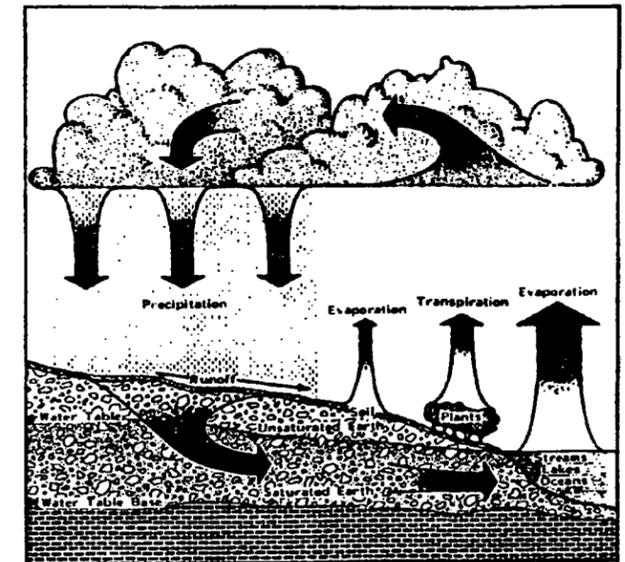
	Percent of Ground Water Use	Dependent on Ground Water
Irrigation	44%	10%
Public Supply	35%	66%
Industrial	11%	14%
Rural Domestic	5%	90%
Rural Livestock	5%	80%

Utah Water Users Conference, 1987

### Ground Water Contamination

Ground water and surface water are interrelated. In fact, they are parts of the same natural water system, the hydrologic cycle.

Water that falls as rain or snow runs into streams or lakes, evaporates, or soaks into the soil. Some of the water that enters the soil is taken up by plant roots and



The hydrologic cycle. (Drawing by Rex Heer, Iowa State University)

Some contaminants are living organisms. Soil bacteria cause the most common odor, taste, and discoloration problems. Occasionally bacteria, which indicate insanitary conditions, are present and are indicators of the possible presence of disease-causing microorganisms.



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Other contaminants include a wide range of synthetic organic compounds, such as trichloroethylene, phenols, benzene and toluene. Heavy metals such as lead and cadmium, and salt or brine used on roads may contaminate water. In general, these contaminants pollute ground water as a result of improper storage or disposal practices. Leaking underground storage tanks and leaking landfills are two common examples. These contaminants may render water unsuitable for drinking.

Contaminants which reach the ground water generally move very slowly. In one sense this is a problem, since continued leakage in one spot will lead to gradually increasing levels of contaminants. On the other hand, this slow movement means that most contaminants will be confined to a small area. In addition, the limited spread increases the possibility that the water can be treated and the aquifer restored, at least partially. However, restoration is generally a large and costly undertaking.

Whether contaminants that leach into the ground water pose a hazard to humans or animals depends on the toxicity and concentration of the compounds. In time, contaminants break down by reaction with minerals and other natural chemicals in the soil or water, by physical factors such as sunlight or heat, or by bacteria, fungi and other microorganisms. The compounds eventually resulting from the break down process are usually nontoxic.

For a contaminant to leach into ground water and present a hazard it must move down through the soil and it must resist break down into nontoxic compounds. This is generally not a common occurrence. The soils, the characteristics of the contaminants, and the amounts of water applied through precipitation and/or irrigation work together to determine the movement and break down of contaminants in the soil.

#### **Soils**

Soil characteristics determine how a contaminant breaks down and whether it leaches into ground water. There is a greater potential for ground water contamination in areas where contaminants move quickly through the soil. Sandy soils have large pore spaces between particles, that provide little surface area for sorption, or physical attachment of contaminants. Large amounts of rainfall or irrigation water can move dissolved contaminants rapidly through the soil into ground water. Clay soils, on the other hand, are made up of extremely small particles that provide a vast surface area for adsorption. The small pores between particles slow the movement of water and dissolved contaminants.

While held securely to soil particles, contaminants are more likely to be broken down. Most chemical and biological break down takes place in the loose, cultivated surface layers where the soil is warm, moist, high in organic matter, and well-aerated.

Soil organic matter is also important in preventing contaminant movement and promoting break down. Organic matter provides additional surface area for sorption and provides an excellent environment for chemical and biological break down to occur. In drier soils and at lower temperatures break down is slower because

both chemical and microbial reactions are slower under these conditions.

#### **Contaminant Characteristics**

The characteristics of the contaminants also affect both how they move through the soil and break down. Contaminants have different abilities to adhere to soil particles. Some contaminants stick very tightly to soil grains; others stick only loosely; still others stick a little harder but can be dislodged with water.

Equally important, contaminants and their interim break down products differ in their ability to dissolve in water. Contaminants that are very soluble in water and poorly adsorbed can move through the soil to the ground water much more easily than contaminants that are not very soluble and strongly adsorbed by soil particles.

#### **Amounts of Water**

The movement and break down of contaminants in the soil can be affected by the amount of rainfall, irrigation, or both.

Both soil moisture and temperature can affect chemical break down. If cold rain or irrigation water cools the soil, break down reactions can be slowed. It can also wash pesticides off plants and into the soil, removing them from sunlight which might otherwise promote break down. Too much water can leach water-soluble chemicals beyond plant roots, resulting in ground water contamination.

#### **Well Water Testing**

About 90% of the rural population of Utah depends on ground water as the primary source of drinking water. Many of these individuals, especially those residing in rural areas, have their own wells. In light of recent reports of ground water contamination in many states, much concern exists about the safety of well water.

No regulations govern water quality in private wells. There are no enforceable limits for particular contaminants and no requirements for tests to be made at regular time intervals. However, health agencies do make recommendations as to the suitability of well water based on standards established for public drinking water supplies.

Tests of well water have to be very specific. It is not possible to test one well and determine what the contaminant levels are in other wells in that area. Thus, it is up to the well owner to decide if particular tests should be performed.

If well water quality is in doubt, the first thing that a well owner should do is to contact the local health department. Department sanitarians can discuss the problem and recommend further action. In some cases, a visit to the well site may be needed before a decision can be reached.

#### **Sampling**

If testing is recommended, the first step is the collection of the water sample. If the well owner performs the sampling, he or she is usually provided with the

appropriate sterilized sample bottle and instructions on how, when and where to collect the sample. This is a crucial step, since the contaminants are generally present in very minute amounts, and careless sampling can destroy the possibility of obtaining accurate results.

Once the sample is obtained, it may be tested for a number of different types of contaminants. One type of test is designed to detect bacterial contamination. Since most odor, taste, and discoloration problems are due to bacteria, this test is performed quite commonly.

A second type of evaluation, a partial chemical analysis, is used to detect commonly occurring inorganic constituents, such as magnesium, calcium, sodium, iron, fluoride, chloride and nitrate. Some of these, such as fluoride and nitrate, may be health hazards at high levels. Others, such as magnesium and iron, are usually of concern due only to their effects on water taste, color, odor or cleansing properties. This type of test is more expensive than the bacteriological analysis, but it is still not very costly.

A third, and potentially very expensive, type of analysis is a specific chemical analysis. This is used to look for one or a few particular chemicals which are suspected of being present in the water. It is extremely costly to analyze water for everything. The well owner must narrow down the possible sources of the problem so that a limited set of tests can be conducted.

Once the tests are completed, the well owner is faced with interpreting any positive results. The presence of a contaminant is not always an indication of a health hazard. It is the level at which it is found that is most important. Although there are no established levels for private well water, the levels established for public supplies can be used as guides. It is best to discuss results with a sanitarian from the local health department, since he or she will have these established levels available and can help you interpret your results.

If the well owner finds that the well should not be used, there are five basic alternatives: install a new well; connect with a public system (if available); use bottled water; install filters; or move to another area.

Drilling a new well into the same aquifer may not solve the problem if the contaminant has polluted all or most of the aquifer or if the source of contamination has not been identified. It is also expensive. Connecting with a public system will only work if one is close enough. Bottled water is generally just a temporary solution. In addition to the expense, the quality of bottled water is not always certain. Installation of filters may appear to be an attractive solution but these devices are unregulated and vary in effectiveness; they require careful maintenance and generally lack malfunction indicators. The last solution, moving to another location, is a drastic one but may be necessary in extreme situations.

#### **Water Analysis Laboratories**

If you believe that you have a water problem, contact your local health department. In some instances they may be able to offer assistance. In some cases you may find it necessary to obtain your own analysis.

The following list of certified laboratories can conduct various water analyses. Contact the laboratory for instructions on how to sample the water and for cost information. These laboratories have been certified by the Utah Department of Health to perform various environmental chemical and microbiological analyses.

American West Analytical Laboratories  
463 West 3600 South  
Salt Lake City, Utah 84115  
266-5858

Central Valley Water Reclamation Lab  
800 West Central Valley Road  
Salt Lake City, Utah 84119  
973-9100

Chemtech  
6100 South Stratler Avenue  
Murray, Utah 84107  
262-7299

DataChem Laboratories  
960 West LeVoy Drive  
Salt Lake City, Utah 84123  
266-7700

Ford Chemical Laboratory  
40 West Louise Avenue  
Salt Lake City, Utah 84115  
466-8761

Mountain States Analytical  
1645 West 2200 South  
Salt Lake City, Utah 84119  
973-0050

Southern Utah State Water Laboratory  
351 West Center Street  
Cedar City, Utah 84720  
586-7914

Utah State University  
Soil, Plant, and Water Analysis Laboratory  
Logan, Utah 84322-4830  
750-2217

#### **For Further Information**

More extensive information on ground water and on drinking water in Utah can be obtained from the following:

Utah Department of Agriculture  
- Division of Environmental Quality 538-7179

Utah Department of Health  
- Division of Drinking Water - Sanitation 538-6159  
- Division of Water Pollution Control 538-6146

Utah Department of Natural Resources  
- Division of Water Resources 538-7230