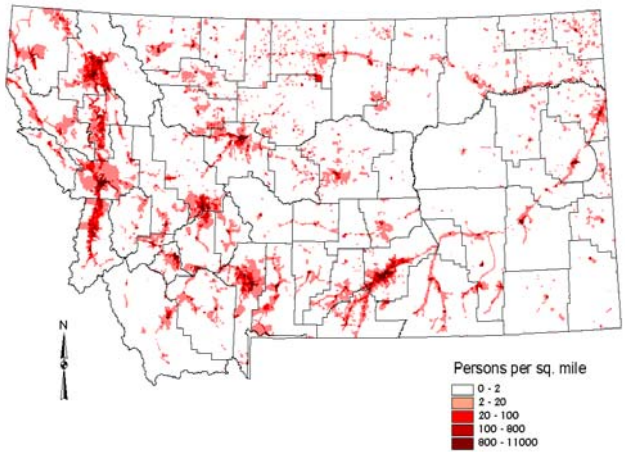
MONTANA GROUND WATER CONDITIONS

***Ground Water Importance*:** Montana, the fourth largest state (147,046 square miles) in the United States, had a population of 909,453 people in 1998 and a population density of around six people per square mile. Montana has seven major urban areas, the largest of which is Billings in Yellowstone County with 130,622 people. Fifty nine percent of Montanans live in these seven urban areas. The remaining population is rural and generally lives in small communities located along the alluvial valleys throughout the state. Approximately 616,701 residents or about sixty-eight-percent of the total population of Montana utilize a public drinking water system for domestic uses (community PWS). An even larger percentage of the population uses water from public systems when considering the use of other types of PWSs such as restaurants, businesses, schools, and campgrounds.

How Good is the Water?

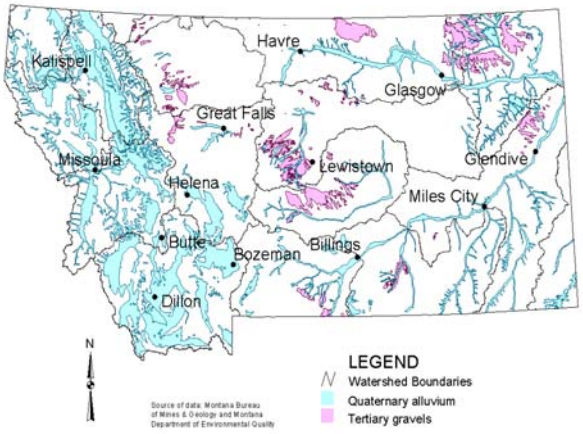
Ground Water in Montana generally remains free of human-caused contamination. The unconsolidated alluvial aquifers and glacial outwash deposits that supply most public and private wells in Montana provide high quality and plentiful drinking water. Concentrations of dissolved solids in water from the western Montana alluvial aquifers commonly are less than 300 milligrams per liter (mg/L) contrasting with water from the eastern alluvial aquifers that usually exceed 1,000 mg/L. The higher quality but vulnerable aquifers of western Montana underlie approximately 16 percent of the state.

Only around 15 percent of the 670 community public water supplies are associated with incorporated towns or cities and almost half of the community public water systems serve less than 100 inhabitants. More than one half of the people in Montana rely on ground water for household use. The most accessible and highest quality water is from alluvial aquifers and glacial outwash deposits wherever these are found in the state. Alluvial aquifers occupy river valleys and are shallow unconfined or semi-confined sand and gravel deposits. Glacial outwash deposits generally consist of gravel, cobbles, and boulders and are usually unconfined or semi-confined. Both of these types of aquifers are relatively vulnerable to pollution from human activities, with population growth and human developments posing the greatest risk to the alluvial aquifers, especially in the western part of the state. The challenge for Montana is to



protect, sustain, and improve ground water quality as more people and businesses move into the river valleys and on top of their source of water.

Bedrock aquifers in limestone in west-central and southwestern Montana and some of the aquifers in semi-consolidated Tertiary age deposits in northeastern and southwestern Montana are also vulnerable to contamination from human activities. This vulnerability is due to the potential for vertical or horizontal solution channels in the limestone and to surface exposure of the Tertiary deposits. These two aquifers occupy approximately 11 percent of the state. Bedrock aquifers in the Cretaceous and Paleocene age sandstones under the eastern two-thirds of Montana generally are much less vulnerable to contamination from human



activities due to the great depth to water and the widespread presence of low permeability

confining layers. These aquifers underlie approximately 70 to 75 percent of the state.
Natural substances may affect water used for domestic or general agricultural purposes, especially in bedrock aquifers. While the national secondary drinking water standard for dissolved solids (TDS) is 500 mg/L; TDS in some eastern bedrock aquifers exceeds 5,000 mg/L. Some water from eastern bedrock aquifers is suitable only as stock water. Water quality in bedrock aquifers tends to be highest near the recharge area.

The Town of Fairfield is located on a gravel terrace in a malting barley growing region in west central Montana. The shallow gravelly aquifer tapped by the drinking water supply is perched on a shale formation and is very vulnerable to contamination. The aquifer is termed "sensitive." Recharge occurs primarily through irrigation infiltration and irrigation canal leakage.
Sensitive aquifers often may contain several different contaminants resulting from activities on the land surface. The Fairfield public water supply has had detects, at one time or another, of:

- *Nitrate*
- *Picloram*
- *Assert*
- *Prometon*
- *Chlopyralid*

Costs of Contamination: Contamination generally refers to the alteration of water so that it may not be put to some intended use. Most of the contaminants of concern in Montana are related to human activities but a few, like arsenic, appear to have significant natural sources. Contaminants can enter ground water in different ways including direct injection, underground discharge, and ground surface discharge.

In Montana, there are few documented examples of direct costs associated with contamination of ground water. When contamination does occur, costs are incurred due to initial investigation, site remediation, and sometimes because of the need to replace a drinking water supply. For example, contamination of a well used by the town of Opheim required the development of a new source. Similarly, nitrate contamination at Wilsall required the town to find a replacement source. Leaking petroleum product at Judith Gap required the town construct a new well far outside the developed community. When ground water contamination causes a public water supply to construct a new well, costs can exceed $250,000.

Efforts to Protect Ground Water: Protection of ground water in Montana is the responsibility of several state agencies. Primary responsibility for protecting ground water quality lies with the *Department of Environmental Quality.* Primary responsibility for administering water rights to manage ground water quantity is the *Department of Natural Resource and Conservation*. Primary responsibility for ground water characterization is the *Montana Bureau of Mines and Geology*. A plan describing the conservation, development, and utilization of Montana's ground water resource was finalized in 1999. Called the Montana Ground Water Plan (MGWP), it provides for agency and citizen coordination to achieve effective protection of Montana's ground water, education of its citizens regarding ground water, and adequate, yet cost-effective, cleanup of ground water contamination. MGWP addresses both ground water quality and quantity. The program has three major components; 1) Protection; 2) Education; and 3) Remediation and will likely form the basis for comprehensive ground water planning in Montana.

What Else is Needed? As a headwaters state Montana enjoys relatively clean water. Educating and informing the public about ground water and pollution prevention remains one of the most significant challenges that must be met in order to help maintain our high quality water. The MGWP recognizes that some of the recommendations will require additional resources to implement and unless the additional resources are made available, they will not get done. Moreover, funding mechanisms and levels are set by the Legislature. An informed and educated citizenry will help insure this process moves forward to protect, sustain, and improve a clean and healthful environment.

* The information in this fact sheet is derived from the 1998 Montana 305b Report.