



## Where Is Ground Water and Is It Available for Use?

***Ground-water resources vary across the state.***

Ground water is everywhere beneath Minnesota's land surface, but it is not necessarily *available for use* everywhere. The distribution of aquifers in the state is uneven. The varying types and layers of sediment and rock under the land surface in an area determine whether any aquifers are present from which to pump ground water.

The types of sediment and rock also determine whether an aquifer is capable of supporting large withdrawals or only able to support limited use.

Minnesota has six ground-water areas that combine the two general types of bedrock, sedimentary and fractured igneous and metamorphic, with two general types of overlying sediments, sandy and clayey. In the northeast and southeast, overlying sediment is thin or absent. The layers of sedimentary limestone and sandstone bedrock that form the bedrock aquifers in southeastern Minnesota are well known for their good aquifer qualities and are commonly used. Elsewhere in Minnesota, the fractured igneous and metamorphic bedrock has relatively poor aquifer qualities, generally supporting only limited use.

Much of Minnesota is covered by sediments deposited by glaciers or streams. Some of those sediments are sands and gravels that occur as surficial deposits or they may be buried within clayey glacial deposits. The sandy glacial deposits that cover much of central Minnesota include extensive sand and gravel aquifers at or near the land surface that have good aquifer qualities. South and west, the glacial sediments are more clayey, and aquifers within the sediments are less common and generally more limited in extent.

Many parts of Minnesota are underlain by sediment and rock that do not make good aquifers. Nonetheless, that sediment and rock is still important for limited ground-water storage. The water stored in those sediments and rocks is the source of slow replenishment for aquifers and surface waters.

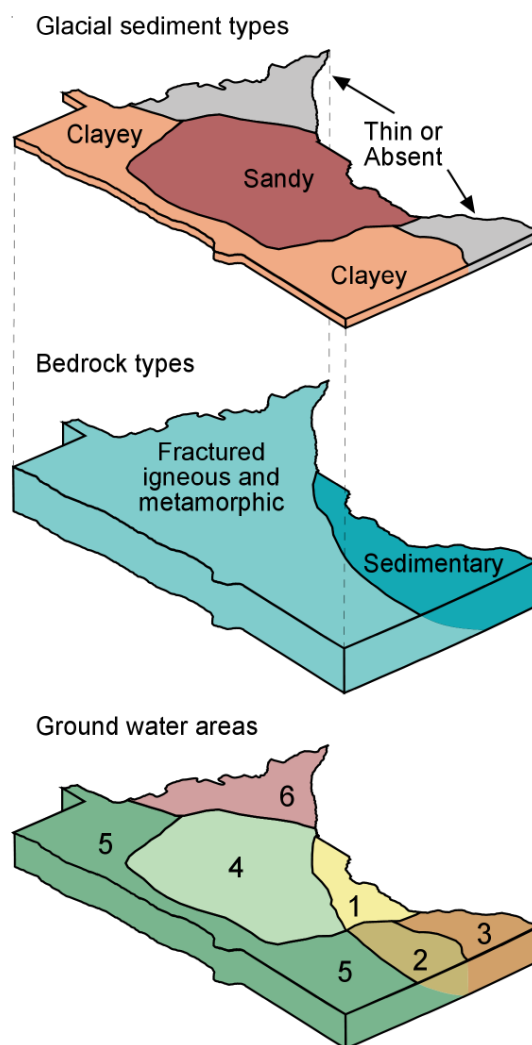


FIGURE 1. General availability of ground-water resources depends on the type of sediment and rock beneath the land surface.

### General Ground-Water Availability in Minnesota

Minnesotans generally live where aquifers are present. With proper management, those aquifers can provide some or all of their water-supply needs. In some areas, such as the Twin Cities metropolitan area, where ground water and surface water are both available, those resources used together can provide a dependable long-term supply. In other areas, such as western Minnesota, ground-water resources in both glacial sediment and bedrock are limited. Careful management of water resources is needed in those areas to ensure adequate, long-term supply.

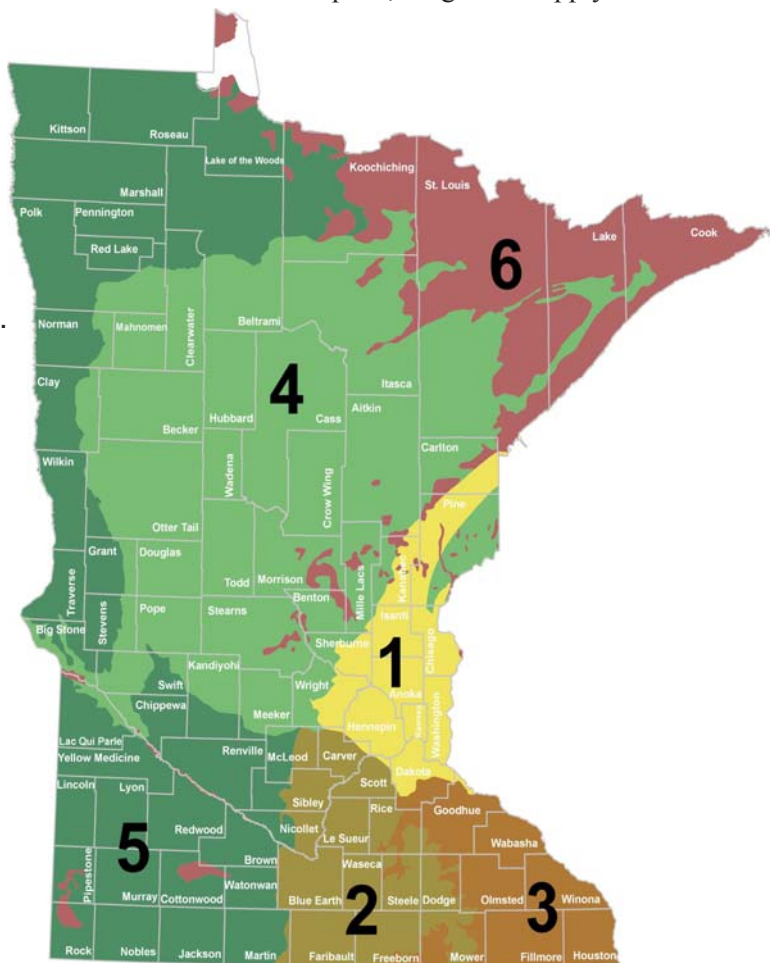


TABLE 1. Ground-water availability in the state.

Area	General Availability of Ground Water by Source		
	Surficial Sands	Buried Sands	Bedrock
1	Moderate	Moderate	Good
2	Limited	Moderate	Good
3	Limited	Limited	Good
4	Good	Moderate	Limited
5	Moderate	Limited	Limited
6	Limited	Limited	Limited

#### Long-Term Availability of Ground Water and Management Issues in Minnesota

- Area 1**—Ground water supports lakes, wetlands, and streams; includes core of Twin Cities metropolitan area and expanding northern edge. Expect continuing pressure on all ground-water resources as development continues.
- Area 2**—Limited buried sand aquifers can be easily depleted. The northern part of the area includes the southern Twin Cities metropolitan area that is expanding south.
- Area 3**—Karst common; springs and cold-water streams depend on ground-water discharge; overpumping ground water may deplete surface waters dependant on ground water.
- Area 4**—Ground water supports lakes, wetlands, and streams; overpumping ground water may deplete them.
- Area 5**—Limited buried sand and gravel aquifers can be easily depleted; stream flow depletions from surficial aquifer use are likely; ground water from bedrock is generally very limited.
- Area 6**—Generally poor supply from both sediment and fractured rock requires careful water supply planning and management for dependable supplies. Surface water may be the only available resource.