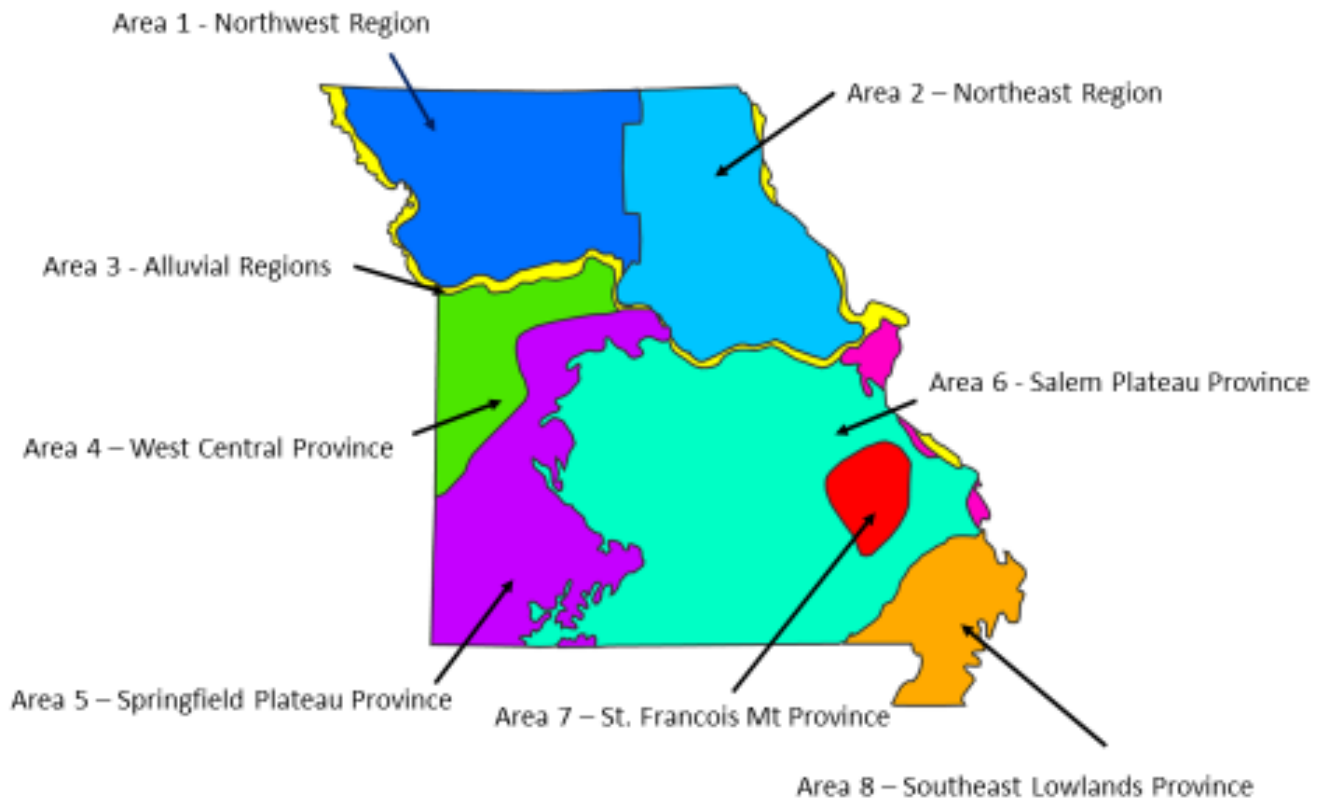


**Missouri Groundwater Provinces and Aquifer Characteristics
Adopted from the Missouri Department of Natural Resources
Division of Geology and Land Survey**



Area 1 – Northwest Missouri has geologic characteristics similar to northeastern part of the state. However, there are no high-yield, potable bedrock aquifers available. The glacial drift is typically more water productive than to the east. There are drift-filled channels, most of which are covered with younger glacial drift. These are the pre-glacial stream valleys and were filled with water-borne coarse sediment during the glacial periods. Wells that are located in these drift filled channels can yield several hundred gallons of water per minute

The northwest groundwater province is estimated to contain about 2.2% of Missouri’s potable groundwater, or about 10.2 trillion gallons

Area 2 – Northeast Mo has many bedrock formations normally associated with southern Missouri but are also found north of the Missouri River. The southern part of the Northeast groundwater province lies to the south of the freshwater-saline water transition zone. The Mississippian, Ordovician, and Cambrian-age strata in this area can supply from 10 to more than

1000 gallons per minute of potable water, depending on depth. North of the transition zone the water from deeper bedrock aquifers is generally too highly mineralized for most uses. The shallow Mississippian strata will have modest quantities of marginally potable groundwater, where it isn't overlain by Pennsylvanian strata. The Pennsylvanian strata has an overall low permeability and generally yields small quantities of marginal to poor quality water.

Glacial drift overlies much of the bedrock throughout the region. Thousands of shallow, large-diameter, hand-dug glacial drift wells once supplied many of the rural residents. These wells generally yielded less than 3 gallons per minute and relied on their large diameters for storage. These wells are very vulnerable to contamination from bacteria, animal wastes and agricultural chemicals.

In most of the area the glacial drift is not capable of supplying enough water suitable for public water use. The alluvial deposits consisting of sand and gravel underlying the floodplains of major rivers in this area can yield large quantities of good-quality water. Groundwater storage in the Northeast Missouri groundwater province is estimated at 13% of the state's usable groundwater or 66.7 trillion gallons.

Area 3 – This area along the Mississippi and Missouri River is the Alluvial Aquifer. The alluvial aquifers beneath the floodplains of the rivers are some of Missouri's most valued water resources. These aquifers are capable of yielding from 500 to more than 2,000 gallons of water per minute and are widely used for municipal water supplies and agricultural irrigation.

The alluvial materials of the valley are composed of clay, silt, fine to coarse sand and fine to medium gravel. The size of the alluvial materials generally increases with depth. Finer-grained materials directly underlie the land surface and coarser sands and gravel are found at greater depths. The alluvium ranges in thickness from very thin at the edge of the valley to as much as 170 feet. The volume of water stored in the Mississippi and Missouri River alluvial aquifer varies but is estimated at 1% or 4.88 trillion gallons.

Area 4 – West-Central Missouri Groundwater Province – lies northwest of the Salem Plateau, mainly in the southeastern corner of the state of Missouri. Groundwater in the Springfield Plateau, Ozark and St. Francois aquifers is of good quality. In the North and West of this area these aquifers yield water that may be too mineralized for good domestic use. Potable groundwater in the west-central Missouri groundwater Province is typically difficult to obtain. Relatively shallow Pennsylvanian-age limestones and sandstones can produce marginal quality water but yields are generally low. This province contains about 0.24% of the state's resource or 1.2 trillion gallons.

Area 5 – Springfield Plateau Groundwater Province – Occupies the southwestern part of the state and a small region on central Missouri south of the Missouri River. The thick Mississippian-age limestones and cherty limestones form the bedrock surface in the region and overlie the same Ordovician and Cambrian strata found in the Salem Plateau.

Numerous Mississippian-age units crop out across southwestern Missouri. The yield varies dramatically but it isn't usual to see wells provide from 200 gallons per minute to more than 2000 gallons per minute. Most will yield between 600-800 gallons per minute. Different layers in this area cause water holding capacity and yields to vary. The upper aquifer, Springfield Plateau, is from 0-450 feet deep and can produce up to 20 gallons per minute of water. The Ozark Confining Unit is 0-80 feet in depth and is generally a low yielding area of 30-70 gallons per minute. The Ozark Aquifer can range from 600 to 1600 feet in thickness and is made up of layered deposits of Cotter dolomite, Jefferson City dolomite, Roubidoux Formation, Gasconade dolomite, Eminence dolomite and Potosi dolomite. These are high yielding areas ranging from 100 to greater than 2000 gallons per minute.

Area 6 – Salem Plateau Groundwater Province – surrounds the St. Francois Mountains and includes all of part of 49 counties in south central and southeast Missouri. The groundwater resources in the Salem Plateau groundwater province are the most extensive in the state. There are two major aquifers that underlie this region, the St. Francois aquifer and the Ozark aquifer. The aquifers receive recharge in a number of ways. In an unconfined aquifer (St. Francois) precipitation can move downward into the aquifer. Wells in this area can produce between 70 and 125 gallons per minute. This area holds about 46.65 of the potable groundwater or about 233 trillion gallons.

Area 7 – St. Francois Mountains Groundwater Province – this is the structural high point of a Precambrian-age mountain range where the oldest rocks that outcrop in Missouri are found. They consist mostly of rhyolites and granites. This area of Missouri is steep with rounded mountains and narrow valleys. These rock formations are poor water producers. The rock is nearly impermeable except where they are fractured. Well in the area generally produce less than 2-3 gallons per minute

Some of the area does have Bonneterre Formation and Lamotte Sandstone which is the best yielding aquifer in this region, the St. Francois aquifer. This formation goes from 0-200 feet in thickness and generally can provide modest yields for private water supplies.

Area 8 – Southeast lowlands Groundwater Province – is an area of approximately 4,000 sqmi in the far southeast part of Missouri. The area is a high agricultural producing area with excellent soils and a favorable growing season. Most of the usable groundwater is contained in thick deposits of shallow alluvium and deeper Tertiary – and Cretaceous-age unconsolidated sands.

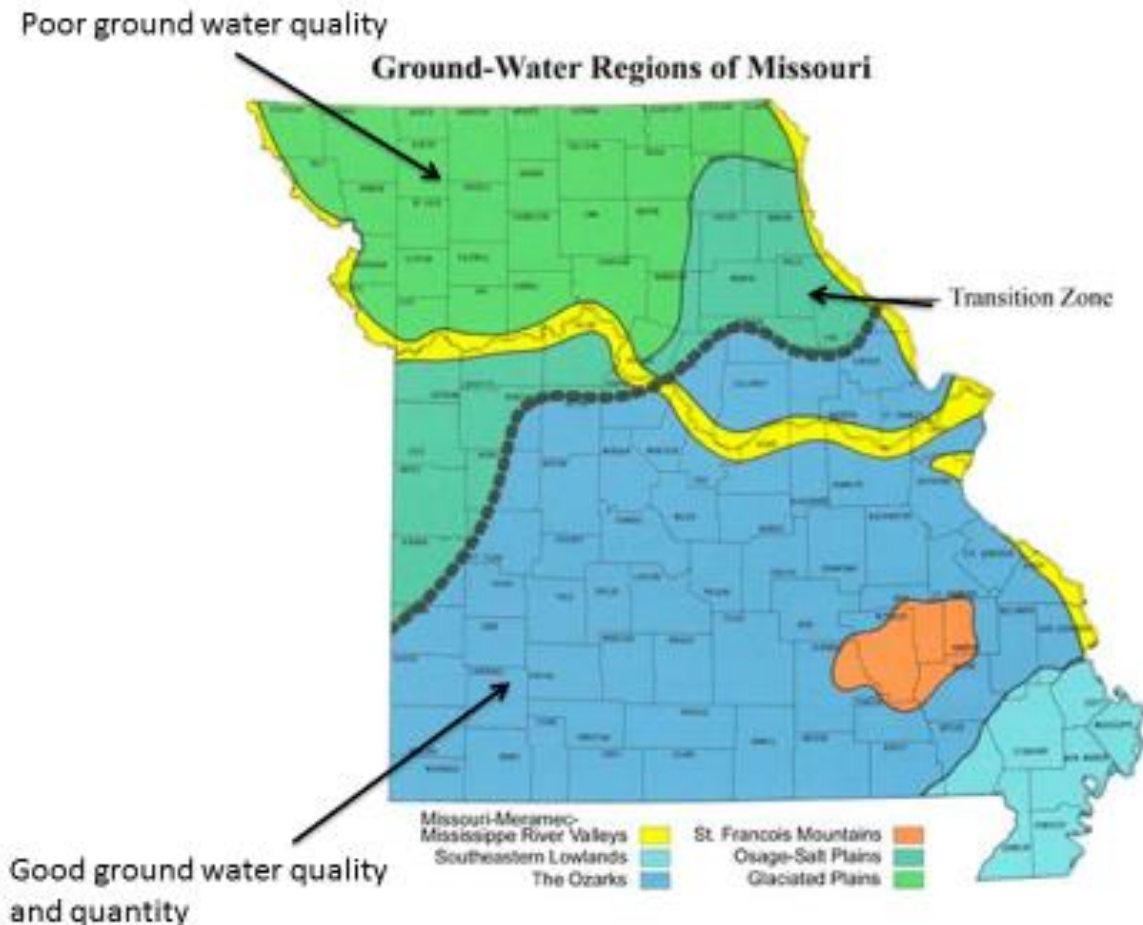
Many of the wells in this area can deliver between 150 and 750 gallons per minute. In the northern part of the province the water is harder and contains more calcium, magnesium, bicarbonate and iron. The water in the south, is typically very soft, contains little iron, calcium and magnesium but greater amounts of sodium and potassium. In part of eastern Stoddard county, and southern Scott the McNairy formation yields water that is a sodium-chloride type that is generally too highly mineralized for most uses. The Wilcox Group is a series of Tertiary-age sands containing minor clay and lignite. The unit thins to a feather ledge in the northern part of the lowlands along Crowley's Ridge and thickens to the south, reaching a thickness of

about 1,400 feet. The water is mostly a calcium-bicarbonate or calcium-magnesium-bicarbonate type and generally contains high levels of iron and manganese. The area produces 200 to 1,700 gallons per minute of water.

The southeast Lowlands alluvial aquifer is the most prolific and widely used aquifer in this groundwater province and underlies about 92% of the Southeastern Lowlands, Mississippi and the Ohio rivers. An estimated 75.8 trillion gallons of water (or about 15.2% is found in this southeastern corner.

For more information on Missouri's groundwater Provinces and aquifer characteristics go to: <http://dnr.mo.gov/geology/wrc/groundwater/education/provinces/gwprovince.htm?env/wrc/groundwater/education/provinces/gwprovince.htm>

Missouri Ground-Water Regions



Missouri is as diverse in ground water as it is in weather and crop production. Even though average rainfall may go from 35 inches in the Northwest corner to more than 55 inches in the Southeast corner the soils and underlying parent material does much to explain the availability of water in the state.

Missouri is generally broken down into six groundwater regions.

Area 1: Glaciated Plains – very little deep ground water and most is heavy in mineral. Upper glacial soil can be 35-50 feet deep and provides some upper level ground water

Area 2: Missouri, Meramec, Mississippi River Valleys – alluvial soils in the floodplain that are saturated with water and quickly recharged

Area 3: Osage Salt Plains – partially in what is called the transition zone for groundwater quality and quantity. High mineral content water makes the water marginal for use

Area 4: The Ozarks – combines the ground water areas of the Salem and Springfield plateaus. This area has high levels of water quality and quantity with wells that can yield tremendous amounts of water

Area 5: St. Francois Mountains – very little available water in both shallow and deep aquifers. Water in this area is generally captured on the surface due to such poor water holding capacity of the underlying rock.

Area 6: Southeastern Lowlands – alluvial area fed by underground water supplies from Mississippi river and other sources. High water table and high quantity and quality of ground water.