



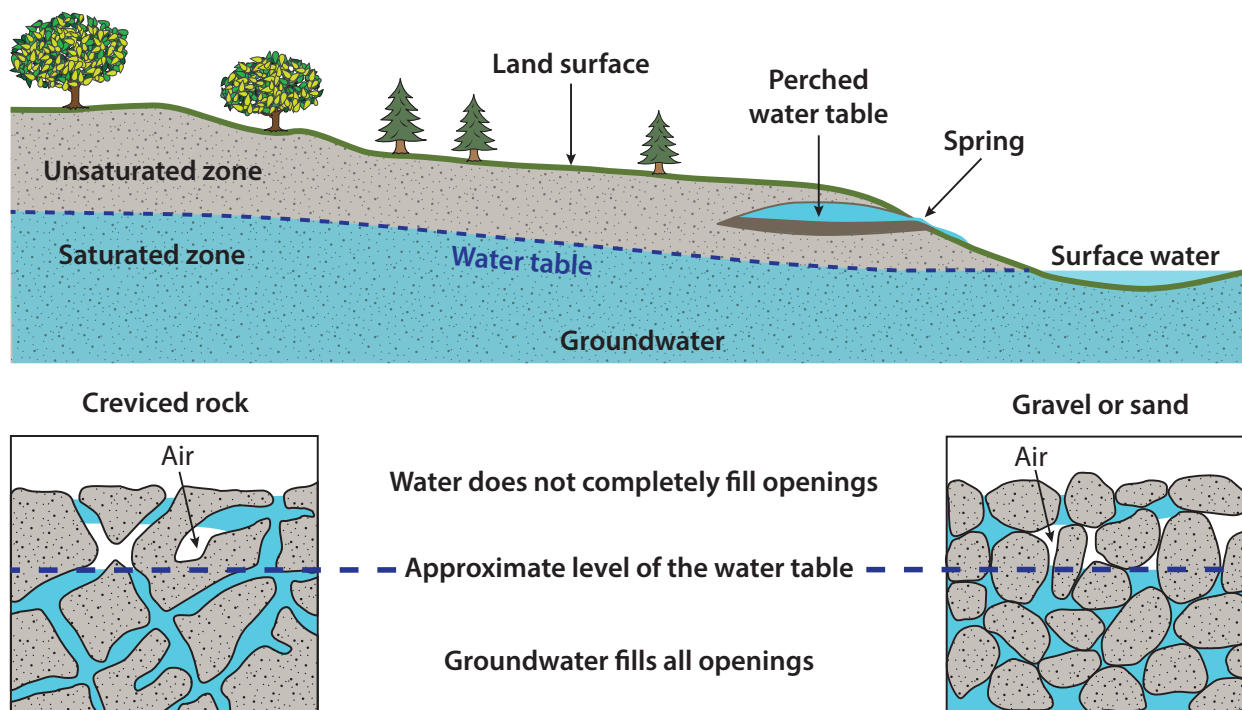
Shallow Groundwater Hazard in Utah

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WHAT IS GROUNDWATER?

Groundwater occurs beneath the land surface at various depths within soil and rock. The water typically fills the space (**pores**) between the grains of soil and fractures within rock. Groundwater exists in two zones: the unsaturated zone and the saturated zone. The **unsaturated zone** contains both water and air in the pore spaces of the soil and rock, whereas water completely fills the pore spaces in the **saturated zone**. The top of the saturated zone is called the **water table**.

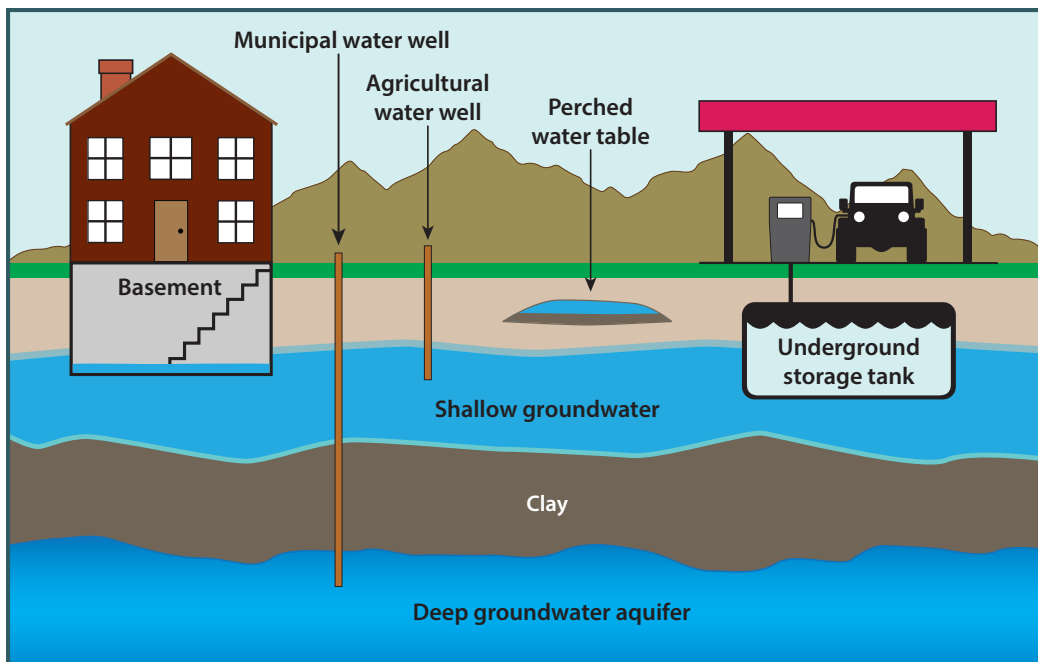


Types of groundwater, showing the saturated zone, unsaturated zone and perched water table.

Groundwater can also occur as local perched zones. **Perched groundwater** develops where water from precipitation, snowmelt, irrigation, or urban runoff percolates through thin, permeable (lots of connected pore space) soils and collects above less-permeable layers (typically clay-rich soils or rock). Areas of localized, perched shallow groundwater may result from excessive landscape irrigation or poor stormwater control.

Shallow groundwater, generally within 10 feet (3 meters) of the surface, can occur anywhere in Utah, but is more likely in low-lying areas of valleys and near rivers, streams, ponds, lakes, and reservoirs. It can occur in or near old drainage areas, where streams have been diverted or piped underground, and is also common at the base of slopes, where springs and wetlands occur. Shallow groundwater levels are typically dynamic and fluctuate in response to a variety of conditions including long-term climatic change, seasonal precipitation, and landscape and agricultural irrigation.

Aquifers are layers of water-saturated rock or sediment that have abundant and interconnected pore space that can transmit usable amounts of water to a well or spring. Shallow groundwater aquifers are susceptible to surface contamination, and not often used for drinking water. Shallow aquifers can, however, be used for watering crops.



Shallow groundwater vs. the deep groundwater aquifer. Shallow groundwater can affect structures below the surface.

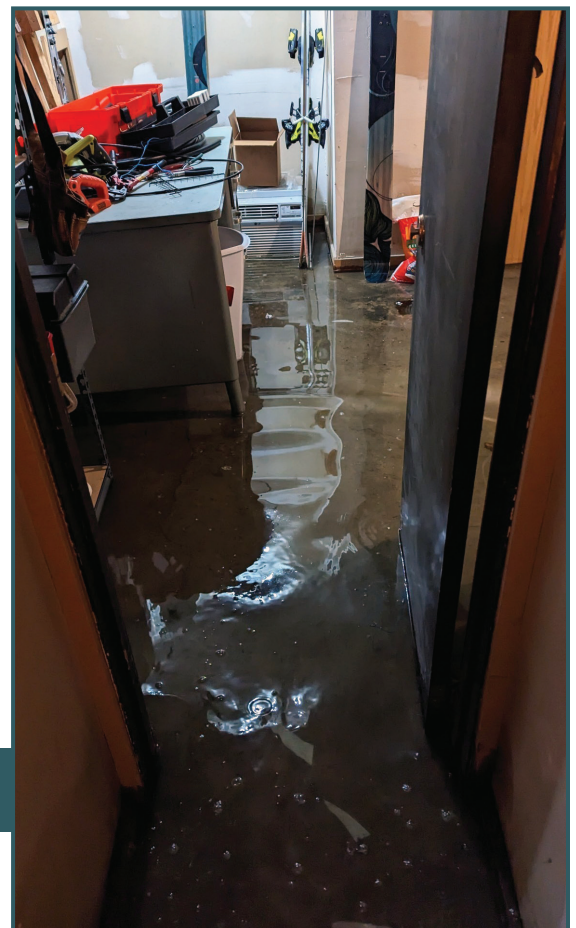
WHAT CAUSES SHALLOW GROUNDWATER SUSCEPTIBILITY?

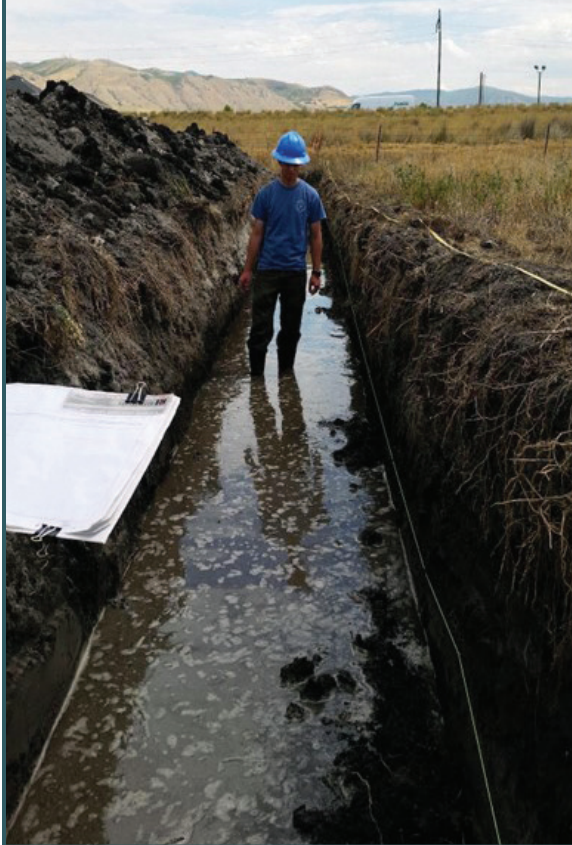
Shallow groundwater susceptibility is caused by a variety of factors including topography, proximity to water sources such as rivers and lakes, low permeability of soils, and variations in precipitation or irrigation. Low-lying areas such as valley bottoms and lake shores are more prone to having shallow groundwater. Generally, areas that have soils with low permeability (i.e., soils that drain slowly), such as clay-rich soils, or any soil type lying above a non-permeable layer (like clay, some types of bedrock, etc.) are susceptible to the effects of shallow groundwater when rates of water input exceed drainage capacity. Increased rainfall and snowmelt, as well as irrigation for landscaping and agriculture, can raise shallow groundwater levels. Under certain conditions natural geologic features such as fractured rock or faults can create pathways for deeper groundwater to flow up towards the surface.

WHY SHOULD UTAHNS BE CONCERNED ABOUT SHALLOW GROUNDWATER?

Flooding can occur not only from surface water, such as from rivers and streams, but also through shallow groundwater. In developed areas, problems can occur when groundwater is within about 10 feet (3 meters) of the ground surface. Shallow groundwater can flood basements and other underground and low-lying infrastructure, damage buried utility lines, destabilize excavations, and trigger landslides and rockfalls. Shallow groundwater inundation of landfills, waste dumps, and septic-tank/wastewater disposal systems can impair the performance of these facilities and lead to groundwater contamination. Groundwater can also change the physical and chemical nature of rock and soil, causing soil and rock susceptible to expansion and collapse to activate. During moderate to large earthquakes, groundwater within approximately 50 feet (15 meters) of the ground surface can cause liquefaction in sandy or silty soils.

Shallow groundwater flooding in a basement in the Ogden area. UGS file photo.





HOW ARE SHALLOW GROUNDWATER HAZARD AREAS IDENTIFIED?

The Utah Geological Survey (UGS) creates comprehensive geologic hazard maps including maps showing shallow groundwater susceptibility. These maps show areas that have the potential for shallow groundwater based on soil drainage capacity and the local geology and hydrology.

The soil and water-level data used to create the maps come from geotechnical investigations (surface and subsurface investigations performed prior to development) and water-well logs. Additionally, geologic mapping can indicate soil and rock types that are susceptible to shallow groundwater, such as sand or gravel above clay layers.

Shallow groundwater in a trench located east of the Salt Lake International Airport. UGS Photo: Adam Hiscock.

DOES HOMEOWNERS INSURANCE COVER SHALLOW GROUNDWATER FLOODING?

Standard homeowners' insurance does not cover damage from groundwater flooding. Neither does the National Flood Insurance Program, which only covers surface water flooding. Reach out to your insurance provider for additional information.

HOW DO I PROTECT MY HOME OR PROPERTY?

Steps that can be taken to mitigate or prevent shallow groundwater flooding include:

- Install a sump pump. A sump pump system can collect water that accumulates in a basement or below its concrete floor slab and pump it out and away from the house. Sump pump systems should be inspected and maintained annually, in the winter before shallow groundwater typically becomes a problem. Portable sump pumps that rest directly on a basement floor and discharge through a garden hose are also available for emergency use.
- Install a French drain. A French drain is a gravel-filled trench that helps redirect water away from structures and may help remove water from slopes.

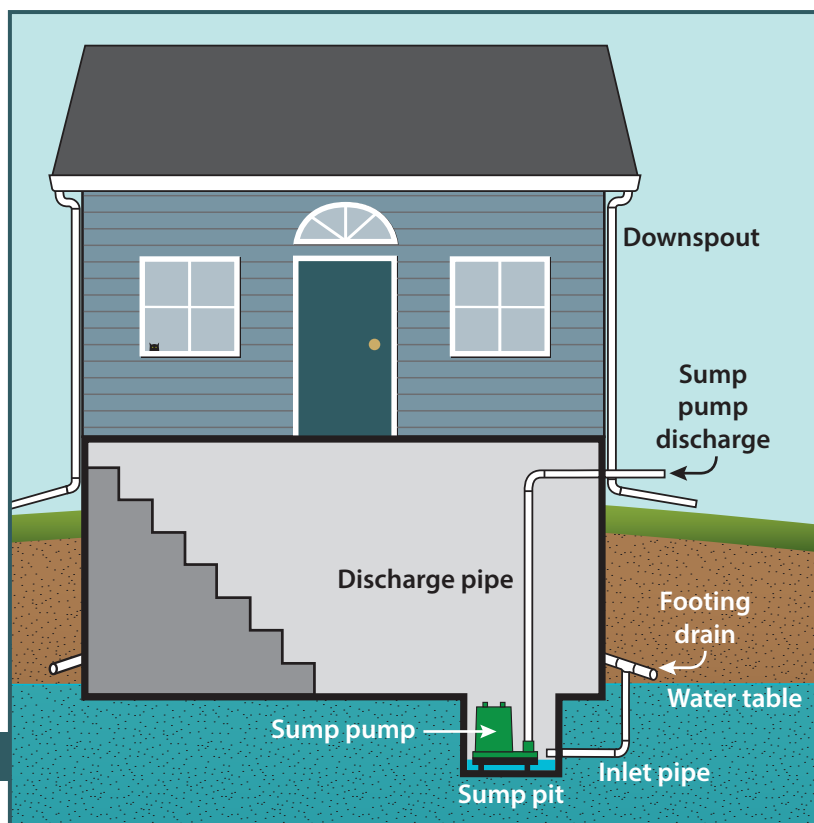
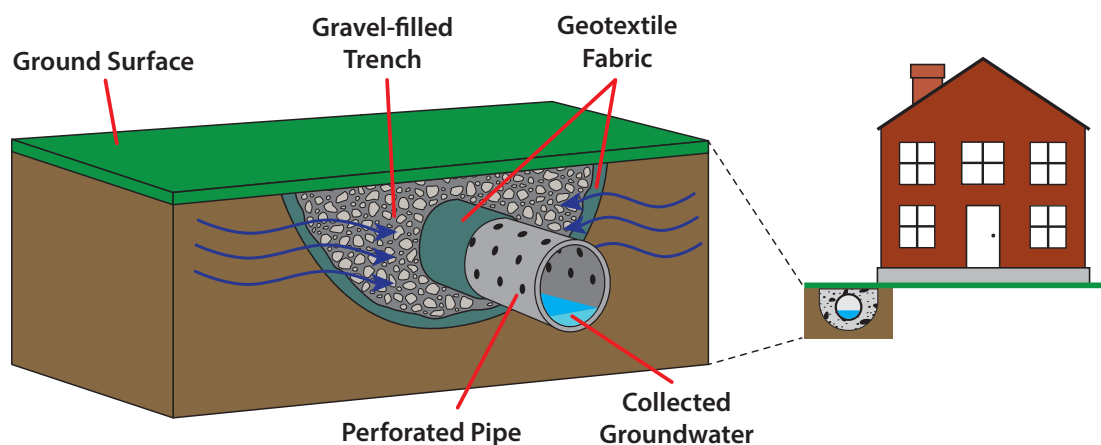


Illustration of a sump pump installed under a home.



French drain illustration and installation location.

- Seal cracks or gaps in foundation walls and basement floors to prevent water from seeping in.
- Ensure the ground surface around your house slopes away to direct surface water away from the foundation.
- Route rain gutters and drainage away from foundations. Rain gutters and downspouts should be inspected and maintained at least annually.
- Limit irrigation water, use drought tolerant landscaping, and use irrigation controllers that use local weather and site-specific landscape information to create a customized watering schedule, in place of standard timers.
- Consider waterproofing the foundation. If flooding is severe or frequent, it may be necessary to waterproof the foundation to prevent water from seeping in. Depending on the building, waterproofing may be performed from the exterior or interior of the foundation walls.

WHERE CAN I GET MORE INFORMATION?

UGS shallow groundwater hazard maps can be viewed at <https://geology.utah.gov/apps/hazards/>. Mapping is ongoing and added upon completion. The UGS is available to answer questions for homeowners, local officials, and others regarding shallow groundwater and other geologic hazards (geology.utah.gov, 801-537-3300).

Other resources:

- General flooding information—Be Ready Utah. <https://beready.utah.gov/utah-hazards/flood/>
- Surface flood zone mapping—Utah Division of Emergency Management. <https://floodhazards.utah.gov/>
- Flood insurance information—National Flood Insurance Program (excludes groundwater flooding). <https://floodhazards.utah.gov/>
- Geotechnical reports—UGS GeoData Archive. <https://geodata.geology.utah.gov/pages/home.php>

If geotechnical reports for your area are not found in the GeoData Archive, you can also contact the city or county offices for the area. Geotechnical reports are typically required prior to building permits being issued. For questions on information contained in geotechnical reports you can contact the UGS.

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