

Ground-Water Flooding in Glacial Terrain

What Is Ground-Water Flooding?

Ground-water flooding happens when the natural level of water in the ground rises above the land surface in lower-elevation areas,¹ causing them to flood. Sometimes ground-water flooding is mistaken for depression flooding, which occurs when water on the land surface runs off and collects in low-lying areas, because it can not percolate into the ground as quickly as it collects.² Ground-water and depression flooding can occur simultaneously although they are caused by different factors.



Photo by A.K. Williamson, USGS, 1997



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Color overlay modified from Landsat Thematic Mapper, BRG format, Bands 1-7, 07-18-1996. Base map modified from USGS 10 m Digital Elevation Model 1:24,000, 1999. Universal Transverse Mercator Projection Zone 10.

What Causes Ground-Water Flooding?

Conditions that have been associated with ground-water flooding are two or more consecutive years of above normal precipitation; and cool, wet springs, followed by mild summers.^{2,7} The excess precipitation percolating into the ground-water system, combined with cooler temperatures that reduce the evaporation losses from the ground-water system, leads to increased ground-water storage. When the total available ground-water storage is exceeded, ground-water flooding occurs.

Adding septic systems, irrigation, and certain types of drainage systems can also contribute to ground-water flooding by increasing the rate and amount of ground-water recharge.

Changes in land use may also contribute to ground-water flooding. Developing forested areas for commercial and residential use can slow ground-water removal by evaporation and plant transpiration.

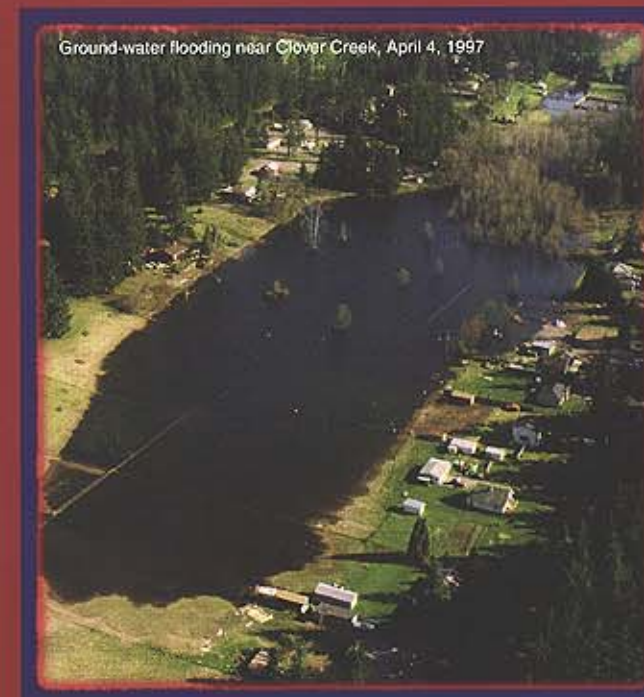
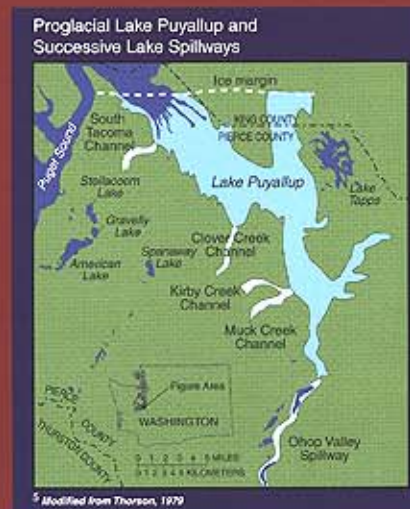


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Ground-Water Flooding Is Related To The Local Geology

Ground-water flooding occurs almost exclusively in areas that have been covered by glaciers. The last extensive glacier advanced and retreated over the Puget Sound area starting about 18,000 years ago.^{3,4} It left behind distinctive features such as ice contact depressions and outwash channels that are visible on the shaded relief map of Southern Puget Sound, Washington shown above. In both cases, these are typically the lowest spots in the terrain. Large volumes of water flowing through the outwash channels eroded and modified the uplands but also deposited coarse sediments over the area.^{1, 8, 5}

Many of these outwash channels developed surface-water drainage systems. But in the abandoned outwash channels that have not developed drainage systems, a unique phenomenon may occur during flooding: The ground-water flow follows and moves progressively down the abandoned outwash channel. This is often called transient ground-water flooding. When the ground-water level rises in the low-lying areas, it is often called static ground-water flooding because it is not moving in any noticeable direction. In both cases, it can take several months for the ground water to recede from the area.



Modified from Thorson, 1979

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Aerial image generated by Ed Jostberger using ERDAS IMAGINE image processing.
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