

WATER QUANTITY MONITORING

Groundwater is a critical source of water affecting lake levels, springs and streamflow. Groundwater withdrawals may result in a lowering of the water table that can impact streamflow and lakes, especially in parts of the state where groundwater and surface waters are well-connected. In areas such as the northeast and southeast, groundwater level declines are mainly in aquifers that are confined and therefore, not well-connected to surface waters. In these parts of the state monitoring groundwater levels is important for ensuring water availability for the communities and industry that rely on these deep wells. The long-term monitoring data collected allows us to create an accurate and accessible water resources inventory, manage withdrawals and protect the waters of the state¹ (streams, rivers, wetlands, lakes, springs and private wells) from significant adverse environmental impacts² by cataloguing water resources and understanding groundwater-surface water interactions and the effects of withdrawals and consumptive uses.

Streams Monitoring

Wisconsin has about 32,000 miles of streams and rivers that flow perennially, or continuously, throughout the year. These streams and rivers have important uses including supporting fish and aquatic life, recreation, navigation, wildlife, and public health and welfare. Fish and aquatic life depend on baseflow, the groundwater portion of streamflow. For example, baseflow provides a consistent source of cold water to streams, critical for trout. This baseflow to streams is an example of how groundwater and surface water interact. Water that starts as groundwater is discharged to surface water and plays an important role in maintaining the plants and animals that depend on the water resource. Similarly, springs, many lakes and many types of wetlands are dependent on groundwater discharging to these surface water to maintain their character and provide habitat for plants and animals. To understand these groundwater and surface water interactions DNR staff, UW-Stevens Point staff and others collect instantaneous flow measures on streams and install continuous monitoring devices in areas with high groundwater withdrawals to determine the potential effects of groundwater pumping on streams. These measurements are also essential to calibrating groundwater flow models used to simulate surface water/groundwater interactions. DNR partners with the University of Wisconsin-Stevens Point Center for Watershed Science to collect monthly baseflow measurements at approximately 40-50 sites. DNR relies on baseflow measurements to determine the significance of depletion potential from a groundwater or nearby surface water withdrawal. In-stream ecological impacts can be predicted using estimated depletion data, fish survey data and in-stream temperature data. DNR also partners with United States Geological Survey (USGS) stream gage network to collect continuous streamflow measurements to provide a representation of a stream's response to precipitation, nearby water withdrawals, runoff and overall baseflow conditions.

Lake Level Monitoring

Most of Wisconsin's 15,000 lakes are directly or indirectly connected to the groundwater system meaning some fraction of the lake's water is derived from groundwater inflow. Long-term lake level records, in conjunction with site-specific conceptualization of a lake's interaction with groundwater, allow for the assessment of water level fluctuation associated with natural factors (drought, climate) and human-induced factors such as water withdrawals and changes in land use. Water levels of small spring lakes and

seepage lakes³ are highly valuable, as they are the most vulnerable due to their reliance on water table connectivity. Historic, long-term lake level data are used to determine statistical metrics to assist in better lake management. Lakes are monitored at least monthly, although long-term, weekly to biweekly measurements would be optimal.

Long-term monitoring of lake levels is important to guide lake management and to understand fluctuations in lake levels. Currently, lake level monitoring is conducted by the Citizen Lake Monitoring Network (CLMN), UW Long Term Ecological Research Section (LTER), USGS, Central Sands (County-led projects) and North Lakeland Discovery Center in Vilas County. Citizen volunteers complete a substantial portion of lake level monitoring across the state. The USGS engages volunteers to monitor lake levels on the index lakes across the state. The North Lakeland Discovery Center has engaged volunteers in monitoring lake levels with staff gages since 2010. In the Central Sands region, volunteers have been monitoring shallow wells, as representative of lake levels, near lakeshores since 2013. The Land and Water Conservation departments in Adams, Marquette, Portage, Waupaca, and Waushara counties lead lake level monitoring efforts in each of their respective counties and monitoring is conducted by a combination of volunteers and county staff.

Groundwater-Level Monitoring

Monitoring groundwater levels can be used for: understanding local water resources, assessing aquifers in drought or wet conditions, assessing groundwater divides and surface water impacts, calibrating groundwater flow model and decision-making tools; and helping determine the relationship between water resources and withdrawals. The DNR and its partners at the United States Geological Survey (USGS) and the Wisconsin Geological and Natural History (WGNHS) collectively operate and maintain a statewide network of approximately 100 monitoring wells that provide necessary long-term data for Wisconsin's statewide water resources inventory. Groundwater level monitoring wells are in 47 of Wisconsin's 72 counties. The DNR's water quantity data viewer shows the location and water levels associated with the statewide groundwater monitoring network. In FY 2018, due to increasing reliance on network data to meet its Water Use program needs, DNR expanded its funding and management support of the groundwater level monitoring network. On a day-to-day basis USGS and WGNHS continue to support the evaluation and maintenance of the monitoring network, aid in data collection, interpretation, and provide information to public and private clients through dedicated webpages.

WGNHS provides an [overview](#) of the monitoring network and USGS maintains an [interactive portal](#) for viewing and downloading data. In FY 2024, DNR committed \$100,000 to the Wisconsin Groundwater Monitoring Network and provided additional funding of \$75,550 to USGS to conduct additional monitoring on 5 stream gages, 1 lake gage, and 18 short-term project wells in central Wisconsin. WGNHS received grants the USGS National Ground-Water Monitoring Network (NGWMN) program in FY 2023 and FY 2025 for \$177,899 and \$42,604 respectively. Once the work on both grants is completed, these two recent grants, together with FY2017, FY2019, FY2021 NGWMN grant, will result in repairs to 40 wells, twelve well replacements, seven new wells, and equipment upgrades to 17 wells. These improvements add three new counties to the Network (Barron, Buffalo, and St. Croix).

The DNR maintains [a monitoring website](#) to share information and illustrating the collaboration between DNR, WGNHS, USGS, UW and others to collect water quantity data

to support our understanding on groundwater levels and interaction between surface water and groundwater. Also visit our [Monitoring StoryMap](#) to learn more about the data and partnerships. Currently, the WU section funds USGS to monitor 18 short-term projects wells, on public and private lands, in the Central Sands region. All sites have been georeferenced and each well has been outfitted with pressure transducers to record water levels. Depending on the data generated within the first several years of these project wells, operation of some of these monitoring wells may be recommended and discussed with USGS/WGNHS for incorporation into the long-term Core Network if priorities and funds remain.

Springs

Groundwater [springs](#) are special places where the water table reaches the land surface and overflows into streams and wetlands. Springs are critical natural resources since they supply cool, oxygen-rich water for trout and often harbor threatened and endangered species. Spring data can provide us with insight on local groundwater levels and groundwater quality. Springs are often cherished for their scenic beauty at public parks and are spiritually significant to the indigenous tribes of Wisconsin. Because these special natural resources are vulnerable to groundwater pumping, the Department of Natural Resources (DNR) reviews high capacity well applications involving wells constructed near springs for adverse environmental impacts. There are over 10,000 known springs in Wisconsin, and it's critically important to have ongoing springs monitoring efforts to continue to improve Wisconsin's spring's inventory.

Aligning with the GCC mission - to assist in the efficient management and exchange of groundwater data - since 2007, agencies and researchers have worked together to the establishment a statewide springs inventory. In 2017, an initial springs inventory of more than 400 springs, with a flow rate of 0.25 cfs or more, was completed by Beloit College. The DNR continues the springs inventory monitoring project by revisiting these springs on a rotational basis, quarterly visiting eight reference spring sites across the state, and identifying new springs. More on springs and the map of springs monitoring can be found on [the DNR website](#). The [DNR Wisconsin Water Quantity Viewer](#) provides the public springs inventory to scientists, water resources managers and the public.

References:

1. Wis. Stats. s. 281.01(18) defines "Waters of the State" to include those portions of Lake Michigan and Lake Superior within the boundaries of this state, and all lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, marshes, watercourses, drainage systems and other surface water or groundwater, natural or artificial, public or private, within this state or its jurisdiction.
2. For DNR determinations for approval, see 281.35(5)(d)2. and NR 142.06(3)(d).
3. Spring lakes have no inlet but do have an outlet. Seepage lakes do not have a stream coming into or out of them but get most of their water from precipitation or runoff, supplemented by groundwater (<http://dnr.wi.gov/lakes/commonquestions/>). For additional lake information, see [DNR, WISCONSIN LAKES, PUB-FH-800 \(2009\)](#).