NORTH Dakota | Environmental Quality

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Agricultural Groundwater Monitoring Program

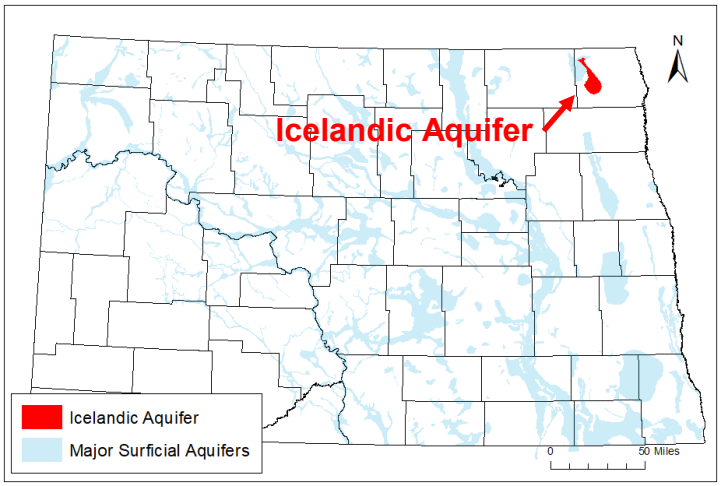
Icelandic Aquifer

Pembina County

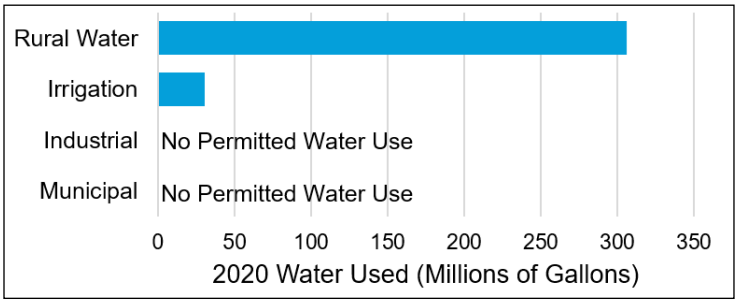
Aquifer At-a-Glance	
Area	88.6 square miles
Aquifer Type	Unconfined Surficial
Major Land Uses over Aquifer (percentage of aquifer area covered in 2017)[1]	Crops (60%) Grassland/Pasture (14%)
Depth to Water (2021)*	5-18 feet
Total Unique Wells Sampled	47
Wells Sampled in 2021	17
Samples Collected in 2021	20
Years Sampled	1992, 1997, 2002, 2007, 2012, 2016, 2021

*Depths to water may vary seasonally, year to year, and across the aquifer

- Aquifer materials consist of fine and medium sands that are interspersed with silt and clay. These materials were deposited as a sand spit by waves and currents along the shoreline of Glacial Lake Agassiz, which covered much of eastern North Dakota during the last ice age. Aquifer materials become more fine-grained in the deeper and eastern parts of the aquifer.[2]
- The aquifer is up to 70 feet thick and averages about 30 feet thick.[2]
- Domestic, irrigation, and stock wells are installed in the aquifer.
- The North Valley Water District rural water system draws water from the aquifer.
- In North Dakota, permits are required to withdraw large quantities of groundwater. In 2020, 337 million gallons of permitted water were drawn from the aquifer; rural water use consumed the largest quantity of water. For more information on water use and permits, contact the North Dakota Department of Water Resources (dwr.nd.gov).



2020 Icelandic aquifer permitted water use (from North Dakota Department of Water Resources (dwr.nd.gov))



About the Agricultural Groundwater Monitoring Program

- The North Dakota Department of Environmental Quality monitors a network of wells in approximately 50 surficial aquifers that are at elevated risk of agricultural contamination.
- Aquifers are sampled on a 5-year rotation.
- Monitoring began in 1992.
- The vast majority of these aquifers are located in central and eastern North Dakota.
- Water is tested for 21 general chemistry parameters, eight trace metals, and 64 pesticides.

References

(1) US Department of Agriculture, 2017, National Agricultural Statistics Service Cropland Data Layer.

(2) Hutchinson, R.D., 1977, Ground-Water Resources of Cavalier and Pembina Counties, North Dakota, North Dakota State Water Commission County Ground-Water Studies 20-Part 3, North Dakota Geological Survey Bulletin 62.

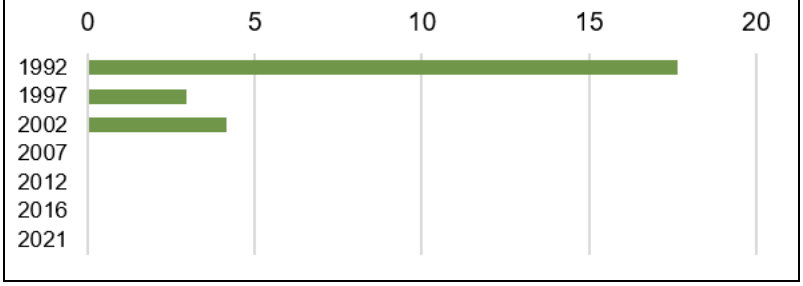
Water Chemistry

Is Aquifer Water High in…?	Analyte	Result	2021 Median Concentration	Potential Effects
	Arsenic	**Locally**	0.009 mg/L	Skin or circulatory system damage, increased cancer risk
	Iron	**YES**	12.9 mg/L	Metallic taste/odor, discoloration of surfaces
	Manganese	**YES**	1.40 mg/L	
	Sodium	**NO**	3.10 mg/L	Taste, people with certain health conditions may need to limit intake
	Sulfate	**NO**	29.9 mg/L	Taste/odor, laxative effect for people not used to the water
	For more information about Maximum Contaminant Levels (MCLs), health effects, and treatment options for these contaminants and more, see the NDDEQ's fact sheets (deq.nd.gov/wq/1_Groundwater) or visit the US EPA website (epa.gov/ground-water-and-drinking-water).			

Dominant Water Type	Water Hardness
Calcium-Bicarbonate	Very Hard

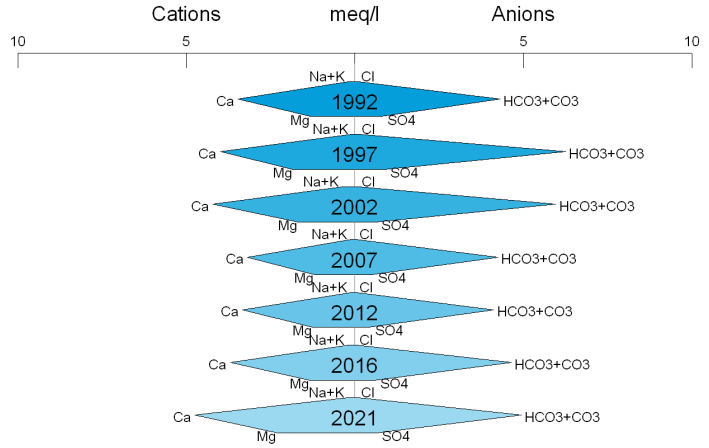
Nitrate

Percentage of Wells Exceeding the Nitrate Maximum Contaminant Level (MCL) (10 mg/L as N).*



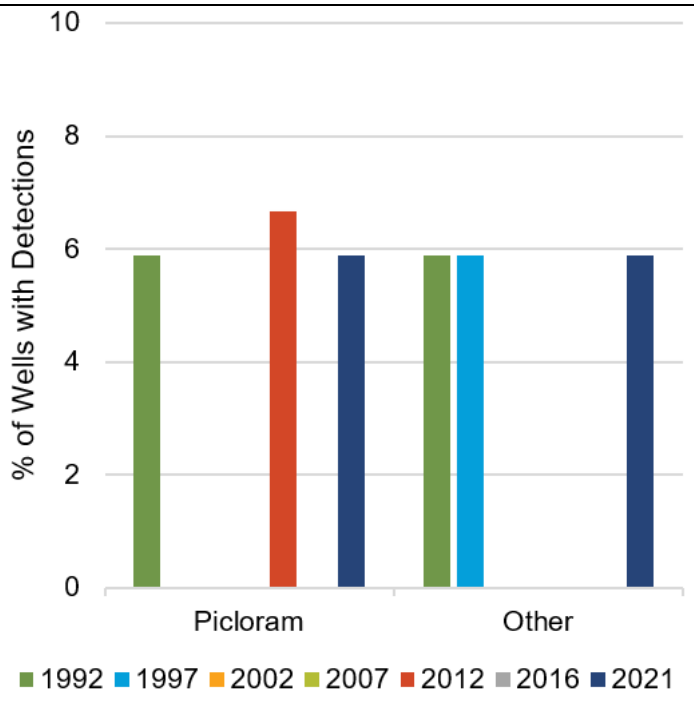
Stiff diagram of aquifer median general water chemistry.

Changes in diagram shape represent changes in general chemistry.



Pesticides

Percentage of wells with detections of each pesticide detected in the aquifer.



State Pesticide Management Plan

Agricultural Groundwater Monitoring Program aquifers are monitored as a part of the State Pesticide Management Plan. A Prevention Action Level (PAL) threshold of 25% of the pesticide's Maximum Contaminant Level (MCL)* or Health Advisory Level (HAL) is used to identify whether action is needed to prevent further contamination.

Prevention Action Level Exceedances	**None**
MCL or HAL Exceedances	**MCPA** at 460% of HAL in 1997; not detected in 1997 resample or later samples

Number of Unique Wells with Pesticide Detections since 1992	**5** of 47 Total Wells

2021 Pesticide Detections

Picloram	1 Well	Herbicide applied to crops and roads/rights-of-way
Metolachlor	1 Well	Herbicide applied to crops

*Note that MCLs are for public drinking water systems; private wells are not regulated in North Dakota. MCLs still provide guidelines for drinking groundwater.