NORTH Dakota | Environmental Quality
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Agricultural Groundwater Monitoring Program

Oakes Aquifer

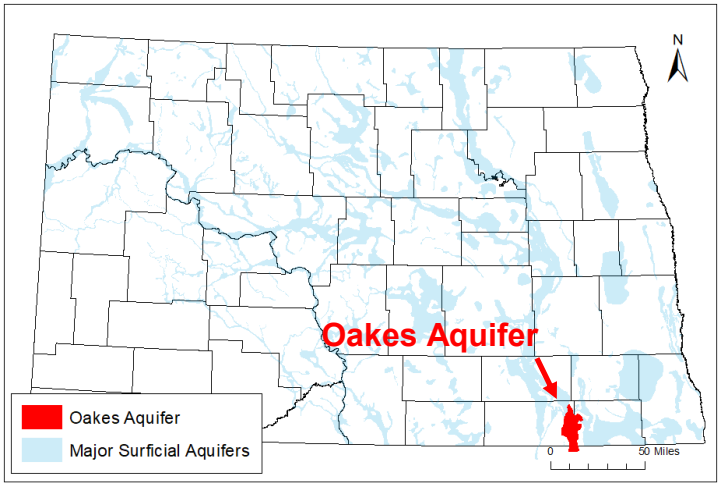
Dickey and Sargent Counties

Aquifer At-a-Glance	
Area	162.9 square miles
Aquifer Type	Unconfined and Confined Surficial
Major Land Uses over Aquifer (percentage of aquifer area covered in 2017)[1]	Crops (50%) Grassland/Pasture (30%)
Depth to Water (2017)*	0-20 feet
Total Unique Wells Sampled	175
Wells Sampled in 2017	66
Samples Collected in 2017	79
Years Sampled	1992, 1997, 2002, 2007, 2012, 2017
*Depths to water may vary seasonally, year to year, and across the aquifer	

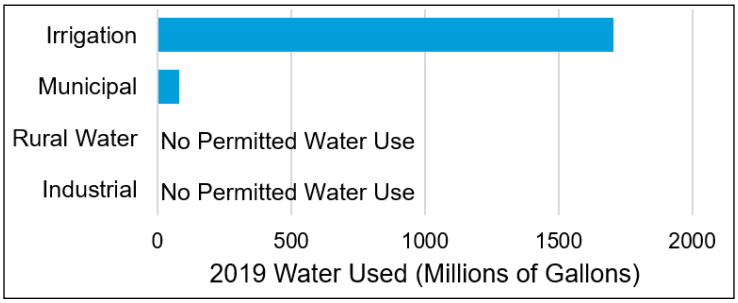
- Aquifer materials consist of silts, sands, and gravels. Deeper parts of the aquifer consist of sands and gravels deposited in an ancient stream valley. This was buried by sands and silts left behind by Glacial Lake Dakota during the last ice age. The northeastern part of the aquifer is buried by glacially-deposited clay till.[2,3]
- The aquifer ranges from 2-185 feet thick and averages about 30 feet thick in Dickey County and 80 feet thick in Sargent County.[2,3]
- Irrigation wells are common throughout the aquifer. Several domestic and stock wells are also installed in the aquifer.
- The city of Oakes draws water from the aquifer.
- In North Dakota, permits are required to withdraw large quantities of groundwater. In 2019, 1.8 billion gallons of permitted water were drawn from the aquifer; irrigation use consumed the largest quantity of water. For more information on water use and permits, contact the North Dakota State Water Commission (swc.nd.gov).

References

(1) US Department of Agriculture, 2017, National Agricultural Statistics Service Cropland Data Layer.
(2) RArmstrong, C.A., 1980, Ground-Water Resources of Dickey and LaMoure Counties, North Dakota, North Dakota State Water Commission County Ground-Water Studies 28-Part 3, North Dakota Geological Survey Bulletin 70.
(3) Armstrong, C.A., 1982, Ground-Water Resources of Ransom and Sargent Counties, North Dakota, North Dakota State Water Commission County Ground-Water Studies 31-Part 3, North Dakota Geological Survey Bulletin 69.



2019 Oakes aquifer permitted water use (from North Dakota State Water Commission (swc.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.

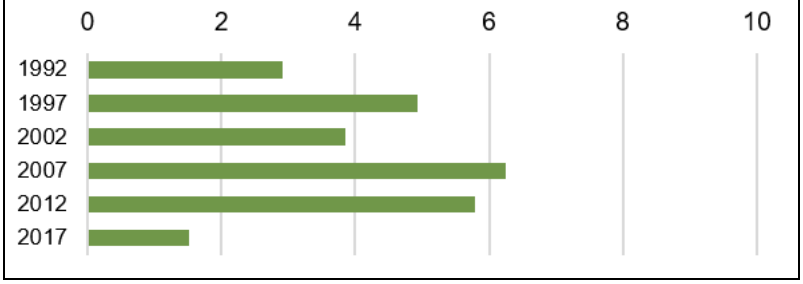
Water Chemistry

Is Aquifer Water High in…?	Analyte	Result	2017 Median Concentration	Potential Effects
	Arsenic	YES	0.014 mg/L	Skin or circulatory system damage, increased cancer risk
	Iron	YES	4.42 mg/L	Metallic taste/odor, discoloration of surfaces
	Manganese	YES	1.22 mg/L	
	Sodium	NO	29 mg/L	Taste, people with certain health conditions may need to limit intake
	Sulfate	NO	181 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

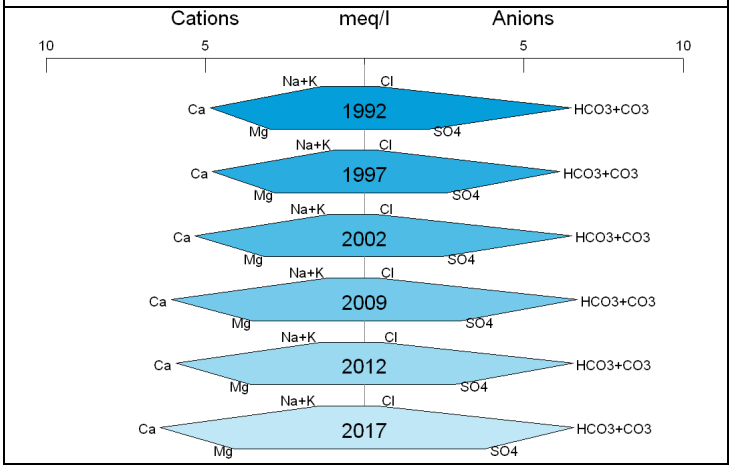
Nitrate

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



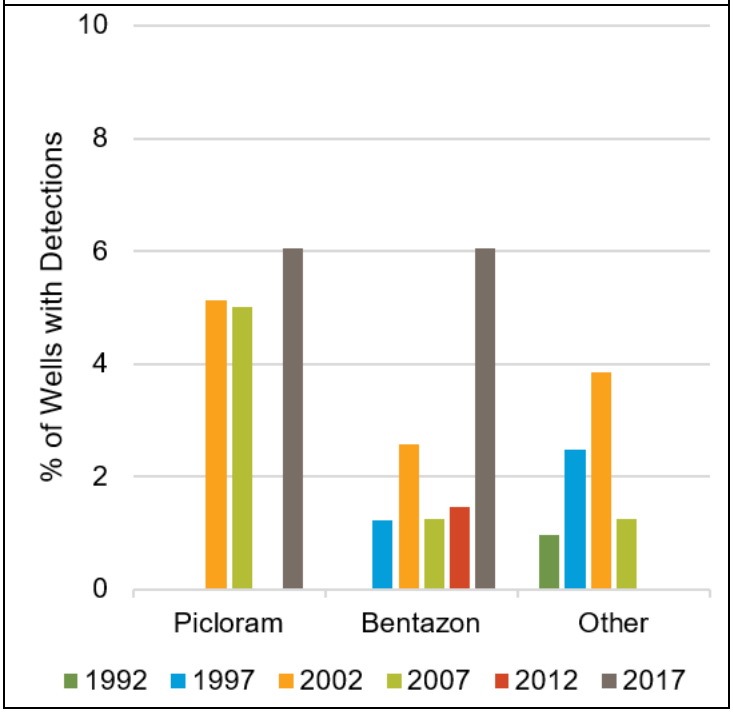
Stiff diagram of aquifer median general water chemistry.

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	**PCP** at 136% of MCL in 1997; at 34-56% of MCL in 2002 and 2003. Not sampled after 2003.
MCL or HAL Exceedances	**PCP** at 136% of MCL in 1997 (see above)

Number of Unique Wells with Pesticide Detections since 1992	**17** of 175 Total Wells

2017 Pesticide Detections

Picloram	4 Wells	Herbicide applied to crops and roads/rights-of-way
Bentazon	4 Wells	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.