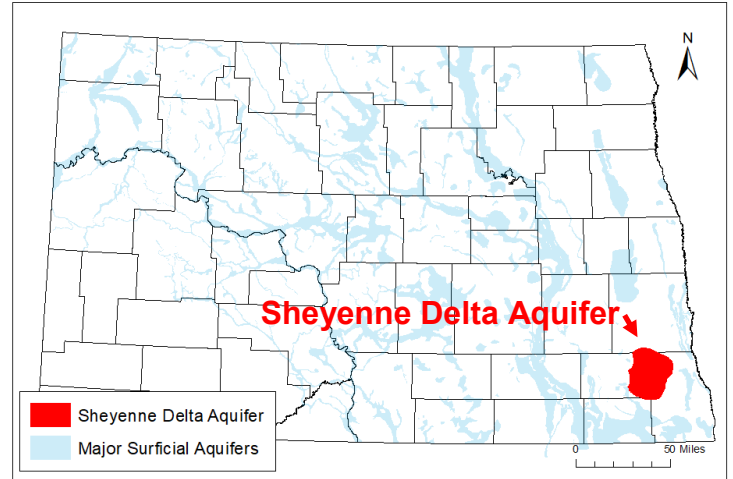


Sheyenne Delta Aquifer

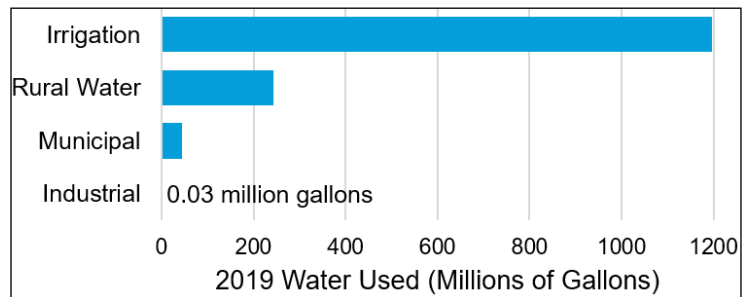
Cass, Ransom, Richland, and Sargent Counties

Aquifer At-a-Glance	
Area	504.2 square miles
Aquifer Type	Unconfined Surficial
Major Land Uses over Aquifer (percentage of aquifer area covered in 2017) ¹	Crops (46%) Grassland/Pasture (41%)
Depth to Water (2019)*	2-20 feet
Total Unique Wells Sampled	117
Wells Sampled in 2019	51
Samples Collected in 2019	72
Years Sampled	1994, 1999, 2004, 2009, 2014, 2019

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



2019 Sheyenne Delta aquifer permitted water use (from North Dakota State Water Commission (swc.nd.gov)) ↓



- Aquifer materials trend from coarse sands in the west to fine sands and silts in the east. Most aquifer materials were deposited by a river during the last ice age. The deep deposits are sands and silts that thicken to the east. These are overlain by coarser sands that are thickest in the west. The uppermost sands are wind-blown dunes.^{2,3}
- The aquifer is thickest (~200 feet) at its eastern edge and thins to the west. The more productive upper sand layer is thickest in the west at over 100 feet thick.^{2,3}
- Domestic and irrigation wells are the most common types of wells in the aquifer. Irrigation is concentrated in the western part of the aquifer.
- The Cass Rural Water District and Southeast Water Users District rural water systems draw water from the Sheyenne Delta aquifer.
- In North Dakota, permits are required to withdraw large quantities of groundwater. In 2019, 1.5 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) Armstrong, C.A, 1982, Ground-Water Resources of Ransom and Sargent Counties, North Dakota, North Dakota State Water Commission County Ground Water Study 31-Part 3, North Dakota Geological Survey Bulletin 69.
 (3) Baker, C.H. Jr & Paulson, Q.F, 1967, Geology and Ground Water Resources, Richland County, North Dakota, North Dakota State Water Commission County Ground Water Study 7-Part 3, North Dakota Geological Survey Bulletin 46.

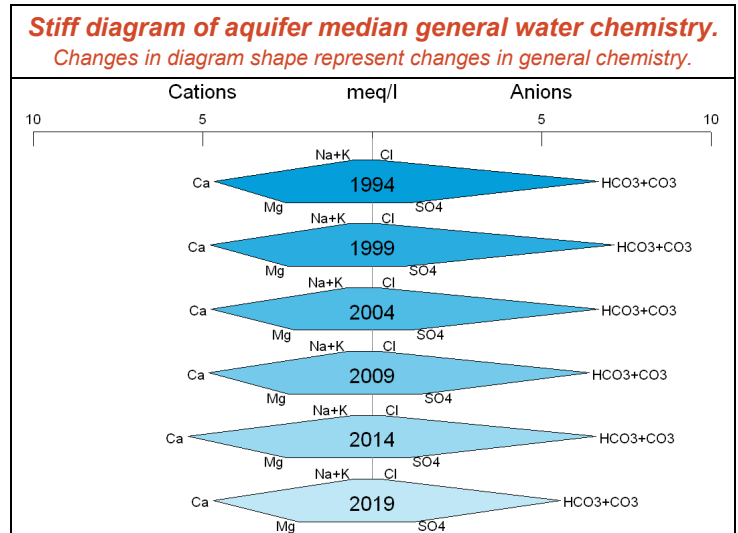
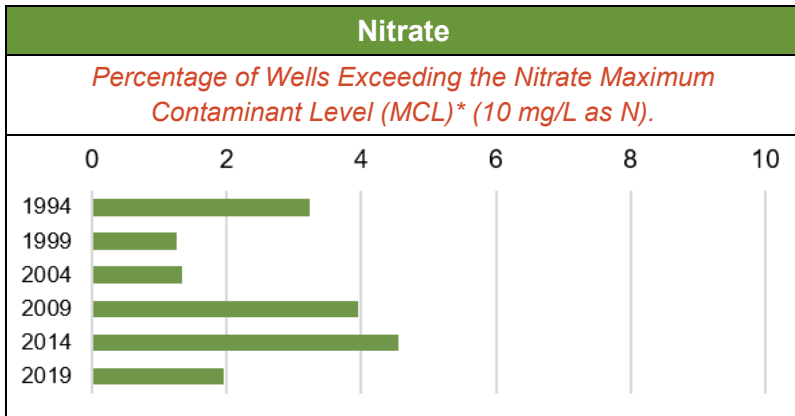
About the Agricultural Groundwater Monitoring Program

- 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.

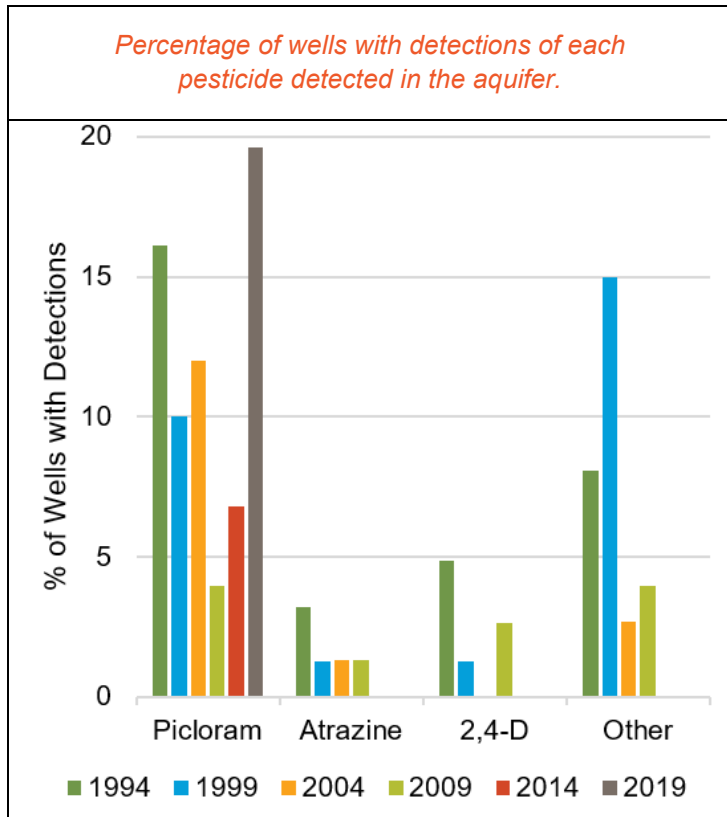
Water Chemistry

Is Aquifer Water High in...?	Analyte	Result	2019 Median Concentration	Potential Effects
	Arsenic	YES	0.011 mg/L	Skin or circulatory system damage, increased cancer risk
	Iron	YES	4.01 mg/L	Metallic taste/odor, discoloration of surfaces
	Manganese	YES	0.88 mg/L	
	Sodium	NO	10.5 mg/L	Taste, people with certain health conditions may need to limit intake
	Sulfate	NO	58.8 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



Pesticides



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	<p>Alachlor at 56% of MCL in 2009; resample in 2009 at 26% of MCL. Not detected above the PAL in any later samples.</p> <p>Atrazine at 45% of MCL in 1995; not detected in 1995 resample. Detected in same well at 27% of MCL in 1999; not detected in 1999 resample. Not detected above the PAL in any later samples.</p> <p>Aldicarb-Sulfoxide at 27% of MCL in 1994; not detected in 1995 resample or any later samples.</p>
MCL or HAL Exceedances	None
Number of Unique Wells with Pesticide Detections since 1994	42 of 117 Total Wells
2019 Pesticide Detections	
Picloram	10 Wells Herbicide applied to crops and roads/rights-of-way

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

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