DEPARTMENT OF HEALTH

2020-2022 Nitrate Annual Report

COMMUNITY PUBLIC WATER SYSTEMS

September 2024

2020-2022 Nitrate Annual Report: Community Public Water Systems

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Introduction

The Drinking Water Protection Section (DWP) at the Minnesota Department of Health (MDH) typically updates this report once per year, although the current report covers data from 2020 to 2022.

The nitrate report was created to provide a summary of recent nitrate monitoring results and some of the actions that are being taken to reduce nitrate levels in Minnesota's drinking water. The report includes information from Community Public Water Systems (PWSs), which are water systems that provide water to people in their homes or place of residence. PWSs are tested for the presence of nitrate no less than once per year under the federal Safe Drinking Water Act (SDWA). Water samples described in this report measure the level of nitrate by the presence of nitrogen. These samples are collected from two places in a water system:

- The drinking water supply source: this is raw (untreated) water.
- The entry point into the distribution system: this represents finished water (after any treatment), which is the water that is delivered to consumers at their homes.

Other public water systems in Minnesota, called noncommunity water systems, are also tested for nitrate under the SDWA at least once per year. Noncommunity water systems serve places such as schools, businesses, churches, parks, restaurants, and campgrounds which use their own water supply (e.g., well). While data for noncommunity systems is not included in this report, more information about nitrate at noncommunity systems is available from MDH and may be included in future editions of this report.

Nitrate in Drinking Water

Nitrate occurs naturally in water but becomes elevated due to anthropogenic activities at which point it is considered a contaminant. Natural processes, such as plant decay, can cause low levels of nitrate in drinking water. Natural processes usually contribute less than 3 milligrams of nitrate (measured as nitrogen) per liter of drinking water (mg/L)[1]. Nitrate levels above this amount suggest human-made nitrate sources have contaminated the water, and those levels could increase over time. Human-made sources of nitrate can include runoff or leakage from fertilized soil, wastewater, landfills, animal feedlots, septic systems, or urban drainage. It can be difficult to identify where the nitrate in drinking water comes from because there are many possibilities.

The Safe Drinking Water Act (SDWA) limit for nitrate in drinking water is 10 mg/L [(2)]. Drinking water with levels of nitrate at or below 10 mg/L is considered safe for everyone. However, drinking water above that level is a health risk, primarily for infants under six months. This is because the infant's digestive system can convert the nitrate to nitrite, which can interfere with the ability of the infant's blood to carry oxygen. The result is a serious illness known as methemoglobinemia, or "blue baby

[1] Madison, R.J., and J.O. Brunett. 1985. Overview of the occurrence of nitrate in ground water of the United States. In National Water Summary 1984: Hydrological Events, Selected Water-Quality Trends, and Ground-Water Resources, USGS Water Supply Paper 2275, 93–105. Washington, D.C.: U.S. Government Printing Office.
[2] One milligram per liter (mg/L) is roughly the same as 1 part per million.

syndrome", where the blood can no longer transport oxygen around the body. Methemoglobinemia can be fatal if nitrate levels in the water are high enough and the illness isn't treated adequately.

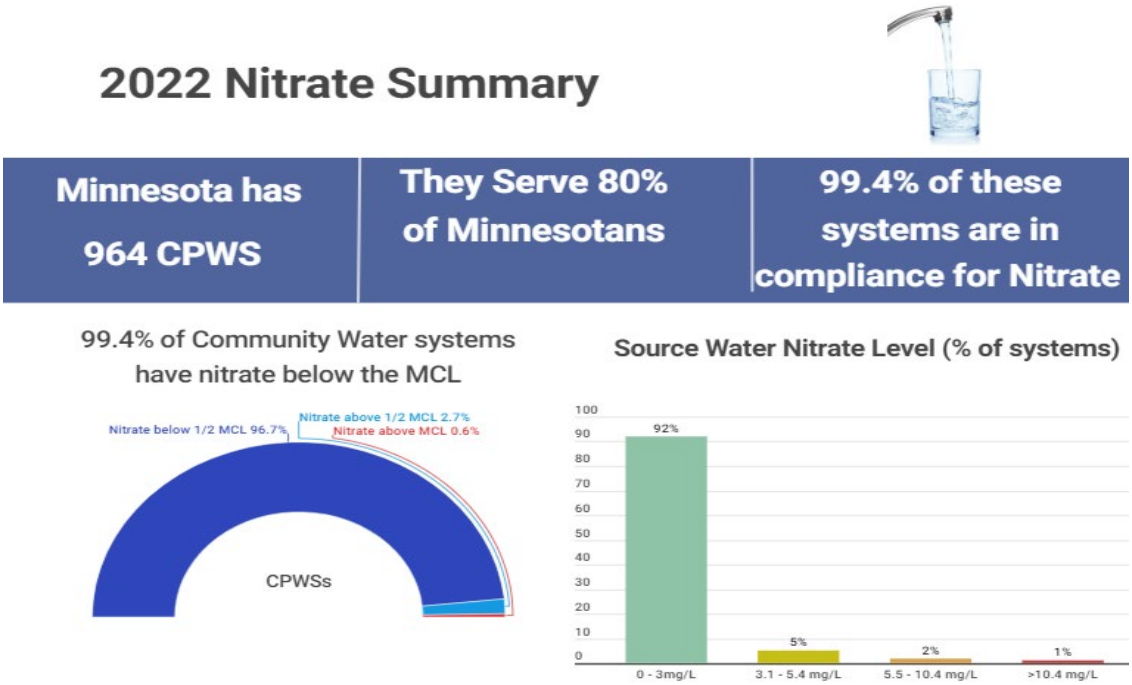
All CPWSs in Minnesota are tested at least once a year for nitrate to ensure levels meet the SDWA limit. If a public water system exceeds the SDWA standard limit, the people who use the water are notified and advised not to use the water for mixing infant formula or other uses that might result in the consumption of the water by infants under six months of age. The advisory is kept in place until steps can be taken to reduce nitrate levels in the water. Possible remedial measures include treating the water to remove the nitrate or drilling a new well.

To find the level of nitrate detected at a particular CPWS, read the system's Consumer Confidence Report (CCR). Search for your Consumer Confidence Report (CCR)(https:/mnccr.web.health.state.mn.us/index.faces) online or contact your public water system for a paper copy.

For more information, please visit Nitrate in Drinking Water https://www.health.state.mn.us/communities/environment/water/contaminants/nitrate.html

What is Being Done

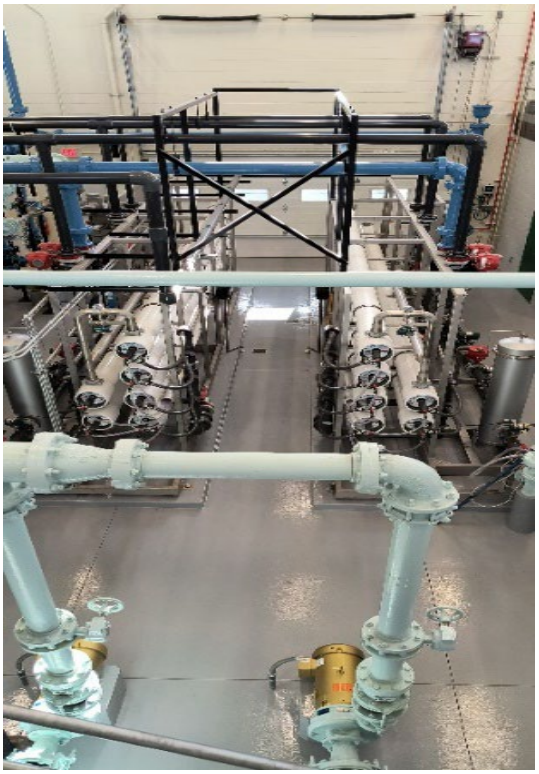
MDH works with public water systems in various ways to protect drinking water. The Drinking Water Protection Program focuses on enforcing the Safe Drinking Water Act through inspections and corrective action, reviewing plans for new infrastructure or changes in water treatment procedures, coordinating training and certification for water operators, and helping public water suppliers address contamination problems.



In addition, MDH requires systems to conduct wellhead protection planning and implementation to protect their water sources from contamination. Grants and technical assistance are available to

facilitate the implementation of activities that protect drinking water sources. MDH helps private well owners by establishing and enforcing laws and rules for proper construction and sealing of wells and borings and by providing guidance for private well owners on Water Quality/Well Testing/Well Disinfection (https://www.health.state.mn.us/communities/environment/water/wells/waterquality/index.html).

MDH also partners with organizations working to reduce nitrate in our groundwater. The Minnesota Department of Agriculture (MDA) monitors and helps reduce nitrate from agricultural sources. Local governments, including counties and Soil and Water Conservation Districts, help people manage nitrate from lawns, agriculture, and other sources. The University of Minnesota Extension Services conducts research and provides education for nitrogen fertilizer use. The Minnesota Pollution Control Agency released the Groundwater Protection Recommendations Report (PDF) in 2016, which outlines ways to reduce nitrate and other contaminants in our water.



Health Equity

Safe, reliable, and affordable drinking water is essential for the health of all Minnesotans and our economy. Minnesota's CPWSs have high compliance with the Safe Drinking Water Act and do much better than the national average. Yet, challenges remain, especially with smaller CPWSs and systems servicing disadvantaged communities. About 7 percent of CPWSs had nitrate levels above 3 mg/L in their treated water in 2022. These water systems are mostly in the state's southwestern, southeastern, central, and north-central agricultural regions. To address challenges, the Drinking Water Revolving Fund (DWRF) provides financial and technical assistance to systems in need, through principal-forgiveness grants and below-market-rate loans.

One success story is the central Minnesota city of Verndale. In 2017, one of the city's two drinking water wells exceeded the MCL for nitrate, and the city stopped using that well. Because nitrate levels in the remaining well were also high and alternative water sources were hard to find, their best option was to install treatment for nitrate removal. Verndale is a small city with a population of 559 and a poverty level of 29.53%. Their 2022 median household income was $55,756. The cost per household for the project in 2018 would have been close to $17,000.

The city qualified for a DWRF loan at 1% for 20 years, a DWRF principal forgiveness grant, and a Water Infrastructure grant totaling $3,705,878. This enabled Verndale to build a reverse osmosis treatment system for nitrate removal, which began fully operating in 2020, and also to drill an additional well. The grants and low interest loan reduced the financial burden that would have been

placed on Verndale's residents, and now they have a brand-new facility providing them with excellent, safe drinking water.

MDH also provides assistance to low-resource communities and small systems serving disadvantaged communities through Source Water Protection (SWP) Grants. Grants are awarded through a points system, and water systems below the county median household income receive a health equity point, which helps prioritize getting grants to the systems who most need the help.

Battle Lake Mobile Home Park is an example of a system that received an equity point due to small size. In 2012, the system had to quit using their original well due to increasing nitrate Levels. They drilled a new, deeper well, which started out with low nitrates and then steadily increased until 2019 when it exceeded the MCL for nitrate.

A Source Water Protection competitive grant received in 2019 assisted Battle Lake Mobile Home Park to seal the original well, which had holes in its casing. Sealing the well prevented contaminated surface water from leaking through the old well shaft back down into the ground and affecting the new well. As a result, Battle Lake Mobile Home Park saw a dramatic drop in nitrate levels (12.00 mg/L in May 2020 to 9.50 mg/L in December 2020 and then 6.00 mg/L in June 2022). With the water source now protected, Battle Lake Mobile Home Park will have safe drinking water for years to come.

Notes on the Data in this Report

The data tables found at the end of this report provide several views of the status of nitrate at Minnesota's public water systems. Table 1 illustrates where nitrate results above 8.0 mg/L in finished water have been observed. As systems with these levels are nearing, or above, the MCL of 10 mg/L, MDH has worked with them to address and lower nitrate levels, as described in the table. Tables 2 and 3 illustrate situations where nitrate is above 3.0 mg/L in source water, an indication that nitrate related to human activity is potentially impacting the source water.

The data source for this report is the Minnesota Drinking Water Information System (MNDWIS), which is made up of all the results of samples collected for compliance with the Federal Safe Drinking Water Act. This report includes data from sampling that occurred through December 31, 2022.

The data tables found at the end of this report provide several views of the status of nitrate at Minnesota's public water systems. Table 1 illustrates where nitrate results above 8.0 mg/L in finished water have been observed. As systems with these levels are nearing, or above, the MCL of 10 mg/L, MDH has worked with them to address and lower nitrate levels, as described in the table. Tables 2 and 3 illustrate situations where nitrate is above 3.0 mg/L in source water, an indication that nitrate related to human activity is potentially impacting the source.

CPWSs may take multiple samples for nitrate in a given period. A CPWS is included in this report if any of those samples is above the level of interest (3.0 mg/L or 8.0 mg/L). Nitrate levels vary over time and when they are above 8.0 mg/L, a system is considered to be at a higher risk for exceeding the nitrate MCL of 10 mg/L.

Scope

- Most data in this document goes back to 1994 when electronic reporting began. Monitoring for nitrate began earlier, but we do not have electronic records of these results.
- We have data on pre-1994 violations, which are included in this document.
- The data includes all known CPWS wells that were active from 1994-present. Not all of these wells are actively used today. Some are now only used in emergencies. Some are no longer used and may be sealed.
- The data does not include wells that were only ever used for emergency purposes.

Sources of Drinking Water

- Source data includes all drinking water sources (e.g., wells, intakes) that have been active since 1994. Some sources may now be sealed, inactive, or otherwise not currently used.
- Some CPWSs may have more than one source with nitrate issues.

Costs

- Actions to address nitrate, including installing treatment, finding a new source of water, or connecting to another public water system, can cause unintended consequences and costs. For example, installing one treatment to address nitrate without considering other impacts or contaminants could result in unintended consequences. This document does not capture these unintended consequences and the costs associated with them.
- This document includes capital costs for treatment, where data is available to MDH.
- Cost figures do not include costs for other nitrate management actions like blending, drilling a new well, or connecting to another system.
- Cost figures do not include maintenance and operation (ongoing) costs.

Finished Drinking Water Data

Finished water is the water that reaches customers at their taps, after any treatment.

Table 1. CPWSs with Nitrate Levels of Greater Than 8.0 mg/L in Finished Drinking Water *(1994-present)*

Since 1994, 52 CPWSs have had finished drinking water nitrate levels greater than 8.0 mg/L.

Community Public Water System	County	Current Population	Surface or Groundwat-er System	Highest Historic Nitrate Level in Drinking Water (mg/L)	Most Recent SDWA Nitrate Violation Year	Highest 2022 Nitrate Level in Drinking Water (mg/L)[3]	Actions (Management, SWP, or Both)[4]	Estimated Capital Cost for Treatment in 2022 Dollars[5]	Estimated Cost per household[6] (2022 Dollars)
Adrian	Nobles	1,211	Groundwater	16	1993	3.0	Both	$1,072,652	$2,001
Altura	Winona	493	Groundwater	8.2	No Violation	7.0	Both		
Atwater	Kandiyohi	1,133	Groundwater	9.7	No Violation	9.2	Both		
Balaton	Lyon	639	Groundwater	9.7	No Violation	0.84	Both		
Battle Lake Mobile Home Park	Otter Tail	31	Groundwater	13	2019	8.0	Both		
Beardsley	Big Stone	181	Groundwater	12	1996	<0.05	Management		

[3] "Inactive" means the CWS is no longer providing drinking water. "Buys water" means the CWS buys water from another CWS and is therefore not required to test for ntirate.
[4] Management actions include treatment, blending, changing the source of drinking water (i.e. drilling a new well or connecting to another CWS), and enhanced monitoring. Source water protection (SWP) actions mean the CWS has a source water protection plan and/or has received an MDH source water protection grant.
[5] This column presents the estimated cost for installing treatment for all systems that installed treatment for nitrate. We didn't include other costs such as drilling a new well, but the costs were explained in the paragraph above the table.
[6] Costs marked with a "*" were estimated using a value of 2.5 people per household.

Community Public Water System	County	Current Population	Surface or Groundwat-er System	Highest Historic Nitrate Level in Drinking Water (mg/L)	Most Recent SDWA Nitrate Violation Year	Highest 2022 Nitrate Level in Drinking Water (mg/L)[3]	Actions (Management, SWP, or Both)[4]	Estimated Capital Cost for Treatment in 2022 Dollars[5]	Estimated Cost per household[6] (2022 Dollars)
Brookhaven Development	Scott	45	Groundwater	12	2022	12	Management		
Chandler	Murray	270	Groundwater	16	1999	5.0	Both		
Clear Lake	Sherburne	525	Groundwater	13	1993	1.9	Both	$787,950	$3,592
Cold Spring	Stearns	4,201	Groundwater	12	2004	7.8	Both		
Country Court Manufactured Home Park	Renville	Inactive	Groundwater	18	No Violation	Inactive	None		
Darfur	Watonwan	87	Groundwater	9.7	No Violation	Buys water	Both		
Edgerton	Pipestone	1,171	Groundwater	20	1993	8.1	Both	$556,408	$1,078
Eitzen	Houston	242	Groundwater	18	1993	<0.05	Both		
Elgin	Wabasha	1,089	Groundwater	11	No Violation	8.8	Both		
Ellsworth	Nobles	462	Groundwater	20	2019	8.2	Both	$711,038	$3,847.6*
Fairmont	Martin	10,328	Surface water	12	2016	0.93	Both		
Halstad	Norman	576	Groundwater	8.2	No Violation	1.1	None		
Hardwick	Rock	198	Groundwater	11	No Violation	Buys water	Management		
Hastings	Dakota	23,222	Groundwater	11	1999	8.4	Both	$4,731,047	$527
Hills	Rock	685	Groundwater	8.2	No Violation	Buys water	Management		

Community Public Water System	County	Current Population	Surface or Groundwat-er System	Highest Historic Nitrate Level in Drinking Water (mg/L)	Most Recent SDWA Nitrate Violation Year	Highest 2022 Nitrate Level in Drinking Water (mg/L)[3]	Actions (Management, SWP, or Both)[4]	Estimated Capital Cost for Treatment in 2022 Dollars[5]	Estimated Cost per household[6] (2022 Dollars)
Ivanhoe	Lincoln	559	Groundwater	8.4	No Violation	Buys water	Management		
Jasper	Pipestone	623	Groundwater	8.8	No Violation	Buys water	Management		
Leota	Nobles	209	Groundwater	22	2011	Buys water	Management		
Lewiston	Winona	1,620	Groundwater	12	1998	<0.05	Both		
Lincoln-Pipestone Rural Water System	Lincoln	13,644	Groundwater	25	1997	9.0	Both	$2,980,423	$546.1*
Luverne	Rock	4,688	Groundwater	19	No Violation	0.58	Both		
Magnolia	Rock	214	Groundwater	8.2	No Violation	Buys water	Management		
Melrose	Stearns	3,677	Groundwater	14	1996	4.3	Both		
Mobile Manor Mobile Home Park	Scott	197	Groundwater	10	No Violation	8.7	Management		
Northfield	Rice	20,515	Groundwater	9.4	No Violation	1.4	Both		
Oak Grove Mobile Home Park	Becker	60	Groundwater	12	2022	12	Both		
Oak Hills Fellowship Bible College	Beltrami	150	Groundwater	14	2009	1.0	Management		

Community Public Water System	County	Current Population	Surface or Groundwat-er System	Highest Historic Nitrate Level in Drinking Water (mg/L)	Most Recent SDWA Nitrate Violation Year	Highest 2022 Nitrate Level in Drinking Water (mg/L)[3]	Actions (Management, SWP, or Both)[4]	Estimated Capital Cost for Treatment in 2022 Dollars[5]	Estimated Cost per household[6] (2022 Dollars)
Ostrander	Fillmore	256	Groundwater	9.8	No Violation	<0.05	Both		
Park Rapids	Hubbard	4,247	Groundwater	12	2010	<0.05	Both		
Perham	Otter Tail	3,421	Groundwater	10	No Violation	4.4	Both		
Randall	Morrison	650	Groundwater	14	2015	1.0	Both		
Richmond	Stearns	1,457	Groundwater	11	1996	0.16	Both		
Rock County Rural Water System	Rock	2,919	Groundwater	23	No Violation	5.8	Both		
Rockwood Estates	Benton	400	Groundwater	27	2006	6.6	Management		
Roscoe	Stearns	104	Groundwater	11	2021	9.1			
Saint John's University	Stearns	2,500	Groundwater	24	No Violation	0.47	None		
Shakopee	Scott	40,610	Groundwater	12	No Violation	7.0	Both		
Southview Heights	Blue Earth	Inactive	Groundwater	9.5	No Violation	Inactive	None		
Steen	Rock	180	Groundwater	8.2	No Violation	Buys water	Management		
Sundsruds Court	Hubbard	40	Groundwater	22	2015	3.8	Both	$21,655	$1,353.44*

Community Public Water System	County	Current Population	Surface or Groundwat-er System	Highest Historic Nitrate Level in Drinking Water (mg/L)	Most Recent SDWA Nitrate Violation Year	Highest 2022 Nitrate Level in Drinking Water (mg/L)[3]	Actions (Management, SWP, or Both)[4]	Estimated Capital Cost for Treatment in 2022 Dollars[5]	Estimated Cost per household[6] (2022 Dollars)
Tamarack Court, Inc.	Stearns	Inactive	Groundwater	13	2004	Inactive	Management		
The Meadows	Wright	1,000	Groundwater	10	No Violation	6.8	Management		
Timberline Mobile Home Park	Roseau	130	Groundwater	9.9	No Violation	<0.05	Management		
Trosky	Pipestone	86	Groundwater	9.0	No Violation	Buys water	Management		
Utica	Winona	293	Groundwater	14	2020	8.6	Both		
Verndale	Wadena	559	Groundwater	11	2017	2.10	Both	$4,319,050	$19,316*

Source Water Data

Source water is the water that comes from the drinking water source before any treatment and before it is distributed to customers.

Table 2. Number of CPWSs with Nitrate above 3.0 mg/L in Source Water *(January 2020 – December 2022)*

Data from January 2020 – December 2022, 80 CPWSs had source-water nitrate levels above 3.0 mg/L.

Nitrate Level (mg/L)	2020 CPWS	2021 CPWS	2022 CPWS
> 3 to 5	41	39	39
> 5 to 10	20	19	21

Nitrate Level (mg/L)	2020 CPWS	2021 CPWS	2022 CPWS
Over 10	12	12	10
Total	**73**	**70**	**70**

See Appendix A for a map of CPWSs with nitrate above 3.0 mg/L in source water.

Table 3. CPWSs with Nitrate above 3.0 mg/L in Source Water *(January 2020 – December 2022)*

This table shows data from January 2020 – December 2022, 80 CPWSs had source-water nitrate levels above 3.0 mg/L.

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2020-2022 Nitrate Level in Source Water (mg/L)
Adrian	1,211	Groundwater	32	13
Altura	493	Groundwater	8.2	7.7
Atwater	1,133	Groundwater	9.7	9.7
Austin Mobile Home Park	59	Groundwater	6.7	4.8
Austin Utilities	26,174	Groundwater	3.5	3.5
Battle Lake	918	Groundwater	5.1	3.8
Battle Lake Mobile Home Park	31	Groundwater	13	12
Bay Lake Reserve Development	80	Groundwater	3.9	3.9
Beardsley	181	Groundwater	13	3.7
Becker	4,720	Groundwater	7.5	6.4
Belle Plaine	6,901	Groundwater	5.2	4.6
Bethany Water Company	60	Groundwater	6.2	6.2
Big Lake	11,686	Groundwater	6.9	4.8

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2020-2022 Nitrate Level in Source Water (mg/L)
Bonnevista Terrace Mobile Home Park	579	Groundwater	6.3	5.2
Brookhaven Development	45	Groundwater	12	12
Brownsdale	682	Groundwater	5.4	4.4
Canton	310	Groundwater	3.4	3.4
Chandler	270	Groundwater	16	7.8
Chatfield	2,997	Groundwater	5.4	5.4
Clearwater	1,922	Groundwater	4.5	4.5
Clearwater Well Company	65	Groundwater	3.9	3.1
Cold Spring	4,201	Groundwater	12	11
Darfur	87	Groundwater	9.7	9.2
Edgerton	1,171	Groundwater	20	18
Elgin	1,089	Groundwater	11	10
Ellsworth	462	Groundwater	32	18
Glenwood	2,657	Groundwater	8.1	8.1
Goodhue	1,200	Groundwater	6.9	6.9
Harmony	1,042	Groundwater	5.1	5.1
Hastings	23,222	Groundwater	13	13
Hiawatha Estates, Subds. I, II & III	95	Groundwater	3.8	3.3
Holdingford	770	Groundwater	3.7	3.6
Indian Hills Development	156	Groundwater	5.1	3.5

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2020-2022 Nitrate Level in Source Water (mg/L)
Isanti Estates	267	Groundwater	5.9	5.2
Kasota	670	Groundwater	5.1	4.0
Kellogg	469	Groundwater	4.0	3.4
Lake City	5,042	Groundwater	3.8	3.5
Lake Elmo	8,122	Groundwater	4.0	3.9
Lincoln-Pipestone Rural Water System	13,644	Groundwater	25	19
Mankato	42,803	Surface water	14	6.0
Melrose	3,677	Groundwater	14	9.6
Milaca	2800	Groundwater	4.0	4.0
Milan	369	Groundwater	6.2	6.2
Millville	171	Groundwater	3.4	3.4
Mobile Manor Mobile Home Park	197	Groundwater	10	10
Moose Lake	1,259	Groundwater	7.2	4.2
Northfield	20,515	Groundwater	9.4	4.6
Oak Grove Mobile Home Park	60	Groundwater	12	12
Oak Park Heights	4,849	Groundwater	3.7	3.6
Paynesville	2530	Groundwater	3.4	3.4
Perham	3,421	Groundwater	12	12
Pine River	941	Groundwater	5.5	4.6
Pines Mobile Estates	60	Groundwater	7.5	4.4

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2020-2022 Nitrate Level in Source Water (mg/L)
Pipestone	4,273	Groundwater	4.7	3.9
Plainview	3,340	Groundwater	5.7	5.4
Rice	1,279	Groundwater	7.3	7.3
Rock County Rural Water System	2,919	Groundwater	28	24
Rockwood Estates	400	Groundwater	27	7.5
Roosevelt Court	60	Groundwater	5.6	5.6
Roscoe	104	Groundwater	11	11
Rosemount	22,445	Groundwater	5.6	5.4
Saint Paul Park	5,404	Groundwater	3.6	3.4
Saint Peter	11,784	Groundwater	21	21
Sauk Rapids	13,083	Groundwater	5.4	4.7
Scandia Water Company	35	Groundwater	3.2	3.2
Shakopee	40,610	Groundwater	12	6.5
Shores of Eagle Lake	68	Groundwater	5.0	5.0
South Saint Paul	20,400	Groundwater	4.3	3.5
Spring Grove	1,291	Groundwater	3.9	3.7
Stillwater	19,471	Groundwater	4.0	4.0
Sundsruds Court	40	Groundwater	32	32
Swanville	351	Groundwater	5.1	3.8
The Meadows	1,000	Groundwater	10	7.1

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2020-2022 Nitrate Level in Source Water (mg/L)
Timberlane Estates	64	Groundwater	3.6	3.2
Utica	293	Groundwater	18	15
Valley Mobile Home Park	34	Groundwater	5.8	3.9
Vermillion	451	Groundwater	4.0	4.0
Verndale	559	Groundwater	11	8.7
Walker	934	Groundwater	6.1	6.1
Zumbro Falls	181	Groundwater	3.5	3.2

Table 4. CPWSs with Nitrate above 3.0 mg/L in Source Water *(1994-present)*

This table shows data since 1994, 122 CPWSs have had source-water nitrate levels above 3.0 mg/L.

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2022 Nitrate Level in Source Water (mg/L)[7]	Source Water Protection Activities (plan, grant, or both)[8]	Estimated Capital Cost for Treatment in 2022 Dollars
Adams	820	Groundwater	6.8	< 0.05	Plan	
Adrian	1,211	Groundwater	32	13	Both	$1,072,652
Altura	493	Groundwater	8.2	7.6	Both	
Atwater	1,133	Groundwater	9.7	9.2	Both	
Austin Mobile Home Park	59	Groundwater	6.7	4.0		
Austin Utilities	26,174	Groundwater	3.5	3.5	Plan	
Avon	1,454	Groundwater	4.3	No Sampling	Both	
Balaton	639	Groundwater	9.7	1.1	Both	
Battle Lake	918	Groundwater	5.1	3.6	Both	
Battle Lake Mobile Home Park	31	Groundwater	13	8.0	Both	
Bay Lake Reserve Development	80	Groundwater	3.9	3.9		
Beardsley	225	Groundwater	13	No Sampling		

[7] "Inactive" means the CWS is no longer providing drinking water. "Buys water" means the CWS buys water from another CWS. No sampling" means the CWS did not collect voluntary source samples because they are inactive, buy water from another CWS, did not need to sample because previous samples showed low nitrate levels (below 3.0 mg/L), did not have the resources to collect samples, or collected their own samples and MDH does not have the results.

[8] The CWS has a source water protection plan, has received an MDH source water protection grant, or both. If blank, the CWS may be working on a plan. CWSs with higher risk of contamination must start a plan by June 2020.

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2022 Nitrate Level in Source Water (mg/L)[7]	Source Water Protection Activities (plan, grant, or both)[8]	Estimated Capital Cost for Treatment in 2022 Dollars
Becker	4,720	Groundwater	7.5	6.4	Plan	
Belle Plaine	6,901	Groundwater	5.2	3.8	Plan	
Bellechester	169	Groundwater	4.5	< 0.05	Both	
Bethany Water Company	60	Groundwater	6.2	6.2		
Big Lake	11,686	Groundwater	6.9	4.4	Plan	
Bonnevista Terrace Mobile Home Park	579	Groundwater	6.3	4.9		
Boyd	175	Groundwater	7.0	Buys water		
Brookhaven Development	45	Groundwater	12	12		
Brownsdale	682	Groundwater	5.4	4.2	Plan	
Buckman	270	Groundwater	6.9	0.80	Plan	
Caledonia	2,824	Groundwater	8.6	1.0	Both	
Cambridge	9,249	Groundwater	7.3	No Sampling	Both	
Canton	310	Groundwater	3.4	3.3	Plan	
Chandler	270	Groundwater	16	5.0	Plan	
Chatfield	2,997	Groundwater	5.4	4.9	Both	
Clear Lake	525	Groundwater	31	< 0.05	Both	$787,950
Clearwater	1,922	Groundwater	4.2	3.6	Both	
Clearwater Well Company	65	Groundwater	3.9	3.1		
Cold Spring	4,201	Groundwater	12	7.8	Both	

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2022 Nitrate Level in Source Water (mg/L)[7]	Source Water Protection Activities (plan, grant, or both)[8]	Estimated Capital Cost for Treatment in 2022 Dollars
Cottage Grove	39,712	Groundwater	6.3	0.66	Both	
Darfur	87	Groundwater	9.7	Buys water	Both	
Dexter	338	Groundwater	5.3	< 0.05	Plan	
Edgerton	1,171	Groundwater	20	14	Both	$556,408
Elgin	1,089	Groundwater	11	8.8	Plan	
Ellsworth	462	Groundwater	24	18	Plan	$711,038
Fairmont	10,328	Surface water	7.6	No Sampling	Both	
Glenwood	2,564	Groundwater	8.1	8.1	Both	
Goodhue	1,200	Groundwater	6.9	6.9	Plan	
Hardwick	198	Groundwater	11	Buys water		
Harmony	1,042	Groundwater	5.1	5.1	Plan	
Hastings	23,222	Groundwater	13	11	Both	$4,731,047
Hiawatha Estates, Subds. I, II & III	95	Groundwater	3.8	2.8		
Hills	685	Groundwater	8.2	Buys water		
Holdingford	770	Groundwater	3.7	2.1	Both	
Ihlen	63	Groundwater	11	Buys water		
Indian Hills Development	156	Groundwater	5.1	3.0		
Isanti Estates	267	Groundwater	5.9	4.8	Grant	
Ivanhoe	559	Groundwater	3.8	Buys water		

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2022 Nitrate Level in Source Water (mg/L)[7]	Source Water Protection Activities (plan, grant, or both)[8]	Estimated Capital Cost for Treatment in 2022 Dollars
Jasper	623	Groundwater	13	Buys water		
Kasota	670	Groundwater	5.1	4.0	Both	
Kellogg	469	Groundwater	4.0	3.4	Plan	
Kerkhoven	806	Groundwater	3.1	No Sampling		
Lake City	5,042	Groundwater	3.8	3.3	Both	
Lake Elmo	8,122	Groundwater	4.0	3.9	Plan	
Leota	209	Groundwater	15	Buys water		
Lewiston	1,620	Groundwater	12	< 0.05	Both	
Lincoln-Pipestone Rural Water System	13,644	Groundwater	22	19	Both	$2,980,423
Luverne	4,688	Groundwater	8.4	No Sampling	Both	
Mabel	747	Groundwater	11	< 0.05	Plan	
Magnolia	214	Groundwater	8.2	Buys water		
Mankato	42,803	Surface water	14	4.0	Both	
Melrose	3,677	Groundwater	14	9.0	Both	
Milan	369	Groundwater	6.2	4.9	Plan	
Millville	171	Groundwater	3.4	3.4		
Minnesota Veterans Home	180	Groundwater	4.7	0.06		
Mobile Manor Mobile Home Park	197	Groundwater	10	8.8		
Moose Lake	1,259	Groundwater	7.2	No Sampling	Plan	

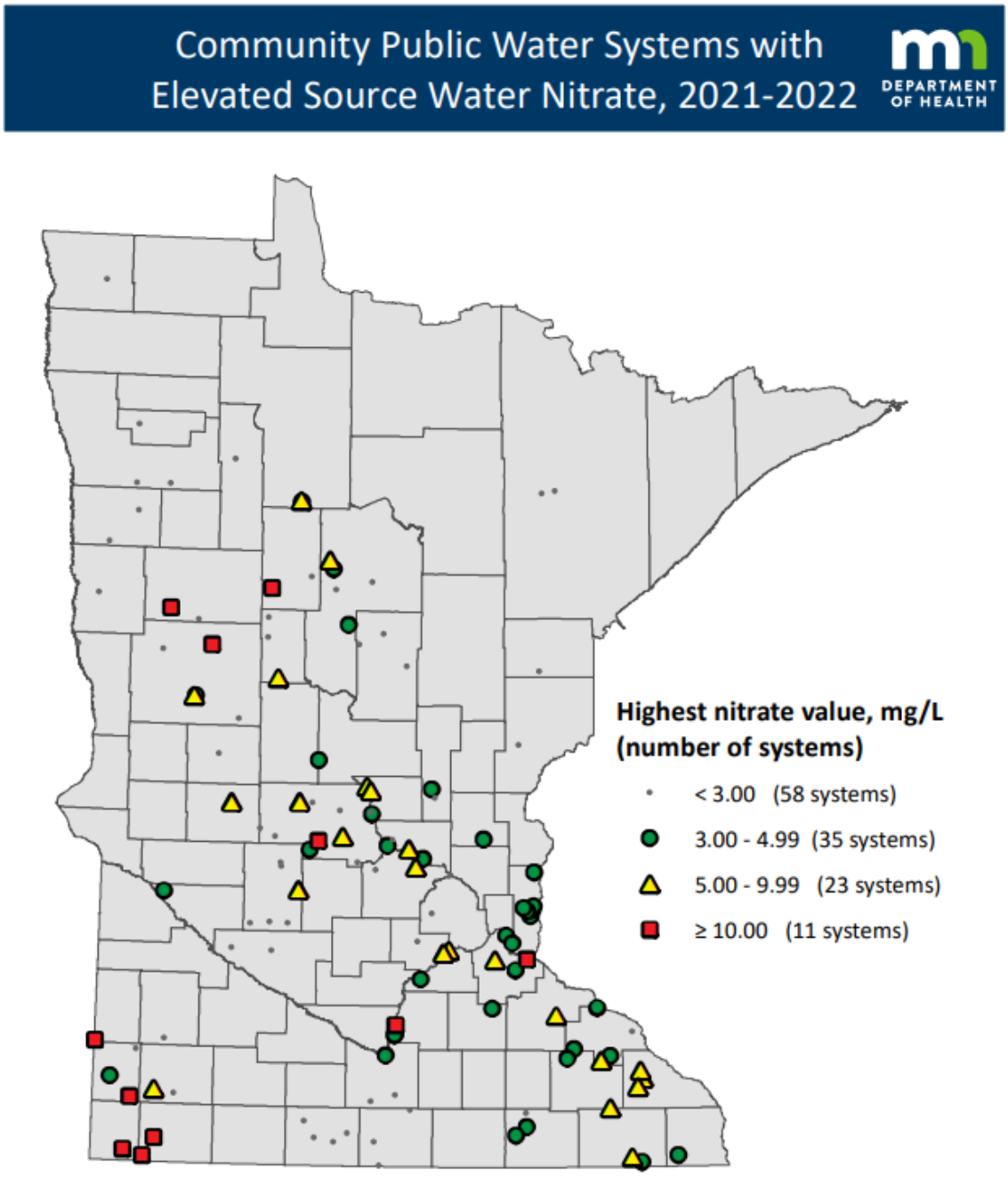
Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2022 Nitrate Level in Source Water (mg/L)[7]	Source Water Protection Activities (plan, grant, or both)[8]	Estimated Capital Cost for Treatment in 2022 Dollars
Nevis	416	Groundwater	3.7	0.13	Both	
Northfield	20,515	Groundwater	9.4	1.4	Both	
Oak Grove Mobile Home Park	60	Groundwater	12	12	Both	
Oak Park Heights	4,849	Groundwater	3.7	3.6	Both	
Ormsby	129	Groundwater	8.5	Buys water	Grant	
Ostrander	256	Groundwater	9.8	< 0.05	Plan	
Paradise Park Mobile Home Park	50	Groundwater	3.1	2.7		
Park Rapids	4,247	Groundwater	12	No Sampling	Both	
Paynesville	2,530	Groundwater	3.4	3.4	Both	
Perham	3,421	Groundwater	12	8.1	Both	
Pine Land Mobile Home Park (Carda's)	70	Groundwater	5.1	< 0.05	Plan	
Pine River	941	Groundwater	5.5	3.7	Both	
Pines Mobile Estates	60	Groundwater	7.2	4.3		
Pipestone	4,273	Groundwater	4.7	2.8	Both	
Plainview	3,340	Groundwater	5.7	5.3	Both	
Randall	650	Groundwater	14	1.2	Both	
Rice	1,279	Groundwater	7.2	7.0	Both	
Rich Prairie Sewer and Water District	1,500	Groundwater	5.1	No Sampling	Both	
Richmond	1,457	Groundwater	11	No Sampling	Both	

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2022 Nitrate Level in Source Water (mg/L)[7]	Source Water Protection Activities (plan, grant, or both)[8]	Estimated Capital Cost for Treatment in 2022 Dollars
Rock County Rural Water System	2,919	Groundwater	28	15	Plan	
Rockville	751	Groundwater	4.3	0.55	Both	
Rockwood Estates	400	Groundwater	27	6.7		
Rollingstone	664	Groundwater	5.5	0.67		
Roosevelt Court	60	Groundwater	5.6	5.6		
Roscoe	104	Groundwater	11	9.1	Both	
Rosemount	22,445	Groundwater	5.6	5.4	Both	
Saint Paul Park	5,404	Groundwater	3.6	3.4	Both	
Saint Peter	11,784	Groundwater	21	19	Both	$24,334,047
Sauk Rapids	13,083	Groundwater	5.4	4.6	Both	
Scandia Water Company	35	Groundwater	3.2	3.0		
Shady Oaks Mobile Home Park	40	Groundwater	4.3	2.3	Plan	
Shakopee	40,610	Groundwater	12	6.0	Both	
Shores of Eagle Lake	68	Groundwater	5.0	5.0		
South Saint Paul	20,400	Groundwater	4.3	3.0	Both	
Spring Grove	1,291	Groundwater	3.9	3.8	Plan	
Steen	180	Groundwater	8.2	Buys water		
Stillwater	19,471	Groundwater	4.0	4.0	Plan	
Sundsruds Court	40	Groundwater	32	31	Plan	$21,655

Community Public Water System	Current Population	Surface or Groundwater System	Highest Historic Nitrate Level in Source Water (mg/L)	Highest 2022 Nitrate Level in Source Water (mg/L)[7]	Source Water Protection Activities (plan, grant, or both)[8]	Estimated Capital Cost for Treatment in 2022 Dollars
Sunray Water Company, LLC	90	Groundwater	6.1	< 0.05	Plan	
Swanville	351	Groundwater	5.1	3.4		
The Meadows	1,000	Groundwater	10	7.1		
Timberlane Estates	64	Groundwater	3.6	3.1		
Timberline Mobile Home Park	130	Groundwater	9.9	< 0.05		
Town and Country Mobile Home Park	315	Groundwater	3.1	0.06		
Trosky	86	Groundwater	9.0	Buys water		
Twin Haven Estates	200	Groundwater	3.7	< 0.05	Plan	
Utica	293	Groundwater	18	8.6	Plan	
Valley Mobile Home Park	34	Groundwater	5.8	3.8	Plan	
Vermillion	451	Groundwater	4.0	4.0	Plan	
Verndale	559	Groundwater	11	8.0	Both	$4,319,050
Walker	934	Groundwater	6.1	6.1	Both	
Wilmont	344	Groundwater	6.0	Buys water	Grant	
Zumbro Falls	181	Groundwater	3.5	3.2		

Appendices

Appendix A: Map of Community Public Water Systems with Elevated Source Water Nitrate, 2021-2022



This map shows those community water systems where source water samples for nitrate were collected and analyzed during 2021-2022. Each sample was collected from a source or entry point and represents source water nitrate levels. These results do not represent finished water quality. A total of 968 community public water systems exist in Minnesota. Community water systems provide water to people in their homes. Note: the nitrate water quality standard for finished water is 10 mg/L.

Appendix B: Sources of Cost Estimates

- Adrian: $601,000 in 1998
  Lewandowski, A., Rosen, C., & Moncrief, J. 2007. Cost of Nitrate Contamination of Public Water Supplies: A Report of Interviews with Water Suppliers. University of Minnesota Department of Soil,
  Water, and Climate. https://www.house.leg.state.mn.us/comm/docs/CostofNitrateContaminationtoPublicSuppliers2007.pdf
- Clara City: $3.2 million total project cost including tower, new well, 2 miles of watermain; completed fall 2002; online August 2002
  Minnesota Department of Health. "Clara City Joins the Membrane Wave: Reverse-Osmosis Successful in Removing Nitrite." From the winter 2003-04 *Waterline* newsletter.
- Clear Lake: $412,390 in 1995
  Lewandowski, A., Rosen, C., & Moncrief, J. 2007. Cost of Nitrate Contamination of Public Water Supplies: A Report of Interviews with Water Suppliers. University of Minnesota Department of Soil,
  Water, and Climate. https://www.house.leg.state.mn.us/comm/docs/CostofNitrateContaminationtoPublicSuppliers2007.pdf
- Edgerton: $352,000 in 2003
  Lewandowski, A., Rosen, C., & Moncrief, J. 2007. Cost of Nitrate Contamination of Public Water Supplies: A Report of Interviews with Water Suppliers. University of Minnesota Department of Soil,
  Water, and Climate. https://www.house.leg.state.mn.us/comm/docs/CostofNitrateContaminationtoPublicSuppliers2007.pdf
- Ellsworth: $362,000 in 1994
  Lewandowski, A., Rosen, C., & Moncrief, J. 2007. Cost of Nitrate Contamination of Public Water Supplies: A Report of Interviews with Water Suppliers. University of Minnesota Department of Soil,
  Water, and Climate. https://www.house.leg.state.mn.us/comm/docs/CostofNitrateContaminationtoPublicSuppliers2007.pdf
- Hastings
  Email, Mark Peine, 05/17/2019, confirmed. Minnesota Department of Health. "Hastings Removes Nitrate with New Plant." From the summer 2011 *Waterline* newsletter.
  https://www.health.state.mn.us/communities/environment/water/waterline/featurestories/hastings.html
- Lincoln-Pipestone: Holland Treatment Plant online October 1999;
  Minnesota Department of Health. "Lincoln-Pipestone Tackles Nitrate with New Reverse-Osmosis Plant"; From the spring 2000 *Waterline* newsletter.

- Saint Peter

  Minnesota Department of Health. "Saint Peter Adds Reverse Osmosis as Part of Expansion and Upgrade." From the summer 2011 *Waterline* newsletter. https://www.health.state.mn.us/communities/environment/water/waterline/featurestories/saintpeter.html

- Sundsruds Court

  Minnesota Department of Health. Minnesota Drinking Water 2015 Annual Report for 2014. https://www.mn.gov/gov-stat/images/MDH_drinking_water_report.pdf

- Verndale: $3,705,878 in 2018

  Minnesota Public Facilities Authority. City of Verndale Award Letter https://mn.gov/deed/assets/verndale-12-12-18_tcm1045-362339.pdf

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