NITRATES ON TAP

The Cost of Nitrate Contamination in Wisconsin's Drinking Water

SEPTEMBER 2025

ALLIANCE for the GREAT LAKES

clean wisconsin

About this Report

About the Alliance for the Great Lakes

The Alliance for the Great Lakes is a nonpartisan nonprofit working across the region to protect our most precious resource: the fresh, clean, and natural waters of the Great Lakes. Our mission is to protect, conserve, and restore the Great Lakes, ensuring healthy water in the lakes and in our communities for all generations of people and wildlife. We advance our mission as advocates for policies that support the lakes and communities, by building the research, analysis, and partnerships that motivate action, and by educating and uniting people as a voice for the Great Lakes. More at greatlakes.org.

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Clean Wisconsin strives to ensure a safe, healthy future for every Wisconsin community by fighting climate change and pollution. With an active membership and advocacy base 20,000-strong, Clean Wisconsin's dedicated staff of experts conducts sound science, engages in public policy, takes legal action, and fosters strong partnerships to advocate for laws and practices that ensure a healthy future for all Wisconsin communities. For more than 50 years, since our founding as Wisconsin's Environmental Decade in 1970, Clean Wisconsin has been working to protect all that makes our state special — breathable air, drinkable water, fishable, swimmable lakes and rivers, and thriving ecosystems. Learn more at cleanwisconsin.org.

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Find this report online at greatlakes.org/nitratesWI.

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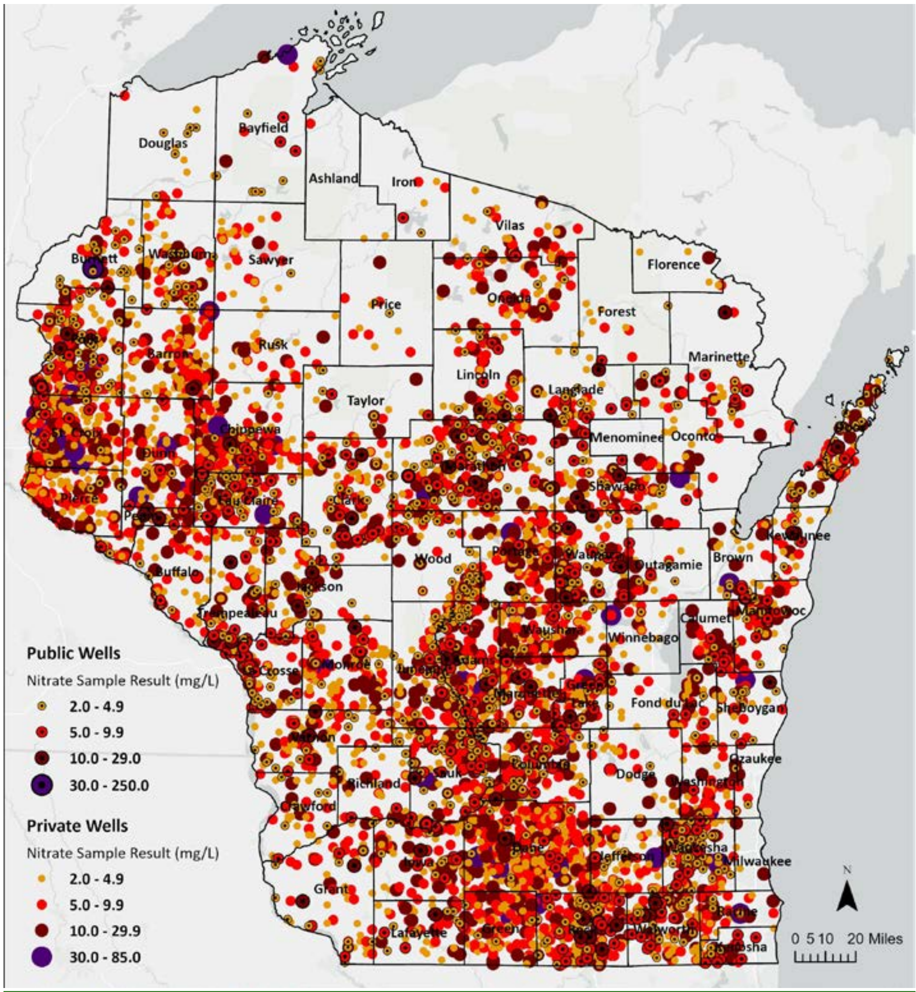
Executive Summary

Wisconsin is facing a public health and environmental crisis fueled by widespread nitrate contamination in drinking water. Thousands of households, particularly in rural areas and regions with karst geology or shallow bedrock, are confronting mounting financial burdens and health concerns made more complex by the need to manage nitrate contamination. Nitrate exposure has been linked to serious health effects, including cancer, pregnancy complications, and infant methemoglobinemia (blue baby syndrome). For both municipalities and private well owners, contamination drives up costs through increased reliance on water treatment infrastructure, bottled water, and well replacement—costs that are largely borne by ratepayers and homeowners, not the polluters responsible.

Figure 1: 2020-2025 state nitrate standards exceedances in Wisconsin wells[1]



All wells are mapped to the Public Land Survey System section centroid (within ~0.5 mile of each well location).

More than 90% of nitrate pollution is linked to agricultural sources such as excessive manure and synthetic fertilizer application. A statewide, conservative mass balance analysis completed for this report estimates that, in 2022 alone, over 16 million pounds of nitrogen was likely applied beyond crop needs, significantly contributing to groundwater and surface water contamination. Current state policies and voluntary programs

1 The standards include the Preventive Action Limit (2 mg/L) and Enforcement Standard (10 mg/L), as required by Wis. Stat. § 160. All data sourced from the Department of Natural Resources' Groundwater Retrieval Network (July 2020-July 2025). Public wells include municipal, other than municipal, transient, and non-transient. Private well data includes monitoring wells.

have failed to curb this problem, placing at risk both public and private drinking water systems—and the communities that depend on them. With less than half of statewide cropland covered by certified nutrient management plans (NMP), more proactive planning and stronger enforcement are essential to curb the contribution of nitrate from the agricultural industry.

Communities like Chippewa Falls, Plover, Janesville, and Trempealeau have already spent over $45 million on nitrate mitigation, while private well owners continue to face hidden, but often overwhelming, costs. When countywide private well replacement estimates are included, the total climbs to more than $116 million. Wisconsin's piecemeal approach stands in contrast to that of neighboring states like Minnesota and Ohio, which have implemented coordinated efforts through improved data collection, permitting, and nutrient reduction strategies.

Legislative and regulatory action is urgently needed to address nitrate pollution meaningfully and protect Wisconsin's water, health, economy, and environment.

Long-Term Policy Recommendations

Update state water and agriculture standards to reduce nitrate pollution
Wisconsin should reevaluate state nitrate groundwater and drinking water standards, establish targeted performance standards to set stronger fertilizer- and manure-application requirements in areas with high contamination, and set a surface water limit for nitrate.

Seize the moment to implement groundwater standards and other environmental protections
Recent developments in the law have opened the door for the Wisconsin Department of Natural Resources (WDNR) and the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) to implement Wisconsin's environmental laws through rulemaking. These agencies need to move quickly to establish groundwater standards and other protections.

Improve enforcement of nutrient management plans
State cost-share funding of any kind for farms should be contingent on having and following an approved nutrient management plan, and concentrated animal feeding operation (CAFO) permit reviews. Approvals should be based on how much manure a watershed can safely utilize without harming water quality.

Create a statewide manure hauler registration system
Educating manure haulers and tracking manure application at the watershed level would help ensure that nitrogen and phosphorus from manure are effectively and efficiently used for crop productivity while preventing overapplication of nutrients.

Medium-Term Policy Recommendations

Establish a standard process for requiring groundwater monitoring for large animal feeding operations
A consistent, science-based process to determine when monitoring is needed would make it clearer for permittees, reduce legal challenges, and ensure fair treatment across farms.

Track and report nitrate-related costs for public water systems
Public water utilities should report the cost and timing of new treatment technologies installation to reduce nitrate levels so that the state can better support funding and technical assistance efforts for clean drinking water.

Short-Term Policy Recommendations

Expand and fully fund the Private Well Compensation Program
The state should revise program eligibility requirements like household income limits and nitrate concentration thresholds so that owners of more contaminated wells can receive state assistance to access clean drinking water.

Increase use of nitrogen fertilizer tonnage fees to support clean water efforts
Fees collected from nitrogen fertilizer sales could reduce reliance on taxpayer dollars to fund the well compensation program while also discouraging overuse of nitrogen.

Wisconsin cannot afford to delay. The cost of inaction—both financial and human—is rising. A coordinated, science-based policy response is essential to reduce nitrate pollution at its source, protect public health and ecosystems, and ensure clean, safe drinking water for future generations.

I.

Current challenges of nitrate pollution in Wisconsin

“

I mean, it’s water. You don’t have a choice about drinking water—that’s the one thing you have to have. You can change your diet, eat other kinds of meat, do other things to protect your health--but you have to drink water.”

Anonymous
Portage County

A. Nitrate pollution is dangerous to human health and aquatic life

The dangers of nitrate pollution to human health have been recognized for decades. Health effects of nitrate ingestion can occur within hours or days of short-term exposure. For example, methemoglobinemia, more commonly known as blue baby syndrome, is caused by excess nitrate in the blood that limits its ability to carry oxygen, leading to serious injury or death. Infants and pregnant people are particularly at risk.[2] In Wisconsin, there have been at least three suspected cases of blue baby syndrome directly linked to ingestion of nitrate-contaminated drinking water.[3]

The federal regulatory standard of 10 mg/L (10 ppm) for nitrate was first set in 1962 to protect against blue baby syndrome in infants. In 1991, the United States Environmental Protection Agency (USEPA) established this limit as the Maximum Contaminant Level (MCL) under the Safe Drinking Water Act for public water systems—systems that have at least 15 connections or serve at least 25 people for 60 days of the year.[4] However, research conducted since 1991 indicates that long-term exposure to nitrate at levels well below the 10 mg/L limit is also linked to additional serious human health issues. Numerous human epidemiological studies illustrate that chronic exposure to nitrate levels between 3 and 5 mg/L causes a statistically significant increase in the risk of colorectal cancer,[5] thyroid cancer,[6] ovarian cancer,[7] and pregnancy and birth complications.[8] In children, evidence also suggests a correlation between nitrate exposure and diabetes.[9] The Wisconsin Groundwater Coordinating Council (GCC) acknowledged all of these health risks in its 2024 report to the Wisconsin legislature.[10] One study of the health impacts of nitrate in Wisconsin indicates that all nitrate-attributable adverse health outcomes amount to direct medical costs between $23 and $80 million annually.[11]

Although USEPA has attempted to conduct updated human health assessments of nitrate multiple times, the last time nitrate toxicity was fully reviewed was in 1991. That assessment only considered data regarding blue baby syndrome in infants, disregarding other health concerns or impacts on adults.[12] During a public comment period for the nitrate health assessment initiated in 2023, a former USEPA toxicologist voiced concern that the data and analysis underpinning the current 10 mg/L standard lacks scientific merit.[13]

2 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 2.
3 Knobeloch, L., B. Salna, A. Hogan, J. Postle, H. Anderson. 2000. Blue babies and nitrate-contaminated well water. Environmental Health Perspectives, 108(7):675-678.
4 USEPA, National Primary Drinking Water Regulations.
5 Nadia Espejo-Herrera et al., Colorectal cancer risk and nitrate exposure through drinking water and diet, 139 Intl. J. of Cancer 334-346 (2016); Jorg Schullehner et al., Nitrate in drinking water and colorectal cancer risk: A nationwide population-based cohort study, 143 Intl. J. of Cancer, 73-79 (2018).
6 Mary H. Ward et al., Drinking Water Nitrate and Human Health: An Updated Review, Intl. J. Envtl. Research and Public Health (2018).
7 Maki Inoue-Choi et al., Nitrate and nitrite ingestion and risk of ovarian cancer among postmenopausal women in Iowa, 137 Intl. J. of Cancer, 173-182 (2015).
8 Mary H. Ward et al., Drinking Water Nitrate and Human Health: An Updated Review, Intl. J. Envtl. Research and Public Health (2018).
9 Moltchanova E., M. Rytkonen, A. Kousa, O. Taskinen, J. Tuomilehto, M. Kavonen. 2004. _. Diabetic Medicine, 21(3):256-261. See also Parslow, R.C., P.A. McKinney, G.R. Law, A. Staines, R. Williams, H.J. Bodansky. 1997. Incidence of childhood diabetes mellitus in Yorkshire, northern England, is associated with nitrate in drinking water: An ecological analysis. Diabetologia 40(5):550-556.
10 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 2-3.
11 Mathewson PD, Evans S, Byrnes T, Joos A, Naidenko OV. Health and economic impact of nitrate pollution in drinking water: A Wisconsin case study Environ Monit Assess. 2020 Oct 23;192(11):724. doi: 10.1007/s10661-020-08652-0. PMID: 33095309.
12 USEPA, Integrated Risk Information System Assessment of Nitrate; CASRN 14797-55-8.
13 David A. Belluck, Letter to EPA, Re: Response to US EPA on RFD Announcement, Docket Number: EPA-HQ-ORD-2017-0496 for nitrate/nitrite (Dec. 18, 2023).

"When the results came back, we found out that the nitrate levels were 26.6 mg/L. Blue baby syndrome was definitely a concern. We had done some research of our own after discovering the contamination and wanted to protect our family from not only blue baby syndrome, but also the other health risks like cancer, thyroid problems, birth defects, chronic headaches, and more... We do really like living here. We love the community and the church. We know a lot of our neighbors. I volunteer with the fire department. But there's the nitrate issue hanging over our heads."

Tyler Frye of Casco, Wisconsin

Nitrate pollution doesn't just threaten human health; it also harms aquatic life and animals that drink contaminated water. When excessive nitrate enters surface waters, it can degrade aquatic habitats and reduce biodiversity. High nitrate levels often lead to eutrophication, a process that triggers rapid growth of algae and aquatic plants. As these organisms die and decompose, oxygen is depleted in the water, creating unstable habitat conditions for amphibians and invertebrates and making the environment unsuitable for many fish species, sometimes resulting in large-scale fish kills.[14]

14 Camargo J.A. and J.V. Ward. 1995. Nitrate toxicity to aquatic life: A proposal of safe concentrations for two species of nearctic freshwater invertebrates. Chemosphere, 31(5):3211-3216; Marco A., C. Quilchano, A.R. Blaustein. 1999. Sensitivity to nitrate and nitrite in pond-breeding amphibians from the Pacific Northwest, USA. Environmental Toxicology and Chemistry, 18(12):2836- 2839; Crunkilton, R.L. and T. Johnson. 2000. Acute and chronic toxicity of nitrate to brook trout (Salvelinus fontinalis). Wisconsin groundwater management practice monitoring project, DNR-140; Camargo J.A., A. Alonso, A. Salamanca. 2005. Nitrate toxicity to aquatic animals: A review with new data for freshwater invertebrates. Chemosphere, 58:1255-1267; Smith, G.R., K.G. Temple, D.A. Vaala, H.A. Dingfelder. 2005. Effects of nitrate on the tadpoles of two Ranids (Rana catesbeiana and R. clamitans). Archives of Environmental Contamination and Toxicology, 49(4):559-562; McGurk M.D., F. Landry, A. Tang, C.C. Hanks. 2006. Acute and chronic toxicity of nitrate to early life stages of lake trout (Salvelinus namaycush) and lake whitefish (Coregonus clupeaformis). Environmental Toxicology and Chemistry, 25(8):2187-2196; Stelzer, R.S. and B.L. Joachim. 2010. Effects of elevated nitrate concentration on mortality, growth, and egestion rates of Gammarus pseudolimnaeus amphipods. Archives of Environmental Contamination and Toxicology, 58(3): 694-699.

Ron Hall on his pasture-based livestock farm in Nekoosa, Wisconsin

In addition to oxygen loss, elevated nitrogen levels can also increase the toxicity of harmful algal blooms.[15] While these toxins haven't been directly linked to fish mortality in the Great Lakes, they can bioaccumulate in fish tissue, disrupt food web dynamics, and pose serious risks to human health.[16]

Many streams in Wisconsin's agricultural watersheds have elevated levels of nitrate, at times exceeding 30 mg/L.[17] Major fish kills in Wisconsin in spring and summer of 2024 were caused by manure spills and at least one major fish kill has already occurred in spring of 2025.[18] Stillbirths, spontaneous abortion, and gastrointestinal problems can also occur in livestock that consume water contaminated by excessive nitrate.[19]

The effects of nitrate pollution do not stop in Wisconsin. The annual hypoxic "dead zone" that forms in the Gulf of Mexico is caused, in part, by nitrate pollution washed into the Mississippi River. Nitrogen loads from Midwestern states, including Wisconsin, have caused nearly $2.4 billion in damage to fish stocks and habitat in the Gulf every year since 1980.[20]

15 Davis, TW; GS Bullerjahn; T Tuttle; RM McKay, SB Watson. 2015. Effects of increasing nitrogen and phosphorus concentrations on phytoplankton community growth and toxicity during Planktothrix blooms in Sandusky Bay, Lake Erie. Environ Sci Technol. 49(12):7197-207; Gobler CJ; JM Burkholder; TW Davis; MJ Harke; T Johengen; CA Stow; DB Van de Waal. 2016. The dual role of nitrogen supply in controlling the growth and toxicity of cyanobacterial blooms. Harmful Algae. 54, 87-97.

16 Wituszynski DM; C Hu; F Zhang; JD Chaffin; J Lee; SA Ludsin; JF Martin. 2017. Microcystin in Lake Erie fish: Risk to human health and relationship to cyanobacterial blooms. Journal of Great Lakes Research. 43(6), 1084-1090; Briland, RD; JP Stone, M Manubolu, J Lee, SA Ludsin. 2020. Cyanobacterial blooms modify food web structure and interactions in western Lake Erie. Harmful Algae. 92, 101586; Camargo J.A. and J.V. Ward. 1995. Nitrate toxicity to aquatic life: A proposal of safe concentrations for two species of nearctic freshwater invertebrates. Chemosphere, 31(5):3211-3216; Marco A., C. Quilchano, A.R. Blaustein. 1999. Sensitivity to nitrate and nitrite in pond-breeding amphibians from the Pacific Northwest, USA. Environmental Toxicology and Chemistry, 18(12):2836- 2839; Crunkilton, R.L. and T. Johnson. 2000. Acute and chronic toxicity of nitrate to brook trout (Salvelinus fontinalis). Wisconsin groundwater management practice monitoring project, DNR-140; Camargo J.A., A. Alonso, A. Salamanca. 2005. Nitrate toxicity to aquatic animals: A review with new data for freshwater invertebrates. Chemosphere, 58:1255-1267; Smith, G.R., K.G. Temple, D.A. Vaala, H.A. Dingfelder. 2005. Effects of nitrate on the tadpoles of two Ranids (Rana catesbeiana and R. clamitans). Archives of Environmental Contamination and Toxicology, 49(4):559-562; McGurk M.D., F. Landry, A. Tang, C.C. Hanks. 2006. Acute and chronic toxicity of nitrate to early life stages of lake trout (Salvelinus namaycush) and lake whitefish (Coregonus clupeaformis). Environmental Toxicology and Chemistry, 25(8):2187-2196; Stelzer, R.S. and B.L. Joachim. 2010. Effects of elevated nitrate concentration on mortality, growth, and egestion rates of Gammarus pseudolimnaeus amphipods. Archives of Environmental Contamination and Toxicology, 58(3): 694-699.

17 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 3. The 30 ppm rate noted in this report is equivalent to 30 mg/L. For consistency, this report will use mg/L.

18 Heim, Madeline, "DNR investigating two Wisconsin fish kills that could be the result of heavy rains." Milwaukee Journal Sentinel, (July 19, 2024); Kaeding, Danielle, "Hundreds of fish killed by manure runoff in Monroe County." WPR, (May 22, 2025).

19 Larry J. Thompson, Nitrate and Nitrite Poisoning in Animals, Merck Veterinary Manual, (April 2021).

20 Boehm, Rebecca. 2020. Reviving the Dead Zone: Solutions to Benefit Both Gulf Coast Fishers and Midwest Farmers, Cambridge, MA: Union of Concerned Scientists.

B. Wisconsin's surface and groundwater is already contaminated by nitrate and pollution is getting worse

Nitrate is the most widespread contaminant in Wisconsin's groundwater, and the problem is increasing in both scale and severity. Nitrate loads have increased statewide since 2013, with the state noting statistically significant increases for most years between 2013 and 2018.[21]

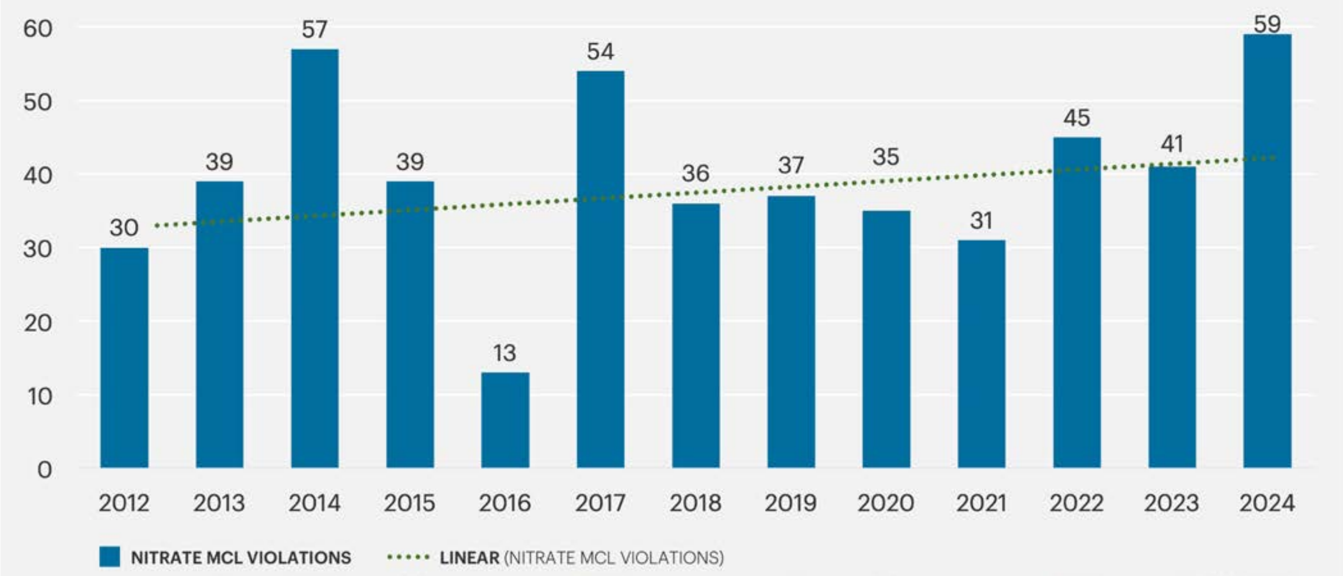
> The whole issue is very stressful. At 80+ [years old], we're not in a position to uproot and move to an environment where it's safer to live."
>
> ***Marianne Walker***
> Portage County

With respect to public water systems, violations of the nitrate MCL are also trending upward over time. When violations occur in public water systems (those with 15 or more service connections or that regularly serve 25 people for at least 60 days of the year), the system must take action to reduce nitrate levels below the MCL. Using publicly available data from Wisconsin's annual drinking water reports, it is not possible to determine definitively what is causing this upward trend. Year to year, systems in violation may be coming into compliance while other systems are experiencing new violations for the first time. Systems may also be cited for more than one violation per year. The chart below illustrates the number of MCL violations each year across all types of public water systems in Wisconsin.

One-third of Wisconsin families rely on private wells, which face an even greater risk of nitrate contamination than public systems. Statewide, about 10% of private well samples exceed the MCL for nitrate-N, though one-third of private well owners have never even had their water tested.[22] The Wisconsin Department of Natural Resources (WDNR) estimates that there are 800,000 private wells in the state, meaning that more than 250,000 wells may never have been tested for nitrate.[23]

In intensively agricultural areas, the percentage of wells that have exceeded the MCL doubles or triples: 20 to 30% of private well samples violate the nitrate MCL in those areas.[24] Studies conducted by the Department of Agriculture, Trade, and Consumer Protection (DATCP) between 1994 and 2023 confirm that nitrate MCL violations increased in and corresponded to agriculturally intensive areas.[25]

Figure 1.2: Trend of increasing nitrate MCL violations in Wisconsin public water systems since 2012[26]



21 WDNR 2017-2019 Nutrient Reduction Strategy: Implementation Progress Report (April 2020), p. 6.
22 Knobeloch, L., P. Gorski, M. Christenson, H. Anderson. 2013. Private drinking water quality in rural Wisconsin. Journal of Environmental Health, 75(7):16-20 25; Schultz, A. and K.C. Malecki. 2015. Reducing human health risks from groundwater: Estimating private well testing behaviors and barriers among private well owners in Wisconsin, 2015. Wisconsin groundwater management practice monitoring project, DNR-221.
23 Wisconsin Department of Natural Resources, Wells.
24 Mechenich, D. 2015. Interactive Well Water Quality Viewer 1.0. The University of Wisconsin-Stevens Point, Center for Watershed Science and Education.
25 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024), p. 5-6.
26 Compiled using WDNR's Annual Drinking Water Reports from 2012 to 2023. Excluded from this chart are the number of transient systems allowed to continue in violation of the 10 mg/L standard but below 20 mg/L, provided they meet certain conditions.

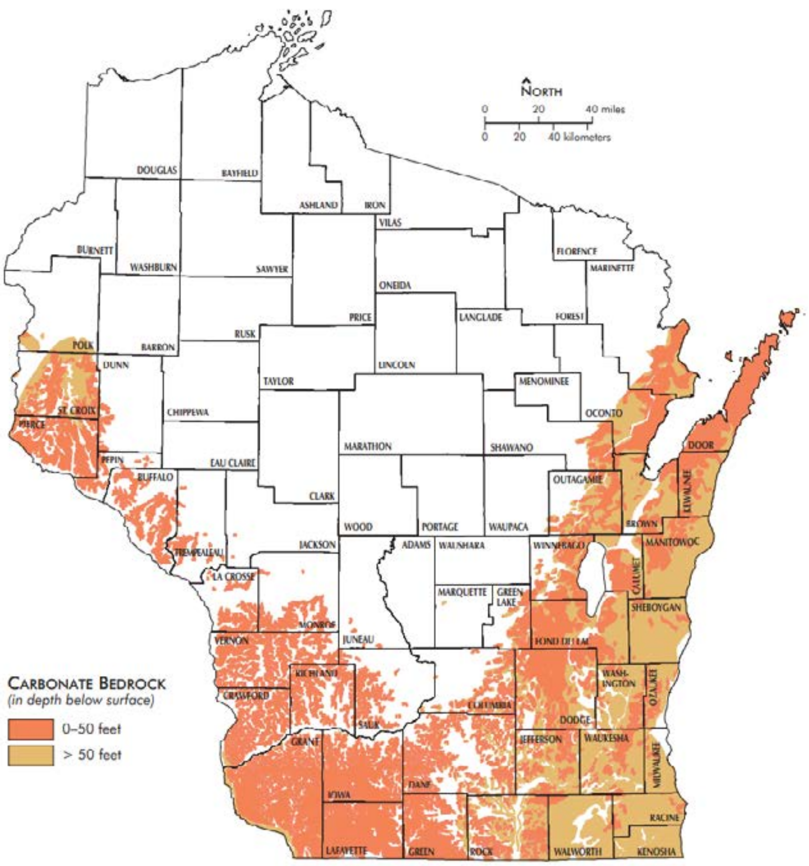
C. Certain areas of the state are particularly vulnerable

While overall trends indicate a persistent and increasing nitrate problem, certain areas of the state are particularly vulnerable and more susceptible to groundwater contamination from nitrate than others. WDNR used five factors to evaluate groundwater contamination susceptibility when creating a groundwater susceptibility map in 1989: type of bedrock, depth to bedrock, depth to water table, soil characteristics, and characteristics of surficial deposits.[27] Coarse-textured soils, shallow depth to bedrock, and karst geology (soluble rocks, like limestone and dolomite, that are very porous) allow nitrate applied at the surface to move easily and quickly through soil into groundwater.

In karst areas, and especially where shallow soil overlies fractured limestone carbonate bedrock, water and contaminants can rapidly move from the surface into groundwater aquifers. The groundwater flow can be extremely fast— between tens to hundreds of feet per day—and carbonate rocks do not filter or remove contaminants such as nitrate.[28] This rapid movement of water necessitates more frequent testing for nitrate in private wells. Wisconsin's karst areas are likely to be found in a V-shaped pattern that extends southeast from St. Croix County along the Mississippi River, across the bottom two tiers of counties, and northeast along Lake Michigan up to Marinette County, as shown in figure 1.3[29]:

> It is distressing to me that we live in an area of karst geology and that the WDNR continues to allow CAFO expansions in areas east of us. One farm is set to expand to 3300 cows, another to 6500 cows! The spreading of manure from these CAFOs on fields around us is frightening and irresponsible. We are considering moving due to all of this."
>
> ***Linda Hendrix***
> St. Croix County

Figure 1.3: Extent of Karst geology in Wisconsin



27 The Wisconsin Department of Natural Resources, Groundwater Contamination Susceptibility in Wisconsin.
28 Kenneth R. Bradbury, Karst and Shallow Carbonate Bedrock in Wisconsin, Wisconsin Geological and Natural History Survey Factsheet 002 (2009), p.2.
29 Wisconsin Geological and Natural History Survey, Karst and Sinkholes.

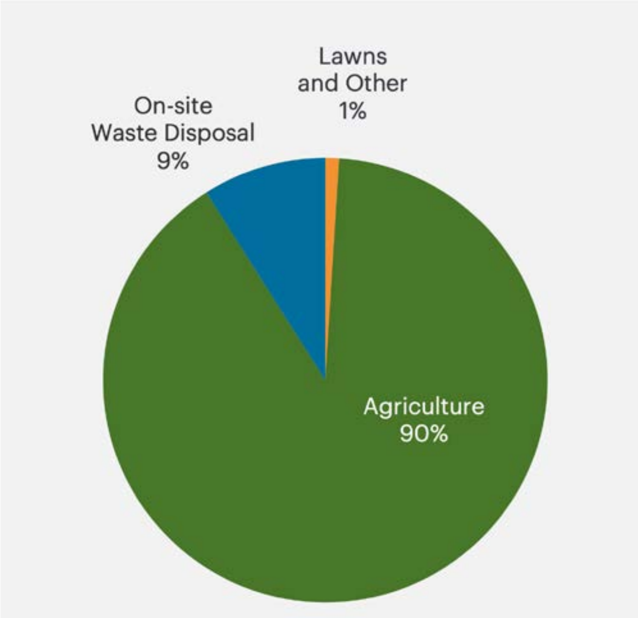
Corn field outside of Nelsonville, Wisconsin

D. Wisconsin's nitrate pollution is predominantly caused by agricultural activities

The primary source of Wisconsin's nitrate water pollution is agricultural. When nitrogen is applied to farm fields, whether in the form of manure or fertilizer, it is not immediately taken up by crops. Microorganisms in the soil must first convert nitrogen to ammonium, which plants can absorb. The bacteria in the soil then convert the ammonium to forms plants can use—nitrate and nitrite—in a process called nitrification. While ammonium binds tightly to soil particles, nitrate does not; it is highly water soluble and readily leaches through the soil profile.[30]

90% of nitrate in Wisconsin's groundwater comes from the application of nitrogen-containing fertilizers (including manure, commercial fertilizer, and biosolids) to farm fields, while less than 10% is attributable to private septic treatment systems[31]:

Figure 1.4: Sources of nitrate in Wisconsin's groundwater



SOURCES OF NITRATES IN WISCONSIN'S GROUNDWATER. WISCONSIN GROUNDWATER COORDINATING COUNCIL.

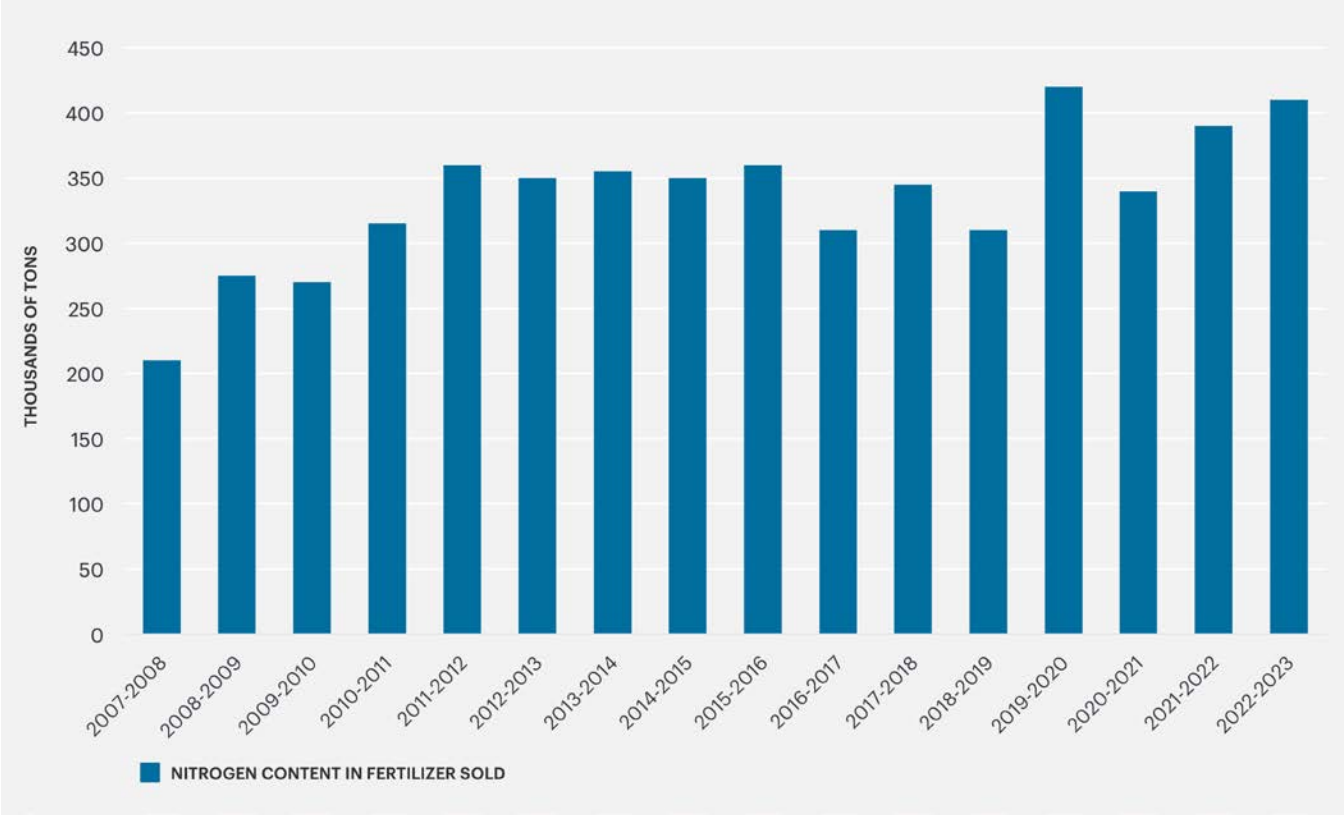
30 Bundy, et. Al, Nitrate in Wisconsin Groundwater: Sources and Concerns (2018), p. 1-2.
31 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 5; Nitrates in Wisconsin Waters – A Wisconsin's Green Fire Policy Analysis, Wisconsin Green Fire, p.2 (Jul. 16, 2019).

Nitrate loss estimates from crop production vary based on factors including soil type, precipitation, use of irrigation, historical farming practices, and depth to groundwater, but studies show that an average of more than 25% of applied nitrogen leaches into groundwater as nitrate.[32]

1. MANURE AND FERTILIZER ARE BEING OVERAPPLIED

Compounding this problem is an imbalance in the amount of nitrogen needed for crop production in Wisconsin and the amount of manure and nitrogen fertilizer actually applied. A 2022 study by Environmental Working Group and Midwest Environmental Advocates found that in four of nine Wisconsin counties studied, nitrogen was applied at a rate **50% higher than the nitrogen rates recommended** by University of Wisconsin (UW) Extension agronomists to meet crop demand.[33] Between 2007 and 2023 annual nitrogen fertilizer sales in Wisconsin nearly doubled, from 210,000 to 404,000 tons,[34] suggesting an increased risk of nitrogen losses to groundwater. In addition, "in dairy intensive regions, increased manure applications coupled with increases in precipitation in large storm events has multiplied negative pressures on water quality."[35]

Figure 1.5: Annual nitrogen fertilizer tonnage sold in Wisconsin



32 Cardiff M, Schachter L, Krause J, Gotkowitz M, Austin B. Quantifying Annual Nitrogen Loss to Groundwater Via Edge-of-Field Monitoring: Method and Application. Groundwater. 2023 Jan;61(1):21-34. doi: 10.1111/gwat.13217. Epub 2022 Jun 23. PMID: 35647903; PMCID: PMC10084006.
33 Environmental Working Group, Double trouble: Wisconsin's land and water are inundated with pollution from animal manure and excess farm fertilizer (2022).
34 DATCP, Fertilizer Tonnage Summaries (2006 to 2023) (Oct. 4, 2024).
35 Rissman, et. Al, Bridging a Major Disconnect: Ideas for Farm Standards and Systems to Achieve Phosphorous Goals in Wisconsin Lakes and Streams, Sept. 2024, p. 26.

To further evaluate the nitrogen need and use patterns statewide for agricultural production, we used a simplified mass balance approach to estimate whether a nitrogen imbalance exists on a statewide basis. To do this, we used publicly available data on the amount of nitrogen fertilizers sold and animal manure generated statewide and the total nitrogen need of the top crops produced in the state in 2022.

The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) collects fertilizer tonnage data that quantifies the amount of fertilizer sold annually and the quantity of nitrogen in those fertilizer products. According to DATCP's 2021-2022 fertilizer tonnage data, over 800 million pounds of nitrogen was sold that reporting year. Unfortunately, DATCP does not consistently collect data on the end-use of the fertilizer products sold in the state. To estimate the amount of nitrogen fertilizer used for agricultural production, we evaluated current land use categories and use trends. Forests and agricultural land uses dominate in Wisconsin with approximately 16 million and 14 million acres respectively. Given that fertilizer is not generally applied to forest land, it is presumed that nitrogen fertilizer is being applied to agricultural fields, golf courses, and lawns. Lawns, turf, and landscaping make up only about 1 million acres of land use in Wisconsin, so for our evaluation, we conservatively estimated that only 75% of the nitrogen fertilizer sold was used for agricultural purposes, leaving 25% of the nitrogen in fertilizer sales to account for turf and landscaping uses.[36] This is likely an overestimation of non-agricultural uses since those land areas cover such a small area of the state compared to agriculture. To identify the amount of nitrogen needed to meet crop needs statewide, we identified the acreage and recommended nitrogen application rate for the top 15 crops grown in Wisconsin using the U.S. Department of Agriculture's (USDA) 2022 Census of Agriculture and the UW publication A2809 Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops.[37] Annual manure generation and nitrogen content were derived from the USDA 2022 Census of Agriculture and UW's Nutrient and Pest Management Program.[38]

In each component of this assessment, our estimates included conservative assumptions about fertilizer use in agricultural production. For example, we assumed the lowest nitrogen availability levels when calculating available manure nitrogen content. Similarly, we assumed mid-range nitrogen application rates based on University of Wisconsin-Madison recommendations. Again, we conservatively estimated that only three-quarters of the total nitrogen fertilizer sold was used for agricultural purposes. Table 1 below depicts the supply versus demand values used for this calculation.

After calculating the total amount of nitrogen applied to cropland in 2022 and the nitrogen need of the top 15 crops grown, our mass balance analysis revealed that in 2022, **an estimated 16 million pounds of nitrogen was applied beyond crop needs**. This excess application of nitrogen is a significant cause of nitrate leaching to groundwater and runoff to surface water systems.

Table 1: Total amount of nitrogen applied to cropland vs. crop need in 2022

2022 Crop Year	Nitrogen Supply or Demand (-) in lbs.
COMMERCIAL nitrogen applied	606,700,500
MANURE nitrogen applied	138,721,867
LEGUME nitrogen credited	89,686,500
Total nitrogen inputs	835,108,867
Nitrogen required to meet crop need	(-) 819,027,000
Nitrogen applied in excess of crop need (lbs.)	**16,081,867**

Overapplication also comes at a cost to farmers. Depending on the cost of nitrogen fertilizer, growers spend an estimated $8 to $11 million on excess application. At $0.50 per pound of nitrogen, the cost of overapplication totals approximately $8,040,933; at $0.60 per pound, it rises to $9,649,120; and at $0.70 per pound, the cost reaches $11,257,307. When nitrogen is applied beyond what crops need, farmers may be spending millions more on fertilizer than necessary—dollars that could be saved with more precise application.

36 The Wisconsin Department of Agriculture, Trade and Consumer Protection, Fertilizer Summary Report; University of Wisconsin-Madison, Turf and lawn care in Wisconsin.
37 U.S. Department of Agriculture, 2022 Census Volume 1, Chapter 1: State Level Data, Wisconsin; A2809 Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin.
38 University of Wisconsin-Madison, Nutrient and pest management program.

2. UNSAFE MANURE MANAGEMENT AND STORAGE PRACTICES ALSO CAUSE COLIFORM IMPAIRMENTS

Bacterial contaminants associated with manure also harm public health. *E. coli* and other pathogens contained in livestock manure can leach into drinking water, underscoring the need for improved farm manure management and application practices. Total coliforms are an indicator of pathogen presence, and their levels are often used as a surrogate to determine the adequacy of water treatment and the integrity of water distribution systems. USEPA set the MCL goal level for total coliforms at zero because waterborne disease outbreaks often occur at very low coliform concentrations.[39] Yet, in Wisconsin's 2024 Water Condition Lists, 25 waterways across the state are listed as impaired due to coliforms and 90 are listed as impaired due to *E. coli*.[40]

Ongoing well tests have also shown that groundwater contamination in vulnerable areas, such as Kewaunee County, continues unabated. In a 2015 study, the UW-Stevens Point Center for Watershed Science database of private well water quality indicated that in Kewaunee County, 12% of 857 samples exceeded the nitrate standard, 20% of 720 samples tested positive for coliform bacteria, and 16% of the 142 positive coliform bacteria water samples also tested positive for *E. coli*.[41] In a 2019 study, those figures were as follows: 11% in exceedance of the nitrate standard (of 1350 samples), 19% positive for coliform bacteria (of 1206 samples), and 2.2% positive for *E coli.* (of 1206 samples).[42]

In 2021, researchers tested water from private wells in the five-county area that covers the fractured Silurian dolomite aquifer, and they found that 14% of samples exceeded the nitrate standard. Of the 6,739 wells sampled, 23% tested positive for coliform bacteria and 2% tested positive for *E. coli*.[43] Primary risk factors for coliform detection were:

- Distance to the nearest field with a nutrient management plan where manure and commercial fertilizer were applied;
- Bedrock depth (which determines groundwater vulnerability);
- Distance to the nearest manure storage structure.

Wells located within 48 meters of manure storage structures were 87% more likely to have coliform detected than wells 4,000 meters away. Distance to the nearest field with a nutrient management plan where commercial fertilizer and manure were land applied was the single biggest risk factor associated with an increase in coliform levels.[44] Thus, practices that improve manure management, storage, and handling and that reduce runoff from manure would not only address the public health risks of nitrate, but also dangerous bacteria and pathogens.

E. Nitrate pollution is ultimately costing drinking water ratepayers and private well owners

Nitrate remediation is expensive, regardless of the type of water system or treatment efforts, though public data on specific amounts is sparse. To explore the cost of nitrate contamination to municipal water systems and ratepayers, we used a case study approach to review costs for nitrate treatment in four municipal water systems. This section also explores costs experienced by transient non-community systems and provides insight into the costs that private well owners experience.

39 USEPA, Revised Total Coliform Rule and Total Coliform Rule (last visited Nov. 7, 2024).
40 The Wisconsin Department of Natural Resources, Water Condition Lists, Appendix A and B.
41 Muldoon, Maureen and Borchardt, Mark, et. al, Assessing Groundwater Quality in Kewauneee County, Wisconsin, p. 1 (2015).
42 Borchardt, Mark, et. al, Assessing groundwater quality in Kewaunee County, Wisconsin and Characterizing the timing and variability of enteric pathogen contamination within the dolomite aquifer in northeastern Wisconsin, p.39 (2019).
43 Mark Borchardt et al., Sources and Risk Factors for Nitrate and Microbial Contamination of Private Household Wells in the Fractured Dolomite Aquifer of Northeastern Wisconsin, Environmental Health Perspectives 129(6), at 3-4 (June 2021).
44 Id. at 23-24 and 26.

1. MUNICIPAL WATER SYSTEMS

Wisconsin's maximum contaminant level (MCL) for nitrate is 10 mg/L. When nitrate levels exceed the MCL in municipal water systems, the water utility must foot the bill to either replace the well or install one of several new treatment technologies to reduce nitrate levels below 10 mg/L. The cost to do either can be very high. As of 2024, the Wisconsin Groundwater Coordinating Council (GCC) estimates that municipal systems have spent over $40 million to remediate nitrate contamination, though complete public data on these costs remains unavailable.[45] To pay these costs, public water systems are forced to increase water rates, meaning the cost of nitrate pollution ultimately trickles down to ratepayers. Our independent research further illustrates the cost of treatment systems and resulting increases in water rates.

Chippewa Falls Water Utility, Chippewa County

Geography: Northwestern Wisconsin

Treatment Type(s): new well and blending treatment plant

Chippewa Falls Water Utility in Chippewa County sits in the northwestern area of the state. The water system has been owned and operated by the City of Chippewa Falls since 1920 and currently draws from nine wells that pump over 826 million gallons each year to approximately 13,375 individuals.[46]

In 1985, the city observed elevated nitrate levels in the groundwater supplying its east wellfield, which provides approximately 60% of the city's water. As a result of persistent nitrate levels above the MCL of 10 mg/L, a new well was drilled in 1995, and an ion exchange nitrate removal treatment plant was built in 1998. Six years later, a ninth well was drilled in July 2004.[47] Not including upgrades in 2007, the city spent over $2.5 million on the treatment plant installation alone.[48] Costs associated with maintenance of the plant—including electricity used to run the pumps, upkeep on the machine parts such as valves and pumps, and the cost of salt for recharge—are also not included in this figure. Today, six of the nine wells are treated for nitrate via blending—a process that combines water low in nitrate with water high in nitrate to maintain levels in the 7-8 mg/L range. This level is targeted due to the federal MCL and Wisconsin state enforcement standard set at 10 mg/L, but as previously discussed, it is outdated and likely not protective of human health. If the $2.5 million installation costs are passed on to ratepayers, it amounts to approximately $186 per customer.

With respect to private wells, the Wisconsin Groundwater Coordinating Council estimates that it would cost over $15.9 million—or approximately $8,900 per well—to replace all wells in Chippewa County with concentrations exceeding the 10 mg/L health standard for nitrate.[49]

Despite these mitigation efforts, nitrate levels in the water system have been rising over the past 10 years from an average of 6.55 mg/L in 2014 to 7.47 mg/L in 2023.[50]

Plover Water System Department, Portage County

Geography: Central Wisconsin

Treatment Type(s): two blending treatment plants

The Plover Water System Department in Portage County sits in the central portion of the state. The water system was developed in 1989 and currently draws from three wells.[51] It pumps over 599 million gallons each year to approximately 13,486 individuals.[52]

45 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 16.
46 City of Chippewa Falls, 2025; Environmental Protection Agency's Safe Drinking Water Information System, 2024.
47 Chippewa Falls Water Utility Consumer Confidence Reports.
48 The Wisconsin Department of Natural Resources 2004 Nitrate Mitigation Cost Survey.
49 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, pg. 14.
50 Chippewa Falls Water Utility Consumer Confidence Reports.
51 Village of Plover, 2025.
52 Plover Water System Department, 2025; Environmental Protection Agency's Safe Drinking Water Information System, 2024.

The water system has been treating nitrate since the early 1990s and currently utilizes two ion exchange treatment plants installed in 1994 and 2000 to blend water.[53] Essentially, a subsection of water is treated to 0 mg/L of nitrate and then blended with untreated water (approximately 10-11 mg/L of nitrate) to produce a combined mix of around 7 mg/L, just under the enforcement standard of 10 mg/L for compliance purposes. The latest Plover Water System Department 2023 Consumer Confidence Report states that nitrate samples averaged at 7.65 mg/L.[54] The construction of the two plants cost approximately $4 million, plus another $2.8 million for subsequent upgrades—including the replacement of an ion exchange treatment system in 2019.[55] The total construction and upgrade cost of the two treatment plants amounts to approximately $504 per customer.

The Wisconsin Groundwater Coordinating Council estimated that it would cost over $13.1 million—or approximately $8,500 per well—to replace all private wells in Portage County with concentrations exceeding the 10 mg/L MCL for nitrate.[56] Similarly, a study conducted by Portage County in 2019 estimated that the minimal cost of treatment for private well owners is $200-$800 at the point of use (i.e., a drinking water faucet filter), $5,000-$14,000 at the point of entry, not including maintenance (such as a whole home water filtration system), and $2,000-$9,000 to drill a new well.[57]

Janesville Water Utility, Rock County

Geography: Southeastern Wisconsin

Treatment Type(s): abandoned well and three blending treatment plants

The Janesville Water Utility in Rock County sits in the southeastern portion of the state. The Utility was developed in 1887 and currently draws from eight wells, two of which are reserved for emergencies.[58] It pumps over 3.6 billion gallons each year to approximately 64,415 individuals.[59]

After taking one of their wells offline due to elevated nitrate levels in 1980, the Utility built an ion exchange nitrate blending facility in 1991, followed by a second in 2004 and a third in 2005.[60] Each blending facility operates two paired wells—one deep and one shallow. Generally, deeper wells present more risk of elevated levels of arsenic, and shallow wells are more at risk of nitrate. By combining water pumped from both wells, the Utility is able to meet regulatory standards for both contaminants. For example, the latest Janesville Water Utility 2024 Consumer Confidence Report noted nitrate samples averaged 6.45 mg/L.[61] The first two facilities cost approximately $22 million, and, from that number, we estimate the third at 11 million.[62] If the blending facility installation costs are passed on to ratepayers, it amounts to approximately $512 per customer, and that does not include annual maintenance or financing costs. While annual maintenance costs for nitrate-related treatments are difficult to distinguish, the Utility, and all others in the state, are encouraged to pull and inspect each well at least once every 10 years, a cost estimated for this system between $60,000 and $80,000 per well.[63] Those maintenance costs total approximately $0.27-$0.36 per year, per customer, for the three additional wells needed to address nitrate contamination.

The Wisconsin Groundwater Coordinating Council estimates that it would cost over $32.45 million—or approximately $10,800 per well—to replace all private wells in Rock County with concentrations exceeding the 10 mg/L health standard for nitrate.[64]

53 Plover Water System Department Consumer Confidence Report; Plover Water System Department, 2025.
54 Plover Water System Department 2023 Consumer Confidence Report (Archived).
55 The Wisconsin Department of Natural Resources 2004 Nitrate Mitigation Cost Survey.
56 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, pg. 15.
57 Portage County, 2019.
58 City of Janesville, 2025.
59 City of Janesville, 2025; Environmental Protection Agency's Safe Drinking Water Information System, 2024.
60 City of Janesville, 2025.
61 Janesville Water Utility 2024 Consumer Confidence Report.
62 The Wisconsin Department of Natural Resources 2004 Nitrate Mitigation Cost Survey.
63 NR 810.13(1)(a); Janesville Water Utility, 2025.
64 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, pg. 15.

Trempealeau Water and Sewer Department, Trempealeau County
Geography: Western Wisconsin
Treatment Type(s): two deepened wells

The Trempealeau Water and Sewer Department in Trempealeau County sits in the western portion of the state. The water system was developed around 1957 and currently draws from two wells.[65] It pumps over 55 million gallons each year to approximately 1,888 individuals.[66]

In 2009 the Village of Trempealeau addressed elevated nitrate levels in two wells by drilling two new deeper wells and then abandoning the contaminated wells.[67] That is approximately $1,503 per customer.[68]

The Wisconsin Groundwater Coordinating Council estimates that it would cost over $10.05 million—or approximately $10,900 per well—to replace all private wells in Trempealeau County with concentrations exceeding the 10 mg/L health standard for nitrate.[69]

2. TRANSIENT NON-COMMUNITY SYSTEMS

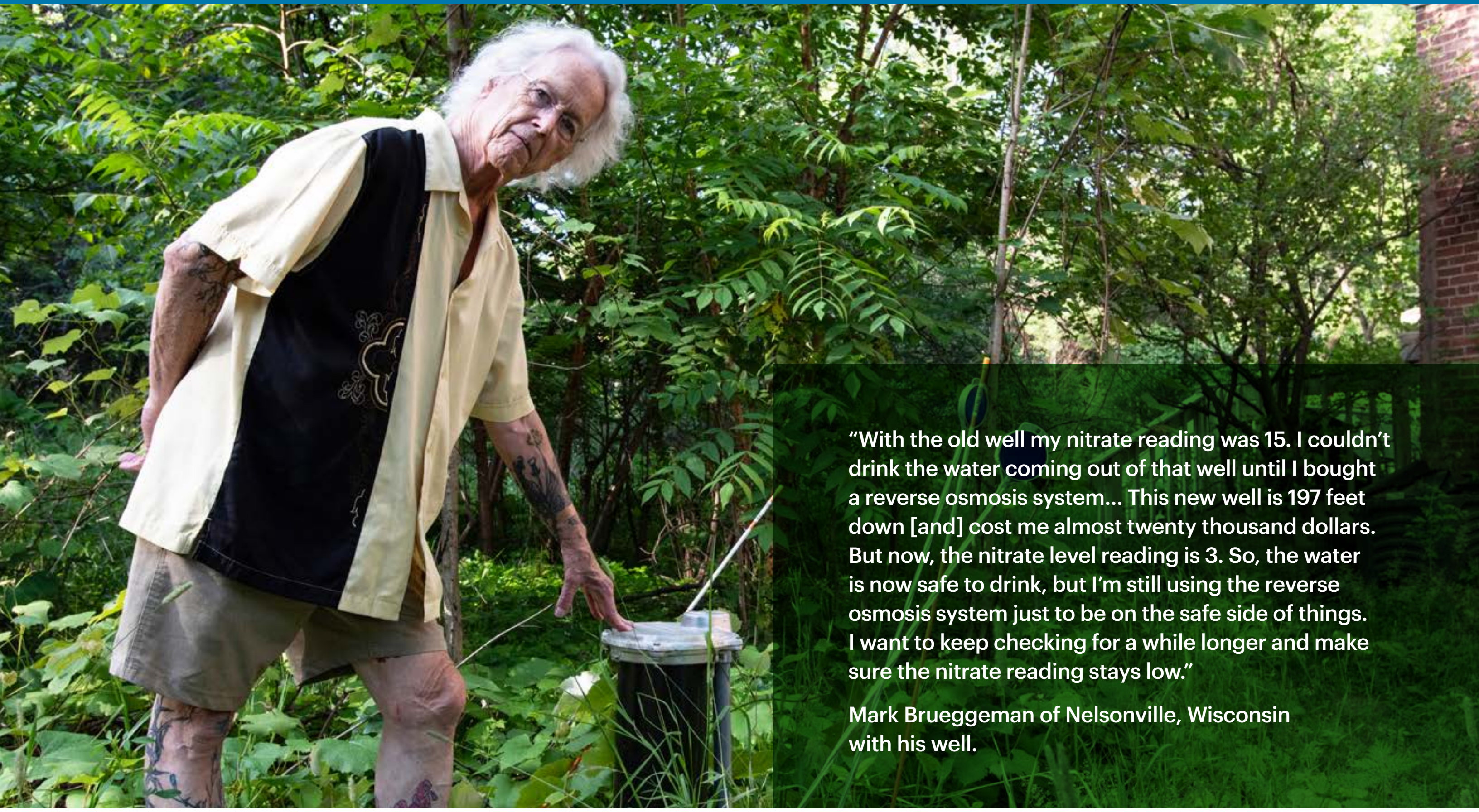
Transient non-community (TN) water systems are small systems that serve places such as churches, gas stations, motels, campgrounds, etc., where people do not stay for long periods of time. Transient non-community systems are often located in rural, agricultural areas of the state and are allowed to lawfully exceed the nitrate health standard of 10 mg/L if the owner provides bottled water and posts notice of the nitrate level warning and the nitrate concentration doesn't exceed 20 mg/L (twice the nitrate health standard). As many as 300 TN systems have been in this situation in recent years, with the estimated cost to replace them totaling $3.2 million. While WDNR is implementing a plan it began in 2023 to end this practice and bring TNs back into compliance with the 10 mg/L standard, each year about 20 new TNs exceed the nitrate standard.[70] Under that plan, TN systems that are "continuing on operation" in violation of the 10 mg/L standard must evaluate options to return to compliance by April 1, 2026. Systems with new nitrate exceedances will work with WDNR to return to compliance with the standard in a shorter timeframe of up to three years.[71]

Portage County

In Portage County, many TNs (including local small businesses) have faced costs associated with well replacement or implementing a treatment system because of nitrate contamination. Portage County has the second-highest number of TN systems in the state that exceed the drinking water standard for nitrate and has had the most TN systems operating over 20 mg/L. In response, Portage County opted to develop its own Well-owner Assistance for Treatment and Economic Recovery Program (WATER) in 2022 to assist TNs and residents on private wells experiencing high concentrations of nitrate. With $2.3 million of federal American Rescue Plan Act (ARPA) funding, the program supports private well owners by providing free, annual private well testing for any interested residents, and up to $1,500 to install treatment systems for private wells exceeding the nitrate standard.[72]

The program also allowed TN systems exceeding the nitrate health standard to apply for up to $10,000 for well replacement, treatment, or connecting to a municipal system. As of spring 2025, WATER had reimbursed 22 TN systems at a total cost of $202,095, with another $75,000 allocated for additional projects under this $10,000 grant portion of the program, which has since ended. Of the 22 grant awards made, 7 were for new wells, 14 were for treatment systems, and 1 was used to connect to a municipal system. Recipients included bars, restaurants, churches,

65 Great Lakes Utilities, 2025; Village of Trempealeau, 2025.
66 Village of Trempealeau, 2025; Environmental Protection Agency's Safe Drinking Water Information System, 2024.
67 The Wisconsin Department of Natural Resources' Well Construction Report Inventory, 2025.
68 The Wisconsin Department of Natural Resources 2004 Nitrate Mitigation Cost Survey.
69 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, pg. 15.
70 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 16; Transient Non-Community Public Drinking Water: Nitrate at Transient Non-Community Water Systems, The Wisconsin Department of Natural Resources, p. 4.
71 Transient Non-Community Public Drinking Water: Nitrate at Transient Non-Community Water Systems, The Wisconsin Department of Natural Resources, p. 4; Public Water Supply Operations Handbook, The Wisconsin Department of Natural Resources, 6.5.2.1.
72 Portage County WATER Program, Portage County (2023).



"With the old well my nitrate reading was 15. I couldn't drink the water coming out of that well until I bought a reverse osmosis system... This new well is 197 feet down [and] cost me almost twenty thousand dollars. But now, the nitrate level reading is 3. So, the water is now safe to drink, but I'm still using the reverse osmosis system just to be on the safe side of things. I want to keep checking for a while longer and make sure the nitrate reading stays low."

Mark Brueggeman of Nelsonville, Wisconsin with his well.

campgrounds, hotels, and recreational education camps. According to the program's administrator, more systems opted to install anion exchange systems with these funds because there are no guarantees that a well will not become contaminated with nitrate again. However, these systems are expensive to install and maintain. Estimates on the lifespan of anion exchange systems vary depending on the type of system, but they generally must be maintained with salt and the resin core must be replaced after between three and seven uses.[73]

"I own a daycare center, and the mental toll of just staying in business because I did not cause the contamination of my well and yet am expected to solve the problem is exhausting...This could put me out of business. I work hard to provide my community with a service that assures that each child is receiving the best care and it can be shut down because of a nitrate test that I cannot control."

Lisa Cochart, daycare owner
Kewaunee County

3. NON-TRANSIENT NON-COMMUNITY SYSTEMS

Non-transient non-community systems (NTNC) are those serving at least 25 of the same people for at least six months per year. Examples of non-transient non-community systems include schools, daycares, factories, office buildings, mobile home parks, and hospitals that have their own water systems. Over the past 10 years, 61 NTNC systems have exceeded the standard with an estimated cost to replace those systems of $747,000.[74]

4. PRIVATE WELLS

When a private well is contaminated with nitrate, individuals not currently served by a public water system might opt to replace an existing well with a deeper and/or deeper-cased well, add on-site filtration, or seek to connect to a public water supply system. Wisconsin administers a statewide well compensation program to assist in remediating contaminated private water systems, discussed in further detail in the next section of this report.

73 Aldex Chemical, Resin Service Life Guidelines.
74 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 16.

Mark Brueggeman of Nelsonville, Wisconsin, at his kitchen sink served by his reverse osmosis system.

Financial assistance is critical because replacing a well is expensive. The cost to drill a new well varies based on a variety of factors, including soil type, casing type, and aquifer depth in addition to labor, well equipment, and site preparation costs. In 2024, Homeadvisor suggests that a well system, electricals, and casing can cost between $3,800 and $29,200, depending on the size, type, and water flow requirements.[75] The GCC estimated, using data from 2019, that private well owners have already spent more than $9 million to replace wells due to elevated nitrate.[76]

Alternatively, some homeowners may opt to install a reverse osmosis (RO) filtration system, which also comes at considerable ongoing expense. While these systems can filter nitrate, they will rarely treat well water down to zero, meaning some level of nitrate will still likely be present even post-RO treatment.[77] RO systems also require regular maintenance to replace filters and protect the membrane inside. Estimates on the lifespan of an RO system vary based on frequency of usage, type of system, incoming water quality, and regular maintenance.

"Reverse osmosis unit only got me to just below the 10 [mg/L] threshold. Time will render that inadequate. I anticipate having to spend between $15,000 – 20,000 for a new well."

Jery Dunn
Portage County

75 HomeAdvisor, How much does well drilling cost in 2024?
76 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 13.
77 PennState Extension, Nitrates in Drinking Water (2022).

Tyler Frye of Casco, Wisconsin with his reverse osmosis system.

Installing treatment systems, replacing wells, and drilling wells deeper is not a sustainable solution to the increasing nitrate contamination problem. Without fundamentally addressing nitrate contamination at the source, access to uncontaminated groundwater will become even more cost-prohibitive and scarce. The GCC's 2019 data analysis estimated that 42,000 private wells exceeded the nitrate health standard at a total estimated cost to abandon and replace with a new safe water supply of $446 million. Inflation, supply chain, steel, cement, and labor costs have likely doubled this estimate.[78] Nitrate is also more common in wells that tap shallow groundwater, meaning homeowners may have to drill at greater expense, to access older groundwater. However, other contaminants such as arsenic and pesticides are more common in older, deeper groundwater, further exacerbating the affordability and access issues of finding safe groundwater sources for consumption.[79]

Survey of private well owners disproportionately affected by agricultural pollution beyond their control

As part of this report, we surveyed owners of private wells contaminated by nitrate to better understand their personal experiences with nitrate remediation costs. The findings presented here draw on a survey conducted in March and April 2025. Respondents included ten private well owners and one person connected to a municipal system. Of those ten, nine experienced nitrate contamination levels exceeding the 10 mg/L standard. The individual whose nitrate levels did not exceed the standard is connected to a municipal water system but chooses to treat that water with an RO system anyway due to health concerns and a family history of cancer. Counties where respondents to the survey reside have high agricultural activity and include:

- Kewaunee
- Portage
- St. Croix
- Wood
- Polk

78 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 13.
79 USGS, The quality of our nation's waters: Water quality in the glacial aquifer system, northern United States, 1993-2009, Circular 1352, p.33-34.

"All the water we use comes from this system. The water we drink, wash dishes with, and bathe in passes through these filters... The water we use is very heavily filtered. But that's what we had to do. We had a town meeting about the water issues here. Not many people came. Especially not the younger people, with kids. Even though they're the ones that this water is going to affect the most."

Gordy Gottbeheut of Nekoosa, Wisconsin, in the basement of his home with water softener tank and Anion exchange system.

One respondent from Portage County agreed to participate anonymously. Costs presented below do not account for inflation.

Well replacement costs are high

Of the ten private well owners, two had fully replaced a well—one at a total cost of $22,636 in 2024 and another at a total cost of $7,500 in 2015. Two others anticipate that they will need a new well at an estimated cost between $15,000 and $20,000. One participant, the owner of the NTNC system and daycare business in Kewaunee County, estimated that replacing her well could cost as much as $75,000.

Treatment systems come with ongoing costs

The survey results provide insight into the ongoing associated costs of implementing nitrate treatment systems. These systems can be leased or purchased outright and require annual service and filter changes to properly maintain. RO systems were the most common solution among participants, with six of the eleven participants opting to have them installed. Of those six, two opted to purchase the system outright, spending about $3000 each for the installation and necessary filters. For the four who instead leased the system, the total installation of the system and the first year of use ranged between $617 and $1321. The ongoing annual cost thereafter to lease the RO system and maintain it with service, filters, and quarterly water testing was between $380 and $674. Some of these respondents noted that RO was either inadequate or would become so in the future and that drilling a new well might eventually be required. For example, one participant who started with an RO system in 2018 eventually had to replace the well entirely by 2024.

One participant had an anion exchange system installed for $6,158, and another was considering installing that type of system and was quoted

Residents with nitrate contamination are often forced to purchase bottled water. Featured here is Mary Warner of Nekoosa, Wisconsin, with bottled water she purchases as her well is currently testing at 12 mg/L – 2 mg/L over the MCL of 10mg/L.

$4,700 for it. Anion exchange systems require salt to maintain, and eventually, replacement of the resin core.

Finally, several participants stated that they had purchased bottled water at times when their water was not safe to drink, especially when providing water to more vulnerable individuals, including pregnant women and young children. Most participants did not have adequate records to specify amounts spent on bottled water from the point of learning about nitrate contamination in their well to the present day. One participant who kept records noted that the annual cost to provide bottled water for a pregnant spouse was about $416. In any event, it bears noting that bottled water was an additional cost experienced by participants.

Health concerns complicated by nitrate contamination

All participants in the survey had concerns about experiencing health issues from nitrate contamination. Nearly all had direct experience with some type of health concern made more complex by virtue of having to deal with nitrate contamination in their well.

Respondents included:

- One person who had to take special care to ensure their spouse with dementia did not drink from taps in the home not connected to the RO system;
- A parent who began purchasing spring water to protect their daughter's pregnancy;
- Someone who was not taking thyroid medications before relocating to Kewaunee County;
- One person diagnosed with cluster headaches, which can be attributable to nitrate. This person's spouse is pregnant and is avoiding drinking tap water despite installation of an RO treatment system for fear of blue baby syndrome;
- A homeowner with family history of ovarian and colon cancer opting to install an RO treatment system despite being connected to municipally treated water;
- Someone whose spouse was diagnosed with stage 4 colon cancer;
- One person with both skin and prostate cancer whose spouse also has had a hysterectomy due to cancer;
- A parent with an autistic child who cannot bathe in water above 20 mg/L on the advice of doctors.

Left to right:
Mary Warner, Ron Hall, and Michael Barfknechet of Nekoosa, Wisconsin. Ron Hall: "My quest here is for my family and for every other family around here, that doesn't have clean drinking water, to make things better for all of us. Our nitrate number right now is 12. So, it's just over the limit. So, we can't drink the water here. It's got to be below 10 to be safe."

F. Wisconsin's efforts to control nitrate pollution have not been sufficient to protect drinking water sources

Despite possessing significant knowledge about the causes, dangers, and extent of nitrate pollution throughout the state, Wisconsin's state agencies have not effectively addressed this pollution. Groundwater and surface waters continue to exhibit persistent levels of contamination and even increases in nitrate loads and concentrations.[80]

1. WELL COMPENSATION PROGRAMS ARE A BAND-AID AND WILL NOT RESOLVE NITRATE CONTAMINATION ISSUES IN THE LONG TERM

When a private well is contaminated with nitrate, homeowners not connected to a public water system may choose to drill a deeper or differently cased well, install on-site filtration, or attempt to connect to a public water supply—each option bringing considerable cost. In Wisconsin, the state Well Compensation Grant Program offers cost-sharing assistance to help private well owners remediate contaminated systems. For nitrate-only contamination, grants cover up to 75% of eligible costs and are capped at $12,000. However, the current program includes stringent eligibility requirements:

- A household income under $65,000 (grants are incrementally reduced above $45,000);
- Nitrate levels exceeding 40 mg/L (four times the 10 mg/L health-based MCL);
- The well must serve both humans and livestock, and it must be in use at least three months per year, supplying over 100 gallons of water daily to livestock.

80 WDNR, 2017-2019 Nutrient Reduction Strategy: Implementation Progress Report (April 2020), p. 6.

These restrictions severely limit access for families impacted by nitrate contamination. Despite multiple efforts by lawmakers and environmental advocates such as Clean Wisconsin to reform the program, legislative revisions have failed. In response, Governor Evers allocated $10 million in federal American Rescue Plan Act (ARPA) funds in late 2022 to expand eligibility and reduce program barriers. As of June 2024, nearly 450 compensation grants had been awarded, with 73% of those addressing nitrate contamination. Small systems, including schools, churches, and businesses, received 67 awards, 80% of which targeted high nitrate levels. Due to high demand, the initial $10 million was fully expended by the end of the 2024 fiscal year, prompting a second allocation of $5 million in ARPA funding in February 2025.[81]

Well compensation programs, while vital for near-term relief, are ultimately a stopgap. They do not address the root cause of nitrate pollution. Without stronger upstream controls on nitrate pollution, more families will face the high cost and growing scarcity of access to safe drinking water. Wisconsin's program and eligibility requirements are also too restrictive to help even those whose wells exceed the 10 mg/L nitrate standard. Figure 1.6 compares Wisconsin's restrictive state-run well compensation program with the expanded ARPA-funded versions implemented in 2022 and 2025.[82] These temporary expansions highlight the urgent need for permanent, structural solutions to address nitrate at its source.

Figure 1.6: Wisconsin Well Compensation Program compared to ARPA Well Compensation Grant Program

Eligibility Characteristics	Wisconsin Well Compensation Program	ARPA Well Compensation Grant Program
Level of nitrate contamination	40 mg/L nitrate-nitrogen	10 mg/L nitrate-nitrogen
Family income	Cannot exceed $65,000	Cannot exceed $100,000
Who can apply	Landowner, spouse, dependent, heir, assignee or legal representative of a landowner, renter, or shared well owner of a private residential supply. Local governments, school districts, and government agencies are excluded.	Same, but adds Wisconsin business owners with a non-community well (TNs and NTNCs such as churches, daycares, rural restaurants, and other small businesses). Local governments, school districts, and government agencies are excluded
Who must have been impacted	The well must serve livestock. The residence must be used at least three months each year and while in use provide an estimated average of more than 100 gallons per day for consumption by livestock.	No requirement that the well also serve livestock.
Maximum award	Grant program pays 75% of eligible costs up to $16,000. The maximum grant possible is $12,000.	$16,000, no cost share requirement

2. LEGISLATIVE CHANGES BLOCKED AGENCY ACTION

Starting in 2011, the Wisconsin state legislature made multiple attempts to limit the ability of the governor and administrative agencies to protect public health and the environment. Act 21, passed in 2011, prevented agencies from adopting any standard or regulation not explicitly authorized or required by state statute. The so-called REINS ("Regulations from the Executive in Need of Scrutiny") Act, enacted in 2017, prohibited an agency from adopting a rule with compliance costs over $10 million over any two-year period. Over the same period, the state senate repeatedly declined to approve Governor Evers's appointees to agency boards like WDNR's Natural Resources Board tasked with approving proposed rules before submission to legislative committees. As a result, agencies have been able to promulgate fewer rules than necessary to implement basic provisions of the law over the past 15 years.

In 2019 Governor Evers announced "The Year of Clean Drinking Water" and issued an executive order to

81 Wisconsin Groundwater Coordinating Council Report to the Legislature – 2024, p. 12-13.
82 WDNR, Well Compensation Grant Program and ARPA Well Compensation Grant Program.

the WDNR to address nitrate pollution. WDNR put forth a scoping statement calling for rules to address nitrate pollution in vulnerable areas with highly permeable soils. That same year, DATCP began working on corresponding revisions to its agricultural pollution rules.

Agency efforts to adopt targeted agricultural nonpoint source performance standards, however, ran headlong into the legislature's obstacles. Despite WDNR's internal economic analysis stating that the rule would not exceed the new threshold for compliance costs, in 2021 WDNR withdrew the proposed rule. Vocal opposition over compliance costs and challenges led WDNR to conclude that its Natural Resources Board and the legislature's Joint Committee for Review of Administrative Rules (JCRAR) might block the rule. More recently, WDNR withdrew proposed groundwater quality standards for PFAS compounds because of concerns about the $10 million threshold.[83]

Fortunately, advocates have stepped in to restore balance. Wisconsin Supreme Court decisions in two 2021 cases, each named *Clean Wisconsin v. WDNR,* severely limited the potential scope of Act 21.[84] Then in a July 2025 decision, the Court found it unconstitutional for JCRAR to block rules created by state agencies implementing the law.[85] This decision also makes it impossible for JCRAR to second-guess agency determinations that a rule does not exceed the $10 million threshold. Taken together, these decisions have gone a long way toward restoring the ability of administrative agencies to carry out the law as directed. Agencies should harness this opportunity by prioritizing rule revision efforts to address the most egregious situations of outdated or ineffective rule language and parameters.

3. AGRICULTURE AND FERTILIZER POLICIES ARE NOT ADDRESSING NITRATE CONTAMINATION AT THE SOURCE

Because Wisconsin administrative agencies have been severely limited in their ability to establish new regulations, they have relied heavily on voluntary incentives, such as cost-sharing and price supports to incentivize farmers to implement conservation measures. However, it is clear that these voluntary incentives alone aren't enough to solve Wisconsin's nitrate problems. For example, while Wisconsin conditions cost-share benefits on the development of a nutrient management plan, only 44% of the state's harvestable cropland is covered by a certified nutrient management plan (NMP), according to 2024 data.[86] More importantly, the rate of implementation and compliance with NMPs is unknown.

Similarly, the Nitrogen Optimization Pilot Program (NOPP), enacted by the state legislature in 2022, provides funding (up to $40,000) to farmers who for two growing seasons undertake on-farm research efforts to optimize the application of commercial nitrogen. Early results of the program demonstrate that nitrogen fertilizer application rates can be reduced and still maintain or increase crop yields.[87] While the program is a good step toward incentivizing education regarding reducing the use of nitrogen and conservation practices, it has not demonstrated measurable improvement in Wisconsin's nitrate pollution problem and exemplifies the inadequacy of the voluntary approach toward reducing nitrogen application.

83 Scope statement SS 075-22 (2025).
84 Clean Wisconsin, Inc. v. DNR, 2021 WI 71; Clean Wisconsin, Inc. v. DNR, 2021 WI 72.
85 Evers v. Marklein, 2025 WI 36.
86 DATCP, 2024 Annual Nutrient Management Report.
87 Schulte, Laura. "Wisconsin abandoned rules on nitrates pollution. Now, solutions seem far off" Milwaukee Journal Sentinel. April 25, 2024.

G. Other states are implementing policies that help reduce pollution from nitrate

1. GROUNDWATER MONITORING REQUIREMENTS

One way to gain a more comprehensive understanding of responsibility for nitrate contamination is to more closely track its presence with groundwater monitoring. Under current Wisconsin law, where an owner or operator of an industry is responsible for causing an exceedance of the MCL, the owner or operator must notify the proper regulatory authority (DATCP, WDOT, WDSPS, WNDR, and "other agencies that regulate activities, facilities, or practices that are related to substances that have been detected or have reasonable probability of entering groundwater").[88] The agency must then require a response from the facility operator or owner unless the agency determines no scientifically valid determination (at a significance level of .5%) can be made that an exceedance occurred.[89]

However, to even know whether exceedances are happening, groundwater monitoring needs to be in place. Wisconsin haphazardly—and rarely—imposes groundwater monitoring requirements in WPDES permits issued to Concentrated Animal Feeding Operations (CAFOs). Despite having authority to do so, WDNR has only been imposing groundwater monitoring requirements in a small handful of permits, and only under significant public pressure. WDNR does not currently have a standard process for determining when to require a CAFO to conduct groundwater monitoring. The location of manure storage is regulated by local governments, subject to minimum requirements set by the state. But local governments are prohibited from enforcing ordinances that attempt to enforce groundwater protection by N.R. 151.096 without approval from WDNR or DTCAP. In addition, local governments may not have the expertise and capacity to develop ordinances that are more protective of groundwater. Thus, the responsibility to administer and enforce laws that adequately and comprehensively protect groundwater statewide rests with WDNR. In 2021, the Wisconsin Supreme Court explicitly upheld this authority.[90]

In addition, unlike the other states shown in the table below, Wisconsin does not:

- Specify certain types of areas where manure storage may not be located or condition the location of that storage in those areas on instituting groundwater monitoring;
- Require annual nitrate testing at a well located at a CAFO;
- Set a threshold of animal units at which groundwater monitoring must be considered;
- Require permit applicants, rather than the state, to pay for hydrogeologic analysis to determine whether groundwater monitoring is needed and, if so, where it should be implemented.

88 N.R. 140.14 and 140.05(20).
89 N.R. 140.26 and N.R. 140.14.
90 Clean Wisconsin, Inc. v. DNR, 2021 WI 71.

Other states are doing better than Wisconsin on this front. Figure 1.7 illustrates how Ohio and Michigan incorporate groundwater monitoring-related provisions as compared to Wisconsin:

Figure 1.7: Comparison of state groundwater monitoring laws

State	Regulations	Citations	Wisconsin Analog
Ohio 	Manure storage is regulated by the state. In a permit to install a manure storage pond or manure treatment lagoon, the Director can require groundwater monitoring if necessary to meet siting requirements.	O.A.C. 901: 10-2-03 (B)(8)	Manure storage siting is regulated by local manure storage ordinances. Wisconsin law sets requirements that those ordinances must meet but does not specifically include groundwater monitoring requirements. Wis. Admin Code ATCP 50.56.
	Manure storage ponds and treatment lagoons are outright prohibited from being located above a sole source aquifer, in a 100-year floodplain, karst area, or area of potential subsidence due to an underground mine, without design of groundwater monitoring or engineered controls approved by the Director.	O.A.C. 901:10-2-02 (F) to (H) and (J)	Wisconsin law does not provide a statewide standard for requirements related to manure storage siting beyond those described in NRCS technical standards for manure storage systems. Wisconsin's Livestock Siting Law (ATCP 51) does provide a framework that counties and towns can adopt that includes some requirements for areas where manure storage facilities are prohibited but does not condition the location of storage facilities based on groundwater contamination risk, nor does it include groundwater monitoring requirements. Currently the WPDES permit process allows the permittee to decide to include additional controls and allows WDNR to require monitoring only if WDNR determines it is necessary to evaluate groundwater impacts and geologic or construction conditions warrant monitoring. WDNR may impose monitoring after considering: • Whether facilities are located on or near areas that are susceptible to groundwater contamination such as direct conduits to groundwater, sandy soils, and sites with minimal separations between bedrock and high water tables. • The size and depth of the facility. • The type of liner used. • Characteristics of waste being stored. • Other considerations based on potential impacts to waters of the state. N.R. 243.15(3)(c) and (7).

State	Regulations	Citations	Wisconsin Analog
Ohio	Annual sampling of water for nitrate at a well at a concentrated animal feeding facility is required as part of the manure management plan. If no well exists at the facility, one must be installed.	O.A.C. 901: 10-2-08 (D)(12)	While not required as part of CAFO WPDES permitting, dairy farms sample their livestock water sources annually for nitrate and E. coli as part of their milk grading certification requirements. WDNR should work with DATCP to access those data to identify increasing, decreasing, or stable trends in groundwater nitrate concentrations around the production facility. This information could be useful for determining when and to what extent groundwater monitoring is necessary.
	The Director of ODA has the authority, via a corrective permitting action, to require groundwater monitoring where nitrate consistently exceeds the action level of 10 mg/L.	Discussion with Chief of Environmental Livestock Permitting, 8/22/24	Wisconsin has more explicit authority to require groundwater monitoring of land application areas than Ohio, per Wis. Stat. § 283.31(3) – (5) and related regulations. In practice, however, WDNR rarely requires groundwater monitoring at land application areas.
Michigan	Facilities that house 5,000 animal units (a defined amount for each species—3,500 for dairy cattle) must obtain a groundwater discharge permit as part of NPDES permitting, which may include groundwater monitoring requirements.	R. 323.2210(f) and 323.2218	Wisconsin does not set an animal unit number at which groundwater monitoring must be more closely considered.
	Groundwater discharge permit applicants must complete a hydrogeologic study if certain risk factors are present and subsequently, a hydrogeologic report that meets certain requirements.	R. 323.2218 and 323.2221. See also Guidesheet I, Hydrogeologic Study Requirements, EGLE	WDNR pays for hydrogeologic analysis and reports, rather than permit applicants.

2. Tracking the cost of pollution to ratepayers—Ohio and Harmful Algal Blooms (HABs)

Collecting information about the cost of nitrate to municipal water systems for the case studies included in this report was difficult and required individual outreach to systems because Wisconsin does not comprehensively collect this data. However, another state in the Great Lakes region, Ohio, has taken a different approach with respect to a particular category of drinking water contaminant. By surveying public water systems about the cost of responding to cyanotoxins, the Ohio Environmental Protection Agency (OEPA) gains a more comprehensive understanding of the costs those systems experience in monitoring and treating drinking water. OEPA can use this data to better inform water infrastructure funding and identify areas where assistance is needed. Ohio's approach is one that could be replicated with respect to nitrate in Wisconsin.

Fueled by excessive nutrients coming predominantly from agricultural land use, harmful algal blooms (HABs) regularly occur in the Western Lake Erie basin. HABs produce cyanotoxins, such as microcystin, which can poison public drinking water supplies—potentially making the water unsafe to drink, as occurred in Toledo in 2014. Following that crisis, OEPA adopted new rules requiring public water systems to monitor and test for cyanotoxins, including microcystin.[91] However, monitoring, testing, and treating drinking water for cyanotoxins comes at a price. Due to these increased costs, public water systems have been forced to shift that burden onto ratepayers.

In 2020, OEPA conducted a survey to ask public water systems about how much HABs are costing them in capital expenditures for facility upgrades, source water monitoring, treatment technology, and HAB residuals disposal. What the survey shows is enlightening: an Ohio resident in the municipalities surveyed paid an annual average of $9.76 in increased rates. But the average for Toledo residents was $18.75—meaning a family of five in Toledo is paying about an extra $100 per year to deal with HABs. Thus, downstream ratepayers in Ohio are ultimately shouldering the cost of the upstream agricultural pollution that causes HABs.[92]

OEPA's 2020 survey provided tremendous insight into the real cost of HABs to public water systems and residents. The data gleaned from the survey provided a valuable estimate of the resources needed to deal with HABs. According to OEPA Division of Drinking and Ground Water (DDAGW), DDAGW intends to conduct the survey again, according to the five-year rules review cycle, and potentially on a three-year cycle. However, which HAB-related costs a system may face and when those costs will be incurred vary. For example, chemicals necessary to treat drinking water for cyanotoxins fluctuate in price and are currently very expensive. The severity of HABs varies year to year and capital costs for upgrades might be incurred outside of the five- or three-year survey cycles. To give a more complete picture of the costs associated with HAB protocols and to ensure systems have the financial capacity to meet those costs, more frequent reporting of this data in a more standardized way would be invaluable.

Administrative rulemaking in Ohio faces similar challenges set by the legislature in Wisconsin. Because of legislation passed in 2022, state agencies are prohibited from adopting new regulatory restrictions without eliminating two existing ones until June 30, 2025. In addition, agencies are under a mandate to reduce regulatory restrictions by 30% by that date. Agencies that do not meet that target must eliminate two regulatory restrictions for every new one adopted beginning on July 1, 2025.[93] OEPA is currently streamlining the survey it provided to water systems in 2020 with plans to readminister it in 2025.

3. Minnesota permit revisions

Minnesota is Wisconsin's most geologically similar neighbor and faces similar problems with nitrate contamination of groundwater. In 2023, the Minnesota Pollution Control Agency was ordered by the U.S. Environmental Protection Agency (USEPA) to use all available tools to address its drinking water contamination crisis caused by nitrate, including revising permits for feedlots to reduce nitrate over the long term. In response, Minnesota's Pollution Control Agency (MPCA) revised those permits and is adjusting some of its regulations.

Minnesota made changes in those permits concerning manure transfer, visual inspection, and winter application that go further than Wisconsin law in many respects. First, Minnesota outright prohibits the transfer of manure to recipients who intend to apply during winter conditions. Wisconsin has no such equivalent prohibition on manure transfer. Minnesota will also require

91 O.A.C. Chapter 3745-90.
92 Alliance for the Great Lakes, Western Lake Erie Basin Drinking Water Systems: Harmful Algal Bloom Cost of Intervention (May 2022).
93 R.C. 121.951.

Public spring in Casco, Wisconsin.

permittees to collect crop information, total nutrients applied, and soil test results from third-party recipients on a manure transfer tracking form to be reported along with the permittee's annual report. While Wisconsin requires third-party recipients of manure to follow the manure management plan of the permittee, it does not require this important information about manure applications to be reported on a tracking form.

Minnesota's permits will also now require specific structures to be inspected (downgradient field edges, tile intakes, and water features) to be visually inspected at least once each day manure is applied, at the end of application, and within 24 hours of a half-inch or greater rainfall that occurs within 14 days of the end of application unless the manure is injected or incorporated. While Wisconsin generally requires visual inspection to determine if runoff has occurred, its requirements are not as specific regarding the locations to be inspected and when inspection must occur.

Finally, Minnesota sets new stricter winter application requirements. Liquid manure is outright prohibited from being applied from December through March (unless incorporated or injected). Solid manure application is permissible from December through February on frozen or snow-covered ground only when all of the following conditions (among others) are met:

- Slope is 6% or less, and 2% or less in February;
- Less than a 50% chance of a ¼ inch of rain within 24 hours, or within 5 days in February;
- If 2 inches or more of snow on the ground, the temperature must remain below 40 degrees for 24 hours after land application, or for 5 days in February.

Liquid and solid manure application to frozen or snow-covered ground is prohibited for the month of March.

By comparison, Wisconsin prohibits liquid manure application from February through March, except in emergency situations. Thus, Minnesota's liquid application prohibition is two months longer. Application of solid manure is prohibited in Wisconsin from February through March if the ground is frozen or snow cover is one inch or greater, but otherwise, solid spreading is permissible on slopes of up to 9% on frozen (December to February) or snow-covered ground (December to February and under one inch from February through March), with no additional rainfall or temperature consideration. Wisconsin has no general prohibition against the application of solid manure to frozen or snow-covered ground for the month of March.[94]

Additional changes may be made to the rules governing feedlots in Minnesota to comply with USEPA's directive.

It is clear that Wisconsin's approaches to date are not adequately addressing nitrate contamination. Fortunately, there are several actions the state could take to make progress on this pressing problem.

94 MPCA, Notable changes to the feedlot general permits (Jan. 2025).

II.

Policy recommendations to address nitrate pollution

Nitrate filter for reverse osmosis system.

> "Living in an agriculture community, it can be difficult to speak about these issues as your neighbors, family, and friends are all connected to agriculture in some way. Homeowners with private wells have no way to protect their water but are expected to "be their own water utility manager".... Small communities such as [mine] lack the resources to solve these problems by themselves. We need protections for our groundwater."
>
> ***Tyler Frye***
> Kewaunee County

A. Long term—Agricultural program revisions are needed

1. REEVALUATE GROUNDWATER, PERFORMANCE, AND SURFACE WATER STANDARDS TO BETTER ADDRESS NITRATE POLLUTION

In the long term, Wisconsin will need to make policy changes to remedy nitrate contamination at the source. One way to do so would be for the Wisconsin Department of Health Services (WDHS) to reevaluate the groundwater standards for nitrate and incorporate additional information related to chronic effects of nitrate consumption on human health. As this report illustrates, new literature indicates that a human health standard of 10 mg/L is not protective enough against the chronic health conditions associated with consumption of nitrate. But Wisconsin's current groundwater nitrate enforcement standard was adopted in 1994—over 30 years ago, and well before public health data identified risks from chronic exposure to nitrate at low levels. Wisconsin law allows WDHS to adopt an enforcement standard beyond what federal law requires if "there is significant technical information which is scientifically valid and which was not considered when the federal number was established."[95] As such, if WDHS re-evaluated nitrate and made a recommendation for a new, lower standard, WDNR would be required to adopt that as the new enforcement standard as well.[96]

WDNR should also reconsider addressing nonpoint nitrate pollution in specific areas of the state through the establishment of a targeted performance standard for nitrate. As our report explores, some areas of the state experience greater contamination from nitrate than others. WDNR could reevaluate areas of the state experiencing the highest degree of groundwater contamination and establish stronger fertilizer and manure application requirements for those areas to reduce the potential for losses to groundwater sources. Though WDNR attempted this type of standard in the past, the REINS Act was a significant obstacle to that effort, so the proposed rule was abandoned by WDNR before the entire administrative rulemaking process and should be revisited.

Establishing a surface water standard for nitrate would provide discharge limits for surface water dischargers statewide and reduce contributions from point sources while providing WDNR with information needed to pursue Total Maximum Daily Load development to more accurately assess nonpoint contributions of nitrate to surface waters. The Triennial Review Process has already identified nitrate pollution of surface water as a priority contaminant to address, setting up the opportunity to expand sampling and data collection to pursue this oversight option. WDNR should continue these efforts to improve monitoring with an end goal of establishing a surface water standard for nitrate.[97]

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95 Wis. Stat. 160.07(4)(e).
96 Wis. Stat. 160.07 (5).
97 The Wisconsin Department of Natural Resources, 2025-2027 Triennial Standards Review (TSR) Priorities for the Water Quality Standards Program.

2. WDNR AND DATCP MUST NOW MOVE SWIFTLY TO IMPLEMENT GROUNDWATER STANDARDS AND OTHER ENVIRONMENTAL PROTECTIONS

After 15 years of regulatory stagnation, decisions by the Wisconsin Supreme Court and changed composition of agency boards over the past four years have opened the door to new opportunities for state government to address nitrate through rulemaking. As of this writing, advocates are still working to understand the full legal effect of the *Evers v. Marklein* decision on various statutory provisions, but the basic message for WDNR and DATCP could not be clearer: **these agencies need to move as quickly as possible to restart or initiate rulemaking to protect Wisconsin residents from nitrate pollution**. They can now move forward with confidence knowing that special interests will no longer be able to influence a few legislators to replace an agency's cost calculations with their own or to otherwise stop a needed rule in its tracks.

3. ADMINISTRATIVE PROGRAM REVISIONS

At the administrative agency level, WDNR and DATCP should make program revisions that ensure compliance with nutrient management plans. Cost-share payments should be made conditional upon implementation of developed nutrient management plans, and compliance should be verified through documentation such as fertilizer bills and manure spreading logs before payments are issued. WDNR should also seek to use its existing groundwater monitoring data to inform the maximum carrying capacity of watersheds, to identify the maximum animal units a watershed can handle, and use those limits when considering approval of farm expansions or permits for new facilities.

> "CAFOs need enforceable regulation and the DNR needs funding for staff. WPDES permits and Nutrient Management Plans do not protect groundwater. Without proper oversight, we are put in the position of having to fight for safe drinking water."
>
> ***Lisa Anderson***
> Portage County

4. CREATE A NON-REGULATORY MANURE HAULER REGISTRATION SYSTEM

Finally, as our conservative estimates indicate, manure and fertilizer are being overapplied, particularly in watersheds with dense concentrations of CAFOs. Thus, in revising its nutrient loss reduction strategy, WDNR should explore ways to address the overapplication of nitrogen. One option is to condition cost share on the implementation of nutrient management plans, but an additional step the state should consider is how to encourage pathways for greater distribution of manure, away from where it is being overapplied. To do so, the state could enact a manure hauler registration program. By creating a system of registration and recordkeeping for manure haulers, as Minnesota is actively doing, the state could more readily track manure volumes and application by general geographic location, while determining compliance with nutrient management plans. In addition, manure volume and land application data would enable and facilitate greater potential for transfer of manure from manure-dense areas of the state to areas that would most benefit from the organic matter and microbial activity. This, in turn, would improve soil health and plant productivity. Practices that improve manure management, storage, and handling and that reduce manure runoff would not only address the public health risks of nitrate, but also dangerous bacteria and pathogens.

B. Medium term—WPDES permitting, groundwater monitoring, and nitrate treatment costs

1. ESTABLISH A STANDARD OPERATING PROCEDURE THAT INCLUDES AN INITIAL SCREENING TOOL FOR GROUNDWATER MONITORING

As previously discussed, WDNR has the authority to require large animal feeding operations to implement groundwater monitoring as a condition of a WPDES CAFO permit. In 2021, the Wisconsin Supreme Court explicitly found that groundwater monitoring conditions are appropriate for WDNR to require when:

- Necessary to ensure compliance with effluent limitations, based on both the presence of existing wells contaminated by manure **and the susceptibility of the area** to groundwater contamination; or
- Necessary to ensure compliance with groundwater protection standards, based on the presence of contaminated wells and the need for WDNR to be able to enforce those protections.

WDNR, however, has elected to require groundwater monitoring in only a limited number of cases to date. Additionally, when WDNR has required monitoring well installations, the decision is often challenged by the permittee, suggesting that the justification for requiring monitoring is being questioned and a more robust and consistent process for decision-making should be established to underpin those decisions and make the process more transparent for all parties.

To help address the overwhelming prevalence of nitrate and fecal coliform contamination in Wisconsin's drinking water, WDNR can legally and should establish a standard operating procedure for determining when to impose groundwater monitoring in WPDES permits that evaluates and incorporates the two factors identified in the Court's findings: susceptibility of the area and the need for WDNR to meaningfully enforce groundwater protection standards. Establishing a standard operating procedure would provide several important benefits, including:

- Streamlining internal WDNR reviews and decision-making—Historically, internal procedure setting helps provide a consistent lens through which all program staff are reviewing permits, which facilitates the staff's ability to move more quickly through document reviews and permit issuance.
- Potentially reducing the ability of permittees to challenge WDNR's decision to require groundwater monitoring—If WDNR adopts a standard operating procedure that is applied consistently to every WPDES permit, the strength of legal arguments on which to challenge that decision would be diminished, meaning WDNR could potentially spend less time and resources on litigation in the long term.
- Providing clarity for permittees—Through awareness of the monitoring criteria, permittees will be better able to anticipate if monitoring will be required on their farm and therefore can factor in the cost of monitoring into their business plans.
- Providing clarity and transparency to the public—Helping community members better understand why monitoring is or is not going to be required in a permit can help increase understanding about the decision-making process and the actions WDNR is taking to protect their drinking water resources.
- Ensuring science and data underpin permit requirement decisions—Identifying key pieces of farm-specific information that must be collected and considered when applying permit conditions for monitoring will ensure consistency across WPDES permit regions and staff, while also assuring the regulated community that decisions on permit conditions are being made using publicly available and solid baseline data.

Currently, it appears that WDNR regional permitting specialists review CAFO WPDES permit applications and make the determination of whether to forward an application to the CAFO hydrogeologist for a full groundwater analysis and preparation of a hydrogeologic report. However, that decision appears to be based only on the regional specialist's individual general knowledge of whether a particular area may be susceptible to groundwater contamination. How regional specialists make that decision and whether they do so according to a consistent set of factors is unclear. This process also does not appear to effectively or consistently capitalize on the depth of the hydrogeologist's expertise.

To overcome this process gap, a screening tool should be developed and incorporated into the permit review process that regional specialists would utilize to provide a high-level, site-specific evaluation of risk and identify farms that require a full hydrogeologic assessment by the CAFO hydrogeologist. The screening tool should enable applicants to input farm-specific information (see below) to determine whether groundwater monitoring is likely to be necessary as part of the permit or permit renewal. If an applicant's input meets a set of risk factors established by WDNR's screening tool, the application could be flagged for the hydrogeologist, who could then either begin to prepare a hydrogeologic analysis or request that the applicant submit a hydrogeologic analysis for the hydrogeologist's review. At minimum, WDNR should consider and include the following factors as part of the initial screening tool:

- <u>Minimum depth to bedrock</u>—Extensive data exists on the depth to bedrock across the state. WDNR should use this data to establish a bedrock depth and percentage of a farm's cropland acreage that, when exceeded, would require either a full hydrogeologic assessment or automatic implementation of groundwater monitoring.
- <u>Minimum depth to water table</u>—Similar to a minimum depth to bedrock, WDNR should establish a water table depth and percentage of a farm's cropland acreage that, when exceeded, would require either a full hydrogeologic assessment or automatic implementation of groundwater monitoring.
- <u>Animal unit number</u>—WDNR should utilize both a minimum animal unit threshold at which groundwater monitoring is automatically required and designate a maximum number of animal units for a particular HUC-10 watershed at which, when exceeded, all applicants in that watershed must be required to implement groundwater monitoring;
- <u>Susceptibility to groundwater contamination</u>—Evaluating factors that are already considered by WDNR in other siting scenarios (e.g., manure storage facility siting) in combination, such as distance to direct conduits to groundwater, presence of high permeability soils, minimal separation between bedrock and high water table, size of area over which manure and fertilizer are planned to be spread, characteristics of the waste stored and spread, and other considerations based on potential impacts to waters of the state; and
- Other automatic factors—In other states, groundwater monitoring requirements are automatically triggered by certain factors. For example, in Ohio groundwater monitoring or other engineered controls are automatically required for any manure storage facility located above a sole source aquifer, within a karst area, 100-year flood plain, or areas prone to subsidence due to an underground mine. In Michigan, exceeding a specific number of animal units automatically triggers a requirement to obtain a groundwater discharge permit and may further require completion of a hydrogeologic study and report.

The screening tool should also separately assess whether monitoring may be necessary near manure storage areas, production areas, and fields for land application based on the factors listed above.

WDNR currently makes determinations about whether to include groundwater monitoring in approval documents issued for the operation of landfills using a standard operating procedure. Per WDNR guidance documents and Ch. NR 507, WDNR evaluates and imposes groundwater detection monitoring requirements as are appropriate for the individual facility. However, most modern facilities subject to design standards imposed in 1996 must conduct sampling to evaluate changes in groundwater at least every six months.[98] By setting this minimum requirement and allowing design standards to guide its decision-making, WDNR eases the burden of comprehensively evaluating the intricacies of the need for groundwater monitoring in each individual landfill permit. Moreover, the burden to demonstrate detection monitoring is not needed to protect groundwater rests with the facility. WDNR should consider how WPDES permit applicants can more actively participate in the process of determining whether groundwater monitoring requirements should be included in the permit.

In Wisconsin, manure storage system operation and maintenance are largely regulated by local governments through ordinances, subject to siting and construction requirements set by the state. Local governments are prohibited from enforcing ordinances that attempt to enforce groundwater protection under NR 151.096 without approval from WDNR or DATCP. Thus, the responsibility to administer and enforce laws that adequately protect groundwater comprehensively rests with WDNR. Furthermore, though WDNR considers some broad factors when assessing whether to impose groundwater monitoring in the vicinity of manure storage locations (NR 243.15(3)(c) and (7)), WDNR does not specifically and consistently utilize those same factors when making determinations about imposing monitoring on land application areas. In other words, stored waste is considered differently by WDNR than the same waste when it is land applied. Establishing consistent triggers for groundwater monitoring under each scenario would give both the farm and the community greater confidence in the regulatory component of farm oversight.

2. REQUIRE PUBLIC WATER SYSTEMS TO TRACK AND REPORT COSTS INCURRED BY NITRATE

As of 2024, no Wisconsin state agency has a comprehensive picture of how much public water systems have spent to address nitrate contamination. While the Wisconsin Department of Natural Resources (WDNR) has made some effort to collect this information, detailed financial data is sparse. In contrast, Ohio surveys its public water systems about the costs of monitoring and treating harmful algal bloom-related toxins, an approach Wisconsin should consider adopting for nitrate. WDNR needs consistent, statewide data collection on the costs of nitrate monitoring and treatment to better inform infrastructure investments, funding decisions, and system capacity assessments.

Our analysis drew from a limited number of case studies, where we were able to obtain detailed cost information, and illustrates how nitrate-related treatment costs are already being passed on to municipal ratepayers. However, without a proactive, standardized reporting requirement, the true statewide financial burden remains unknown.

Obtaining detailed cost information is challenging. While some data is publicly available on municipal and water utility websites, financial reporting for specific contaminant-related expenses is generally lacking. For example, federally required Consumer Confidence Reports offer transparency on water quality, such as nitrate levels, but do not disclose treatment costs or ratepayer impacts. Similarly, the Wisconsin Public Service Commission (PSC) requires annual financial reports from utilities, which include general categories like "water treatment chemicals" and "maintenance of treatment equipment," but do not itemize expenses by contaminant—such as the cost of ion exchange resins or the maintenance of nitrate removal systems.

98 WDNR, Waste & Materials Management, Reducing or Terminating Groundwater Monitoring at Solid Waste Landfills, PUB-WA-1013 2019.

These existing federal and state-level reporting frameworks could be expanded to include more granular cost data. The PSC, which regulates and oversees public utilities, is well positioned to require this level of detail, especially during rate case assessments. Doing so would give both regulators and ratepayers a clearer understanding of the financial impacts of nitrate contamination, strengthen public transparency, and better support informed water quality decision-making statewide.

C. Short term—fully fund and expand eligibility requirements for the private well compensation program

There are no quick and easy solutions to Wisconsin's nitrate contamination issues. However, in the short term, to relieve the burden on Wisconsin's impacted private well owners, the legislature should immediately take action to establish a state-funded well testing program through county public health departments and revise eligibility for the state well compensation program to match those of the ARPA-funded program. Demand for the federal funding available has been extreme, such that all ARPA funds were quickly exhausted in 2024. Portage County's program to support treatment or replacement of transient, non-community wells also illustrates there are needs unmet by the current state-sponsored well compensation program. A state legislative effort to remove the livestock watering requirement was proposed in the 2023 legislative session but did not move forward.[99] Strong support exists to remove several barriers impacting utilization of the funding, including:

- Increasing the family income threshold;
- Lowering the nitrate contamination level from 40 mg/L nitrate-nitrogen to 10 mg/L nitrate-nitrogen;
- Removing the requirement that the water supply also serve livestock; and
- Increasing the maximum reimbursement amount to reflect increases in treatment and replacement costs.

Wisconsin could potentially fund the program using tonnage fees on the sale of nitrogen fertilizer. Wisconsin's total current tonnage fertilizer fee is $0.62 per ton of fertilizer sold. Only $0.10 of that fee is deposited into an environmental fund, to be used for nonpoint source pollution abatement, and the remainder is used for research and administration of the fertilizer program.[100] By comparison, Minnesota imposes fertilizer tonnage fees totaling $1.11 per ton.[101] Legislation was introduced last session in Minnesota to increase those fees and add a $0.99 per ton fee specifically to the sale of nitrogen in order to fund a private well drinking-water assistance program.[102] While that legislation was not enacted, in 2024 Minnesota allocated over $5 million from its Clean Water Fund to monitor nitrate levels and to inventory, test, and provide education and outreach related to water quality in southeastern Minnesota's private wells, and another $2.8 million to assist private well owners with treatment system installation.[103] Legislation introduced recently seeks to provide an additional $7.7 million for private well mitigation for the 2026-2027 biennium (including RO treatment systems), and well repair and reconstruction in eight of Minnesota's most affected counties.[104] While these measures will provide some relief to private well owners who need it, the source of this funding is Minnesota taxpayers, who should not carry the burden of addressing nitrate contamination they did not cause.

Finally, as our calculations illustrate, nitrogen overapplication is costing farmers as much as $11 million on unnecessary nitrogen fertilizer purchases. Connecting the funding stream for nitrate remediation costs to nitrogen tonnage fees would instead place the burden of financing well testing and remediation on agricultural industry players rather than taxpayers and would simultaneously discourage the overapplication of nitrogen to Wisconsin's cropland.

99 S.B. 58 (2022-2023 Leg.) Wis.
100 Wis. Stat. 94.64(4)(a) and (c).
101 Minn. Stat. Sec. 18C.425.
102 HF 4135 and SF 4311 of the 93rd Minn. Legislature (2023-2024).
103 Kian, Ava, "What the Legislature did to address nitrate contamination in Minnesota groundwater," MinnPost (June 10, 2024).
104 HF 821 and SF 1183 of the 94th Minn. Legislature (2025-2026).

Appendix 1: Nitrogen Content and Application Calculation Tables

Table 2: Annual manure production and nitrogen content for 2022

Animal Type	2022 US Census Animal Numbers	Manure Produced/ head/ day (lbs.)	Manure Produced – All Animals (lbs./yr)	Nitrogen Content of Manure (lbs./ton)	Nitrogen Content of Manure by Animal Type (lbs./yr)
Milk cows (1400 lbs.), solid manure (tons)	316,068	155	17,881,547,100	2	17,881,547
Milk cows (1400 lbs.), liquid manure (gallons)	948,204	17.7	6,125,871,942	7	42,881,104
Cows/heifers/ young stock combined	3,014,852	40	44,016,839,200	2	44,016,839
Beef cows (1100 lbs.)	284,400	54	5,605,524,000	3	8,408,286
Poultry: chickens	14,983,478	0.17	929,724,810	24	11,156,698
Poultry: duck	26,007	0.44	4,176,724	6	12,530
Poultry: turkey	2,356,316	0.74	636,440,952	26	8,273,732
Hogs and pigs	335,975	1.2	147,157,050	22	4,120,397
Sheep	71,801	4.1	107,450,197	5	268,625
Goats	108,237	8.4	331,854,642	3	497,782
Horse	60,653	54.4	1,204,325,968	2	1,204,326
Totals			**76,990,912,584**		**138,721,867**

Table 3: Major crop acreage and nitrogen recommendations for 2022 crop year

Top crops by acreage 2022	2022 Crop Year – Acres Planted	Recommended Nitrogen Application Rate (lbs./acre)	Nitrogen Need by Crop (lbs./yr)
Alfalfa	1,630,000	0	—
Barley	3,000	50	150,000
Cabbage	3,800	140	532,000
Carrots	3,200	100	320,000
Corn	3,910,000	165	645,150,000
Cranberries	20,300	150	3,045,000
Cucumbers	6,700	80	536,000
Green Peas	25,100	30	753,000
Oats	65,000	40	2,600,000
Potato	66,500	210	13,965,000
Snap Beans	52,200	40	2,088,000
Sweet Corn	57,600	130	7,488,000
Soybeans	2,150,000	40	86,000,000
Winter Wheat	240,000	60	14,400,000
Forage (non-alfalfa)	420,000	100	42,000,000
Total	**7,023,400**		**819,027,000**

Table 4: Total nitrogen credit from legumes for 2022 crop year

Crop	2022 Crop Year – Acres Planted	Nitrogen Credit (lbs./acre)**	Total Nitrogen Credit (lbs.)
Alfalfa*	1,630,000	90	57,050,000
Soybean	2,150,000	20	32,250,000
Green Peas	25,100	20	125,500
Snap Beans	52,200	20	261,000
Total Nitrogen Credit from Legumes			**89,686,500**

*Alfalfa provides both 1st year (90 lbs./acre) and 2nd year (50 lbs./acre) nitrogen credits)

**Assumes that 25% of alfalfa, green peas, and snapbeans will be planted to corn or another nitrogen-demanding crop the following year. For soybeans, it is assumed 75% of the acres will be planted to corn or another nitrogen-demanding crop the following year.

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