DEPARTMENT OF AGRICULTURE

Minnesota's 2023 Water Testing Clinics for Nitrate Summary

Minnesota Department of Agriculture

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CLEAN WATER LAND & LEGACY AMENDMENT

Minnesota Water Testing Clinics for Nitrate Summary Report – 2023

Nitrate is one of the most common contaminants in Minnesota's groundwater. The majority of Minnesota households have access to safe drinking water supplies. However, in areas vulnerable to groundwater contamination, some public and private wells have nitrate levels that exceed the health risk limit for nitrate. While elevated levels of nitrate in groundwater can result from several factors, a major contributor in rural Minnesota is nitrogen fertilizer that leaches past the crop root zone.

Nitrate in Groundwater

The health risk limit for nitrate in drinking water is 10 mg/L , according to the U.S. Environmental Protection Agency (EPA) and the Minnesota Department of Health. The reference of 10 mg/L of nitrate is the same as 10 parts per million. Through local partners such as SWCDs and County Environmental Services, the Minnesota Department of Agriculture (MDA) offers water testing clinics to test for nitrate and increase public awareness of nitrate contamination in rural drinking water. The MDA has purchased spectrophotometers that use ultraviolet light to measure nitrate in water. A spectrophotometer is an instrument used to measure the amount of light absorbed by a sample at different wavelengths, providing information about the sample's composition. The MDA uses the spectrophotometer specifically to measure the nitrate concentration of the sample. This process takes only a few minutes per sample. The MDA loans these machines to local partners across Minnesota as a public service to provide private well owners a screening tool to evaluate nitrate concentrations in the well water.

In 1993, the MDA developed an onsite, walk-in style water testing clinic with the objective of increasing public awareness of nitrate levels in private well water. The program was successful in achieving high monitoring rates in counties that have a chronic problem with nitrate concentrations greater than 10 mg/L. The program was funded through the Environment and Natural Resources Trust Fund and other grants between 1999 and 2006. This funding ended in 2006, and the program was discontinued. Counties were still able to use the MDA nitrate testing equipment but had to provide their own personnel to run the clinic and record the nitrate analysis results. The Water Testing Clinic Program was reinstated in 2011 with help of Clean Water Funds and continues to be funded through those dollars.

The Minnesota Department of Agriculture currently sponsors spectrophotometers to any entity in Minnesota that would like to host a water testing clinic.

Locations of Water Testing Clinics for Nitrate in 2023

The MDA collaborates with local partners to conduct water testing clinics for private well owners across the state of Minnesota. Clinics are held primarily in areas vulnerable to groundwater contamination and in areas with a high percentage of agricultural land. Elevated levels of nitrate in groundwater can result from several factors, a major contributor in rural Minnesota is nitrogen fertilizer or manure that leaches past the crop root zone. Water testing clinics were held across the 20 counties that are displayed in Figure 1.

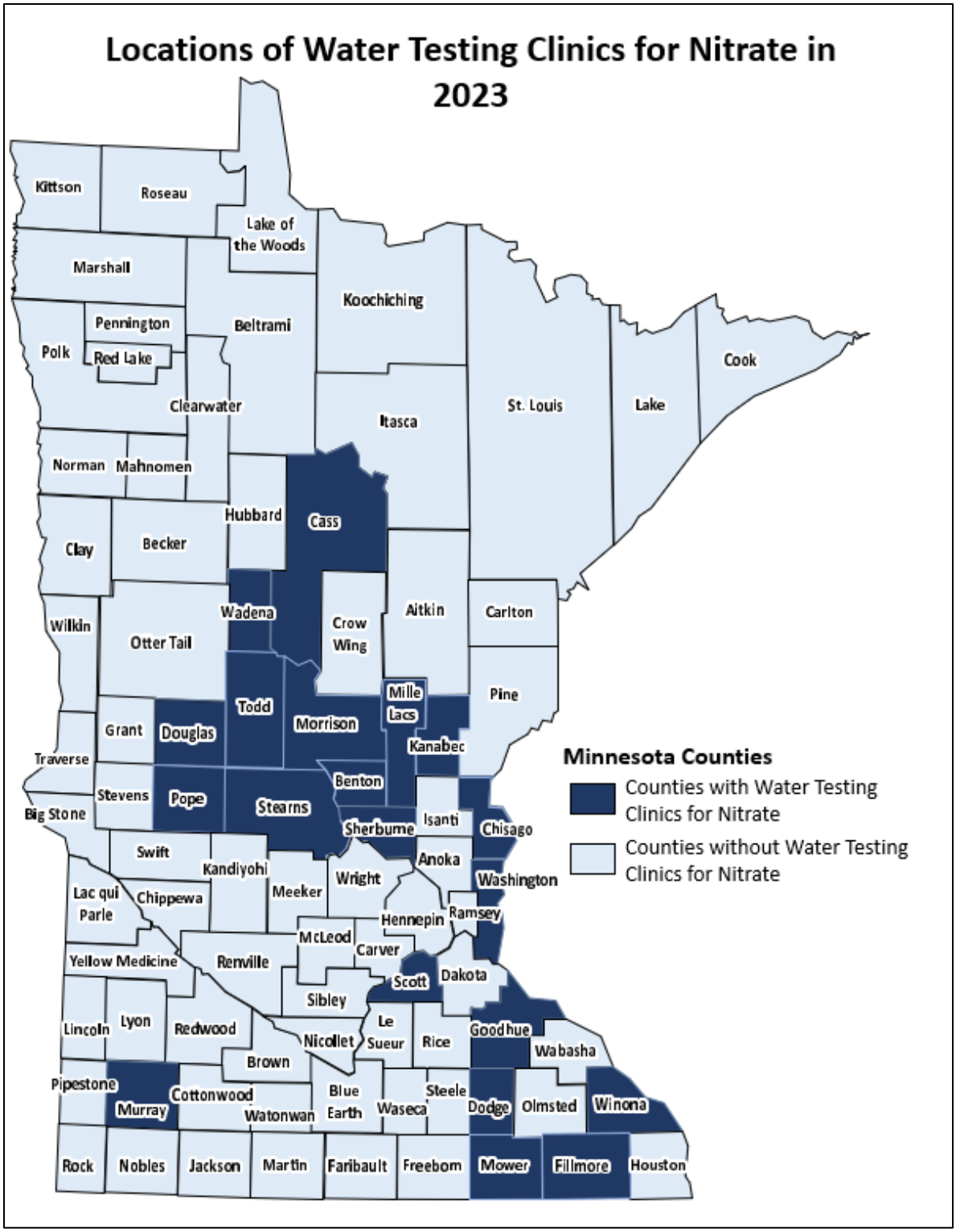

Figure 1. Location of the 20 water testing clinics in 2023

The total number of water samples tested in individual counties across Minnesota are displayed in Figure 2. There were 2,685 water samples tested in 2023.

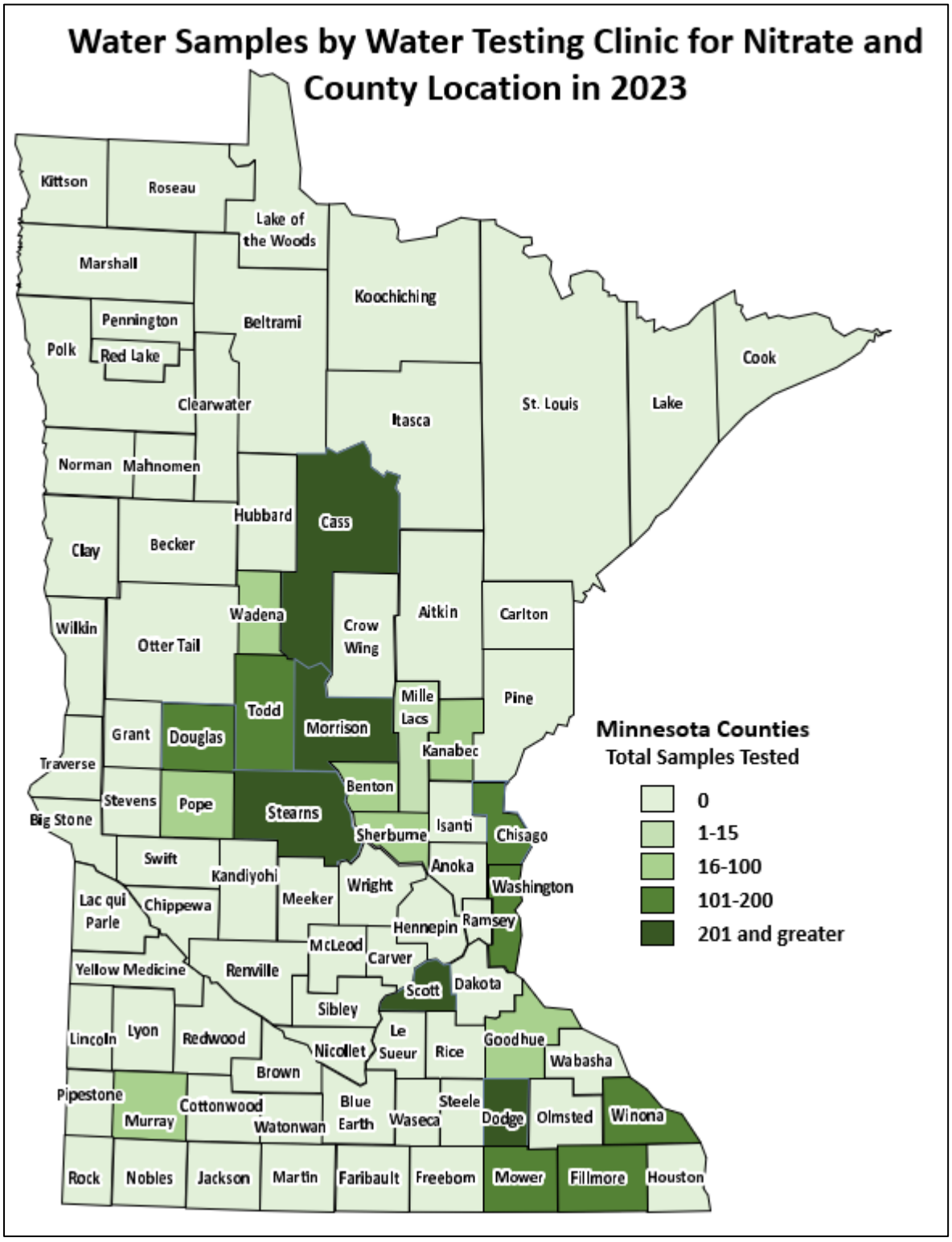

Figure 2. Total water samples by county in 2023

Water Sample Testing Results by Water Partner

Overall, 2,685 water samples for nitrate were reported in 2023 in Minnesota. Water partners varied in the number of water samples tested and their results. There were 22 partners who conducted water testing clinics for nitrate in 2023 as shown in Figure 3. There were 113 samples that were above the health risk limit of 10 mg/L. Nine of the water testing clinics were held by two or more partners and they are listed separately in Figure 3. Water testing clinics with two partners, list the primary water partner first and secondary water partner last The Minnesota Well Owners Organization (MNWOO) and Minnesota Ground Water Association (MGWA) have partnered together with their water sample testing and accounted for 1,127 samples (42%) in multiple water clinics. A complete list is provided in Table 1 on Page 9. Individual names are not published in this report.

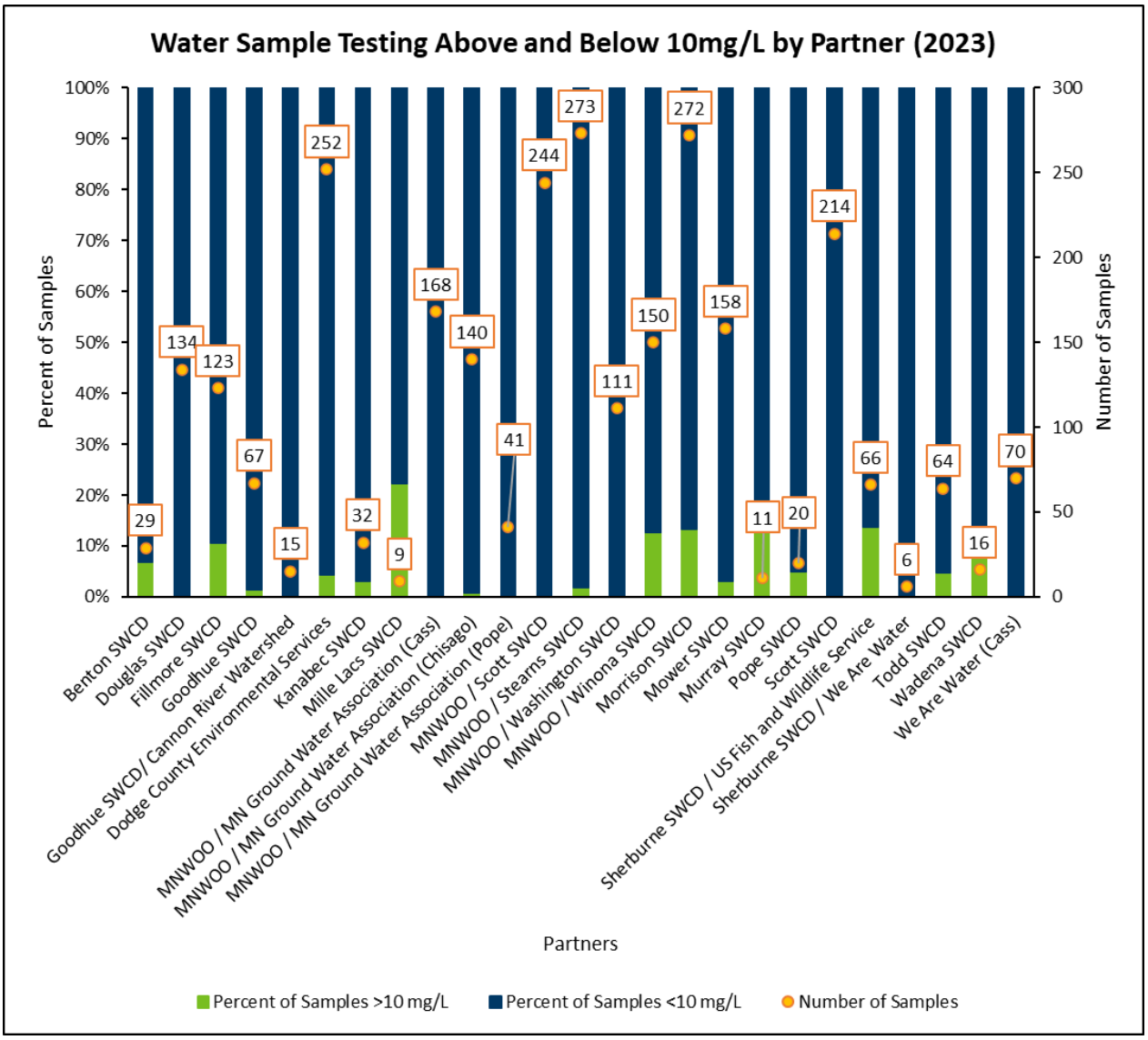

Figure 3. Water sample testing for nitrate by partner (2023)

Water Sample Testing for Nitrate by County in Minnesota

Water samples from 20 Minnesota counties were tested for nitrate as shown in Figure 4. Water samples by county ranged from nine per county to 458 per county.

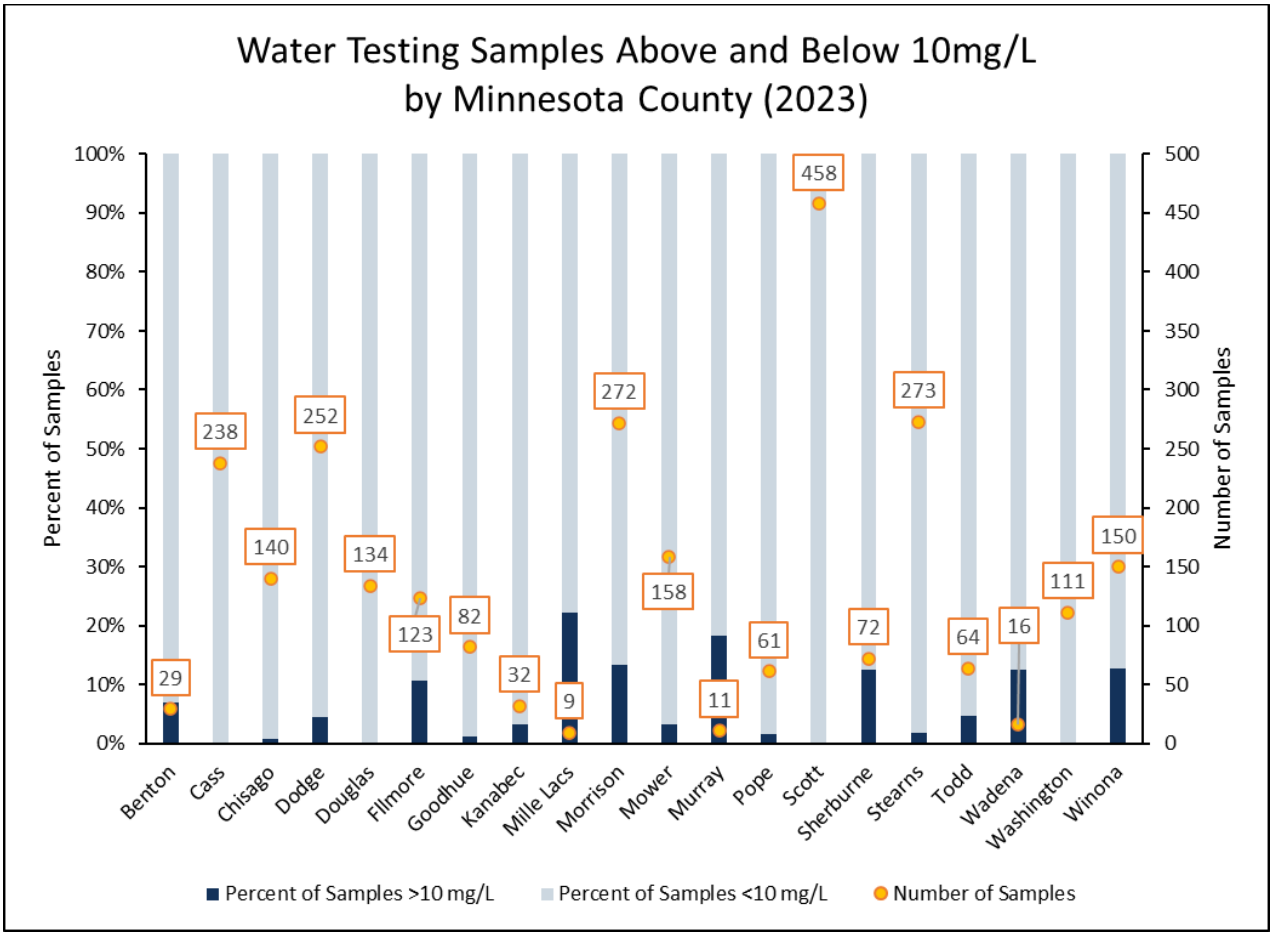

Figure 4. Water sample testing for nitrate by county (2023)

- Across all counties, 4% (113) of 2,685 water samples exceeded the drinking water standard for nitrate (>10 mg/L).
    - Seven counties had greater than 10% of water samples over 10 mg/L nitrate
    - One county had between 5% and 9% of water samples over 10 mg/L nitrate
    - Twelve counties had less than 5% of water samples over 10 mg/L nitrate

Minnesota BMP Regions for Nitrogen

Minnesota's Best Management Practice (BMP) Regions for nitrogen are displayed below in Figure 5. Each region has unique properties that can affect nitrogen use for crops and corresponding nitrate leaching.

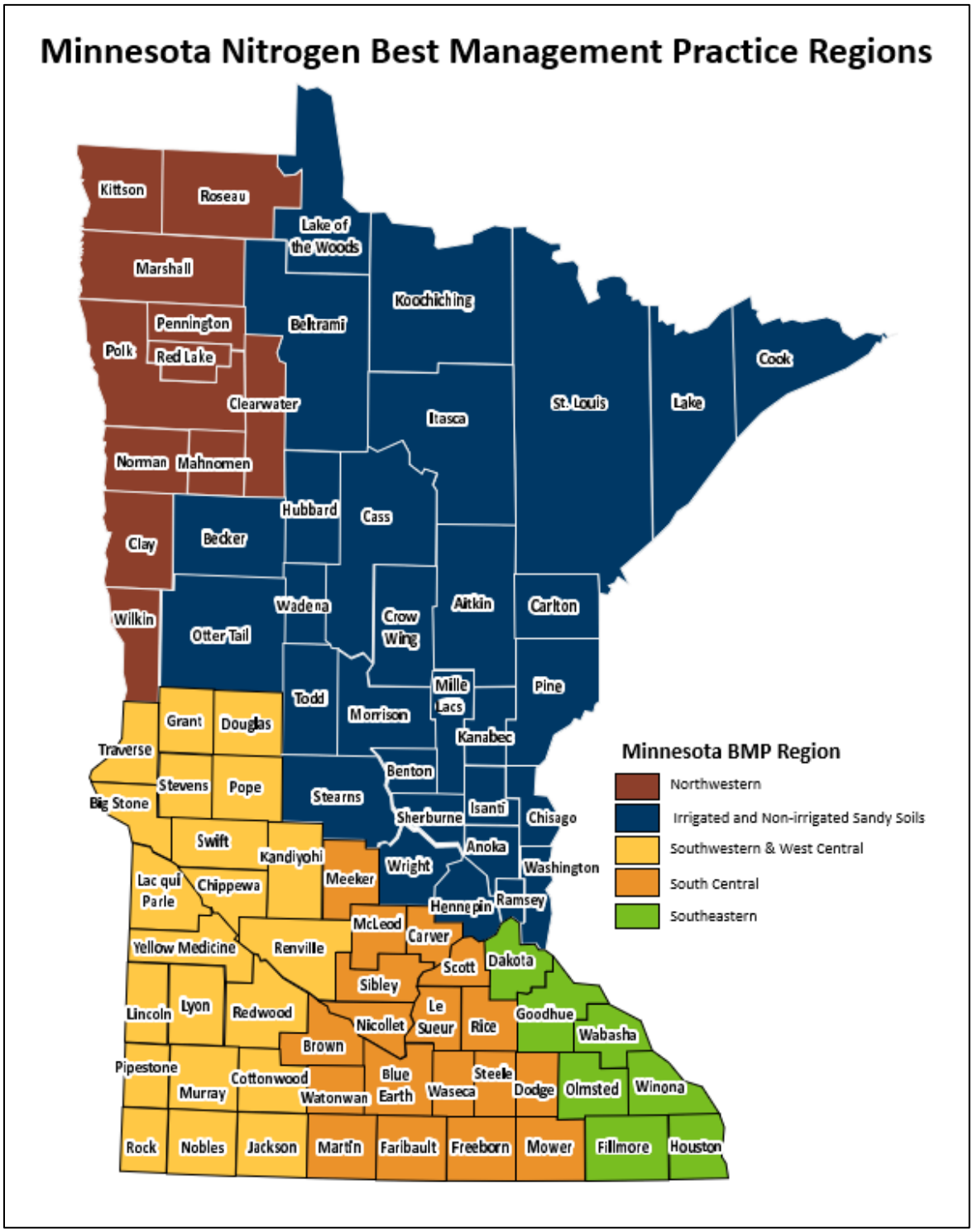

Figure 5. Minnesota Nitrogen BMP Regions (2023)

Water Sample Testing for Nitrate by Minnesota Nitrogen BMP Region

Water testing clinics were held in four of five Minnesota Nitrogen BMP Regions in 2023. Figure 6 details the number of samples by region and percent of samples for each region that had private well water results over 10mg/L for all 2,685 samples. Sandy soils and soils with karst geology tend to be located in the Irrigated and Non-Irrigated Sandy Soils BMP and Southeastern BMP regions of Minnesota.

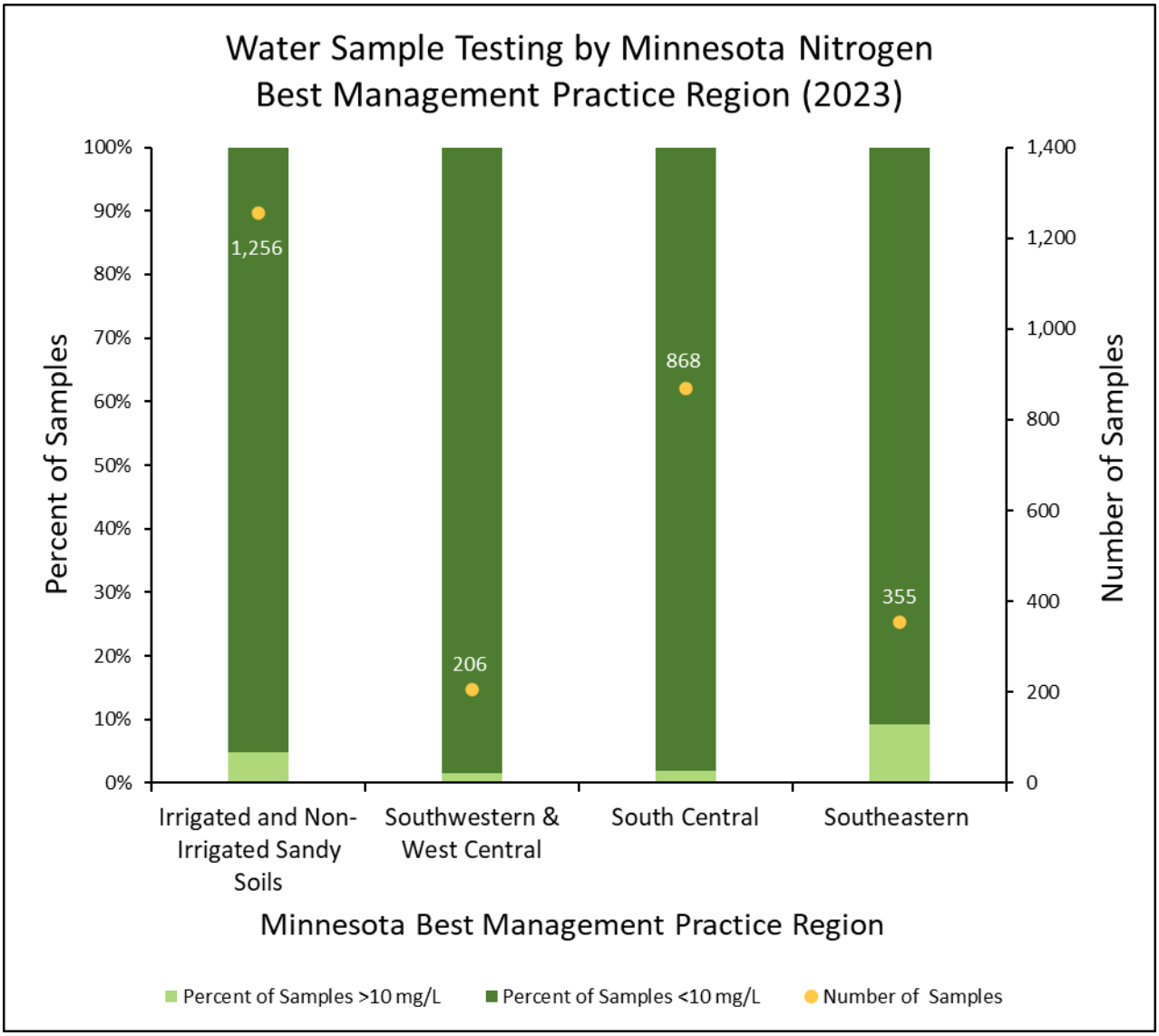

Figure 6. Water sample testing for nitrate by Nitrogen BMP Region (2023)

Water testing clinics for nitrate were held in 20 counties across four Minnesota Nitrogen BMP Regions.

- Statewide, 2,685 water samples were tested. There were 113 (4%) water samples that were above 10 mg/L for nitrate.
- The Irrigated and Non-Irrigated Sandy Soils BMP Region had 1,256 water samples tested. There were 61 (5%) well water samples that were over 10 mg/L of nitrate.

- The Southwestern and West Central BMP Region had 206 water samples tested. There were 3 (1%) water samples that were over 10 mg/L of nitrate.
- The South Central BMP Region had 852 water samples tested. There were 16 (2%) water samples that were over 10 mg/L of nitrate.
- The Southeastern BMP region had 355 water samples tested. There were 33 (9%) water samples that were over 10 mg/L of nitrate.
- The Northwestern BMP region did not host any water testing clinics for nitrate.

Results and Explanations

Participants had their water tested and then were provided and explanation of the results by one of the partners who sponsored the clinic. The explanation was generally provided by someone with some expertise in ground water who could help the participant in understanding where the nitrate could be coming from if there were any in the sample. This is though discussion of the location of the well, age of the well, depth of the well, and other factors that could affect nitrate concentrations.
The explanation of the results was followed by potential remediation of the nitrate in the water, again dependent on the level of nitrate such as using reverse osmosis, distillation, alternative water supplies or even if a new well would be an option. A list of certified laboratories was also provided, and suggested to use, if the nitrate was above or near the health standard.

Conclusions

There were 2,685 water samples tested in Minnesota by MDA's water partners in 2023. Of those 2,685 water samples, 113 samples (4%) were above the health risk limit of 10 mg/L. There were 25 partners who conducted water testing clinics for nitrate in 2023. Twenty counties had water sample clinics for nitrate ranging from 9 samples in Mille Lacs County to 458 samples in Scott County. Water clinics were held in 4 of Minnesota's nitrogen BMP regions and the Southeastern BMP Region had the highest percent of water samples over 10 mg/L at 9%. Remediation and recommendations to address nitrate in the well water was also provided with the results.

Appendix

There were 2,685 water samples tested for nitrate. Table 1 reflects the water testing results by partner in Figure 3 on page 4.

Table 1. Water sample testing for nitrate by partner (2023)

Water Testing Partner	Number of Water Samples	Percent of Water Samples >10mg/L	Percent of Water Samples <10mg/L
Benton SWCD	29	7%	93%
Dodge County Environmental Services	252	4%	96%
Douglas SWCD	134	0%	100%
Fillmore SWCD	123	11%	89%
Goodhue SWCD	67	0%	100%
Goodhue SWCD / Cannon River Watershed	15	1%	99%
Kanabec SWCD	32	3%	97%
Mille Lacs SWCD	9	22%	78%
MNWOO / MN Ground Water Association (Cass)	168	0%	100%
MNWOO / MN Ground Water Association (Chisago)	140	1%	99%
MNWOO / MN Ground Water Association (Pope)	41	0%	100%
MNWOO / Scott SWCD	244	0%	100%
MNWOO / Stearns SWCD	273	2%	98%
MNWOO / Washington SWCD	111	0%	100%
MNWOO / Winona SWCD	150	13%	87%
Morrison SWCD	272	13%	87%
Mower SWCD	158	3%	97%
Murray SWCD	11	18%	82%
Pope SWCD	20	5%	95%
Scott SWCD	214	0%	100%
Sherburne SWCD / We Are Water	6	14%	86%
Sherburne SWCD / US Fish and Wildlife Service	66	0%	100%
Todd SWCD	64	5%	95%
Wadena SWCD	16	12%	88%
We Are Water (Cass)	70	0%	100%
Total	**2,685**	**4%**	**96%**

Water samples from 20 Minnesota counties were tested for nitrate in 2023. Only counties with water testing clinics are listed in Table 2. Table 2 reflects the water testing results by county in Figure 4 on page 5.

Table 2. Water sample testing for nitrate by county (2023)

County	Number of Water Samples	Percent of Water Samples >10mg/L	Percent of Water Samples <10mg/L
Benton	29	7%	93%
Cass	238	0%	100%
Chisago	140	1%	99%
Dodge	252	4%	96%
Douglas	134	0%	100%
Fillmore	123	11%	89%
Goodhue	82	1%	99%
Kanabec	32	3%	97%
Mille Lacs	9	22%	78%
Morrison	272	13%	87%
Mower	158	3%	97%
Murray	11	18%	82%
Pope	61	2%	98%
Scott	458	0%	100%
Sherburne	72	13%	87%
Stearns	273	2%	98%
Todd	64	5%	95%
Wadena	16	12%	88%
Washington	111	0%	100%
Winona	150	13%	87%
Total	**2,685**	**4%**	**96%**

Water testing clinics were held in four of five Minnesota Nitrogen BMP Regions in 2023. The Northwest Region had no water testing clinics and is not listed in Table 3. Table 3 reflects the water testing results by Minnesota Nitrogen BMP Region in Figure 6 on page 7.

Table 3. Water sample testing for nitrate by Nitrogen BMP Region (2023)

Nitrogen BMP Region	Number of Water Samples	Percent of Water Samples >10mg/L	Percent of Water Samples <10mg/L
Irrigated and Non-Irrigated Sandy Soils	1,256	5%	95%
Southwestern & West Central	206	1%	99%
South Central	868	2%	98%
Southeastern	355	9%	91%
Statewide	**2,685**	**4%**	**96%**