

Wisconsin Coastal Management Final Report

Grant Cycle 2022-2023

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This final report is funded by the Wisconsin Coastal Management Program and the National Oceanic and Atmospheric Administration, Office for Coastal Management under the Coastal Zone Management Act, Grant # AD229119-023.21

Project Summary

Coastal Management Grant # AD229119-023.21 was submitted to continue addressing groundwater quality in Kewaunee County by targeting wells located in less than 20 feet to bedrock, which represents the focus area of the 2018 NR151 Silurian Dolomite Performance Standards. Peninsula Pride Farms (PPF) donated \$6000.00/year (\$10/bottle) to cover the landowner's expense, making the well test free to the public. Water samples were analyzed by UW-Stevens Point Water Environmental Analysis Lab and results were entered into the Stevens Point [WI Well Water Quality Viewer \(uwsp.edu\)](http://uwsp.edu) as well as Kewaunee County Land and Water Conservation Department's (LWCD) GIS.

Wisconsin Coastal Management Program and the National Oceanic and Atmospheric Administration, Office for Coastal Management extending the 2022 grant into 2023. The target area changed from wells located in less than 20' bedrock in 2022 to areas with known nitrate issues in 2023.

July & October 2022: Targeted Silurian Standards less than 20' to Bedrock

- July 2022: 276 wells
- October 2022: 317 wells

July & October 2023: Targeted Areas with Known Nitrate Contamination

- July 2023: 289 wells
- October 2023: 276 wells

Education/Outreach

Kewaunee County LWCD held four in-person educational presentations (August 2022 & January 2023 – for 2022 results & September 2023 & January 2024 for 2023 results). Each event lasted about two hours with an average of 50 people in attendance, including well testing participants, concerned citizens, County Board members, State Representatives and press. Prior to each event, participants were mailed their individual private results.

Kevin Masarak from UW-Stevens Point led the groundwater and well education presentations along with Davina Bonness, County Conservationist. This was followed by a question and answer session. Presentations are posted on the LWCD website at [Kewaunee County » Departments » Land & Water Conservation » Groundwater & Well Testing](#).

Furthermore, since approximately 30% of private well participants were new testers, well maintenance education was a priority. Several wells that tested positive for coliform bacteria, but had less than 1.0 mg/L nitrate, had well cap issues, cracks in casing, ponding water around well caps and/or bugs inside the well cap. LWCD and local well installers assisted those landowners' in identifying those problems, and once corrected, those wells were re-tested and came back negative for coliform bacteria.

Summary of Results: Caveat - Wells tested between 2021 and 2023 were not randomly selected to identify a county-wide contamination rate. Wells were targeted with known contamination and/or located in the surrounding areas.

LWCD staff identified the depth of bedrock for each of the wells tested to mimic the categories of Borchardt et al, 2021. In the following figures, the unadjusted contamination rates of wells sampled (by depth to bedrock as a percent) are compared to the unadjusted rates of wells sampled in November 2015 and July 2016 by Borchardt et al, 2021. The wells tested in 2015 and 2016 **were** to provide an accurate county-wide contamination rate, prior to the NR151 Silurian Dolomite Standards that were implemented in 2018 by

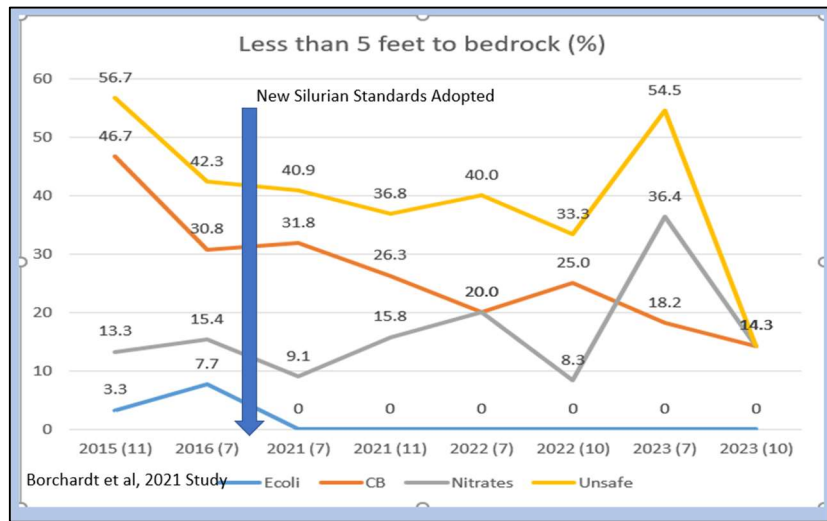
Wisconsin Department of Natural Resources (WDNR) and then locally by Kewaunee County Ordinance Chapter 39.

LESS THAN 5 FEET TO BEDROCK (FIGURE 1)

In wells located in less than five feet to bedrock, Kewaunee County noted an overall decline (yellow line) in unsafe wells with either bacteria positive and/or nitrates > 10 mg/l from wells tested pre-Silurian standards.

All categories outlined in Figure 1 did decrease overall since the Silurian Standards were implemented in 2018; with the exception of nitrates. *Note: Nitrate were not addressed in the Silurian Standards.

Nitrates (targeted in 2023) saw a significant increase to 36.4% in July 2023; followed by a 22.0% decrease in October 2023. Was this increase due to targeting wells, replacing commercial fertilizer in areas that can no longer be applied with manure, or even weather related with drought and higher impact storms?

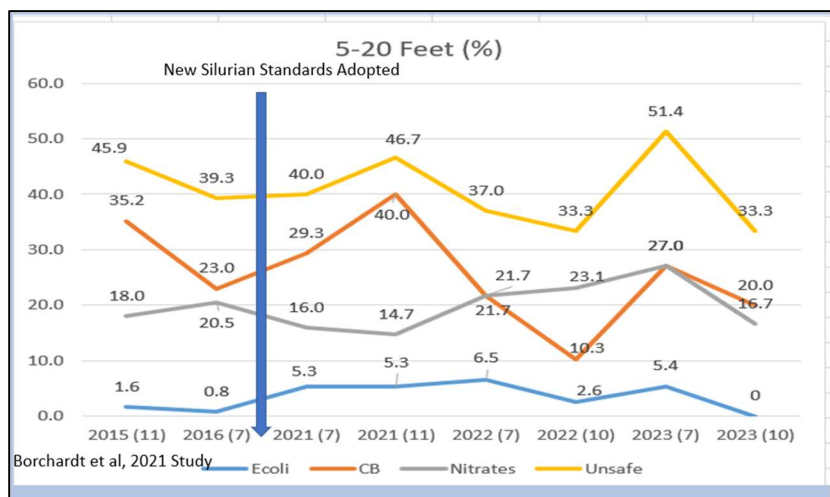


The greatest take away from implementing the NR151 Silurian Standards is the “zero” E. coli positive wells throughout the entire testing period of 2021 to 2023 as compared to pre-Silurian standards of 3.3% (2015) and 7.7% (2016). Silurian Standards were written to reduce bacterial contamination, and even with targeting wells – this data shows stricter standards are working in the shallow soils.

5-20 FEET TO BEDROCK (FIGURE 2)

Unsafe wells (bacteria positive and/or nitrates > 10 mg/l) (yellow) located in 5-20 feet to bedrock, varied from 33.3% (10/2022 and 10/2023) to 46.7% (11/2021) and 51.4% (7/2023). These percentages were similar to pre-Silurian Standard adoption.

Coliform bacteria positive (orange) had a sharp increase to 40% in 11/2021; however, this was followed by a 29.7% decrease for an all-time low of 10.3% in 10/2022. In 2023, coliform bacteria ranged from 20-27%. Wells that have never been tested were also targeted during 2021.



E. coli positive wells (blue) increased approximately 6.0% from July 2016 to July 2022. Percentages decreased slightly afterwards, but remained higher than pre-Silurian implementation except for zero E. coli positive wells in October 2023.

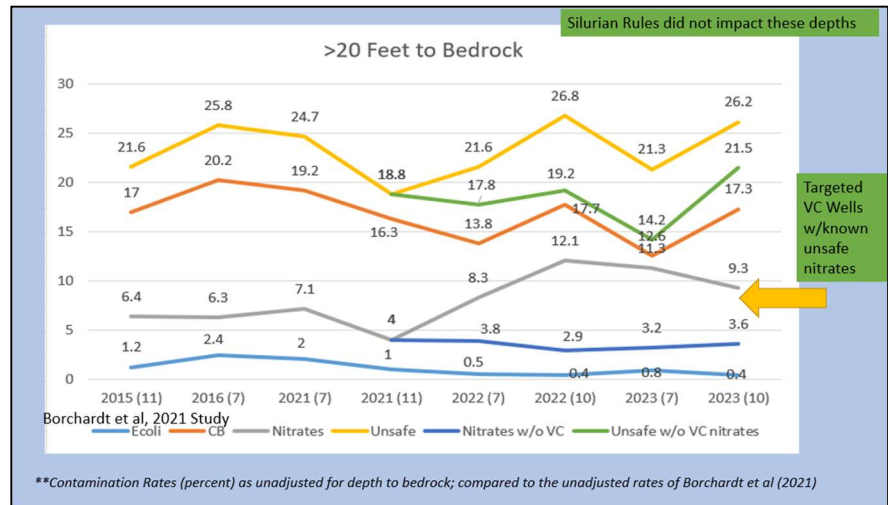
Nitrates greater than 10 mg/l (grey) also continued to increase and surpass pre-Silurian percentages after July 2022. In 2023, when nitrates were targeted, the percentages rose to a high of 27.0% in July.

GREATER THAN 20 FEET TO BEDROCK (FIGURE 3)

In soils greater than 20 feet to bedrock, the new Silurian Standards did not impact current regulations.

Kewaunee LWCD broke the number of tested unsafe wells (bacteria positive and/or nitrates > 10 mg/L) and nitrates greater than 10 mg/L down in two ways.

The first included all tested wells and the second excluded targeted wells (located inside the Village) with known unsafe nitrates. By excluding these wells; a less skewed percentage could be determined for year-year and/or month-month comparisons.



The yellow line (unsafe from bacteria and/or nitrates over 10 mg/l) remains consistent to 2015 and 2016 percentages around 21-26% with lower percentages in fall. However, if targeted wells are excluded to show the remainder of Kewaunee County (green line), the percentage of unsafe wells drop to 14-21%.

Nitrates were again broken down into two categories. The grey line included all tested wells and the blue line excluded the known targeted unsafe wells. In 2022 and 2023 (grey line), LWCD expected to see a spike in unsafe percentages of nitrates (12.1% in 10/2022; 11.3% in 07/2023 and 9.3% in 10/2023) due to targeting wells. Our office targeted wells with high nitrates and neighboring wells to identify areas of concern. However, the blue line shows nitrates in the rest of the county remained consistent around 3-4% from 11/2021 to 10/2023.

Overall, coliform bacteria positive did not change from 2021 around 17%, but there was slight decrease to 13.8% in July 2022. E. coli was relatively stable with a half percentage decrease from 2021 to 2022.

KEWAUNEE COUNTY FULL RESULTS (FIGURE 4)

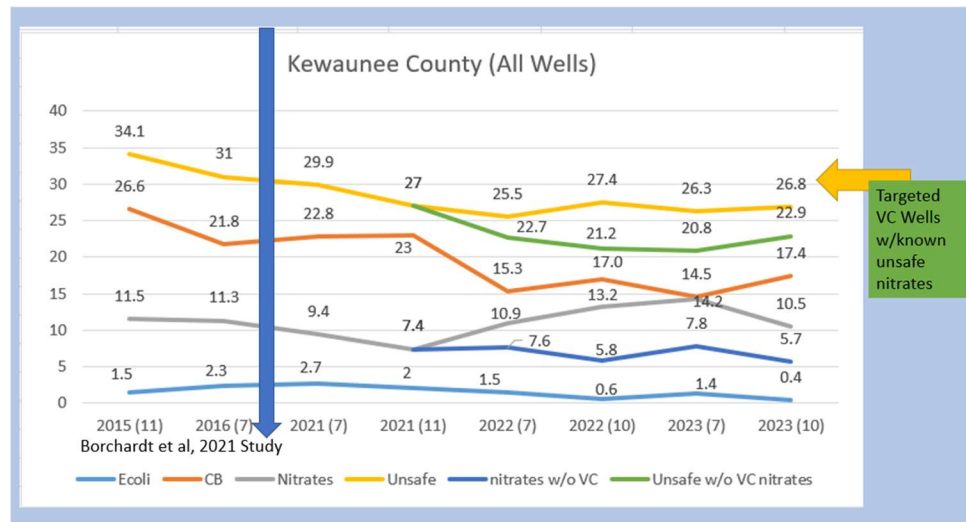
Kewaunee County LWCD again broke down the overall results to include and exclude Village targeted unsafe nitrates wells. The graph overall is relatively positive with unsafe wells (bacteria positive and/or nitrates > 10 mg/L).

First, if targeted unsafe nitrate wells were included, the percentage of unsafe wells average 27% and remain pretty consistent (yellow line) from November 2021 to October 2023. Pre-Silurian Standards (2015 / 2016) noted 31-34% unsafe. Therefore, even by targeting known unsafe wells, the 2021-2023 percentages are still

lower than those in 2015 and 2016. Second, when excluding targeted unsafe wells to determine a more county-wide average (green line), Kewaunee County sees over a 10% decrease from 2015 to 2023. Third, E. coli positive wells continue to trend downward from 2 - 2.7% in 2021 to 1.5 - 0.4% in 2022-2023.

And finally, tested wells unsafe with nitrates (> 10mg/L) are declining overall throughout the County (dark blue without those in Village) from approximately 11% in 2015 & 2016 to 5-9% in 2021, 2022 & 2023.

However, when you include all the hot spot areas where nitrate contamination is on the rise (grey line), 2022-2023 percentages increase post Silurian Standard implementation (standards focused on bacterial contamination, not nitrates).



Overall, Kewaunee County saw reductions in bacterial contamination, especially in less than 5 feet to bedrock and reductions in the overall unsafe well percentages. However, the LWCD must continue to work in areas where nitrates continue to rise with best management practices to address contamination.

Lessons Learned: Even with free well testing, it is hard to get full registration, especially in the summer months! Education and outreach were the most important aspect of this grant. By reaching a large percentage of new well testers it was important to reiterate that the DNR will not shut down their well or require them to drill a new one. Teaching participants that they are their own well manager and giving them the tools to be more informed about groundwater quality and what impacts our groundwater was very rewarding.

Partnership Made / Reinforced:

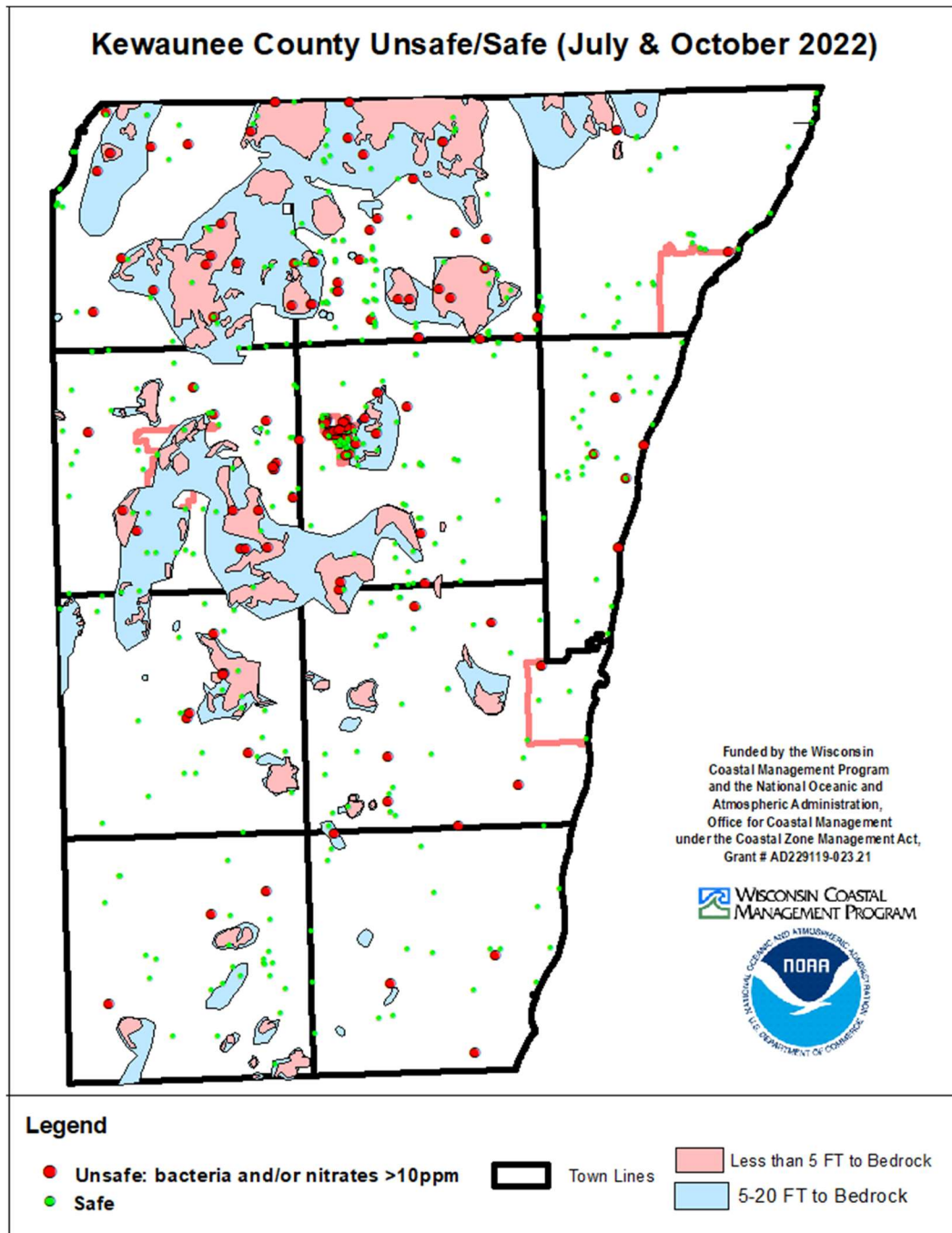
Kewaunee County Land & Water Department and the partnership with Peninsula Pride Farms (PPF) has increased education, outreach, and cost-sharing efforts helped to establish increased cover crop programs with a goal of getting roots in the ground all year long. LWCD was able to reach new farms to talk about nutrient management plans and the importance of soil health and how it directly relates to water quality. Kewaunee County reinforced our partnership with Coastal Management & NOAA as well as UW-Stevens Point.

Additional Funds Leveraged: No additional funds were leveraged through this grant; however, we are hoping to use this data/information as a stepping stone to receive more grants/funding in the future years.

Next Steps: While three years of testing gave our County imperative data, there are still questions to consider to continued testing.

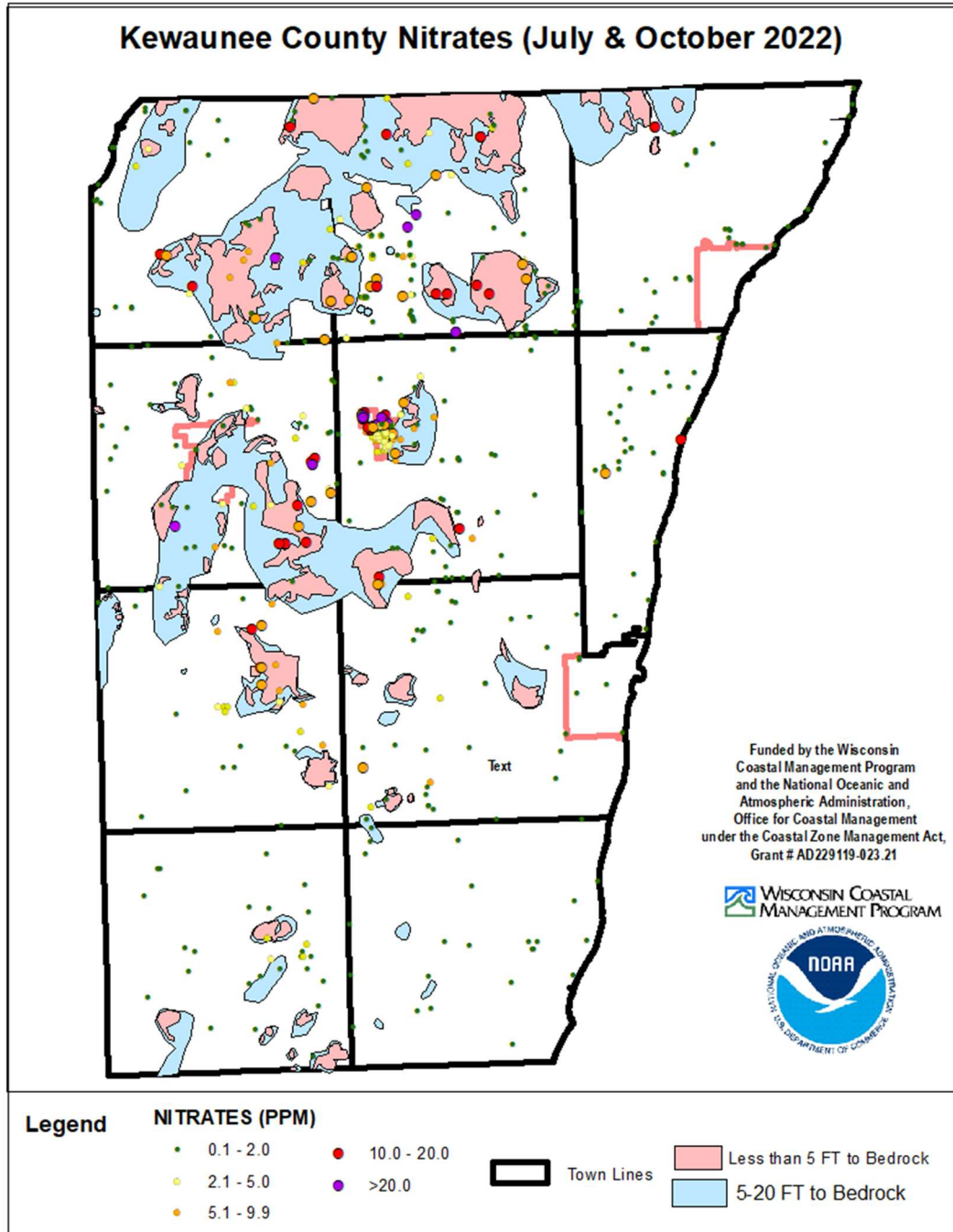
1. Did applying fertilizer as a result of no longer being able to spread manure on certain depths to bedrock increase nitrates in some wells?
2. Is the problem area (less than 5 feet to bedrock) moving to areas with deeper soils?
3. Are we starting to see trends as a result of the NR151 Silurian Standards?

Map 1: Well Locations – Safe / Unsafe 2022



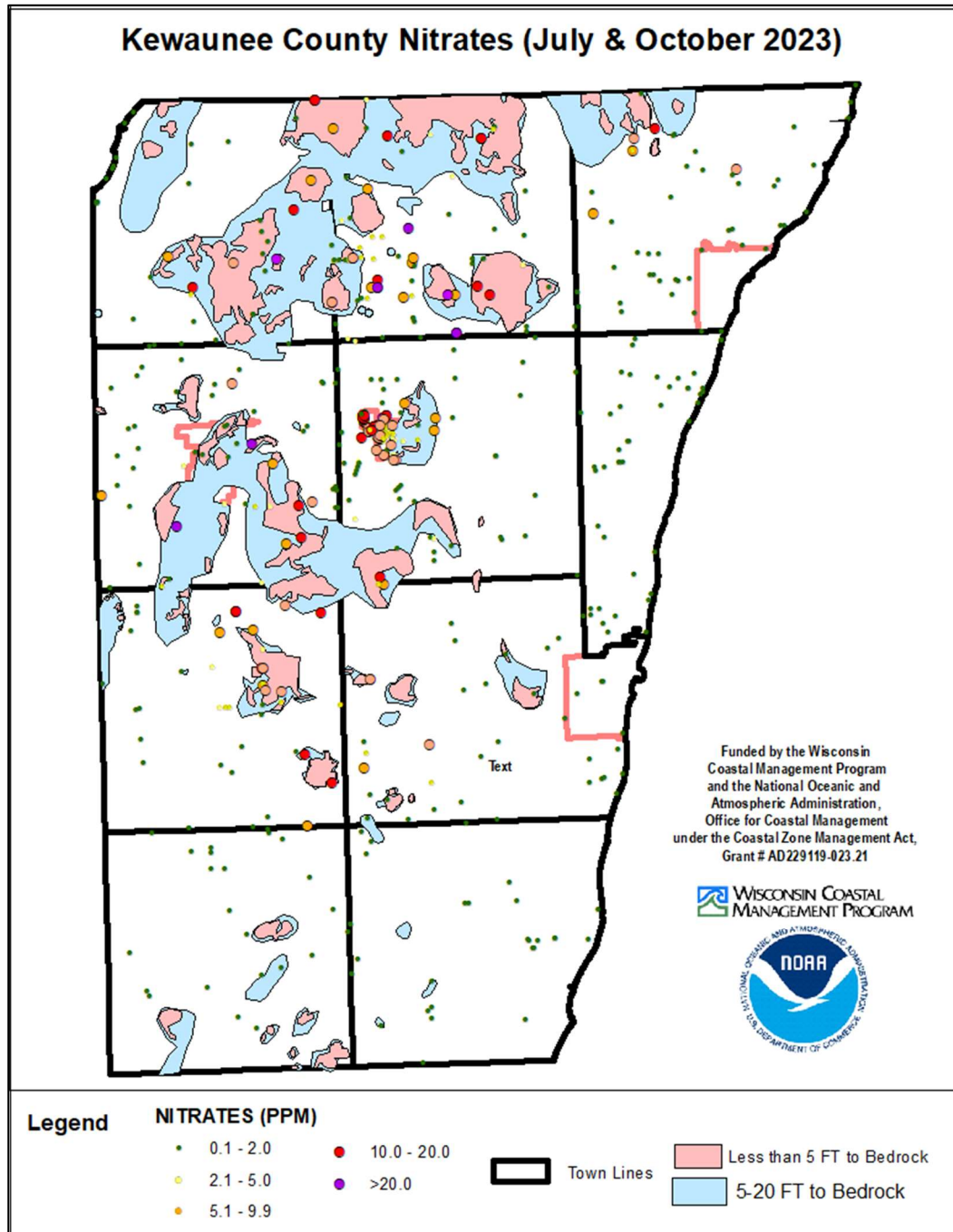
Red dots represent wells that tested unsafe for either bacteria and/or nitrates > 10 mg/L. The blue shaded areas represent the Silurian Dolomite aquifer with less than 20 feet of soil to bedrock. As you can see, the wells that tested unsafe tend to land within/near areas less than 20 feet to bedrock.

Map 2: Well Locations & Nitrate Results 2022



Nitrates between 2 and 10 mg/L (or ppm) are impacting by human activities (yellow and pink dots); less than 2.0 mg/L are considered transitional and less than 0.2 mg/L are “natural” (green dots). Greater than 10 mg/L exceeds the state and federal limits for drinking water and are considered unsafe for drinking, which are shown in the red or black dots.

Map 3: Well Locations & Nitrate Results 2023



Map 4: Well Locations – Safe / Unsafe 2023

