

WWCC well testing update

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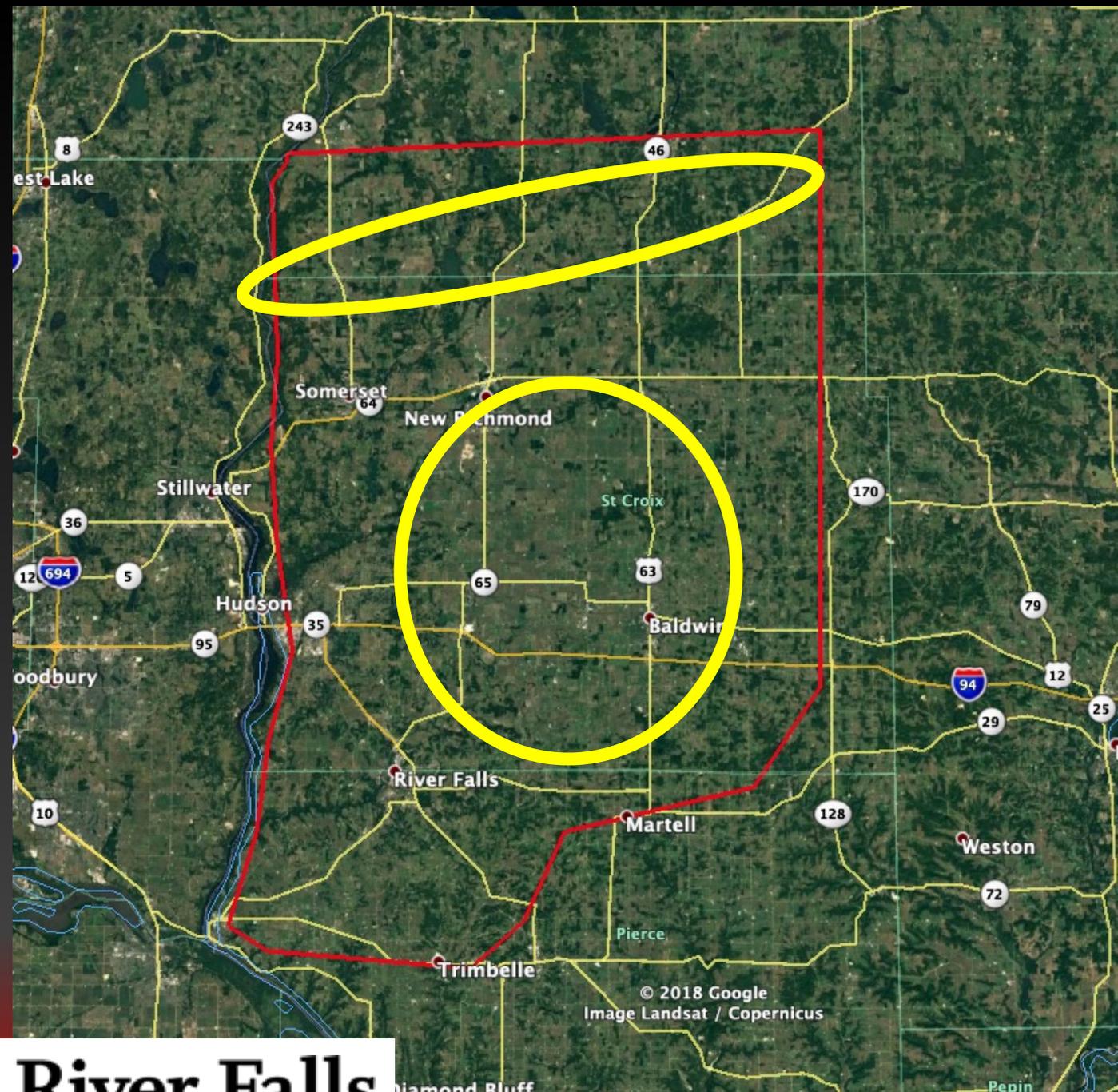
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Why well testing?

- Nitrate levels are increasing in groundwater across many agricultural regions
 - Personal
 - Business
 - Community
- Land use activities impact nitrate levels in groundwater
 - Also depends on soils, depth to bedrock, depth to water table
 - Short-term and long-term effects
- How to control?

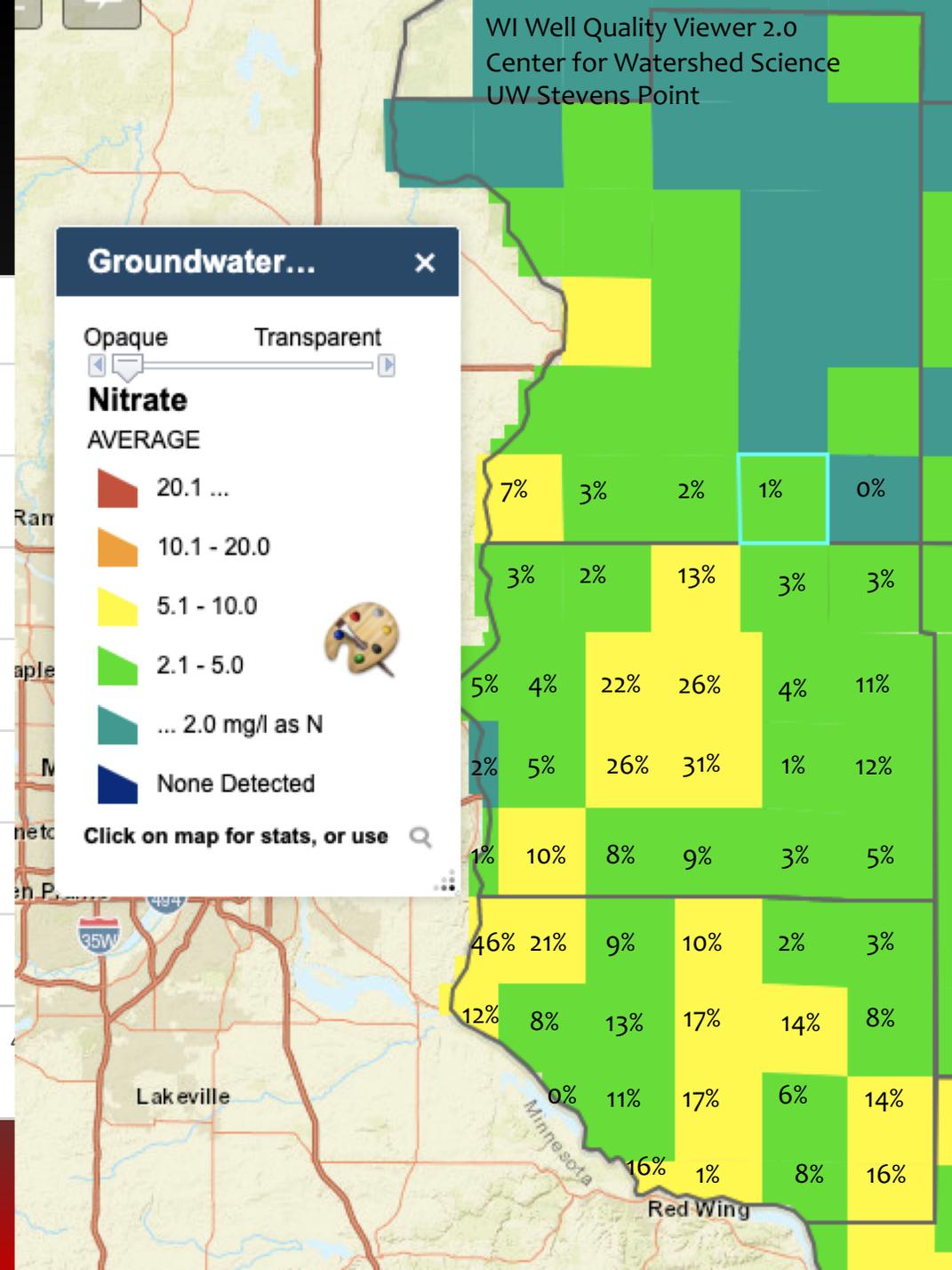
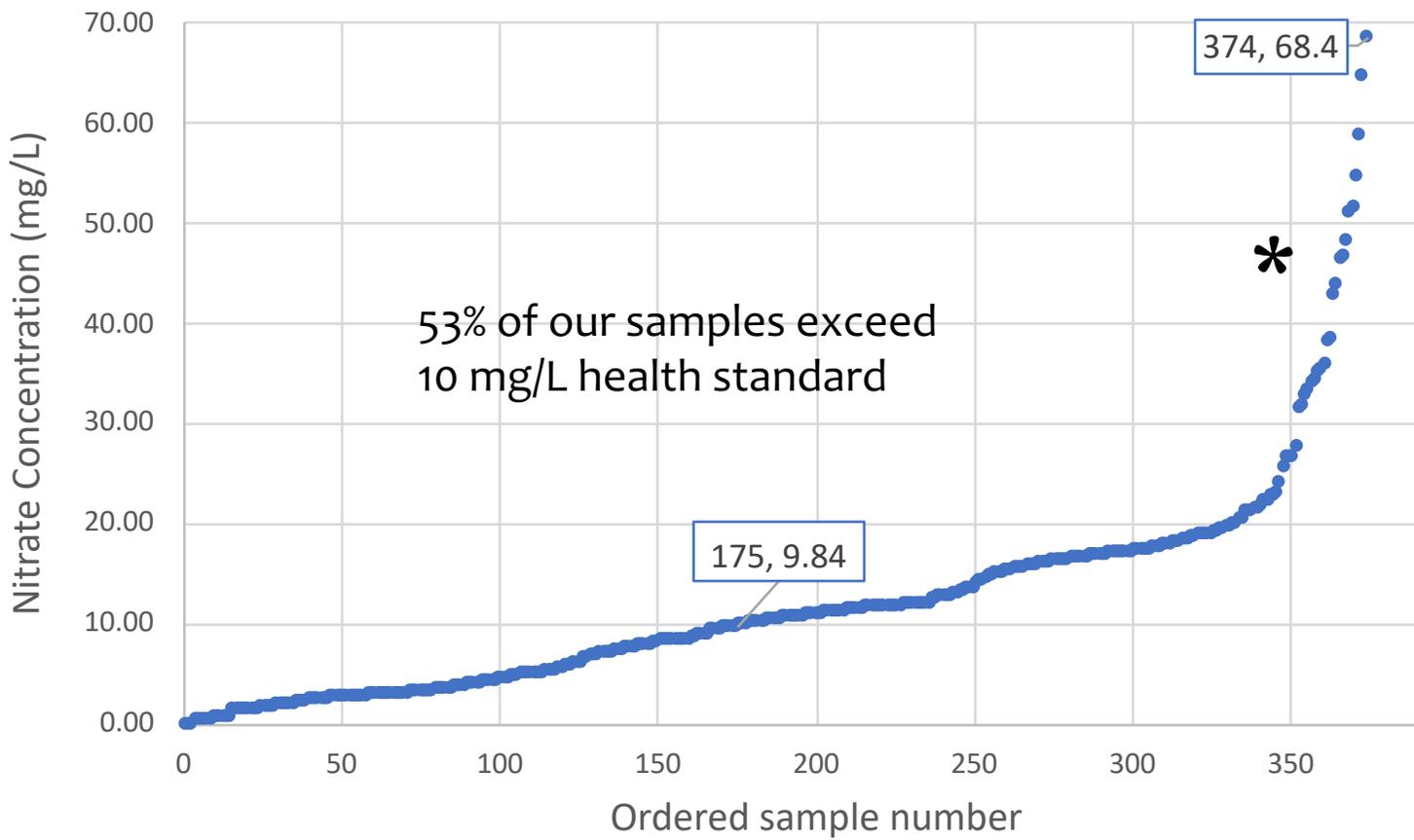
Sampling Effort:

- 2018/19 = 41 → 45 wells
- 2019/20 = 59 wells
- Aug 2020 = 88 wells
- COVID ruins everything
- Each well sampled 4 times during the first year.
- Annual sampling for stable wells, more frequent for variable wells
- Measured: pH, T, Conductivity, Nitrate, Chloride

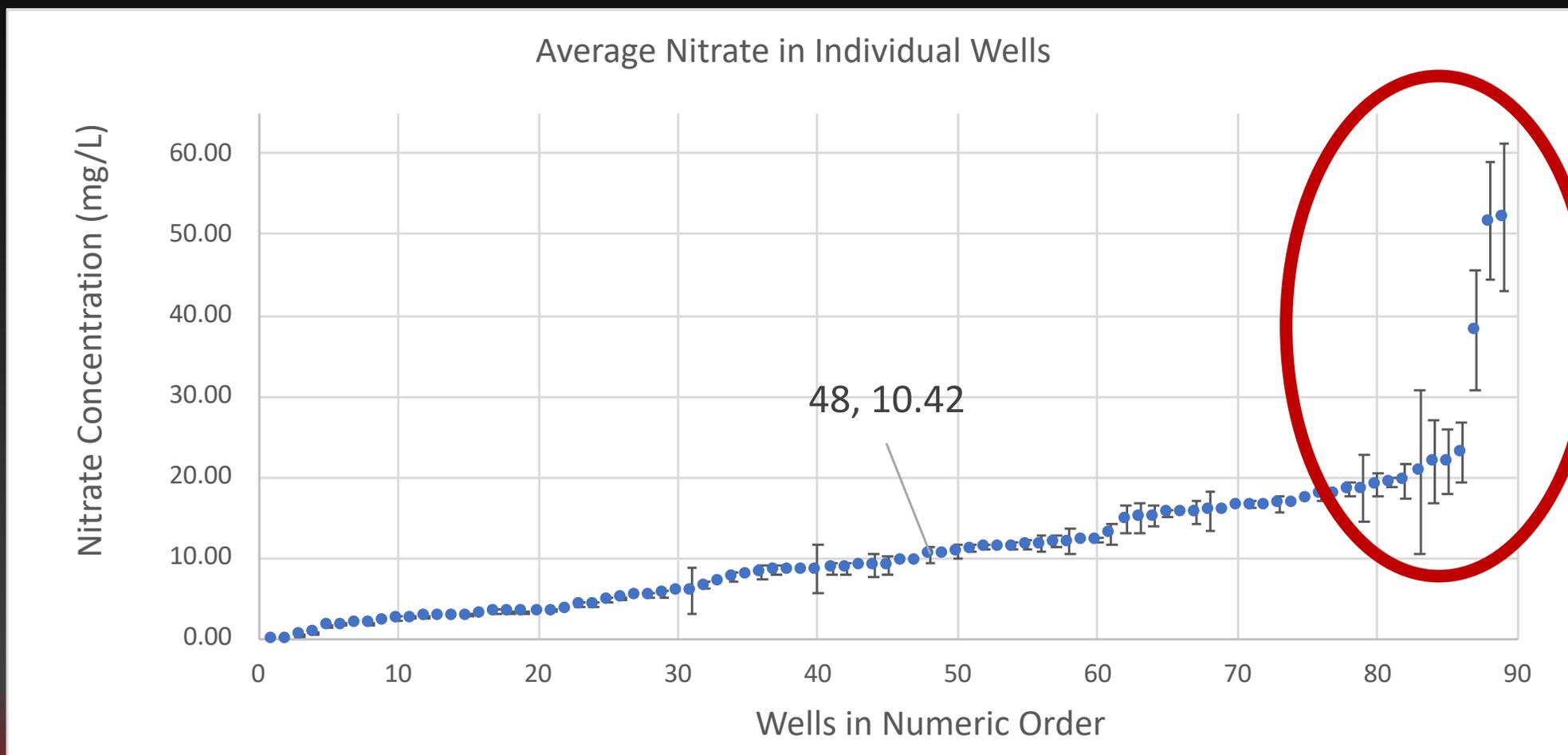


Other well testing programs have found similar results

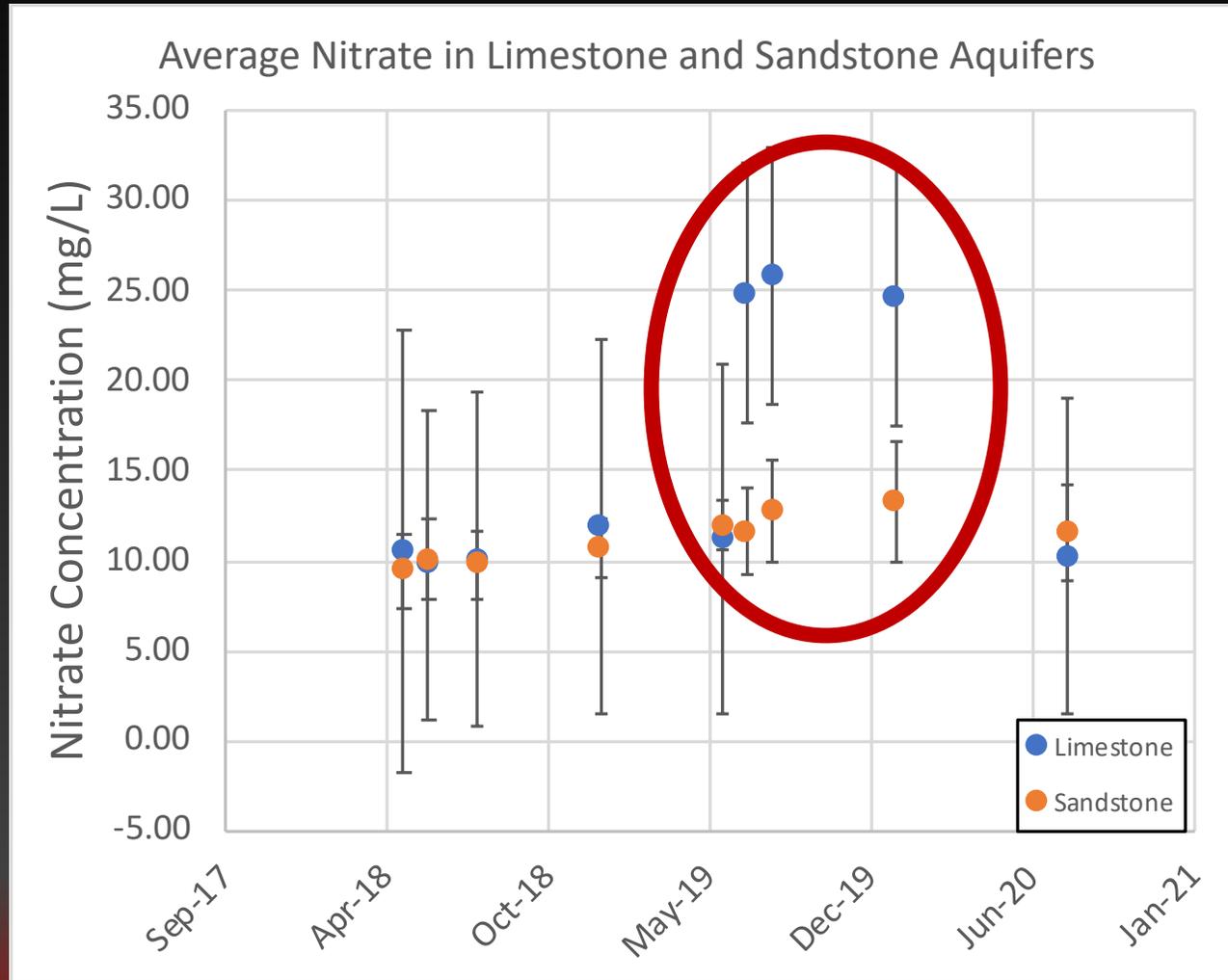
Nitrate Concentrations in Numeric Order (All Samples)



Some wells are very stable, some highly variable



All nitrate data averaged by month



Findings that remain the same since 2020

- Other well testing programs have found similar results
- The deeper the well the less nitrate, mostly
- The more dissolved ions/salts, the more nitrate.
- Chloride and nitrate are positively correlated

- Something new—effects of a wet year?

Concluding thoughts from 2019

- The greater frequency of sampling in year 1 identified wells with high variability.
- Nearly half of samples collected exceed the health standard for nitrate and 95% of samples collected were above background levels (1 mg/L).
- Lysimeters proved useful for seeing nitrate trends in soil water
- BMPs for nitrate in groundwater are not well established

Possible future work (from 2019)

- Continued annual sampling for stable wells and higher frequency sampling for variable wells
- Expand lysimeter studies
 - Longer season
 - More replication—small scale and large scale
 - Different cropping practices
- Well depth and water table measurements
- New in 2020—The concluding thoughts and possible future work discussed in 2019 form the core of a new research fellowship awarded from the Dairy Innovation Hub at UWRF

DIH Research Fellowship

- Dairy Innovation Hub

- **Mission:** Position Wisconsin's dairy community for economic, environmental and social success by advancing science, developing talent and leveraging collaboration.
- **Vision:** To be the world's preeminent source of bold new discoveries and talent development in dairy.
- UWRF, UW-Platteville, UW-Madison
- <https://dairyinnovationhub.wisc.edu/>



Wisconsin Groundwater Coordinating Council

- 2019 Priority Recommendations to State Legislature:
 1. better identify areas that are particularly sensitive to nitrate contamination in the state;
 2. assess the impact of alternative cropping practices on nitrate losses from fields;
 3. study and develop best management practices to minimize loss of nitrogen to groundwater; and
 4. and reach out to stakeholders in the agricultural industry to facilitate on-the-ground use of research results.

DIH Research Fellowship Goals

- Identify alternative cropping practices that are most effective (2,3);
- Assess the long-term impact of nutrient management practices (2,3);
- Determine the hydrogeologic context and sources of very high nitrate concentrations ($>20 \text{ mg L}^{-1} \text{ NO}_3\text{-N}$) measured in certain regional wells (1); and
- Provide preliminary data about regional groundwater systems (1)

DIH Research Fellowship—Methods

- Multi-factor study of nitrate transport
 - Soils, cropping practices, nutrient management, water management
 - Soil water samplers
- Multi-year study
 - How does the weather influence leaching?
- More focused nitrate monitoring in elevated and variable wells
 - Analyze for age markers
 - Probes for continuous monitoring

Questions?

