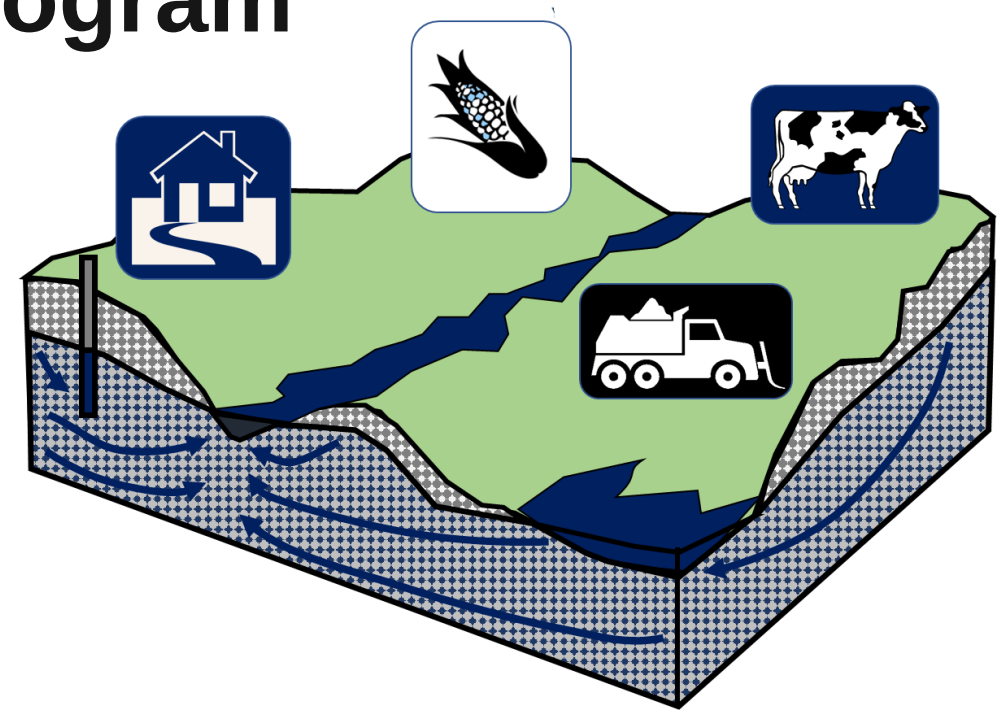
Green County Well Water Monitoring Program

Year 4



GREEN COUNTY WISCONSIN
there's an art to it.

Center for Watershed Science and Education
College of Natural Resources
University of Wisconsin-Stevens Point

Extension
UNIVERSITY OF WISCONSIN-MADISON

Through Extension, all Wisconsin people can access University resources and engage in lifelong learning, wherever they live and work. The Center is a partnership between the University of Wisconsin-Stevens Point and University of Wisconsin-Madison Division of Extension.

GOAL: To learn how well water quality changes over time

Is well water quality getting better, worse, or staying the same.

If changing, what can we learn about where and why

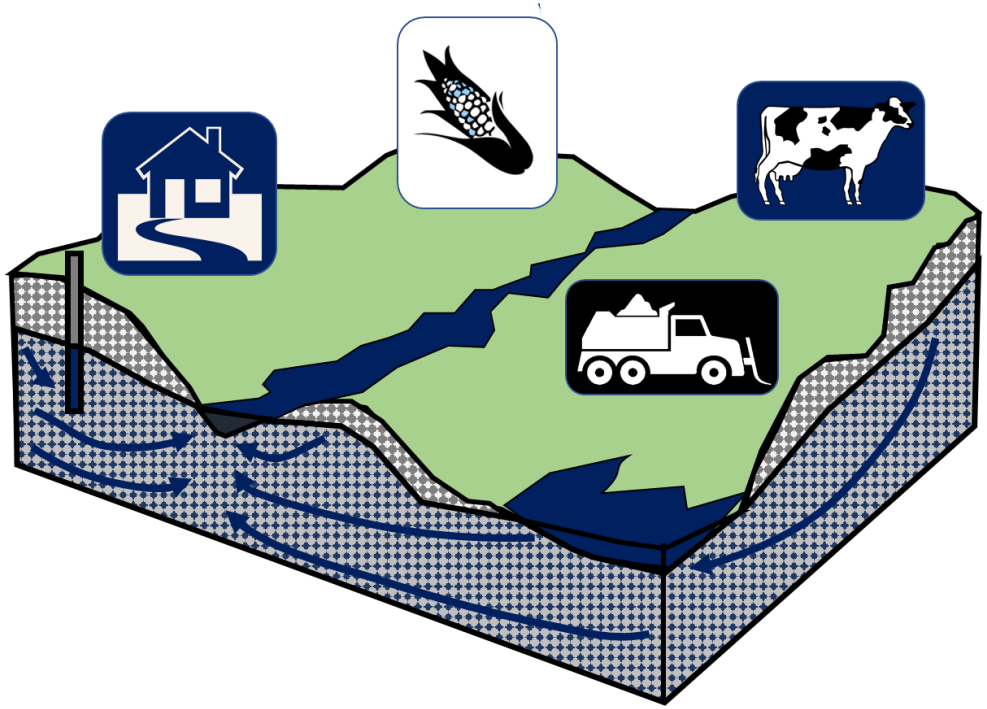
This project works best when:

- Wells are representative of diverse geology and land use
- The same wells are sampled every year

WHAT tests were performed?

Nitrate / Chloride

- Useful for understanding land-use impacts on groundwater



Conductivity

- Overall water quality, combination of both land-use, rocks, and soils

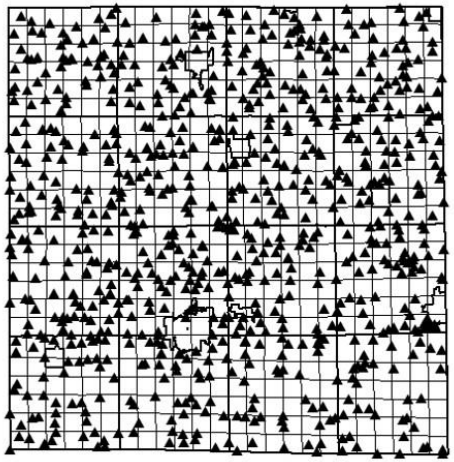
Total Hardness / Alkalinity / pH

- Help us understand how rocks and soils impact groundwater

WHERE and **HOW** many wells?

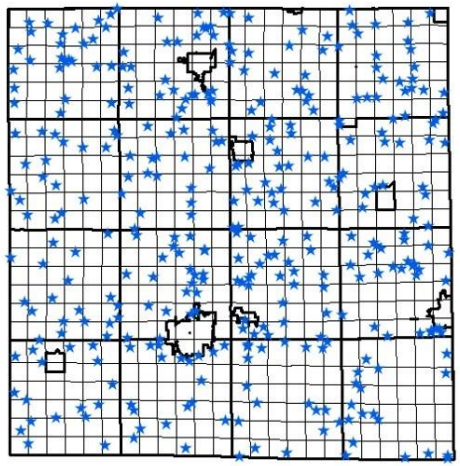
Initial Recruitment

770 Participants



Yes Respondents

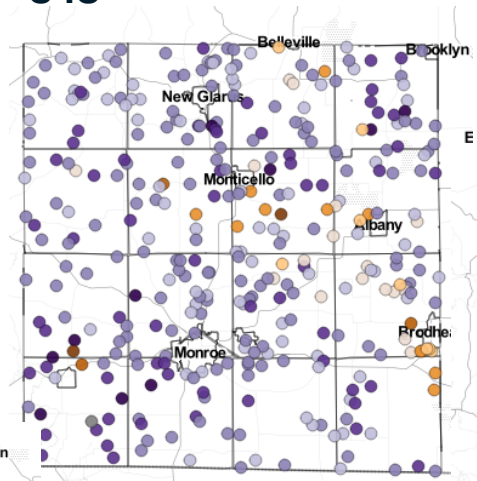
388



2019

Samples Received

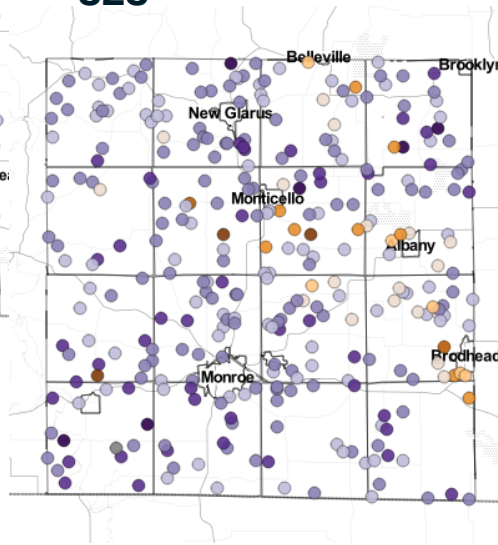
348



2020

Samples Received

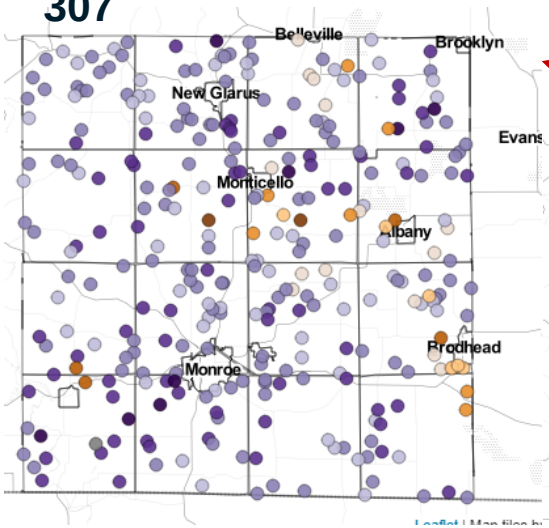
323



2021

Samples Received

307

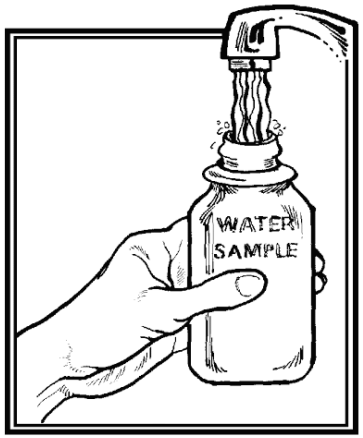


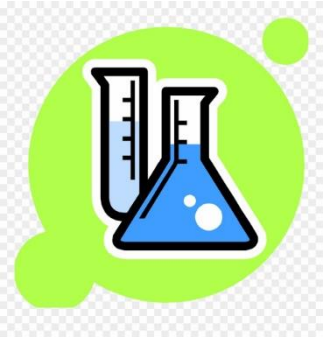
2022

Samples Received

294

Year 4 - Overview





October
Mailed sample kits

November-December
Participants collected samples and mailed back to lab

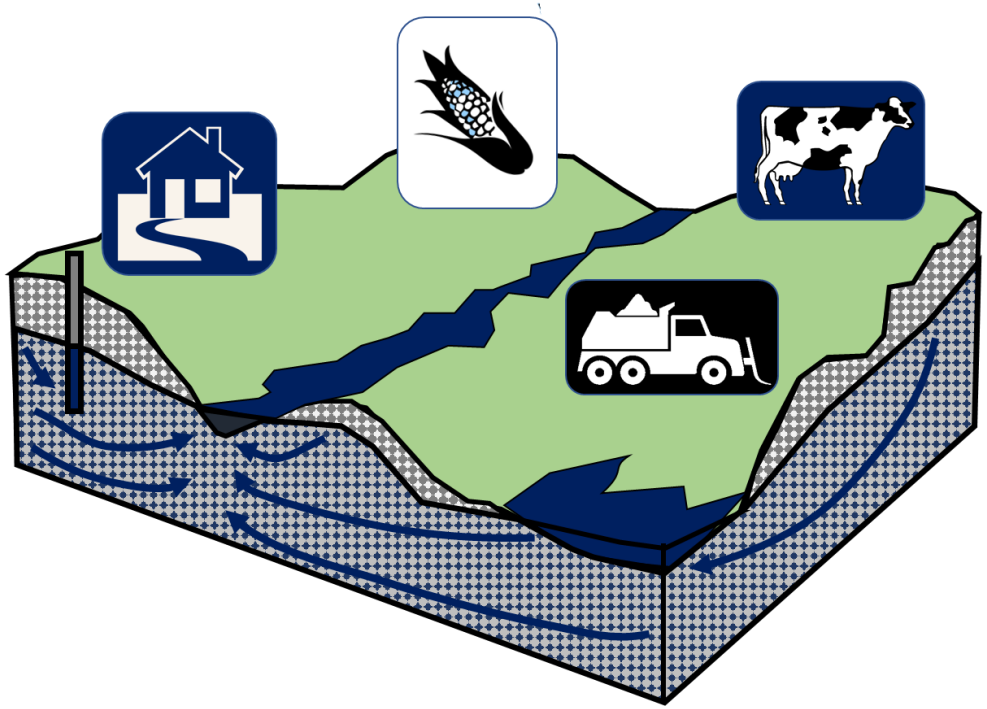
December
Lab analyzed samples

January
Mailed out results

WHAT tests were performed?

Nitrate / Chloride

- Useful for understanding land-use impacts on groundwater



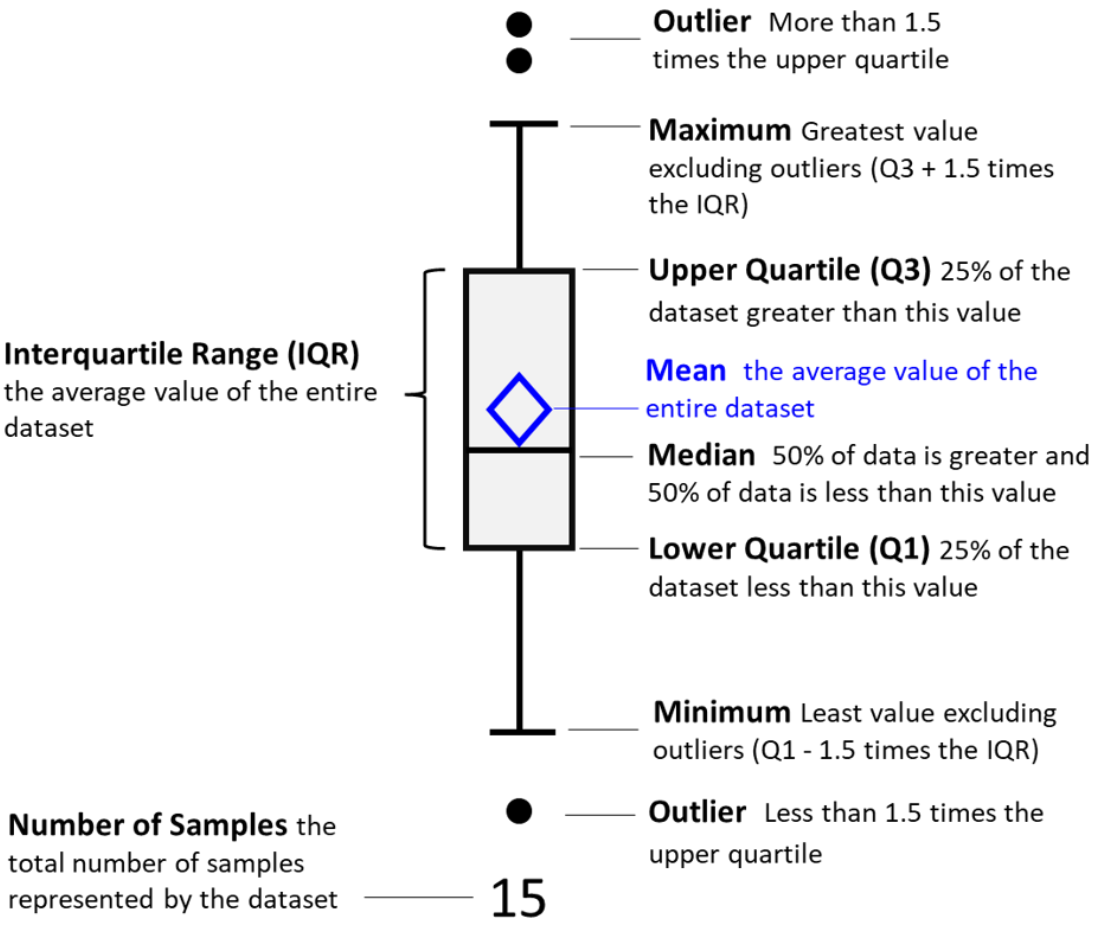
Conductivity

- Overall water quality, combination of both land-use, rocks, and soils

Total Hardness / Alkalinity / pH

- Help us understand how rocks and soils impact groundwater

Interpreting Boxplots

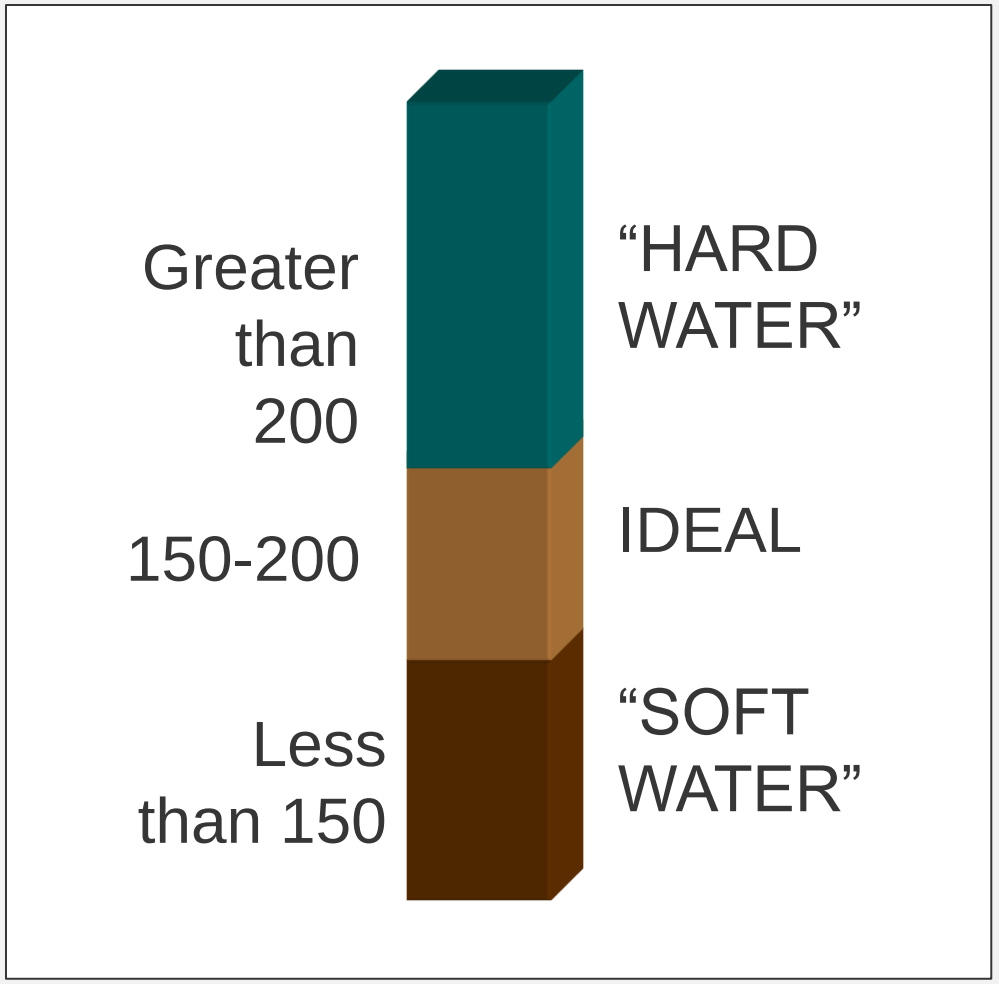


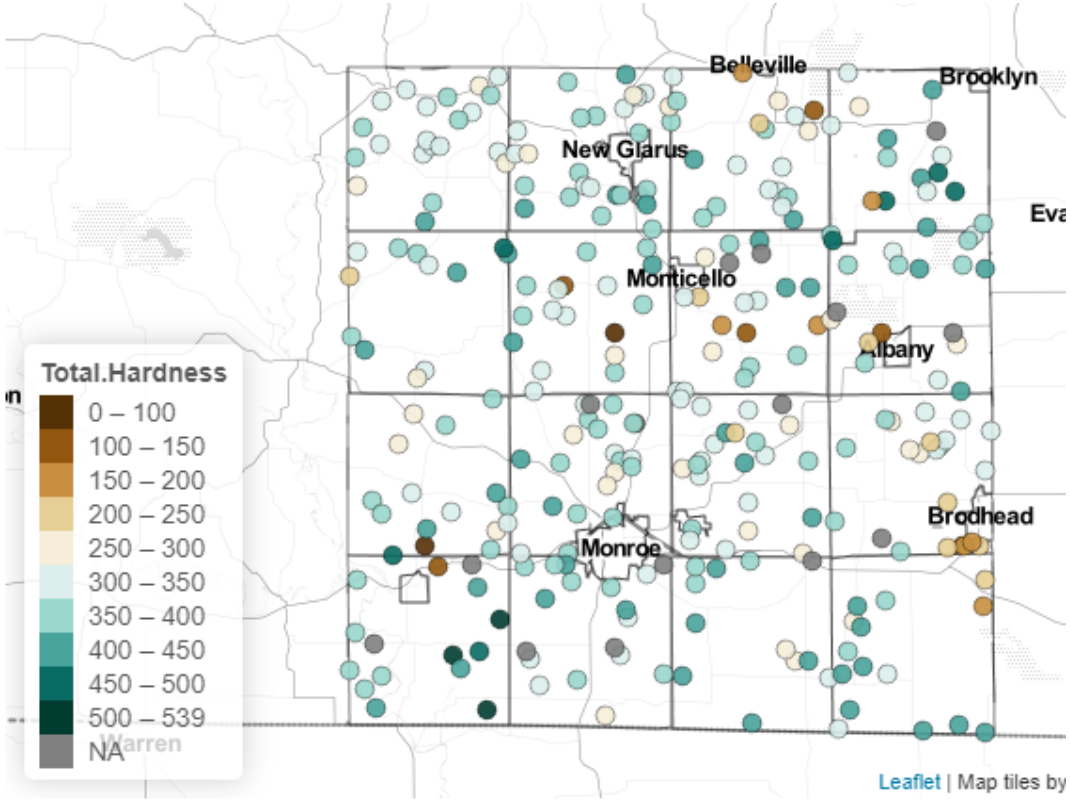
Interpreting the Total Hardness Test

- Natural (rocks and soils)
- Primarily calcium and magnesium

- Problems: scaling, scum, use more detergent, decrease water heater efficiency

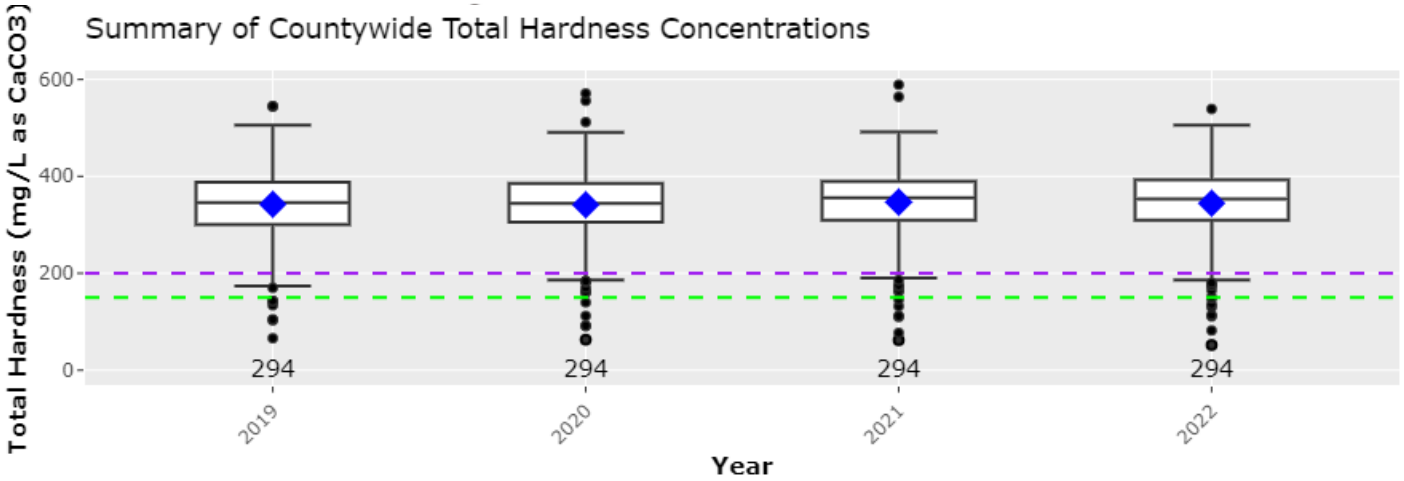
- Treatment:
  - Hard Water: water softener
  - Soft Water: Acid Neutralizer





Total Hardness Summary

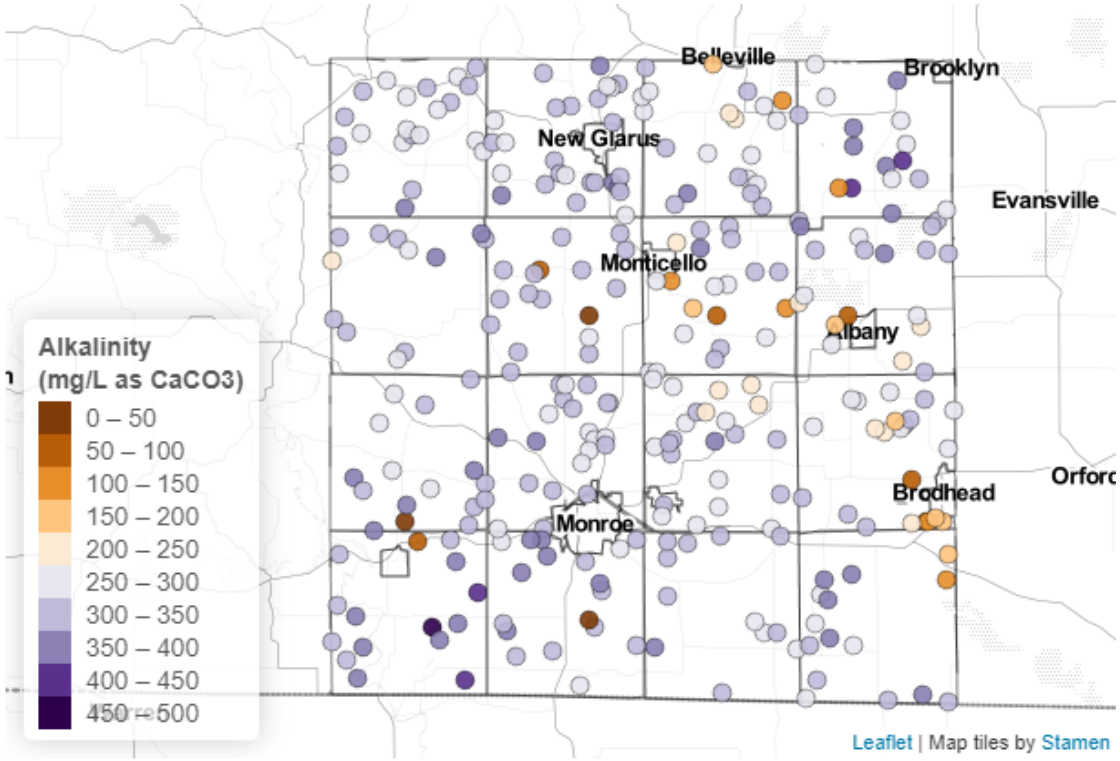
- **Average:** 344 mg/L
- **Median:** 353 mg/L
- **Maximum:** 539 mg/L
- **Minimum:** 52 mg/L



Interpreting tests for Alkalinity and pH

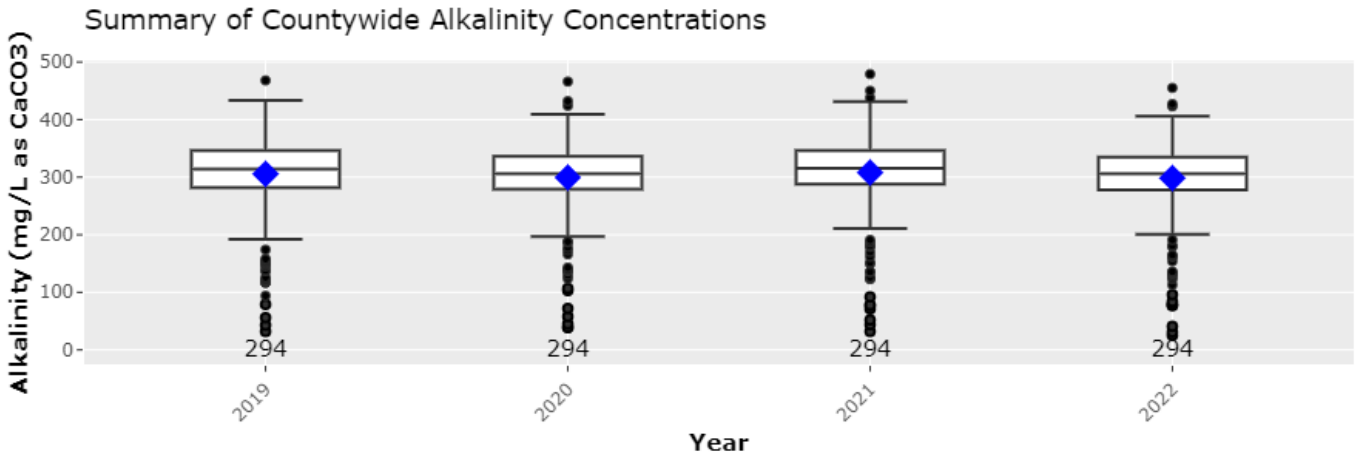
- **Alkalinity** – ability to neutralize acid, helps determine how corrosive water is likely to be
  - Less than 150 mg/L water is more likely be corrosive
  - Greater than 200 mg/L water will be more likely to form scale

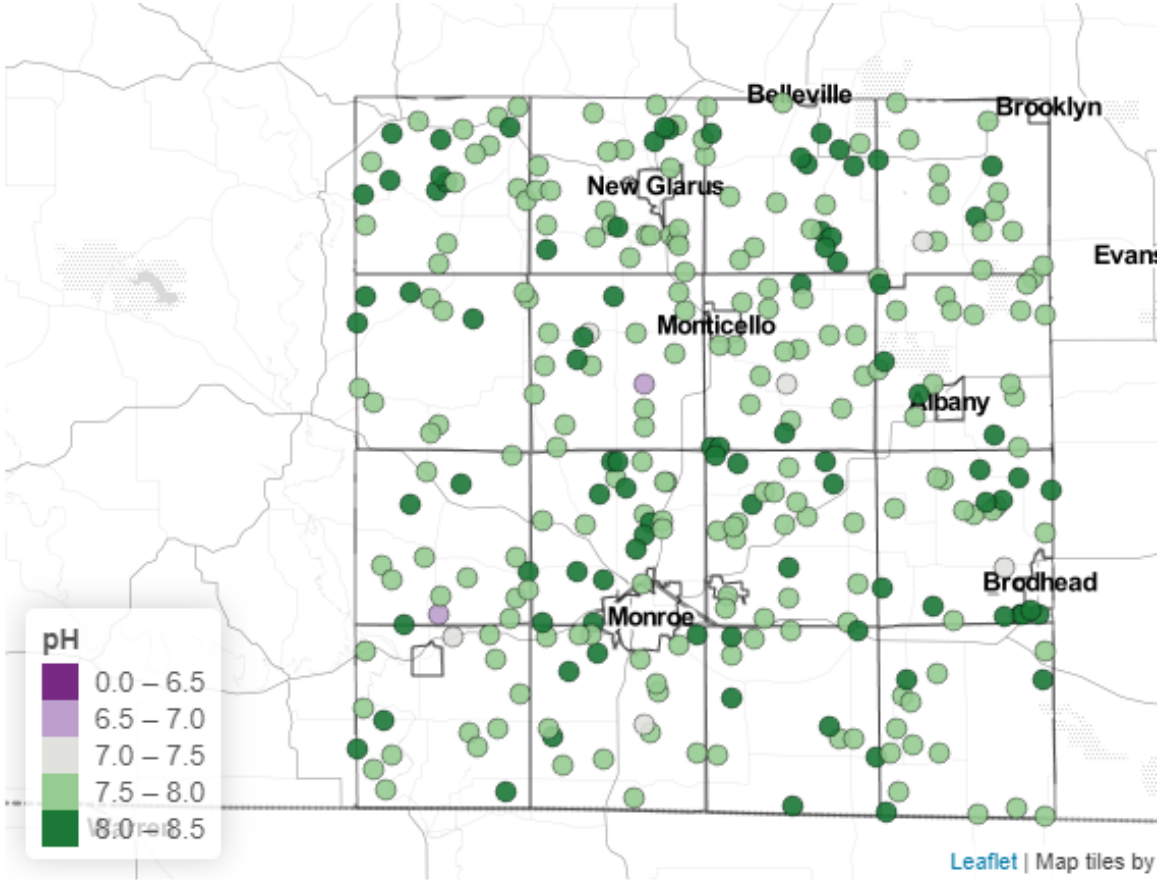
- **pH** – Indicates water's acidity and helps determine if water will corrode plumbing



Alkalinity Summary

- **Average:** 298 mg/L
- **Median:** 306 mg/L
- **Maximum:** 455 mg/L
- **Minimum:** 25 mg/L

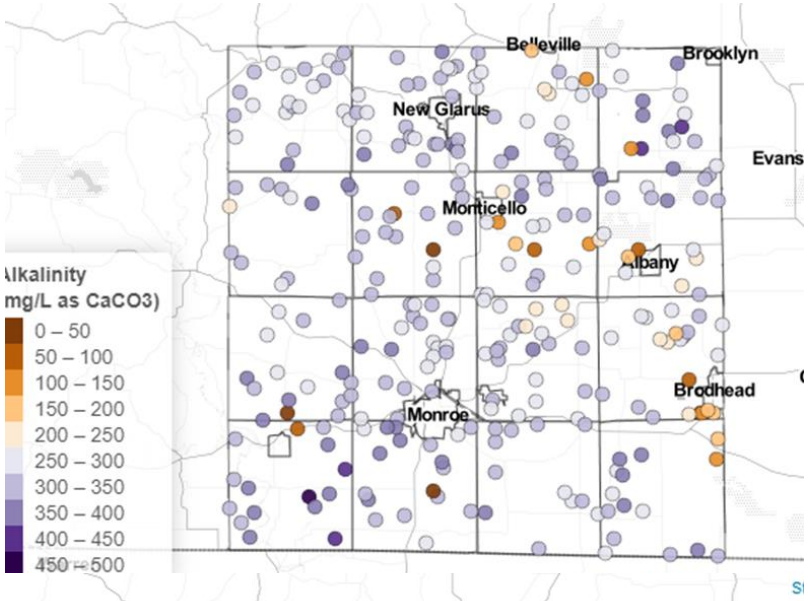


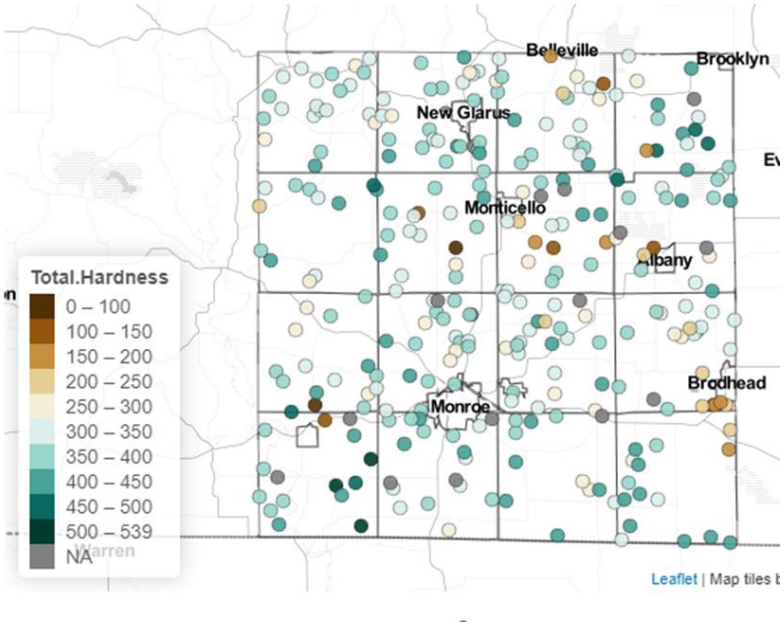


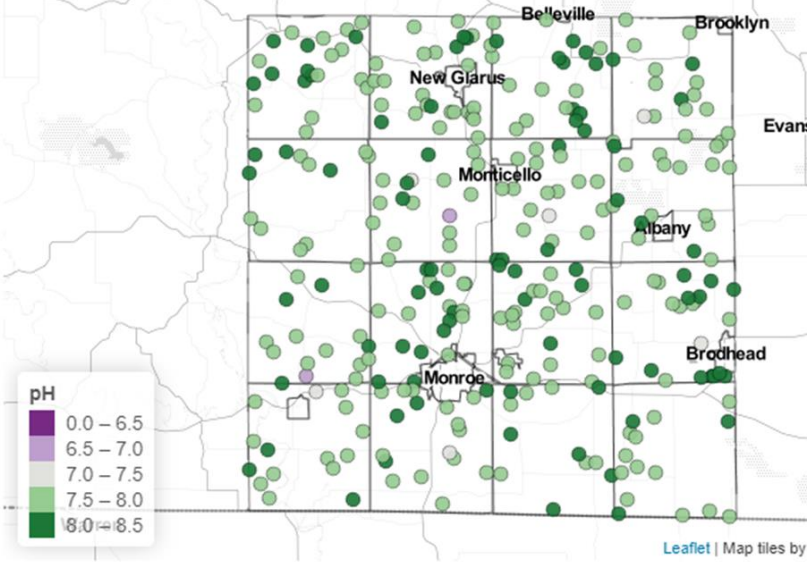
pH Summary

- **Average:** 7.9 mg/L
- **Median:** 7.93 mg/L
- **Maximum:** 8.24 mg/L
- **Minimum:** 6.5 mg/L

2022 Green County Results for:
Alkalinity, Total Hardness, and pH







Averages:

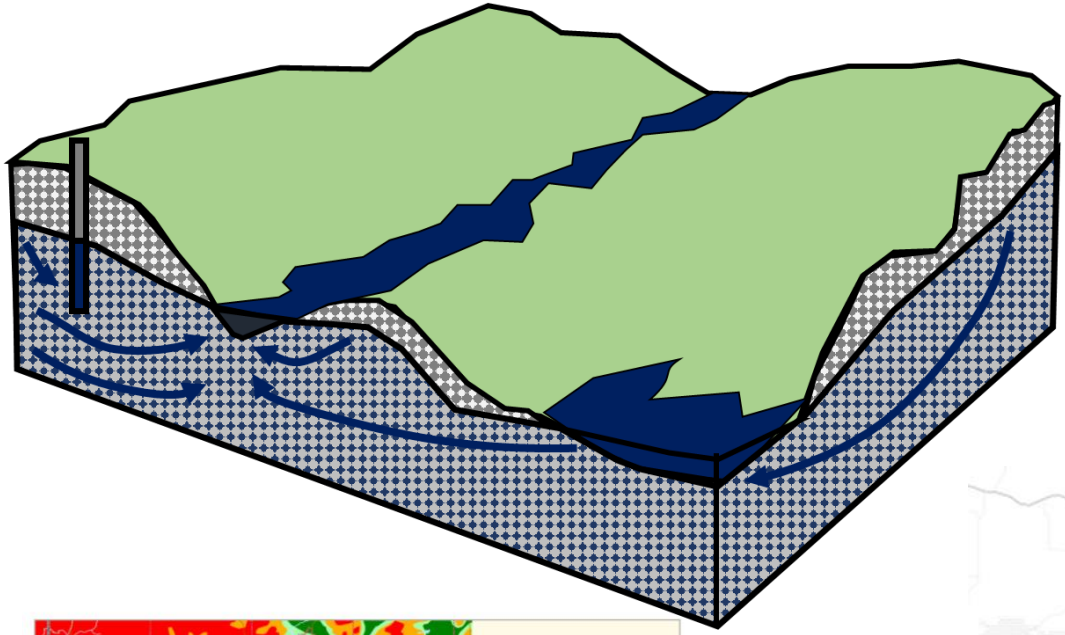
Total Hardness (mg/L as CaCO3) – 344

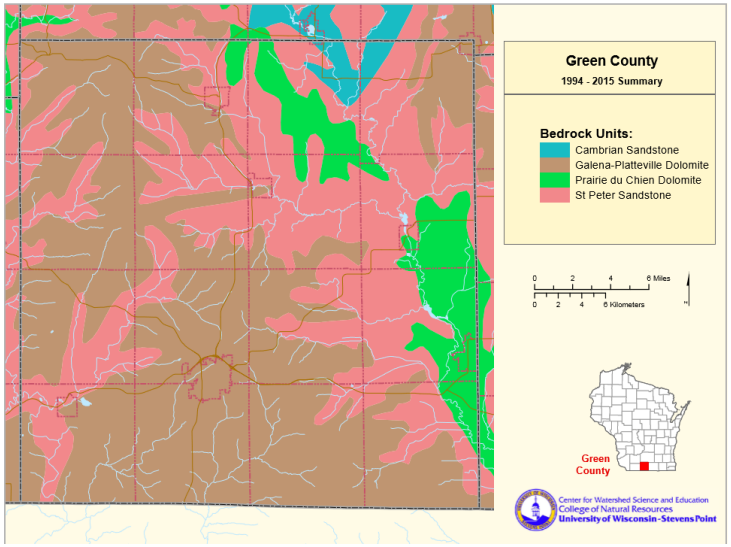
Alkalinity (mg/L as CaCO3) – 298

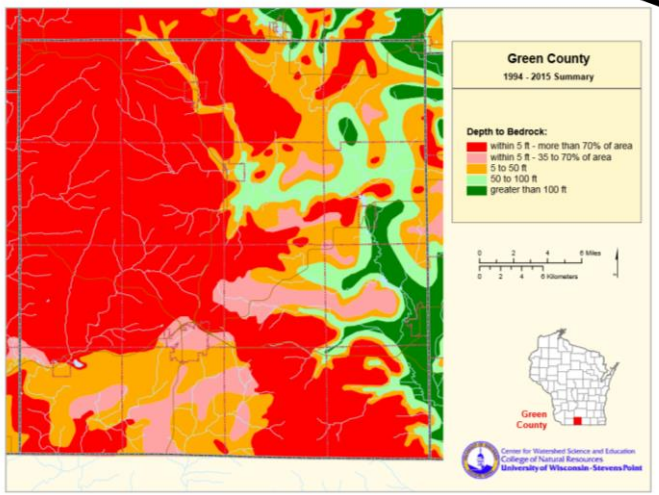
pH – 7.9

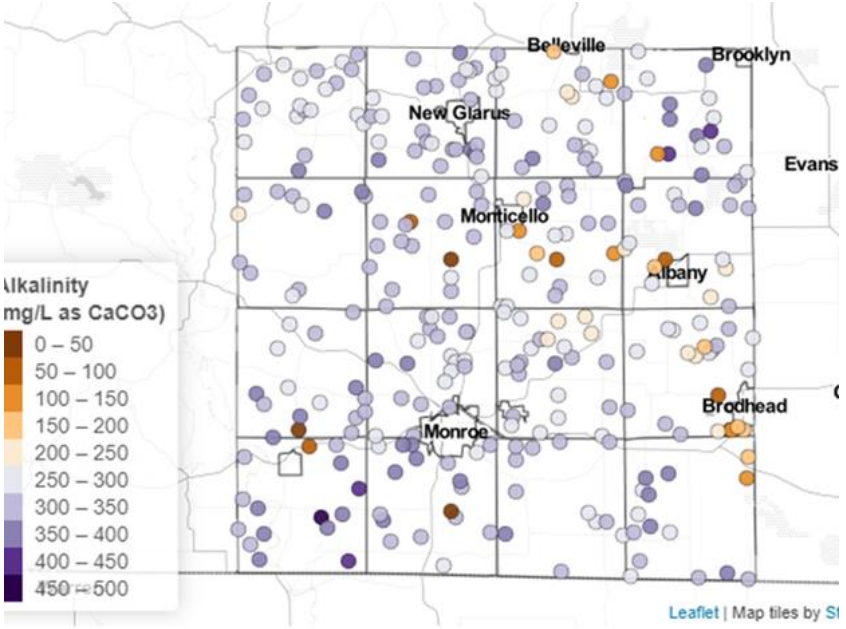
Total Hardness / Alkalinity / pH

- Help us understand how rocks and soils impact groundwater



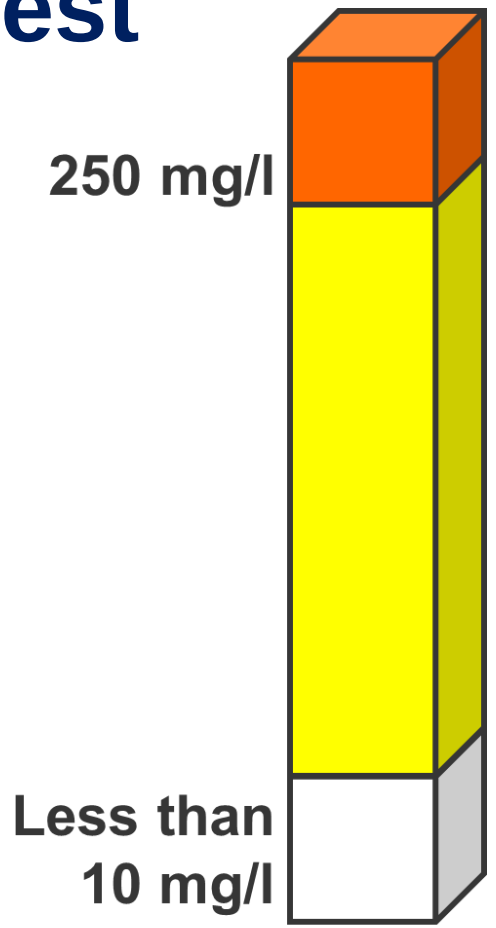






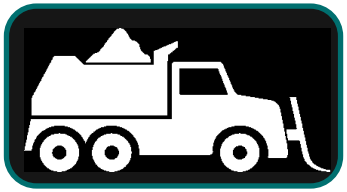
Interpreting your chloride test

- Greater than 250 mg/l
  - No direct effects on health
  - Salty taste
  - Exceeds recommended level
- Greater than 10 mg/l may indicate human impact
- Less than 10 mg/l considered “natural” in much of WI

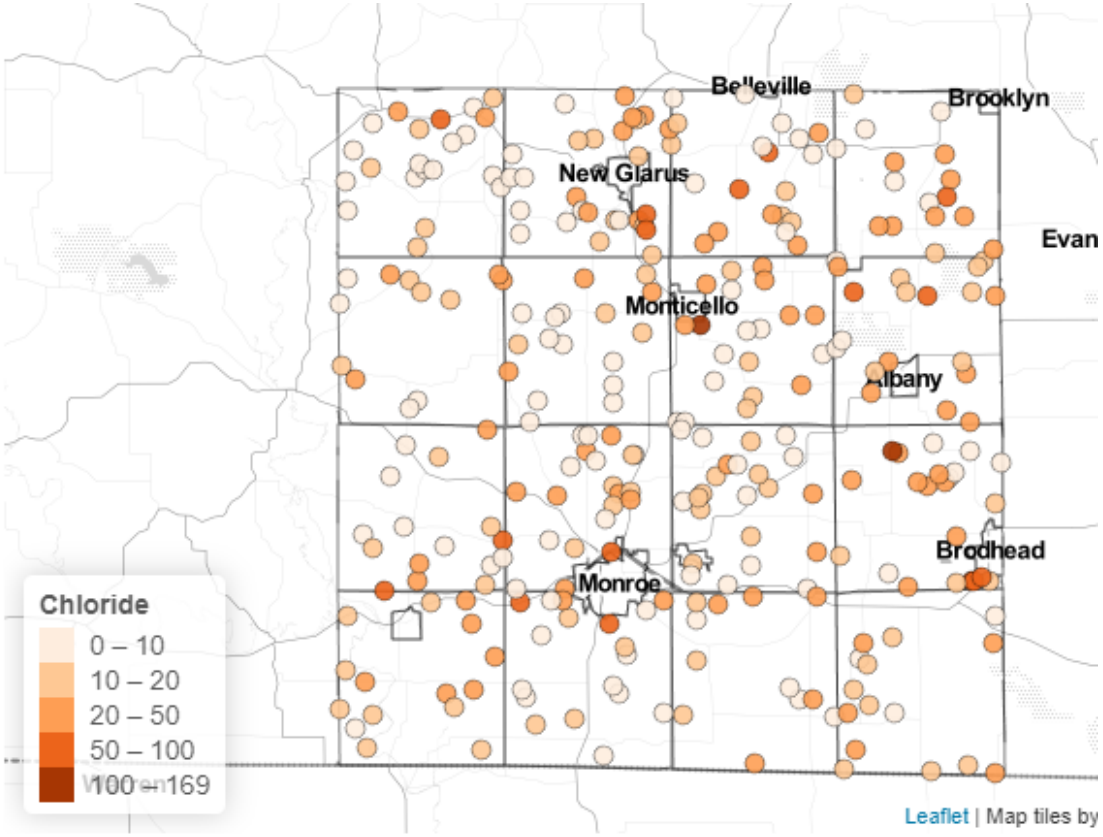


Sources:

Fertilizers / Septic Systems / Road Salt



2022 Green County Chloride Results

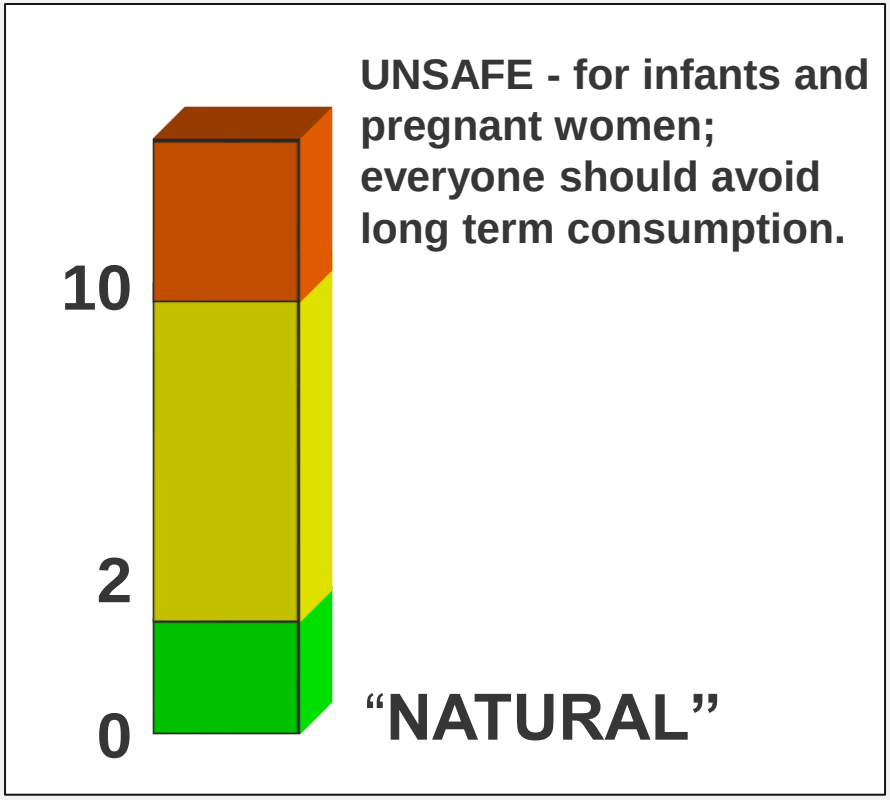


Chloride Summary

- <1% of wells tested greater than 100 mg/L
- 38% of wells tested less than 10 mg/L
- **Average:** 18.9 mg/L
- **Median:** 14.1 mg/L
- **Maximum:** 169 mg/L
- **Minimum:** 0.6 mg/L

Interpreting your nitrate-nitrogen test

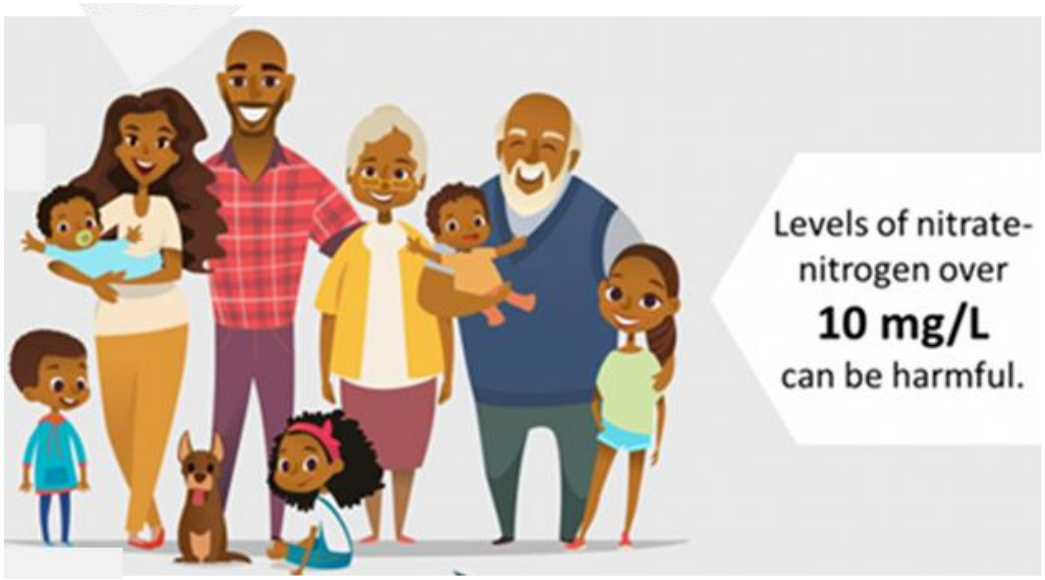
- **Greater than 10 mg/L**
  Exceeds State and Federal Limits for Drinking Water
- **Between 2 and 10 mg/L**
  Some Human Impact
- **Less than 2.0 mg/L**
  "Transitional"
- **Less than 0.2 mg/L**
  "Natural"



Nitrate-Nitrogen

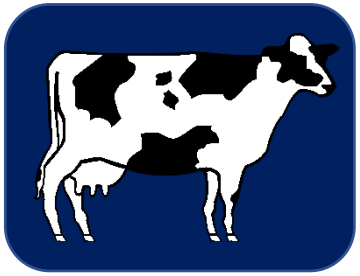
Health Effects:

- **Infants Less than 6 months:**
  - Methemoglobinemia (blue baby disease)
- **Women who are or may become pregnant:**
  - Possible links to birth defects and miscarriages (humans and livestock)
- **Everyone:**
  - Thyroid disease
  - Increase risk of certain types of cancers



Sources:

Agricultural fertilizer / Animal Waste or other bio-solids / Septic Systems / Lawn fertilizer



What can I do to reduce my nitrate levels?

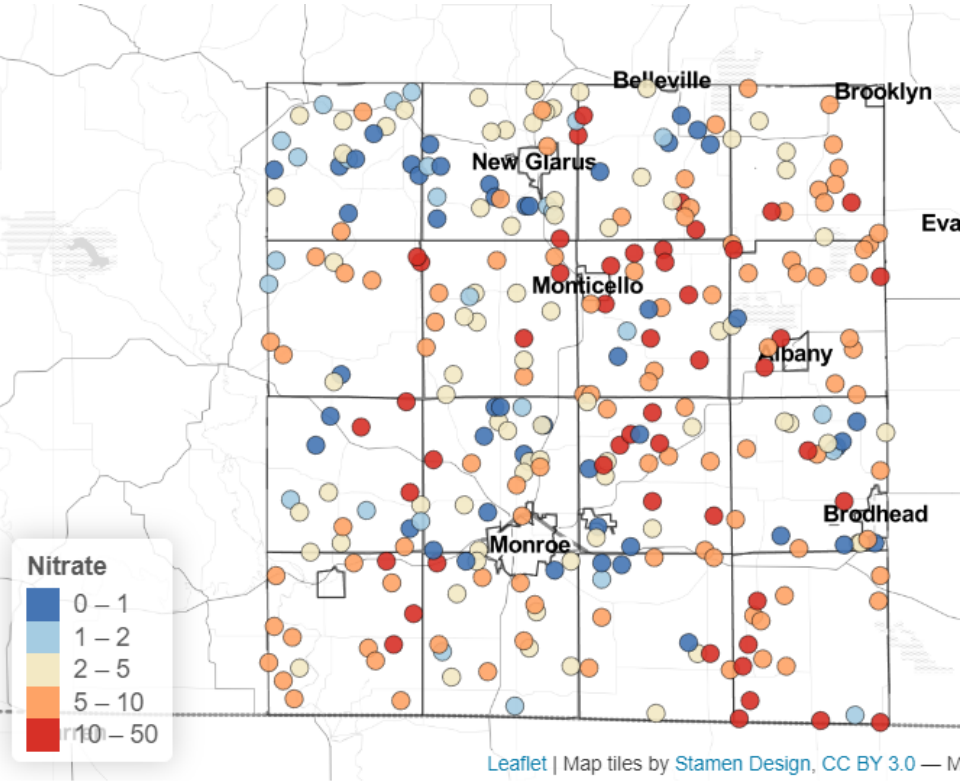
Solution:

- Eliminate contamination source or reduce nitrogen inputs

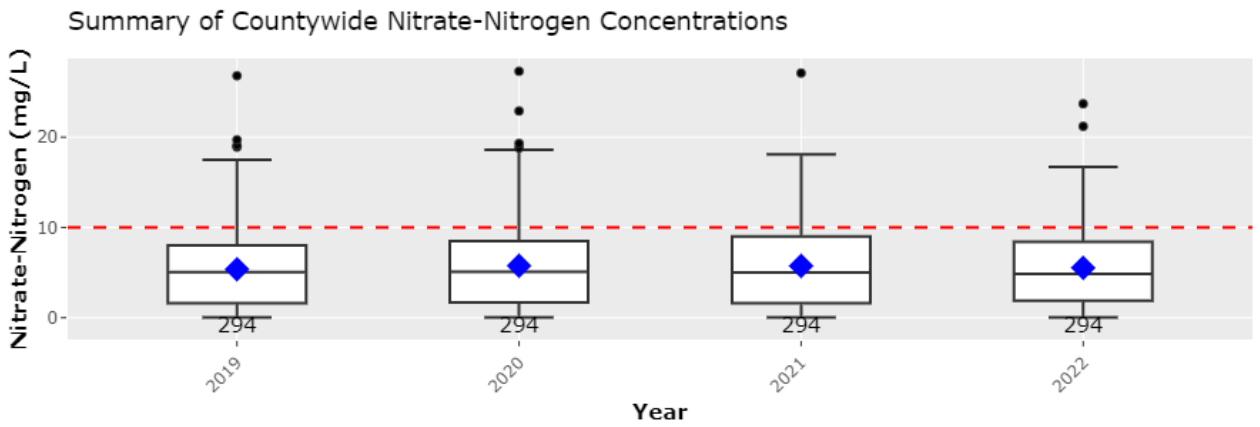
Short term:

- Change well depth or relocate well
- Carry or buy water
- Water treatment devices
  - Reverse osmosis
  - Distillation
  - Anion exchange

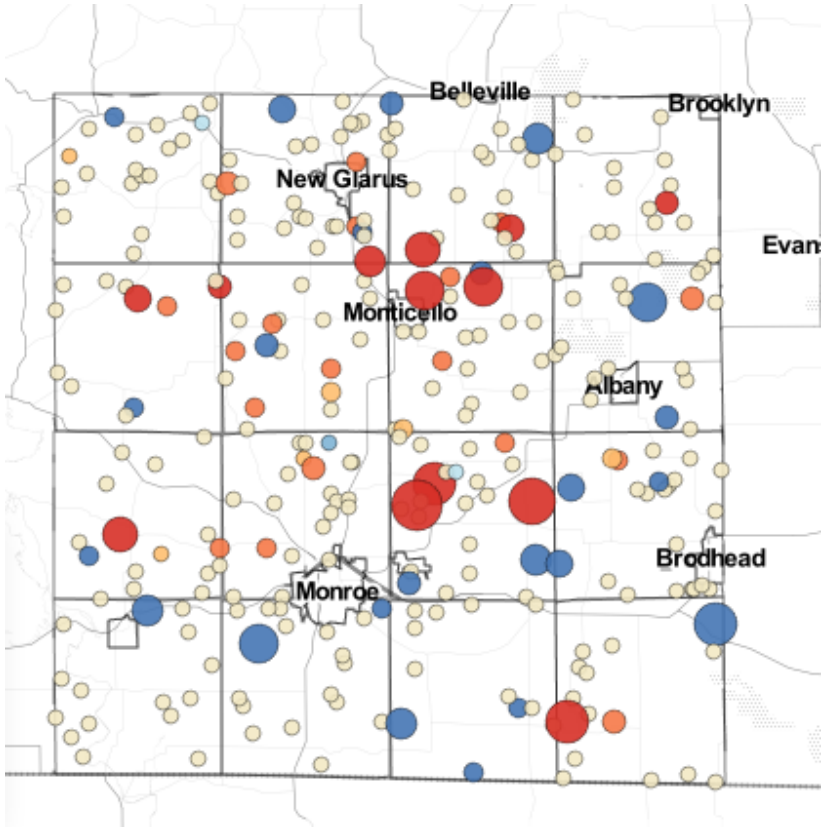
Nitrate-Nitrogen Results



	2019	2020	2021	2022
	Nitrate-N (mg/L)			
Average	5.4	5.7	5.8	5.5
Median	5.0	5.0	5.0	4.9
Minimum	<0.1	<0.1	<0.1	<0.1
Maximum	26.8	27.3	27.1	23.7
Greater than 10	15%	18%	19%	16
Less than 2	28%	27%	27%	26%
N	348	323	307	294



Nitrate-Nitrogen Trends

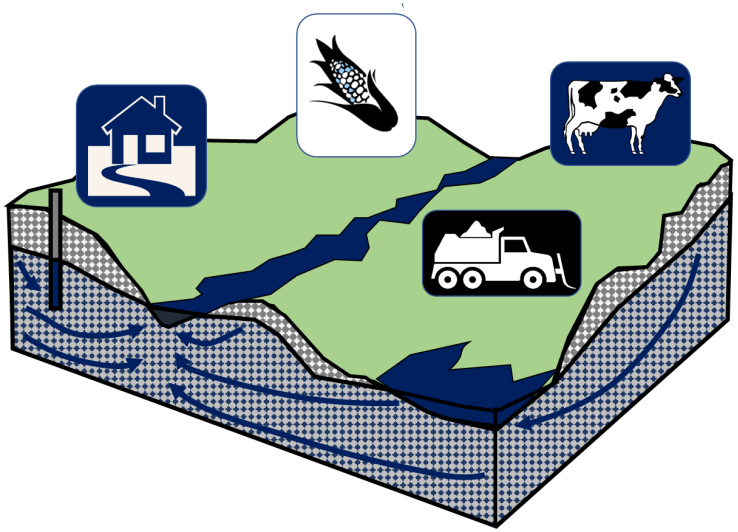


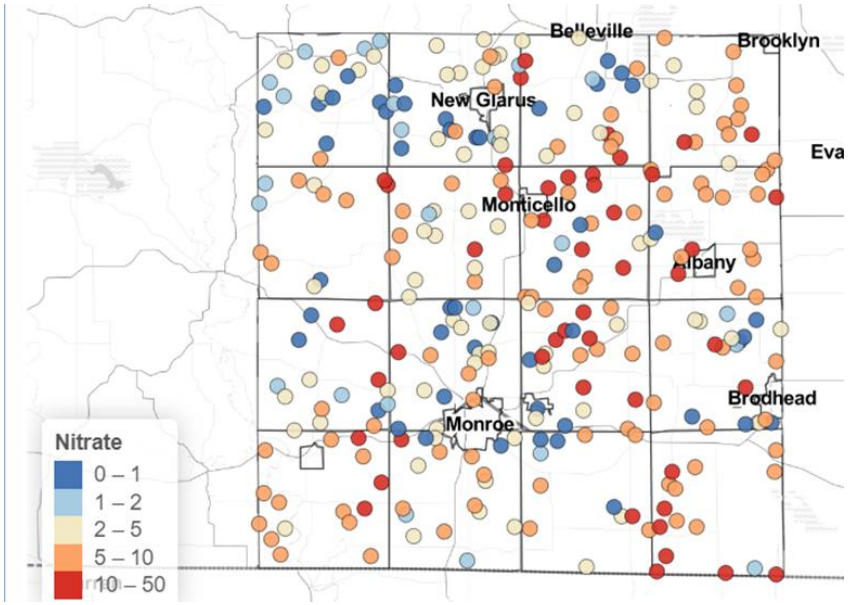
Trend Summary

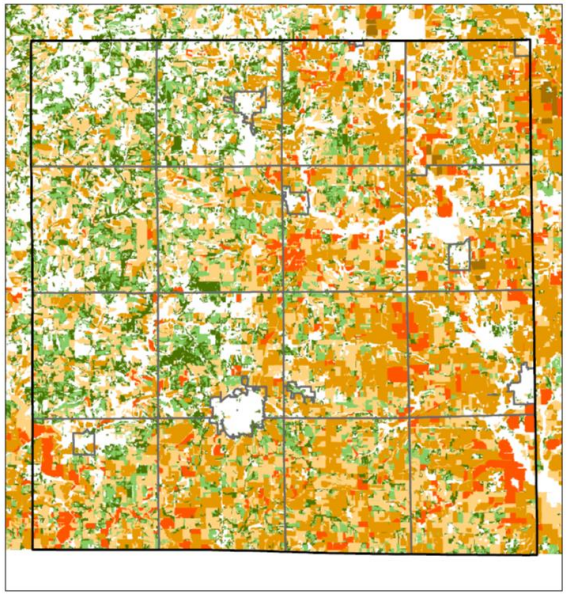
- No Change - 229 (78%)
- Increase – 39 (13%)
- Decrease – 26 (9%)

Nitrate / Chloride

- Useful for understanding land-use impacts on groundwater





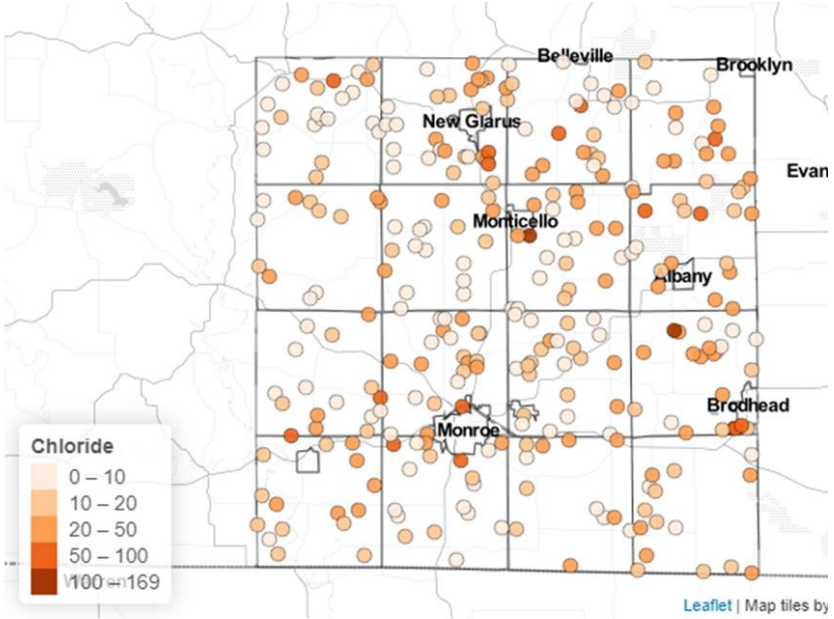


Green County
Well Water Sampling Project

Agricultural Landcover Classification
- Potato/Vegetable
- Pasture
- Hay
- Dairy Rotation
- Cranberries
- Continuous Corn
- Cash Grain

Source: Wiscland 2.0

Created: Elizabeth Belmont. February 28, 2022

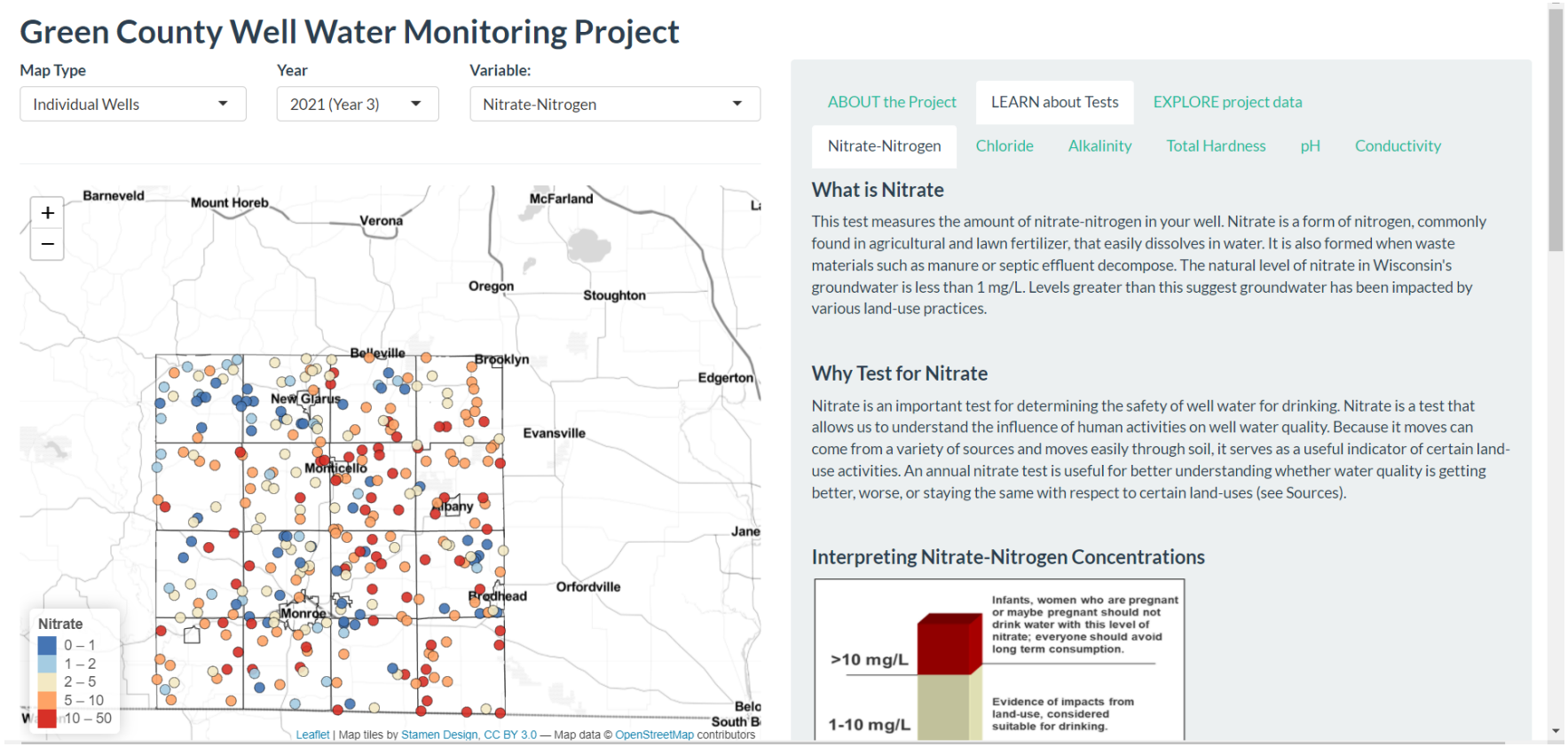


What's next for the project?

- Test kits for Year 5 will be sent sometime in October/November

- **Coming in Year 5:**
  - Add new functionality to dashboard:
    - Land use, well construction, trends, etc.
  - Will continue to investigate relationships between land-use, soils, geology, well depth, etc. on water quality results
    - Develop statistical models to better predict water quality risk for wells that are not part of the project

Website will be updated soon to include Year 4 data



Access the Dashboard here:
http://68.183.123.75:3838/County-Apps/Green/

Questions?

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kmasarik@uwsp.edu

www.uwsp.edu/cnr/watersheds

Thanks to you and the following for helping sponsor this program:

- Green County
- University of Wisconsin-Madison, Division of Extension – Green County
- Green County Health Department
- Green County Land Use and Zoning Department
- Green County Land and Water Conservation

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there's an art to it.

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