Nitrates in Drinking Water: The Threat and Potential Policy Responses

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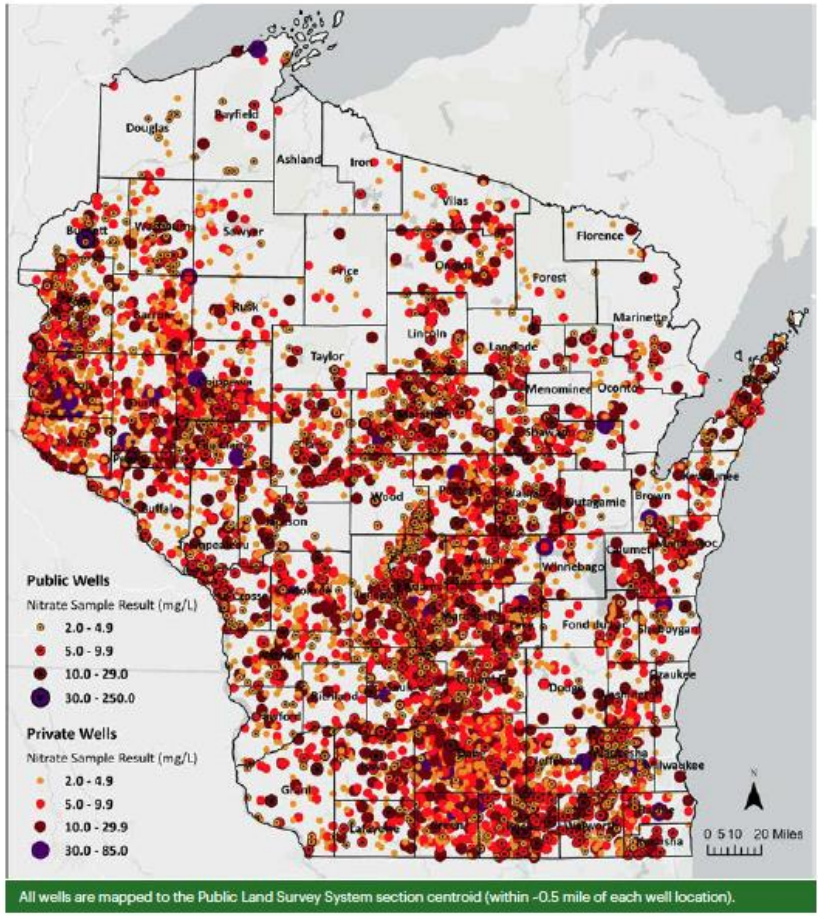
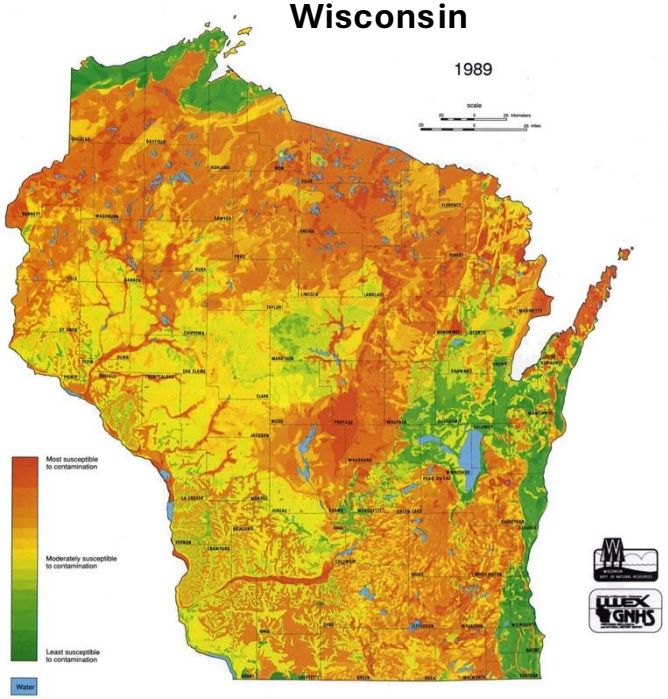
Nitrate Contamination in Wisconsin

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



- Over 11,000 public water systems
- Over 800,000 private wells
- 2/3 of residents rely on groundwater for their drinking water

Groundwater susceptibility of Wisconsin



- Most widespread contaminant in groundwater
  - ~10% of private wells
  - 186 Transient systems (ex. rural bars, restaurants)
  - 20 public water systems
- Loads have increased in SW, SC and Central areas

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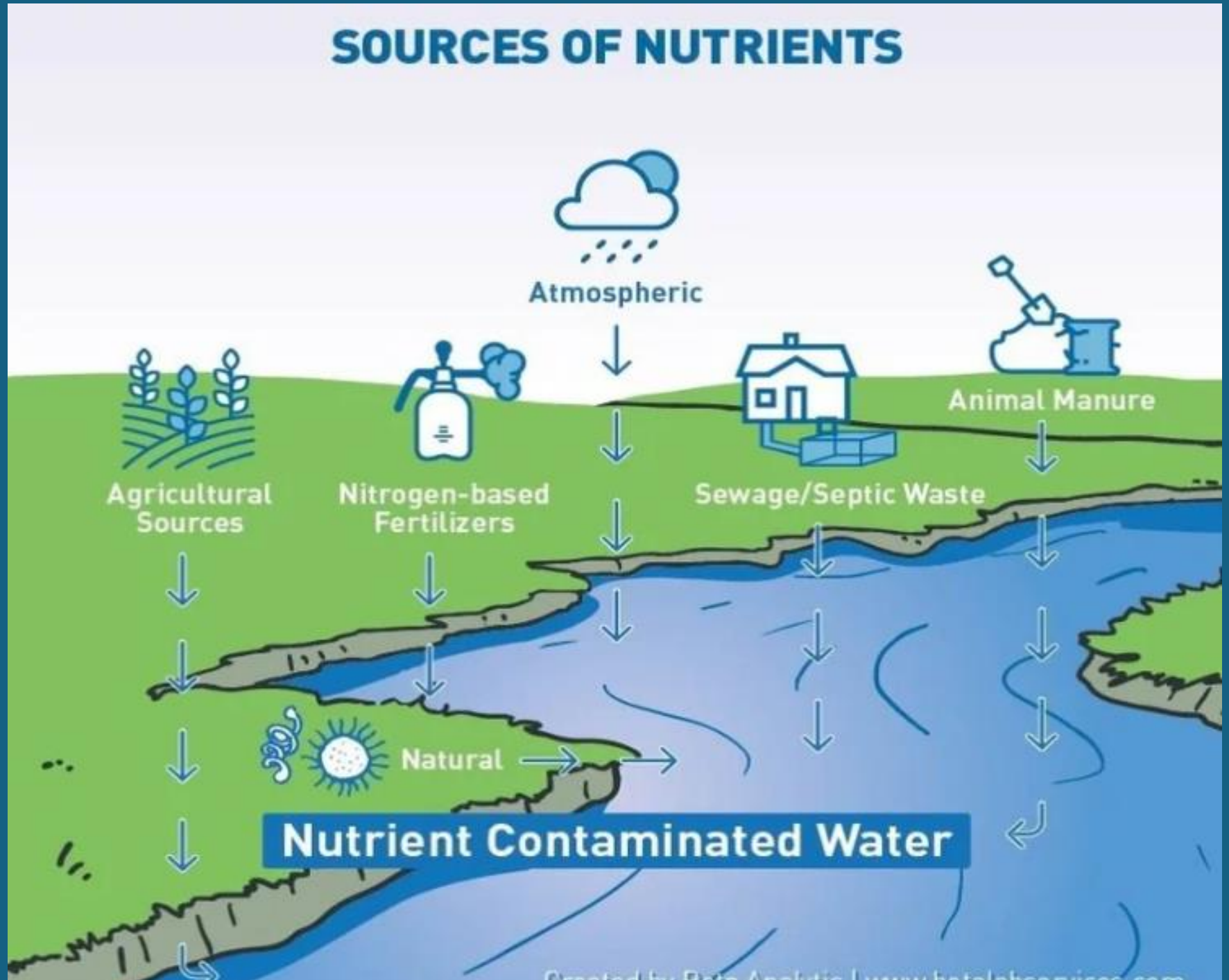
How is nitrate getting into our water?



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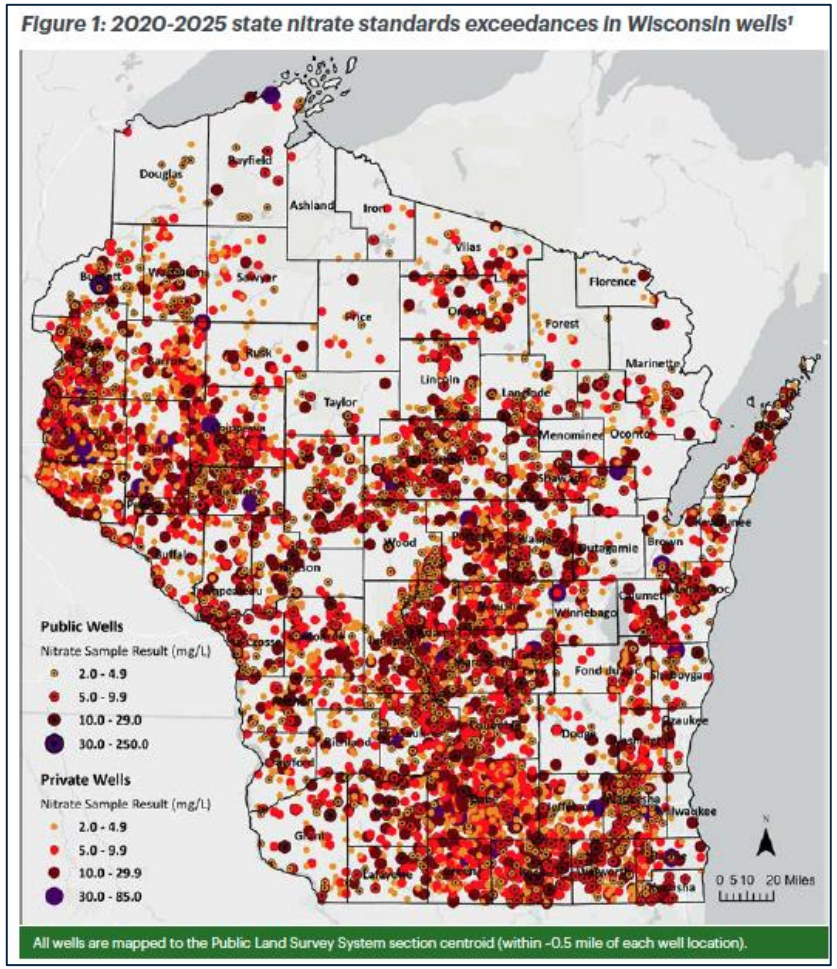
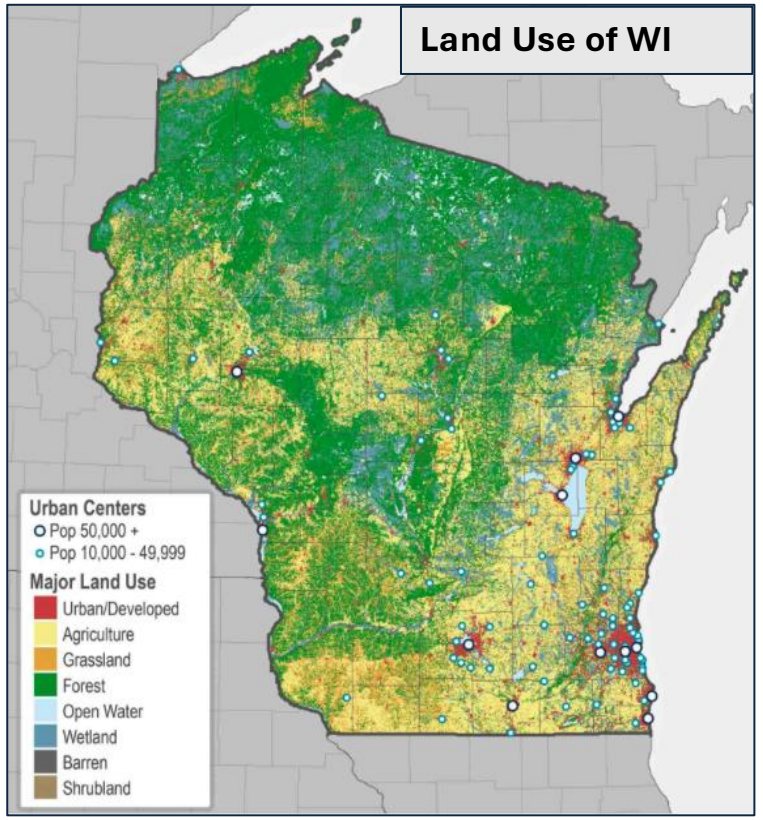


- ~14 million acres of ag land
  - 4 million – Corn
  - 1.2 million – Soybeans
  - 2 million – Forage hay



- Ranked #1
  - Cheese
  - Dry whey
  - Corn silage
  - Cranberries
  - Snap beans
  - Milk goats
  - Mink
- 1.27 million dairy cows - 5,300 herds
- 10.3 million chickens

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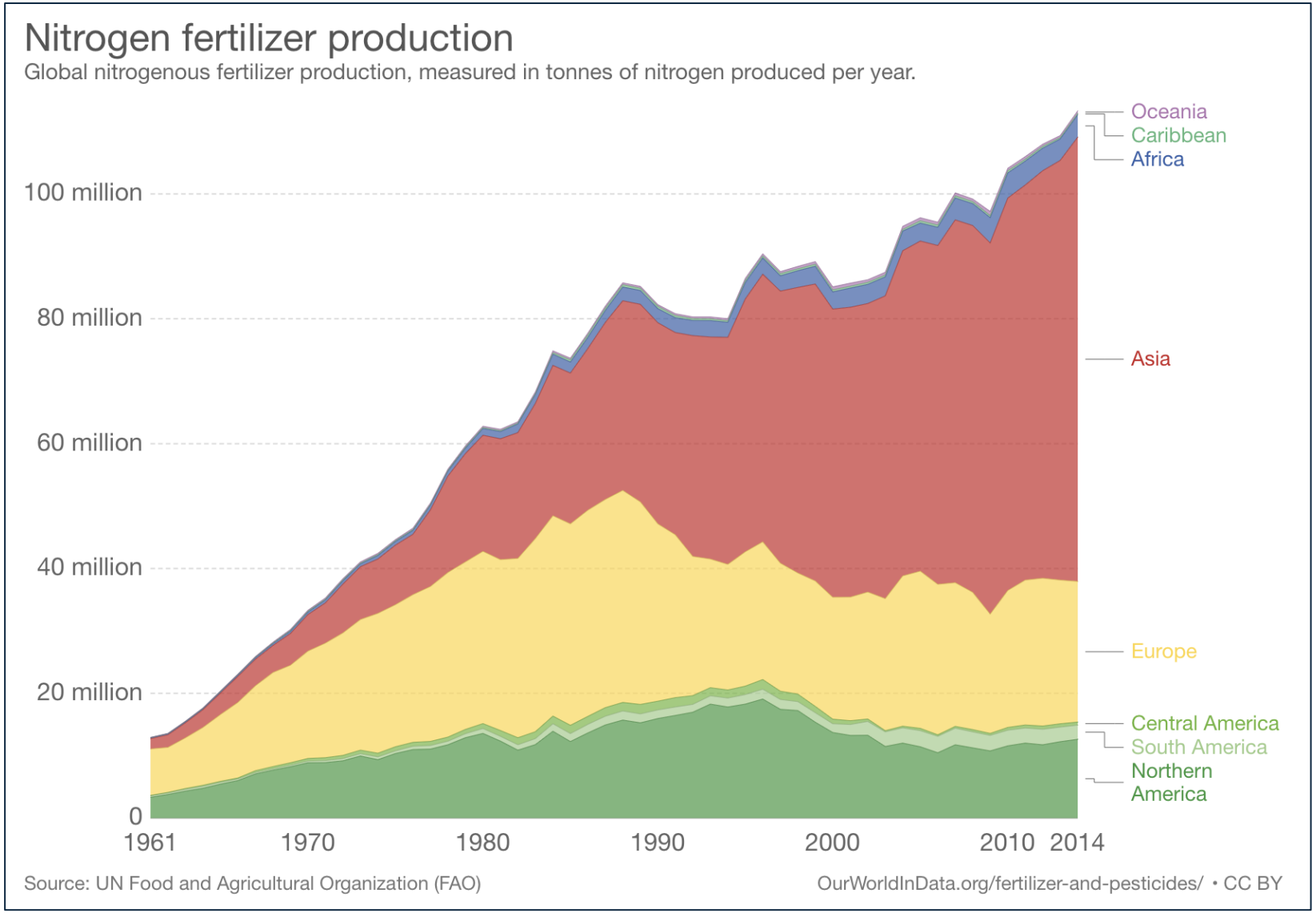
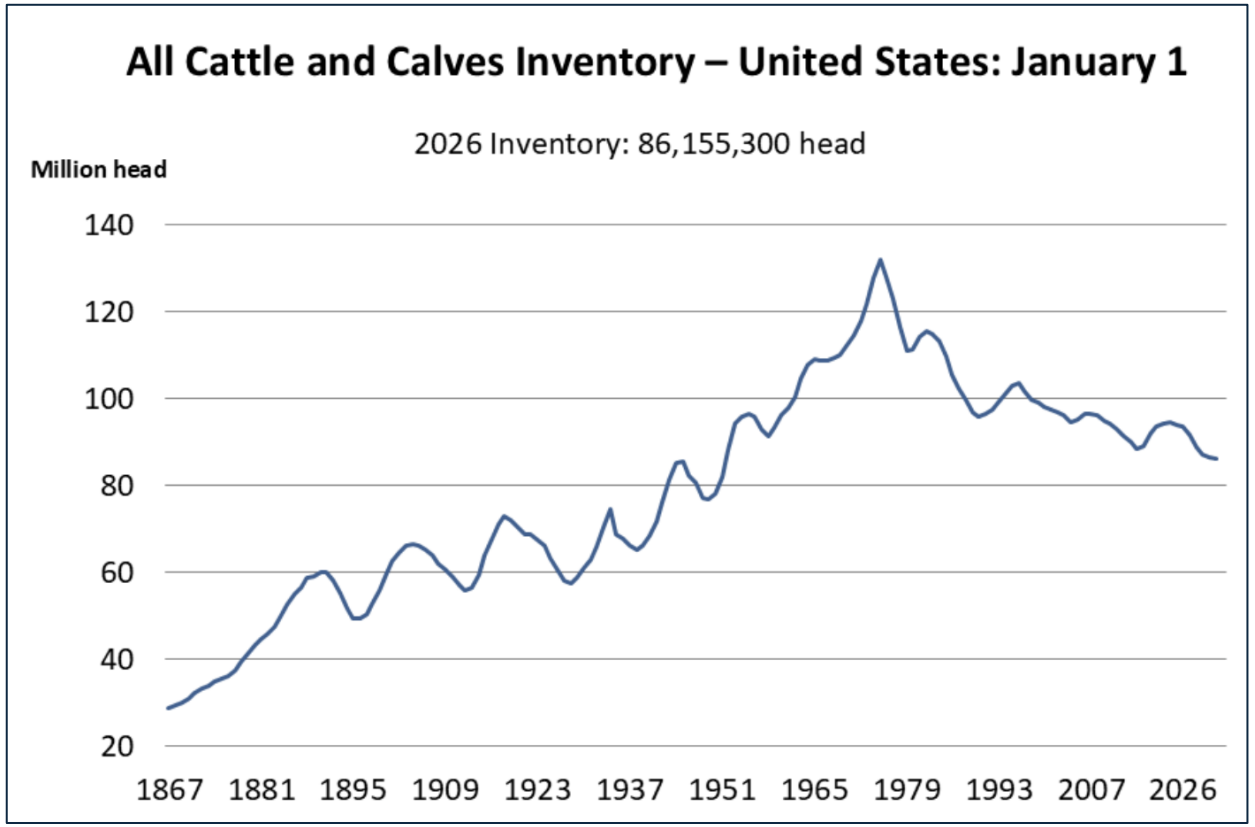
We've always had agriculture, so what's changed?

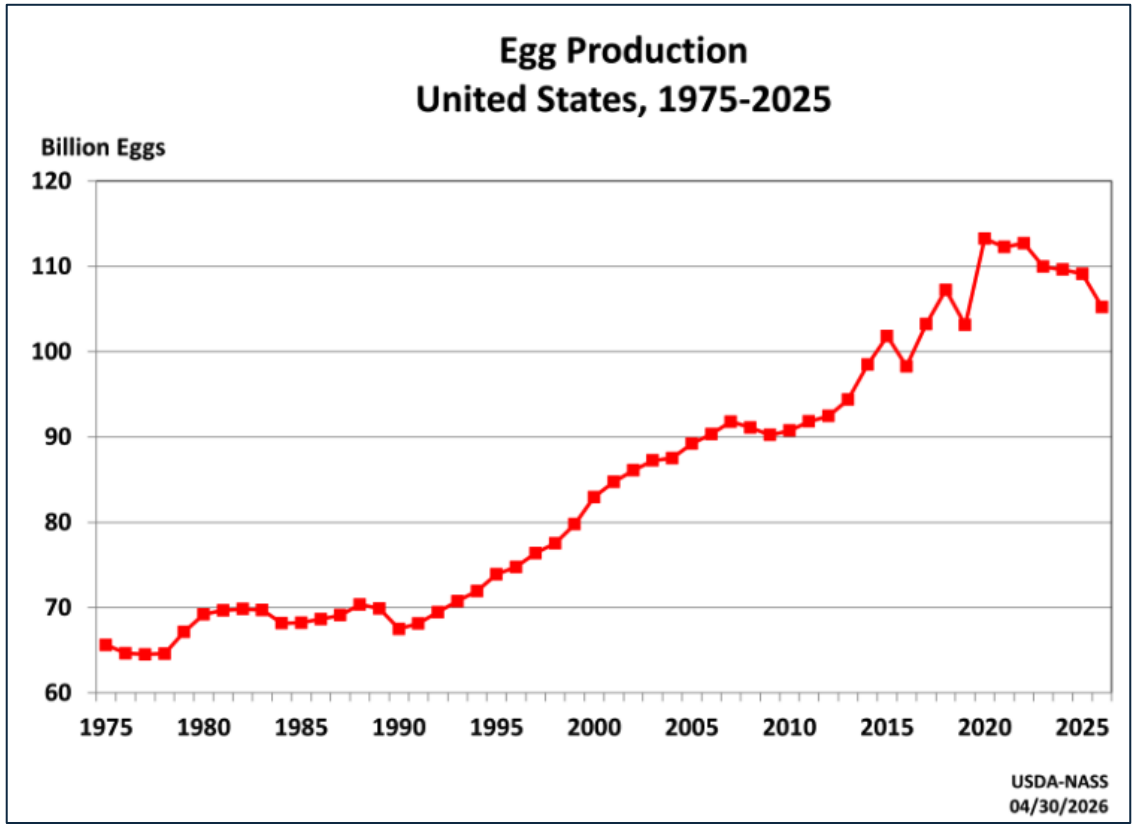
- The rise of commercial nitrogen fertilizer
  - Manure and plant biomass before the early 20th century
  - Huber-Bosch method 1930's
- Between 1960 and 2000, the amount of nitrogen fertilizer applied to agricultural systems more than tripled[1]



We've always had agriculture, so what's changed?

Livestock production increases over time

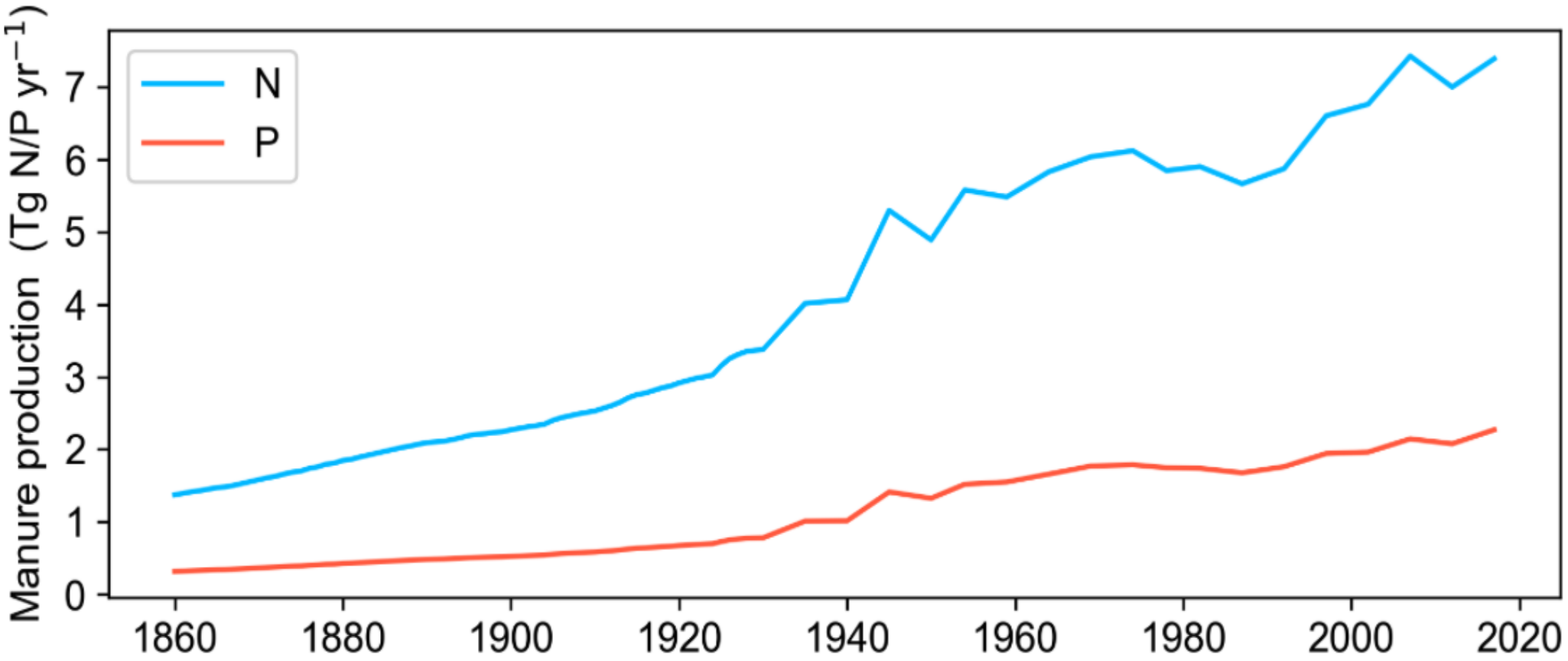




https://www.nass.usda.gov/Charts_and_Maps/

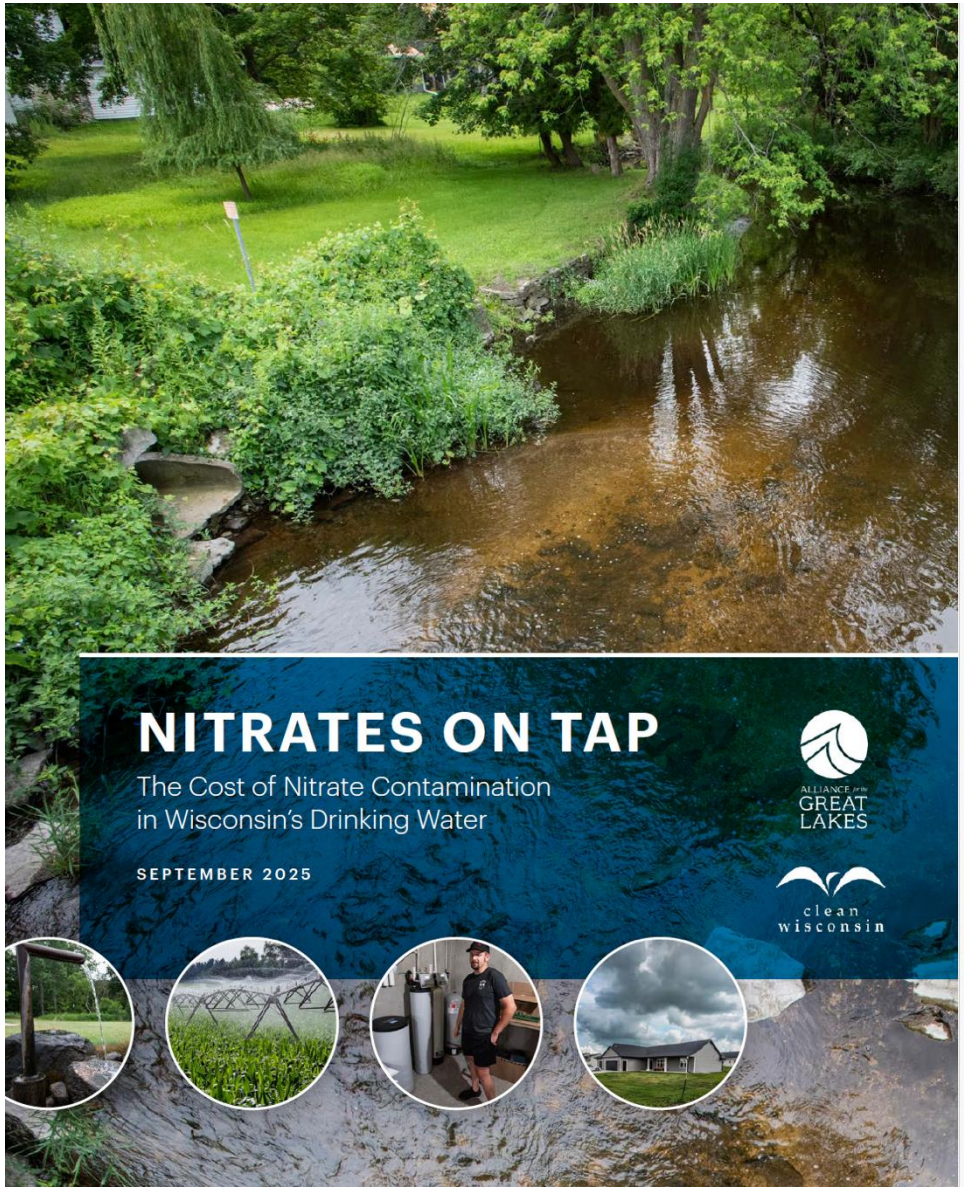
We've always had agriculture, so what's changed?

Livestock Production Increases → Manure Production Increases



Bian, Z., et al. Earth Syst. Sci. Data, 13, 515–527, https://doi.org/10.5194/essd-13-515-2021, 2021.

Nitrates on Tap – A Case Study



Goals:

- Increase awareness about nitrate impacts to drinking water systems
- Estimate the cost to ratepayers for nitrate treatment
- Estimate crop N need vs. annual statewide manure and fertilizer volumes
- Elevate the experiences of private well owners
- Motivate crop management changes
- Identify policy options to protect drinking water

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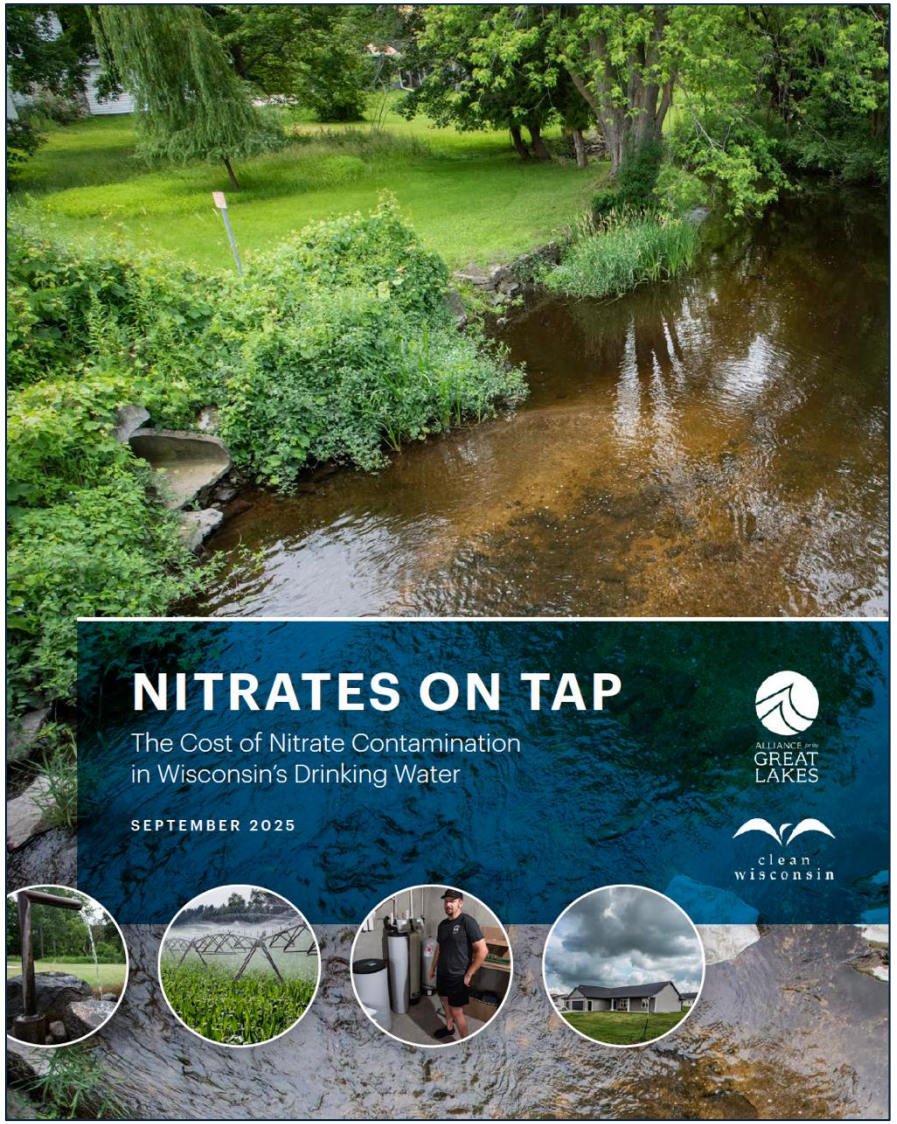
Evaluating the Cost of Nitrate Contamination of WI's Groundwater – A Case Study



Community Input:

- Survey private well owners to document lived experiences, costs, and concerns

Data Analysis:

- Quantified treatment costs for 4 municipal water systems
- Assessed range of private well expenses for nitrate treatment options
- Simplified mass balance approach to estimate amount of N applied vs total annual crop need crop need o Estimated statewide annual crop N need, manure generation volumes, and obtained N fertilizer sales from WI Dept. of Ag

Policy Analysis:

- Reviewed Wisconsin's current regulatory and incentive programs
- Analyzed nutrient management requirements across GL states

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Case Study: Wisconsin Private Wells

"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, Casco, WI**

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Case Study: Wisconsin Public Water Systems

Utility	Population Served	Water Supply	Capital Investment	Cost per Customer	Nitrate Status
Chippewa Falls	13,375	9 wells (826M gal/yr)	>$2.5M	$186	Still rising (6.55 → 7.47 mg/L)
Janesville	64,415	8 wells (3.6B gal/yr)	~$33M	$512	~6.45 mg/L
Plover	13,486	3 wells (599M gal/yr)	~$6.8M	$504	Near standard (7.65 mg/L)
Trempealeau	1,888	2 wells (55M gal/yr)	~$2.8M	$1,503	Addressed by drilling deeper wells

Case Study: Results summary

- Ratepayers are spending millions each year to remove nitrate from public water systems
- Private well owners are exposed to high nitrate levels and costs to remediate without state support
- More nitrogen is being applied to ag fields than crops can utilize

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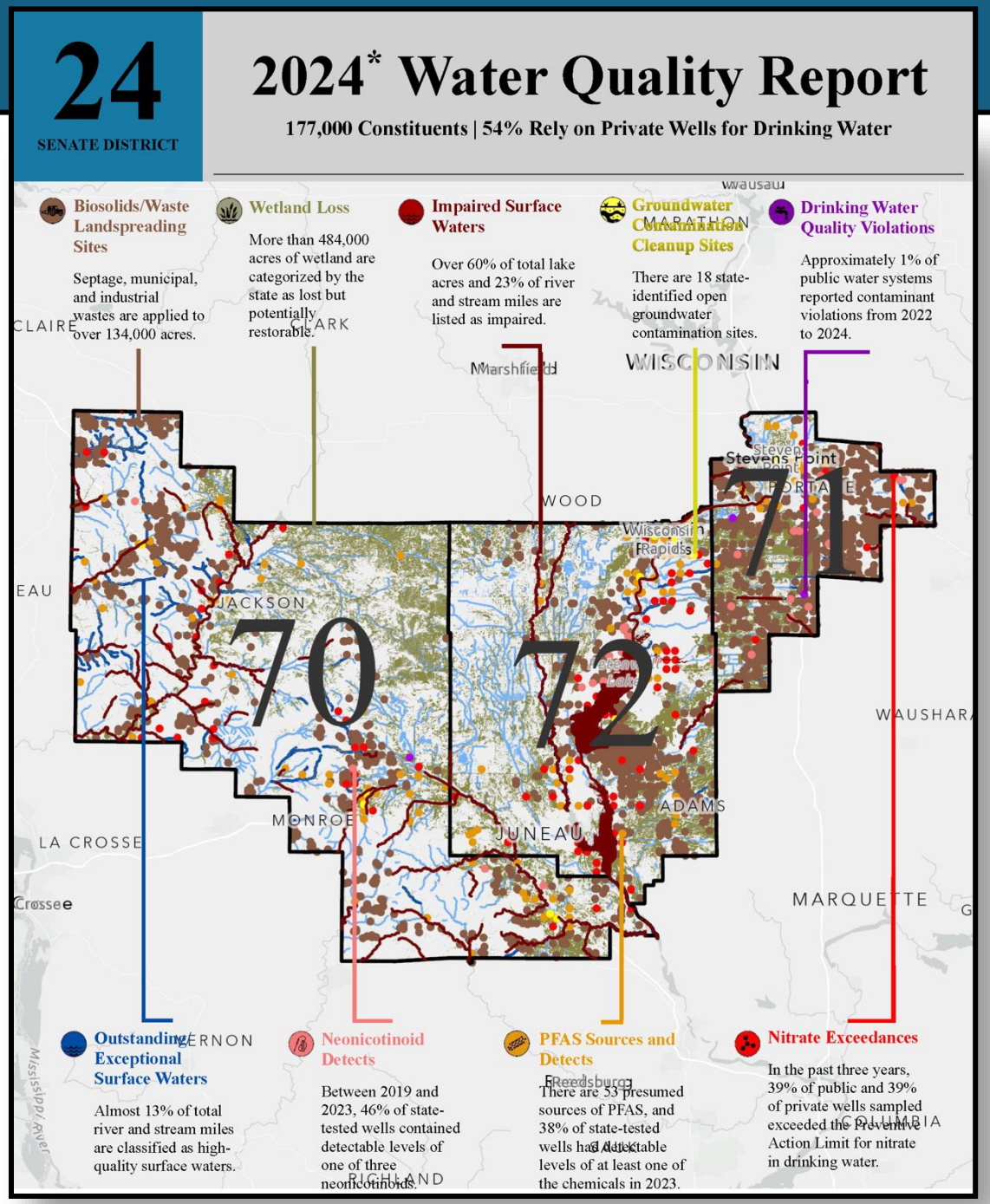
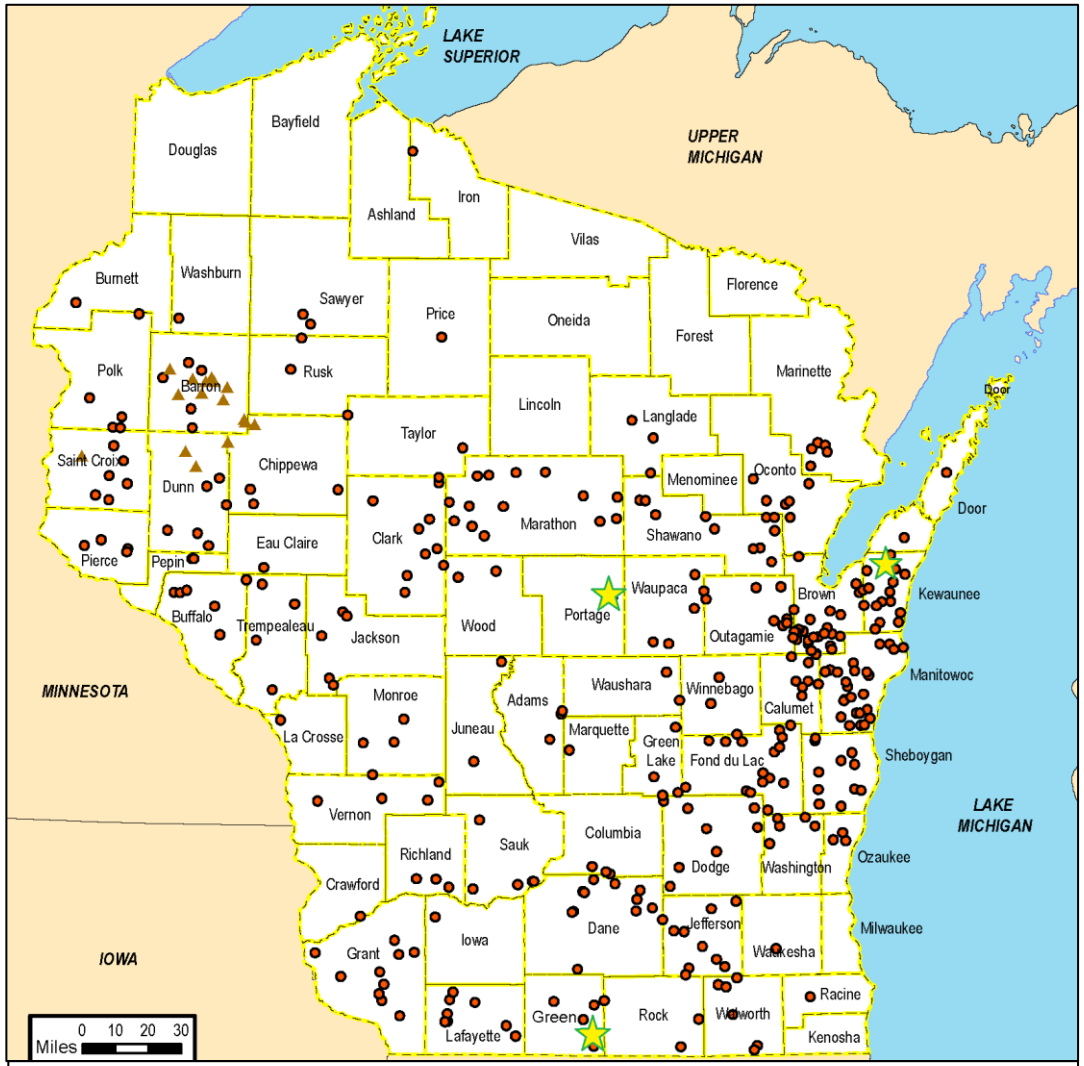
Policy Recommendations

SHORT–TERM

- Create a **statewide well testing program** within county health departments
- **Expand eligibility** for and fully fund the Well Compensation Program
- **Expand wellhead protection planning** and implementation authority and financial resources
- **Increase groundwater mapping** efforts with priority for public systems with increasing nitrate levels
- **Expand education and outreach** on nitrate contamination



Policy Recommendations



Concentrated Animal Feeding Operations (CAFOs) with >1,000 Animal Units

MEDIUM–TERM

- **Standardize groundwater monitoring** triggers and requirements for large animal feeding operations
- **Expand public water systems annual reporting** requirements to include financial data on the upfront and annual costs of remedying nitrate contamination
- **Increase public access** to water quality data in their communities
- **Create a pay-for-performance cost-share program** that pays producers for quantifiable nutrient loss reductions

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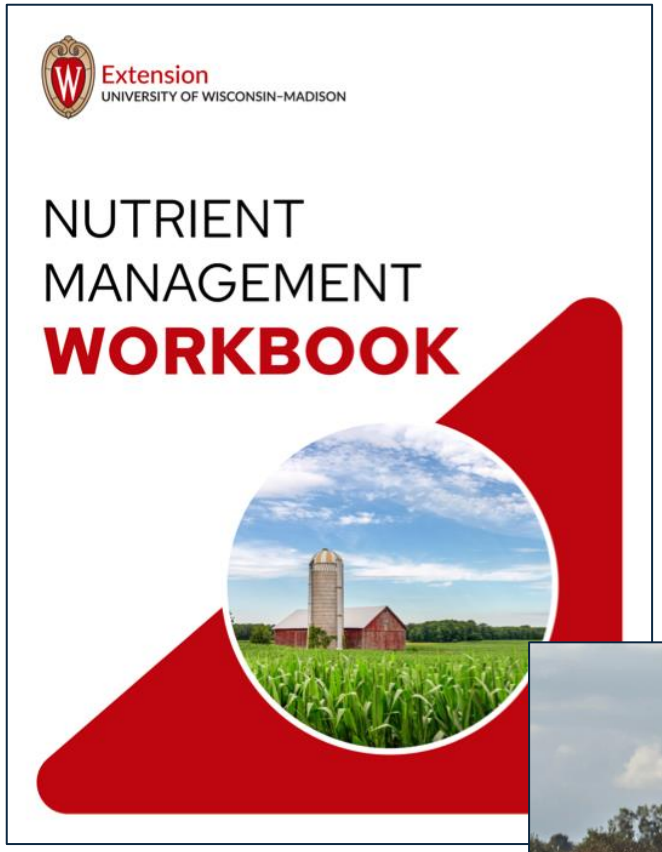
Policy Recommendations

LONG–TERM

- **Reevaluate nitrate drinking water standards** to protect public health
- Establish **stronger fertilizer and manure application restrictions** in high-contamination areas
- **Develop surface water nitrate standards** for specific water bodies
- Increase **accountability for nutrient management plan** implementation
- Create a **statewide manure hauler program** to train applicators and tracking system



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