The Sources, Occurrence, and Management of Nitrogen in Wisconsin Groundwater

Groundwater Coordinating Council
November 4, 2011

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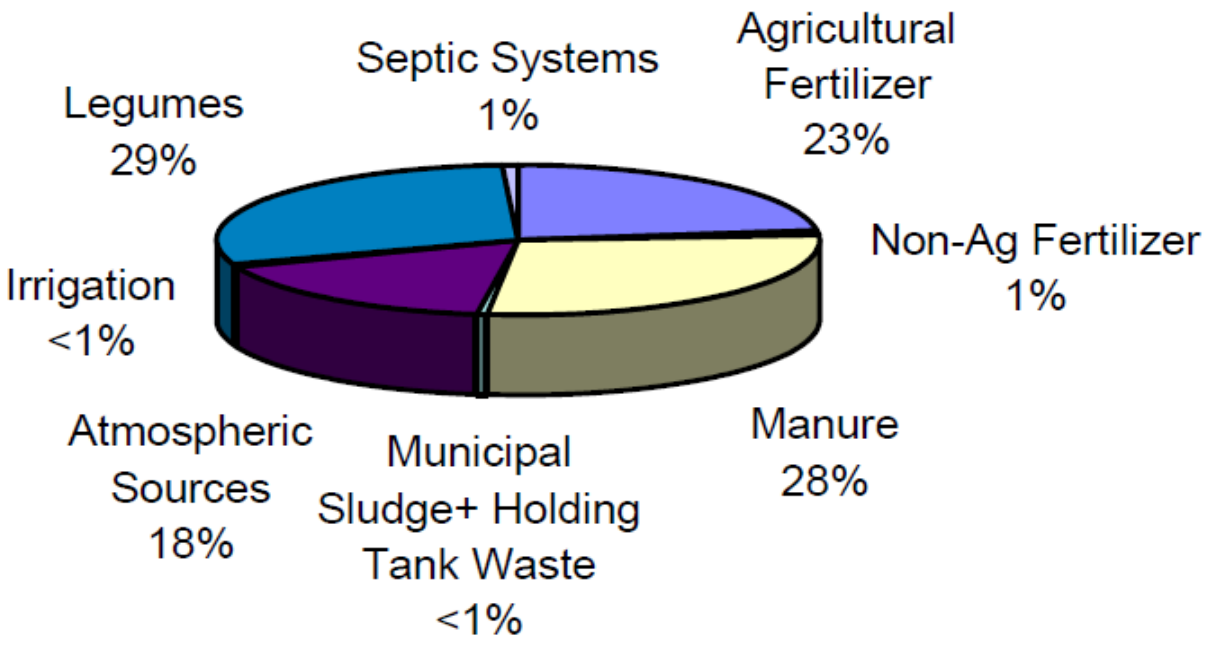
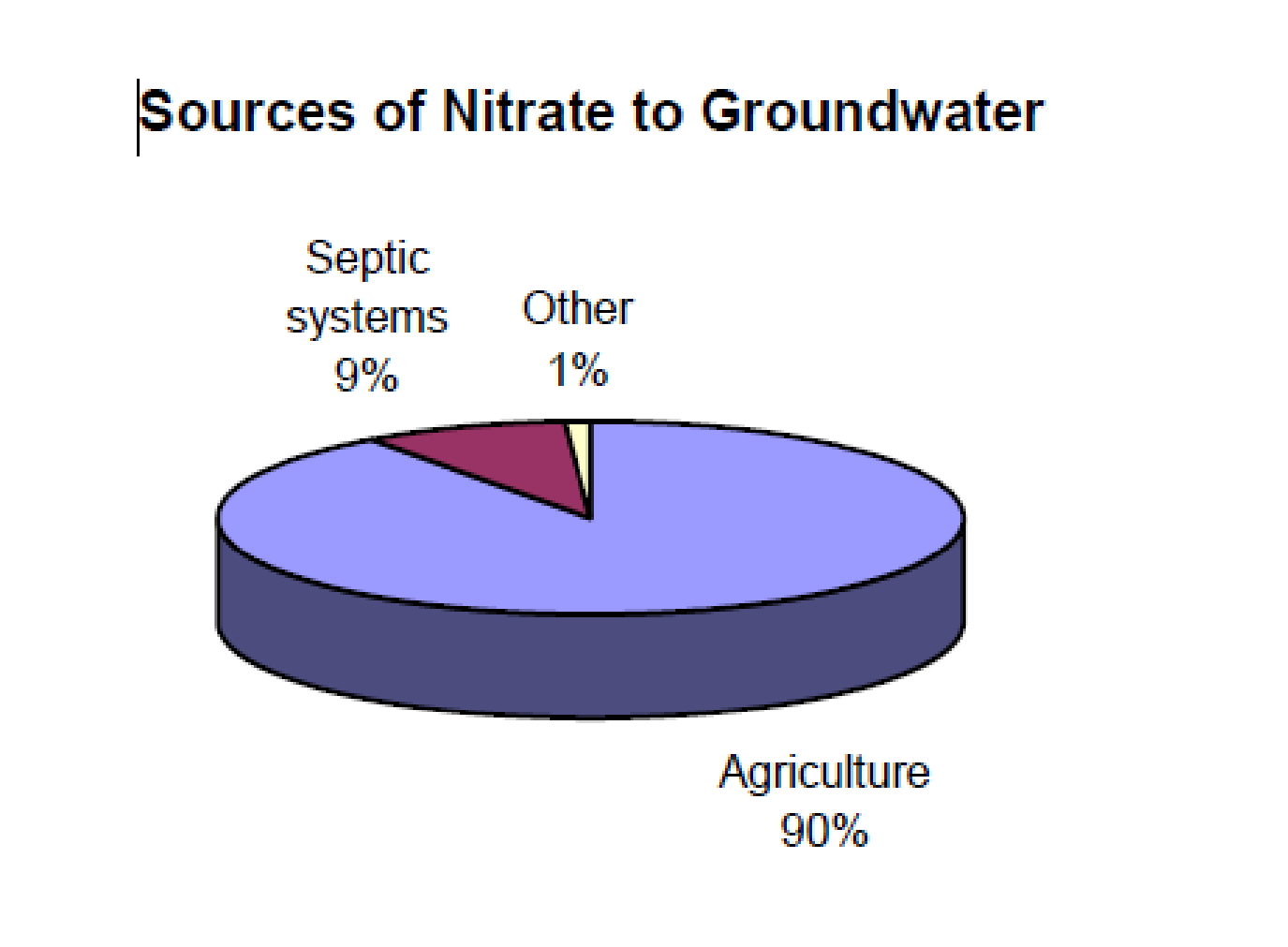
Wisconsin Dept. of Agriculture, Trade and Consumer Protection

Primary Sources of N to Soils



Nitrate in Groundwater - A Continuing Issue for Wisconsin Citizens , March 1999

Primary Sources of N to Groundwater



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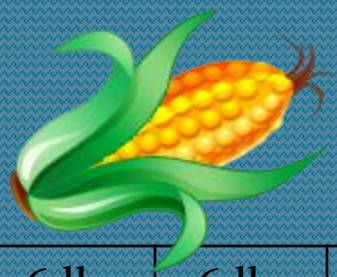
Primary Nitrate Sources to Groundwater in Rural Landscapes



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20 acres

36 lbs	36 lbs	36 lbs	36 lbs
36 lbs	36 lbs	36 lbs	36 lbs
36 lbs	36 lbs	36 lbs	36 lbs
36 lbs	36 lbs	36 lbs	36 lbs
36 lbs	36 lbs	36 lbs	36 lbs

36 lbs/ac x 20 acres = 720 lbs

16 mg/L

20 acres

20 lbs

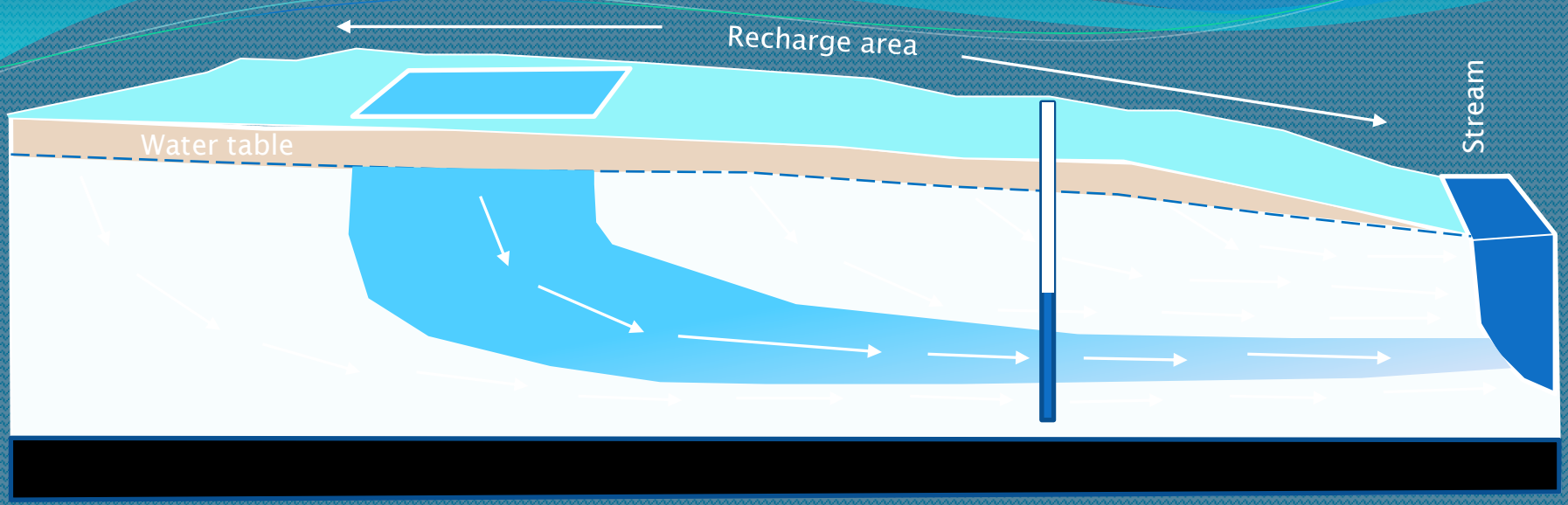
20 lbs/septic system x 1 septic systems = 20 lbs

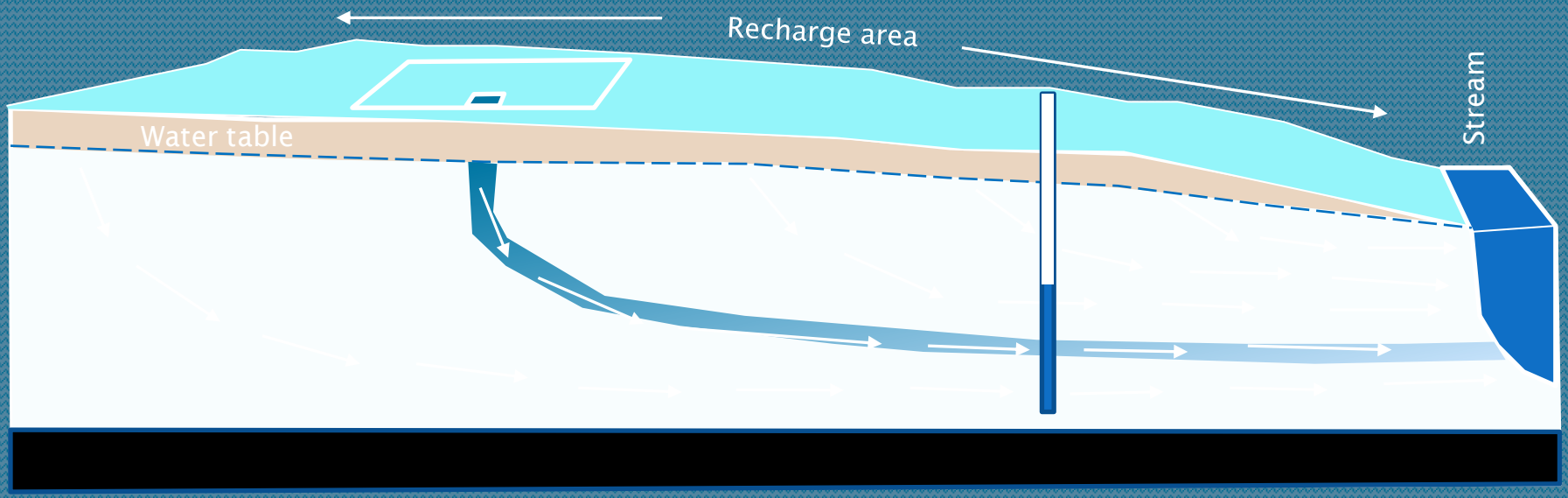
1/36th the impact on water quality

0.44 mg/L

Assuming 10 inches of recharge -

36 lbs/ac x 20 acres = 720 lbs





20 lbs/septic system

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Recharge areas for private wells in concentrated developments

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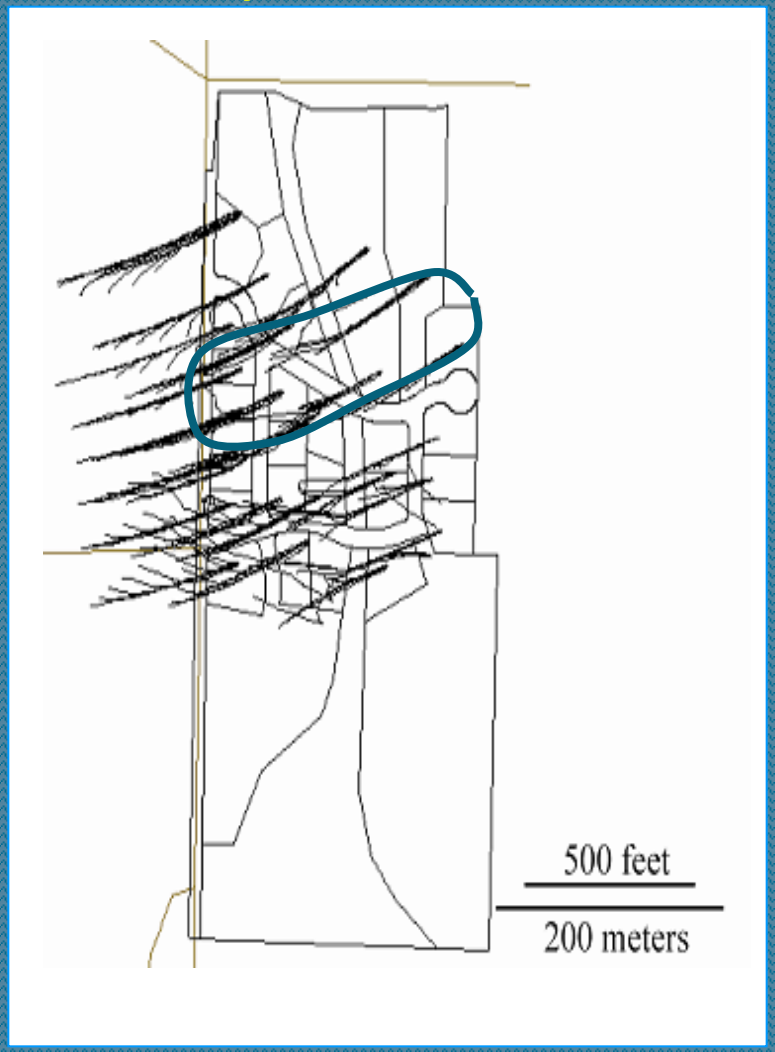
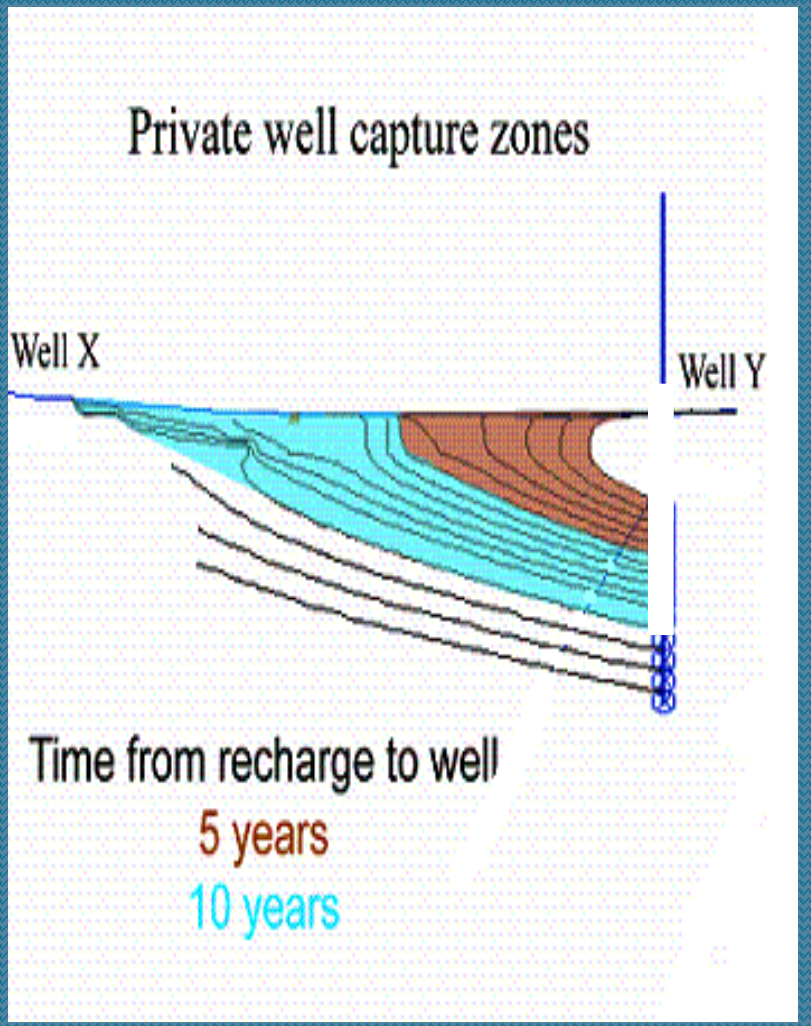


Ten - year capture zones

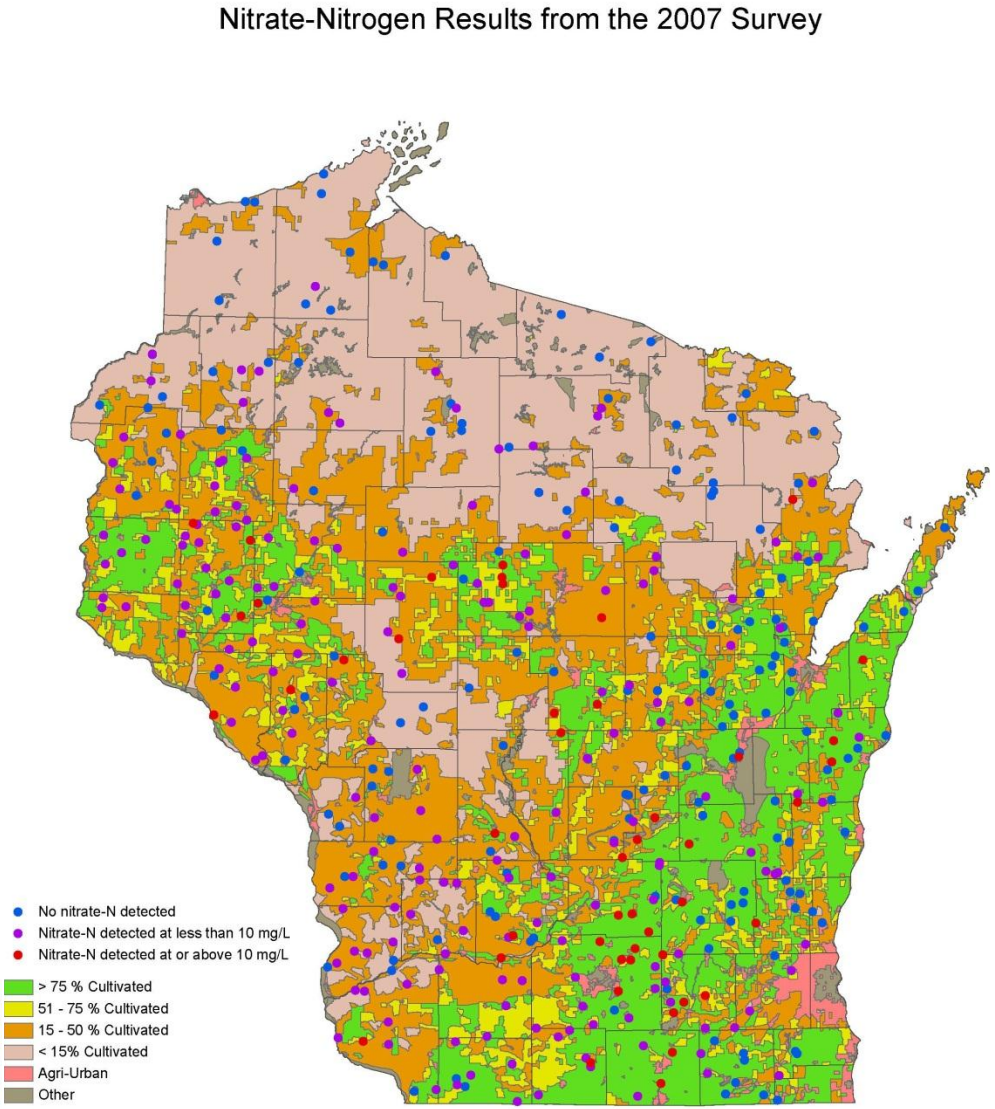


Courtesy of Madeline Gotkowitz, WGNHS

Private well testing shows relationship between landuse & Nitrate

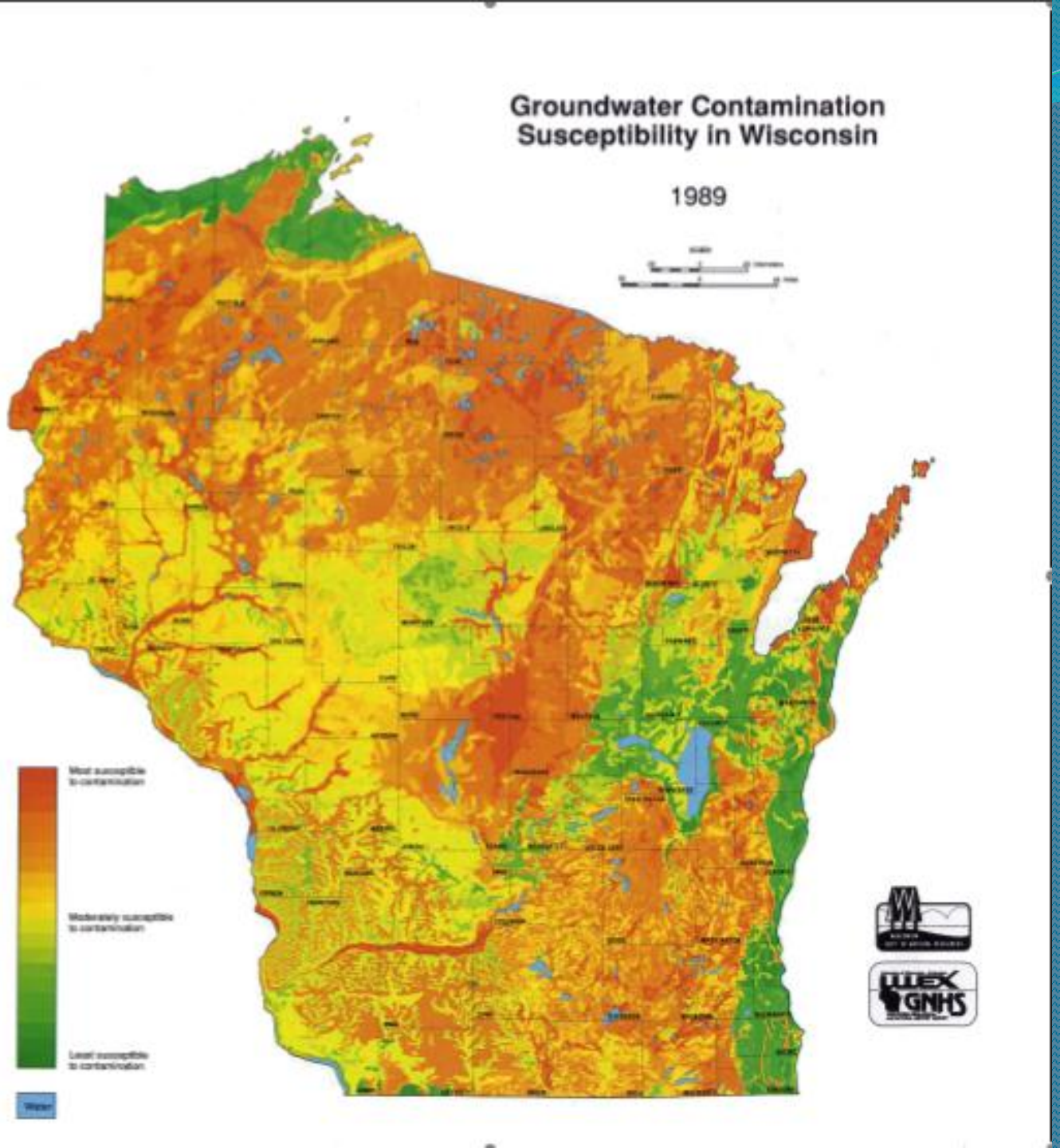
- No Nitrate-N detected
- Nitrate-N detected < 10 mg/l
- Nitrate-N detected > 10 mg/l

- >75% cultivated
- 51-75% cultivated
- 15-50% cultivated
- <15% cultivated

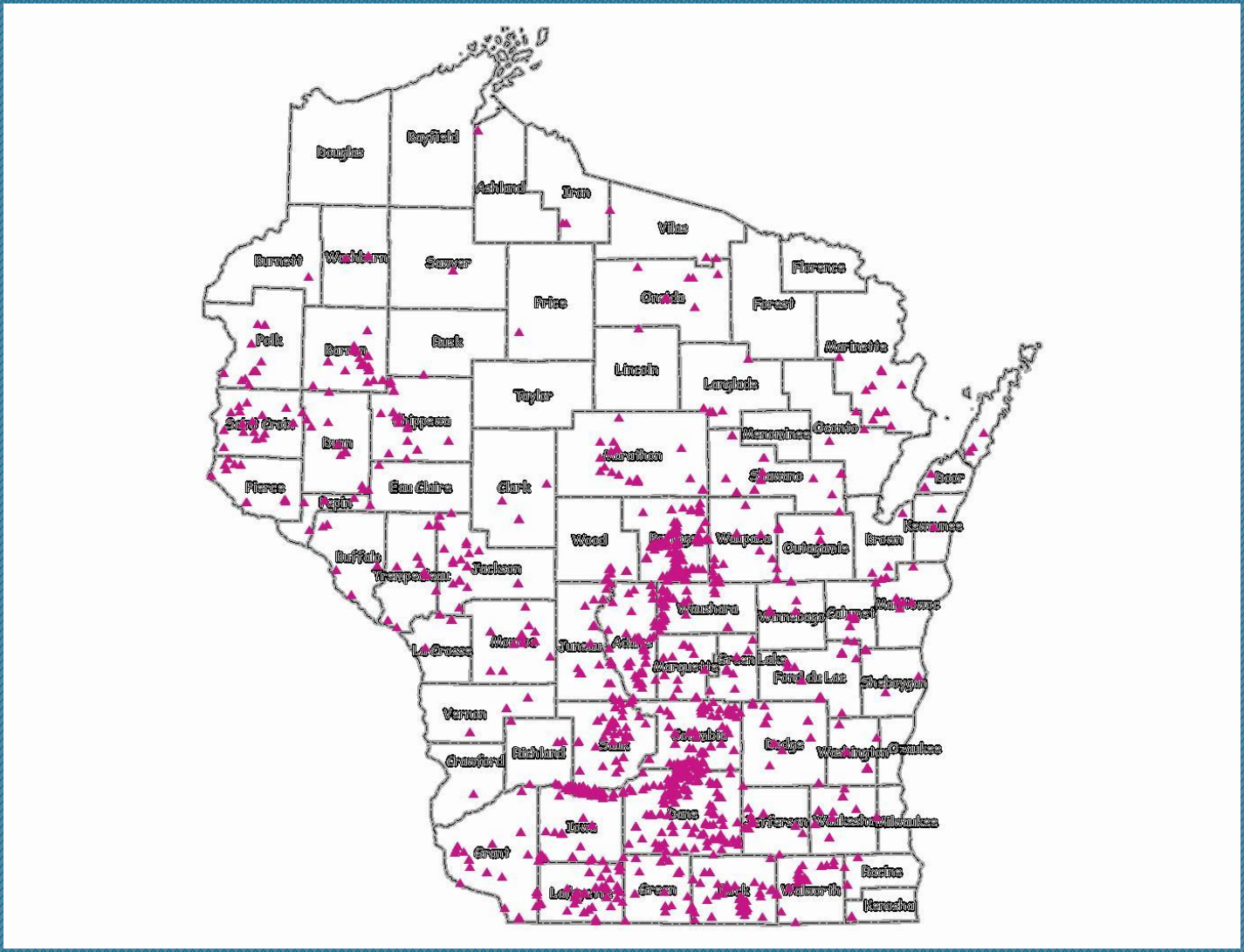


Percentage of Wells with Detectable Nitrate-N >10 mg/l by Surrounding Area Cultivated

% of Surrounding Area Cultivated	% of Wells w/detectable Nitrate-N >10 mg/l
> 75% cultivated	21.0
51-75% cultivated	10.0
15-50% cultivated	8.6
<15% cultivated	1.7

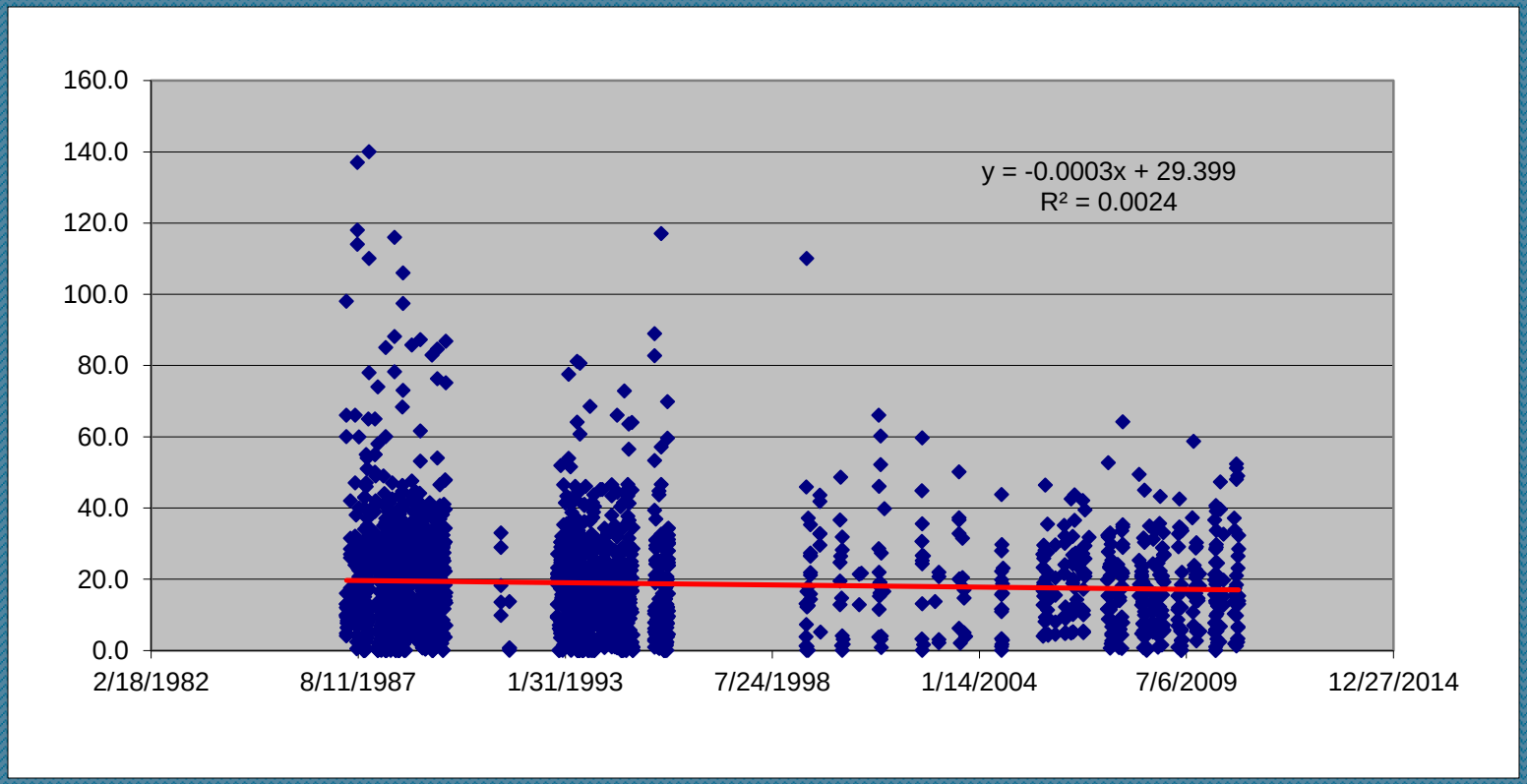

Groundwater Contamination
Susceptibility in Wisconsin
1989
Most susceptible to contamination
Moderately susceptible to contamination
Least susceptible to contamination
Water
WGNHS

Statewide Nitrate results > 20 mg/L – Private Wells DATCP & GRN Results (1988 to present)



Nitrate Trends in DATCP Monitoring Wells – Irrigated Sands

- Average N concentrations essentially constant since 1987
- Very high N concentrations have declined
- Compliance rates w/NM standard not known at these sites



Can N Loading be controlled?

Nutrient Management

- Managing the *amount, source, placement,and timing* of nutrient applications
- UW Soil tests and recommendations:
  - Crop need – nutrient credits = fertilizer to apply
  - Soil sample every 4 yrs according to UW A2100
  - Analyzed by DATCP certified lab
- Account for **all** N-P-K inputs over the entire crop rotation
- Account for landscape vulnerabilities
- Update 590 NM plan annually
- Only qualified planners may prepare NMPs:
  - CCA's, CPAg, SSSA, CPCC, farmer planners

Nutrient Application Restriction Maps

www.manureadvisorysystem.wi.gov

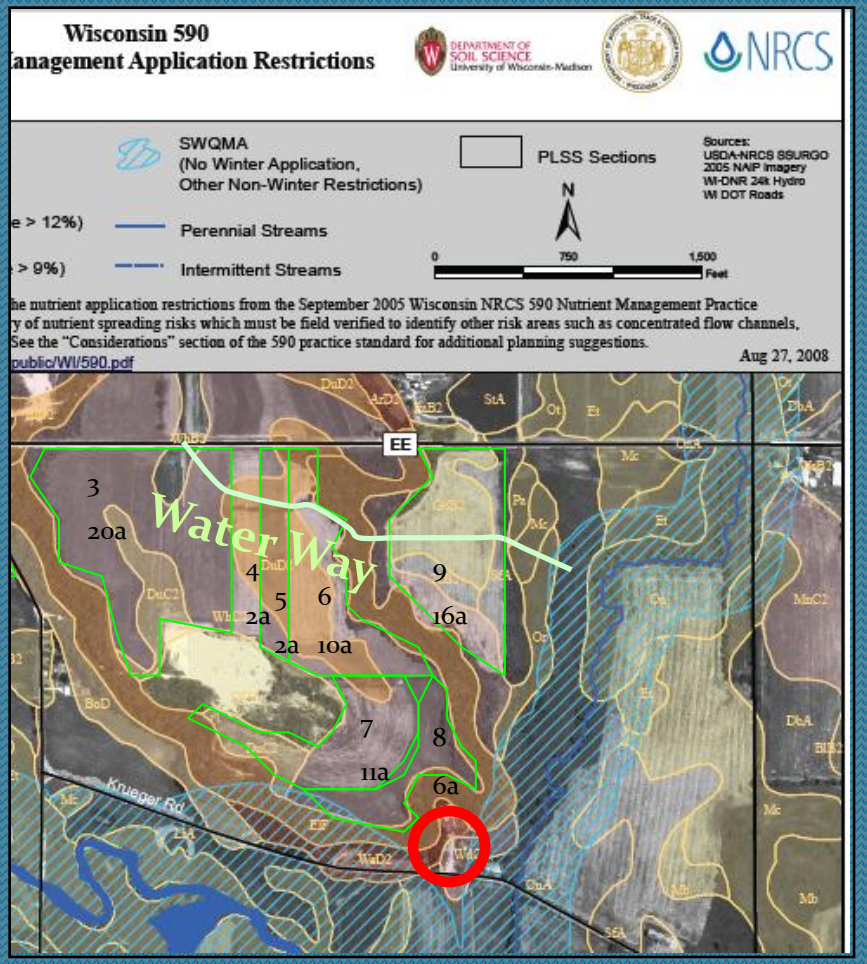
Maps show:

O 200' setback from wells, sinkholes, fractured bedrock at the surface - nutrient applications must be incorporated within 72 hours

Blue No winter apps 300' from perennial streams, 1,000' from lake and ponds. Other non-winter application restrictions required

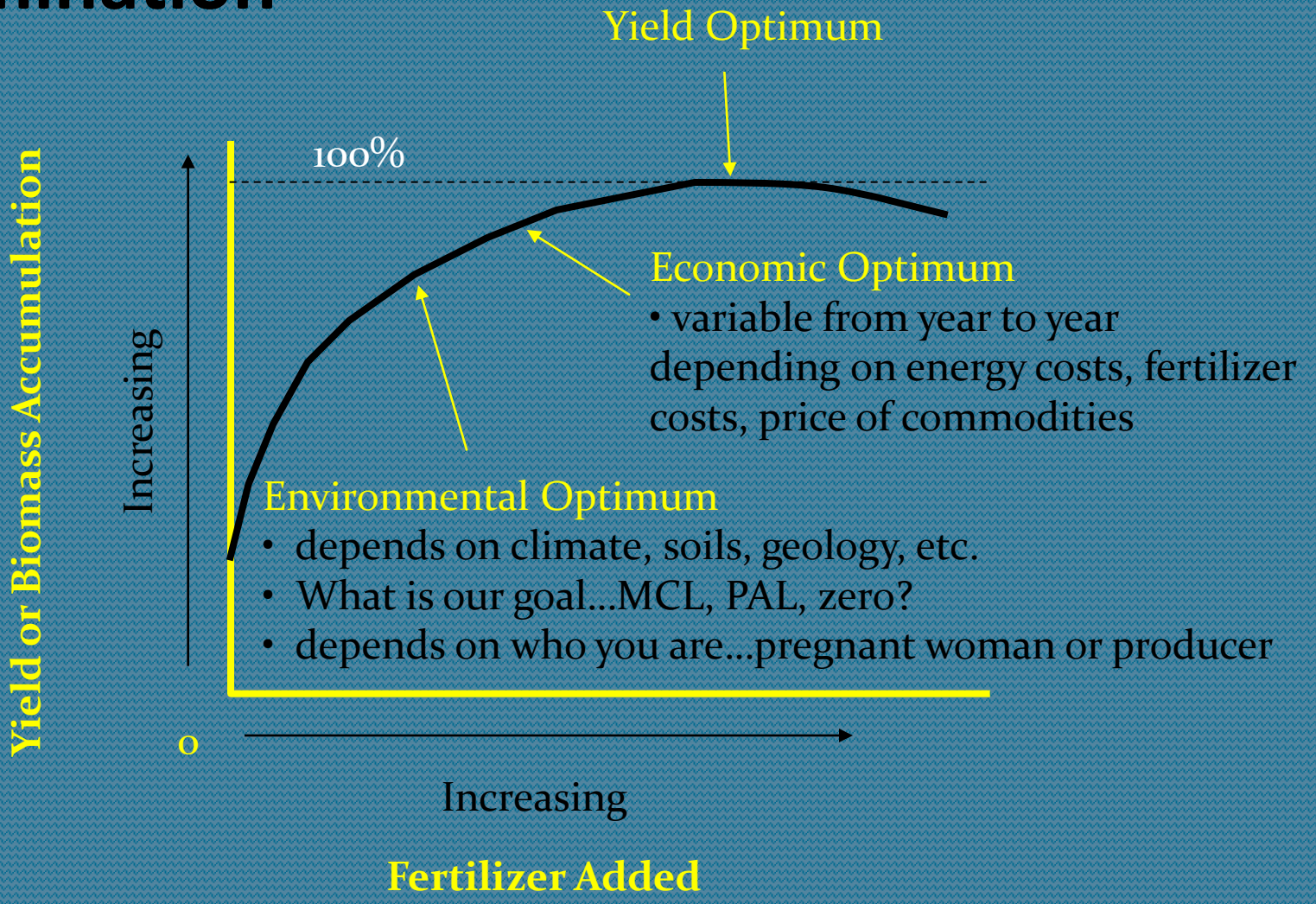
Red No winter applications

Pink and **clear** can have winter manure apps if contoured or if slopes are 9% or less. Winter manure apps can not exceed 7,000 gals/acre or P removal of the crop



Yellow No fall fertilizer N. Fall manure apps limited; best to spring apply.

Nutrient Management to mitigate nitrate contamination



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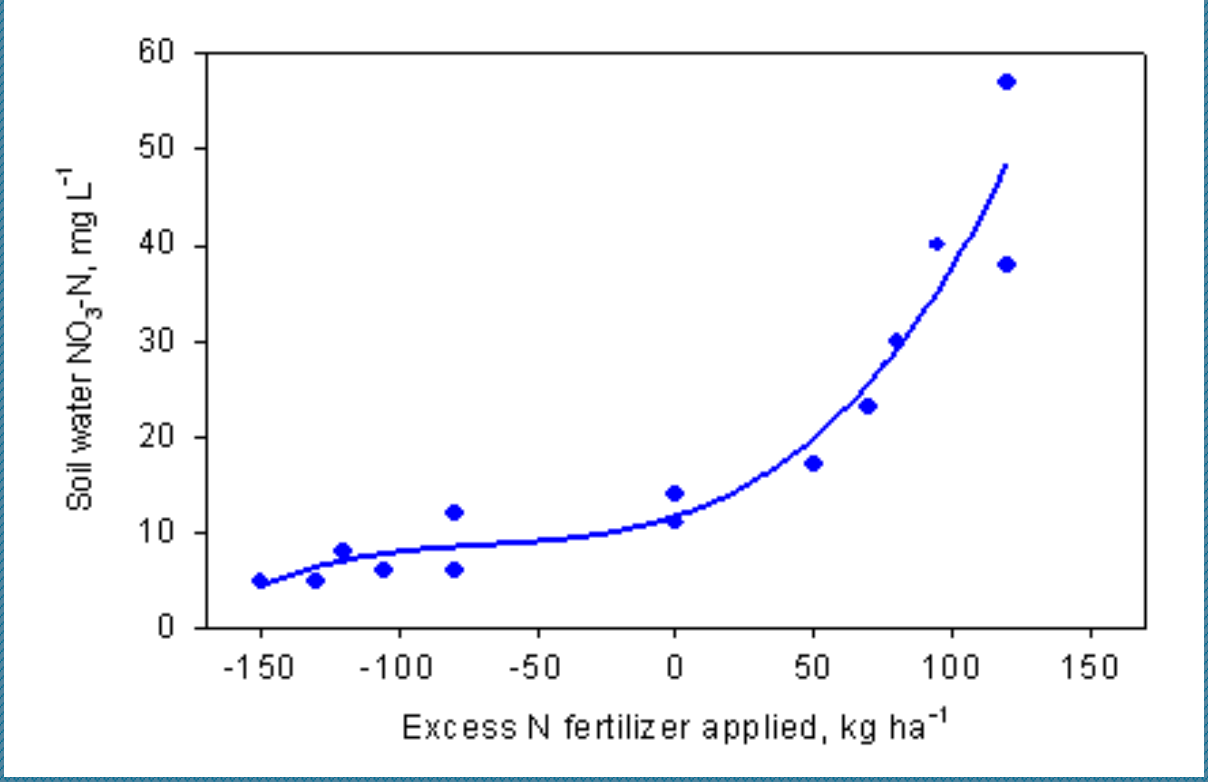
Nitrogen management practices

Improved prediction of crop N needs and timing of N applications can reduce nitrate leaching losses

(but not to zero nor always to 10 mg/L).

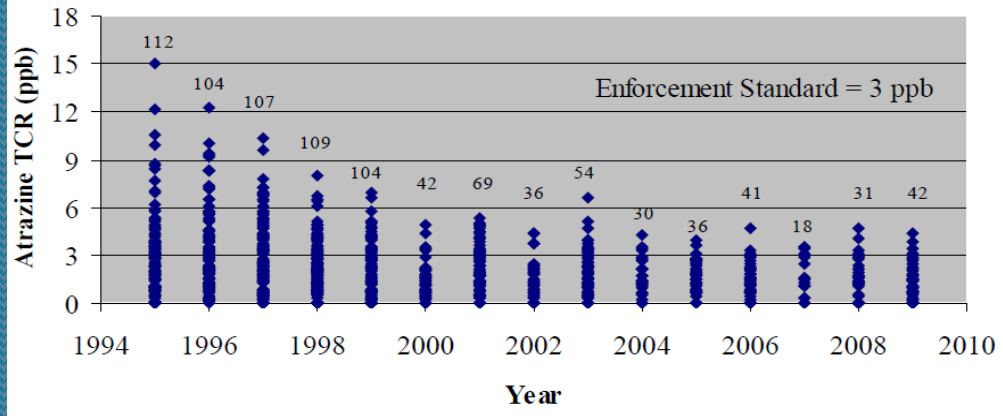


(Andraski, Bundy, Brye; 2000 J. Environ Qual. 29:1095-1103).

Nitrate in Private Wells in Atrazine Prohibition Areas

"From "15 Years of DATCP Exceedence Well Survey"

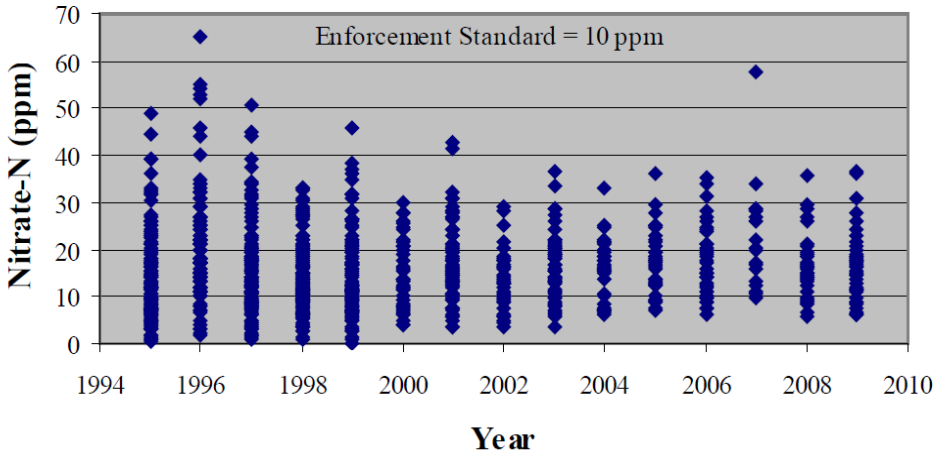
Figure 2. Distribution of Atrazine TCR Results and Number of Samples in the EX Survey, by Year



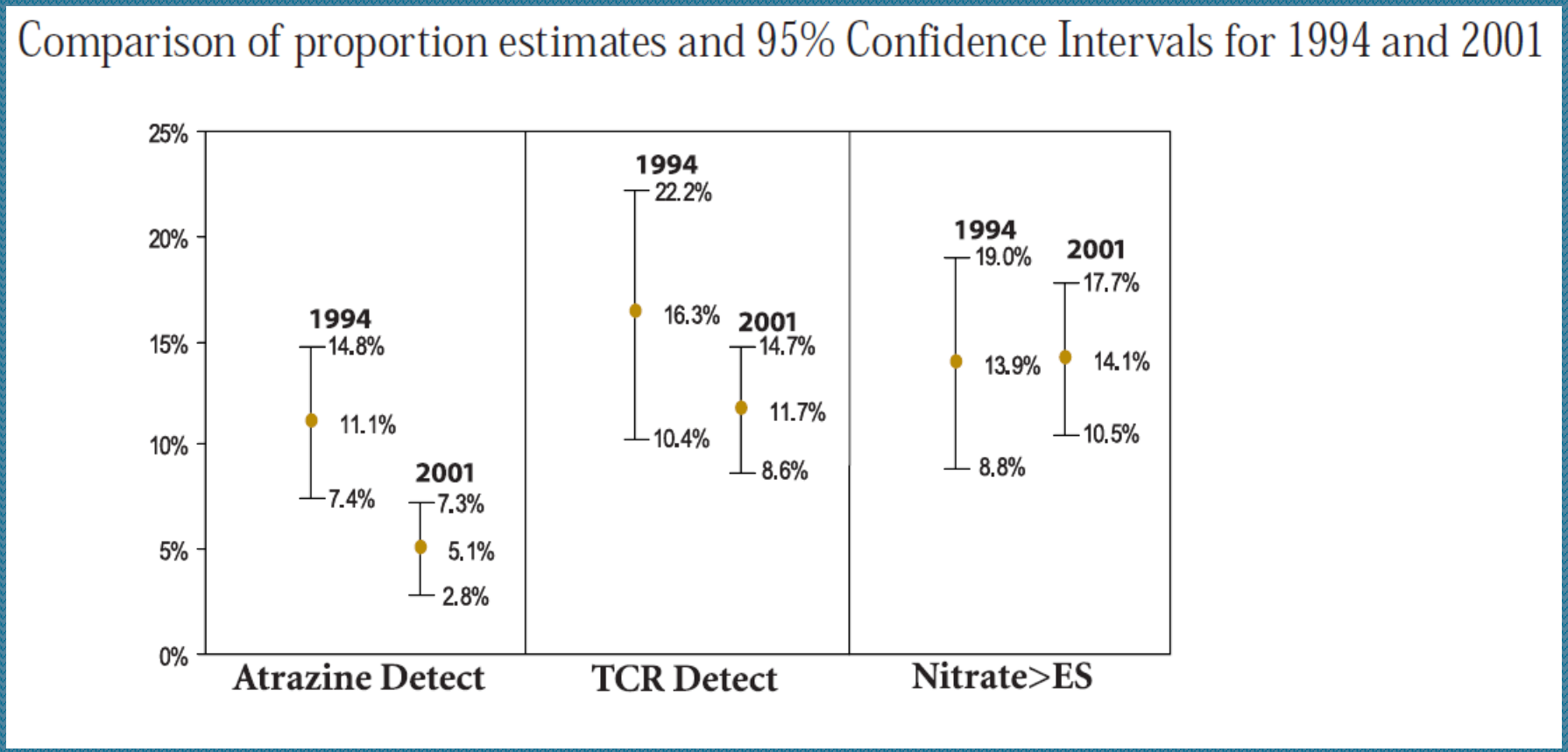
Average atrazine concentrations decline over time with high degree of management

Average nitrate levels slightly increase over time with low degree of management

Figure 5. Nitrate-N Results by Year in the EX Survey

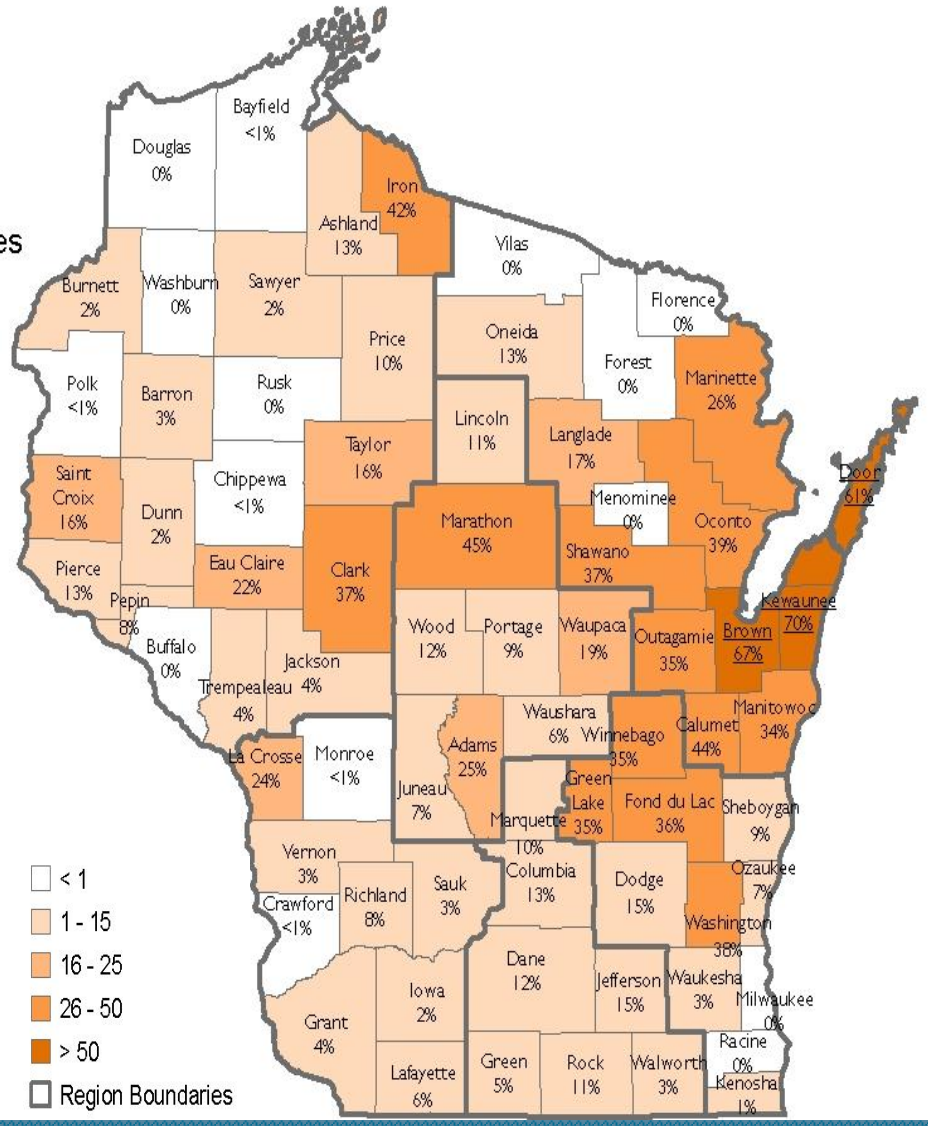


Private well survey – 2001
Does management matter?



Atrazine use rates & other practices required by rule, compliance is high
Nitrogen use strategy (NM) similar to atrazine management, compliance is low

% crop acres under NM plan (1.8 million ac. reported in 2011)



% of Drinking Wells Exceeding 10 mg/L Nitrate-N