2016
Chippewa County Groundwater Quality Inventory

University of Wisconsin-Stevens Point
College of Natural Resources

UW Extension
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Chippewa County
Land Conservation and Forest Management

CHIPPEWA COUNTY
Public Health
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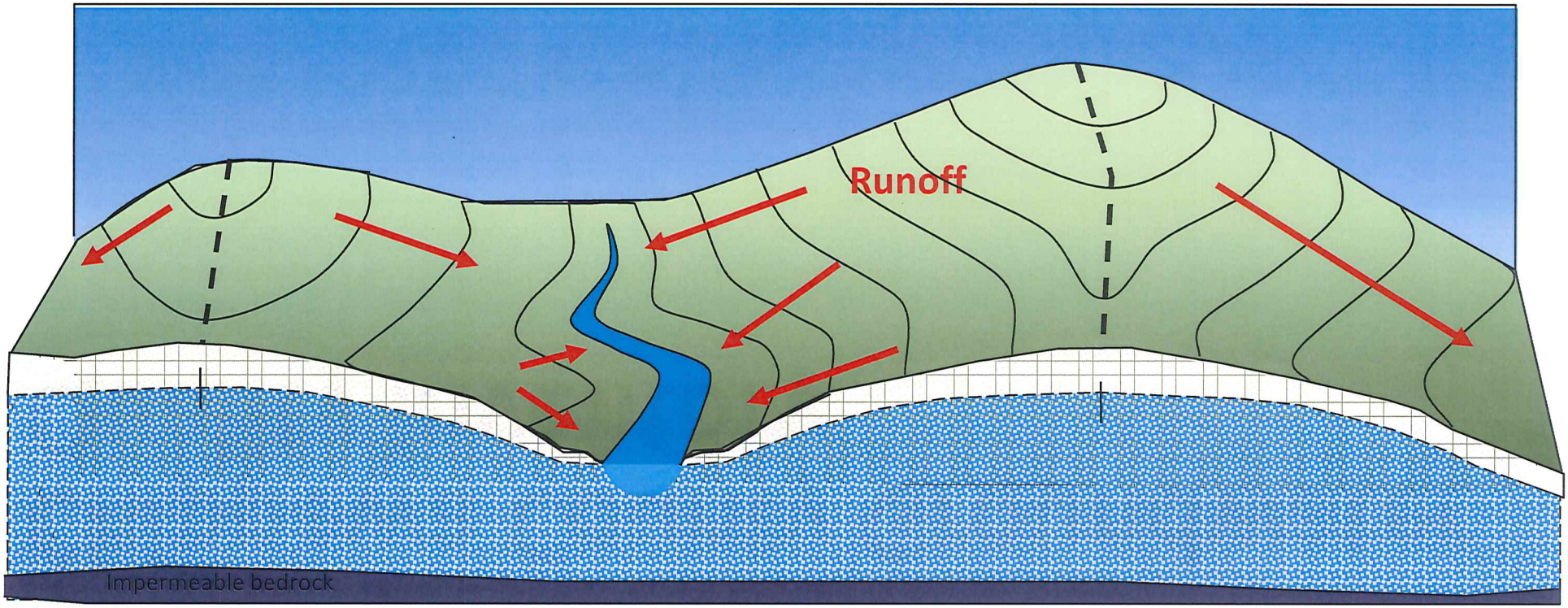
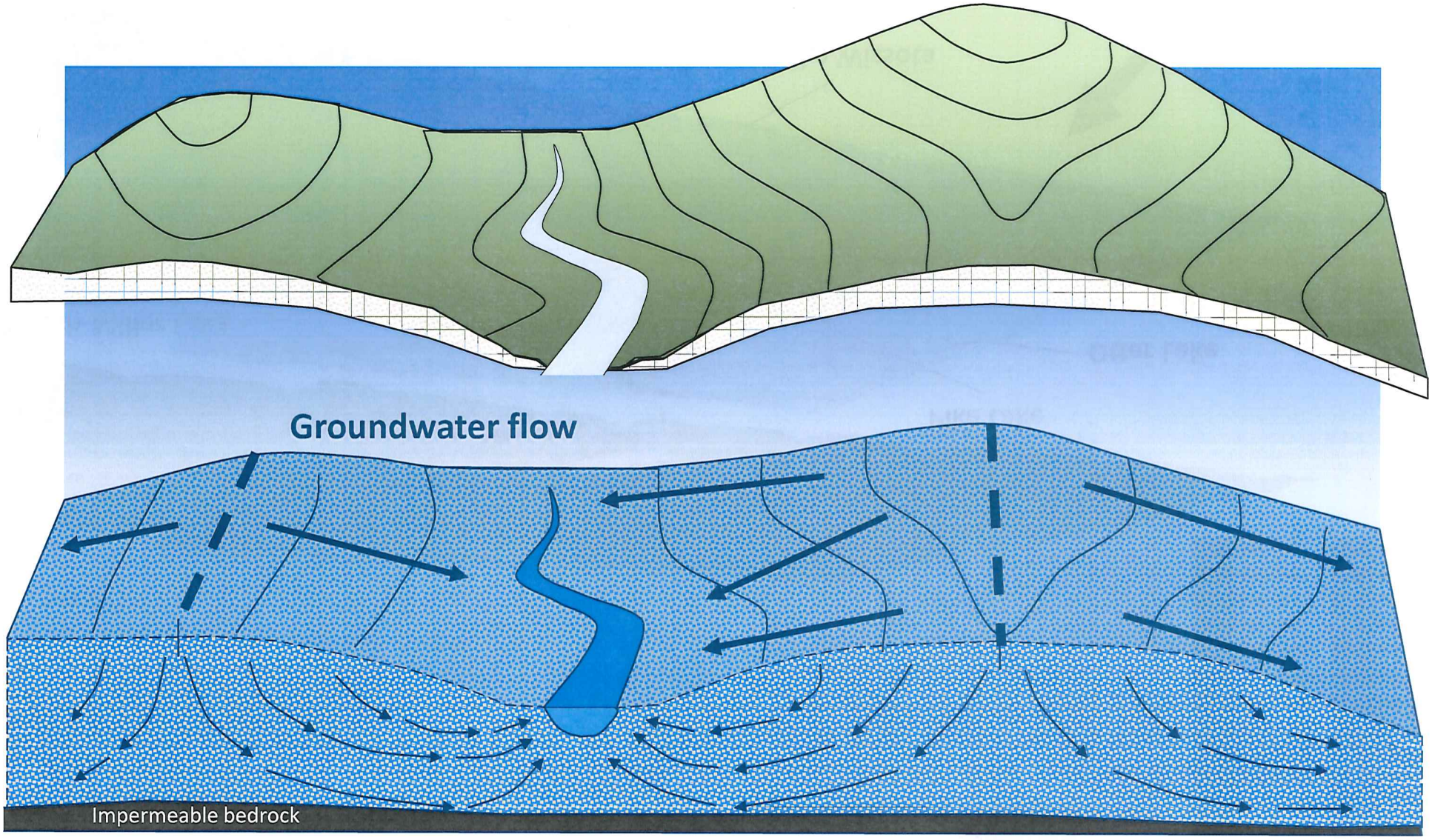
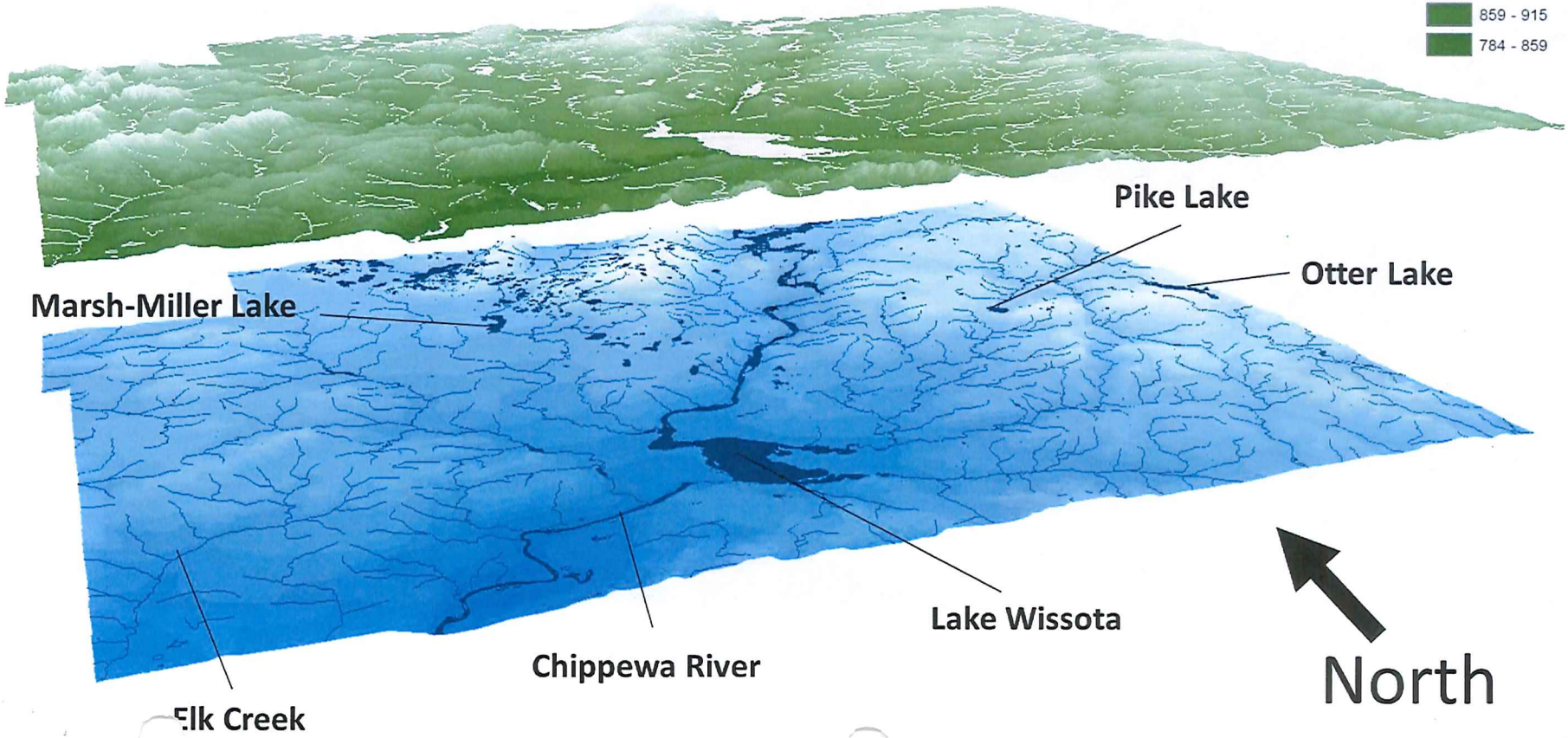
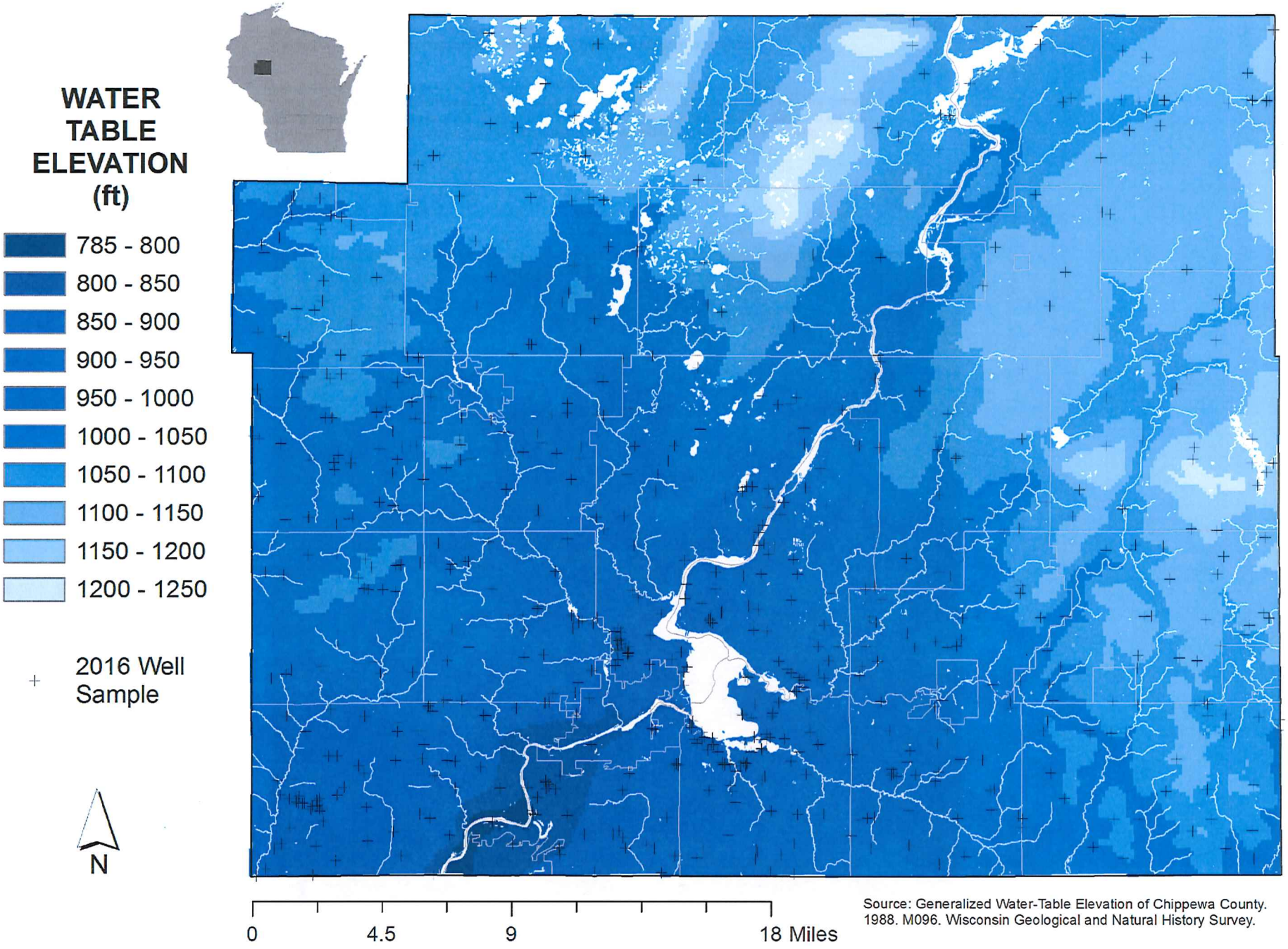

Runoff
Impermeable bedrock


Groundwater flow
Impermeable bedrock

Chippewa County Water Table

Land Surface Elevation (ft)	Water Table Elevation (ft)
1410 - 1532	1,197 - 1,252
1325 - 1410	1,169 - 1,196
1272 - 1325	1,149 - 1,168
1233 - 1272	1,125 - 1,148
1200 - 1233	1,099 - 1,124
1171 - 1200	1,074 - 1,098
1145 - 1171	1,050 - 1,073
1118 - 1145	1,024 - 1,049
1089 - 1118	994 - 1,023
1059 - 1089	965 - 993
1026 - 1059	937 - 964
990 - 1026	911 - 936
951 - 990	887 - 910
915 - 951	854 - 886
859 - 915	817 - 853
784 - 859	781 - 816





Source: Generalized Water-Table Elevation of Chippewa County. 1988. M096. Wisconsin Geological and Natural History Survey.

General Groundwater Flow Direction

0 0.125 0.25 0.5 Miles

N W E S

Legend

Well Water Table

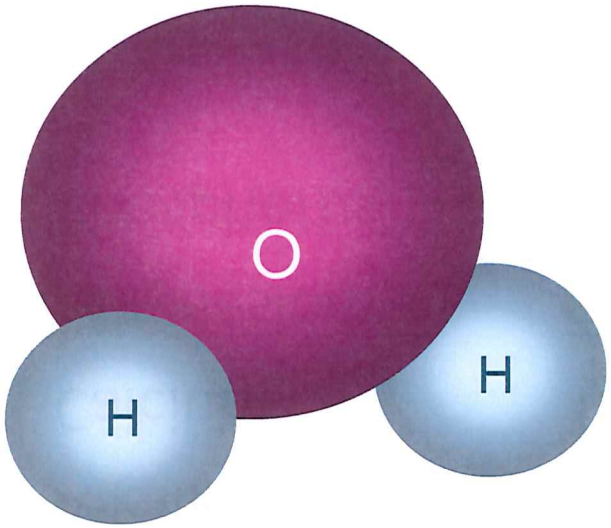
The black arrows show generalized groundwater flow direction in the area near your well. Groundwater flows perpendicular to the groundwater elevation lines and moves from high areas (hills) to low areas (streams,rivers). In general, residential wells impacted by land use are usually the result of those activities occuring within a roughly 1/2 mile distance from a well.

Disclaimer: This map is for educational purposes only. Groundwater flow is a best guess based on currently available information.

Cartography by Sean Piette

water basics

- "Universal Solvent"
- Naturally has "stuff" dissolved in it.
  - Impurities depend on rocks, minerals, land-use, plumbing, packaging, and other materials that water comes in contact with.



What did we test for?

Health Related

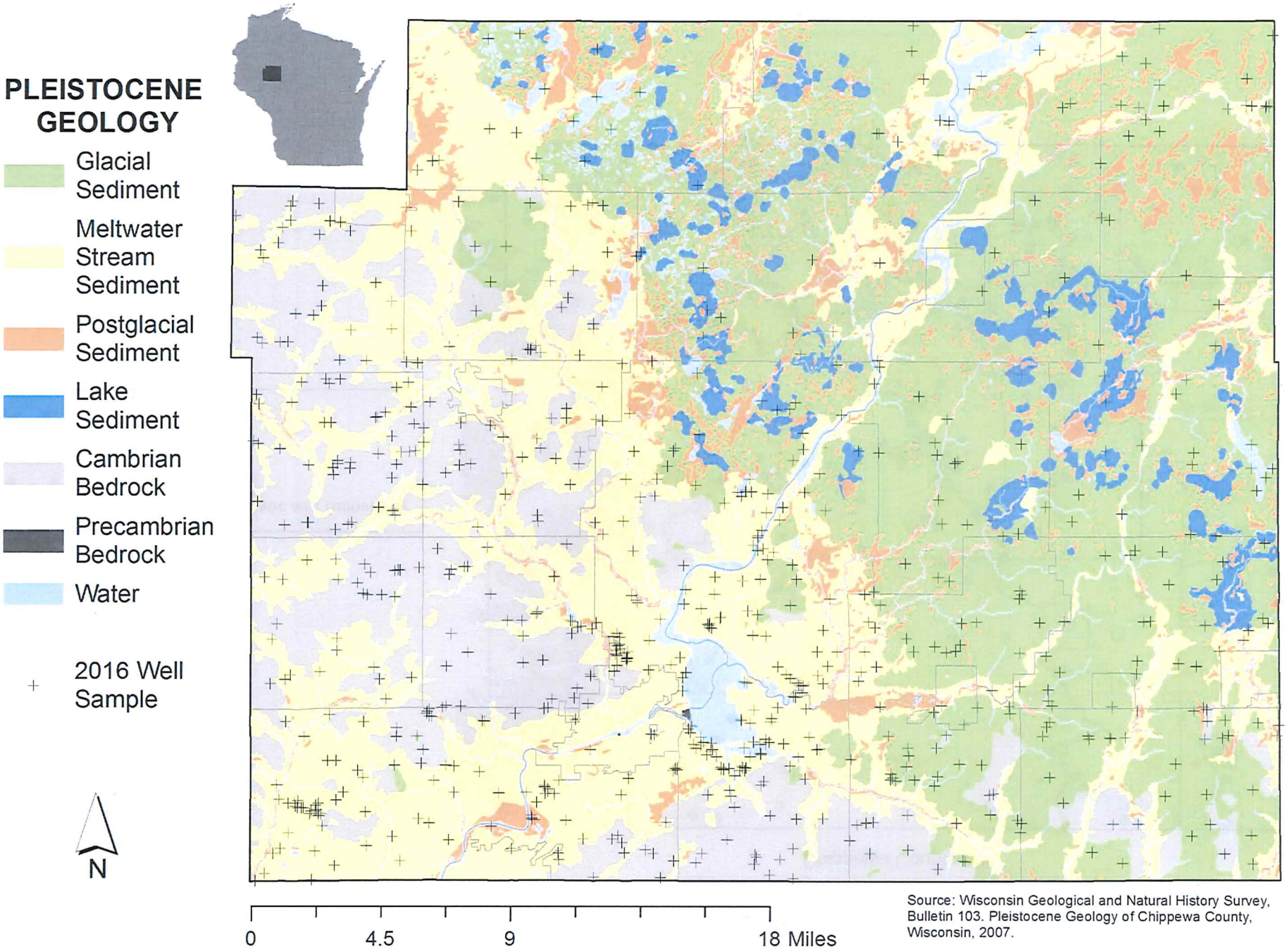
- Nitrate
- Arsenic
- Copper
- Lead
- Manganese
- Sulfate
- Sodium
- Zinc

Aesthetic (taste, color, odor)

- Hardness
- Iron
- Manganese
- Chloride

Overall Water Quality

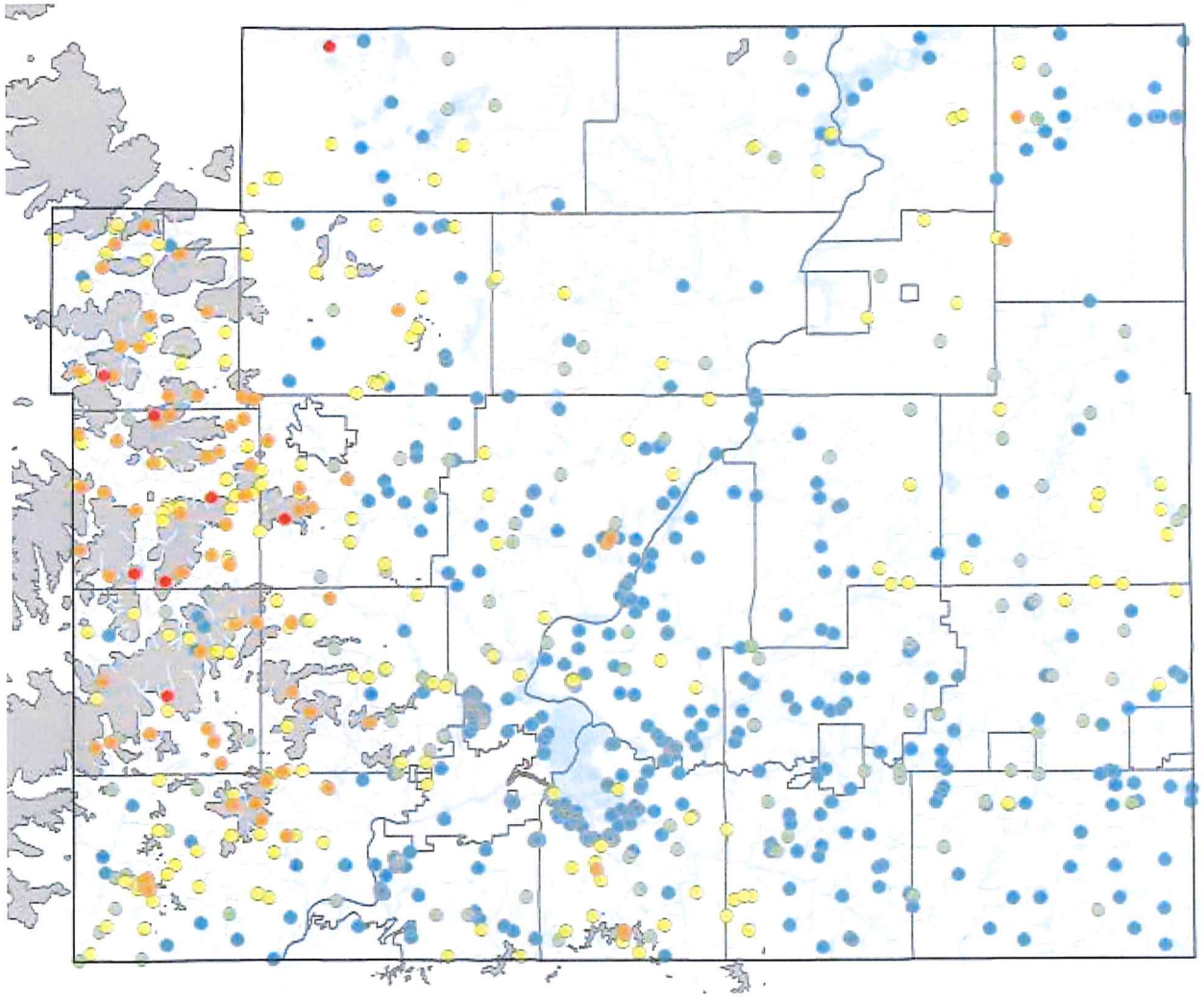
- pH
- Conductivity
- Alkalinity
- Calcium
- Magnesium
- Phosphorus



Source: Wisconsin Geological and Natural History Survey, Bulletin 103. Pleistocene Geology of Chippewa County, Wisconsin, 2007.

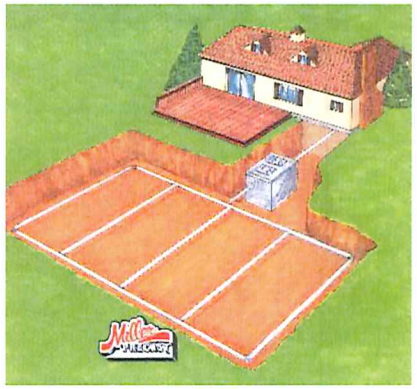
2016 Phosphorous & Intersection with Wonewoc and Tunnel City

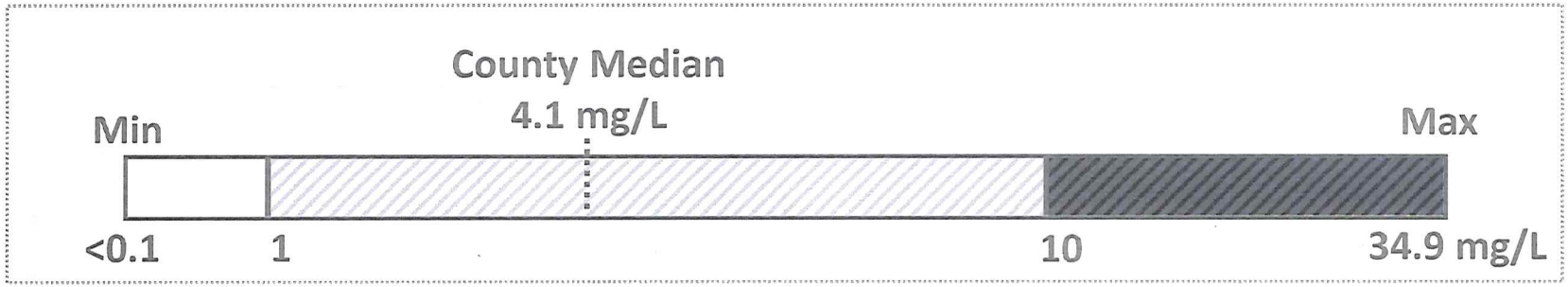
Chippewa County Groundwater Quality Inventory 2016
Chippewa County, WI



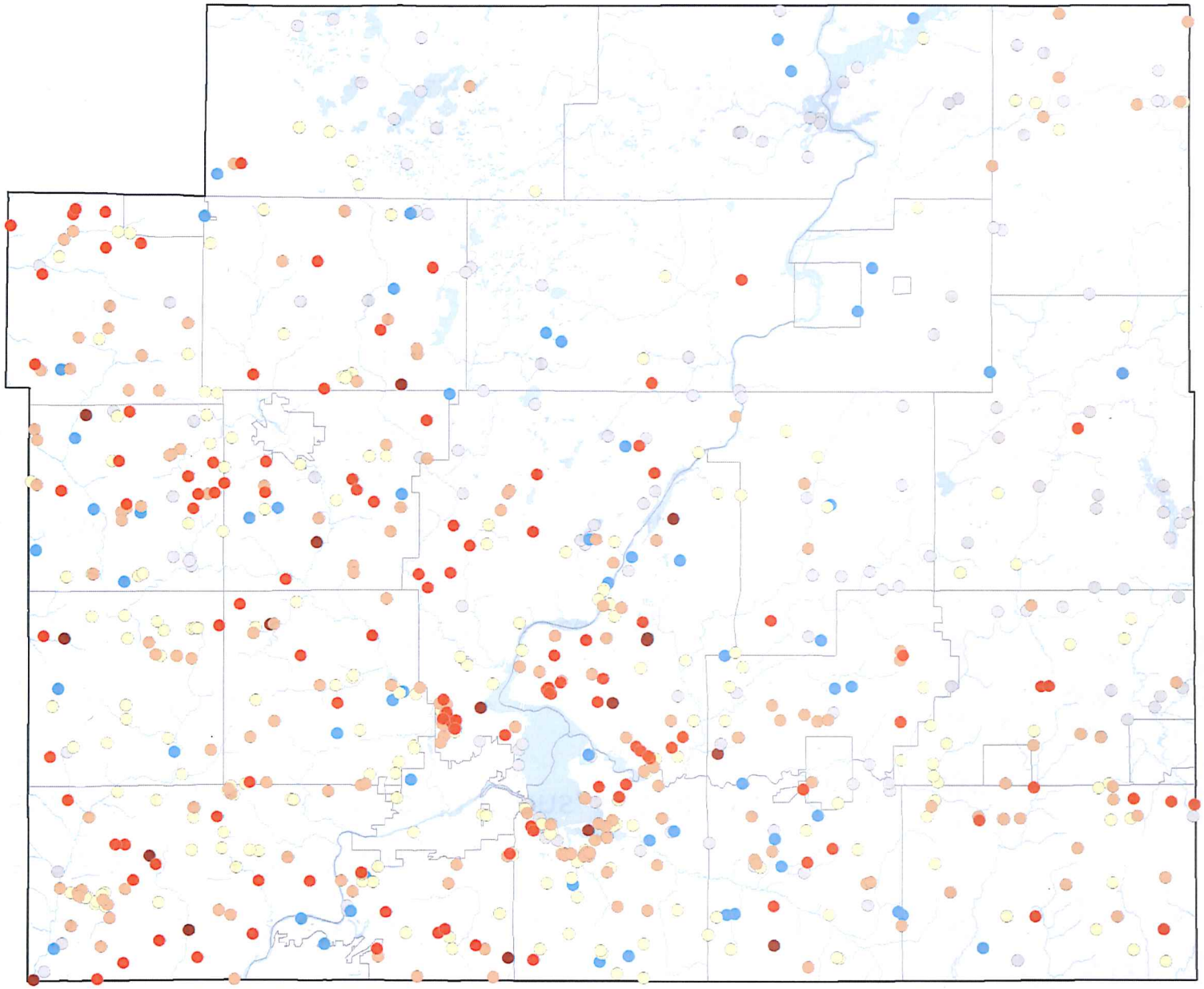
Nitrate

- Natural levels in groundwater < 1 mg/L
- Elevated levels associated with:
  - Fertilizers, manure/bio-solid applications, septic system effluent
- Health Standard: 10 mg/L
  - Methemoglobinemia, birth defects, miscarriages, thyroid function
  - Greater than 10 mg/L should <u>not</u> be used by infants, pregnant women or those trying to become pregnant. Everyone else avoid long-term consumption.
- Treatment: Reverse osmosis, distillation, or anion exchange (drinking water only)





Health considerations | Aesthetic concerns | Likely land use impacts | No health or aesthetic concerns



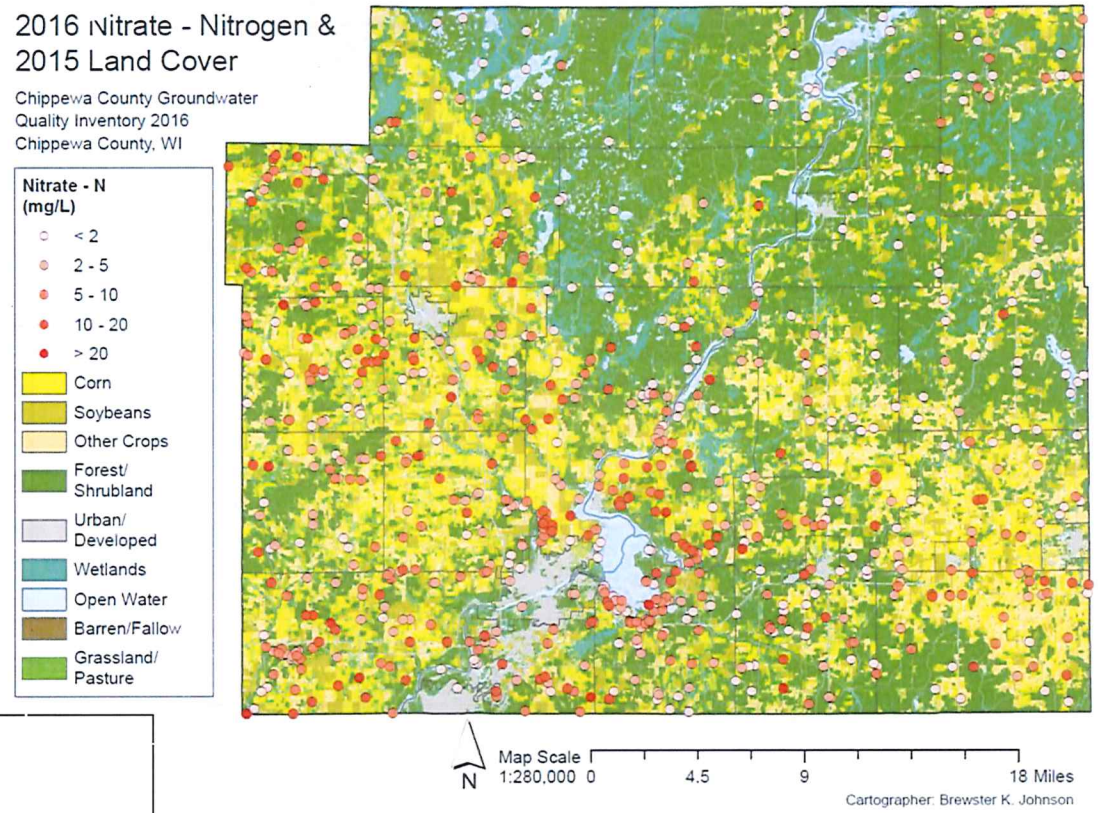
NITRATE-NITROGEN (mg/L)

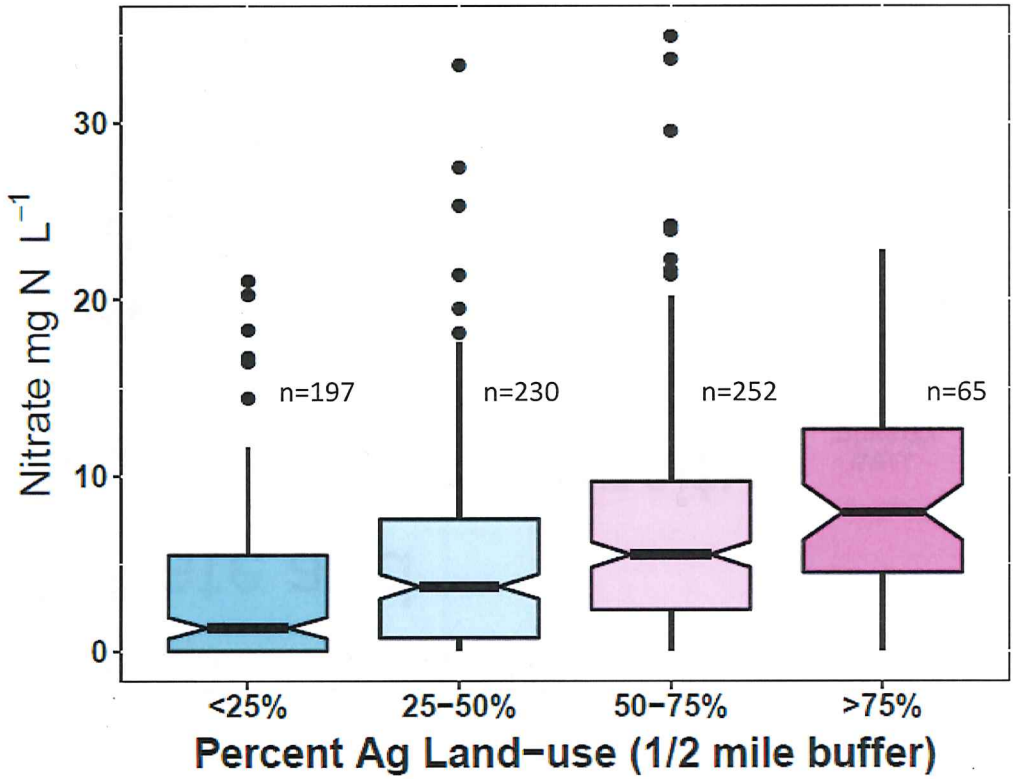
- < 0.1
- 0.2 - 1.0
- 1.1 - 5.0
- 5.1 - 10.0
- 10.1 - 20.0
- > 20.0

N

0 4.5 9 18 Miles

Chippewa County: Nitrate by % Agriculture





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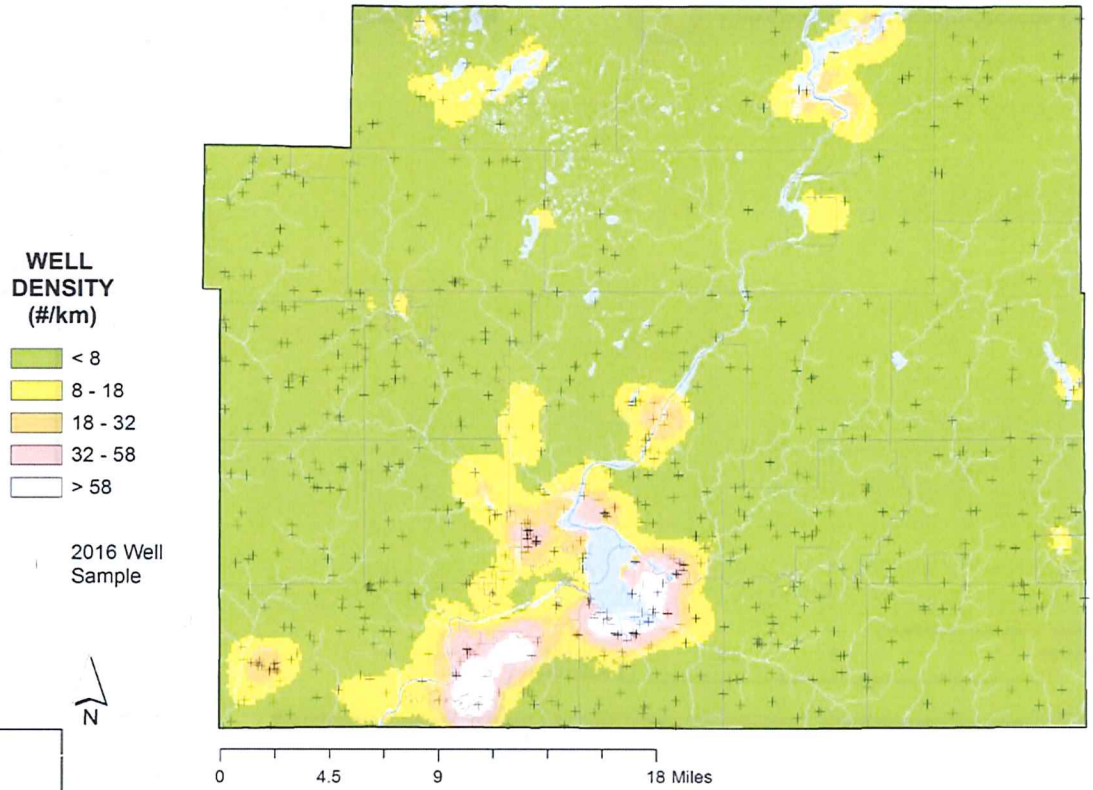
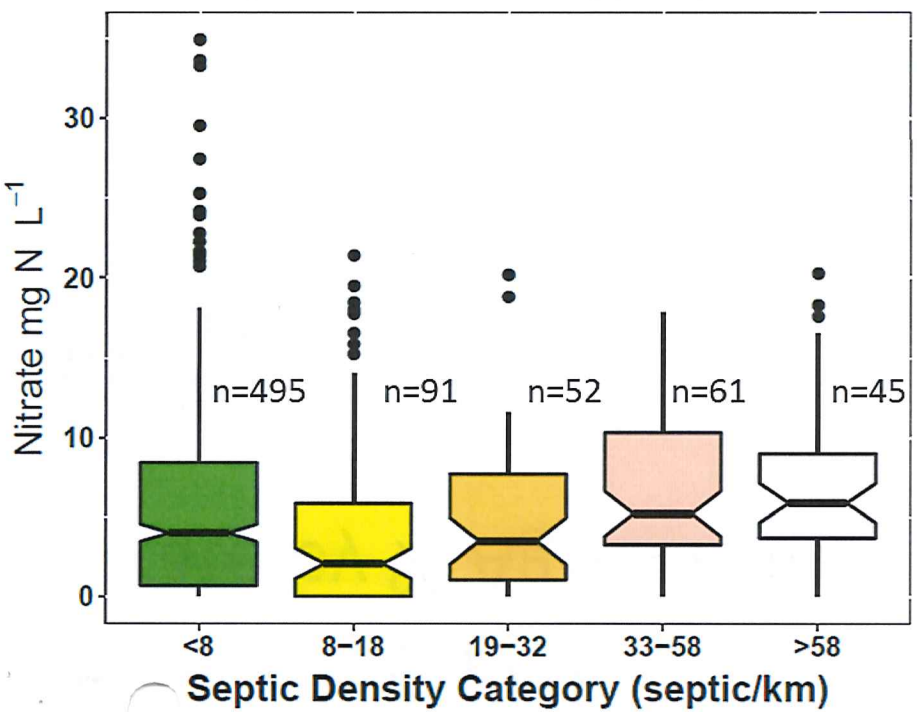
Chippewa County: Nitrate and septic system density





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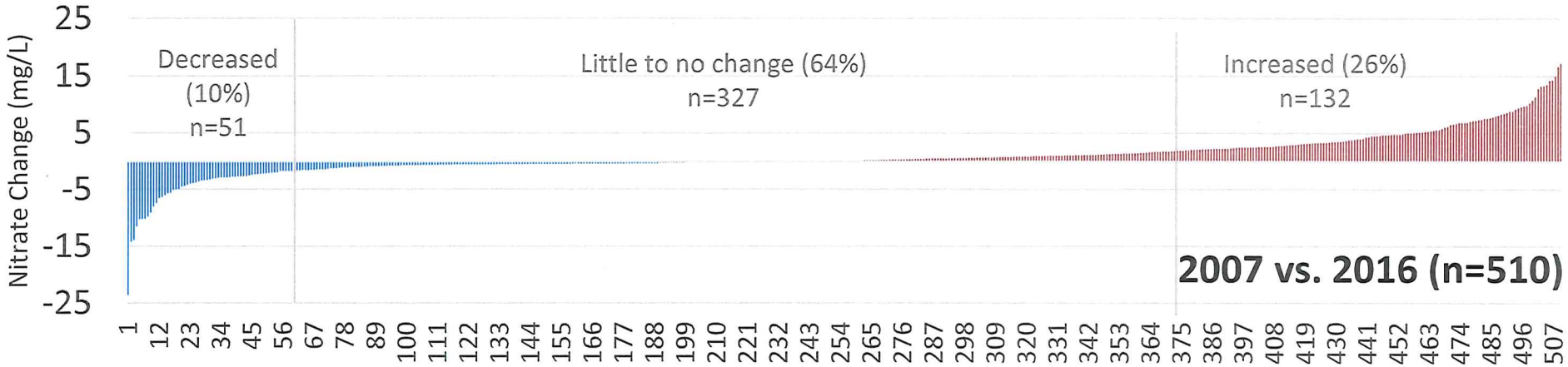
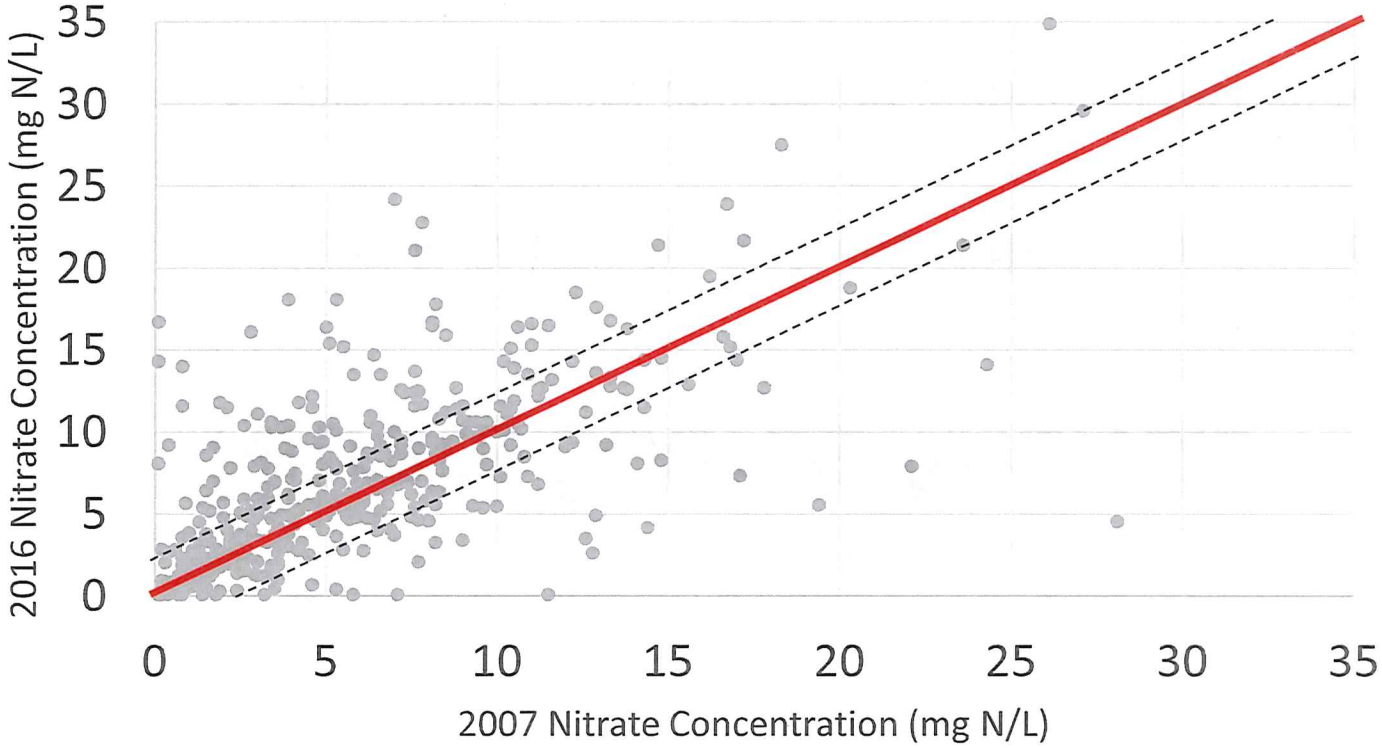
Comparing nitrate concentrations over time





Year	Nitrate Average (mg N/L)	Greater than 10 mg/L
1985	4.2	11.3%
2007	4.7	12.3%
2016	5.5	18.3%

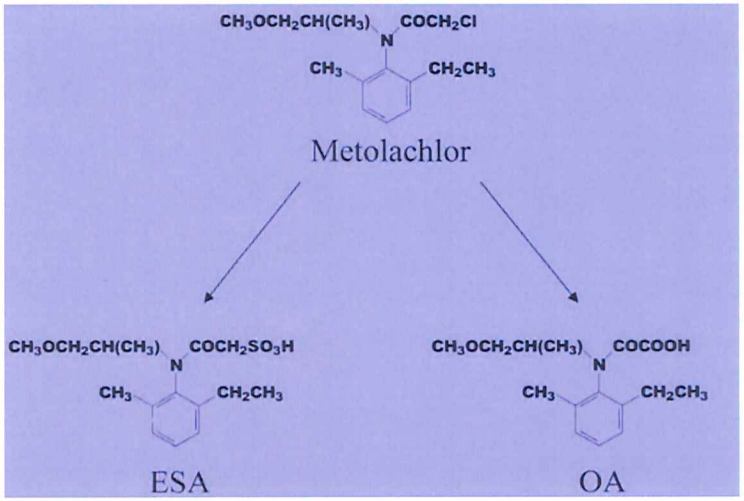
Nitrate Source Analysis

- Nitrate was a primary focus of this groundwater quality inventory.
- Sixty wells were chosen for additional testing to determine the source(s) of nitrate.

What did we look for?

- Two major sources of nitrate contamination:
  - Agricultural Practices
  - On-site waste treatment systems (septic)

What did we look for?

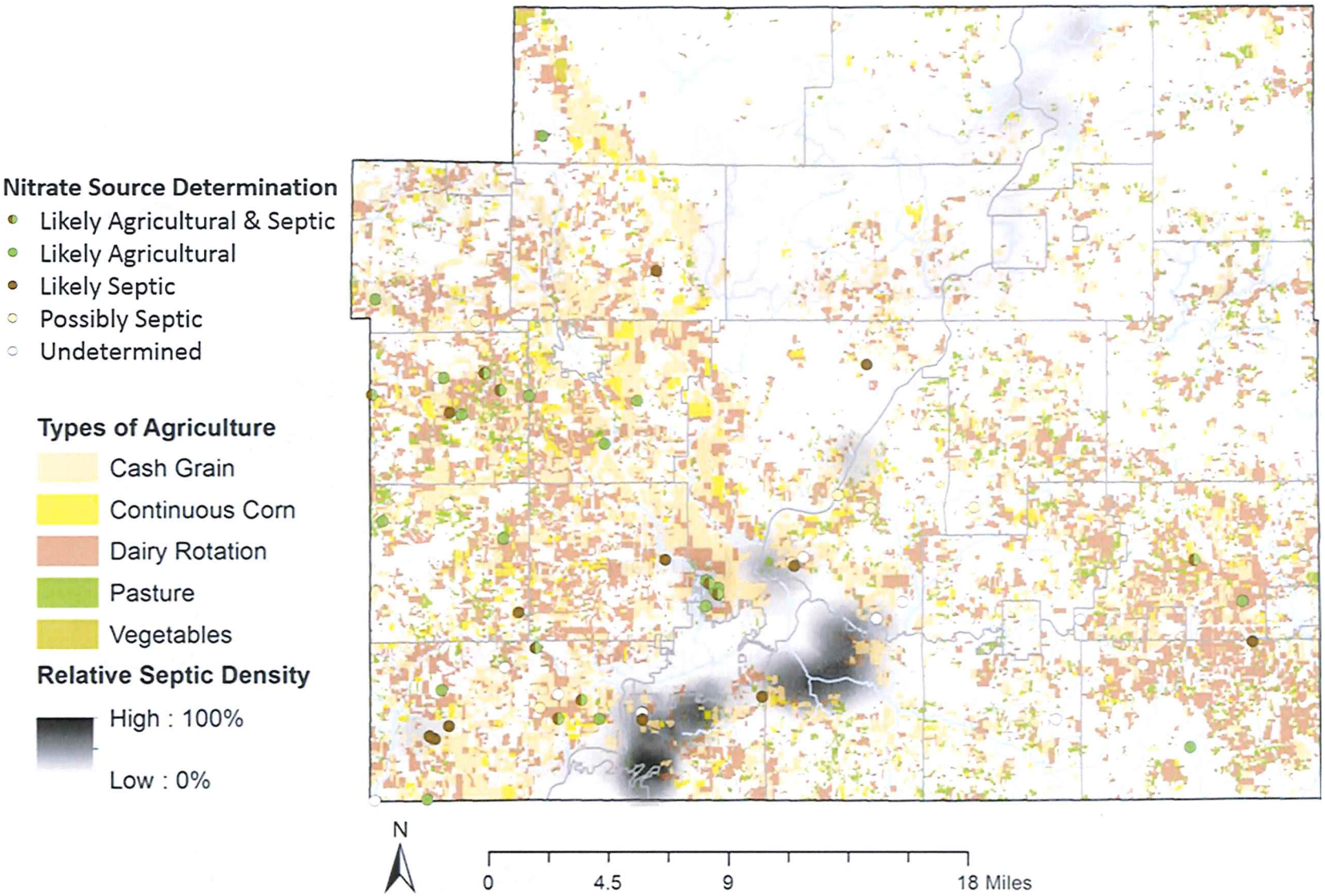


- Agricultural Practices
  - Pesticide Metabolites (breakdown products)
  - Metolacholor, alachlor and acetochlor metabolites
    - Mobile in groundwater
    - Unique to agricultural practices
    - Established testing method
  - Wisconsin Department of Agriculture Trade and Consumer Protection – Groundwater Exceedance Survey:

    "The <u>two most commonly detected pesticide metabolites</u> in the 2012 Targeted Sampling project were **metolachlor ethanesulfonic acid** (ESA) and **alachlor ESA**, which were detected in over 50 percent of the wells sampled. Metolachlor ESA and alachlor ESA were also the most common pesticide metabolites in the 2007 statewide survey, with approximately 21.6 percent of the wells having detectible concentrations."

What did we look for?

- On-site waste treatment systems (septic)
  - Unique to human use
    - Food products (caffeine, artificial sweeteners)
    - Pharmaceuticals
  - Reported in literature
  - Stable, mobile in subsurface environment
  - Good instrumental response


Nitrate Source Determination
Likely Agricultural & Septic
Likely Agricultural
Likely Septic
Possibly Septic
Undetermined
Types of Agriculture
Cash Grain
Continuous Corn
Dairy Rotation
Pasture
Vegetables
Relative Septic Density
High : 100%
Low : 0%
N
0
4.5
9
18 Miles

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