

Groundwater Quality: McHenry County

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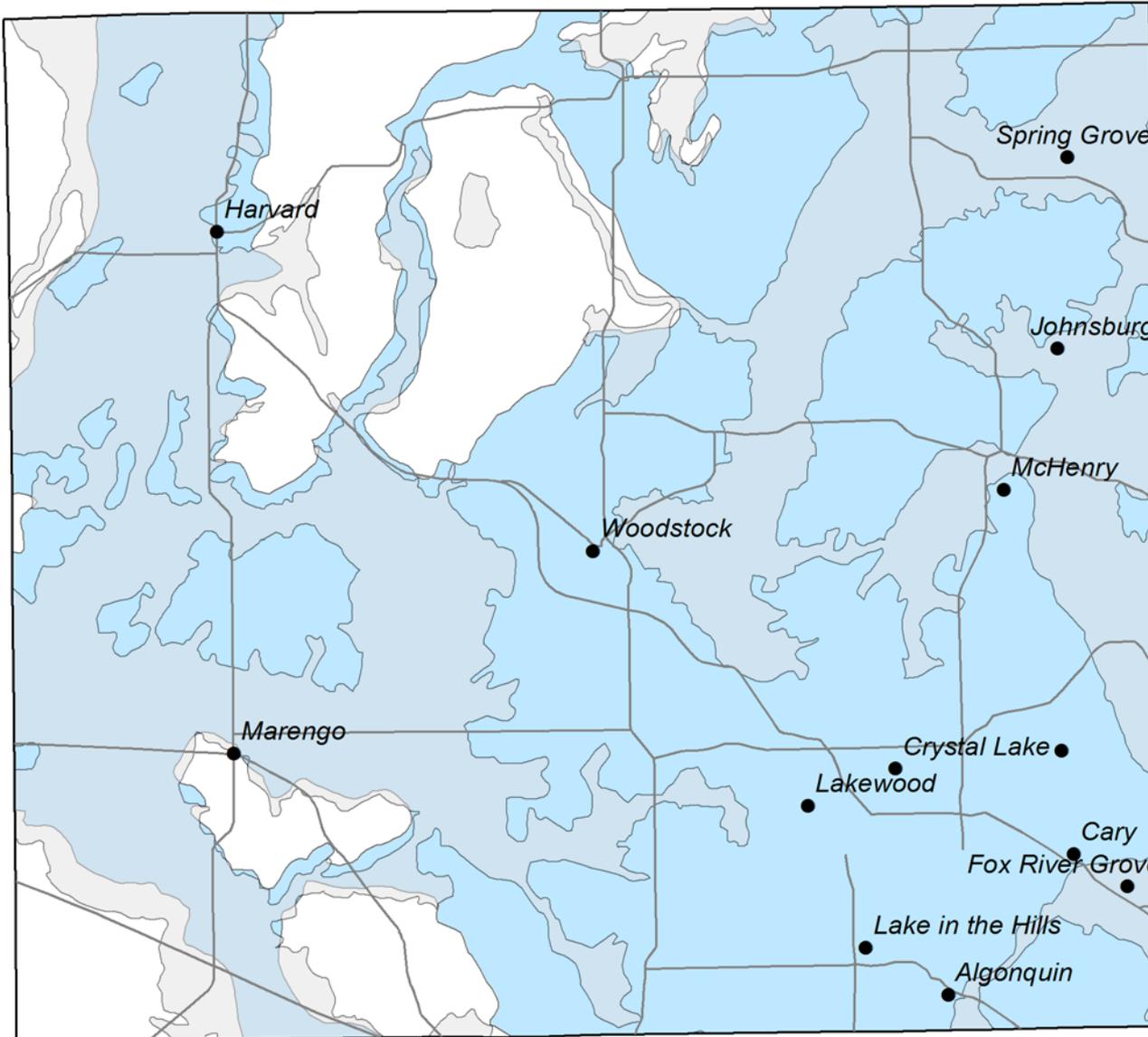
Groundwater Quality Issues: Some Definitions and Concepts

- Mainly concerned with drinking water quality
 - Groundwater discharges to streams and wetlands (base flow), so there are ecological issues as well
- Natural vs. Human contamination
- For human activities: Point source vs. non-point sources

Important Contaminants in McHenry County Groundwater (Regional Scale)

- Natural
 - Arsenic (sand & gravel)
 - Radium (deep bedrock)
 - Barium (deep bedrock)
- Human (non-point source)
 - Nitrate (agriculture, sewage)
 - Total dissolved solids (road salt runoff)

McHenry County is Sandy

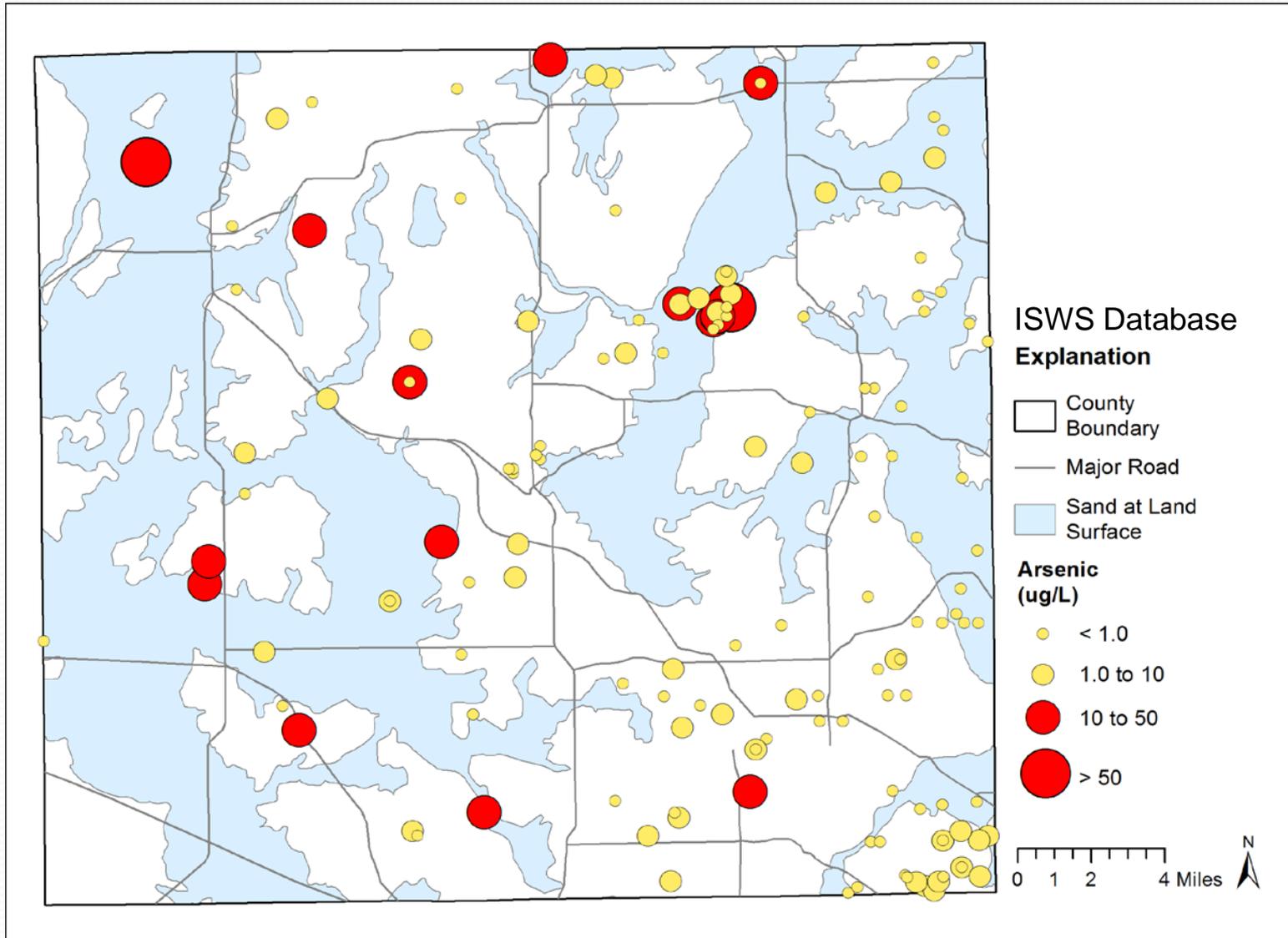


Explanation

- County Boundary
- Major Town
- Major Road
- Sand at Land Surface
- Major Sand and Gravel Aquifer



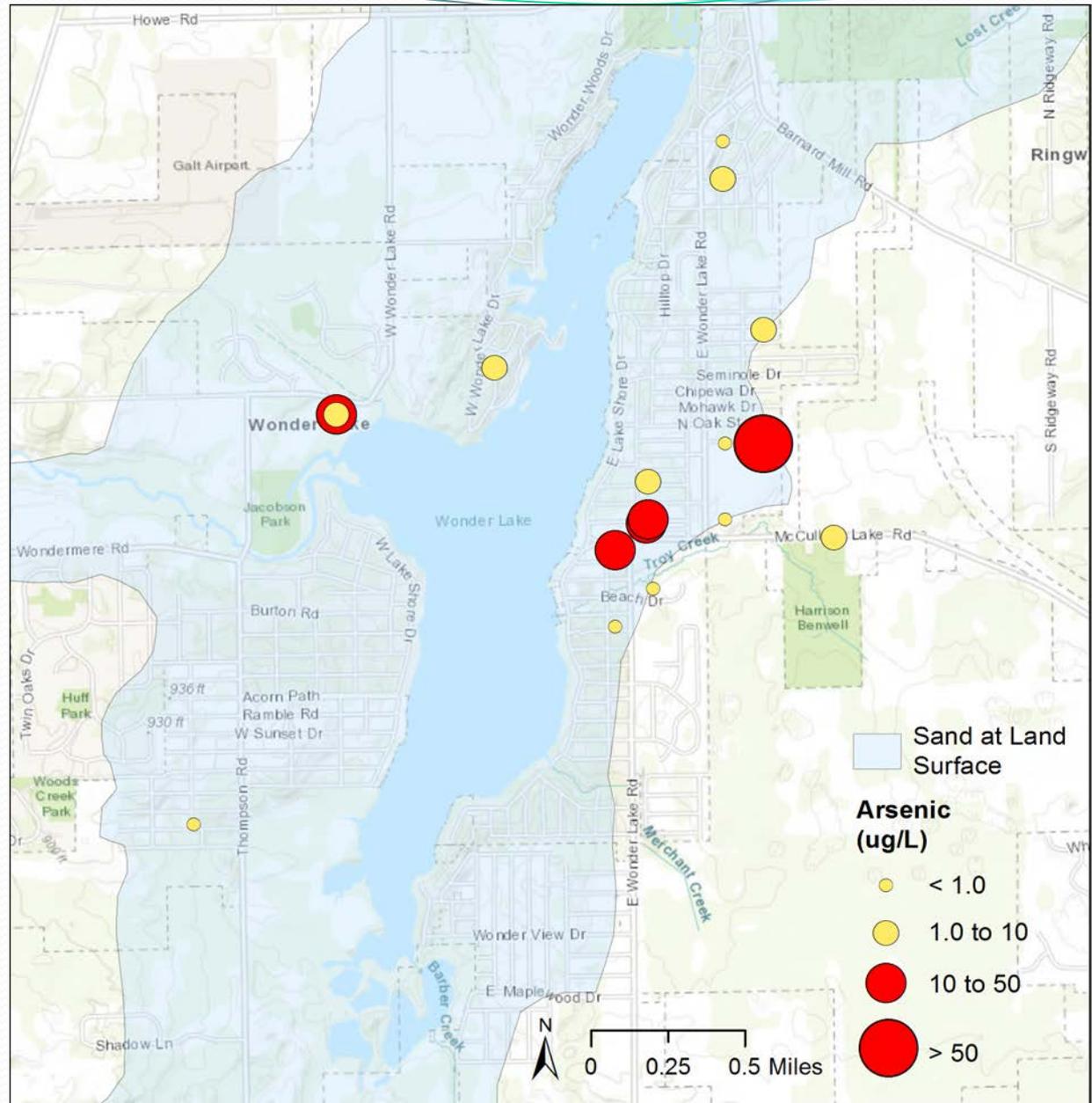
Arsenic in Sand & Gravel Aquifers



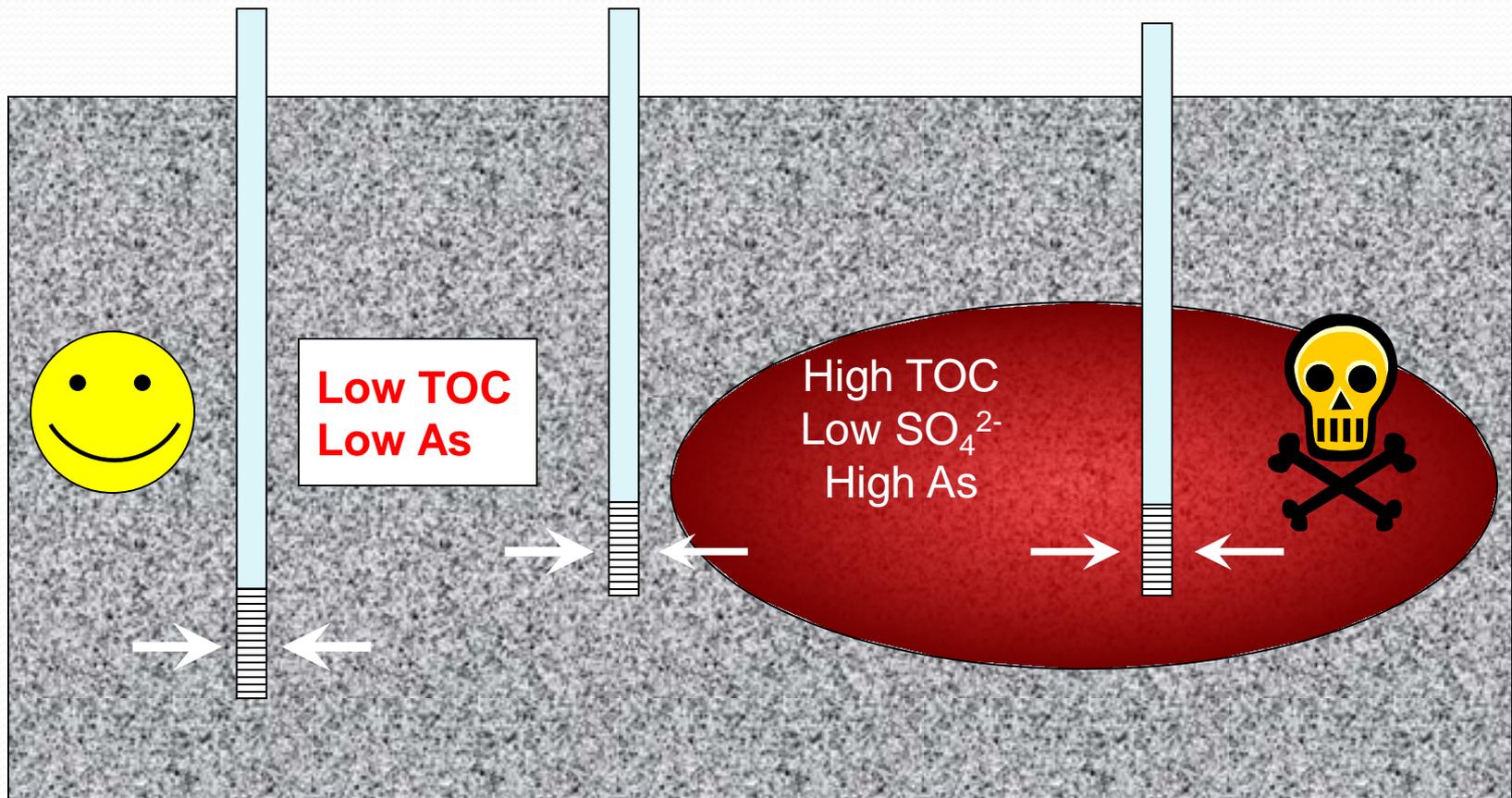
Arsenic: Wonder Lake

Large Local Variability

Holm, T.R. and S.D. Wilson,
2009. ISWS Contract Report
2009-06.



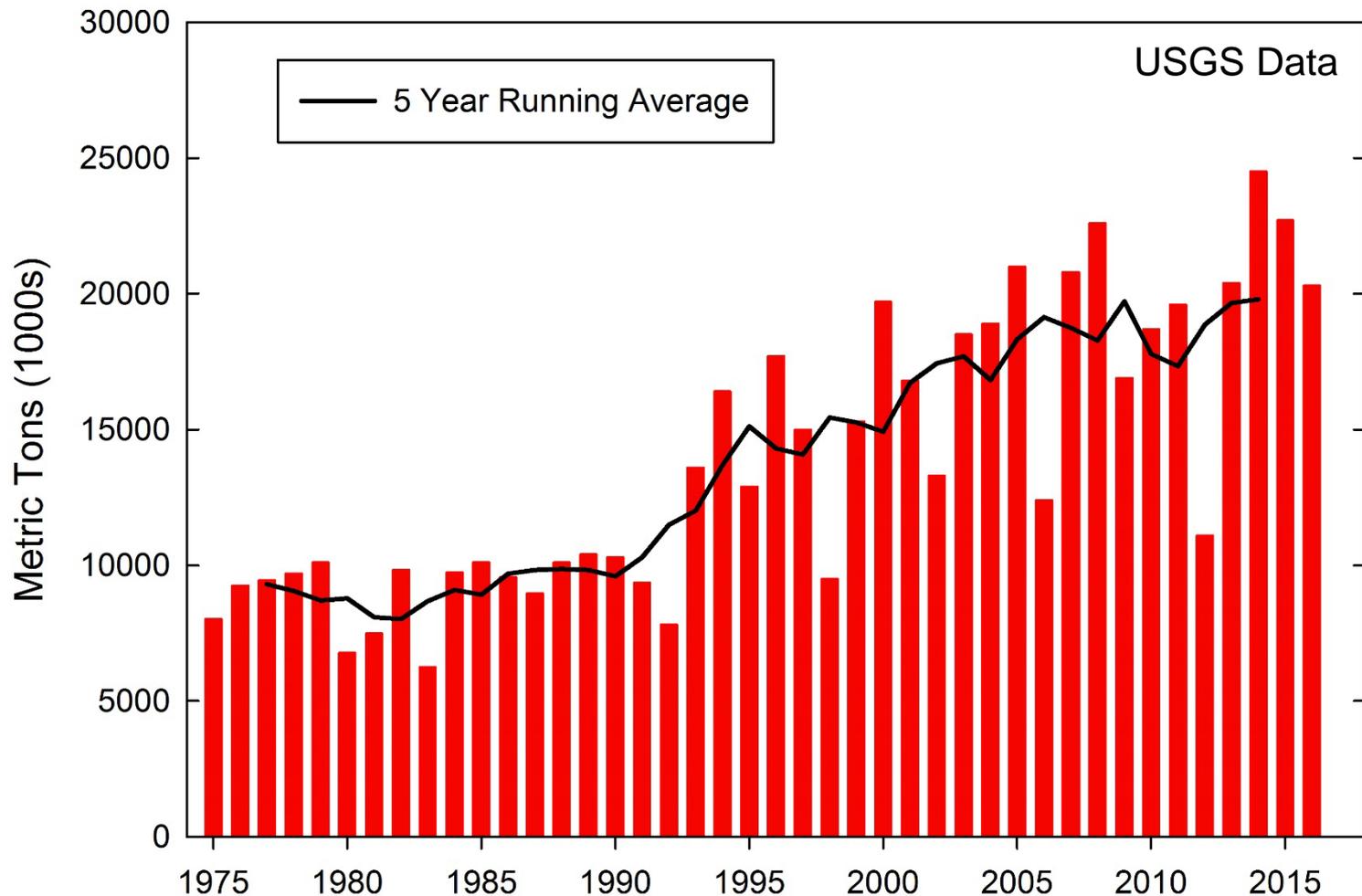
Geochemical Conditions are Controlling Arsenic Concentrations



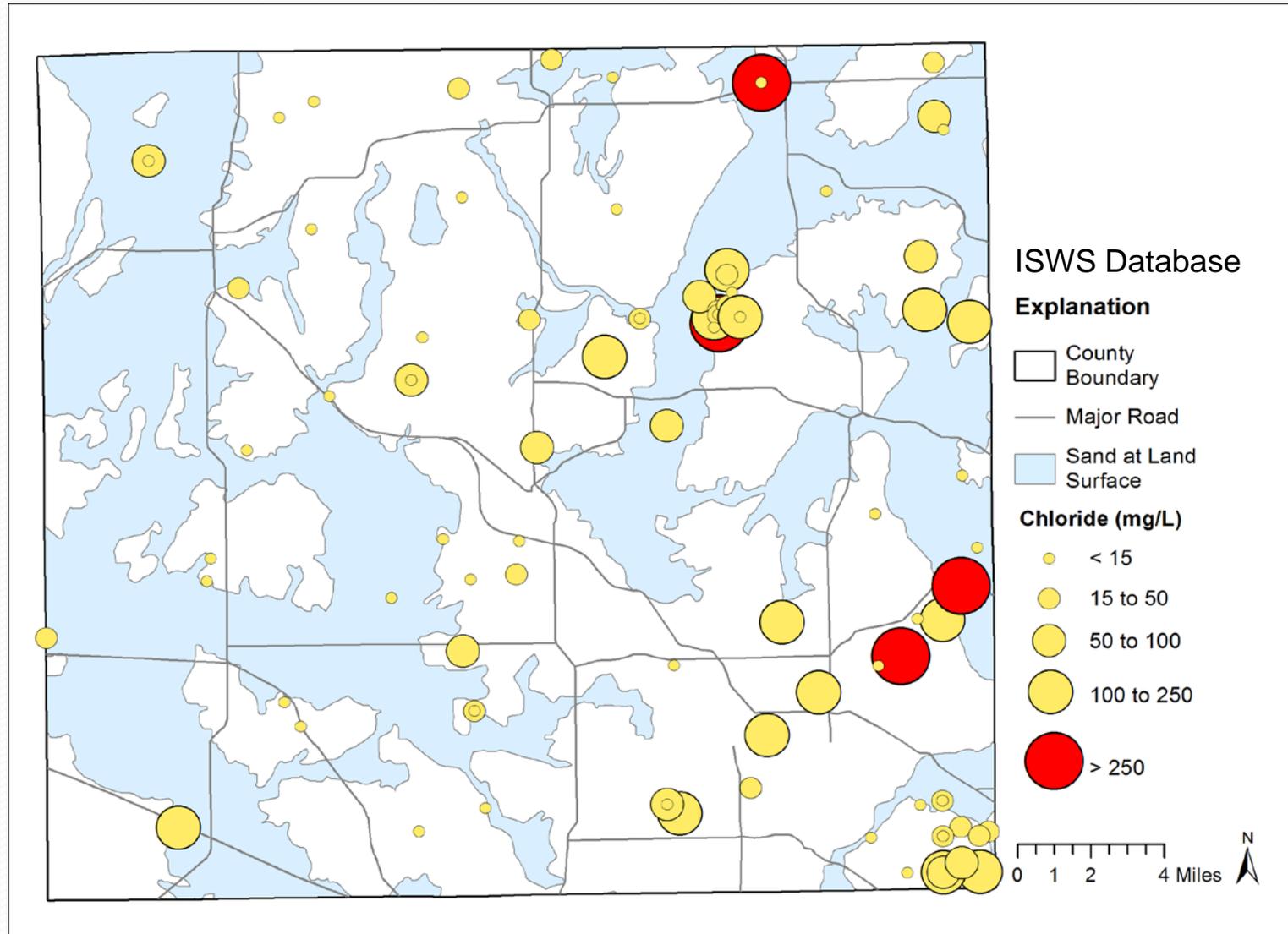
Chloride and Total Dissolved Solids (TDS)

- Shallow sands and gravels means that water quality in these aquifers are vulnerable to surface activities
- One of the major land use activities in northeastern Illinois is road salt application

Road Salt Application (U.S.)



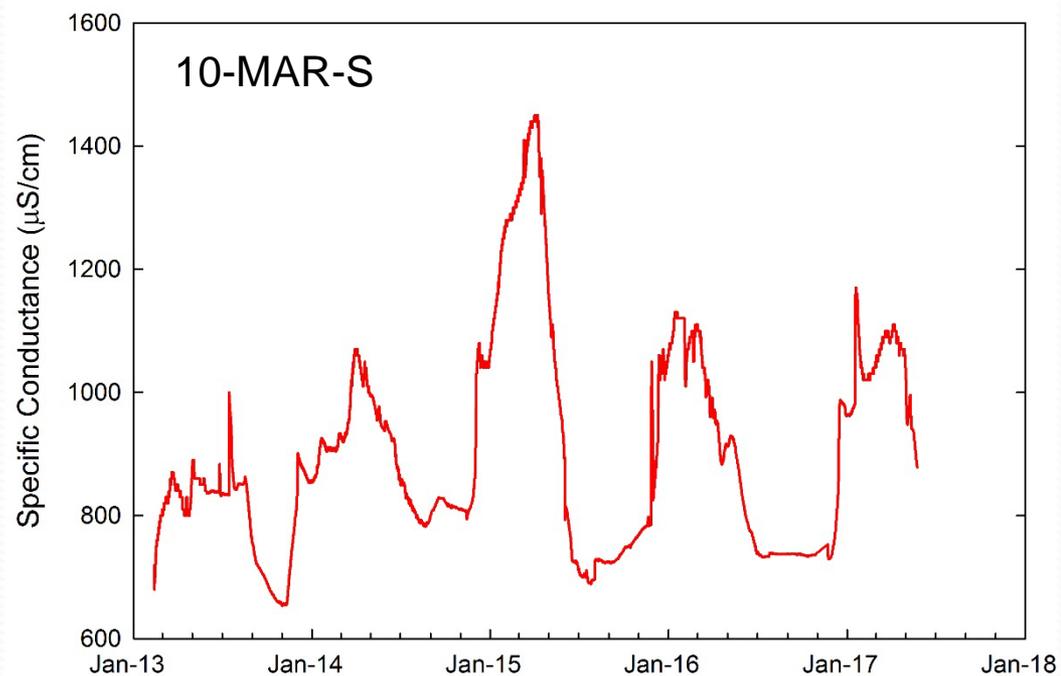
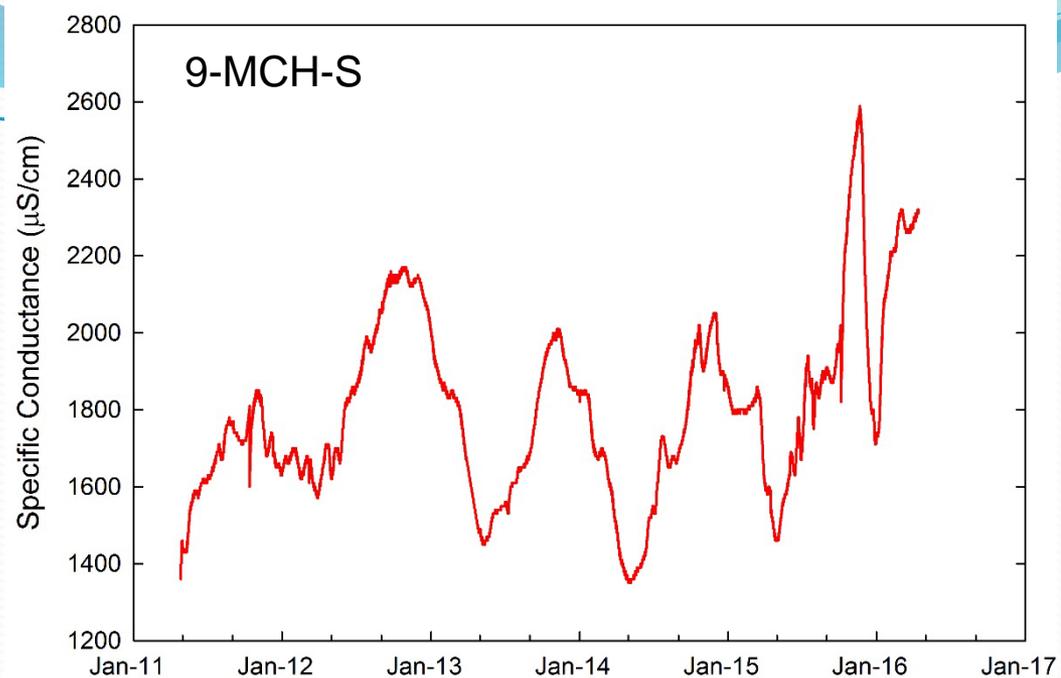
Chloride in Sand & Gravel Aquifers



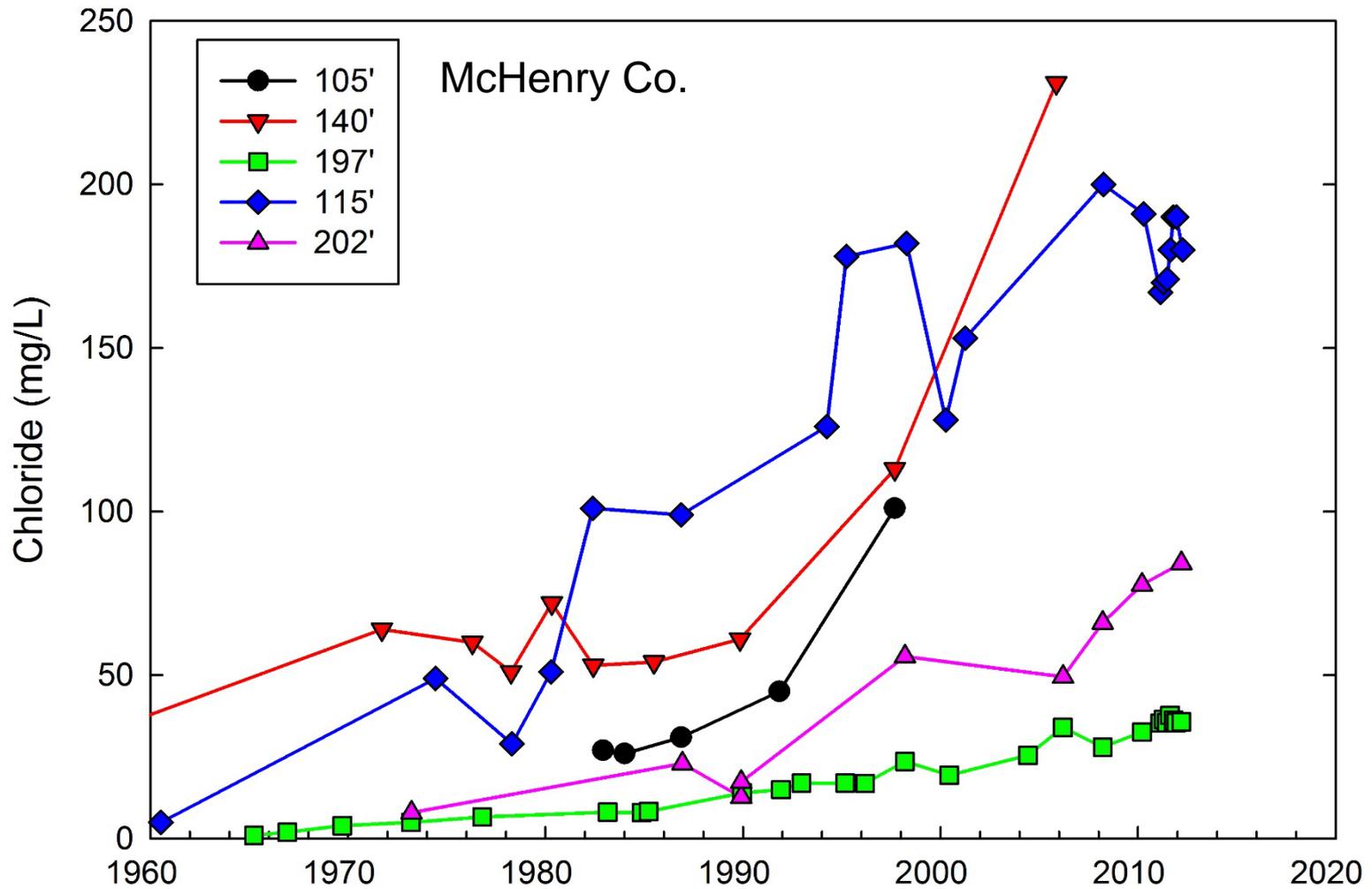
Continuous Measurements

Specific Conductance is a good proxy for TDS and chloride

USGS Data



Chloride in Individual Public Supply Wells



Changes in Chloride in Kane County: 2003 - 2015

- 5 wells increased more than 100 mg/L
- Average chloride increase in East wells was 46.3 mg/L
 - (about 4 mg/L per year)



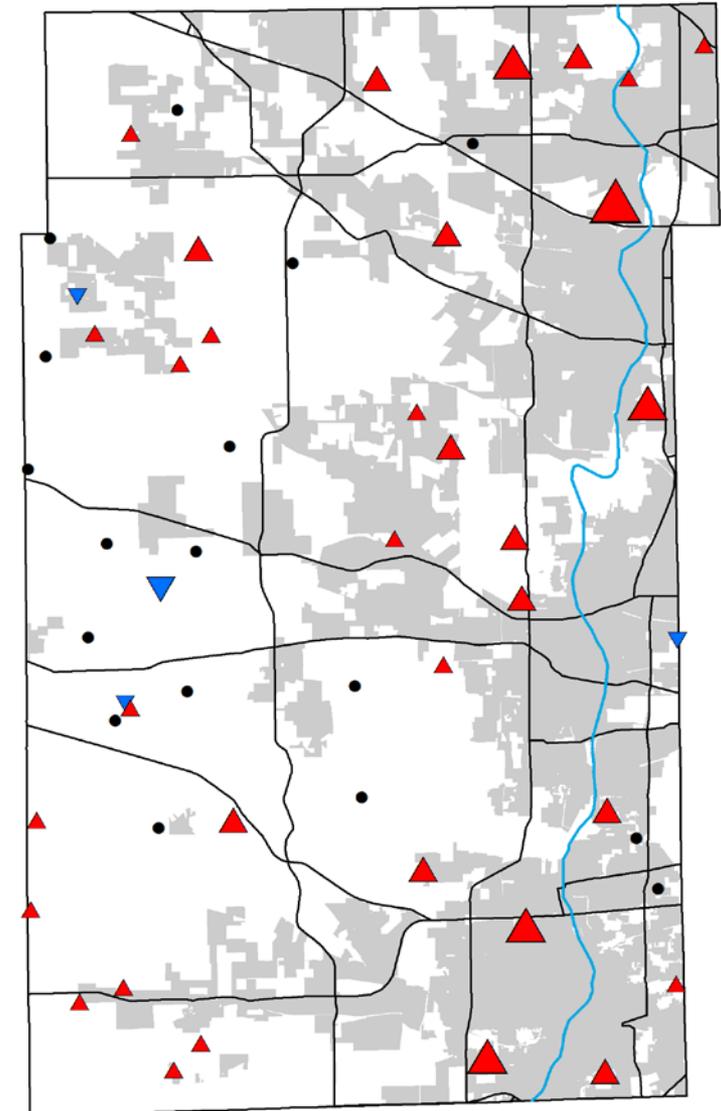
0 1 2 4 Miles

— Fox River
— Major Road
■ Municipal Boundary

Change in Chloride (mg/L)

- ▼ < -10
- ▼ -1 to -10
- No Change
- ▲ 1 to 10
- ▲ 10 to 100
- ▲ 100 to 200
- ▲ > 200

Red

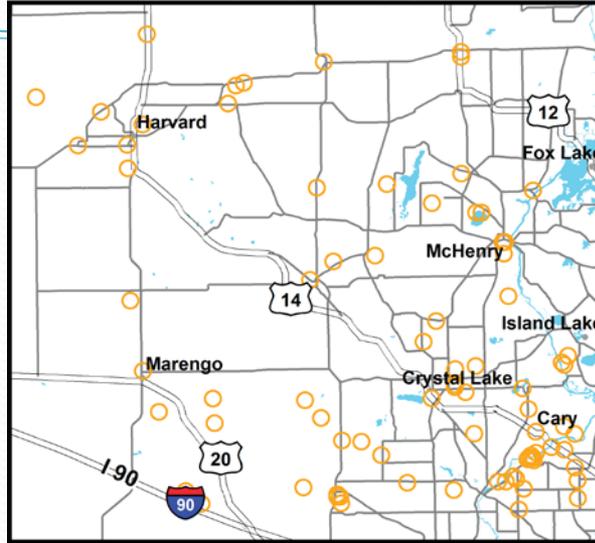


Nitrate in Groundwater

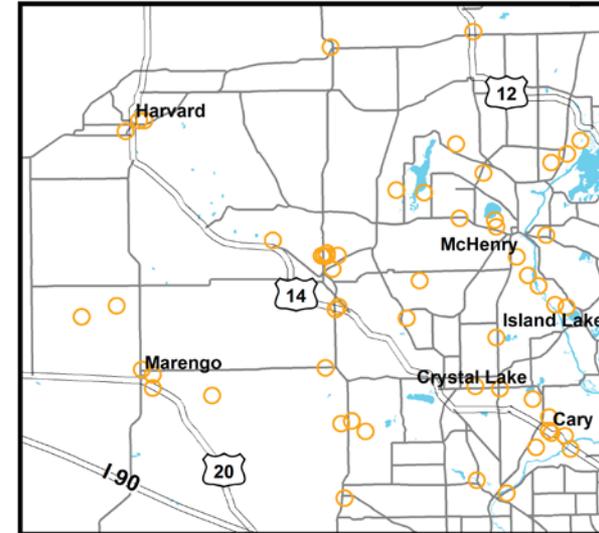
- Nitrate concentrations have been increasing in many shallow aquifers in the last 40-50 years, primarily in agricultural areas
- Synthetic fertilizer is main source in much of the world
 - Also sewage and septic systems, oxidation of soil organic matter, atmospheric deposition

Nitrate-N: Historical Data

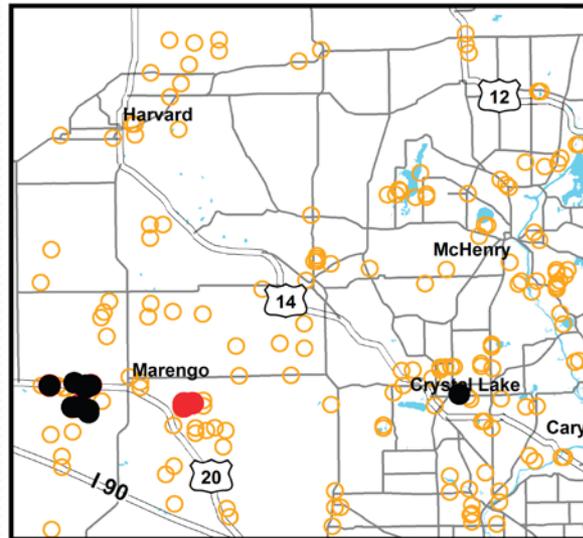
1913 - 1950



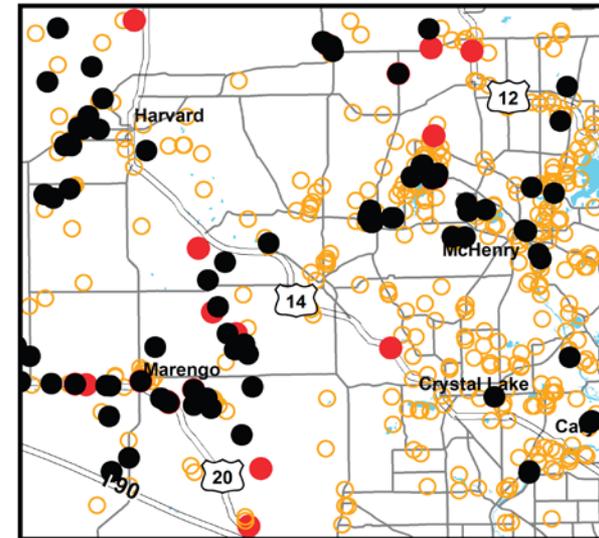
1951 - 1965



1966 - 1980



1981 - 2002



ISGS Study

Hwang et al., 2015. *Environmental & Engineering Geoscience*, XXI(2):75.

NO₃-N (mg/L)

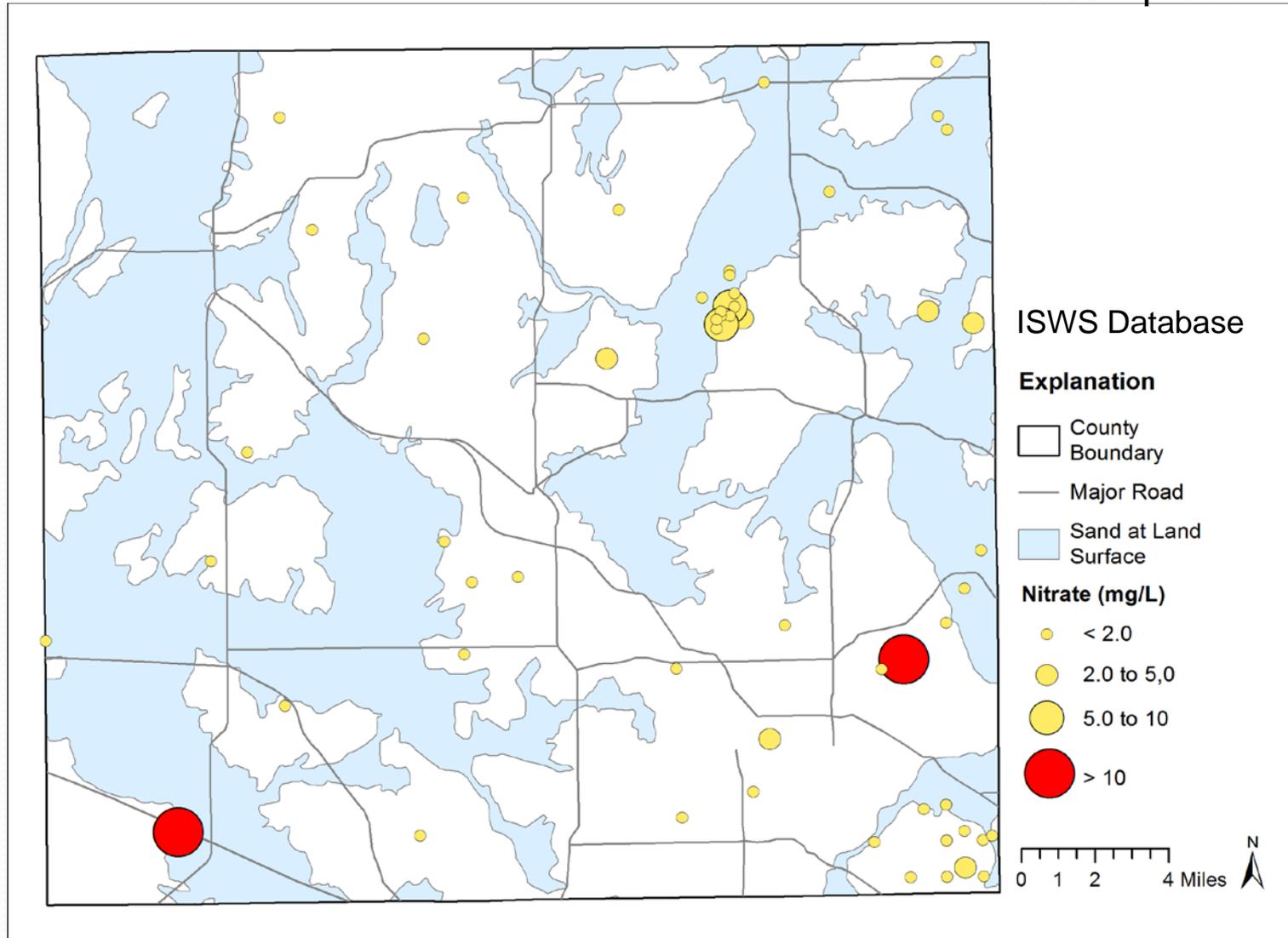
- 1.00 - 9.99
- 10.00 - 19.99
- 20.00 - 41.40

0 5 10 20 Kilometers

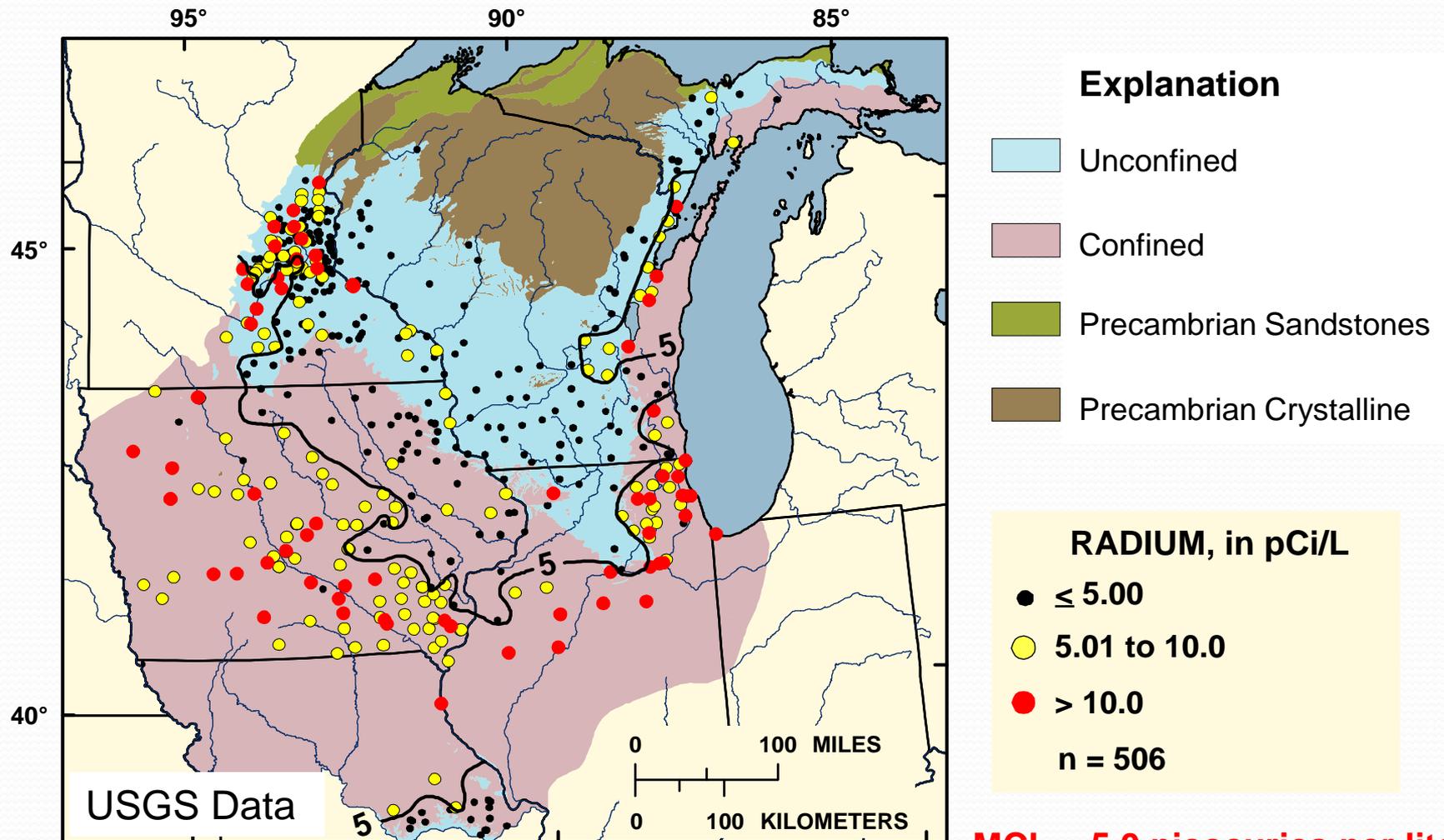


Nitrate-N in Sand & Gravel Aquifers: Recent Data

2008 - present

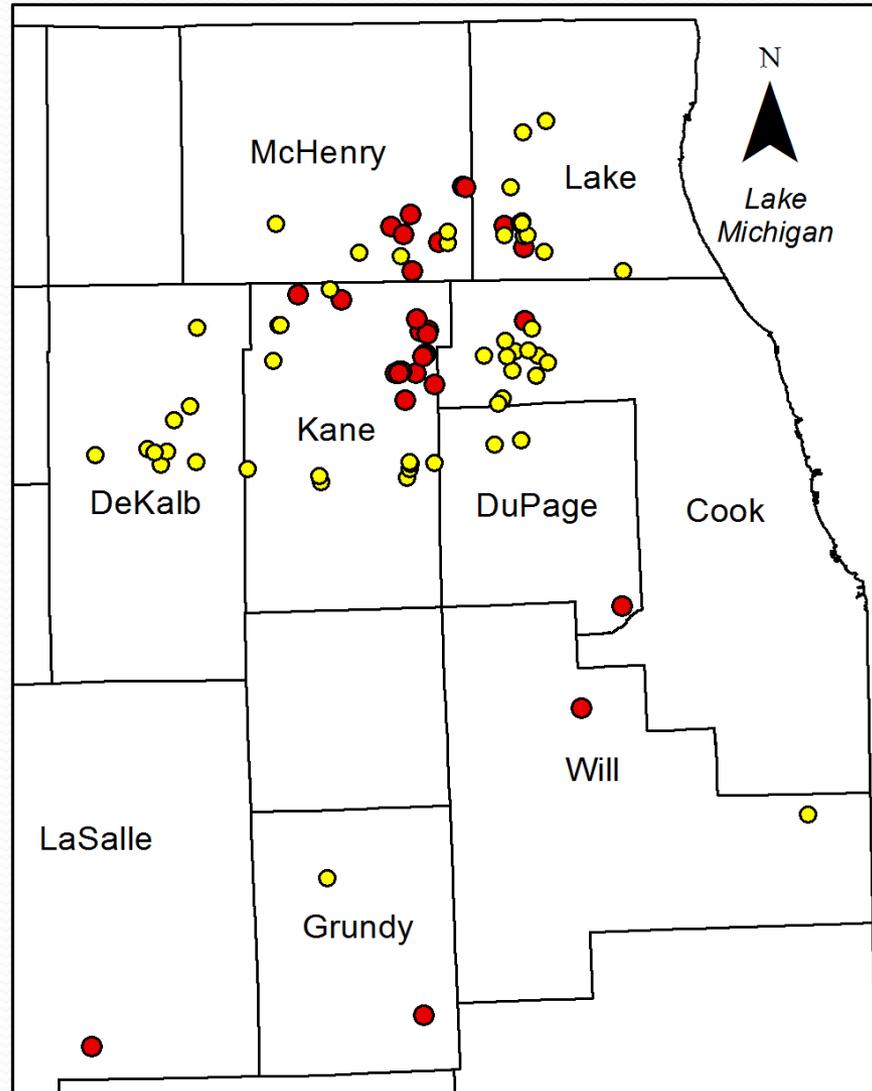


Deep Bedrock Aquifer System: Radium

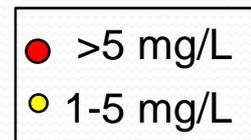


MCL = 5.0 picocuries per liter

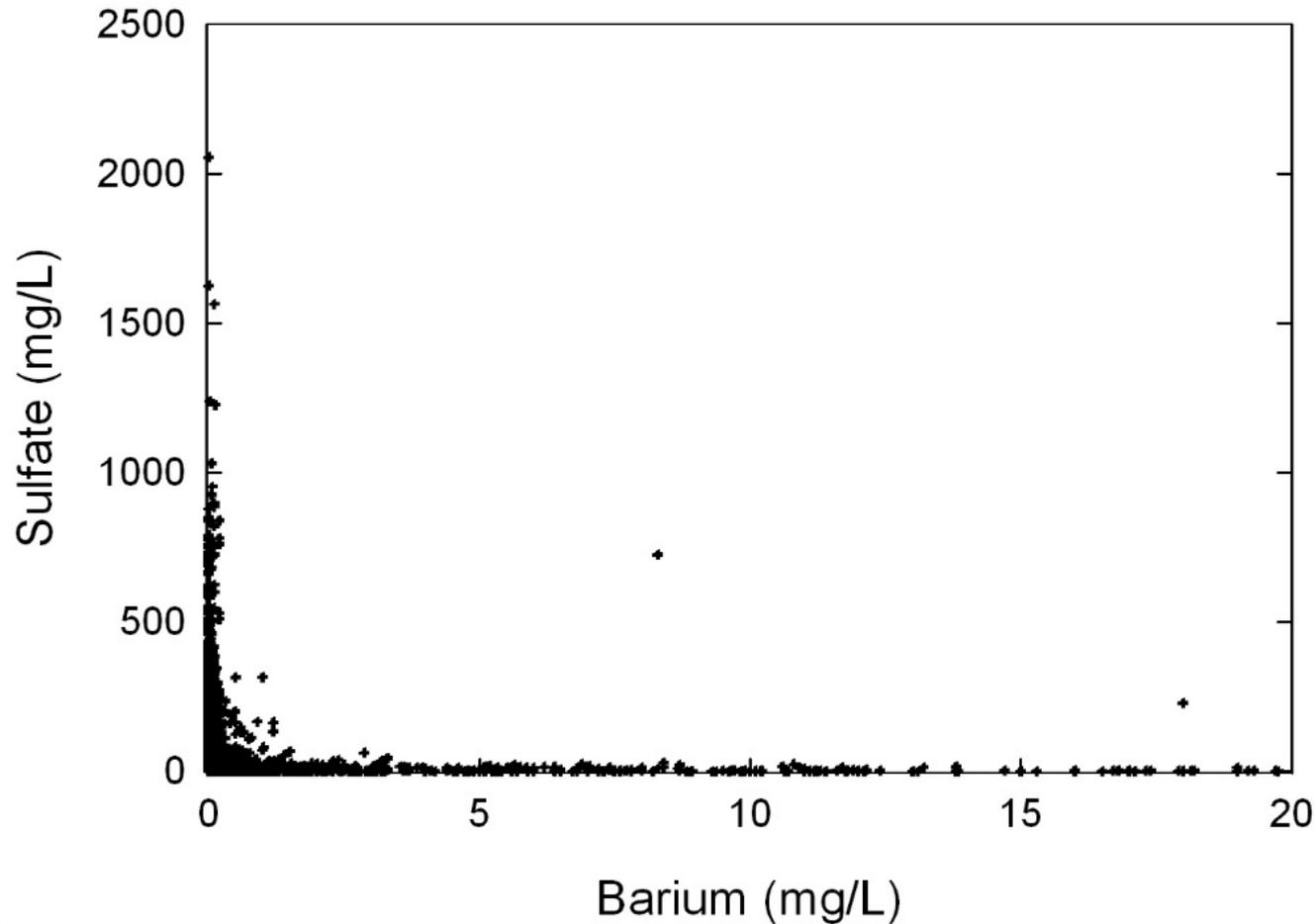
Deep Bedrock Aquifer System: Barium



**The USEPA
drinking water
standard for Ba
is 1 mg/L.**



Barium concentrations controlled by Barite (BaSO_4) solubility

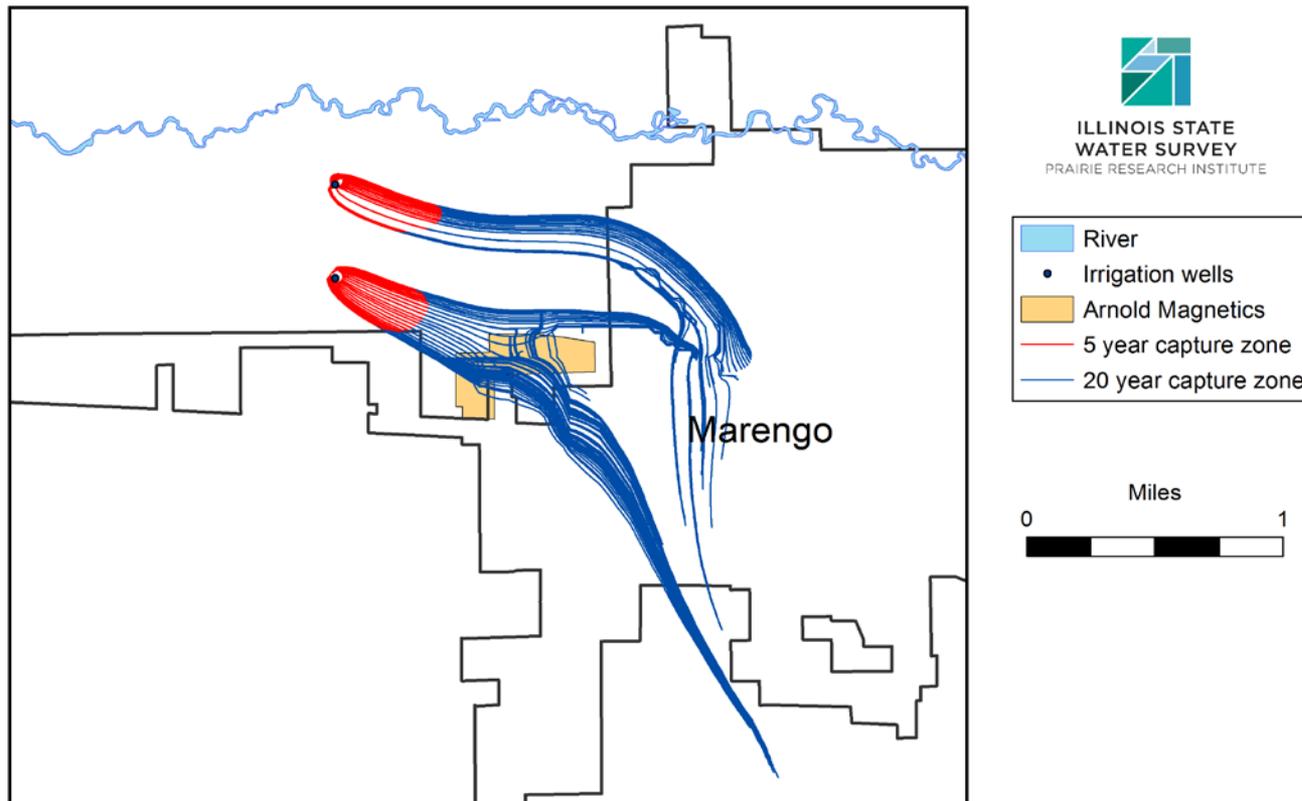


USGS Sampling 2010

- Pesticides: 3 detected, but at very low concentrations in shallow wells (< 50 ft)
 - Atrazine, Prometon, CIAT
- VOCs: 2 detected, very low concentrations in shallow wells (< 50 ft)
 - Trichloroethylene (TCE), Trichloromethane

Gahala, A.M., et al. 2017. USGS Scientific Investigations Report 2017–5112.
<https://pubs.er.usgs.gov/publication/sir20175112>

Point Sources



Irrigation wells pump 30,000 cfd total

Groundwater Quality: Future Activities

- Use Monitoring Well Network
- Encourage private well owners to get their water quality tested
 - ISWS has a public service lab that provides a full mineral content for minimal cost (\$35)
 - Includes nitrate, arsenic, chloride, etc., but no bacteria or organics
- Continue to look for ways to protect sensitive areas, such as wetlands and recharge zones

Private Well On-line Class

- Free on-line class
- Designed to educate homeowners about their private wells
- Self-paced

<http://www.privatewellclass.org/>

The Private Well Class

FREE ONLINE TRAINING for HOMEOWNERS WITH WATER WELLS

You are here : Home

Web Site

The Private Well Class is a free online service, grant-funded to educate homeowners about their private wells.

1 Enroll in class by providing your first name and email address on the form.

2 Your ten lessons will arrive by email. The first and last week will test your knowledge.

3 Register for webinar sessions to reinforce your learning and get questions answered.

[Click Here to Enroll for Free](#)

The Private Well Class is sponsored by

Webinar Schedule

Click here for our video recordings of past webinar events or register below for an upcoming live session.

March 27, 2013
How Your Private Well Works
2-3:30pm Eastern
[View Recordings](#)

April 17, 2013
Proper Care of Your Private Well
2-3:30pm Eastern
[View Recordings](#)

May 15, 2013
Water Quality and Your Private Well
2-3:30pm Eastern
[Register](#)

HAVE A PRIVATE WELL QUESTION? EMAIL US: INFO@PRIVATEWELLCLASS.ORG

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