Promoting Groundwater Education through Community Water Testing

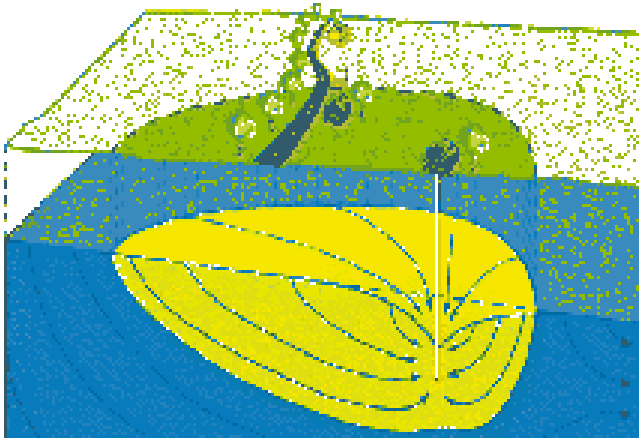
Kevin Masarik
Center for Watershed Science and Education
UW-Stevens Point and UW-Extension
April 1, 2010

Center for Watershed Science and Education

Private vs. Public Water Supplies

Public Water Supplies

- Regularly tested and regulated by drinking water standards.
- If water does not meet standards required to treat the water.
- New municipal wells require a wellhead protection plan.



Residential Private Wells

- Not required to be regularly tested.
- Not required to take corrective action
- Owners must take special precautions to ensure safe drinking water.

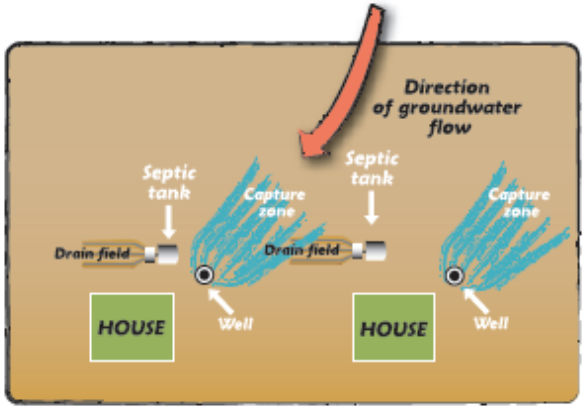
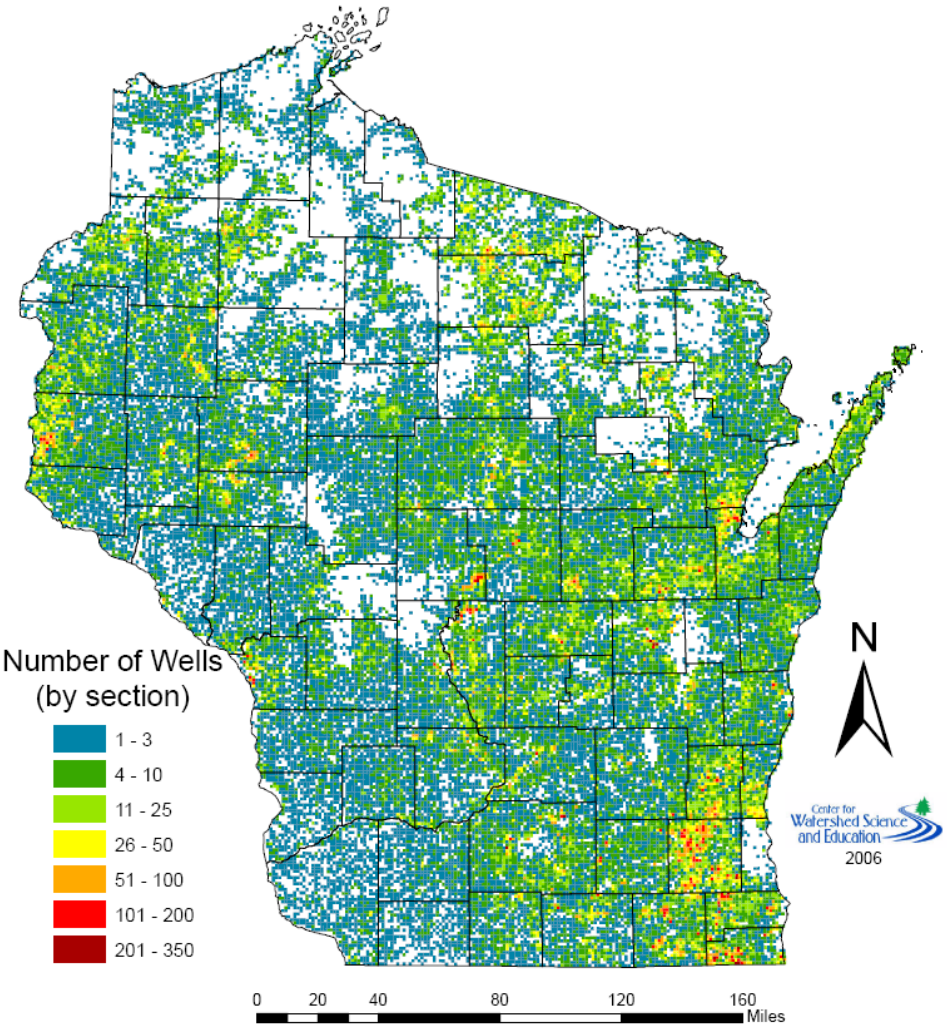


FIGURE 3:
Septic systems are potential sources of contamination to nearby wells.

Wisconsin Well Construction

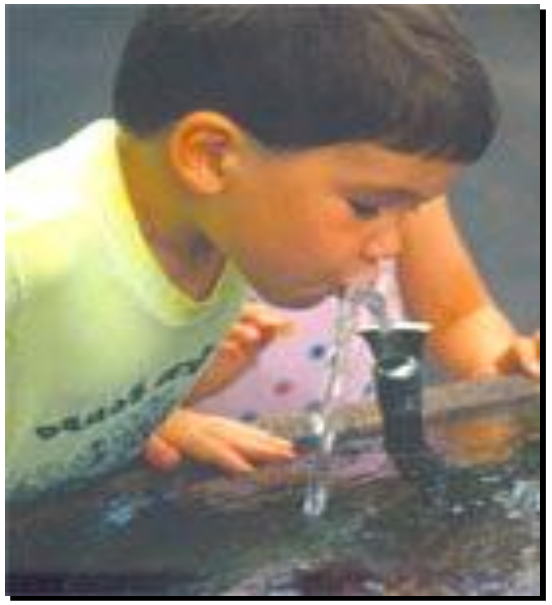
(1988 - 2006)



Disclaimer: Map for educational purposes only. Represents all newly constructed wells in DNR Well Construction Database from 1988 to 2006. Does not distinguish between well types.

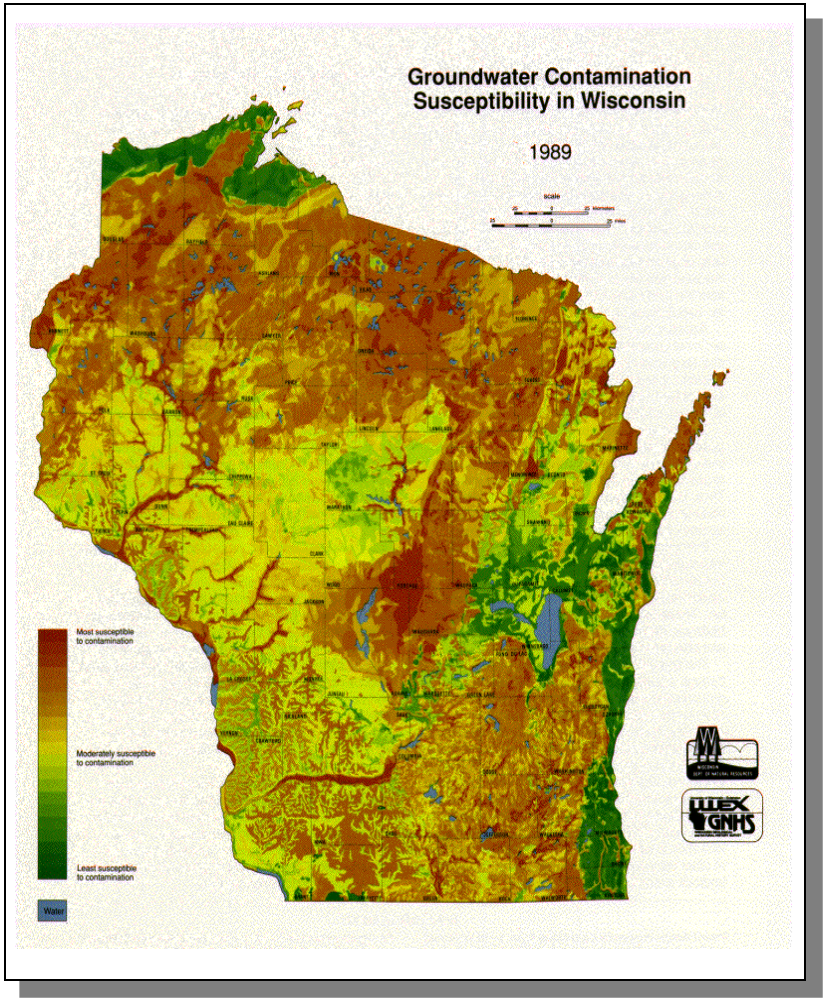
Why do people test their water?

- Installed a new well
- Change in taste or odor
- Buying or selling their home
- Plumbing issues
  - Corrisivity
  - Scaling problems
- Want to know if it's safe to drink.
  - Human impacts
  - Naturally occurring contaminants



Contamination Susceptibility

- Susceptibility is related to the type of soil and the local geology.
- Land-use ultimately determines if groundwater becomes contaminated.



Tests Important to Health

Contaminant	Which wells should be tested?	Frequency
Coliform Bacteria*	Every well	Annually
Nitrate	All wells	Test at least once
	Used by pregnant women	Test before pregnancy
	Levels close to 10 ppm	Test annually
Pesticides	Within ¼ mile of agricultural fields	Consider testing at least once every 5-10 years
Lead	Homes with brass fixtures or copper plumbing installed before 1985	Consider one time test
Copper	Homes with copper plumbing	Consider one time test
Arsenic	All wells	Consider one time test

* Considered the most important test to perform on a private well.

Community Drinking Water Programs

- Definition of Community
  - County, Town, Watershed, Lake Assoc.
- Objectives
  - Offer homeowners a convenient opportunity to test their private well water
  - Educate community about groundwater:
    - Where does your drinking water come from
    - Understanding the connection between water quality, geology and land-use
  - Help participants understand their drinking water quality results and options for improving water quality
  - Learn about condition of local groundwater quality

Water Tests Performed

- **Homeowners Package:**
  - Coliform Bacteria*
  - Nitrate*
  - Chloride
  - Alkalinity
  - Conductivity
  - Hardness
  - pH
  - Saturation Index

- **Metals Package:**
  - Arsenic*, lead*, copper*, zinc, iron, manganese, sodium, calcium, magnesium, potassium, sulfate

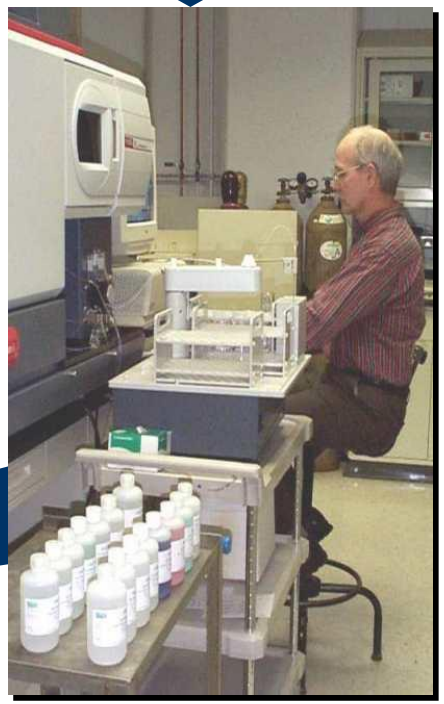
- **Diaminochlorotriazine* (DACT) Screen**
  - Quick and dirty method to measure the amount of the most common corn herbicides

*Health related contaminant

Community Drinking Water Programs

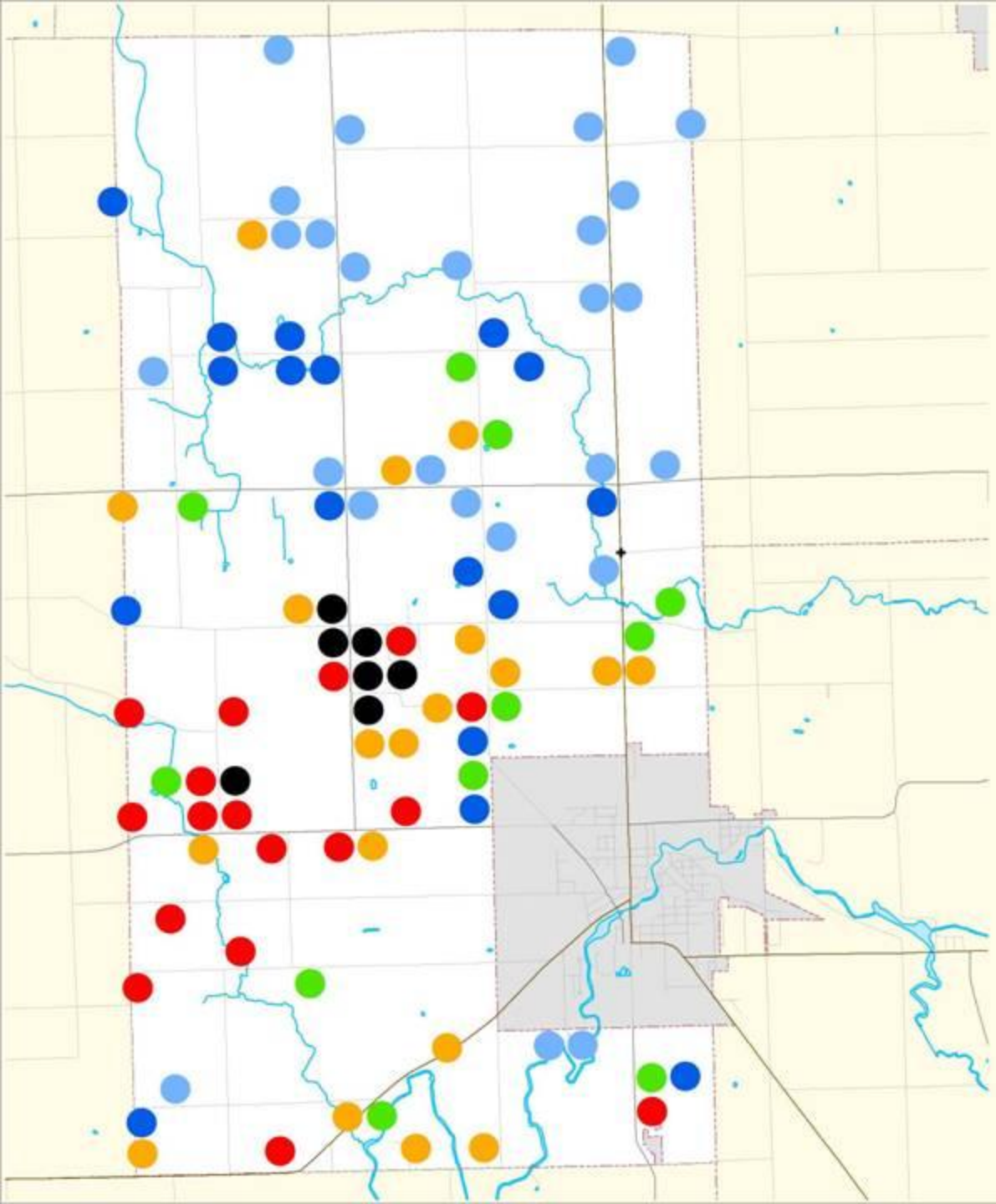
1. Advertising and bottle distribution

2. Sample collection and drop off.



3. Samples are analyzed at WEAL

4. Hold educational program for community.

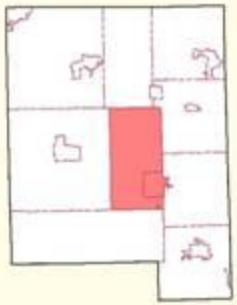


Chilton

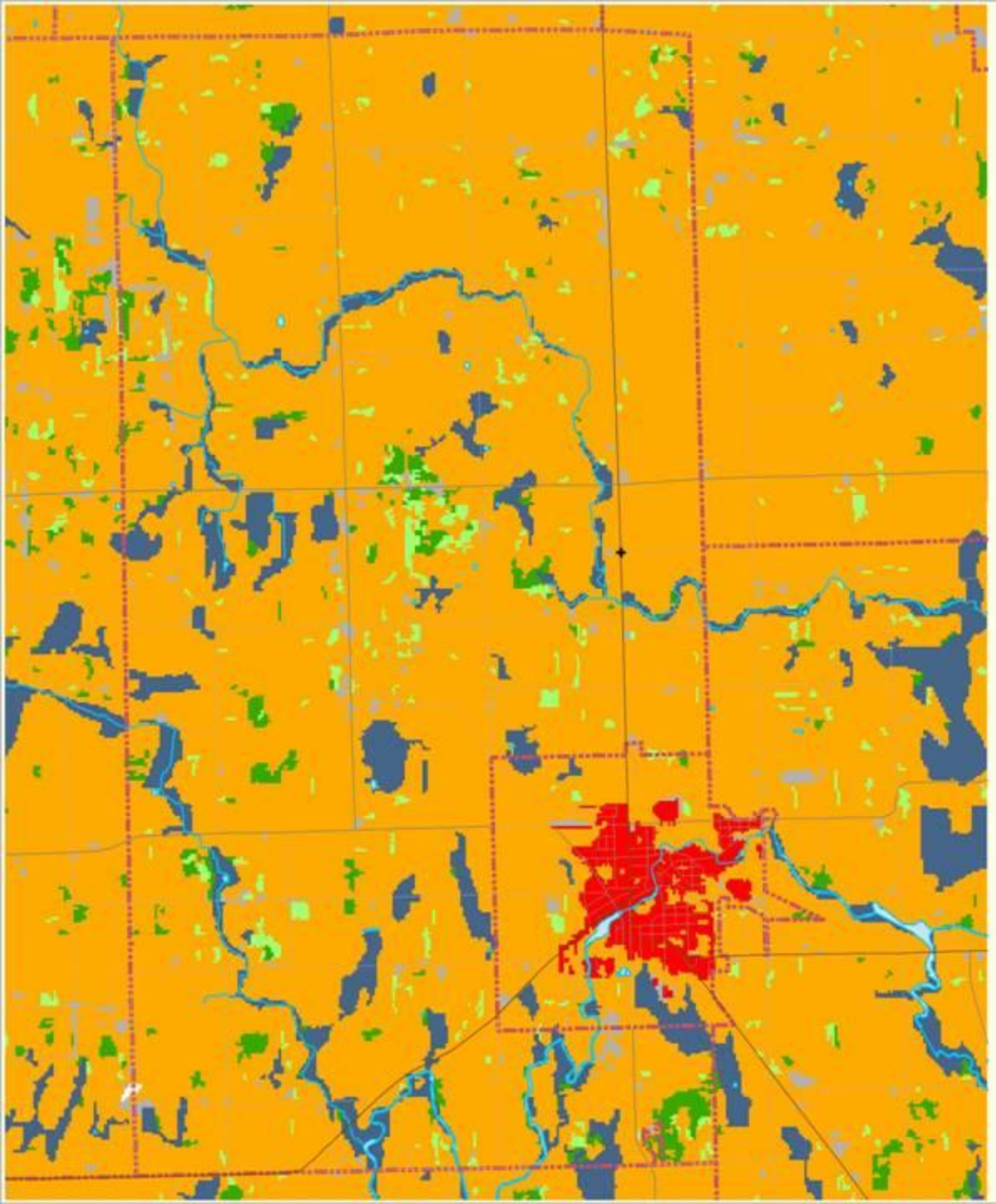
Calumet County
June 2007

NITRATE-NITRITE (ppm N)

NONE DETECTED	32	29 %
[0.1 - 2.0)	16	14 %
[2 - 5)	13	12 %
[5 - 10)	21	19 %
[10 - 20)	22	20 %
[20 ...	8	7 %



Groundwater Center
Center for Watershed Science and Education



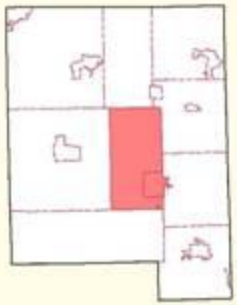
Chilton

Calumet County
June 2007

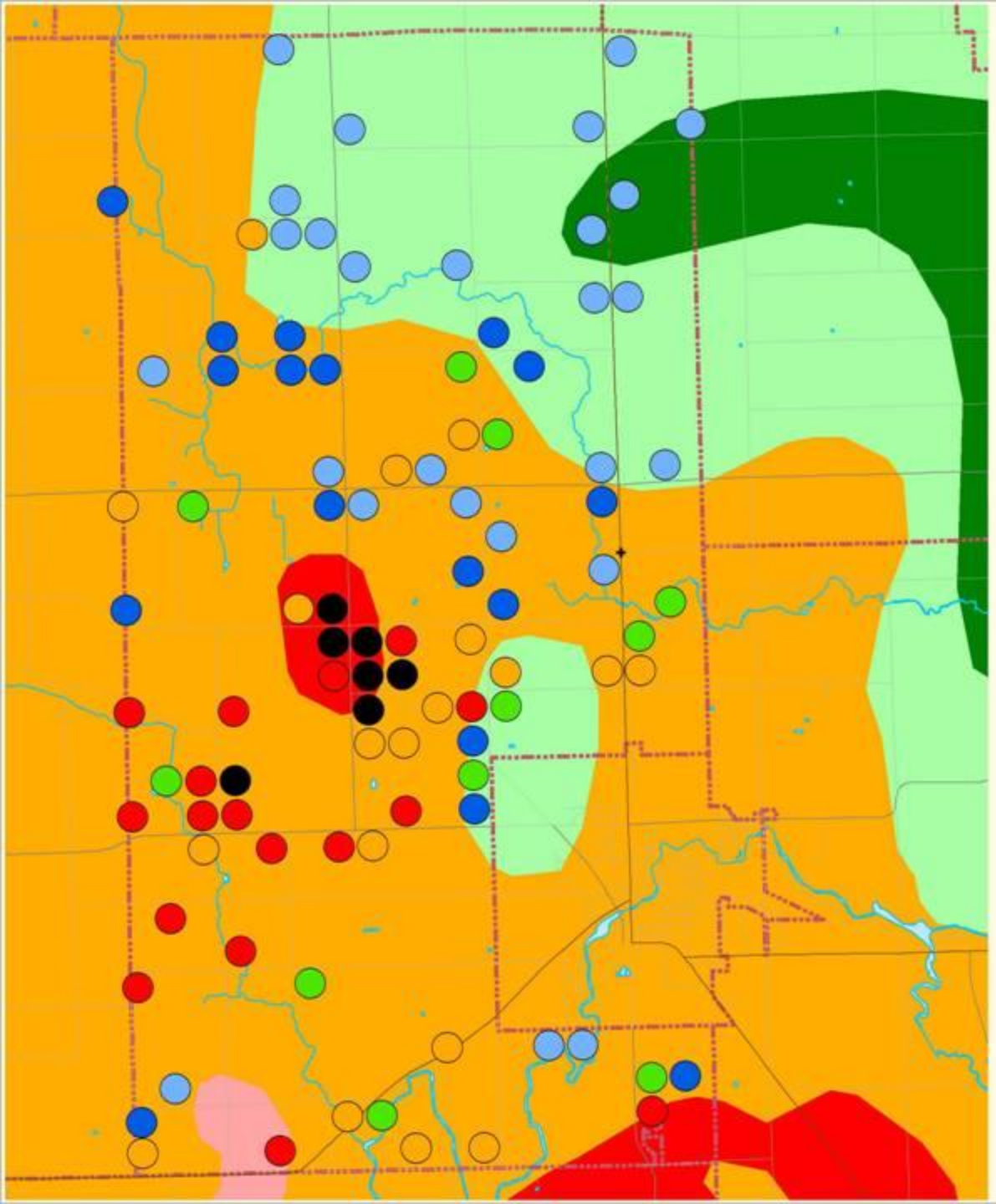
Land Use:

- Urban
- Agriculture
- Forest
- Shrub-Grass
- Wetland
- Water
- Other

0 1 2 3 Miles



Groundwater Center
Center for Watershed Science and Education

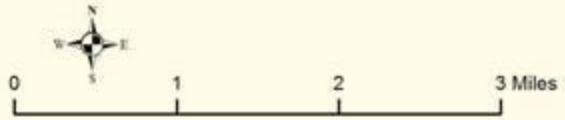


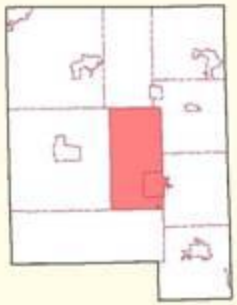
Chilton

Calumet County
June 2007

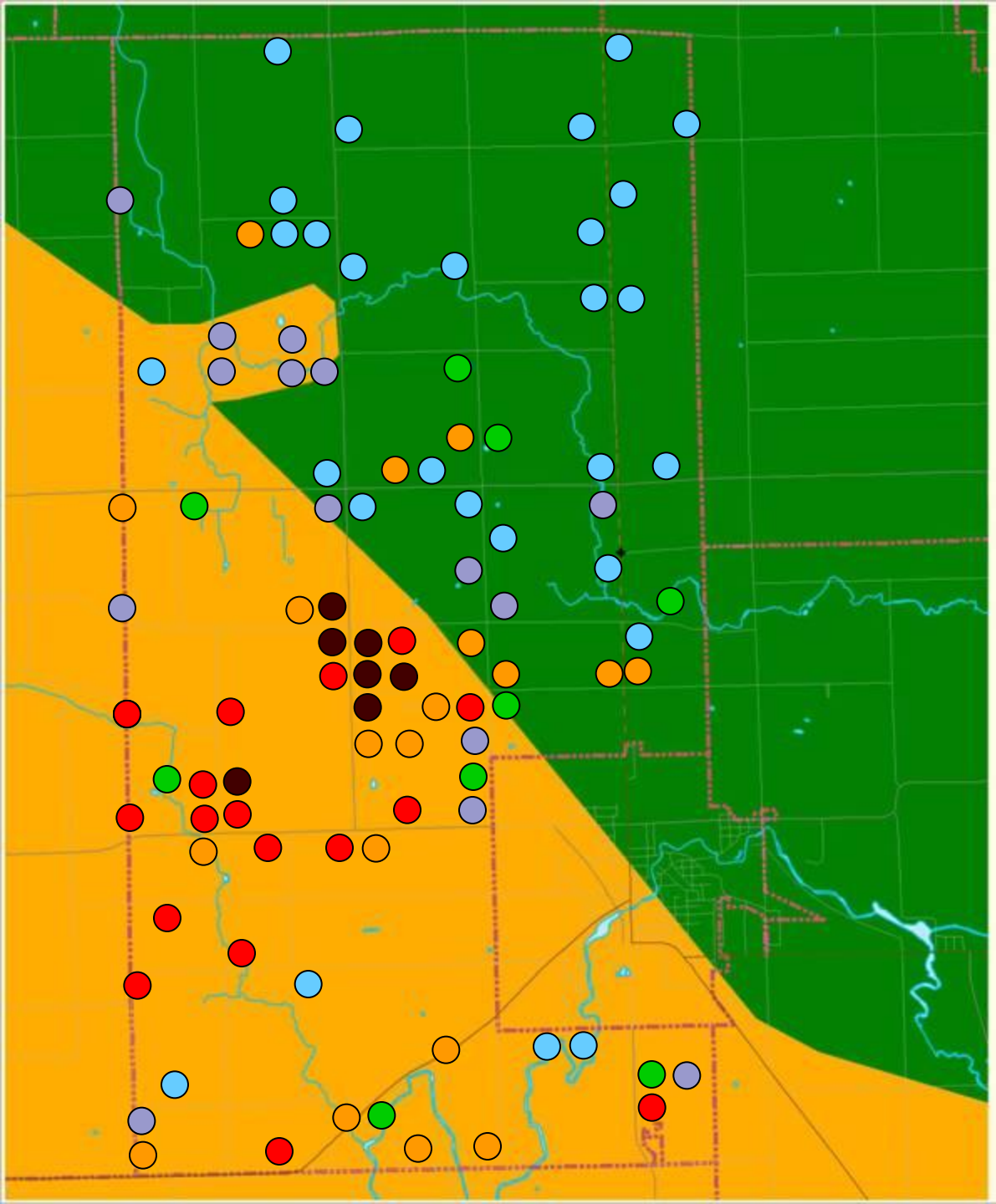
Depth to Bedrock:

- within 5 ft - more than 70% of area
- within 5 ft - 35 to 70% of area
- 5 to 50 ft
- 50 to 100 ft
- greater than 100 ft





Groundwater Center
Center for
Watershed Science
and Education



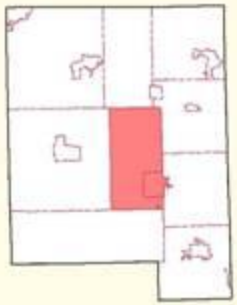
Chilton

Calumet County
June 2007

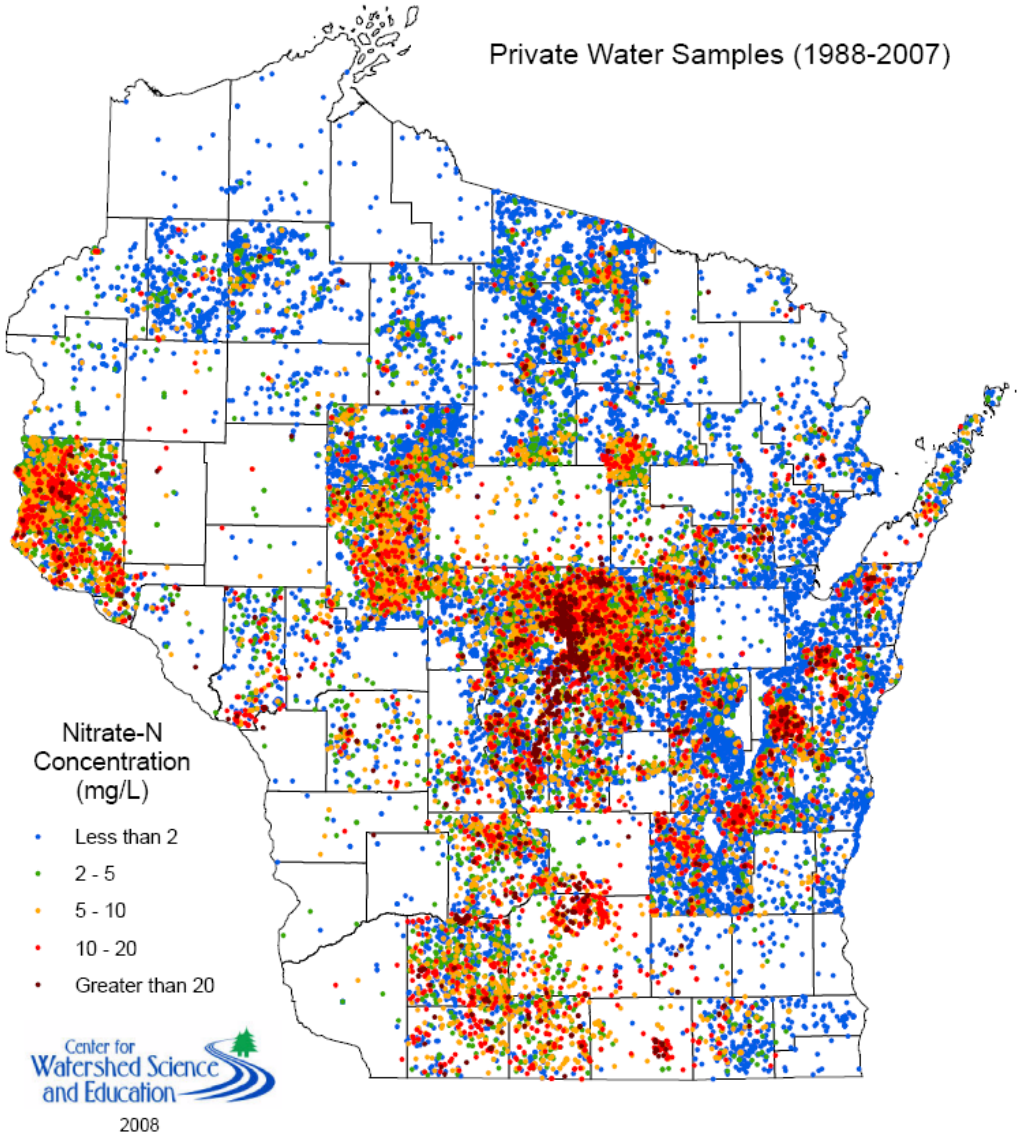
Surficial Deposits:

- Sand & Gravel
- Sand
- Peat
- Loam
- Clay

0 1 2 3 Miles

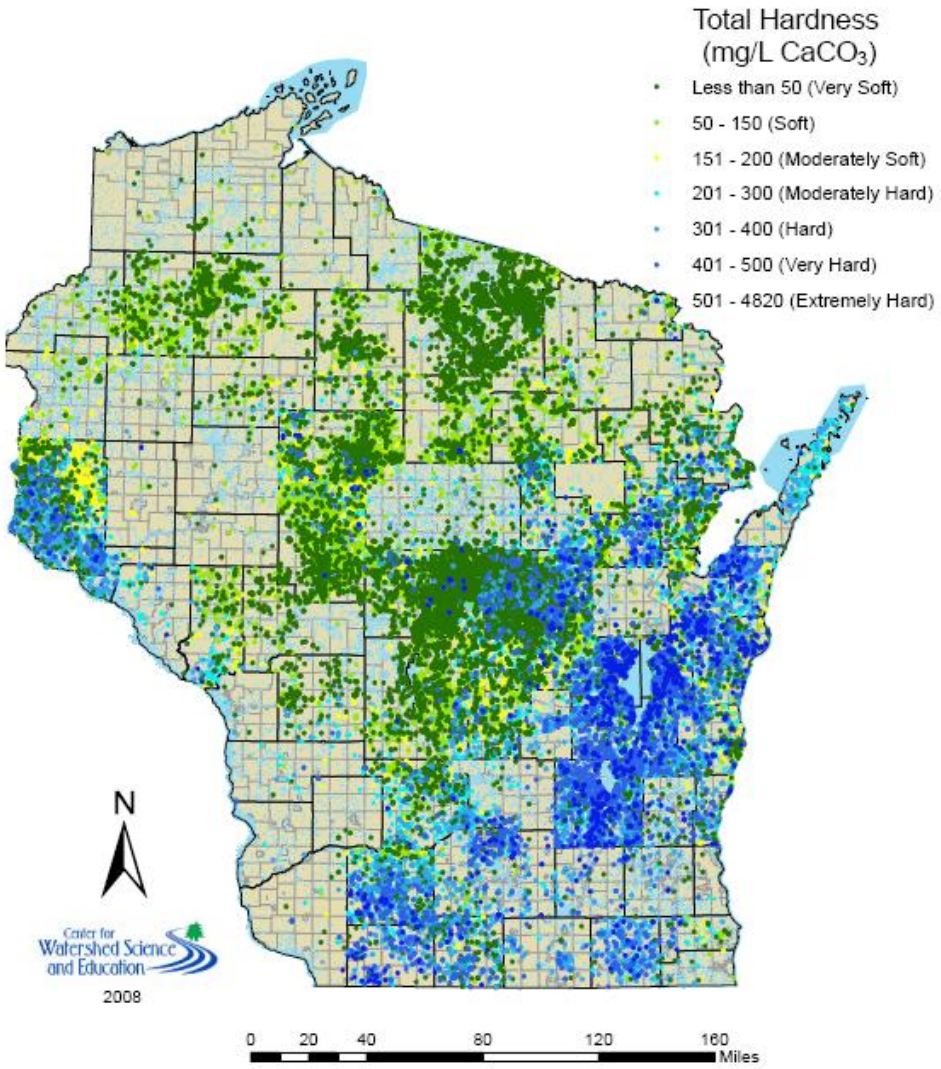


Groundwater Center
Center for Watershed Science and Education



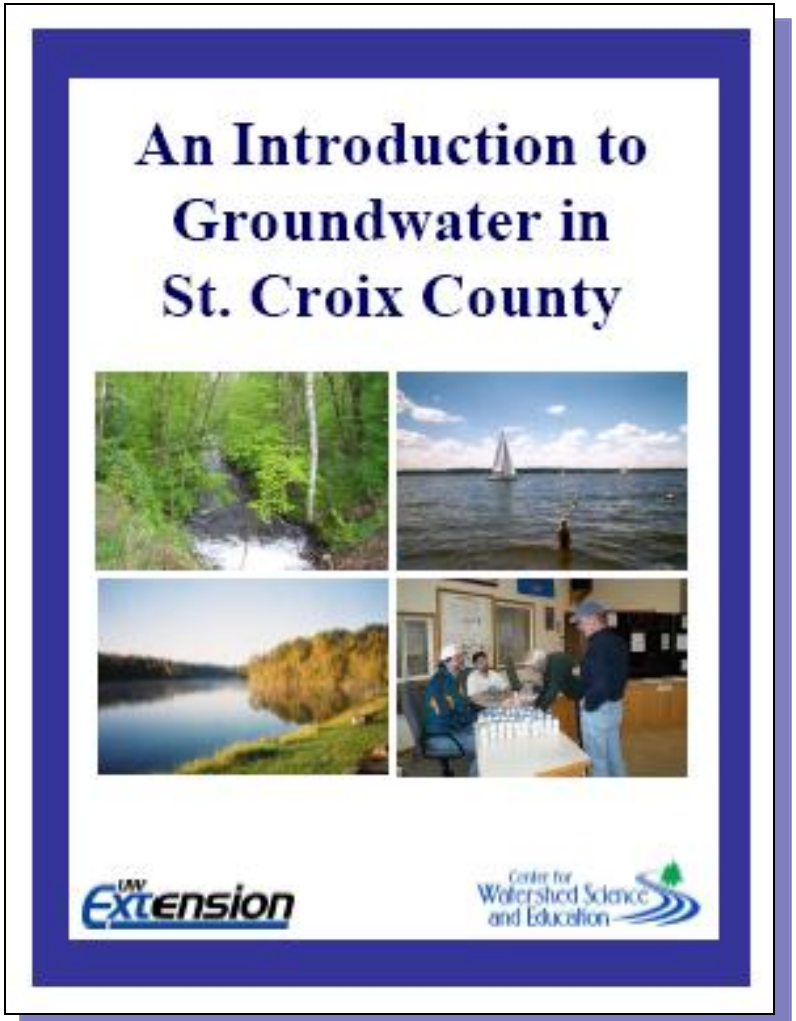
Disclaimer: This map represents data in the Center for Watershed Science and Education database. It does not represent all known private well tests and does not represent a scientifically conducted study.

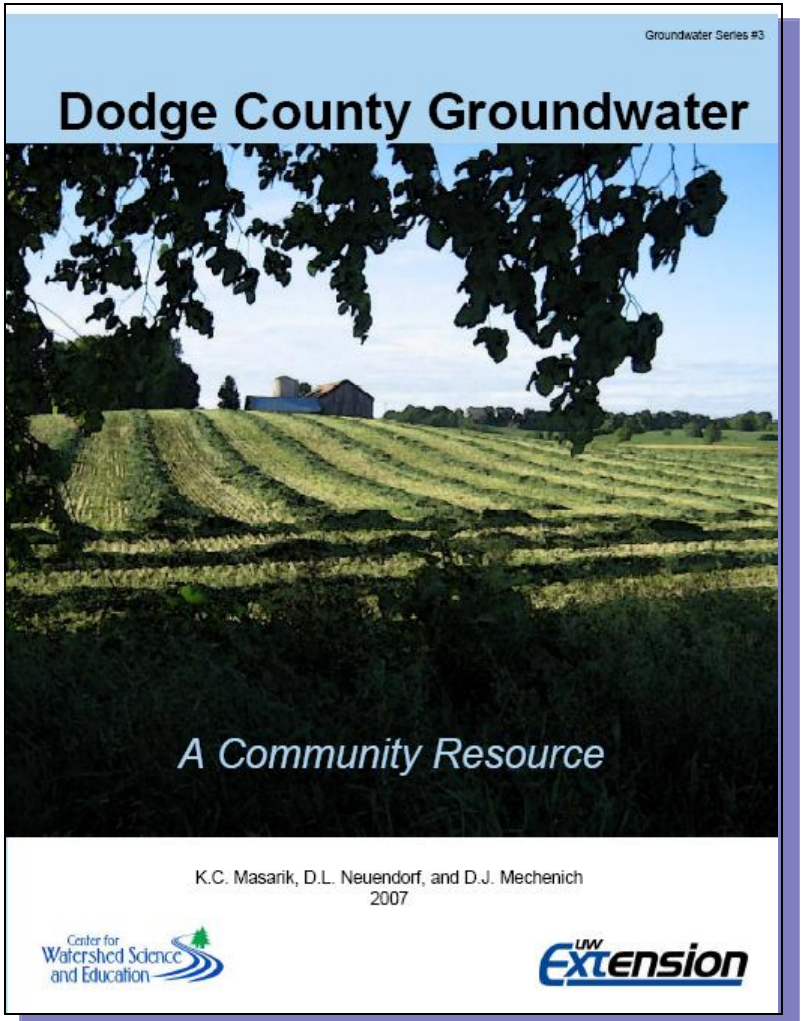
Private Well Samples (1988-2007)



Disclaimer: This map represents voluntarily submitted private well samples in the Center for Watershed Science and Education's database. It does not represent all private wells and does not represent a scientifically conducted study.

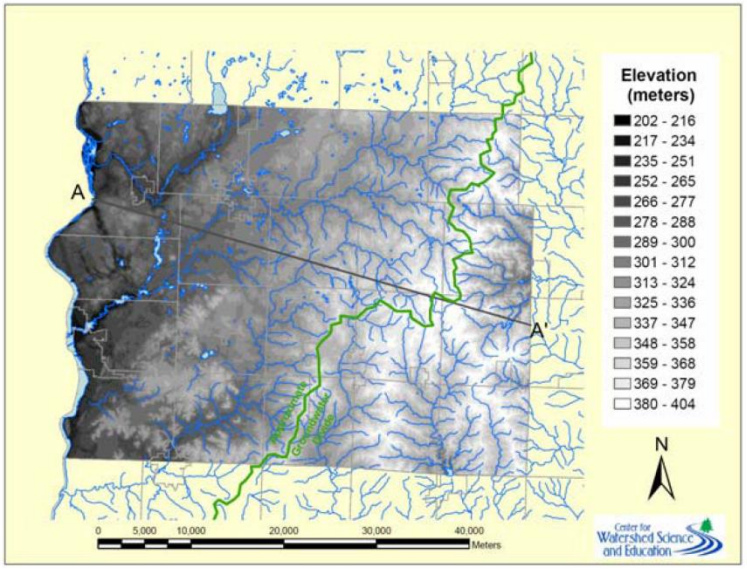
Taking it one step further…..

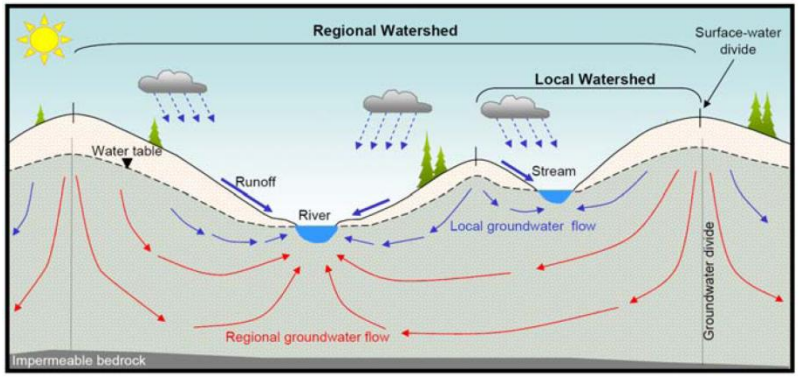


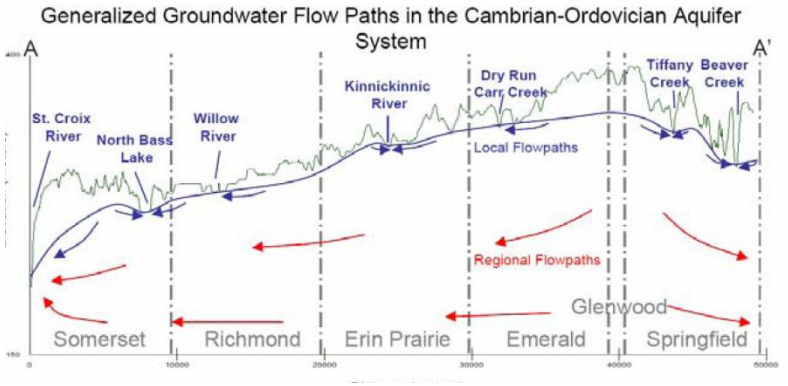


Groundwater Summary:

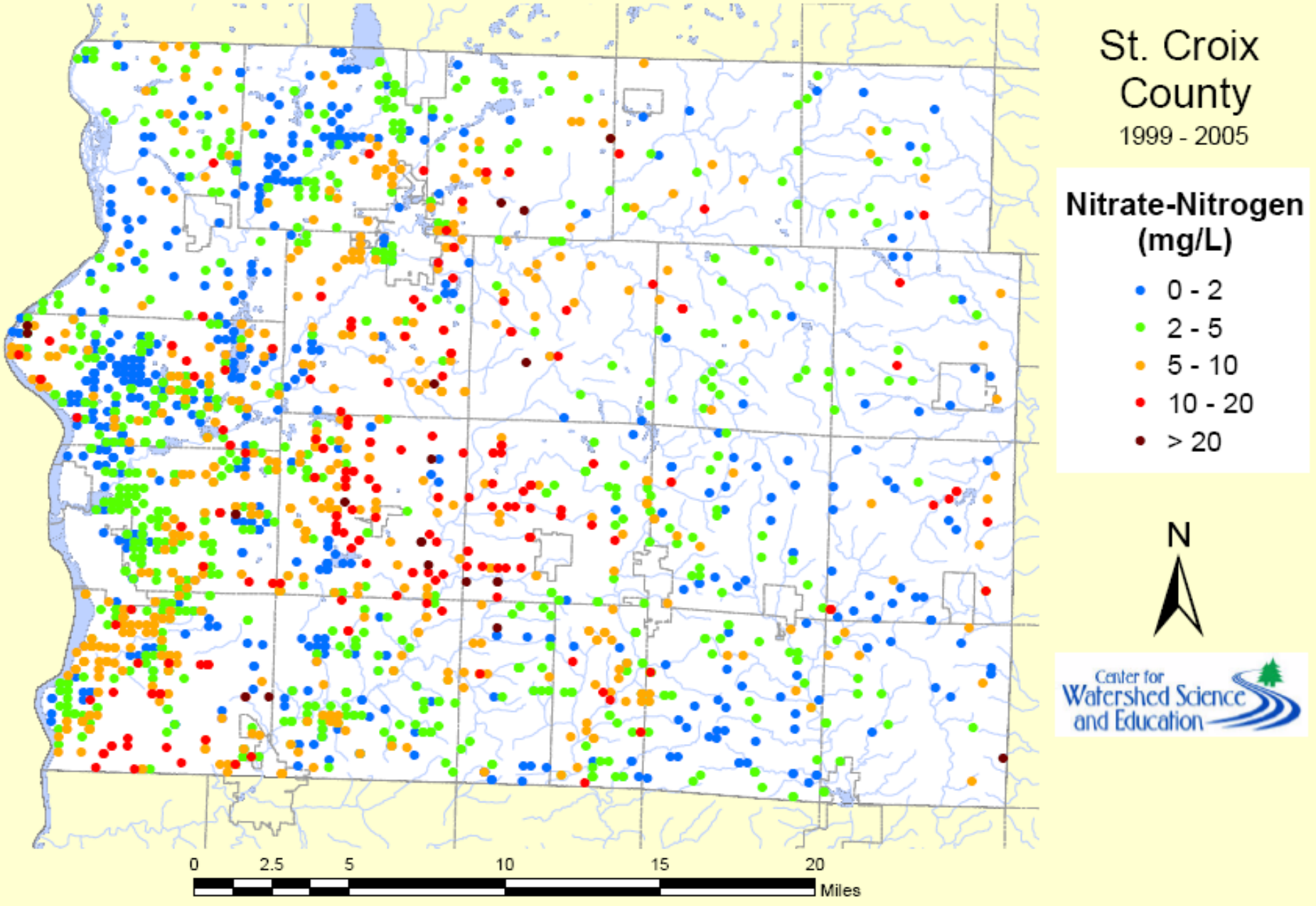
- Groundwater basics
- County-wide maps
  - Land-use
  - Geology
  - Water test results
- Trends
- Interpretation of results
- Information on sources of pollutants

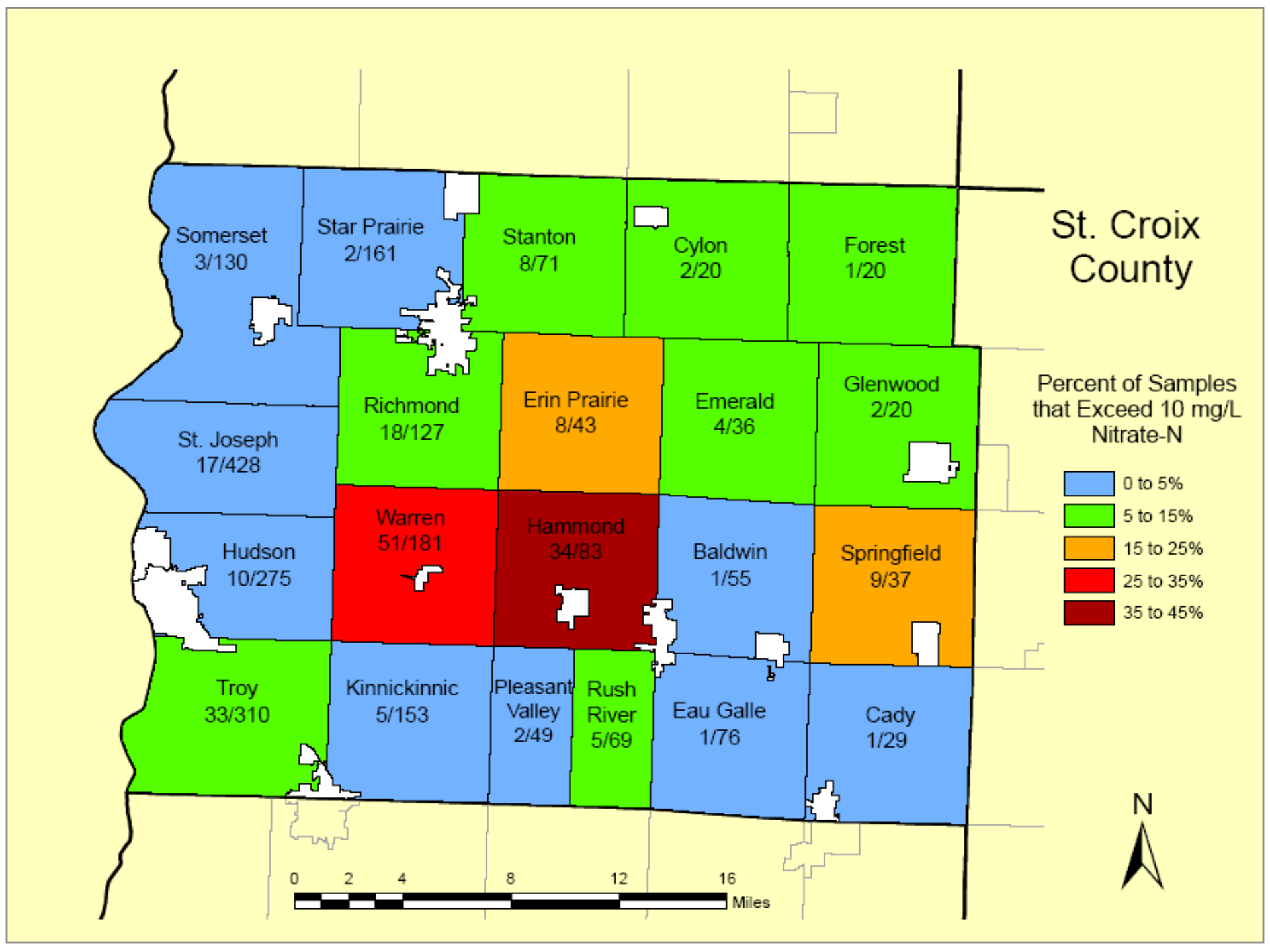




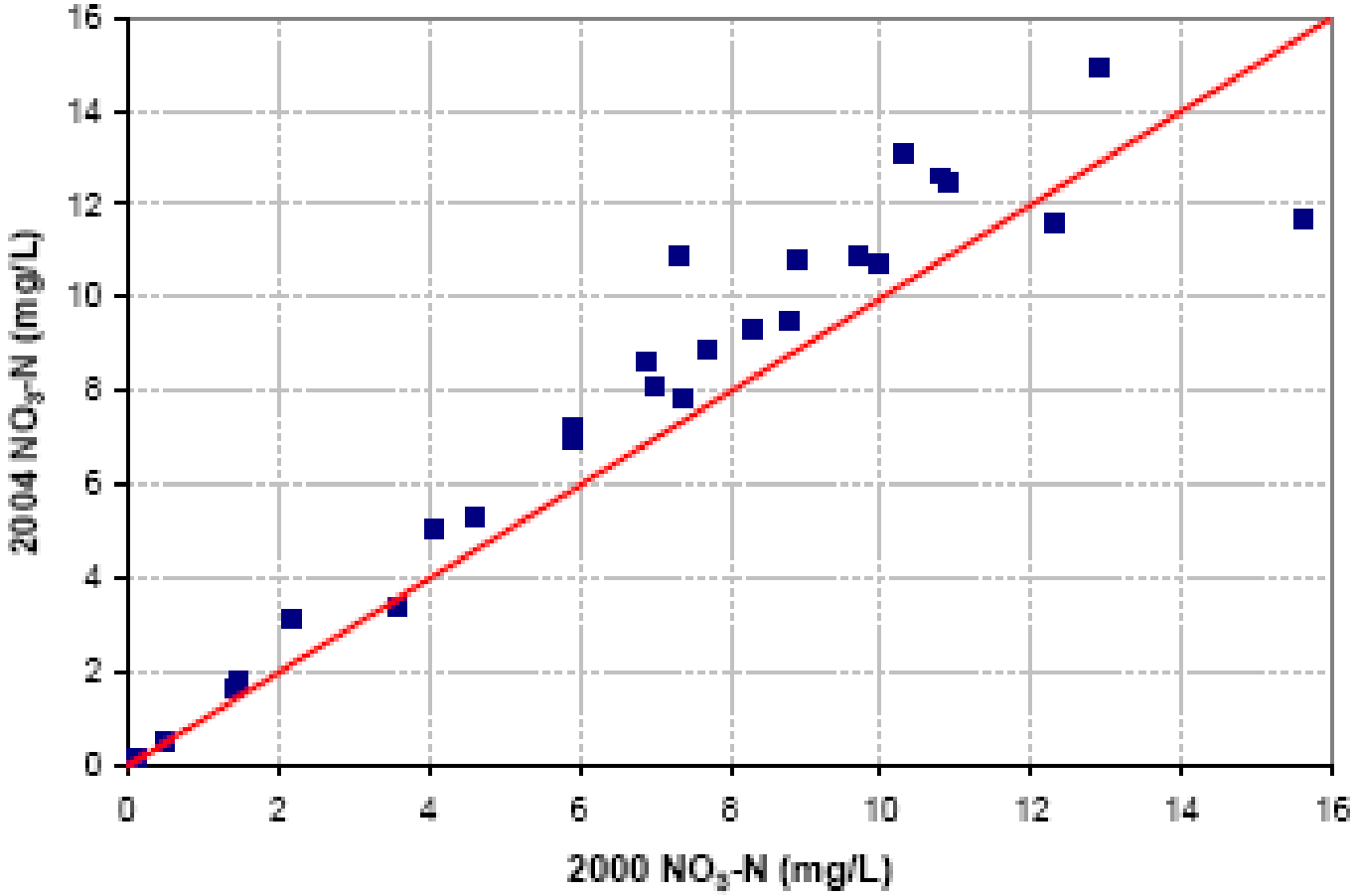


Provides information for the County to assess groundwater quality and plan for protection, management and education.


St. Croix County
1999 - 2005
Nitrate-Nitrogen (mg/L)
0 - 2
2 - 5
5 - 10
10 - 20
> 20
N
Center for Watershed Science and Education
0
2.5
5
10
15
20
Miles

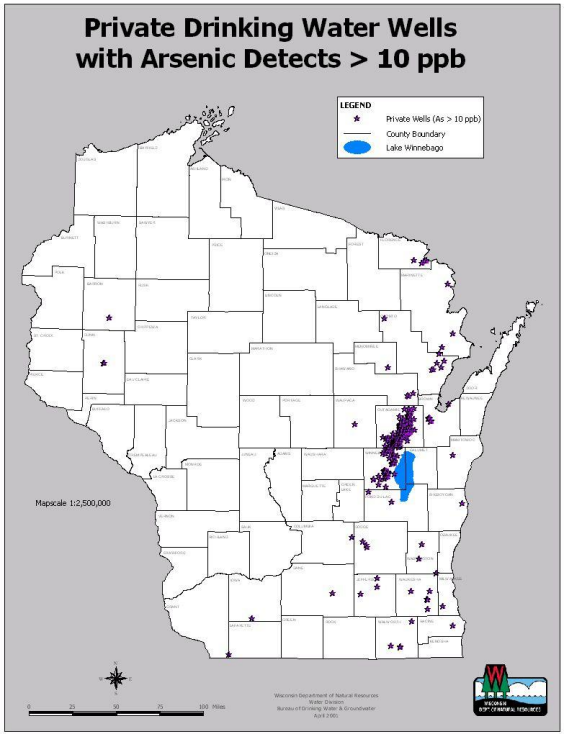

St. Croix County
Somerset 3/130
Star Prairie 2/161
Stanton 8/71
Cylon 2/20
Forest 1/20
Richmond 18/127
Erin Prairie 8/43
Emerald 4/36
Glenwood 2/20
St. Joseph 17/428
Warren 51/181
Hammond 34/83
Baldwin 1/55
Springfield 9/37
Hudson 10/275
Troy 33/310
Kinnickinnic 5/153
Pleasant Valley 2/49
Rush River 5/69
Eau Galle 1/76
Cady 1/29
Percent of Samples that Exceed 10 mg/L Nitrate-N
0 to 5%
5 to 15%
15 to 25%
25 to 35%
35 to 45%
N
0 2 4 8 12 16
Miles

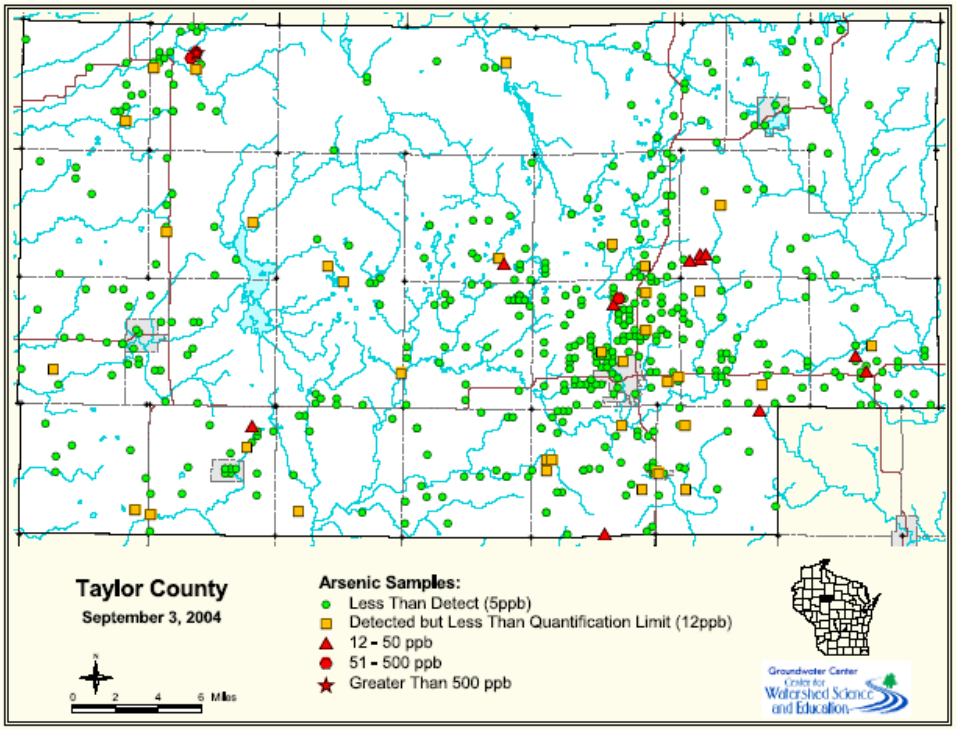
Trends in Groundwater Quality



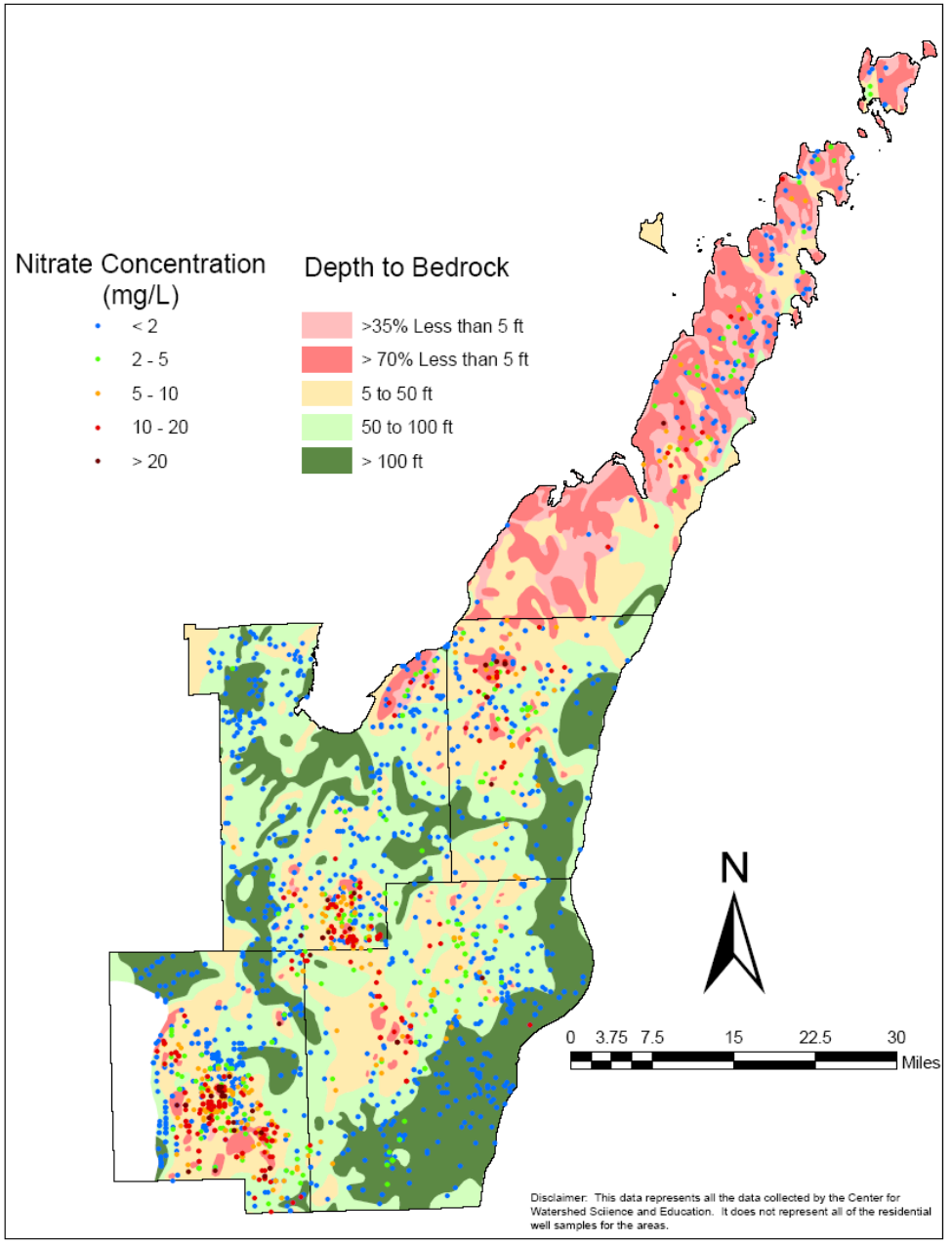
Arsenic

- Testing programs have helped us identify other arsenic areas of concern.





Identify Regional Issues



Community Water Testing Programs

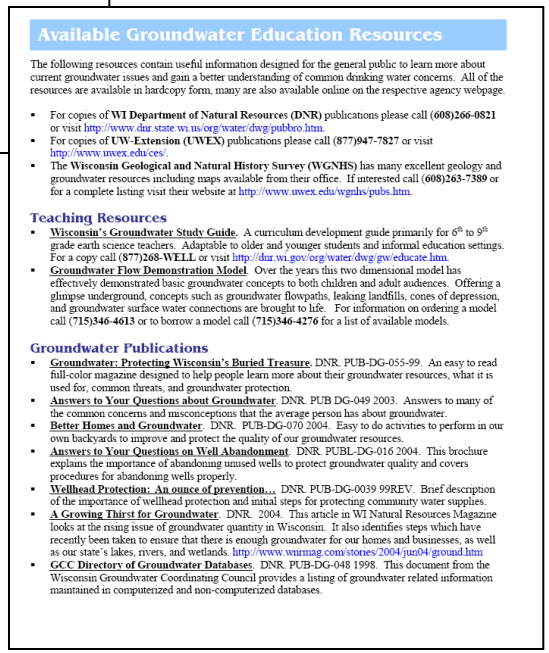
- For more information on organizing one of these programs go to:

  http://www.uwsp.edu/cnr/watersheds

  Reports for the following counties:
  - Iowa
  - St. Croix
  - Dodge
  - More on the way…

Additional Groundwater Resources

- Wisconsin Groundwater Directory
  - Agency responsibilities and contact information
  - Educational Resources (ex. pub., factsheets, videos)



Available Groundwater Education Resources

The following resources contain useful information designed for the general public to learn more about current groundwater issues and gain a better understanding of common drinking water concerns. All of the resources are available in hardcopy form, many are also available online on the respective agency webpage.

- For copies of **WI Department of Natural Resources (DNR)** publications please call **(608)266-0821** or visit http://www.dnr.state.wi.us/org/water/dwg/pubbro.htm.
- For copies of **UW-Extension (UWEX)** publications please call **(877)947-7827** or visit http://www.uwex.edu/ces/.
- The **Wisconsin Geological and Natural History Survey (WGNHS)** has many excellent geology and groundwater resources including maps available from their office. If interested call **(608)263-7389** or for a complete listing visit their website at http://www.uwex.edu/wgnhs/pubs.htm.

Teaching Resources

- **Wisconsin's Groundwater Study Guide.** A curriculum development guide primarily for 6th to 9th grade earth science teachers. Adaptable to older and younger students and informal education settings. For a copy call **(877)268-WELL** or visit http://dnr.wi.gov/org/water/dwg/gw/educate.htm.
- **Groundwater Flow Demonstration Model**. Over the years this two dimensional model has effectively demonstrated basic groundwater concepts to both children and adult audiences. Offering a glimpse underground, concepts such as groundwater flowpaths, leaking landfills, cones of depression, and groundwater surface water connections are brought to life. For information on ordering a model call **(715)346-4613** or to borrow a model call **(715)346-4276** for a list of available models.

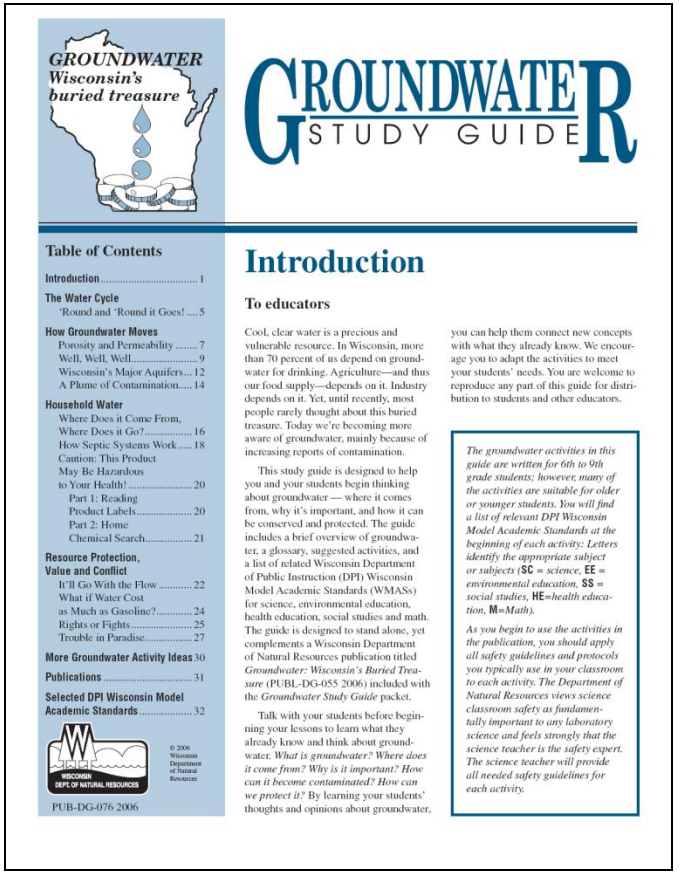
Groundwater Publications

- **Groundwater: Protecting Wisconsin's Buried Treasure.** DNR. PUB-DG-055-99. An easy to read full-color magazine designed to help people learn more about their groundwater resources, what it is used for, common threats, and groundwater protection.
- **Answers to Your Questions about Groundwater**. DNR. PUB DG-049 2003. Answers to many of the common concerns and misconceptions that the average person has about groundwater.
- **Better Homes and Groundwater**. DNR. PUB-DG-070 2004. Easy to do activities to perform in our own backyards to improve and protect the quality of our groundwater resources.
- **Answers to Your Questions on Well Abandonment**. DNR. PUBL-DG-016 2004. This brochure explains the importance of abandoning unused wells to protect groundwater quality and covers procedures for abandoning wells properly.
- **Wellhead Protection: An ounce of prevention…** DNR. PUB-DG-0039 99REV. Brief description of the importance of wellhead protection and initial steps for protecting community water supplies.
- **A Growing Thirst for Groundwater**. DNR. 2004. This article in WI Natural Resources Magazine looks at the rising issue of groundwater quantity in Wisconsin. It also identifies steps which have recently been taken to ensure that there is enough groundwater for our homes and businesses, as well as our state's lakes, rivers, and wetlands. http://www.wnrmag.com/stories/2004/jun04/ground.htm
- **GCC Directory of Groundwater Databases**. DNR. PUB-DG-048 1998. This document from the Wisconsin Groundwater Coordinating Council provides a listing of groundwater related information maintained in computerized and non-computerized databases.

http://dnr.wi.gov/org/water/dwg/gcc/gwinfodirectory.pdf

Additional Groundwater Resources

- Groundwater Study Guide
  - Groundwater activities for grades K – 12
  - Water cycle posters
  - Worksheets
  - Buried Treasure Publ.



GROUNDWATER
Wisconsin's buried treasure

GROUNDWATER STUDY GUIDE

Table of Contents

WISCONSIN DEPT OF NATURAL RESOURCES

PUB-DG-076 2006

Introduction

To educators

Cool, clear water is a precious and vulnerable resource. In Wisconsin, more than 70 percent of us depend on groundwater for drinking. Agriculture—and thus our food supply—depends on it. Industry depends on it. Yet, until recently, most people rarely thought about this buried treasure. Today we're becoming more aware of groundwater, mainly because of increasing reports of contamination.

This study guide is designed to help you and your students begin thinking about groundwater — where it comes from, why it's important, and how it can be conserved and protected. The guide includes a brief overview of groundwater, a glossary, suggested activities, and a list of related Wisconsin Department of Public Instruction (DPI) Wisconsin Model Academic Standards (WMASs) for science, environmental education, health education, social studies and math. The guide is designed to stand alone, yet complements a Wisconsin Department of Natural Resources publication titled *Groundwater: Wisconsin's Buried Treasure* (PUBL-DG-055 2006) included with the *Groundwater Study Guide* packet.

Talk with your students before beginning your lessons to learn what they already know and think about groundwater. *What is groundwater? Where does it come from? Why is it important? How can it become contaminated? How can we protect it?* By learning your students' thoughts and opinions about groundwater, you can help them connect new concepts with what they already know. We encourage you to adapt the activities to meet your students' needs. You are welcome to reproduce any part of this guide for distribution to students and other educators.

*The groundwater activities in this guide are written for 6th to 9th grade students; however, many of the activities are suitable for older or younger students. You will find a list of relevant DPI Wisconsin Model Academic Standards at the beginning of each activity: Letters identify the appropriate subject or subjects (***SC** *= science,* **EE** *= environmental education,* **SS** *= social studies,* **HE***=health education,* **M***=Math).*

As you begin to use the activities in the publication, you should apply all safety guidelines and protocols you typically use in your classroom to each activity. The Department of Natural Resources views science classroom safety as fundamentally important to any laboratory science and feels strongly that the science teacher is the safety expert. The science teacher will provide all needed safety guidelines for each activity.

http://dnr.wi.gov/org/water/dwg/gw/educate.htm

Additional Groundwater Resources

- Sand-tank groundwater flow model.
- Teacher Workshops
  - Teachers can apply to attend workshop and obtain a free model.
  - Applications available online and are due by Nov. 1

http://dnr.wi.gov/org/water/dwg/gw/educate.htm

Questions?

- Kevin Masarik
  Groundwater Education Specialist
  UWEX/UWSP
  715-346-4276
  kmasarik@uwsp.edu