

Drinking Water Education Program

St. Croix County
Town of St. Joseph

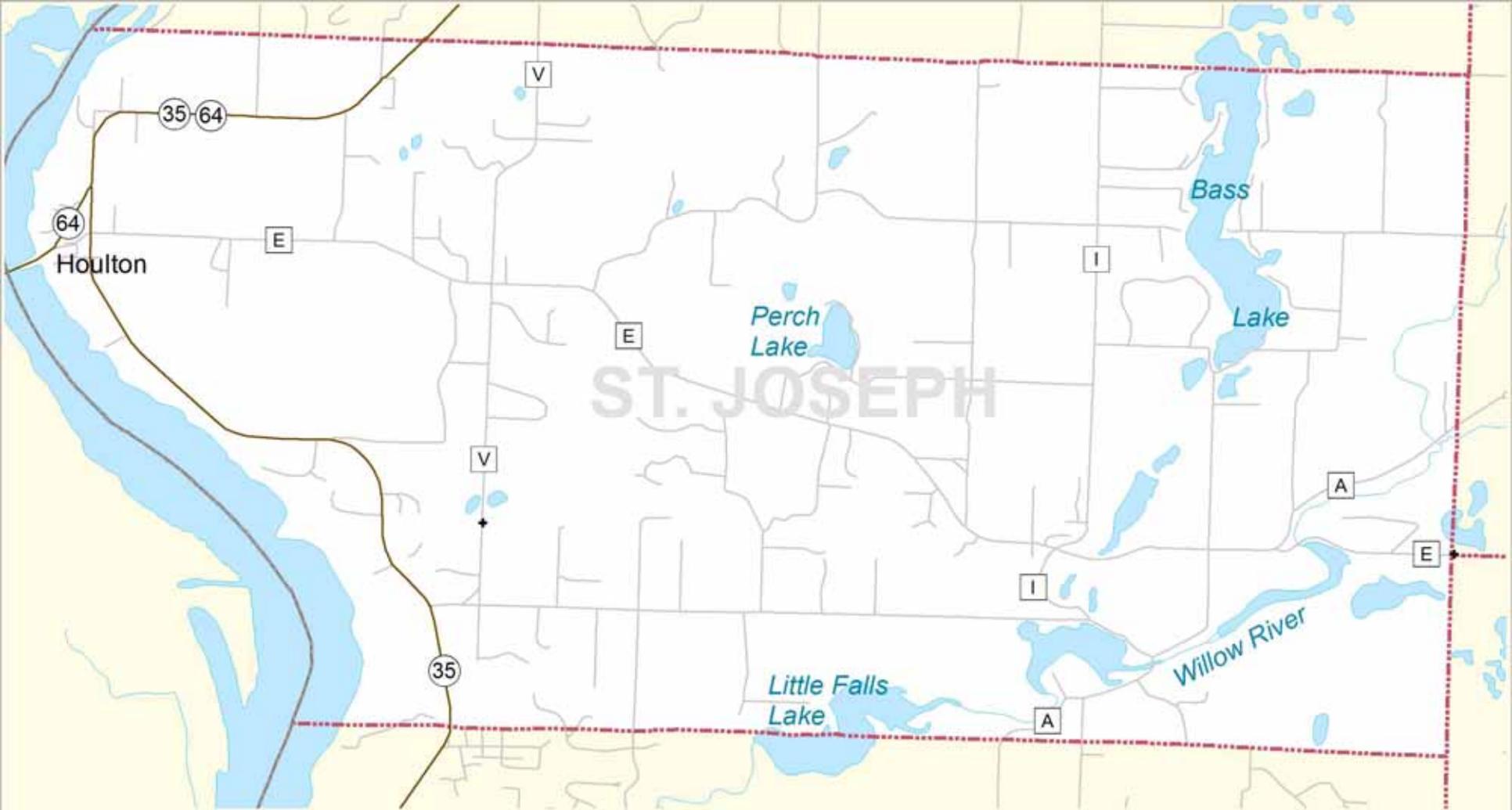
Sponsored by:

- **Town of St. Joseph**
- **St. Croix County UW-Extension**
- **St. Croix County Land and Water
Conservation Department**
- **Center for Watershed Science and Education**

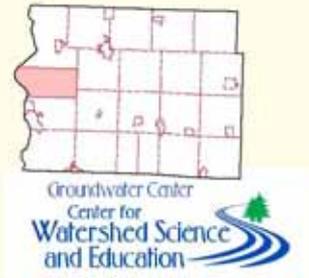


Today's presentation

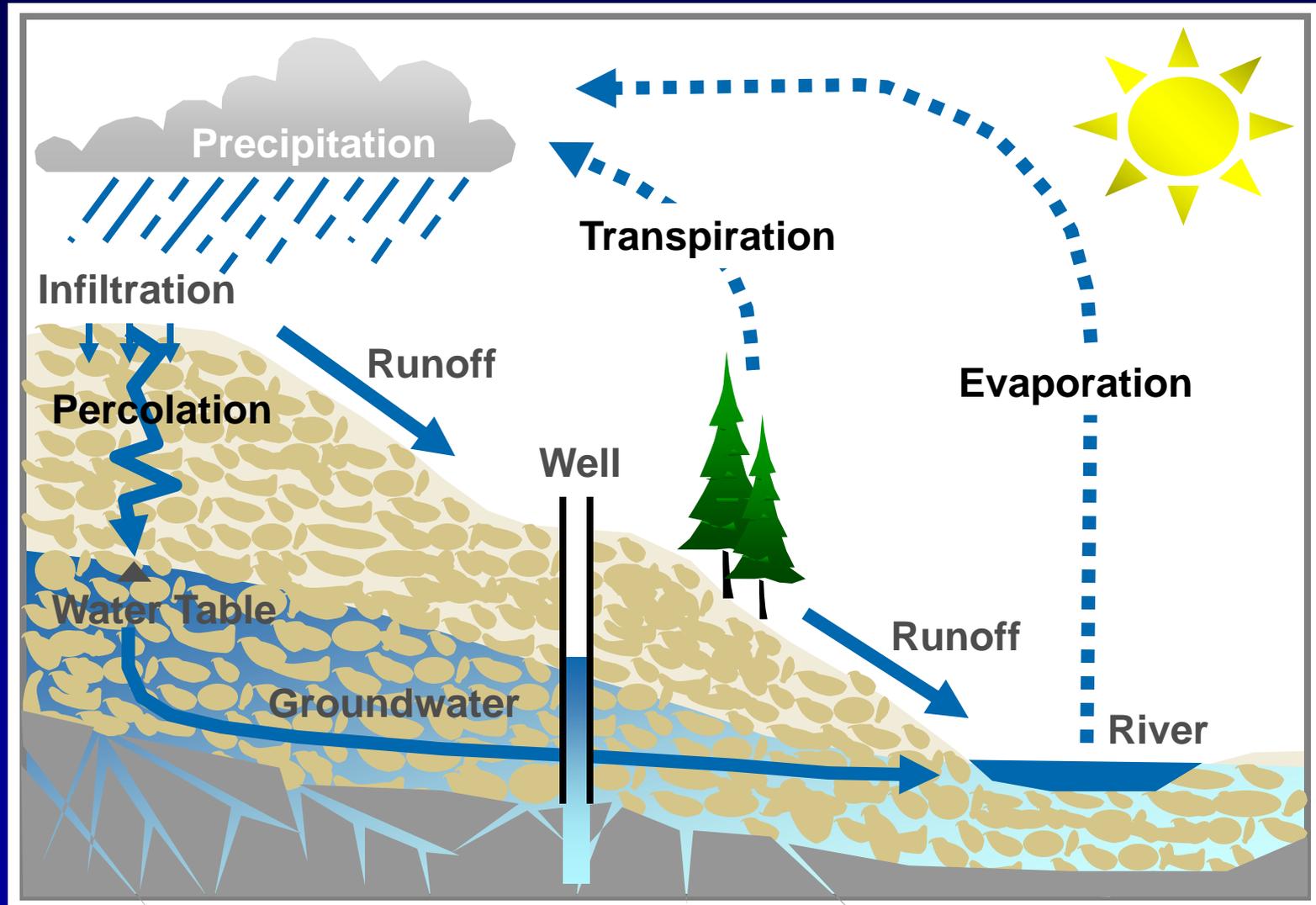
- What is groundwater and where does it come from?
- What do my individual test results mean?
- General groundwater quality in the Town of St. Joseph.
- Improving your water quality

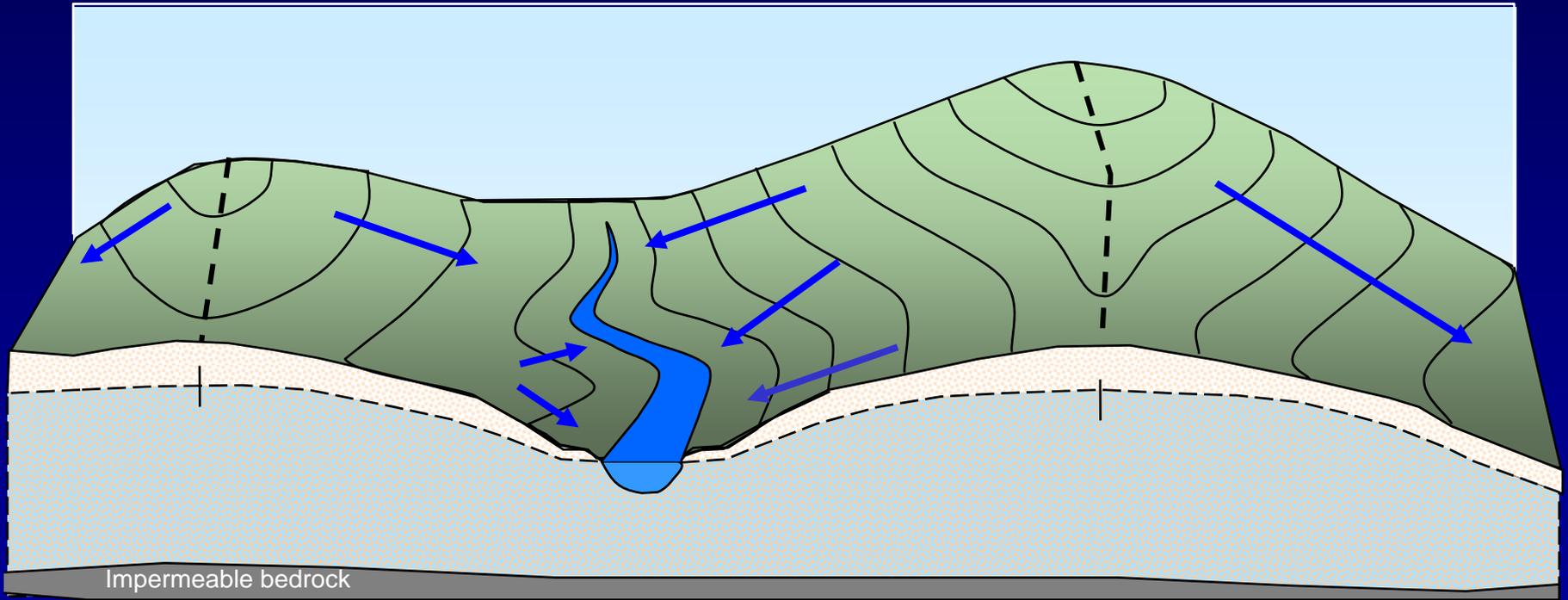


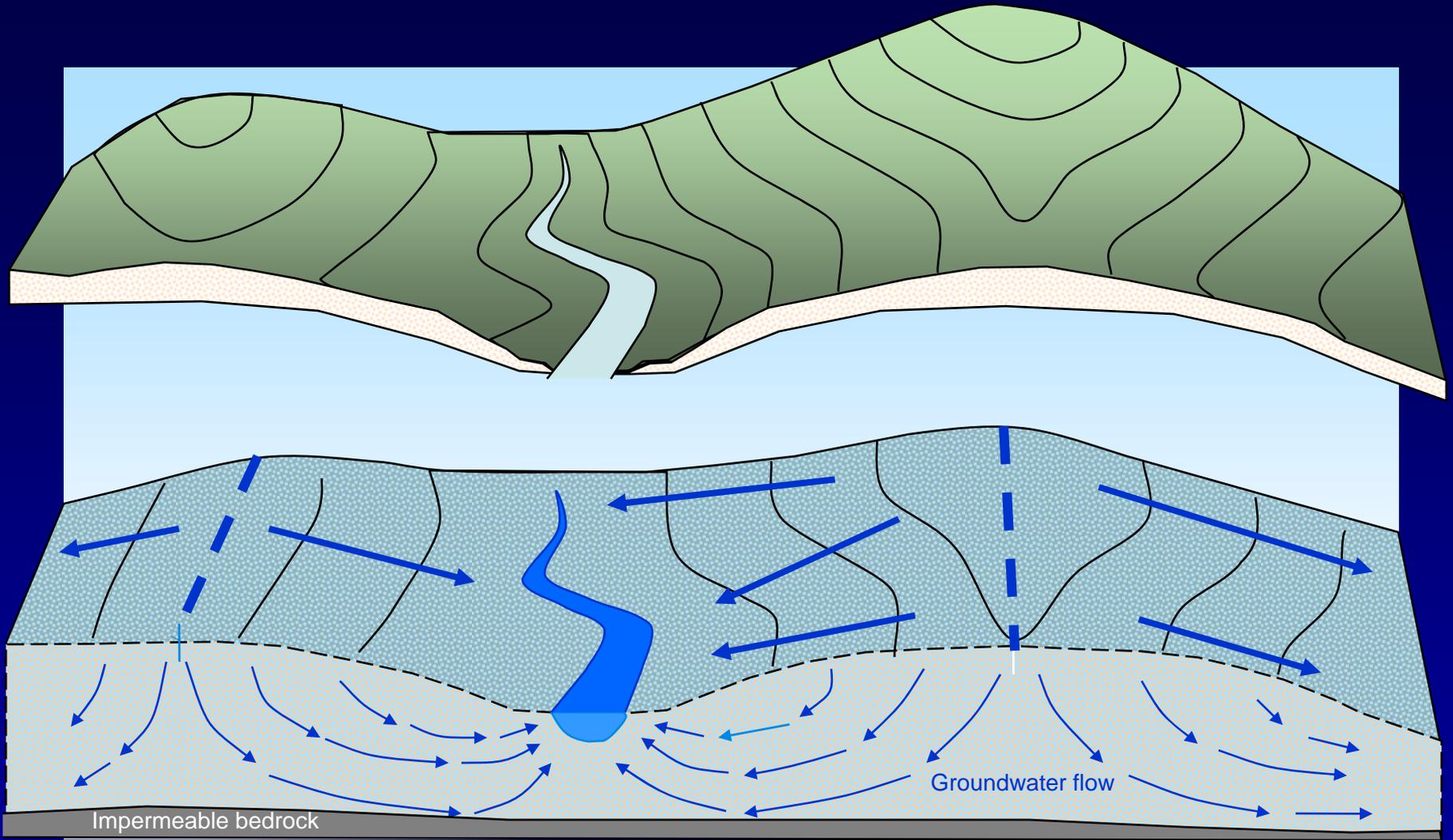
St. Joseph
 St. Croix County Oct 2007



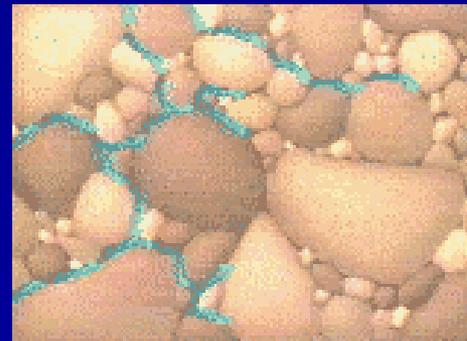
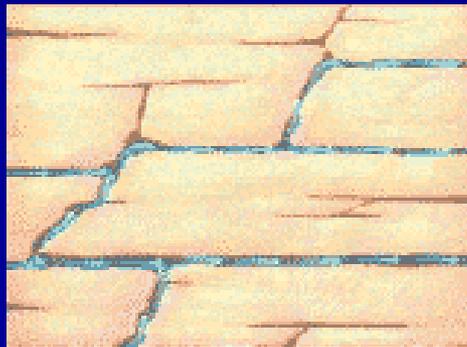
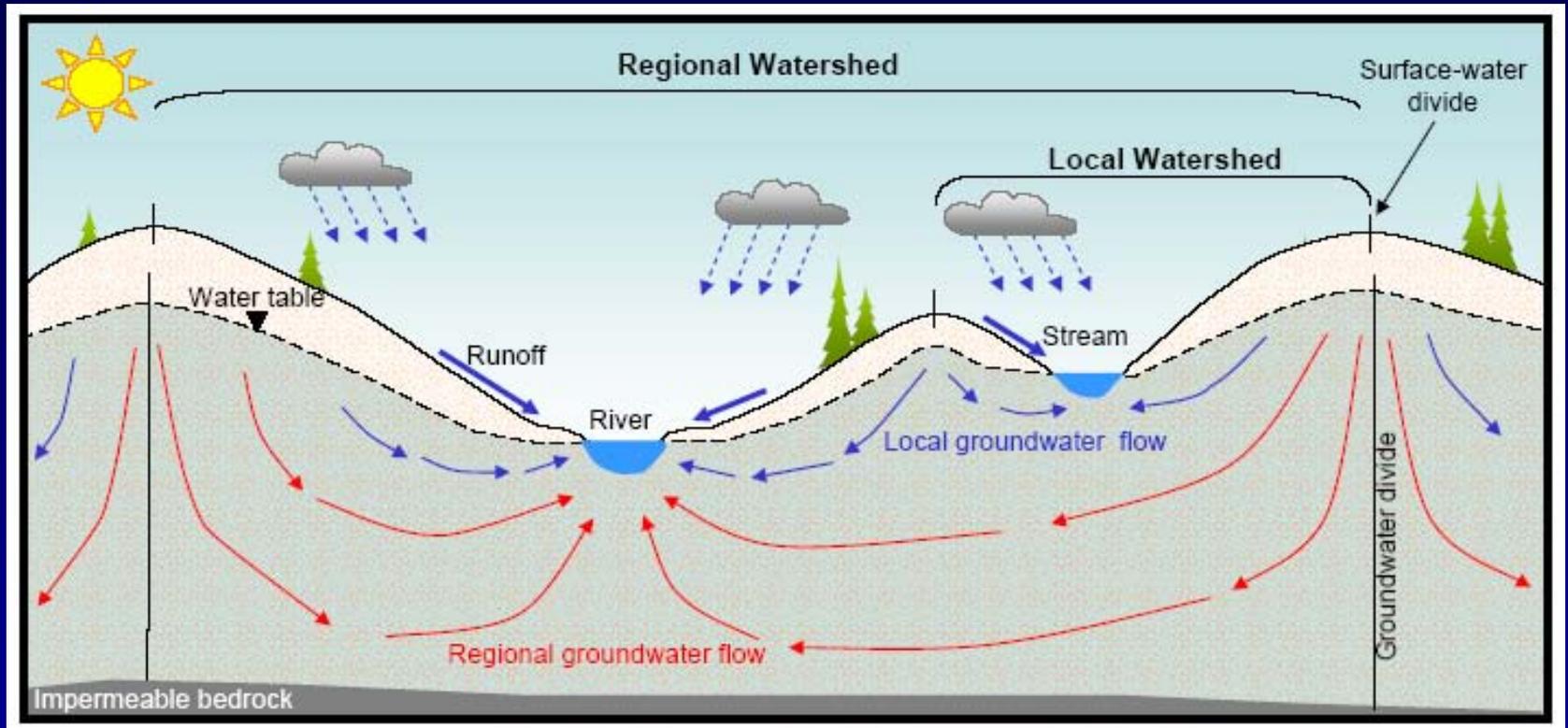
The Water Cycle



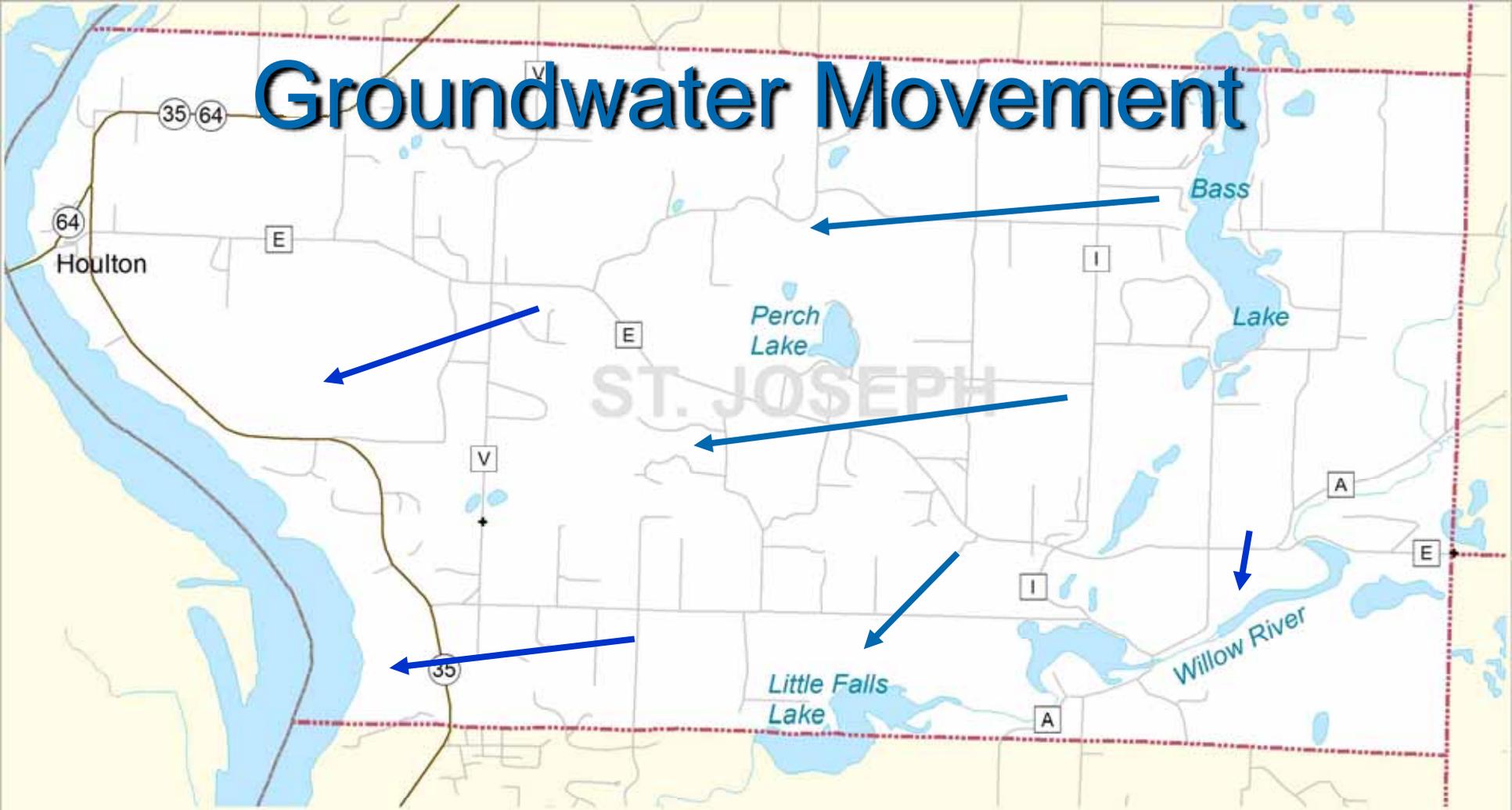




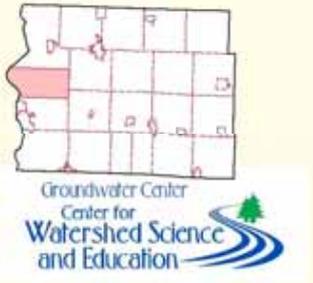
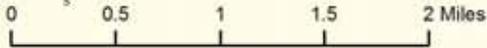
Groundwater Movement



Groundwater Movement

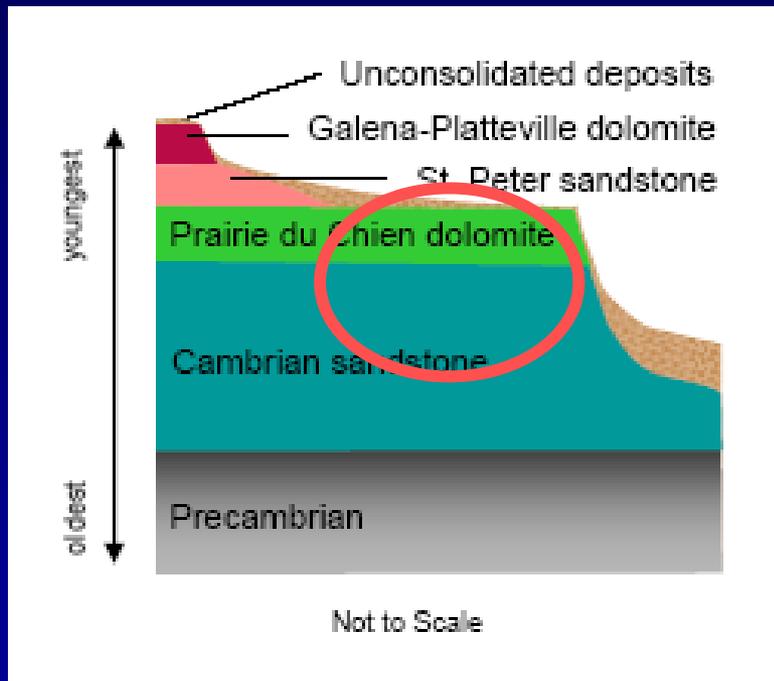


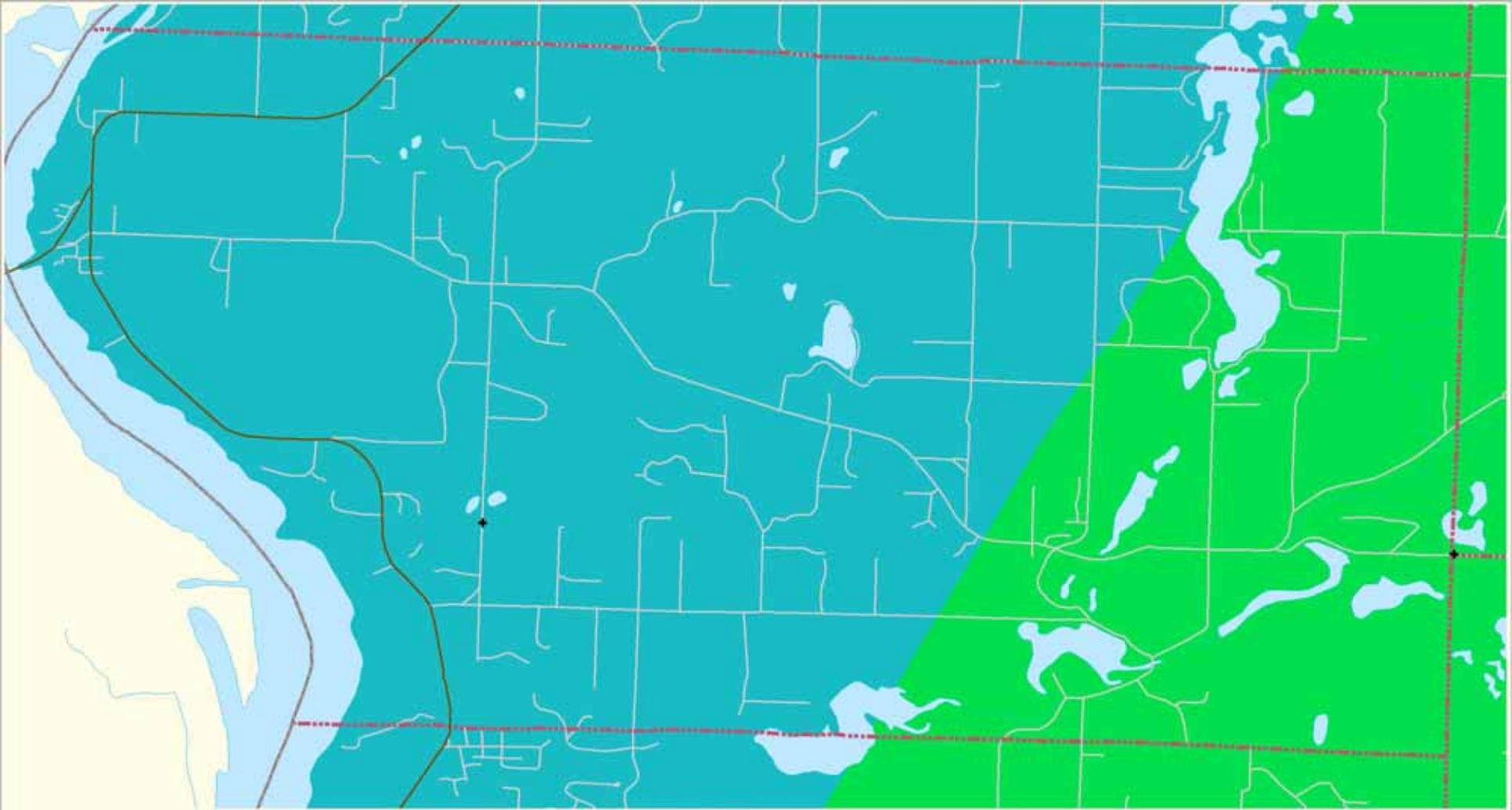
St. Joseph
St. Croix County Oct 2007



St. Croix County Geology

Aquifer – (n.) A water bearing geological formation.





St. Joseph
St. Croix County Oct 2007



Bedrock:
 Prairie du Chien dolomite
 Cambrian sandstone

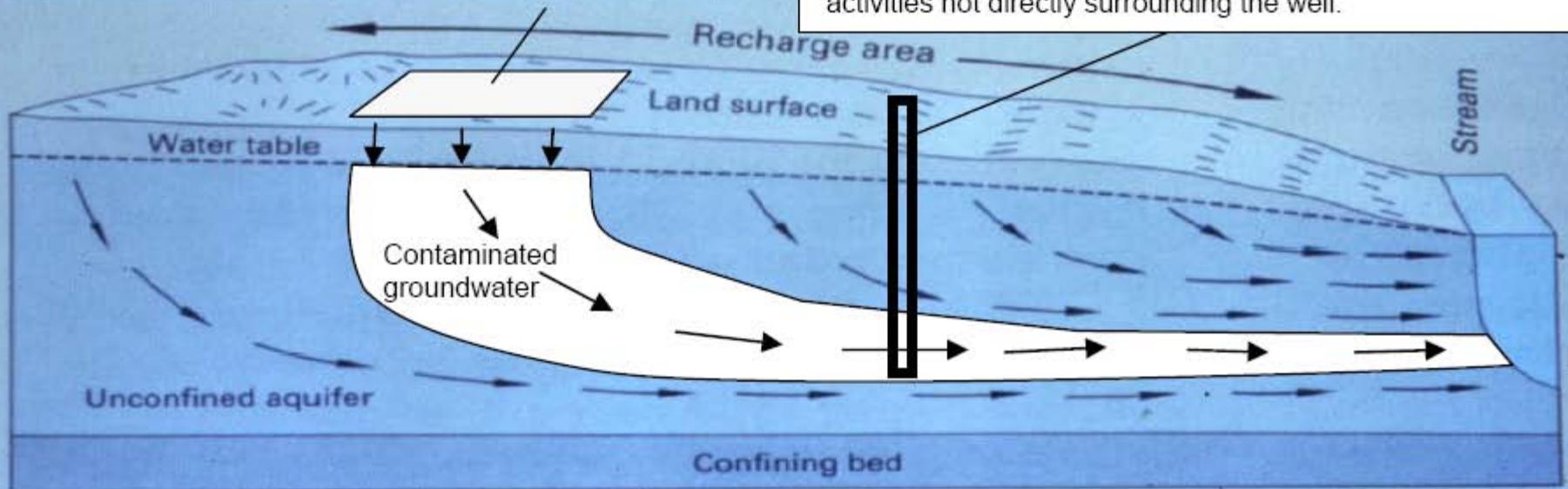


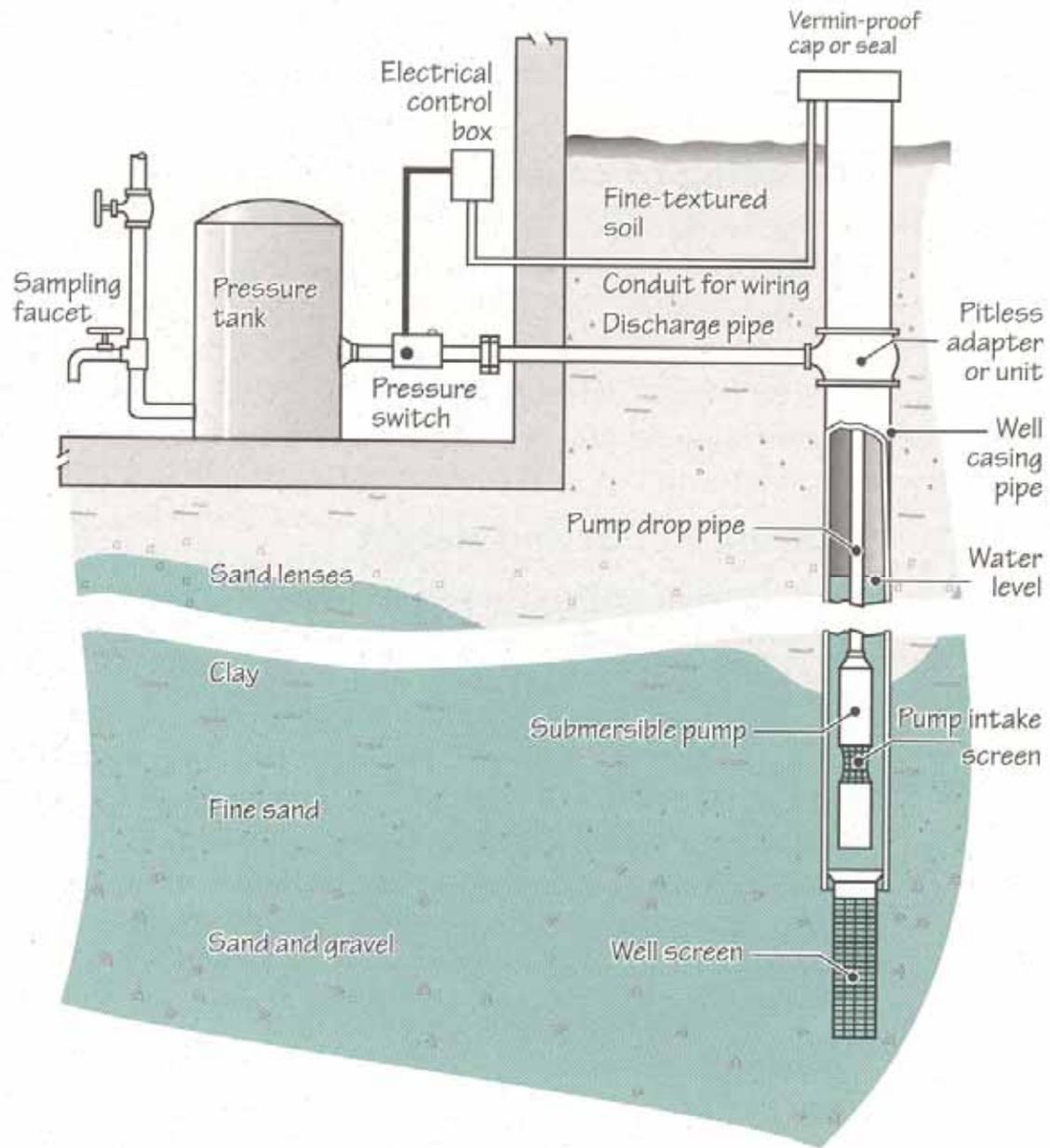


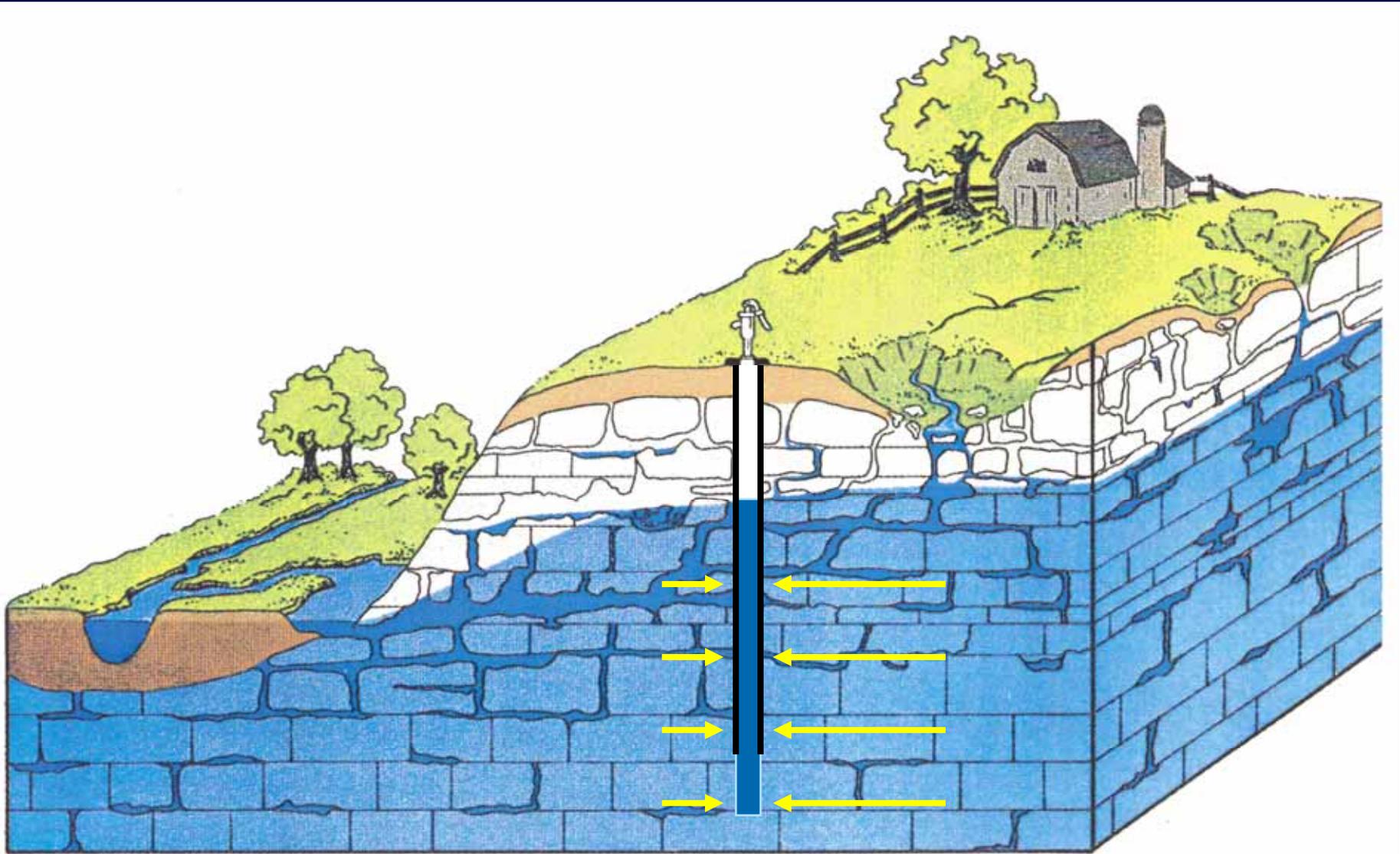
Soil

Land-use activity that pollutes groundwater.

Because groundwater moves, wells located far from the contamination source can sometimes be polluted from activities not directly surrounding the well.







Well Construction Report For
WISCONSIN UNIQUE WELL NUMBER CC 566

Property Owner: Clyde Nuenfeldt Telephone Number: _____
 Mailing Address: Rt 4
 City: Oshkosh State: WI Zip Code: _____
 County of Well Location: Winnebago Permit No.: W Well Completion Date: 9/2/69

Department of Natural Resources
 Private Water Supply - WS/2
 Box 7921
 Madison, WI 53707

SAMPLE

1. Location (Please type or print using a black pen.)
 Town City Village Fire # (if available): _____
 of Oshkosh
 Grid or Street Address or Road Name and Number (if available): _____
 Subdivision Name: _____ Lot #: _____ Block #: _____

Well Constructor (Business Name): Wallace Clark Registration #: _____
 Address: 5411 Ripon Rd
 City: Oshkosh State: WI Zip Code: _____

2. Mark well location in correct 40-acre parcel of section.
 N

		X		

 S
 W E

Gov't Lot # _____ or NE 1/4 of NE 1/4 of Section 26; T 19 N; R 16 W E W

3. Well Type New Replacement Reconstruction
 of unique well # _____ constructed in 19 _____
 Reason for new, replaced or reconstructed well? _____

4. Well serves 1 # of homes and/or (ex: barn, restaurant, church, school, industry, etc.) High Capacity Well? Yes No
 High Capacity Property? Yes No

5. Well Located on Highest Point of Property, Consistent with the General Layout and Surroundings? Yes No If no, explain on back side.
 Well Located in Floodplain? Yes No
 Distance in Feet From Well To Nearest:
 1. Landfill 100
 2. Building Overhang 50
 3. Septic or Holding Tank 110
 4. Sewage Absorption Unit 150
 5. Nonconforming Pit _____
 6. Buried Home Heating Oil Tank _____
 7. Buried Petroleum Tank _____
 8. Shoreline/Swimming Pool _____
 9. Downspout/Yard Hydrant _____
 10. Privy _____
 11. Foundation Drain to Clearwater _____
 12. Foundation Drain to Sewer _____
 13. Building Drain _____
 Cast Iron or Plastic Other
 14. Building Sewer Gravity Pressure Cast Iron or Plastic Other
 15. Collector or Street Sewer _____
 16. Clearwater Sump _____
 17. Wastewater Sump _____
 18. Paved Animal Barn Pen _____
 19. Animal Yard or Shelter _____
 20. Silo - Type _____
 21. Barn Gutter _____
 22. Manure Pipe Gravity Pressure Cast Iron or Plastic Other
 23. Other Manure Storage _____
 24. Other NR 112 Waste Source _____

6. Drillhole Dimensions

Dia. (in.)	From (ft.)	To (ft.)	Method of constructing upper enlarged drillhole only.
10	surface	106	<input type="checkbox"/> 1. Rotary - Mud Circulation
6	106	140	<input type="checkbox"/> 2. Rotary - Air
			<input type="checkbox"/> 3. Rotary - Foam
			<input type="checkbox"/> 4. Reverse Rotary
			<input type="checkbox"/> 5. Cable-tool Bit _____ in. dia.
			<input type="checkbox"/> 6. Temp. Outer Casing _____ in. dia. Removed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If no, explain _____
			<input type="checkbox"/> 7. Other _____

9. Geology

Type, Caving/Noncaving, Color, Hardness, Etc.	From (ft.)	To (ft.)
Clay	surface	18
Sandy clay	18	66
Lime rock	66	100
Sand Stone	100	140
Water bearing		

7. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification	From (ft.)	To (ft.)
6	New Black 18.95	surface	106

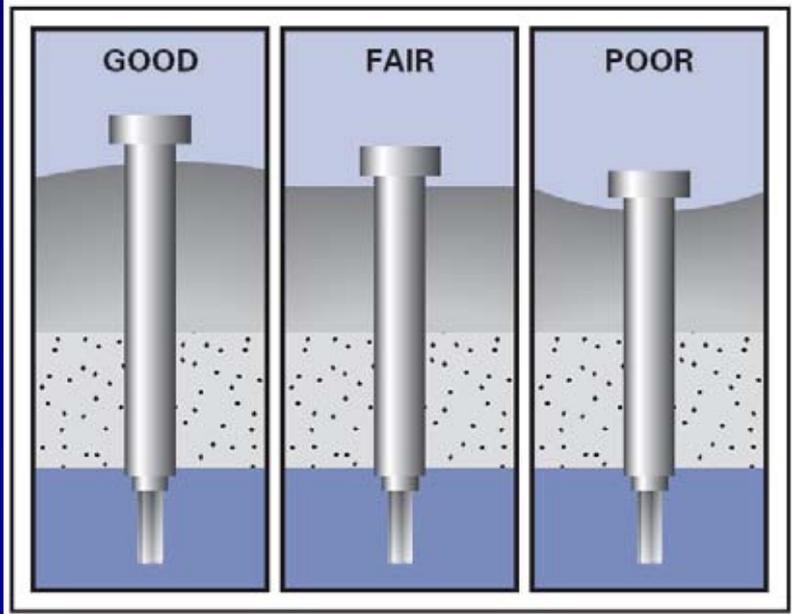
10. Static Water Level _____ ft. above ground level
10 ft. below ground surface
 11. Pump Test
 Pumping Level 13 ft. below surface
 Pumping at 20 GPM for 2 hours
 12. Well Is: Above Below Grade
 Developed? Yes No
 Disinfected? Yes No
 Capped? Yes No

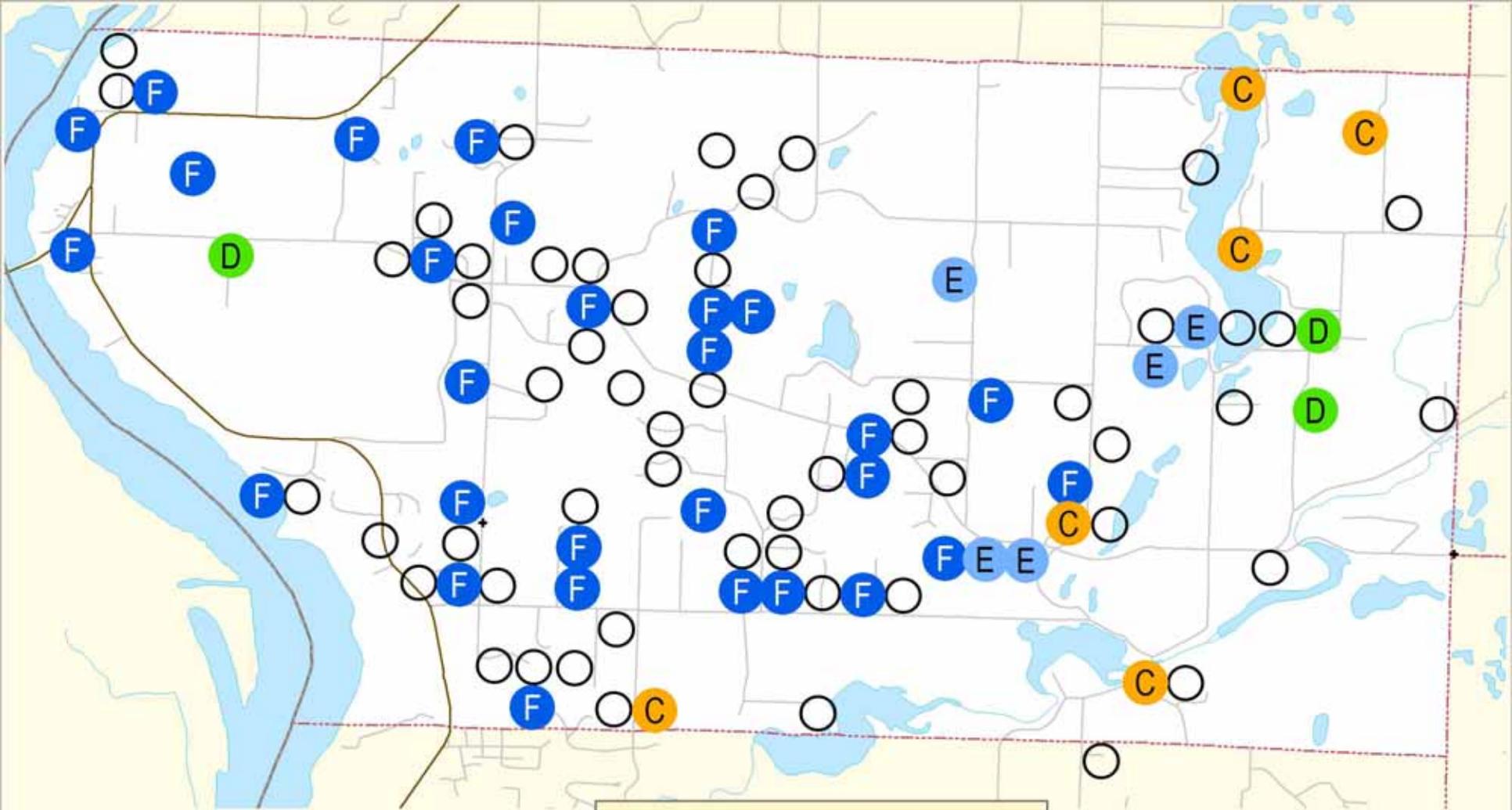
8. Grout or Other Sealing Material

Method	Kind of Sealing Material	From (ft.)	To (ft.)	Sacks of Cement
	Slurry clay + drillings	surface	106	

13. Did you permanently seal all unused, noncomplying, or unsafe wells?
 Yes No If no, explain _____
 14. Signature of Point Driver or Registered Driller _____ Date Signed _____
 Signature of Drill Rig Operator _____ Date Signed _____

Make additional comments on reverse side about geology, etc. WELL CONSTRUCTION REPORT



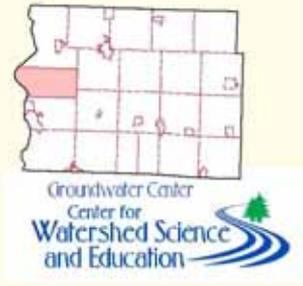


St. Joseph
 St. Croix County Oct 2007



DEPTH OF WELL (ft)

○ UNKNOWN	60 %
● A [1 - 25]	0 %
● B [25 - 50]	1 %
● C [50 - 100]	5 %
● D [100 - 150]	4 %
● E [150 - 200]	4 %
● F [200 ...]	26 %



Private vs. Public Water Supplies

Public Water Supplies

➤ Regularly tested and regulated by drinking water standards.

Private Wells

➤ Not required to be regularly tested.

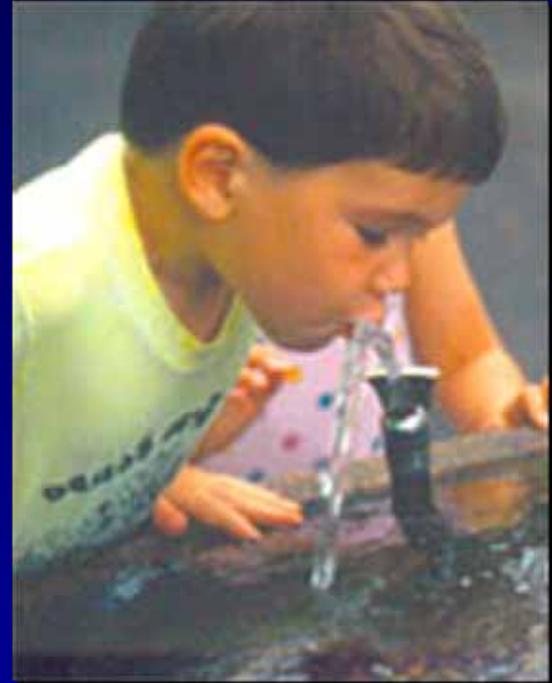
➤ Not required to take corrective action

➤ Owners must take special precautions to ensure safe drinking water.



Why do people test their water?

- Installed a new well
- Change in taste or odor
- Buying or selling their home
- Plumbing issues
- Want to know if it's safe to drink.



What are the Health Concerns?

- **Acute Effects** – Usually seen within a short time after exposure to a substance.

(ex. Bacterial contamination may cause intestinal disease)

- **Chronic Effects** – Results from exposure to a substance over a long period of time.

(ex. Arsenic or pesticides can increase the chance of developing certain types of cancer)



No one test tells us everything we need to know about the safety and condition of a water supply

Tests for Drinking Water from Private Wells

Why should I test my well?

As one of Wisconsin's 700,000 private well owners or private well water consumers, you probably use groundwater for doing your family's laundry, drinking, cooking, bathing and watering your garden. Municipalities are required to test their water supplies regularly to ensure the water is safe to drink. Since there is no requirement to test a private well except for bacteria when it is first drilled or the pump is changed, you are responsible for making sure your water is safe.

Most private wells provide a clean, safe supply of water; however, contaminants can pollute private wells, and unfortunately you cannot see, smell or taste most of them. Consequently, you should test your water on a regular basis. The decision on what to test your water for should be based on the types of land uses near your well.

This brochure gives information about several common contaminants found in private wells. It should help you decide when to sample your well and how often, how to find a certified laboratory and who to call for help.

What tests should be done on my water?

Total Coliform Bacteria and E.coli

Coliform bacteria live in soil, on vegetation and in surface water. Coliform bacteria found in the intestines of warm-blooded animals and their feces are called E.coli. Some strains of coliform bacteria can survive for long periods in soil and water and can be carried into well casings by insects. Bacteria washed into the ground by rainwater or snowmelt are usually filtered out as the water seeps through the soil, but they sometimes enter water supplies through cracks in well casings, poorly sealed caps, fractures in the underlying bedrock, and runoff into sinkholes. Coliform bacteria are the most common contaminants found in private water systems. A 1994 Wisconsin survey found them in 23% of the wells tested and E.coli in 2.4% of the wells.

Most coliform bacteria do not cause illness, but indicate a breach in the water system. However, since E.coli bacteria are found in fecal material, they are often present with bacteria, viruses and parasites that can cause flu-like symptoms such as nausea, vomiting, fever and diarrhea. Private wells should be tested at least once a year for



Interpreting Drinking Water Test Results

Tests important to health:

- Coliform bacteria
- Sodium
- Nitrate
- Copper
- Lead
- Triazine
- Zinc
- Sulfate
- Arsenic

Tests for aesthetic (taste,color,odor) problems:

- Hardness
- Iron
- Manganese
- Chloride

Other important indicator tests:

- Saturation Index
- Alkalinity
- Conductivity
- Potassium

Red = human-influenced, **Blue** = naturally found

Laboratory Results:

Homeowners Package:

Bacteria-Coliform	Absent	
Hardness-Total	357	mg/l CaCO ₃
Alkalinity	326	mg/l CaCO ₃
Conductivity	724	umhos/cm

Homeowners Metal Package:

Arsenic (VISTA-ICP)	Less Than 0.005	mg/l (None Detected)
Calcium	0.5	mg/l
Copper (VISTA-ICP)	0.031	mg/l
Iron (VISTA-ICP)	0.065	mg/l
Lead (VISTA-ICP)	0.016	mg/l

Pesticides:

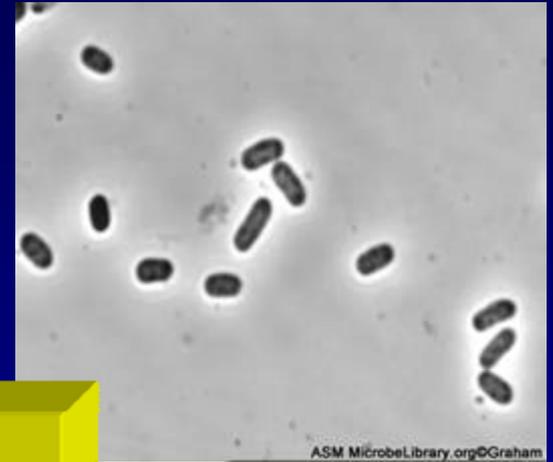
Triazine Screen	0.2	ppb
-----------------	-----	-----

milligrams per liter (mg/l) = parts per million (ppm)

1 mg/l = 1000 parts per billion (ppb)

Coliform bacteria

- Coliform bacteria may indicate the presence of more harmful bacteria with similar life cycles.
- Harmful bacteria can cause gastrointestinal disease, cholera, hepatitis
- If any is present assume that the water is unsafe
- Sources:
 - Live in soils and on vegetation
 - Human and animal waste
 - Sampling error



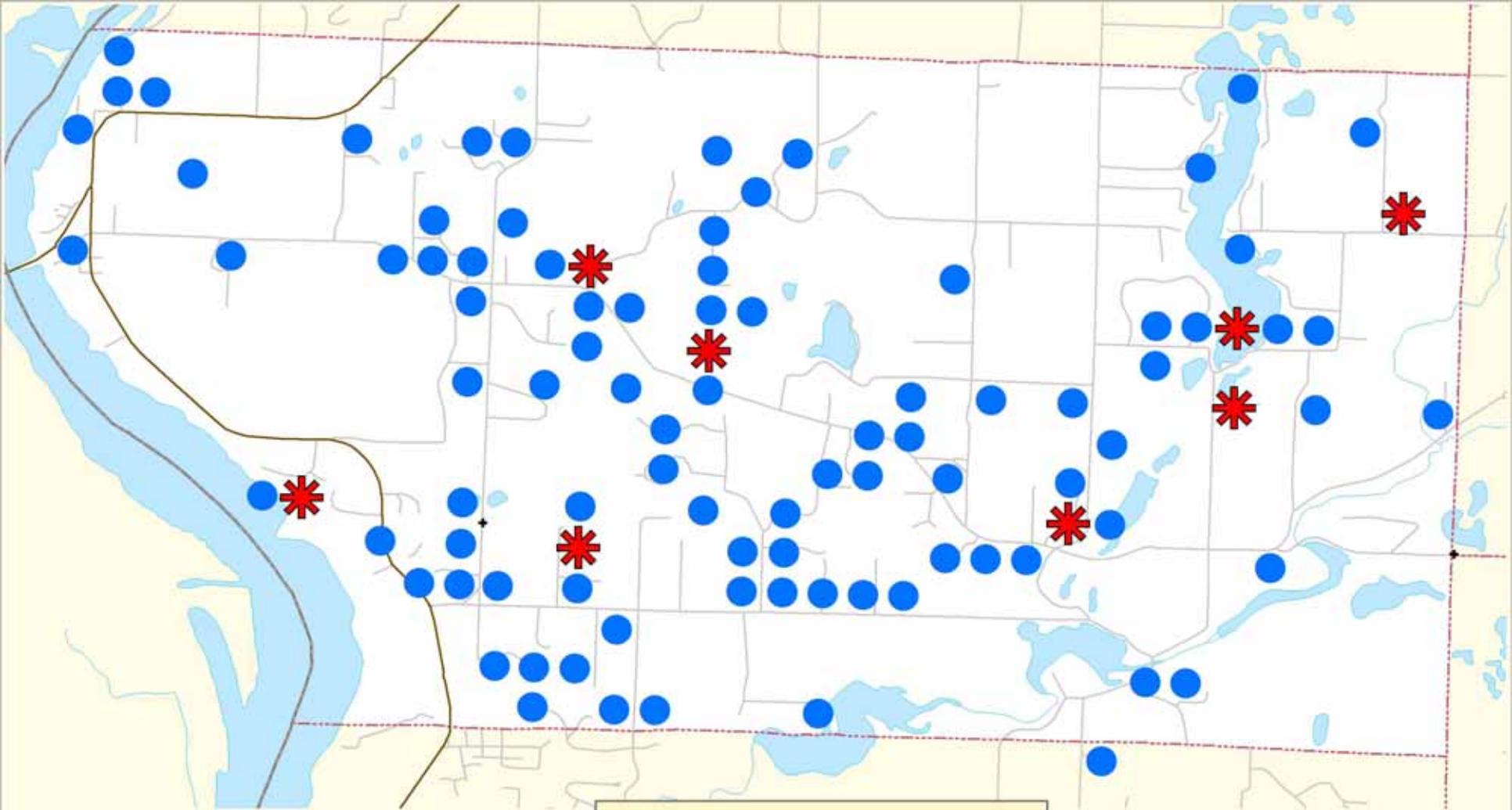
Present = Unsafe

Absent = Safe

E.coli bacteria

- Type of bacteria found in the intestines of warm-blooded animals and their feces are called E.coli.
- E.coli are often present with harmful bacteria, viruses and parasites that can cause serious gastrointestinal illnesses.
- Any detectable level of E.coli means your water is unsafe to drink.

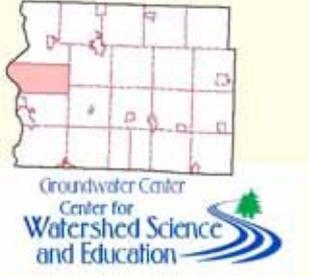




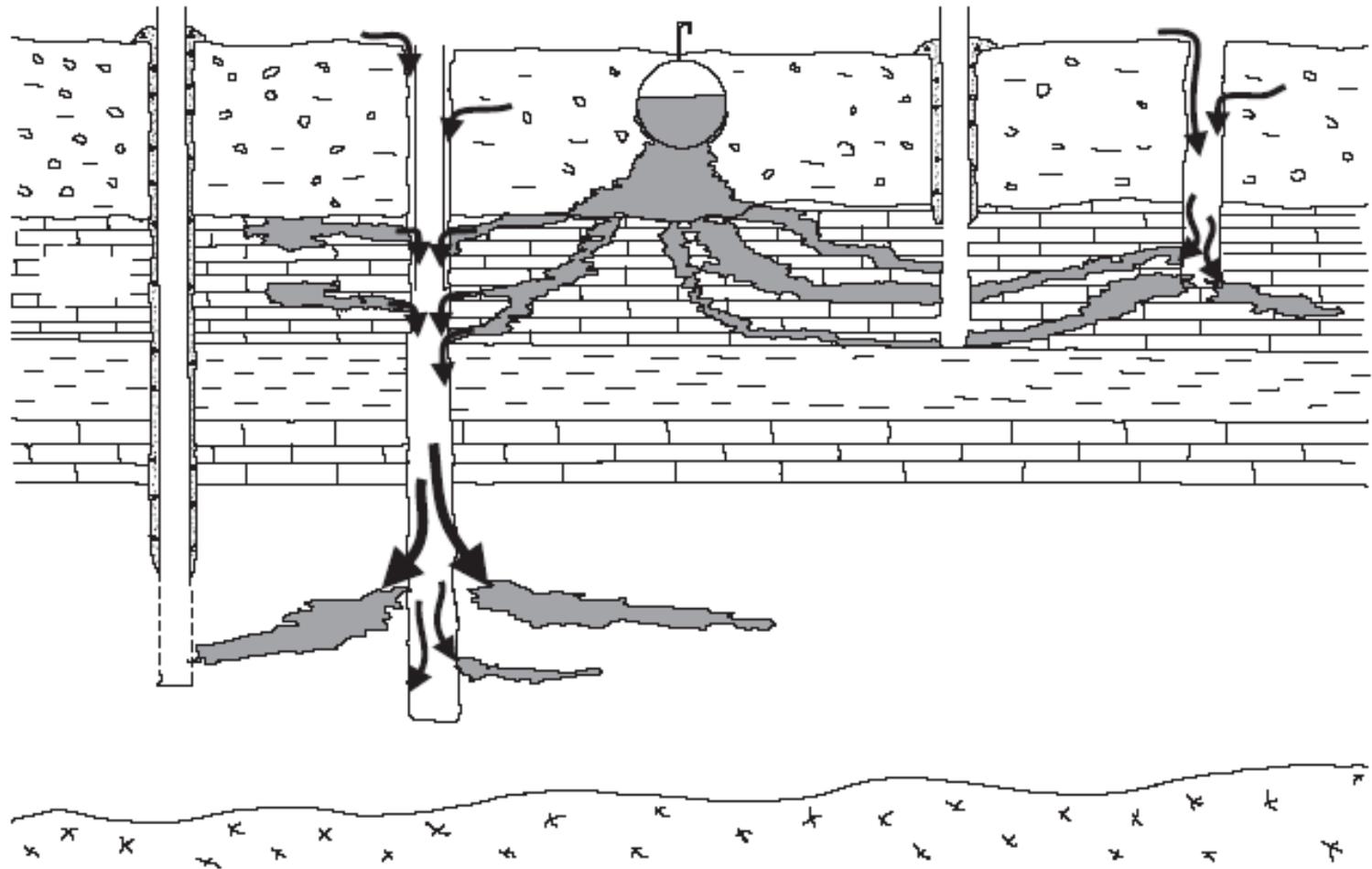
St. Joseph
St. Croix County Oct 2007

*** BACTERIA POSITIVE**

Any sample in the 1/4 1/4 section.



AQUIFER CONTAMINATION THROUGH IMPROPERLY ABANDONED WELLS



Source: Adapted from DiNovo and Jaffe, 1984.

What should I do if I have Bacteria Problems?

1. Use alternative source of water for drinking
 2. Retest
 3. Try to identify any sanitary defects
 - Loose or non-existent well cap
 - Well construction faults
 - Abandoned well
 - Inadequate filtration by soil
 4. Disinfect the well
 5. Retest to ensure well is bacteria free.
- For reoccurring bacteria problems it may be necessary to look into drilling a new well.



Rock and Soil Impacts on Water Quality

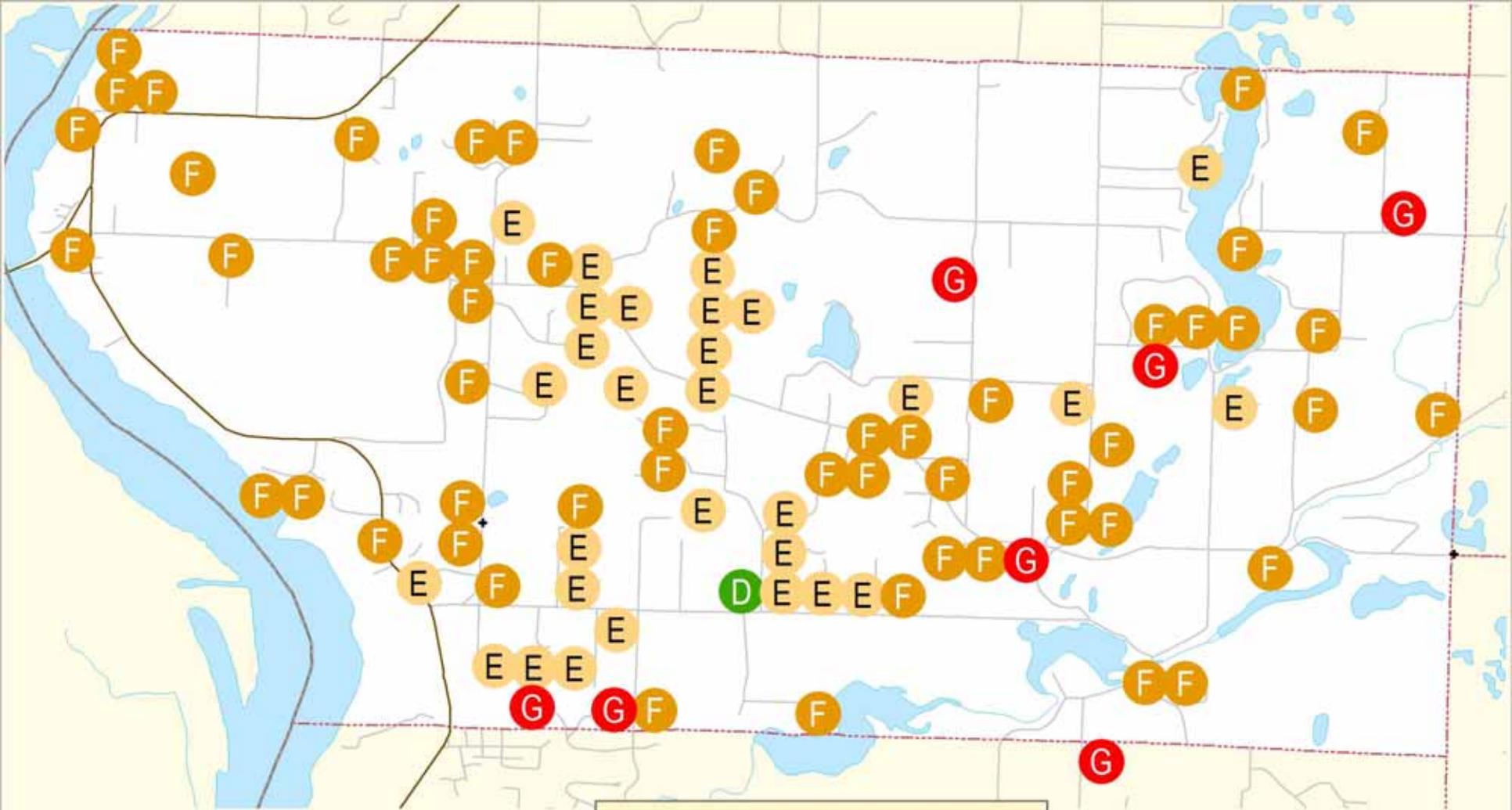
Tests for Aesthetic Problems

Hardness

- Natural (rocks and soils)
- Primarily calcium and magnesium
- Both may benefit health

- Problems: scaling, scum, use more detergent, decrease water heater efficiency



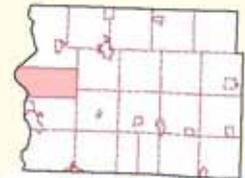
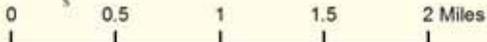


St. Joseph
 St. Croix County Oct 2007

TOTAL HARDNESS (ppm CaCO₃)

A	NONE DETECTED	5	4%
B	[2 - 25)	1	1%
C	[25 - 50)	0	0%
D	[50 - 150)	3	2%
E	[150 - 200)	36	29%
F	[200 - 300)	72	58%
G	[300 - 400)	8	6%
H	[400 - 500)	0	0%
I	[500 ...	0	0%

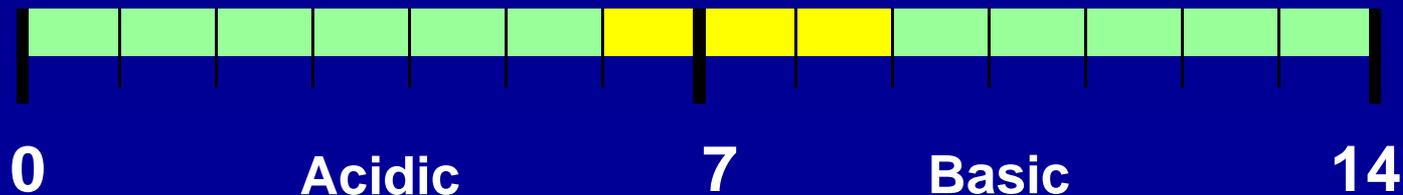
NOTE: Softened samples not mapped.



Groundwater Center
 Center for
 Watershed Science
 and Education

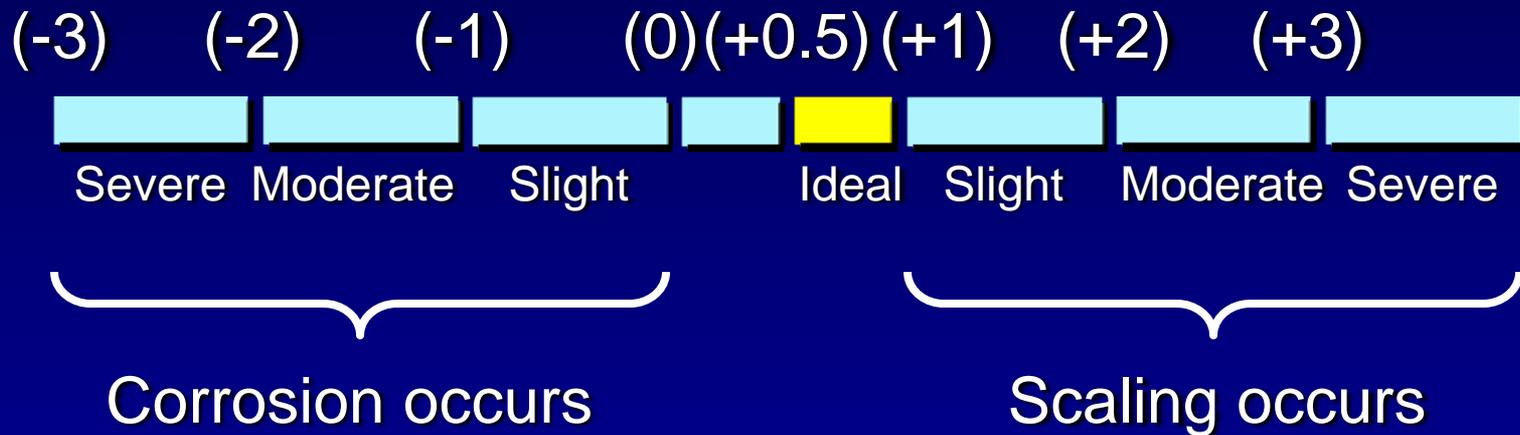
Tests for Overall Water Quality

- **Alkalinity** – ability to neutralize acid
- **Conductivity** –
 - Measure of total ions
 - can be used to indicate presence of contaminants (~ twice the hardness)
- **pH** – Indicates water's acidity and helps determine if water will corrode plumbing



Tests for Overall Water Quality

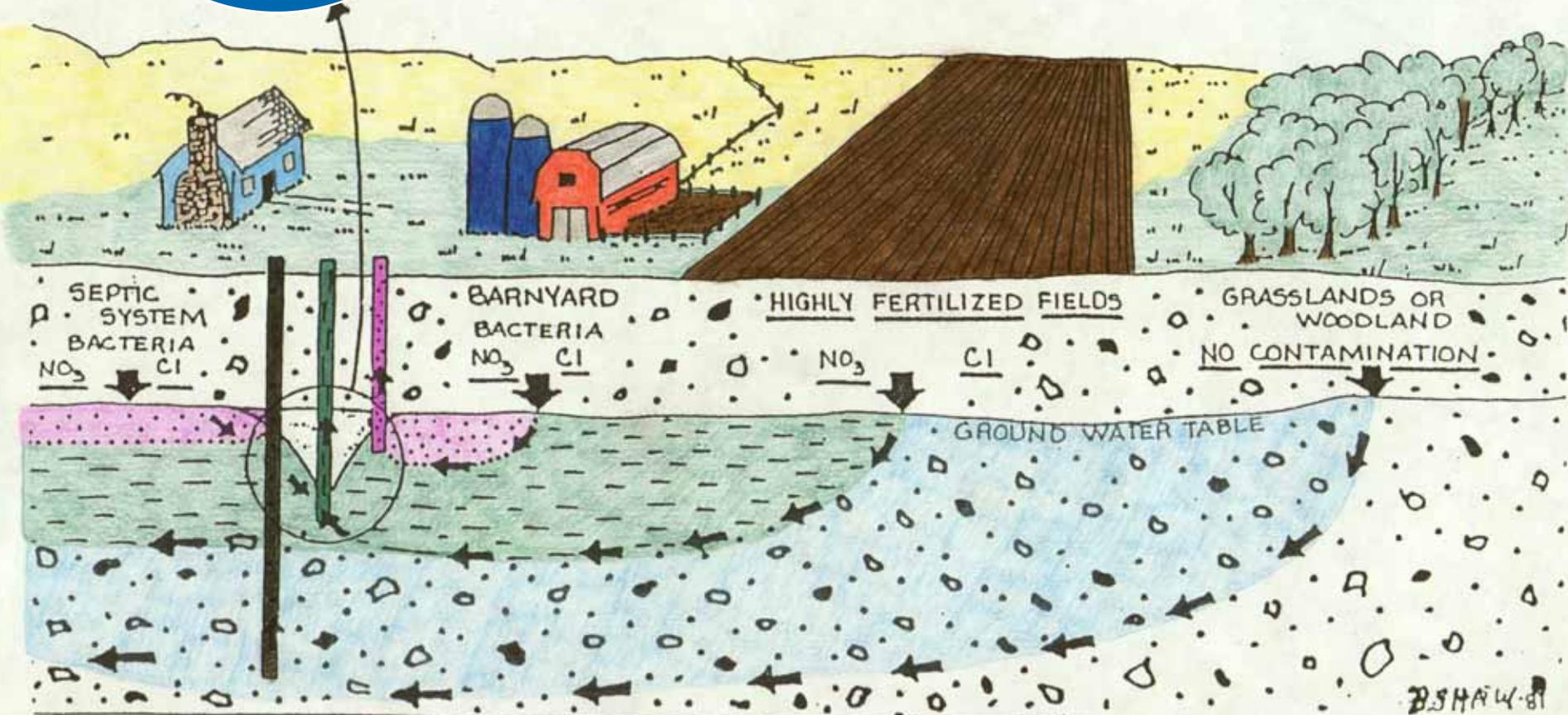
Saturation Index

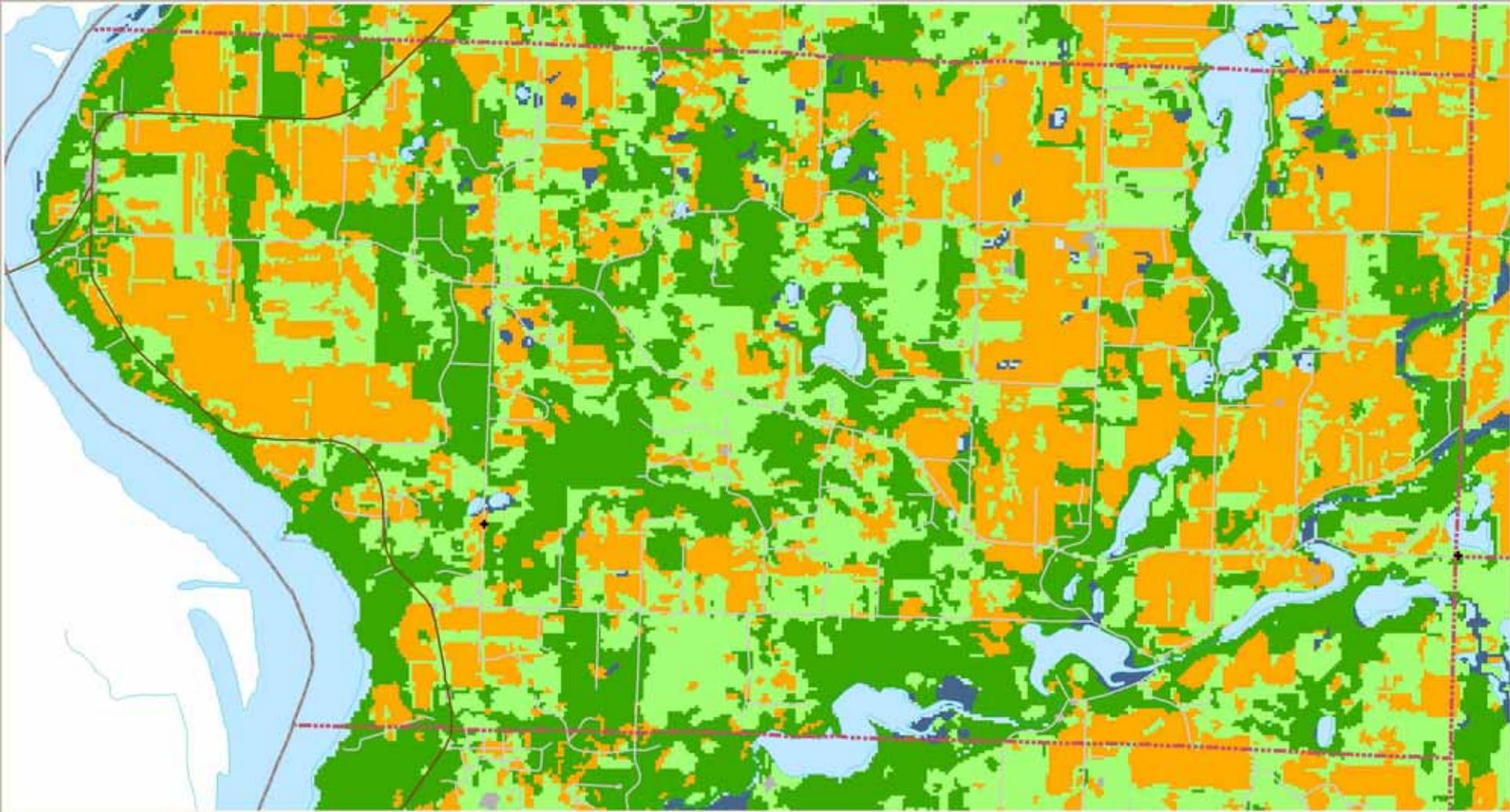




Well
pumping
water

Land Use and Water Quality





St. Joseph
St. Croix County Oct 2007



Land Use:

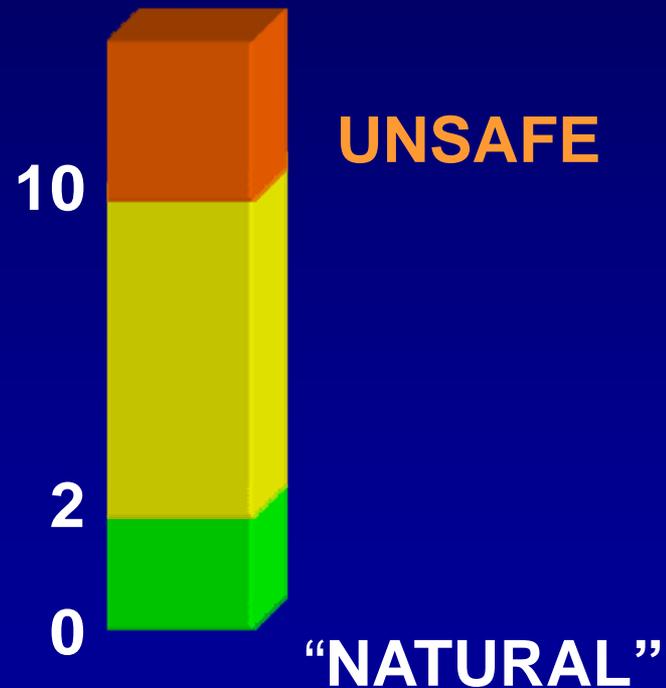
	Urban
	Agriculture
	Forest
	Shrub-Grass
	Wetland
	Water
	Other



Test Important to Health

Nitrate Nitrogen

- **Greater than 10 mg/L**
Exceeds State and Federal Limits for Drinking Water
- **Between 2 and 10 mg/L**
Some Human Impact
- **Less than 2.0 mg/L**
“Transitional”
- **Less than 0.2 mg/L**
“Natural”



Nitrate-Nitrogen

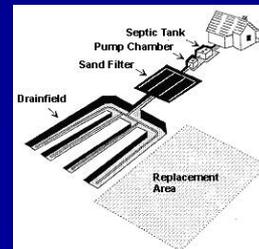
Health Effects:

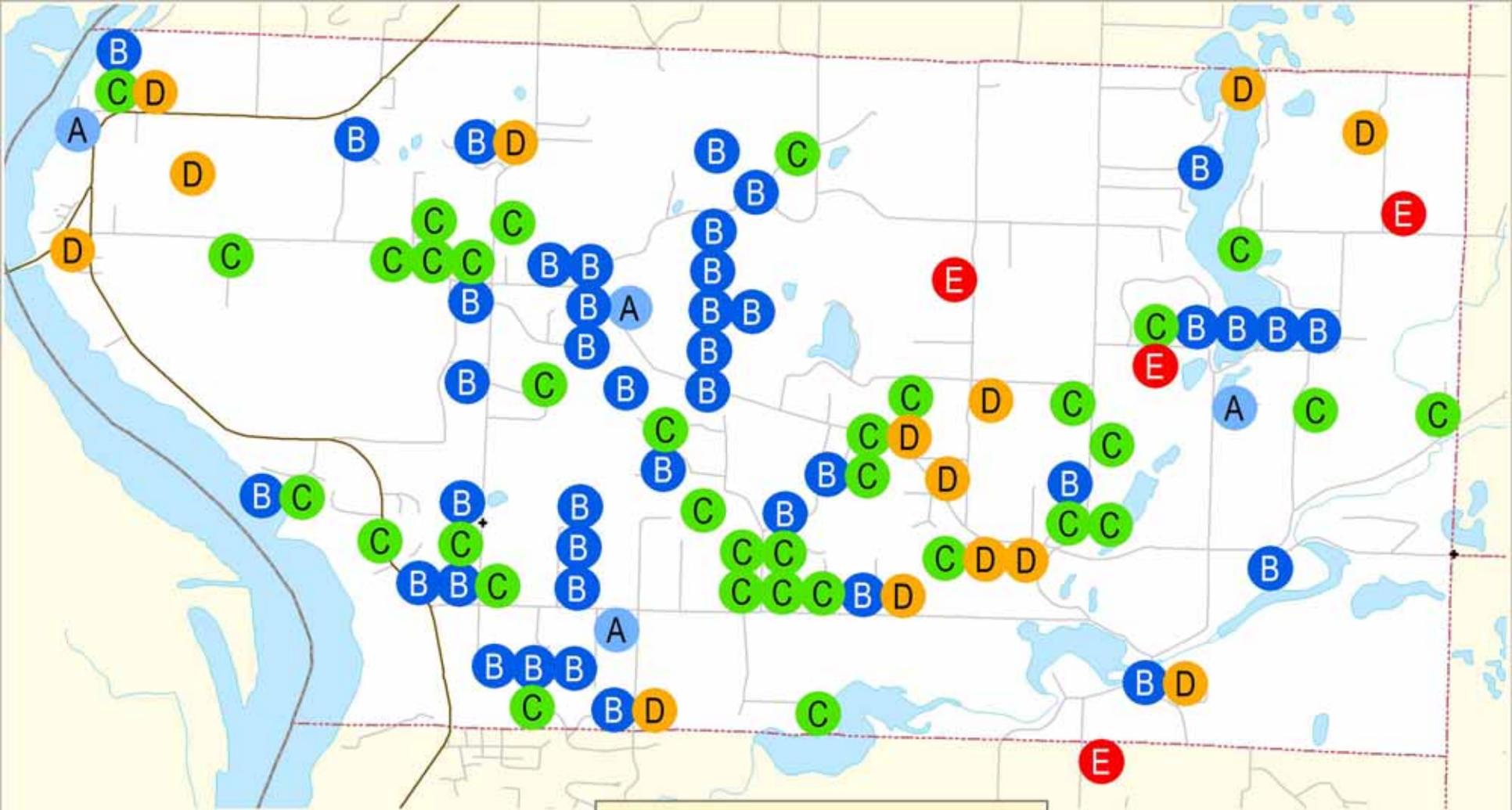
- Methemoglobinemia (blue baby disease)
- Possible links to birth defects and miscarriages (humans and livestock)
- Indicator of other contaminants



Sources:

- Agricultural fertilizer
- Lawn fertilizer
- Septic systems
- Animal wastes



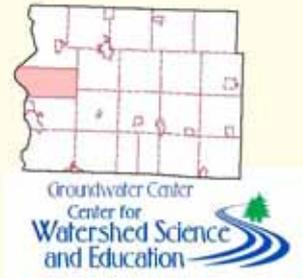


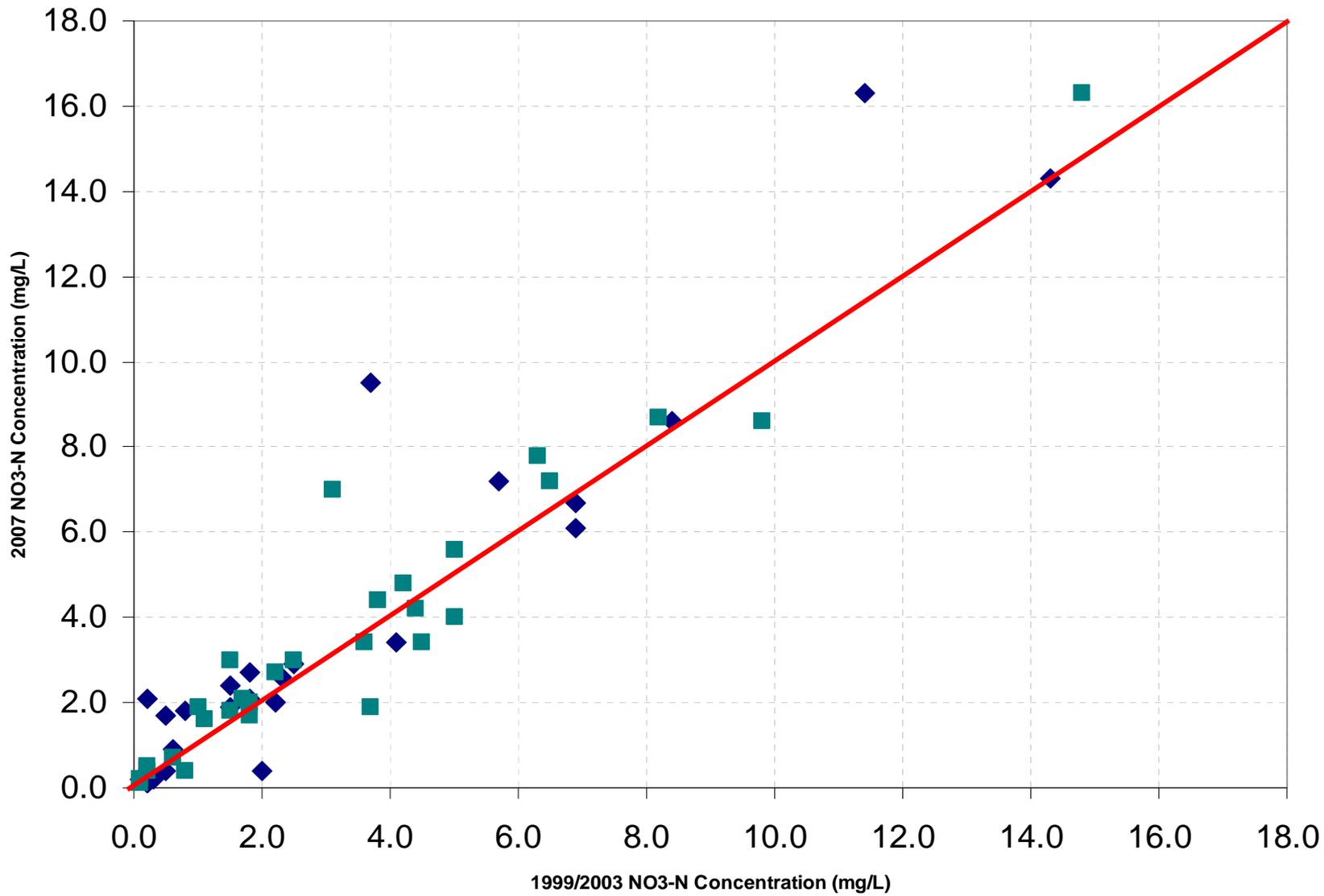
St. Joseph
 St. Croix County Oct 2007



NITRATE-NITRITE (ppm N)

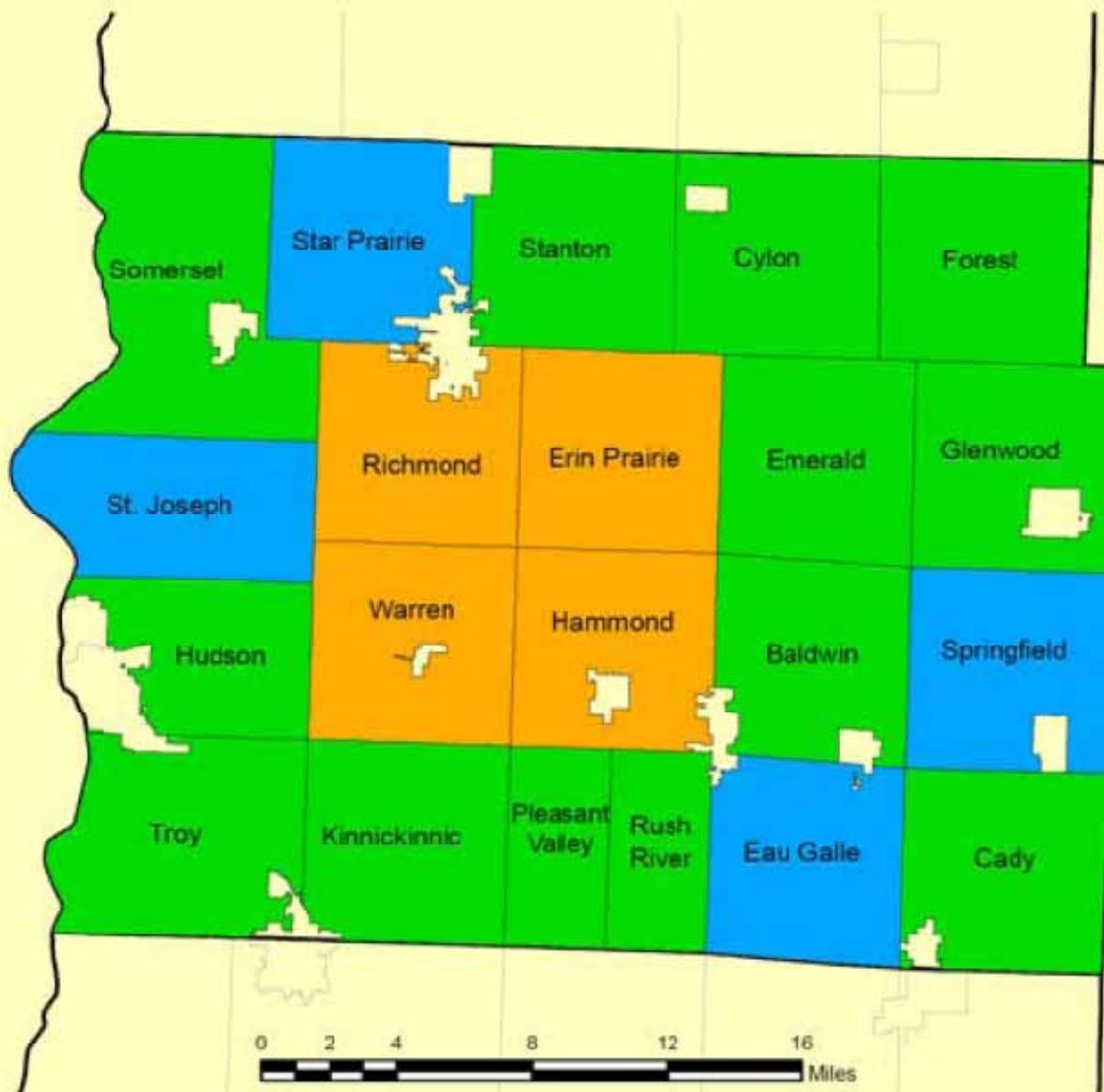
A	NONE DETECTED	9	7%
B	[0.1 - 2.0)	53	42%
C	[2 - 5)	41	33%
D	[5 - 10)	18	14%
E	[10 - 20)	4	3%
F	[20 ...	0	0%





St. Croix County

Median Nitrate-N
Concentration
(mg/L)



What can I do to reduce my nitrate levels?

- **Eliminate contamination source or reduce nitrogen inputs**
- **Change well depth or relocate well**
- **Carry or buy water**
- **Water treatment devices**
 - **Reverse osmosis**
 - **Distillation**
 - **Anion exchange**

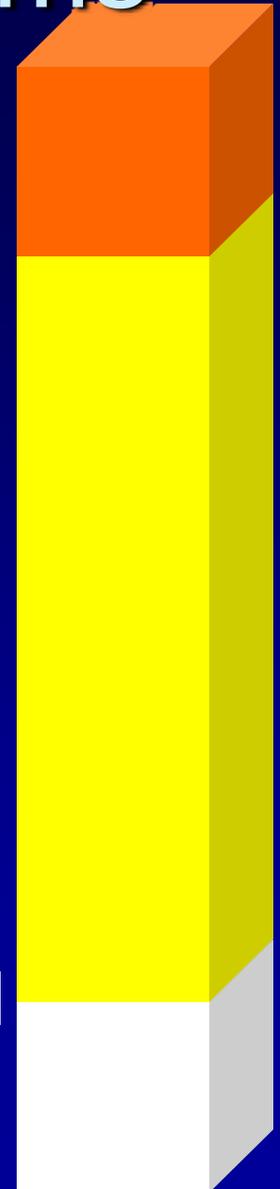
Tests for Aesthetic Problems

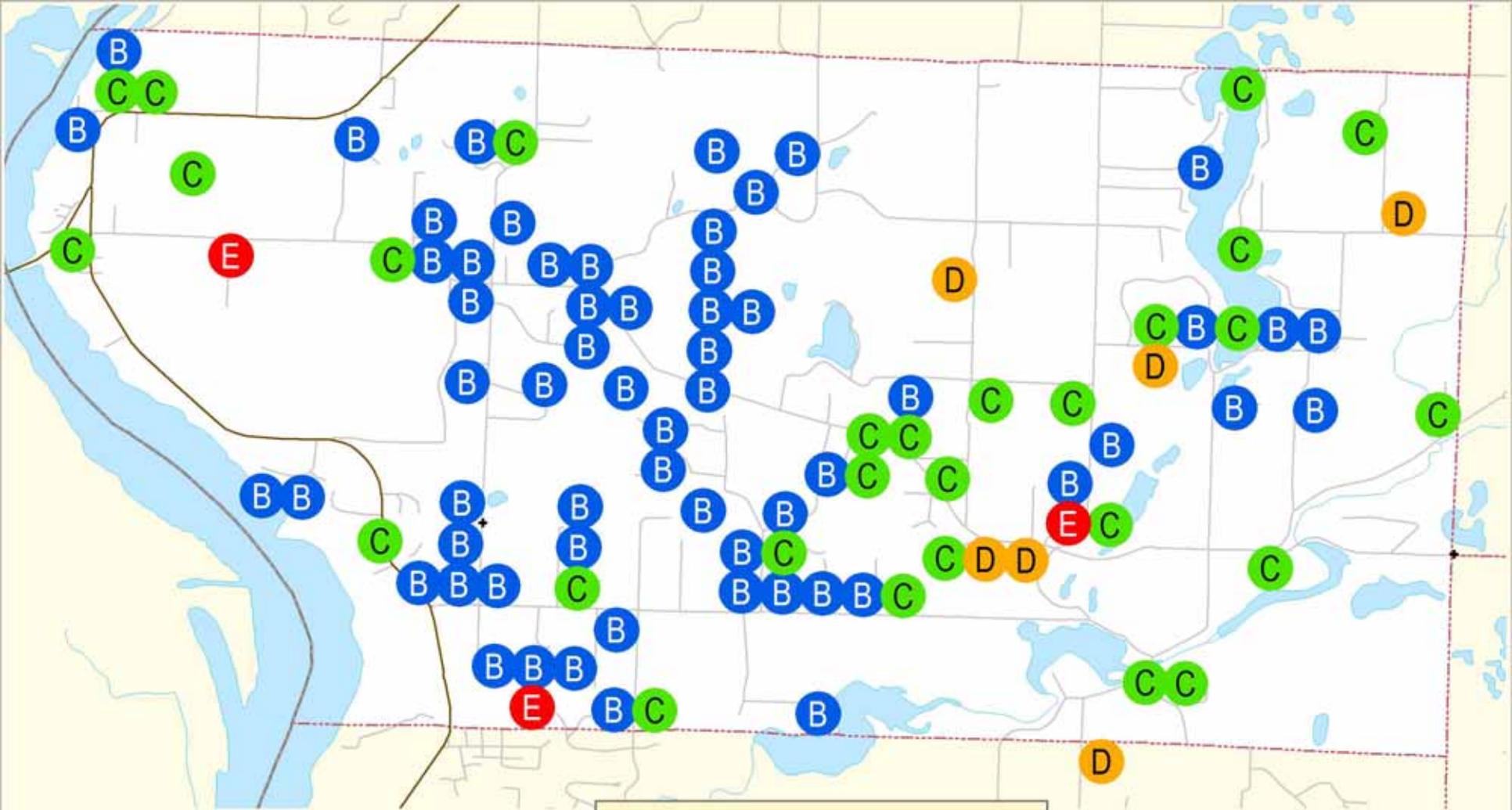
Chloride

- **Greater than 250 mg/l**
 - No direct effects on health
 - Salty taste
 - Exceeds recommended level
- **Greater than 10 mg/l may indicate human impact**
- **Less than 10 mg/l**
“Natural” in much of WI

250 mg/l

10 mg/l



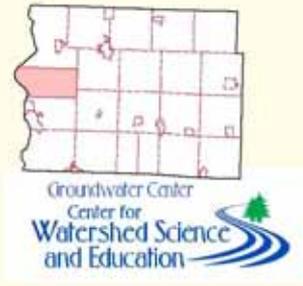


St. Joseph
 St. Croix County Oct 2007



CHLORIDE (ppm)

A	NONE DETECTED	0	0%
B	[0.5 - 10)	80	64%
C	[10 - 25)	33	26%
D	[25 - 50)	9	7%
E	[50 - 100)	1	1%
F	[100 - 200)	2	2%
G	[200 ...	0	0%



Tests for Aesthetic Problems

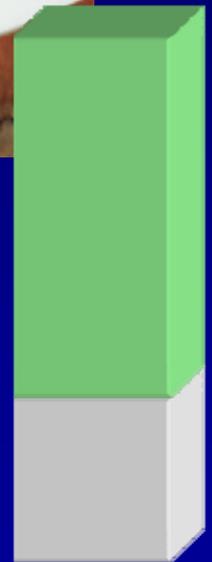
Iron

- Natural (rocks and soils)
- May benefit health
- Red and yellow stains on clothing, fixtures
- Potential for iron bacteria
 - Slime, odor, oily film



0.3 mg/L

0



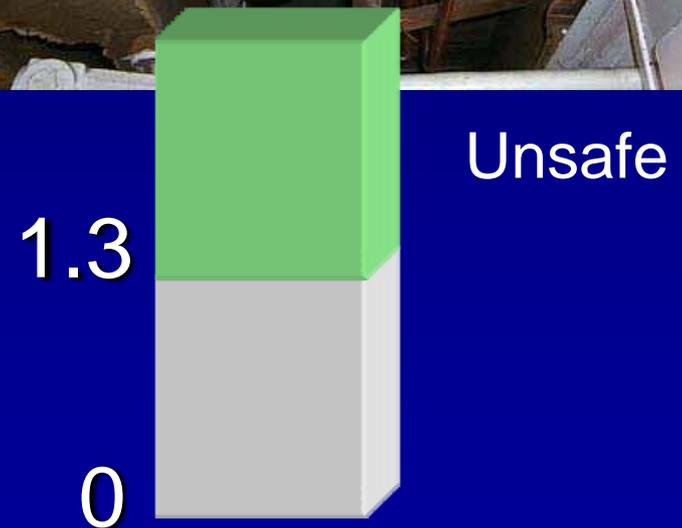
Test Important to Health

Copper

- Sources: Copper water pipes
- Standard: 1.3 mg/L

Health Effects:

- Some copper is needed for good health
- Too much may cause problems:
 - Stomach cramps, diarrhea, vomiting, nausea
 - Formula intolerance in infants



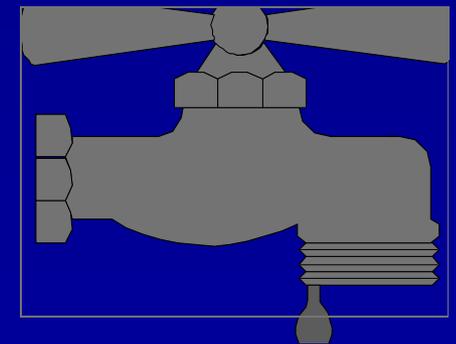
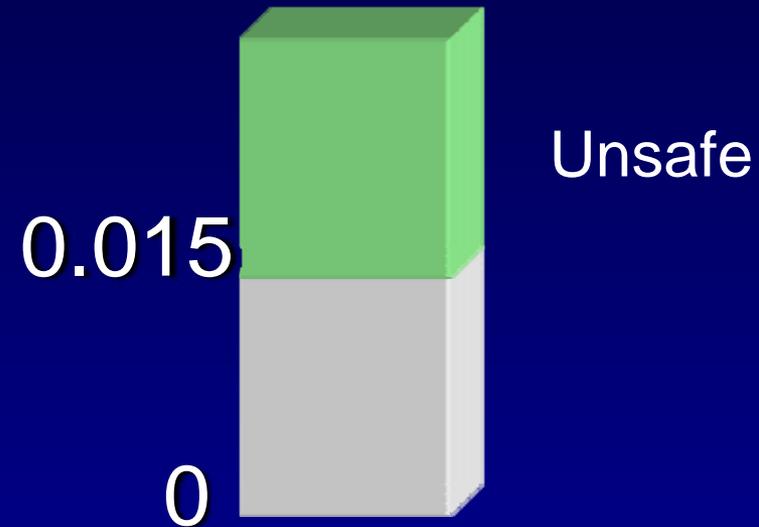
Test Important to Health

Lead

- Sources: Lead solder joining copper pipes (pre-1985)
- Standard: 0.015 mg/L (15 ppb)

Health Effects:

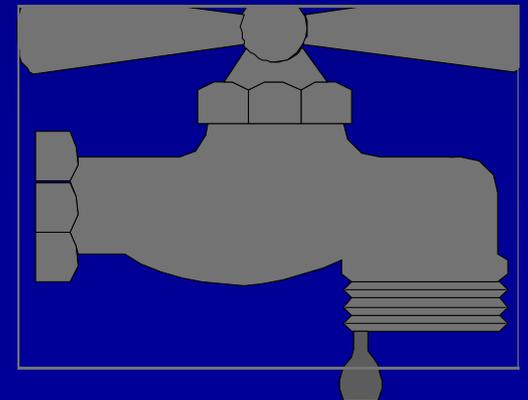
- Young children, infants and unborn children are particularly vulnerable.
- Lead may damage the brain, kidneys, nervous system, red blood cells, reproductive system.



Lead and Copper

Solutions:

- Run water until cold before drinking.
- Use a treatment device.



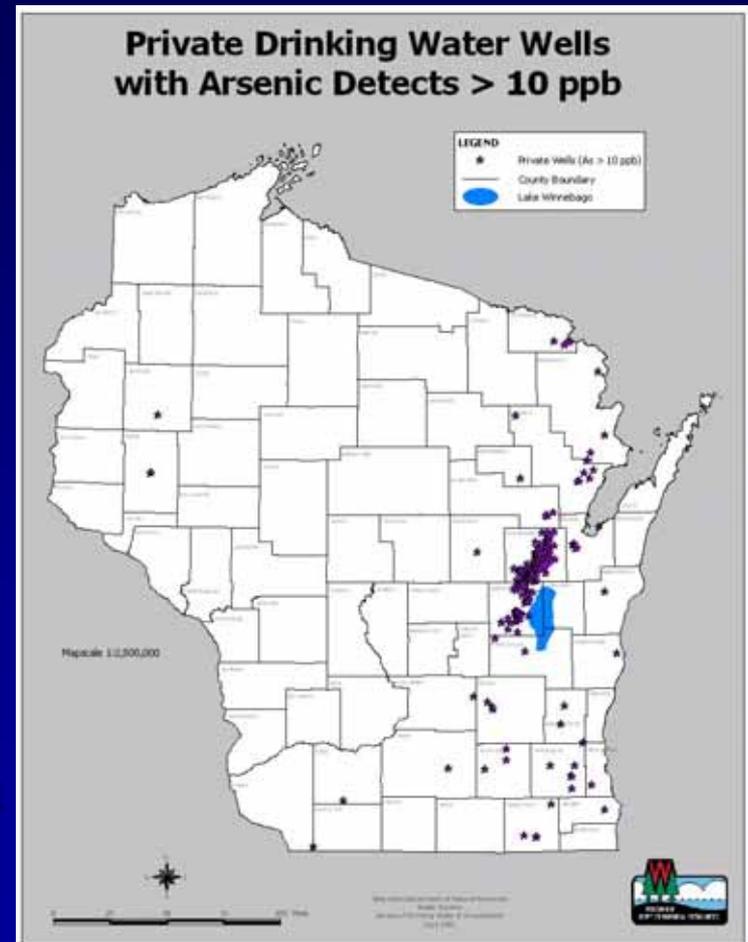
Test Important to Health

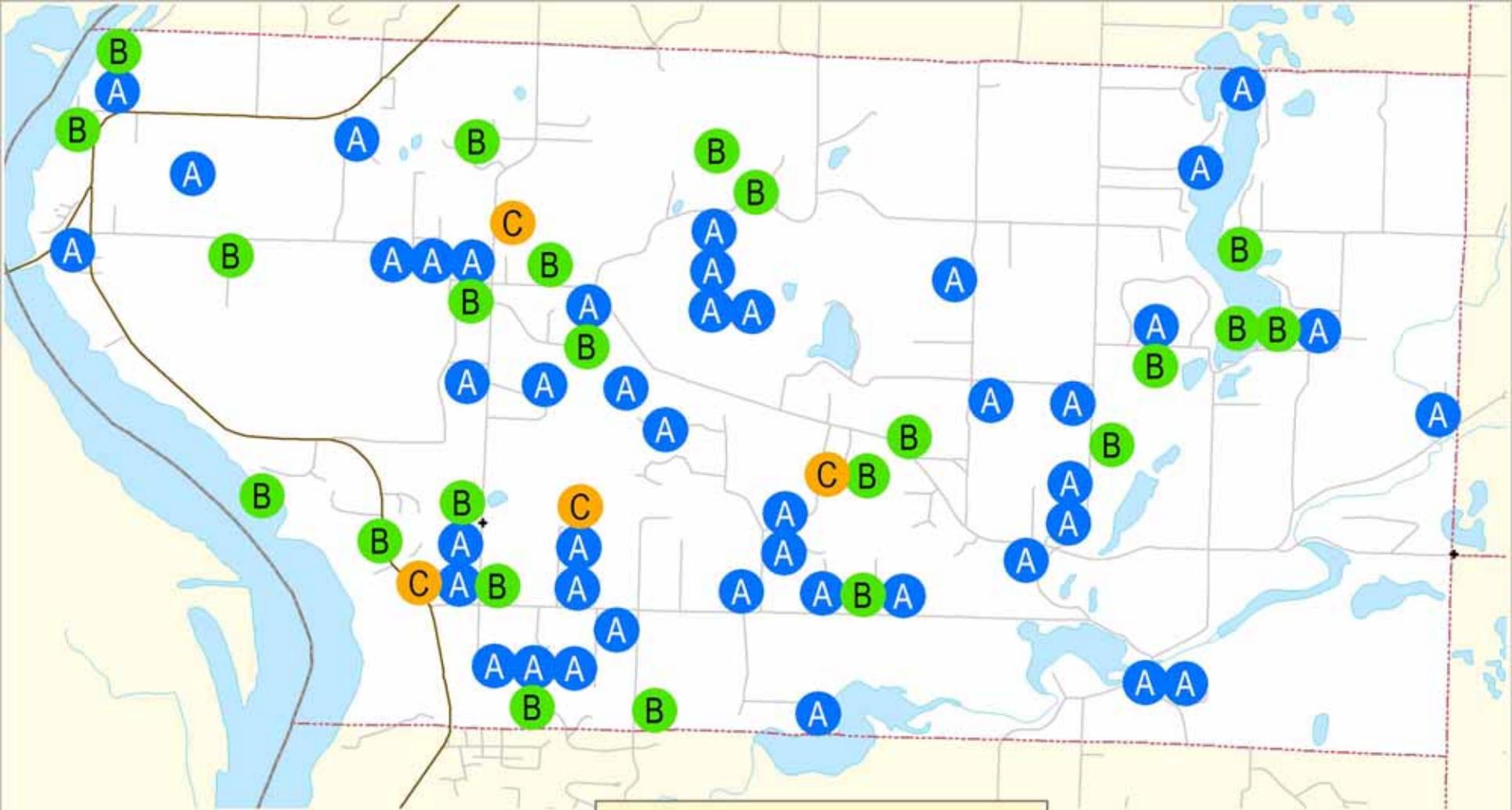
Arsenic

- Sources: Naturally occurring in mineral deposits
- Standard: 0.010 mg/L (10 ppb)

Health Effects:

- Increased risk of skin cancers as well as lung, liver, bladder, kidney, and colon cancers.
- Circulatory disorders
- Stomach pain, nausea, diarrhea
- Unusual skin pigmentation





St. Joseph
 St. Croix County Oct 2007



ARSENIC (mg/l)

A	NONE DETECTED	54	67 %
B	[0.003 - 0.010]	23	28 %
C	[0.010 - 0.050]	4	5 %
D	[0.050 - 0.100]	0	0 %
E	[0.100 ...]	0	0 %

Maximum value for the 1/4 1/4 section.

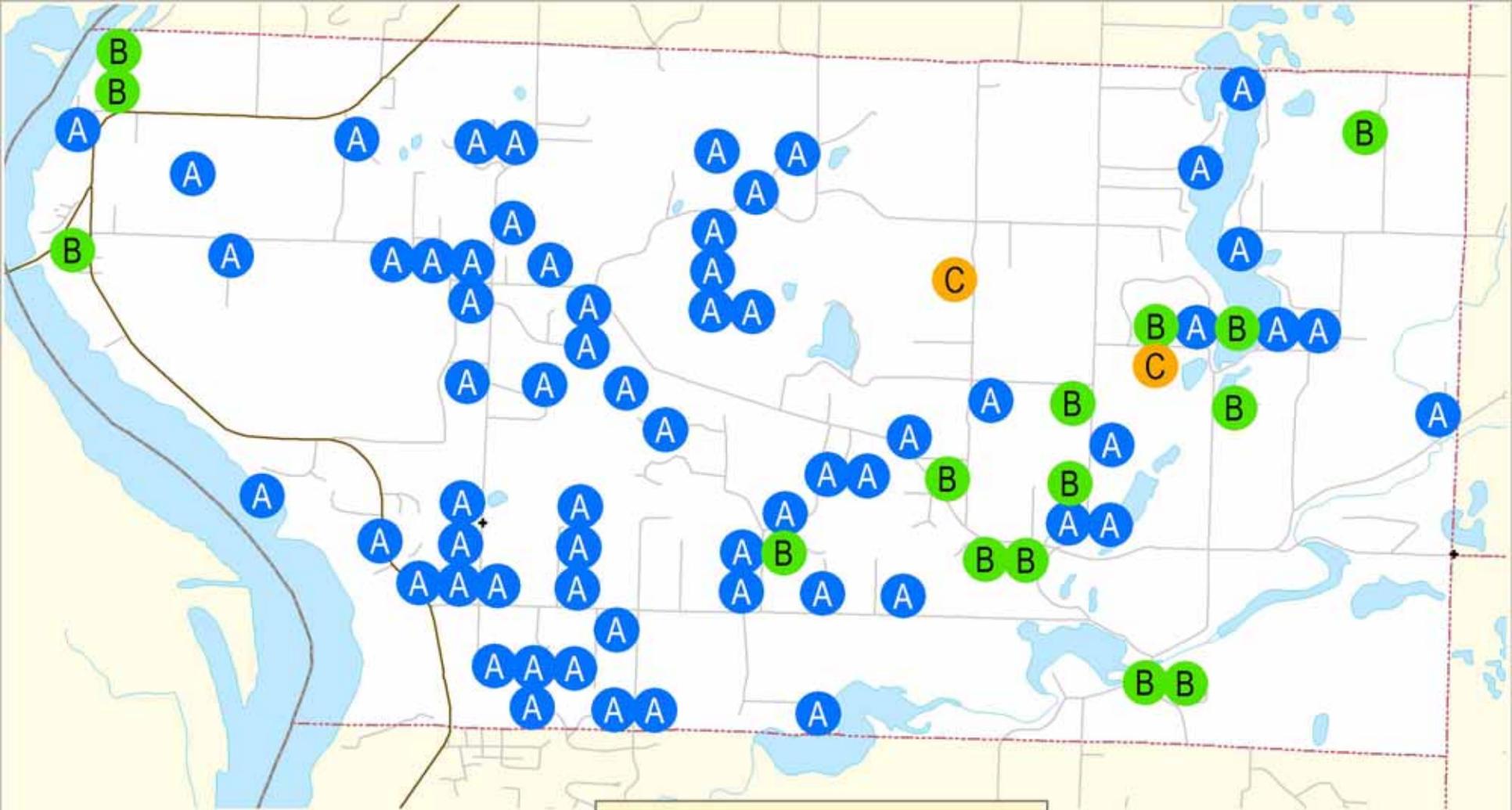


Tests Important to Health

Triazine Screen

- Measures the levels of triazine pesticides (atrazine, simazine, propazine, cyanazine, etc)
- Sources: Triazine pesticides (mainly atrazine used on corn crops)
- Drinking water limit:
3 ppb





St. Joseph
 St. Croix County Oct 2007

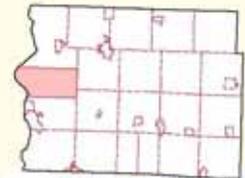


0 0.5 1 1.5 2 Miles

TRIAZINE (ug/l)

A	NONE DETECTED	74	80 %
B	[0.1 - 0.3)	16	17 %
C	[0.3 - 1.0)	2	2 %
D	[1.0 - 3.0)	0	0 %
E	[3.0 ...	0	0 %

Maximum value for the 1/4 1/4 section.



Groundwater Center
 Center for
 Watershed Science
 and Education

A word about water treatment...

- Test water at a certified lab
- Know the types and amounts of contaminants you need to remove
- Choose a device approved by the Wisconsin Department of Commerce for the problems found in your water
- **Maintenance is necessary to ensure proper treatment.**



Next Steps

- Test well annually for bacteria, or if water changes color or clarity.
- If levels are elevated, test again in 15 months for nitrate.

Next Steps

➤ Test for known or potential contaminants in your neighborhood

- Gasoline?
- Pesticides?
- Solvents?



Check for known contamination sites in St. Croix County at:
<http://dnr.wi.gov/org/aw/rr/gis/index.htm>

For more information:

- St. Croix County has long history of groundwater education.
- Past results are summarized in groundwater guide.
- Maps display nearly 2,100 results.

An Introduction to Groundwater in St. Croix County



UW
EXTENSION

Center for
Watershed Science
and Education 

➤ Can be found online at: <http://www.uwex.edu/ces/cty/stcroix/cnred/index.html>

Thank you for coming!



The boundaries of the University
are the boundaries of the state.

