

Town of Saratoga Community Drinking Water Program



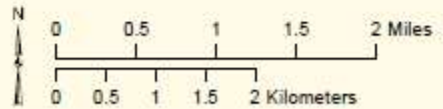
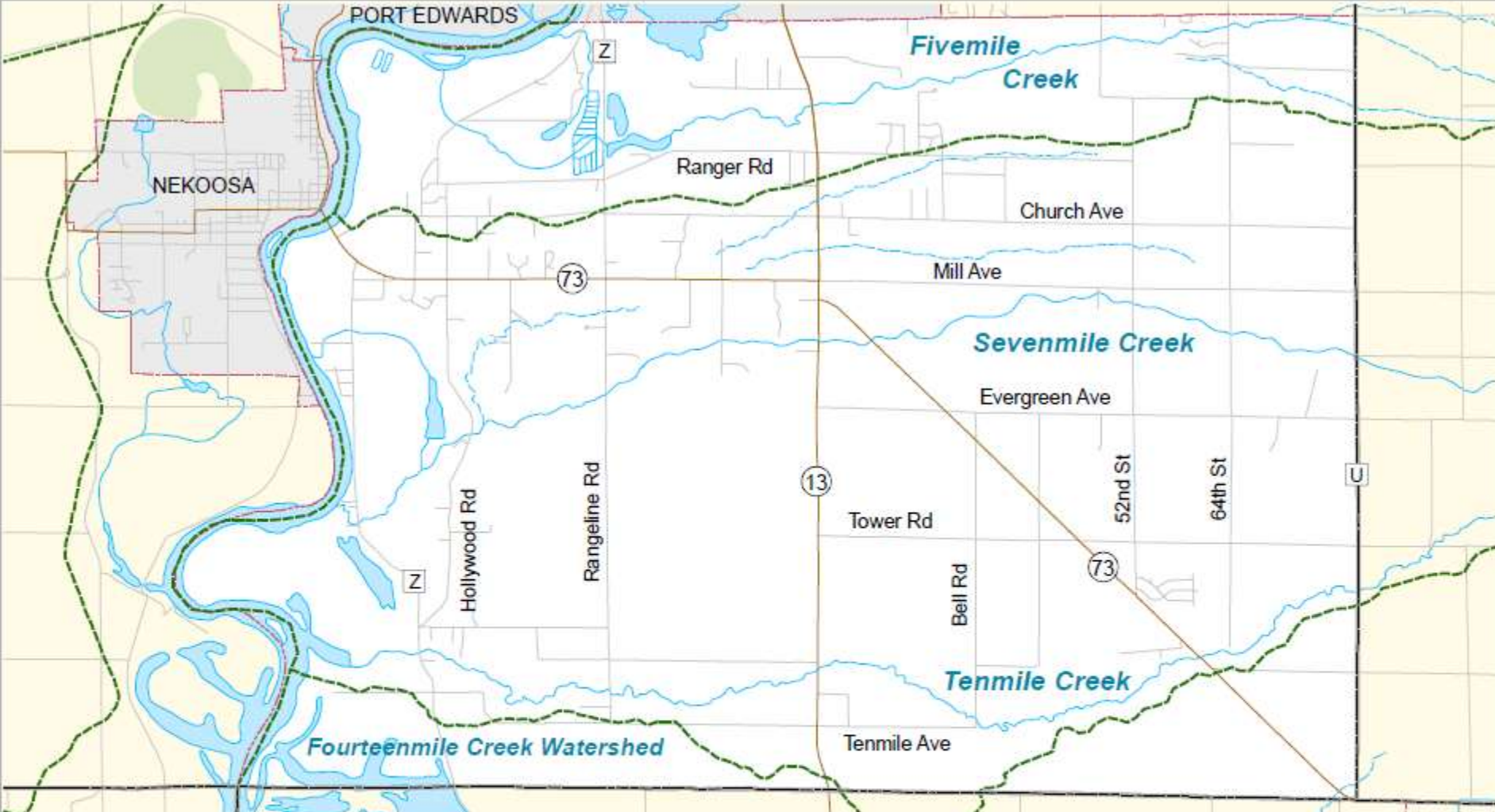
University of Wisconsin-Stevens Point
College of Natural Resources

Through the University of Wisconsin-Extension, all Wisconsin people can access University resources and engage in lifelong learning, wherever they live and work.

Today's presentation









- Groundwater Basics: Where does my water come from
- Well Construction
- What do my individual test results mean?
- General groundwater quality in the Town of Saratoga.
- Improving your water quality

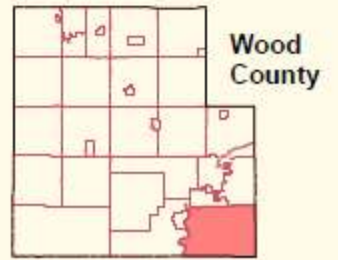




Town of Saratoga

Wood County
November 2012

-  Watershed Boundary
-  Streams
-  Lakes/Reservoirs
-  Wetlands
-  State/US Highways
-  Other Roads
-  Town Boundaries
-  Municipalities



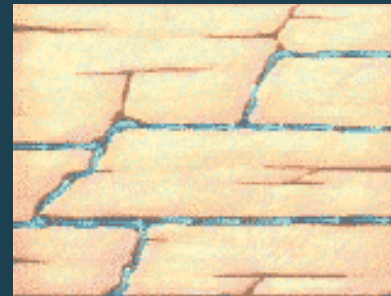
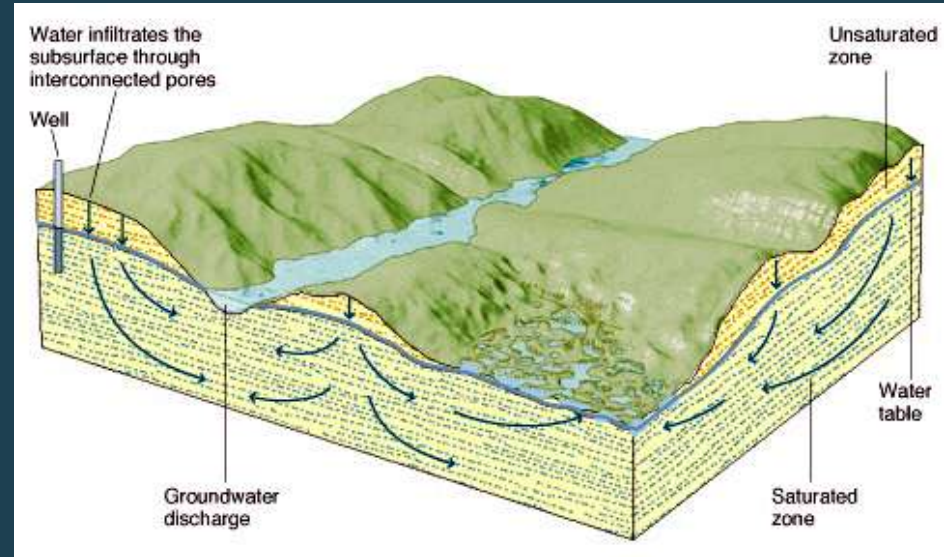
What is groundwater?

Rainfall or snowmelt that infiltrates into the subsurface will eventually reach a point where all the empty spaces in either the soil or rock are completely filled with water. This area is sometimes referred to as the saturated zone.

The water in the saturated zone is our groundwater. Groundwater is always moving very slowly through the interconnected pores and fractures in the rock beneath the land surface.

Groundwater typically flows from recharge areas, to discharge areas. Discharge areas occur in areas where the top of the saturated zone (the water table) intersects the land surface. Rivers, streams, lakes, springs and wetlands are all examples of groundwater discharge features.

Your well extends down past the water table and removes groundwater from the surrounding aquifer. Most private wells access groundwater that recharged within $\frac{1}{4}$ to $\frac{1}{2}$ mile of the well.



Groundwater is the area below the land surface where all the cracks and spaces between soil and rock are completely filled with water. Aquifers are simply the water bearing geological formations that hold our groundwater. Groundwater in fractured rock aquifers will move much more quickly than water in a sandstone or sand and gravel aquifer.

What is a Watershed?

A watershed is the land area where water originates for a particular river or stream. Some of the water will reach the surface water body from overland flow, much of it however will come from groundwater that recharged somewhere within the watershed. Large regional watersheds are made up of many small local watersheds that are tributaries of a larger river system.

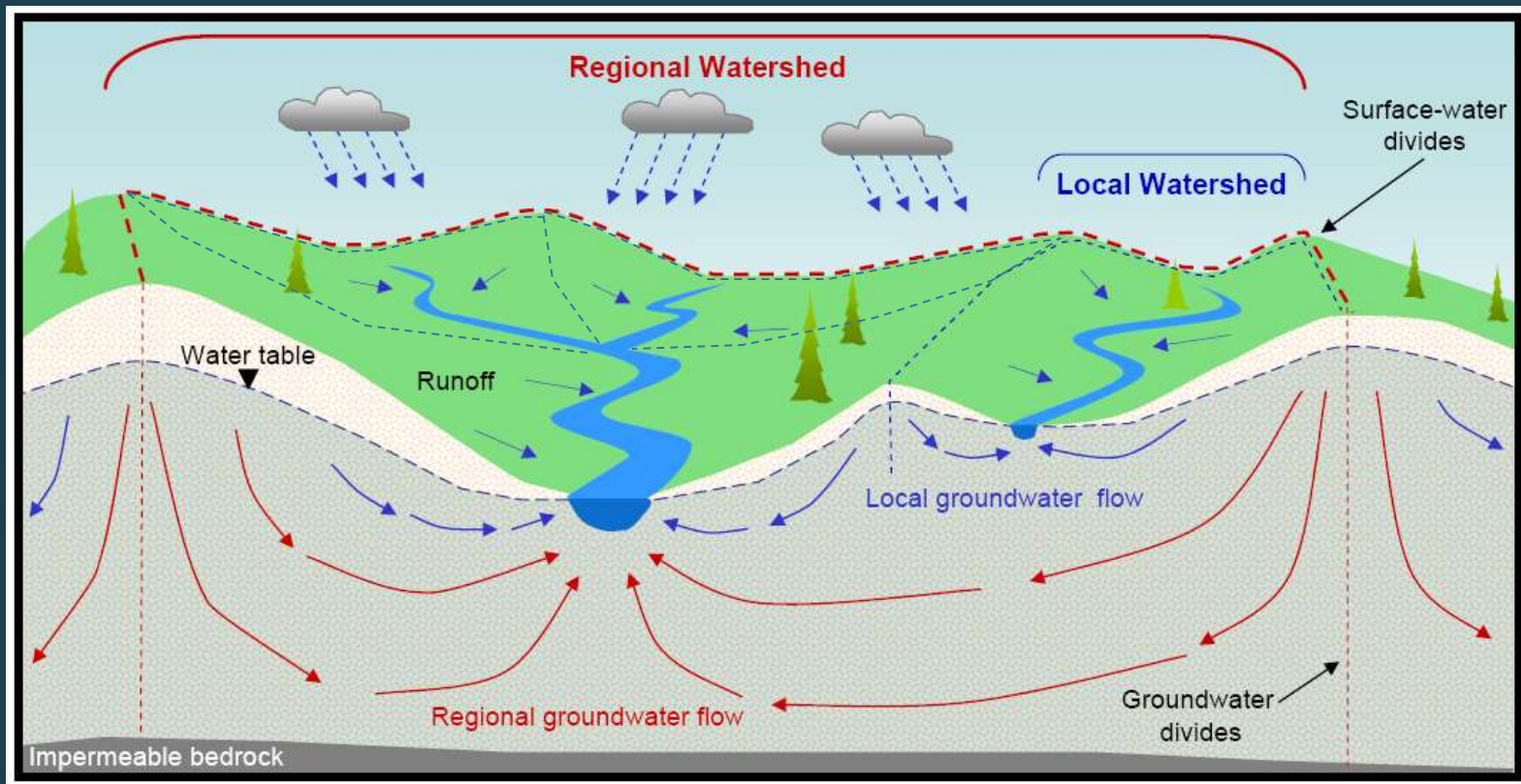
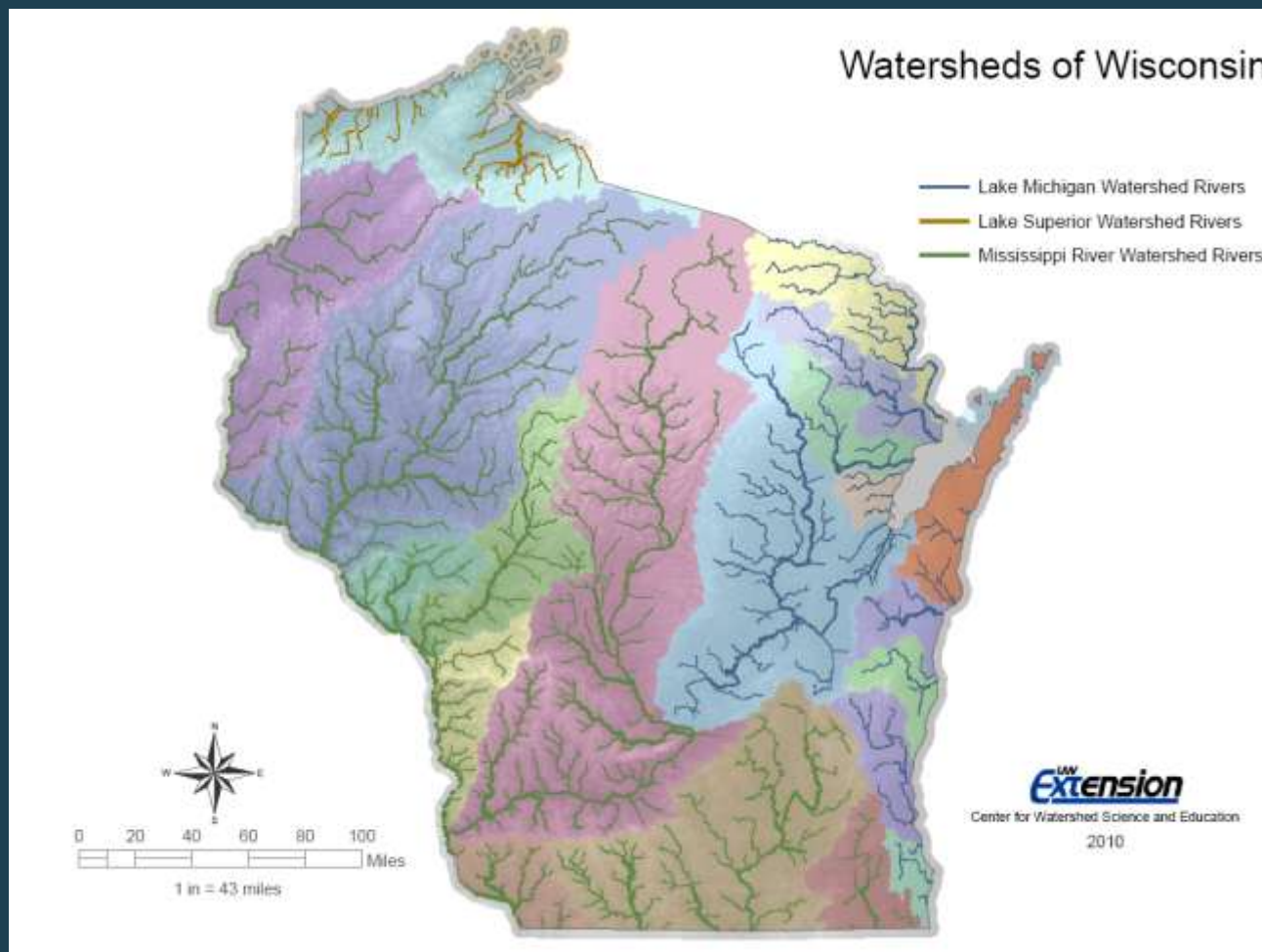


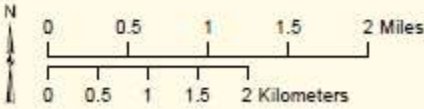
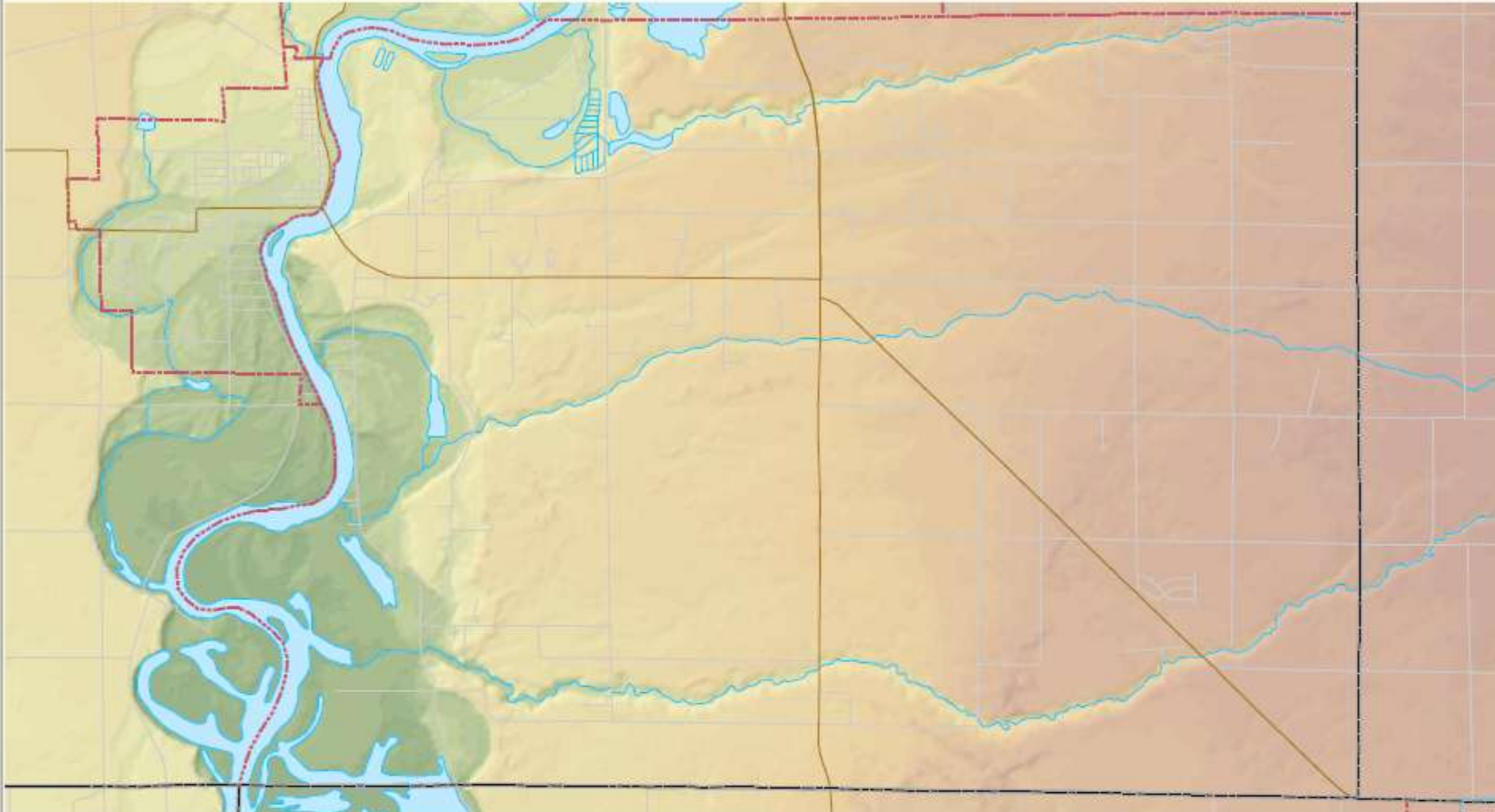
Figure by Kevin Masarik, CWSE

Wisconsin's Watersheds

Wisconsin has three major watersheds or drainage basins. Rivers in the Lake Michigan Watershed are indicated by blue lines, rivers in the Lake Superior Watershed are indicated by orange lines, and rivers in the Mississippi River Watershed are indicated by green lines.

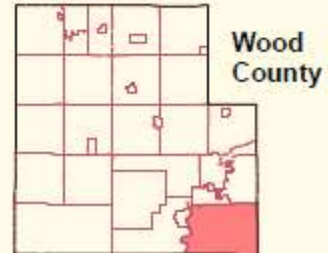
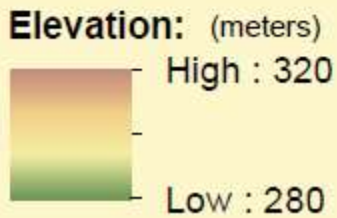
These three watersheds are further subdivided into the watersheds that you see below, represented by the different colors.

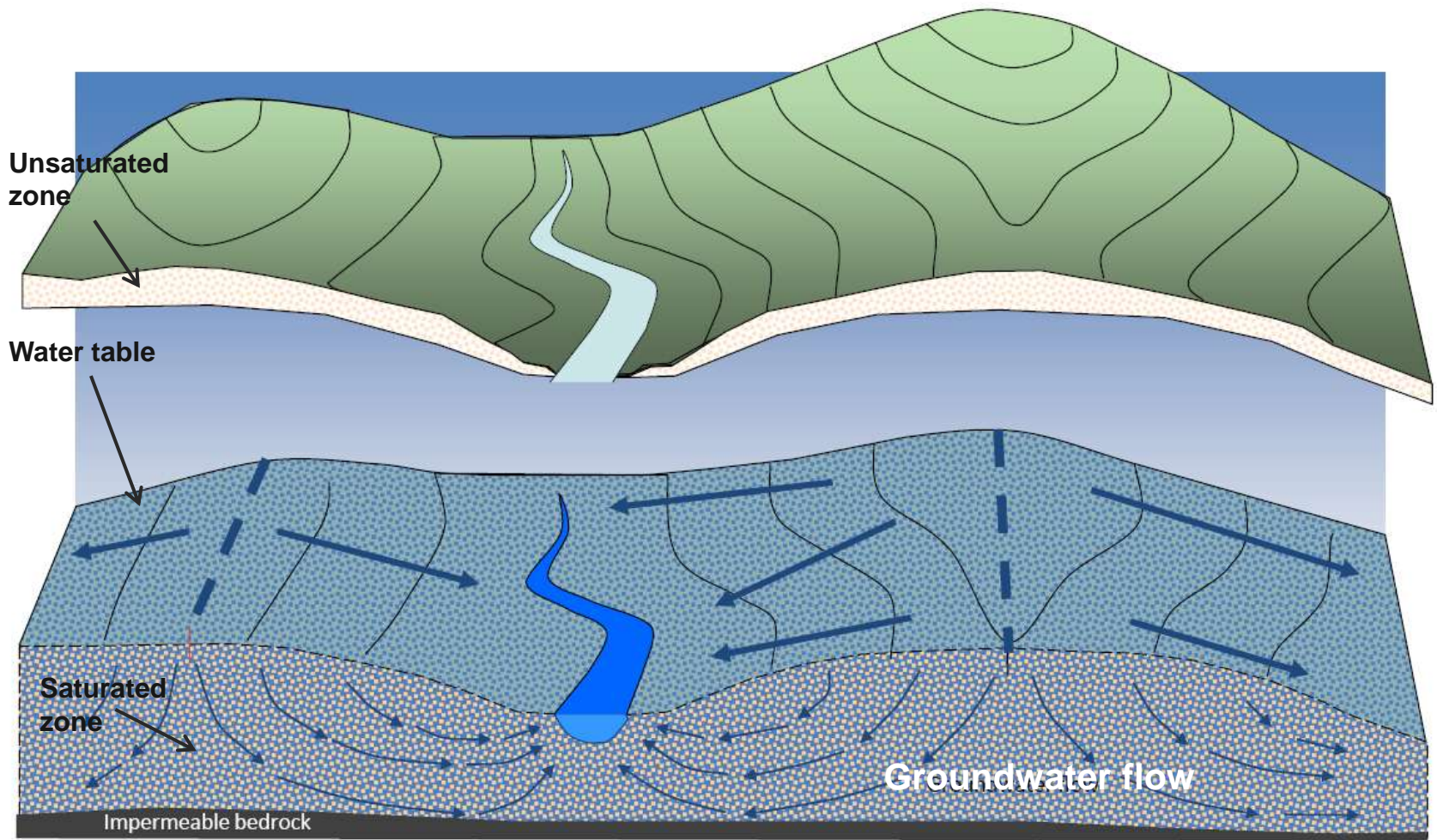




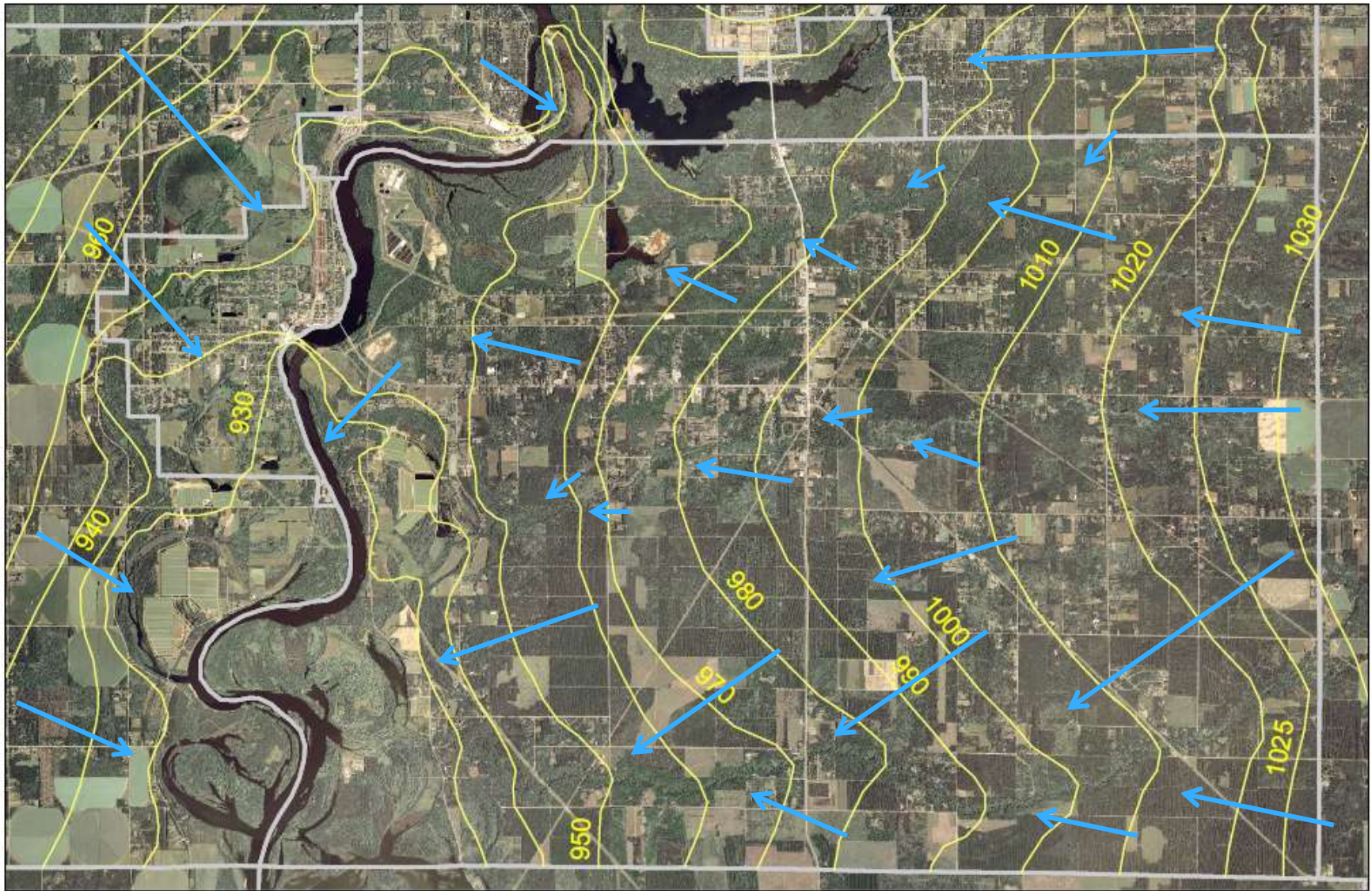
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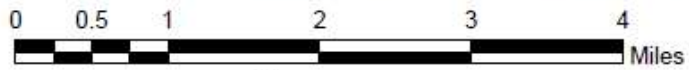


Groundwater flows from recharge areas to discharge areas (streams, rivers, lakes and wetlands). It is responsible for providing a large percentage of the water in Wisconsin's surface waters. The water table is not flat and changes in groundwater elevation are often similar to changes in the land surface elevation. Groundwater can often be determined by locating the nearest river or stream and assuming that the water is traveling to that discharge feature.



Town of Saratoga
Water Table
Elevation

-  Water Table Elevation (ft)
-  Municipal Boundaries

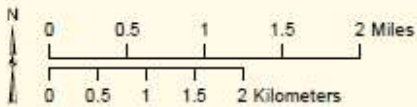
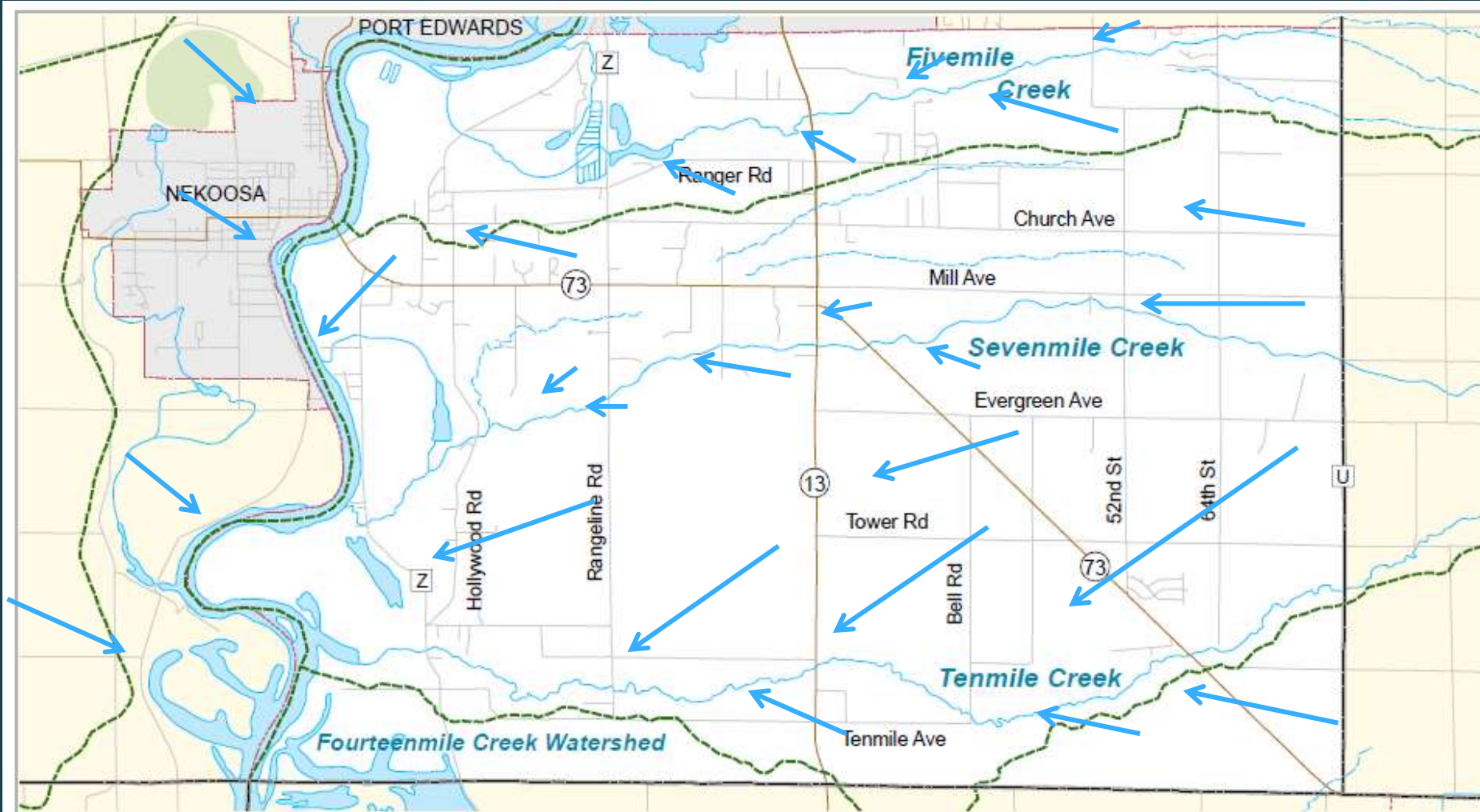


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Groundwater flow direction based off of water table elevation map



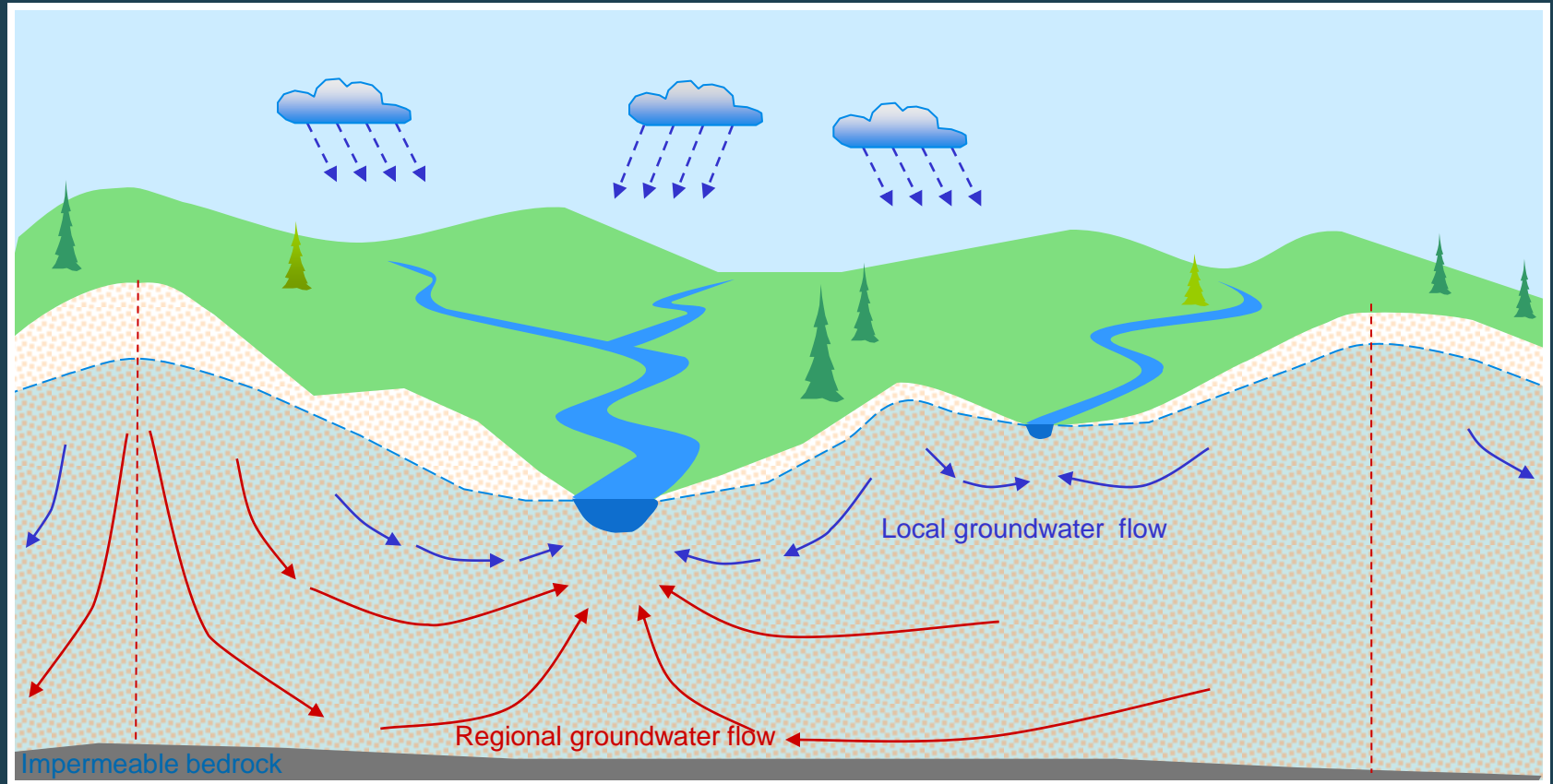
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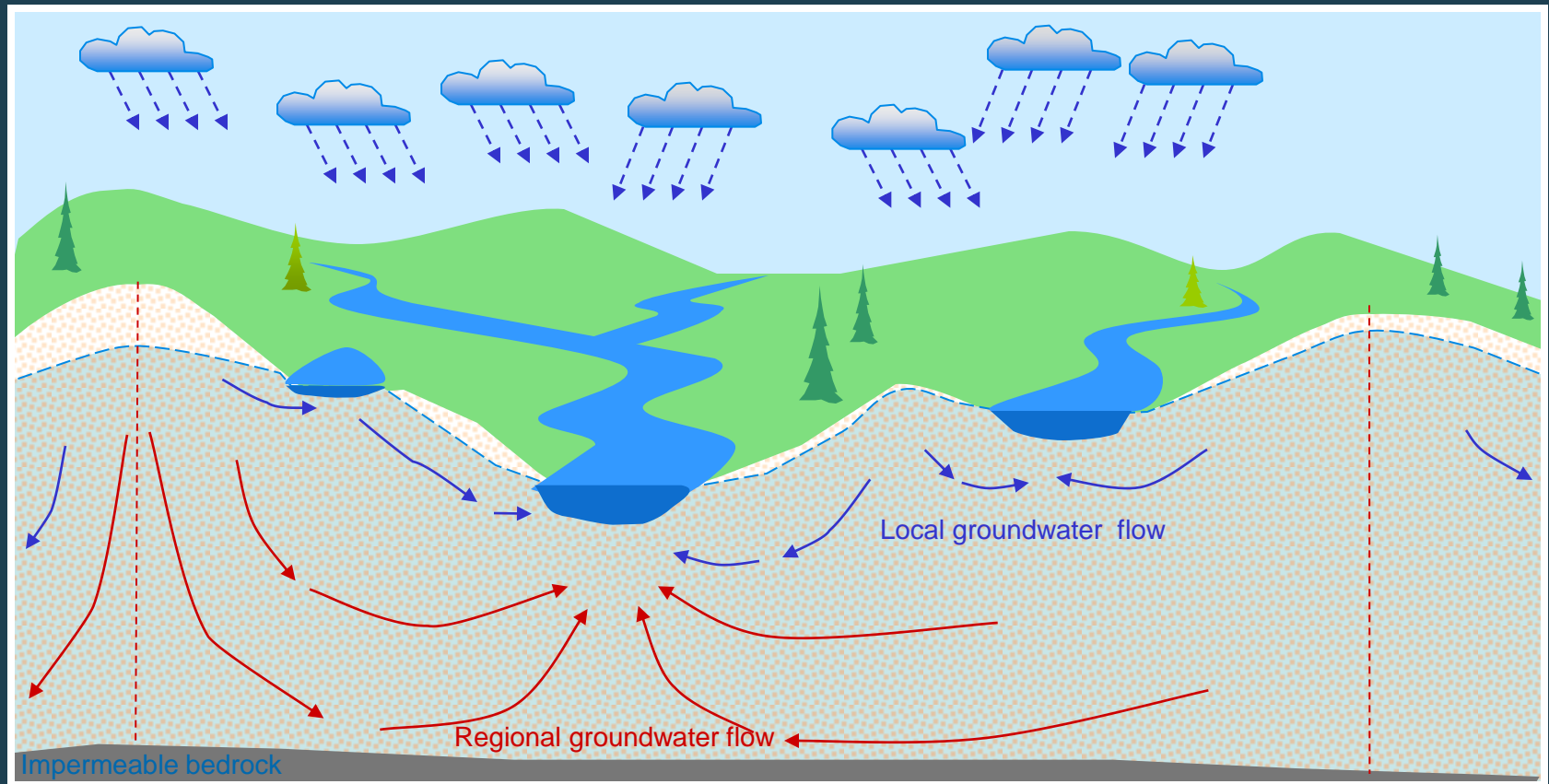
- Watershed Boundary
- Streams
- Lakes/Reservoirs
- Wetlands
- State/US Highways
- Other Roads



What happens when we have more rain?

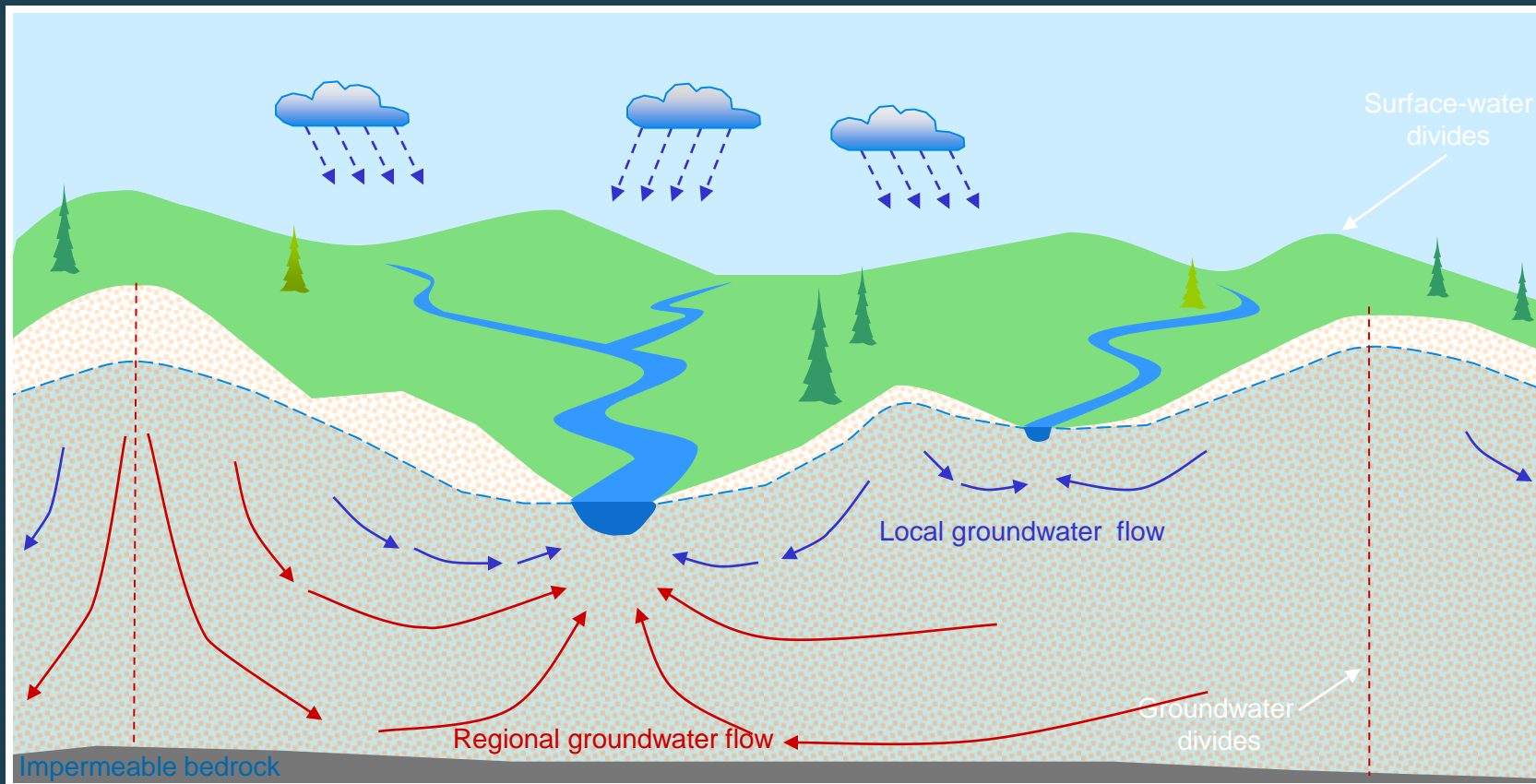


What happens when we have more rain?

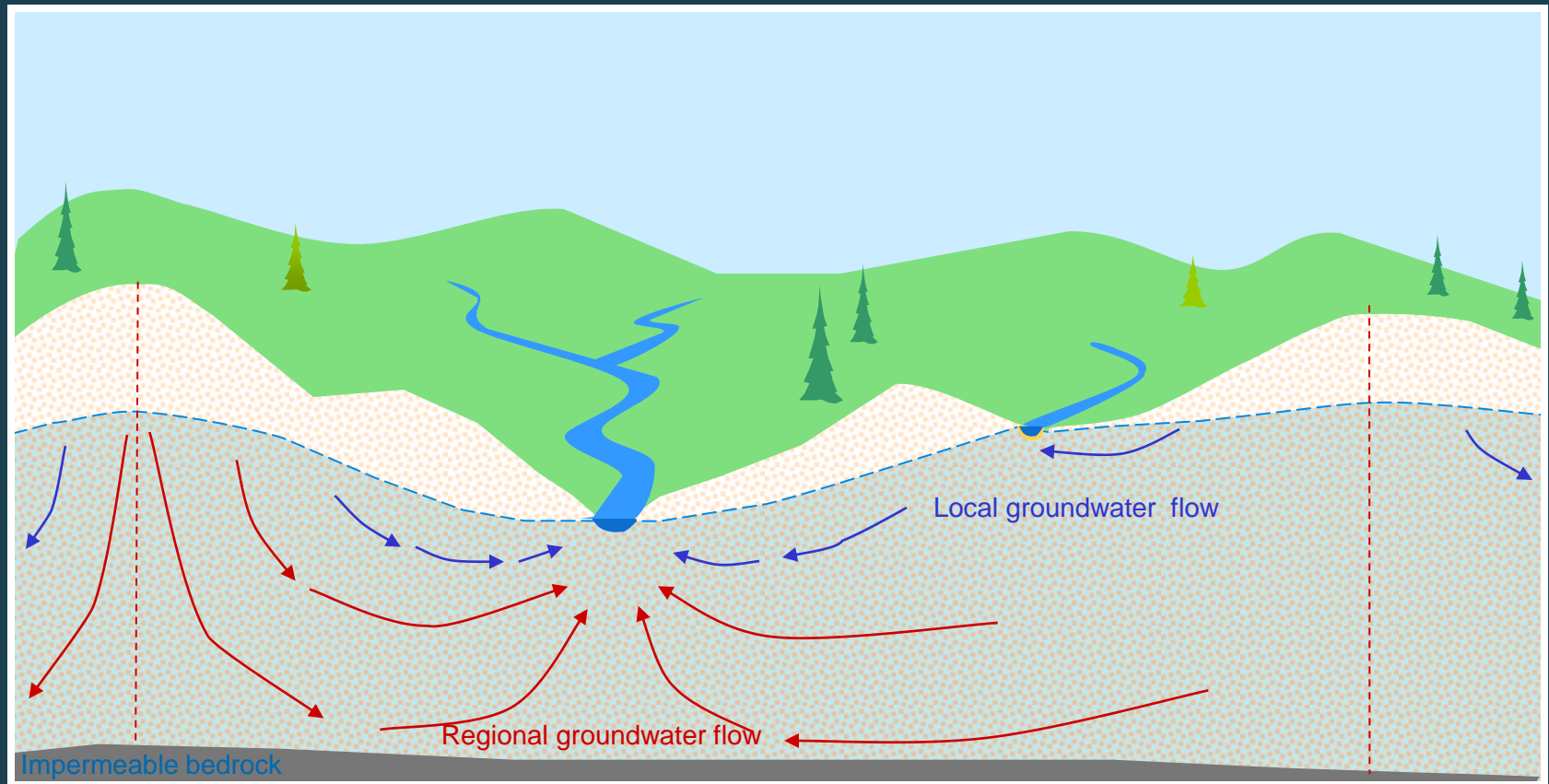


- More infiltration
 - Groundwater levels rise
- More water in rivers, lakes and streams
 - *Seasonal and Climatic Implications*

What happens when we have less rain?



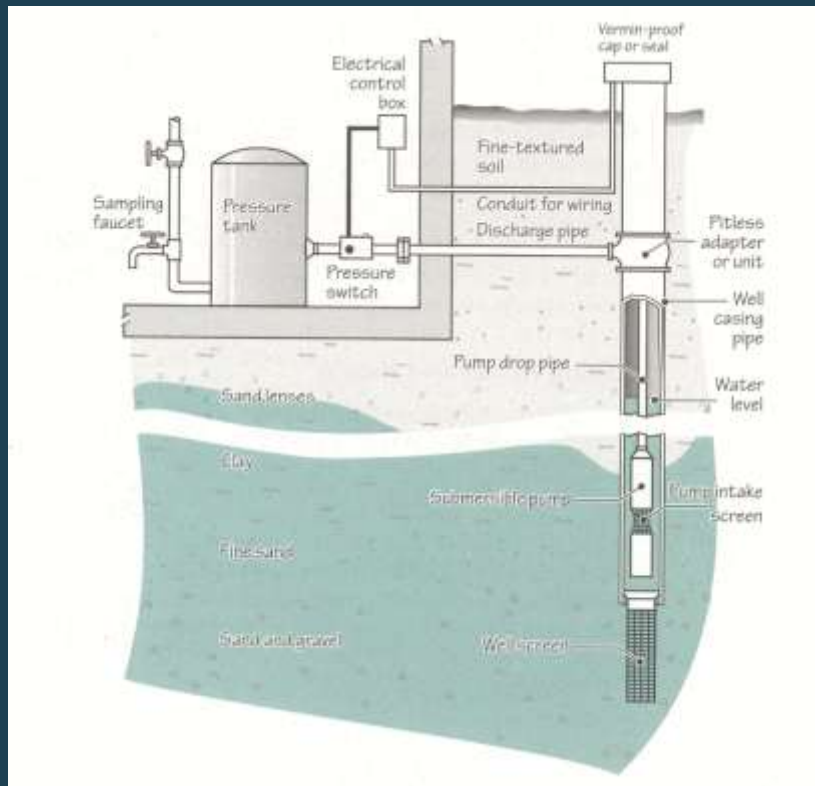
What happens when we have less rain?



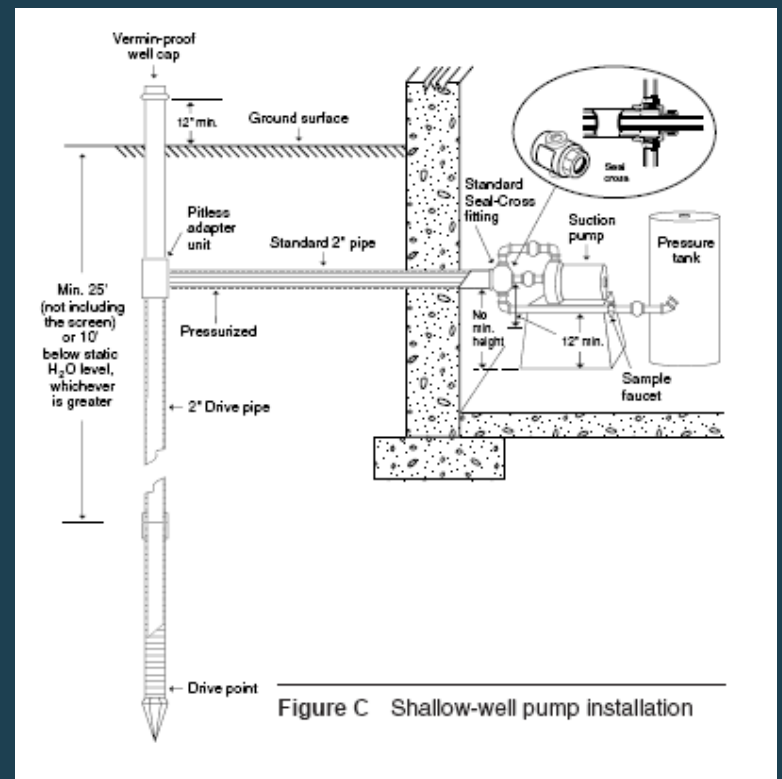
- Less infiltration
- Groundwater levels start to go down
- Less water in rivers, lakes and streams
- *Seasonal and Climatic Implications*

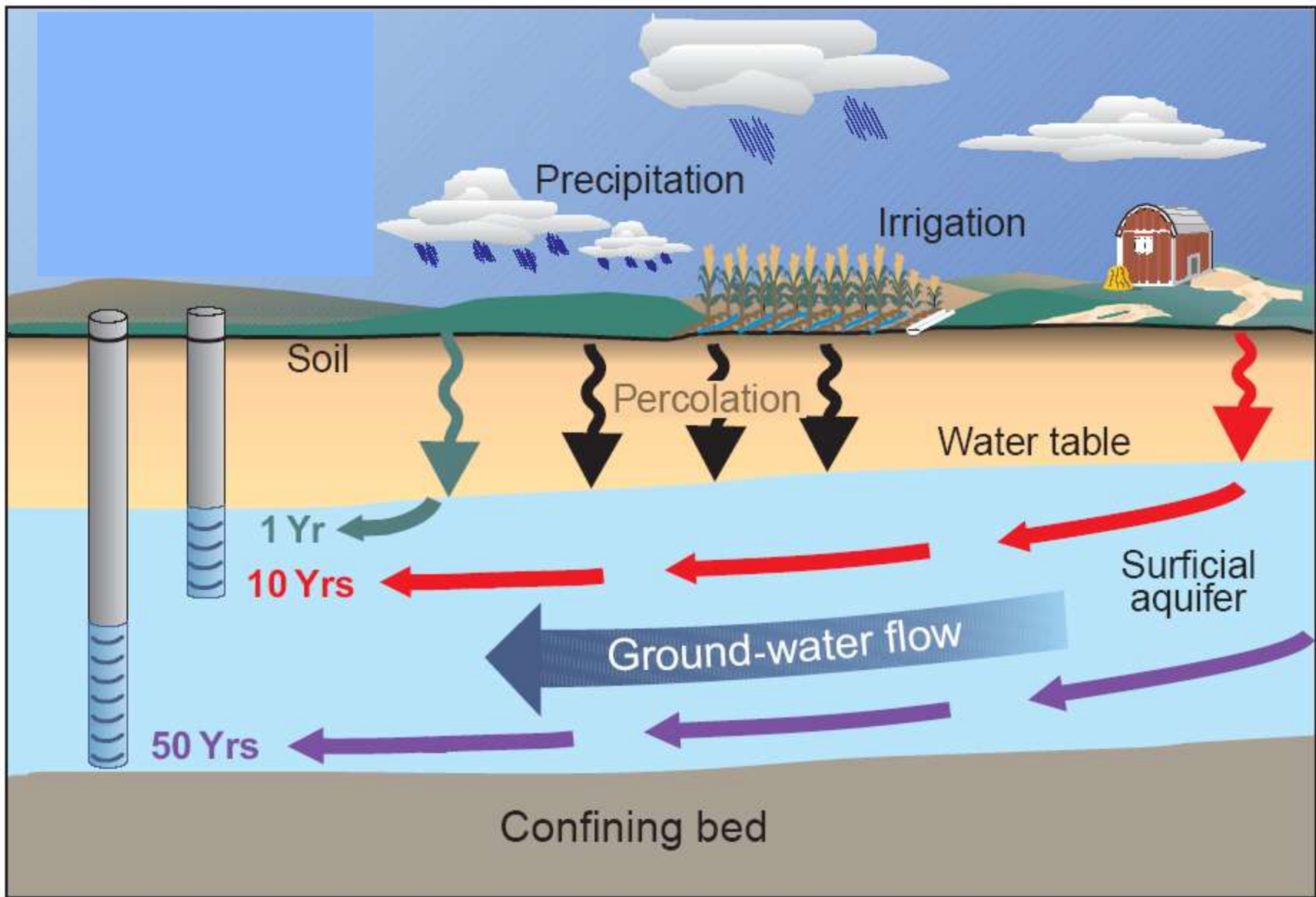
Types of Wells

Drilled Well

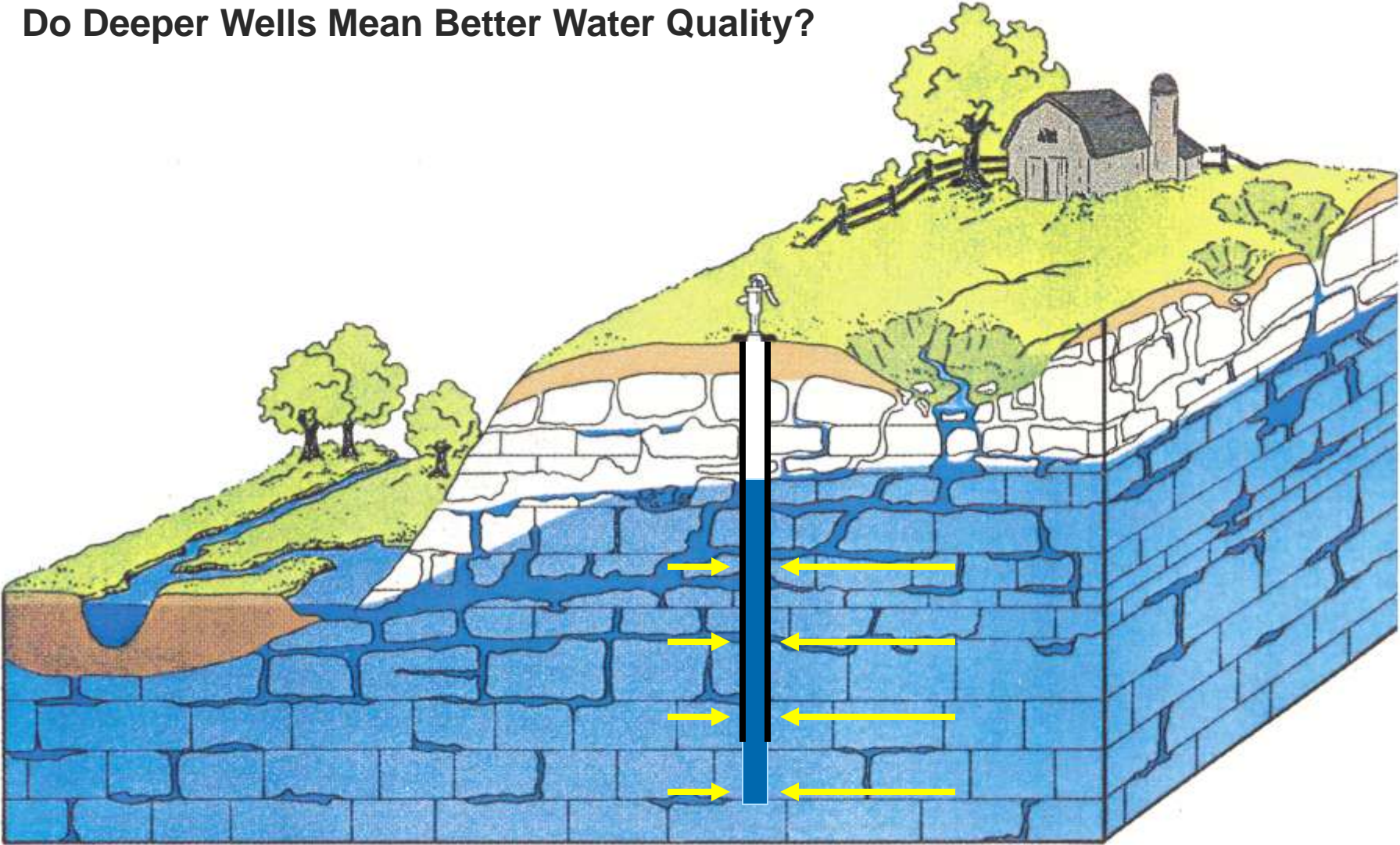


Driven Point Well





Do Deeper Wells Mean Better Water Quality?



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: Waushara Permit No.: W Well Completion Date: 9/2/89

Department of Natural Resources
 Private Water Supply - WWS
 Box 1921
 Madison, WI 53707

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
 W E
 S E
 Gov't Lot # _____ or NE 1/4 of NE 1/4 of Section 34; T 19 N; R 10 E; W _____
 3. Well Type New Replacement Reconstruction
 of unique well # _____ constructed in 19 _____
 Reason for use, replaced or reconstructed well? _____

4. Well serves 1 # of human and/or _____ (ex: barn, restaurant, church, school, industry, etc.)
 High Capacity Well? Yes No
 High Capacity Property? Yes No
 Drilled Driven Point Jetted Other

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 Floodplains? Yes No
 Distance in Feet From Well To Nearest:
 1. Landfill 100
 2. Building Overhang 110
 3. Septic or Holding Tank 150
 4. Sewage Absorption Unit _____
 5. Nonconforming Pit _____
 6. Buried Home Heating Oil Tank _____
 7. Buried Petroleum Tank _____
 8. Sheds/Boat/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	Method of constructing upper enlarged drillhole only.	From (ft.)	To (ft.)	Geology	From (ft.)	To (ft.)
10 surface	1. Rotary - Mud Circulation	140	140	Clay	surface	12
6	2. Rotary - Air			Sandy clay	18	66
	3. Rotary - Foam			Lime rock	66	100
	4. Reverse Rotary			Sand Stone	100	140
	5. Cable-tool Bit _____ in. dia.			Water bearing		
	6. Temp. Outer Casing _____ in. dia. Removed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If no, explain _____					
	7. Other _____					

7. Casing, Liner, Screen	Material, Weight, Specification	From (ft.)	To (ft.)
6	New Black 18.95	surface	66

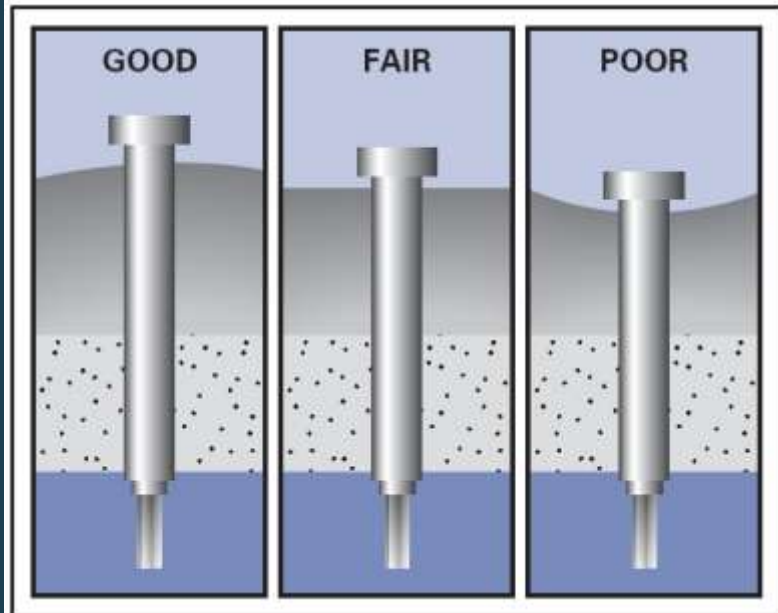
8. Static Water Level 10 ft. above ground level 10 ft. below ground surface
 12. Well Is Above Below Grade
 Developed? Yes No
 Disinfected? Yes No
 Capped? Yes No
 11. Pump Test
 Pumping Level 13 ft. below surface
 Pumping at 20 GPM for 2 hours

9. Grout or Other Sealing Material
 Method: _____ From (ft.): _____ To (ft.): _____ Sacks of Cement: _____
 Kind of Sealing Material: Slurry clay + drillings From (ft.): surface To (ft.): 66

13. Did you permanently seal all unused, noncomplying, or unsafe wells?
 Yes No If no, explain _____

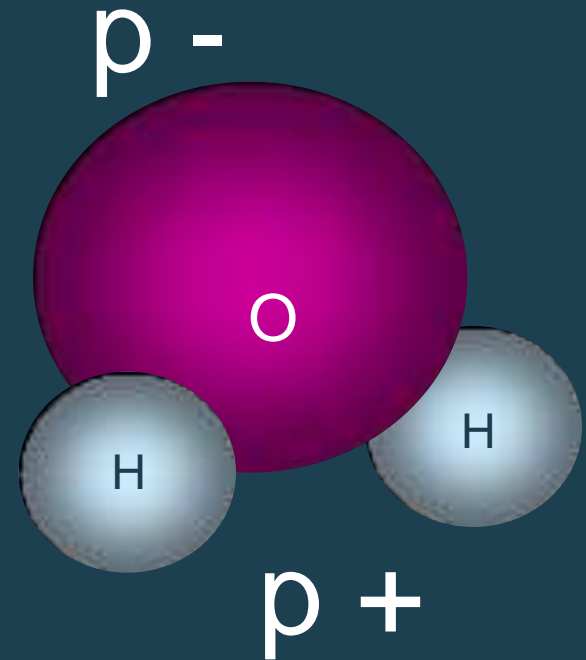
14. Signature of Point Driver or Registered Driller _____ Date Signed: _____
 Signature of Drill Rig Operator _____ Date Signed: _____

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



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.
- Can also treat water to take “stuff” out



Interpreting Drinking Water Test Results

Tests important to health:

- 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

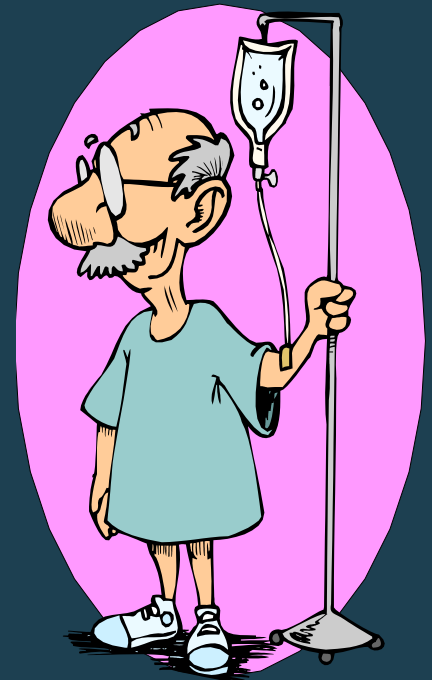
What are the Health Concerns?

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

(ex. Bacteria or viral contamination which 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)



Understanding Risk...?

Dying from a lightning strike.	0.013 in 1,000 chance.
0.010 mg/L of arsenic in drinking water.	3 out of 1,000 people likely to develop cancer.
2 pCi of indoor radon level.	4 out of 1,000 people likely to develop lung cancer. ¹
Dying in a car accident.	4 in 1,000 chance.
2 pCi of indoor radon combined with smoking.	32 out of 1,000 people could develop lung cancer. ¹

Drinking water quality is only one part of an individual's total risk.

¹<http://www.epa.gov/radon/healthrisks.html>

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.



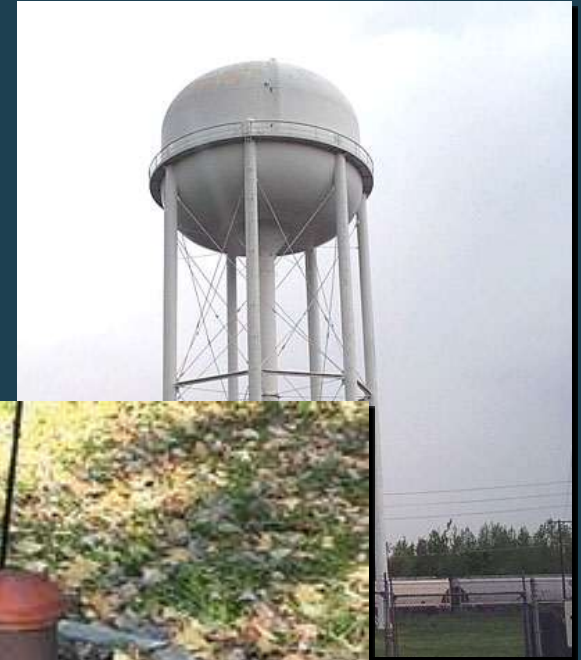
Private vs. Public Water Supplies

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.



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.

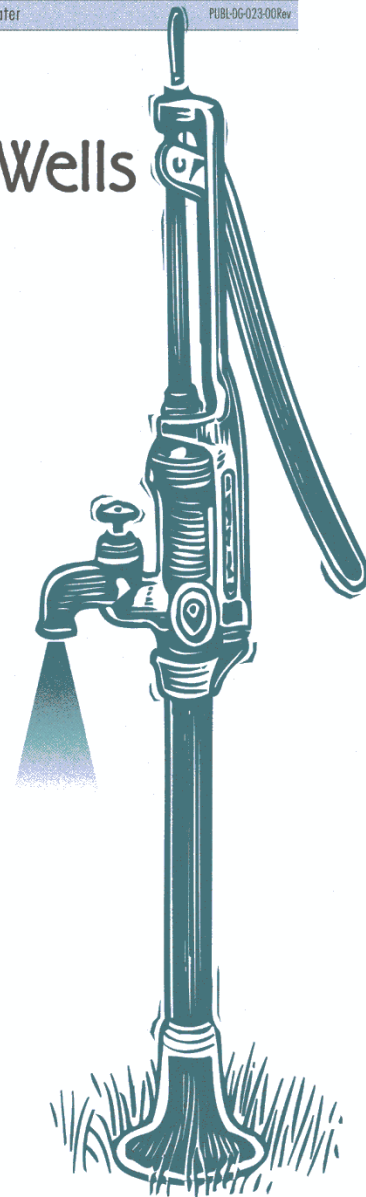
This brochure gives information about several common contaminants found in private wells. It should help you decide when to sample your well and how often, how to find a certified laboratory and who to call for help.

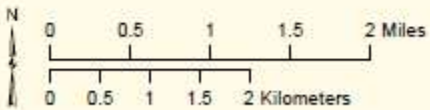
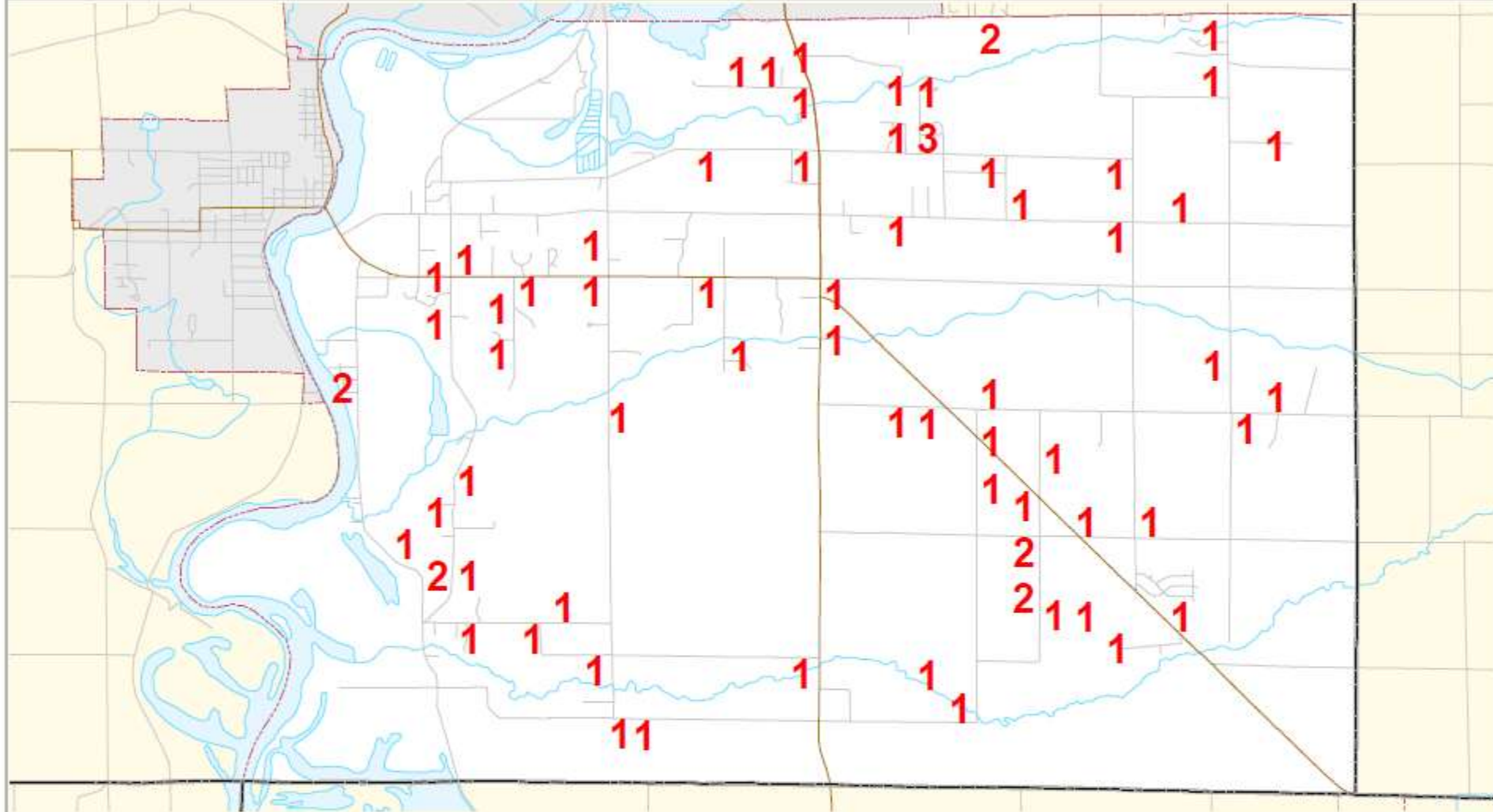
What tests should be done on my water?

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



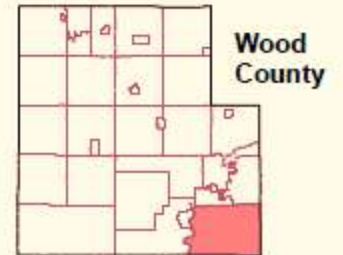


Town of Saratoga

Wood County
November 2012

SAMPLE DISTRIBUTION

NUMBER OF SAMPLES
per 1/4 1/4 SECTION





Water and Environmental Analysis Lab

UW Stevens Point, College of Natural Resources
Phone (715)346-3208 or Toll free (877)383-8378
www.usnp.edu/cm/well



Monday, August 15, 2011

WELL INFORMATION:

WI Unique Well Number

Address

City

State

County

Town

Legal Description

1/4 1/4 (section) (town) (range)

Map : Gov't Lot#

Year well installed 1950

Casing Diameter:

1" less 4.0" 10-18" 18"

Total well depth 160

Depth of casing

Depth to water

SOURCE:

Municipal Spring

Other

TREATMENT SYSTEM(S) OWNED:

Water softener Rev Osmosis

Carbon filter Neutralizer

Particle filter Iron Filter

Other

PROBLEMS OBSERVED:

Color Taste Odor

Corrosion Health None

Other

LAST DATE TESTED:

Never Unknown

Less than 1 year 1-2 years

2-5 years 5-10 years

Greater than 10 years

REASON FOR TESTING:

Curious about water quality

Suspect water quality problems

Regularly test my well

Required by lending institution

Result of positive bacteria test

Retest following well disinfection

Infant/pregnant women/daycare

Other

MAIL RESULTS TO:

Last

First

Address

City

State

Phone

SAMPLE(S) COLLECTED

Date 4/25/2011

Time 13:30

SAMPLE(S) TAKEN FROM:

Pressure Tank

Kitchen faucet

Bathroom faucet

Outside faucet

Barn

Other

SAMPLE_ID 78543

Labno 86-11-6

Group ST_CROIX CO 11APR2

(Report continued for Heinbuch, Sample ID 78543)

1. BACTERIA ABSENT – means that no bacteria were found and your water supply is considered bacteriologically safe for uses such as drinking and cooking. You can be reasonably sure that your water supply is free of fecal coliform and other pathogenic bacteria.

To ensure your well remains in good sanitary condition, consider testing your well again for coliform bacteria annually or sooner if you notice a sudden change in taste, color or odor to the water.

2. NITRATE – Water greater than 10 mg/L of nitrate-nitrogen should not be consumed by infants less than 6 months of age or pregnant women. The WI Department of Health Services recommends that all persons should avoid long-term consumption of water with nitrate-nitrogen concentrations greater than 10 mg/L. You may choose to reduce your exposure to nitrate by installing an approved water treatment device (reverse osmosis, distillation or anion exchange), purchasing bottled water or investigate the possibility that a new well would result in lower nitrate levels.

Disclaimer: The analyses run on your samples only cover some of the more common water quality characteristics. Safe levels of these chemicals or bacteria do not guarantee that your water is free of all toxic chemicals. Bacteria die-off in samples over 30 hours old may render results inaccurate and are therefore deemed inconclusive. If you suspect gasoline residues, pesticides, or other trace chemicals, you would need additional analyses. Contact the lab or your Extension office for more information.

LABORATORY RESULTS

Parameter	Qualifier	Results	Units	
Bacteria-Coliform		Absent		(see note 1 below)
Hardness-Total		392	mg/l CaCO3	
Alkalinity		232	mg/l CaCO3	
Conductivity		842	umhos/cm	
pH		7.90	std units	
Saturation Index (Ca)		0.5		Corrosivity Balanced
Nitrogen-Nitrate/Nitrite		27.6	mg/l N	(see note 2 below)
Chloride		51.8	mg/l	
Arsenic	Less Than	0.005	mg/l	
Calcium		93.7	mg/l	
Copper		0.329	mg/l	
Iron		0.002	mg/l	
Lead		0.007	mg/l	
Magnesium		39.0	mg/l	
Manganese	Less Than	0.001	mg/l	
Potassium		16.6	mg/l	
Sodium		15.5	mg/l	
Sulfate		31.5	mg/l	
Zinc		0.697	mg/l	
DACT Screen		0.2	ug/l	

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

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

Coliform bacteria

- Generally do not cause illness, but indicate a pathway for potentially harmful microorganisms to enter your water supply.
 - Harmful bacteria and viruses can cause gastrointestinal disease, cholera, hepatitis
- Sanitary water supply should not contain any coliform bacteria
- Recommend using an alternative source of water until a test indicates your well is absent of coliform bacteria
- Sources:
 - Live in soils and on vegetation
 - Human and animal waste
 - Sampling error

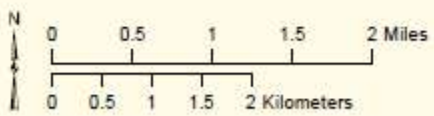
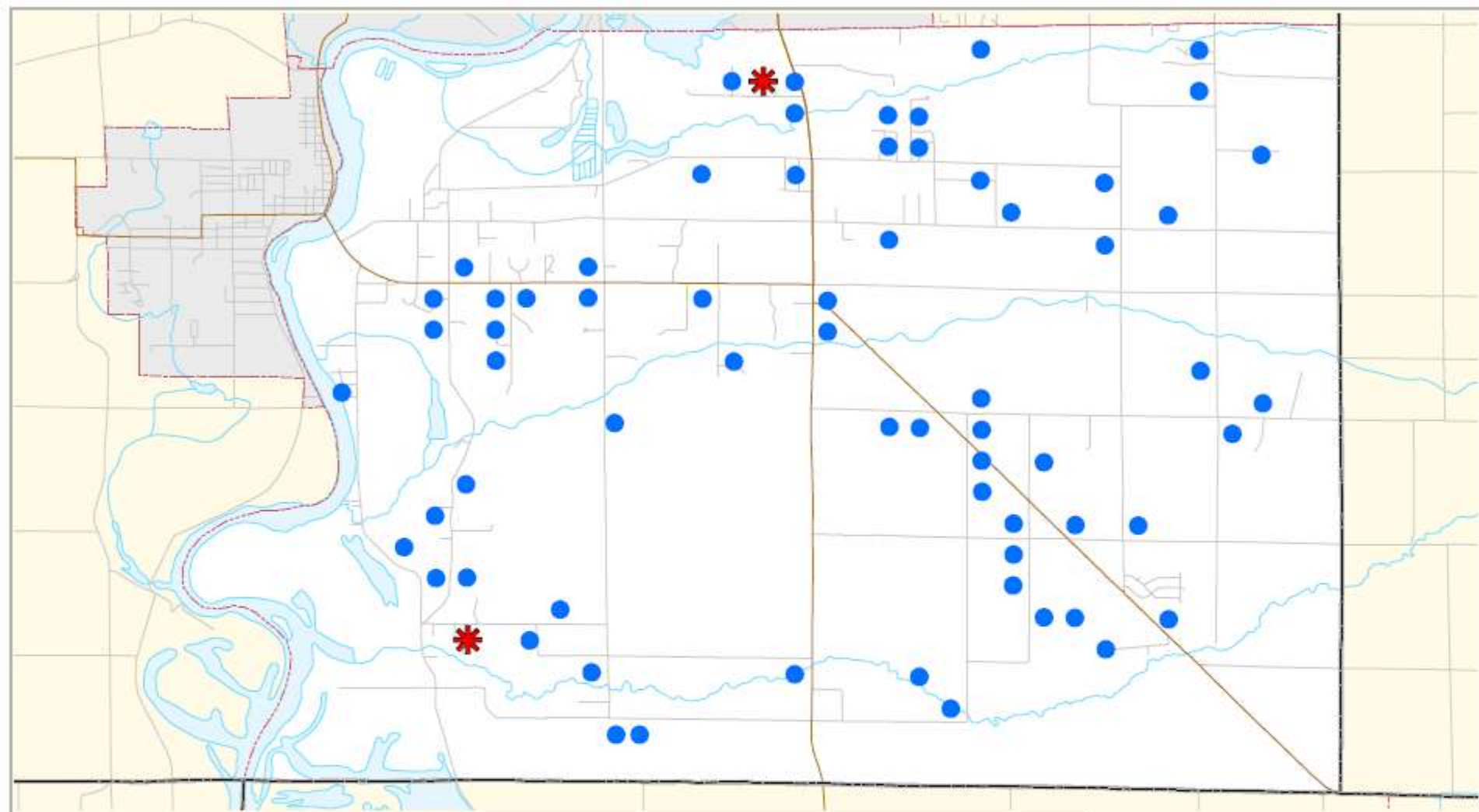


ASM MicrobeLibrary.org©Graham



Present = Unsafe

Absent = Safe

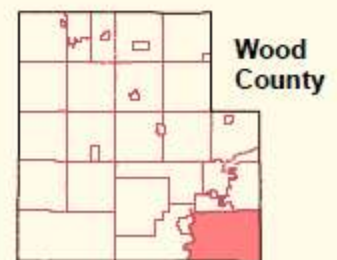


Town of Saratoga

**Wood County
November 2012**

*** BACTERIA POSITIVE**

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



If coliform bacteria was detected, we also checked for e.coli bacteria test

- Confirmation that bacteria originated from a human or animal fecal source.
- 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.

Information Sources: United States Department of Health and Human Services – Centers for Disease Control and Prevention (www.cdc.gov) and United States Environmental Protection Agency (www.epa.gov)

Contaminants	Sources	Symptoms
BACTERIA		
<p><i>Escherichia coliform (E. coli)</i> <i>Salmonella</i> <i>Campylobacter</i> <i>E. coli O157</i> (Requires a special water test for detection. Causes similar, but more serious illness than other E.coli strains. Requires medical treatment.)</p> <hr/> <p><i>Leptosporidia</i></p>	<ul style="list-style-type: none"> • Infected human and animal feces • Manure • Septic systems • Sewage <hr/> <ul style="list-style-type: none"> • Urine of livestock, dogs and wildlife • Manure 	<ul style="list-style-type: none"> • Gastrointestinal illness • Low-grade fever • Begins 12 hrs - 7 days after exposure <hr/> <ul style="list-style-type: none"> • High fever, severe headache and red eyes • Gastrointestinal illness • Begins 2-28 days after exposure
MICROSCOPIC PARASITES		
<p><i>Cryptosporidia</i> <i>Giardia</i></p>	<ul style="list-style-type: none"> • Infected human and animal feces • Manure • Septic systems • Sewage 	<ul style="list-style-type: none"> • Gastrointestinal illness • Begins 2-14 days after exposure
VIRUSES		
<p>Norovirus</p>	<ul style="list-style-type: none"> • Infected human feces and vomit • Septic systems • Sewage 	<ul style="list-style-type: none"> • Gastrointestinal illness • Low-grade fever & headache • Begins 12-48 hrs after exposure
CHEMICALS		
<p>Nitrate</p> <hr/> <p>Atrazine (trade-name herbicide for control of broadleaf and grassy weeds)</p>	<ul style="list-style-type: none"> • Fertilizers • Manure • Bio-solids • Septic systems <hr/> <p>Estimated to be most heavily used herbicide in the U.S. in 1987/89, with its most extensive use for corn and soybeans in the Midwest, including WI. In 1993, it became a restricted-use herbicide nationally. U.S. EPA set a max. contaminant level (MCL) at 3 parts per billion for safe drinking water.</p>	<p>Methemoglobinemia or "Blue Baby Syndrome" – No documented cases in Door County, but elevated nitrate levels in well water may indicate risk of contamination by additional pathogens.</p> <hr/> <p>Short-term exposure above the MCL may cause: congestion of heart, lungs and kidneys; low blood pressure; muscle spasms; weight loss; damage to adrenal glands.</p> <p>Long-term exposure above MCL may cause: weight loss, cardiovascular damage, retinal and some muscle degeneration; cancer.</p>

Some Common Pathways for Bacteria to Enter Your Water System



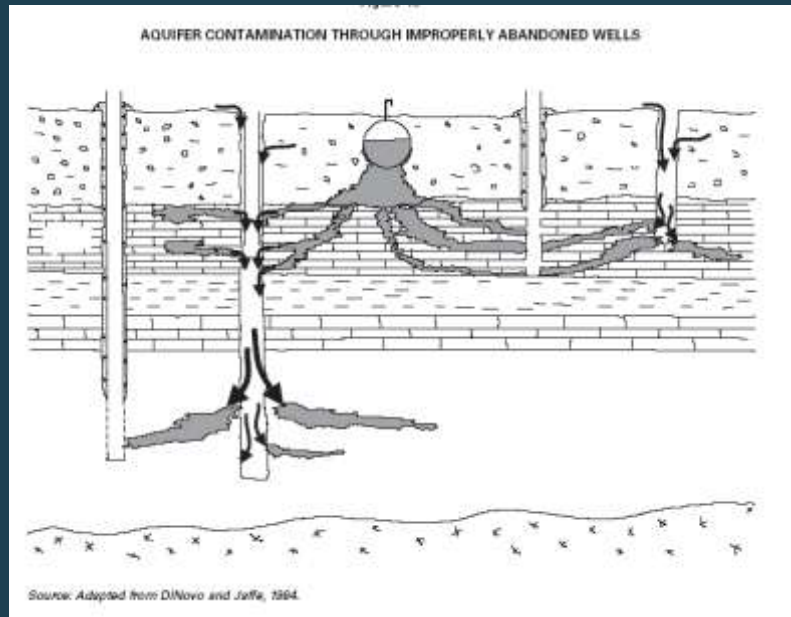
Photo: Sandy Heimke, WI DNR



Photo: Sandy Heimke, WI DNR



Photo: Sandy Heimke, WI DNR

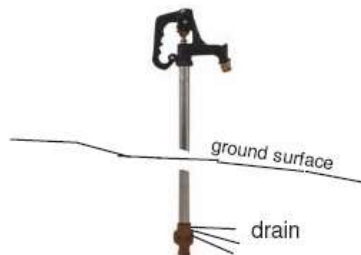


Source: Adapted from DiNovo and Jaffe, 1984.

Comm 82.40(8)(e)2., Wisconsin Administrative Code prohibits the installation of a yard hydrant with a below ground discharge. The code reads:

“Stop and waste-type control valves may not be installed underground.”

This type of hydrant, with a below ground discharge is popular because of the ease of operation and the relative low cost.



The plunger (control valve) is located below the frost line. When the handle is lifted water enters the riser and flows through the head. A drain at the same level as the plunger allows water in the riser and the head to drain each time the handle is lowered. This draining action prevents freezing temperatures from causing the water in the hydrant riser or head to expand and burst the device. If a hose connected to the hydrant without a hose connection vacuum breaker were submerged in a barrel, the entire contents of the barrel could be siphoned through the drain port and could contaminate the groundwater or even your drinking water supply.

If you have further questions, please check the Commerce website at: <http://commerce.wi.gov/SB/SB-PlumbingProgram.html>

*or, contact your local plumbing inspector
or, contact one of the consultants listed*



District #	Name	Phone/fax
1	Tim Joyce	608-235-0557 / 608-283-7454
2	Tom Braun	715-340-5387 / 608-283-7455
3	Don Oremus	715-584-2007 / 608-283-7452
4	Don Hough	715-634-4804 / 608-283-7451
5	Ryan Boebel	608-412-3998 / 608-283-7449

SBD-10893-P(R06/09)

What does an approved yard hydrant look like?



There's no "one" answer for a code-compliant yard hydrant. Many manufacturers produce models that are code compliant. When you buy a hydrant, make sure that it has an approved hose connection vacuum breaker and does not include an underground drain.

And if you install a hose connection vacuum breaker on a yard hydrant make sure you loosen it during the winter to prevent freezing conditions from bursting the hydrant.

If you find a model that you have questions about, contact the department or your local plumbing inspector.

What should I do if coliform bacteria was present?

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
 - A nearby unused well or pit
 - Inadequate filtration by soil
 4. Disinfect the well
 5. Retest to ensure well is bacteria free.
- For reoccurring bacteria problems the best solution may be a new well.



Rock and Soil Impacts on Water Quality

Tests for Aesthetic Problems

Hardness

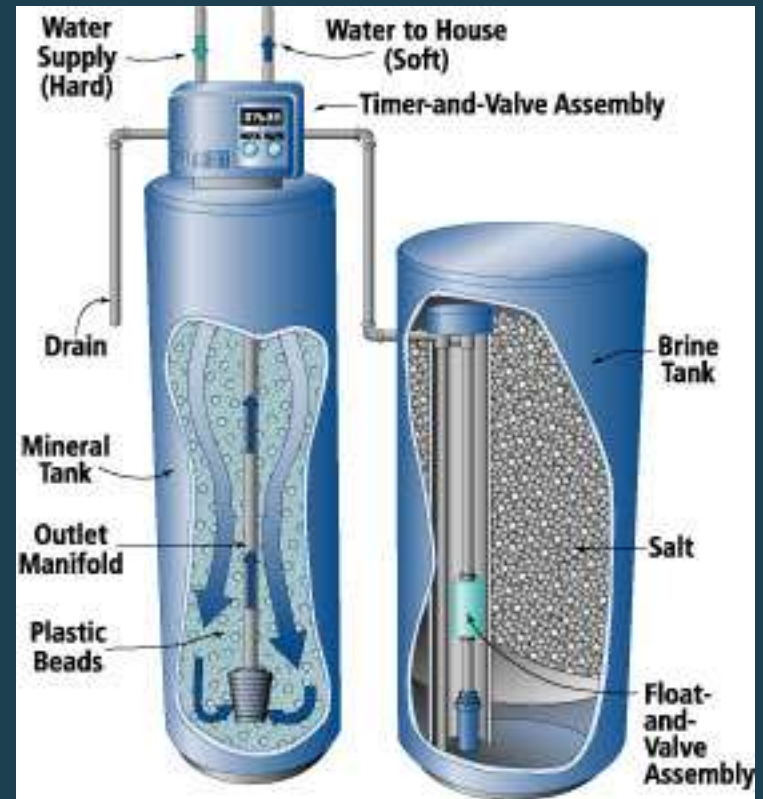
- Natural (rocks and soils)
- Primarily calcium and magnesium
- Problems: scaling, scum, use more detergent, decrease water heater efficiency

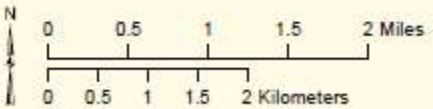
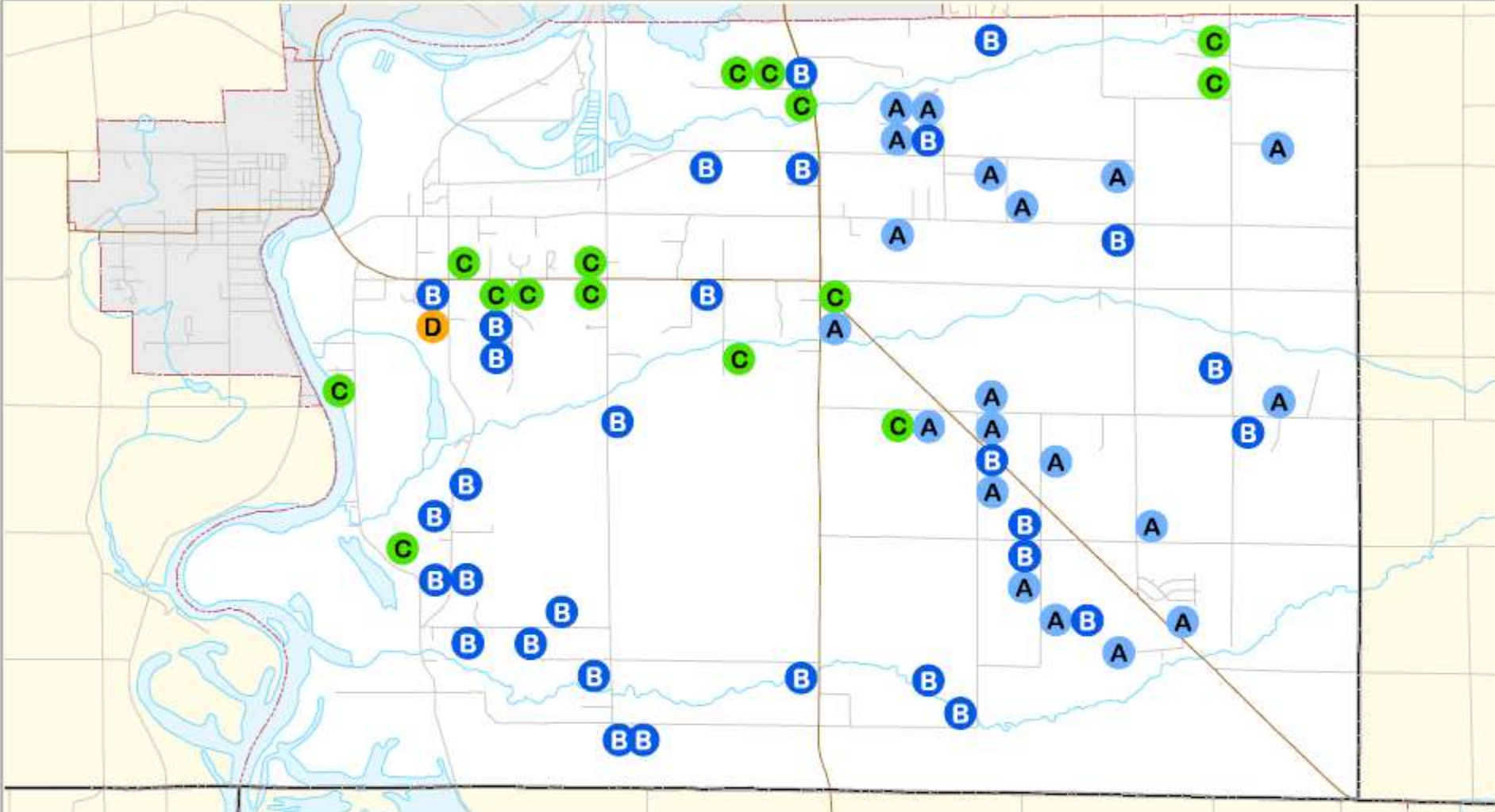


Water Softening

Water softeners remove calcium and magnesium which cause scaling and exchange it for sodium (or potassium).

- Negative: Increases sodium content of water.
- Suggestions:
 - Bypass your drinking water faucet.
 - Do not soften water for outdoor faucets.
 - If you are concerned about sodium levels – use potassium chloride softener salt.





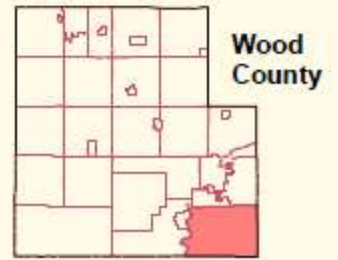
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Wood County
November 2012

TOTAL HARDNESS (ppm CaCO₃)

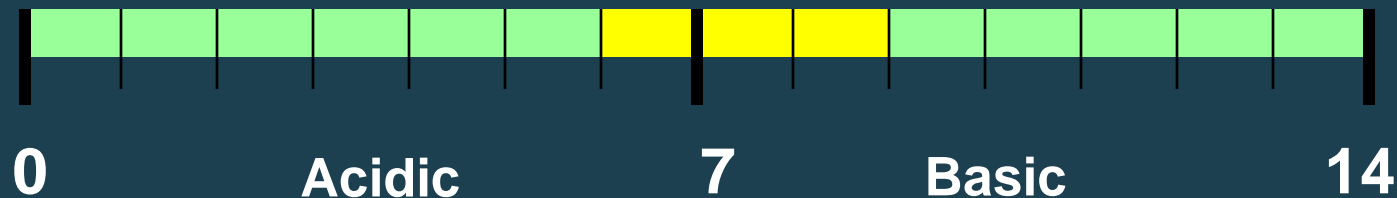
A ... 50	25	32%
B 51 - 100	36	46%
C 101 - 200	14	18%
D 201 - 300	4	5%
E 301 - 400	0	0%
F 401 ...	0	0%

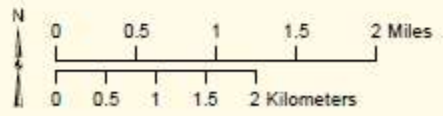
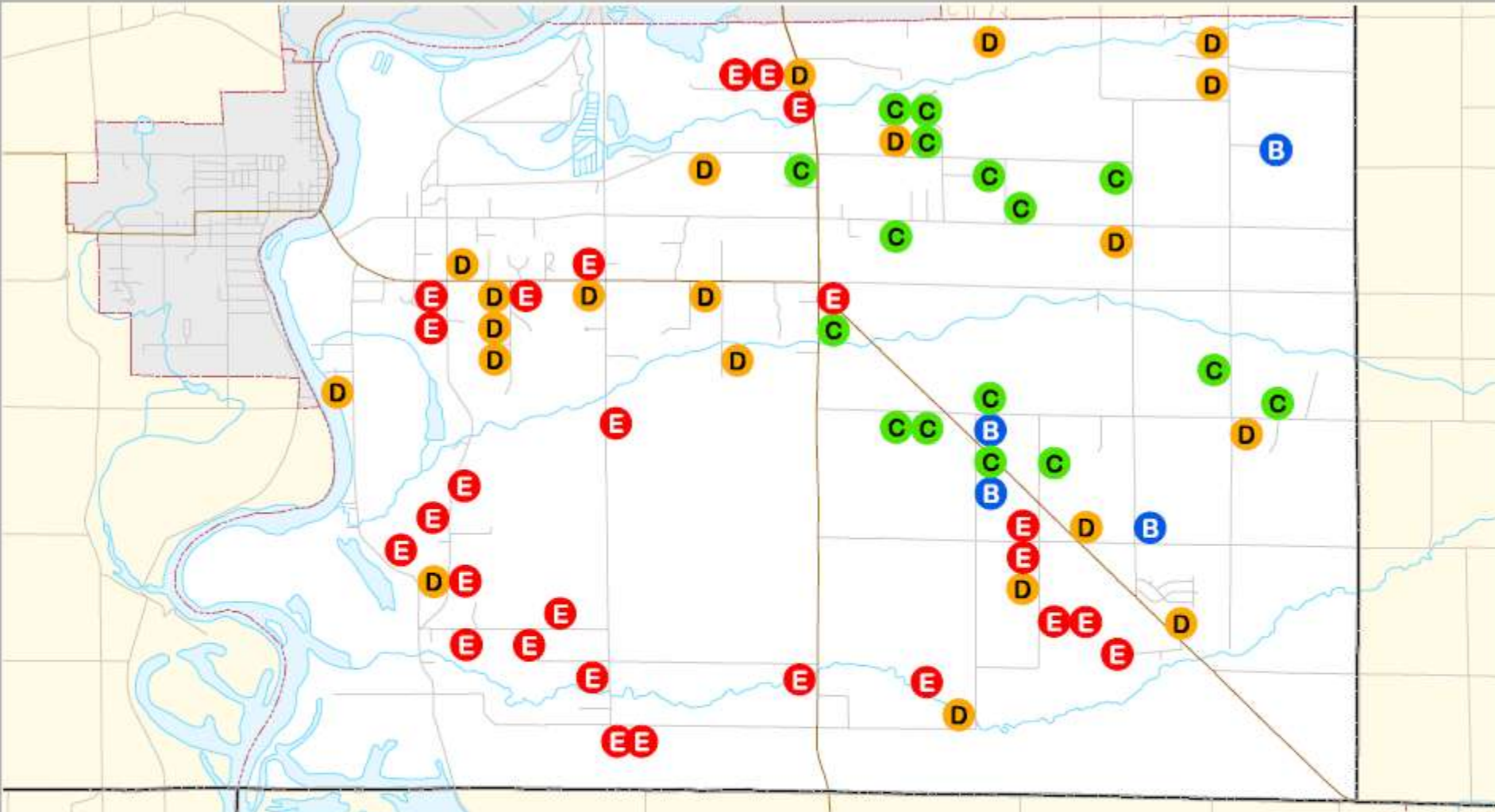
Mapped value is the average unless otherwise indicated.
Treated samples not mapped.



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





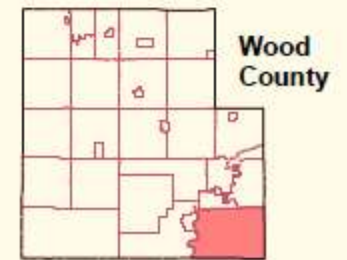
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pH

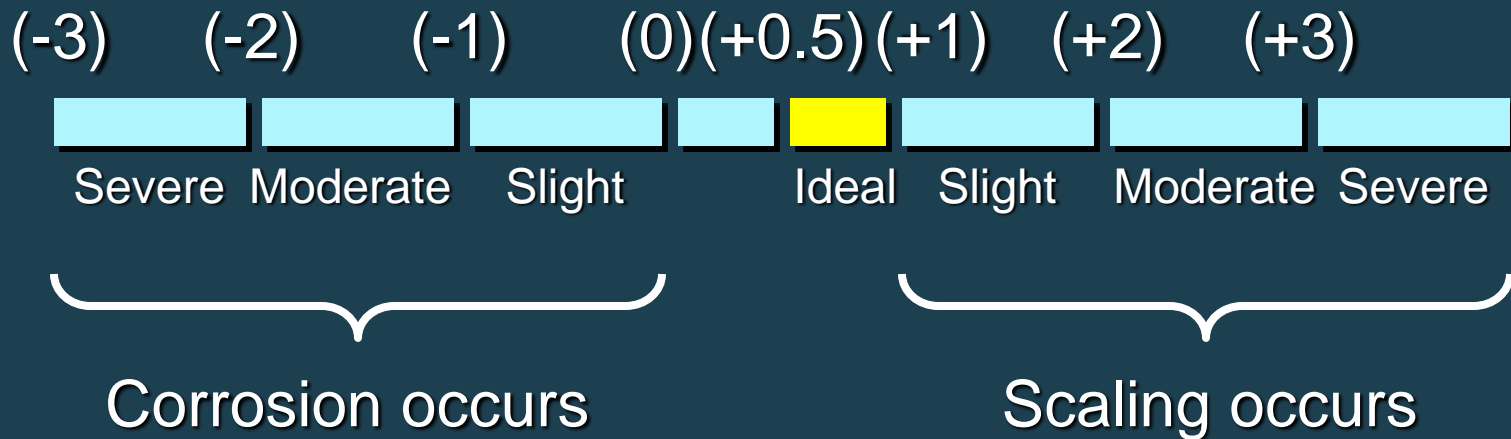
A ... 5.00	0	0 %
B 5.01 - 6.00	4	5 %
C 6.01 - 7.00	17	22 %
D 7.01 - 8.00	24	30 %
E 8.01 - 9.00	34	43 %
F 9.01 ...	0	0 %

Mapped value is the average unless otherwise indicated.
Treated samples not mapped.



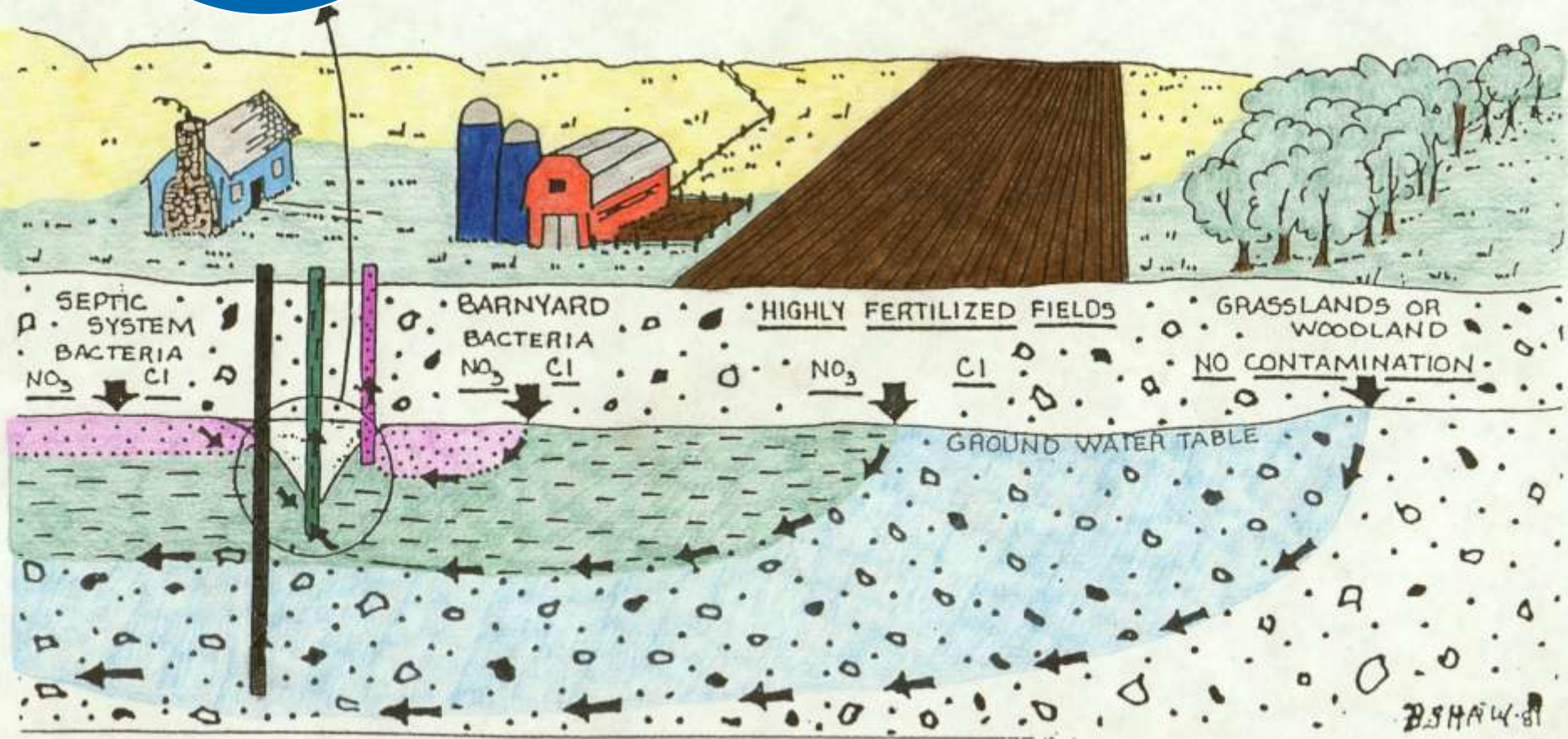
Tests for Overall Water Quality

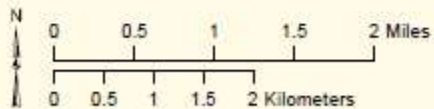
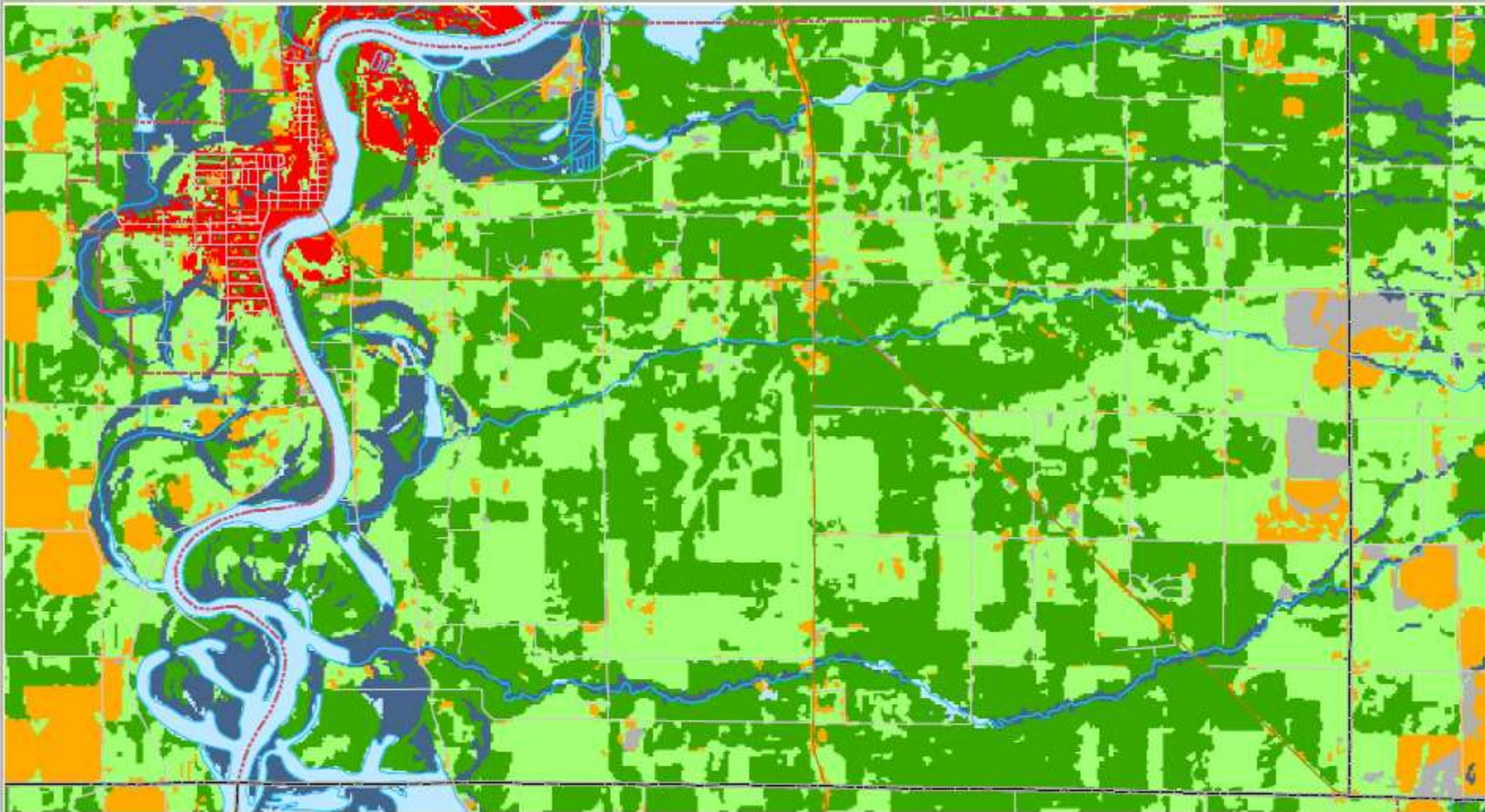
Saturation Index



Well
pumping
water

Land Use and Water Quality



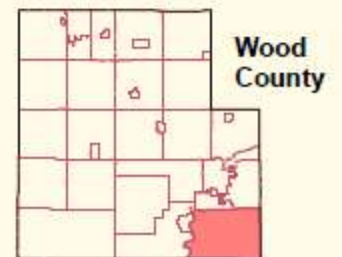


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**Wood County
November 2012**

Land Use:

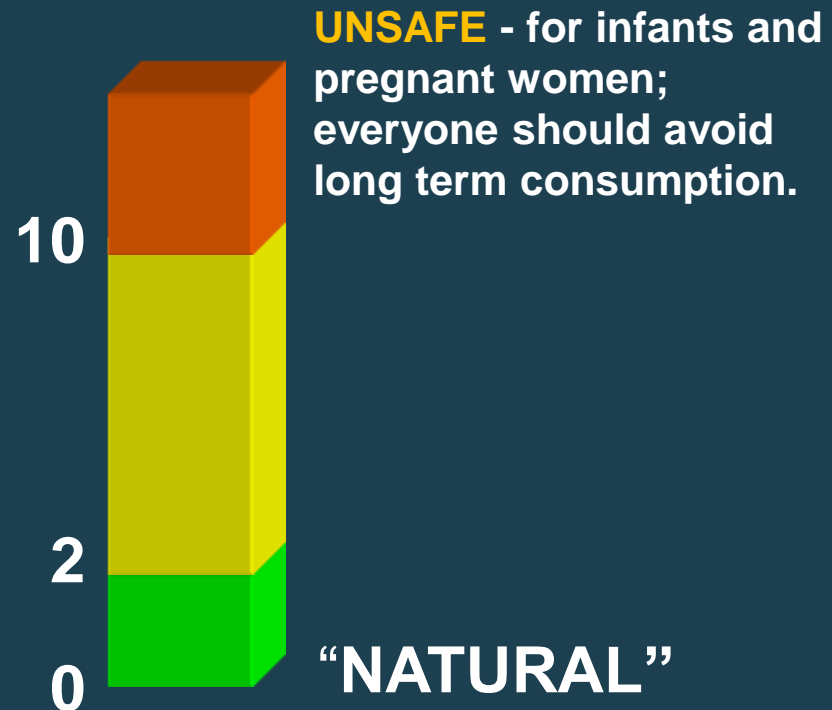
- Urban
- Agriculture
- Forest
- Shrub-Grass
- Wetland
- Water
- Other



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

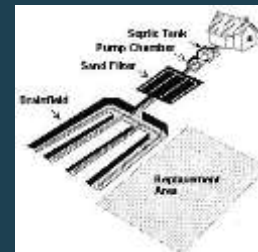
Health Effects:

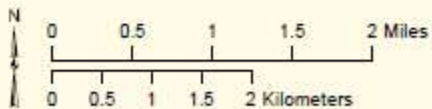
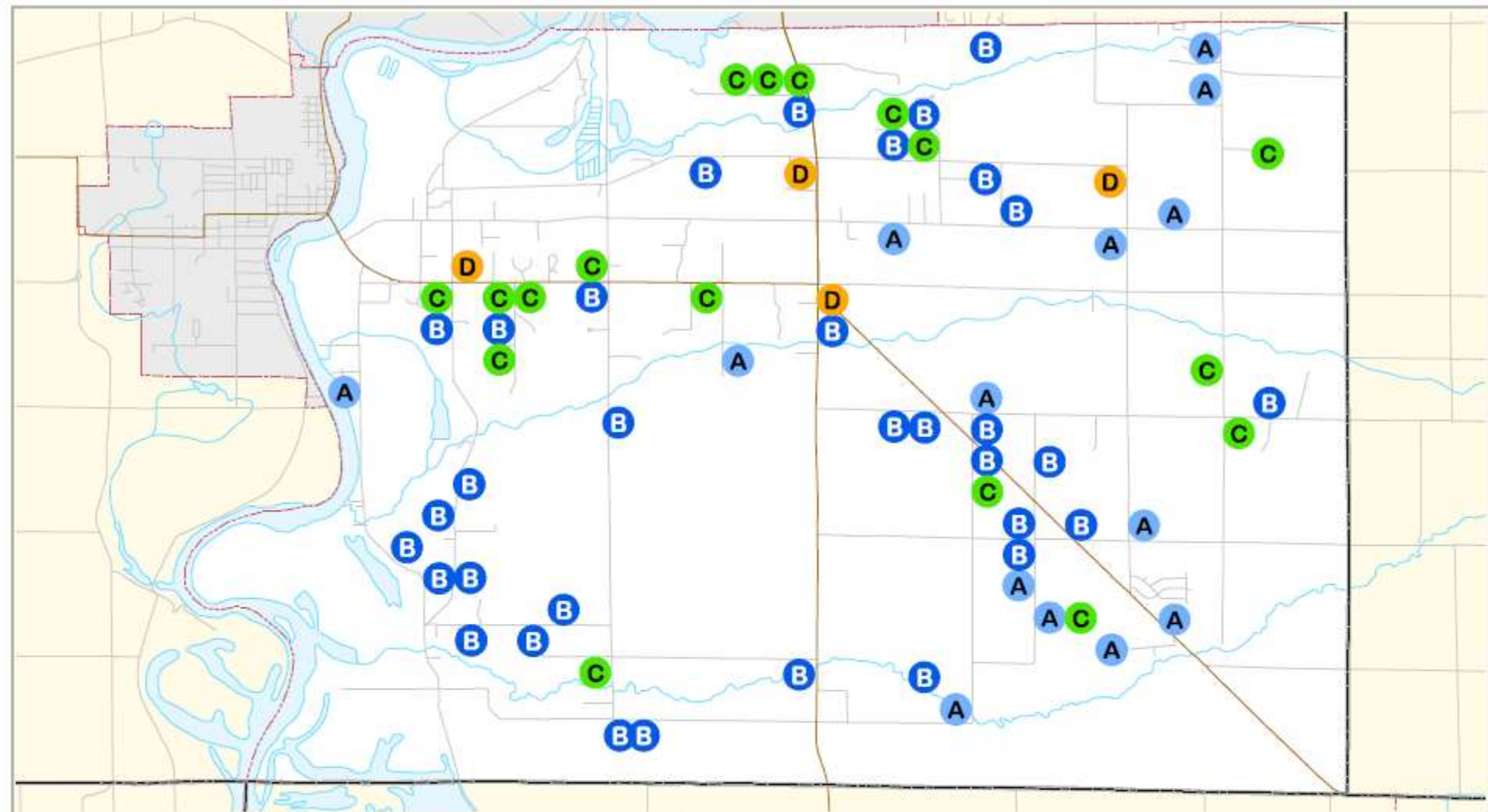
- Methemoglobinemia (blue baby disease)
- Possible links to birth defects and miscarriages (humans and livestock)
- Indicator of other contaminants



Sources:

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





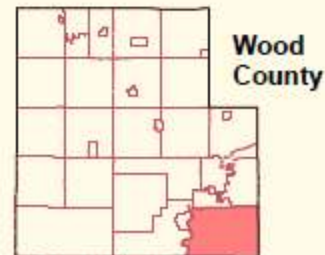
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NITRATE-NITRITE (ppm N)

A	None Detected	19	24 %
B	... 2.0	35	44 %
C	2.1 - 5.0	20	25 %
D	5.1 - 10.0	5	6 %
E	10.1 - 20.0	0	0 %
F	20.1 ...	0	0 %

Mapped value is the average unless otherwise indicated.
Treated samples not mapped.



What can I do to reduce my nitrate levels?

Solution:

- **Eliminate contamination source or reduce nitrogen inputs**

Short term:

- **Change well depth or relocate well**
- **Carry or buy water**
- **Water treatment devices**
 - **Reverse osmosis**
 - **Distillation**
 - **Anion exchange**

Tests for Aesthetic Problems

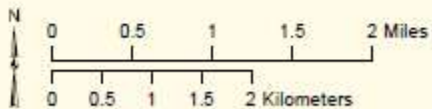
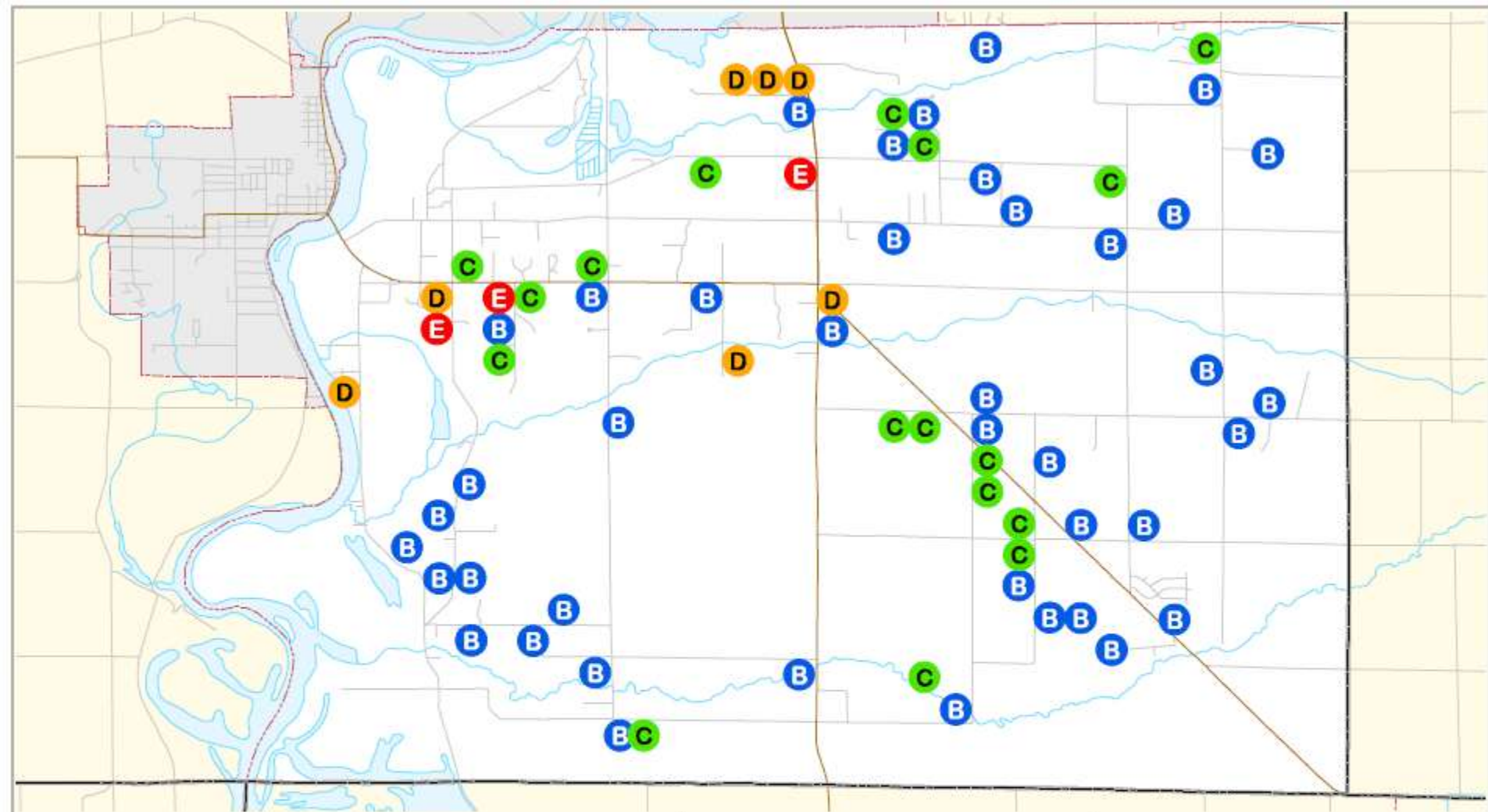
Chloride

- **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





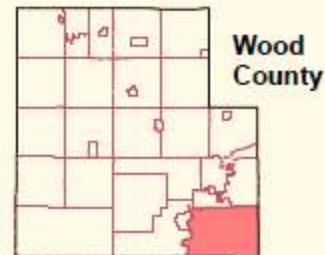
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CHLORIDE (ppm)

A	None Detected	0	0 %
B	... 10	46	58 %
C	11 - 50	22	28 %
D	51 - 100	6	8 %
E	101 - 200	5	6 %
F	201 ...	0	0 %

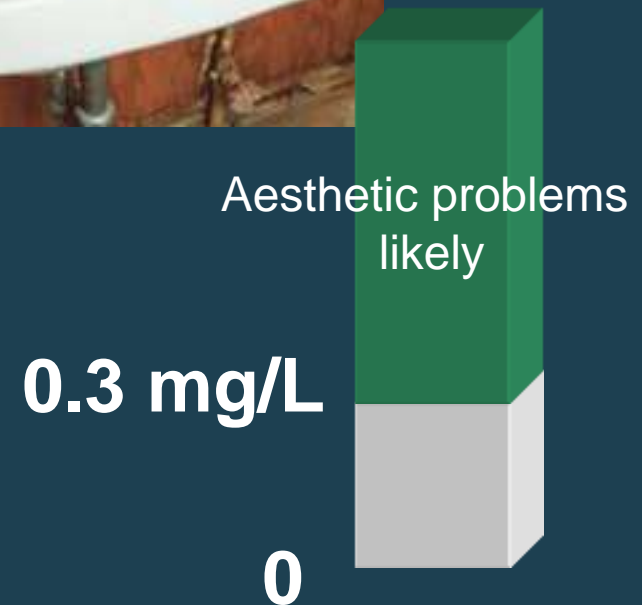
Mapped value is the average unless otherwise indicated.
Treated samples not mapped.

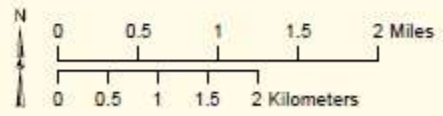
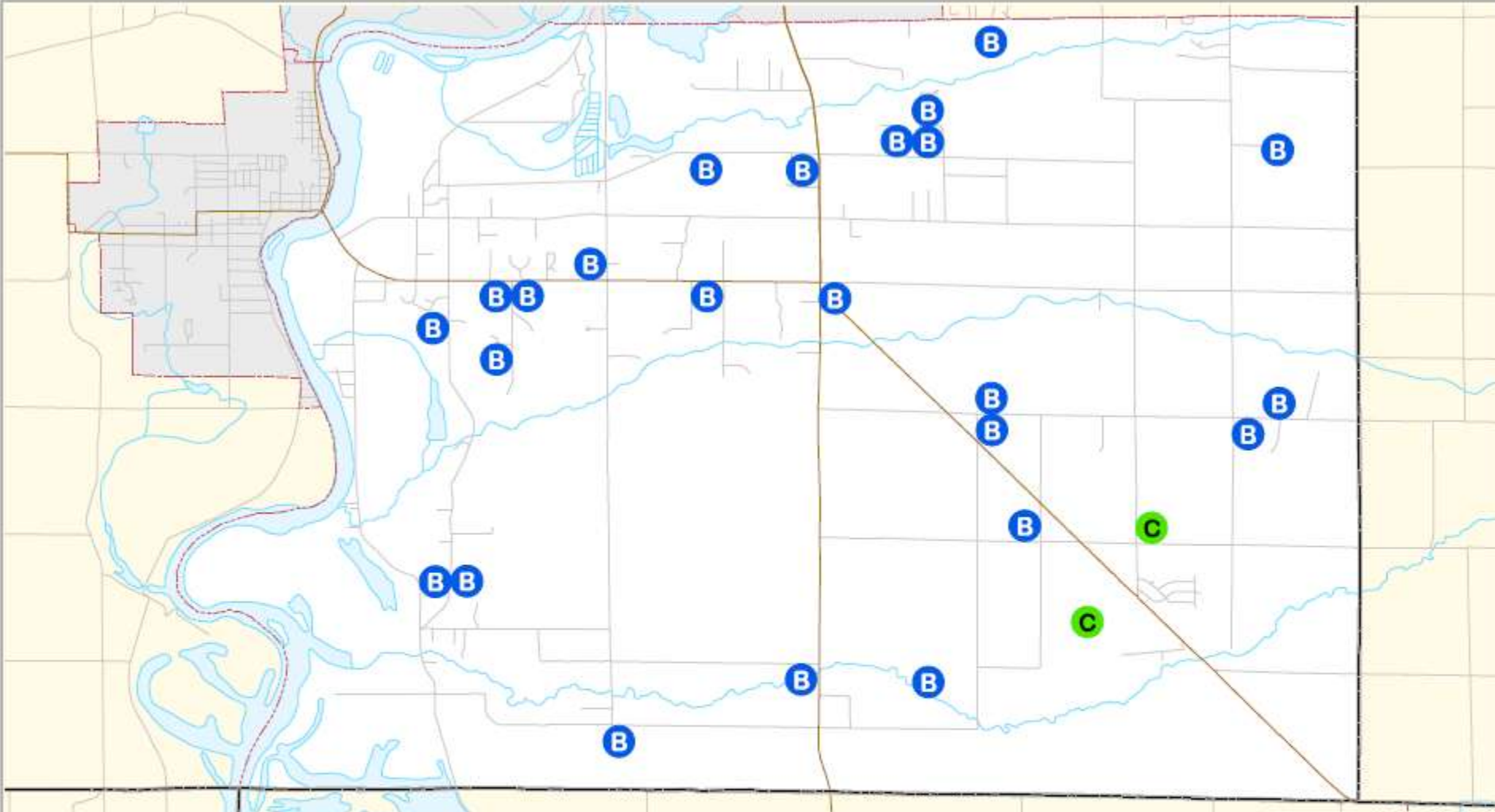


Tests for Aesthetic Problems

Iron

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





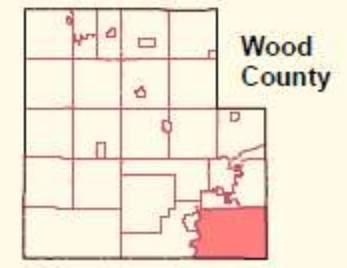
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IRON (mg/l)

A	None Detected	0	0%
B	... 0.300	33	87%
C	0.301 - 1.000	5	13%
D	1.001 - 2.000	0	0%
E	2.001 - 5.000	0	0%
F	5.001 ...	0	0%

Mapped value is the average unless otherwise indicated.
Treated samples not mapped.



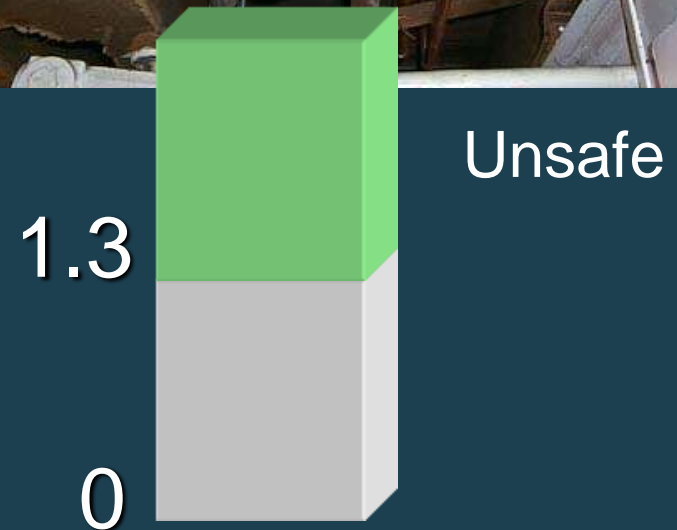
Test Important to Health

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



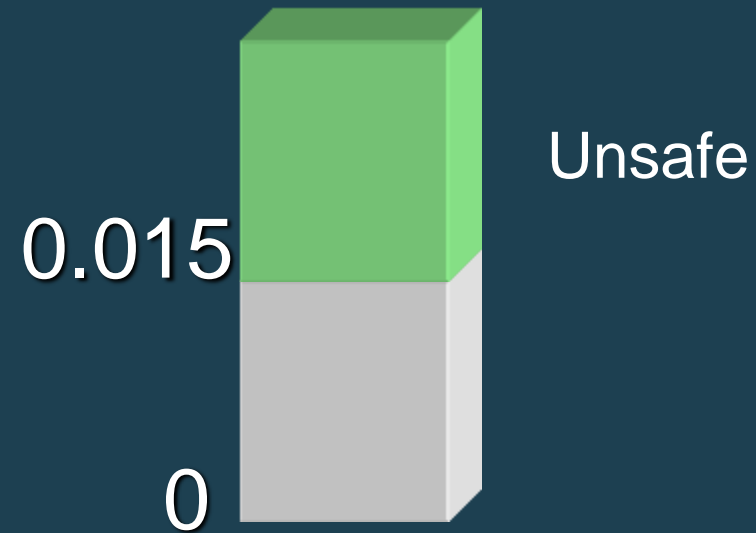
Test Important to Health

Lead

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

Health Effects:

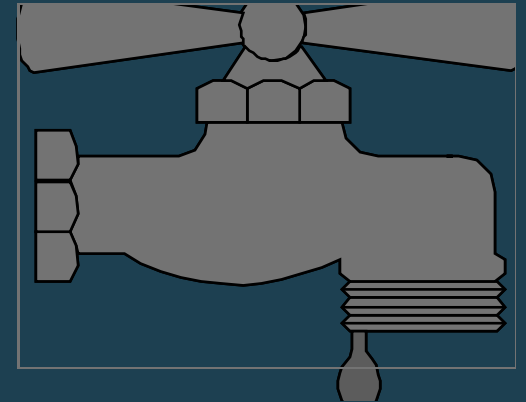
- Young children, infants and unborn children are particularly vulnerable.
- Lead may damage the brain, kidneys, nervous system, red blood cells, reproductive system.



Lead and Copper

Solutions:

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



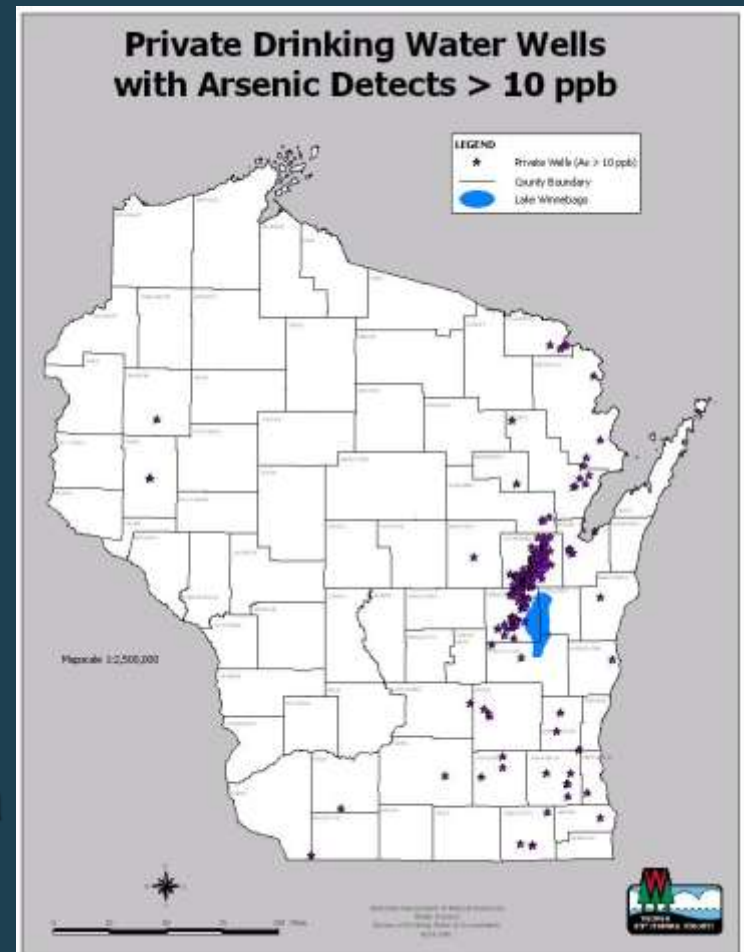
Test Important to Health

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



Pesticides in Drinking Water

- Insecticides, herbicides, fungicides and other substances used to control pests.
- Health standards usually only account for parent compound.
- Parent compounds breakdown over time.
- Little research into health effects from the combination of chemicals..

- Most frequently detected pesticides in WI:
 - Alachlor* and its chemical breakdown products
 - Metolachlor and its chemical breakdown products
 - Atrazine** and its chemical breakdown products
 - Metribuzin
 - Cyanazine and its chemical breakdown products.



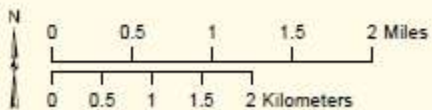
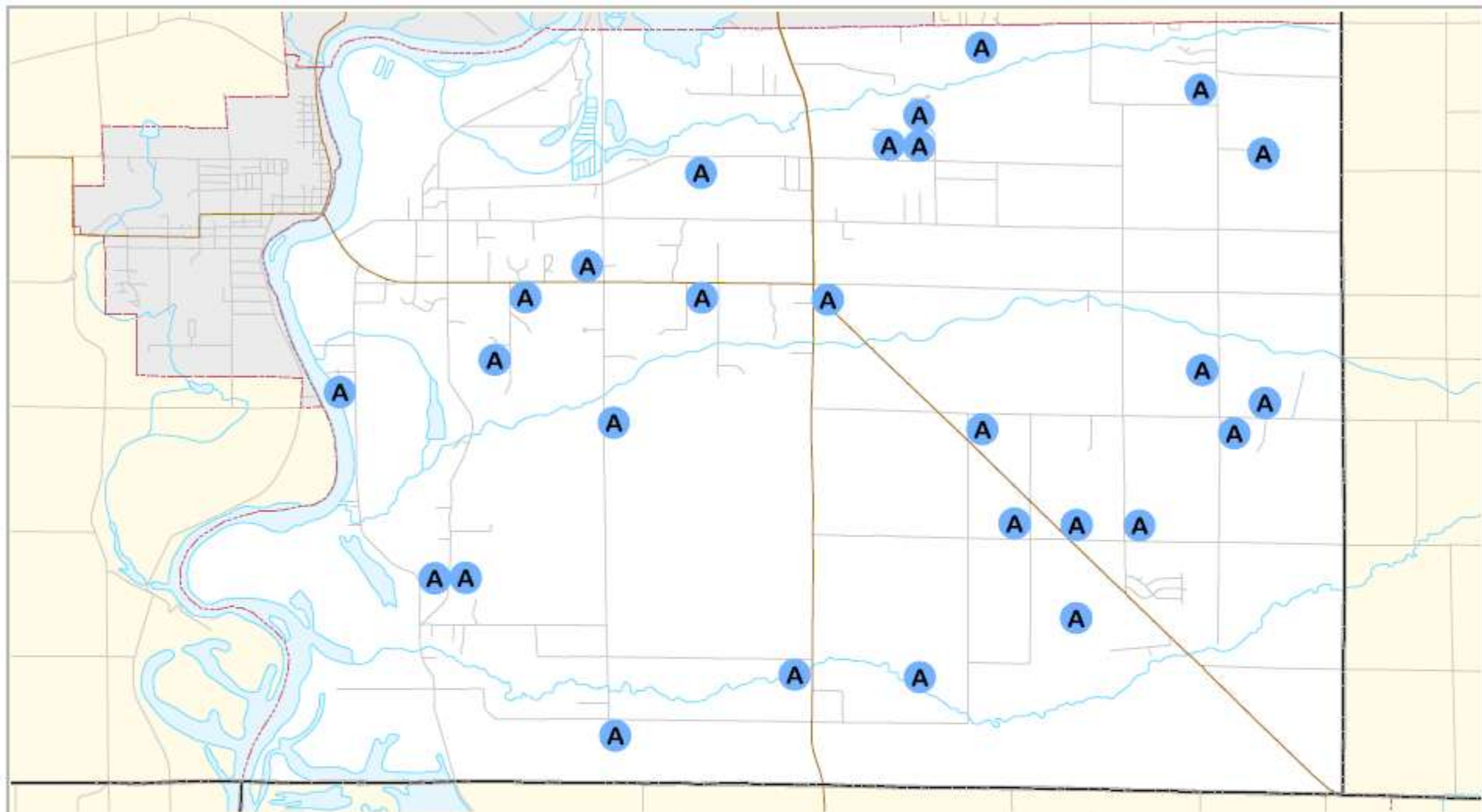
• * WI public health groundwater standard for breakdown component Alachlor ESA.
• ** WI public health groundwater standard is for the total chlorinated atrazine residue

Tests Important to Health

DACT Screen

- Sources: Triazine pesticides (mainly atrazine used on corn crops)
- Screen: Only measures the diaminochlorotriazine (DACT) residue levels of triazine type pesticides (atrazine, simazine, propazine, cyanazine, etc)
- Specific to diaminochlorotriazine (DACT), does not account for parent compound or other breakdown components
- Drinking water limit:
3 ppb of total atrazine
(atrazine + the 3 breakdown components)





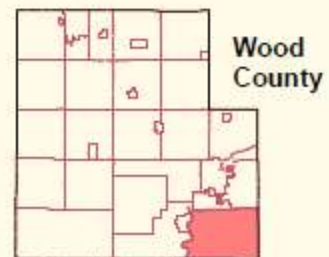
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DACT (ug/l)

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

A	None Detected	31	100 %
B	... 0.3	0	0 %
C	0.4 - 1.0	0	0 %
D	1.1 - 2.0	0	0 %
E	2.1 - 3.0	0	0 %
F	3.1 ...	0	0 %



Improving water quality

➤ Long-term improvements

- Eliminate sources of contamination

➤ Short-term improvements

- Repair or replace existing well
- Connect to public water supply or develop community water system
- Purchase bottled water for drinking and cooking
- Install a water treatment device
 - Often the most convenient and cost effective solution

understanding water treatment

○ Advantages:

- + Reduce level of contaminants and other impurities
- + Improve taste, color and odor

○ Disadvantages:

- Require routine maintenance.
- Can require large amounts of energy.
- Testing is often the only way to know it is functioning properly for most health related contaminants.

○ Cautions:

- Treatment methods often selective for certain contaminants
- Multiple treatment units may be necessary
- Treatment may also remove beneficial elements from water in the process.



Before investing in treatment....

- Always have water tested at a certified lab before investing in water treatment.
 - Know the types and amounts of chemicals you would like removed.
- Choose a device that has been approved by the Wisconsin Department of Commerce.
 - Ask for a copy of the approval letter.
 - or
 - Check the agency's Drinking Water Treatment Product Approval website:
 - http://commerce.wi.gov/php/sb-ppalopp/contam_alpha_list.php

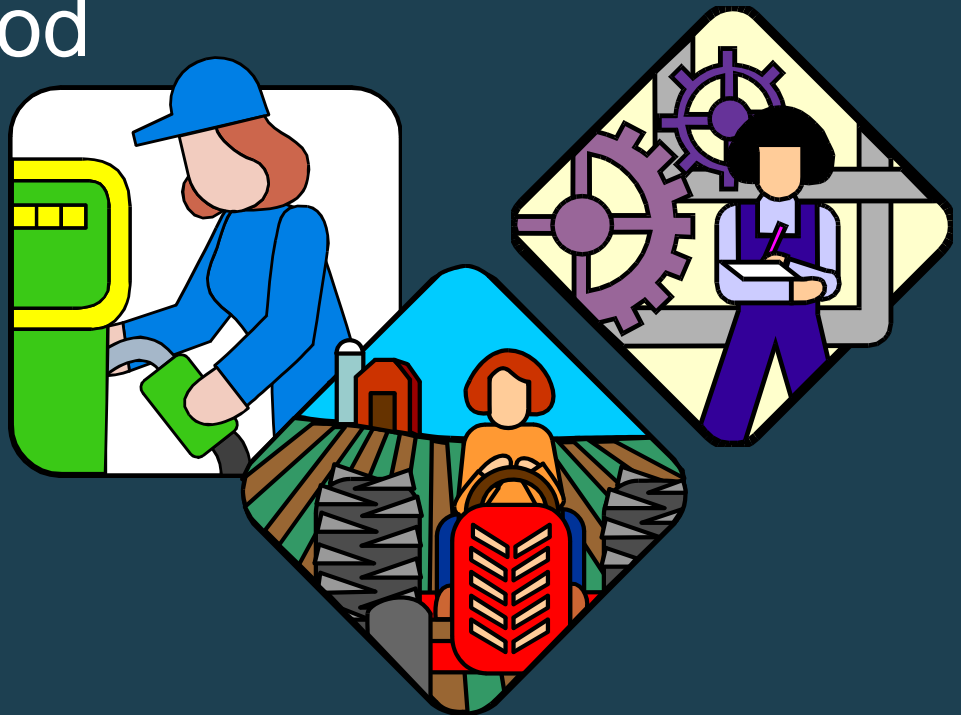
Next Steps

- Test well annually for bacteria, or if water changes color or clarity.
- If levels are elevated, test again in 15 months for nitrate.
- If you detected pesticides, you may want to perform a more extensive and accurate pesticide analysis.

Next Steps

➤ Test for known or potential contaminants in your neighborhood

- Gasoline?
- Pesticides?
- Solvents?



Check for known contamination sites in Wood County at:

<http://dnr.wi.gov/org/aw/rr/gis/index.htm>



What We Do

- **Support** watershed stewardship
- **Assist** Citizens with lake, river and drinking water quality problems
- **Promote** management strategies for water resource protection
- **Provide** water quality assessment and support
- **Prepare** students for careers as water resource professionals



Follow us on Facebook, receive updates on upcoming presentations, recent water testing programs and other water related news in Wisconsin

News from the Center



NEW! USGS report on groundwater pumping impacts on streams

[NEW! 2013 Wisconsin River Water Quality Improvement Symposium](#)

[Use our Well Water Quality Viewer to access groundwater information for your community](#)

[Central Sands study on pumping effects on lakes and streams published in international scientific journal](#)

[Walking on Water: Essays for the Central Sands. Get your free copy today!](#)

[Take a fly-over tour of the Wisconsin River Watershed](#)

Wisconsin Well Water 101:

Helping you make decisions about your private water system:



Available online at www.uwsp.edu/cnr-ae/water101

[Use our decision support tool to learn more about your well water!](#)

Recent Presentations

[Town of Lima Drinking Water Education Program, Dec. 4](#)

[Town of St. Joseph Drinking Water Education Program](#)

[LNRP Lakeshore Water Summit - August 29](#)

[The Land and the Lake, NW Wisconsin Lakes Conference 2012](#)

Thanks to the following for helping sponsor this program:

- **Town of Saratoga**
- **Wood County UW-Extension**
- **Wood County Health Department**

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www.uwsp.edu/cnr-ap/watershed



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