

Groundwater and Drinking Water Education Program

Towns of Freedom, Reedsburg, and Westfield

Kevin Masarik
Center for Watershed Science and Education



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

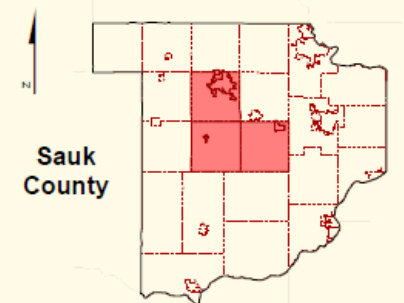
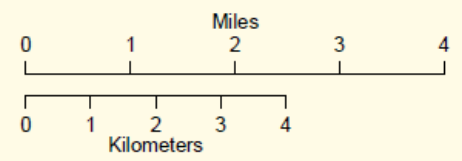
- Groundwater Basics: Where does my water come from
- Well Construction
- What do my individual test results mean?
- General groundwater quality in the Towns of Freedom, Reedsburg and Westfield
- Improving your water quality



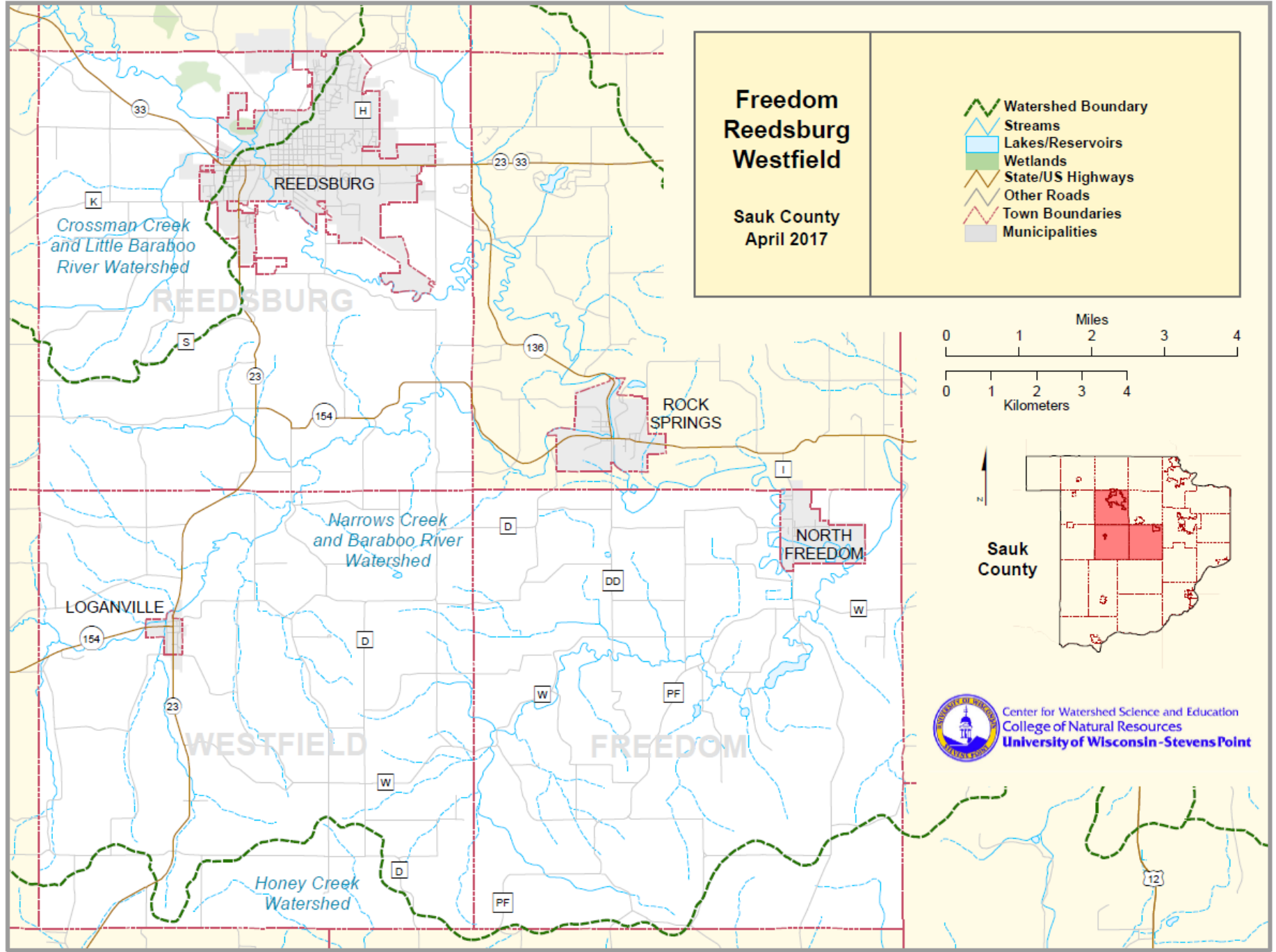
Freedom Reedsburg Westfield

Sauk County
April 2017

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



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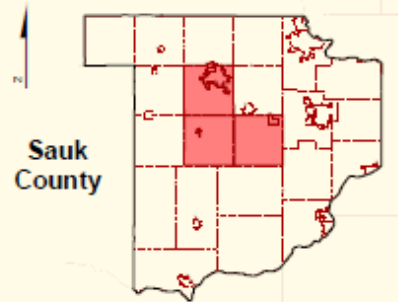
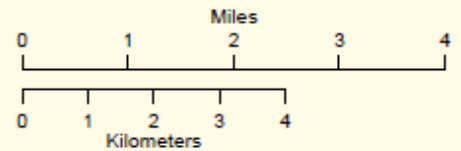
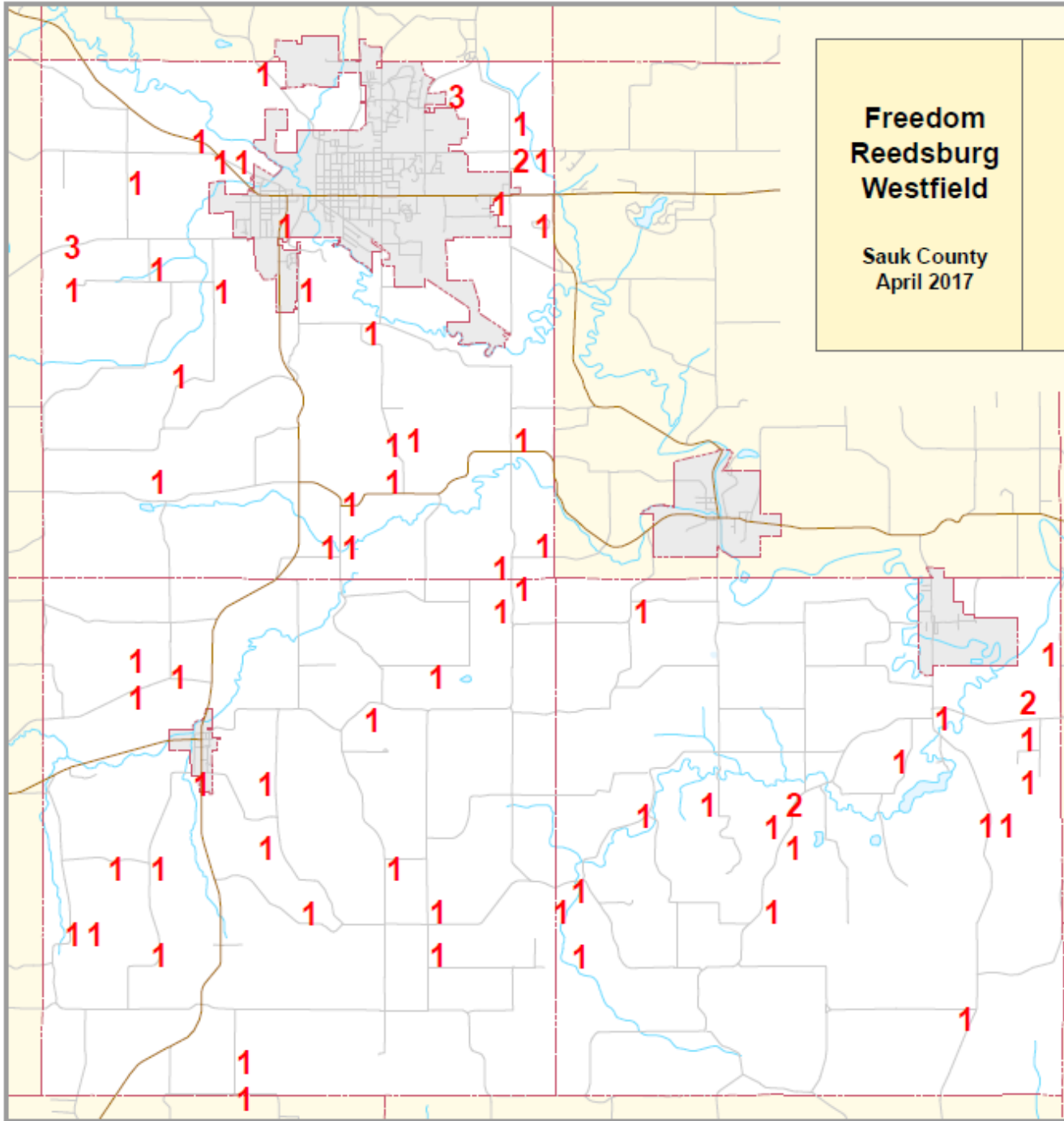


**Freedom
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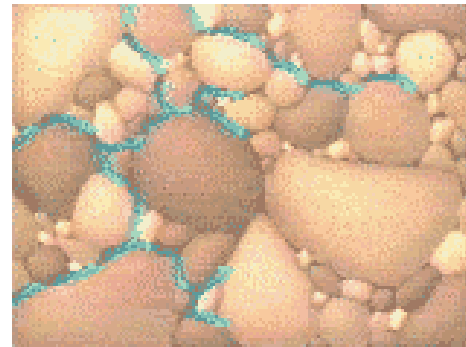
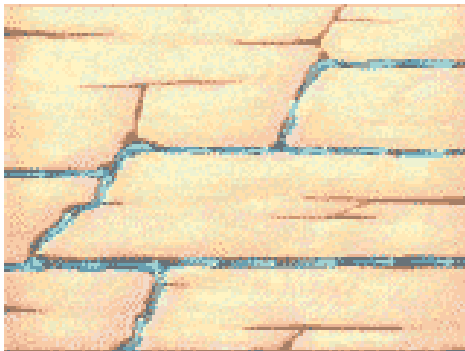
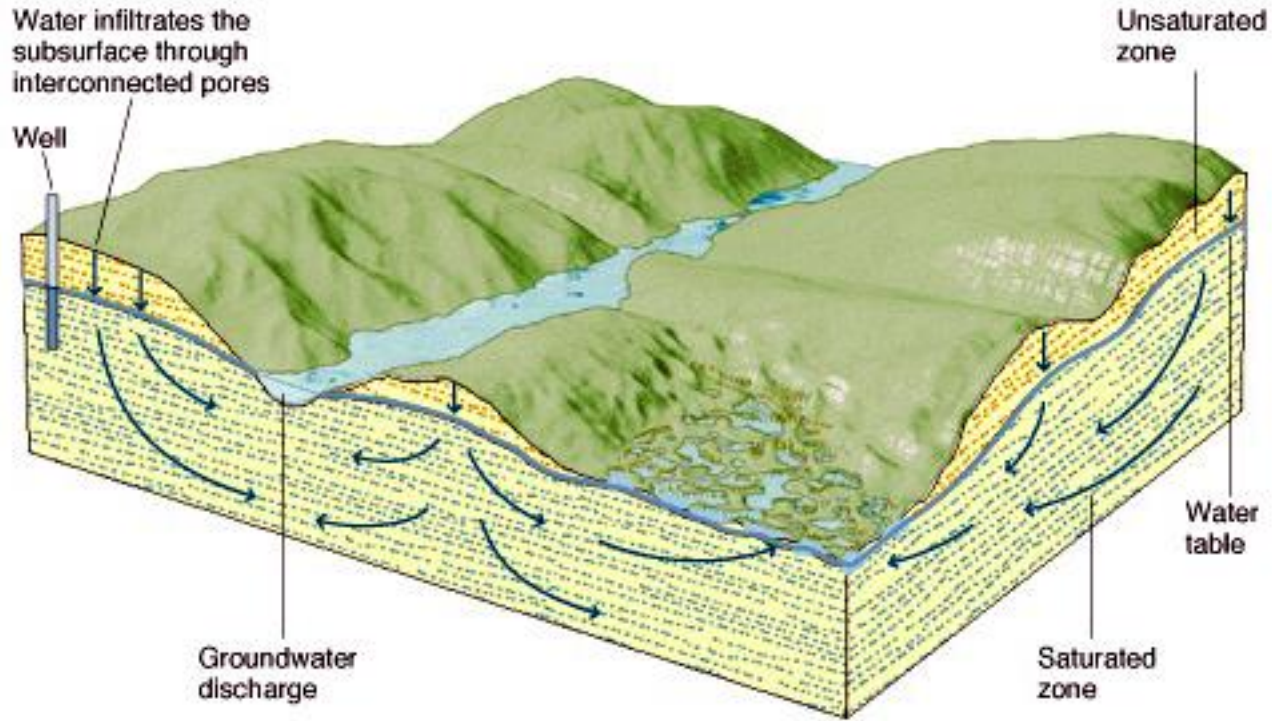
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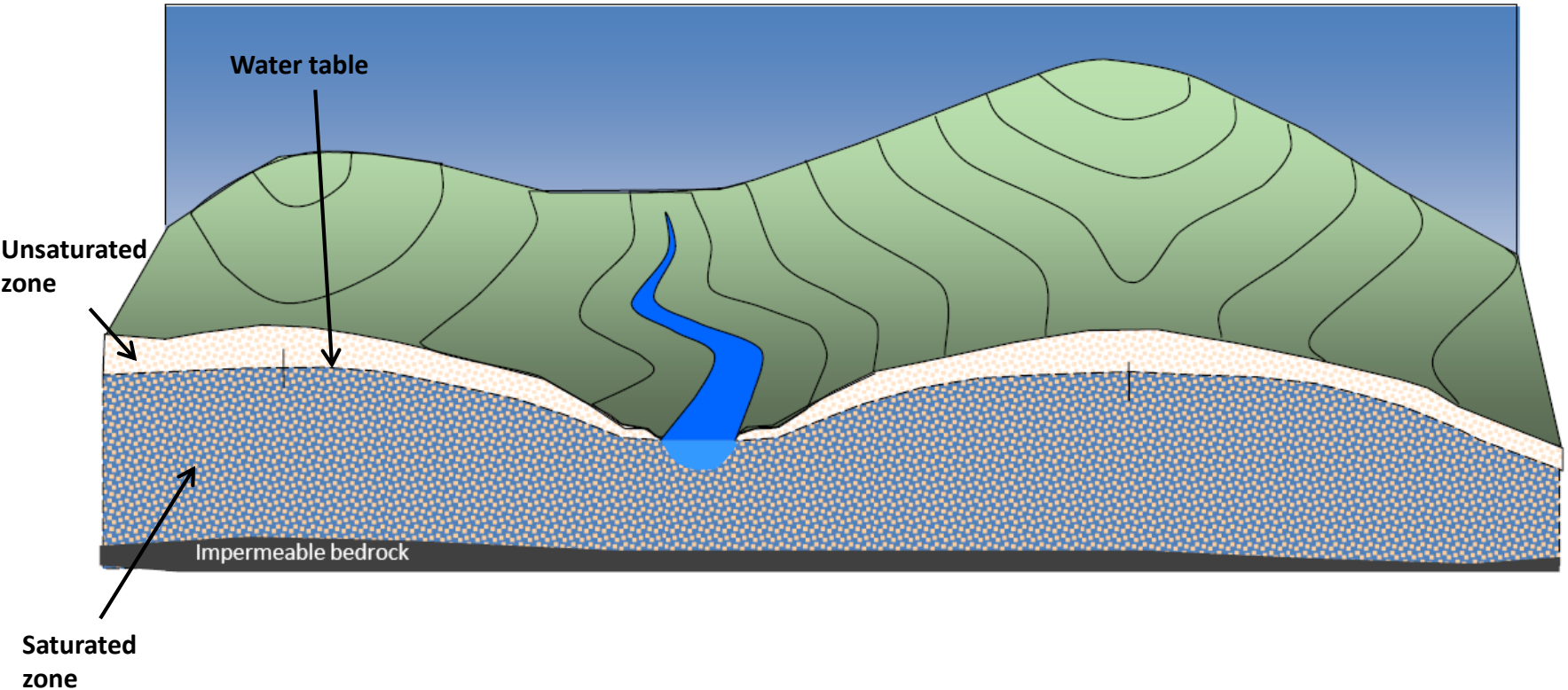
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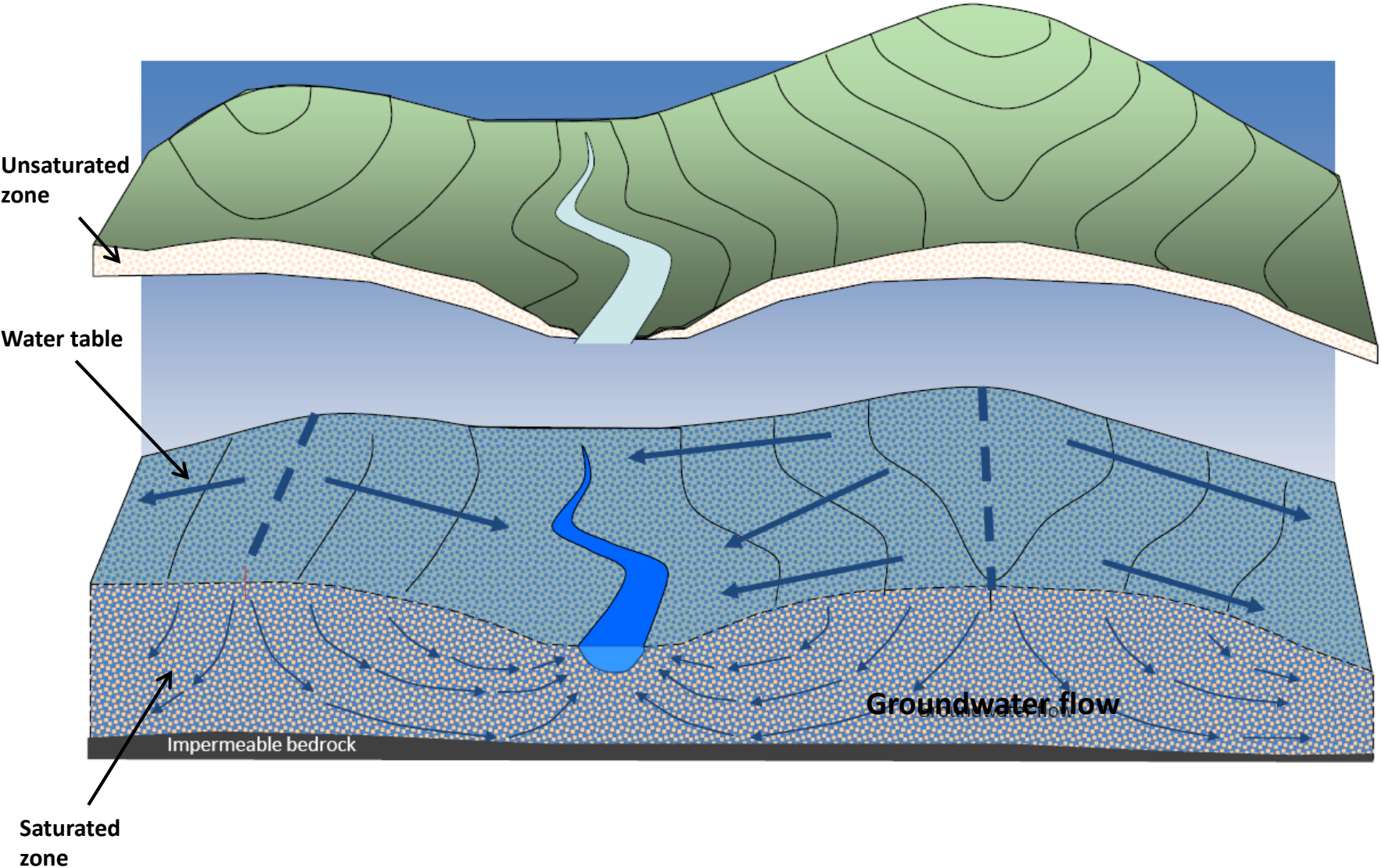


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Groundwater Movement

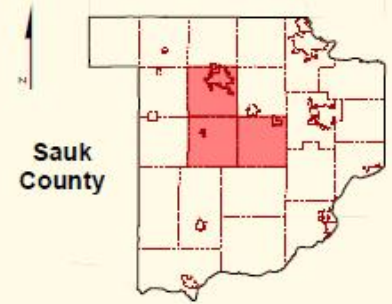
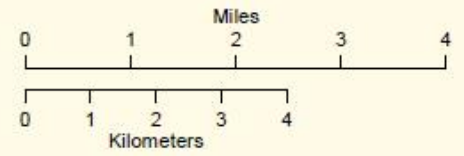
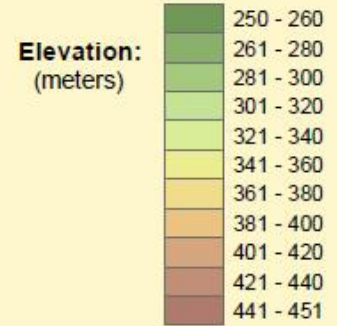




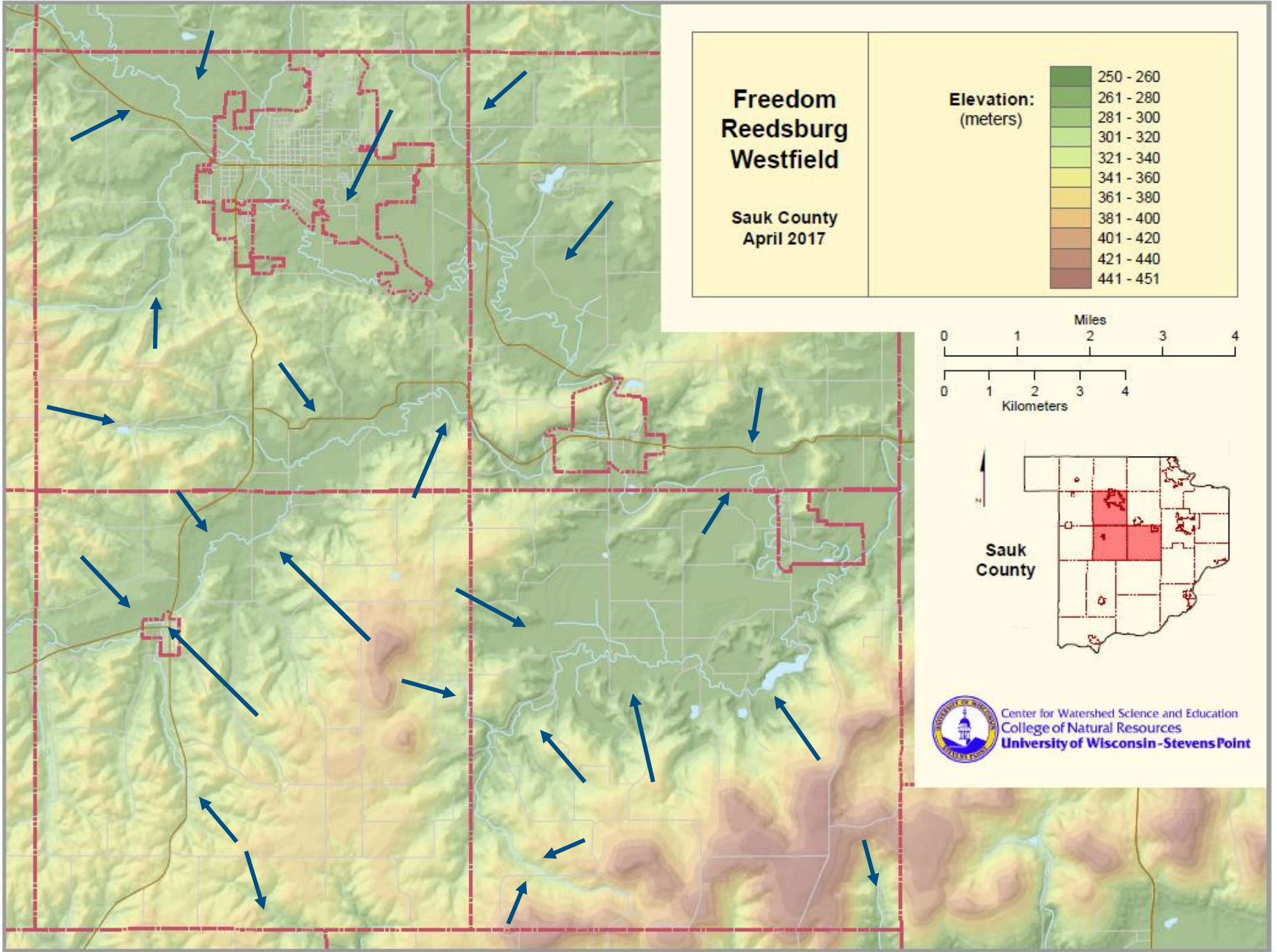


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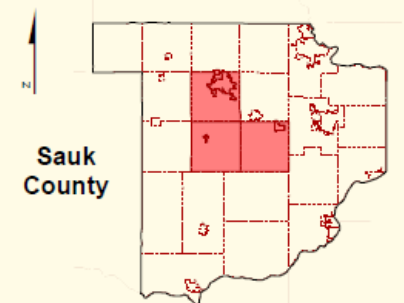
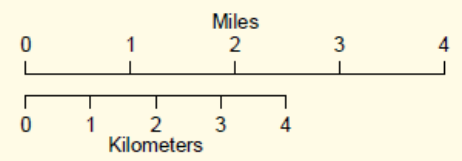
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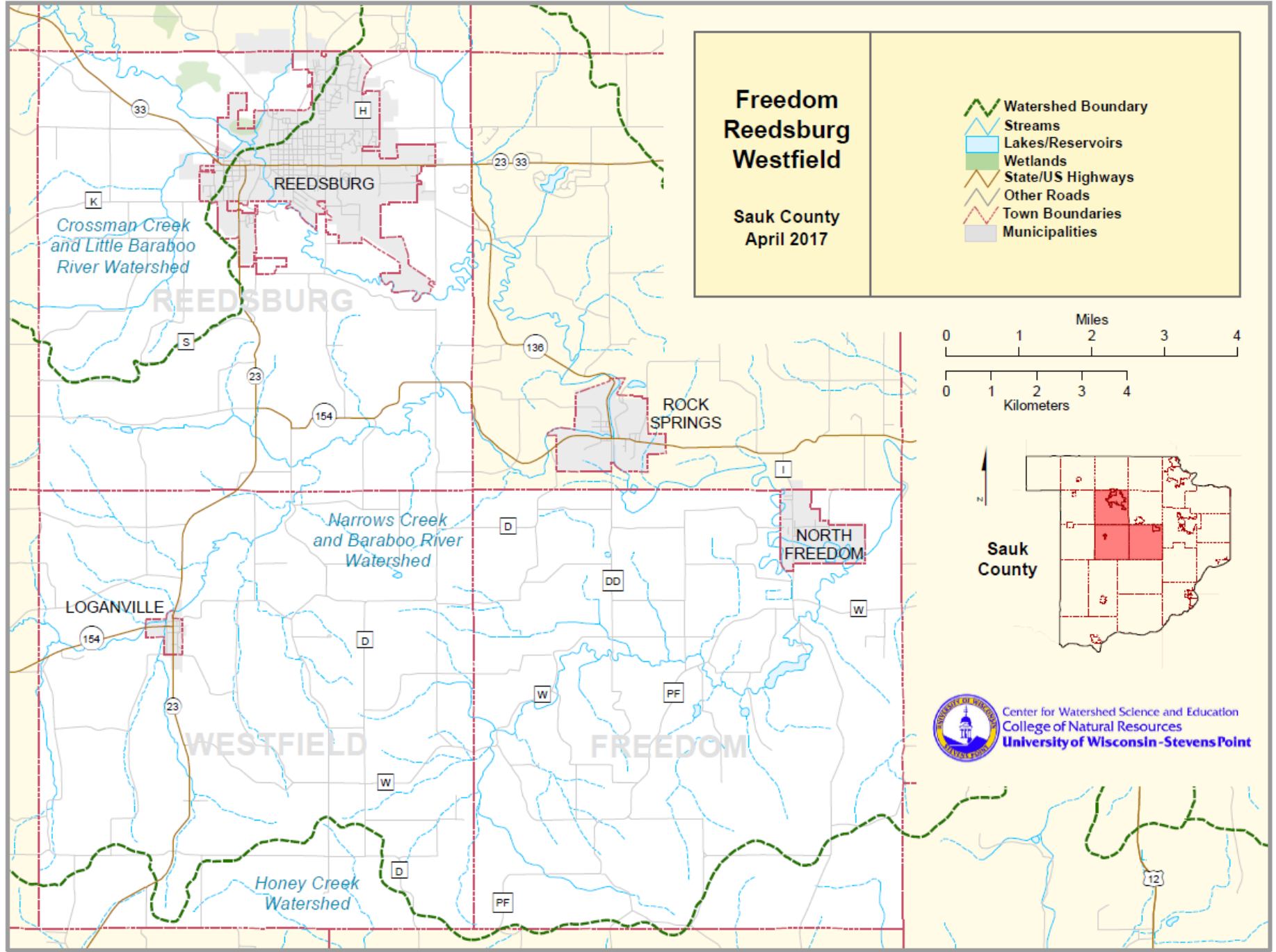
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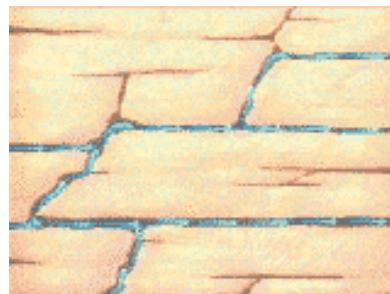


Aquifers: Our groundwater storage units

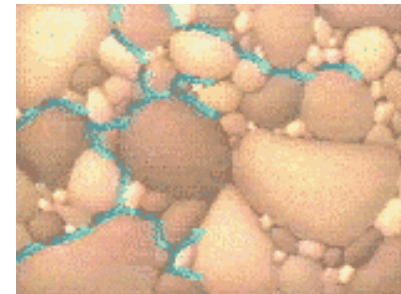
Aquifers are geologic formations that store and transmit groundwater.

The aquifer properties determine how quickly groundwater flows, how much water an aquifer can hold and how easily groundwater can become contaminated. Some aquifers may also contain naturally occurring elements that make water unsafe.

Wisconsin's geology is like a layered cake. Underneath all of Wisconsin lies the Crystalline bedrock which does not hold much water. Think of this layer like the foundation of your house. All groundwater sits on top of this foundation. Groundwater is stored in the various **sandstone, dolomite and sand/gravel** aquifers above the **crystalline bedrock** layer. The layers are arranged in the order which they formed, oldest on the bottom and youngest on top.

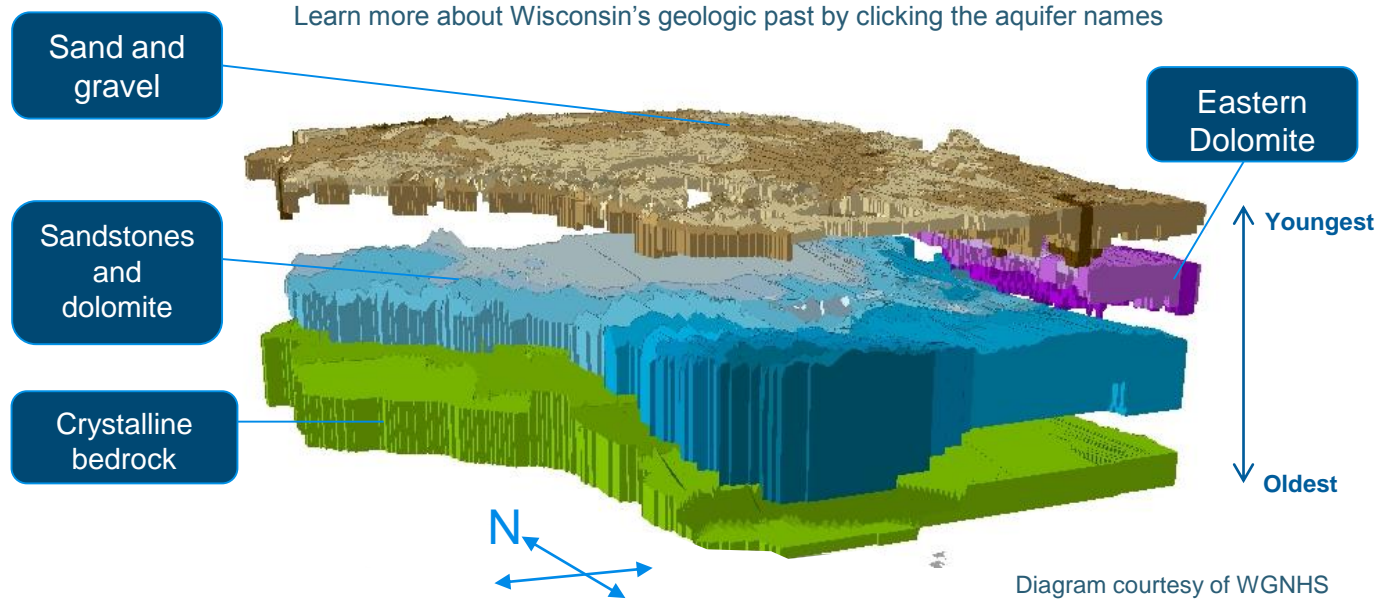


Water and contaminants can move quickly through cracks and fractures.



Water moving through tiny spaces in between sand particles or sandstone moves slower and allows for filtration of some contaminants.




Learn more about Wisconsin's geologic past by clicking the aquifer names

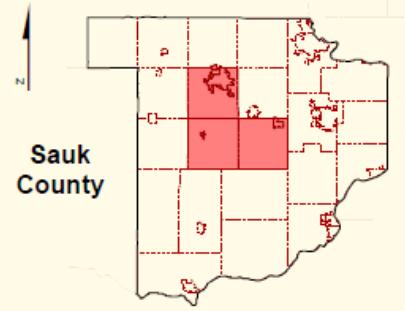
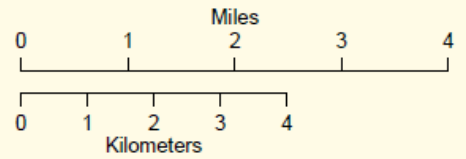


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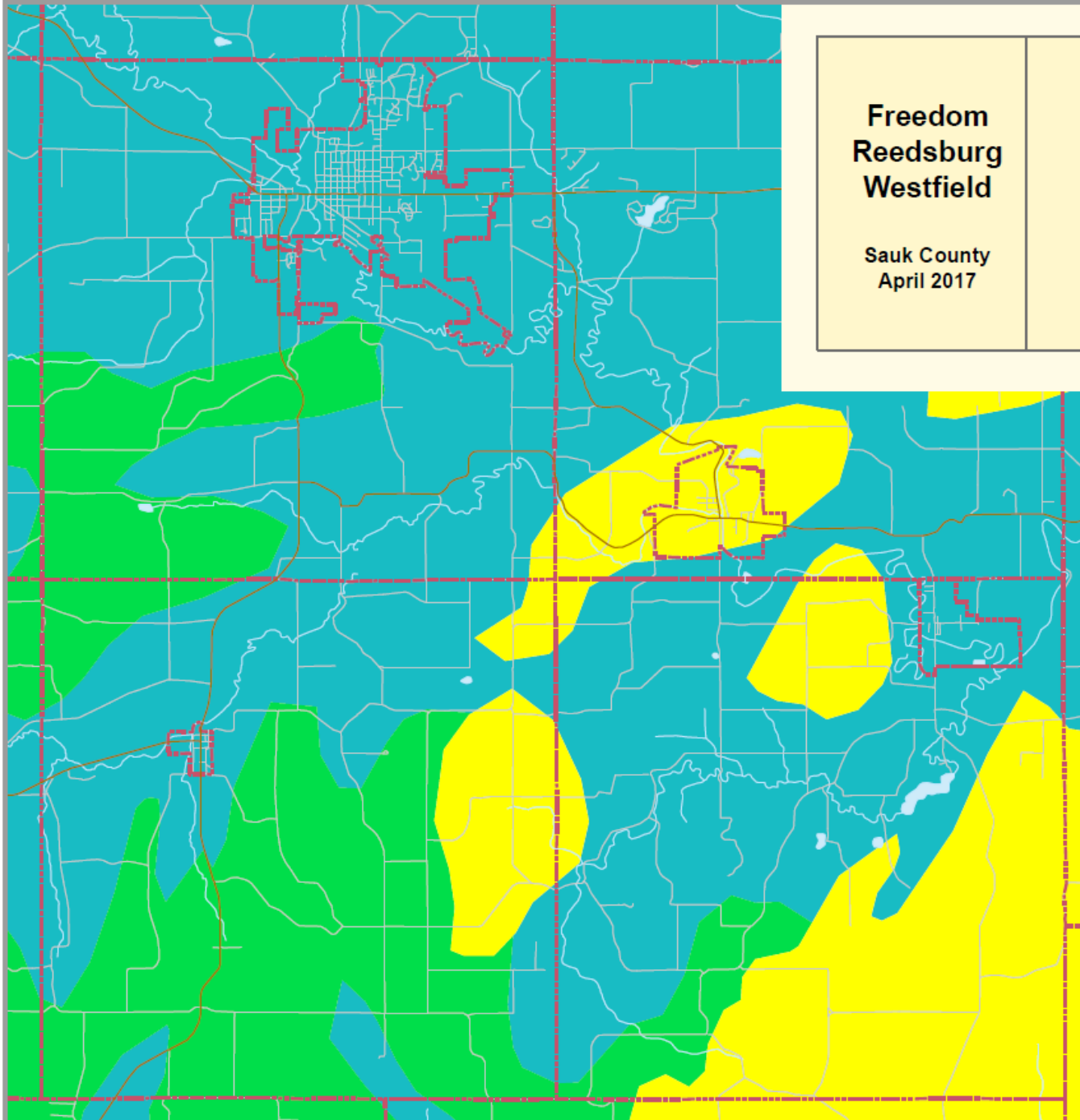
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Bedrock Units:

-  Cambrian Sandstone
-  Prairie du Chien Dolomite
-  Quartzite



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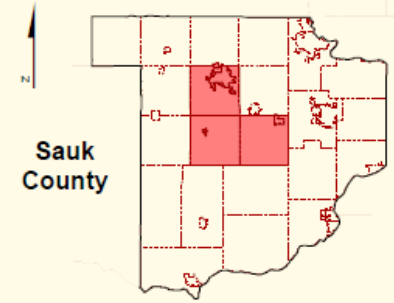
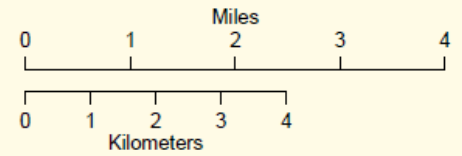


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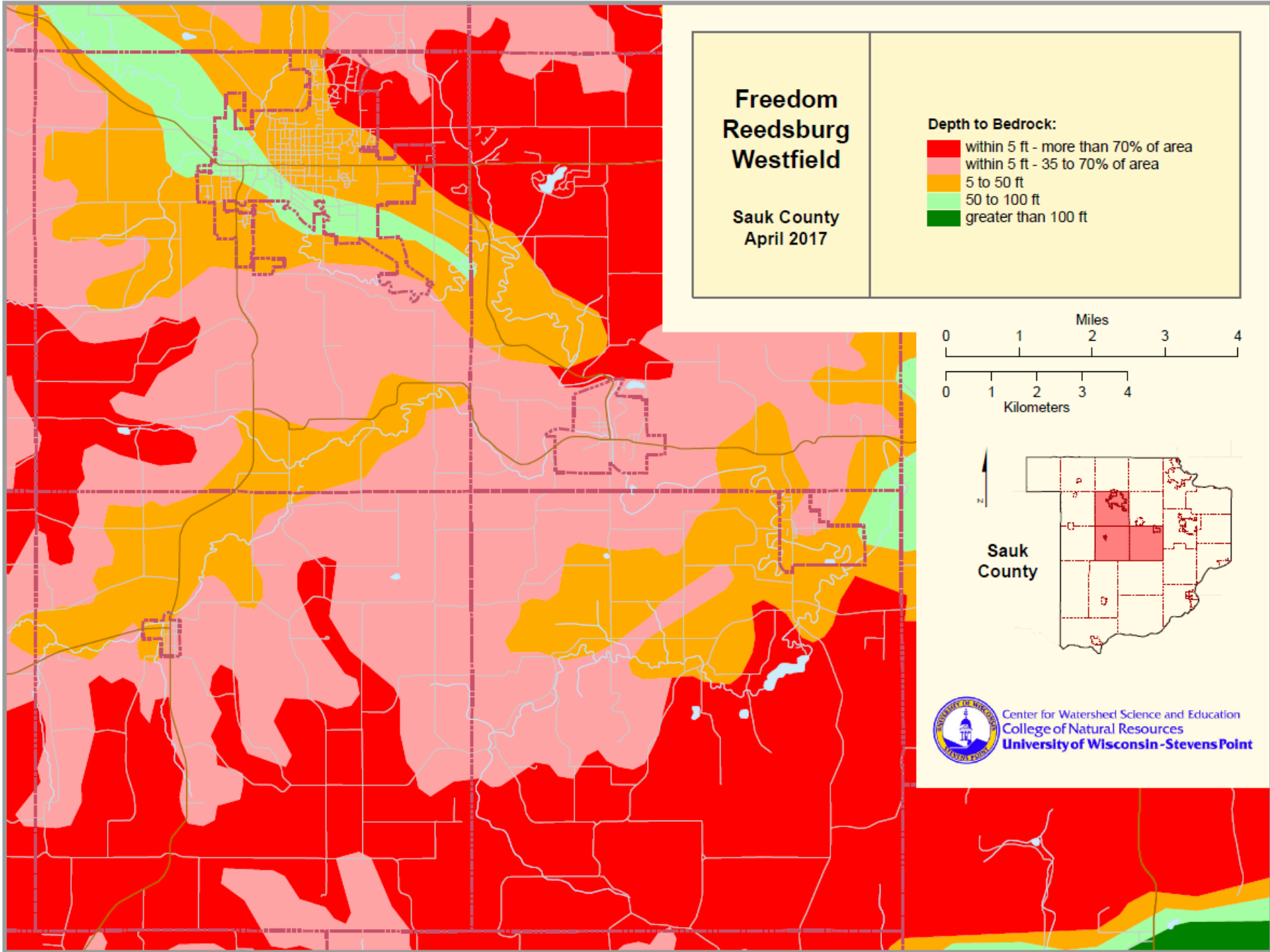
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Depth to Bedrock:

- 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



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Wells in Crystalline Rock



Bedrock like Baraboo Quartzite does not hold much water. Wells rely on fractures with connectivity to overlying aquifers to supply water.

As a result yield in these wells is typically low

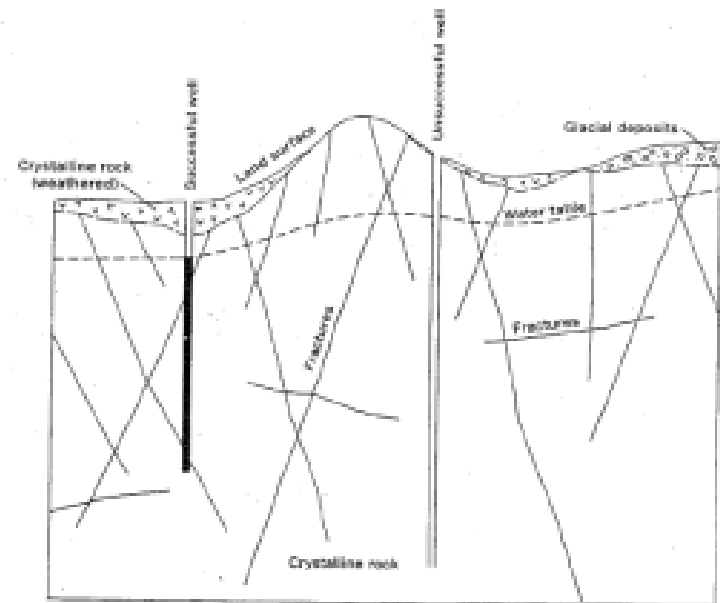
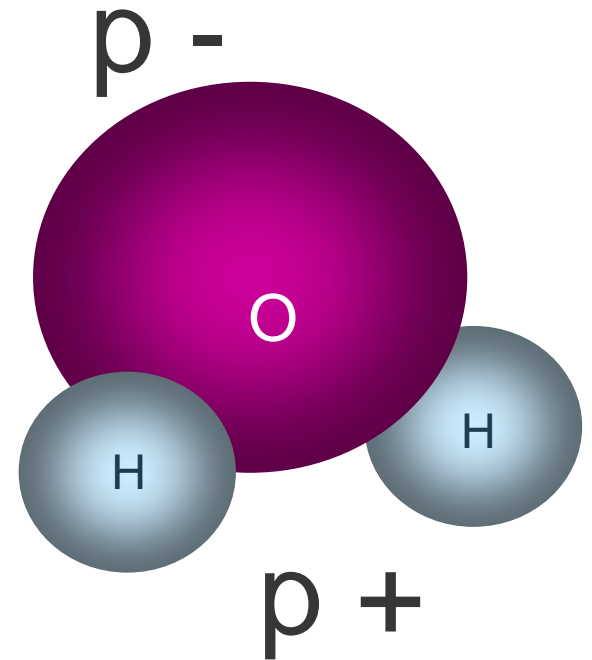


FIGURE 2.—Occurrence of ground water in crystalline rock.

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

Health Concern Categories

Acute Effects

- Usually seen within a short time after exposure to a particular contaminant or substance.

(ex. Bacteria or viral contamination which may cause intestinal disease)

Chronic Effects

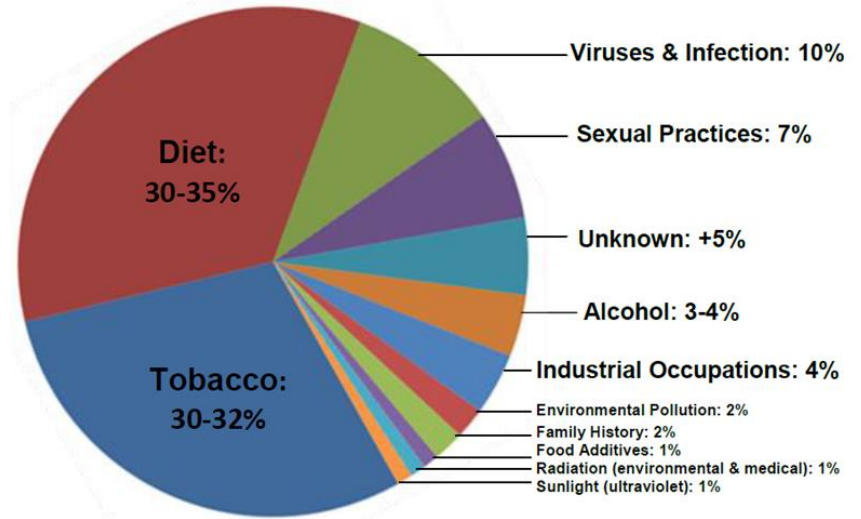
- Result from exposure to a substance over a long period of time.
- Increase risk of developing health complications later in life.

(ex. Arsenic or pesticides can increase the risk of developing certain cancers)



National Cancer Risk Factors with Percentages

Adapted from *Everyone's Guide to Cancer Therapy*



Chronic related health concerns are generally about risk management

Being struck by lightning	0.16 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
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>

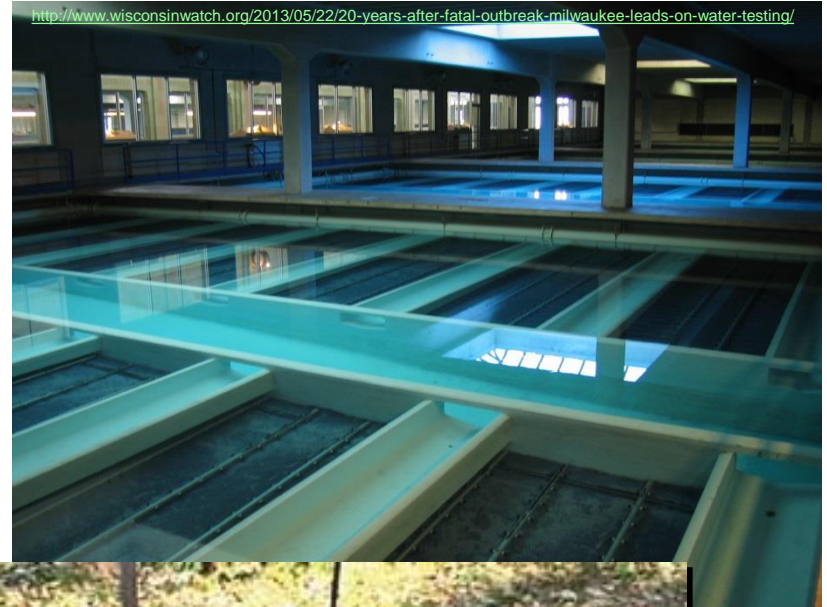
Private vs. Public Water Supplies

Public Water Supplies

- Regularly tested and regulated by drinking water standards.

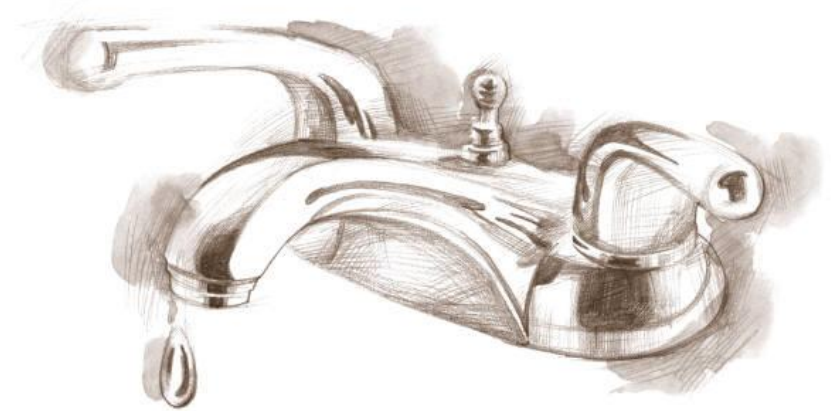
Private Wells

- 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.





Water and Environmental Analysis Lab

UW-Stevens Point, College of Natural Resources
Phone (715)346-3209 or Toll Free (877)383-8378
www.uwsp.edu/cnr/weal



Monday, August 15, 2011

WELL INFORMATION:

WI Unique Well Number

Add

City

State

County SAINT CROIX

Town Pleasant Valley

Legal Description

SW SW Sec 5 T 28 R 17 W

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

Map : Gov't Lot#

Year well installed 1950

Casing Diameter:

3" - less 4-9" 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
 Retest of positive bacteria test
 Retest following well disinfection
 Infant/pregnant woman/daycare
 Other

MAIL RESULTS TO:

last

First

Add

City

State

phon

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 11APR#2

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	

Page 1

(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.

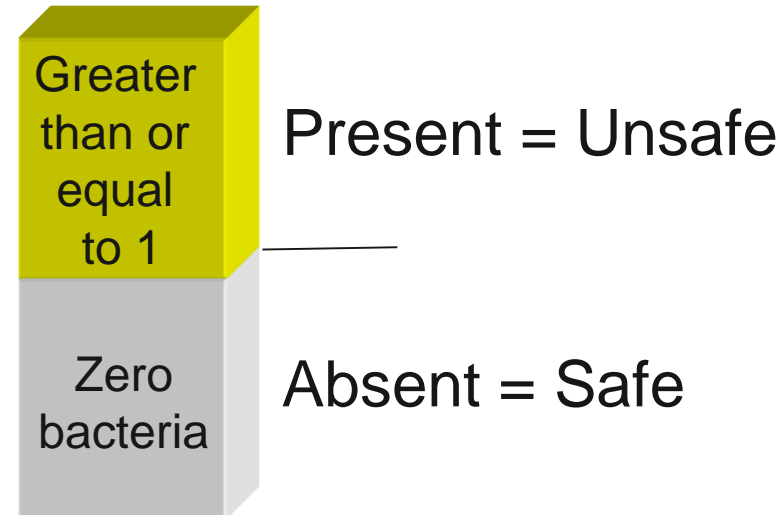
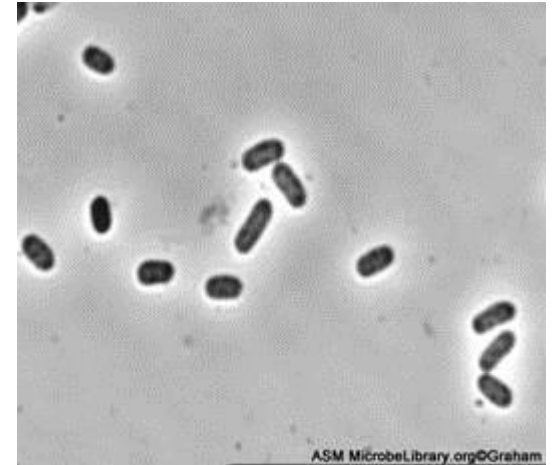
Page 2

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
- Well Code: “Properly constructed well should be able to provide bacteria free water continuously without the need for treatment”
- 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



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.

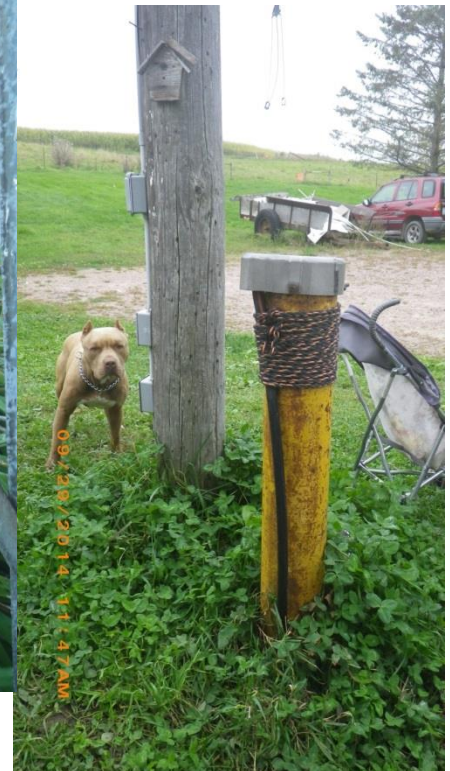
Information Sources: United States Department of Health and Human Services – Centers for Disease Control and Prevention (www.cdc.gov) and United States Environmental Protection Agency (www.epa.gov)

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>	<ul style="list-style-type: none"> • Infected human and animal feces • Manure • Septic systems • Sewage 	<ul style="list-style-type: none"> • Gastrointestinal illness • Low-grade fever • Begins 12 hrs - 7 days after exposure
<p><i>Leptosporidia</i></p>	<ul style="list-style-type: none"> • Urine of livestock, dogs and wildlife • Manure 	<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>	<ul style="list-style-type: none"> • Fertilizers • Manure • Bio-solids • Septic systems 	<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>
<p>Atrazine (trade-name herbicide for control of broadleaf and grassy weeds)</p>	<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>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>

Which of these is a healthy well?



Photo: Sandy Heimke, WI DN



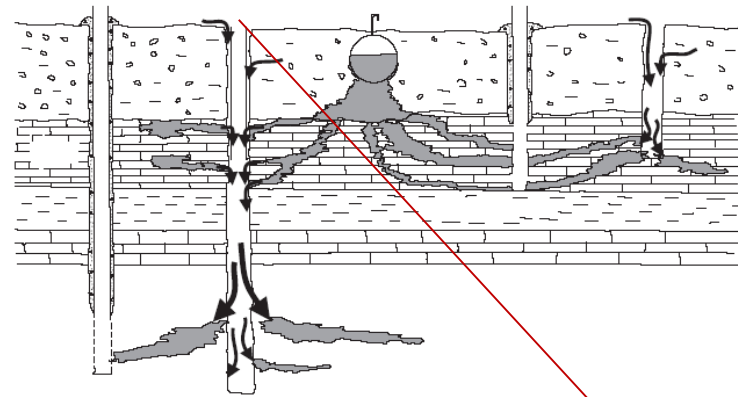
Photos courtesy of: Matt Zoschke

Also check for:

- Cross connections and proper backflow prevention on yard hydrants and livestock waterers.
- Any old unused wells on the property that may represent direct conduits to groundwater



AQUIFER CONTAMINATION THROUGH IMPROPERLY ABANDONED WELLS



Source: Adapted from DiNovo and Jaffe, 1984.



How much do you know about your 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: Waushara Permit No.: W Well Completion Date: 9/2/69

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

Department of Natural Resources
 Private Water Supply - WS/2
 Box 7921
 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 #: _____
 Gov't Lot # _____ or NE ¼ of NE ¼ of Section 20; T 19 N; R 10 E W

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

Drilled Driven Point Jetted Other

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:
50 1. Landfill 100 11. Foundation Drain to Clearwater
110 2. Building Overhang 12. Foundation Drain to Sewer
150 3. Septic or Holding Tank 13. Building Drain
 4. Sewage Absorption Unit Cast Iron or Plastic Other
 5. Nonconforming Pit 14. Building Sewer Gravity Pressure
 Cast Iron or Plastic Other
 6. Buried Home Heating Oil Tank 23. Other Manure Storage
 7. Buried Petroleum Tank 15. Collector or Street Sewer Other NR 112 Waste Source
 8. Shoreline/Swimming Pool 16. Clearwater Sump 24. _____

6. Drillhole Dimensions			Method of constructing upper enlarged drillhole only.		9. Geology		
Dia. (in.)	From (ft.)	To (ft.)	DNE USE ONLY		Type, Caving/Noncaving, Color, Hardness, Etc.	From (ft.)	To (ft.)
10	surface	66	<input type="checkbox"/> 1. Rotary - Mud Circulation	<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 type="checkbox"/> No If no, explain _____ <input type="checkbox"/> 7. Other _____	Clay	surface	18
6	66	140	<input type="checkbox"/> 2. Rotary - Air		Sandy clay	18	66
			<input type="checkbox"/> 3. Rotary - Foam		Lime rock	66	100
			<input type="checkbox"/> 4. Reverse Rotary		Sand Stone	100	140
			<input type="checkbox"/> 5. Cable-tool Bit _____ in. dia.		Water bearing		
			<input type="checkbox"/> 6. Temp. Outer Casing _____ in. dia.				
			Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No				
			If no, explain _____				
			<input type="checkbox"/> 7. Other _____				

7. Casing, Liner, Screen
 Material, Weight, Specification Mfg. & Method of Assembly
 Dia. (in.) 6 New Black 18.95 From (ft.) surface To (ft.) 66

10. Static Water Level _____ ft. above ground level
10 ft. below ground surface

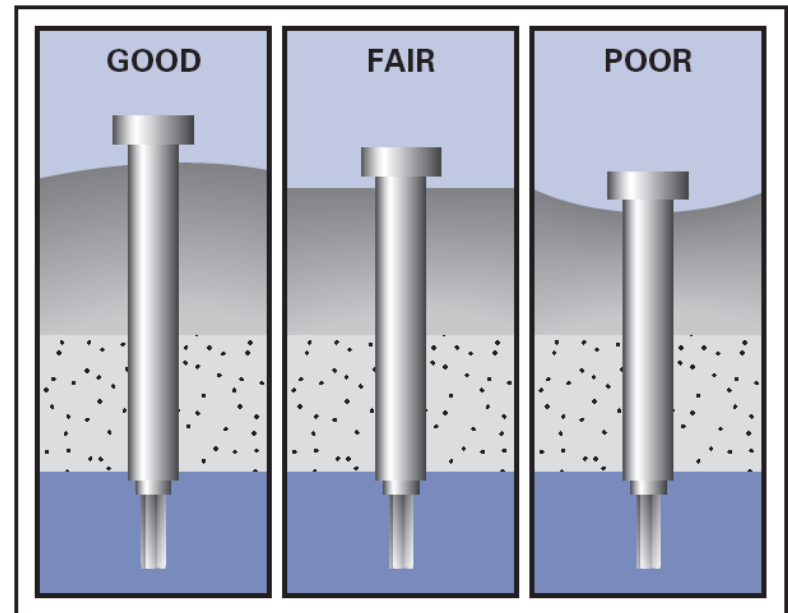
11. Pump Test
 Pumping Level 13 ft. below surface
 Pumping at 20 GPM for 2 hours

12. Well Is:
 Above Grade Below Grade
 Developed? Yes No
 Disinfected? Yes No
 Capped? Yes No

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



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 or if new well is unlikely to remedy the problem because of geology, may seek approval for treatment.*



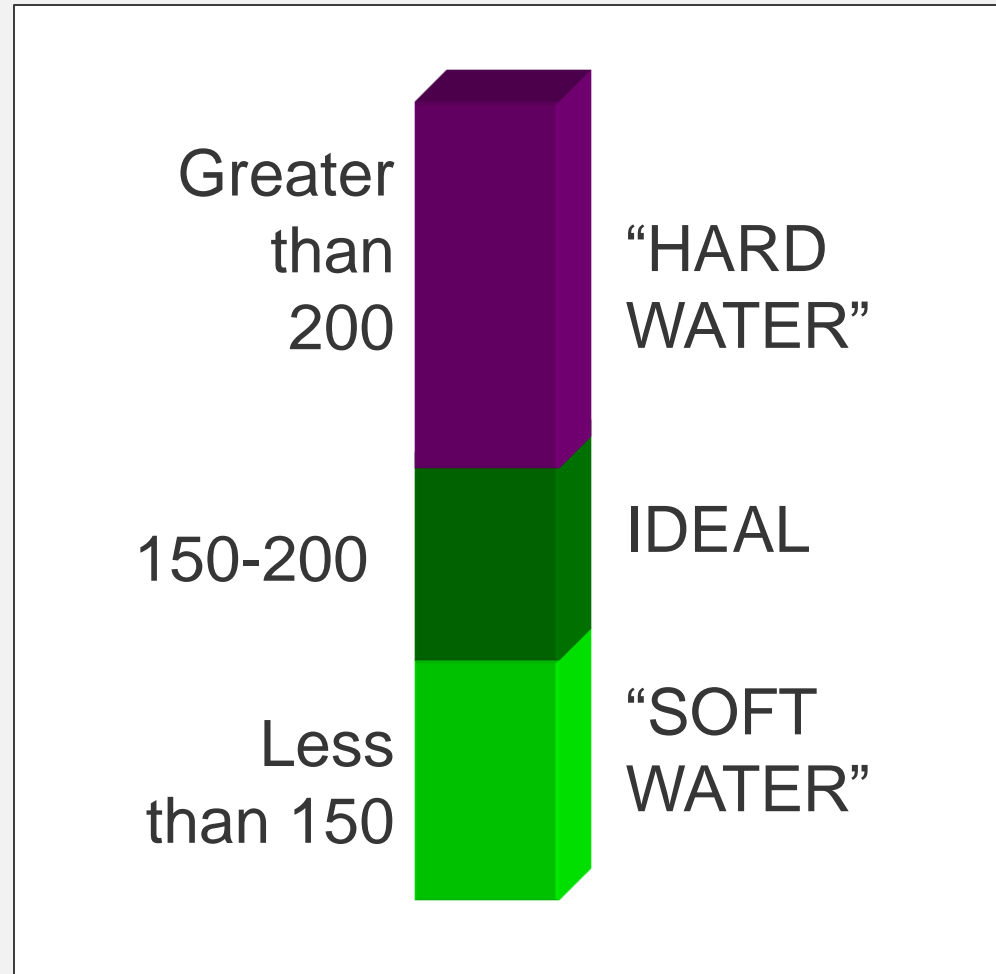
Rock and Soil Impacts on Water Quality

Tests for Aesthetic Problems

Hardness

- Natural (rocks and soils)
- Primarily calcium and magnesium

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



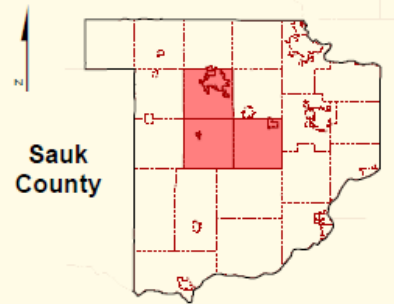
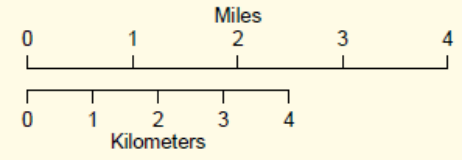
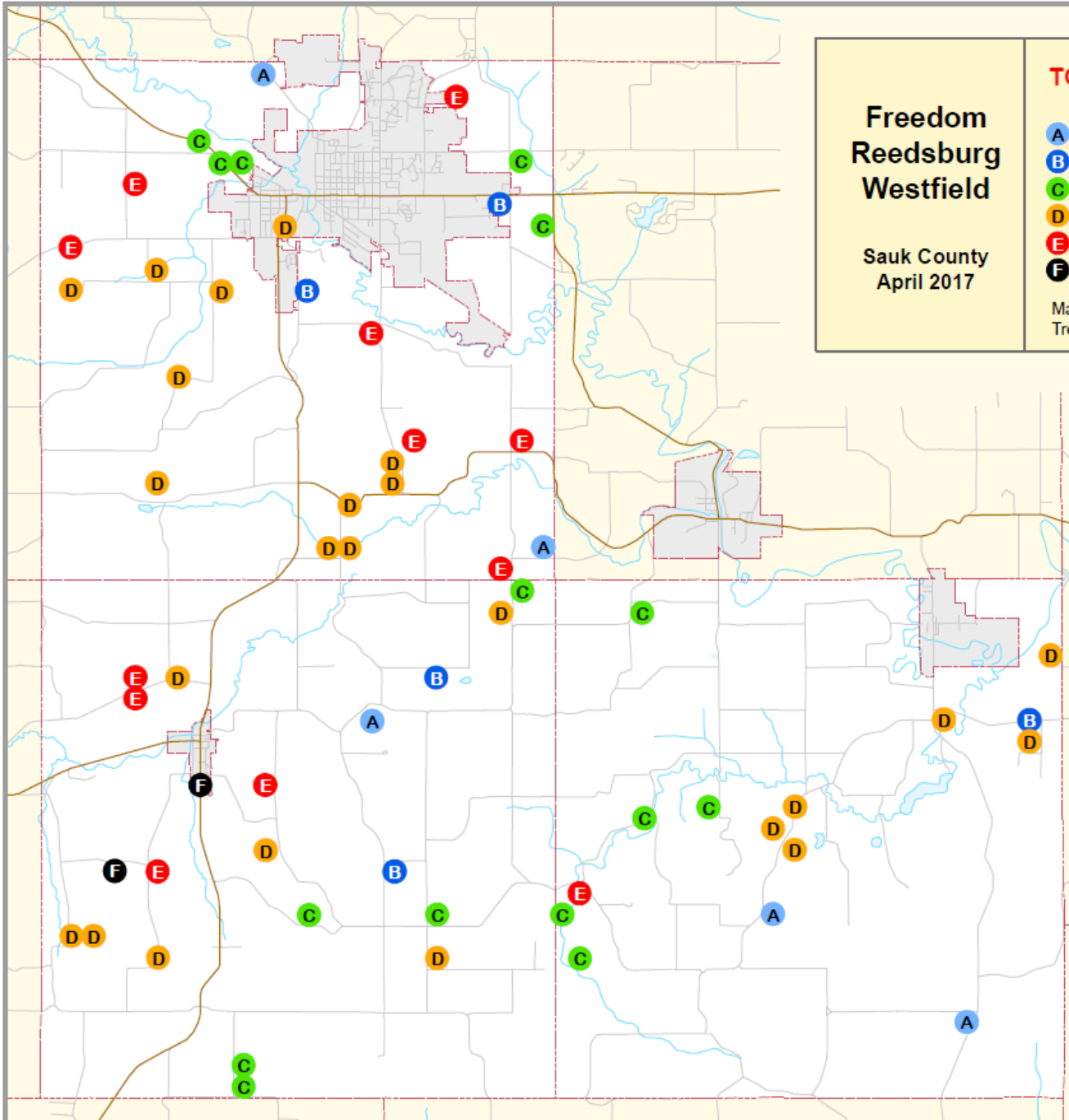
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TOTAL HARDNESS (ppm CaCO₃)

A ... 50	11	15%
B 51 - 100	6	8%
C 101 - 200	16	21%
D 201 - 300	26	35%
E 301 - 400	14	19%
F 401 ...	2	3%

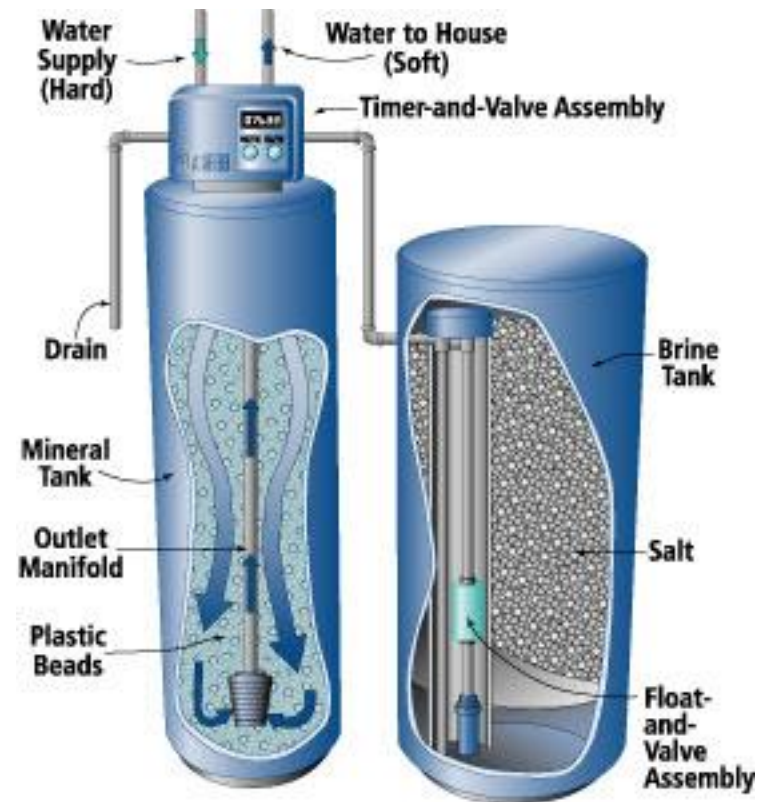
Mapped value is the average for the 1/4 1/4 section
Treated samples not mapped



Water Softening

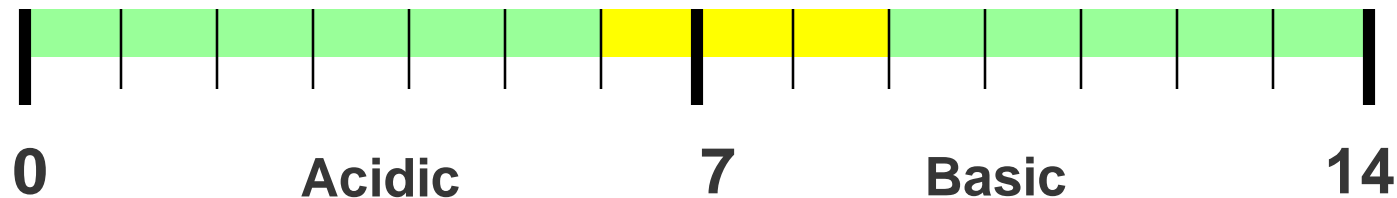
Water softeners remove calcium and magnesium which cause scaling and exchange it for sodium (or potassium).

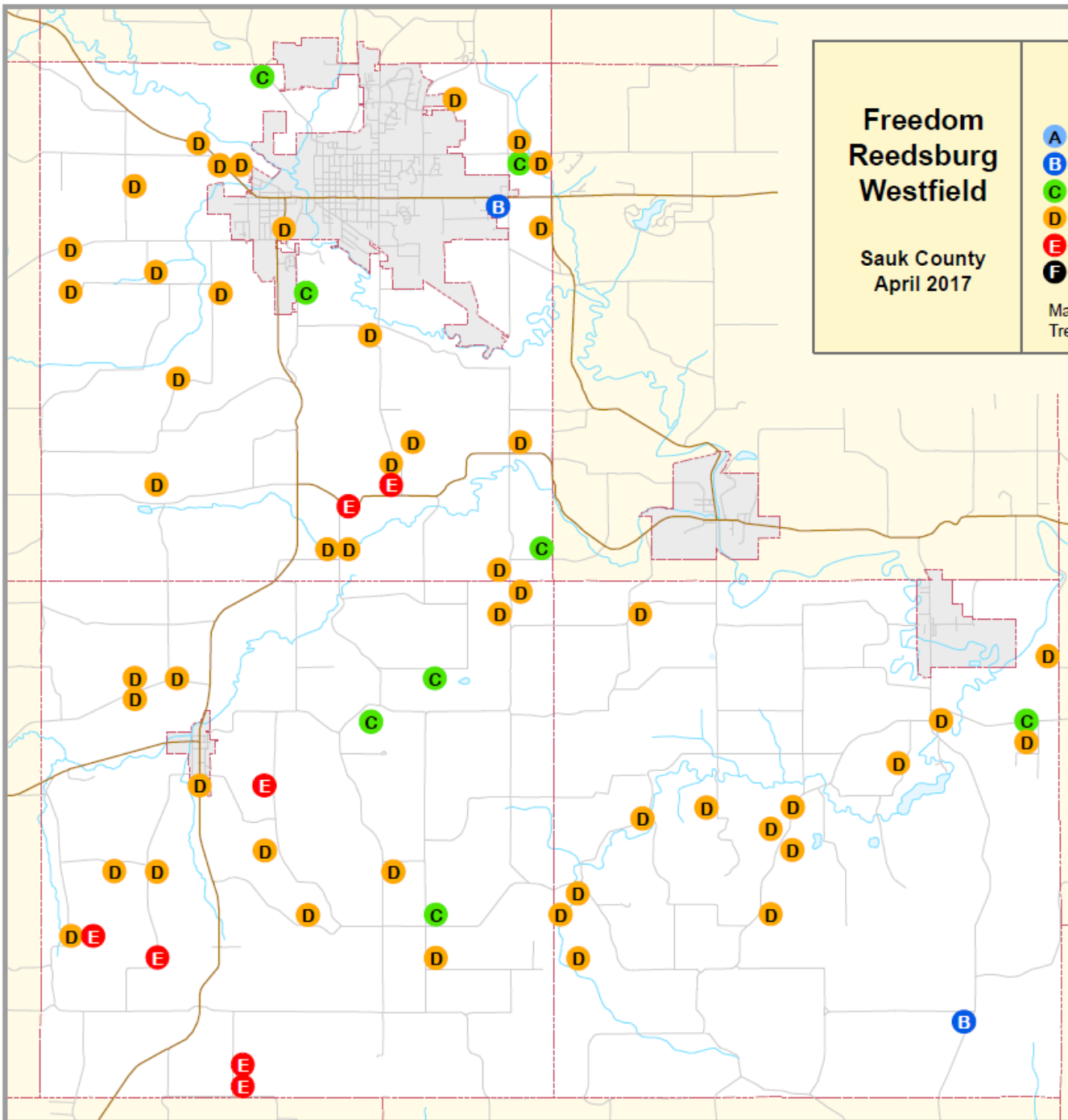
- Negative: Increases sodium content of water.
- Suggestions:
 - Bypass your drinking water faucet.
 - Do not soften water for outdoor faucets.
 - If you are concerned about sodium levels – use potassium chloride softener salt.



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





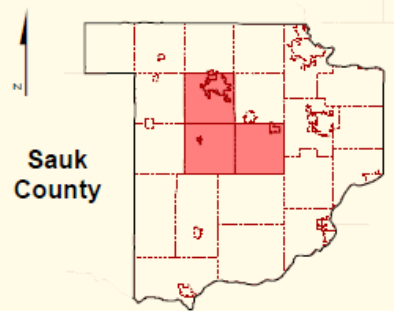
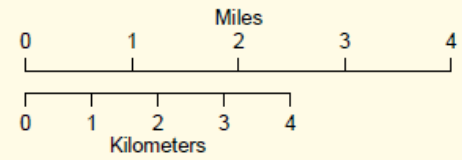
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pH

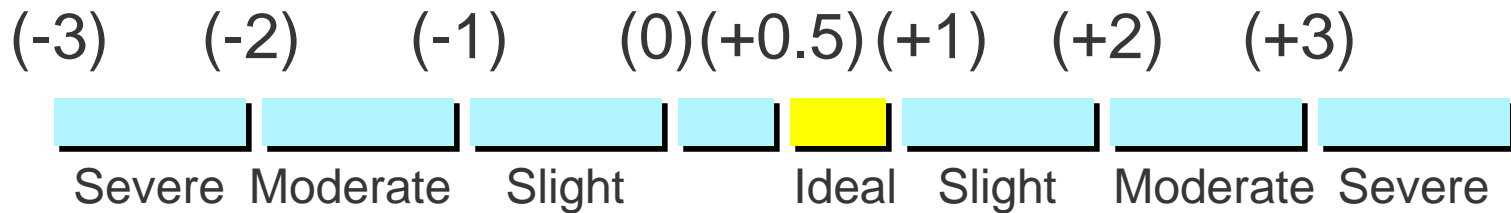
A ... 5.00	0	0%
B 5.01 - 6.00	3	4%
C 6.01 - 7.00	9	12%
D 7.01 - 8.00	54	72%
E 8.01 - 9.00	9	12%
F 9.01 ...	0	0%

Mapped value is the average for the 1/4 1/4 section
Treated samples not mapped



Tests for Overall Water Quality

Saturation Index



Corrosion occurs



Scaling occurs

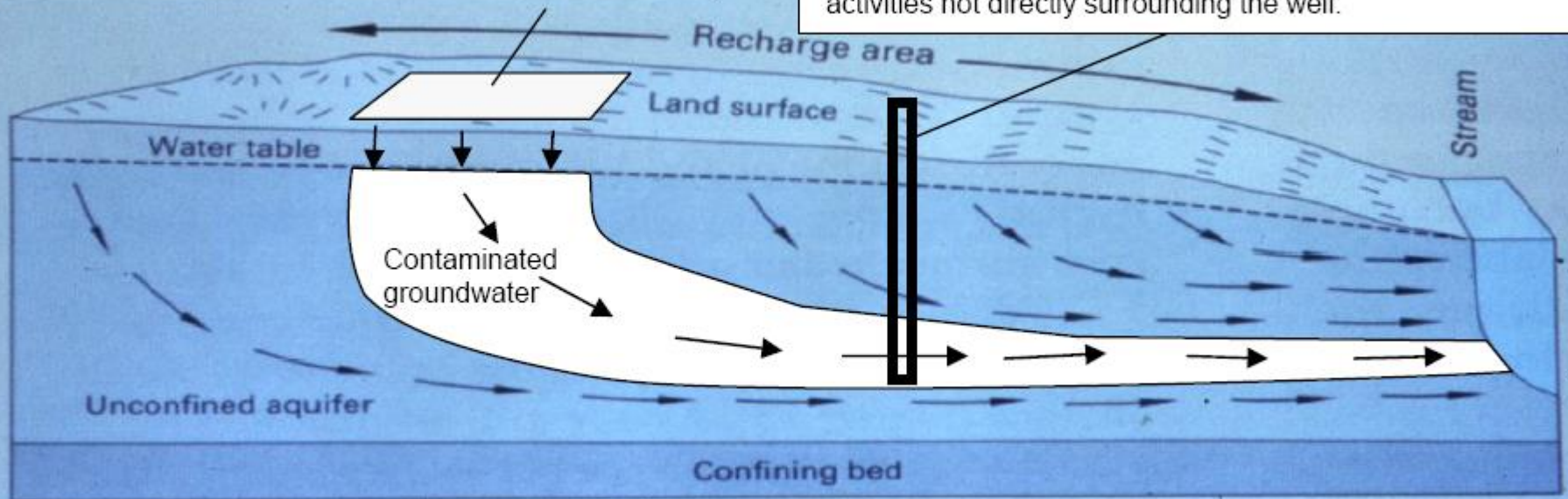




Soil

Land-use activity that pollutes groundwater.

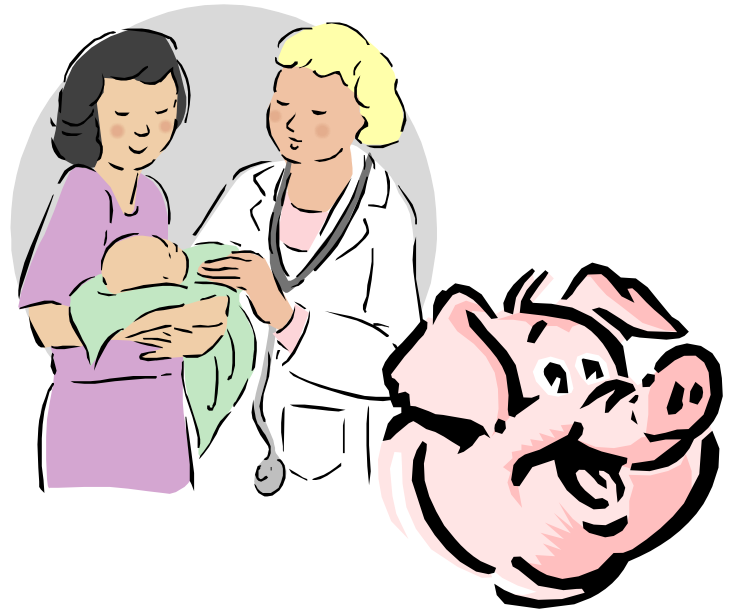
Because groundwater moves, wells located far from the contamination source can sometimes be polluted from activities not directly surrounding the well.



Nitrate-Nitrogen

Health Effects:

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



Sources:

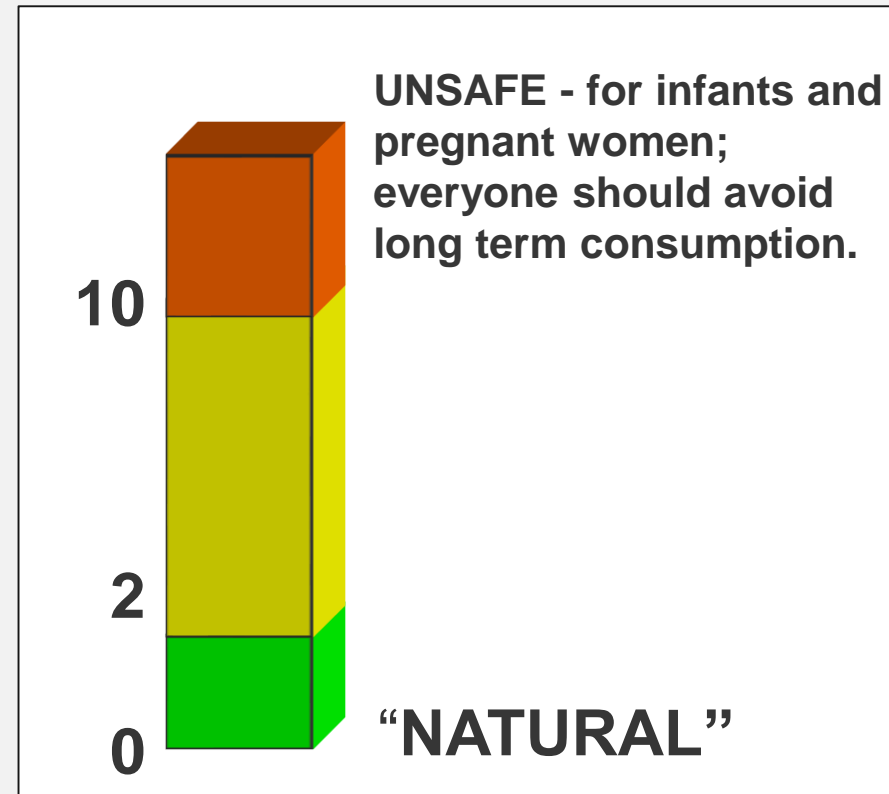
- Agricultural fertilizer
- Lawn fertilizer
- Septic systems
- Animal wastes



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”



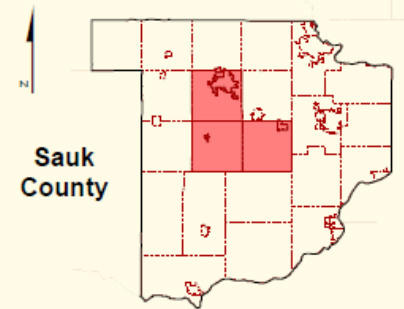
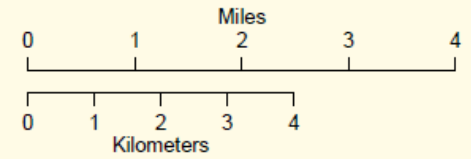
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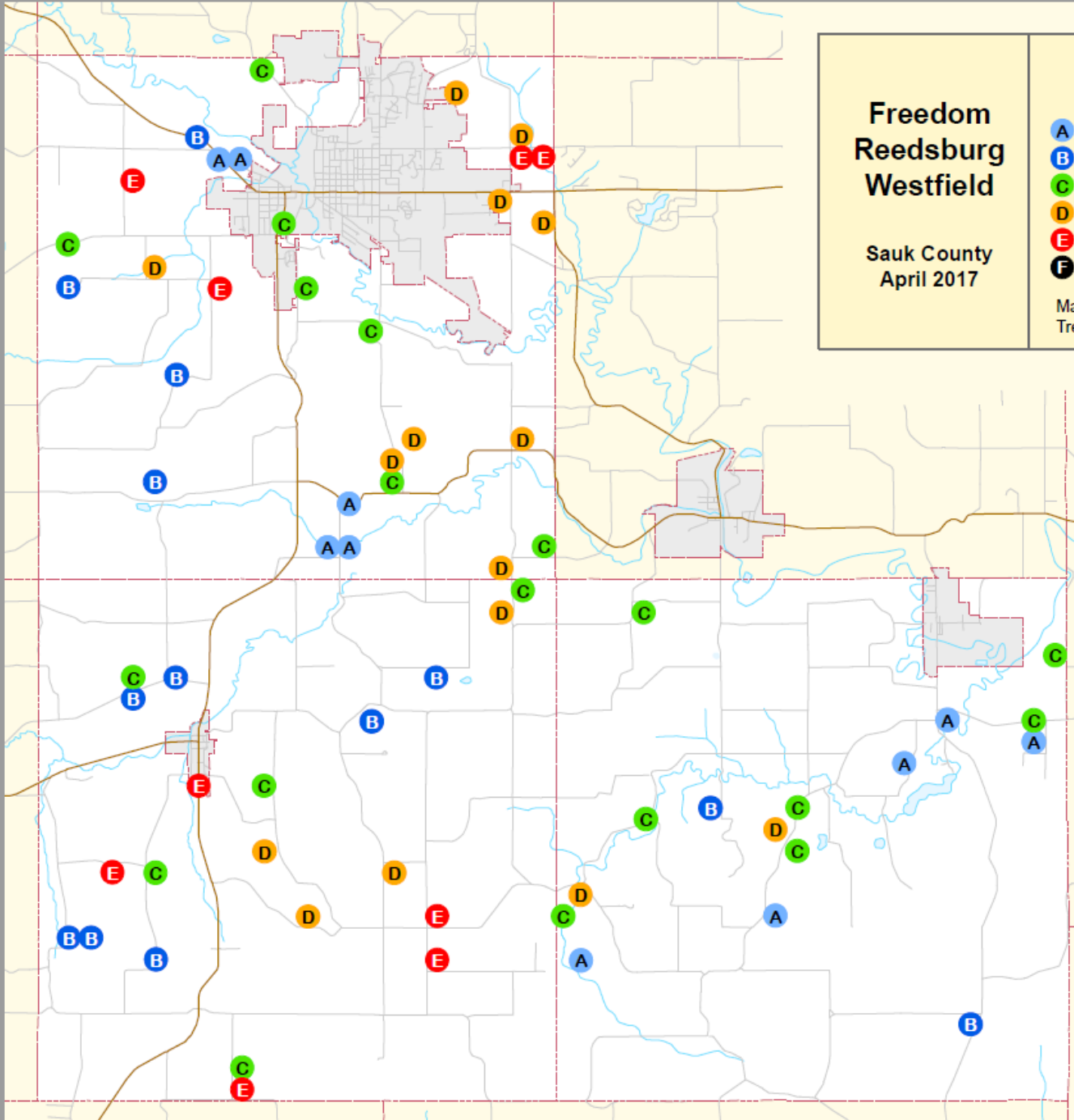
NITRATE-NITRITE (ppm N)

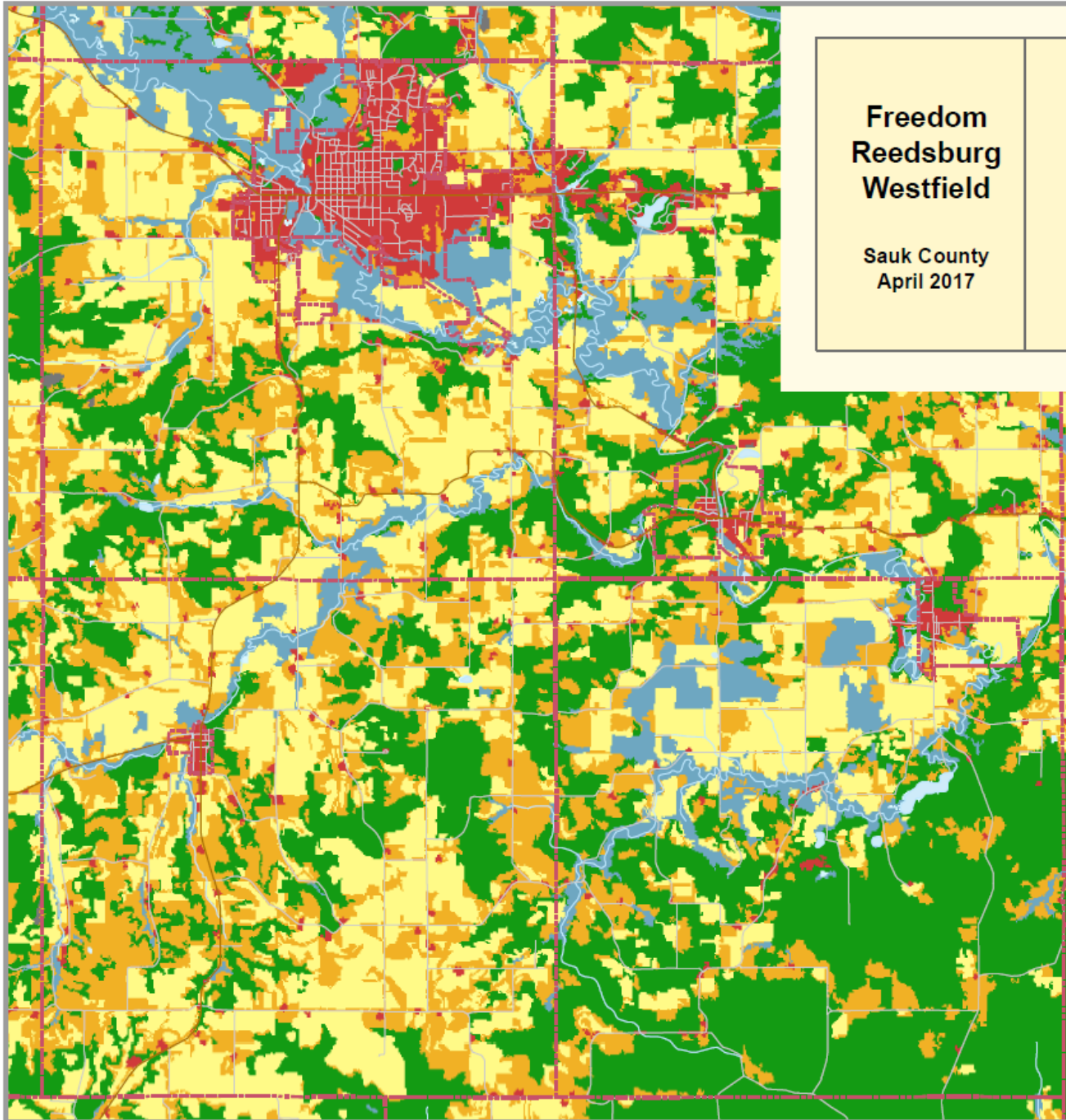
A	None Detected	11	15 %
B	... 2.0	16	21 %
C	2.1 - 5.0	20	27 %
D	5.1 - 10.0	17	23 %
E	10.1 - 20.0	11	15 %
F	20.1 ...	0	0 %

Mapped value is the average for the 1/4 1/4 section
Treated samples not mapped



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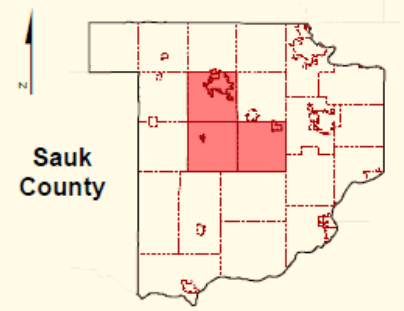
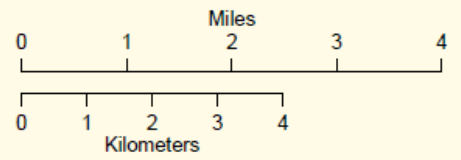




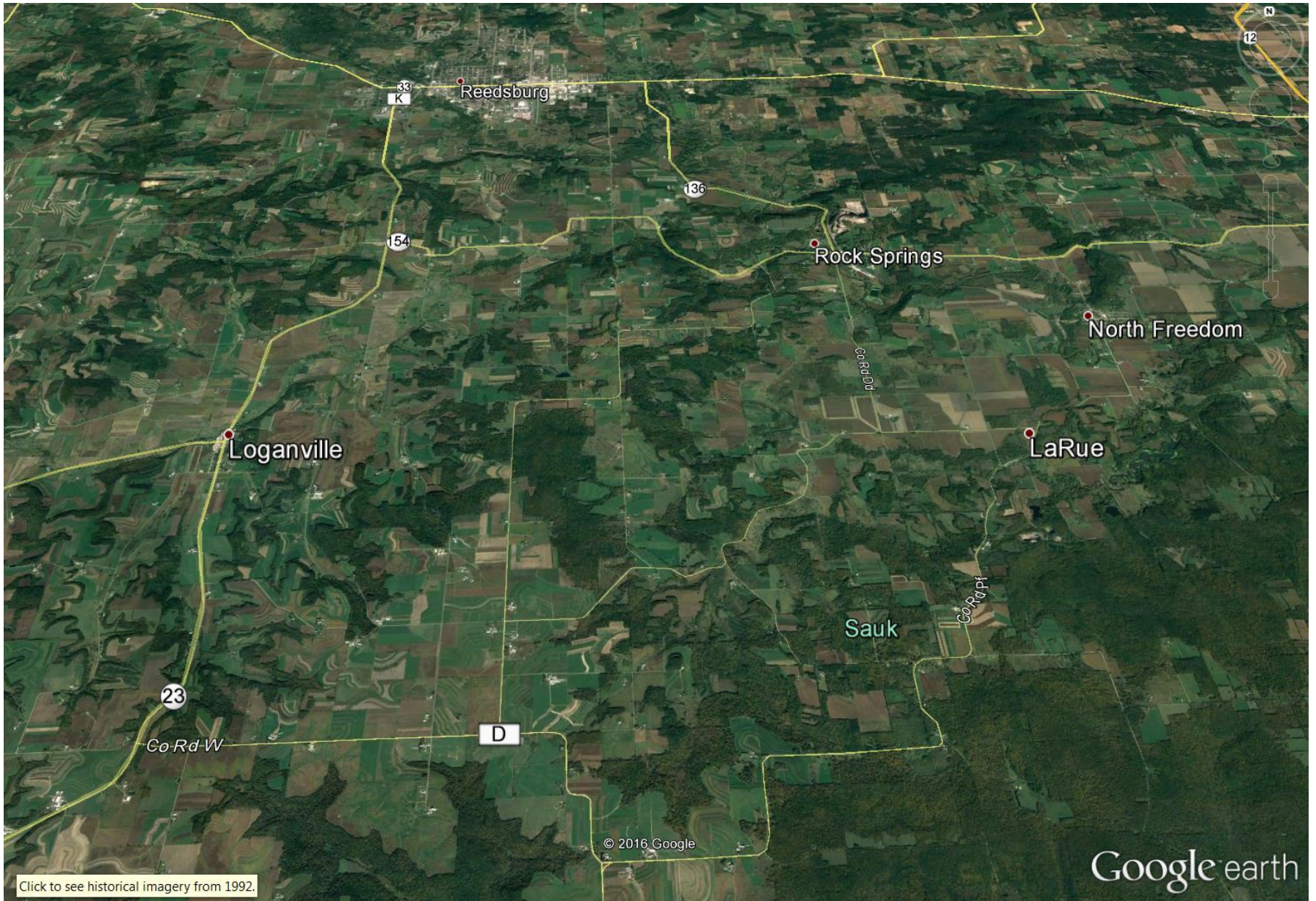
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- Land Use:
- Urban
 - Agriculture
 - Forest
 - Shrub-Grass
 - Wetland
 - Water
 - Barren



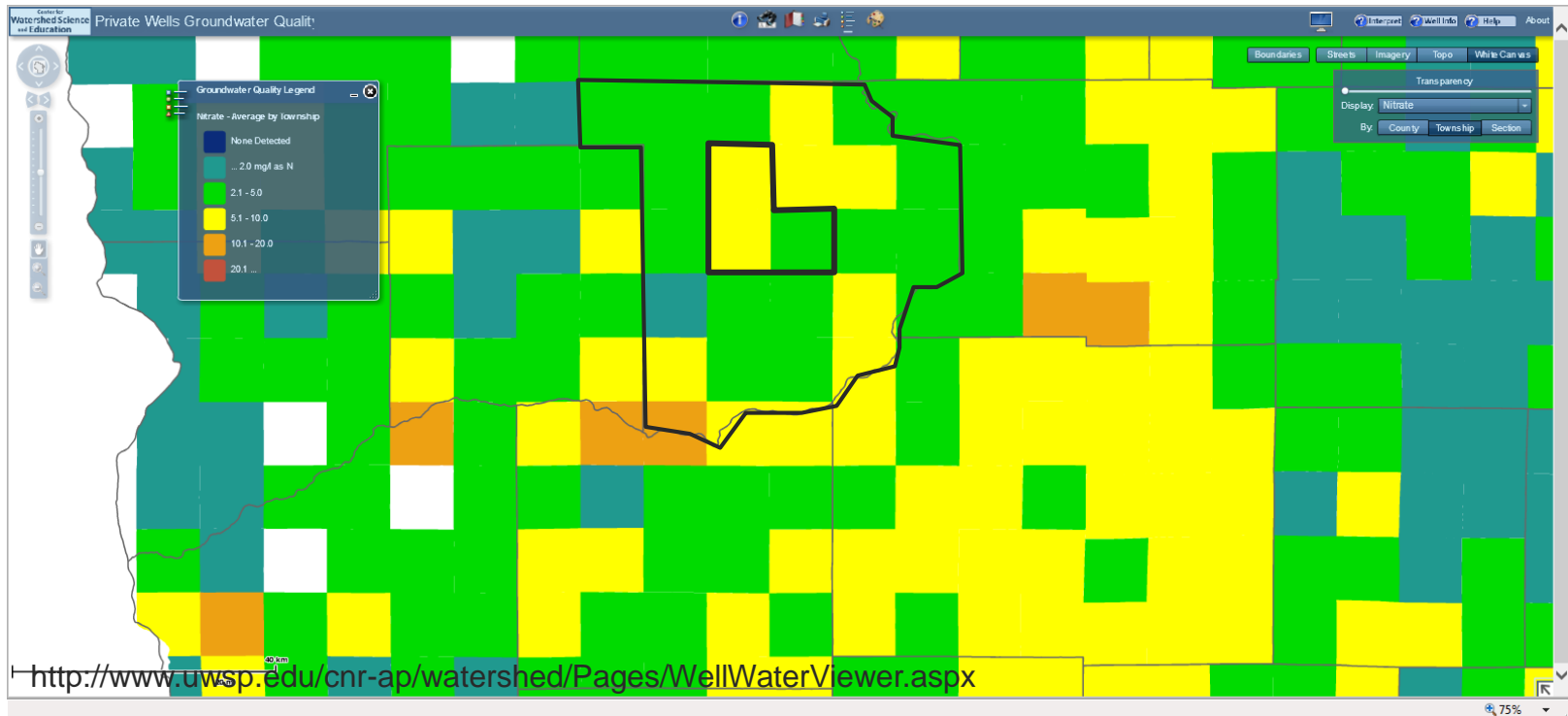
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[Click to see historical imagery from 1992.](#)

Google earth

Sauk County Nitrate Overview



16% of wells in Sauk County are above 10 mg/L nitrate-nitrogen
The median concentration is 3.0 mg/L nitrate-nitrogen
The average concentration is 5.3 mg/L nitrate-nitrogen

What can I do to reduce my nitrate levels?

Solution:

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

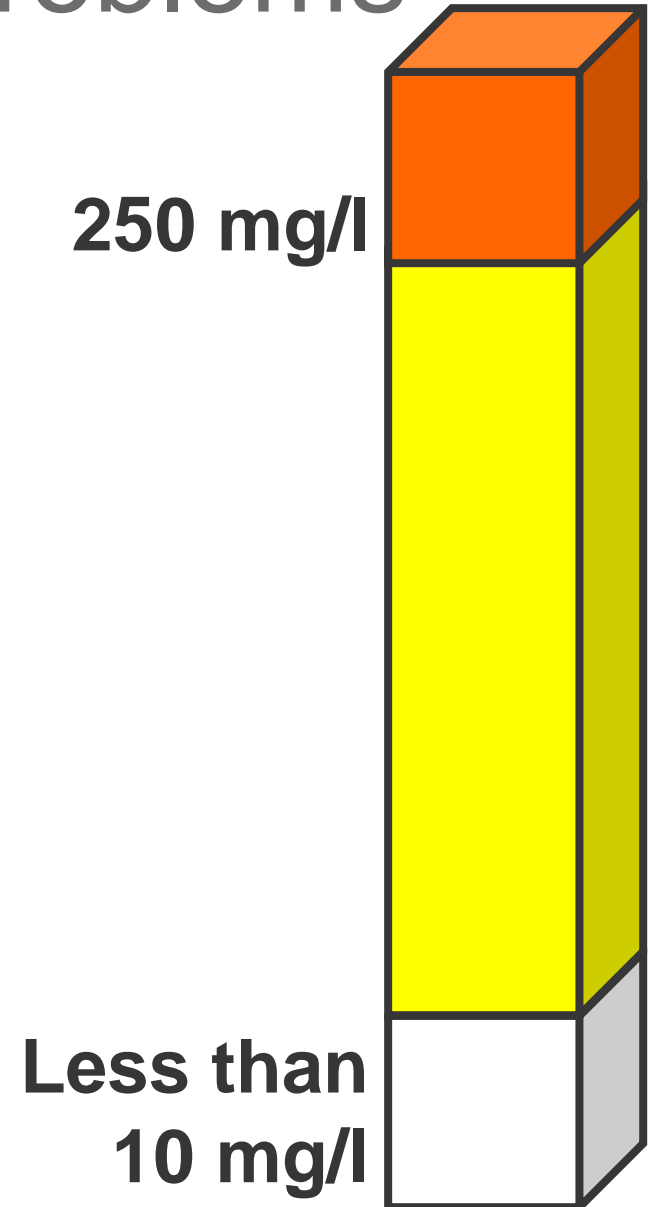
Short term:

- **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 considered “natural” in much of WI
- **Sources:** Fertilizers, Septic Systems and Road Salt



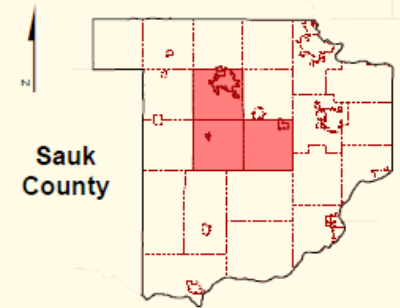
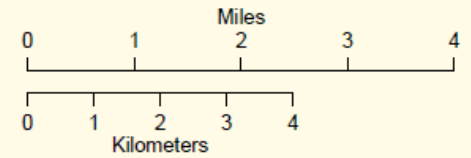
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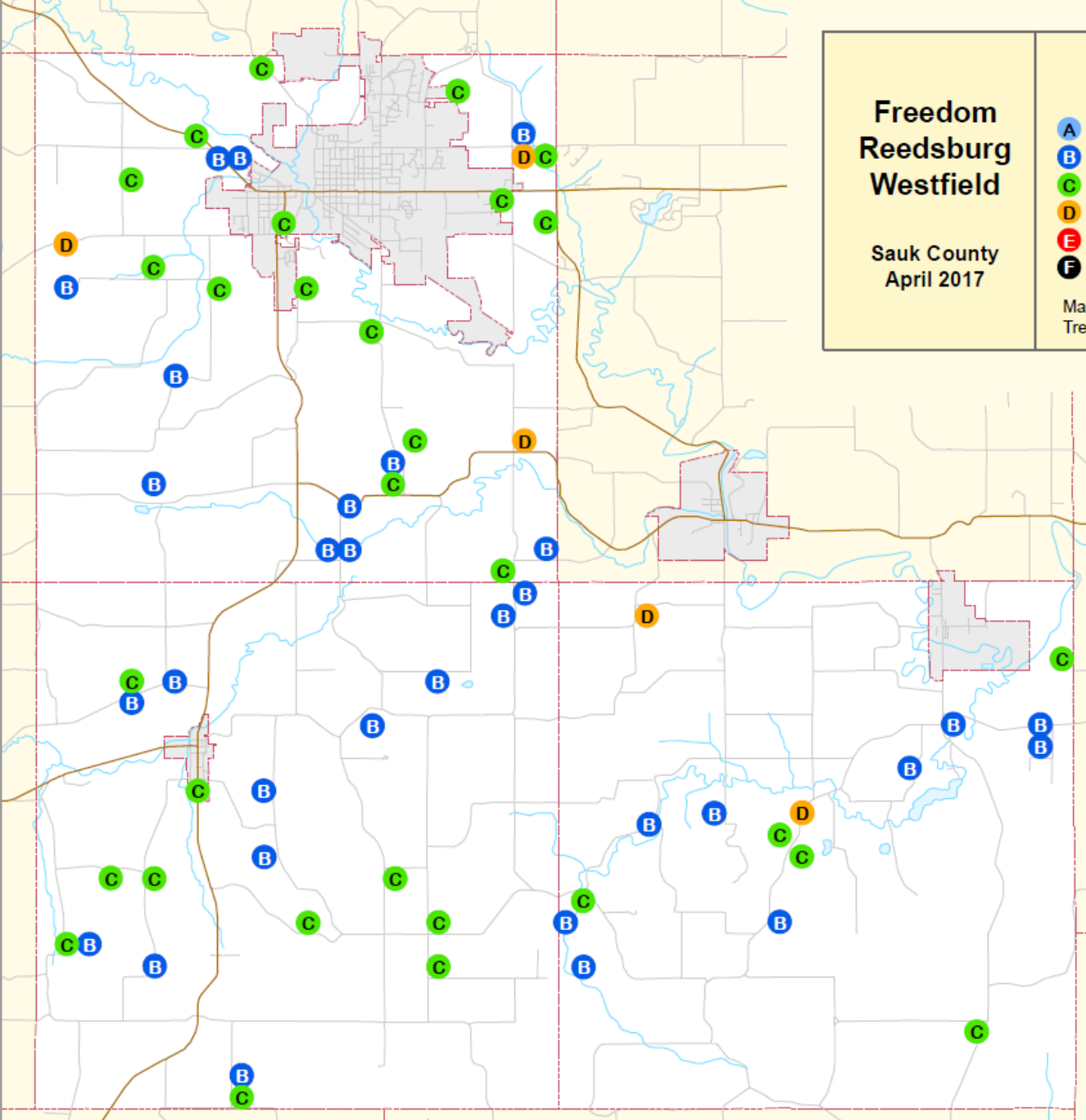
CHLORIDE (ppm)

A	None Detected	0	0%
B	... 10	34	45%
C	11 - 50	35	47%
D	51 - 100	5	7%
E	101 - 200	1	1%
F	201 ...	0	0%

Mapped value is the average for the 1/4 1/4 section
Treated samples not mapped



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Tests for Aesthetic Problems

Iron

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



**Greater
than 0.3
mg/L**

**Less
than 0.3 mg/L**

**Aesthetic
problems
likely**

Tests for Aesthetic Problems

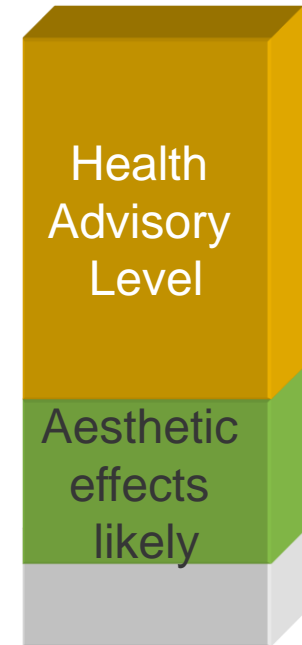
Manganese

- Natural (rocks and soils)
- Aesthetic issues: taste, odor, color (black staining or precipitates)
- Health Advisory Level: 0.300 mg/L
 - Many years of exposure to high levels of manganese can cause harm to the nervous system. A disorder similar to Parkinson's disease can result. This type of effect is most likely to occur in the elderly. The federal health advisory for manganese is intended to protect against this effect.

Greater than 0.300 mg/L

Greater than 0.050

Less than 0.050



Test Important to Health

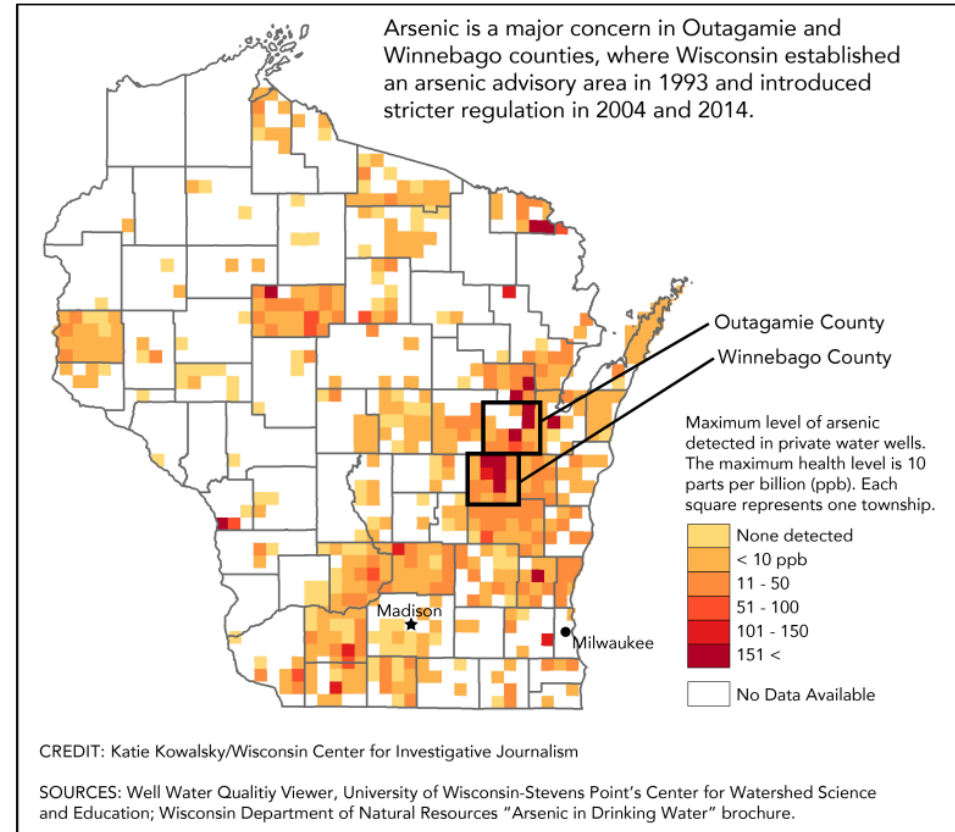
Arsenic

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



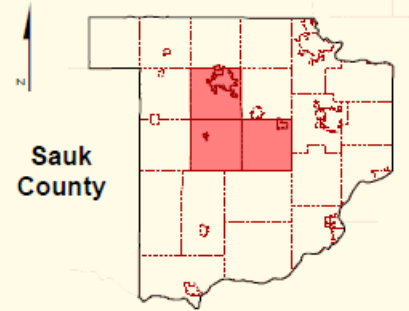
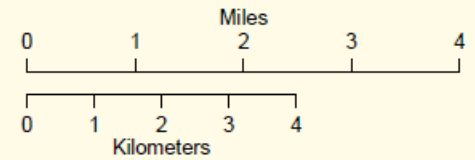
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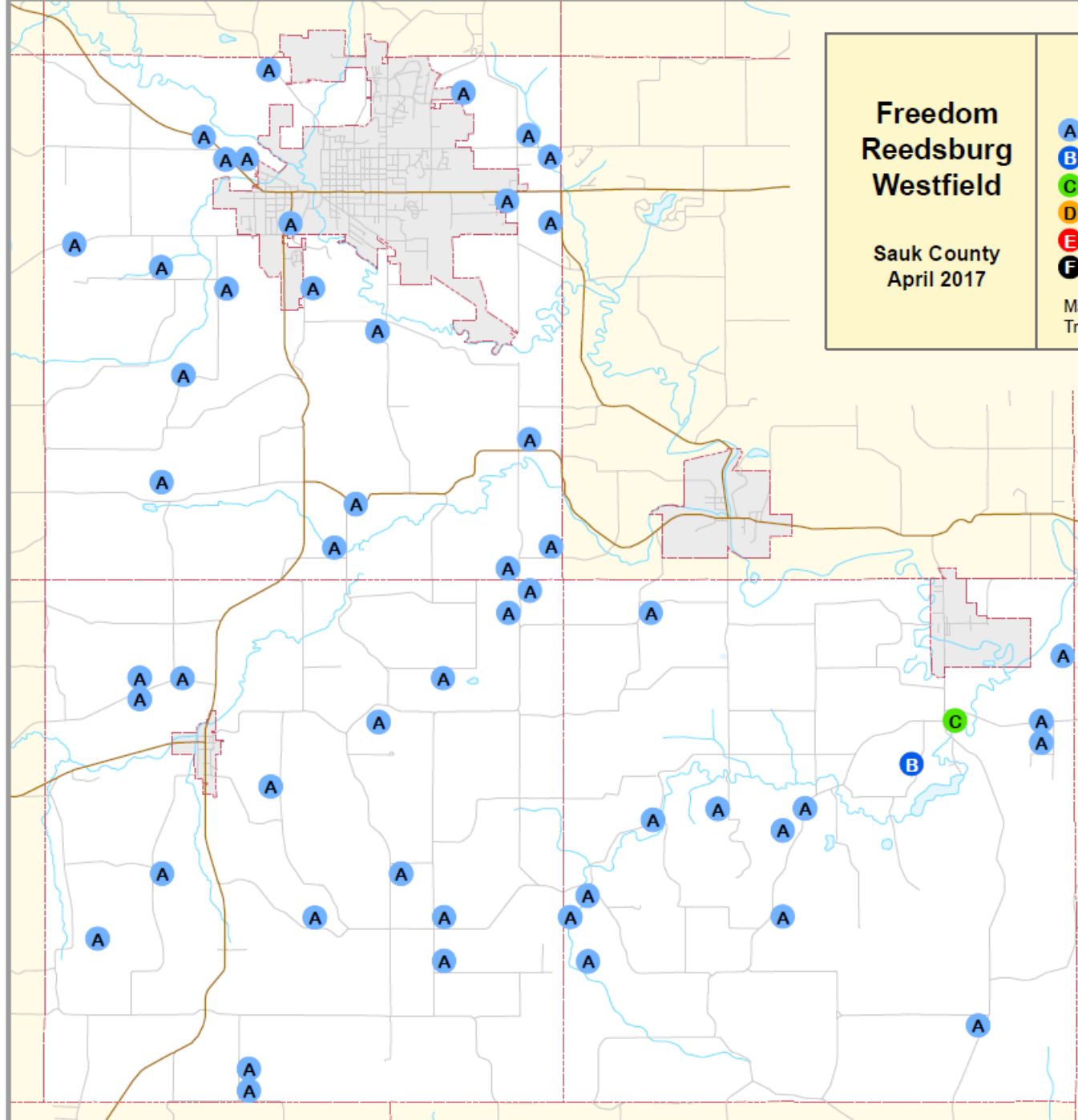
ARSENIC (mg/l)

A	None Detected	59	97%
B	... 0.010	0	0%
C	0.011 - 0.050	2	3%
D	0.051 - 0.100	0	0%
E	0.101 - 0.150	0	0%
F	0.151 ...	0	0%

Mapped value is the average for the 1/4 1/4 section
Treated samples not mapped



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Test Important to Health

Copper

- **Sources:** Copper water pipes
- **Standard:** Less than 1.3 mg/L is suitable for drinking

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) or brass fixtures

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.



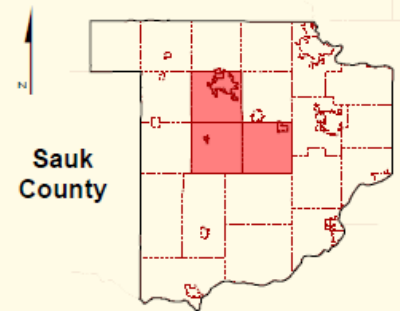
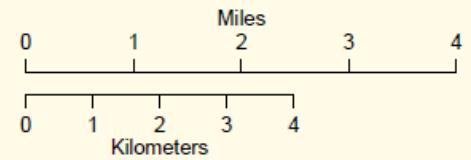
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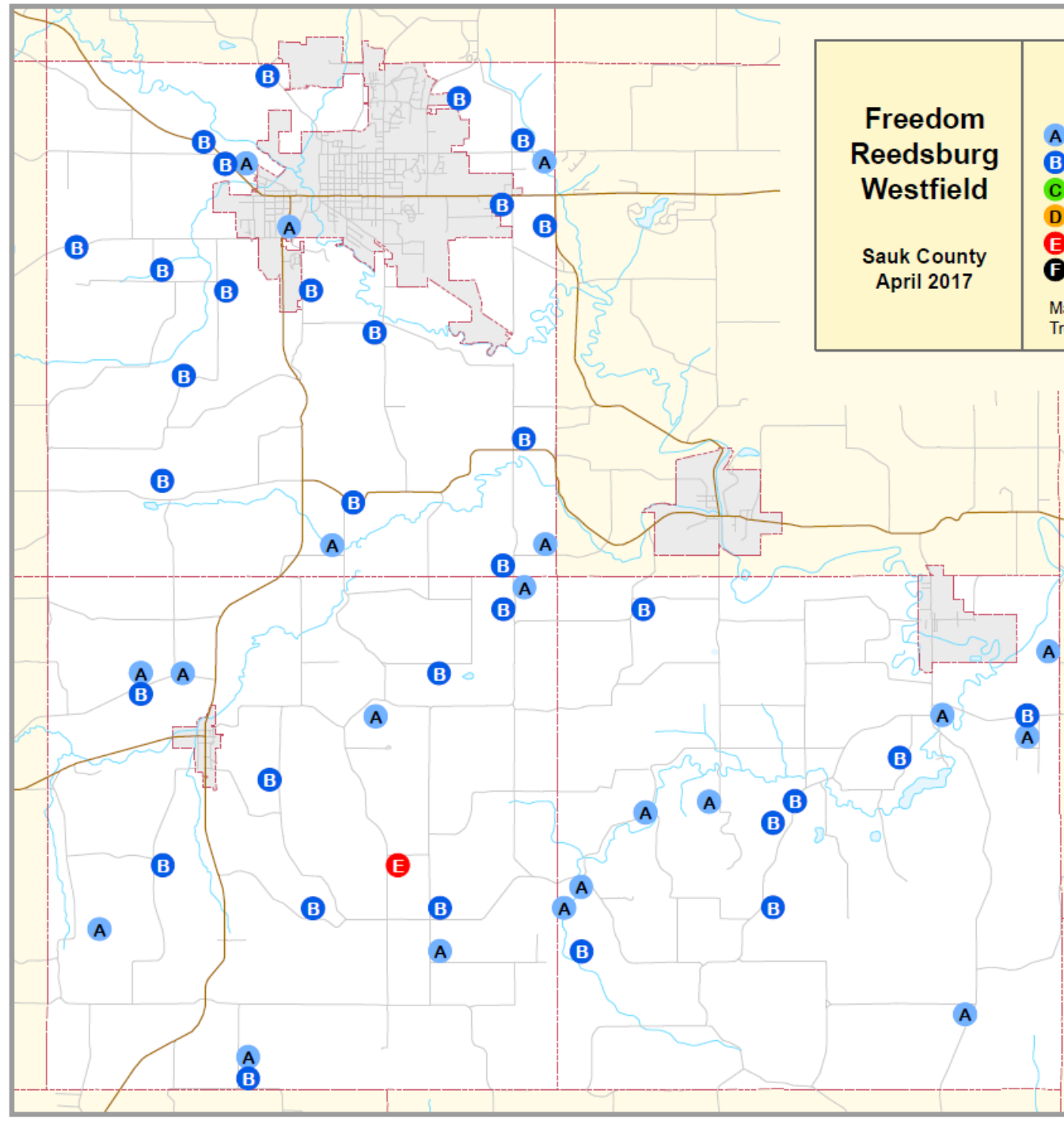
LEAD (mg/l)

A	None Detected	24	39 %
B	... 0.015	36	59 %
C	0.016 - 0.025	0	0 %
D	0.026 - 0.050	0	0 %
E	0.051 - 0.100	1	2 %
F	0.101 ...	0	0 %

Mapped value is the average for the 1/4 1/4 section
Treated samples not mapped



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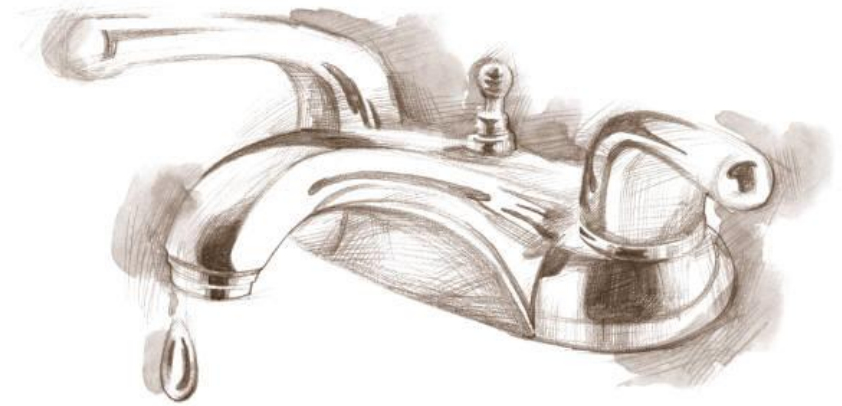
Lead and Copper

Solutions:

- Allow water to run for a minute or two before using for drinking or cooking

or

- Use a treatment device, but generally not necessary



Pesticides in Drinking Water

- Pesticides include: 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 Wisconsin:**
 - 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.



Tests Important to Health

DACT Screen

Sources: Triazine pesticides (a class of pesticides mainly used on corn)

DACT 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*)



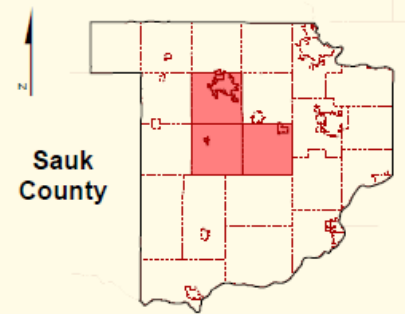
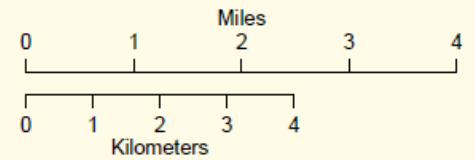
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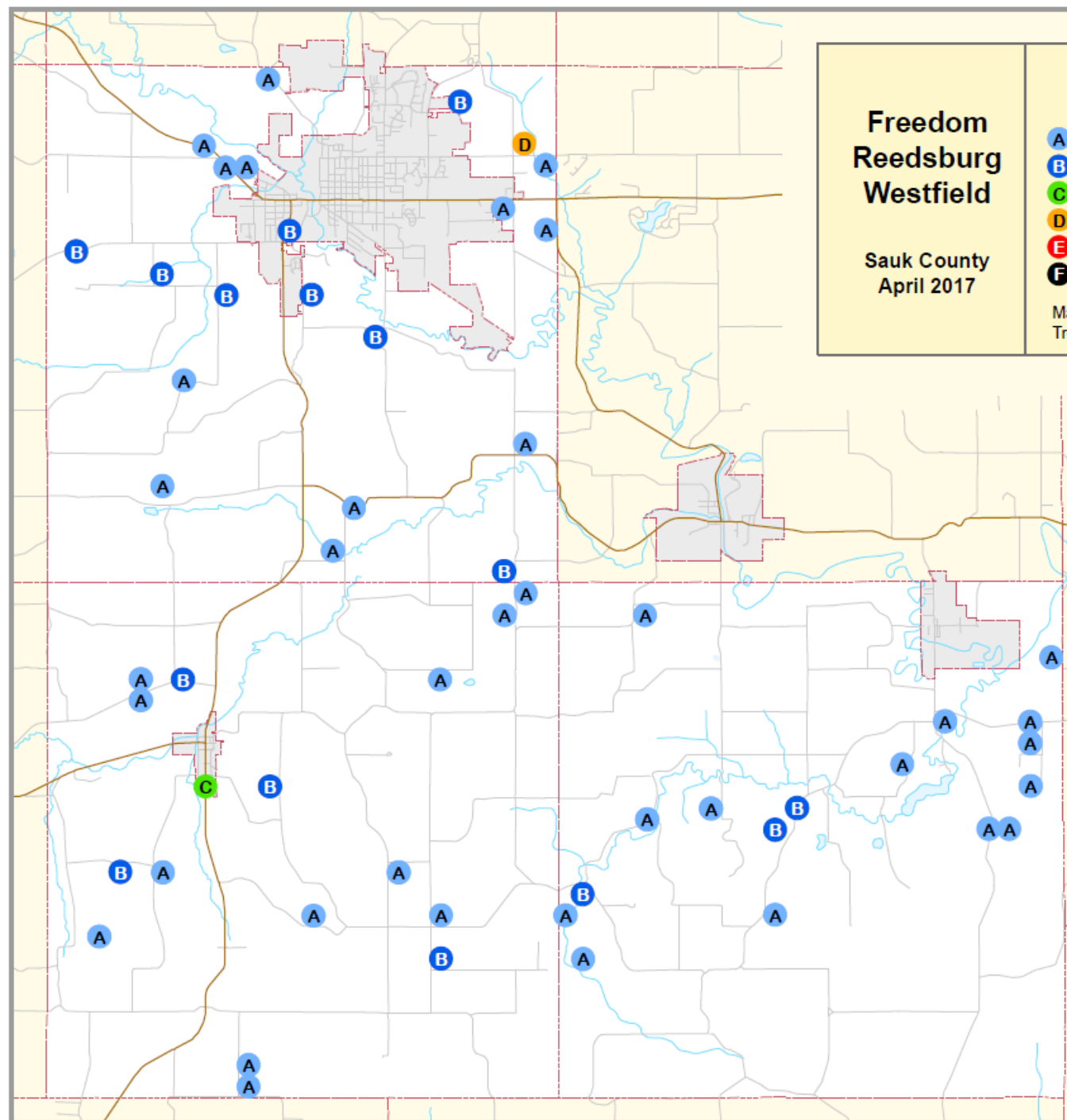
DACT (ug/l)

A	None Detected	42	70 %
B	... 0.3	16	27 %
C	0.4 - 1.0	1	2 %
D	1.1 - 2.0	1	2 %
E	2.1 - 3.0	0	0 %
F	3.1 ...	0	0 %

Mapped value is the maximum for the 1/4 1/4 section
Treated samples not mapped



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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

- **Keep in Mind:**

- Require routine maintenance
- Can require additional energy costs
- Testing is often the only way to know it is functioning properly for most health related contaminants

- **Other important information:**

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



Where to go from here:

- **Coliform Bacteria:**
 - Test well annually for bacteria, or if water changes color or clarity
- **Nitrate:**
 - If nitrate levels are above 5 mg/L, consider testing annually (or seasonally if your result is near 10 mg/L)
- **Arsenic:**
 - If you haven't checked for arsenic consider testing
 - If arsenic was present greater than 0.005 mg/L consider testing again in the future to see if levels have changed

List of laboratories can be found on the DNR Website [“Recommended testing”](#)

Contact Info:
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kmasarik@uwsp.edu
www.uwsp.edu/cnr/watersheds

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- **Towns of Freedom, Reedsburg,
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- **Sauk County UW-Extension**

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