

# Groundwater and Drinking Water Education Program

## Towns of Greenfield, Merrimac, and Sumpter

Kevin Masarik  
Center for Watershed Science and Education



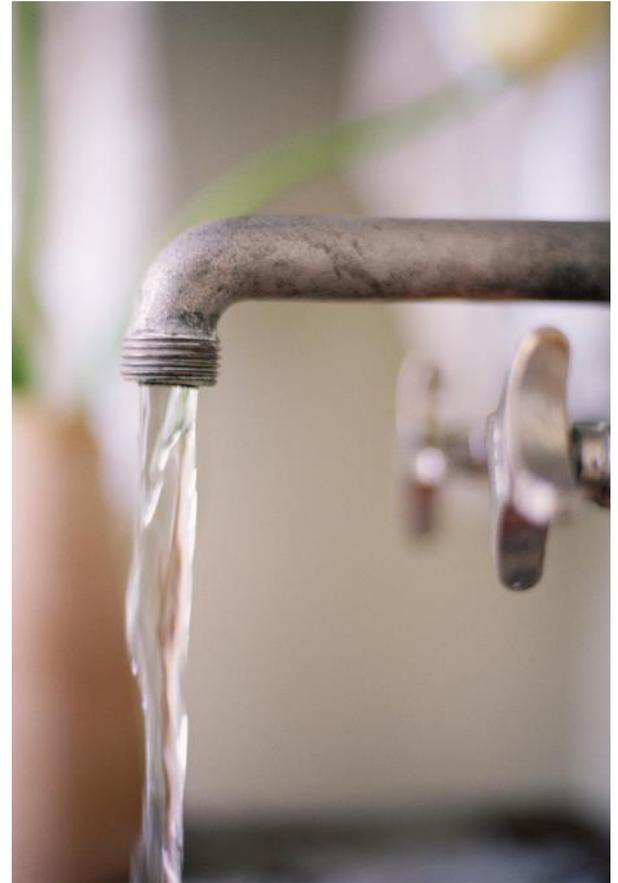
**University of Wisconsin-Stevens Point**  
College of Natural Resources



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 Greenfield, Merrimac and Sumpter
- Improving your water quality



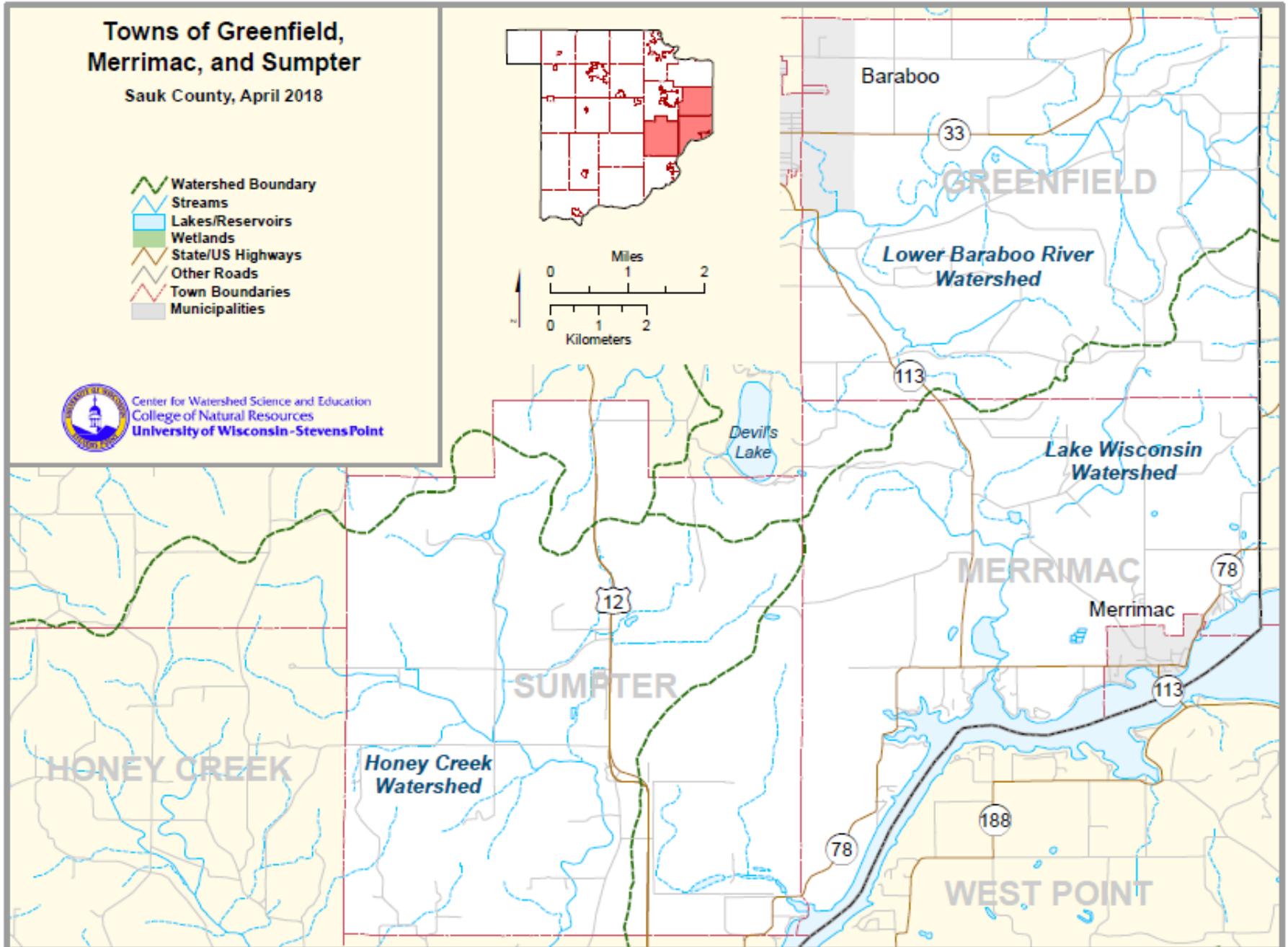
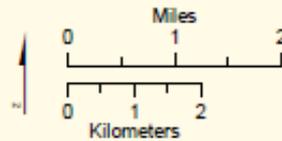
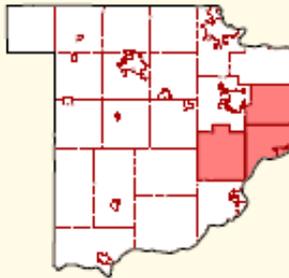
# Towns of Greenfield, Merrimac, and Sumpter

Sauk County, April 2018

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



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point



# Towns of Greenfield, Merrimac, and Sumpter

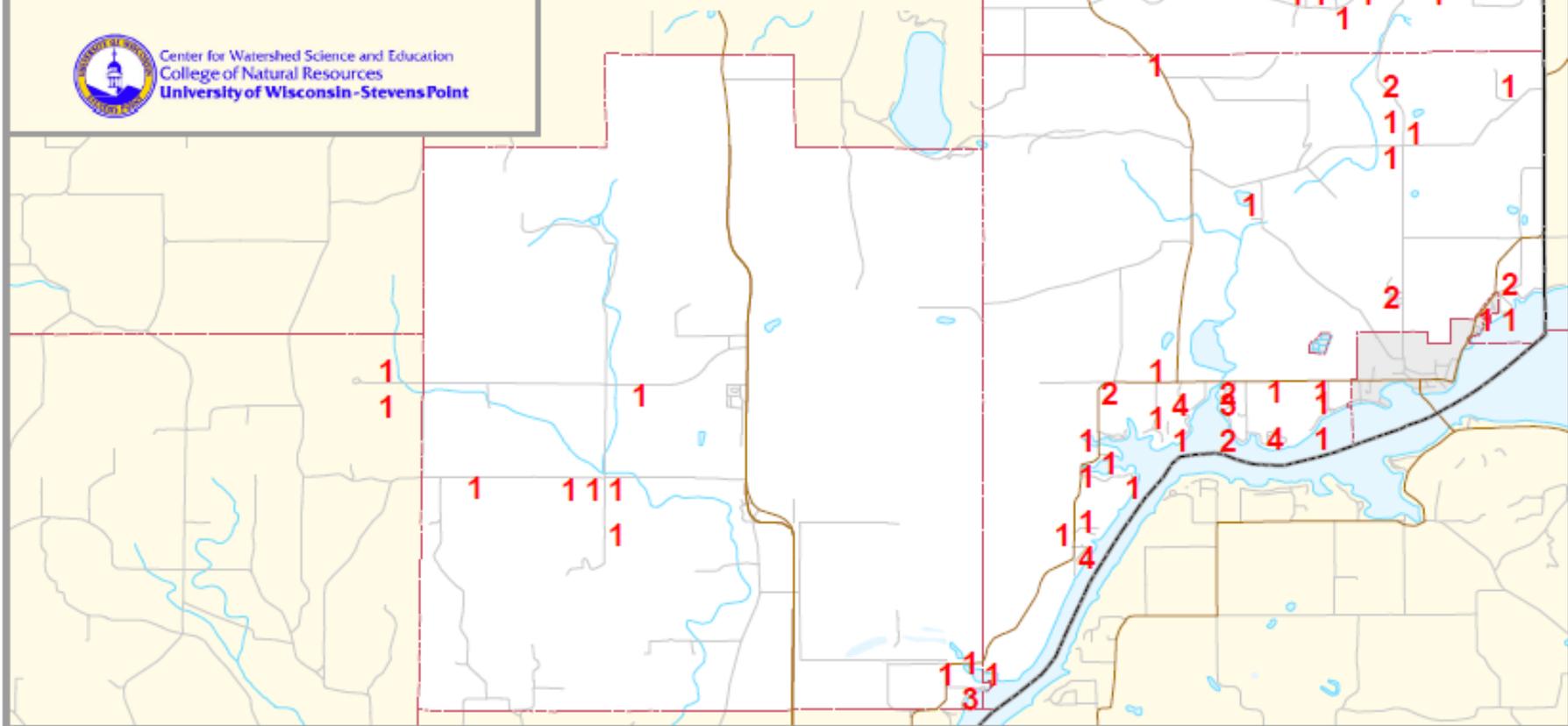
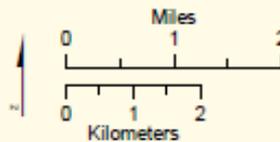
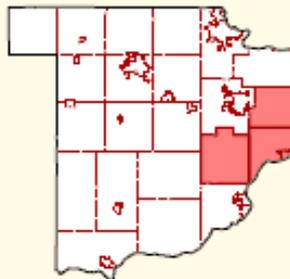
Sauk County, April 2018

## SAMPLE DISTRIBUTION

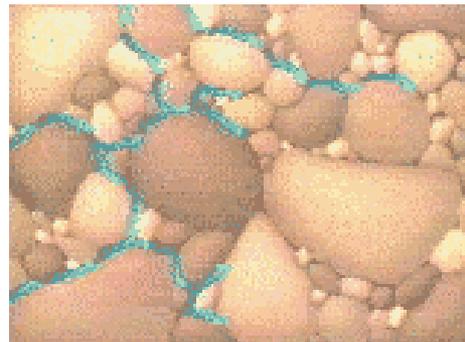
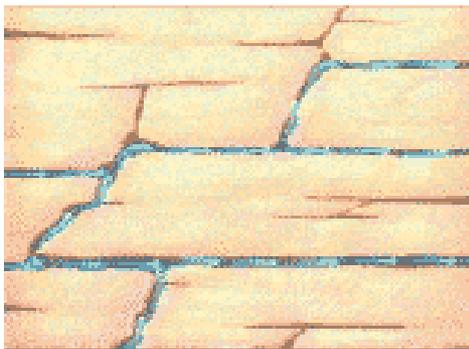
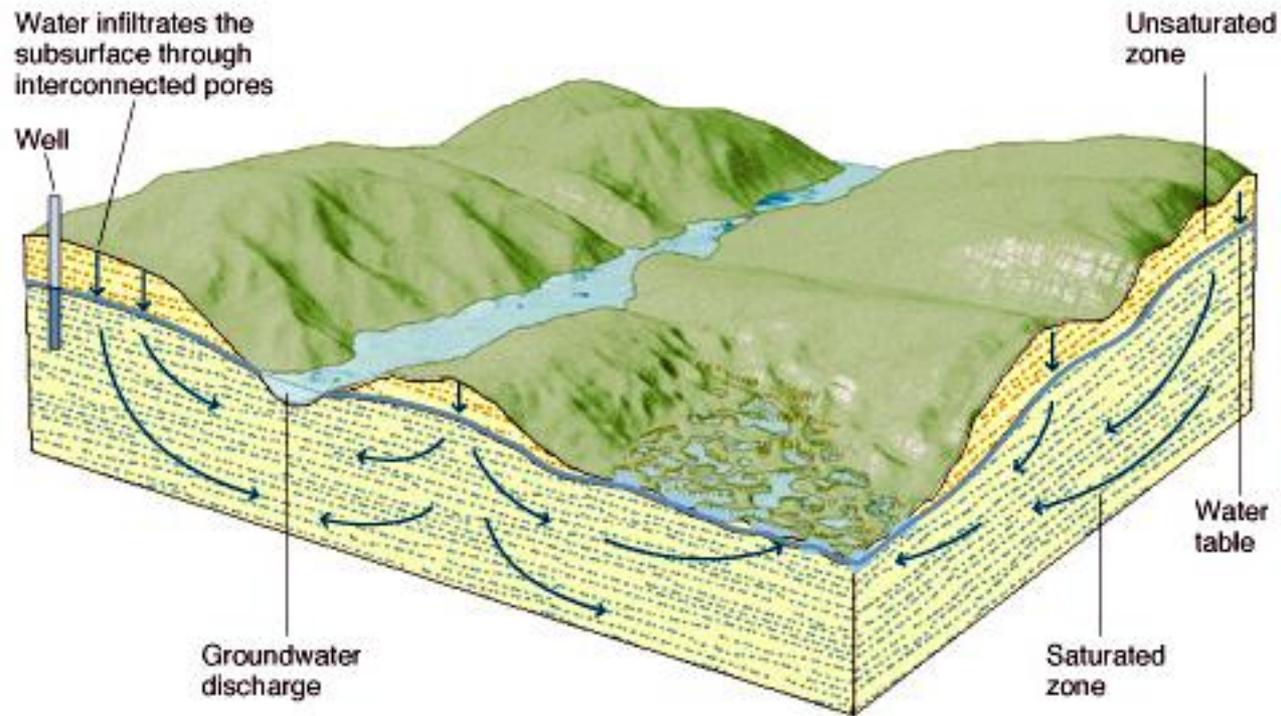
NUMBER OF SAMPLES  
per 1/4 1/4 SECTION

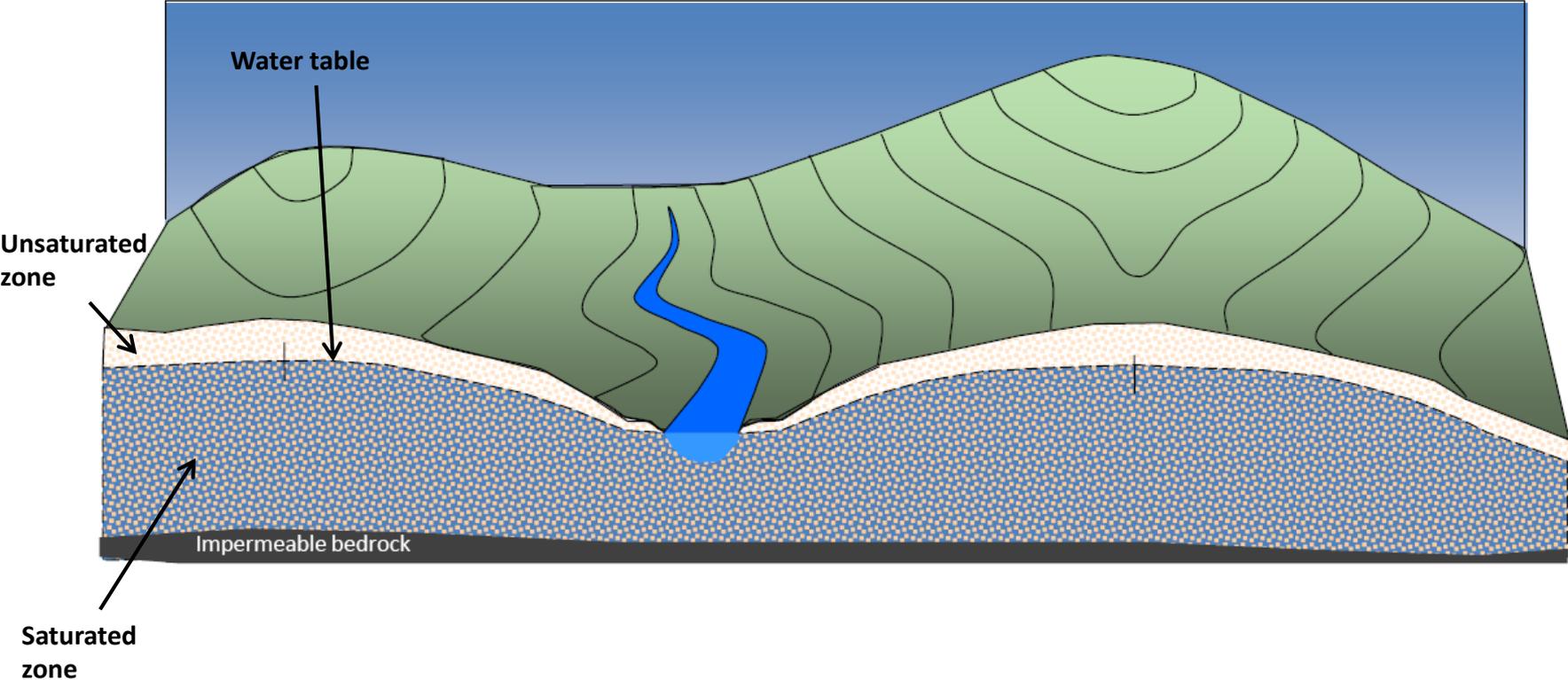


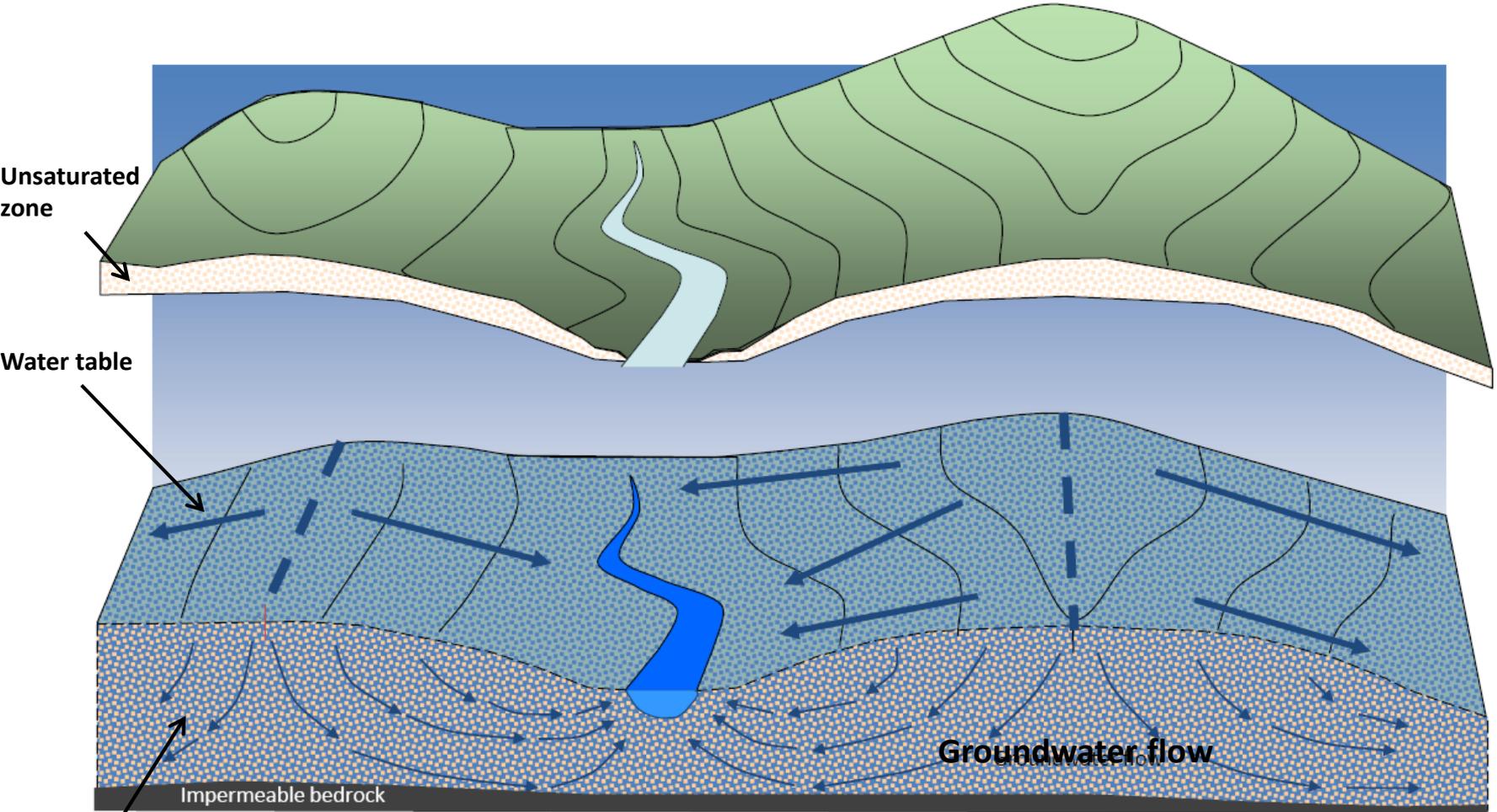
Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point



# Groundwater Movement







Unsaturated zone

Water table

Groundwater flow

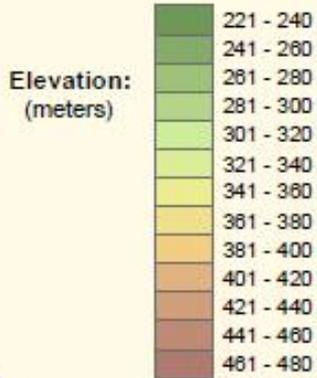
Impermeable bedrock

Saturated zone

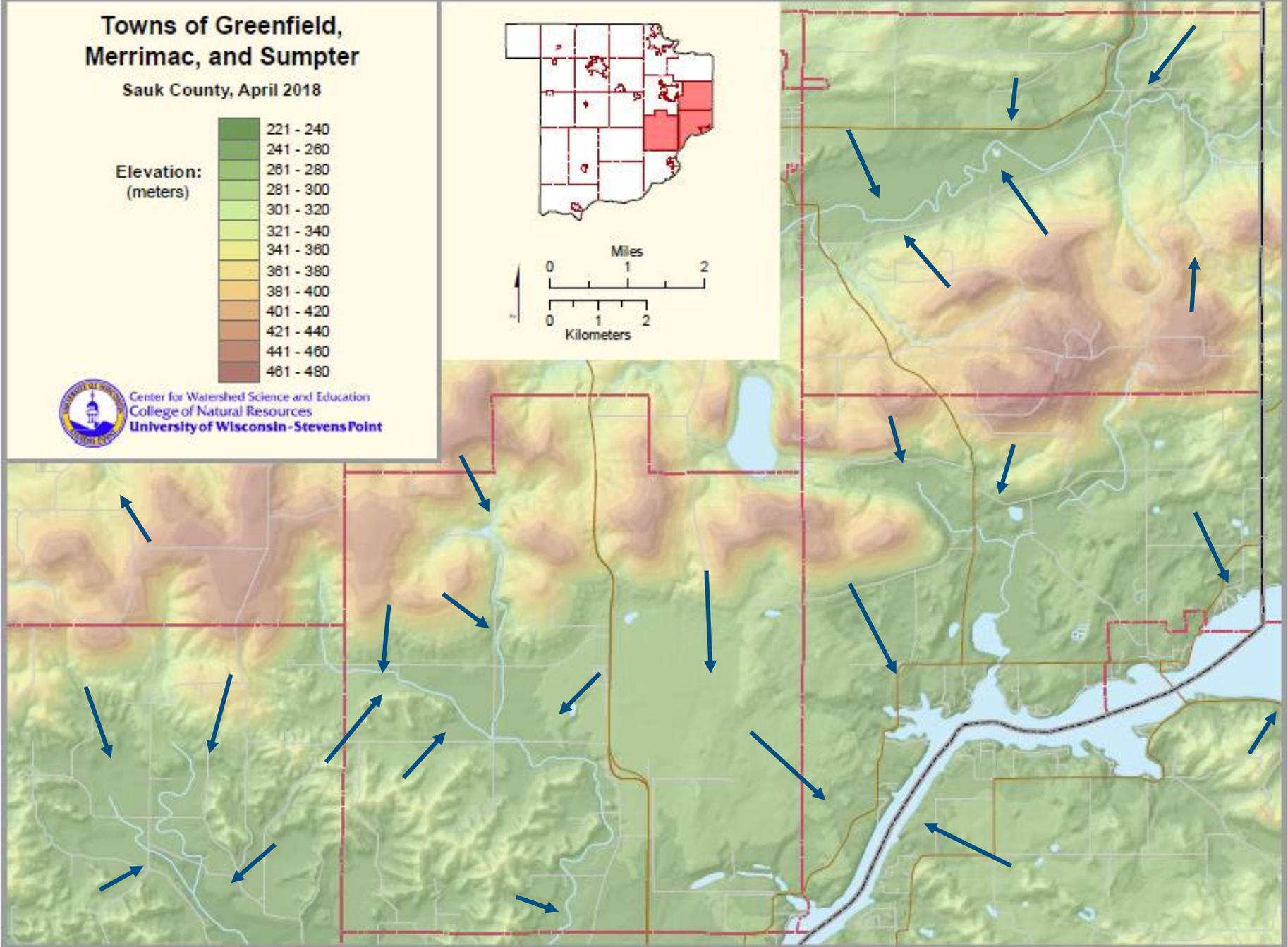
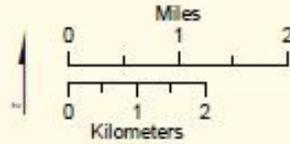
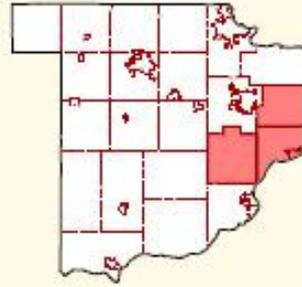


# Towns of Greenfield, Merrimac, and Sumpter

Sauk County, April 2018



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point

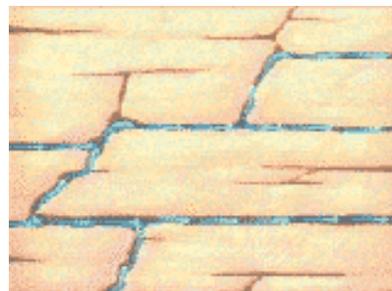


# Aquifers: Our groundwater storage units

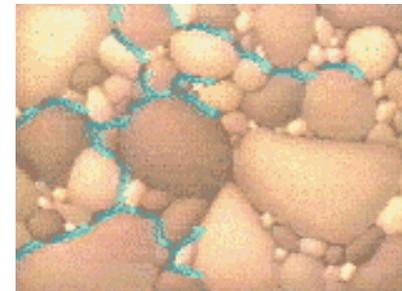
Aquifers are geologic formations that store and transmit groundwater.

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.

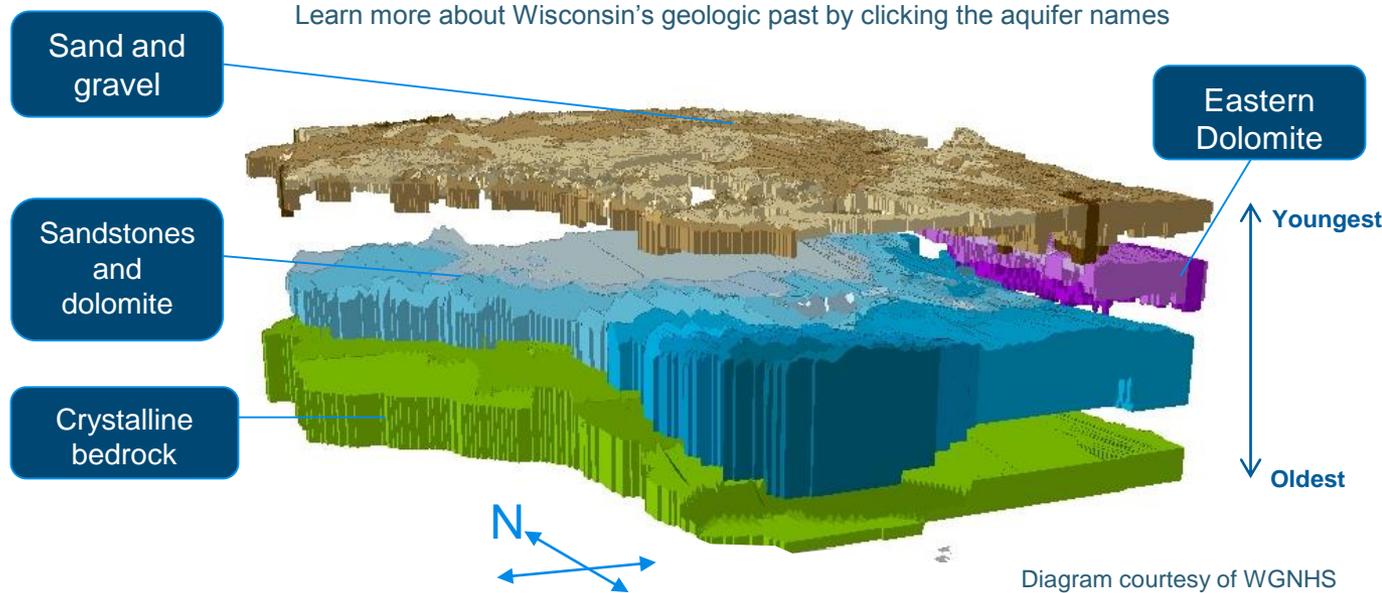


Water and contaminants can move quickly through cracks and fractures.



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

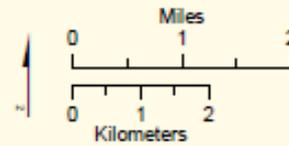
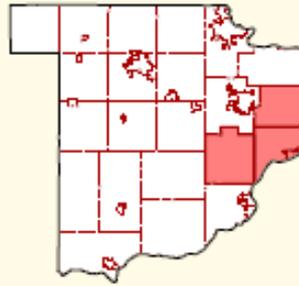


# Towns of Greenfield, Merrimac, and Sumpter

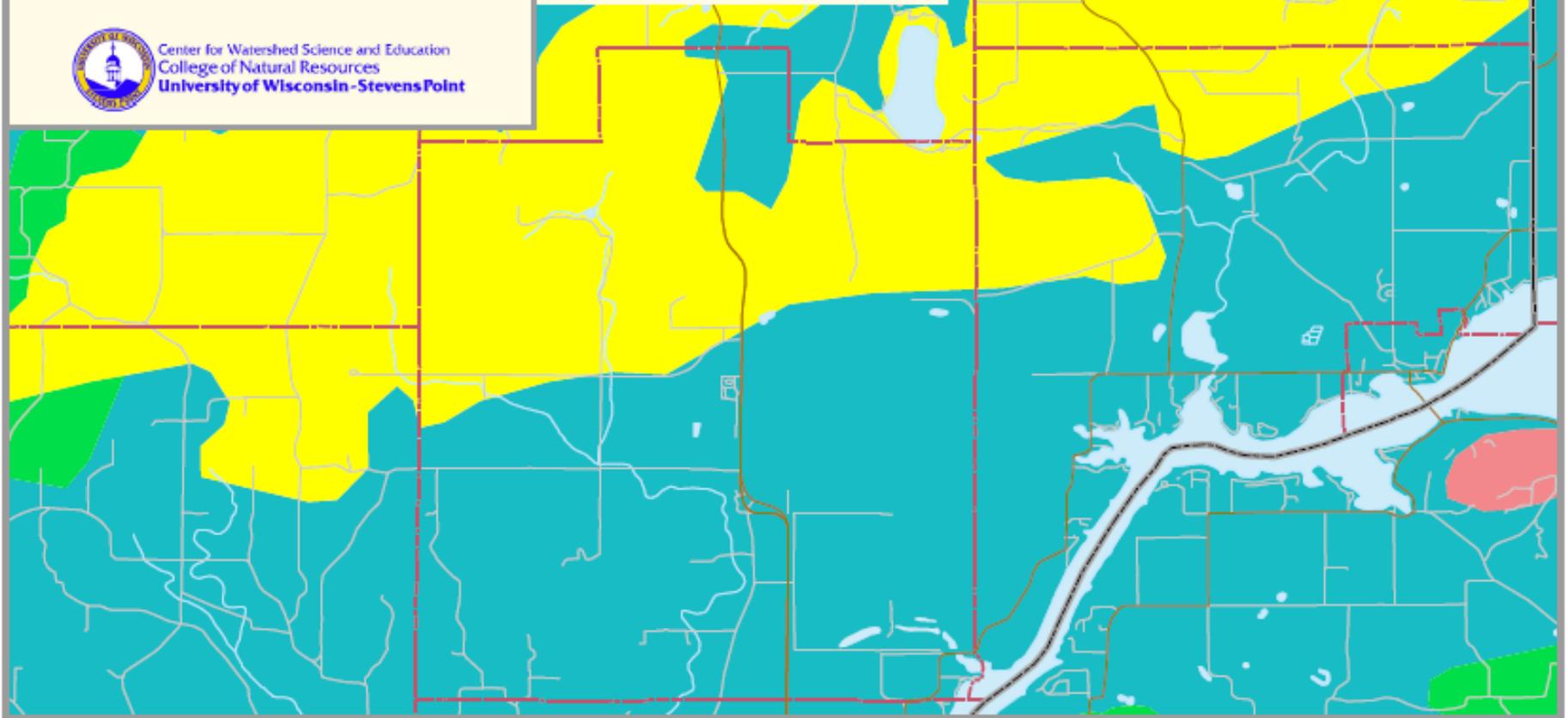
Sauk County, April 2018

## Bedrock Units:

-  Cambrian Sandstone
-  Prairie du Chien Dolomite
-  Quartzite
-  St Peter Sandstone



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point

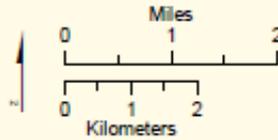
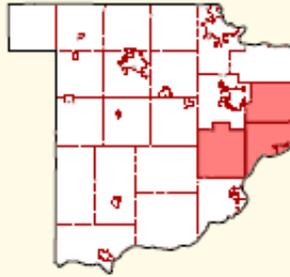


# Towns of Greenfield, Merrimac, and Sumpter

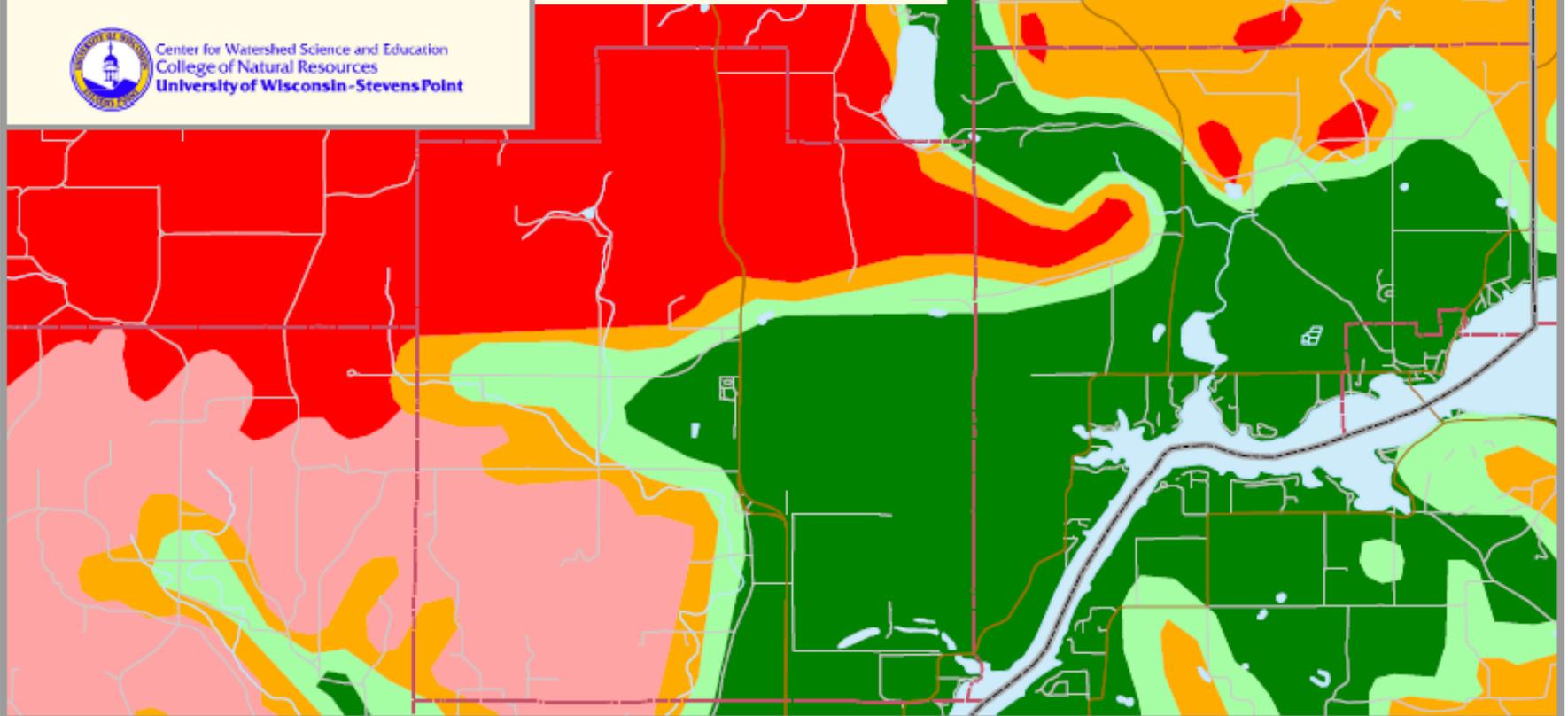
Sauk County, April 2018

## 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



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point



# 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

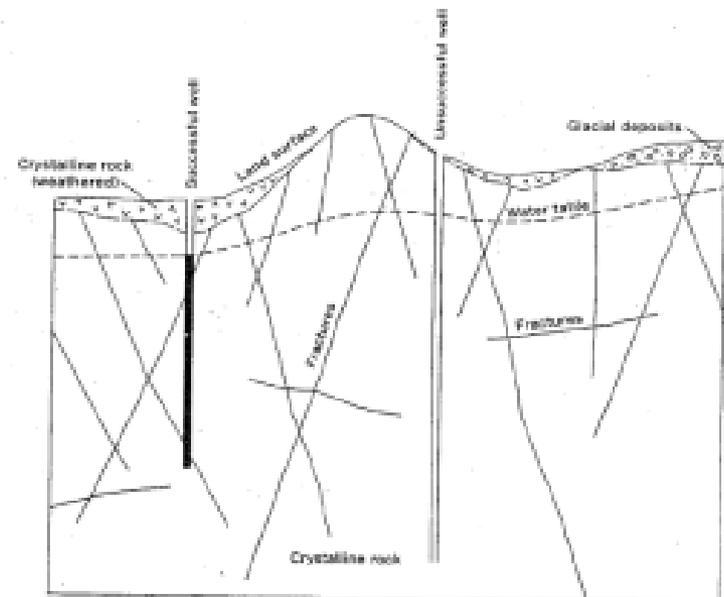
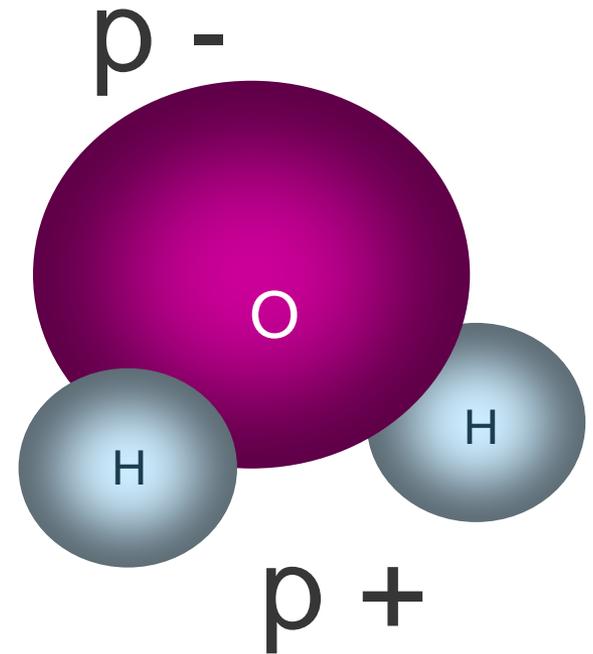


FIGURE 2.—Occurrence of ground water in crystalline rock.

# 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

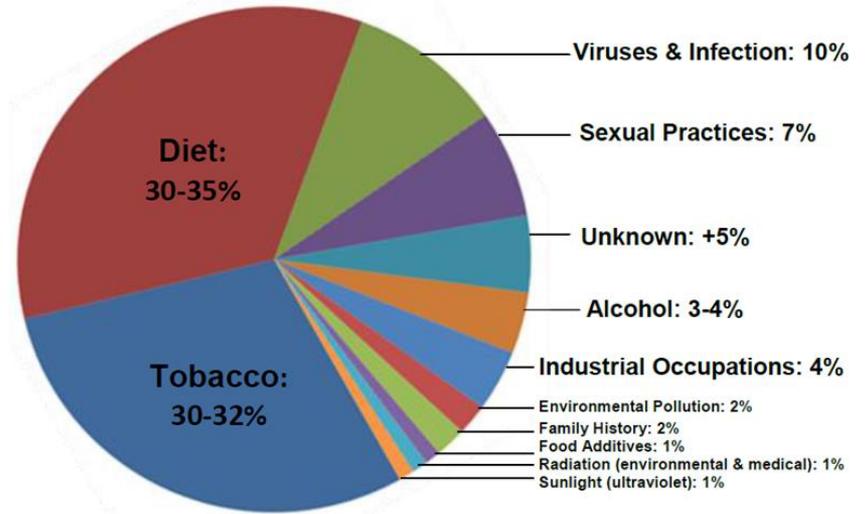
- Result from exposure to a substance over a long period of time.
- Increase risk of developing health complications later in life.

(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**

<b>Being struck by lightning</b>	<b>0.16 in 1,000 chance.</b>
<b>0.010 mg/L of arsenic in drinking water.</b>	<b>3 out of 1,000 people likely to develop cancer.</b>
<b>2 pCi of indoor radon level.</b>	<b>4 out of 1,000 people likely to develop lung cancer.<sup>1</sup></b>
<b>2 pCi of indoor radon combined with smoking.</b>	<b>32 out of 1,000 people could develop lung cancer.<sup>1</sup></b>

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

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

# Private vs. Public Water Supplies

## Public Water Supplies

- Regularly tested and regulated by drinking water standards.

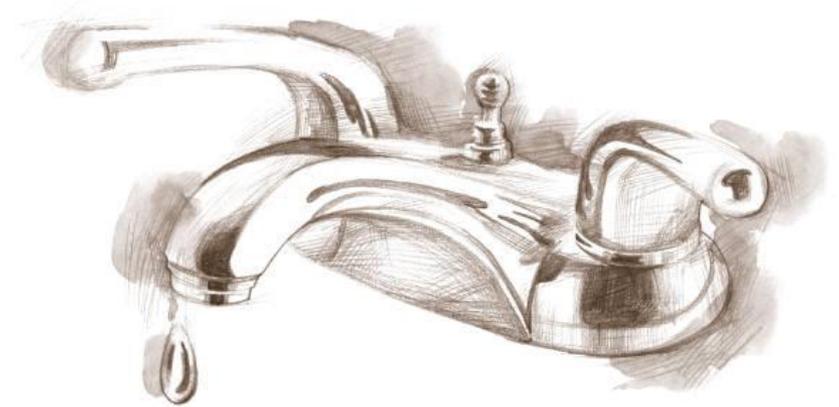
## Private Wells

- 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		<b>Absent</b>		(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	

(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.

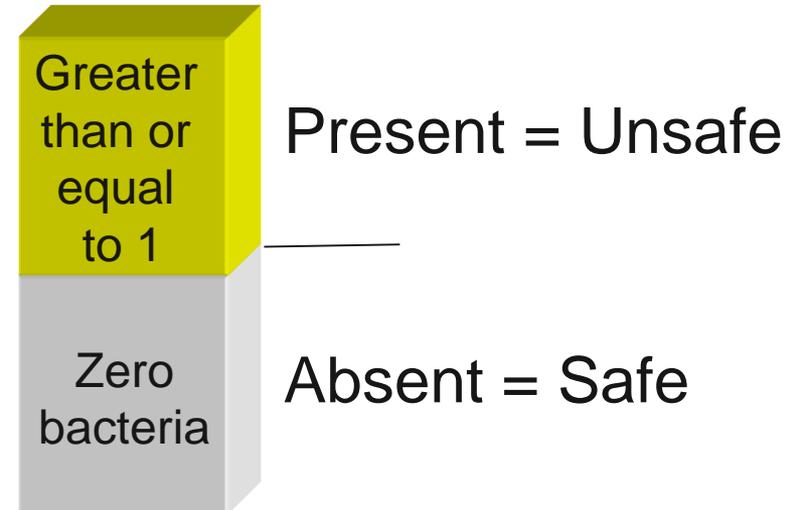
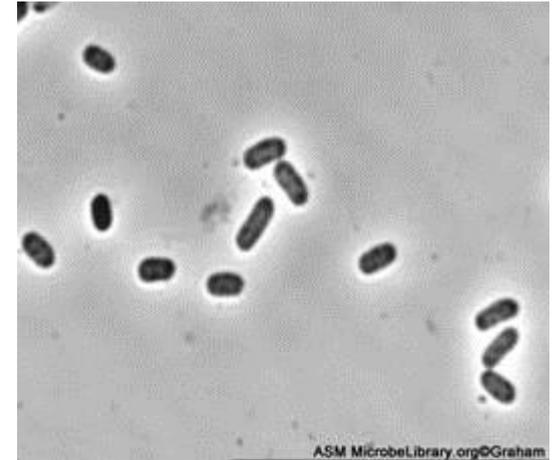
**Disclaimer:** The analyses run on your samples only cover some of the more common water quality characteristics. Safe levels of these chemicals or bacteria do not guarantee that your water is free of all toxic chemicals. Bacteria die-off in samples over 30 hours old may render results inaccurate and 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.

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](http://www.cdc.gov)) and United States Environmental Protection Agency ([www.epa.gov](http://www.epa.gov))

Contaminants	Sources	Symptoms
<b>BACTERIA</b>		
<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"> <li>• Infected human and animal feces</li> <li>• Manure</li> <li>• Septic systems</li> <li>• Sewage</li> </ul>	<ul style="list-style-type: none"> <li>• Gastrointestinal illness</li> <li>• Low-grade fever</li> <li>• Begins 12 hrs - 7 days after exposure</li> </ul>
<p><i>Leptosporidia</i></p>	<ul style="list-style-type: none"> <li>• Urine of livestock, dogs and wildlife</li> <li>• Manure</li> </ul>	<ul style="list-style-type: none"> <li>• High fever, severe headache and red eyes</li> <li>• Gastrointestinal illness</li> <li>• Begins 2-28 days after exposure</li> </ul>
<b>MICROSCOPIC PARASITES</b>		
<p><i>Cryptosporidia</i>  <i>Giardia</i></p>	<ul style="list-style-type: none"> <li>• Infected human and animal feces</li> <li>• Manure</li> <li>• Septic systems</li> <li>• Sewage</li> </ul>	<ul style="list-style-type: none"> <li>• Gastrointestinal illness</li> <li>• Begins 2-14 days after exposure</li> </ul>
<b>VIRUSES</b>		
<p>Norovirus</p>	<ul style="list-style-type: none"> <li>• Infected human feces and vomit</li> <li>• Septic systems</li> <li>• Sewage</li> </ul>	<ul style="list-style-type: none"> <li>• Gastrointestinal illness</li> <li>• Low-grade fever &amp; headache</li> <li>• Begins 12-48 hrs after exposure</li> </ul>
<b>CHEMICALS</b>		
<p>Nitrate</p>	<ul style="list-style-type: none"> <li>• Fertilizers</li> <li>• Manure</li> <li>• Bio-solids</li> <li>• Septic systems</li> </ul>	<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?



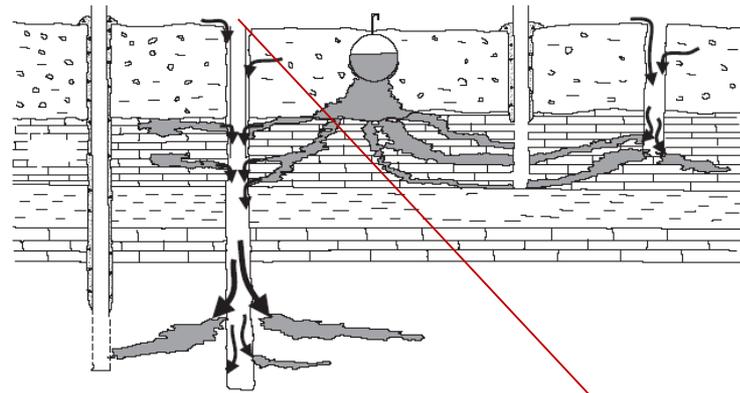
Photos courtesy of: Matt Zoschke

# 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.



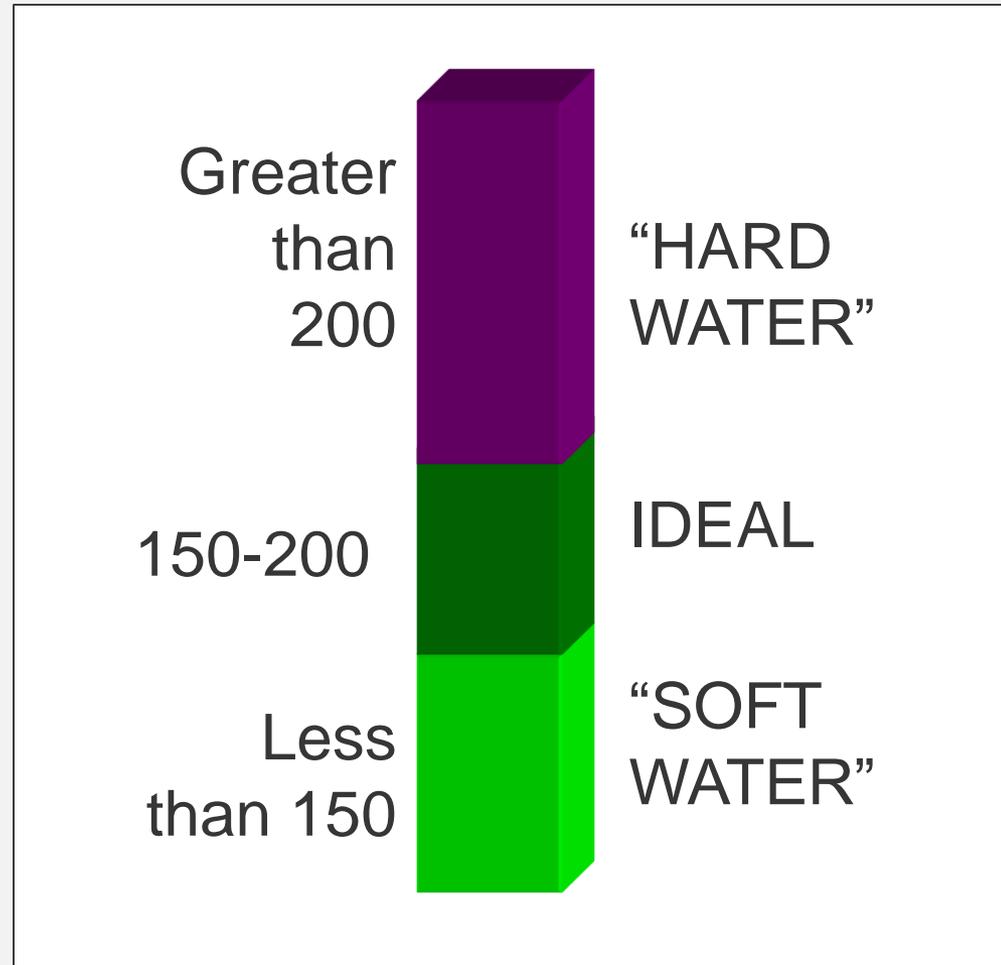
# What should I do if coliform bacteria was present?

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.*

# Tests for Aesthetic Problems

## Hardness

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



# Towns of Greenfield, Merrimac, and Sumpter

Sauk County, April 2018

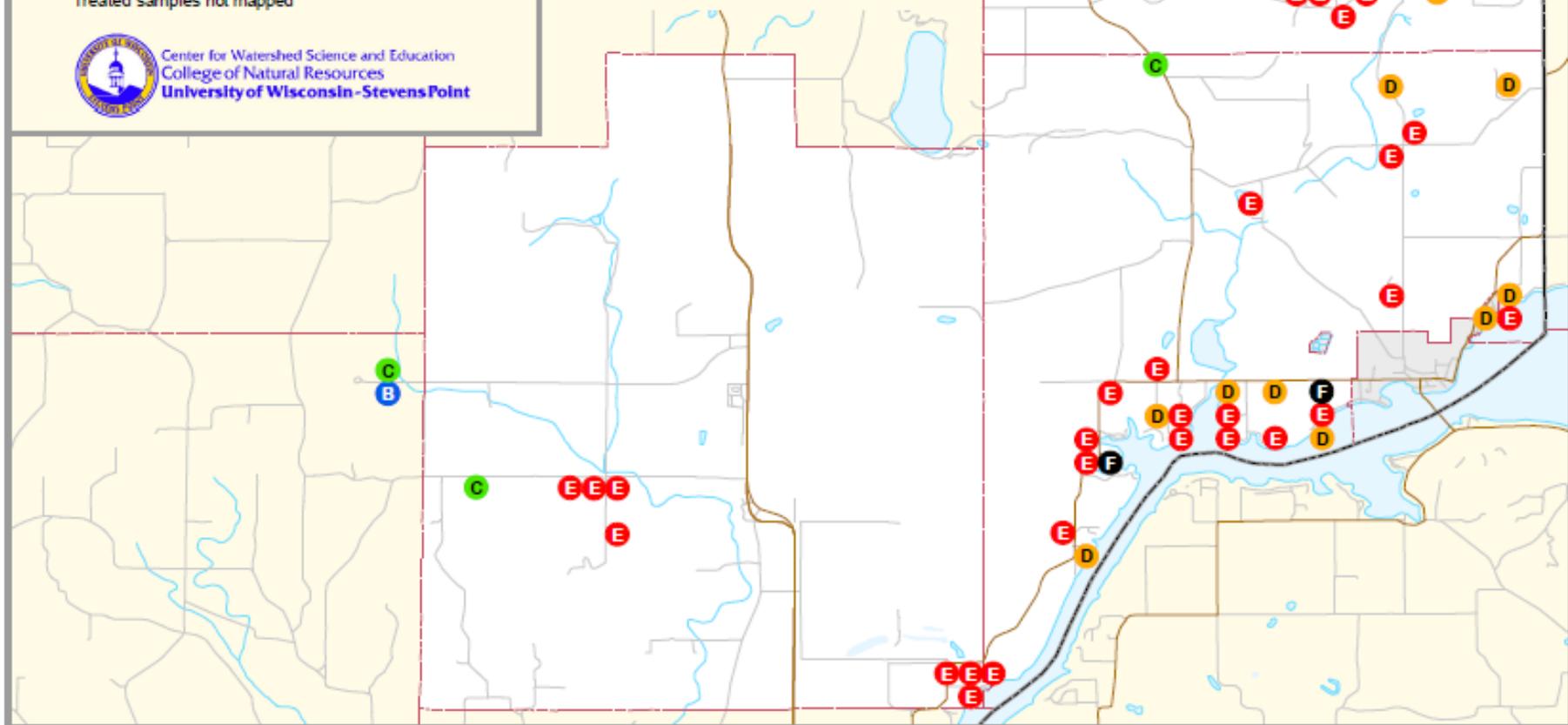
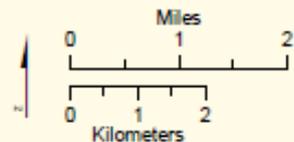
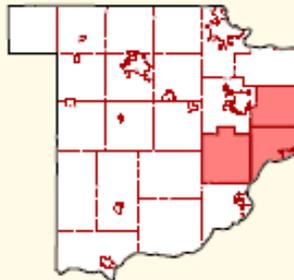
## TOTAL HARDNESS (ppm CaCO<sub>3</sub>)

<b>A</b> ... 50	10	9%
<b>B</b> 51 - 100	1	<1%
<b>C</b> 101 - 200	4	3%
<b>D</b> 201 - 300	29	25%
<b>E</b> 301 - 400	66	56%
<b>F</b> 401 ...	7	6%

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



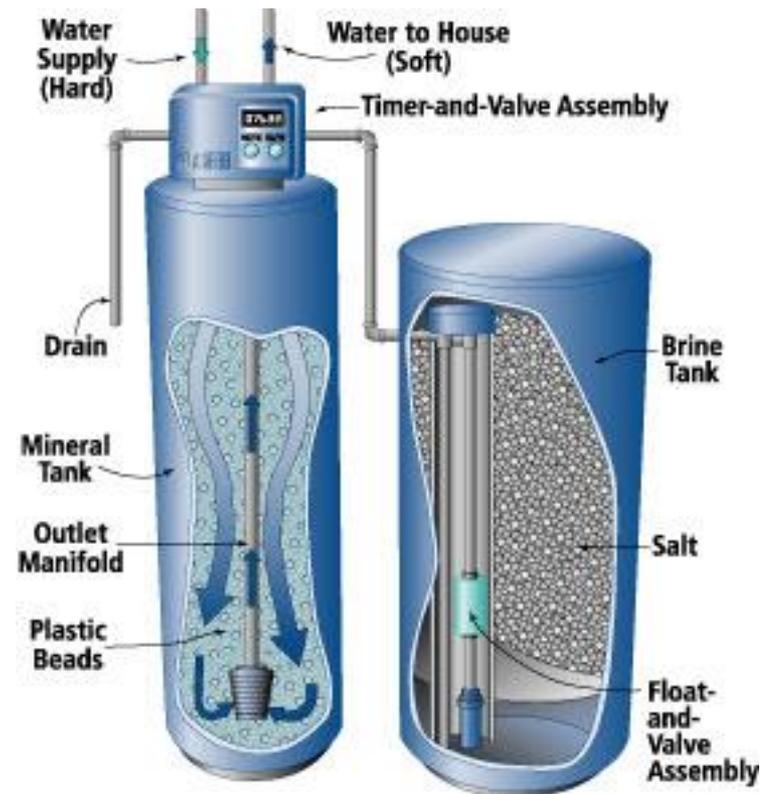
Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point



# Water Softening

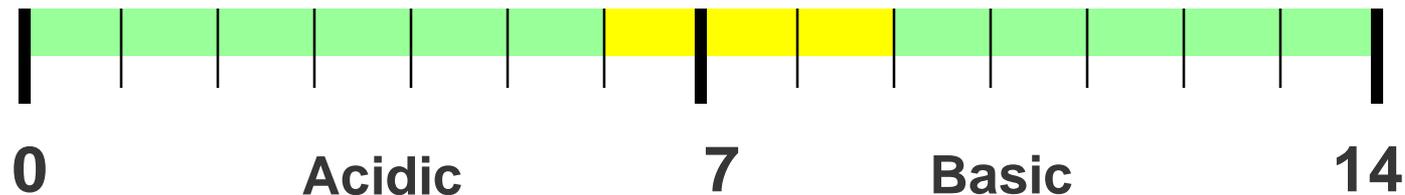
Water softeners remove calcium and magnesium which cause scaling and exchange it for sodium (or potassium).

- 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.



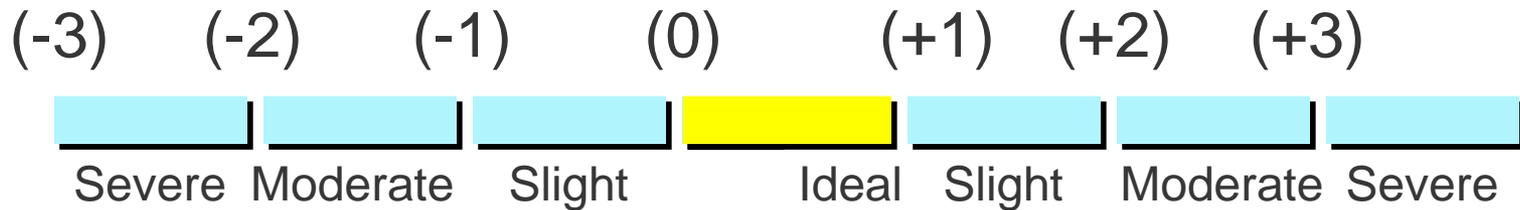
# Tests for Overall Water Quality

- **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



# Tests for Overall Water Quality

## Saturation Index



Corrosion occurs



Scaling occurs

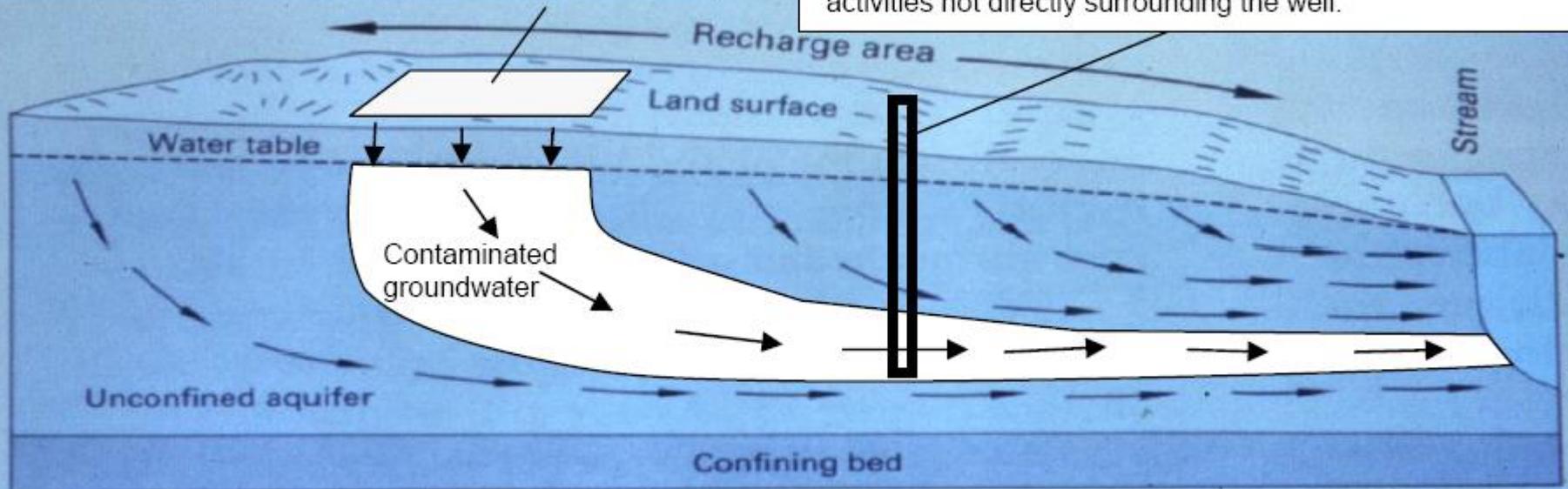




Soil

Land-use activity that pollutes groundwater.

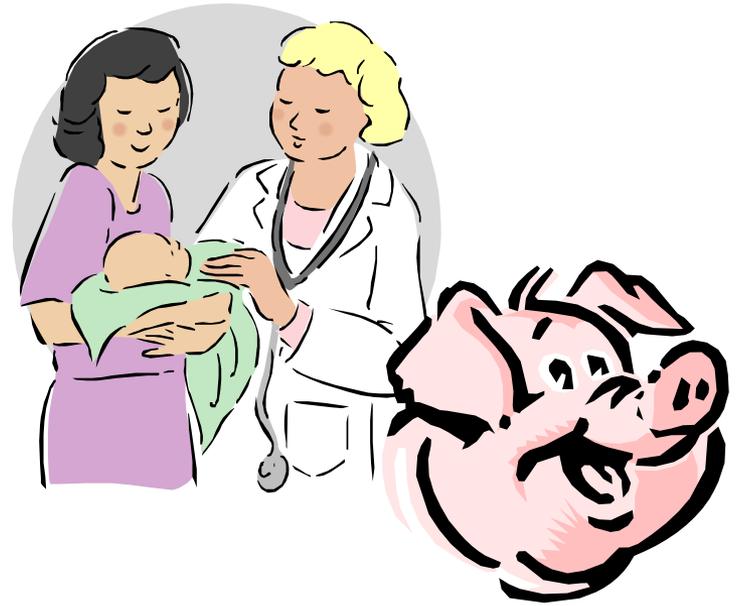
Because groundwater moves, wells located far from the contamination source can sometimes be polluted from activities not directly surrounding the well.



# Nitrate-Nitrogen

## Health Effects:

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



## Sources:

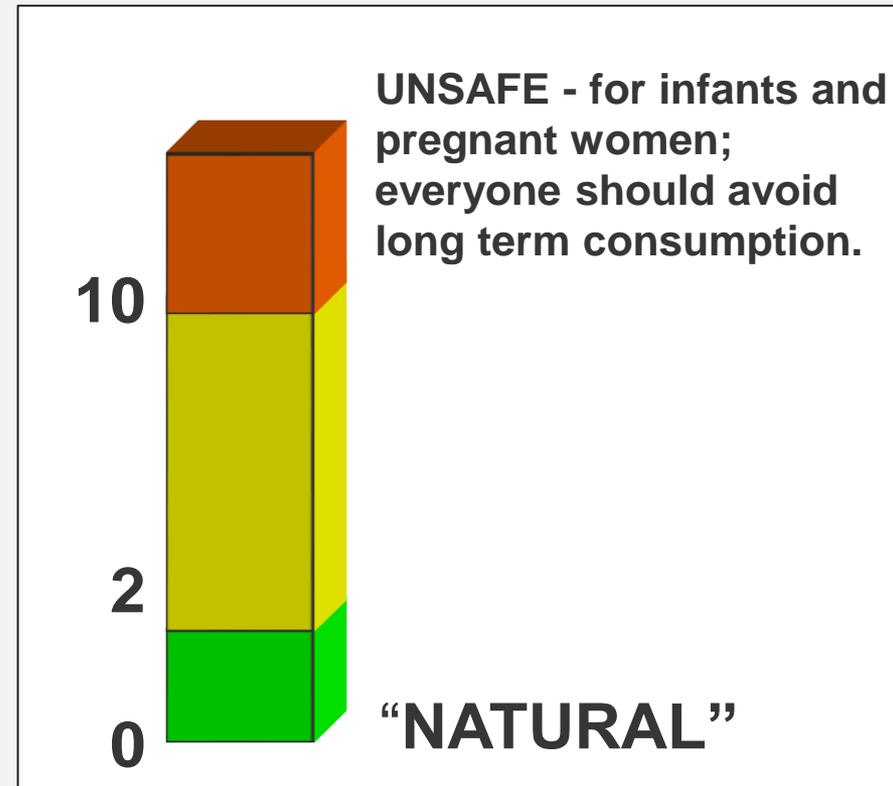
- Agricultural fertilizer
- Lawn fertilizer
- Septic systems
- Animal wastes



# 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”*



# Towns of Greenfield, Merrimac, and Sumpter

Sauk County, April 2018

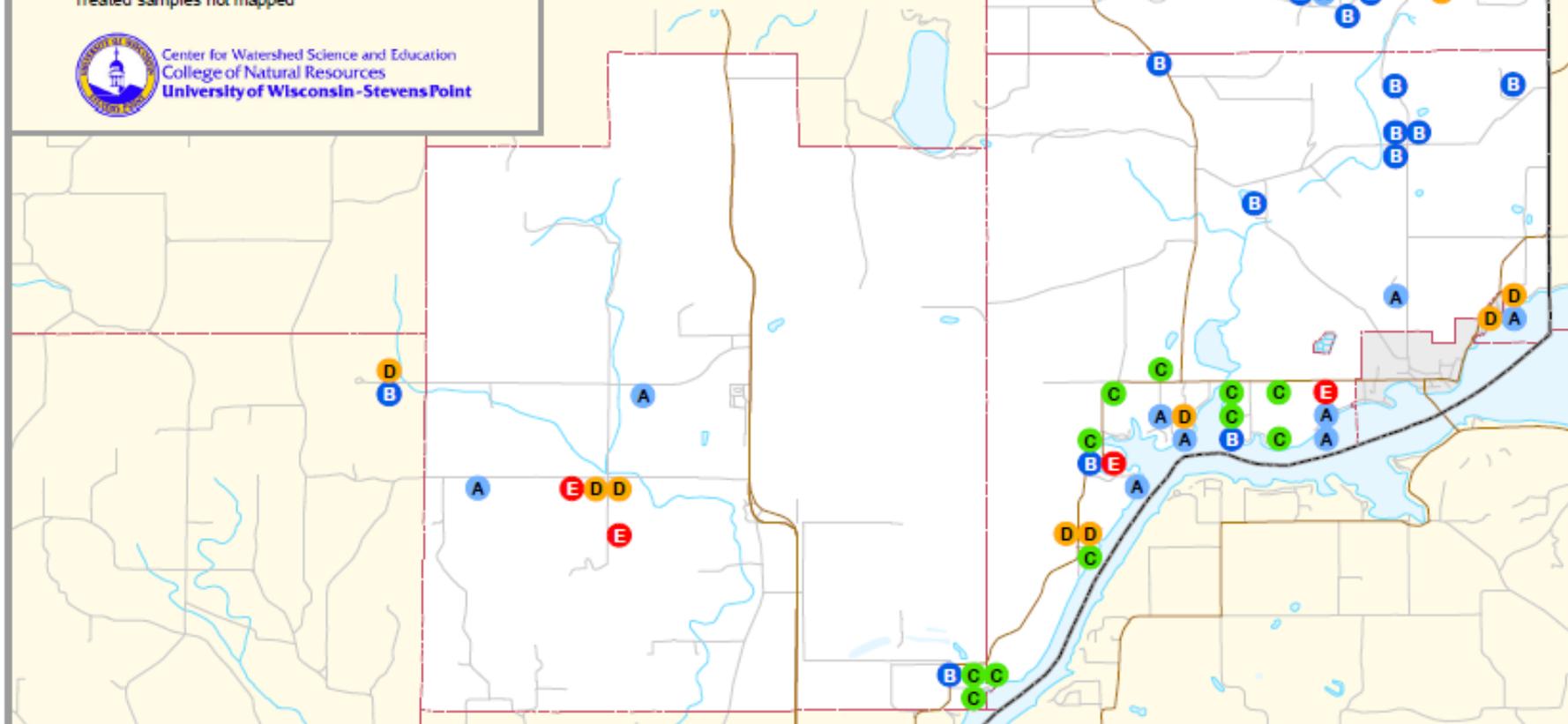
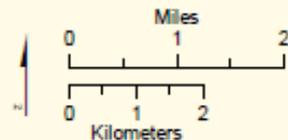
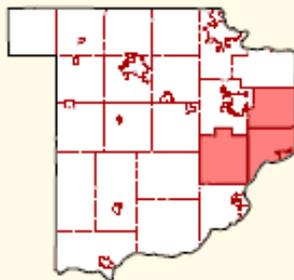
## NITRATE-NITRITE (ppm N)

<b>A</b> None Detected	21	18 %
<b>B</b> ... 2.0	37	32 %
<b>C</b> 2.1 - 5.0	26	22 %
<b>D</b> 5.1 - 10.0	26	22 %
<b>E</b> 10.1 - 20.0	7	6 %
<b>F</b> 20.1 ...	0	0 %

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



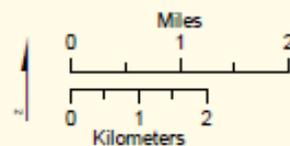
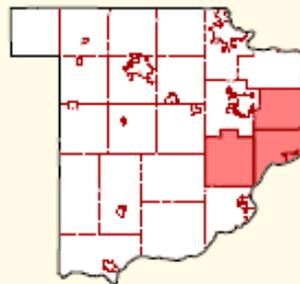
Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point



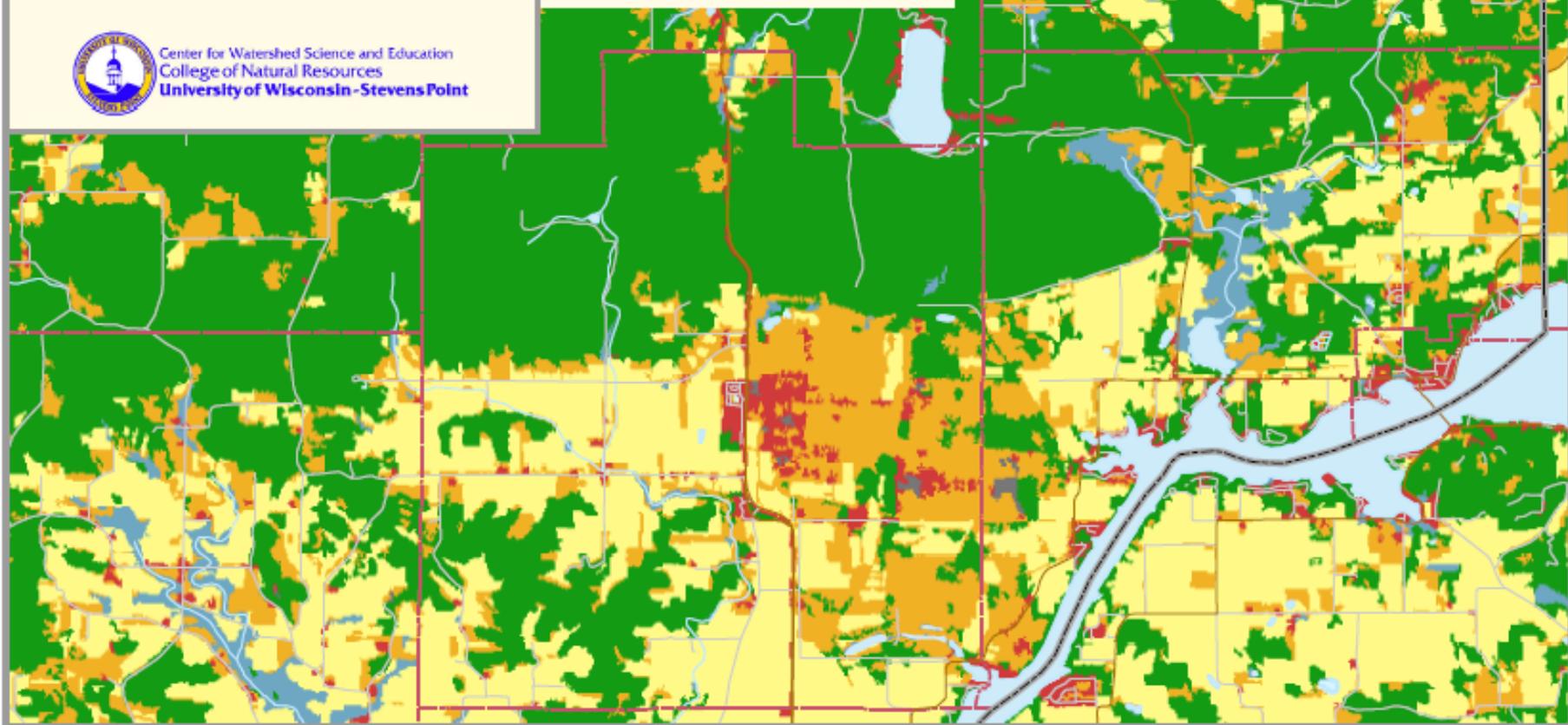
# Towns of Greenfield, Merrimac, and Sumpter

Sauk County, April 2018

Land Use:



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point



# What can I do to reduce my nitrate levels?

## Long-term Solution:

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

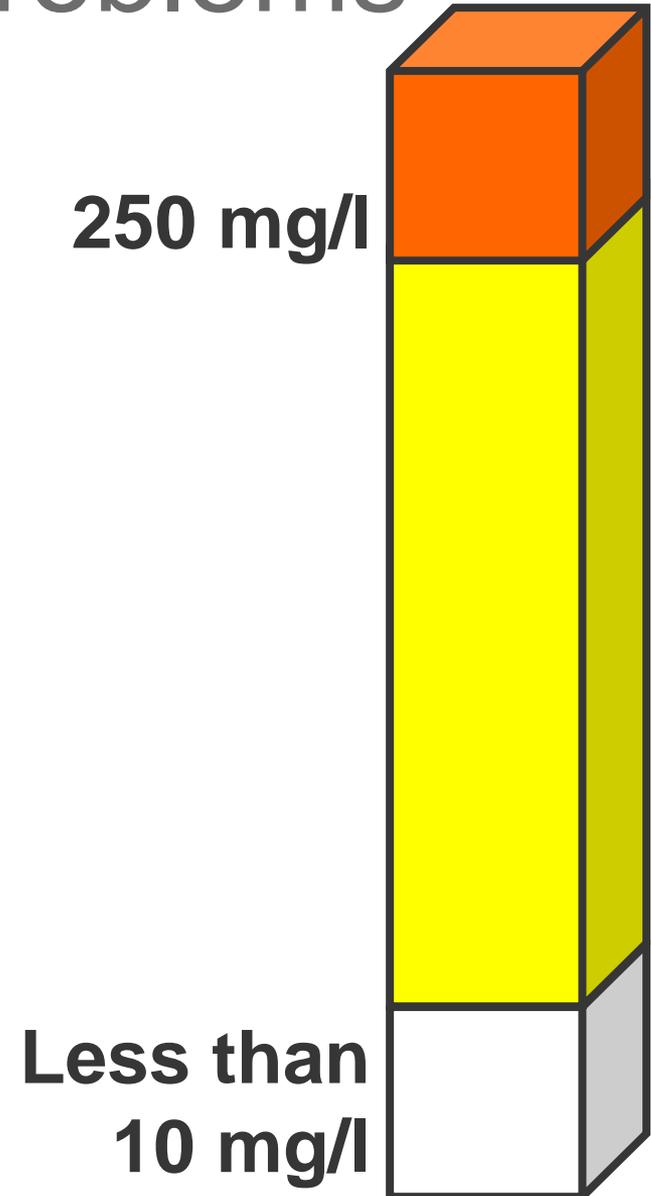
## Short term:

- **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



# Towns of Greenfield, Merrimac, and Sumpter

Sauk County, April 2018

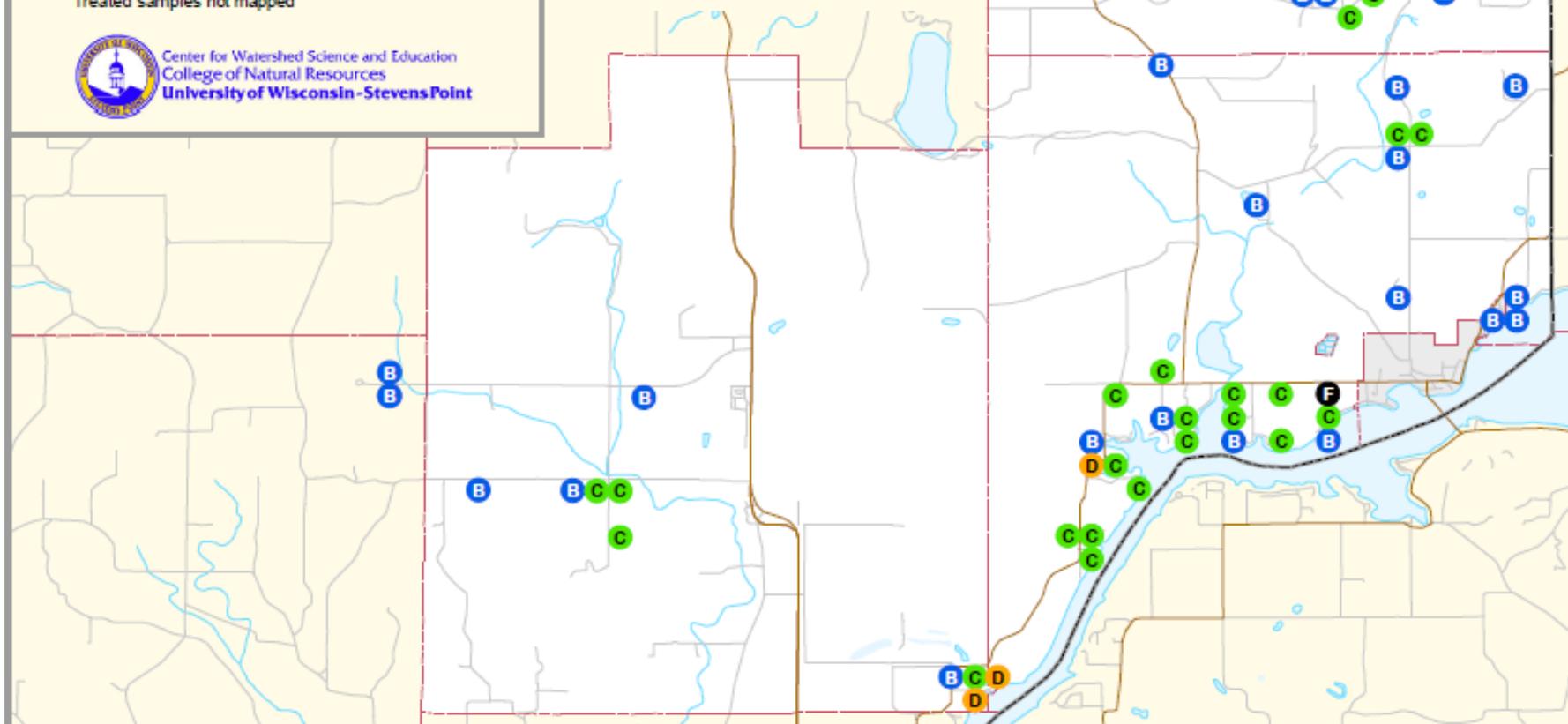
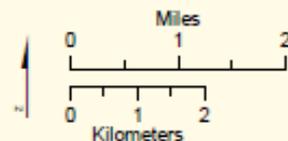
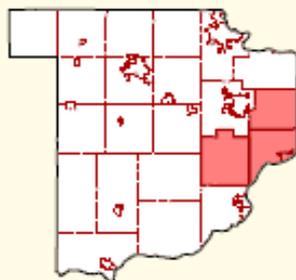
## CHLORIDE (ppm)

<b>A</b> None Detected	0	0 %
<b>B</b> ... 10	68	58 %
<b>C</b> 11 - 50	41	35 %
<b>D</b> 51 - 100	6	5 %
<b>E</b> 101 - 200	1	<1 %
<b>F</b> 201 ...	1	<1 %

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



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point



# 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**

# Test Important to Health

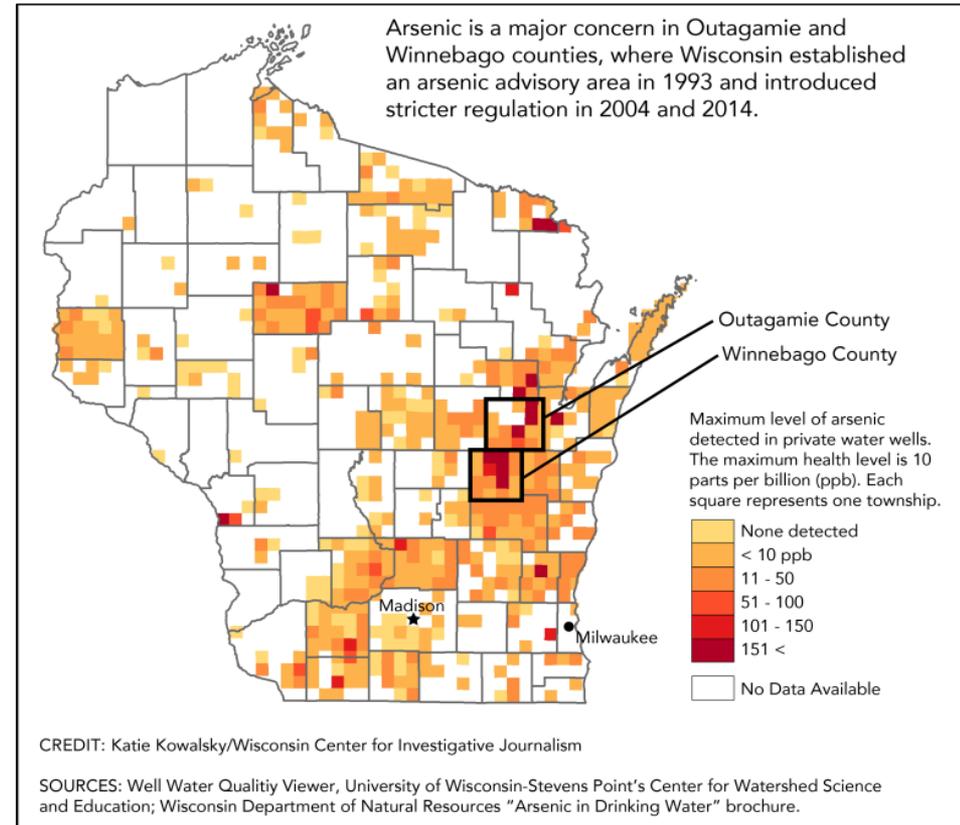
## Arsenic

**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



# Towns of Greenfield, Merrimac, and Sumpter

Sauk County, April 2018

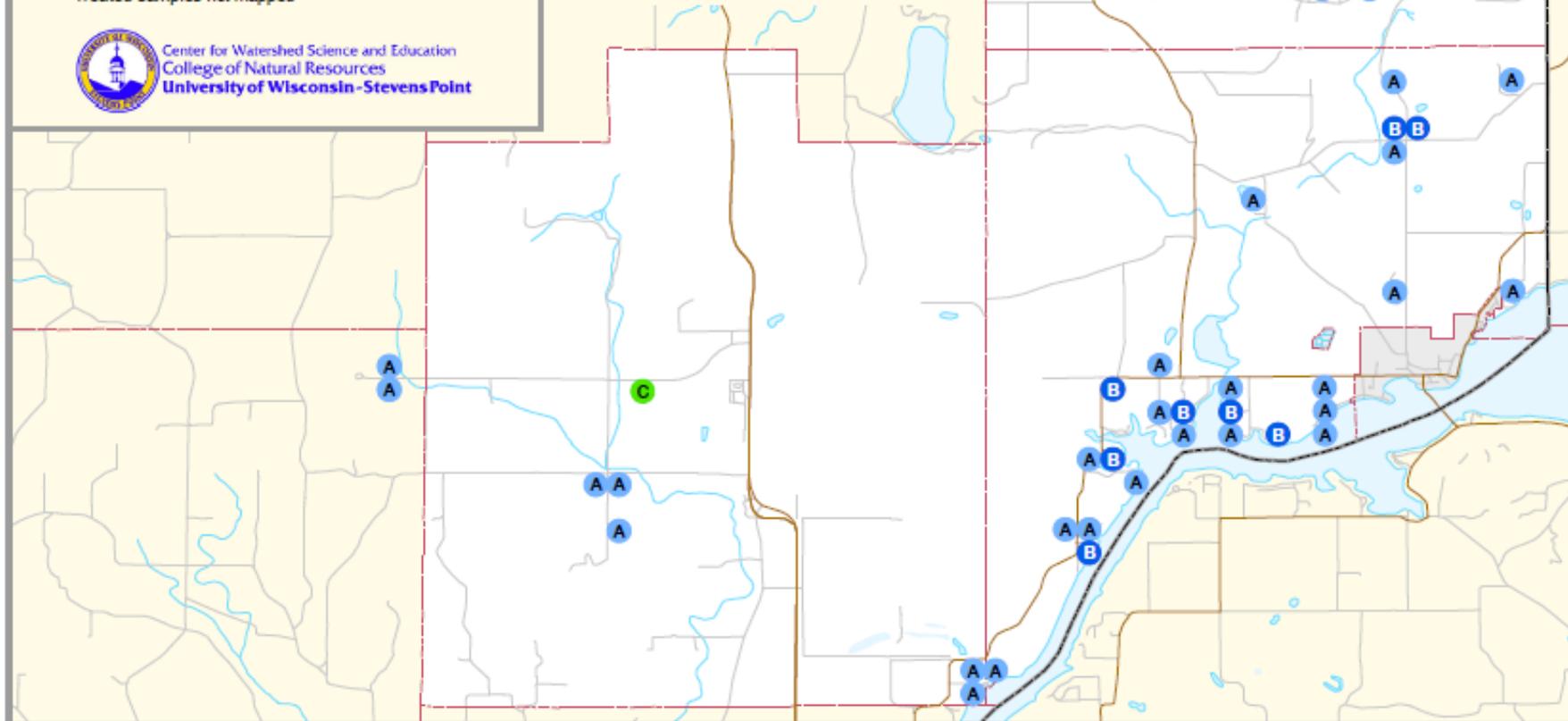
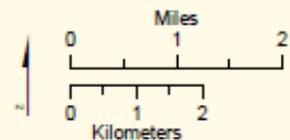
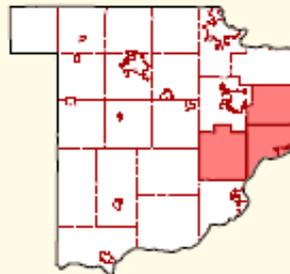
## ARSENIC (mg/l)

<b>A</b> None Detected	81	89 %
<b>B</b> ... 0.010	9	10 %
<b>C</b> 0.011 - 0.050	1	1 %
<b>D</b> 0.051 - 0.100	0	0 %
<b>E</b> 0.101 - 0.150	0	0 %
<b>F</b> 0.151 ...	0	0 %

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



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point



# 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.



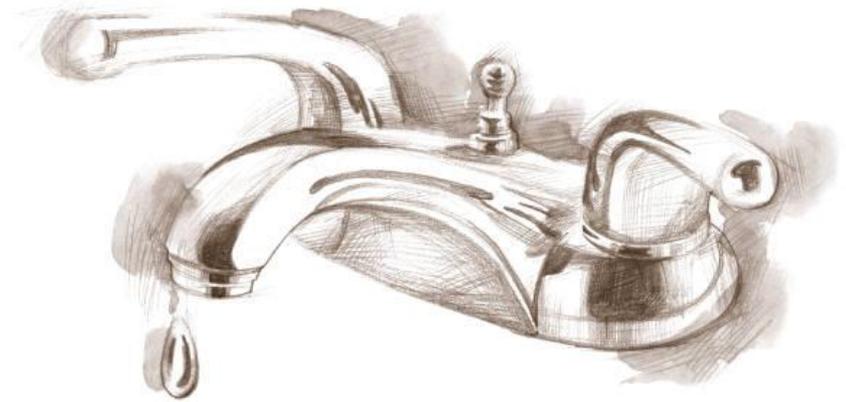
# Lead and Copper

## 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*)



# Towns of Greenfield, Merrimac, and Sumpter

Sauk County, April 2018

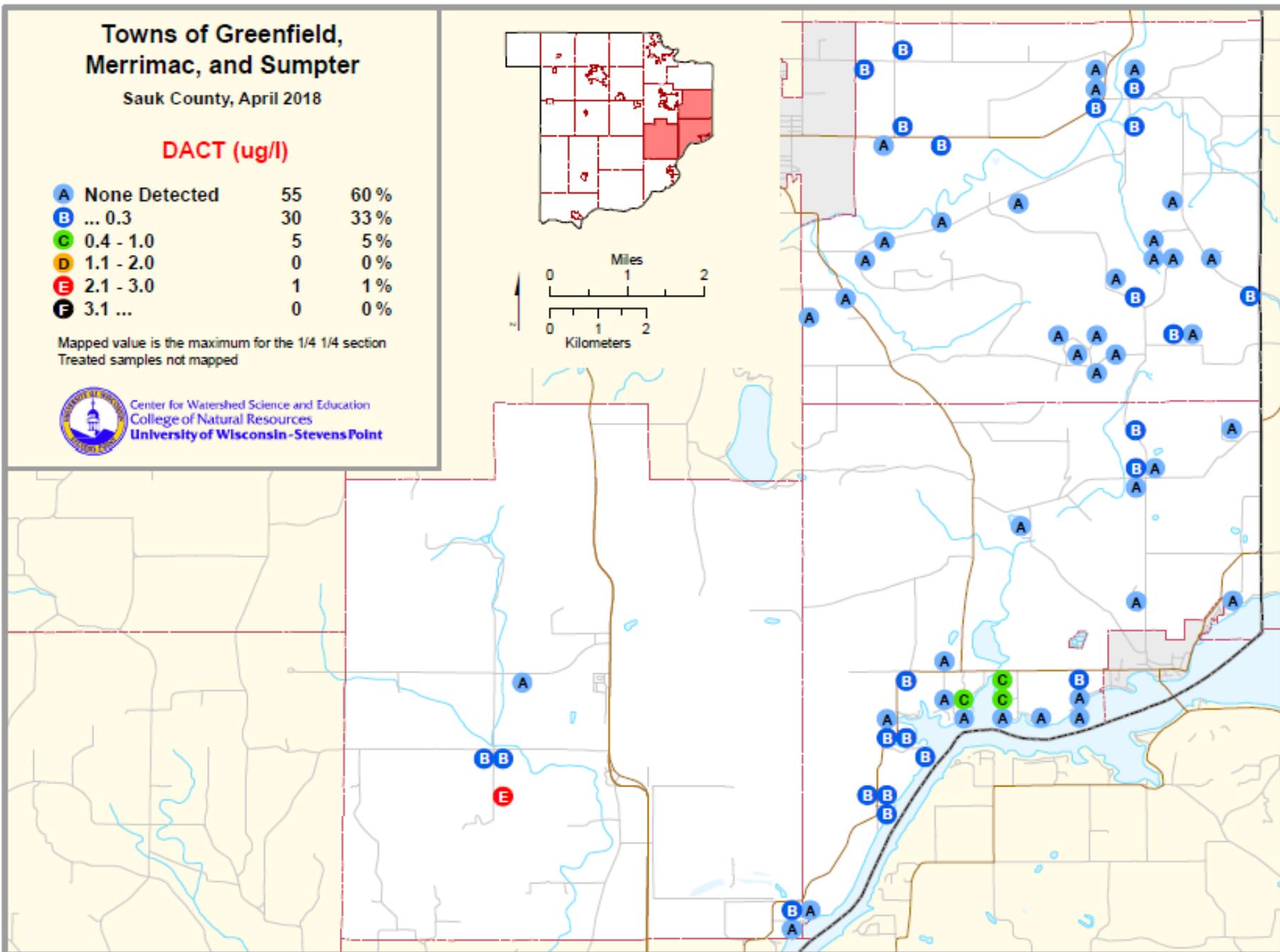
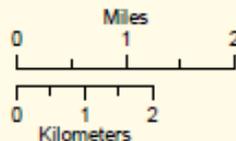
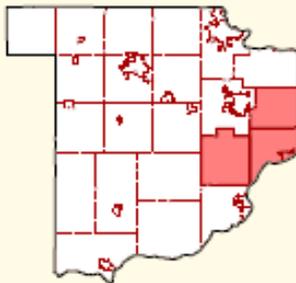
## DACT (ug/l)

<b>A</b> None Detected	55	60 %
<b>B</b> ... 0.3	30	33 %
<b>C</b> 0.4 - 1.0	5	5 %
<b>D</b> 1.1 - 2.0	0	0 %
<b>E</b> 2.1 - 3.0	1	1 %
<b>F</b> 3.1 ...	0	0 %

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



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin - Stevens Point



# 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”](#)

**Thanks to you and the following for helping sponsor this program:**

- **Towns of Greenfield, Merrimac, and Sumpter**
- **Sauk County UW-Extension**
- **Sauk County Conservation Planning and Zoning Department**

Kevin Masarik  
Center for Watershed Science and  
Education  
800 Reserve St.  
Stevens Point, WI 54481  
715-346-4276  
kmasarik@uwsp.edu



**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.