Fond du Lac County Community Drinking Water Program

Byron and Lamartine
A Tale of Two Towns

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Center for Watershed Science and Education

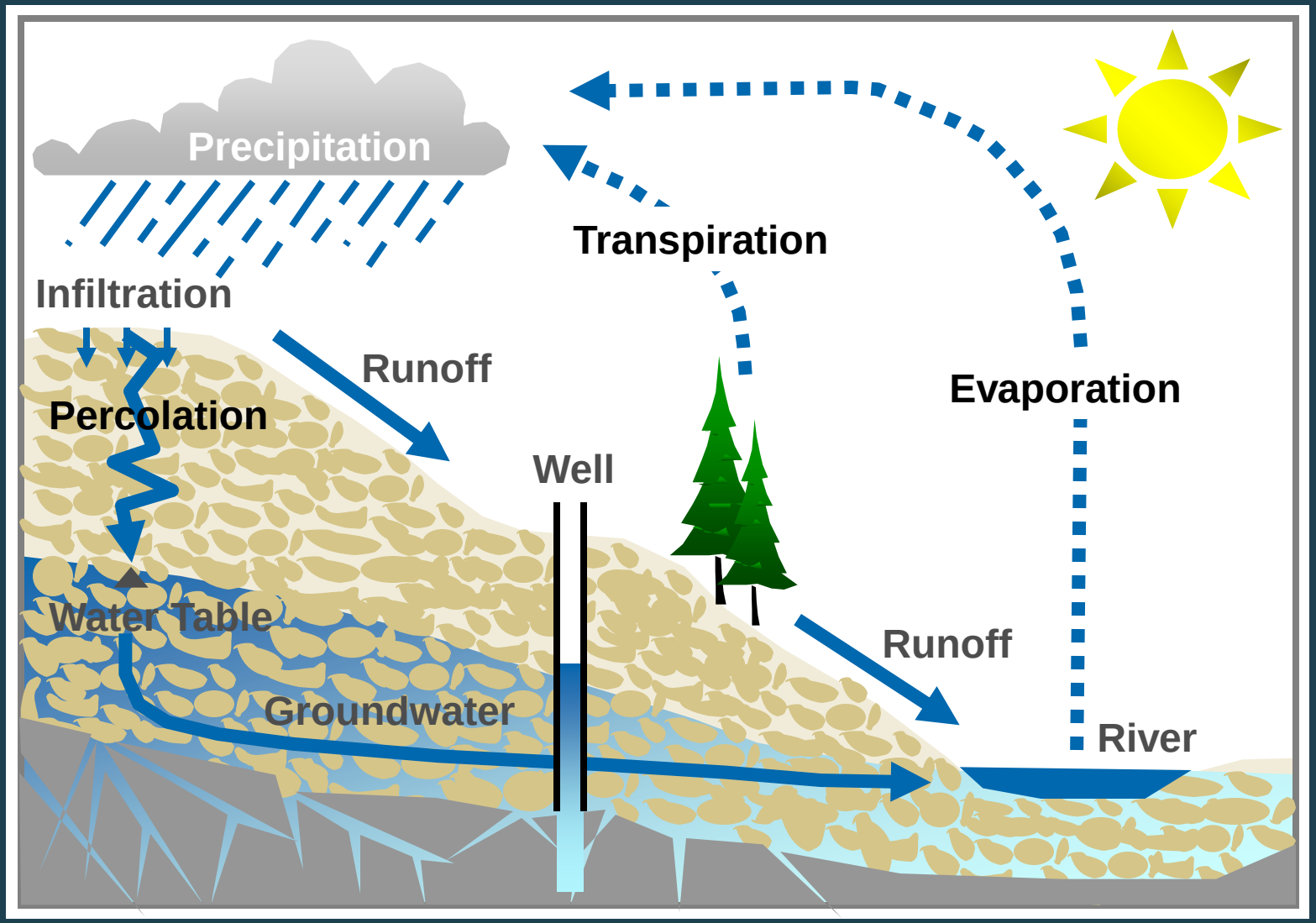
College of Natural Resources

UW Extension

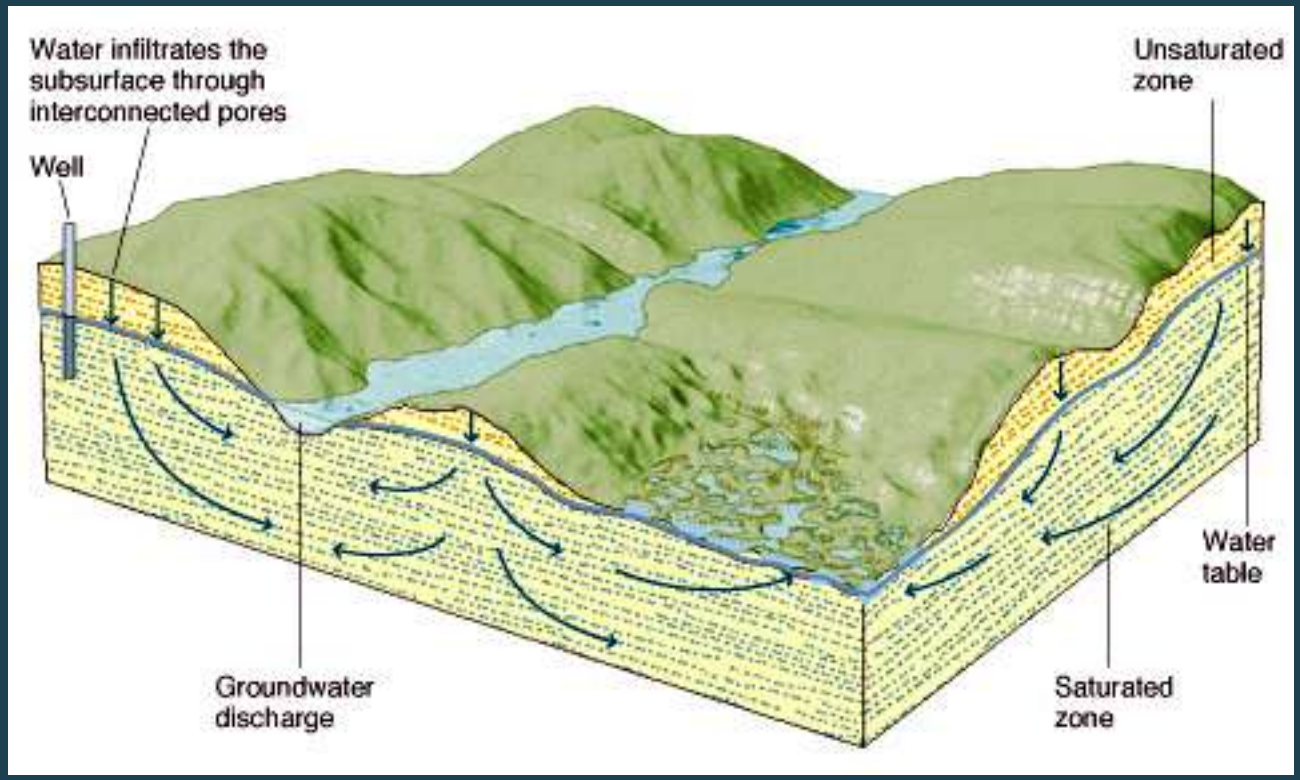
Today's presentation

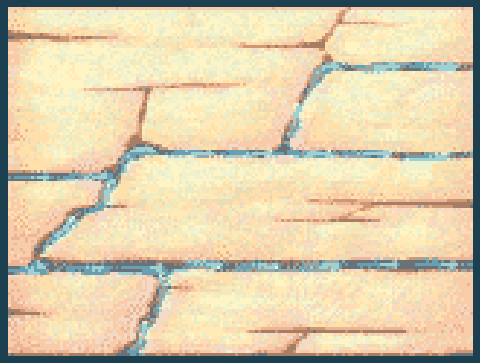
- Groundwater Basics: Where does my water come from
- Well Construction
- What do my individual test results mean?
- General groundwater quality in the Towns of Byron and Lamartine.
- Improving your water quality

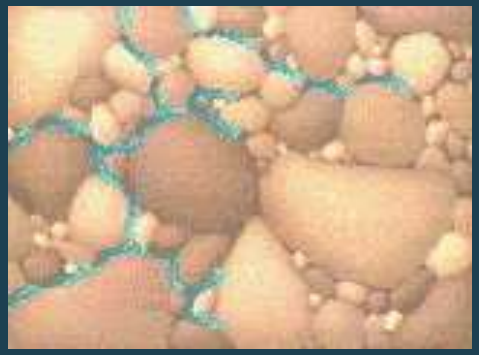
The Water Cycle



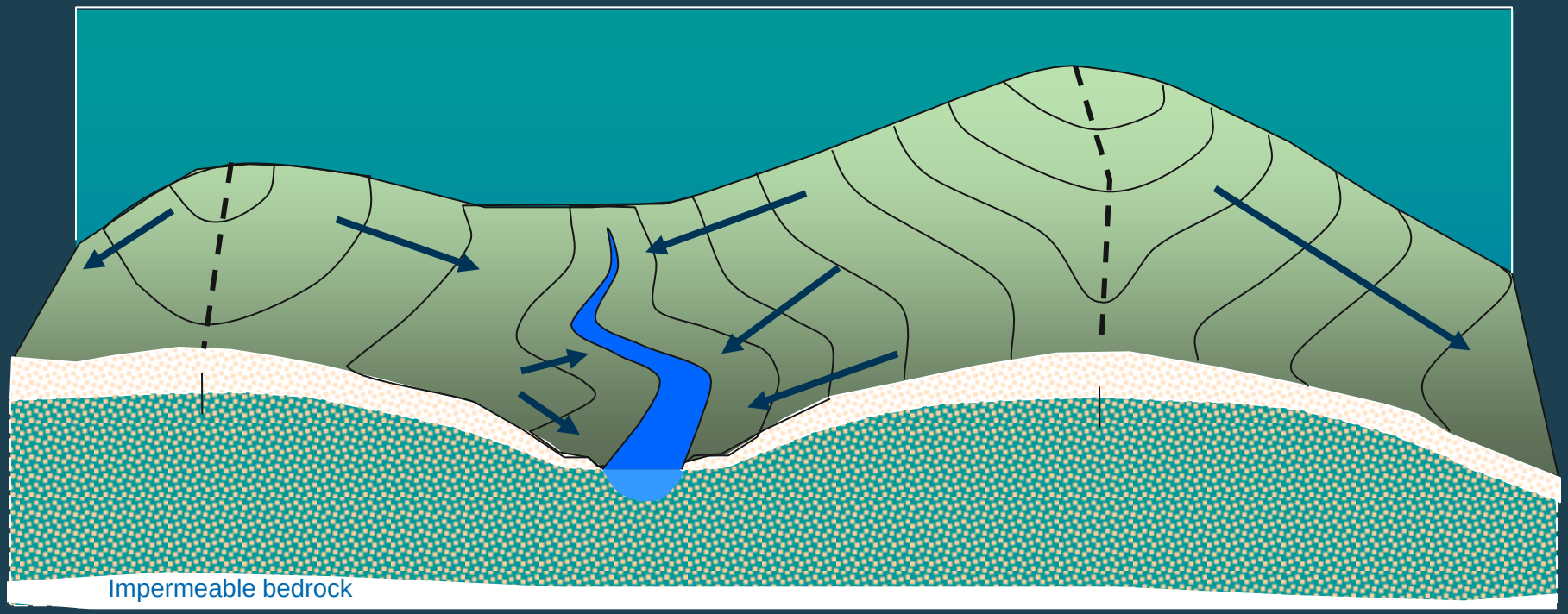
Groundwater Movement

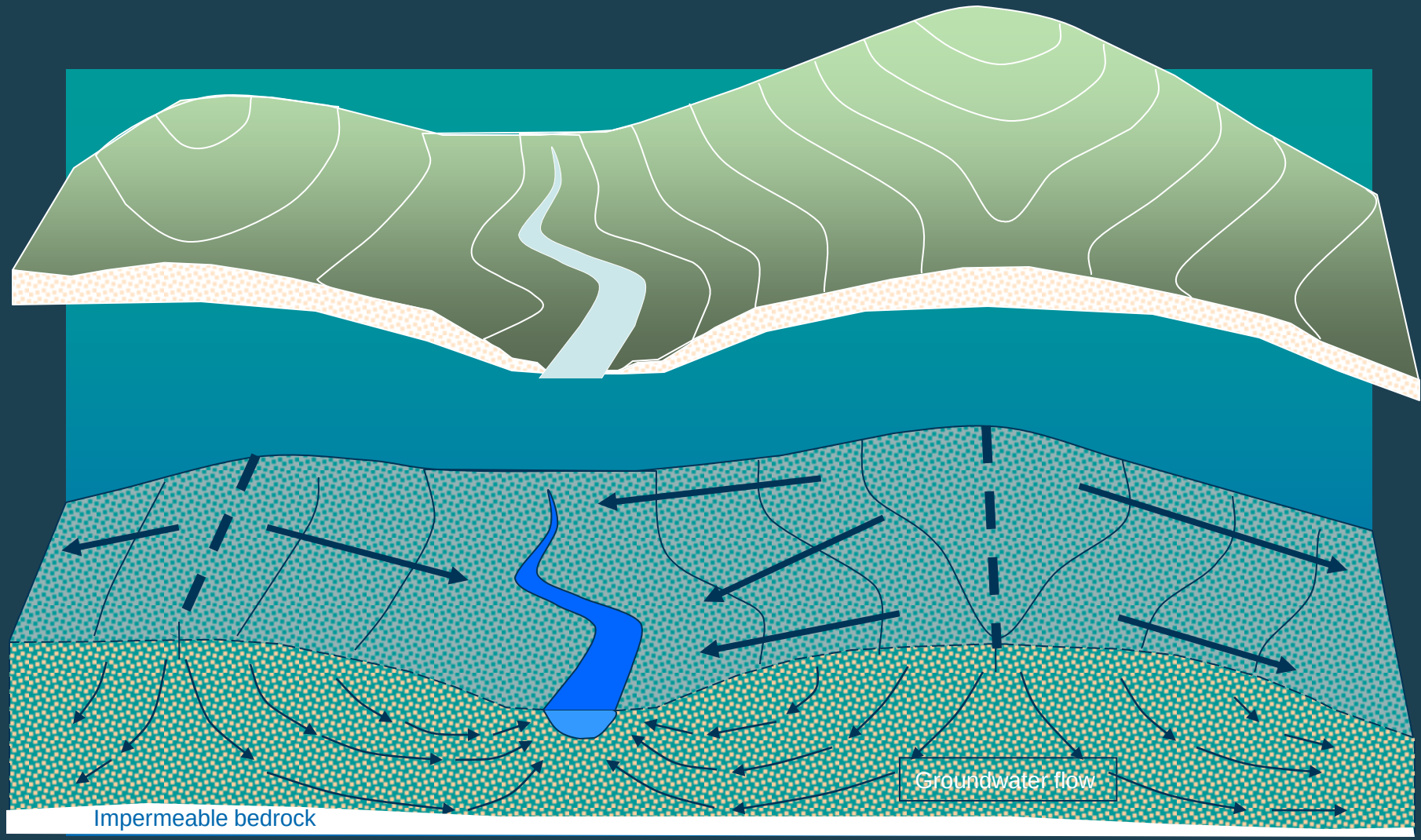


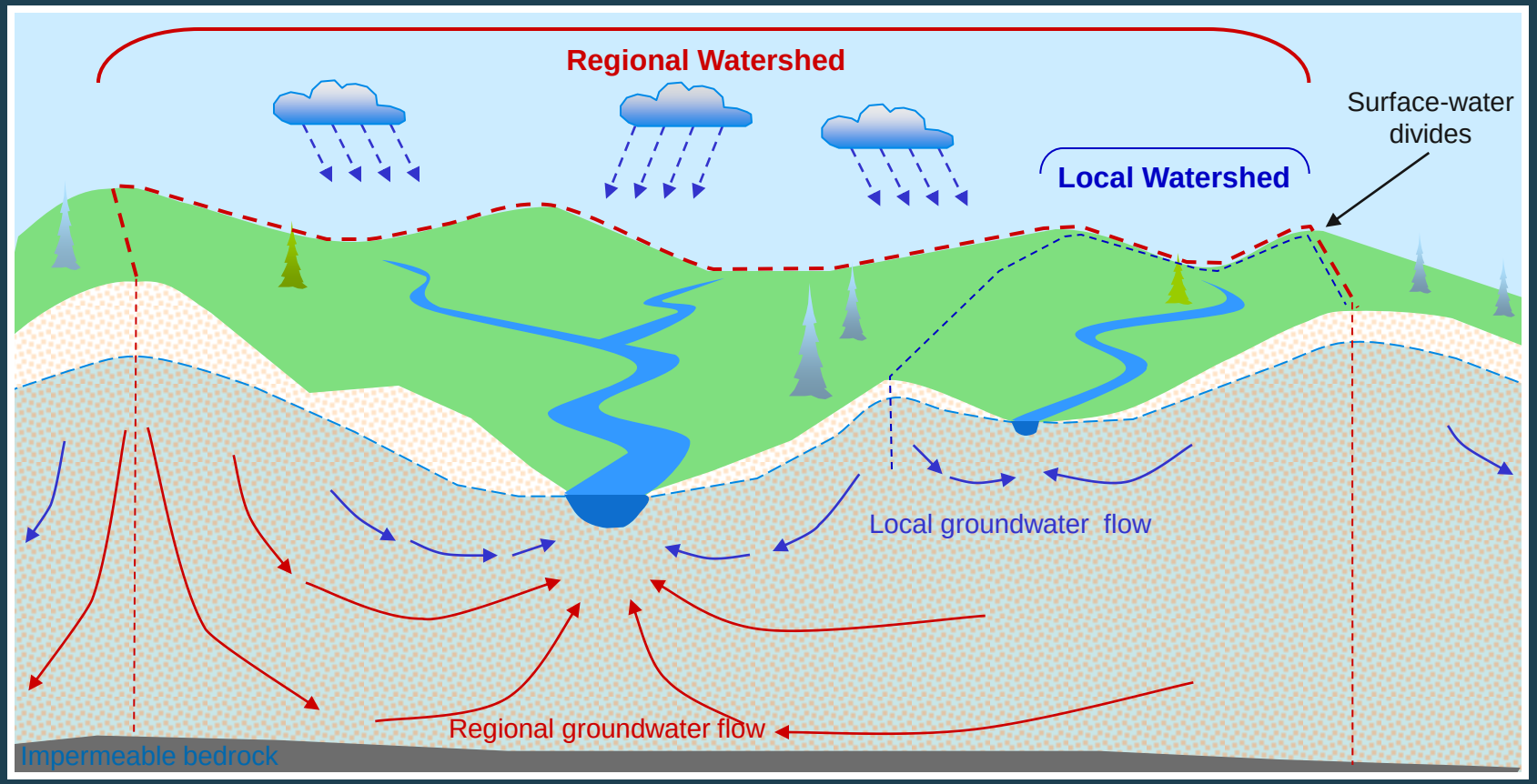




Watershed – the land area where water originates for lakes, rivers or streams. Water flows from high elevation to low elevation.

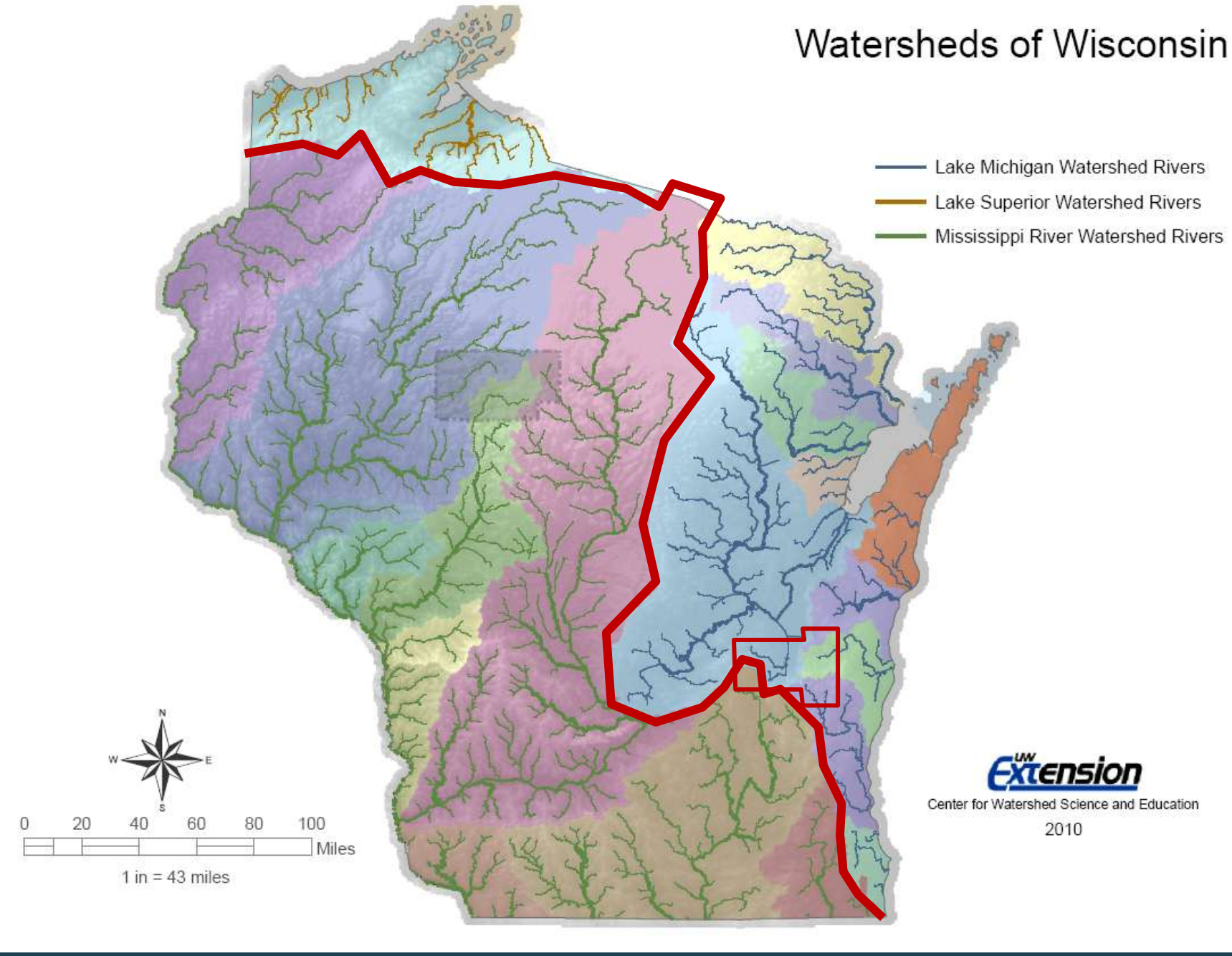



Groundwater flow
Impermeable bedrock



- Water converges at discharge locations
- Rivers and streams act like a drain for water to exit a watershed

Watersheds of Wisconsin



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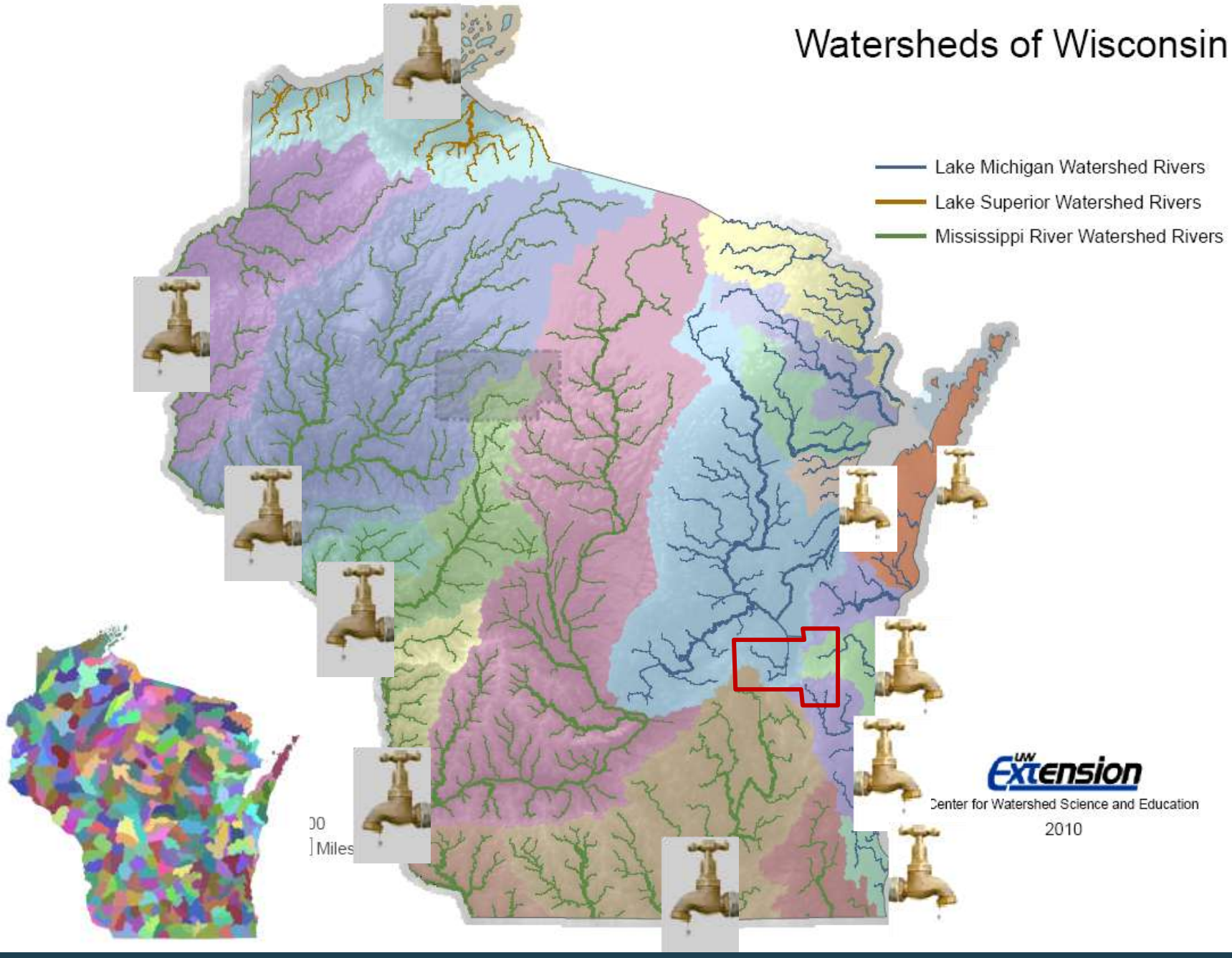
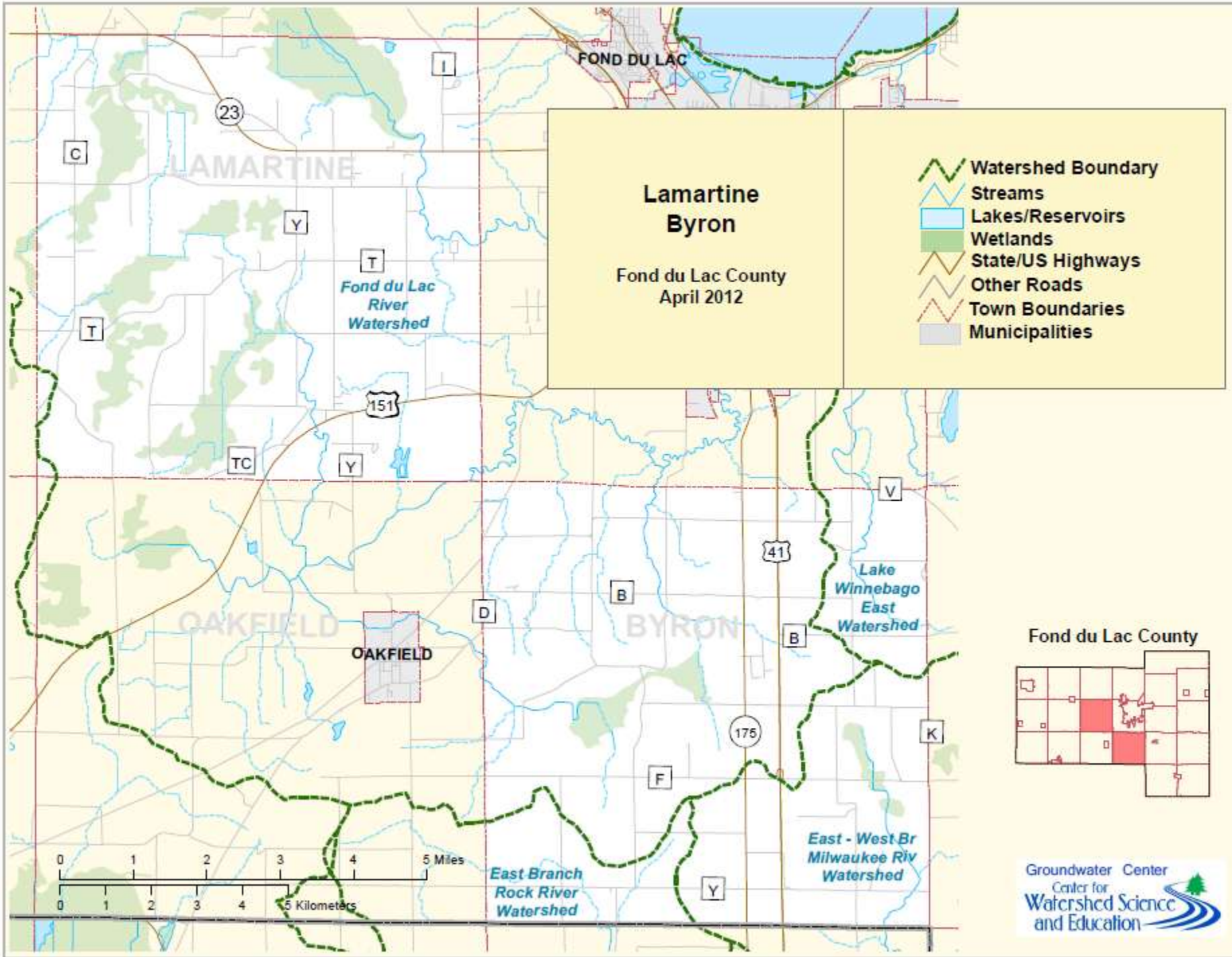
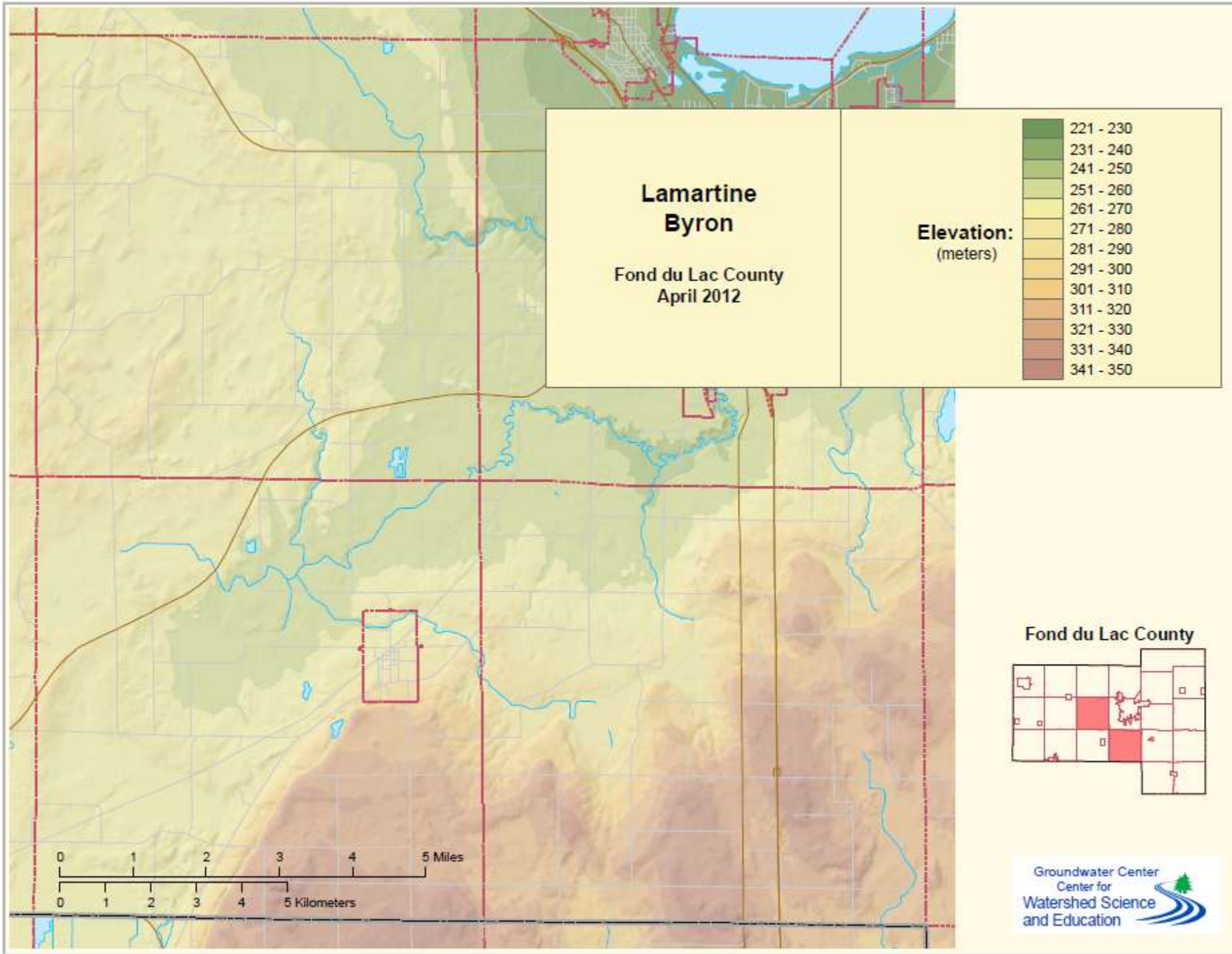
2010

Watersheds of Wisconsin

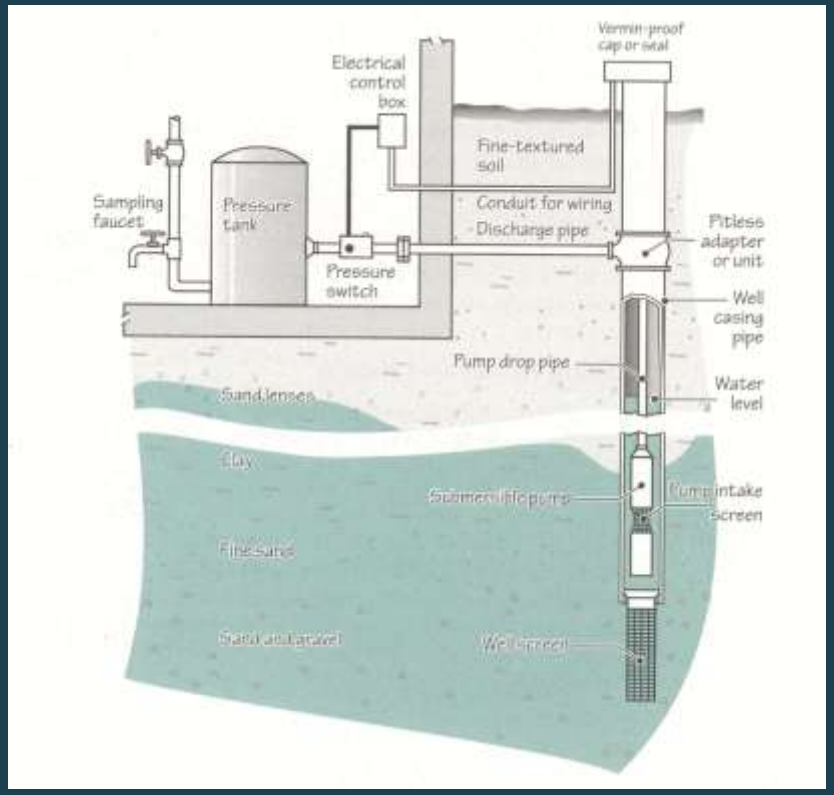



FOND DU LAC
I
23
C
LAMARTINE
Y
T
Fond du Lac River Watershed
T
151
TC
Y
V
41
B
D
OAKFIELD
OAKFIELD
BYRON
B
Lake Winnebago East Watershed
175
K
F
East - West Br Milwaukee Riv Watershed
East Branch Rock River Watershed
Y
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Lamartine
Byron
Fond du Lac County
April 2012
Watershed Boundary
Streams
Lakes/Reservoirs
Wetlands
State/US Highways
Other Roads
Town Boundaries
Municipalities
Fond du Lac County
Groundwater Center
Center for Watershed Science and Education


Lamartine
Byron
Fond du Lac County
April 2012
Elevation:
(meters)
221 - 230
231 - 240
241 - 250
251 - 260
261 - 270
271 - 280
281 - 290
291 - 300
301 - 310
311 - 320
321 - 330
331 - 340
341 - 350
Fond du Lac County
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Groundwater Center
Center for
Watershed Science
and Education

Types of Wells

Drilled Well



Driven Point Well

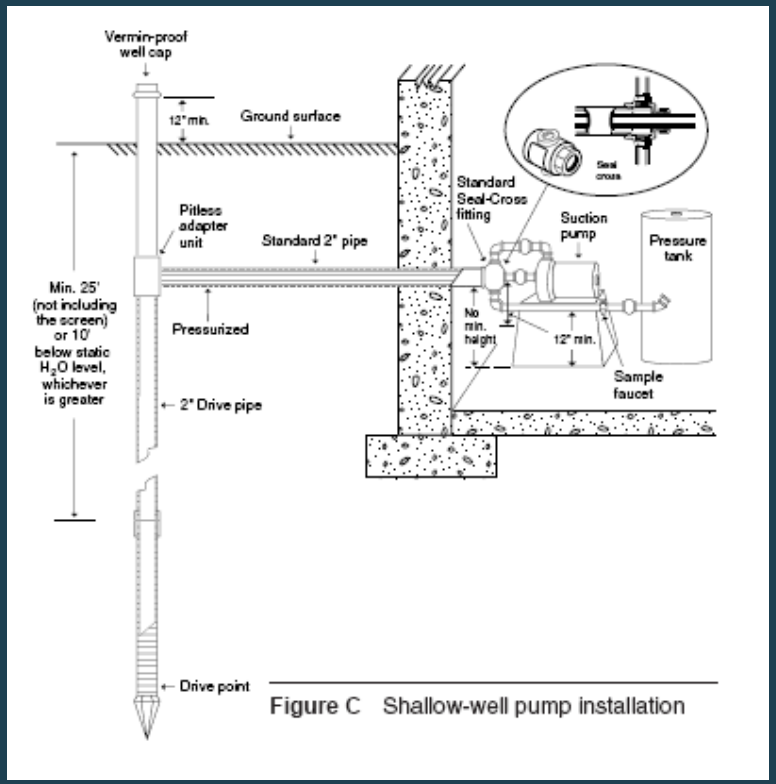
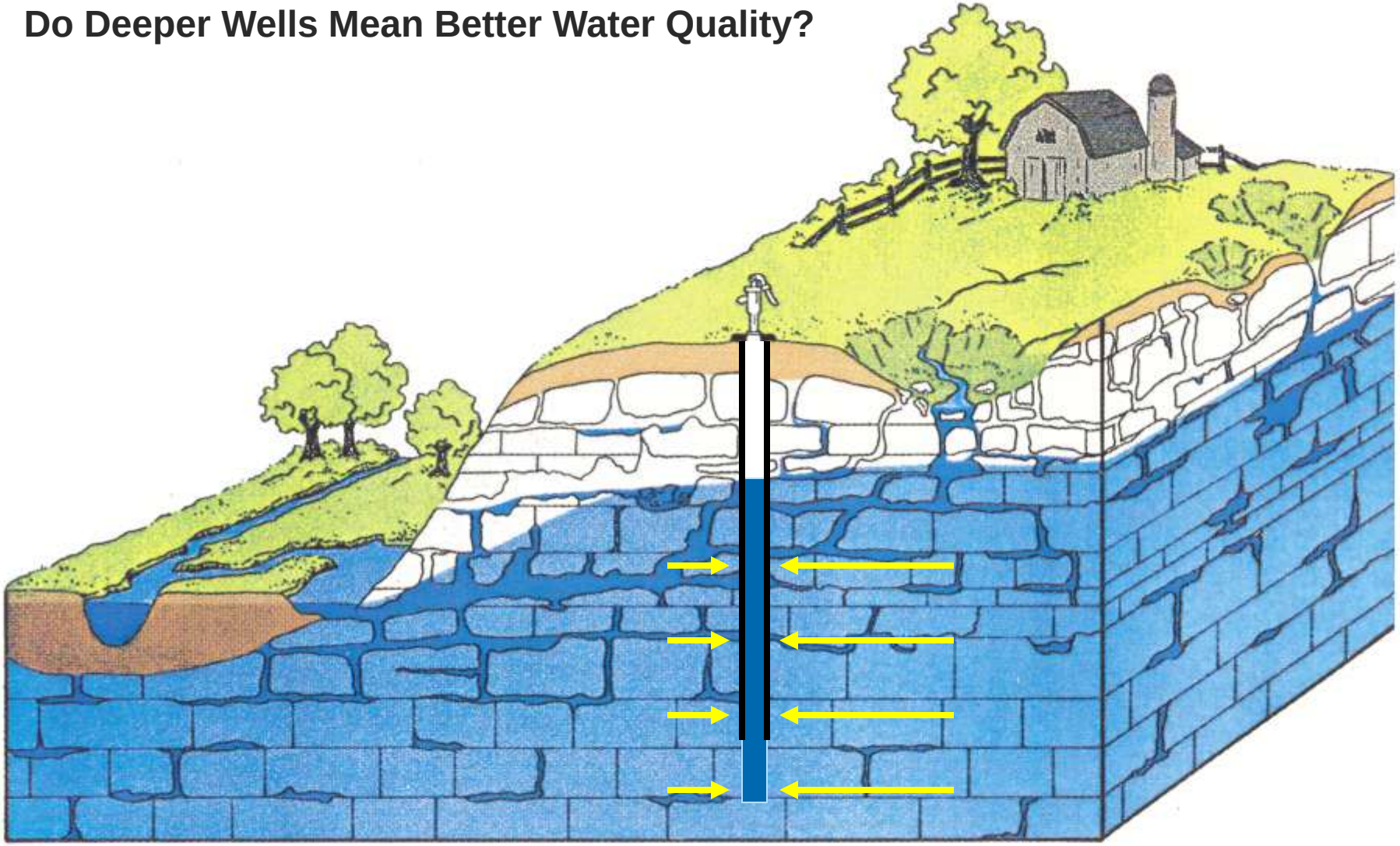


Figure C Shallow-well pump installation

Do Deeper Wells Mean Better Water Quality?



Well Construction Report For WISCONSIN UNIQUE WELL NUMBER CC 566

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

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

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.

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 36; T 19 N; R 16 ☑ E ☐ W

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

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

☑ 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 Floodplain? ☐ Yes ☐ No
Distance In Feet From Well To Nearest:

___ 1. Landfill	___ 9. Downspout/Yard Hydrant	120 11. Foundation Drain to Clearwater	___ 17. Wastewater Sump
50 2. Building Overhang	___ 10. Privy	___ 12. Foundation Drain to Sewer	___ 18. Paved Animal Barn Pen
110 3. Septic or Holding Tank	___ 13. Building Drain	___ 20. Silo — Type ___	___ 19. Animal Yard or Shelter
150 4. Sewage Absorption Unit	☐ Cast Iron or Plastic ☐ Other	___ 21. Barn Gutter	___ 22. Manure Pipe ☐ Gravity ☐ Pressure
___ 5. Nonconforming Pit	___ 14. Building Sewer ☐ Gravity ☐ Pressure	___ 22. Manure Pipe ☐ Gravity ☐ Pressure	☐ Cast Iron or Plastic ☐ Other
___ 6. Buried Home Heating Oil Tank	☐ Cast Iron or Plastic ☐ Other	☐ Cast Iron or Plastic ☐ Other	___ 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

Dia. (in.)	From (ft.)	To (ft.)
10	surface	46
6	46	140

Method of constructing upper enlarged drillhole only.
☐ 1. Rotary — Mud Circulation
☐ 2. Rotary — Air
☐ 3. Rotary — Foam
☐ 4. Reverse Rotary
☐ 5. Cable-tool Bit ___ in. dia.
☐ 6. Temp. Outer Casing ___ in. dia.
Removed? ☐ Yes ☐ No
If no, explain ___
☐ 7. Other ___

7. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Mfg. & Method of Assembly	From (ft.)	To (ft.)
6	New Black 18.95	surface	46
Dia. (in.)	screen type and material	From	To

8. Grout or Other Sealing Material

Method ___ Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
Slurry Clay + drillings	surface	46	

Make additional comments on reverse side about geology, etc.

DNR USE ONLY

9. Geology

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

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

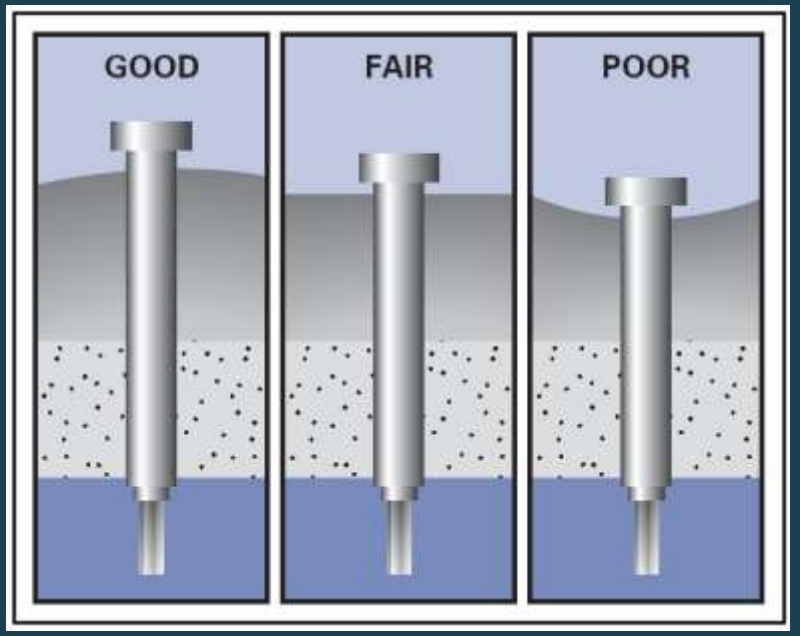
11. Pump Test
Pumping Level 13 ft. below surface
Pumping at 30 GPM for 2 hours

12. Well Is:
☑ Above Grade ☐ Below
10 in.
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 ___

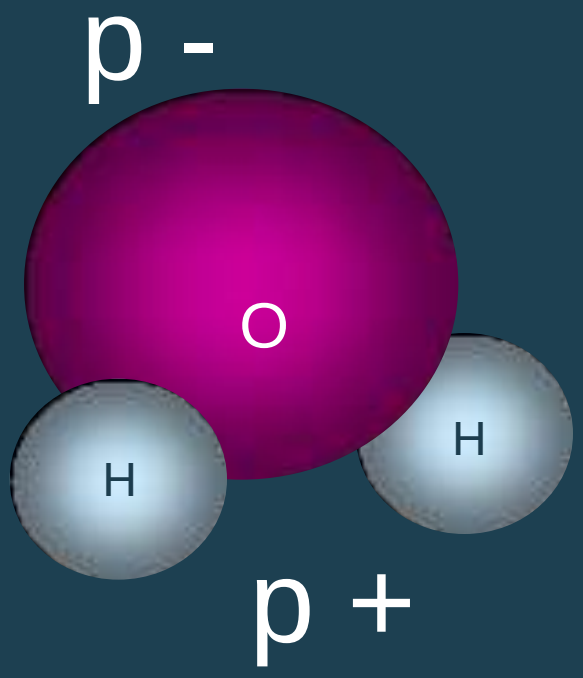
14. Signature of Print Driver or Registered Driller — Date Signed
Signature of Drill Rig Operator — Date Signed

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

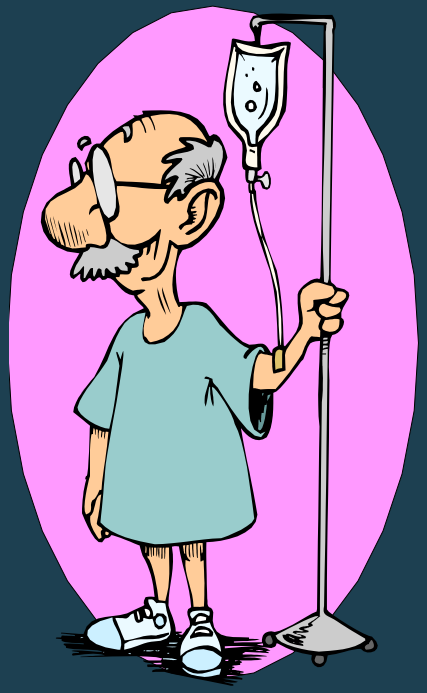
What are the Health Concerns?

- 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.

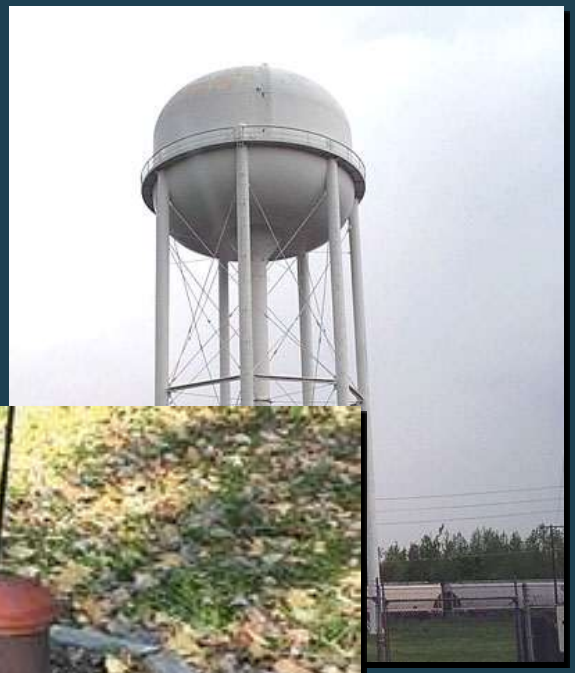
Private vs. Public Water Supplies

Public Water Supplies

- Regularly tested and regulated by drinking water standards.

Private Wells

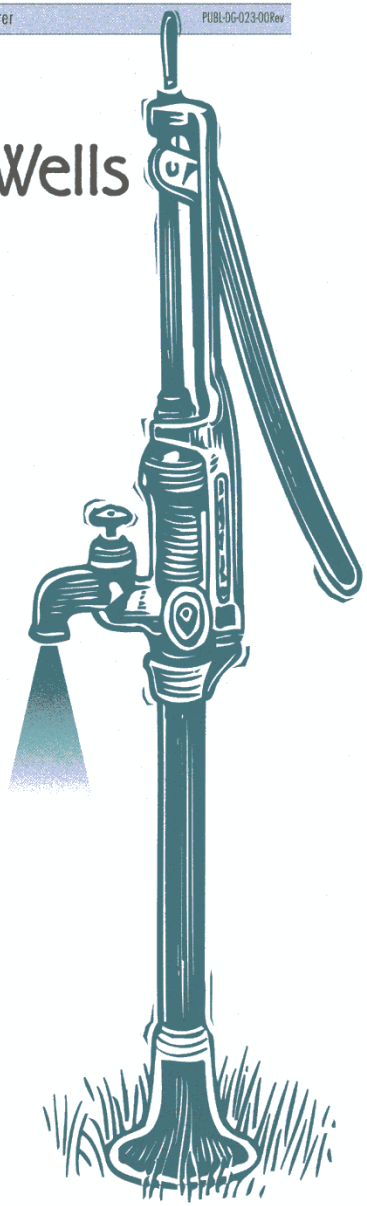
- Not required to be regularly tested.
- Not required to take corrective action
- Owners must take special precautions to ensure safe drinking water.



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

Wisconsin Department of Natural Resources, Bureau of Drinking Water and Groundwater PUBL-DG-023-00Rev

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.

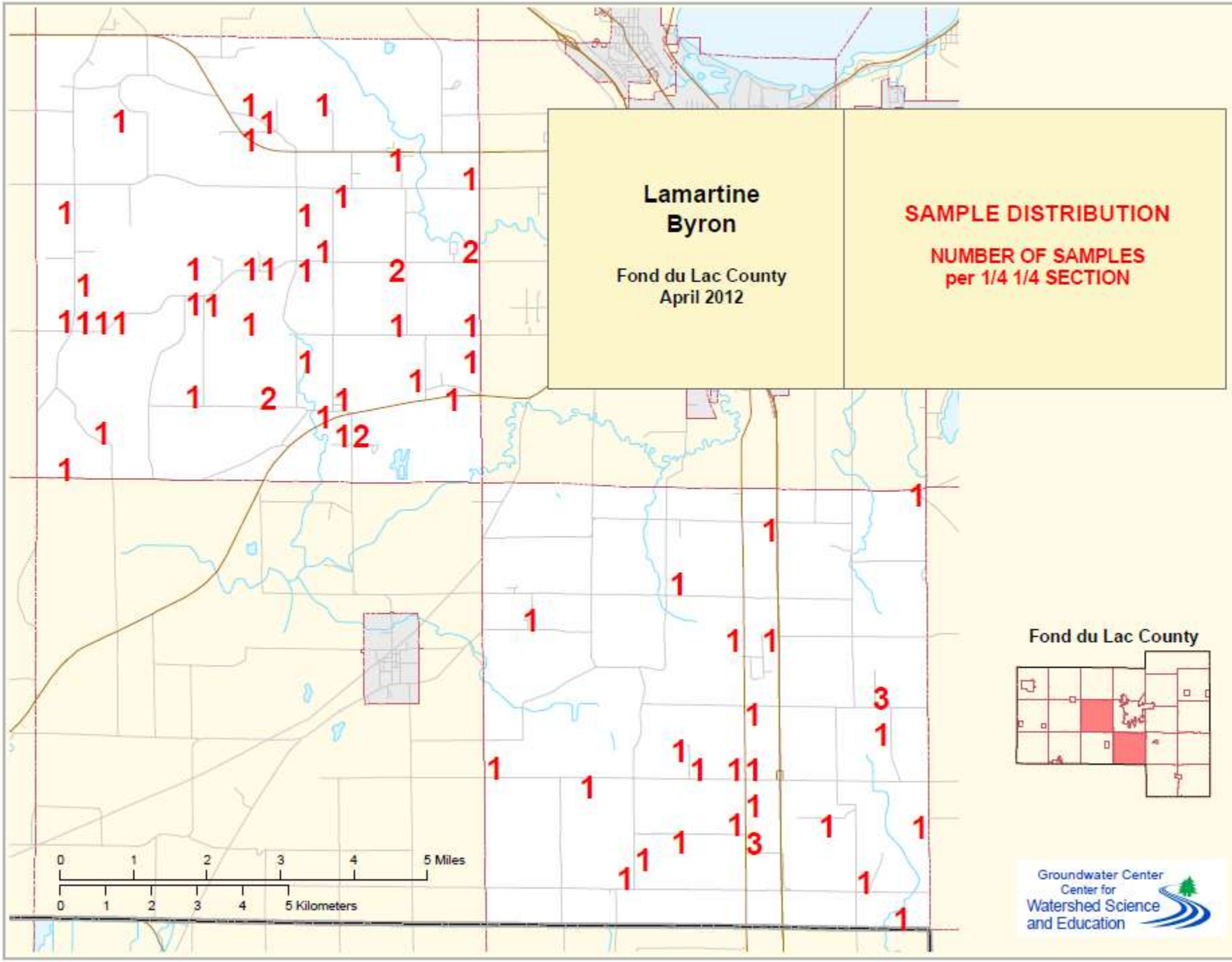
This brochure gives information about several common contaminants found in private wells. It should help you decide when to sample your well and how often, how to find a certified laboratory and who to call for help.

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


Lamartine
Byron
Fond du Lac County
April 2012
SAMPLE DISTRIBUTION
NUMBER OF SAMPLES
per 1/4 1/4 SECTION
Fond du Lac County
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Groundwater Center
Center for
Watershed Science
and Education

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

Center for Watershed Science and Education

Monday, August 15, 2011

WELL INFORMATION:

WI Unique Well Number
Add [redacted]
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 ☑ 4-6" ☐ 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 women/daycare
☐ Other

MAIL RESULTS TO:

last [redacted]
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 11APR82

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	

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.

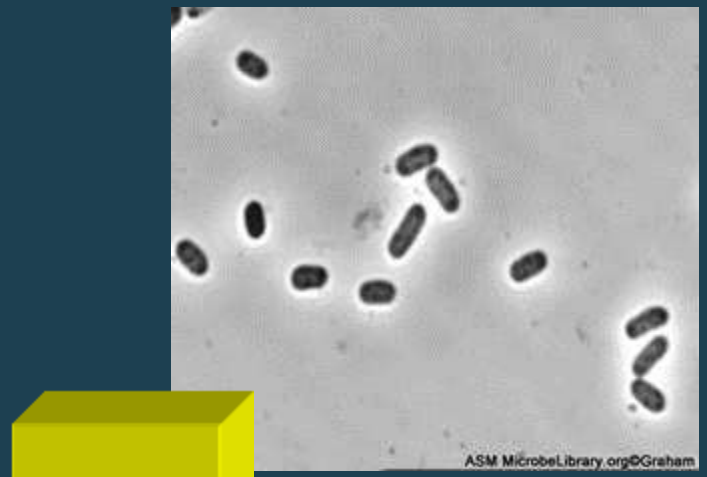
Disclaimer - The analyses run on your samples only cover some of the more common water quality characteristics. Safe levels of these chemicals or bacteria do not guarantee that your water is free of all toxic chemicals. Bacteria die-off in samples over 30 hours old may render results inaccurate and are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

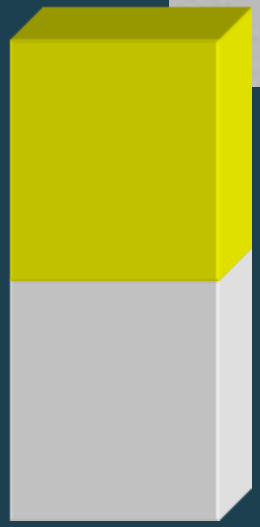
milligrams per liter (mg/l) = parts per million (ppm)

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





Present =Unsafe

Absent = Safe

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.

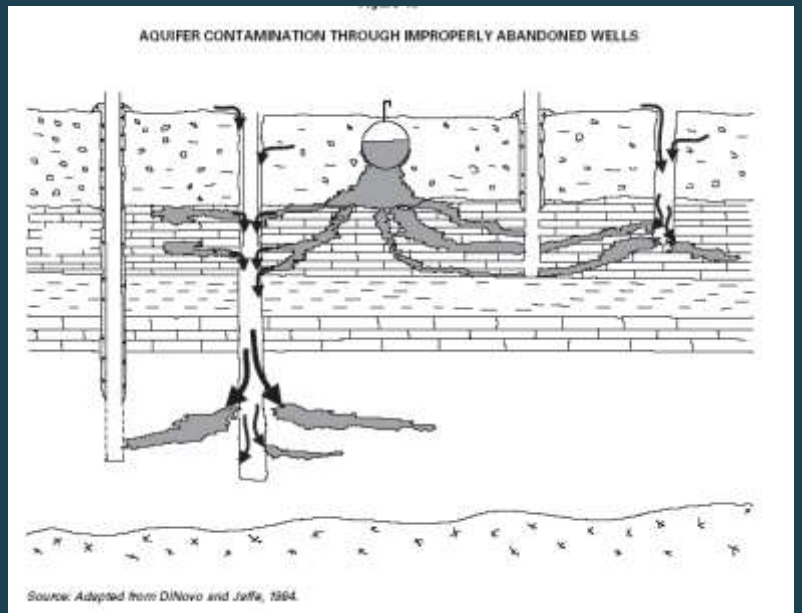
Contaminants	Sources	Symptoms
BACTERIA		
Escherichia coliform (E. coli) *Salmonella* *Campylobacter* *E. coli 0157* (Requires a special water test for detection. Causes similar, but more serious illness than other E.coli strains. Requires medical treatment.)	• Infected human and animal feces • Manure • Septic systems • Sewage	• Gastrointestinal illness • Low-grade fever • Begins 12 hrs - 7 days after exposure
Leptosporidia	• Urine of livestock, dogs and wildlife • Manure	• High fever, severe headache and red eyes • Gastrointestinal illness • Begins 2-28 days after exposure
MICROSCOPIC PARASITES		
Cryptosporidia *Giardia*	• Infected human and animal feces • Manure • Septic systems • Sewage	• Gastrointestinal illness • Begins 2-14 days after exposure
VIRUSES		
Norovirus	• Infected human feces and vomit • Septic systems • Sewage	• Gastrointestinal illness • Low-grade fever & headache • Begins 12-48 hrs after exposure
CHEMICALS		
Nitrate	• Fertilizers • Manure • Bio-solids • Septic systems	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.
Atrazine (trade-name herbicide for control of broadleaf and grassy weeds)	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.	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. Long-term exposure above MCL may cause: weight loss, cardio-vascular damage, retinal and some muscle degeneration; cancer.

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)

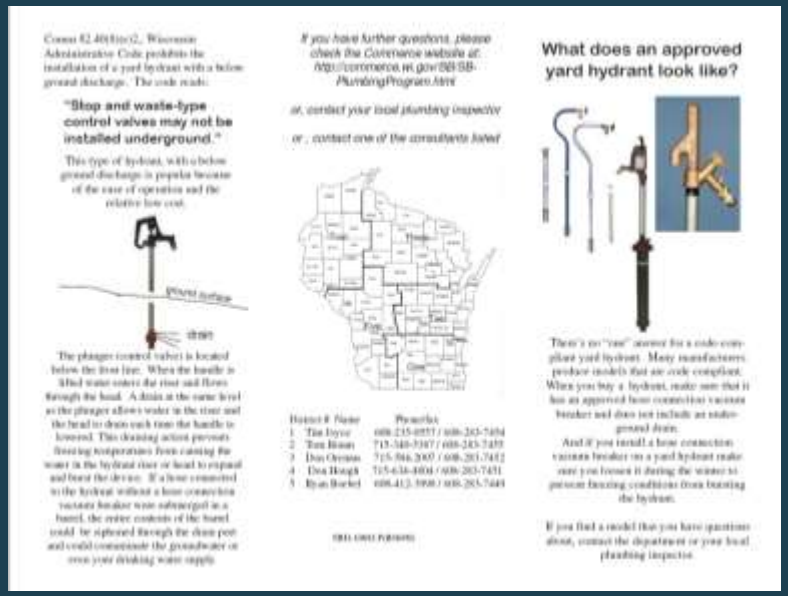
Some Common Pathways for Bacteria to Enter Your Water System

Photo: Sandy Heimke, WI DNR

Photo: Sandy Heimke, WI DNR



Source: Adapted from DiNovo and Jaffe, 1994.



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

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

or, contact your local plumbing inspector

or , contact one of the consultants listed

What does an approved yard hydrant look like?

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

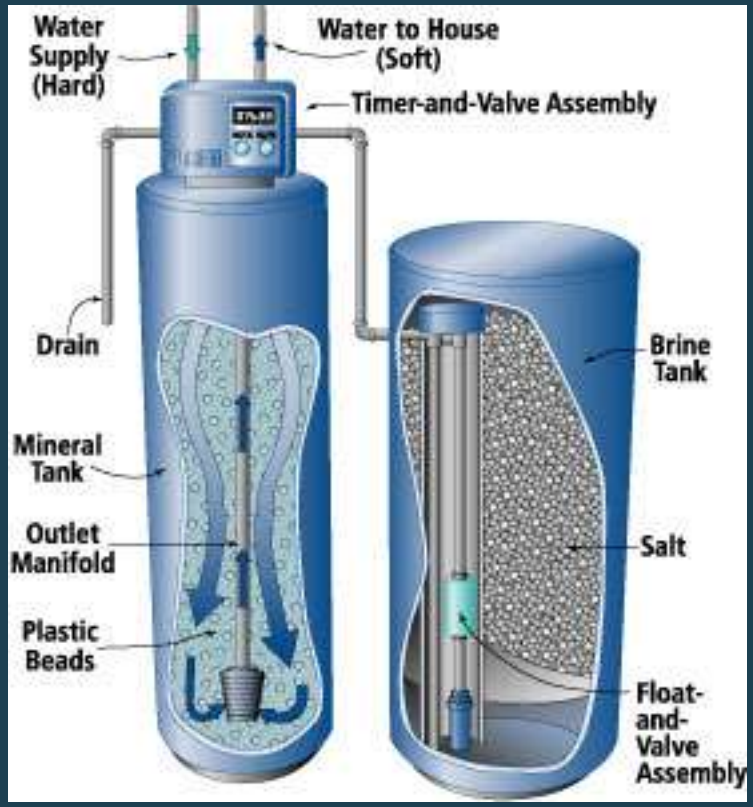
- **Natural (rocks and soils)**
- **Primarily calcium and magnesium**

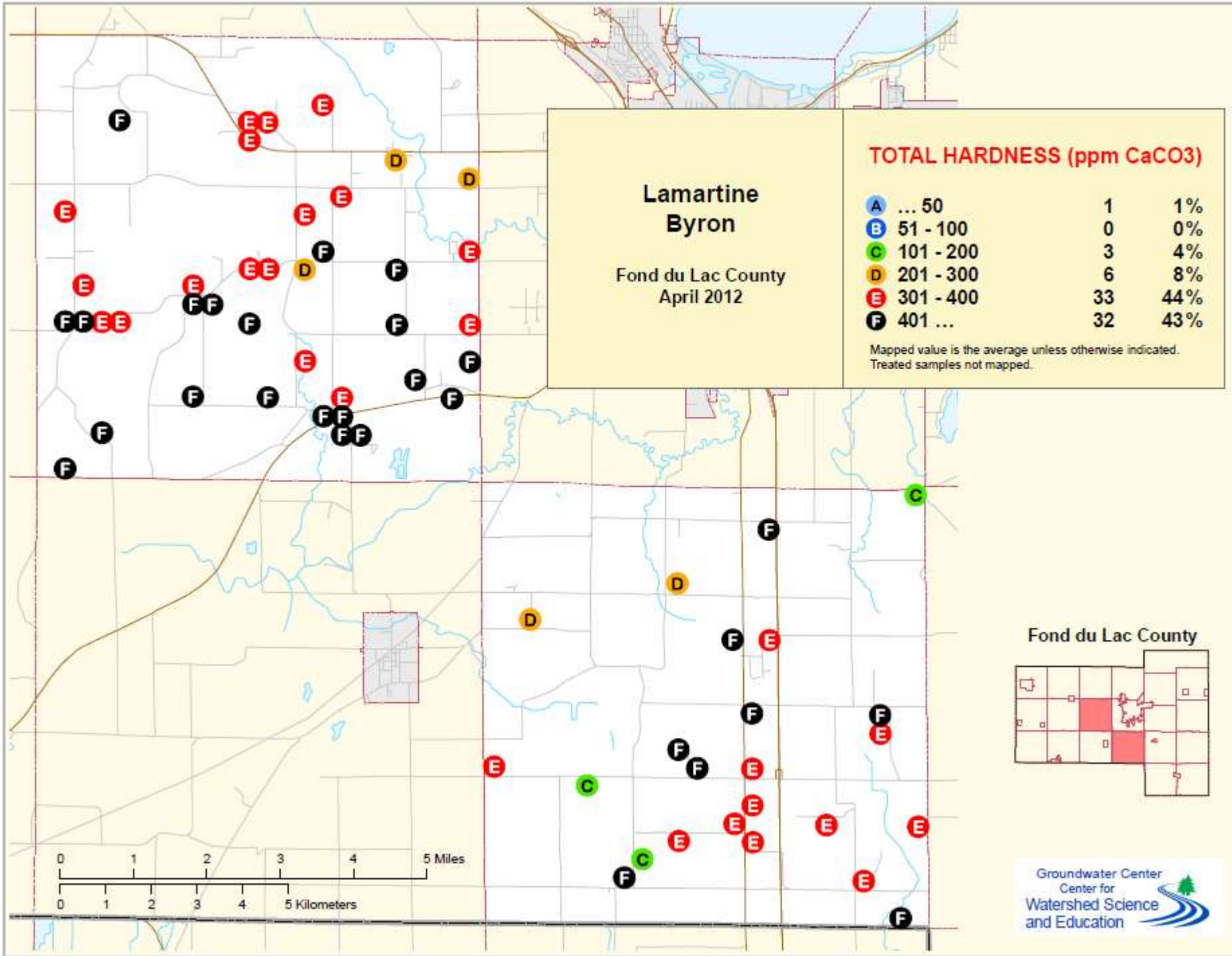
- Problems: scaling, scum, use more detergent, decrease water heater efficiency

Water Softening

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

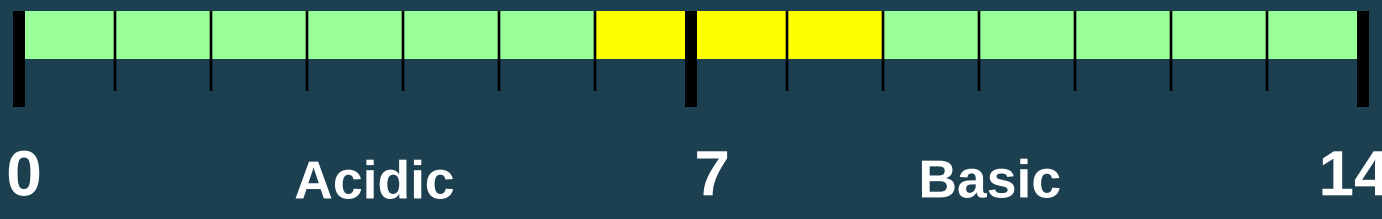
- **Negative: Increases sodium content of water.**
- **Suggestions:**
  - **Bypass your drinking water faucet.**
  - **Do not soften water for outdoor faucets.**
  - **If you are concerned about sodium levels – use potassium chloride softener salt.**




Lamartine
Byron
Fond du Lac County
April 2012
TOTAL HARDNESS (ppm CaCO3)
A ... 50 1 1%
B 51 - 100 0 0%
C 101 - 200 3 4%
D 201 - 300 6 8%
E 301 - 400 33 44%
F 401 ... 32 43%
Mapped value is the average unless otherwise indicated.
Treated samples not mapped.
Fond du Lac County
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Groundwater Center
Center for
Watershed Science
and Education

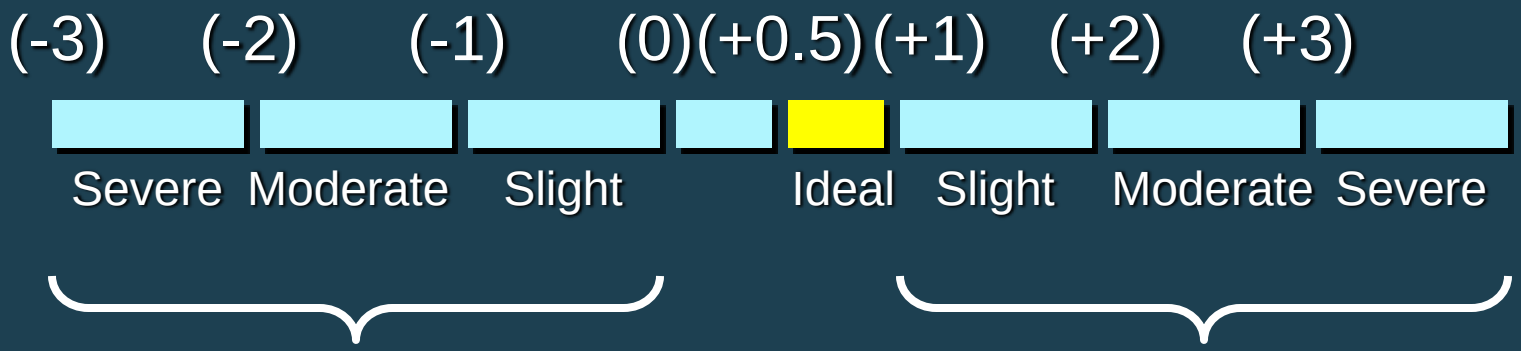
Tests for Overall Water Quality

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

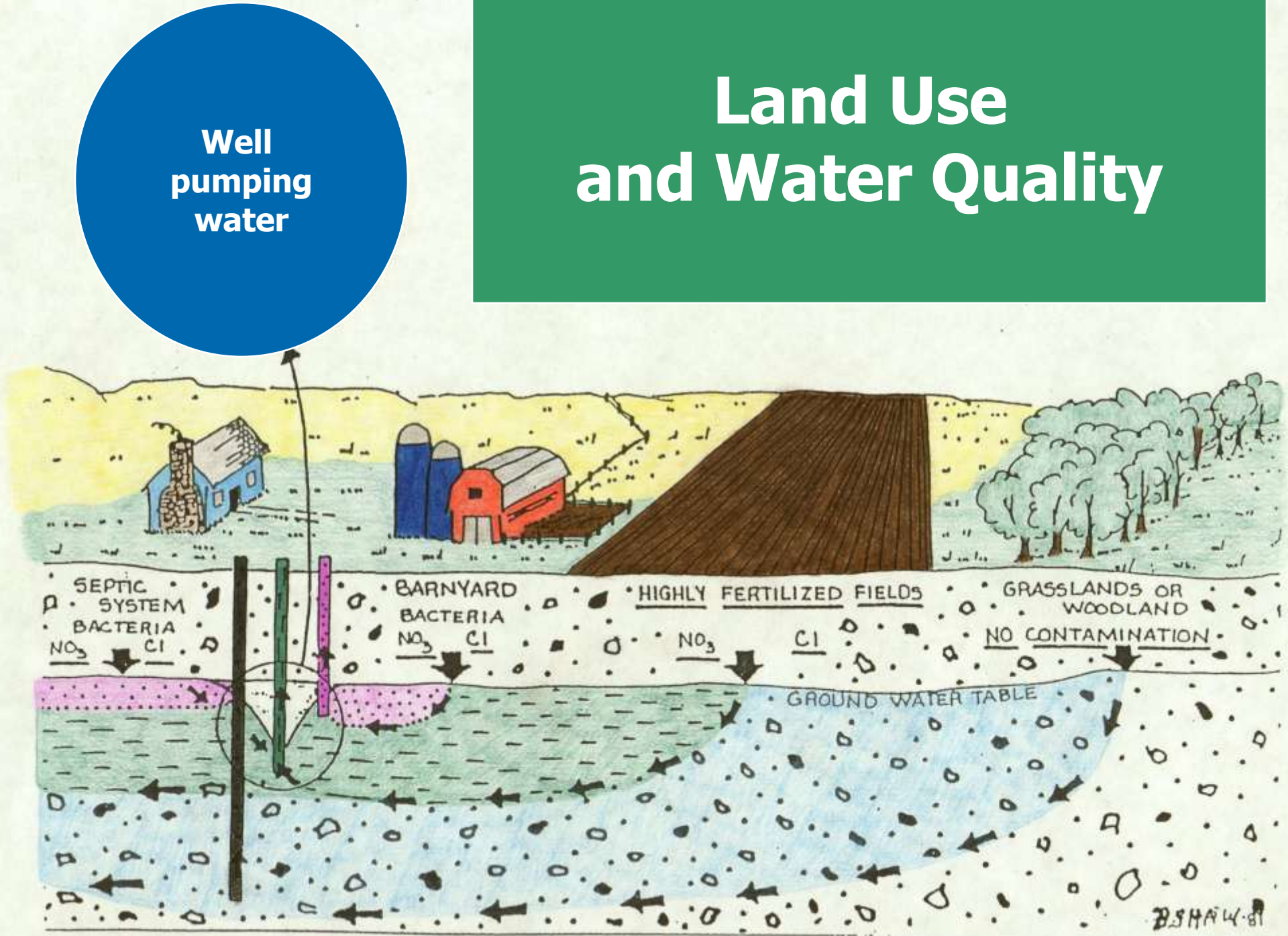


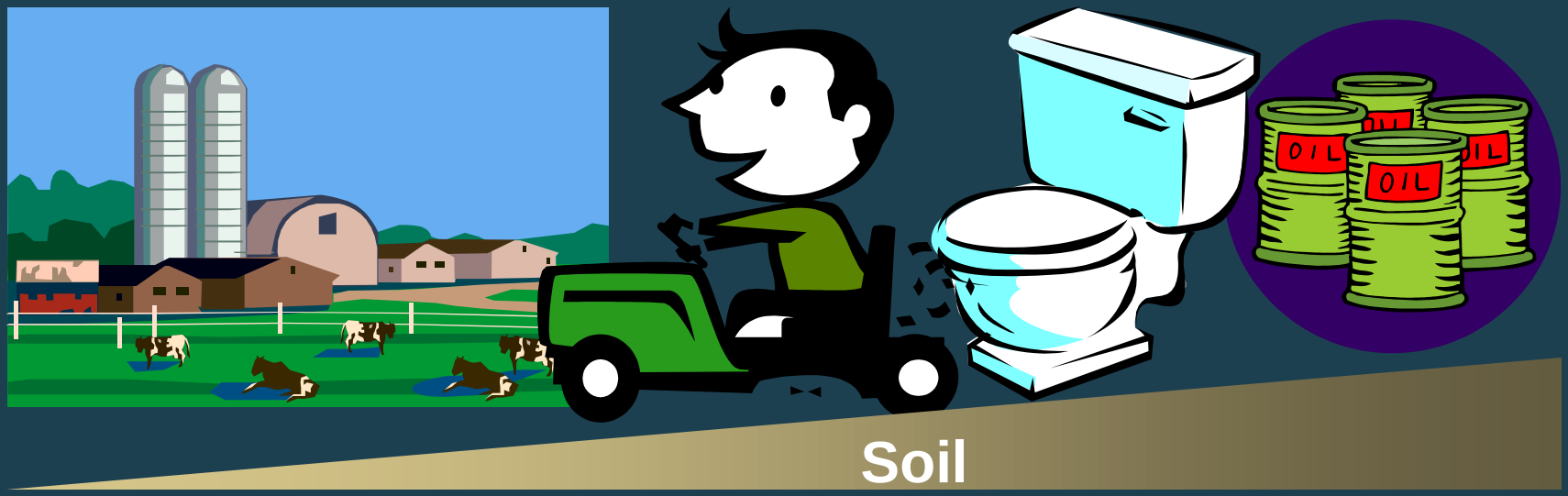
Tests for Overall Water Quality

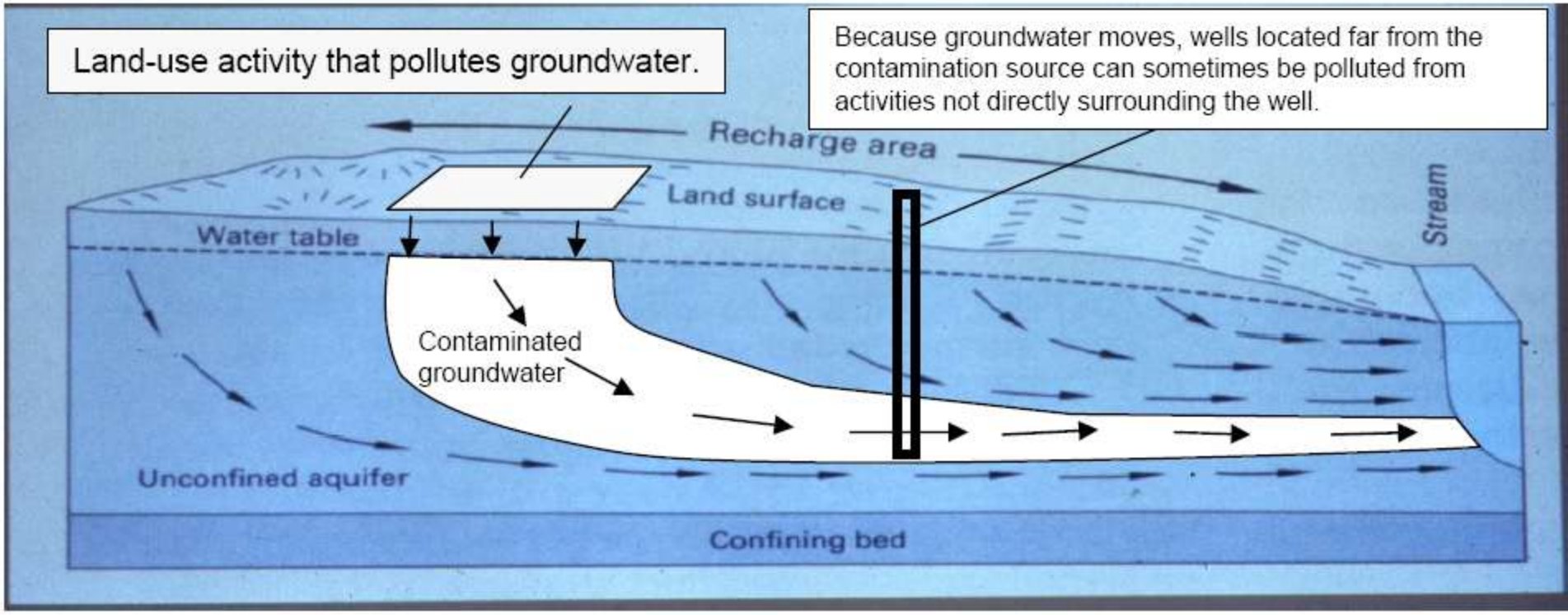
Saturation Index



Land Use and Water Quality



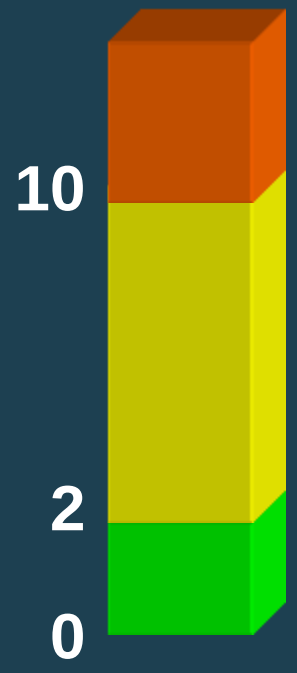

OIL
OIL
OIL
Soil


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.
Recharge area
Land surface
Water table
Stream
Contaminated groundwater
Unconfined aquifer
Confining bed

Test Important to Health

Nitrate Nitrogen

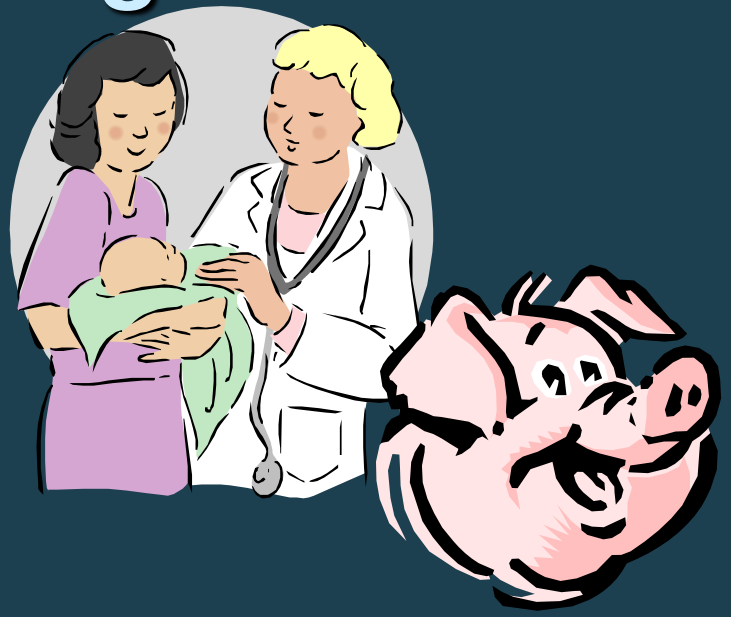
- **Greater than 10 mg/L**
  Exceeds State and Federal Limits for Drinking Water
- **Between 2 and 10 mg/L**
  Some Human Impact
- **Less than 2.0 mg/L**
  "Transitional"
- **Less than 0.2 mg/L**
  "Natural"



UNSAFE - for infants and pregnant women; everyone should avoid long term consumption.

"NATURAL"

Nitrate-Nitrogen

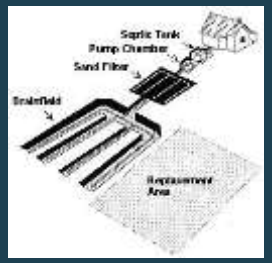


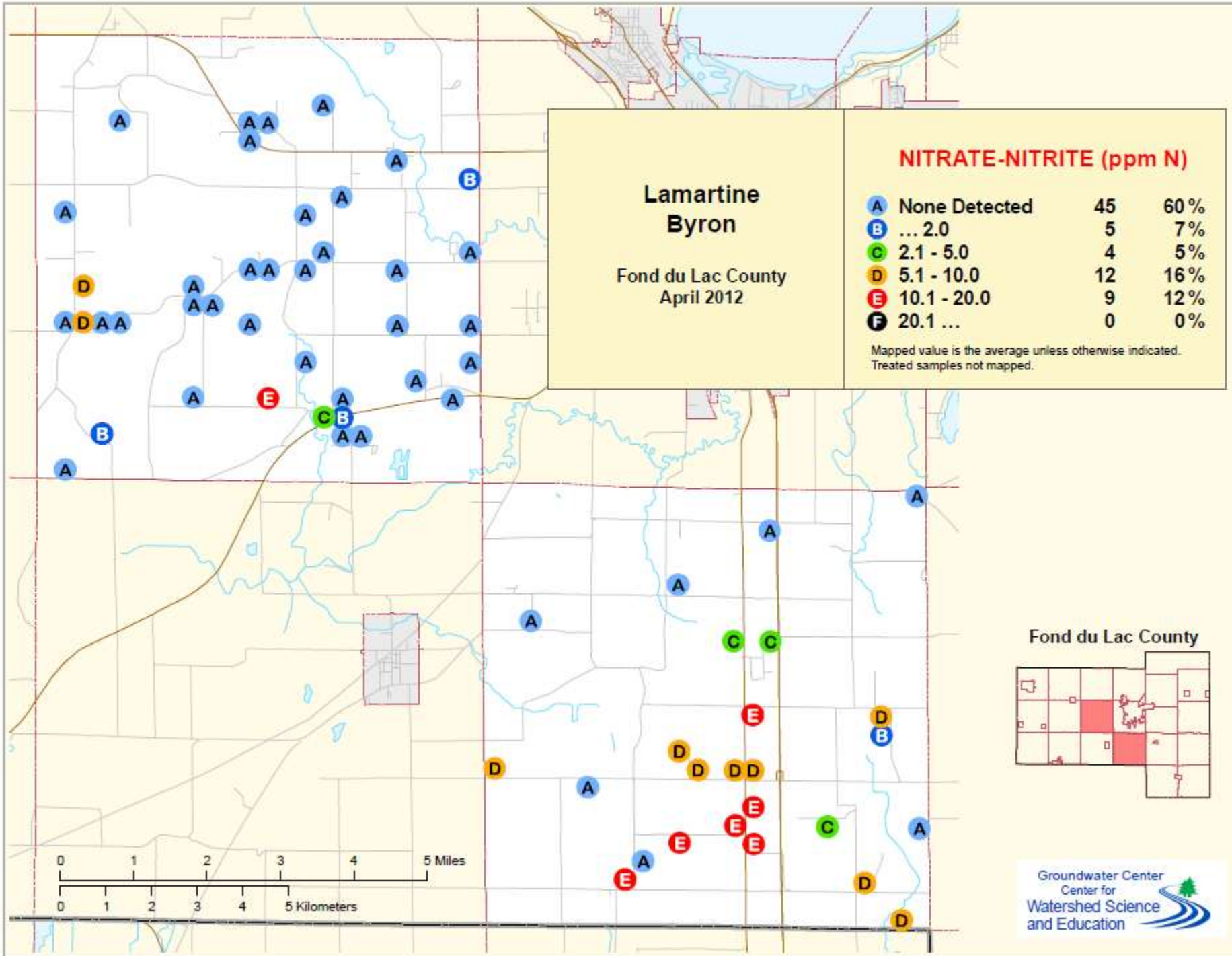
Health Effects:

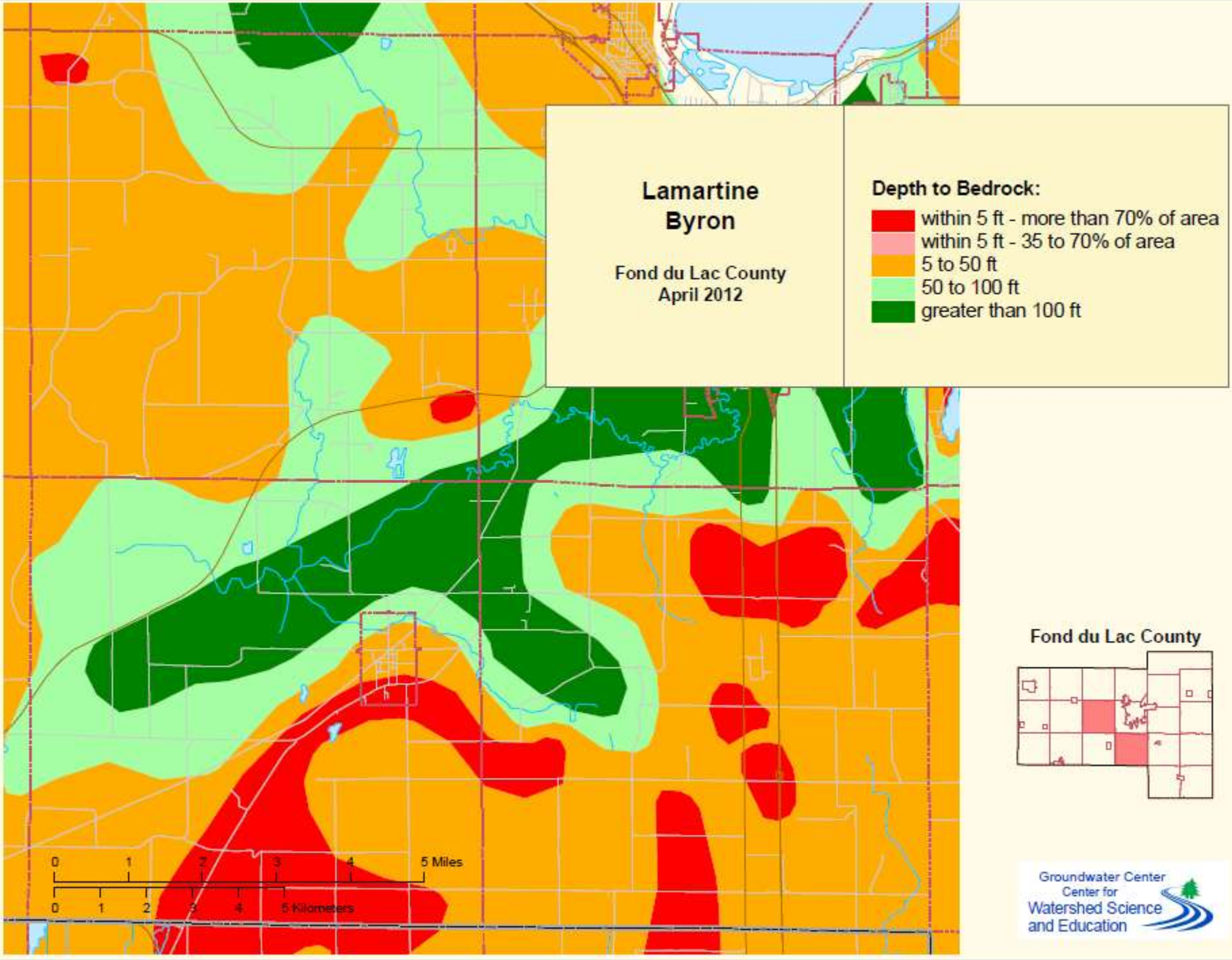
- Methemoglobinemia (blue baby disease)
- Possible links to birth defects and miscarriages (humans and livestock)
- Indicator of other contaminants

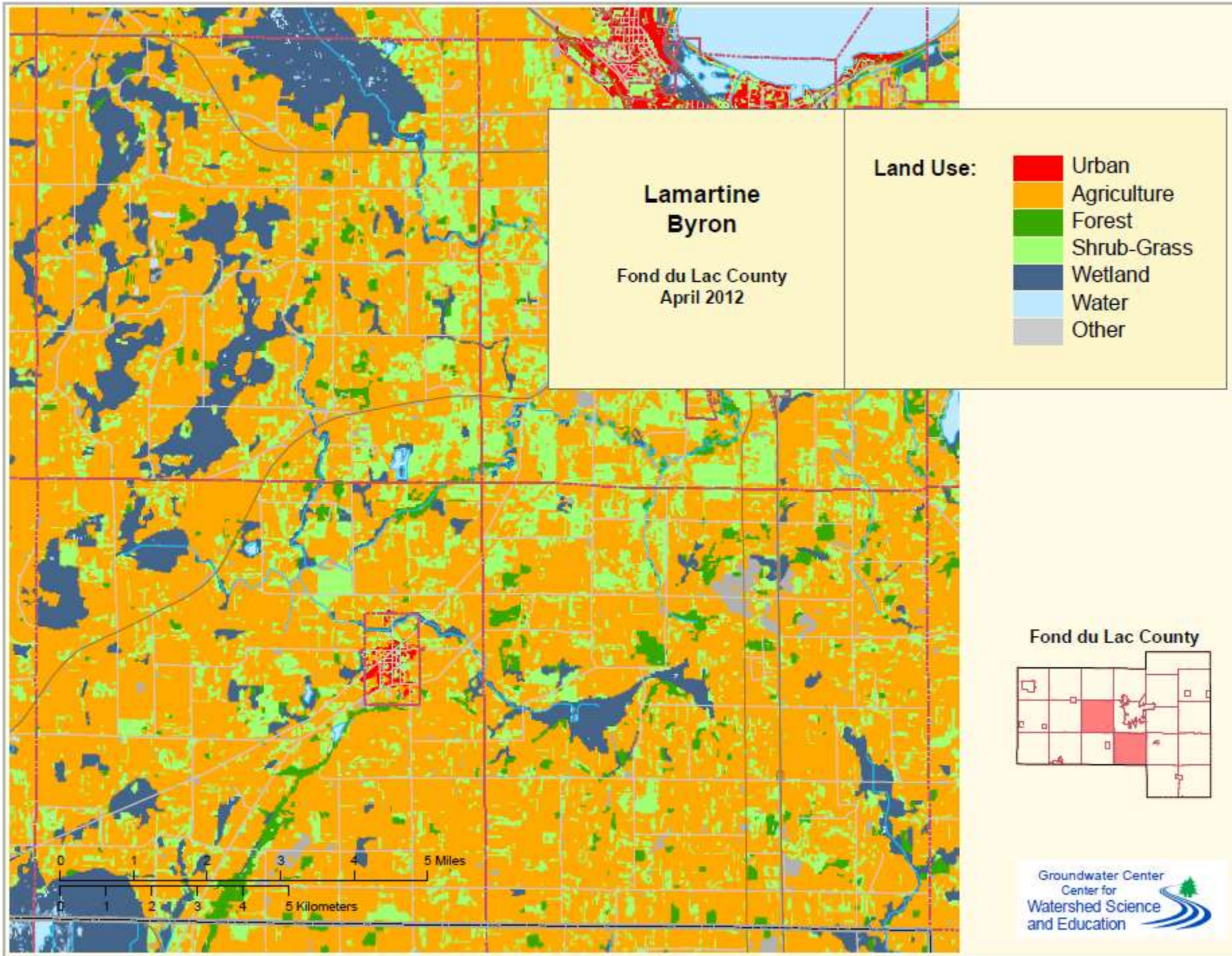
Sources:

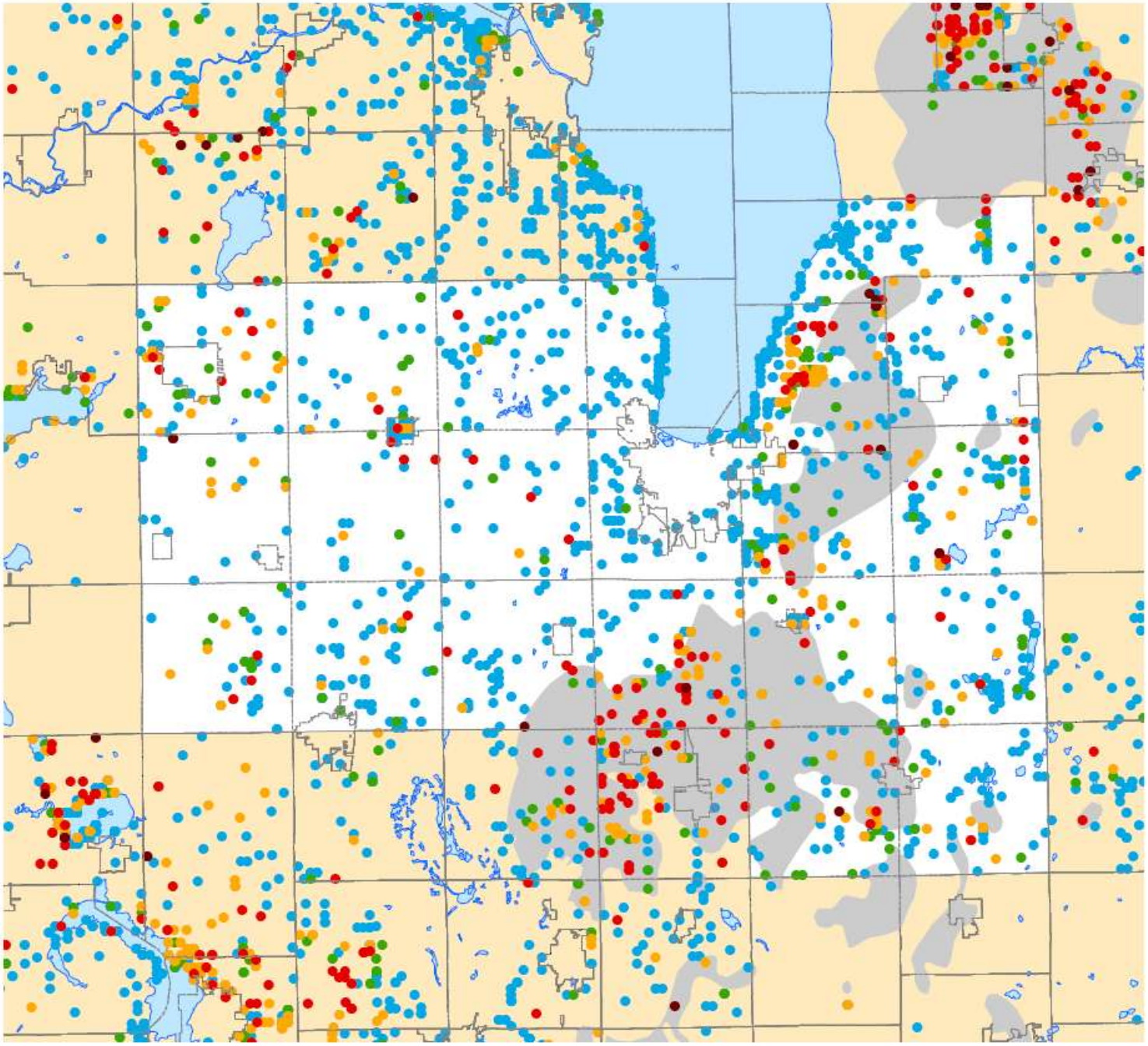
- Agricultural fertilizer
- Lawn fertilizer
- Septic systems
- Animal wastes




Lamartine
Byron
Fond du Lac County
April 2012
NITRATE-NITRITE (ppm N)
A None Detected 45 60%
B … 2.0 5 7%
C 2.1 - 5.0 4 5%
D 5.1 - 10.0 12 16%
E 10.1 - 20.0 9 12%
F 20.1 … 0 0%
Mapped value is the average unless otherwise indicated.
Treated samples not mapped.
Fond du Lac County
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Groundwater Center
Center for
Watershed Science
and Education


Lamartine
Byron
Fond du Lac County
April 2012
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
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Fond du Lac County
Groundwater Center
Center for
Watershed Science
and Education


Lamartine
Byron
Fond du Lac County
April 2012
Land Use:
Urban
Agriculture
Forest
Shrub-Grass
Wetland
Water
Other
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Fond du Lac County
Groundwater Center
Center for
Watershed Science
and Education



Private Well Test Results

Nitrate-N Concentration (mg/L)

- 0 - 2
- 2 - 5
- 5 - 10
- 10 - 20
- > 20

Areas of greatest karst potential

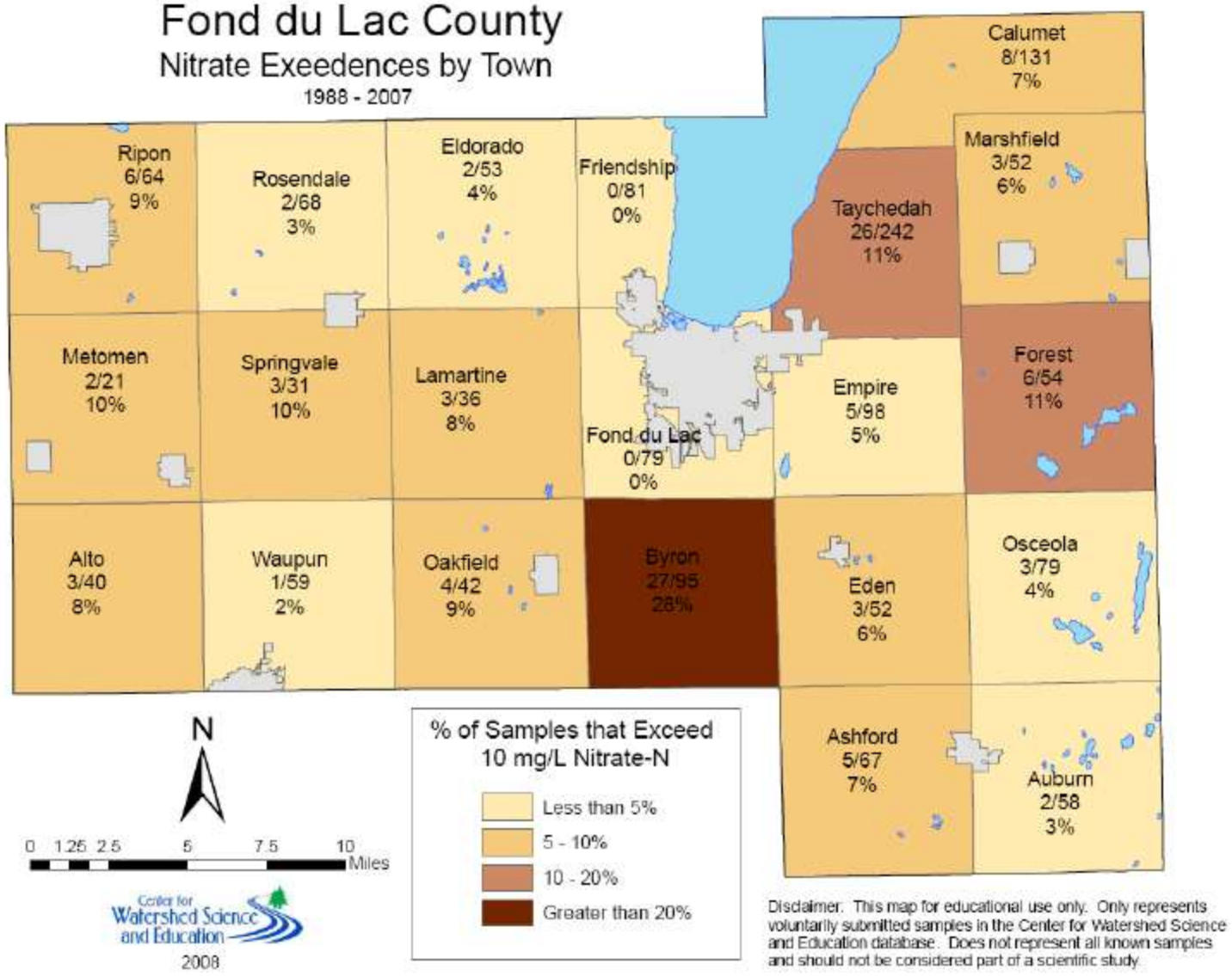
N

Center for Watershed Science and Education

2007

0 1 2 4 6 8 Miles

Disclaimer: This map for educational purposes only. It represents private well testing results in the Center for Watershed Science and Education database it does not represent a scientific study.



Percent of samples (by town) that exceed the 10 mg/L safe drinking water standard for nitrate-nitrogen. Numbers indicate the number of exceedences and the total number of samples per town. (1988-2007) (1988-2007 data)

What can I do to reduce my nitrate levels?

Solution:

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

Short term:

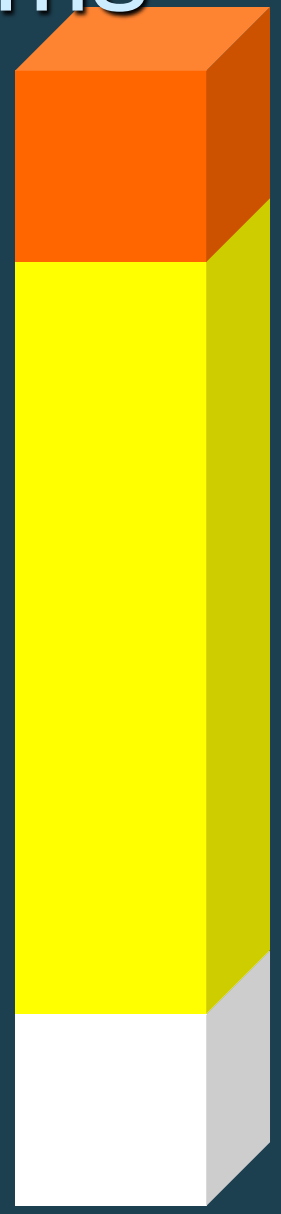
- **Change well depth or relocate well**
- **Carry or buy water**
- **Water treatment devices**
  - **Reverse osmosis**
  - **Distillation**
  - **Anion exchange**

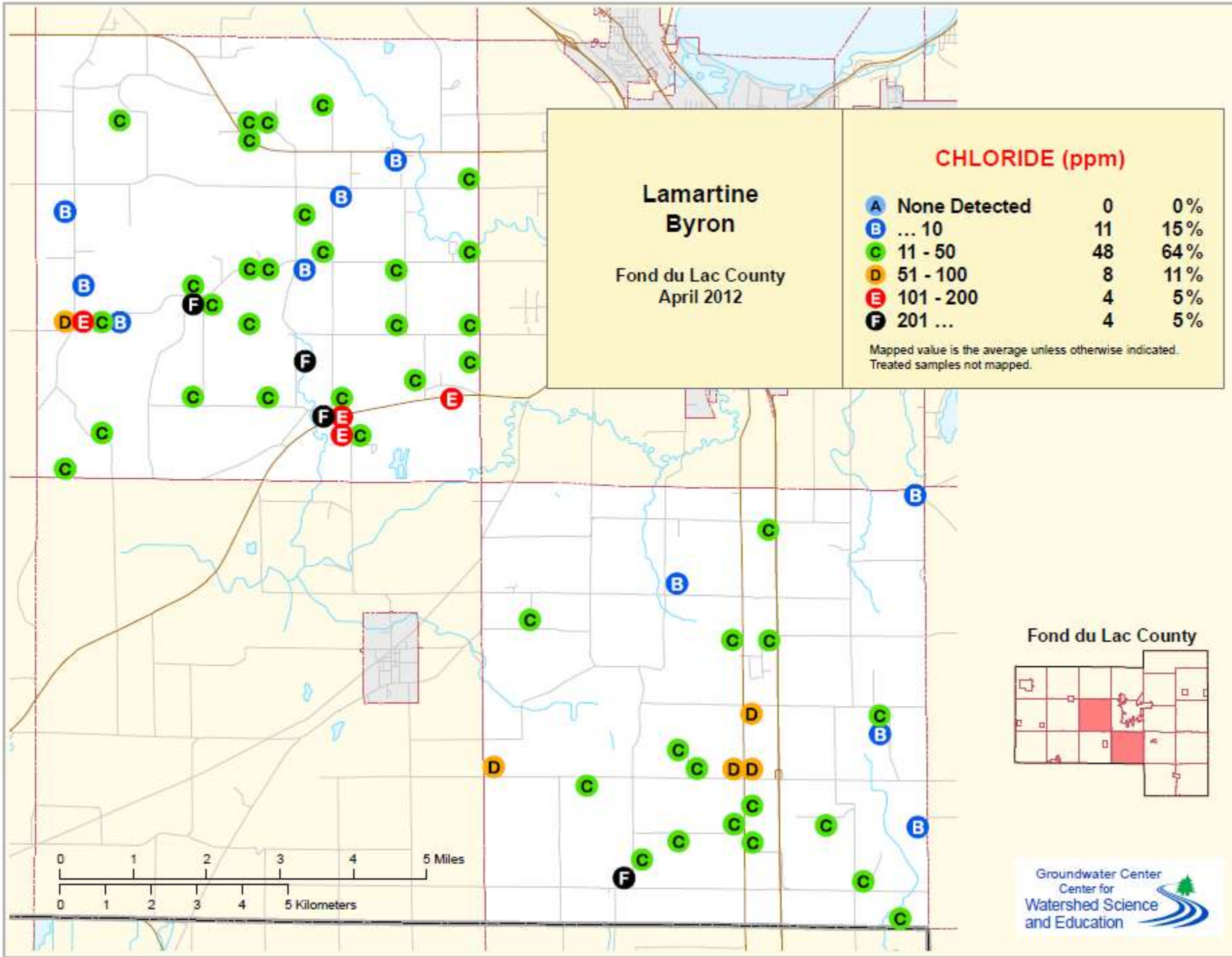
Tests for Aesthetic Problems

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



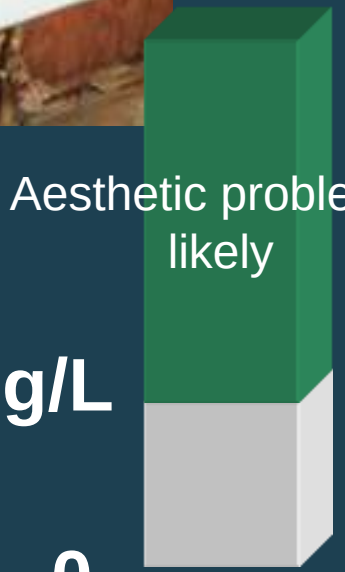

Lamartine
Byron
Fond du Lac County
April 2012
CHLORIDE (ppm)
A None Detected 0 0%
B ... 10 11 15%
C 11 - 50 48 64%
D 51 - 100 8 11%
E 101 - 200 4 5%
F 201 ... 4 5%
Mapped value is the average unless otherwise indicated.
Treated samples not mapped.
Fond du Lac County
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Groundwater Center
Center for
Watershed Science
and Education

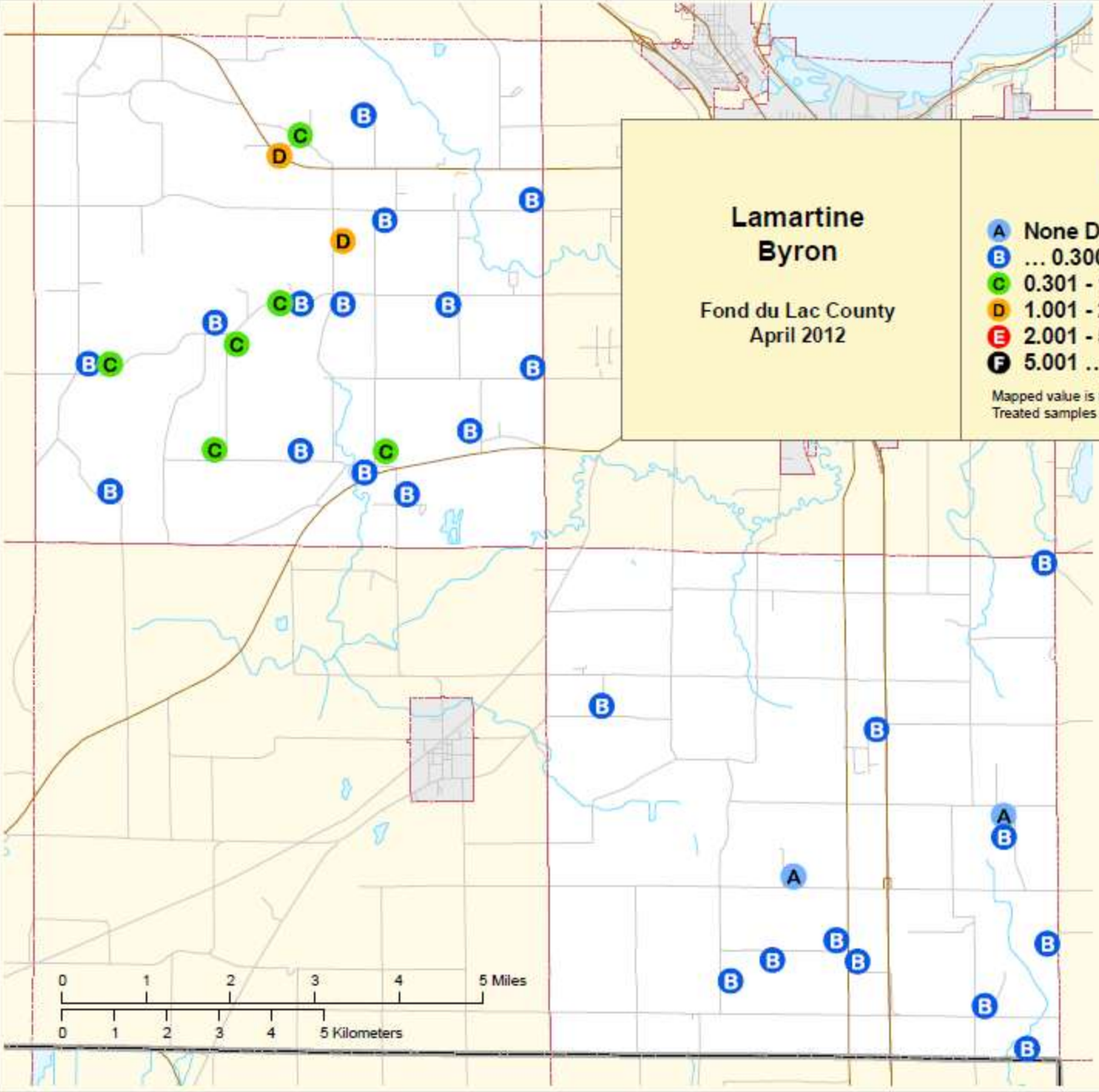
Tests for Aesthetic Problems

Iron

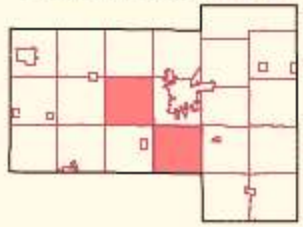
- Natural (rocks and soils)
- May benefit health
- Red and yellow stains on clothing, fixtures

- Potential for iron bacteria
  - Slime, odor, oily film





Fond du Lac County



Groundwater Center
Center for
Watershed Science
and Education

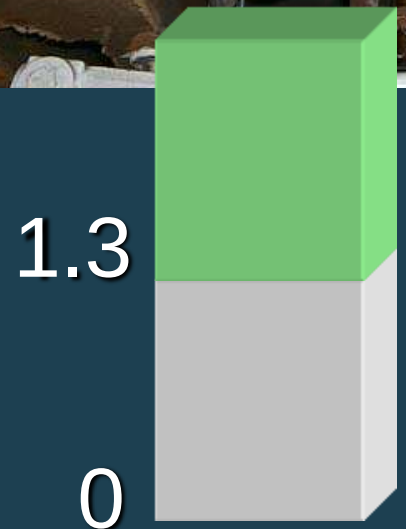
Test Important to Health

Copper

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

Health Effects:

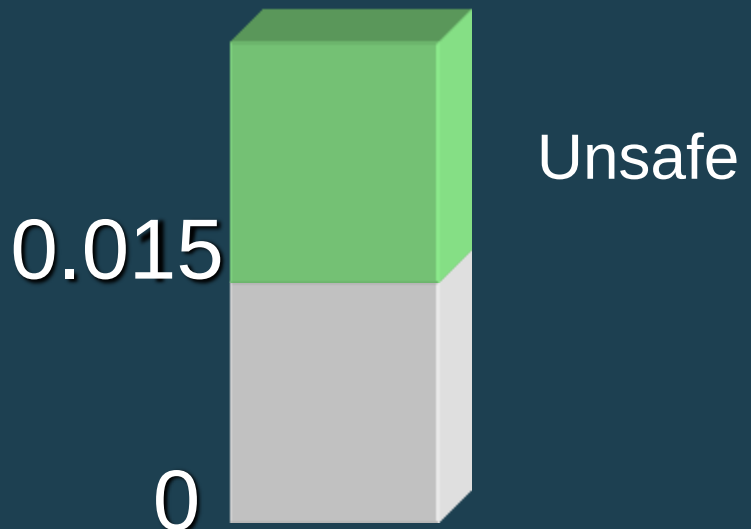
- **Some copper is needed for good health**
- **Too much may cause problems:**
  - Stomach cramps, diarrhea, vomiting, nausea
  - Formula intolerance in infants



Test Important to Health

Lead

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



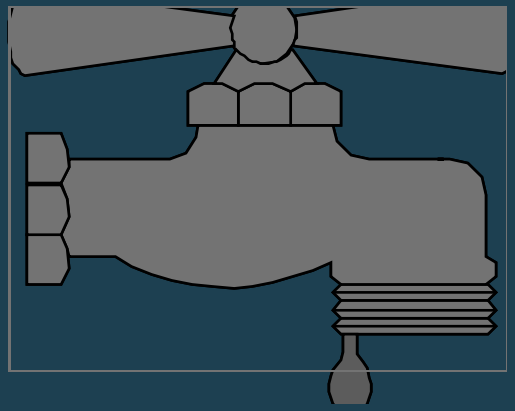
Health Effects:

- **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.**



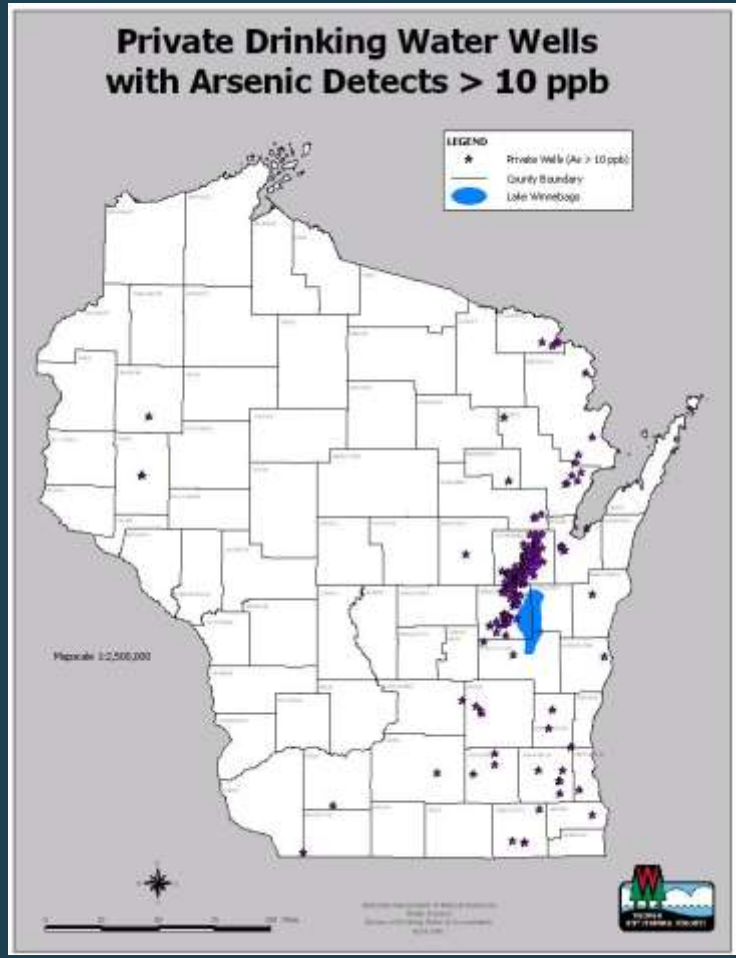
Test Important to Health

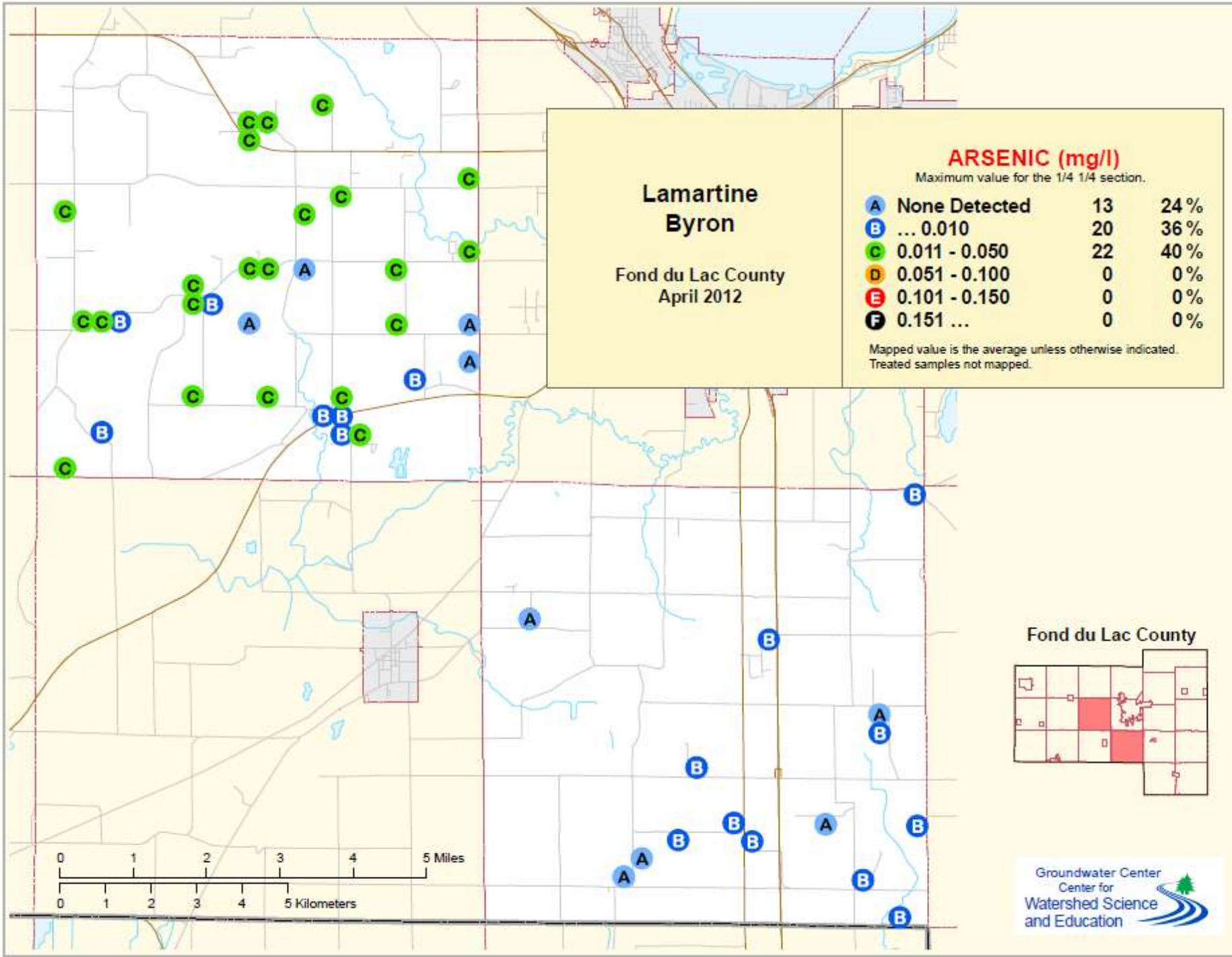
Arsenic

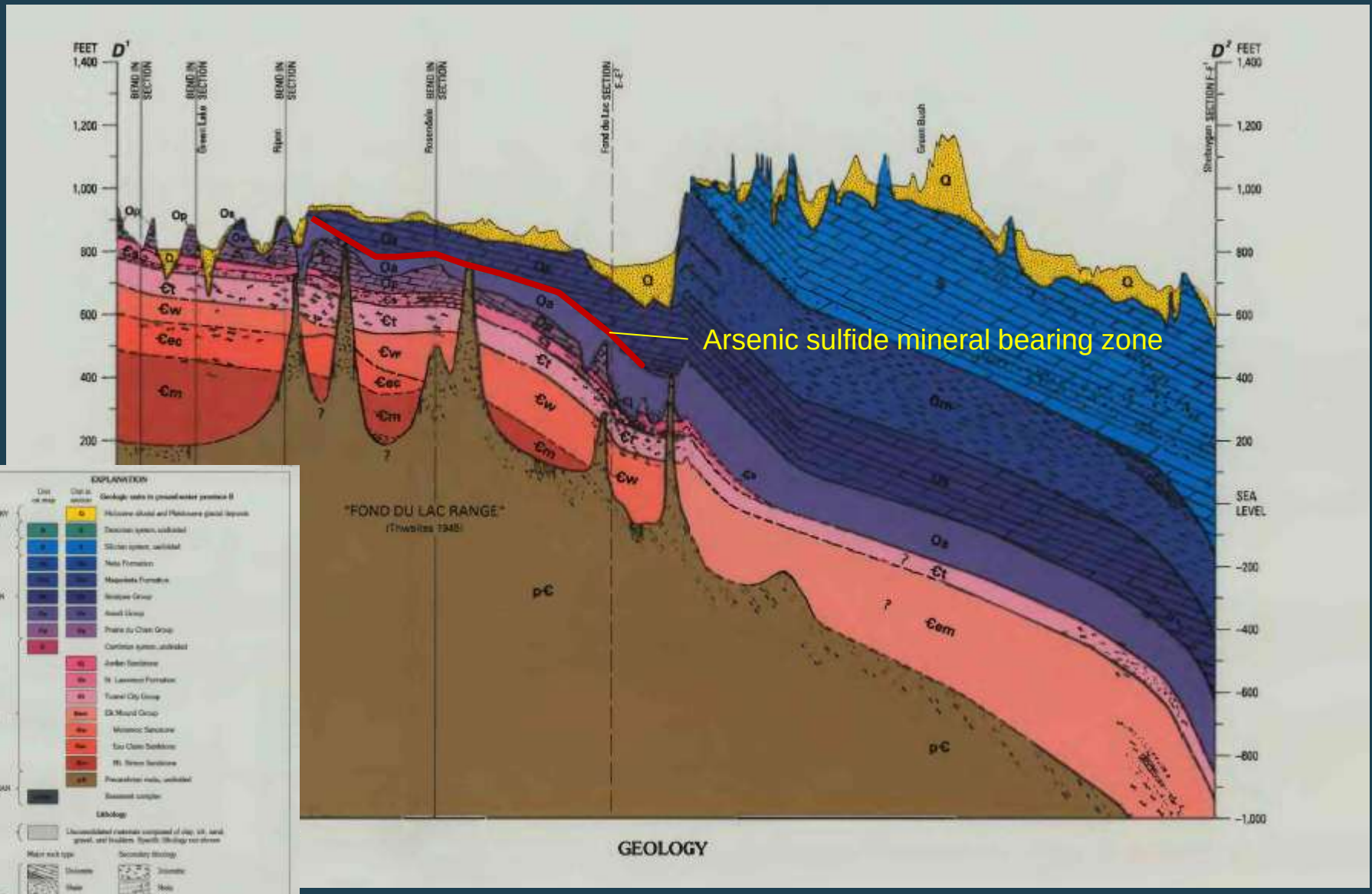
- Sources: Naturally occurring in mineral deposits
- Standard: 0.010 mg/L (10 ppb)

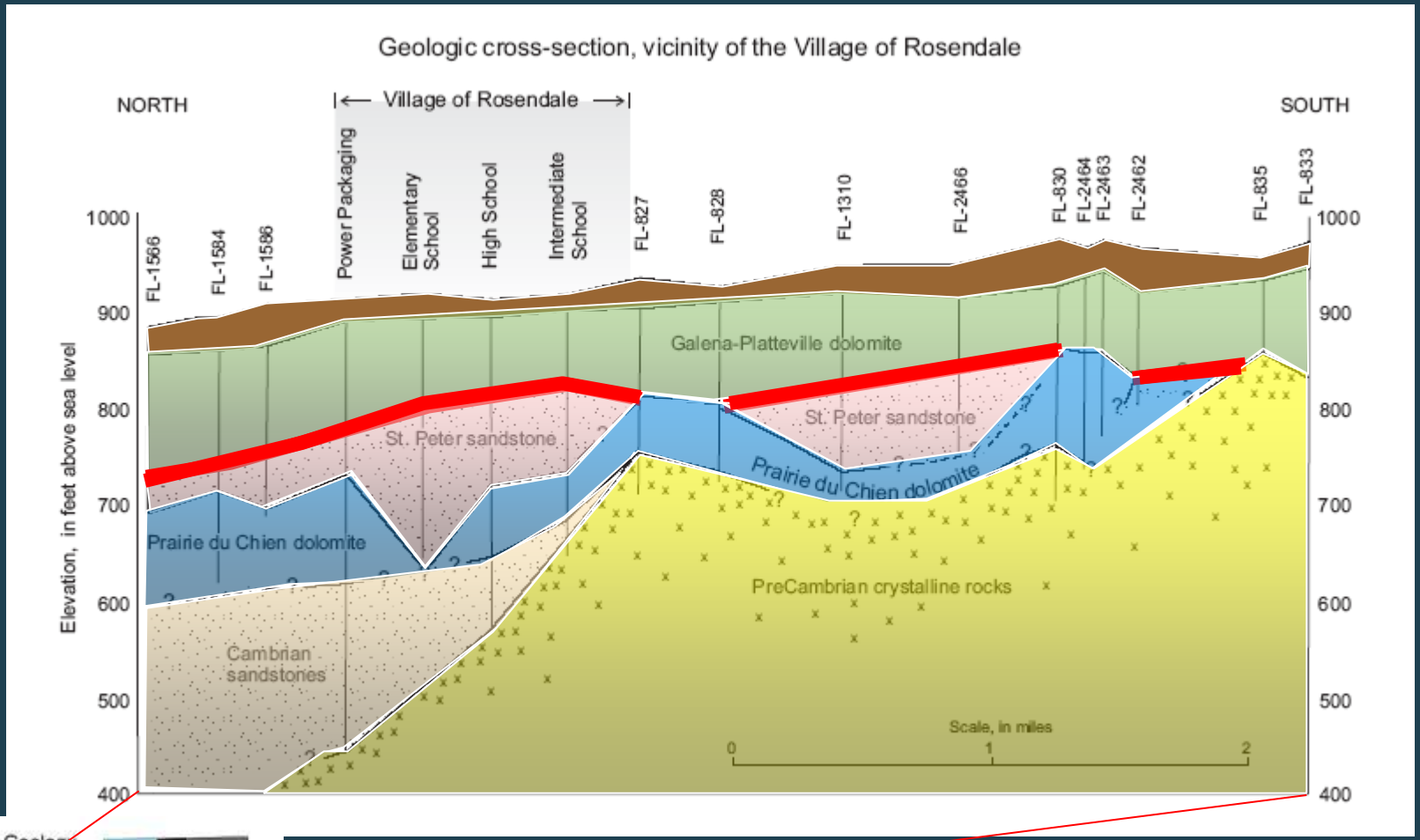
Health Effects:

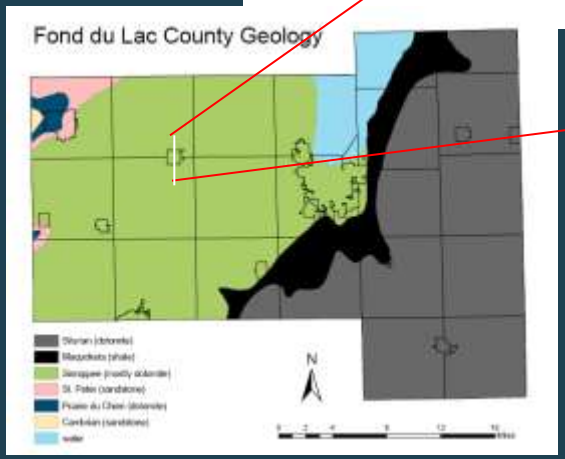
- Increased risk of skin cancers as well as lung, liver, bladder, kidney, and colon cancers.
- Circulatory disorders
- Stomach pain, nausea, diarrhea
- Unusual skin pigmentation




Lamartine
Byron
Fond du Lac County
April 2012
ARSENIC (mg/l)
Maximum value for the 1/4 1/4 section.
A None Detected 13 24 %
B ... 0.010 20 36 %
C 0.011 - 0.050 22 40 %
D 0.051 - 0.100 0 0 %
E 0.101 - 0.150 0 0 %
F 0.151 ... 0 0 %
Mapped value is the average unless otherwise indicated.
Treated samples not mapped.
Fond du Lac County
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Groundwater Center
Center for
Watershed Science
and Education


FEET
D¹
1,400
1,200
1,000
800
600
400
200
BEND IN SECTION
Green Lake SECTION
Ripon
Rosendale
Fond du Lac SECTION E-E²
Green Bush
Sheboygan SECTION F-F¹
D²
Arsenic sulfide mineral bearing zone
"FOND DU LAC RANGE"
(Thwaites 1948)
SEA LEVEL
-200
-400
-600
-800
-1,000
pC
GEOLOGY





Wisconsin Geological and Natural History Survey

Arsenic Summary

- The likely source of the arsenic is the St. Peter Sandstone.
- Due to the presence of the Precambrian highs from the underlying Fond du Lac Range, it would not be practical to have a deeper casing depth/deeper well requirement. (Set your casing and then hit granite--no water!)
- Test annually for the next couple of years to see if concentration is going up.
- Our best recommendation at this time would be treatment.
  - *Iron filter followed up with a Reverse Osmosis system.*

http://dsps.wi.gov/sb_ppalopp/disclaimer1.phtml/c/270

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..

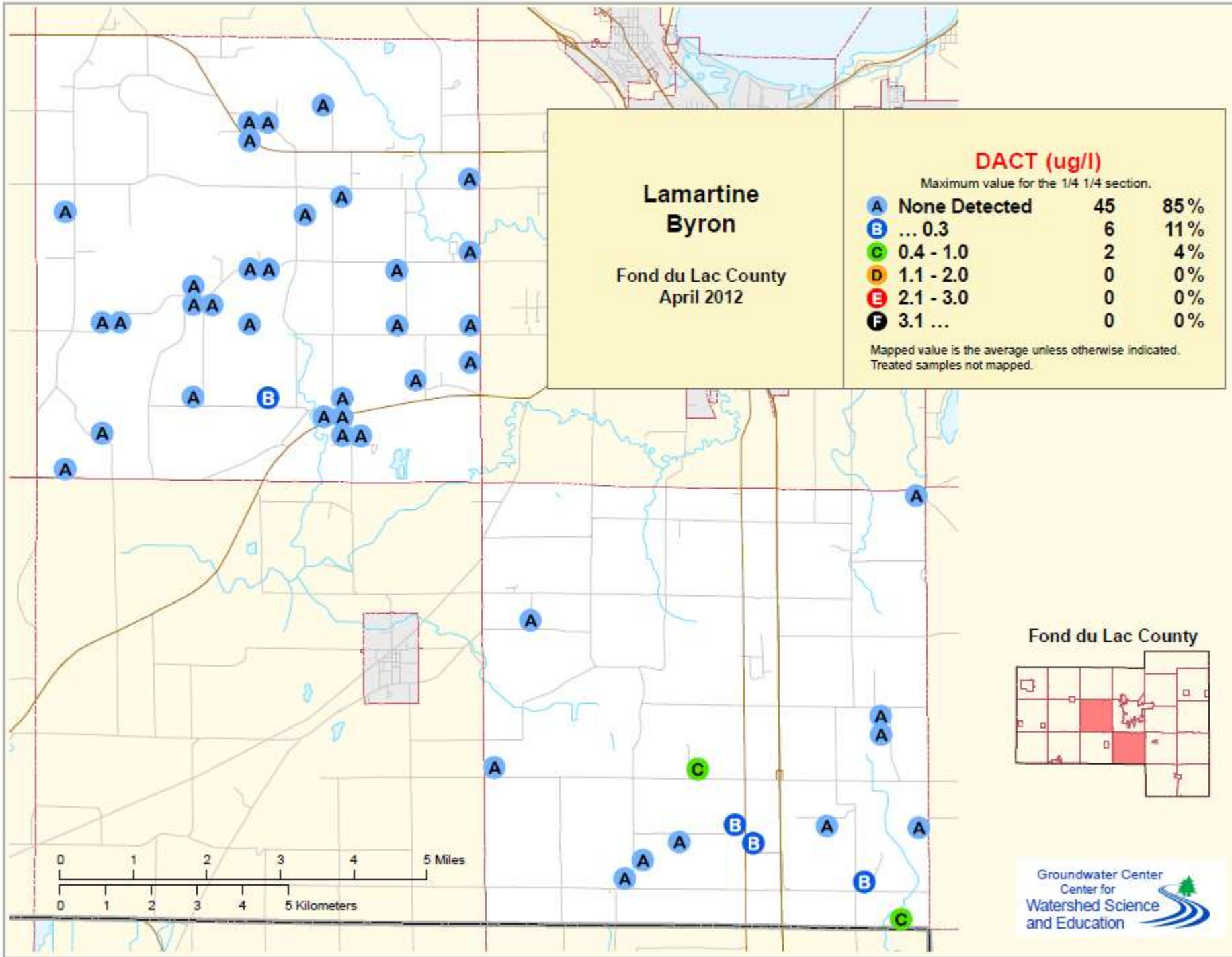
- Most frequently detected pesticides in WI:
  - Alachlor* and its chemical breakdown products
  - Metolachlor and its chemical breakdown products
  - Atrazine** and its chemical breakdown products
  - Metribuzin
  - Cyanazine and its chemical breakdown products.

- * 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)


Lamartine
Byron
Fond du Lac County
April 2012
DACT (ug/l)
Maximum value for the 1/4 1/4 section.
A None Detected 45 85%
B ... 0.3 6 11%
C 0.4 - 1.0 2 4%
D 1.1 - 2.0 0 0%
E 2.1 - 3.0 0 0%
F 3.1 ... 0 0%
Mapped value is the average unless otherwise indicated.
Treated samples not mapped.
Fond du Lac County
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
Groundwater Center
Center for
Watershed Science
and Education

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:

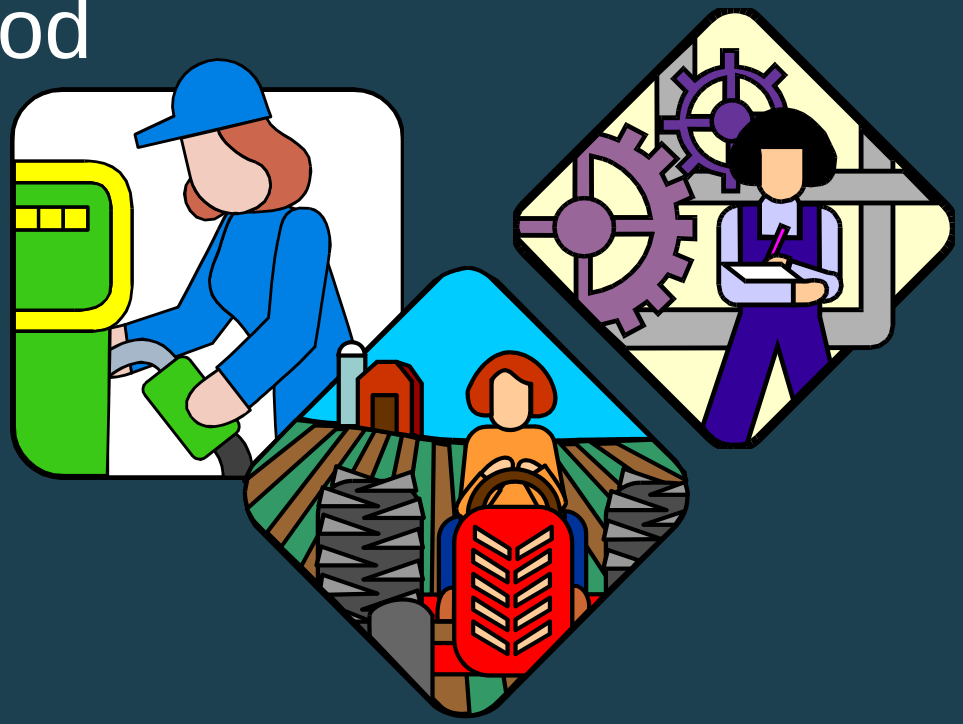
    http://dsps.wi.gov/sb_ppalopp/disclaimer1.phtml/c/270

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.

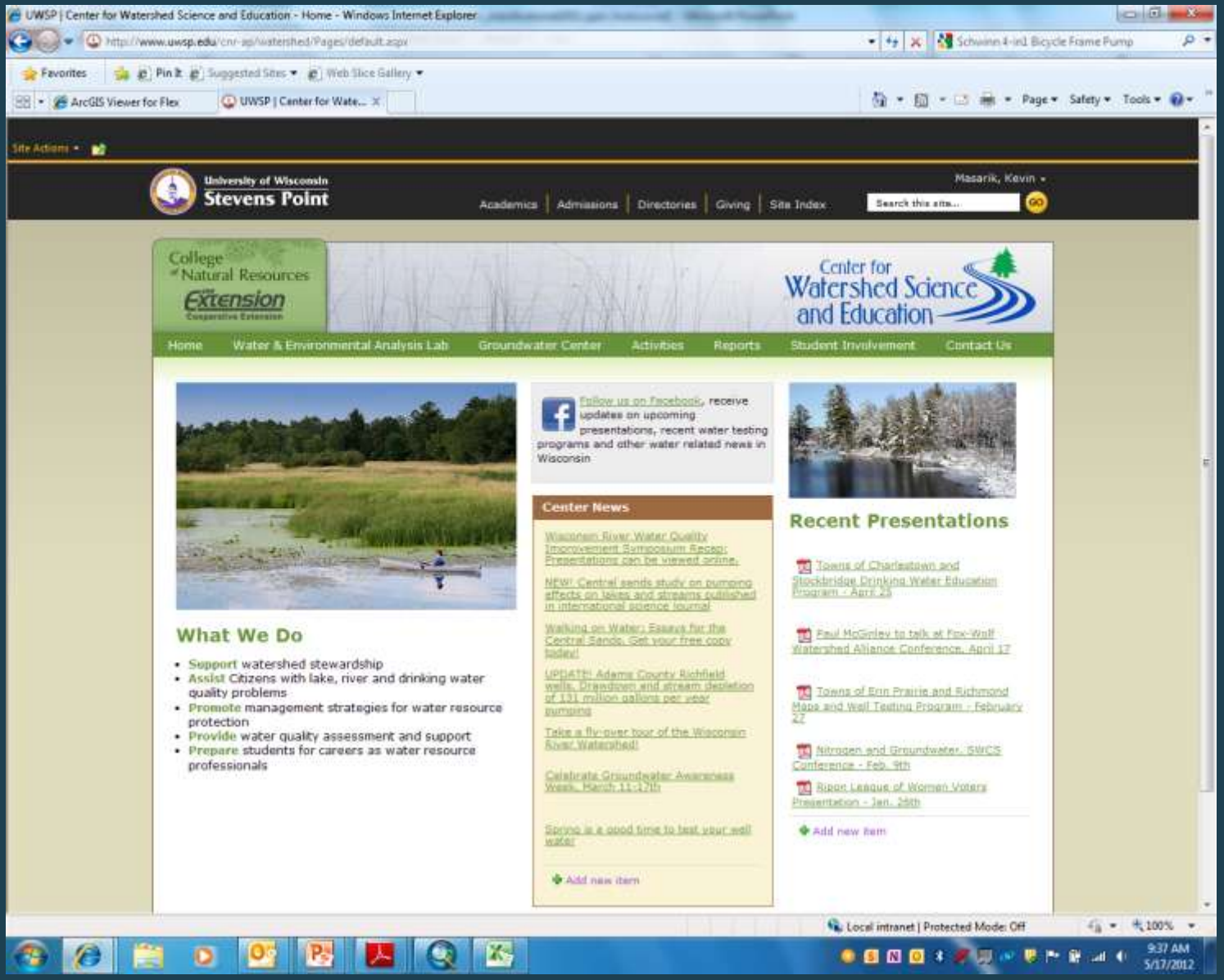
Next Steps

- Test for known or potential contaminants in your neighborhood
  - Gasoline?
  - Pesticides?
  - Solvents?



Check for known contamination sites in Fond du Lac County at:
http://dnr.wi.gov/org/aw/rr/gis/index.htm

www.uwsp.edu/cnr-ap/watershed



Thanks to the following for helping sponsor this program:

- **Towns of Byron and Lamartine**
- **Fond du Lac County UW-Extension**
- **Fond du Lac County Health Dept.**

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Center for Watershed Science and Education
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715-346-4276
kmasarik@uwsp.edu

www.uwsp.edu/cnr/watersheds

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