

Fond du Lac Community Drinking Water Program

Taycheedah, Empire and Eden

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

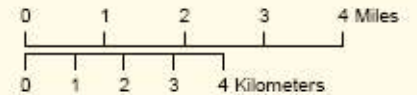
- Groundwater Basics: Where does my water come from
- Well Construction
- What do my individual test results mean?
- General groundwater quality in the Towns of Taycheedah, Eden and Empire.
- Improving your water quality



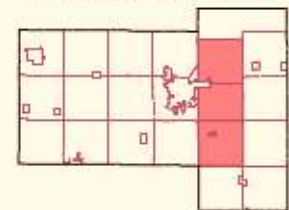
Taycheedah - Empire Eden

Fond du Lac County March 2010

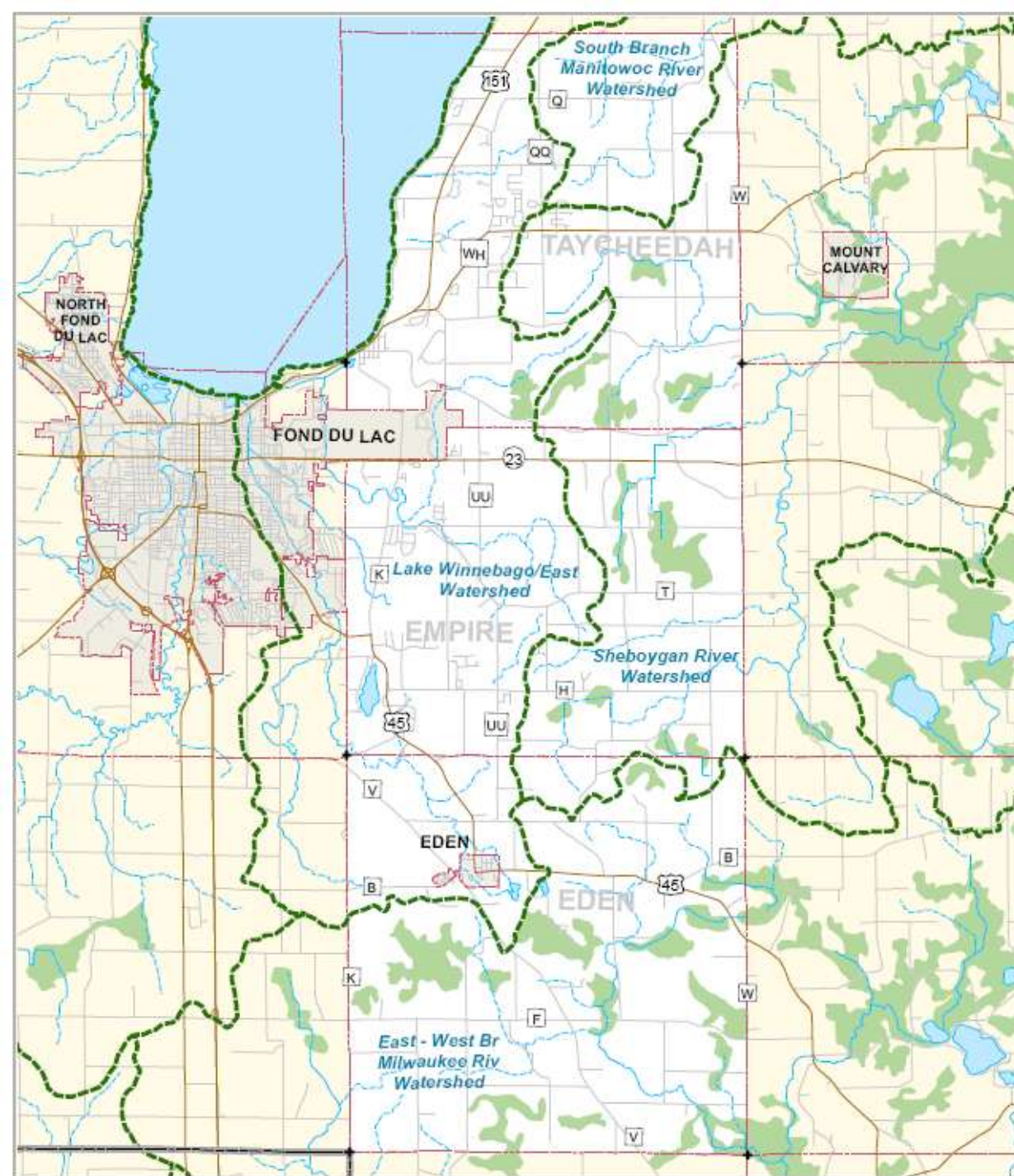
-  Watershed Boundary
-  Streams
-  Lakes/Reservoirs
-  Wetlands
-  State/US Highways
-  Other Roads
-  Town Boundaries
-  Municipalities



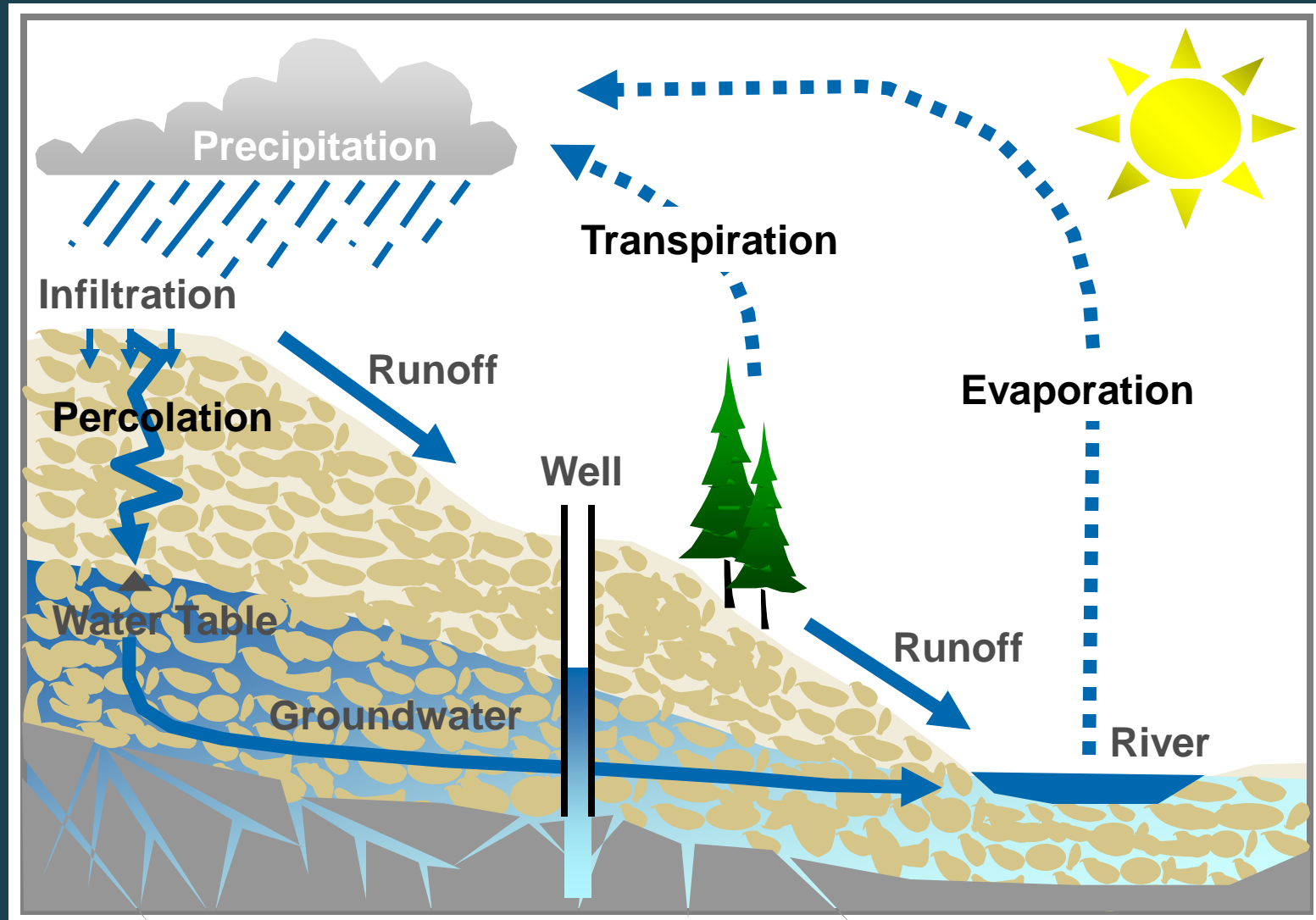
Fond du Lac County



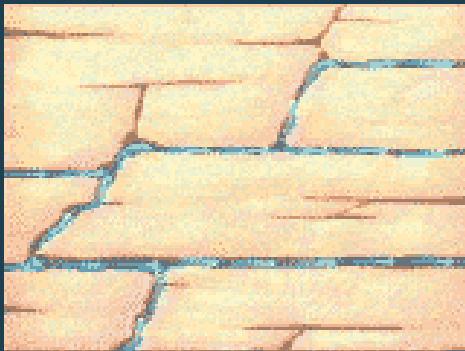
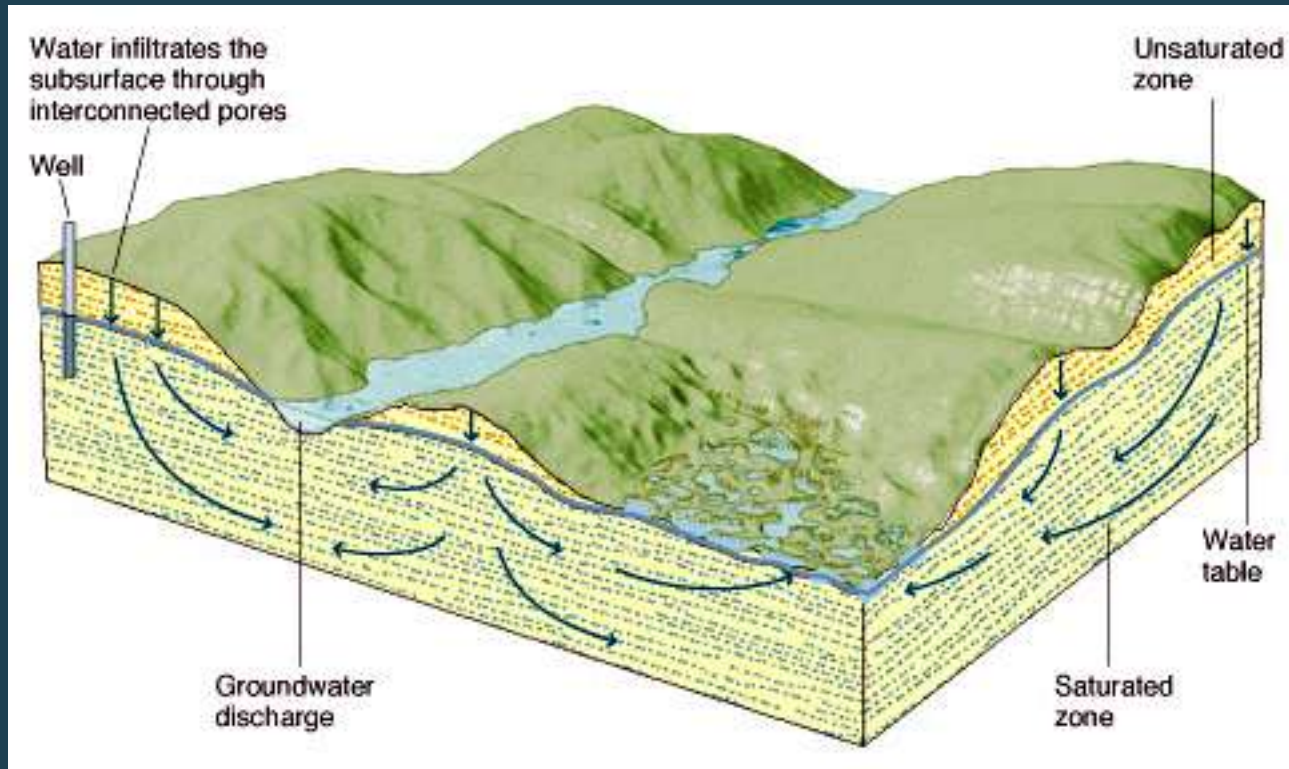
Groundwater Center
Center for
Watershed Science
and Education

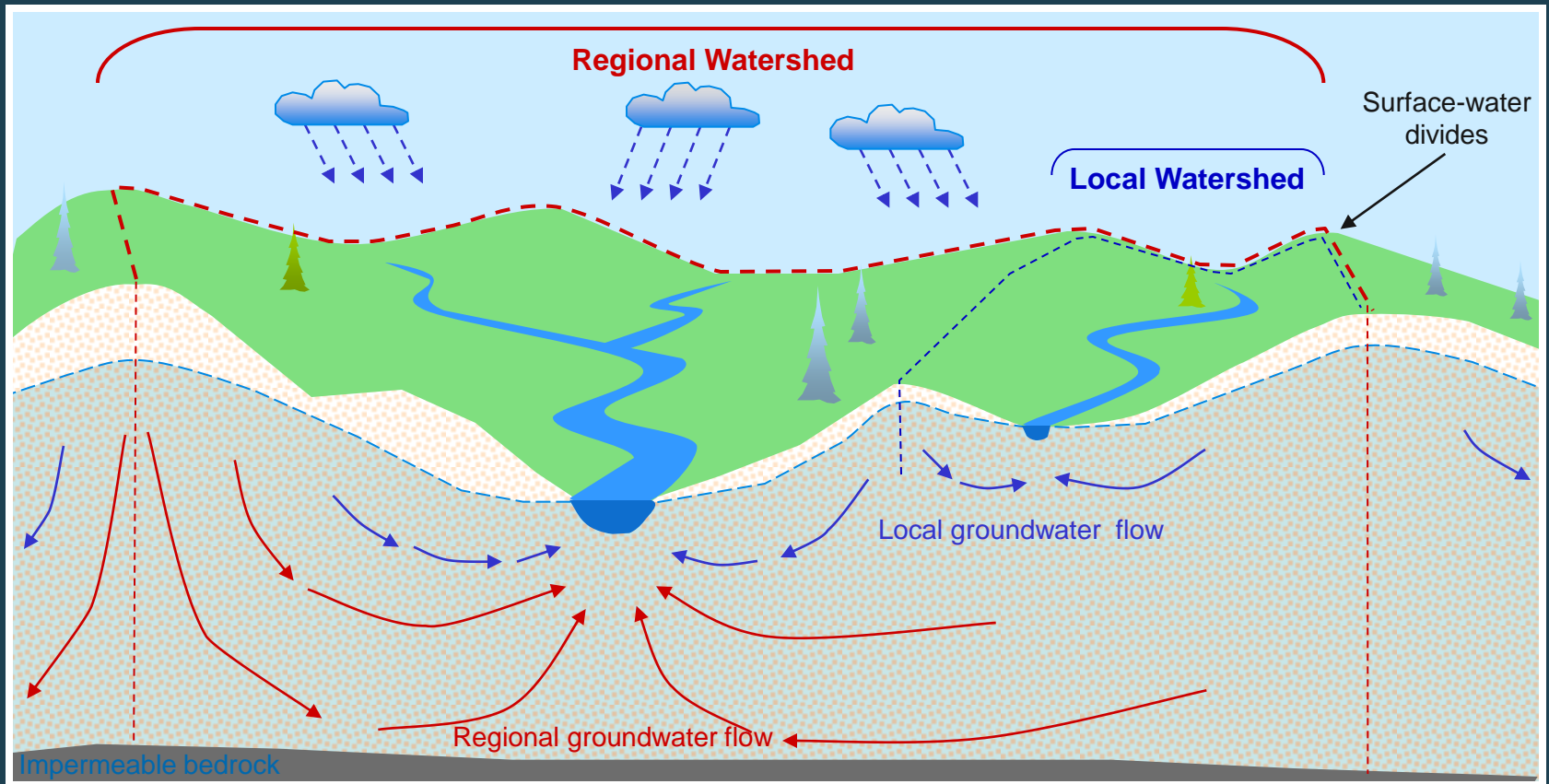


The Water Cycle



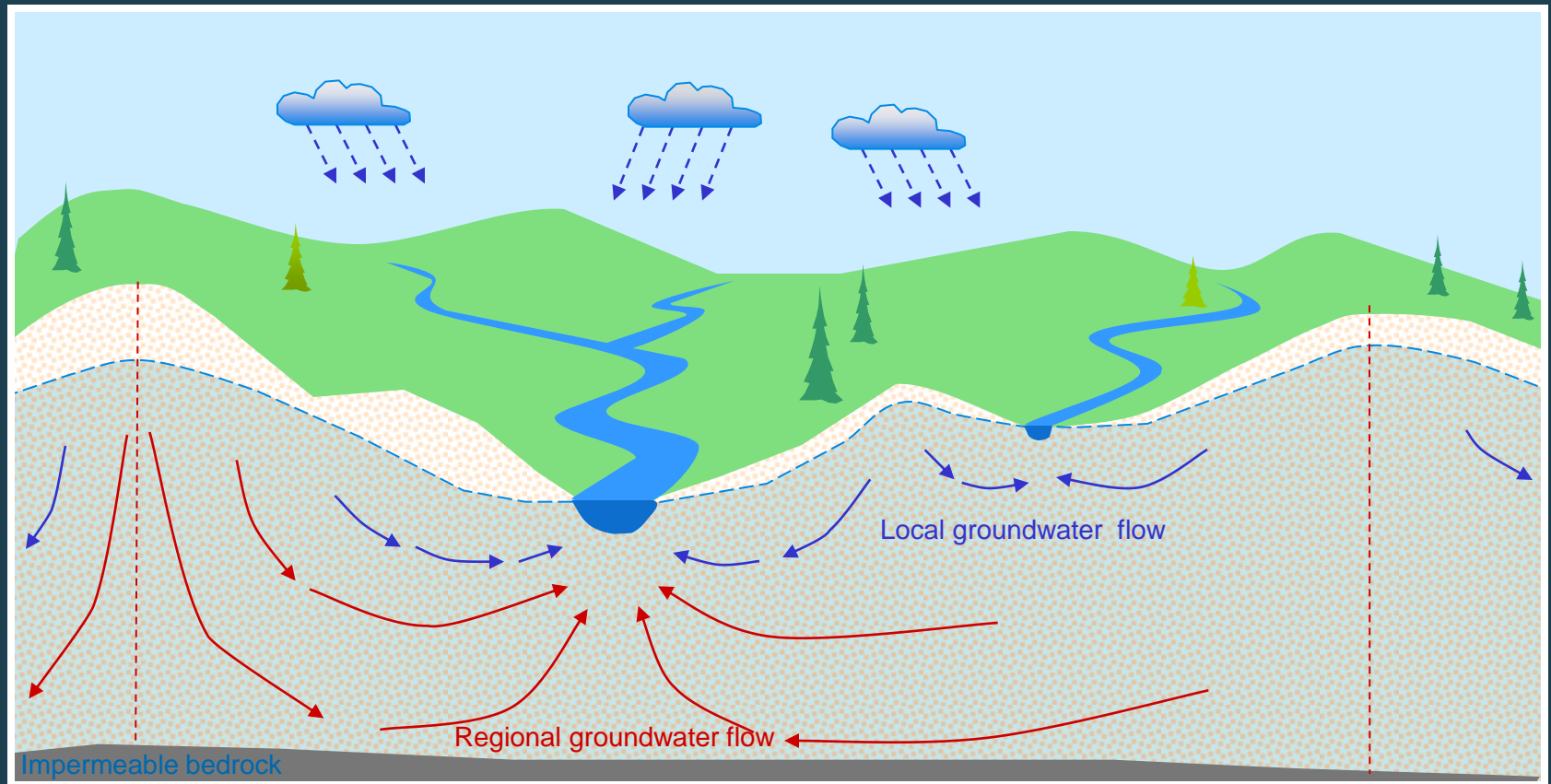
Groundwater Movement



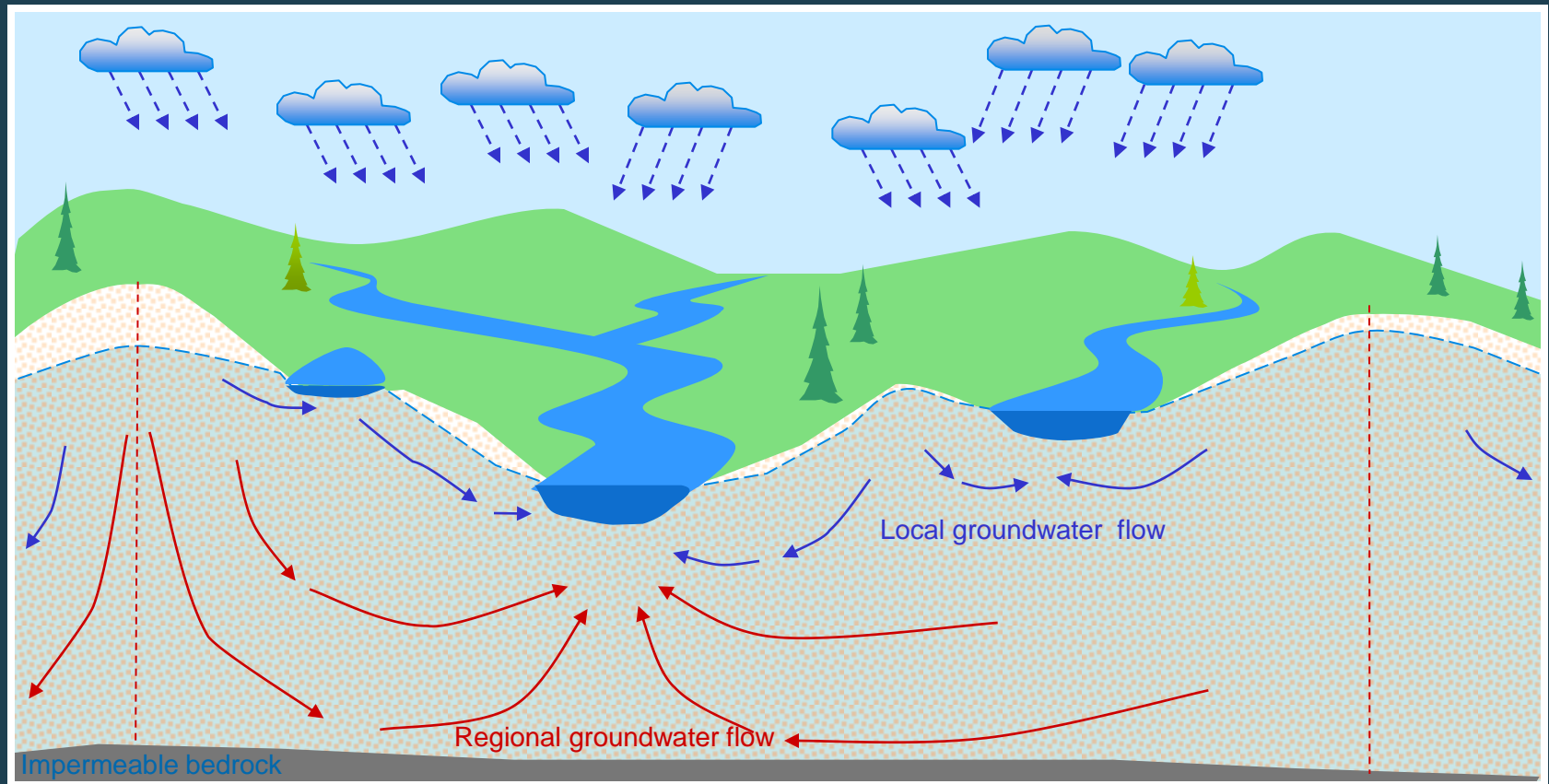


- Water converges at discharge locations
- Rivers and streams act like a drain for water to exit a watershed

What happens when we have more rain?

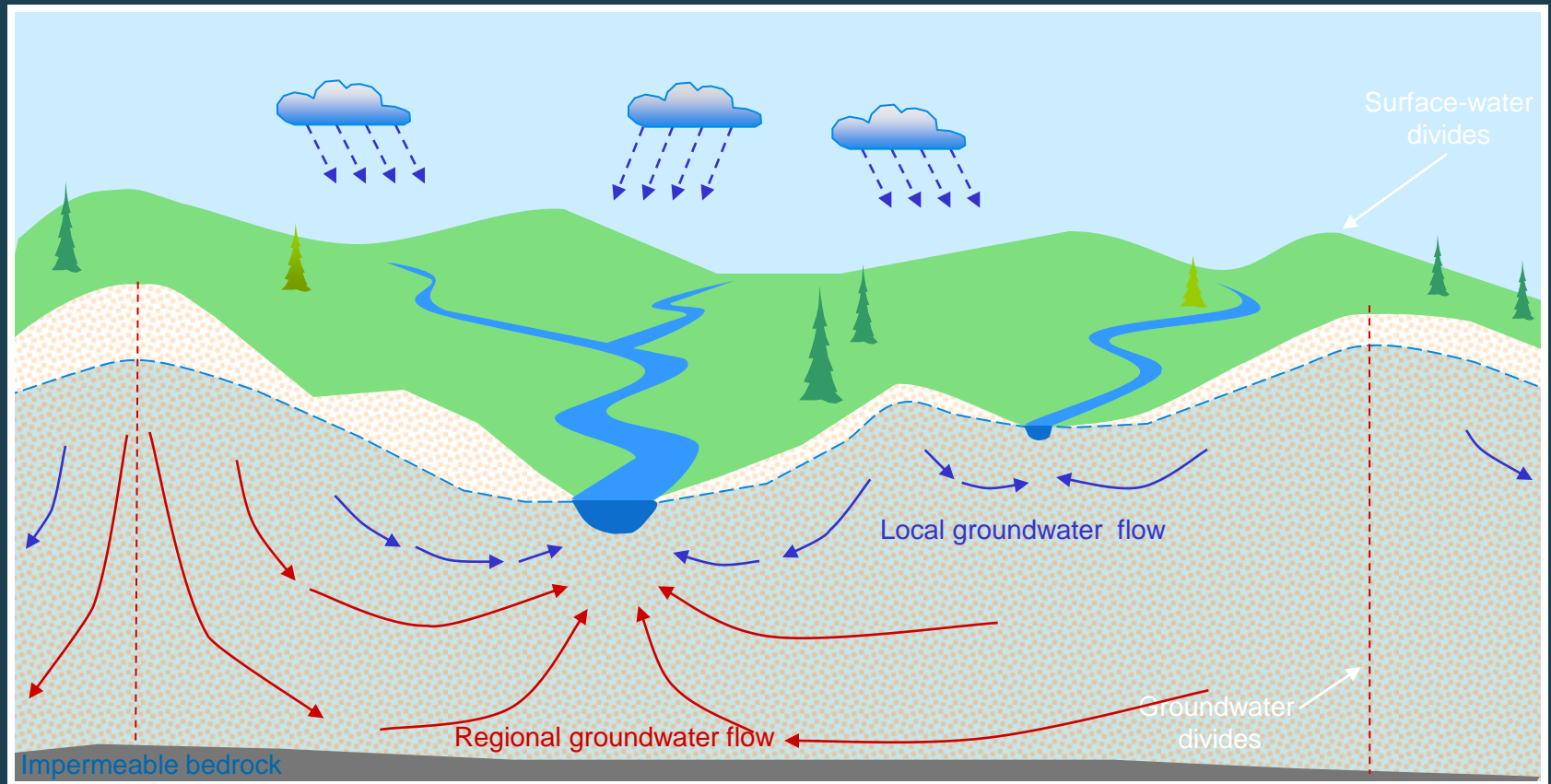


What happens when we have more rain?

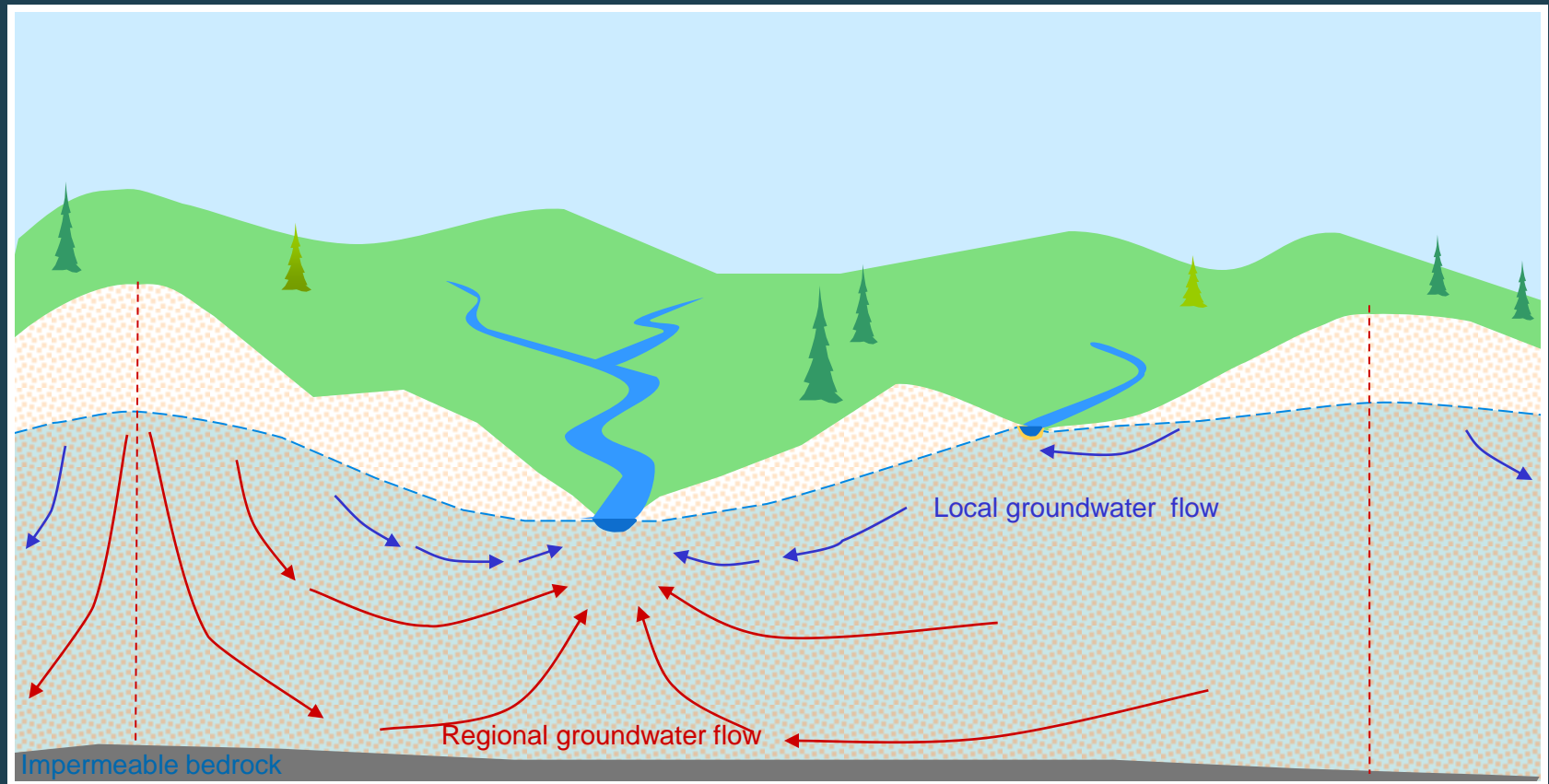


- More infiltration
- Groundwater levels rise
- More water in rivers, lakes and streams

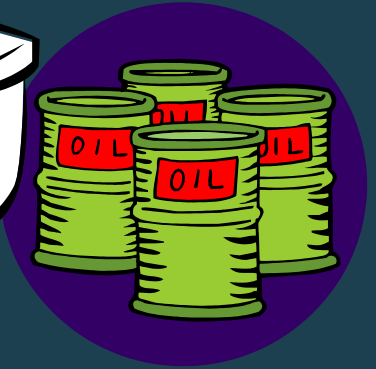
What happens when we have less rain?



What happens when we have less rain?



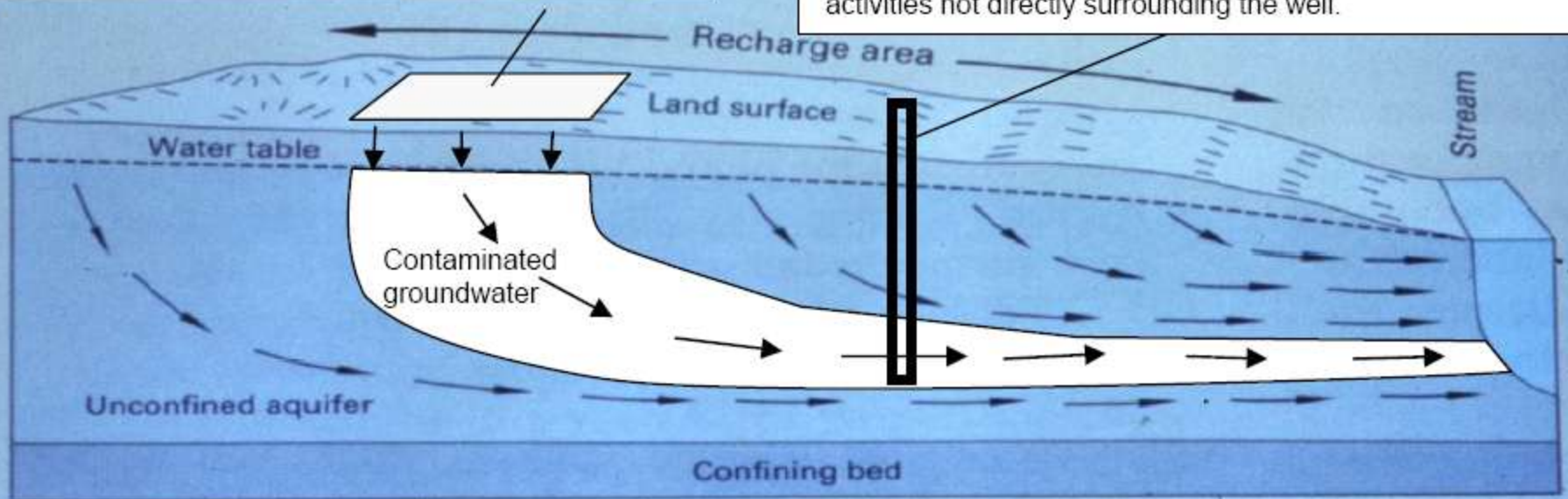
- Less infiltration
- Groundwater levels start to go down
- Less water in rivers, lakes and streams



Soil

Land-use activity that pollutes groundwater.

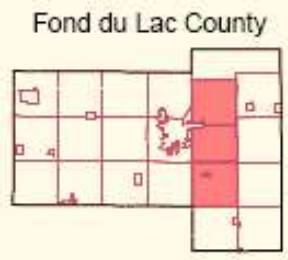
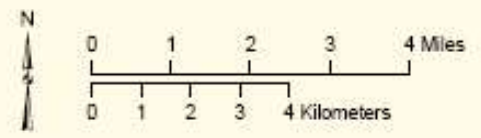
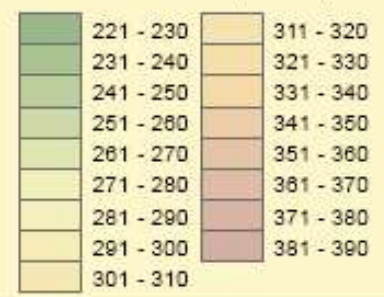
Because groundwater moves, wells located far from the contamination source can sometimes be polluted from activities not directly surrounding the well.



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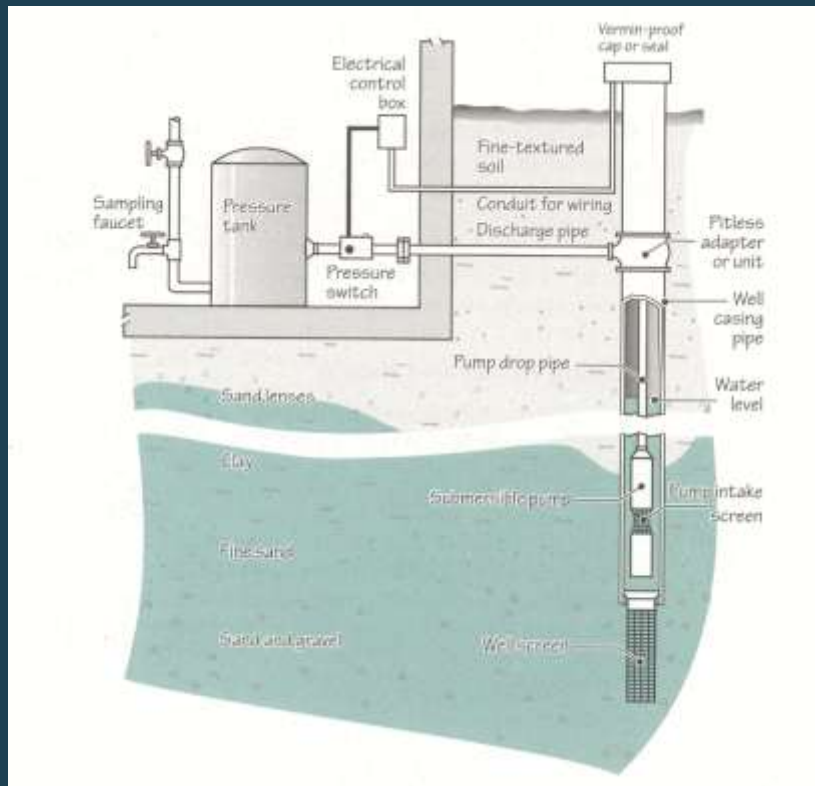
Fond du Lac County March 2010

Elevation: (meters)



Types of Wells

Drilled Well



Driven Point Well

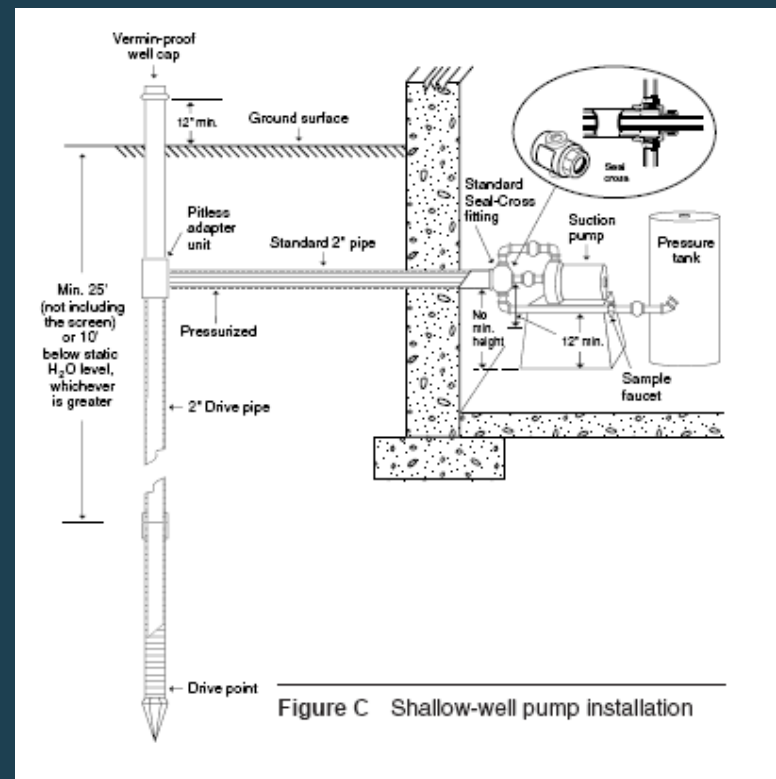
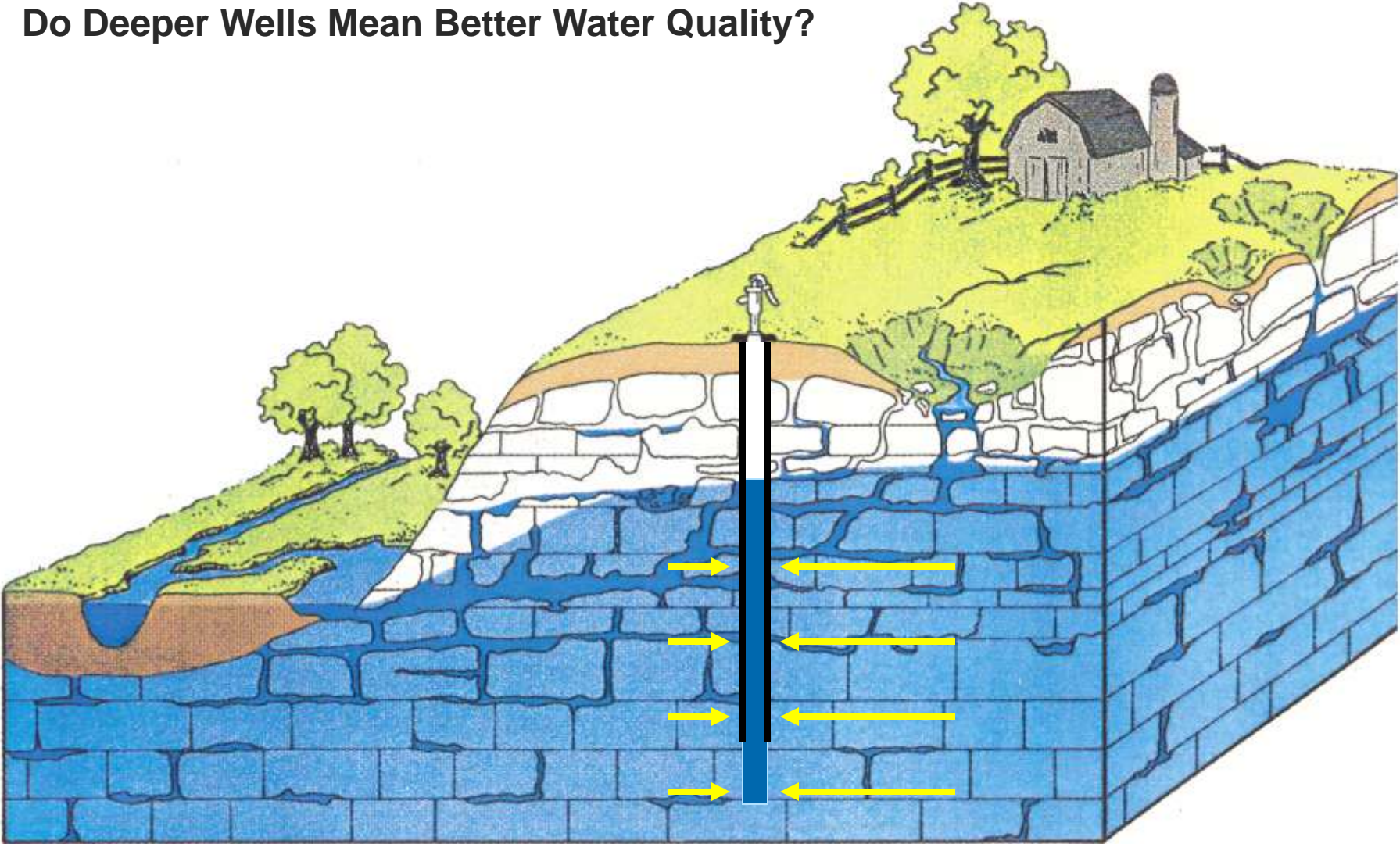
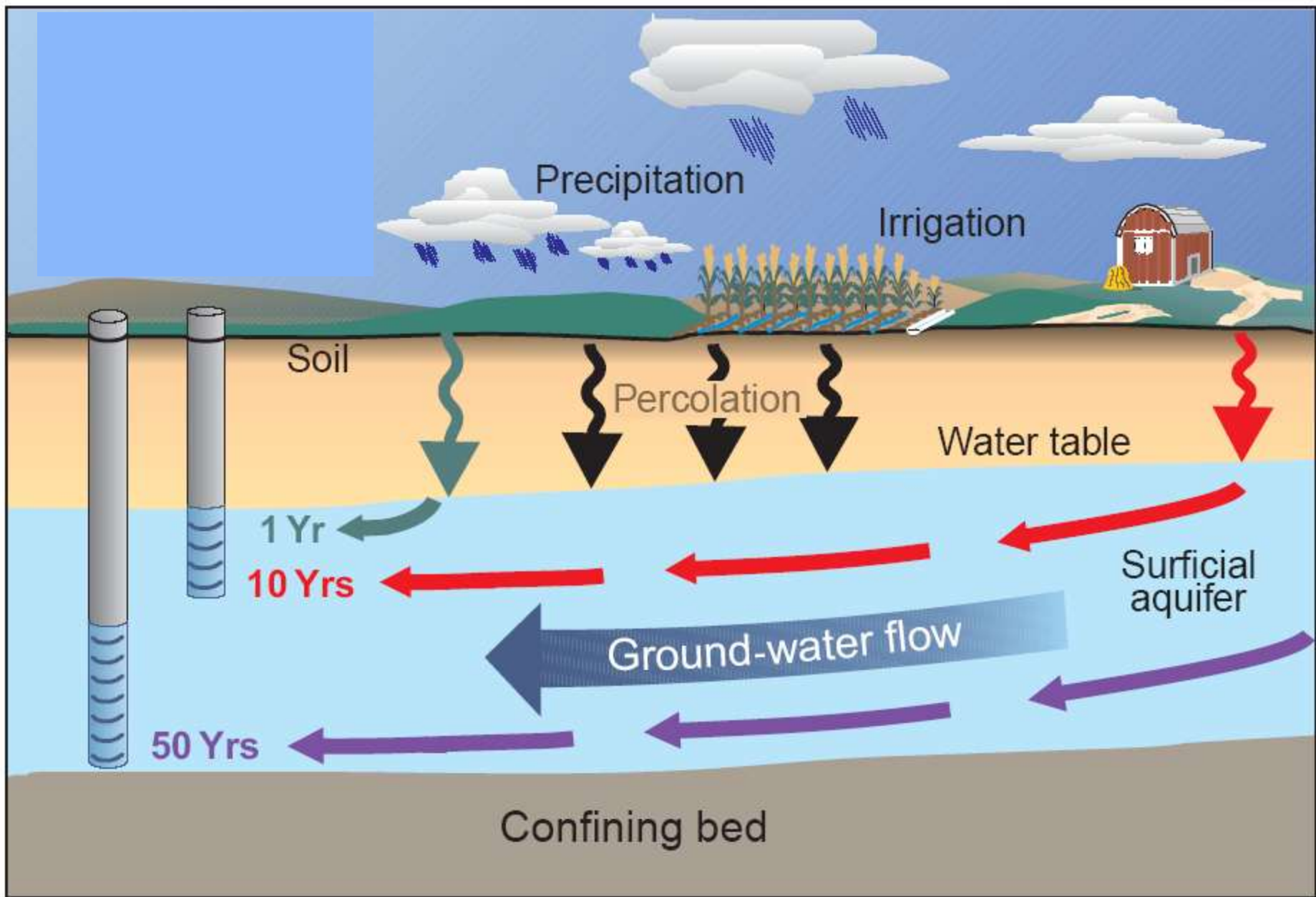


Figure C Shallow-well pump installation

Do Deeper Wells Mean Better Water Quality?





Well Construction Report For
WISCONSIN UNIQUE WELL NUMBER CC 566

Property Owner: Clyde Nuenfeldt Telephone Number: _____
 Mailing Address: Rt 4
 City: Oshkosh State: WI Zip Code: _____
 County of Well Location: Waushara Parcel No.: W Well Completion Date: 9/2/89

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

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

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

2. Mark well location in correct 40-acre parcel of section.
 N
 W E
 S E
 Gov't Lot # _____ or NE 1/4 of NE 1/4 of Section 34; T 19 N; R 10 E; W _____
 3. Well Type New Replacement Reconstruction
 of unique well # _____ constructed in 19 _____
 Reason for use, replaced or reconstructed well? _____

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

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

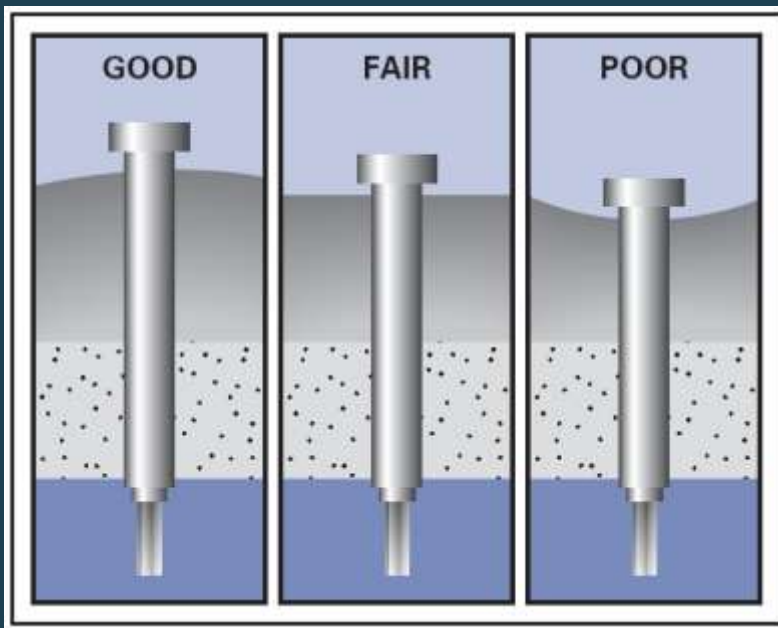
6. Driftless Dimensions	Method of constructing upper enlarged drillhole only.	From (ft.)	To (ft.)	Geology	From (ft.)	To (ft.)
10 surface	<input type="checkbox"/> 1. Rotary - Mud Circulation	140		Clay	surface	12
6	<input type="checkbox"/> 2. Rotary - Air			Sandy clay	18	66
	<input type="checkbox"/> 3. 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	From (ft.)	To (ft.)
6	New Black 18.95	surface	66

8. Static Water Level 10 ft. above ground level 10 ft. below ground surface
 12. Well Is Above Below Grade
 Developed? Yes No
 Disinfected? Yes No
 Capped? Yes No

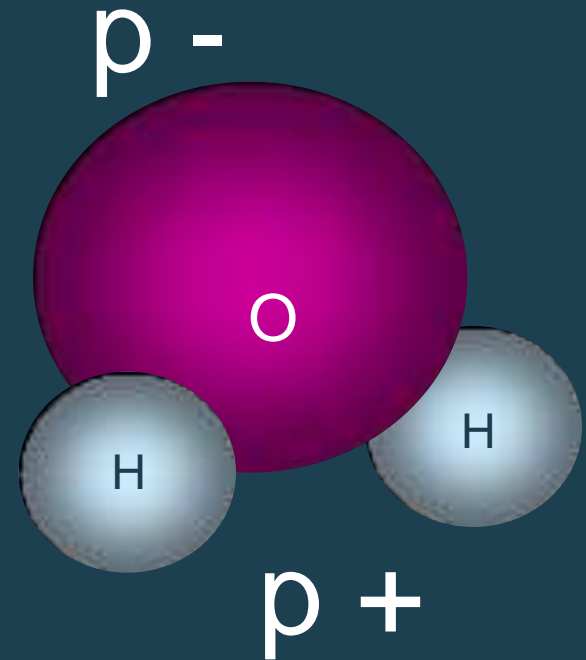
9. Grout or Other Sealing Material
 Method: _____ From (ft.): _____ To (ft.): _____ Sacks Cement: _____
 Kind of Sealing Material: Slurry clay + drillings From (ft.): surface To (ft.): 66
 13. Did you permanently seal all unused, noncomplying, or unsafe wells? Yes No If no, explain _____
 14. Signature of Point Driver or Registered Driller: _____ Date Signed: _____
 Signature of Drill Rig Operator: _____ Date Signed: _____

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



water basics

- “Universal Solvent”
- Naturally has “stuff” dissolved in it.
 - Impurities depend on rocks, minerals, land-use, plumbing, packaging, and other materials that water comes in contact with.
- Can also treat water to take “stuff” out



Interpreting Drinking Water Test Results

Tests important to health:

- Bacteria
- Sodium
- Nitrate
- Copper
- Lead
- Triazine
- Zinc
- Sulfate
- Arsenic

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

- Hardness
- Iron
- Manganese
- Chloride

Other important indicator tests:

- Saturation Index
- Alkalinity
- Conductivity
- Potassium

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

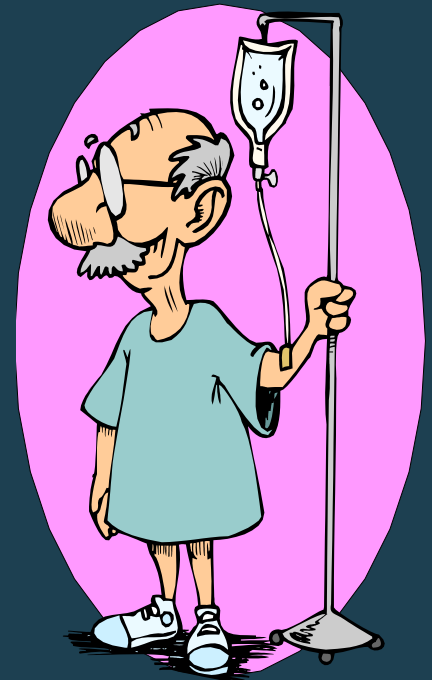
What are the Health Concerns?

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

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

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

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



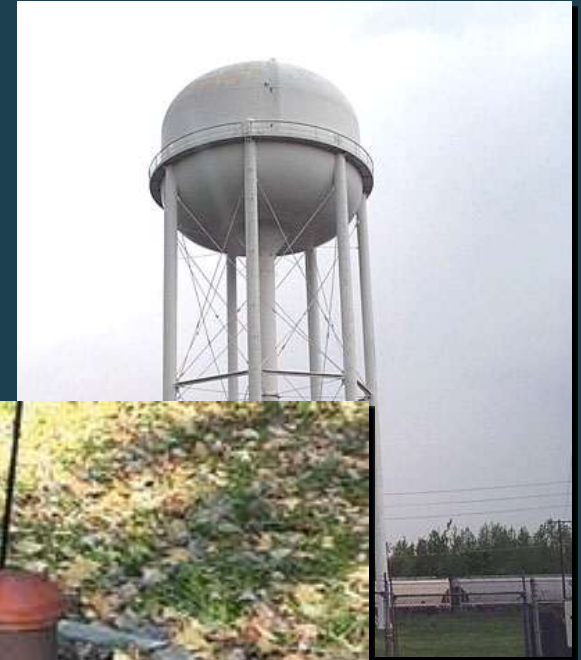
Private vs. Public Water Supplies

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.



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.



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

Tests for Drinking Water from Private Wells

Why should I test my well?

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

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

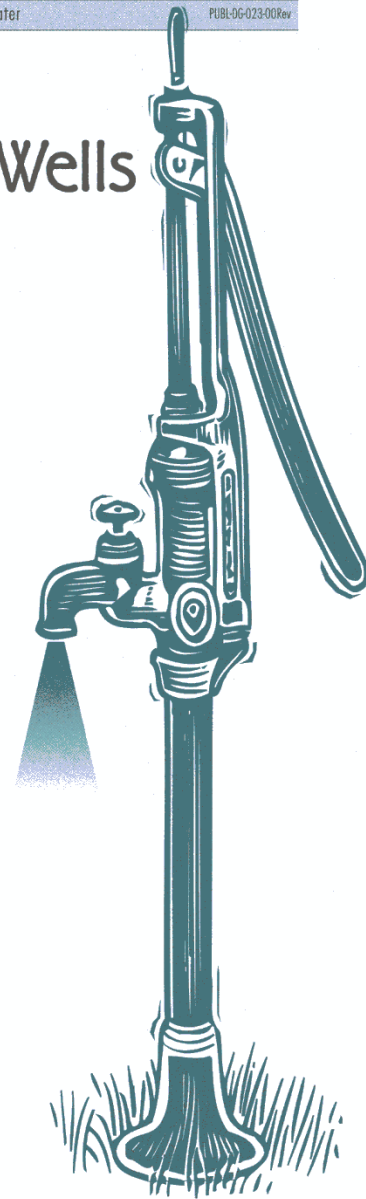
This brochure gives information about several common contaminants found in private wells. It should help you decide when to sample your well and how often, how to find a certified laboratory and who to call for help.

What tests should be done on my water?

Total Coliform Bacteria and E.coli

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

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

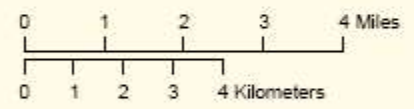
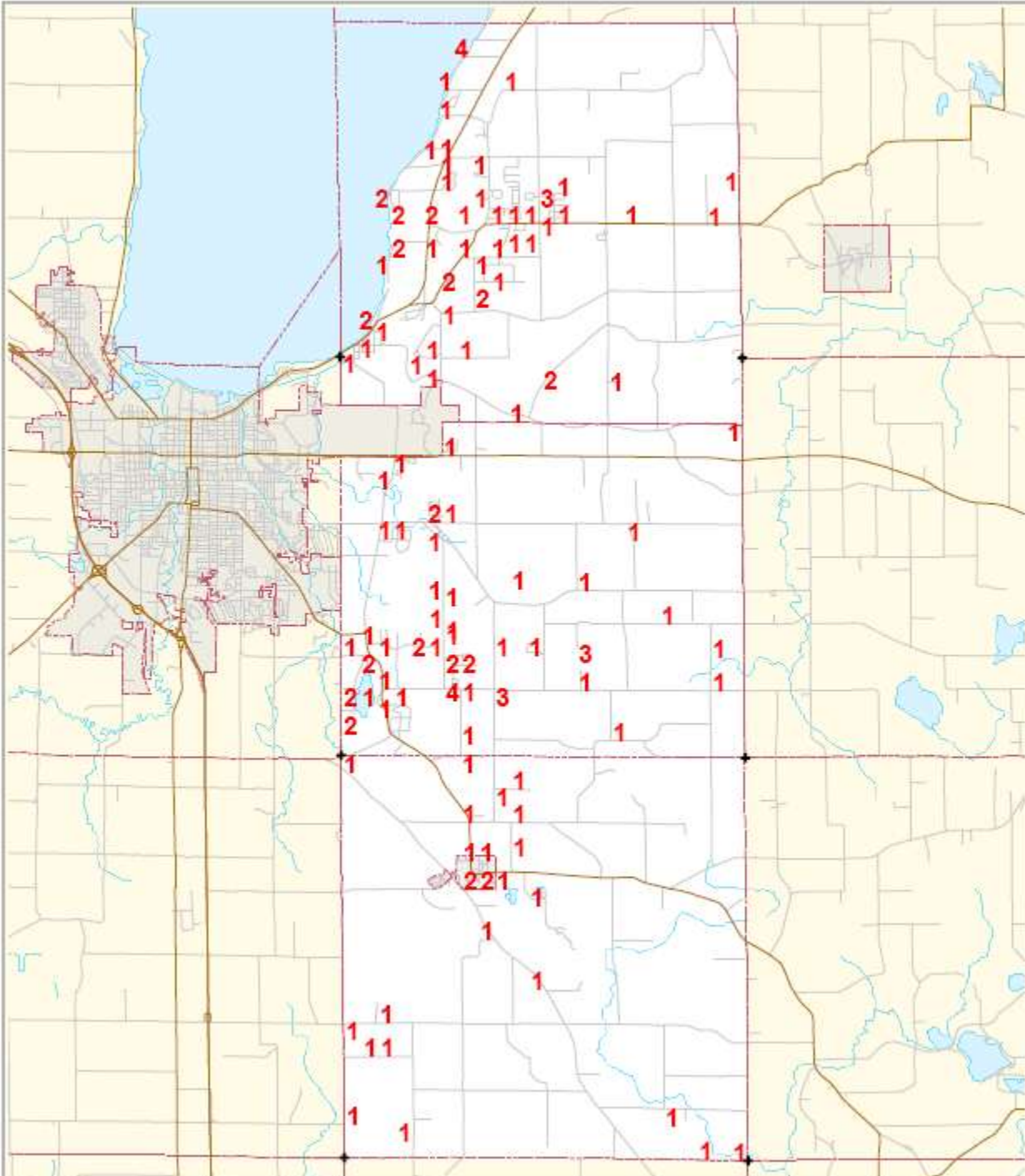


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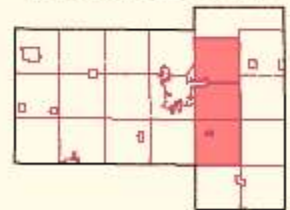
Fond du Lac County March 2010

SAMPLE DISTRIBUTION

NUMBER OF SAMPLES
per 1/4 1/4 SECTION



Fond du Lac County



Sample ID:
 Lab Number:
 Group: FDL/DODGE CO 08NOV

Occupant:	Owner:	Mailing:
Last	Last	Last
F/MI	F/MI	F/MI
Add	Add	Add
City	City	City
State WI Zip	State Zip	State Zip
Phone	Phone	Phone
Yrs Residence 31	Yrs Ownership	No. Wells: NA
Well Construction:	Last Water Quality Test:	Sample Taken:
Date un	Date un	Date 11/17/08
Drill Un	Lab un	Time 16:00
Add	For un	Treatment Systems:
Casing Diam: NA in	Well Location:	Softener? Yes
Method:	County FOND DU LAC	Other
Depth:	Twnshp Waupun	Tap Samples:
of Casing NA ft	Legal	Tap Loc Kitchen, pump
to Water NA ft	SWSW S27 T14N R15E	Before Treat Yes
of Well NA ft	Map Coord 0: 0	Well Depth Changed No
Distance To:	Water Source:	Date Change
Septic Tank NA ft	Private	Problems Observed:
Tile Field NA ft	Other	Color Taste Corr
Seepage Pit NA ft		Odor Health None x
Oth		Oth

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

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

Laboratory Results:

Parameter	Qualifier	Result	Units
Homeowners Package:			
Bacteria-Coliform		Present	(see note below)
Hardness-Total		520	mg/l CaCO3
Alkalinity		312	mg/l CaCO3
Conductivity		1012	umhos/cm
pH		7.82	std units
Saturation Index		0.9	(Corrosivity Balanced)
Nitrogen-Nitrate/Nitrite	Less Than	0.1	mg/l N (None Detected)
Chloride		104.0	mg/l
Homeowners Metal Package:			
Arsenic (VISTA-ICP-0.003)	Less Than	0.003	mg/l (None Detected)
Calcium (VISTA-ICP)		0.7	mg/l
Copper (VISTA-ICP)		0.461	mg/l
Iron (VISTA-ICP)		0.005	mg/l
Lead (VISTA-ICP)		0.006	mg/l
Magnesium (VISTA-ICP)		0.3	mg/l
Manganese (VISTA-ICP)	Less Than	0.001	mg/l (None Detected)
Potassium (VISTA-ICP)		0.6	mg/l
Sodium (VISTA-ICP)		248.9	mg/l
Sulfate (VISTA-ICP)		88.1	mg/l
Zinc (VISTA-ICP)		0.105	mg/l

(Continued)

Coliform bacteria

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



Present = Unsafe

Absent = Safe

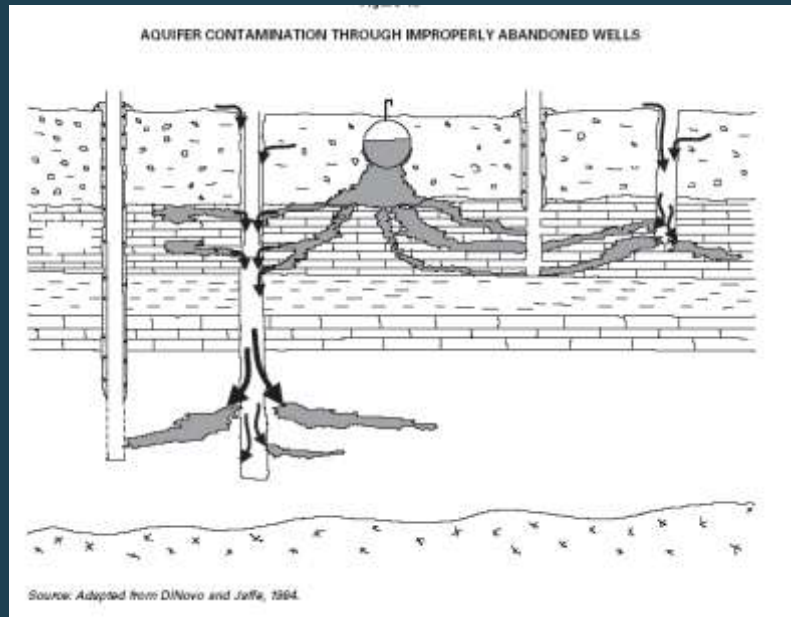
If coliform bacteria was detected, we also checked for e.coli bacteria test

- 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.

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

Contaminants	Sources	Symptoms
BACTERIA		
<p><i>Escherichia coliform (E. coli)</i> <i>Salmonella</i> <i>Campylobacter</i> <i>E. coli O157</i> (Requires a special water test for detection. Causes similar, but more serious illness than other E.coli strains. Requires medical treatment.)</p> <hr/> <p><i>Leptosporidia</i></p>	<ul style="list-style-type: none"> • Infected human and animal feces • Manure • Septic systems • Sewage <hr/> <ul style="list-style-type: none"> • Urine of livestock, dogs and wildlife • Manure 	<ul style="list-style-type: none"> • Gastrointestinal illness • Low-grade fever • Begins 12 hrs - 7 days after exposure <hr/> <ul style="list-style-type: none"> • High fever, severe headache and red eyes • Gastrointestinal illness • Begins 2-28 days after exposure
MICROSCOPIC PARASITES		
<p><i>Cryptosporidia</i> <i>Giardia</i></p>	<ul style="list-style-type: none"> • Infected human and animal feces • Manure • Septic systems • Sewage 	<ul style="list-style-type: none"> • Gastrointestinal illness • Begins 2-14 days after exposure
VIRUSES		
<p>Norovirus</p>	<ul style="list-style-type: none"> • Infected human feces and vomit • Septic systems • Sewage 	<ul style="list-style-type: none"> • Gastrointestinal illness • Low-grade fever & headache • Begins 12-48 hrs after exposure
CHEMICALS		
<p>Nitrate</p>	<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>

Some Common Pathways for Bacteria to Enter Your Water System



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



Untreated Well Water Sample

Problems Observed: Taste Corr
Health None x

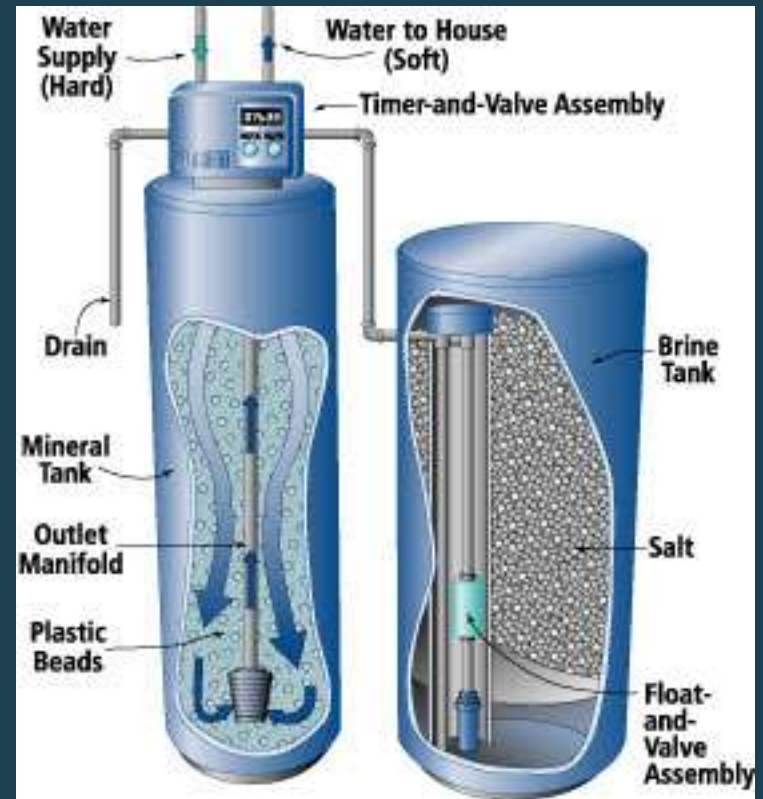
Laboratory Results:			
Parameter	Qualifier	Result	Units
Homeowners Package:			
Bacteria-Coliform		Absent	(see note below)
Hardness-Total		220	mg/l CaCO ₃
Alkalinity		226	mg/l CaCO ₃
Conductivity		434	umhos/cm
pH		7.82	std units
Saturation Index		0.9	(Corrosivity Balanced)
Nitrogen-Nitrate/Nitrite	Less Than	0.1	mg/l N (None Detected)
Chloride		2.5	mg/l
<hr/>			
Homeowners Metal Package:			
Arsenic (VISTA-ICP-0.003)	Less Than	0.003	mg/l (None Detected)
Calcium (VISTA-ICP)		52.0	mg/l
Copper (VISTA-ICP)		0.461	mg/l
Iron (VISTA-ICP)		0.005	mg/l
Lead (VISTA-ICP)		0.006	mg/l
Magnesium (VISTA-ICP)		28.9	mg/l
Manganese (VISTA-ICP)	Less Than	0.001	mg/l (None Detected)
Potassium (VISTA-ICP)		0.6	mg/l
Sodium (VISTA-ICP)		1.4	mg/l
Sulfate (VISTA-ICP)		0.2	mg/l
Zinc (VISTA-ICP)		0.105	mg/l

(Continued)

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.



Septic Tank
Tile Field

NA ft
NA ft

Water Source:

Problems Observed:

Color Taste Odor

Softened Homeowners Sample

Laboratory Results:			
Parameter	Qualifier	Result	Units
Homeowners Package:			
Bacteria-Coliform		Absent	(see note below)
Hardness-Total	Less Than	4	mg/l CaCO ₃
Alkalinity		226	mg/l CaCO ₃
Conductivity		434	umhos/cm
pH		7.82	std units
Saturation Index		0.9	(Corrosivity Balanced)
Nitrogen-Nitrate/Nitrite	Less Than	0.1	mg/l N (None Detected)
Chloride		2.5	mg/l
Homeowners Metal Package:			
Arsenic (VISTA-ICP-0.003)	Less Than	0.003	mg/l (None Detected)
Calcium (VISTA-ICP)		52.0	mg/l
Copper (VISTA-ICP)		0.461	mg/l
Iron (VISTA-ICP)		0.005	mg/l
Lead (VISTA-ICP)		0.006	mg/l
Magnesium (VISTA-ICP)		28.9	mg/l
Manganese (VISTA-ICP)	Less Than	0.001	mg/l (None Detected)
Potassium (VISTA-ICP)		0.6	mg/l
Sodium (VISTA-ICP)		1.4	mg/l
Sulfate (VISTA-ICP)		0.2	mg/l
Zinc (VISTA-ICP)		0.105	mg/l

(Continued)

Unsoftened Metals Package Sample

Septic Tank	NA ft	Water Source:	Problems Observed:	
Tile Field	NA ft	Private	Color	Taste
Seepage Pit	NA ft		Odor	Health
				Corr
				None x

Unsoftened Well Water Sample

Laboratory Results:

Parameter	Qualifier	Result	Units
Homeowners Package:			
Bacteria-Coliform		Absent	(see note below)
Hardness-Total		220	mg/l CaCO ₃
Alkalinity		226	mg/l CaCO ₃
Conductivity		434	umhos/cm
pH		7.82	std units
Saturation Index		0.9	(Corrosivity Balanced)
Nitrogen-Nitrate/Nitrite	Less Than	0.1	mg/l N (None Detected)
Chloride		2.5	mg/l

Homeowners Metal Package:			
Arsenic (VISTA-ICP-0.003)	Less Than	0.003	mg/l (None Detected)
Calcium (VISTA-ICP)		0.7	mg/l
Copper (VISTA-ICP)		0.461	mg/l
Iron (VISTA-ICP)		0.005	mg/l
Lead (VISTA-ICP)		0.006	mg/l
Magnesium (VISTA-ICP)		0.3	mg/l
Manganese (VISTA-ICP)	Less Than	0.001	mg/l (None Detected)
Potassium (VISTA-ICP)		0.6	mg/l
Sodium (VISTA-ICP)		115.6	mg/l
Sulfate (VISTA-ICP)		0.2	mg/l
Zinc (VISTA-ICP)		0.105	mg/l

(Continued)

Softened Metals Package Sample

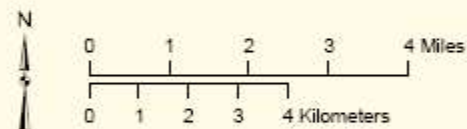
Taycheedah - Empire Eden

Fond du Lac County March 2010

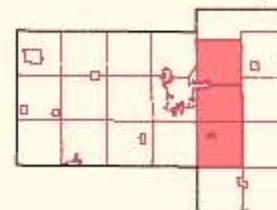
TOTAL HARDNESS (ppm CaCO₃)

A	NONE DETECTED	22	15%
B	[2 - 25)	17	12%
C	[25 - 50)	3	2%
D	[50 - 150)	2	1%
E	[150 - 200)	1	1%
F	[200 - 300)	9	6%
G	[300 - 400)	37	25%
H	[400 - 500)	46	32%
I	[500 ...	9	6%

NOTE: Softened samples not mapped.



Fond du Lac County

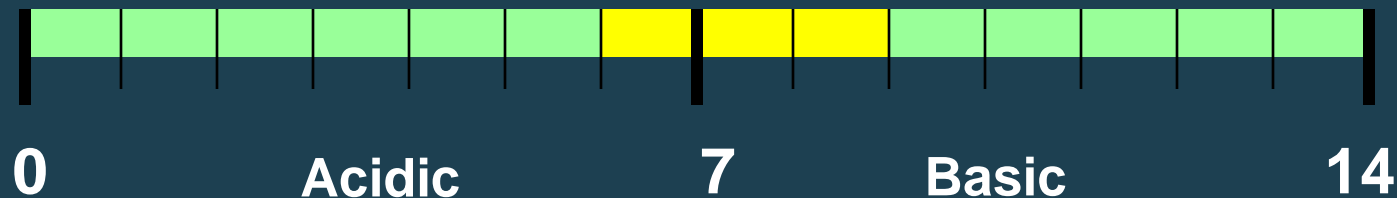


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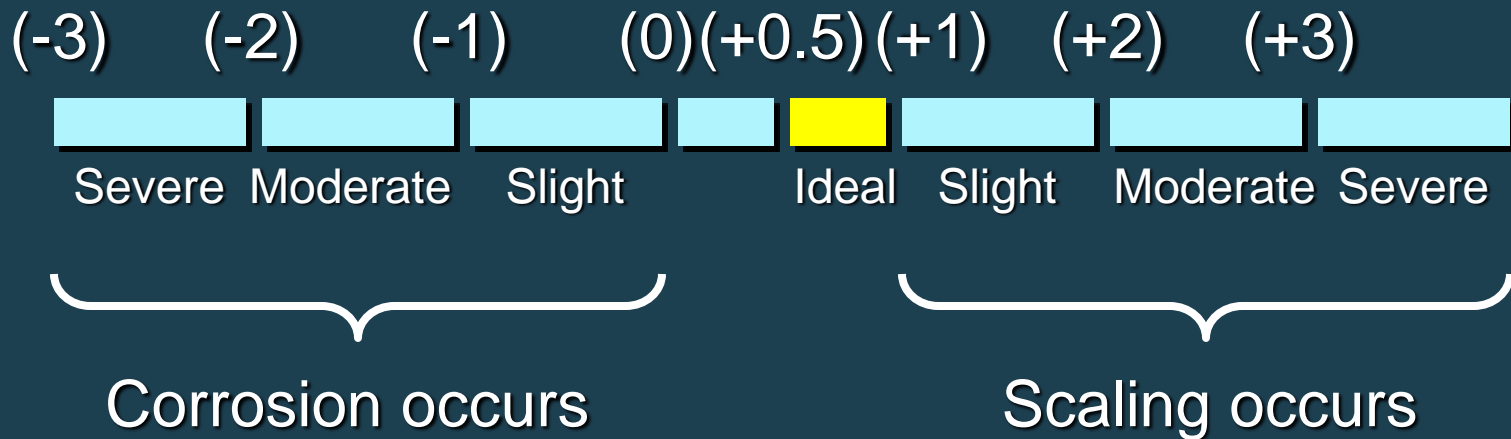
Tests for Overall Water Quality

- **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



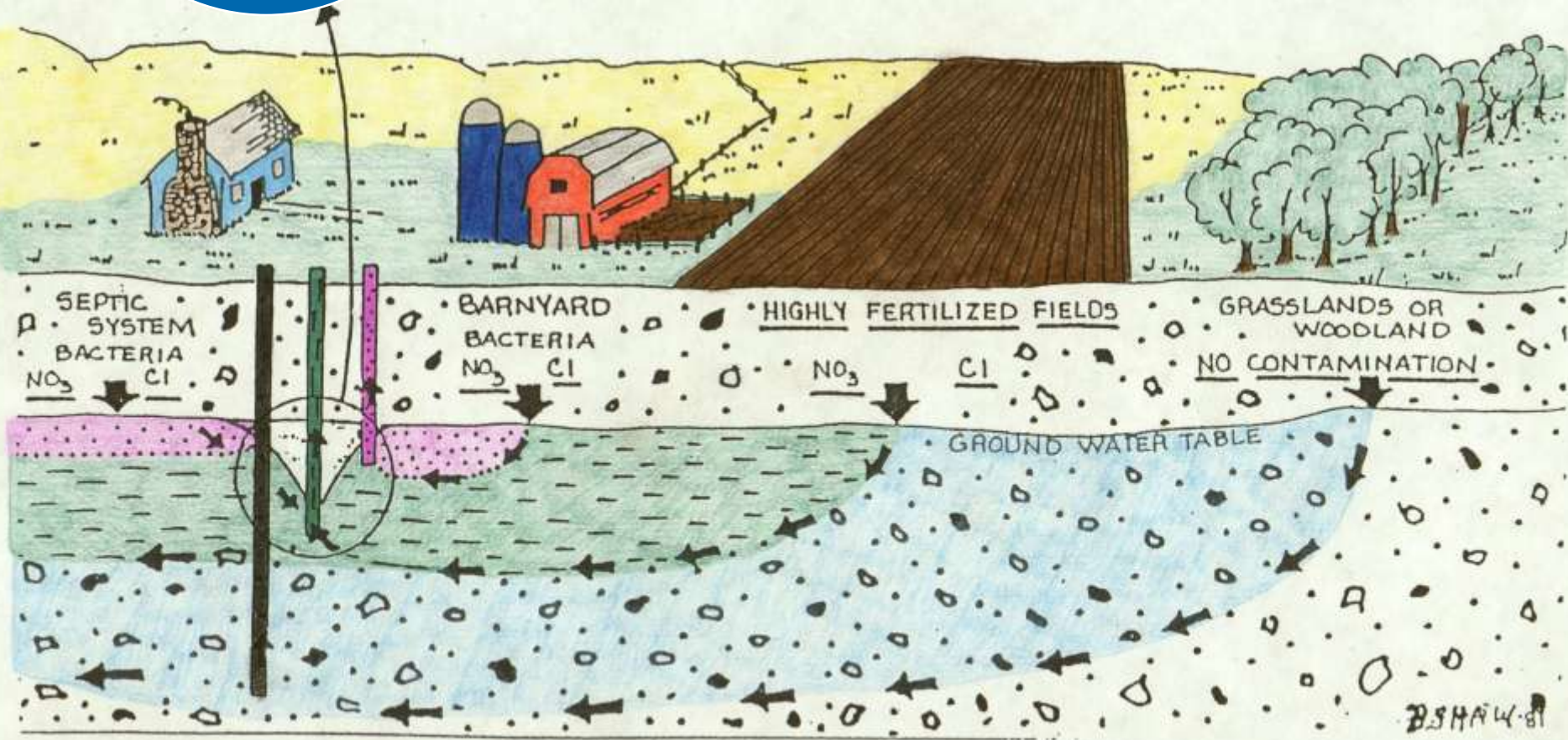
Saturation index of softened sample does not reflect actual corrosivity.

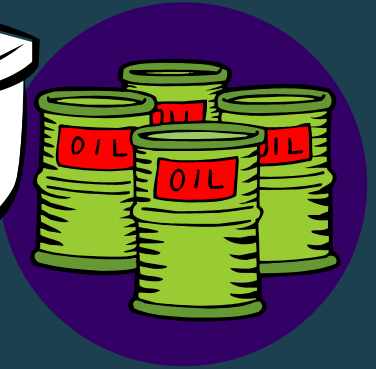
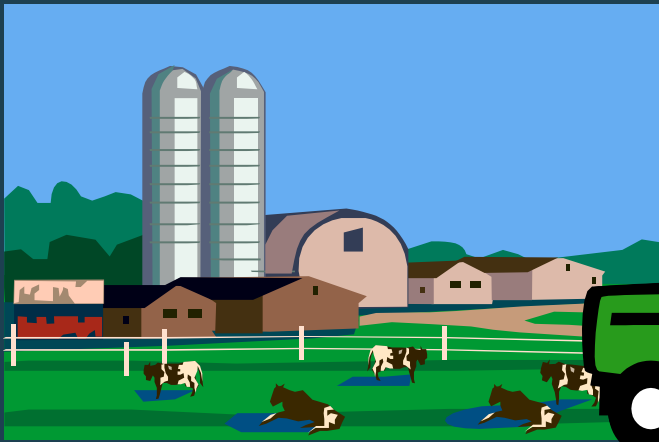
Parameter	Qualifier	Result	Units
Homeowners Package:			
Bacteria-Coliform		Present	(see note below)
Hardness-Total	Less Than	4	mg/l CaCO3
Alkalinity		226	mg/l CaCO3
Conductivity		434	umhos/cm
pH		7.82	std units
Saturation Index		-1.7	(Corrosivity Moderate)
Nitrogen Nitrate/Nitrite	Less Than	0.1	mg/l N (None Detected)
Chloride		2.5	mg/l
<hr/>			
Homeowners Metal Package:			
Arsenic (VISTA-ICP-0.003)	Less Than	0.003	mg/l (None Detected)
Calcium (VISTA-ICP)		0.7	mg/l
Copper (VISTA-ICP)		0.461	mg/l
Iron (VISTA-ICP)		0.005	mg/l
Lead (VISTA-ICP)		0.006	mg/l
Magnesium (VISTA-ICP)		0.3	mg/l
Manganese (VISTA-ICP)	Less Than	0.001	mg/l (None Detected)
Potassium (VISTA-ICP)		0.6	mg/l
Sodium (VISTA-ICP)		115.6	mg/l
Sulfate (VISTA-ICP)		0.2	mg/l
Zinc (VISTA-ICP)		0.105	mg/l

(Continued)

Well
pumping
water

Land Use and Water Quality

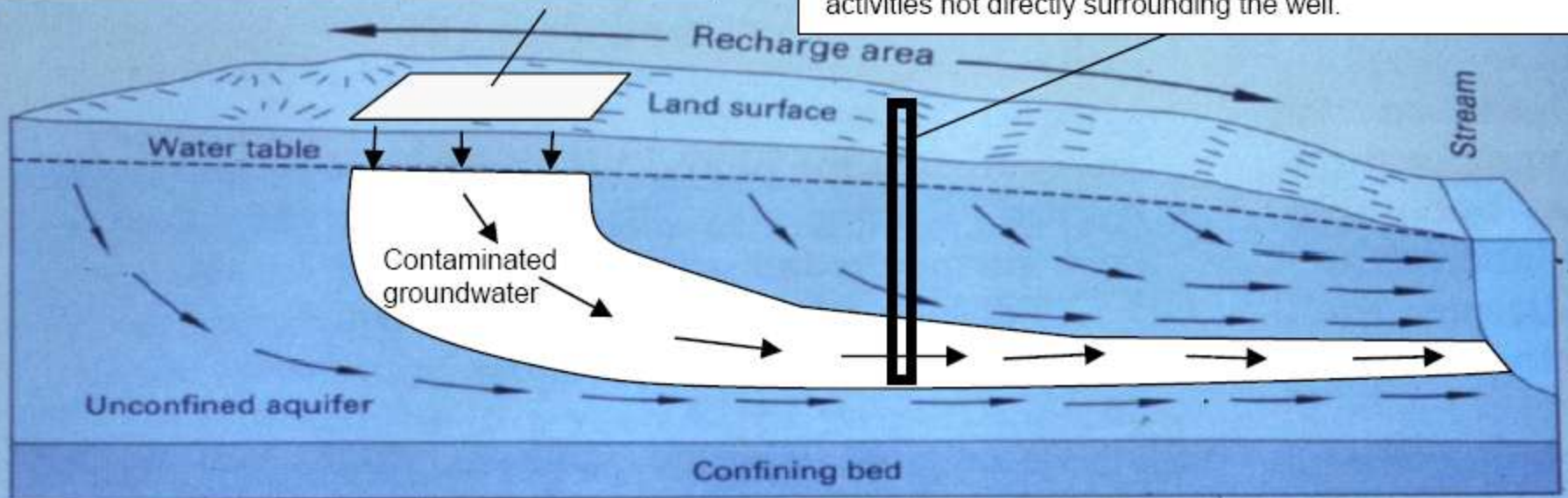




Soil

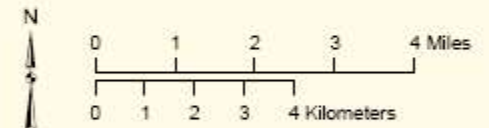
Land-use activity that pollutes groundwater.

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

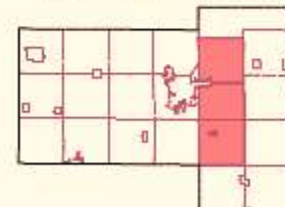


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Fond du Lac County March 2010



Fond du Lac County



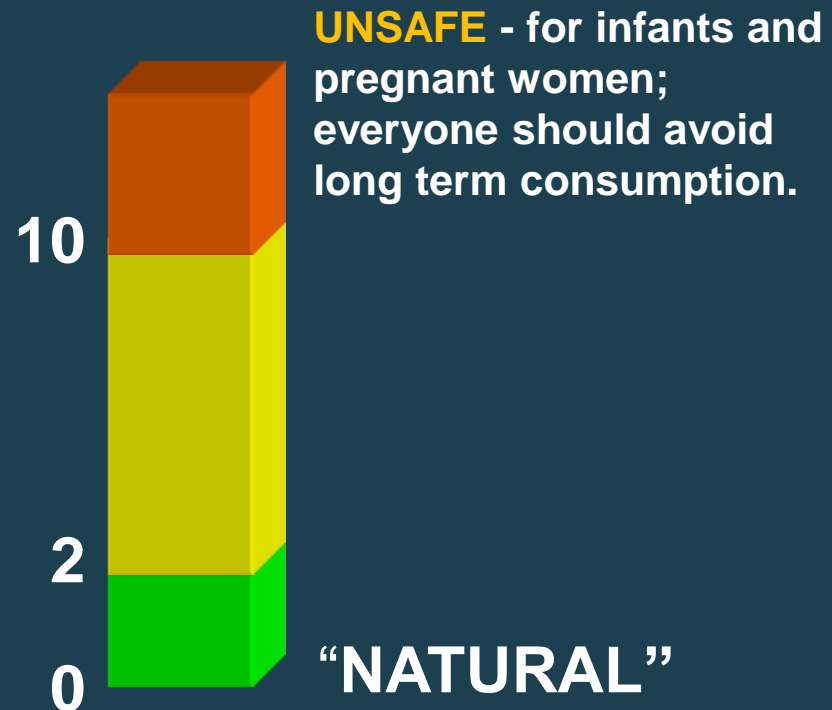
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Test Important to Health

Nitrate Nitrogen

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



Nitrate-Nitrogen

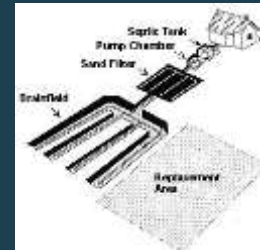
Health Effects:

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



Sources:

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

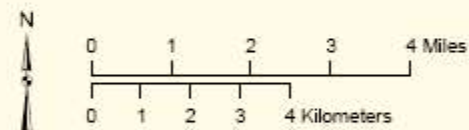


Taycheedah - Empire Eden

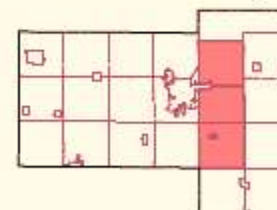
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NITRATE-NITRITE (ppm N)

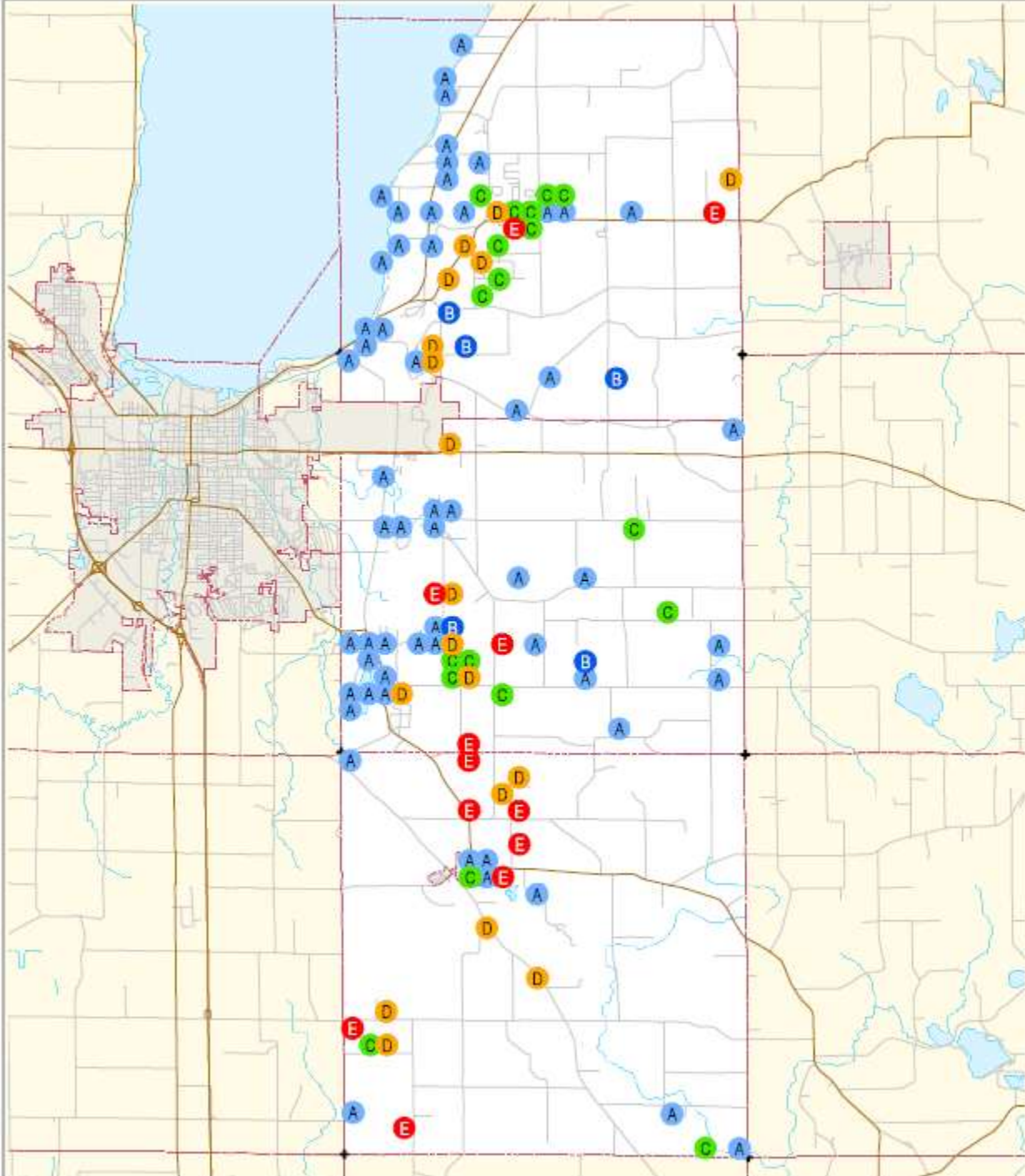
A	NONE DETECTED	78	53 %
B	[0.1 - 2.0]	6	4 %
C	[2 - 5]	25	17 %
D	[5 - 10]	22	15 %
E	[10 - 20]	15	10 %
F	[20 ...]	0	0 %



Fond du Lac County








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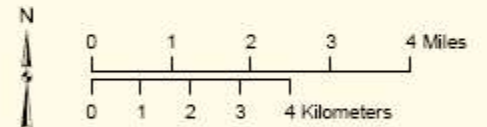


Taycheedah - Empire Eden

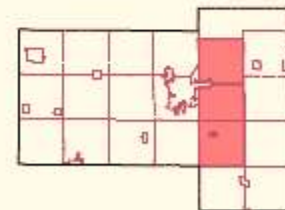
Fond du Lac County March 2010

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



Fond du Lac County



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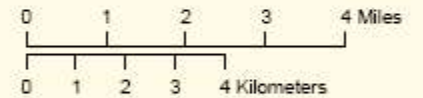
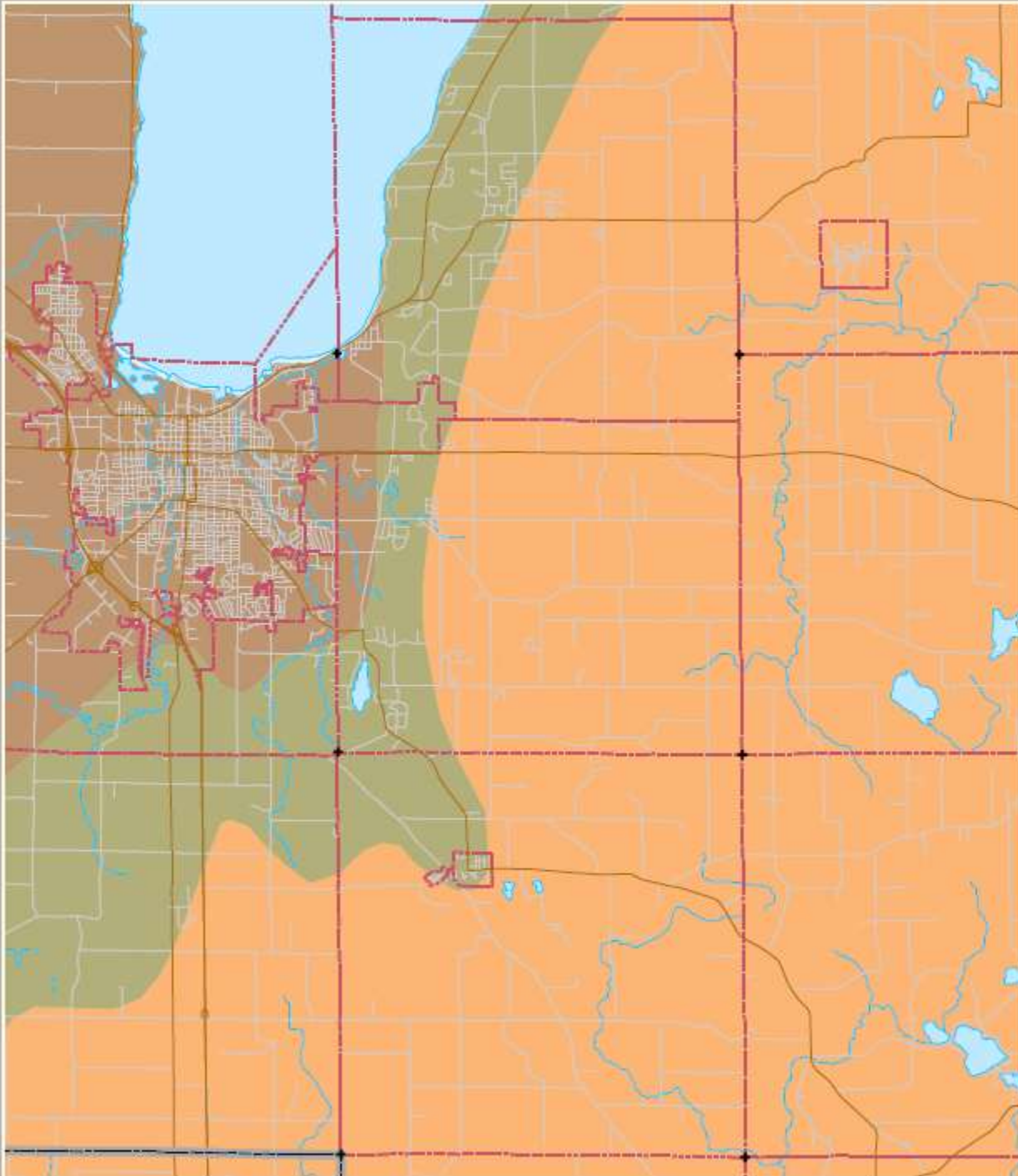


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Bedrock:

-  Silurian dolomite
-  Maquoketa shale
-  Sennepsee dolomite



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Private Well Test Results

Nitrate-N Concentration (mg/L)

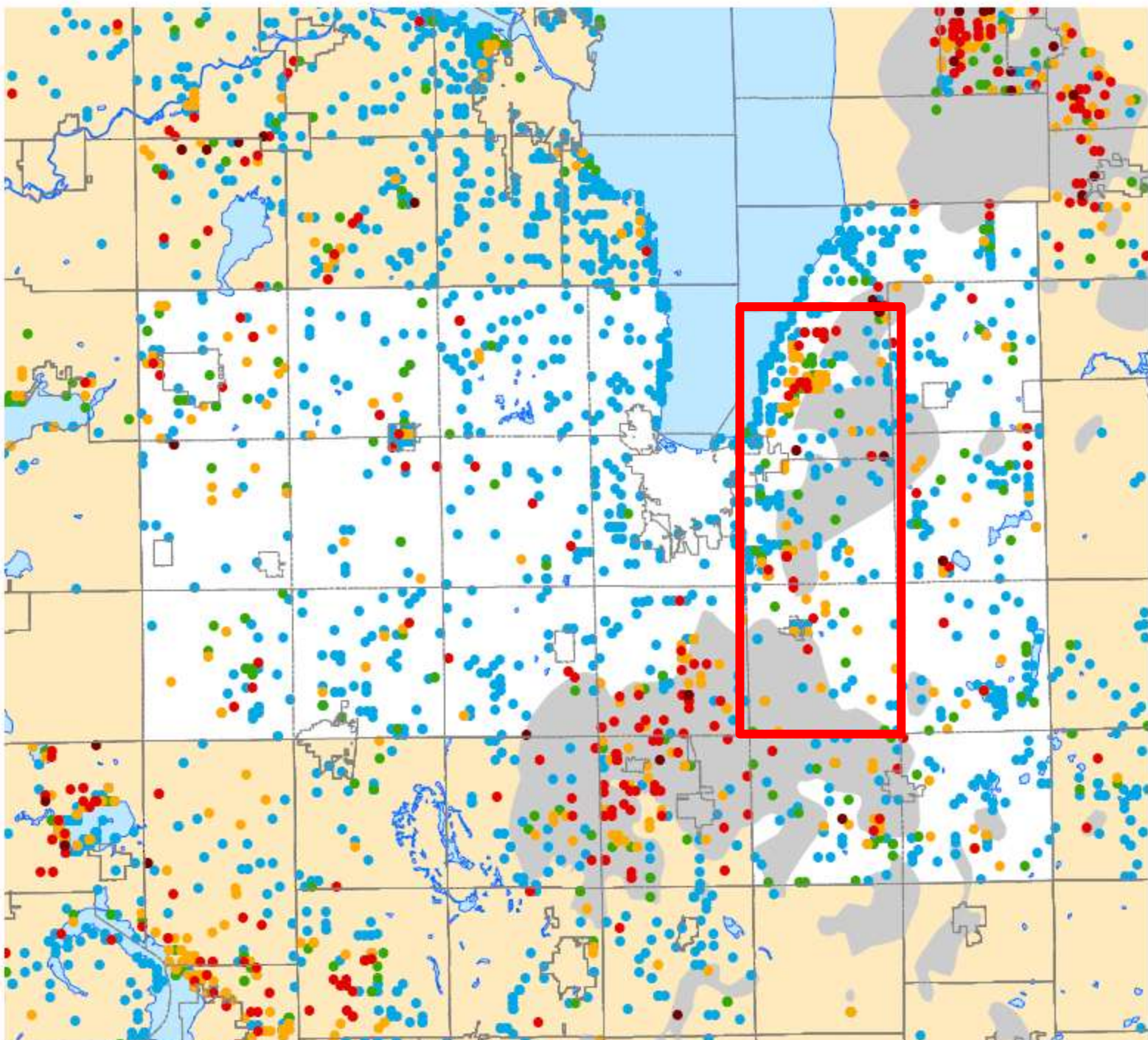
- 0 - 2
- 2 - 5
- 5 - 10
- 10 - 20
- > 20

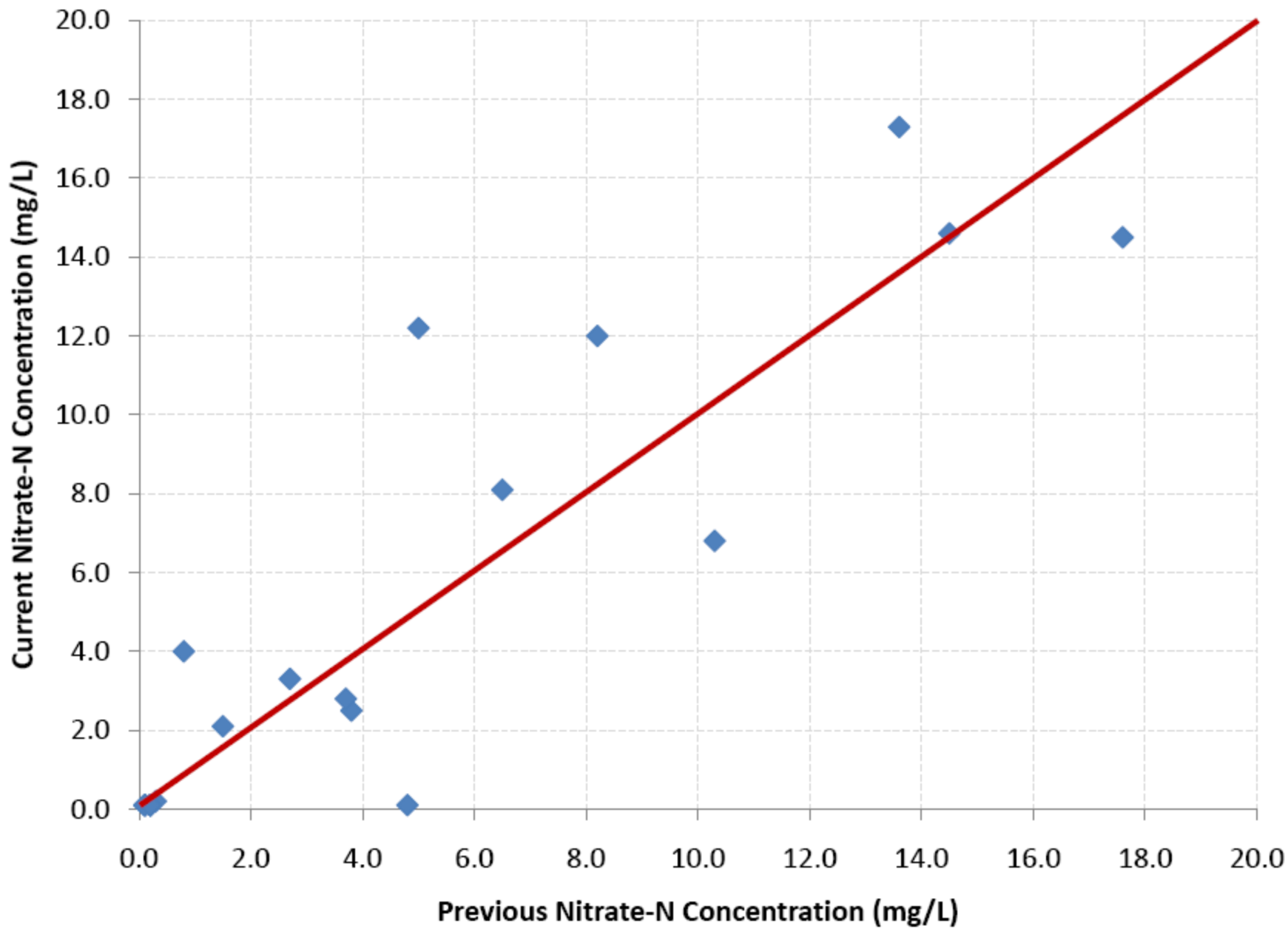
Silurian <50 ft



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What can I do to reduce my nitrate levels?

Solution:

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

Short term:

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

Tests for Aesthetic Problems

Chloride

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

250 mg/l

10 mg/l



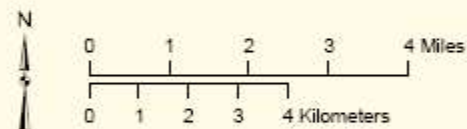
Taycheedah - Empire Eden

Fond du Lac County March 2010

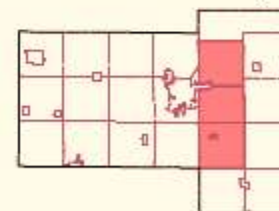
TOTAL HARDNESS (ppm CaCO₃)

A	NONE DETECTED	22	15%
B	[2 - 25)	17	12%
C	[25 - 50)	3	2%
D	[50 - 150)	2	1%
E	[150 - 200)	1	1%
F	[200 - 300)	9	6%
G	[300 - 400)	37	25%
H	[400 - 500)	46	32%
I	[500 ...	9	6%

NOTE: Softened samples not mapped.



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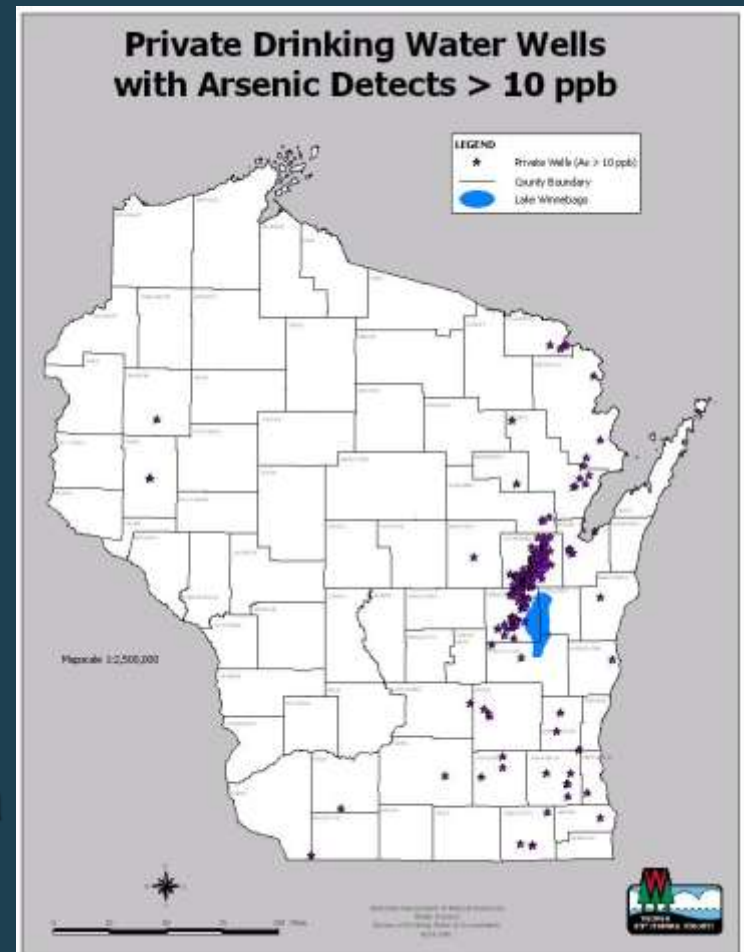
Test Important to Health

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



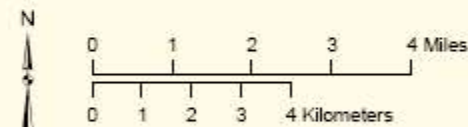
Taycheedah - Empire Eden

Fond du Lac County March 2010

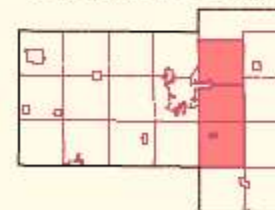
ARSENIC (mg/l)

A	NONE DETECTED	51	56%
B	[0.003 - 0.010]	32	35%
C	[0.010 - 0.050]	8	9%
D	[0.050 - 0.100]	0	0%
E	[0.100 ...]	0	0%

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



Fond du Lac County



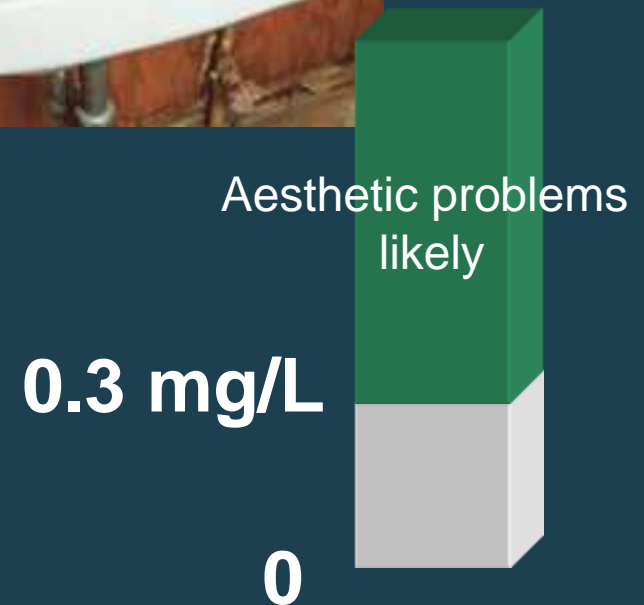
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Tests for Aesthetic Problems

Iron

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



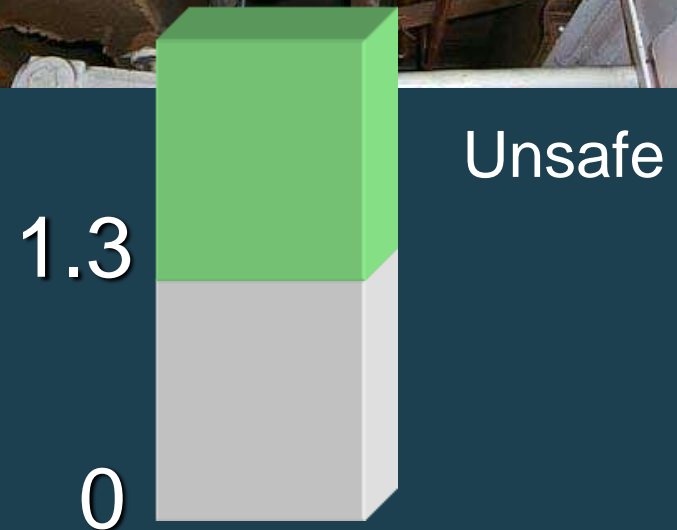
Test Important to Health

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



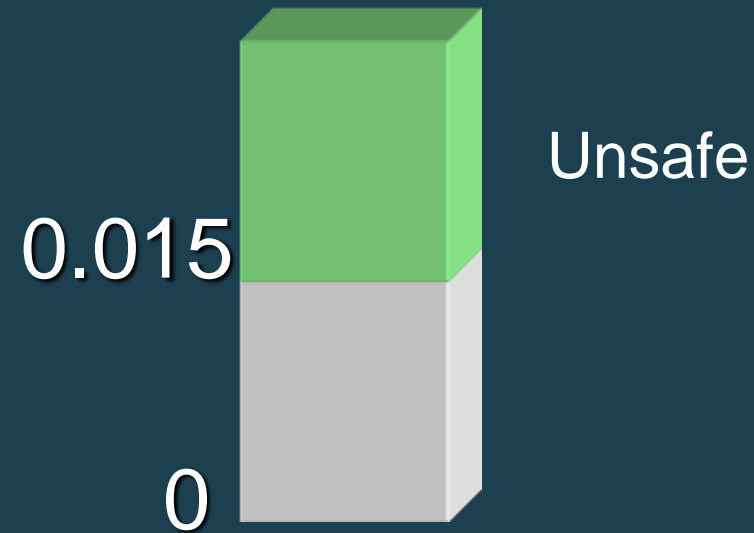
Test Important to Health

Lead

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

Health Effects:

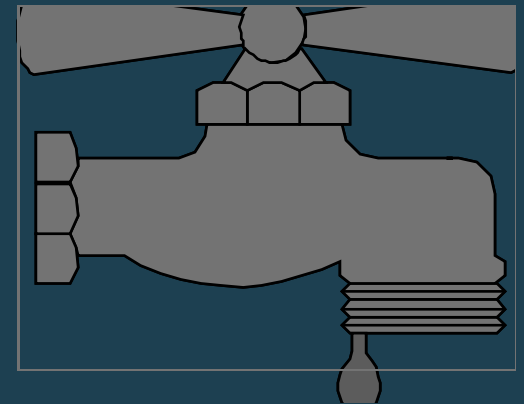
- Young children, infants and unborn children are particularly vulnerable.
- Lead may damage the brain, kidneys, nervous system, red blood cells, reproductive system.



Lead and Copper

Solutions:

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



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)



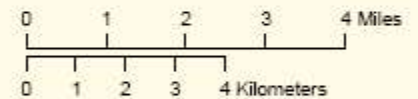
Taycheedah - Empire Eden

Fond du Lac County March 2010

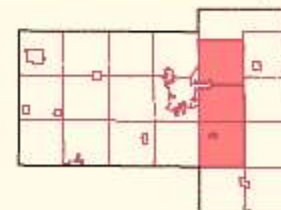
DACT (ug/l)

A	NONE DETECTED	62	73 %
B	[0.1 - 0.3]	14	16 %
C	[0.3 - 1.0]	9	11 %
D	[1.0 - 2.0]	0	0 %
E	[2.0 - 3.0]	0	0 %
F	[3.0 ...]	0	0 %

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



Fond du Lac County



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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

○ Disadvantages:

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

○ Cautions:

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



Before investing in treatment....

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

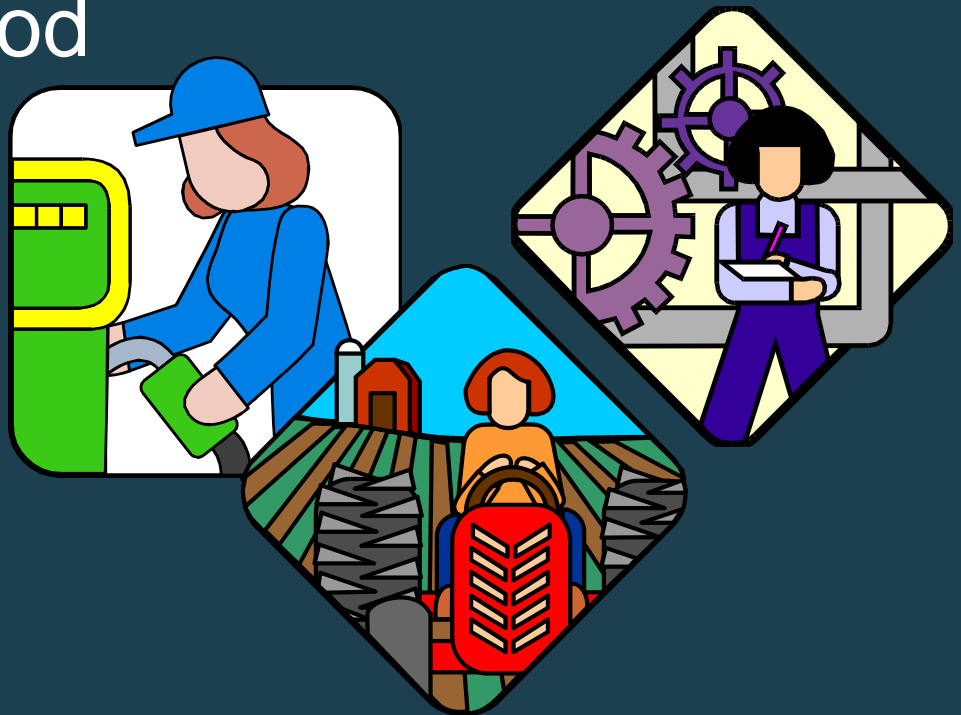
Next Steps

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

Next Steps

➤ Test for known or potential contaminants in your neighborhood

- Gasoline?
- Pesticides?
- Solvents?



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

www.uwsp.edu/cnr/watersheds

The screenshot shows a Windows Internet Explorer browser window displaying the website for the Center for Watershed Science and Education. The browser's address bar shows the URL <http://www.uwsp.edu/cnr/watersheds/default.htm>. The website features a blue header with the center's logo and navigation menu. The main content area includes a 'What We Do' section with a list of activities and a 'Recent Events' section with a list of programs. A 'Center News' section is also present on the left side of the page.

Center for Watershed Science and Education
University of Wisconsin-Stevens Point and University of Wisconsin-Extension

Home | Water and Environmental Analysis Lab (WEAL) | Groundwater Center | Programs/Activities | Reports/Publications | Student Involvement | Staff | Contact

Center News

- Groundwater Awareness Week - March 7-13
- 24 Wisconsin Schools Awarded Sand-tank Groundwater Models
- George Kraft is featured on broadcast of In Wisconsin: Groundwater and Dry Lakes
- On-site water reuse publication available now
- Center awarded NSF Grant funding for new equipment to better detect metals, pharmaceuticals, and pesticides in water
- Staff helping to produce management plans for all Portage County lakes

What We Do

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

Recent Events

- Town of Troy, St. Croix Co. Well Testing Program - March 9
- Shawano County Well Water Testing Program - Feb. 2010
- 2010 Groundwater Model Teacher Workshops
- Town of Greenbush: Community Drinking Water Program

Contact us for more information

[Center for Watershed Science and Education Home](#) | [College of Natural Resources Home](#) | [UWSP Home](#) | [UW-Extension Home](#)
Center for Watershed Science and Education, 800 Reserve St., Stevens Point, WI 54481, 715-348-4270
If you are experiencing problems with the website please direct comments to kmassar@uwsp.edu



Thanks to the following for helping sponsor this program:

- **Towns of Freedom, Reedsburg and Westfield**
- **Sauk County Land and Water Conservation Department**
 - **Sauk County UW-Extension**
 - **Sauk County Health Dept.**

Kevin Masarik
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715-346-4276
kmasarik@uwsp.edu
www.uwsp.edu/cnr/watersheds

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