

# Groundwater in Green County

Presented to  
Green County  
Livestock Facility Study Group  
October 12, 2017

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Wisconsin Geological &  
Natural History Survey

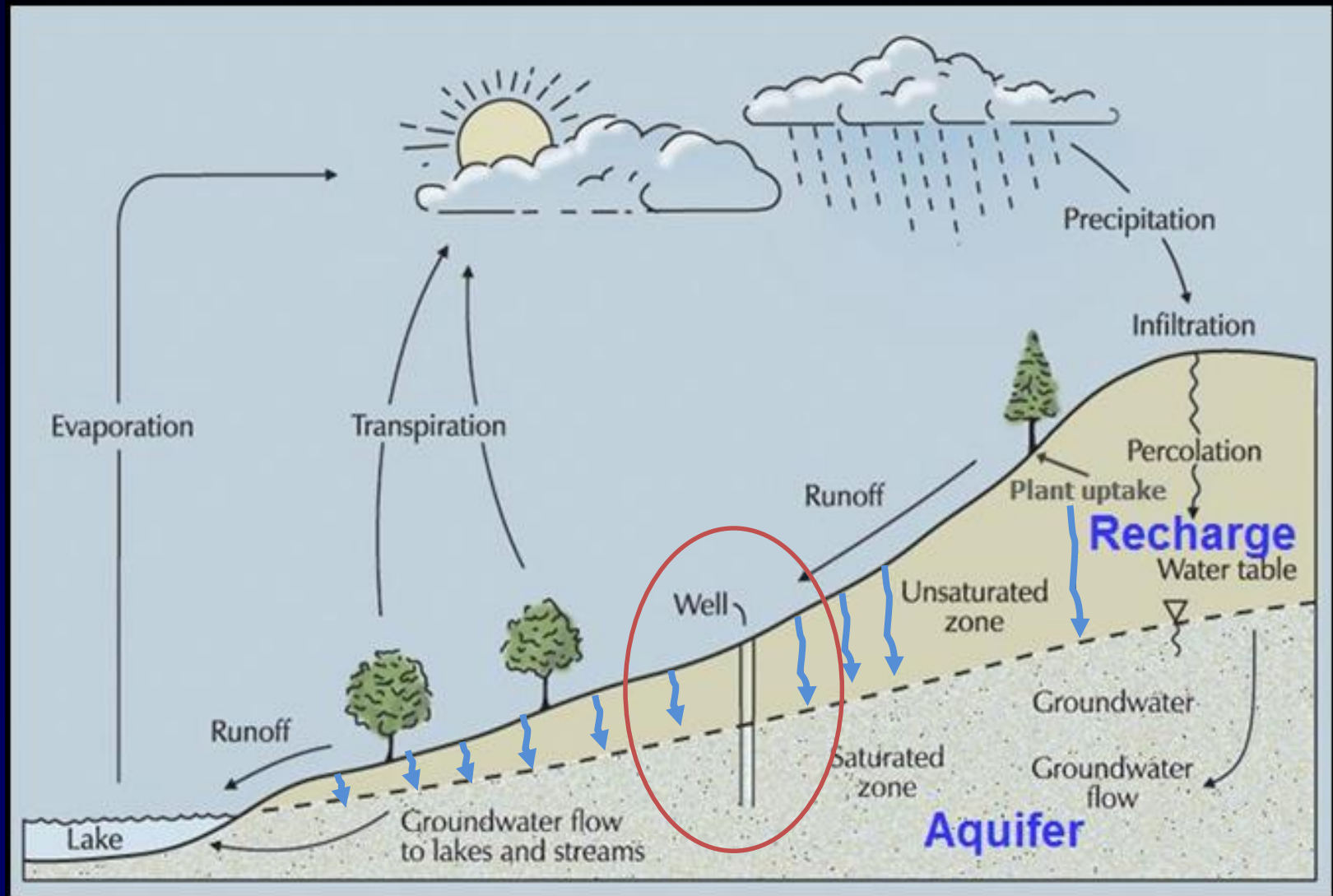


# Groundwater in Green County

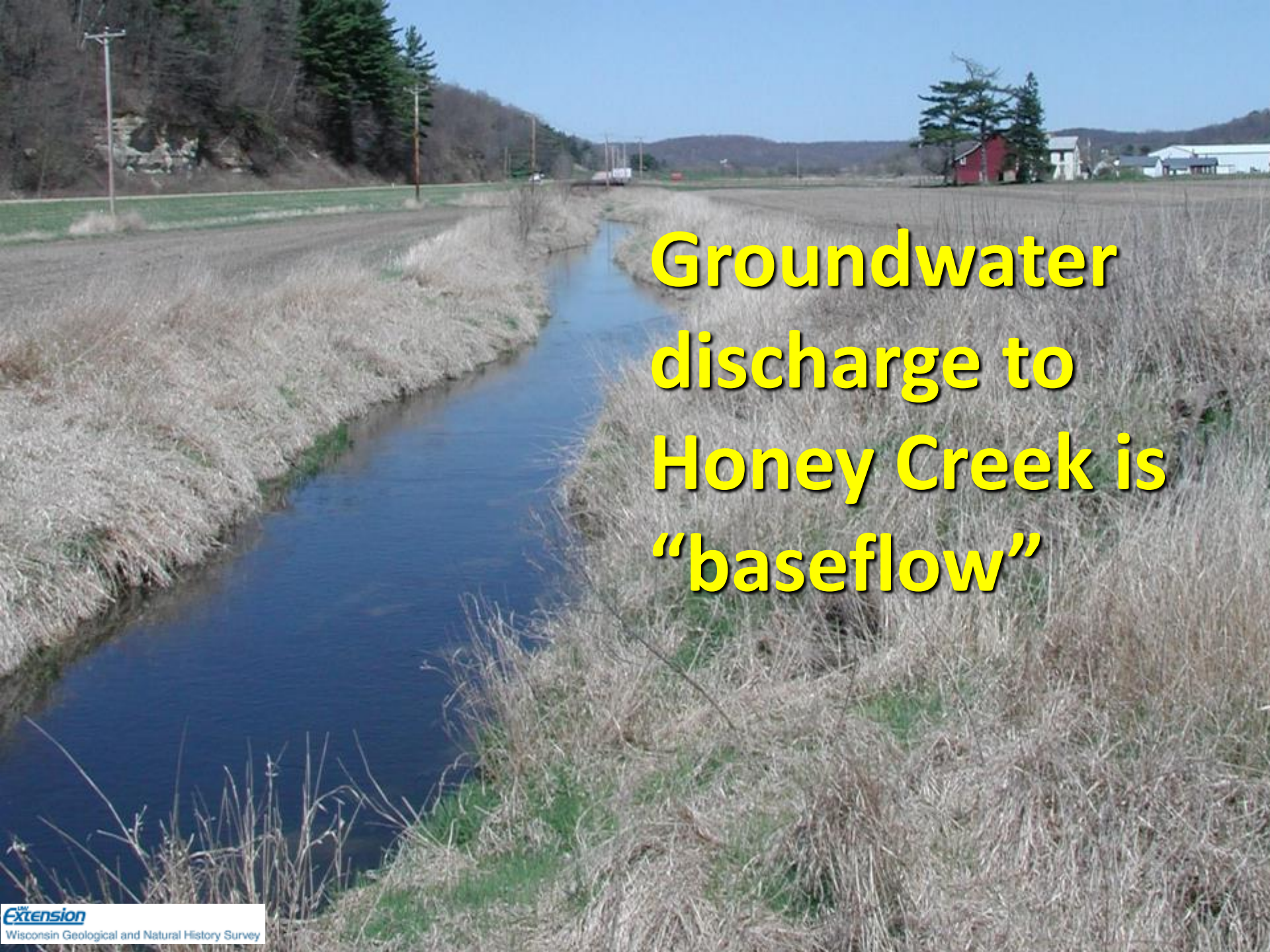
- Groundwater basics
- Hydrogeology across Wisconsin
- Green County
  - Hydrogeology
  - Wells and water use
  - Susceptibility to contamination



# Wisconsin's Water Cycle







**Groundwater  
discharge to  
Honey Creek is  
“baseflow”**

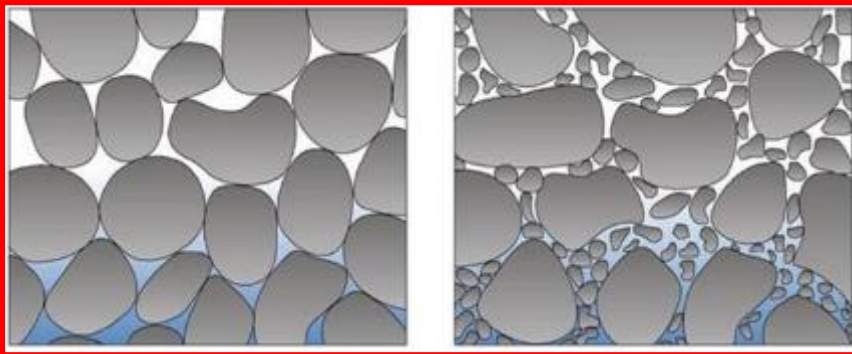


# Hydrogeology:

## Groundwater flows through rock and sediment



Core of the Wonewoc sandstone



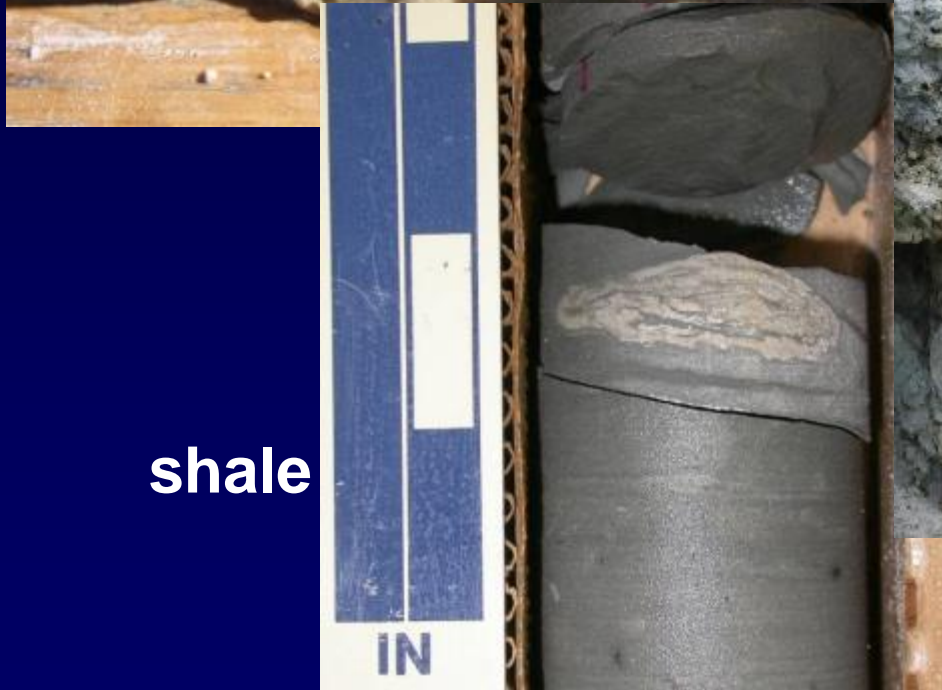
Water under the ground, within an aquifer; porous sand, gravel and rock holds water







**sandstone**



**shale**



**Dolomite and  
limestone**



# Karst is a type of landscape



Formed when soluble rocks, such as limestone and dolomite, dissolve

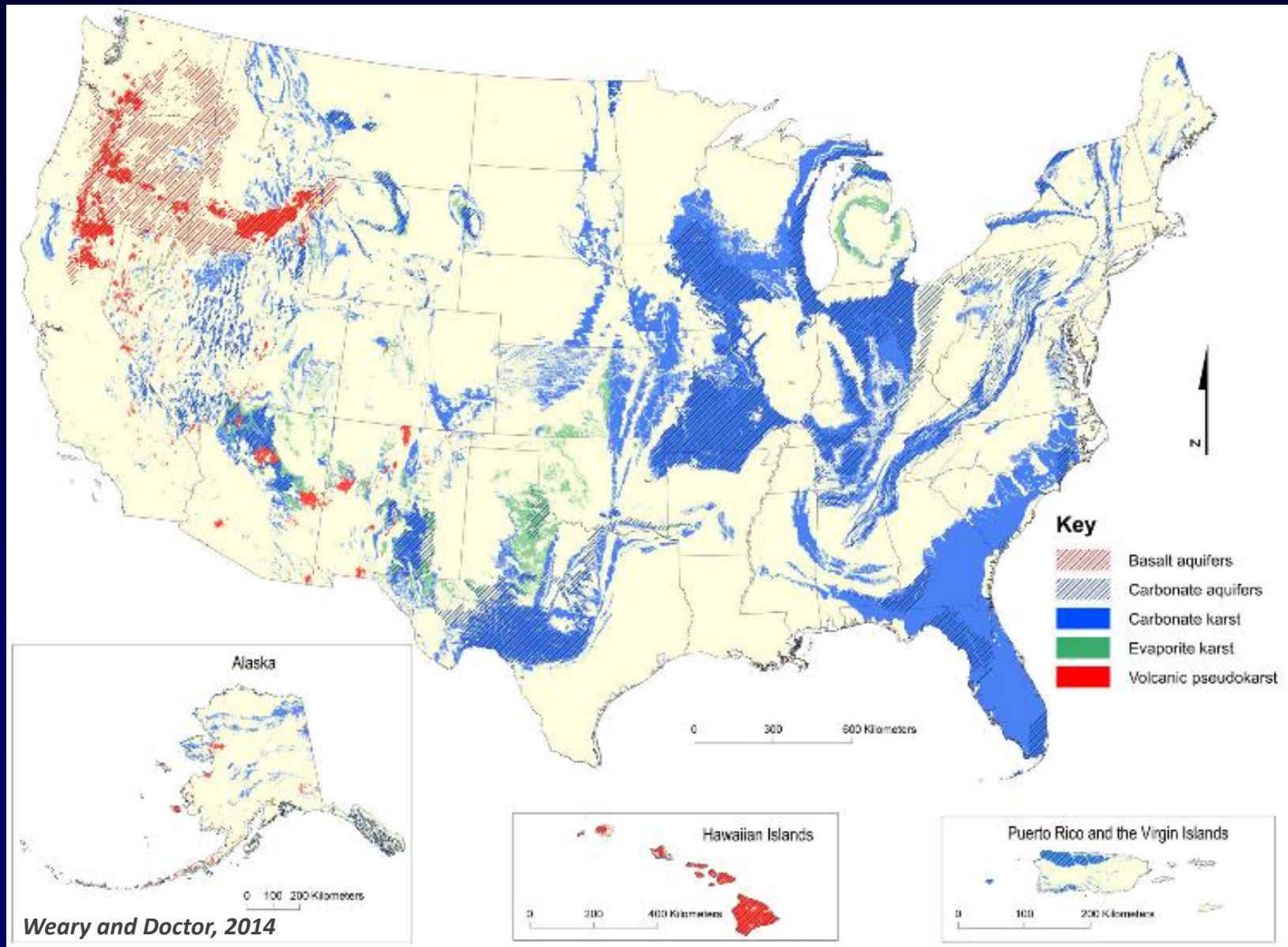
Dissolution occurs because percolating rainwater is slightly acidic, pH about 5.7

Spectacular, well-developed karst systems feature large caves and sinkholes (Kentucky, New Mexico, Cave of the Mounds)

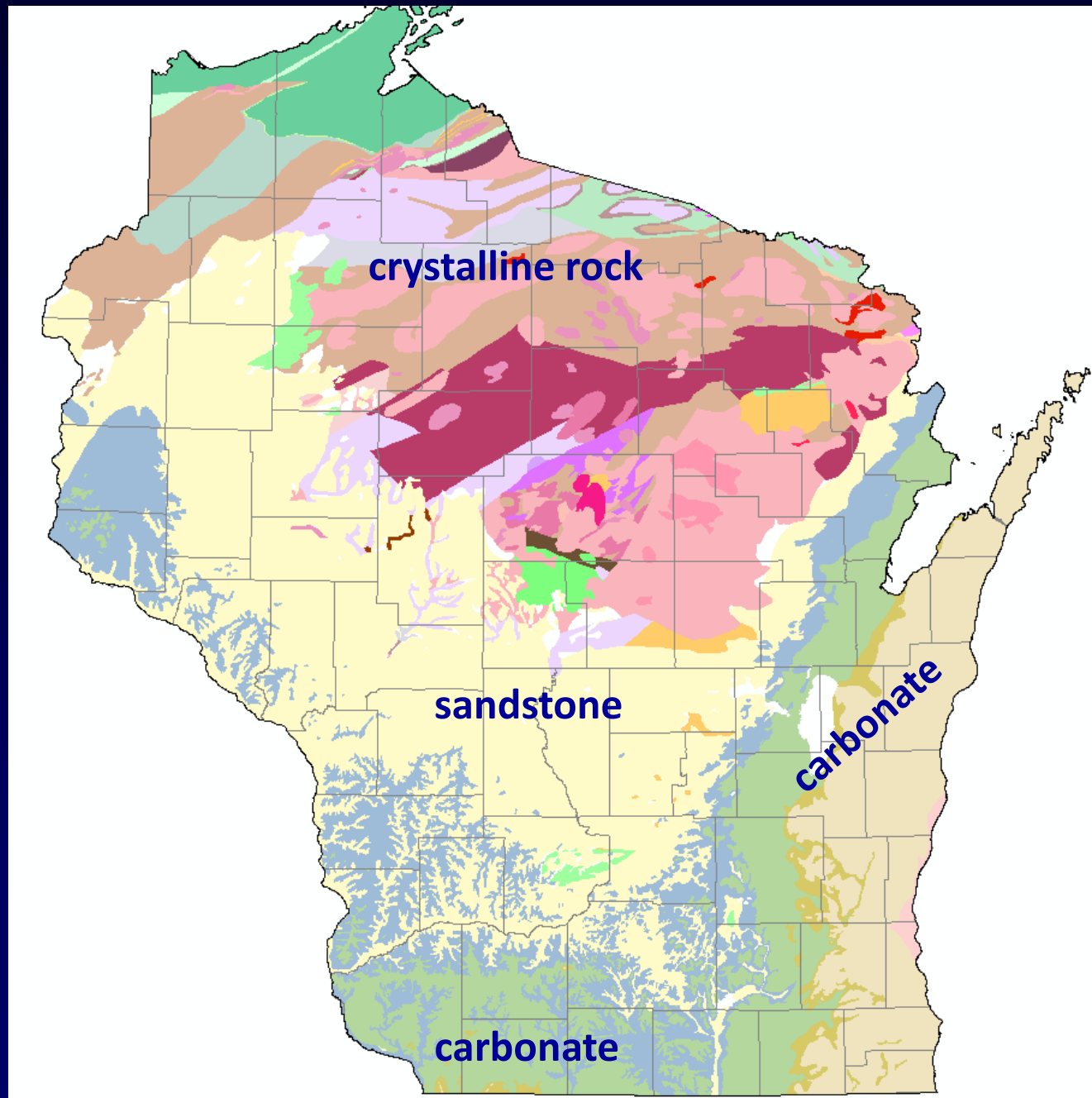
Wisconsin's karst features are relatively muted, with small sinkholes, enlarged fracture networks and conduits



# 20% of U.S. land surface is karst













## Carbonate rocks



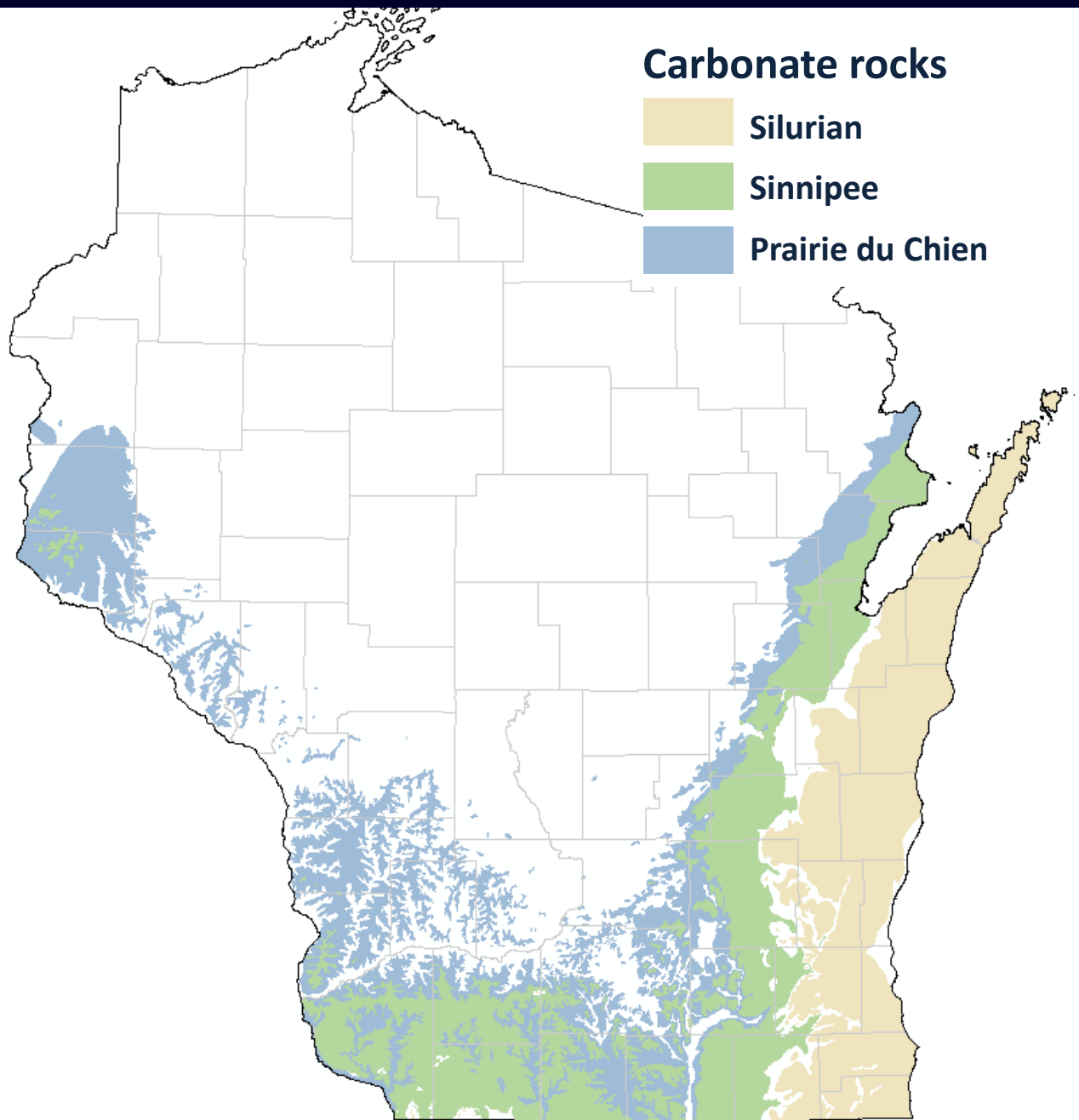
Silurian



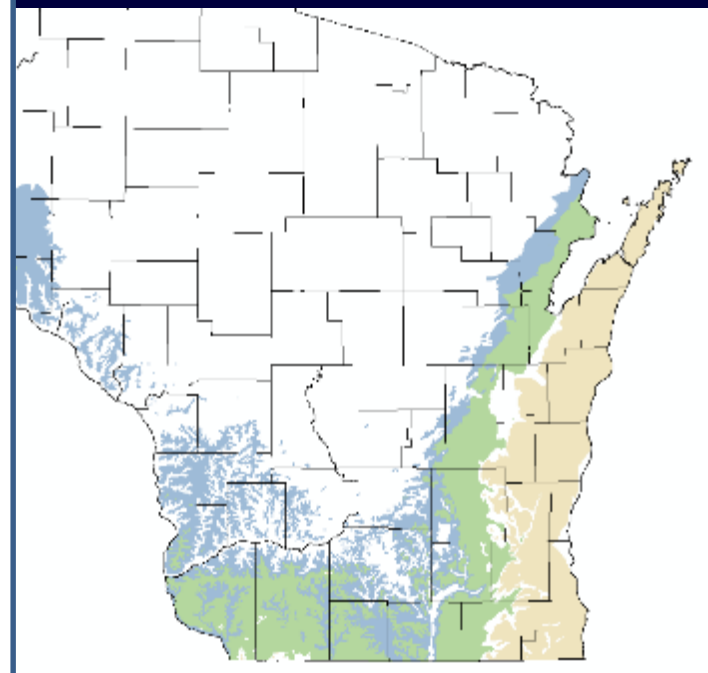
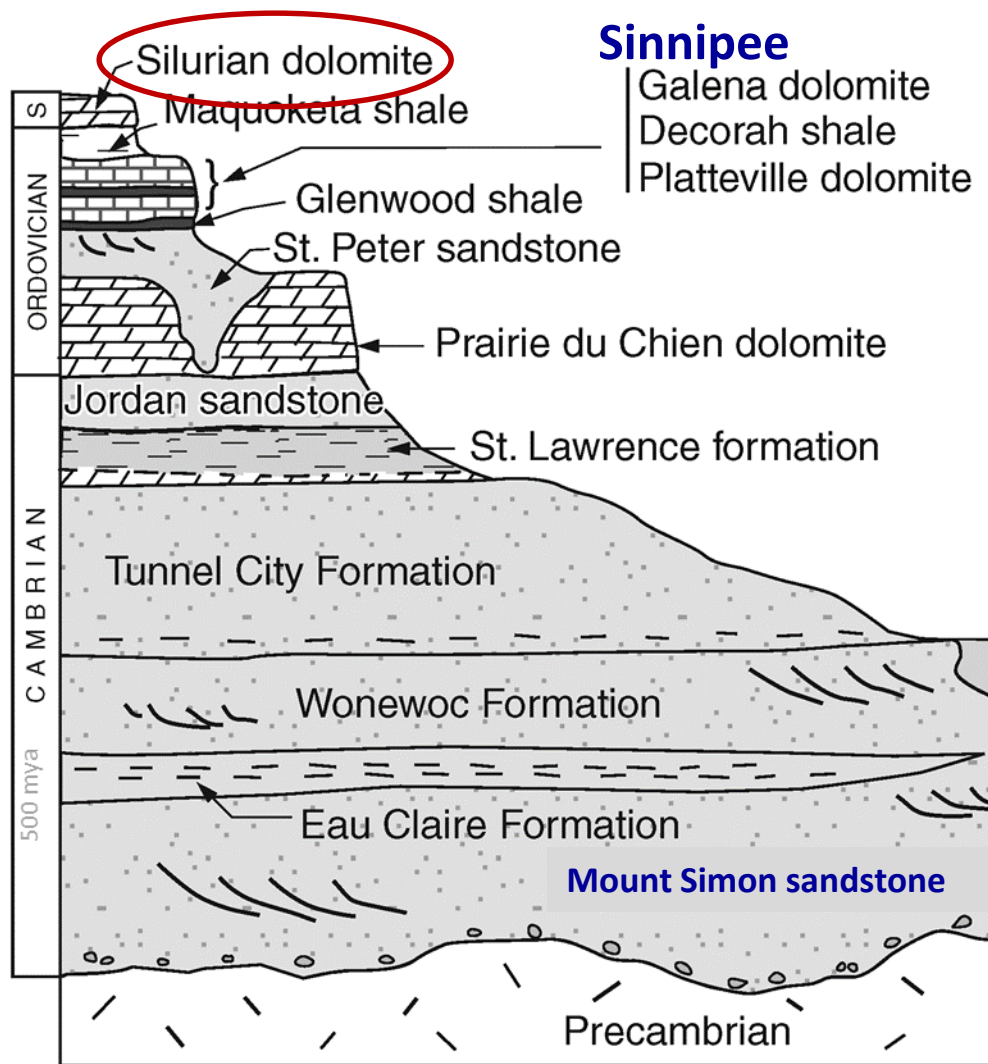
Sinnipee



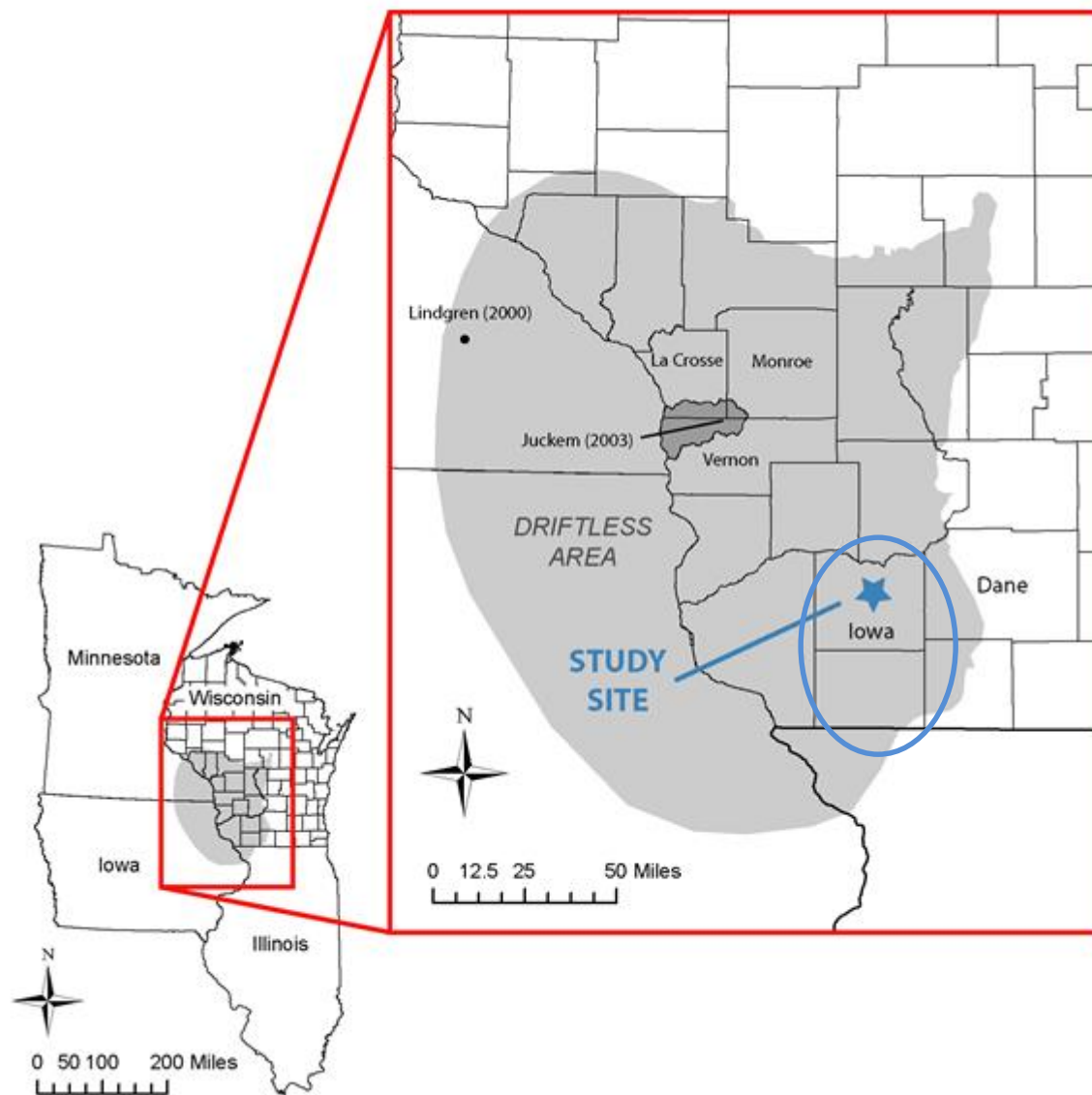
Prairie du Chien











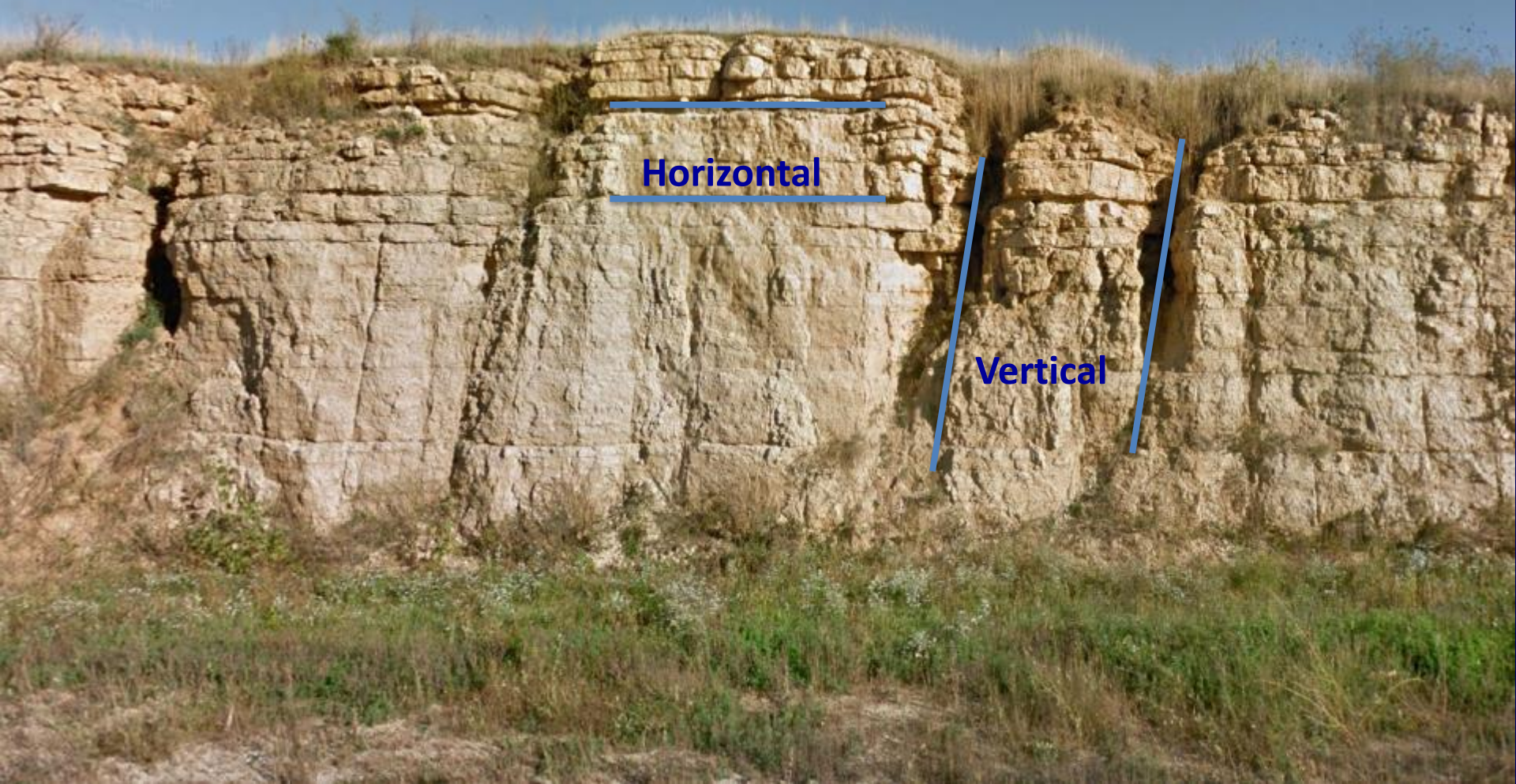




*Bedding plane fractures, Iowa County*



# Platteville Fm, Hwy 151 Lafayette County







southwest



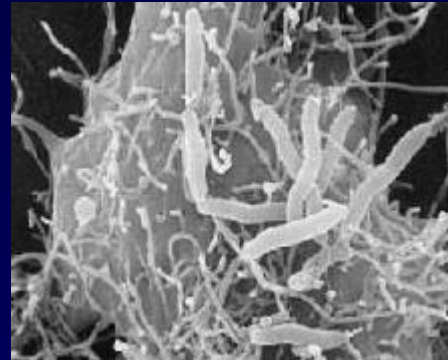
northeast



# Pathogens:

## bacteria, protozoa and viruses

- Cause acute illness
- Survival depends on temperature, moisture, and absence of UV light
- Present in large numbers in human and animal waste
- Septic systems, sewer systems, and manure
- Remain infectious on the order of 10s of months in groundwater



**Bacteria: *Campylobacter*,  
*Salmonella*, *E. coli* O157:H7,  
*Aeromonas***



# Pathogen transport

## Particulates and common diameters:

(1 micron = 1 millionth of a meter)

Human hair (~50-100  $\mu\text{m}$ )

Rock fracture (1 – 1,000s  $\mu\text{m}$ )

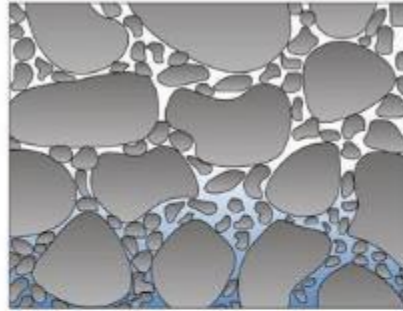
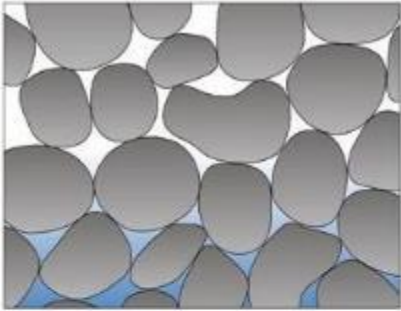
Colloids (<0.2  $\mu\text{m}$ )

Bacteria (~.2 – 20  $\mu\text{m}$ )

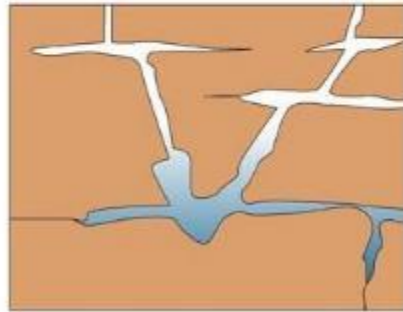
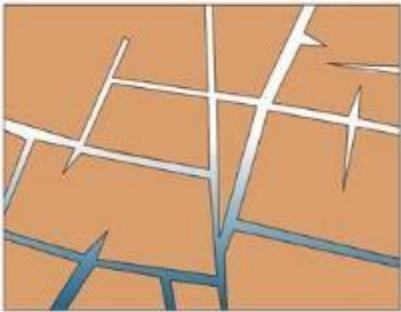
Viruses (~0.005  $\mu\text{m}$ )







**Pore spaces filled with water**



**Porous media: slows groundwater transport, filters pathogens, dilutes dissolved contaminants (e.g. nitrate)**

**Fractures: rapid transport, no filtration or contaminant decay**





# Karst landscape: dolomite and limestone are easily dissolved...



Caves, sinkholes and fractures are common in this rock. Contaminants reach groundwater quickly...



# Dodgeville Fleet Farm



From Sharon L. Hall To: Steve Dierker Date: 05/11/2007 Time: 9:45:10 AM Page 2 of 2

PHWS ID: 12902171  
(PHWS - Iowa County)

## PUBLIC NOTIFICATION OF Boil/Bottle Water Advisory

FARM & FLEET OF DODGEVILLE water contains coliform bacteria

The sampling results below indicate the presence of coliform bacteria in your drinking water and are a violation of State and Federal Safe Drinking Water Regulations.

Multiple water samples collected on **MAY 8, 2007** confirmed the presence of coliform bacteria.

**What precautions should be taken at this time?**

**Yes, Boil:** but only beverages prepared with unsafe water must be discarded. You should boil or use commercially bottled water for drinking, food preparation, and making ice. If you boil water, the water should be heated to a rolling boil for at least **ONE** minute before use. Ice should be made from boiled or bottled water.

**What does this mean?**

Total coliform bacteria are generally not harmful themselves. Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.

Whenever we detect coliform bacteria in any sample, we do follow-up testing to see if other bacteria of concern are present, such as fecal coliforms or E. coli, are present. **We did not find any of these bacteria in our subsequent testing.**

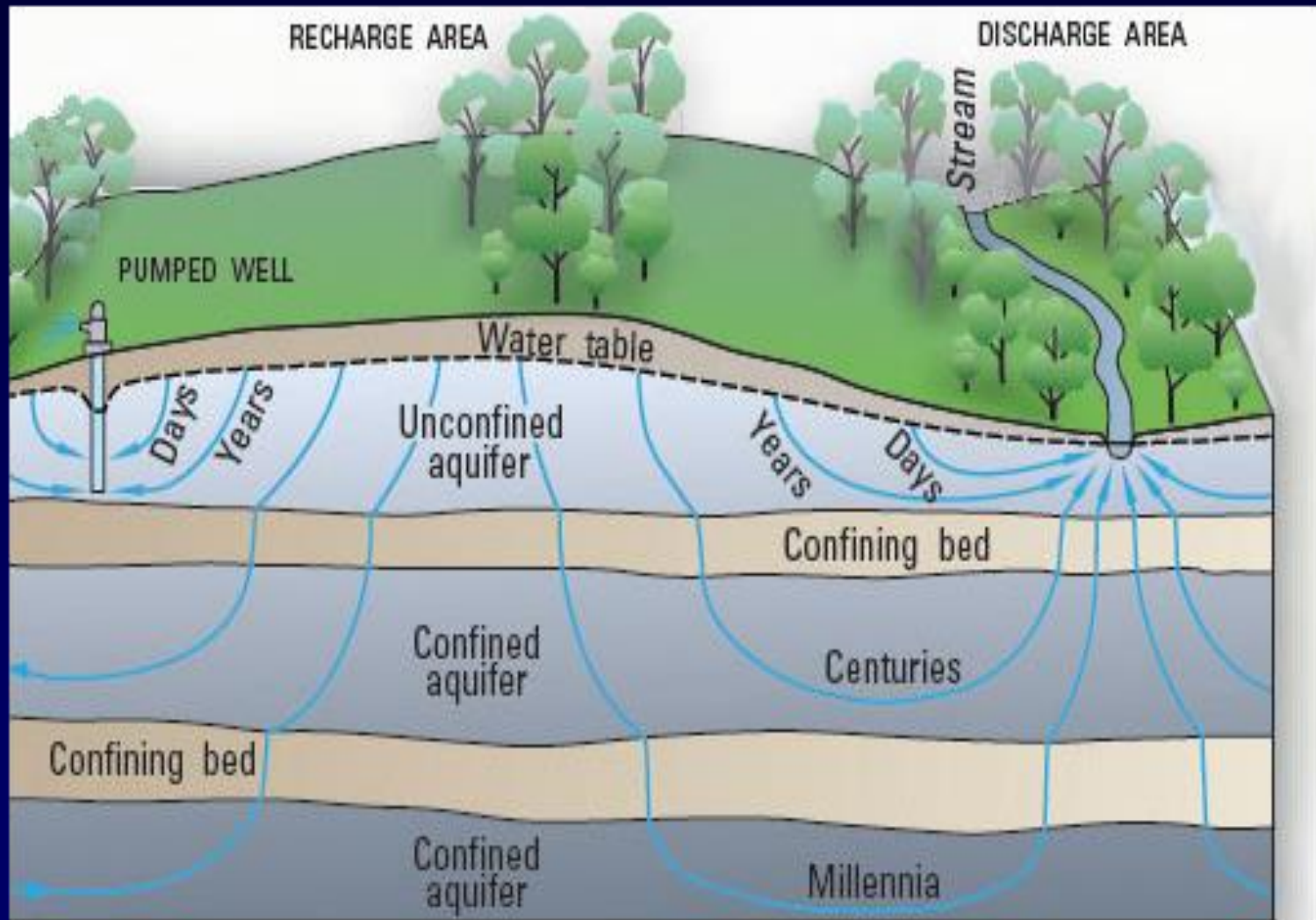
**What is being done to correct the problem?**

Continuing to sample. *Optimization of the well and  
increased sampling*

As a precautionary measure, we will use boiled or bottled water until we inform you that our sampling shows that no bacteria are present. We are working to resolve the problem as soon as possible.



# Aquitards (confining unit) can partially separate aquifers





# Calumet and Brown Counties





# Wisconsin's groundwater contamination issues are significant...



The left jar contains  
“brown water”  
contaminated by  
manure.



**Karst features can be easy to see...**

# **Sinnipee Dolomite: Dane and Iowa Counties**



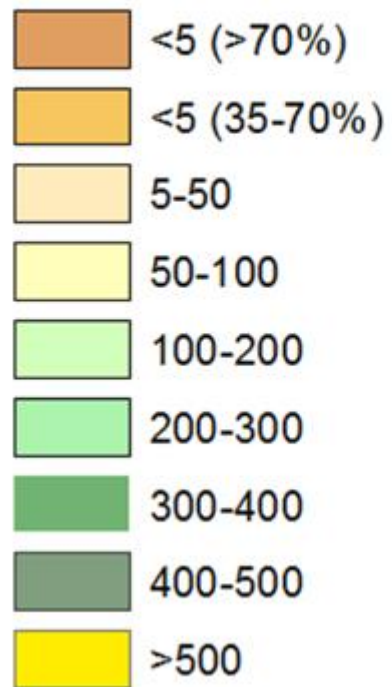


# Green County Hydrogeology



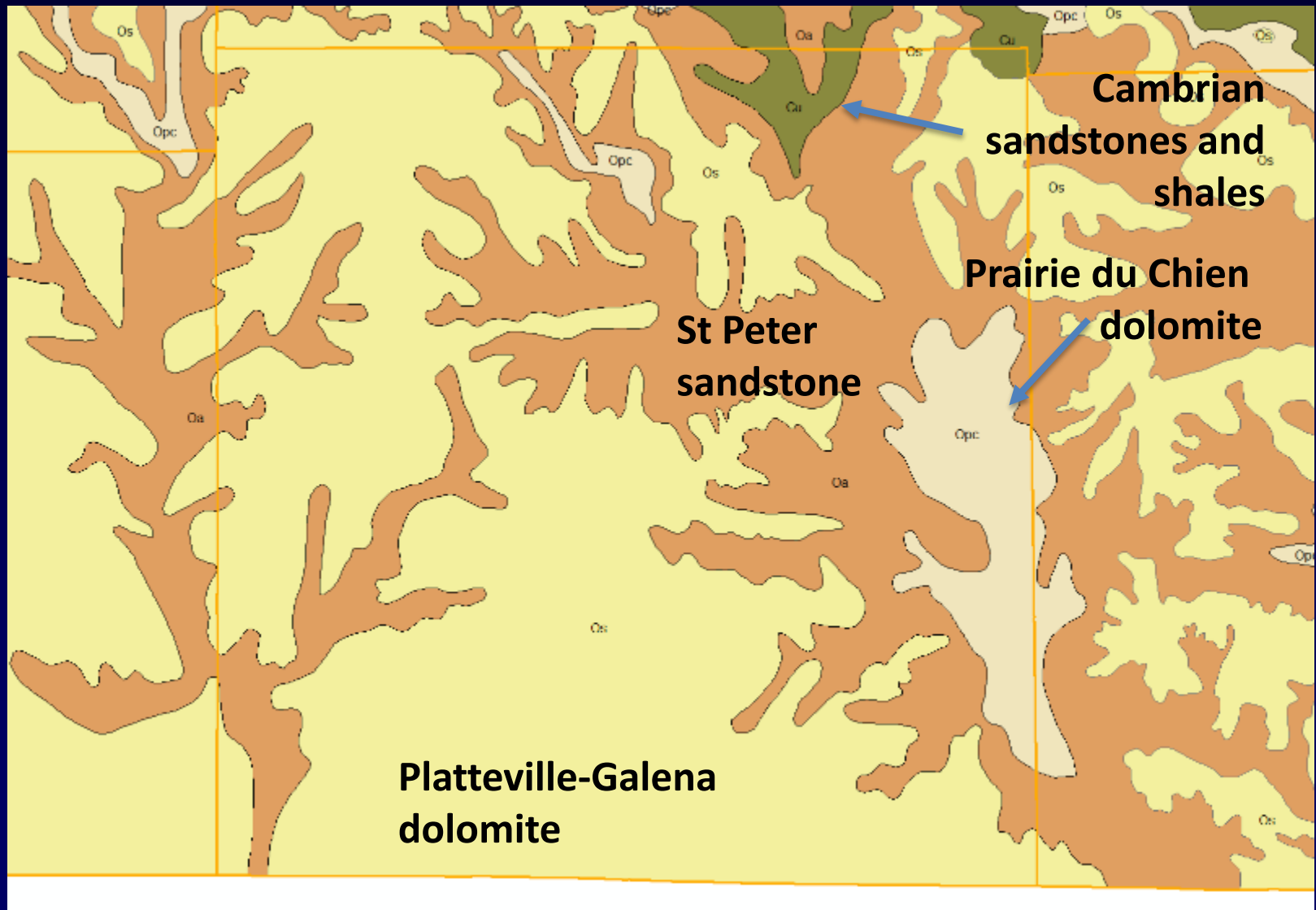
# Depth to Bedrock

## Depth to Bedrock (ft)



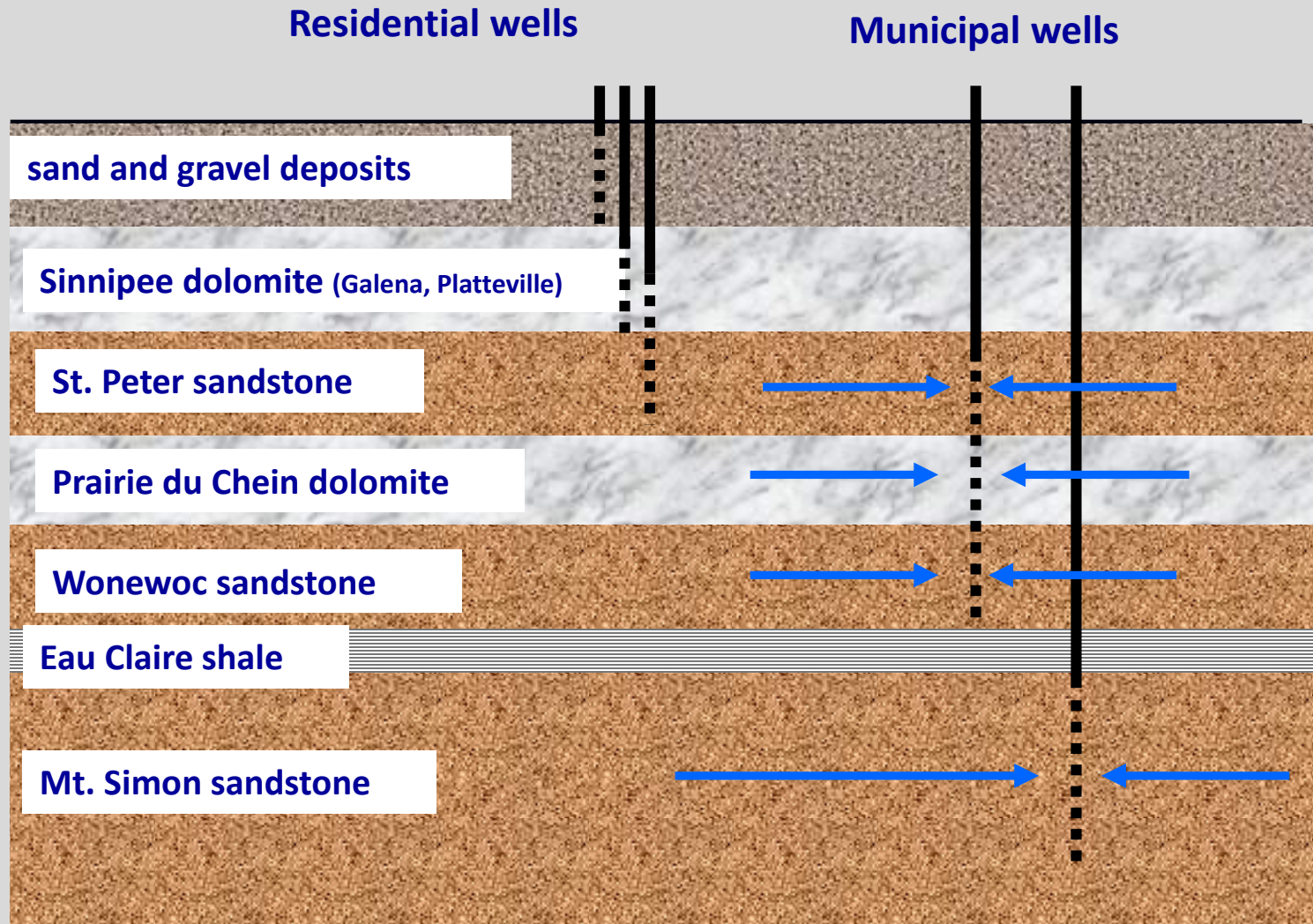


# Green Co Bedrock Geology



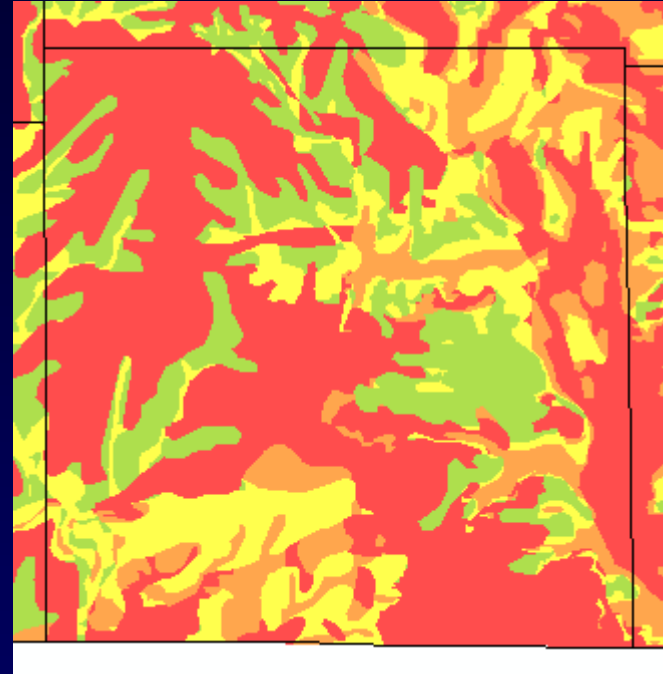
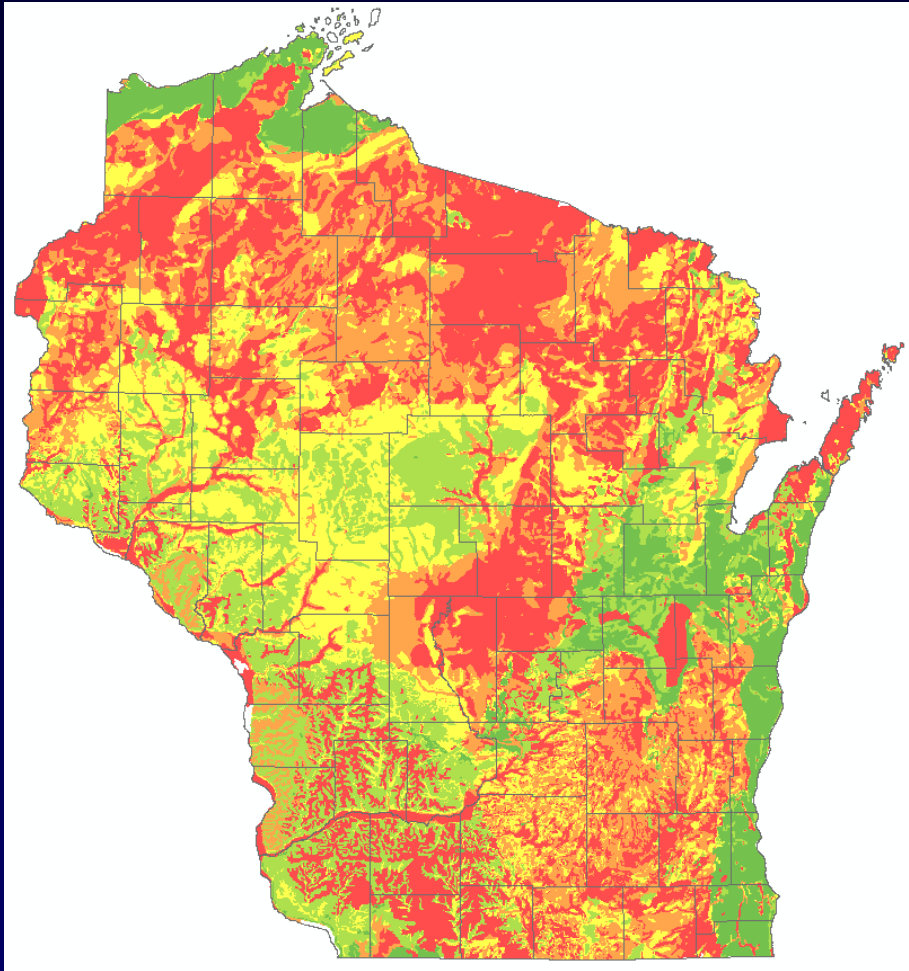


# Green County well construction (likely)





# Wisconsin Groundwater Susceptibility Map



**Depth to bedrock, bedrock type, depth to groundwater,  
soil type, and surficial geologic material**