



# **This is your WAV on Karst**

## Understanding the Connections



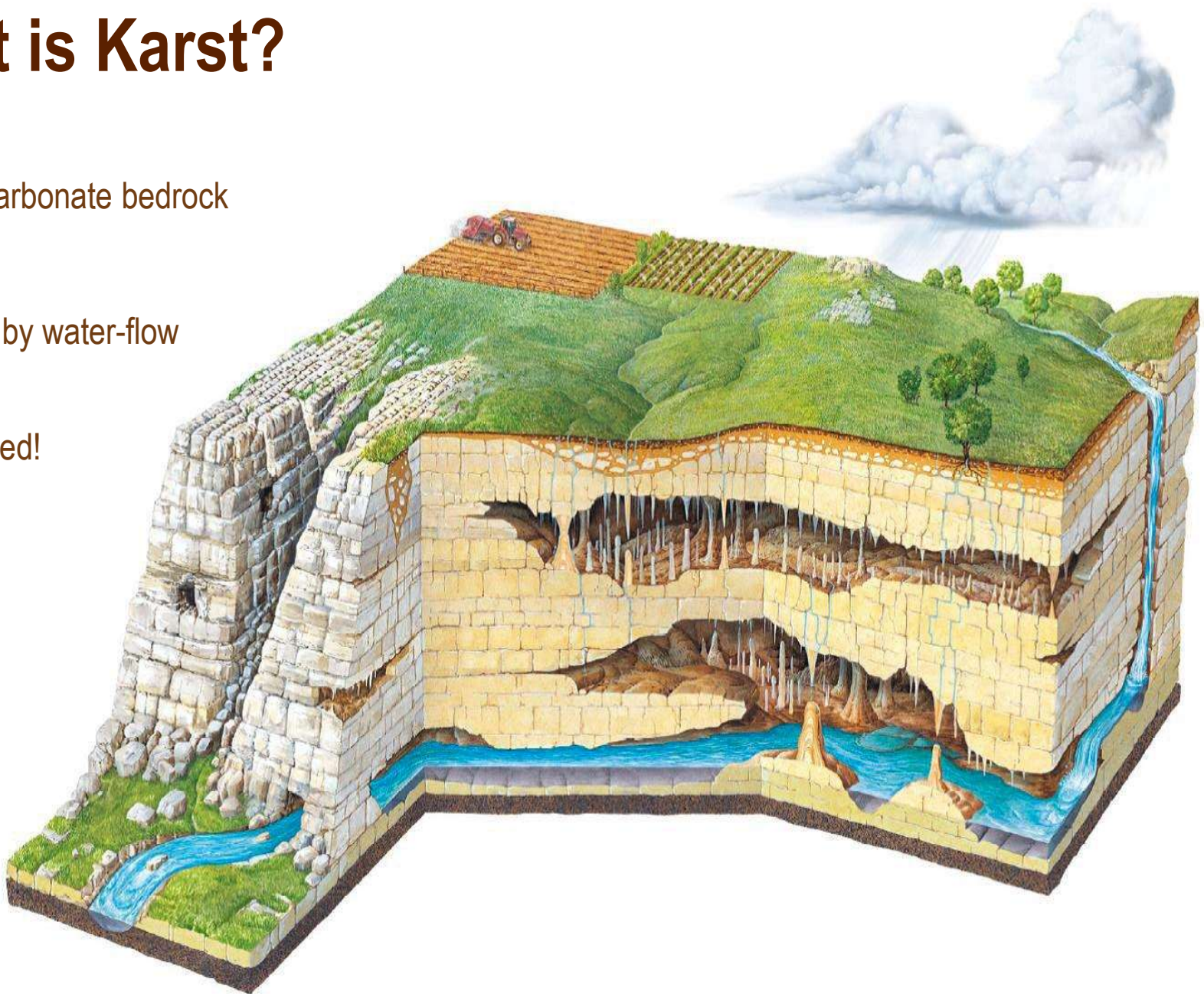
[www.CrawfordStewardship.org](http://www.CrawfordStewardship.org)

# What is Karst?

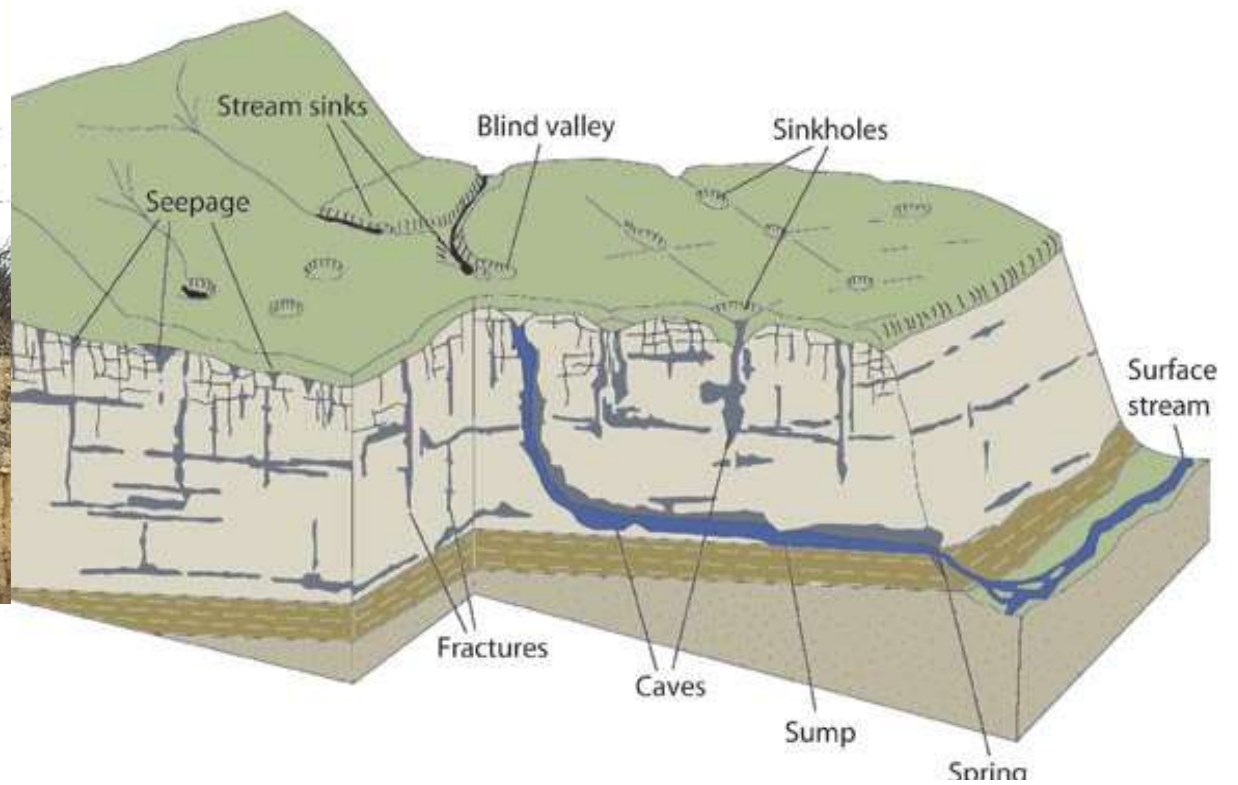
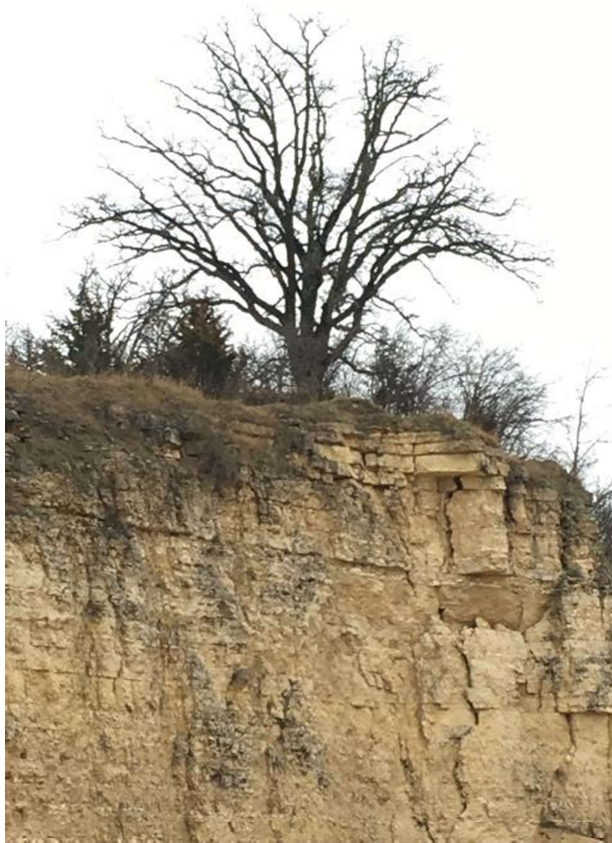
Ancient Carbonate bedrock

Dissolved by water-flow

Complicated!



# Karst features





# Sinkholes





# Caves



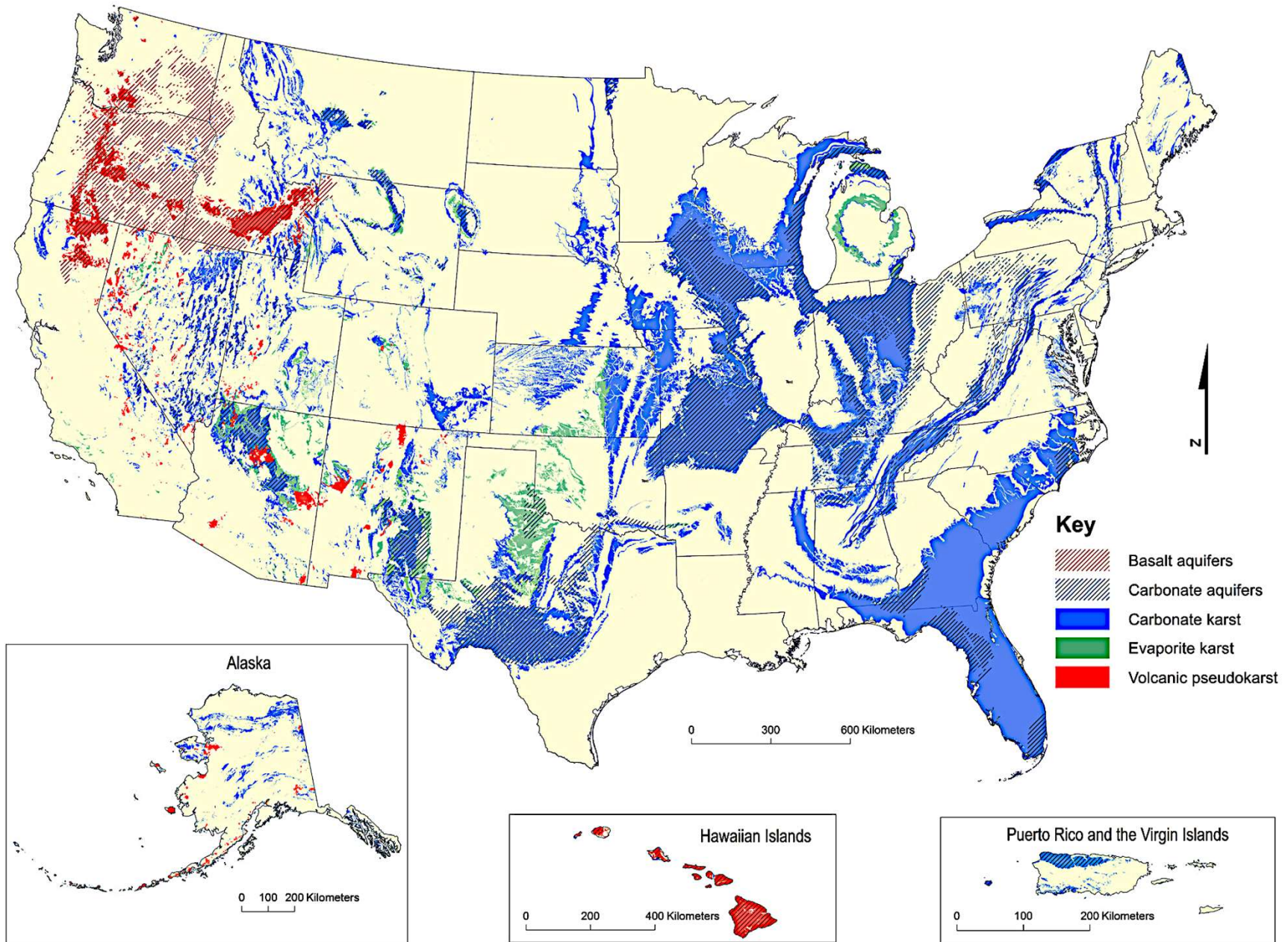


# Springs





# Where is there Karst?





# LEGEND



## DEVONIAN FORMATIONS

■ dolomite and shale

## SILURIAN FORMATIONS

Sd dolomite

## ORDOVICIAN FORMATIONS

Os Masquoketa Formation—shale and dolomite

Oa Sinipee Group—dolomite with some limestone and shale

Sp St. Peter Formation—sandstone with some limestone shale and conglomerate

Opc Prairie du Chien Group—dolomite with some sandstone and shale

## CAMBRIAN FORMATIONS

C sandstone with some dolomite and shale

## MIDDLE PROTEROZOIC ROCKS

Kaweenaw Rocks—  
rs, sandstone  
v, basaltic to rhyolitic lava flows  
t, gabbroic, anorthositic and granitic rocks

Wolf River Rocks—  
g, rapakivi granite, granite and syenite  
s, anorthosite and gabbro

## LOWER PROTEROZOIC ROCKS

q quartzite

gr granite, diorite and gneiss

s, argillite, siltstone, quartzite, graywacke, and iron formation  
vo, basaltic to rhyolitic metavolcanic rocks with some metasedimentary rocks  
ga, meta-gabbro and hornblende diorite

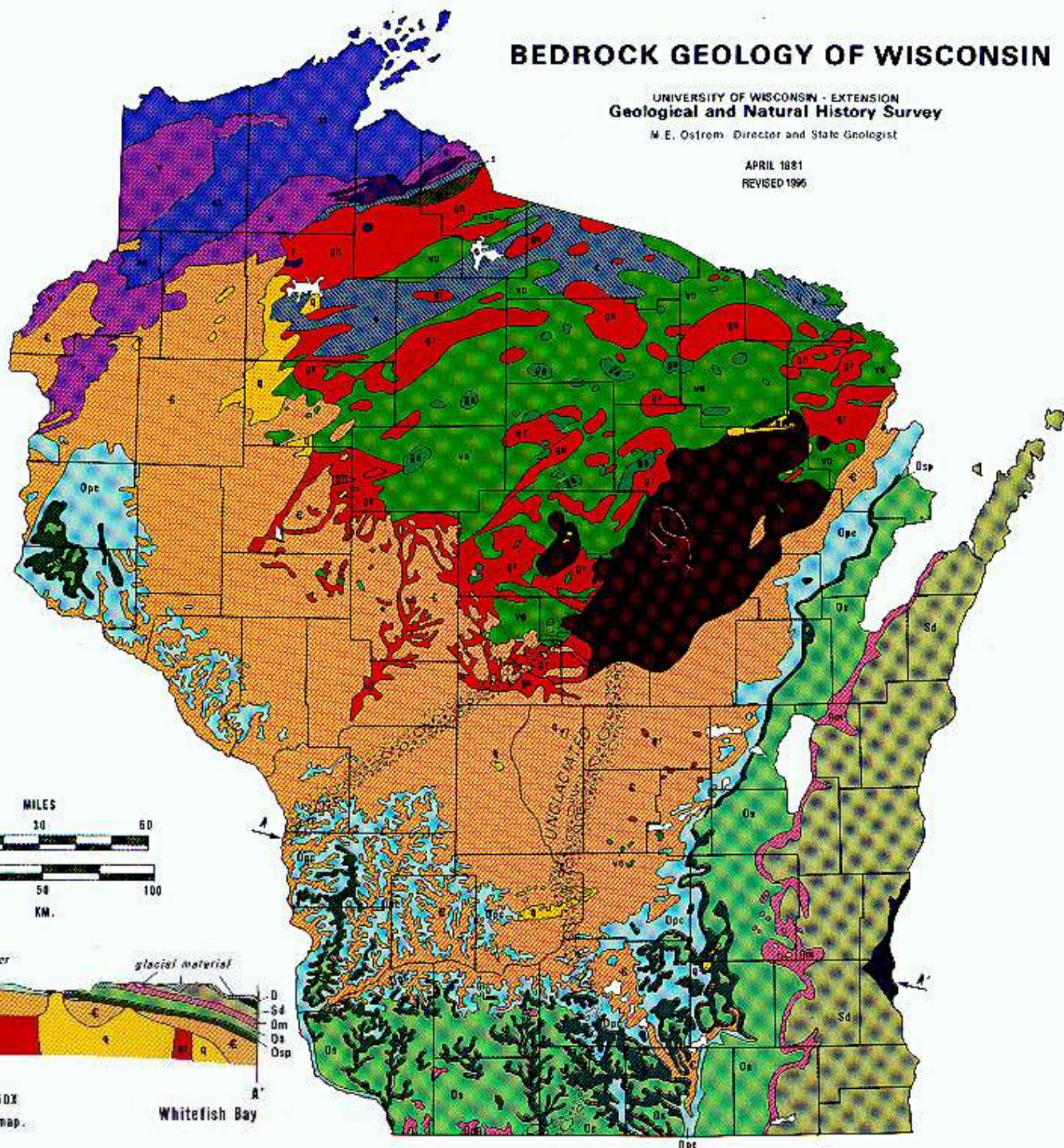
## LOWER PROTEROZOIC OR UPPER ARCHEAN ROCKS

m, metavolcanic rocks  
gn, granite, gneiss and amphibolite

# BEDROCK GEOLOGY OF WISCONSIN

UNIVERSITY OF WISCONSIN - EXTENSION  
Geological and Natural History Survey  
M. E. Ostrom, Director and State Geologist

APRIL 1981  
REVISED 1996

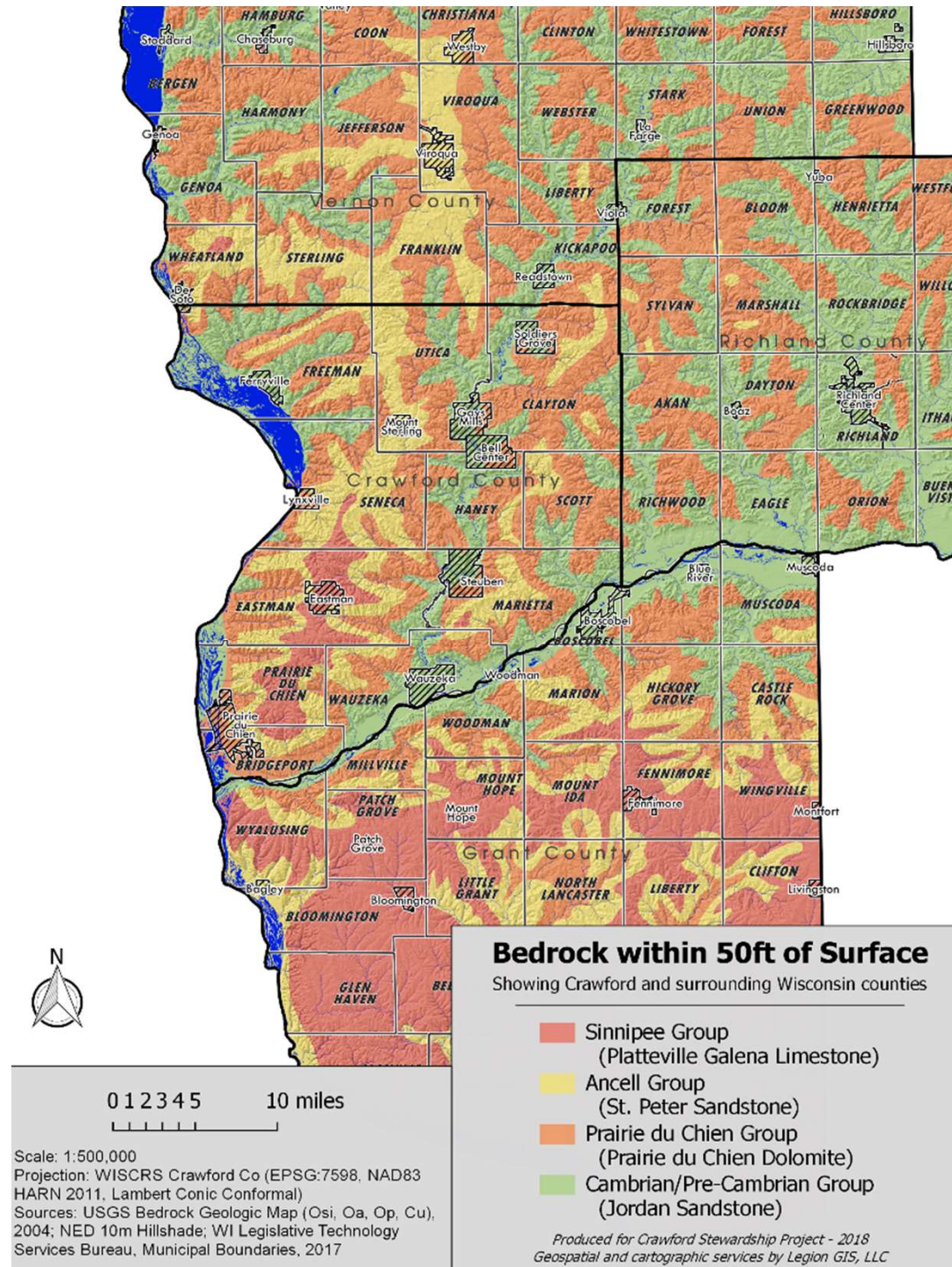


A Stoddard

Whitfish Bay

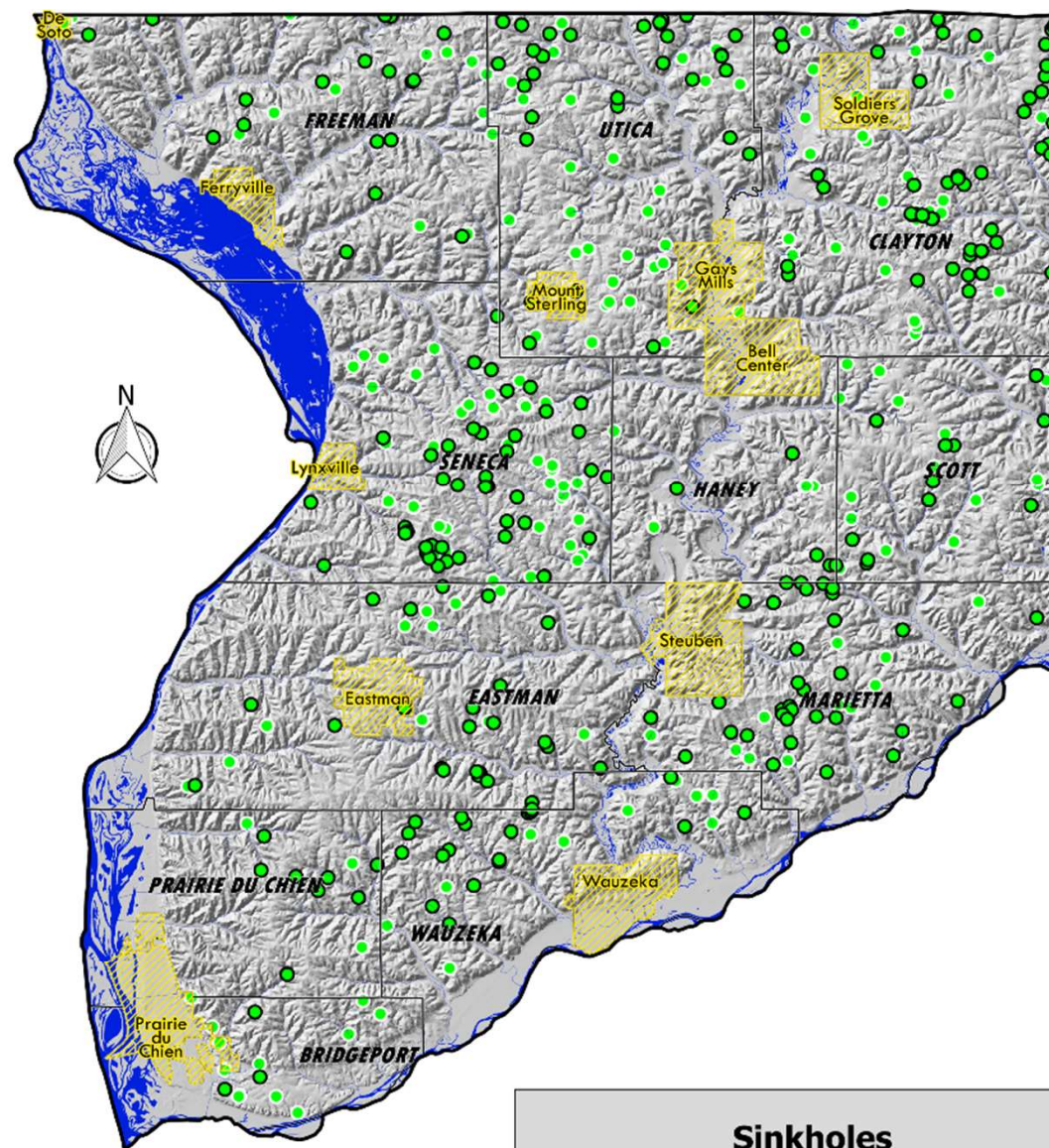


# Bedrock Layers





# Karst Feature Mapping



0 1 2 3 4 5 10 miles

Scale: 1:250,000  
 Projection: WISCRS Crawford Co (EPSG:7598, NAD83  
 HARN 2011, Lambert Conic Conformal)  
 Sources: 5ft resolution LiDAR DEM from WisconsinView;  
 NED 10m Hillshade; WI Legislative Technology Services  
 Bureau, Municipal Boundaries, 2017;

## Sinkholes

in Crawford County

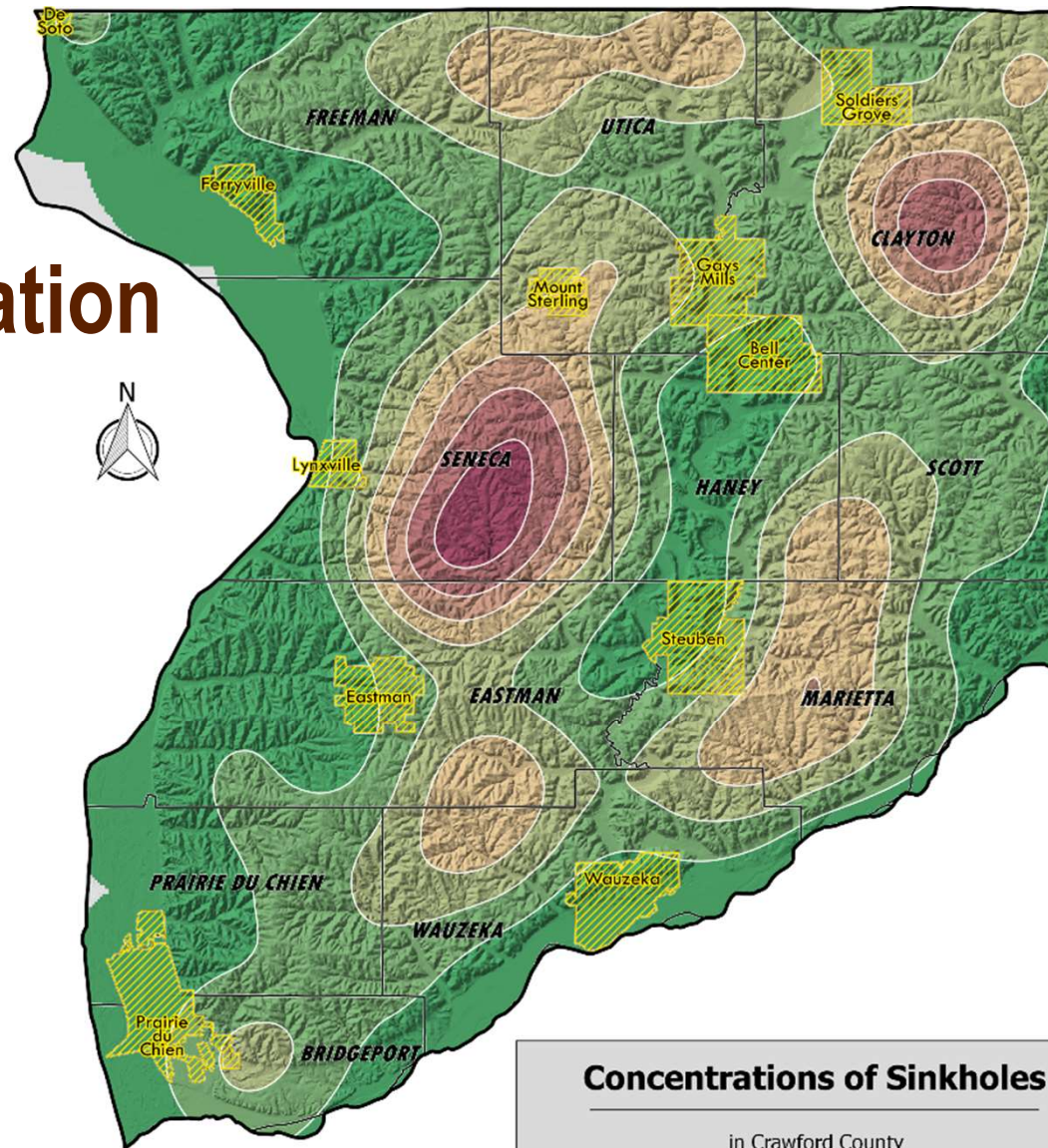
Sink locations derived from LiDAR elevation data,  
 probable/possible sinkhole categorization performed by CSP  
 volunteers.

- Probable Sinkhole
- Possible Sinkhole

*Produced for Crawford Stewardship Project - 2018  
 Geospatial and cartographic services by Legion GIS, LLC*



# Data Generalization



Scale: 1:250,000  
 Projection: WISCRS Crawford Co (EPSG:7598, NAD83  
 HARN 2011, Lambert Conic Conformal)  
 Sources: 5ft resolution LiDAR DEM from WisconsinView;  
 NED 10m Hillshade; WI Legislative Technology Services  
 Bureau, Municipal Boundaries, 2017;

## Concentrations of Sinkholes

in Crawford County

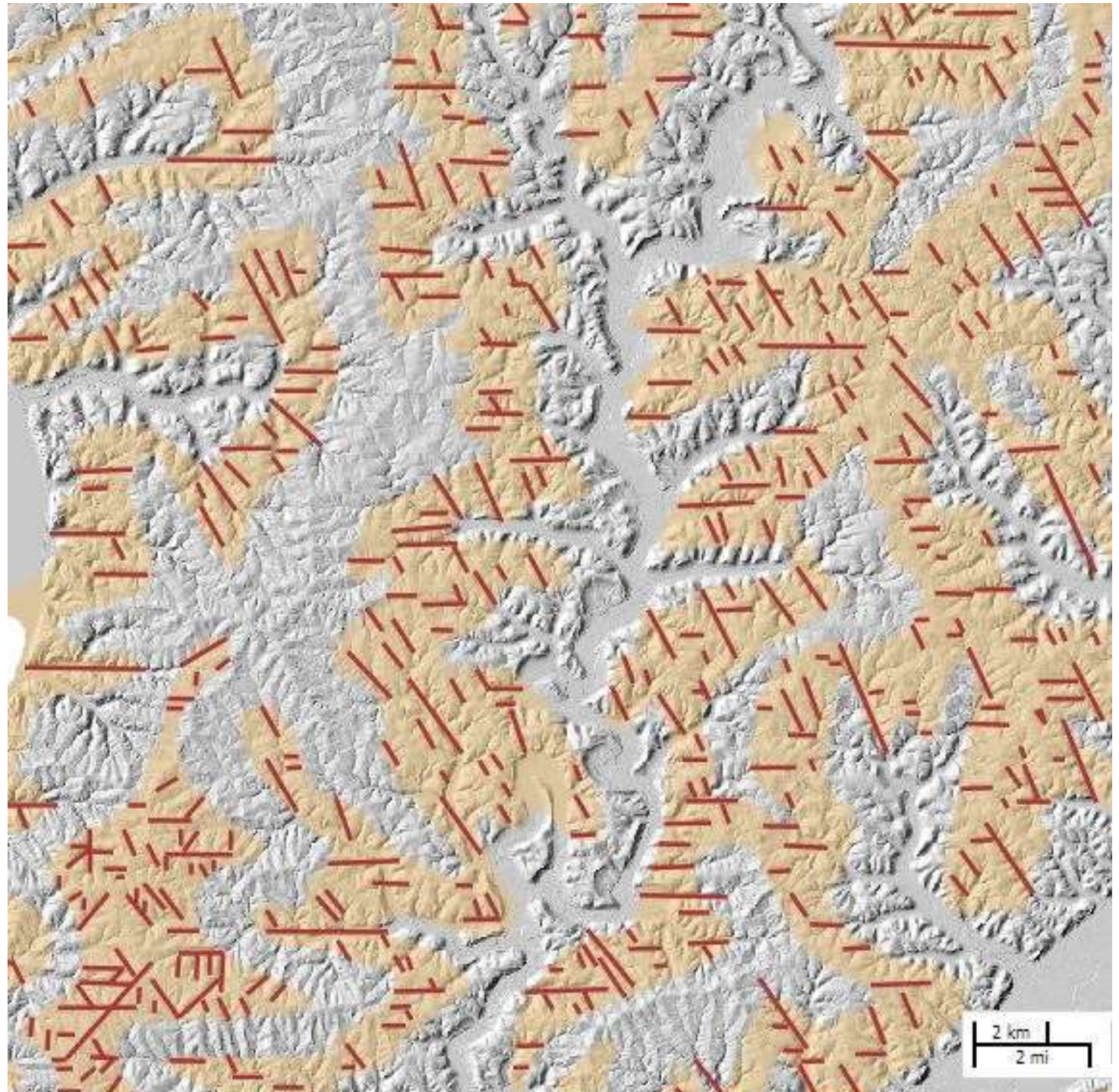
Sinkholes per 100 km<sup>2</sup>



Produced for Crawford Stewardship Project - 2018  
 Geospatial and cartographic services by Legion GIS, LLC



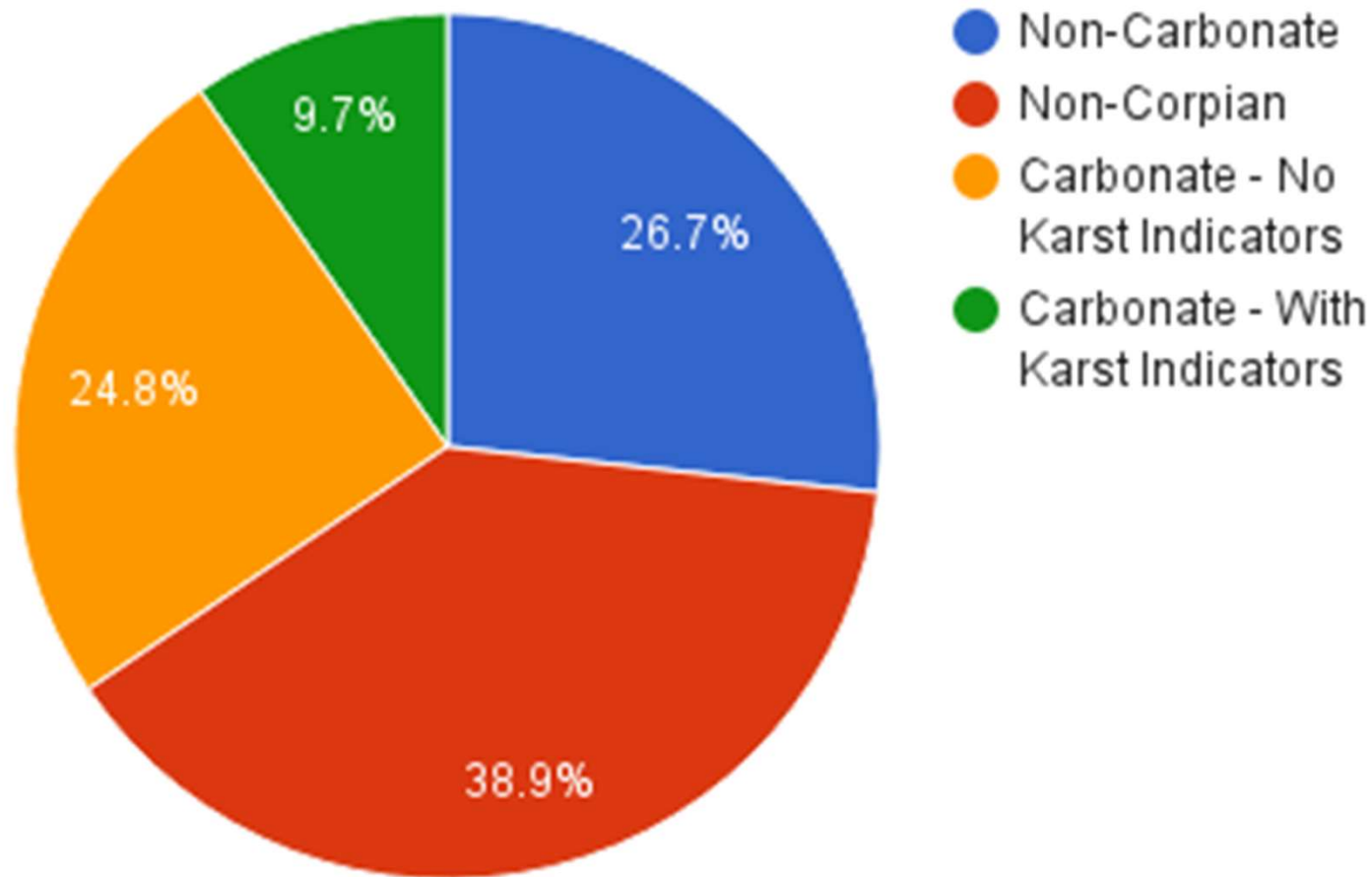
# Karst Fracture Patterns





# Well Construction Report Analysis

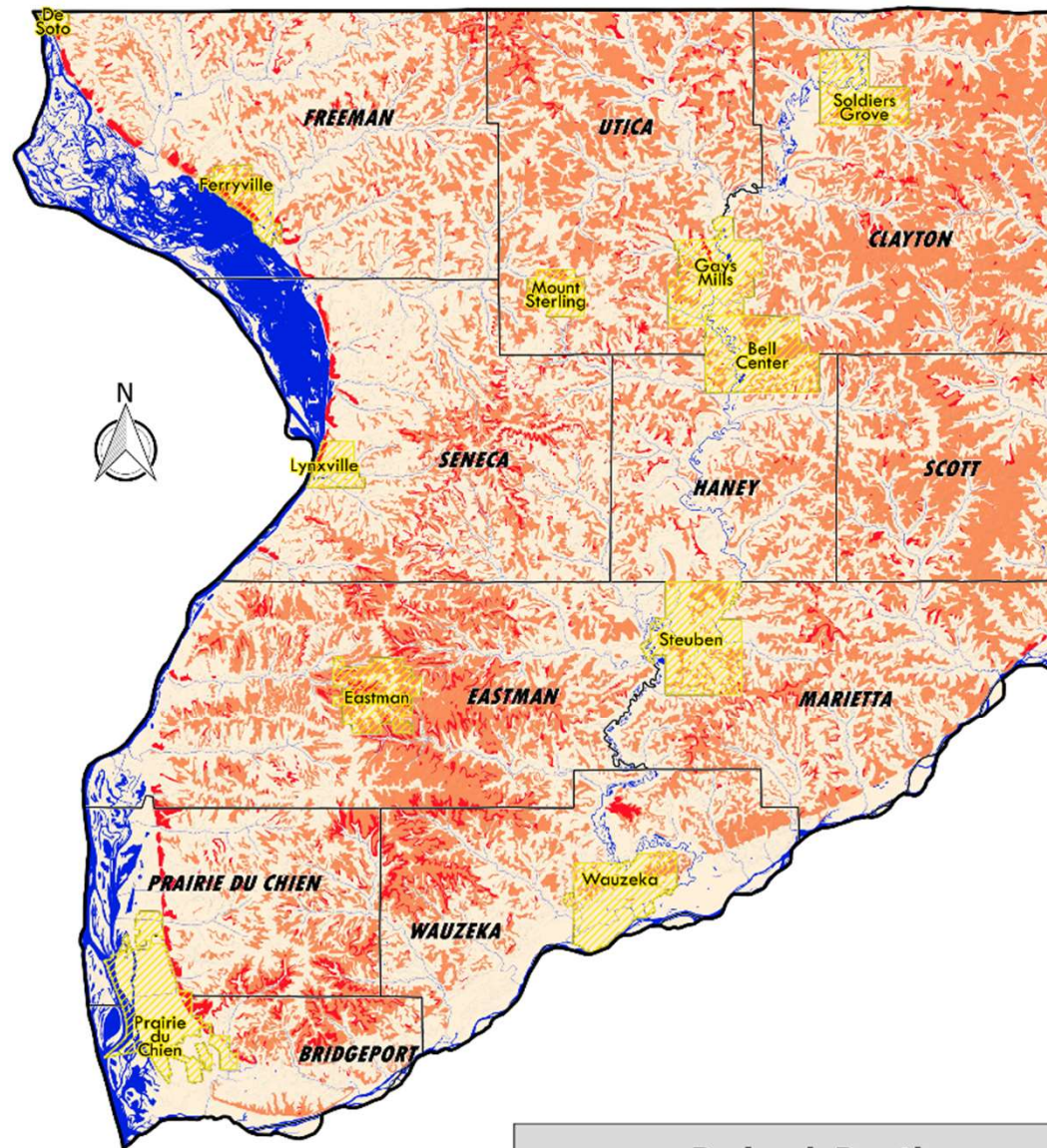
## Full Summary of Analysis



**28% of wells drilled through *any* amount of carbonate bedrock indicate karst features!**



# Shallow Soils



0 1 2 3 4 5 10 miles

Scale: 1:250,000  
 Projection: WISCRS Crawford Co (EPSG:7598, NAD83  
 HARN 2011, Lambert Conic Conformal)  
 Sources: USGS/NRCS SSURGO Database 2.3.2; NED  
 10m Hillshade; WI Legislative Technology Services Bureau,  
 Municipal Boundaries, 2017;

## Bedrock Depth

in Crawford County

Minimum Depth to Bedrock

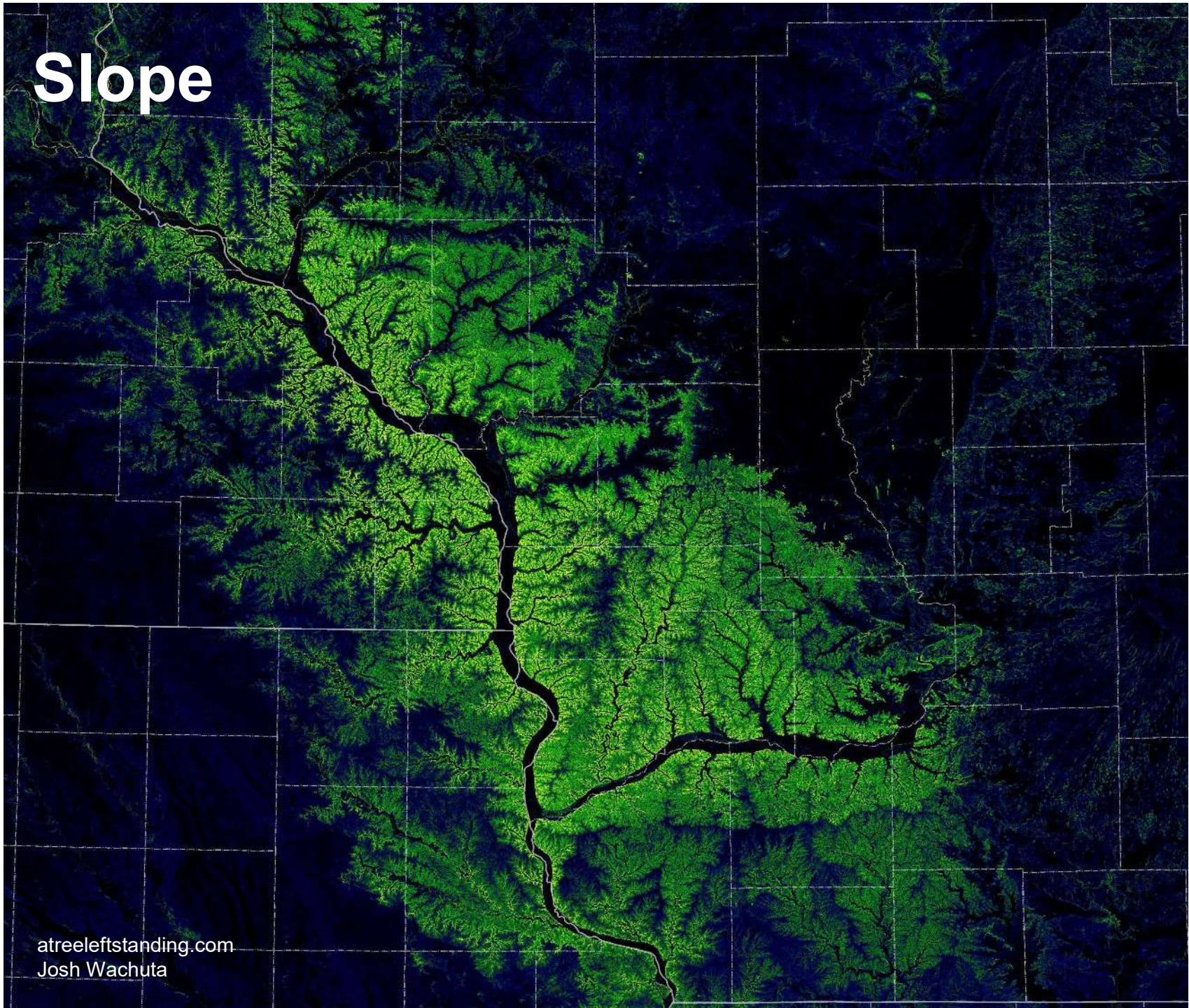
- 0 - 2 ft
- 2 - 5.5 ft
- > 5 ft

Produced for Crawford Stewardship Project - 2018  
 Geospatial and cartographic services by Legion GIS, LLC



# Slope

atreeleftstanding.com  
Josh Wachuta





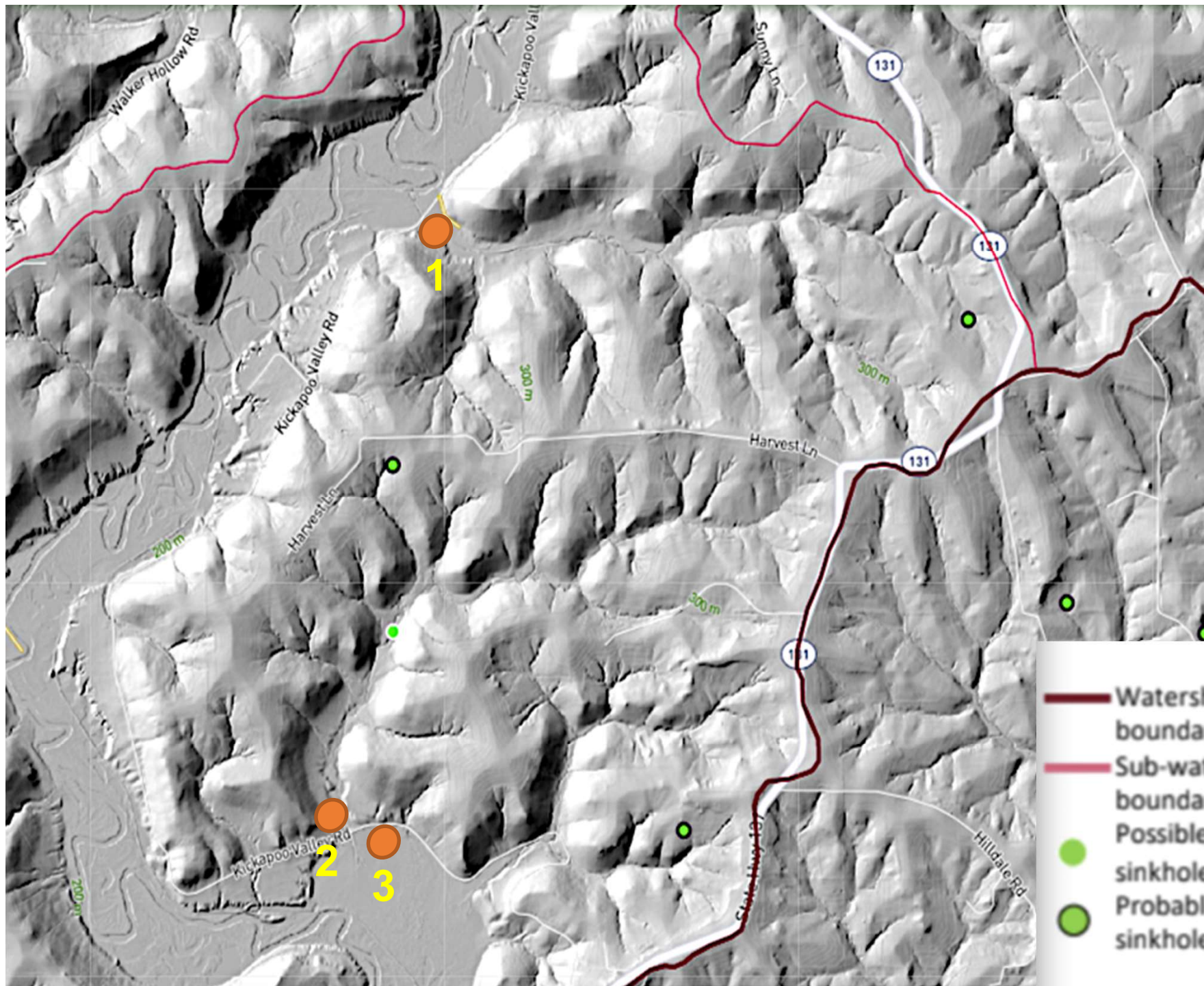


**So...**

**what is the connection with Water Quality Monitoring?**







- Watershed boundary
- Sub-watershed boundary
- Possible sinkhole\*
- Probable sinkhole\*







# ZONE 2: *E. coli* results from 0 up to 5,000 cfu/100mL 2009-2019 WQM Program

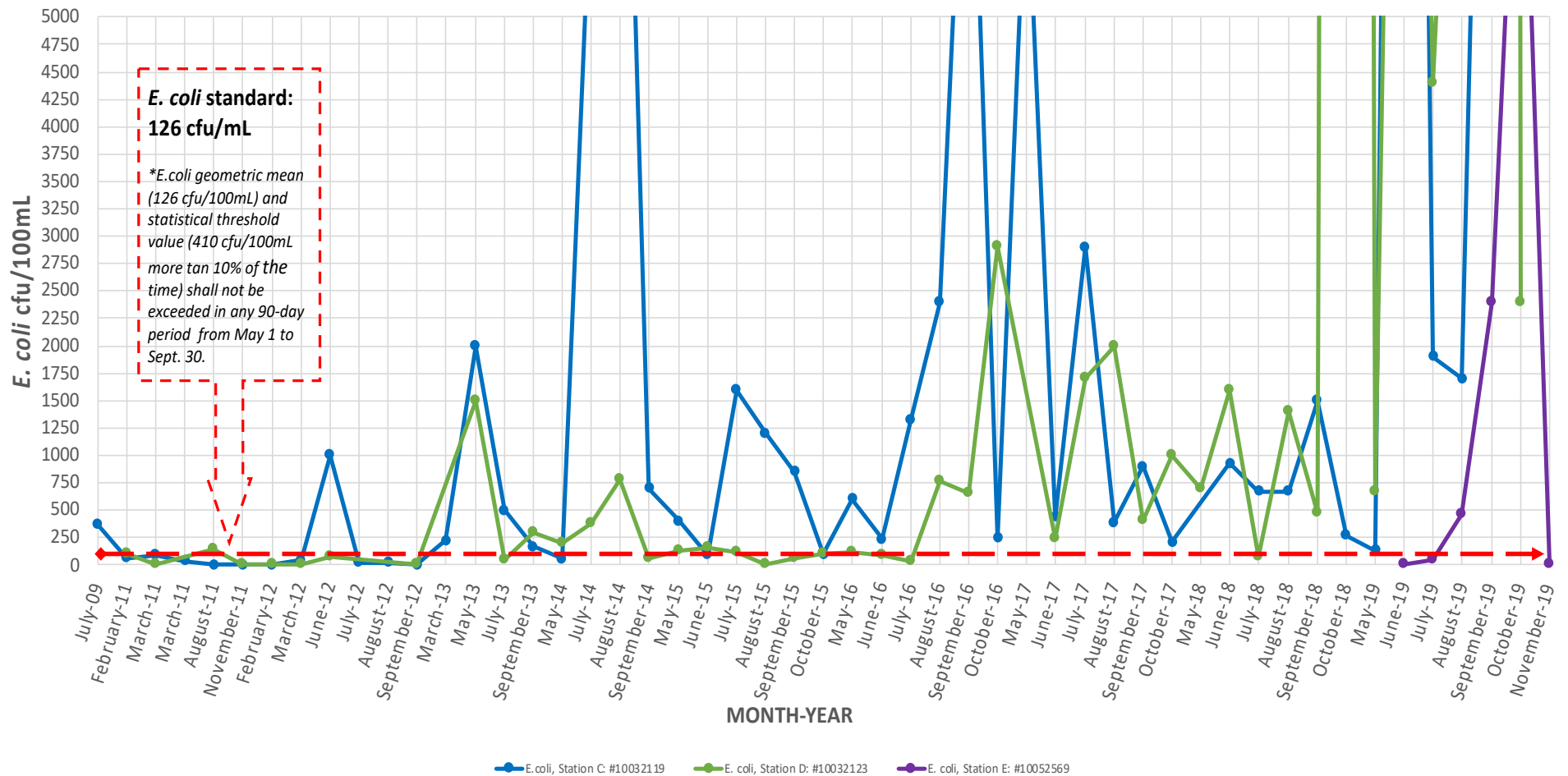


## ZONE 2: *E. coli* RESULTS, 2009-2019

Station C: #10032119 (WI River Tributary, 0.5 mi SE of STH 60 and Knob Ln Intersection)

Station D: #10032123 (Boydtown Creek)

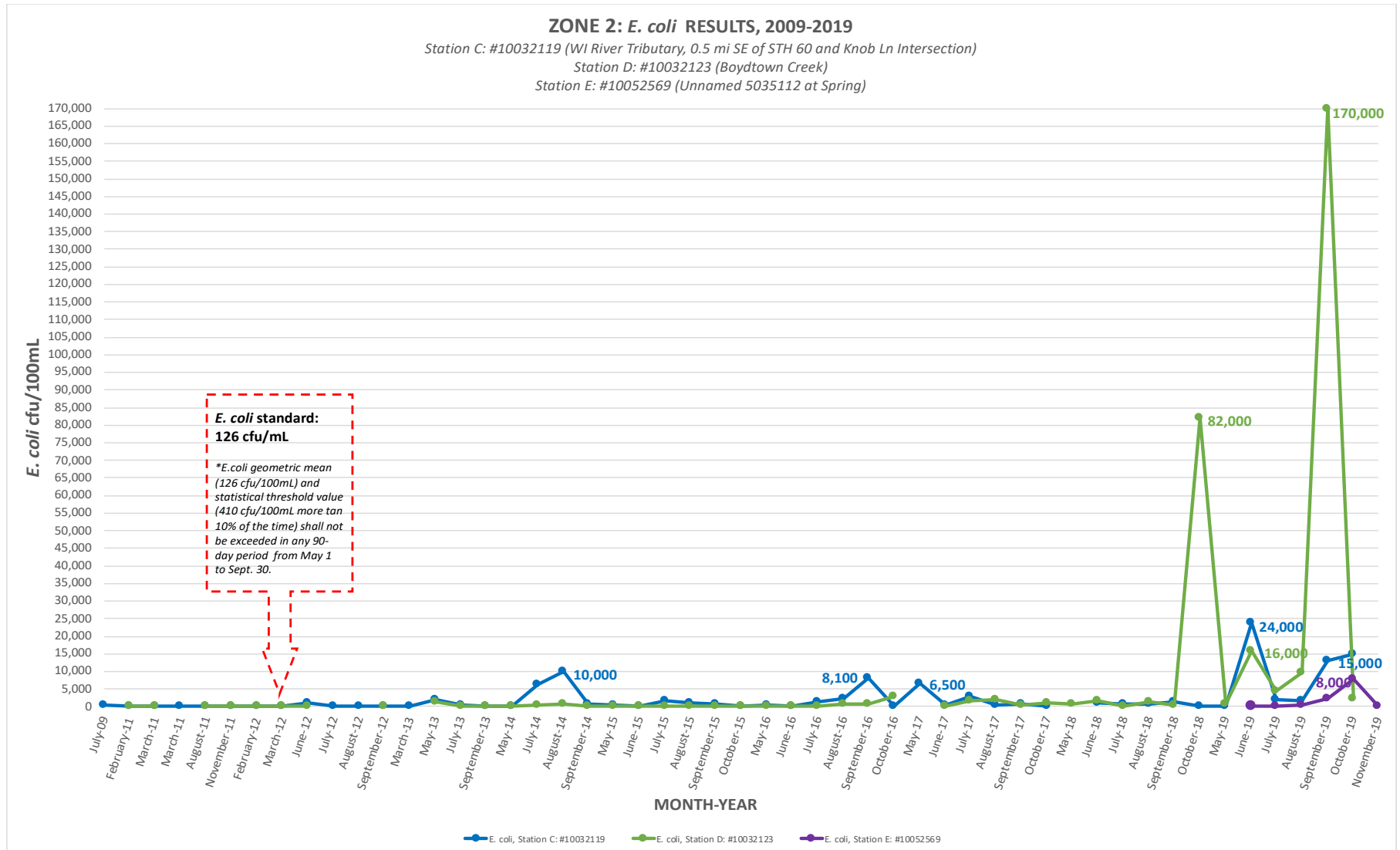
Station E: #10052569 (Unnamed 5035112 at Spring)





# ZONE 2: *E. coli* results from 0 up to 170,000 cfu/100mL 2009-2019

## WQM Program





# ZONE 2: Total Phosphorus results, 2009-2019

## WQM Program

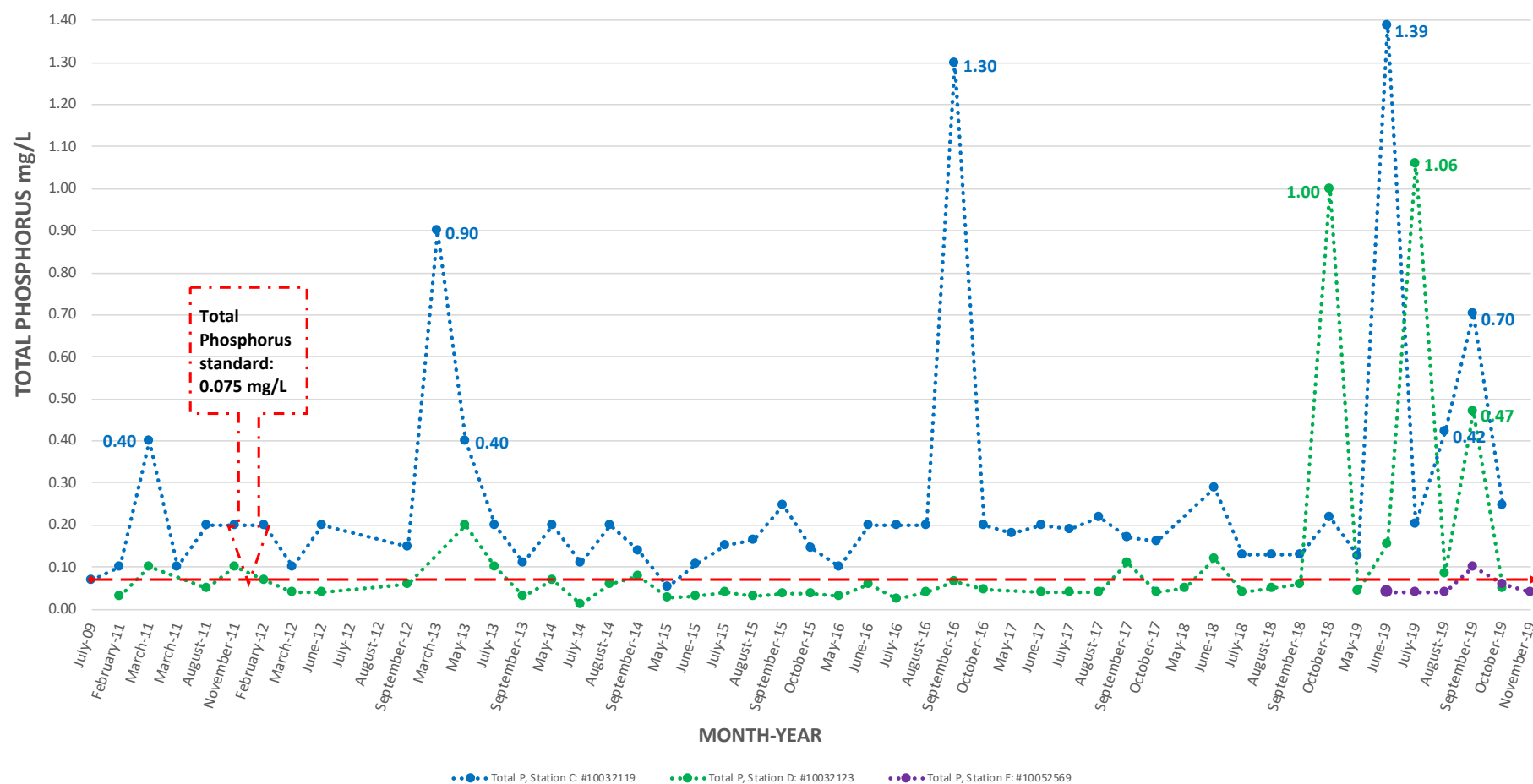


### ZONE 2: TOTAL PHOSPHORUS RESULTS, 2009-2019

Station C: #10032119 (WI River Tributary, 0.5 mi SE of STH 60 and Knob Ln Intersection)

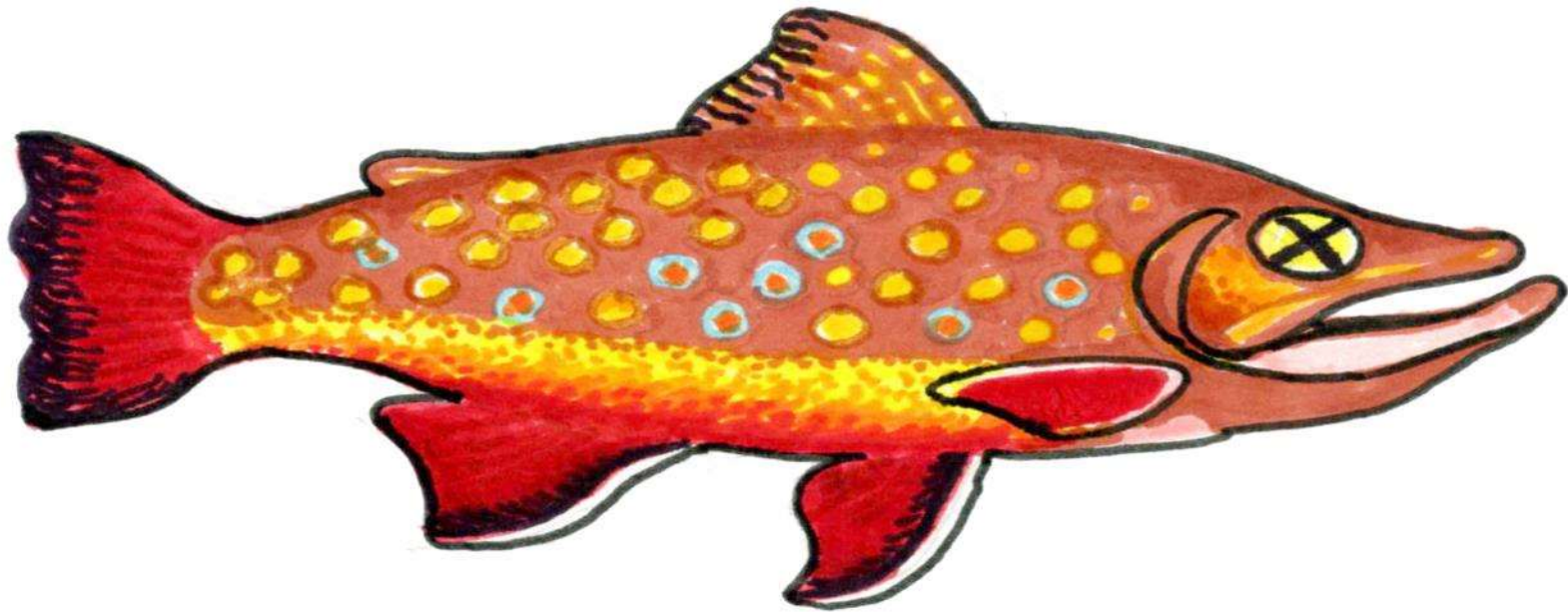
Station D: #10032123 (Boydton Creek)

Station E: #10052569 (Unnamed 5035112 at Spring)





**Questions?**





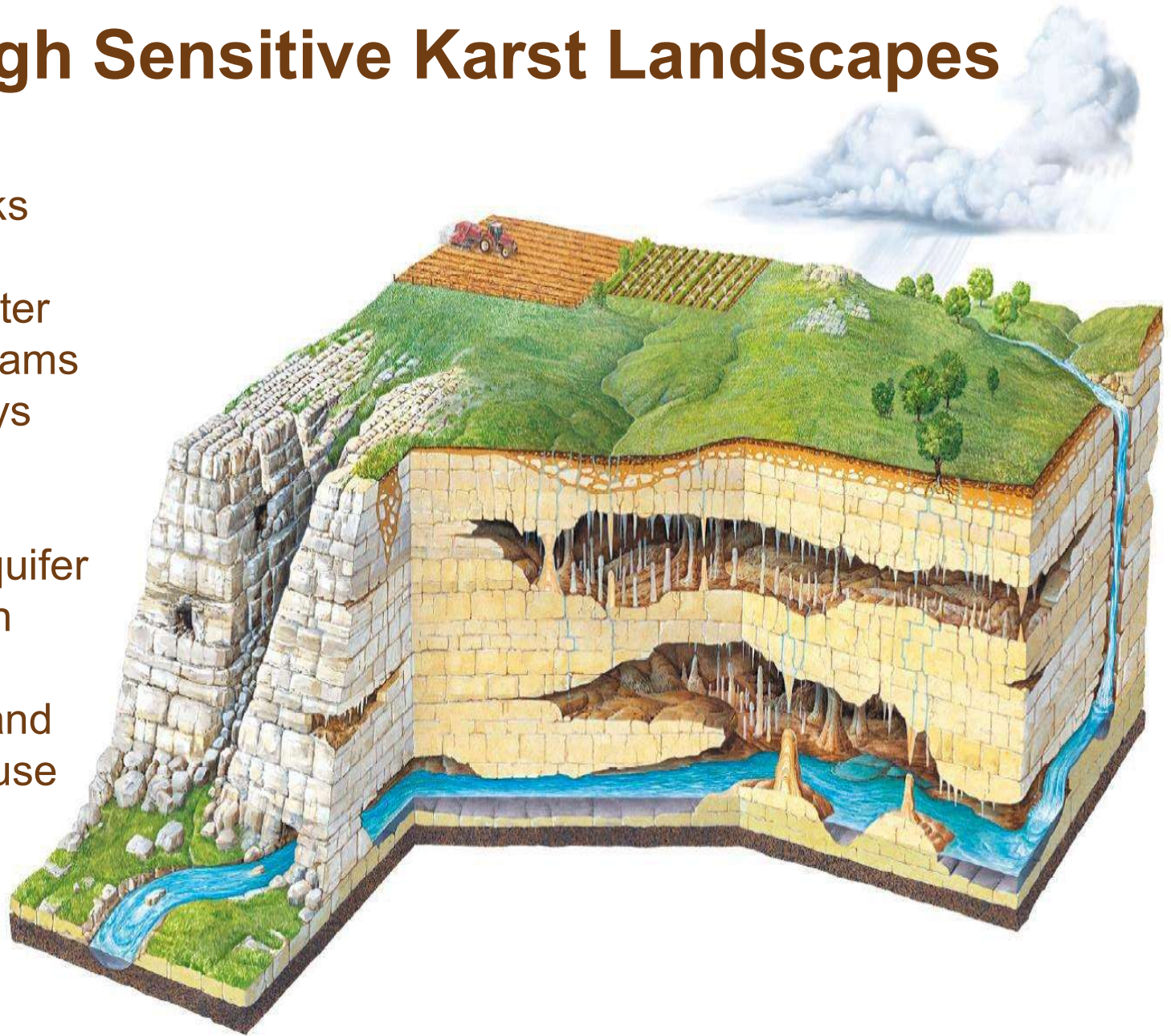
# Understanding the Connections...





# Land use & the Movement of Contaminants through Sensitive Karst Landscapes

- Runoff and infiltration risks
- Impact on water quality in streams and waterways
- Groundwater health and aquifer contamination
- Sustainable and diverse land use





# References:



UW Extension & WI Geological and Natural History Survey

WI Department of Natural Resources

US Department of Agriculture, Natural Resources Conservation Service

US Geological Survey

Legion GIS







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**Thank you!**



**[www.CrawfordStewardship.org](http://www.CrawfordStewardship.org)**