

# Paleo Landslides in SE MN Karst Lands

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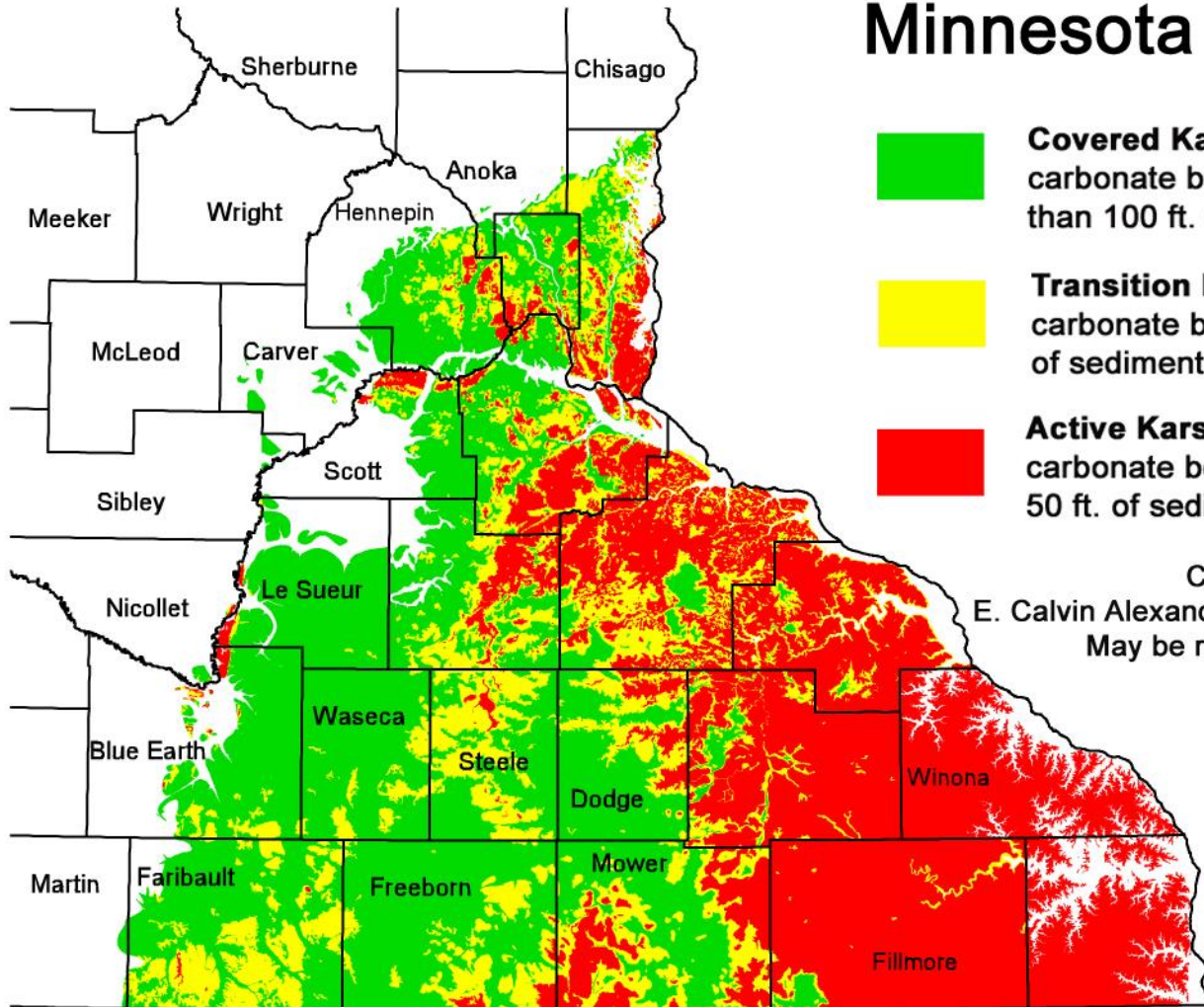
It is hard for scientists to see something  
when they are not looking for it.

As will be abundantly clear as this talk proceeds  
I know very little about landslides.

My goal here is to alert the karst community  
the existences of these landslides.

I hope that some of you may be interested in  
studying them.

# Minnesota Karst Lands



**Covered Karst.** Areas underlain by carbonate bedrock but with more than 100 ft. of sediment cover.

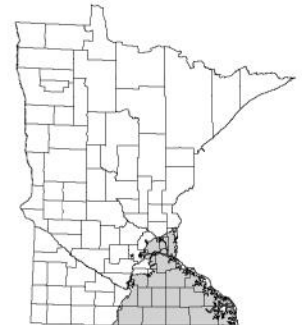


**Transition Karst.** Areas underlain by carbonate bedrock with 50 - 100 ft. of sediment cover.



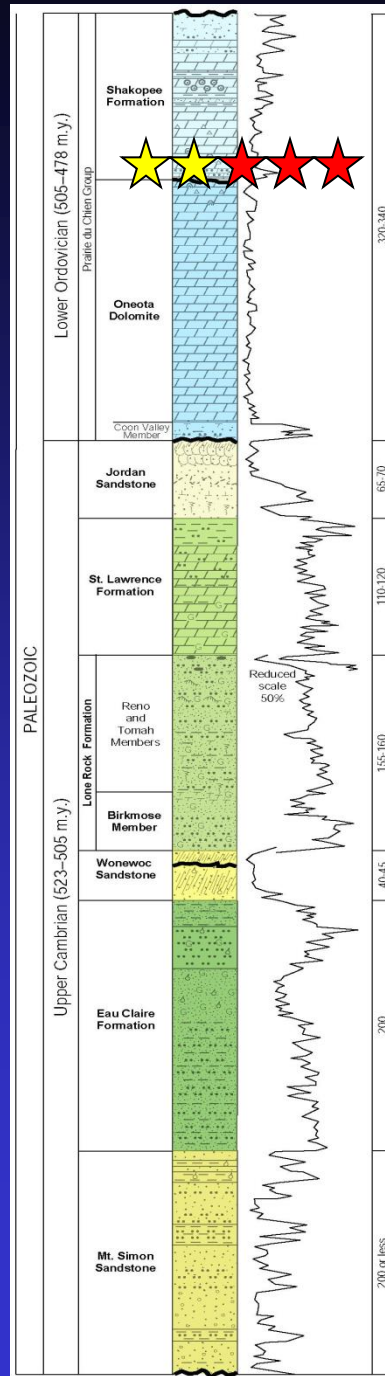
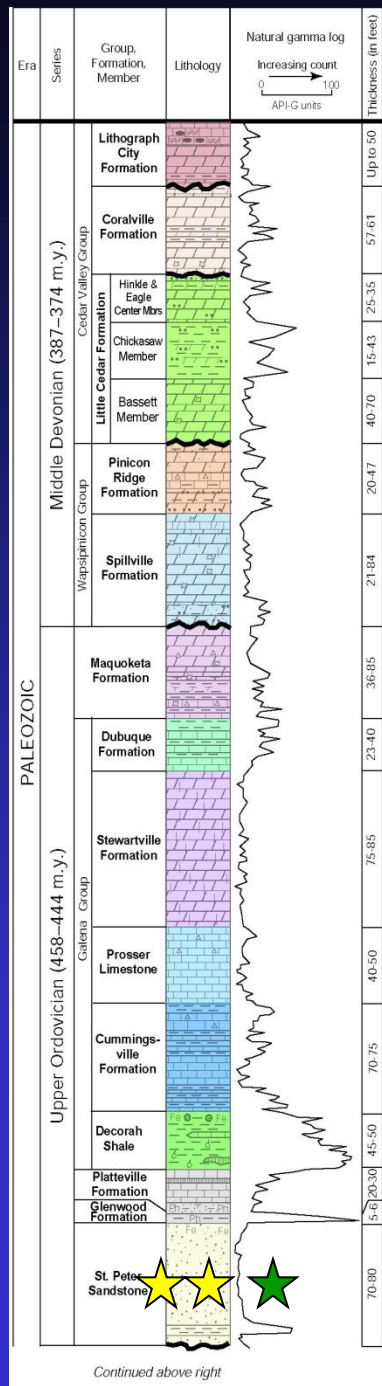
**Active Karst.** Areas underlain by carbonate bedrock with less than 50 ft. of sediment cover.

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50 0 50 100 150 Kilometers

50 0 50 100 Miles



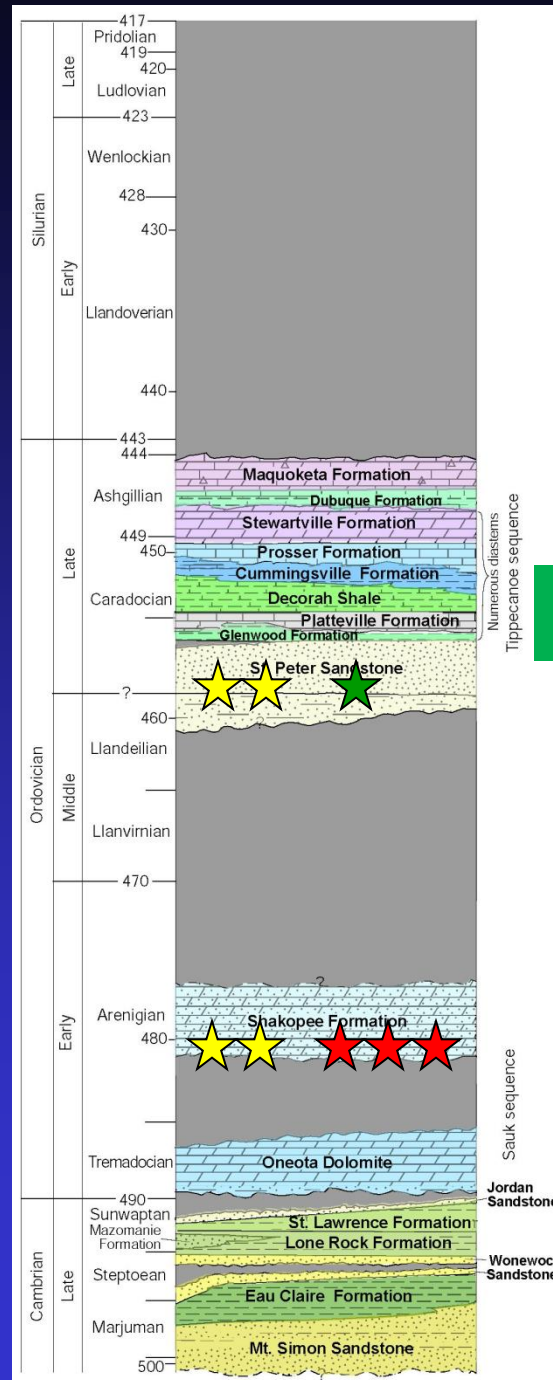
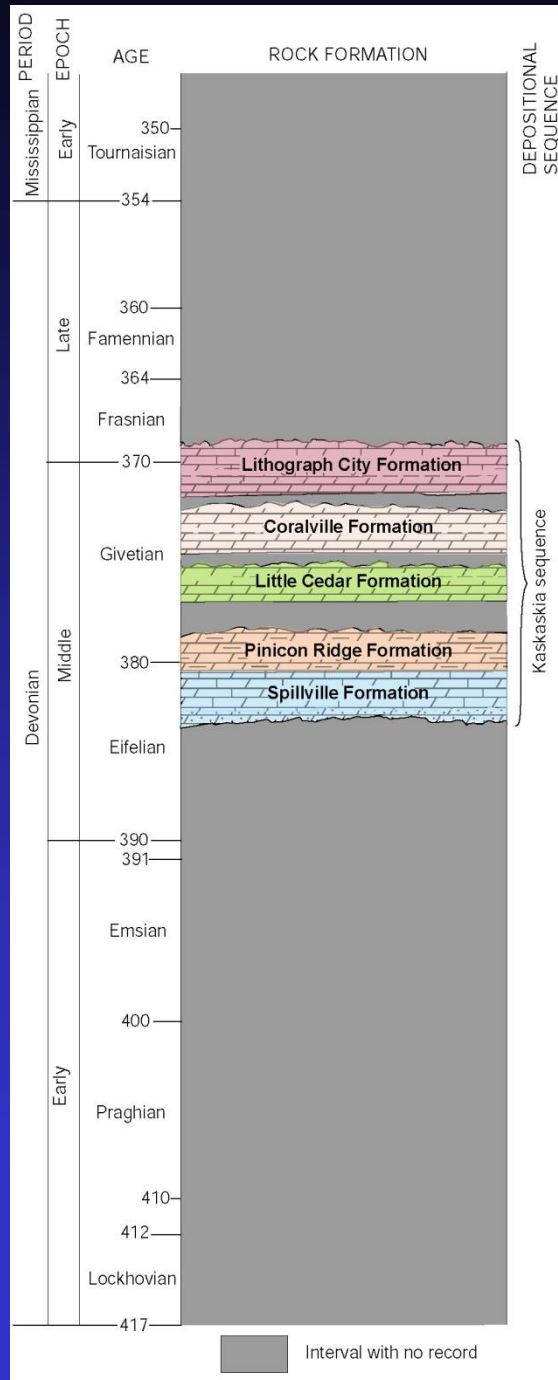
# Paleozoic Lithostratigraphic Column SE Minnesota

Vertical scale proportional to the thickness of each unit.

Wavy black lines are unconformities.

- ★ WWTF lagoon collapses
- ★ Storm water pond failures
- ★ Pumping induced sinkholes

Sinkhole Distribution

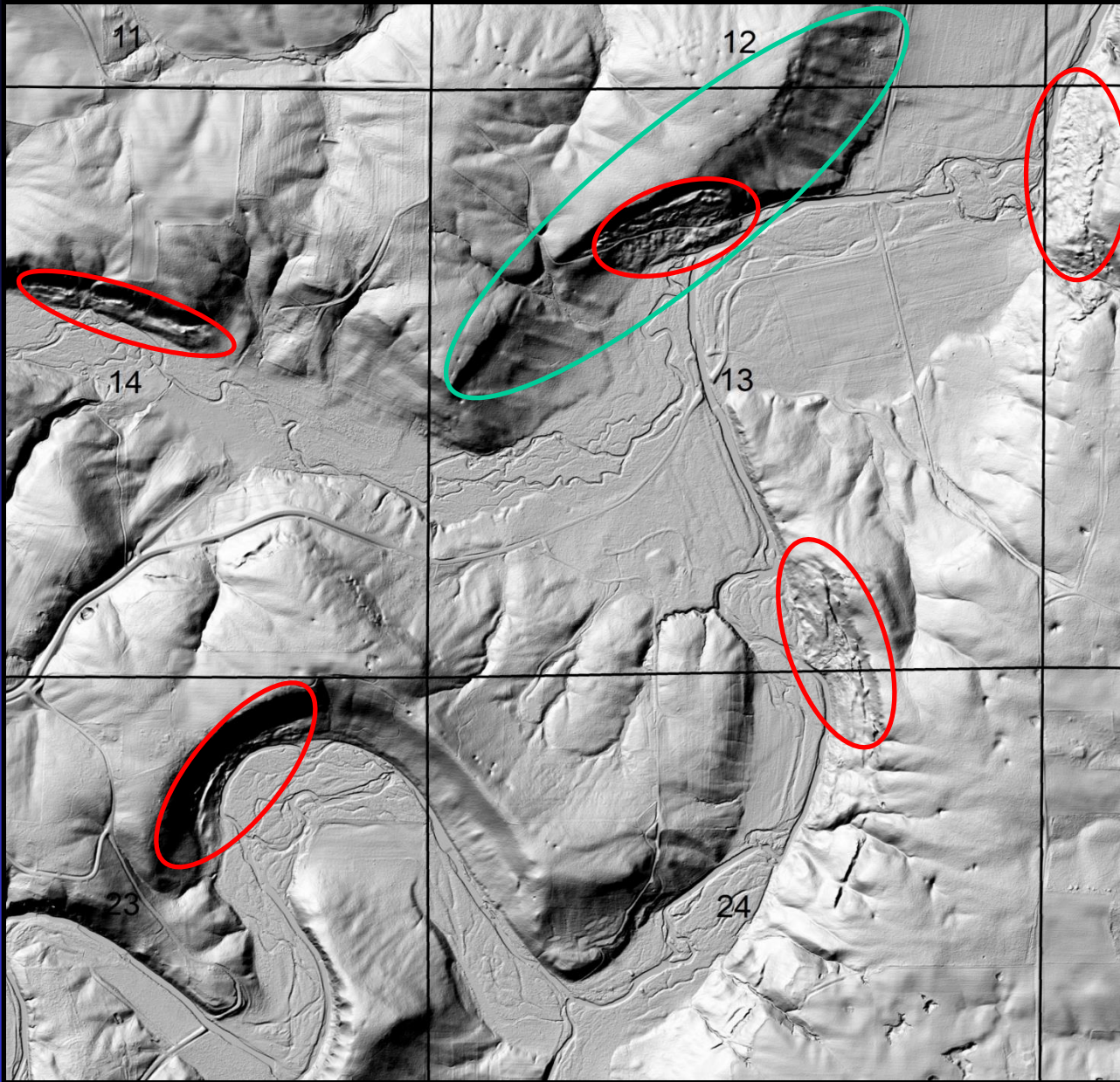


# Paleozoic Chronostratigraphic Column SE Minnesota

- Vertical scale is linear time.
- Gray areas are unconformities.

- WWTF lagoon collapses
- Storm water pond failures
- Pumping induced sinkholes



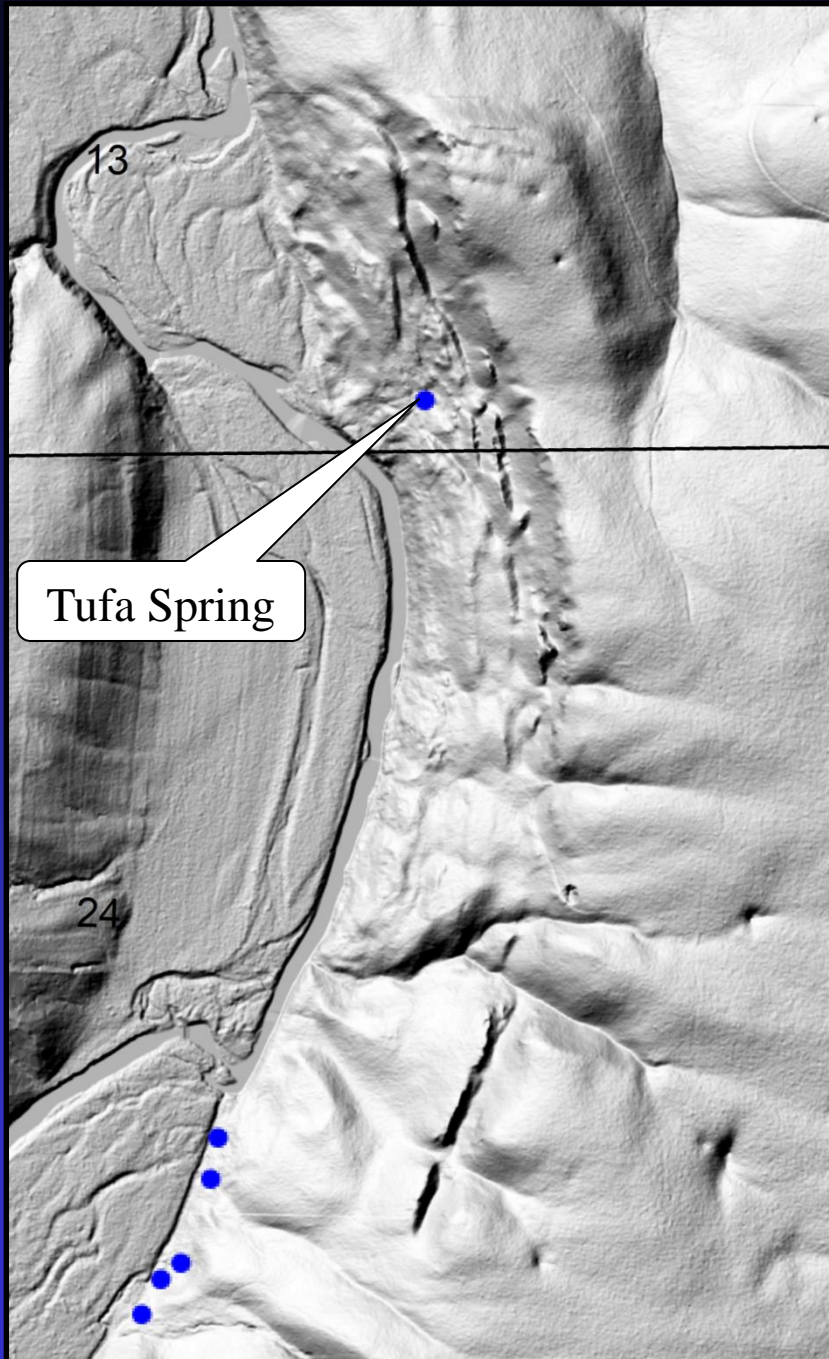


**Forestville  
Mystery Cave  
State Park  
Fillmore Co., MN**

Entrenched  
bedrock  
meanders of the  
South Branch  
Root River

Black lines are section lines in Forestville Township

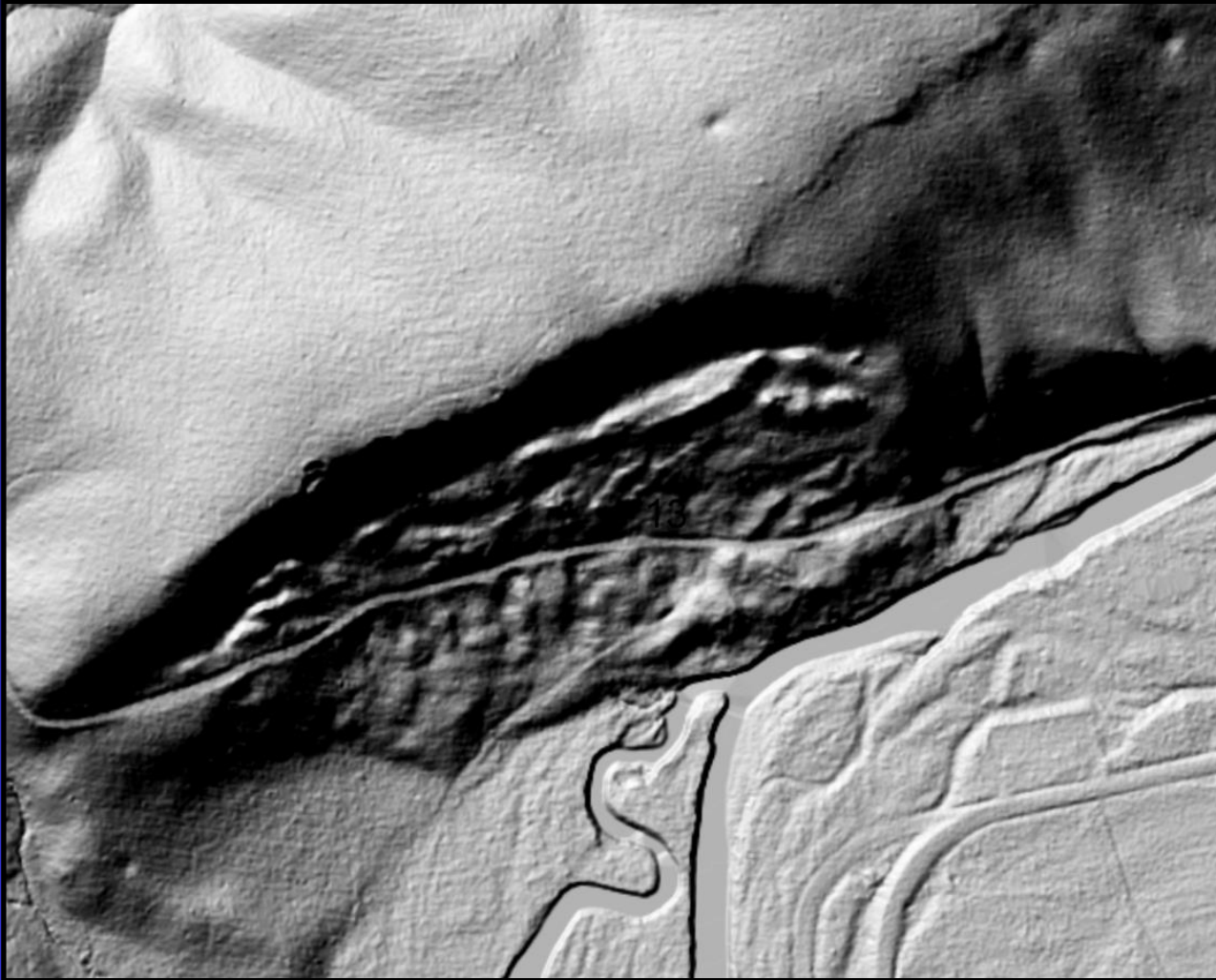
# Tufa Spring Slide



- Chaotic terrane versus smoother valley walls
- Arcuate headwall scarp
- Headwall trench
- Sinkholes on upland
- Erosion ravines cut the southern end
- Tufa Spring



# Forestville Store Slide

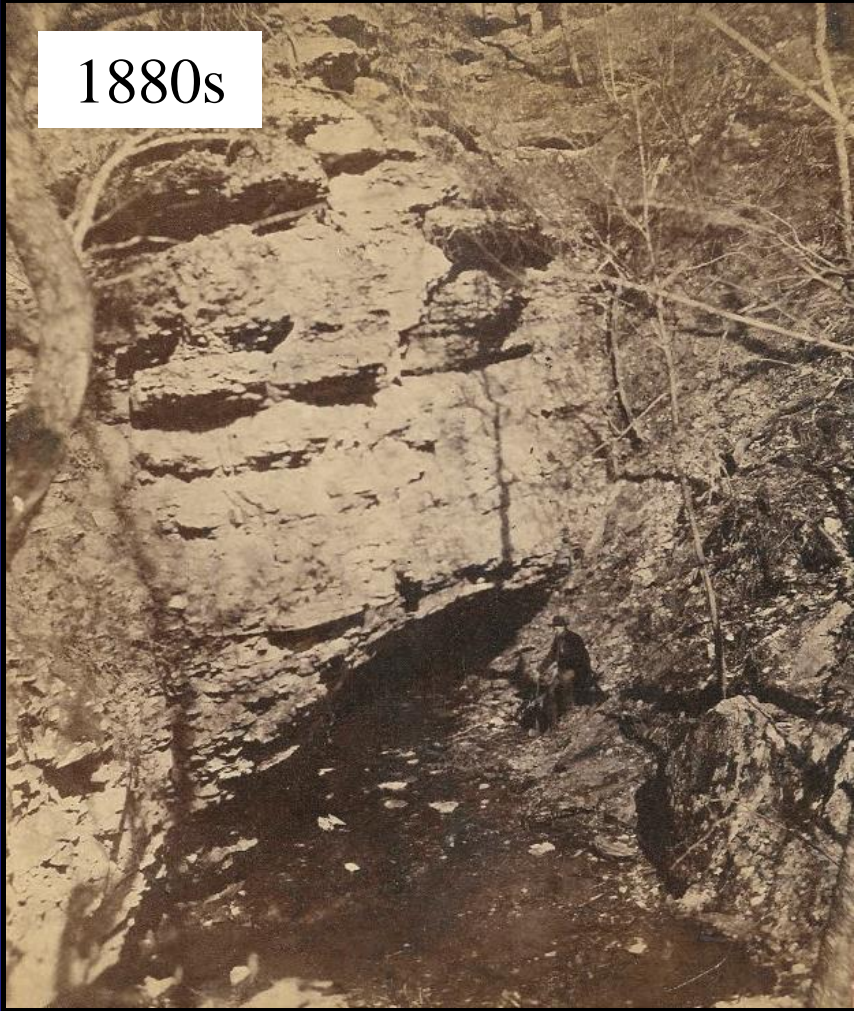


- Chaotic slope
- Headwall scarp and trench
- Cross cutting older slide?
- Sinkholes on uplands and on older slopes
- Trail along early settlement wagon road.

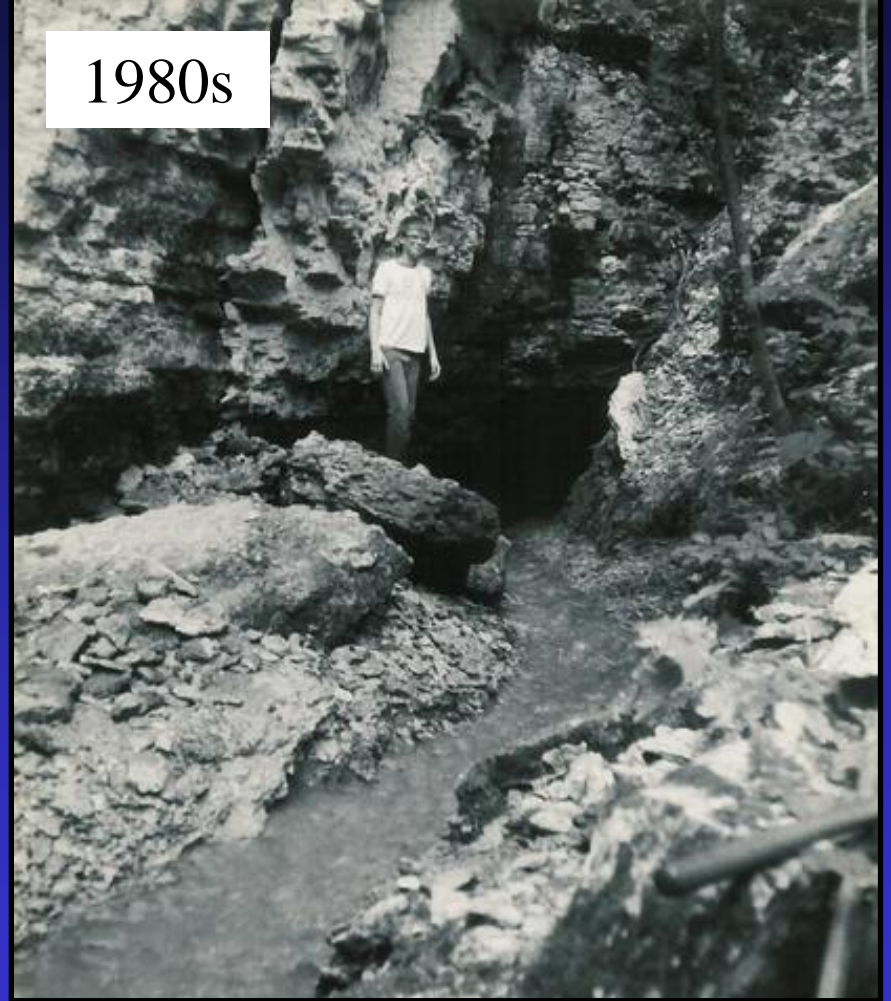


# Tyson Spring

1880s



1980s



photos from Minnesota Cave Preserve, <http://www.cavepreserve.com/>



# Excavation of Turn Lathe Spring



Photo complements of John Ackerman & Minnesota Cave Preserve



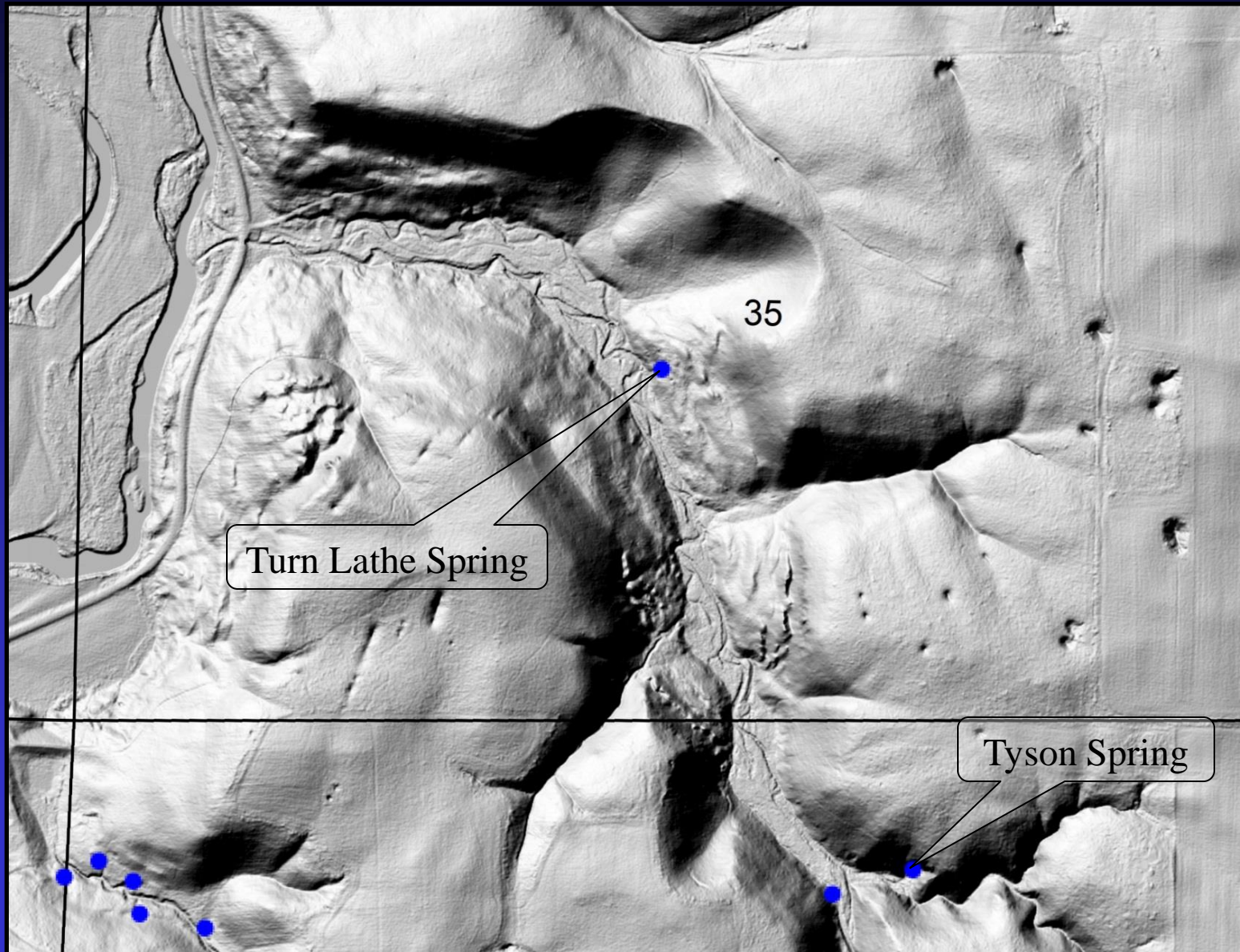
# Turn Lathe Spring



Photo complements of John Ackerman & Minnesota Cave Preserve



# Turn Lathe Spring Slide Complex



# Summary

- 63 paleo landslides identified in LiDAR Shaded Relief DEM images of SE MN.
- Slides occur on over steepened walls on the outside edges of entrenched bedrock meanders of the Root, Zumbro and Cannon Rivers.
- Most represent collapse of the Galena carbonates along the Decorah Shale.