

Modern image of St. Anthony Falls

# Geologic History of St. Anthony Falls

Julia Steenberg

Geologist, Minnesota Geological Survey

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*The Falls of St. Anthony, a painting by Albert Bierstadt*

# Geographic Setting and Importance of St. Anthony Falls

- St. Anthony Falls is the only waterfall that on the Mississippi River.
- The upper dam (horseshoe dam) was built on the limestone cap of the natural falls.
- The lift (height) at the lock is 49 feet.

## Importance of the Falls:

- Cultural and spiritual significance for native tribes.
- Provided a natural source of hydropower supporting the milling industry of the 1800's spurring the growth of the City of Minneapolis.
- Extended navigation upstream, now closed.
- Minneapolis Water Department relies entirely on the Mississippi River for its intake and water storage above the falls.
- St. Paul Water Services intake also upstream of the falls.



Aerial image of St. Anthony Falls noting relevant geographic features

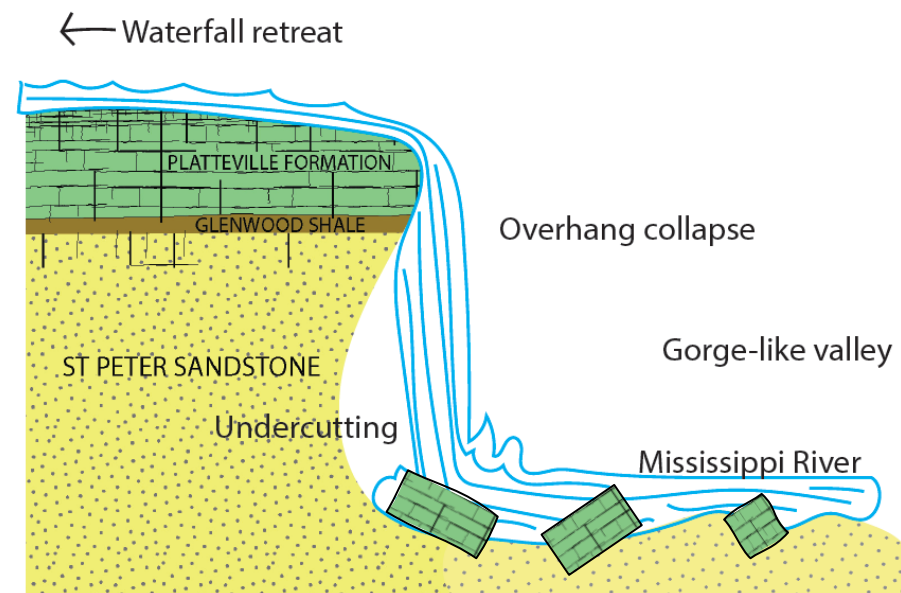
# Geologic Setting of St. Anthony Falls



St. Anthony Falls 1860

Photo credit MHS

Photo of the falls before the dam was built



Formation of a waterfall:

The falls flow over the resistant Platteville limestone, undercutting the soft St. Peter Sandstone and Glenwood shale below.

# Geologic Setting of Minneapolis and St. Paul



A) Columbia Heights



B) U of MN campus



C) Minnehaha Falls



D) Shepard Road

Exposures of the Platteville limestone, Glenwood shale and St. Peter Sandstone formations can be seen throughout the Mississippi River corridor.

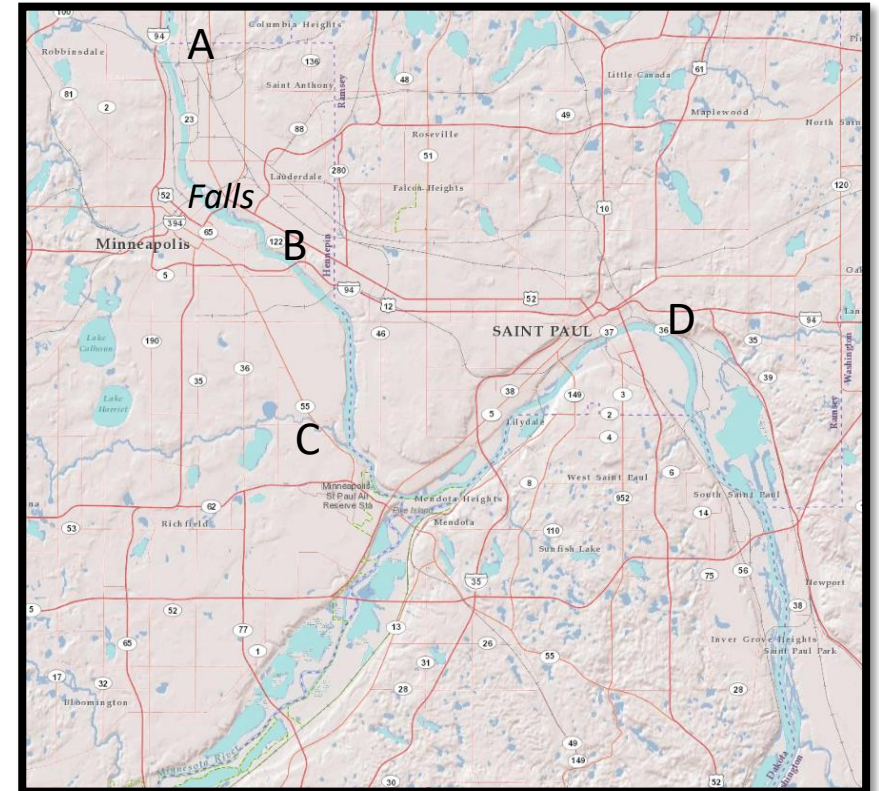
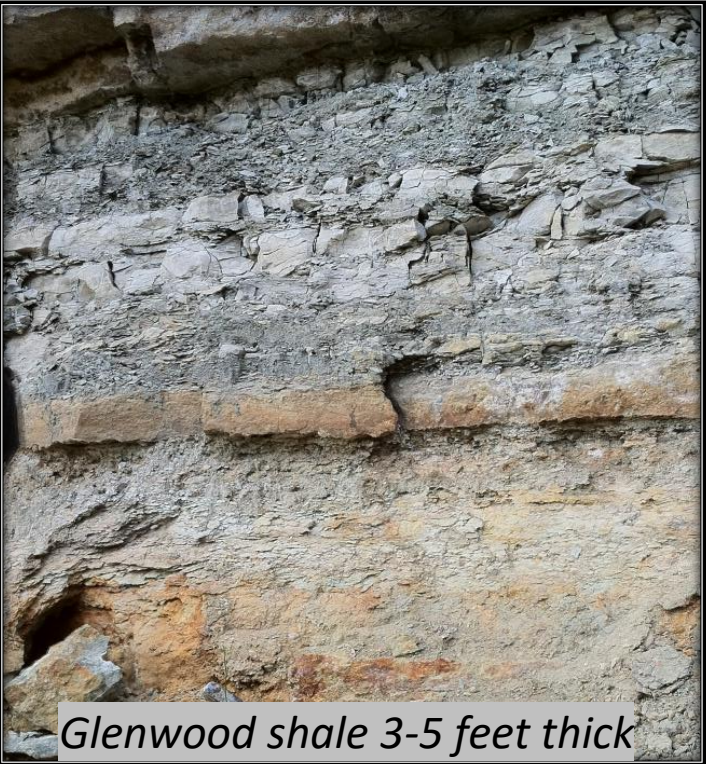
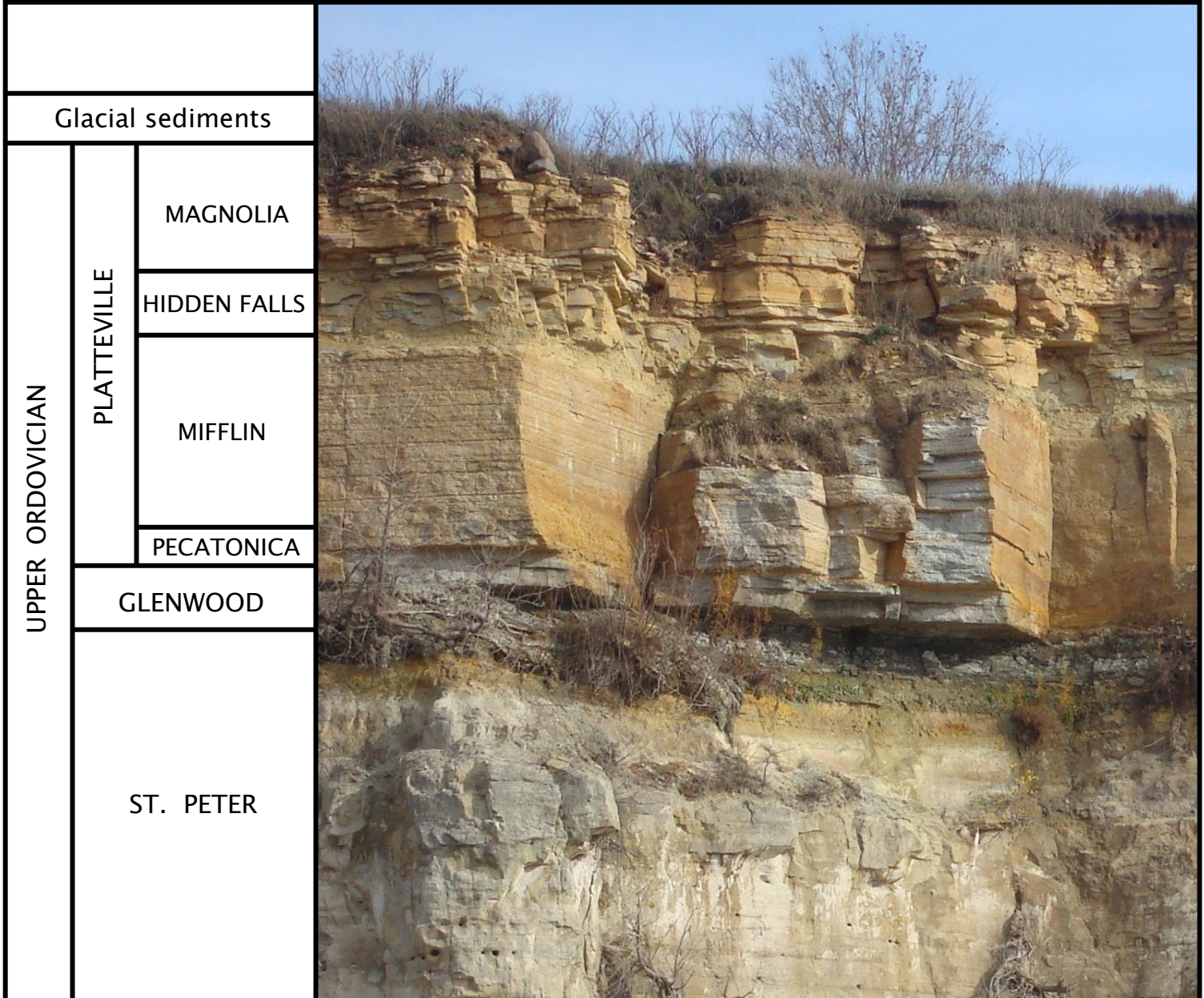


Photo locations are shown on the map

# Characteristics of the Bedrock Layers



*Glenwood shale 3-5 feet thick*











*St. Peter Sandstone*

# Bedrock Geologic Map of the Twin Cities Area



## Index to colors:

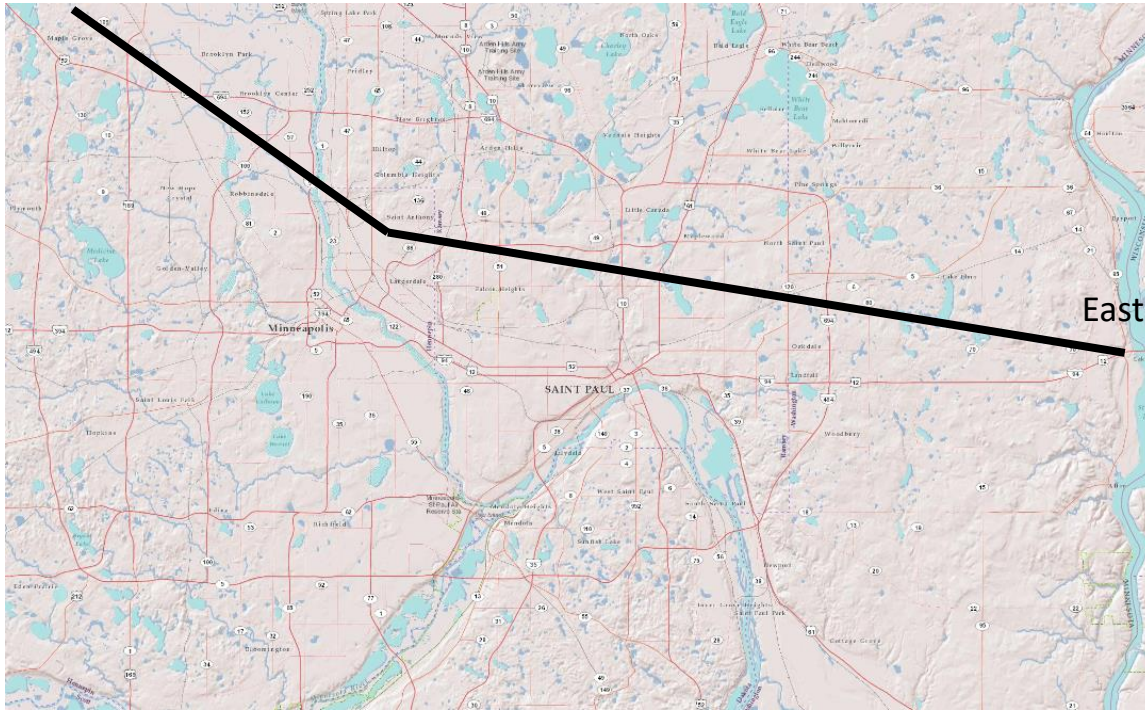
|   |                                     |
|---|-------------------------------------|
|  | Decorah Shale                       |
|  | Platteville and Glenwood Formations |
|  | St. Peter Sandstone                 |
|  | Shakopee Formation                  |
|  | Oneota Dolomite                     |
|  | Jordan Sandstone                    |
|  | St. Lawrence Formation              |
|  | Tunnel City Group                   |

- A bedrock geologic map shows what the surface would look like if all Glacial sediments were stripped away.
- The distribution of bedrock units on the map is primarily influenced by the location of buried river channels that are incised into the bedrock and the angle of the inclined bedrock units.

Relevant geographic locations are shown on the map

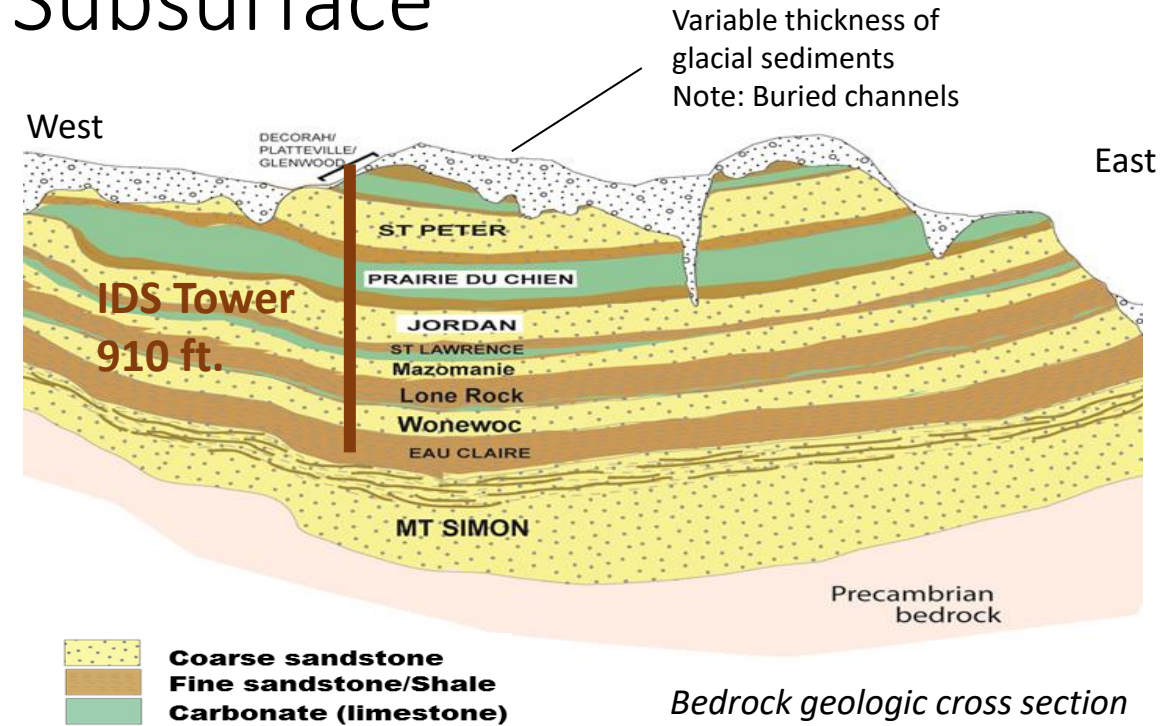
# Twin Cities Bedrock Geology in the Subsurface

West



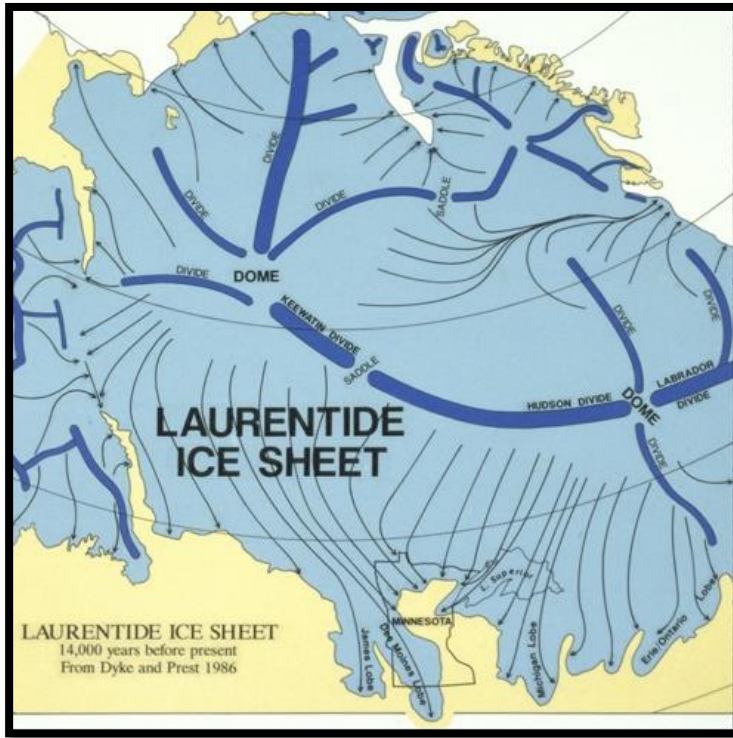
East

Map showing location of schematic geologic cross section



- Bedrock units within the Twin Cities form a basin shape.
- Layers of sandstone, shale and limestone and dolomite (carbonate) nearly 1000 feet deep exist below us. They store and supply the region outside of Mpls and St. Paul with much of our water resources.

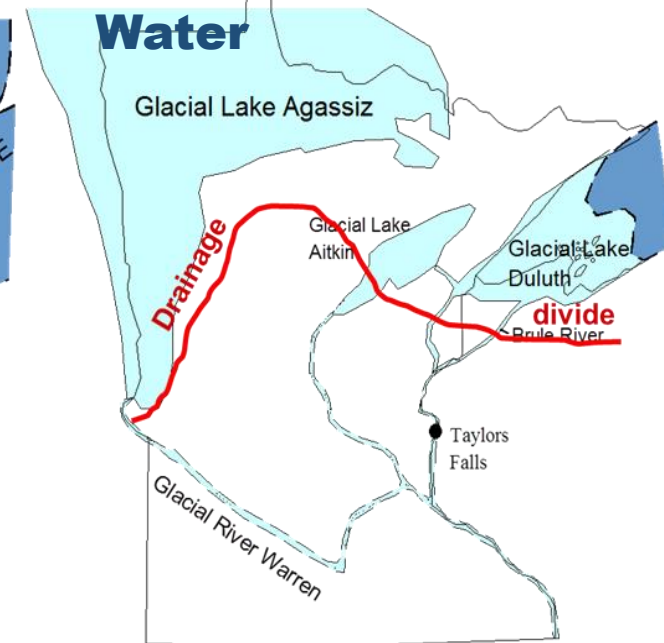
# Minnesota Glacial History and Formation of our River Valleys



14,000 years ago



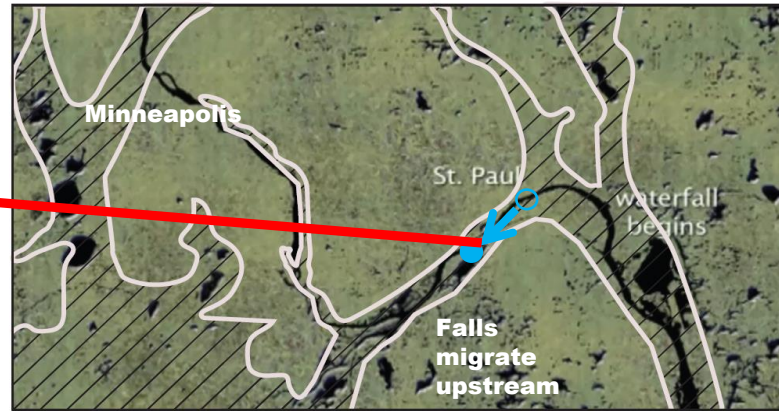
12,000-10,000 years ago



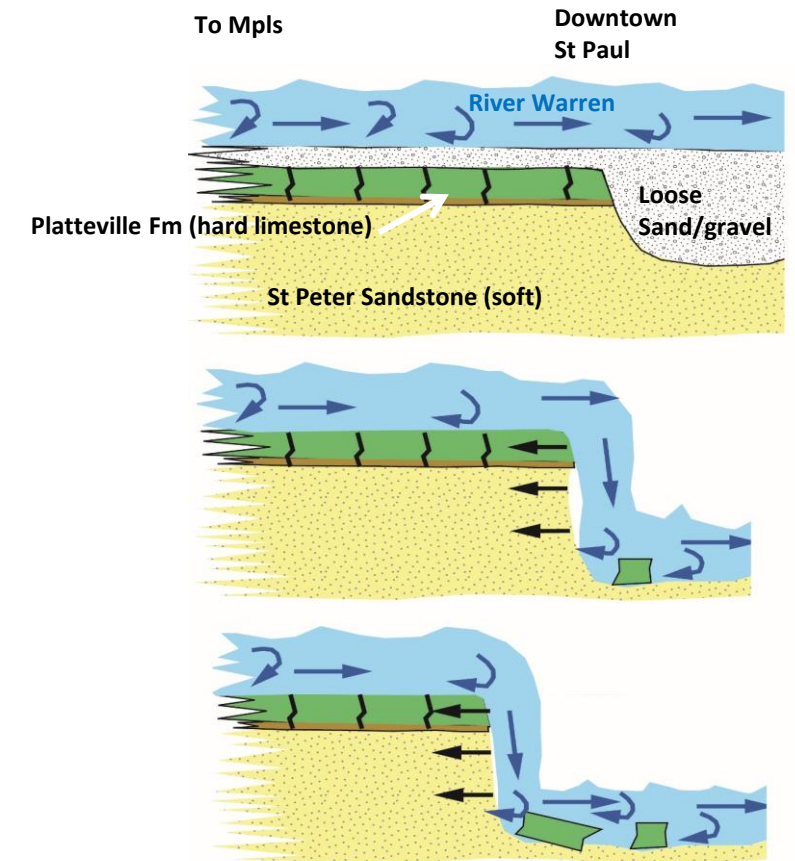
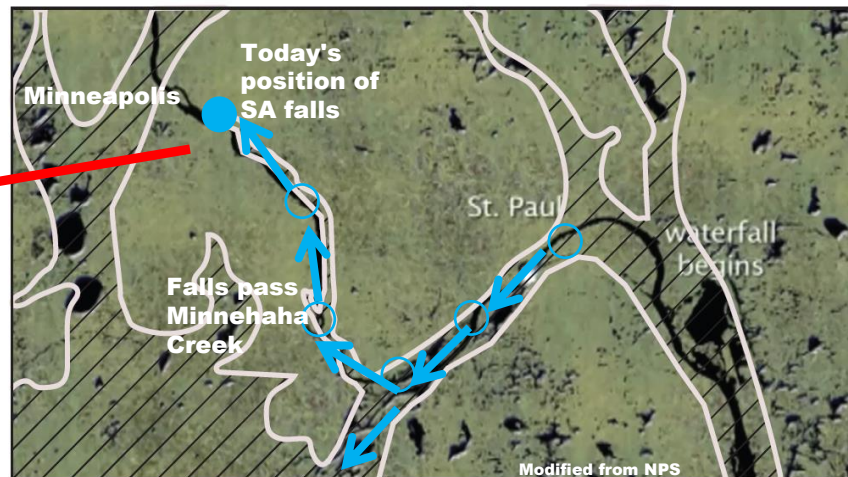
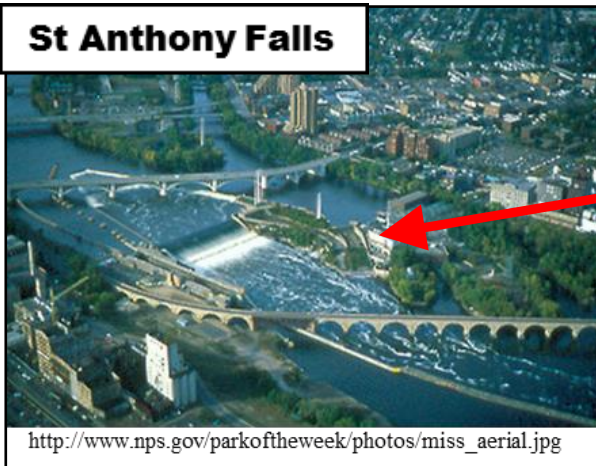
- The final glacial ice retreated across the continental drainage divide forming several glacial lakes.
- Glacial Lake Agassiz drained southward through Glacial River Warren which later became the Minnesota River valley.
- Glacial River Warren was a much larger river than the modern-day Minnesota River.



# Retreat of the waterfall



\*cross hatched lines represent the pre- and interglacial river valleys



- Waterfall began where River Warren was flowing over the resistant limestone and entered a buried river channel near St. Paul, plunging nearly 200 feet.
- The waterfall easily retreated upstream by undercutting the St. Peter Sandstone.
- The height of the falls gets progressively shallower as it retreats.
- Further retreat of the falls has been prevented by the dam structures.

# Geology of the Falls Area



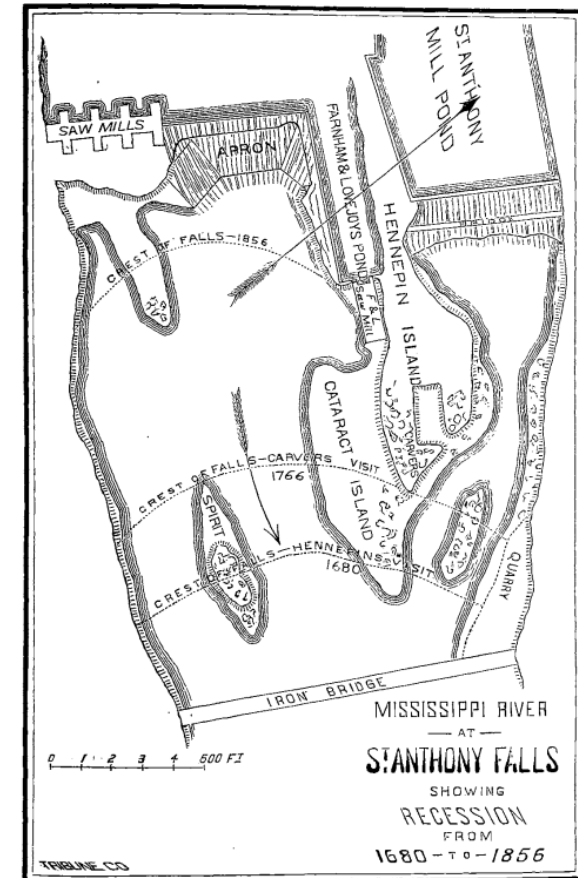
- Decorah Shale
- Platteville and Glenwood Formations
- St. Peter Sandstone
- Shakopee Formation
- Oneota Dolomite
- Cross Section line

Bedrock outcrops are white

Recent mapping completed in 2018 by MGS, part of the Hennepin County Geologic Atlas

- The falls are near the edge of the Platteville limestone.
- Approximately 1500 ft of the Platteville remain.

- Based on historical accounts it can be estimated that the falls were retreating at a rate of  $\sim 6$  ft/year prior to dam construction.
- Within 100 years (from today) the falls would likely have been gone.



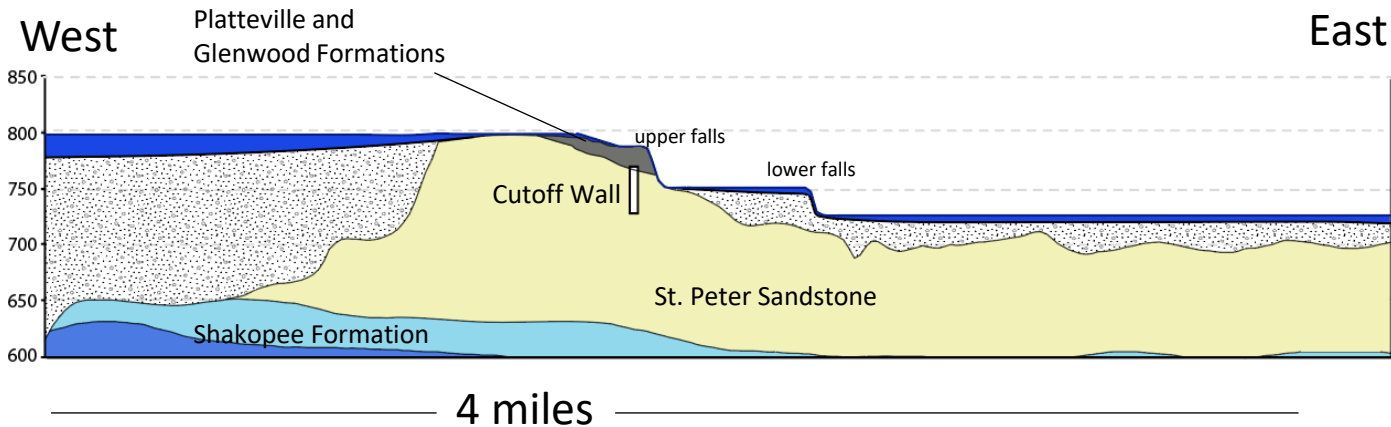
Winchell, 1877

# Geology of the Falls Area



- Decorah Shale
- Platteville and Glenwood Formations
- St. Peter Sandstone
- Shakopee Formation
- Oneota Dolomite
- Cross Section line
- Bedrock outcrops are white
- Cutoff Wall

- Geologic layers dip down to the east, thinning to the west.
- Only the lower Platteville remains at the falls (Mifflin and Pecatonica Members).
- The Platteville is very thin near the southern edge of Nicollet Island where the historical collapses occurred related to the Eastman tunnel.



# Geology of the Falls Area



Mill Ruins Park, spring emerging from the Platteville

