

# Living on the Ledge



Life in Eastern Wisconsin

# Outline

- Location of Niagara Escarpment Eastern U.S.
- General geology
- Locations of the escarpment in Wisconsin
- Neda Iron mine and early geologists
- Silurian Dolostone of Waukesha Co.- Lannon Stone , past and present quarries
- The Great Lakes Watershed

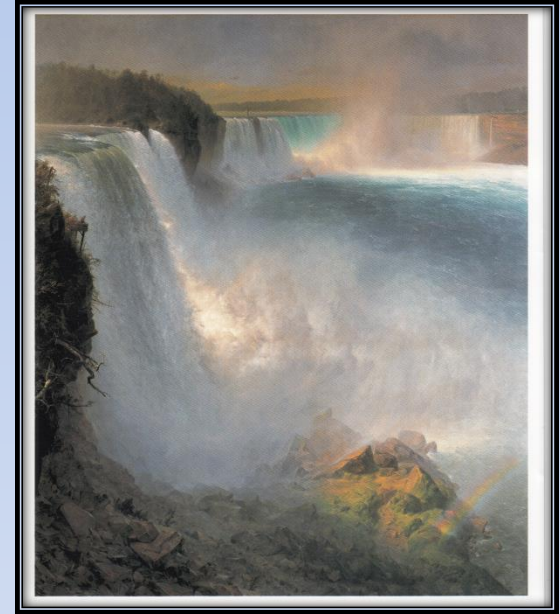
Niagara Falls NY – Rock falls caused by undercutting:  
notice the pile of broken rock at base of American falls.  
**Top Layer is equivalent to Waukesha/ Lannon Stone**



You may have see Niagara Falls locally if you visited the Hudson River painters exhibit at MAM.



Fredrick Church  
1867

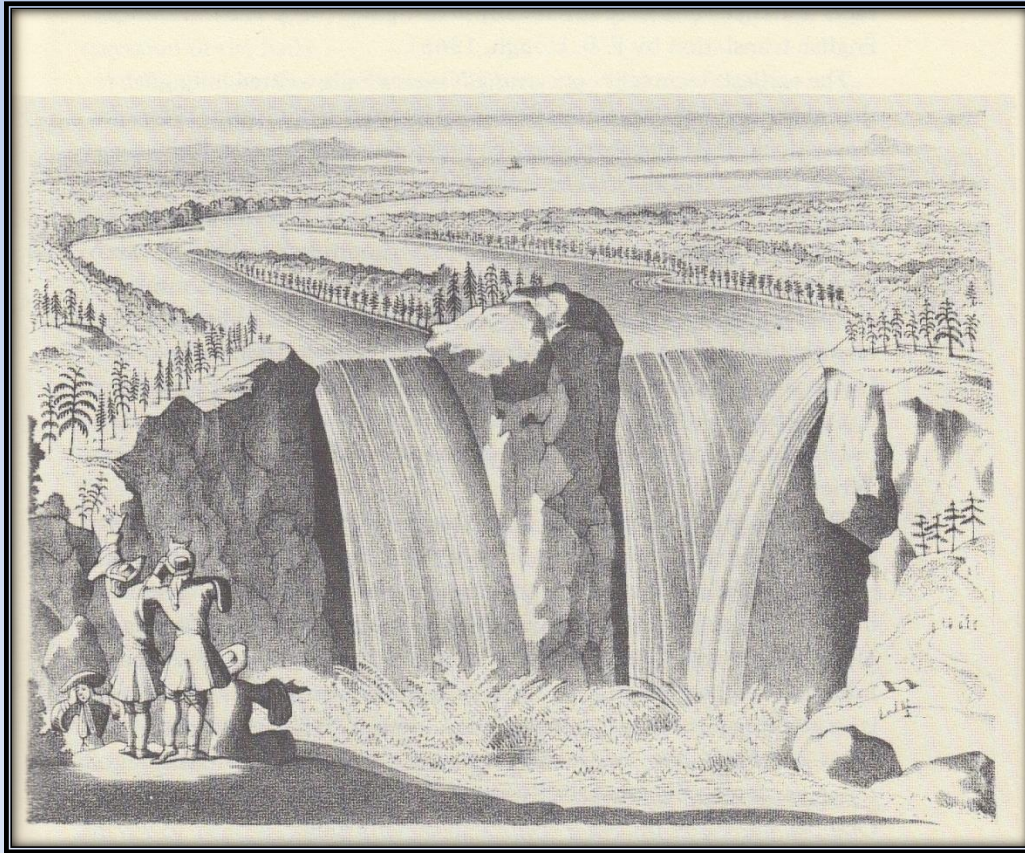


Fredrick Church  
1857

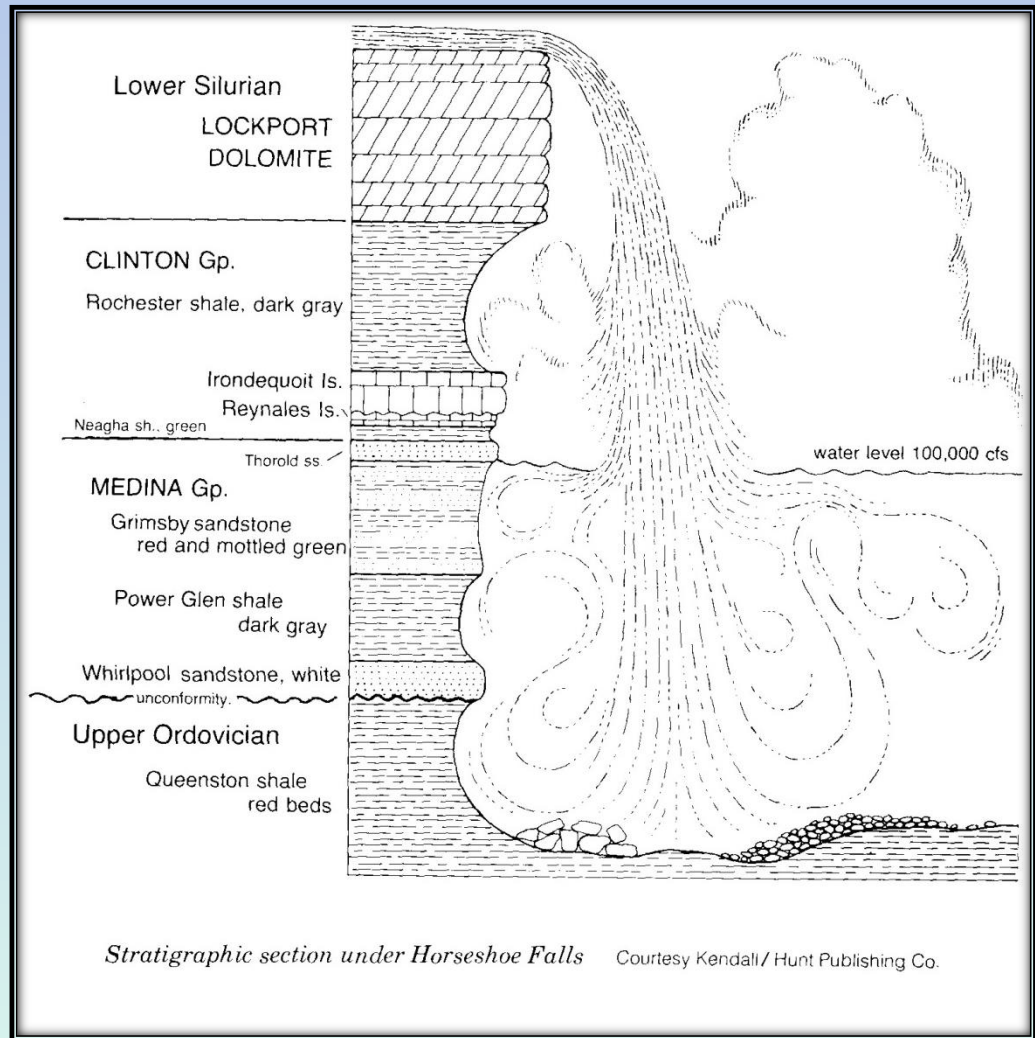
Or you can see a bit  
of the Ledge as a  
table top while  
meditating with a  
bottle of Silurian  
Stout in my yard



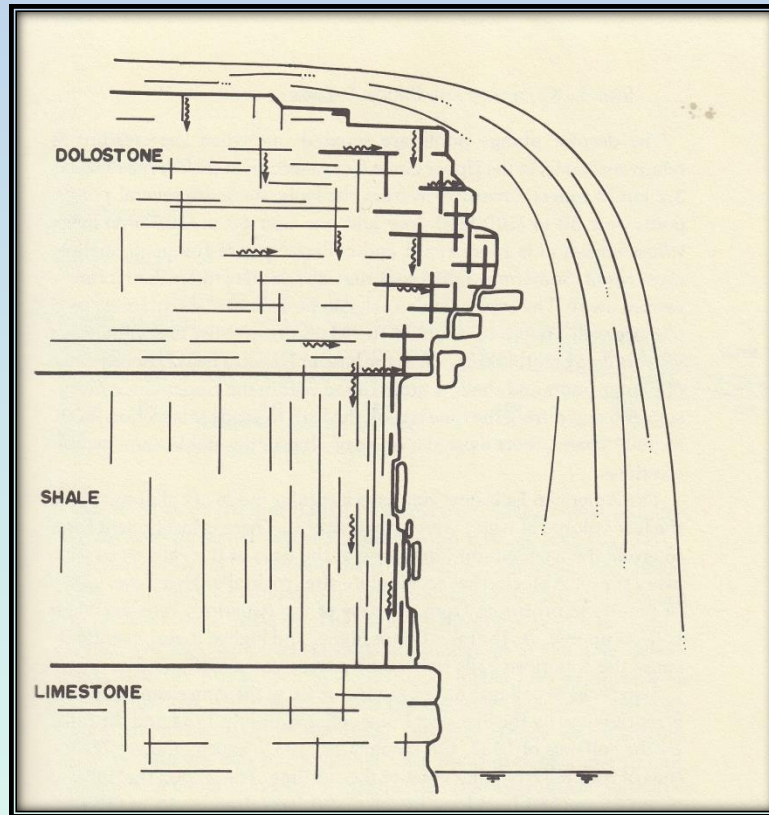
Fr. Louis Hennepin  
sketch of Niagara Falls 1698



Niagara Falls -  
the equivalent  
stratigraphic  
section in N.Y.  
from which the  
correlation of  
the Neda to the  
Clinton Iron  
was incorrectly  
made



Waterfalls associated with the Niagara Escarpment all follow this pattern- resistant cap rock and soft shale underneath





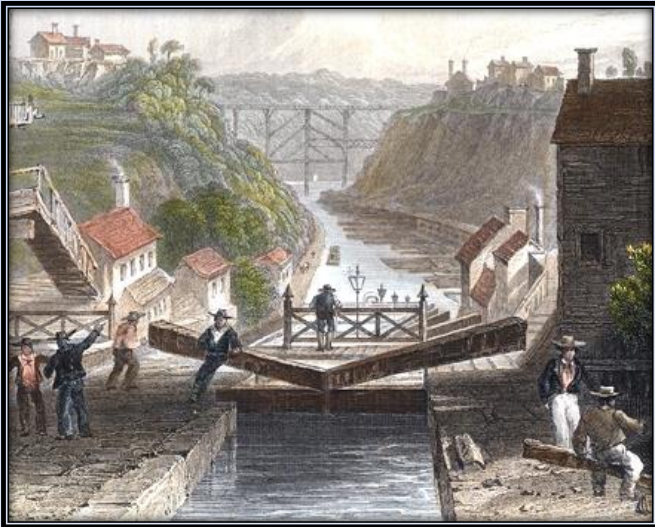
# The “Ledge” of Western NY



# The Niagara Escarpment



# Erie Canal locks at Lockport NY



# The Erie Canal that followed the lowland until it reached the Niagara Escarpment

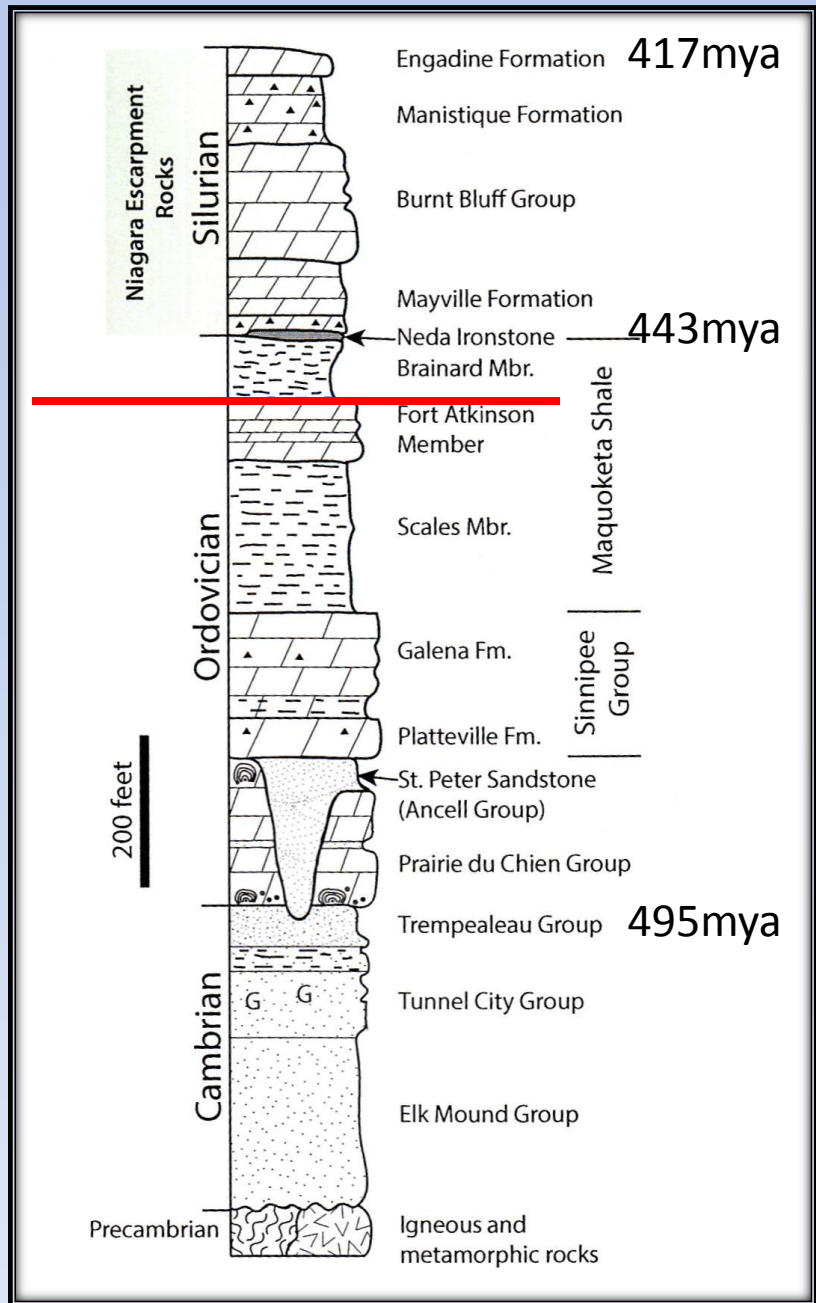


The names of Silurian rocks in the Midwestern states change with location and sometimes with authors!

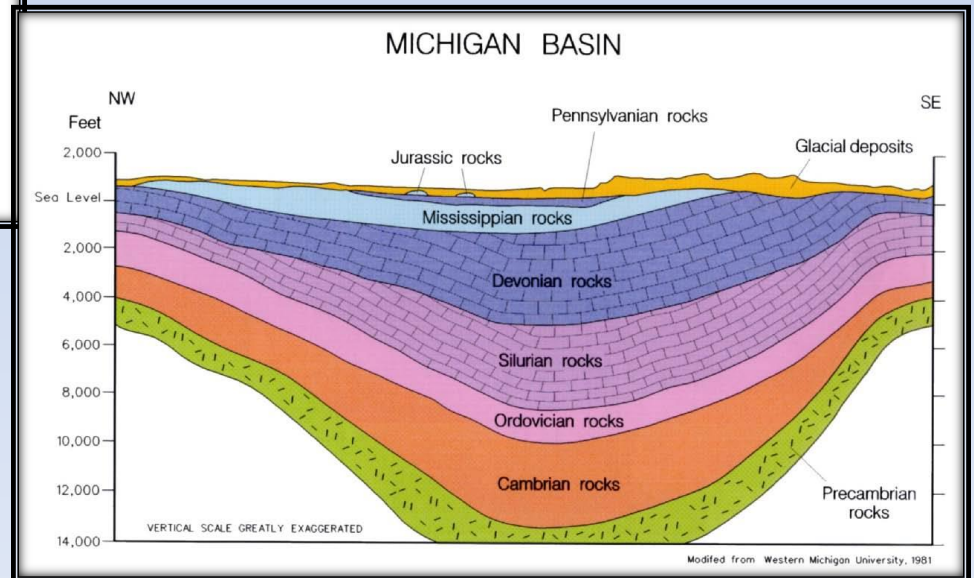
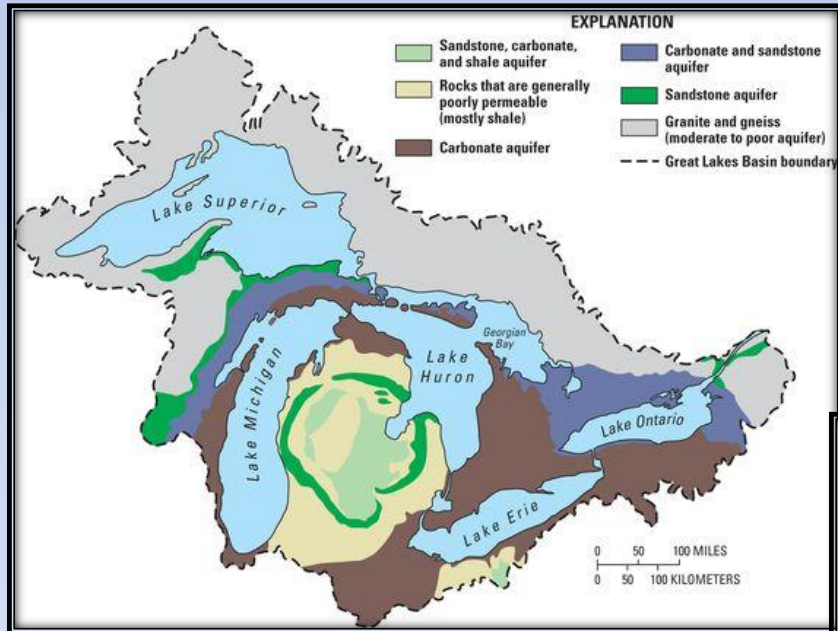
			Southeast WI		Northeast WI		Michigan U.P.
Series	Stage	Age	Kuglitsch (1996, 2000)	Mikulic & Kluessendorf (1998)	Kuglitsch (2000)	Mikulic et al. (2010)	Johnson and Campbell (1980)
			Pridoli	416	?		
Ludlow	Lud.	419	?				
		421	?				
		423	?				
Wenlock	Hom.	426	Racine	Racine Lannon Romeo			
		428		Waukesha			Engadine
Llandovery	Telychian	428	Waukesha	Brandon Bridge	Engadine	Engadine	Cordell Upper Coral-algal Pentameroides Lower Coral-algal
			"Brandon Bridge"	Manistique	Manistique	Manistique	Schoolcraft Upper Laminated Upper Pentamerus Lower Laminated Lower Pentamerus
			Manistique				
			Burnt Bluff	Burnt Bluff	Burnt Bluff Group	Burnt Bluff Group	Henricks Upper Coral-algal Plectatrypa Lower Coral-algal Byron
Aeronian		436					
		439	Mayville	Mayville	Mayville	Mayville	Lime Island Cabot Head
Rhuddanian		444		Wilhelmi			Manitoulin

**Figure 2.** Recent examples of lithostratigraphic classification and biostratigraphic assignment of Wisconsin Silurian rocks compared with that of the Upper Peninsula of Michigan. Question marks in the left column indicate the uncertain age assignment of the Waubesa Formation—while it locally contains brachiopods that indicate Silurian age, no biostratigraphically diagnostic taxa are known from this unit to provide further refinement.

Stratigraphic column for rocks of Eastern Wisconsin. Note the Niagara Escarpment rocks at the top. The Escarpment is the result of resistant dolostone cap rock and soft shale rock below



# The Michigan Basin- Showing outcrops of Silurian rocks



# BEDROCK GEOLOGY OF WISCONSIN

UNIVERSITY OF WISCONSIN—EXTENSION  
Geological and Natural History Survey

APRIL 1981  
REVISED 2005

## EXPLANATION

### DEVONIAN

D dolomite and shale

### SILURIAN

Sd dolomite

### ORDOVICIAN

Om Maquoketa Formation—shale and dolomite

Os Sinnipee Group—dolomite with some limestone and shale

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

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

### CAMBRIAN

€ sandstone with some dolomite and shale

### MIDDLE PROTEROZOIC

ss Keweenaw rock—

ss, sandstone

v, basaltic to rhyolitic lava flows

t, gabbroic, anorthositic and granitic rock

Wolf River rock—

g, rapakivi granite, granite, and syenite

a, anorthosite and gabbro

### LOWER PROTEROZOIC

q quartzite

g<sup>r</sup> granite, diorite, and gneiss

s, metasedimentary rock, argillite, siltstone, quartzite, greywacke, and iron formation

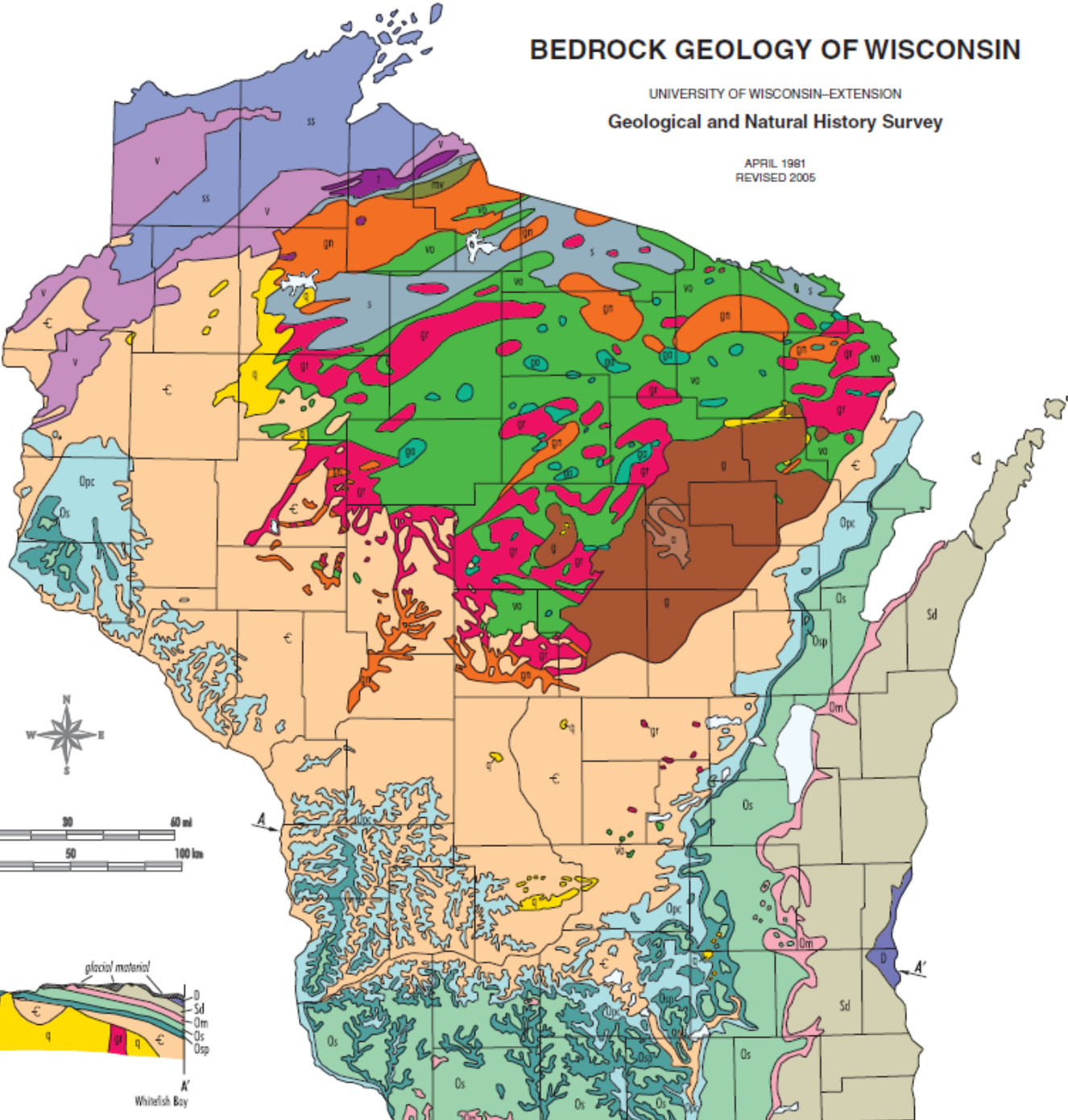
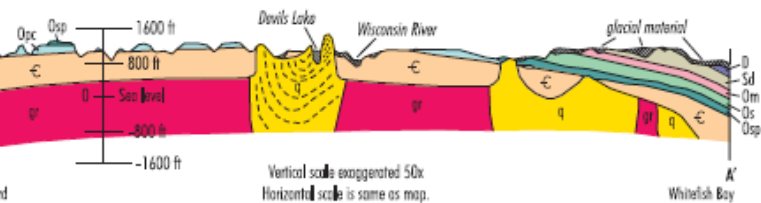
vo, basaltic to rhyolitic metavolcanic rock with some metasedimentary rock

ga, meta-gabbro and hornblende diorite

### LOWER PROTEROZOIC OR UPPER ARCHEAN

mv, metavolcanic rock

gn, granite, gneiss, and amphibolite





# Location of major Silurian Outcrops in Eastern Wisconsin



# Peninsula Park from both top and bottom



Ephraim



Sven's Overlook

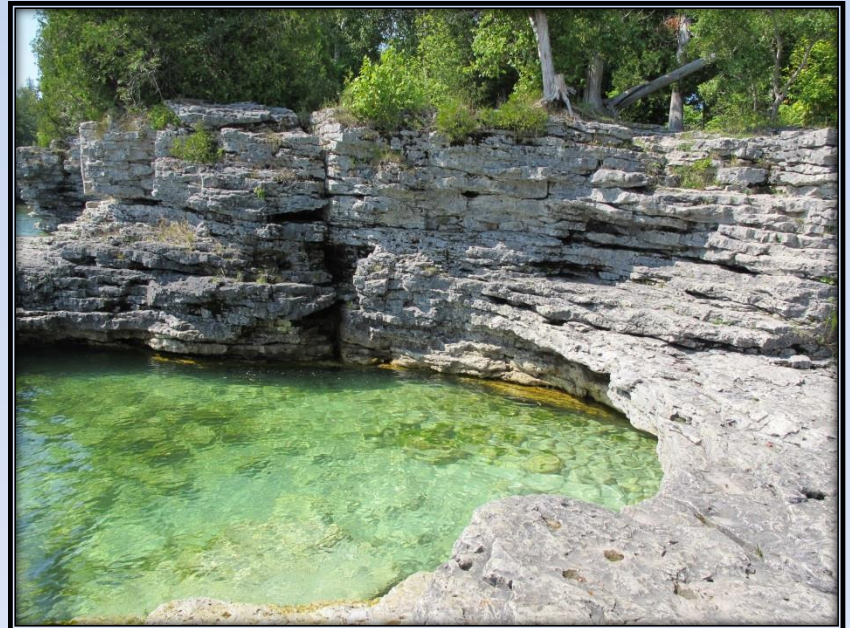
# Door County – Fish Creek Niagara Escarpment in the background



# Door Co Shoreline



# Cave Point near Jacksonport - Door Co



# Cave Point - 2013



# Cave Point - Door Co - 2013 during low lake levels



# Jean Nicolet 1634 overlooking Green Bay WI while standing on the Ledge





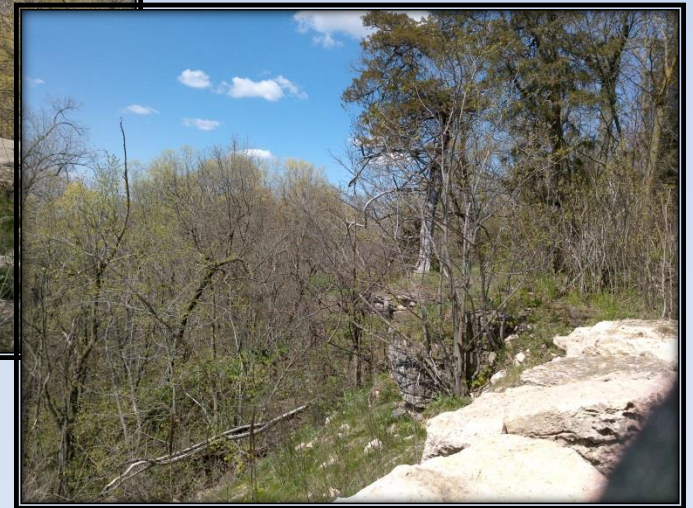
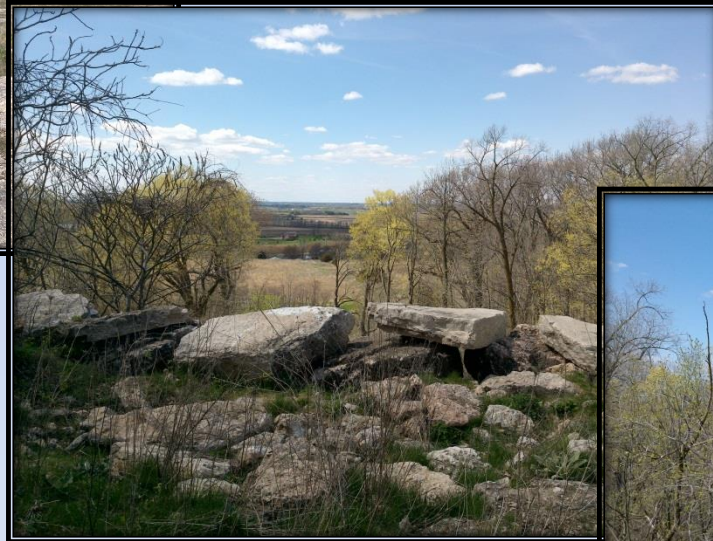
Wequiock Falls  
near  
Green Bay WI.  
Cap rock is  
**Niagara Dolomite,**  
**underneath is**  
**Maquoketa Shale:**  
The water drips  
back under the cap  
rock, erodes the  
soft shale



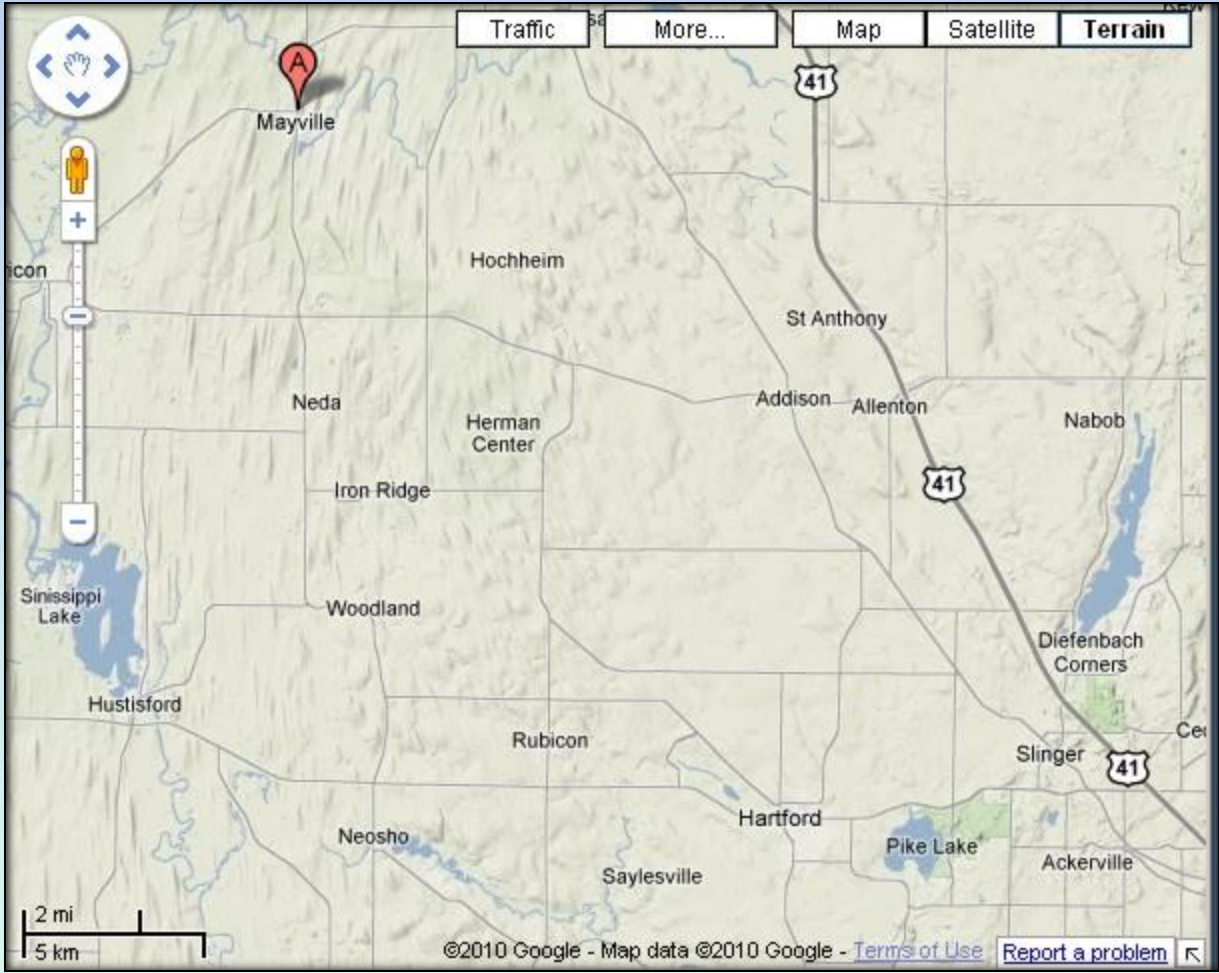
# Wequiock Falls – UWM students tempting fate



# Views of the Ledge near Lomira Wi



# Mayville-Neda- Iron Ridge



UWM Geology  
Class at Neda –  
looking at one of  
the old mine  
entrances -  
Mayville  
Dolomite



# Neda Ore at the base of the Mayville Dolomite





# Founder of Mayville and his son



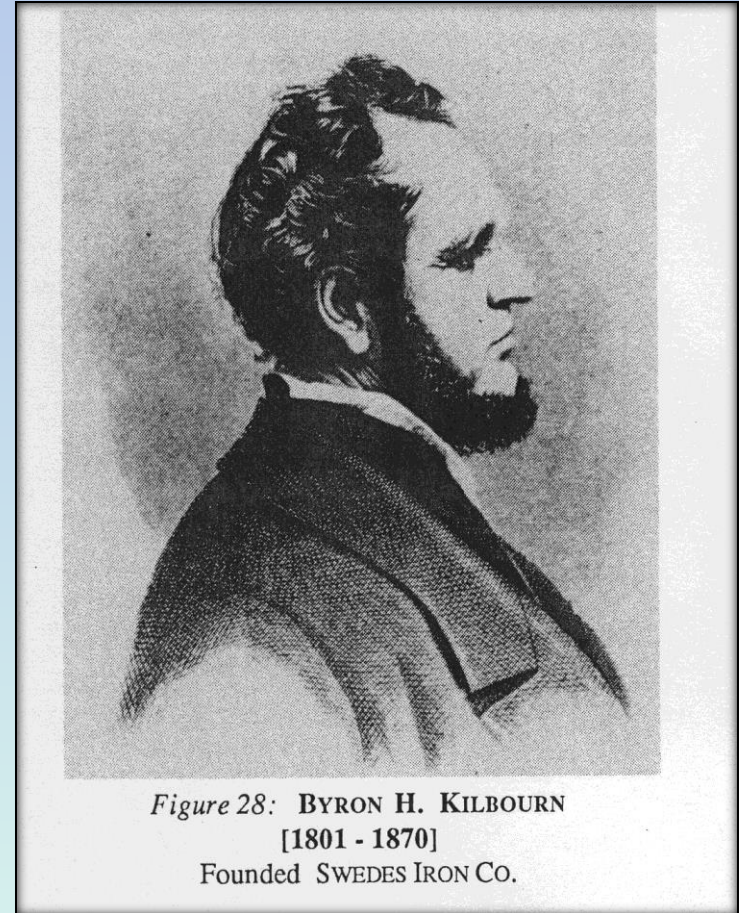
*Figure 24:* **CHESTER MAY**  
[1791 - 1849] Father of Eli P. May  
Discoverer of Wisconsin iron ore in 1845.



*Figure 25:* **ELI P. MAY**  
[1825 - 1909] Youngest son of Chester May  
Dug first iron ore, took it to Indiana in 1846.



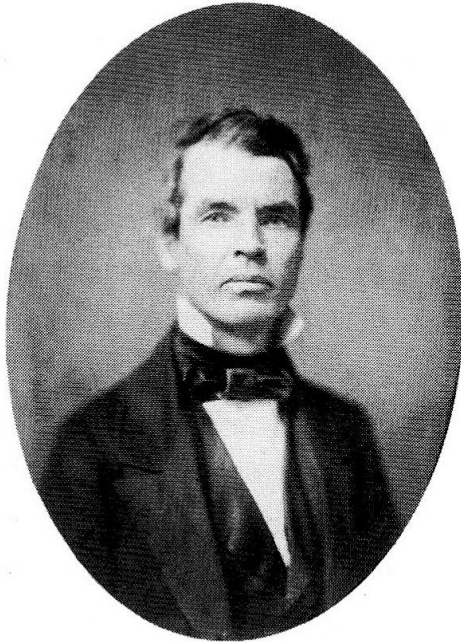
Milwaukee founder  
Byron Kilbourn  
was also in this  
mining business and  
responsible for  
bringing Increase  
Lapham to Wisconsin  
initially as a surveyor  
in the Milwaukee area



# Increase Lapham

1811 to 1875

State Geologist that directed the 4 volume  
Geology of Wisconsin 1879 and started the  
National Weather Bureau



WHI IMAGE ID 43831

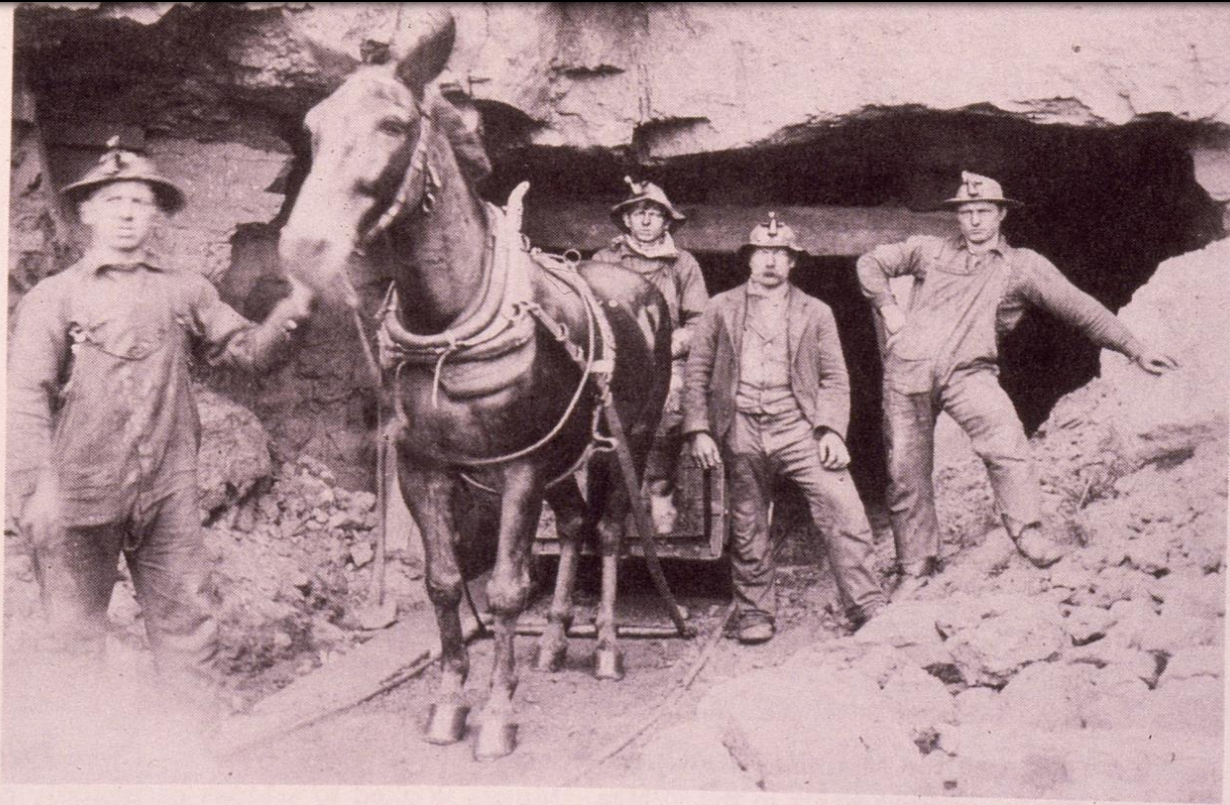
Increase Lapham, ca. 1859



WHI IMAGE ID 1944

In this carefully staged stereoscopic portrait, Increase peers through a magnifying glass at a sizable chunk of the Trenton meteorite. Its odd geometrical patterns came to be called "Laphamite markings."

# Working the mine (1910)

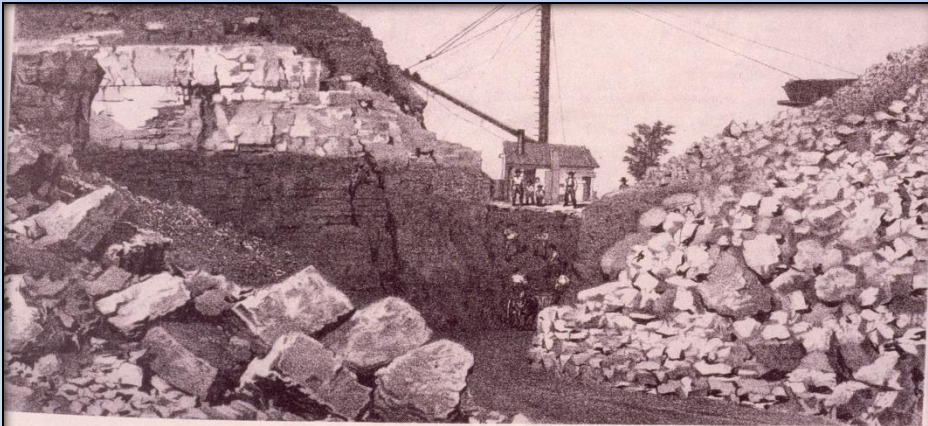


*Figure 68:* Four Unidentified Miners Emerge from the IRON RIDGE MINE

Their trustworthy mule pulls a carload of iron ore. On the men's hats, notice the carbide lamps which provided a miner's only illumination while he worked in the mine.

- Circa 1910

# Mining the open face at Neda



1871

*Figure 60: The IRON RIDGE MINE* - Circa 1873  
This mine was located at [Old] Iron Ridge, now Neda, Wisconsin. For a time, the community was also called Iron Mountain. Mining began in this area in 1849, as an open pit operation. Then the SWEDES IRON CO. opened the IRON RIDGE MINE in 1864. It was operated by the OLIVER IRON MINING CO. from 1902-1914. A total of at least 684,734 tons of ore were removed from the IRON RIDGE MINE between 1849 and 1914. *Records from early years are lost, so the actual total would be slightly higher.*

1911



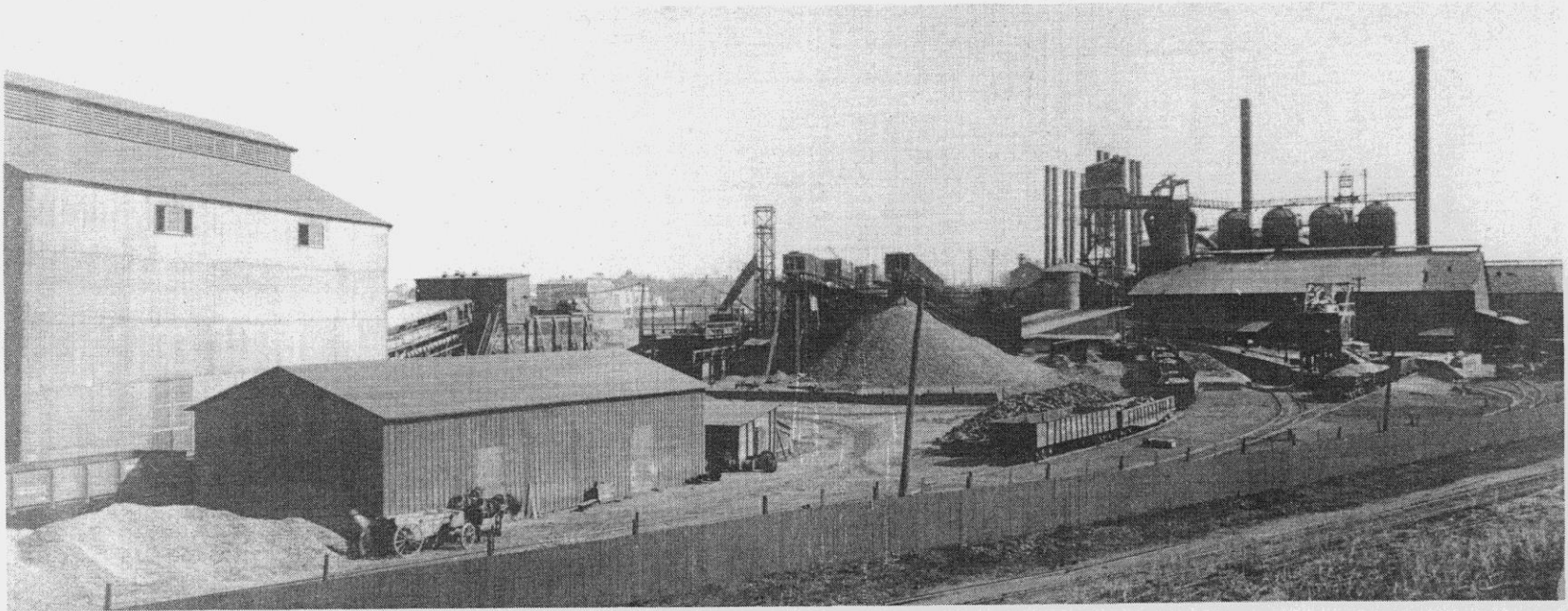
*Figure 45: Iron Mining in Progress at the Open Pit MAYVILLE MINE* - Circa 1911  
This large steam shovel, belonging to NORTHWESTERN IRON CO., was a *Marion Shovel - Model 60*, built by the Marion Steam Shovel Co., of Marion, Ohio. A steam-powered drilling rig, used for exploratory test-drilling, can be seen standing on top of the ledge, above the ore train.

# Northwestern Iron Co, Mayville Circa 1914-1918

*Figure 200:* Panorama of NORTHWESTERN IRON CO.

*Circa 1914 - 1918*

This view is much like *Figure 199*, but expands to the left to show the pig machine casting building, which measured 56 feet by 100 feet. The walls were 40 feet high. Ends of the casting conveyors can be seen protruding from the south end of the building. *This equipment was installed in 1914.* The smaller wood frame building, known as the "brick work house," was where brick was prepared. A worker appears to be loading sand into a dump wagon pulled by horses, just north of the "brick house." Piles of pig iron wait to be loaded into railroad gondola cars in the center foreground of the picture. A wooden fence surrounded the Iron Company property at this time.

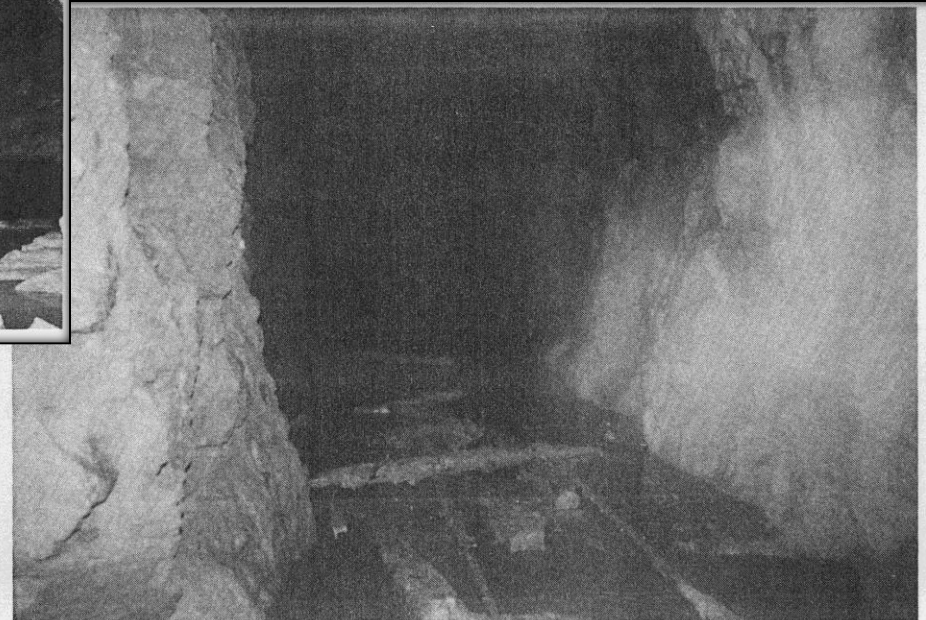
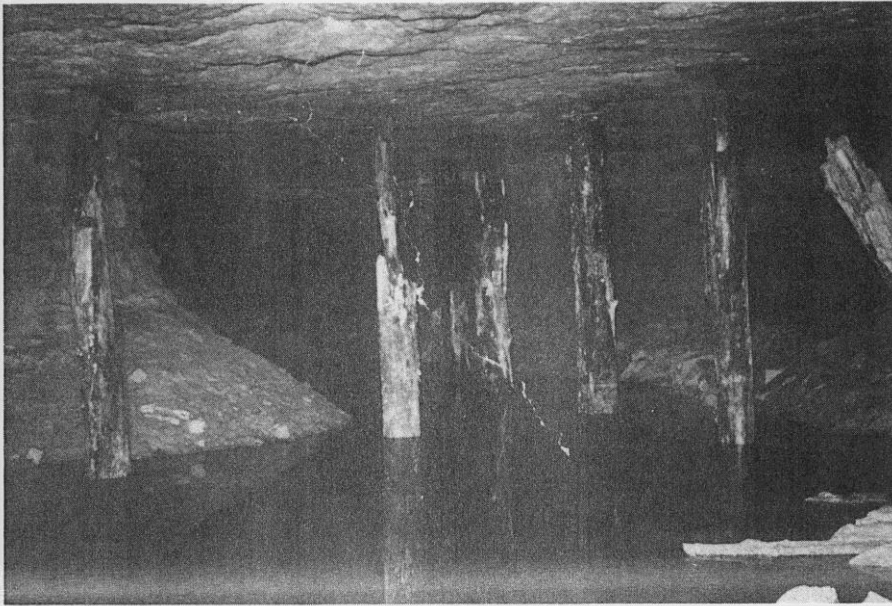


# Neda underground about 1960

*Figure 84: Inside the IRON RIDGE MINE*

*- Late 1960's*

This tunnel, partly filled with water, is typical of the southeastern part of the mine. Timbers are badly decayed, after being in place for over ninety years, without replacement.



*Figure 83: Inside the IRON RIDGE MINE*

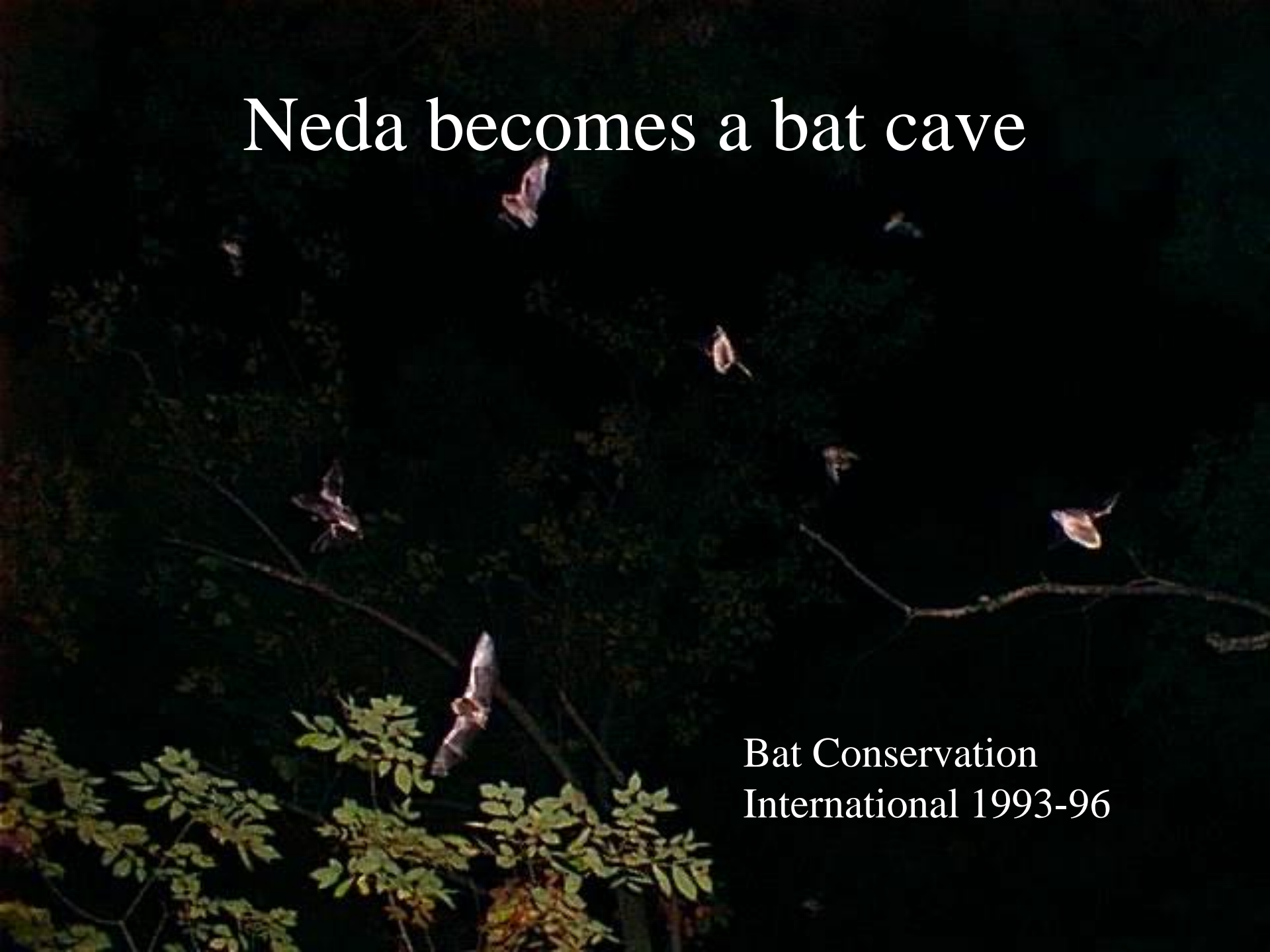
*- Late 1960's*

One of the many tunnels in the mine, this one still has rails in place. Notice some fallen timbers.

# The Neda Mine site along the Niagara Escarpment today



# Neda becomes a bat cave



Bat Conservation  
International 1993-96



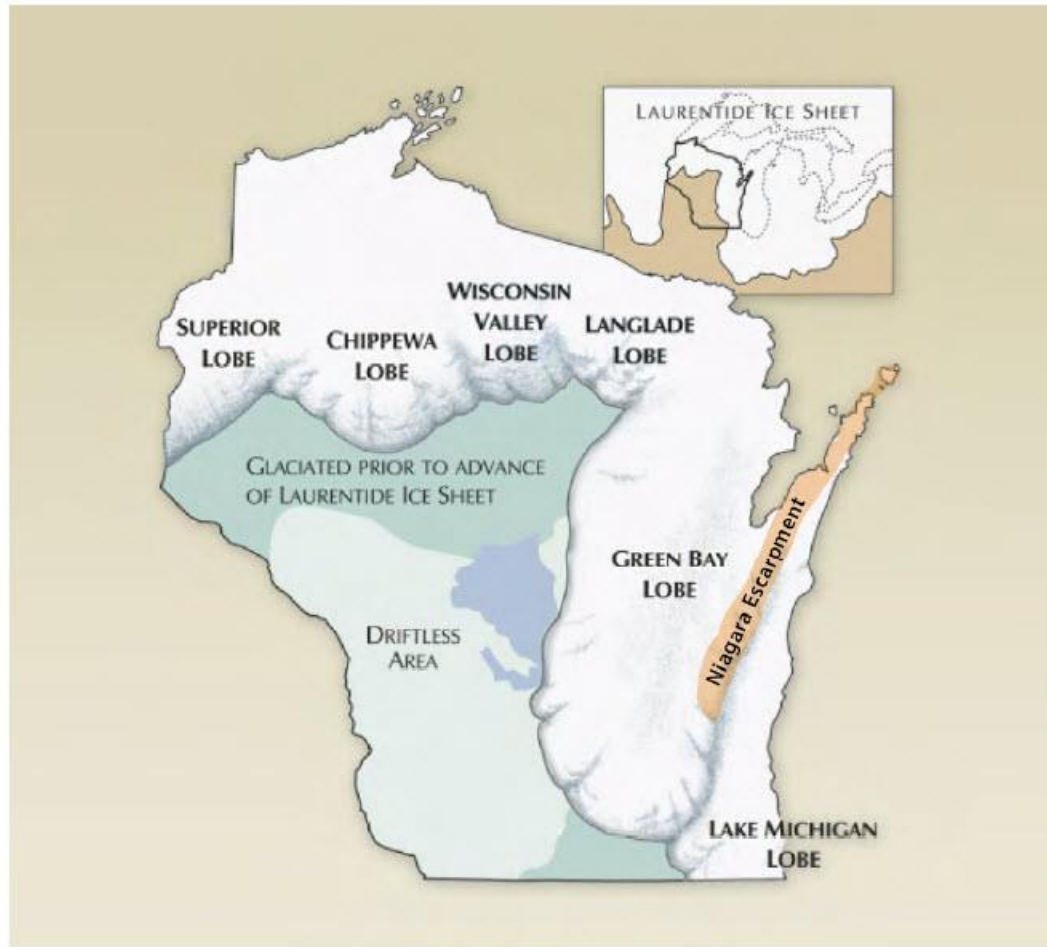
Bats at Neda 75,000+  
One of the top 12 bat condos in the country



# Batman and Robin?

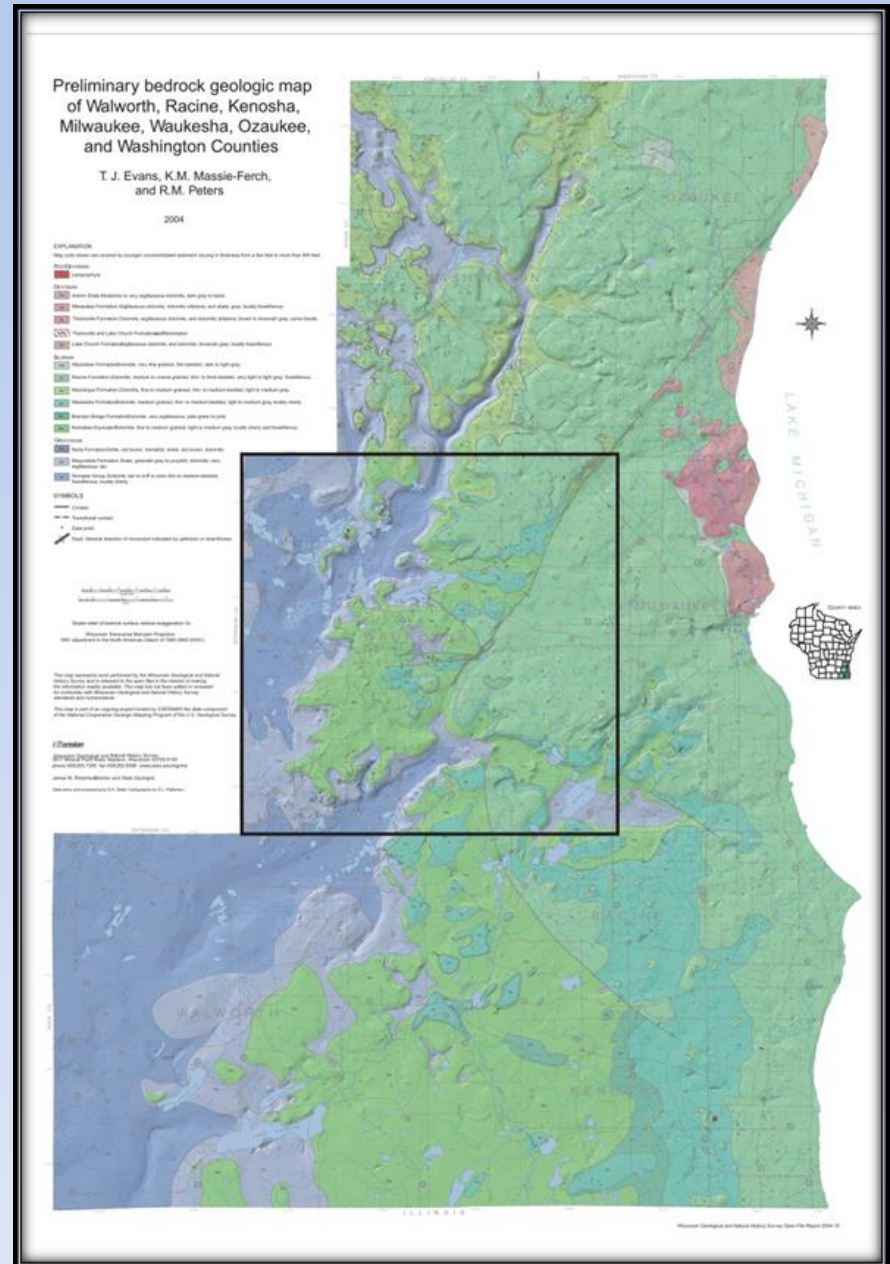


# Glaciers and Niagara Escarpment

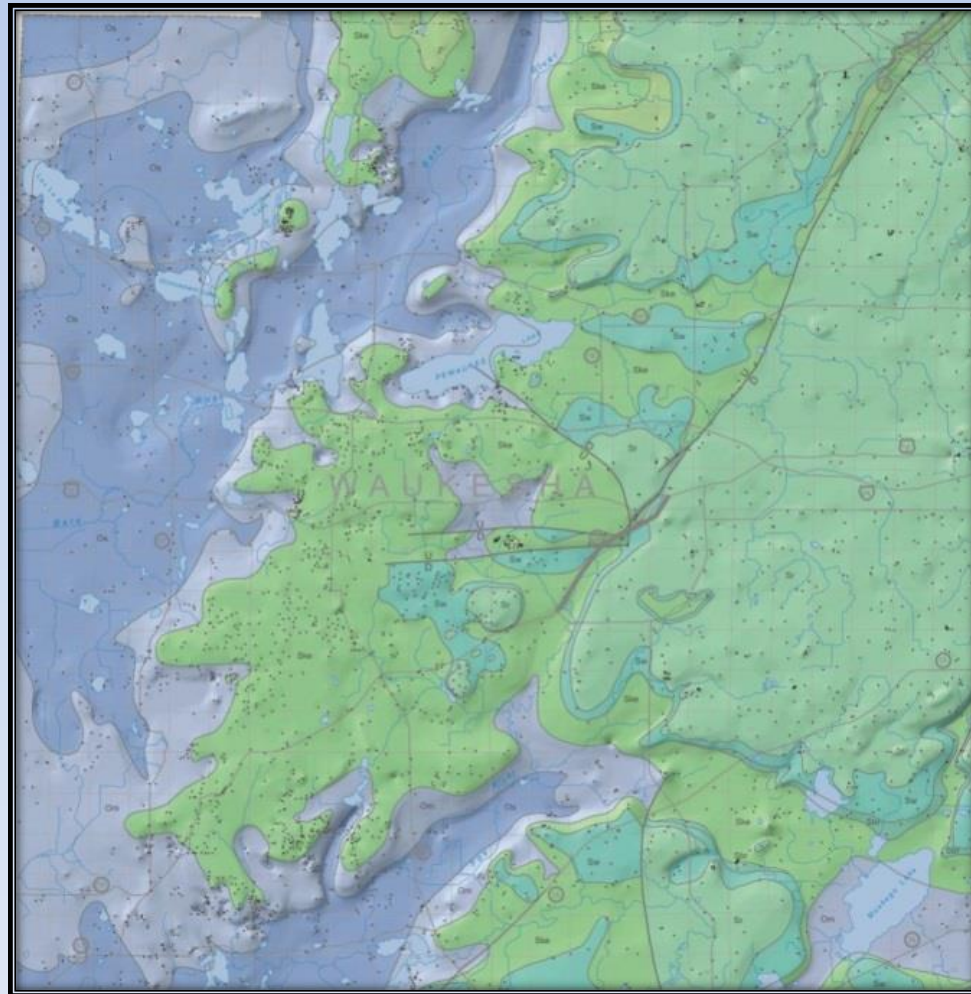


**Figure 14.** Position of Niagara Escarpment relative to glacial ice lobes from the Late Wisconsin Glaciation. Map courtesy of Wisconsin Geological and Natural History Survey.

# Silurian in Walworth, Racine Waukesha Ozaukee and Washington Co.

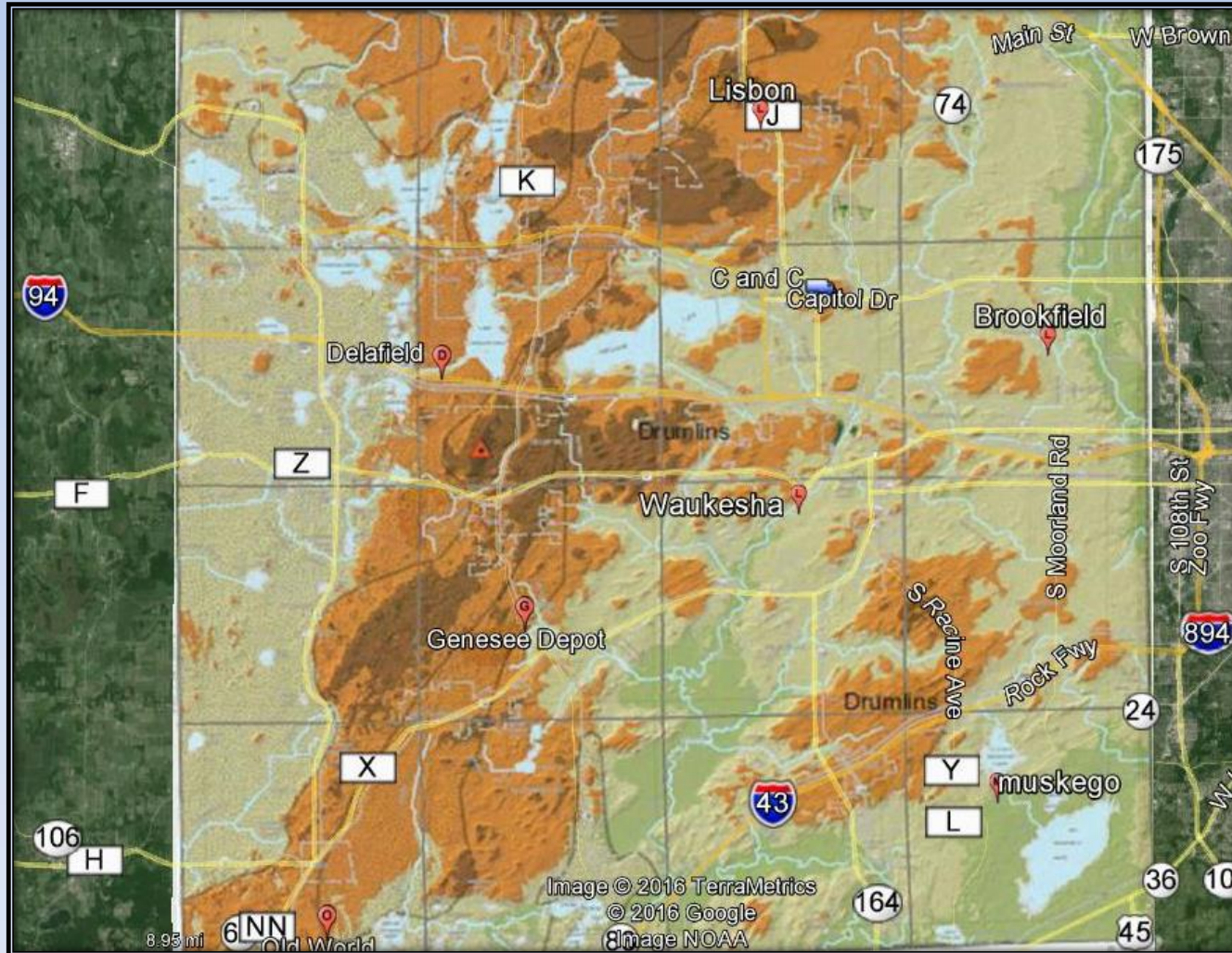


# Bedrock Surface of Waukesha Co. The green colors are the Dolostone

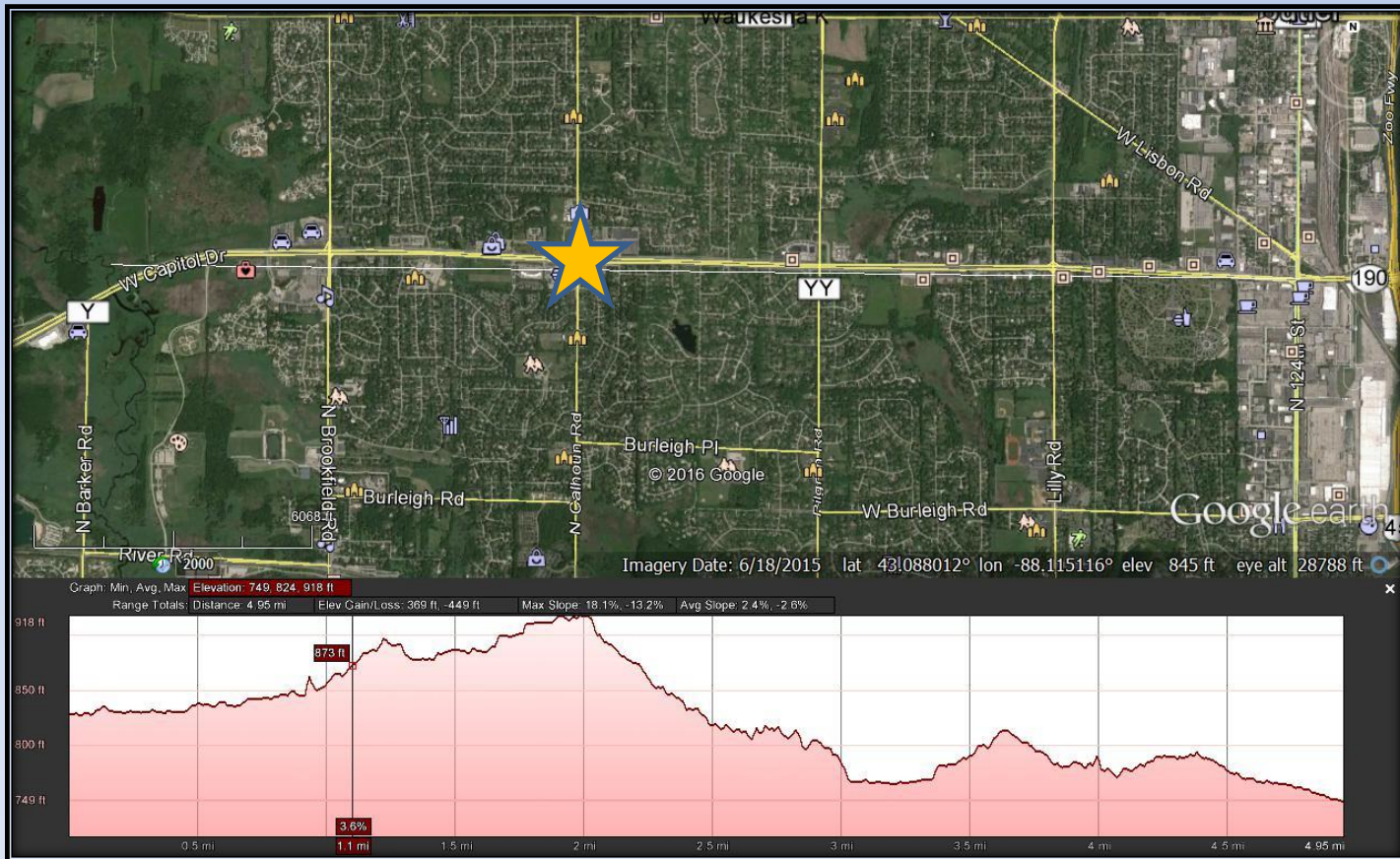


# Topography of Waukesha Co

## Mostly glacial deposits



# Capital and Calhoun Cross section showing elevation



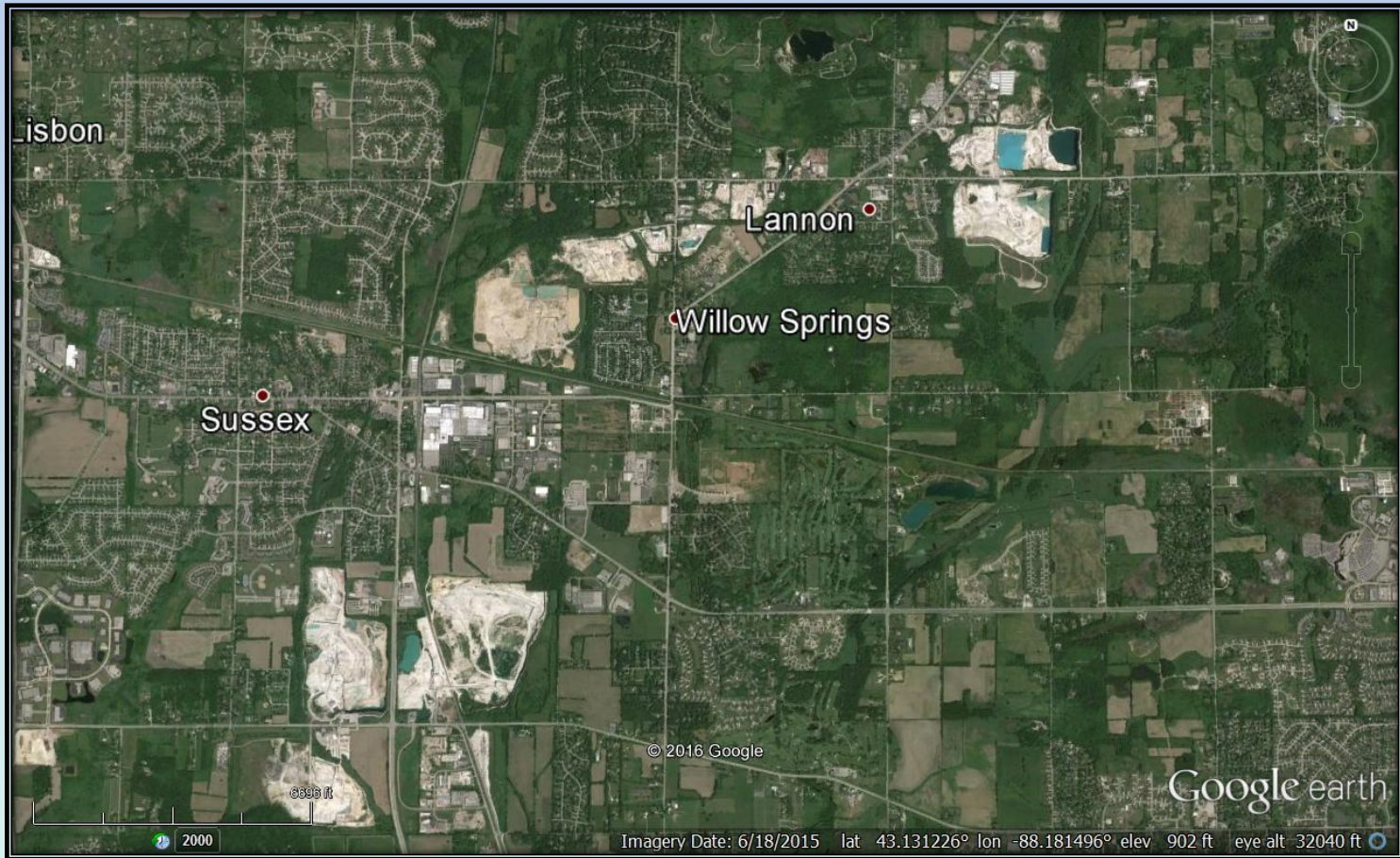
# Bedrock with mineral potential overlay

## Possible resources dolostone and sand and gravel





# Lannon – Sussex quarry area



These quarries have been in existence as far back as 1850 or older



# Halquist Quarry



# Lemke Quarry- Dolostone



# Lannon Stone is found all over SE Wisconsin

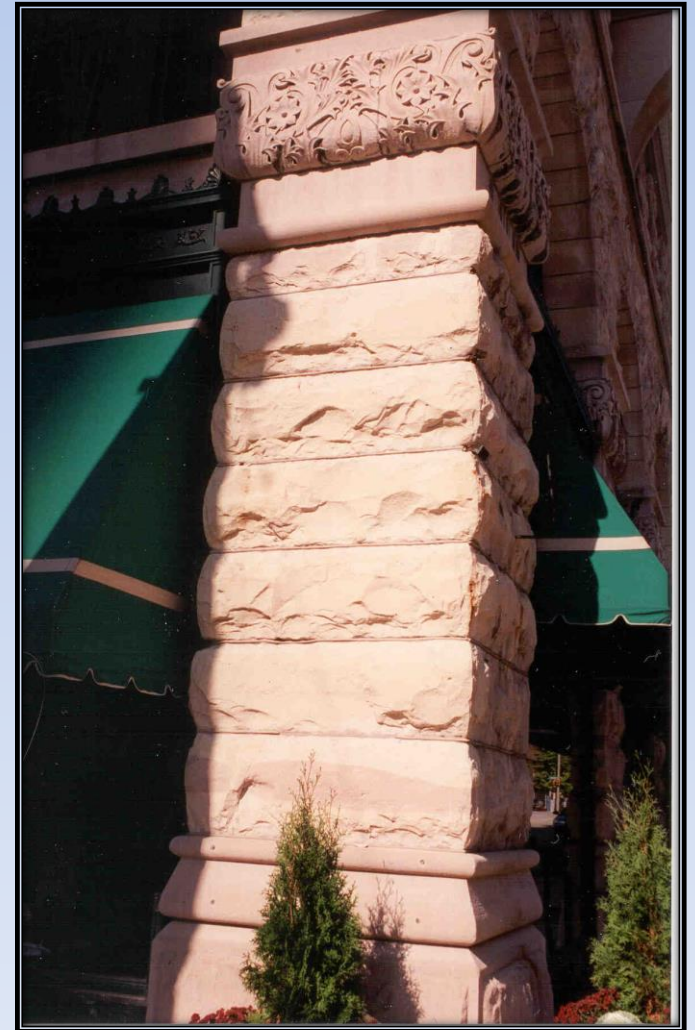


# More Lannon Stone homes both for the rich and not so rich



# Phister Hotel Wawatosa limestone

## The Wawatosa Limestone has thicker bedding



# Wauwatosa “Limestone” in Waukesha





# Story Bros. Quarry was near the present Miller Park

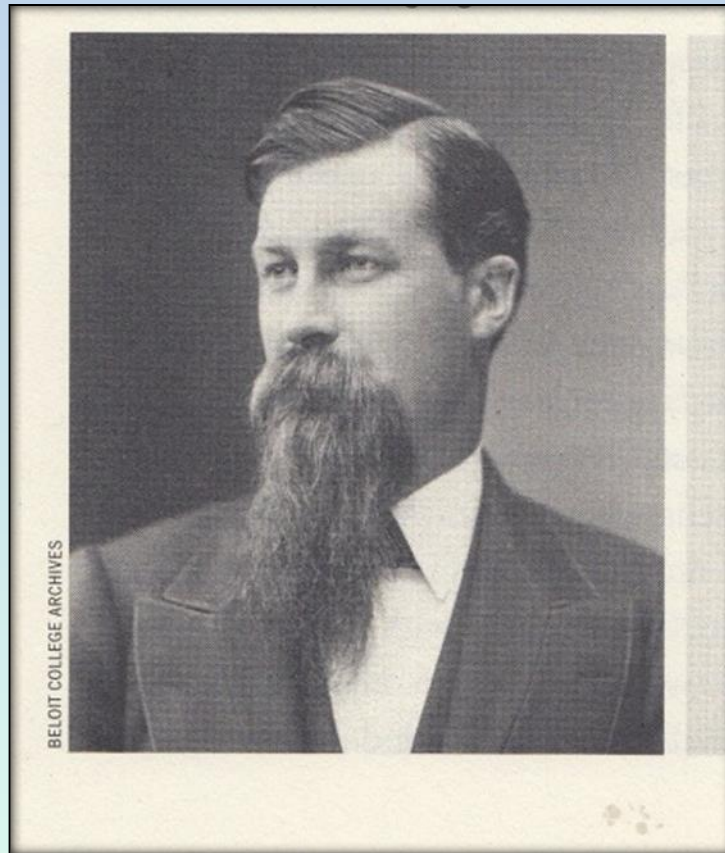


# Significant early writing about the Niagara “Limestone”

Geology of Wisconsin 1873-1877 Vol II, Part II Geology of  
Eastern Wisconsin, pp 95-247  
T.C. Chamberlin

On the Building and Ornamental Stones of Wisconsin  
Ernest Buckley 1896  
Wisconsin geological and Natural History Bulletin #4

T.C. Chamberlin, Author of 4 volume  
Geology of Wisconsin, 1879:  
State Geologist, President of UW



Chapter 6 ( Buckley)  
Limestone-the Niagara Formation  
Pages 295- 347  
Quarry locations

Wawatosa

Waukesha

Genesee area

Lannon area

Templeton area

Pewaukee area

Burlington area

Racine

Cedarburg area

Port Washington

Grimms and Brillion

Mayville area

Knowles area

Marblehead area

Hamilton area

Sheboygan area

Sheboygan Falls area

Peebles area

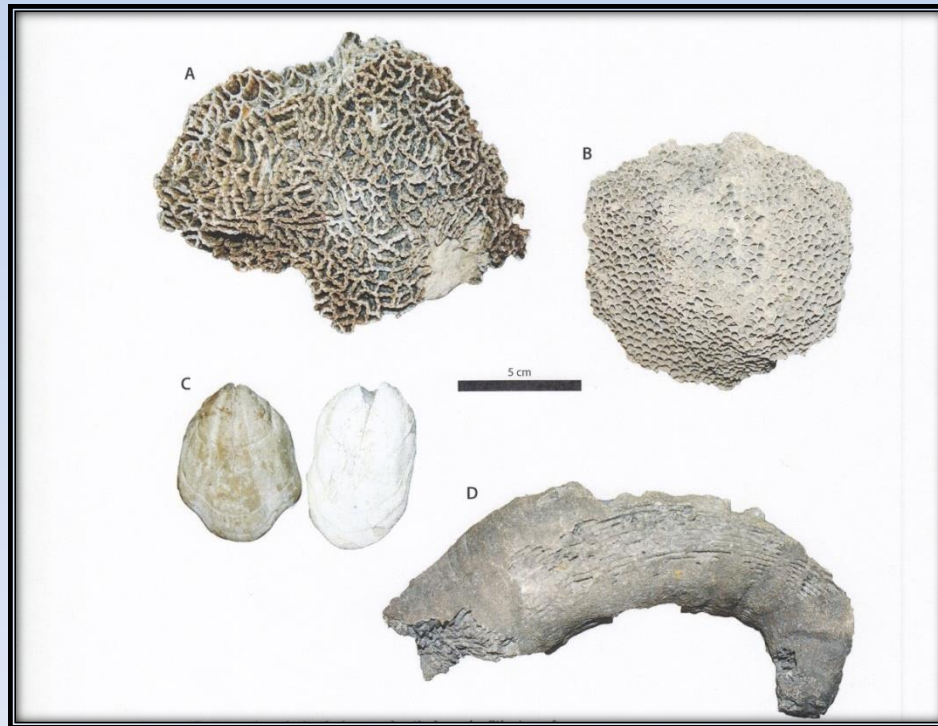
Kewaunee area

Sturgeon Bay area

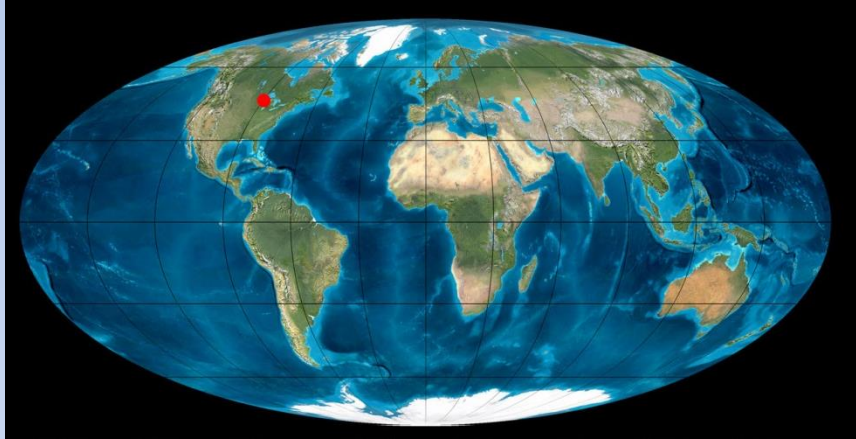
# Some Typical Fossils of the Silurian in Wisconsin

A real love of Increase Lapham

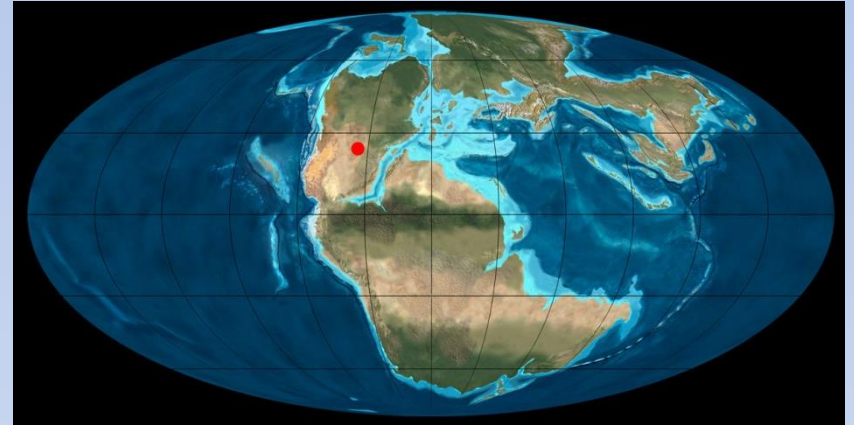
These life forms are representative of shallow marine environments in tropical waters such as coral reefs



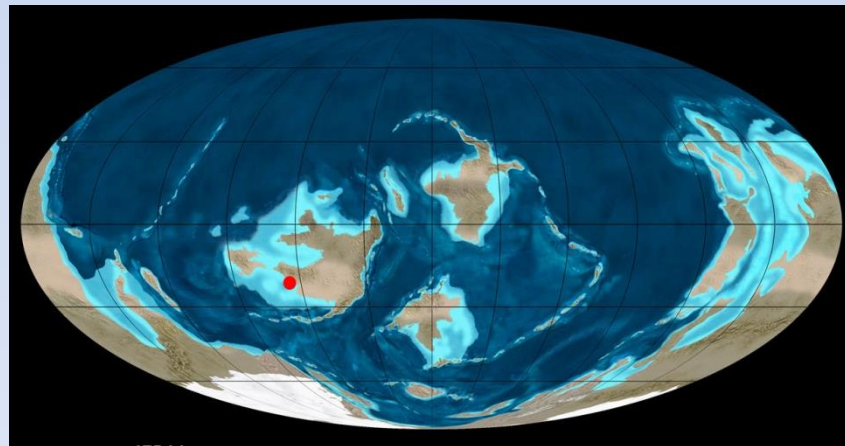
# Wisconsin as it wandered the world



Today



200Ma



475 Ma

And then there is the  
water issue!

## Chamberlin Geology of Wisconsin 1879.

Note the drainage divide



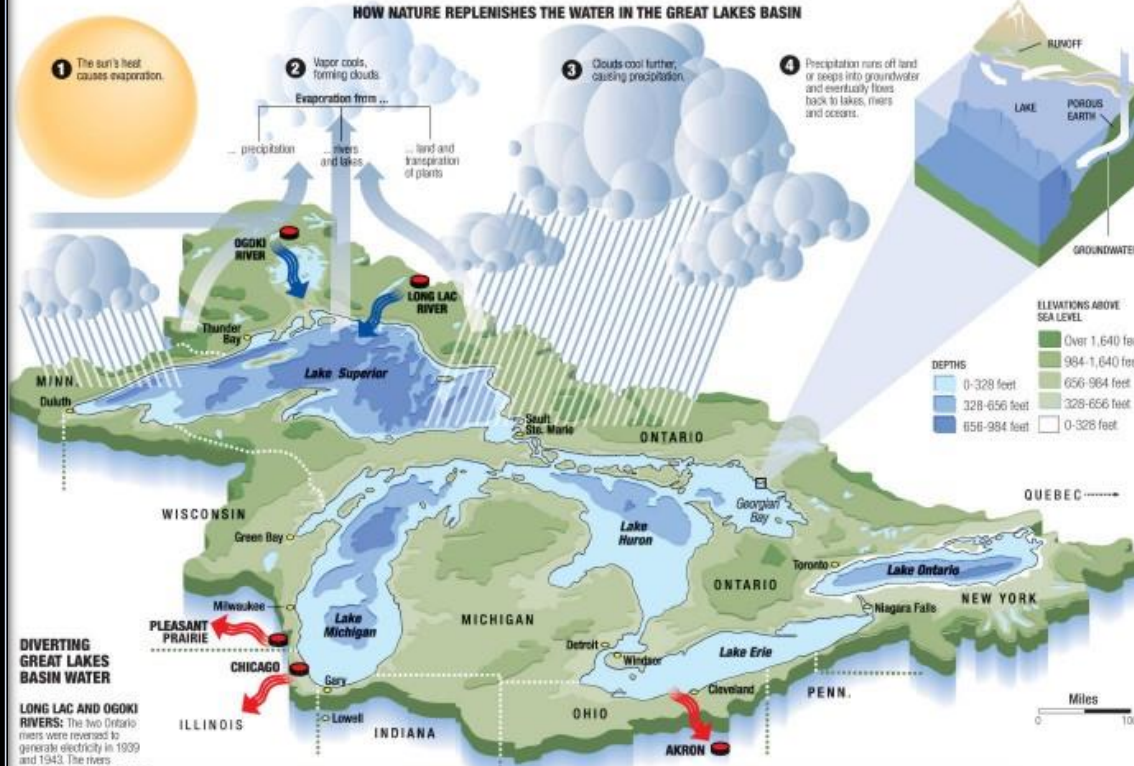
# Great lakes Watershed

GIFTS FROM THE GLACIERS

## THE WORLD'S LARGEST FRESHWATER SYSTEM

The Great Lakes are gifts from the glaciers, the first of which began to advance more than a million years ago. As they inched forward, the glaciers, up to 6,500 feet thick, scoured the earth and altered forever the previous ecosystem. Valleys created by the river systems of the previous era were deepened and enlarged to form the basin for what is now the Great Lakes. Thousands of years later, the climate began to warm, melting and slowly drinking the ice -- and filling the lakes. The cycle was repeated several times.

### HOW NATURE REPLENISHES THE WATER IN THE GREAT LAKES BASIN



### SOME PROPOSALS THAT DIDN'T WORK

- 1900s:** A \$1.0 billion Grand Canal project would have built a dike across the mouth of James Bay. The dike would have allowed inflow from rivers in Ontario and Quebec to be stored and pumped to the Great Lakes as needed in dry parts of the continent.
- 1966:** Congress directed the U.S. Army Corps of Engineers to find ways of diverting water from the Great Lakes to relieve drought in the northeast. In Canada, the Ontario Water Resources Commission began studying whether to divert Great Lakes water to southwestern Ontario as the province was facing water shortages.
- 1987:** Lake Superior was viewed as a source of water for a \$2.2 billion pipeline that would carry coal slurry from the Powder River basin of Wyoming and Montana to the Great Lakes.

- 1964:** Congress authorized a study on diverting Great Lakes water to the Missouri River to replenish the Ogallala Aquifer.
- 1968:** Low water levels on the Mississippi River stalled barge traffic, prompting Illinois Gov. James Thompson to propose diverting water from Lake Michigan to the Mississippi.
- 1992:** Lowell, Ind., which had drinking water problems, was denied permission by Great Lakes governors to divert 2 cubic feet per second from Lake Michigan even as Lowell promised to return the water to the lake.
- 1998:** An entrepreneur in Sault Ste. Marie, Ontario, received permission from Ontario to use tankers to export water from Lake Superior to Asia. The project did not go forward.

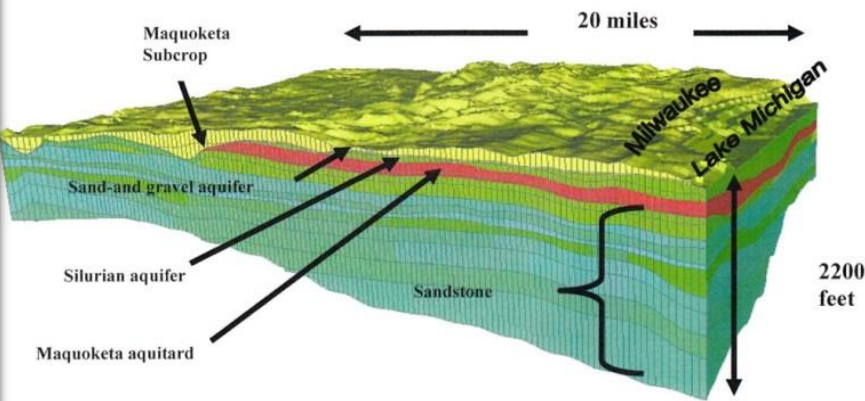
DAVID ARNOLD, ALFRED ELSENTO  
Illustration: David Arnold



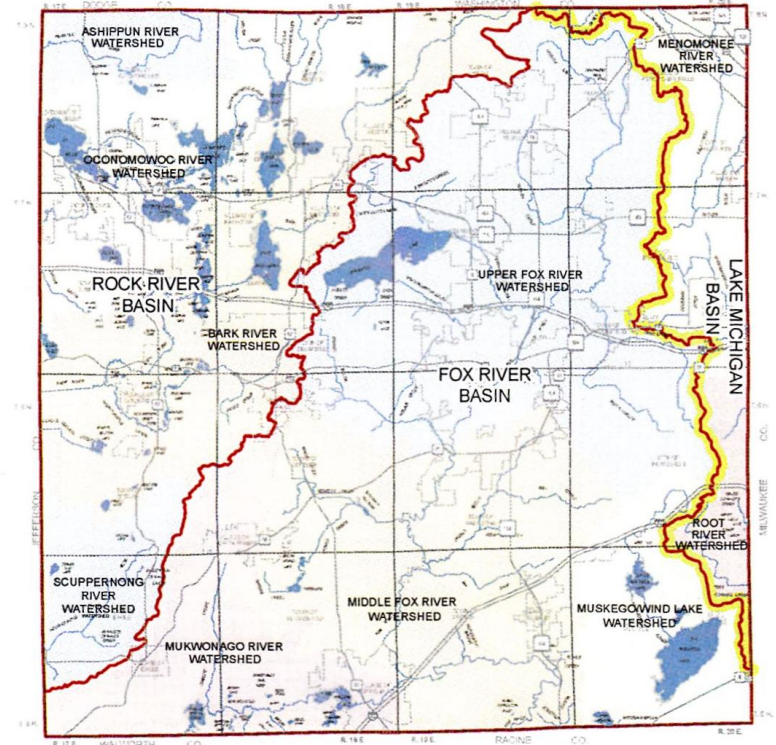
# The Water Divide

Figure III-1

GENERAL HYDROGEOLOGY OF SOUTHEAST WISCONSIN



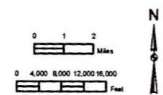
Map III-7  
Watersheds of Waukesha County



**Legend**

- ▭ River Basin Boundaries
- ▭ Subcontinental Divide

Source: SEWRPC, DNR & Waukesha County



# Enjoy the Ledge ..as you dine in downtown Waukesha – so much Silurian to see!



Or sip Silurian Stout in Door Co. as you watch  
the sunset over the escarpment of Peninsula  
Park.



The End