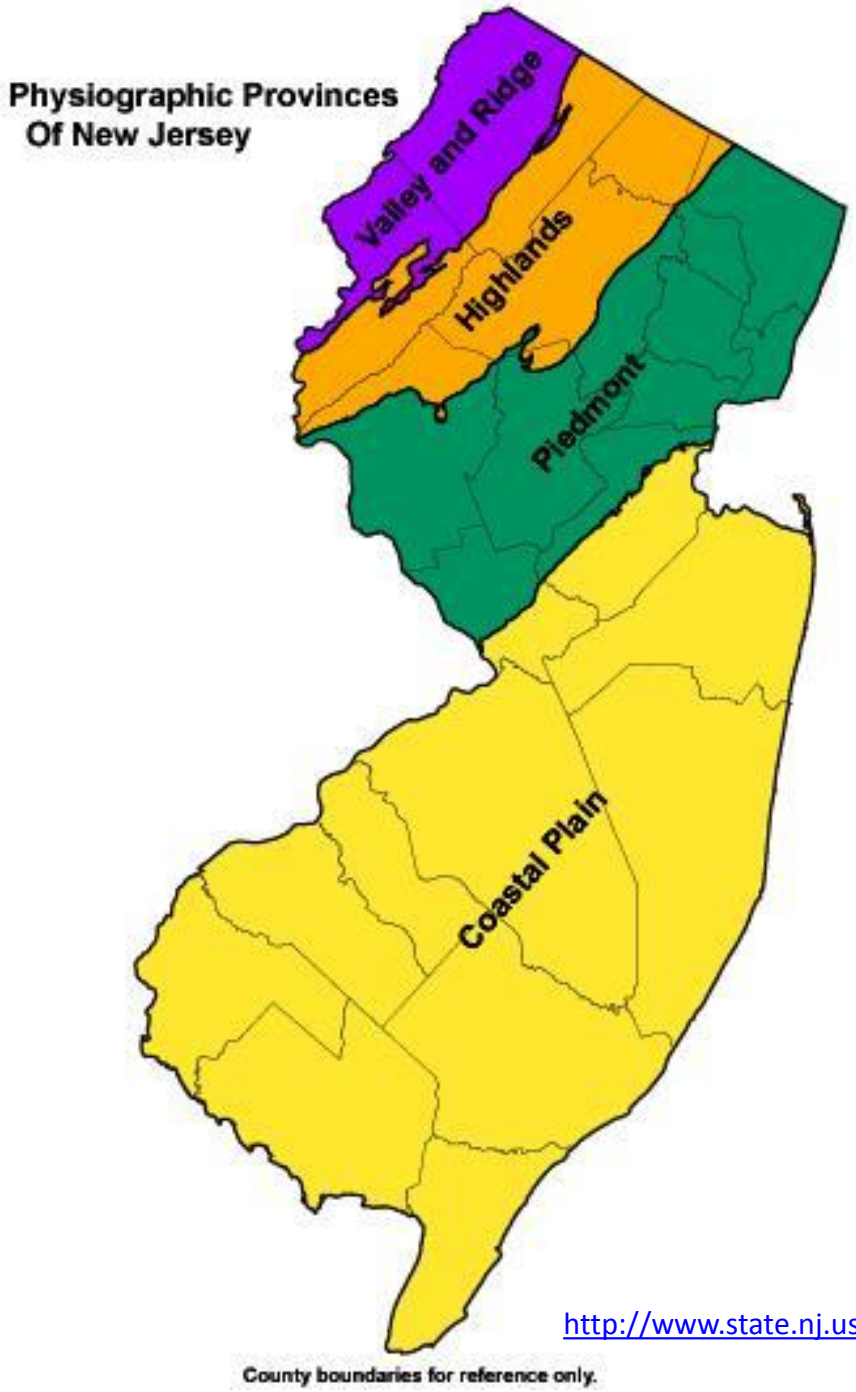
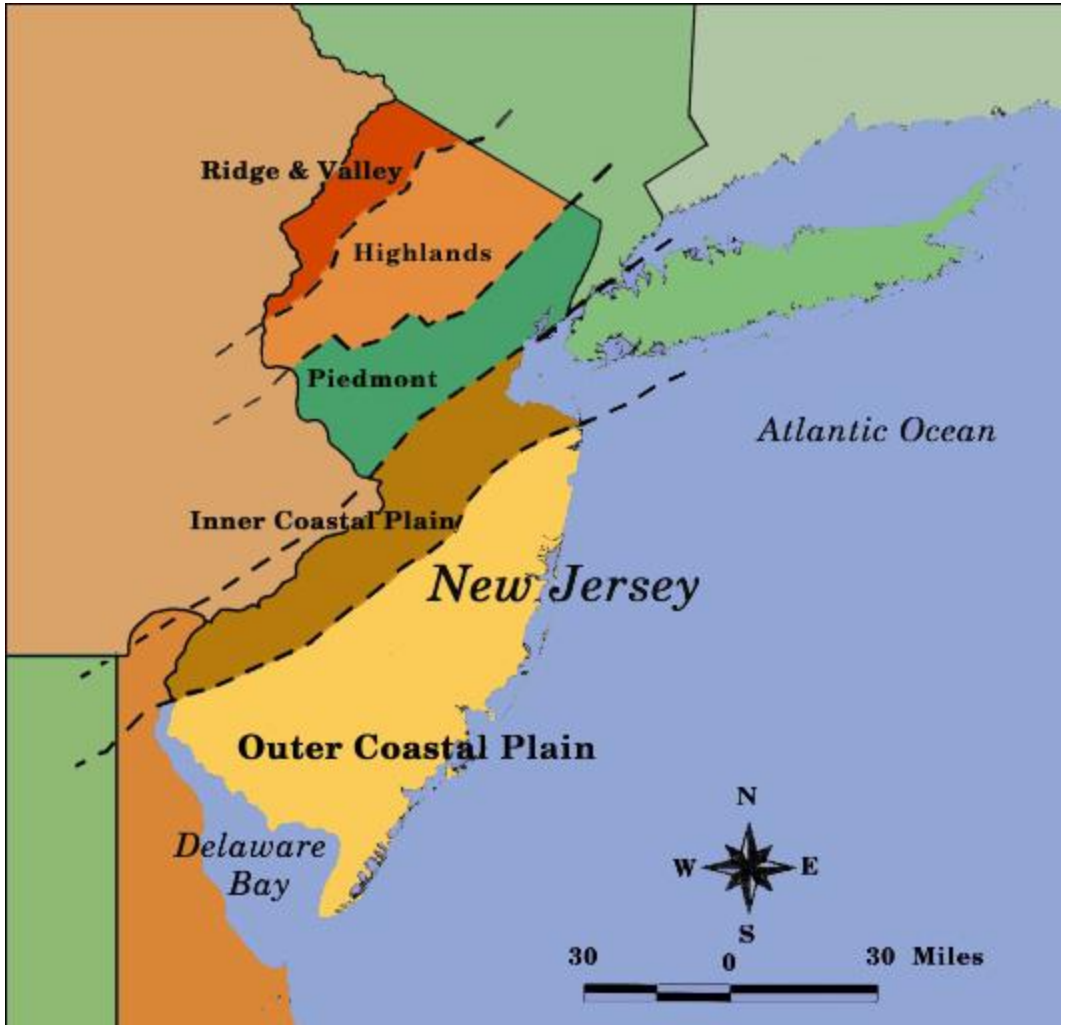
Brief Introduction to the Geology of Flat Rock Brook Nature Center and Bergen County

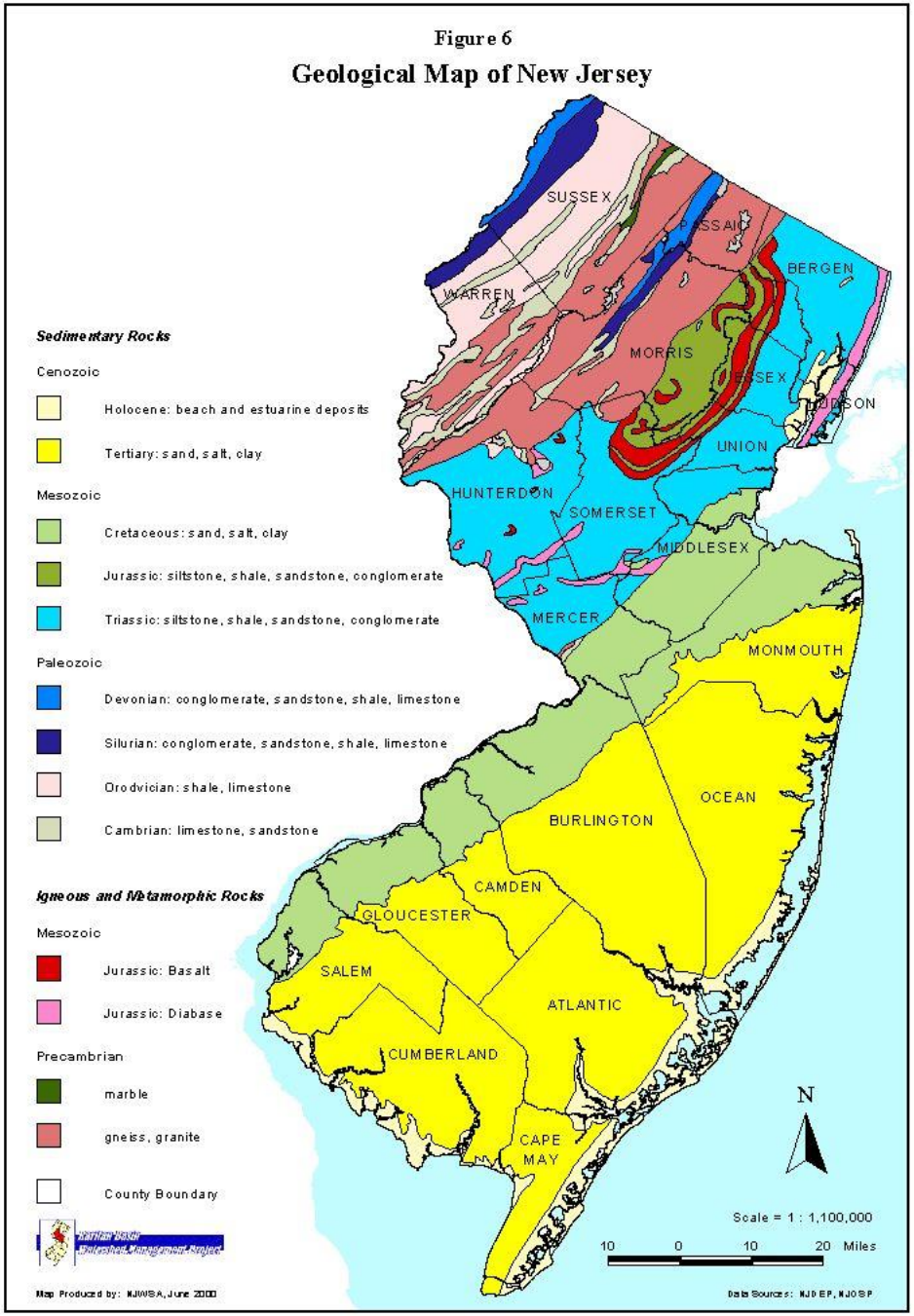
Dr. Mike Passow
FRB Board of Trustees
Earth Science Educator



http://www.state.nj.us/dep/njgs/geodata/provinces.jpg



https://www.cumauriceriver.org/botany/images/Physiographic_snap_NJ-1.jpg



http://www.raritanbasin.org/alliance/RBWMP_CD/Reports/Settings/Figures/figure06.jpg

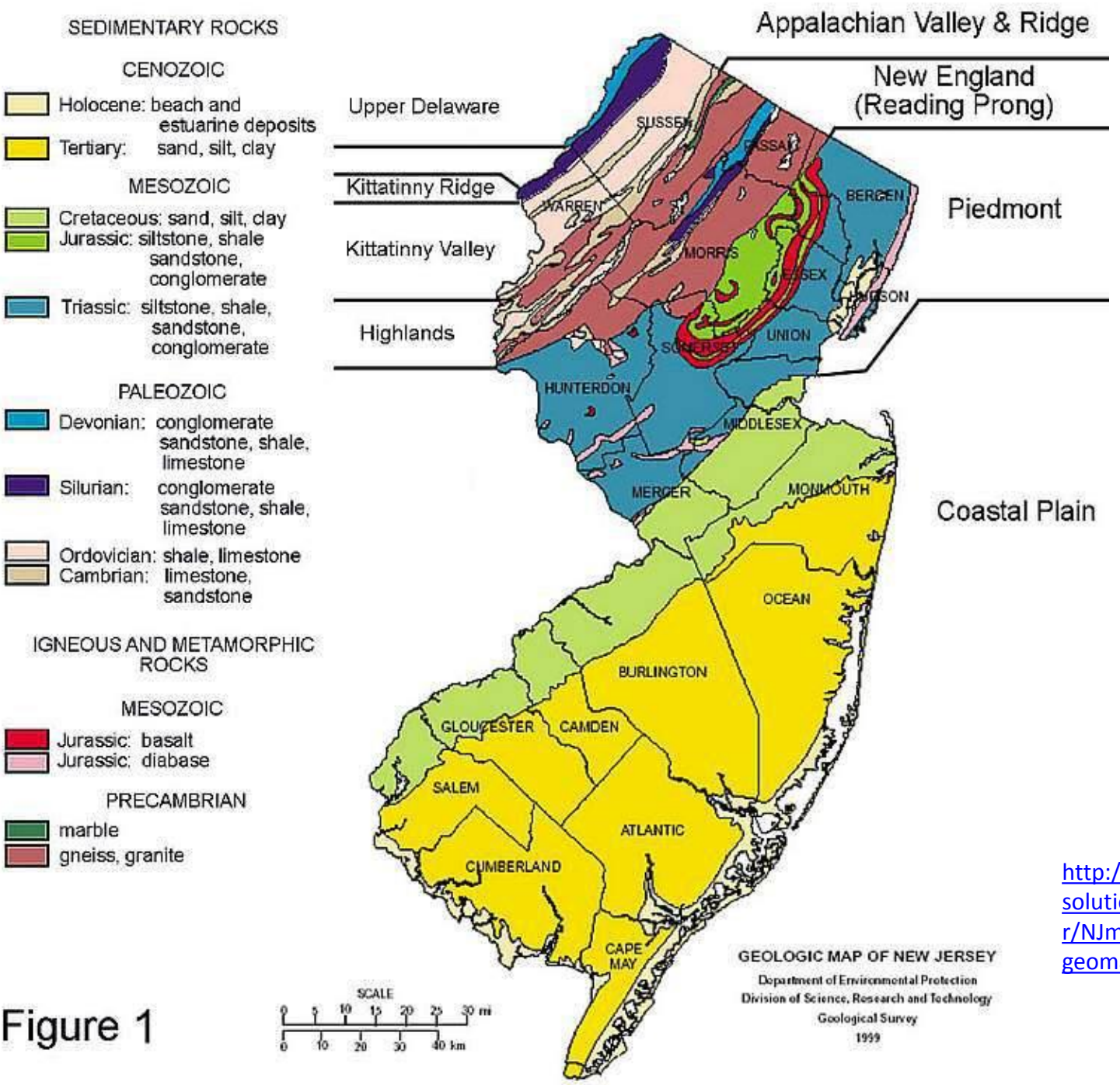
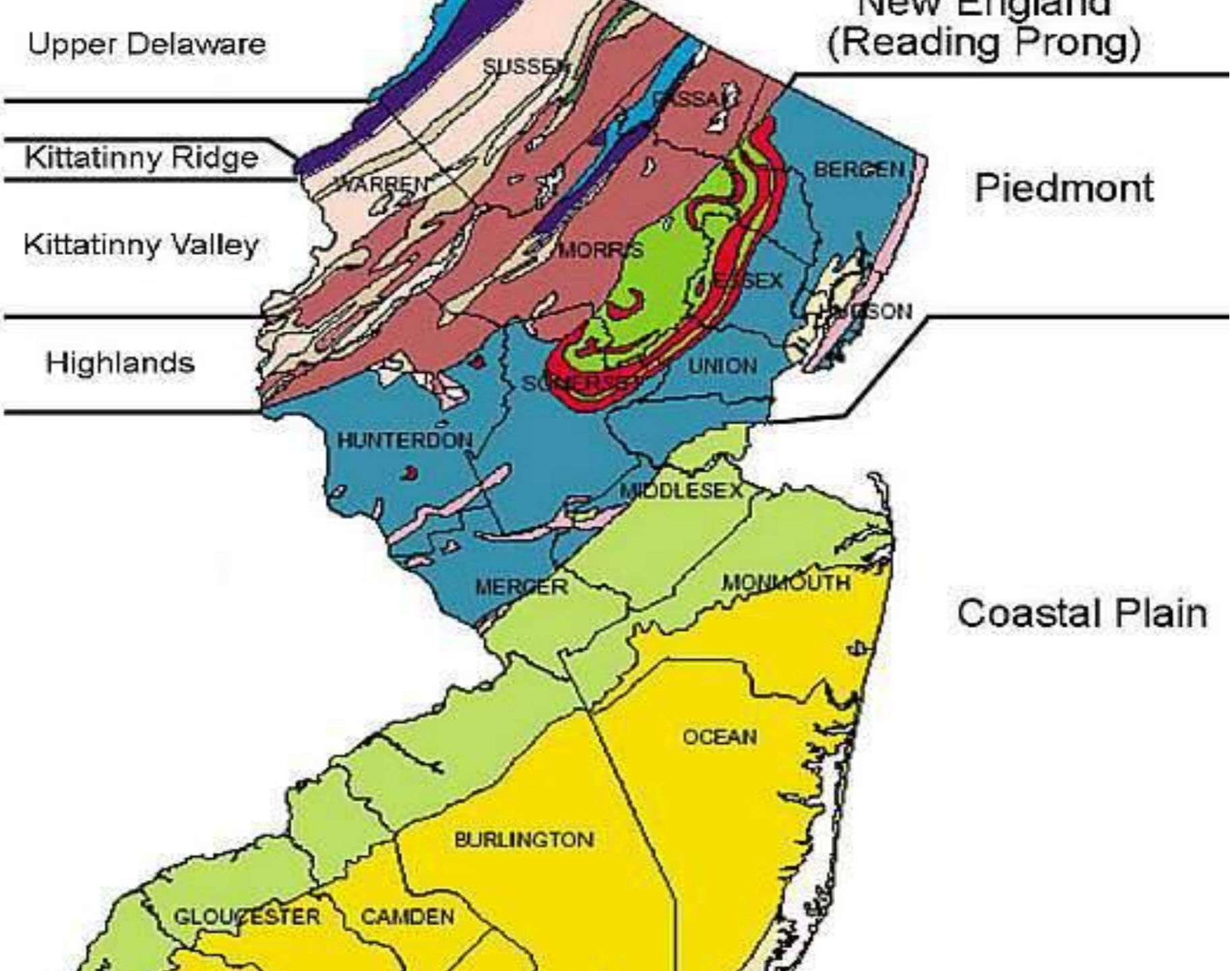
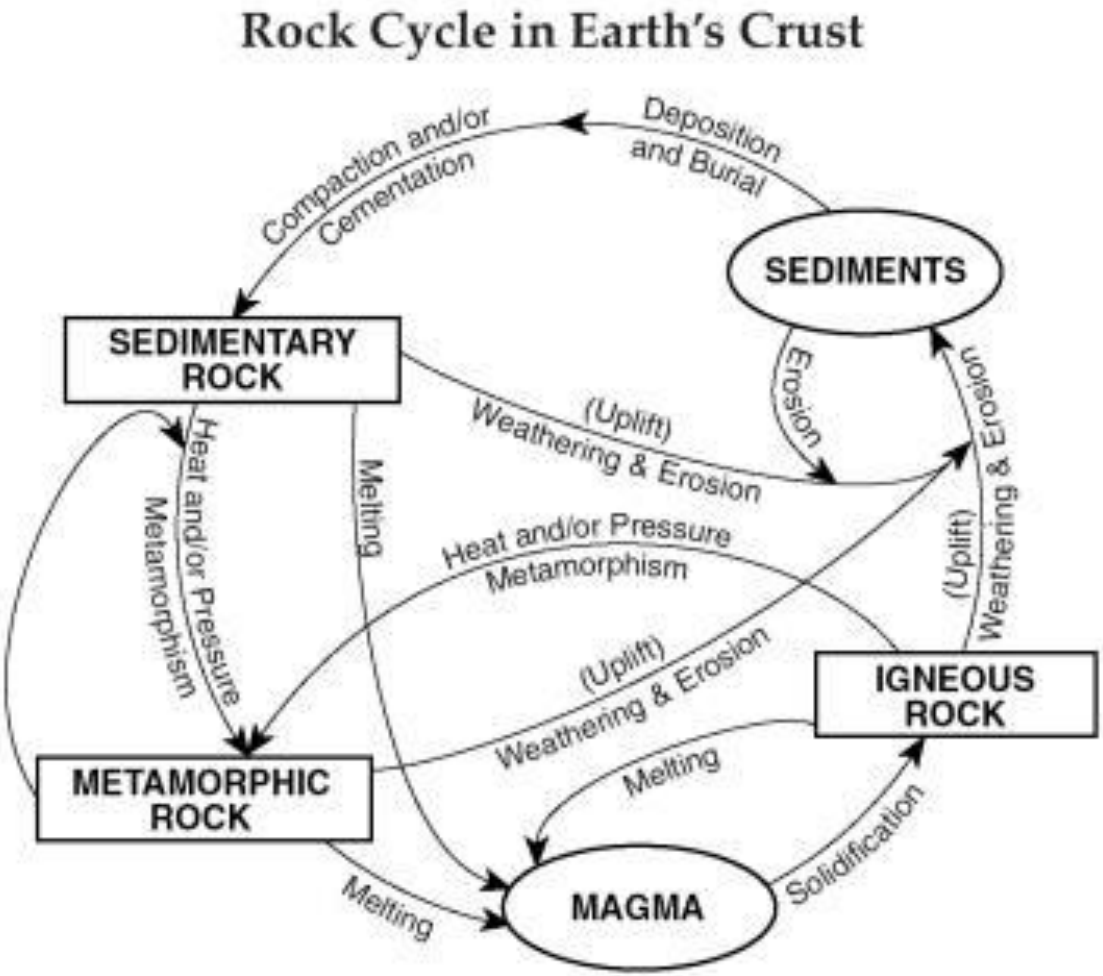


Figure 1

http://www.sunstar-solutions.com/sunstar/NJmaps/Images/NJgeomap5.jpg


Upper Delaware
Kittatinny Ridge
Kittatinny Valley
Highlands
New England
(Reading Prong)
Piedmont
Coastal Plain
SUSSEX
WARREN
MORRIS
BERGEN
UNION
HUNTERDON
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
GLOUCESTER
CAMDEN

The Rock Cycle



Sedimentary Rocks

- Sandstones

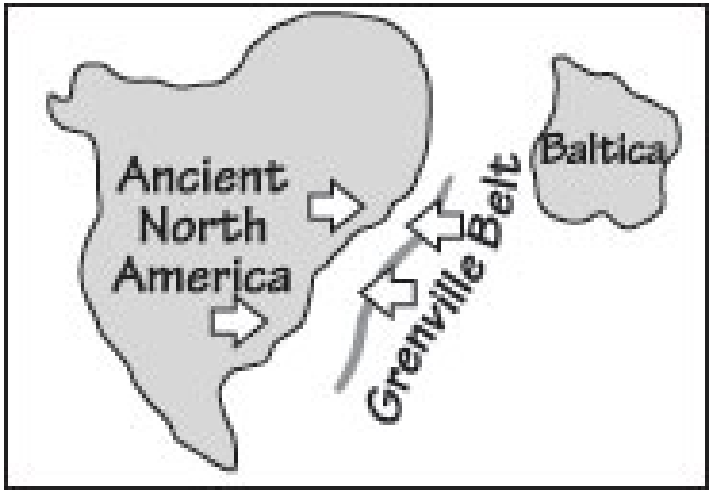
- Shales

Basalts (Diabase)

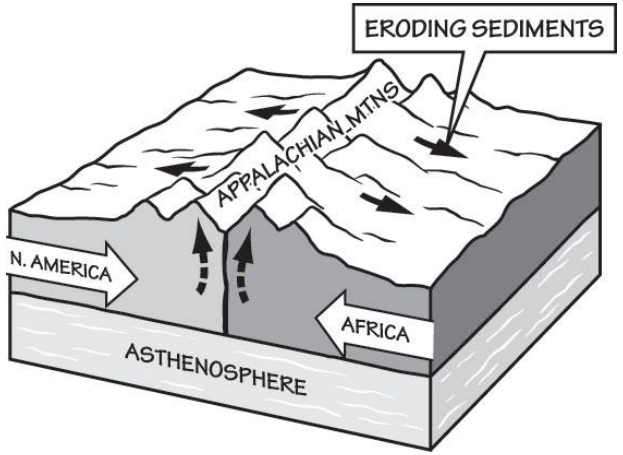
https://en.wikipedia.org/wiki/Diabase

Geologic Origins of Our Area

Oldest rocks form more than 1 billion years ago when early land masses collided to form the Grenville Belt

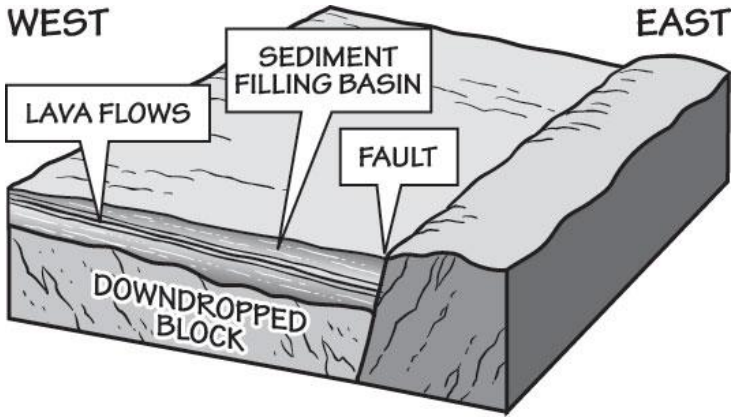


- Skipping over hundreds of millions of years, ancient North America and Africa collided to form Pangaea

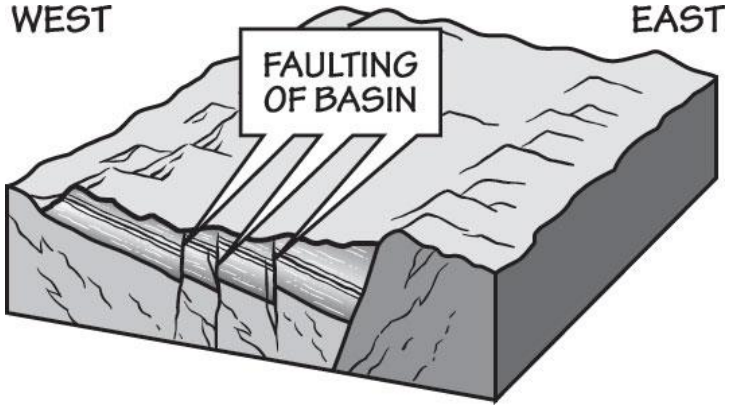


Origins of Our Area – Triassic/Jurassic

- As Pangaea split and the Atlantic Ocean began to form, sediments and lava flows were deposited



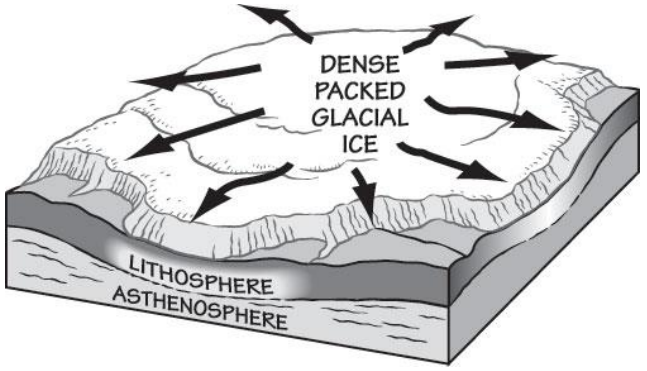
- Faulting and tilted affected the region, as evidenced in the rock outcrops and features visible today

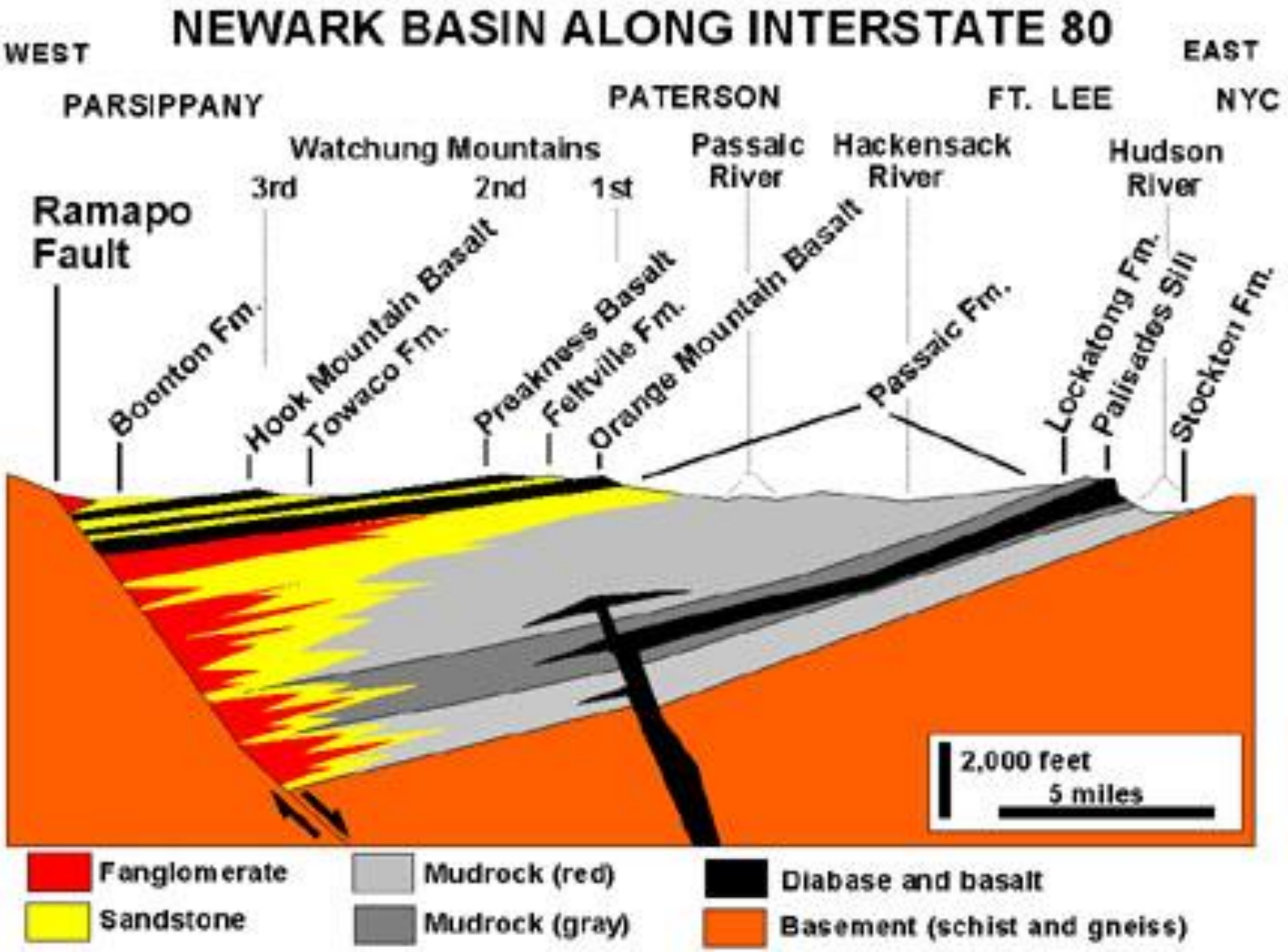


Erosion over the past 150 my

- Day-to-day weathering and erosion wore down the vast mountains to the west and. Sediments were deposited along the Atlantic Coastal Plain. Resistant basalts and diabases stood up as the Palisades and Watchungs

- Ice Sheets covered the land as recently as 10,000 years ago





https://3dparks.wr.usgs.gov/nyc/mesozoic/newarkbasin.htm

“Upper Contact” between Palisades Diabase and Sedimentary Layers

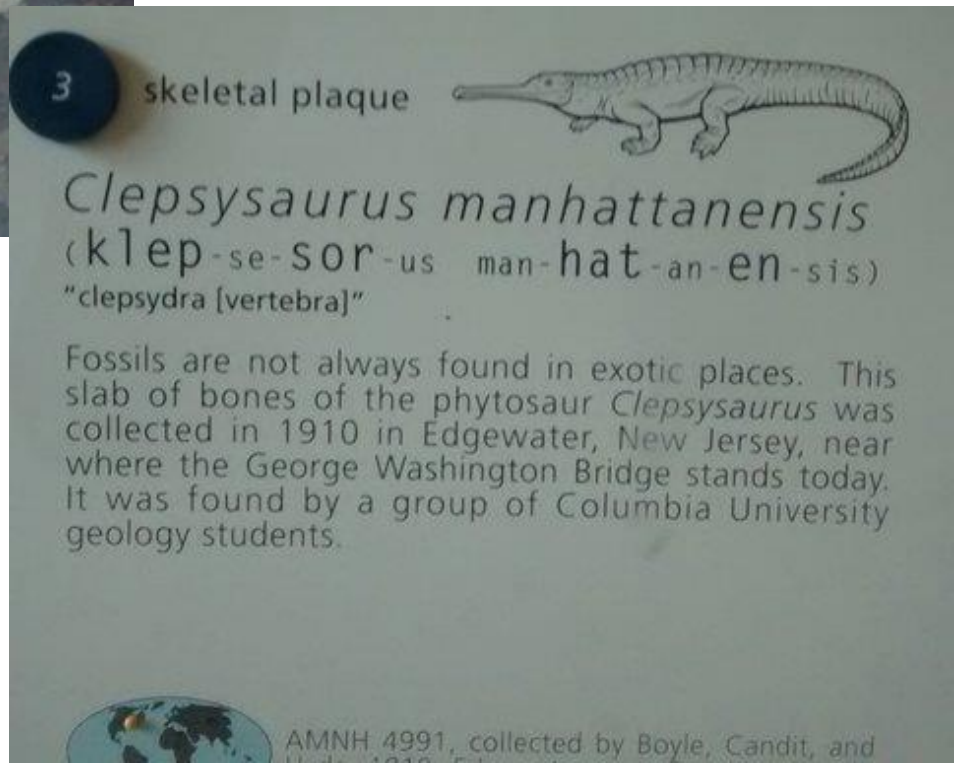
“Trace Fossils” from the Shallow Freshwater Lakes

- “Worm Burrows”

- “Raindrop impressions”

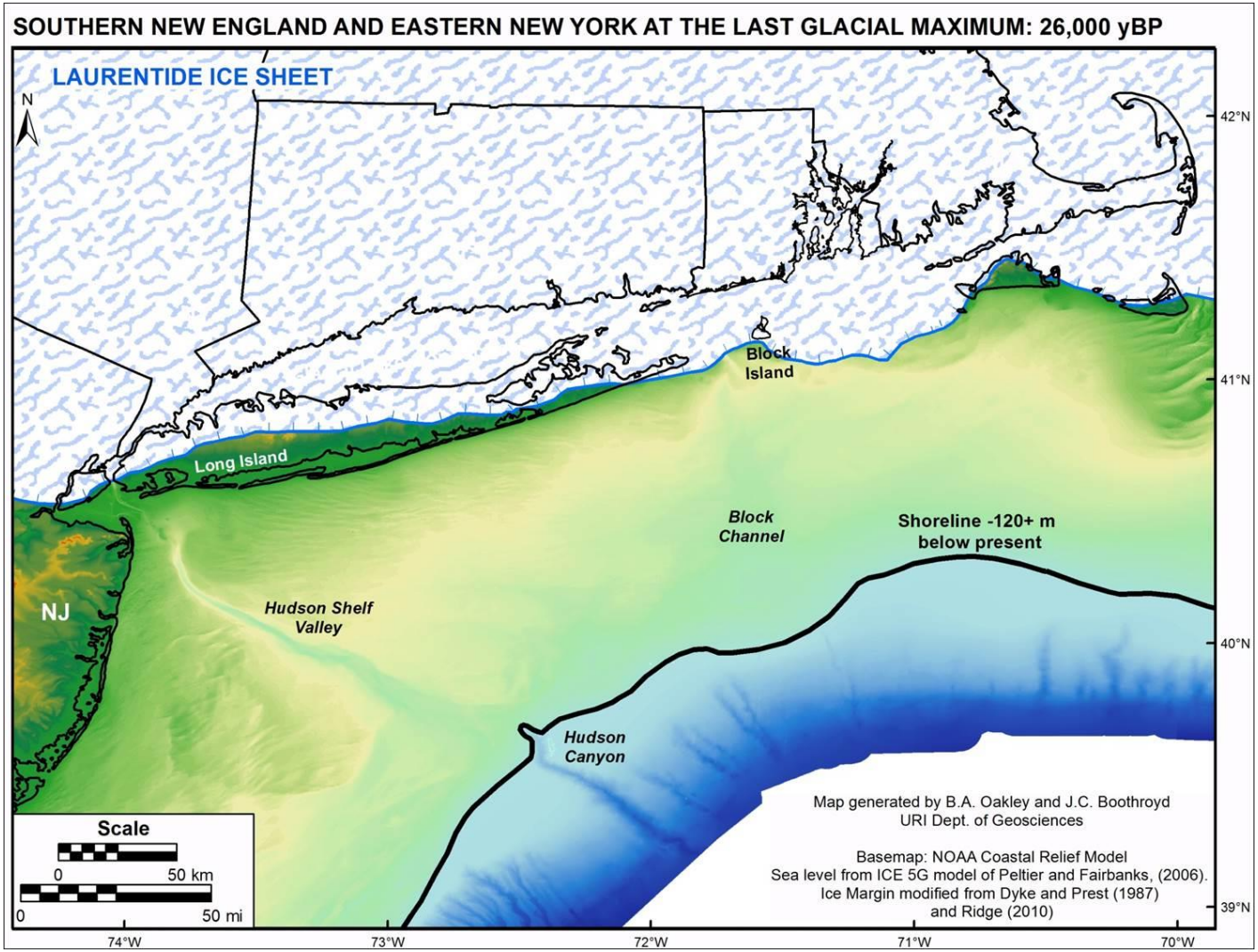
Worm burrows in FRB Quarry specimen

Triassic reptile fossil from Edgewater



http://www.njpalisades.org/triassicPark.html

The Last Ice Age



http://www.easternct.edu/oakleyb/files/2014/01/LIS_LGM_Oakleyt.jpg

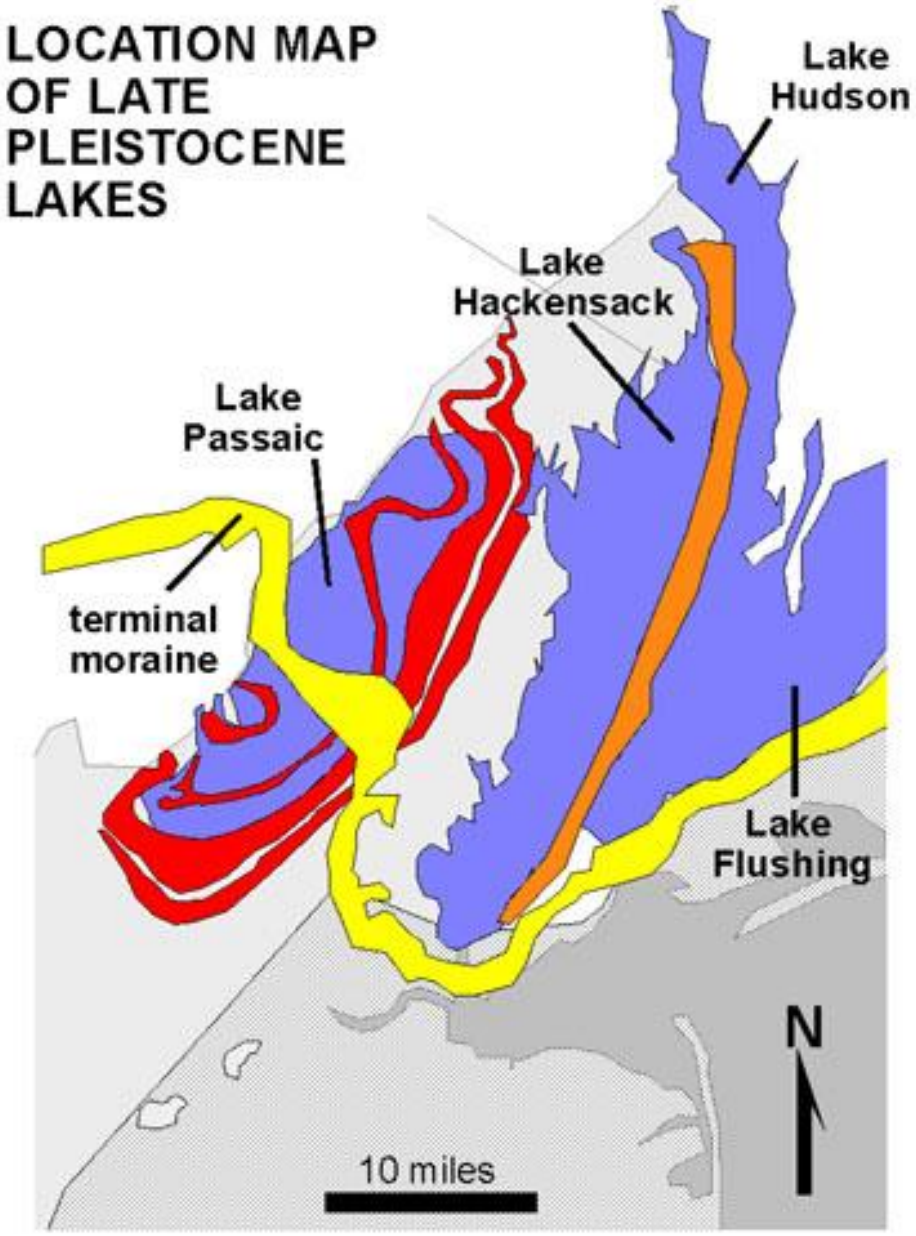
Glacial Striations

Striations on FRB path

Glacial Erratics

https://nsidc.org/sites/nsidc.org/files/styles/large/public/images/erratic_WGobetz.jpg?itok=UB-TNa1J

http://www.landforms.eu/Central%20Park/images/perched1.jpg



https://3dparks.wr.usgs.gov/nyc/images/fig144.jpg

Quarrying on the Palisades – “Carpenter Brothers’s Quarry”

http://www.njpalisades.org/images/quarryConveyer.jpg

Carpenter’s Trail

http://www.njpalisades.org/images/carpenterTrail.jpg

http://3.bp.blogspot.com/_sUCs1pBBpqo/TKtE0yDe_UI/AAAAAAAAEyA/h_f6PWnVRK0/s1600/The+Carpenter+Quarry,+Fort+Lee,+NJ.jpg

Beginning around 1900, the Womens Clubs of NY & NJ mounted campaigns in the State Legislatures leading to establishment of the Palisades Interstate Park. This is Carpenters' Boathouse in 1931

http://www.njpalisades.org/images/carpenterBathhouse.jpg

PRESERVING THE PALISADES

A

TO SAVE THE PALISADES

New-York and New-Jersey May Take Some United Action.

THE COST IS LIKELY TO BE HEAVY

Senator Lexow and Gov. Werts Are Interested in the Matter—Purchase or Condemnation Proposed.

TRENTON, N. J., Nov. 24.—There is to be concerted action between the Legislatures of New-York and New-Jersey to preserve the Palisades along the Hudson River. Senator Lexow and Gov. Werts of New-Jersey are to join forces and do something to prevent the finest stretch of American scenery being destroyed by the stone crushers.

Ever since the half dozen contractors at different points along the line began the work of desecration a healthy agitation has been going on in the two States, which is now beginning to assume some tangible shape.

The Palisades extend into Senator Lexow's bailiwick, and he has committed himself to do all that he can to prevent any damage above the New-York line. He has requested a conference with Senator H. D. Winton of Bergen County, N. J., so that some uniform line of action can be agreed upon.

Through the 1890s, quarries blasted the Palisades for stone to make gravel and concrete. The largest of these, Carpenter Brothers' quarry, was just south of here (background photograph and B). Many thousands of tons of broken rock were taken from this quarry.

Public outrage at this "desecration" of the landscape was captured in newspaper articles such as this one (A) from the *New York Times* in 1895.

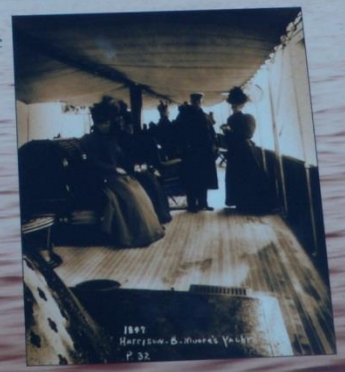
In New Jersey, the fight to preserve the Palisades was led by the New Jersey State Federation of Women's Clubs. In 1897, club women toured the quarries by boat (C), making a stop here at Carpenters' quarry. Could a handful of women—a generation before suffrage—succeed in such an ambitious effort?

In 1900, New Jersey and New York, spurred by the women's clubs and with the backing of several prominent individuals and families, including New York governor Theodore Roosevelt, formed an Interstate Park Commission whose purpose was to close down the quarries and preserve the Palisades. John Pierpont Morgan would donate the funds to close Carpenters' quarry. The last blasting at this spot occurred on Christmas Eve, 1900.

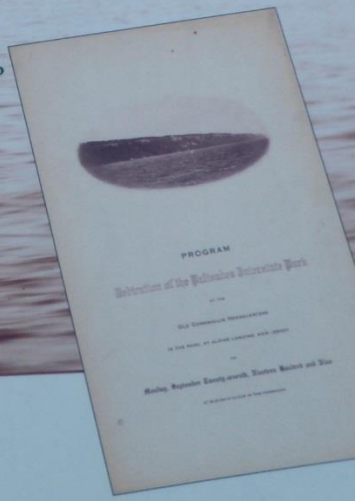
The Palisades Interstate Park was formally dedicated in 1909 at Alpine Landing (D).

B

C



D



Palisades Interstate Park Commission
njpalisades.org

2008

Englewood Crushed Stone Co.

- c. 1900, the Englewood Crushed Stone Company started operations on the back side of the Palisades
- Blasted the diabase under the sandstone/ shale
- Brought slabs to crushing house for reduction in size for use in road construction
- Transported by wagons and trucks to forerunner of Route 4 and other roads

Quarry Operations at FRB

- Continued into late-20s
- Closed due to complaints from neighbors
- Englewood Crushed Rock Company → Englewood Lumber Company → ELCO
- Remains of two-room office (razed in 1970s) and crushing building part of my childhood

Cliff walls in the FRB Quarry

Drill Holes in Quarry Rock

Remains of Crusher Building

Selected References to Learn More

Slideshow available at: **https://earth2class.org/site/?page_id=4969**

More information about the area's geology:

- *"Bedrocks of the Newark Basin—Sediments and Volcanoes"*

https://earth2class.org/site/wp-content/uploads/2015/10/lesson-plan-bedrocks-narrative.pdf

- *The Teacher-Friendly Guide to the Earth Science of the Northeastern United States*

http://geology.teacherfriendlyguide.org/index.php/over-ne

- *Geology of Bergen County in Brief*
  http://www.state.nj.us/dep/njgs/enviroed/county-series/Bergen_County.pdf

- “Triassic Park”

http://www.njpalisades.org/triassicPark.html

- “The Story of Our Valley—The Cold Facts”

http://patch.com/new-jersey/riverdell/bp--the-story-of-our-valley-chapter-two-the-cold-facts

- “Life in the Mesozoic “Hackensack River Basin”

https://earth2class.org/site/wp-content/uploads/2016/07/LIFE-IN-THE-MESOZOIC-%E2%80%9CHACKENSACK-RIVER-BASIN%E2%80%9D.pdf

“The real classroom is outside:
Get into it!”