The PA Flora from a Macroevolutionary and Physiogeographical Perspective

Reading:

- Pages 5-7 in Rhoads & Block.
- Page ix-xi in Wherry ET, JM Fogg, & HA Wahl. 1979. Atlas of the Flora of Pennsylvania. The Morris Arboretum, Philadelphia.

The particular section headers are “Introduction” (p. ix), “Nomenclature” (p. ix), “Geology of Pennsylvania in Relation to Plant Distribution” (pp. ix-x), and “Plants of Unusual Habitats” (p. xi).

I. Overview of PA Flora

A. Generalities

- 3400 vascular plant species (2/3 are native)
- 191 trees (130 native)
- 273 shrubs (170 native)
- 32 lianas (22 native)
- 70 vines (46 native)
- 116 extirpations

Rhoads & Block. 2007. *Plants of Pennsylvania.*

Overview of PA Flora

B. Taxonomic Breakdown

- 94 Ferns & Fern Allies
- 29 Gymnosperms

Rhoads & Block. 2007. *Plants of Pennsylvania.*

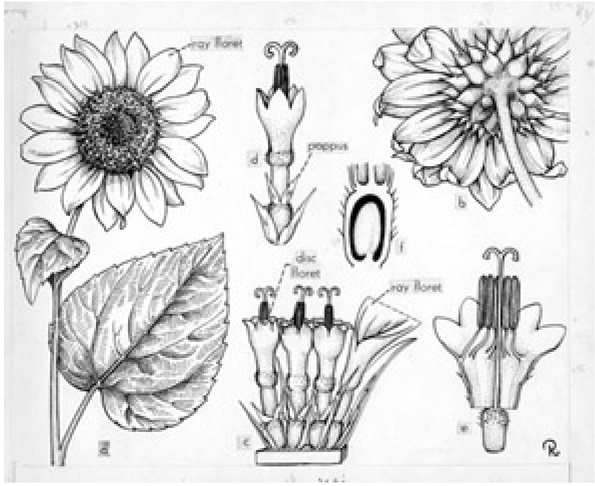
Overview of PA Flora

C. Important Families

•Asteraceae (327)

Aster (*Symphyotrichum*) *novae-angliae* (aster)

Achillea millefolium (yarrow, milfoil)



Helianthus annuus (sunflower)

Solidago canadensis (goldenrod)

Overview of PA Flora

C. Important Families

- Poaceae (281)

Poa annua (annual bluegrass)

Setaria viridis (bristlegrass, foxtail grass)

Overview of PA Flora

C. Important Families

- Cyperaceae (275)

Cyperus papyrus (papyrus)

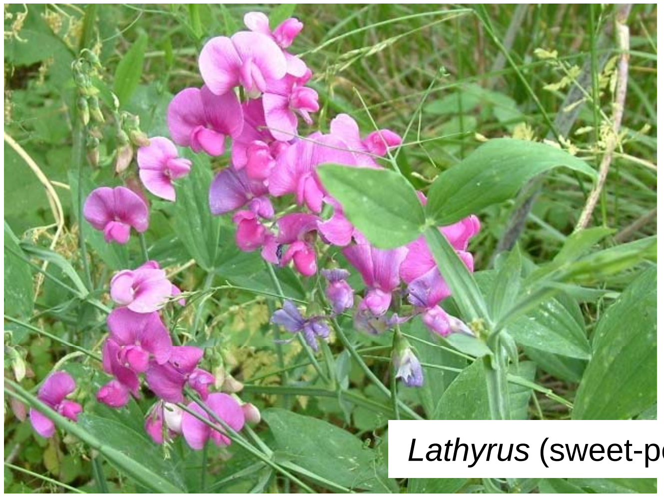
Cyperus esculentus
(yellow nutsedge)

Carex grayi (sedge)

Overview of PA Flora

C. Important Families

- Fabaceae *sensu lato* (98)



Lathyrus (sweet-pea)

Chamaecrista (partridge-pea)

Albizia (mimosa tree)

Overview of PA Flora

C. Important Families

•Orchidaceae (58)

Goodyera pubescens (rattlesnake-plantain)

Cypripedium parviflorum
(yellow lady's Slipper)

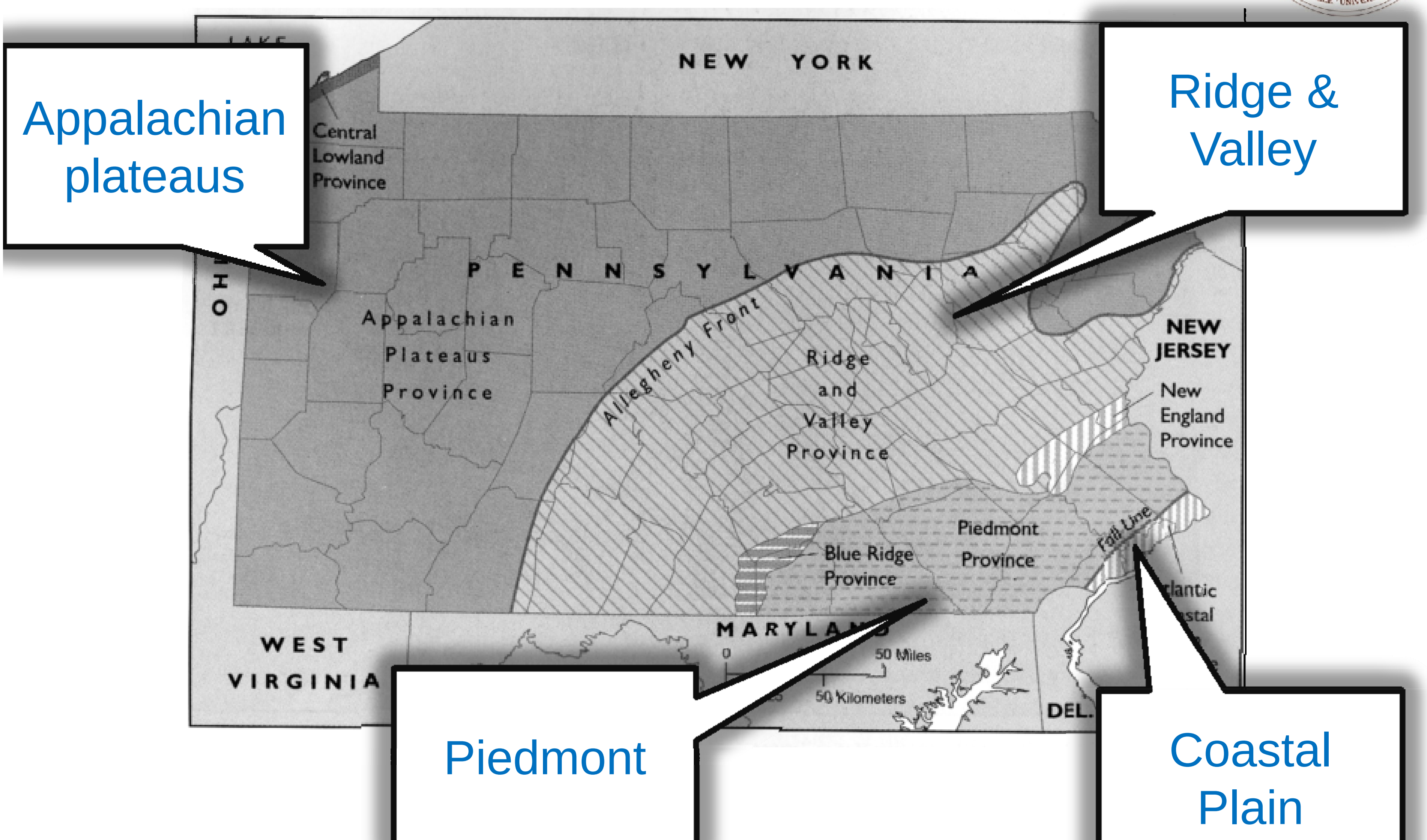
Overview of PA Flora

D. Important Genera

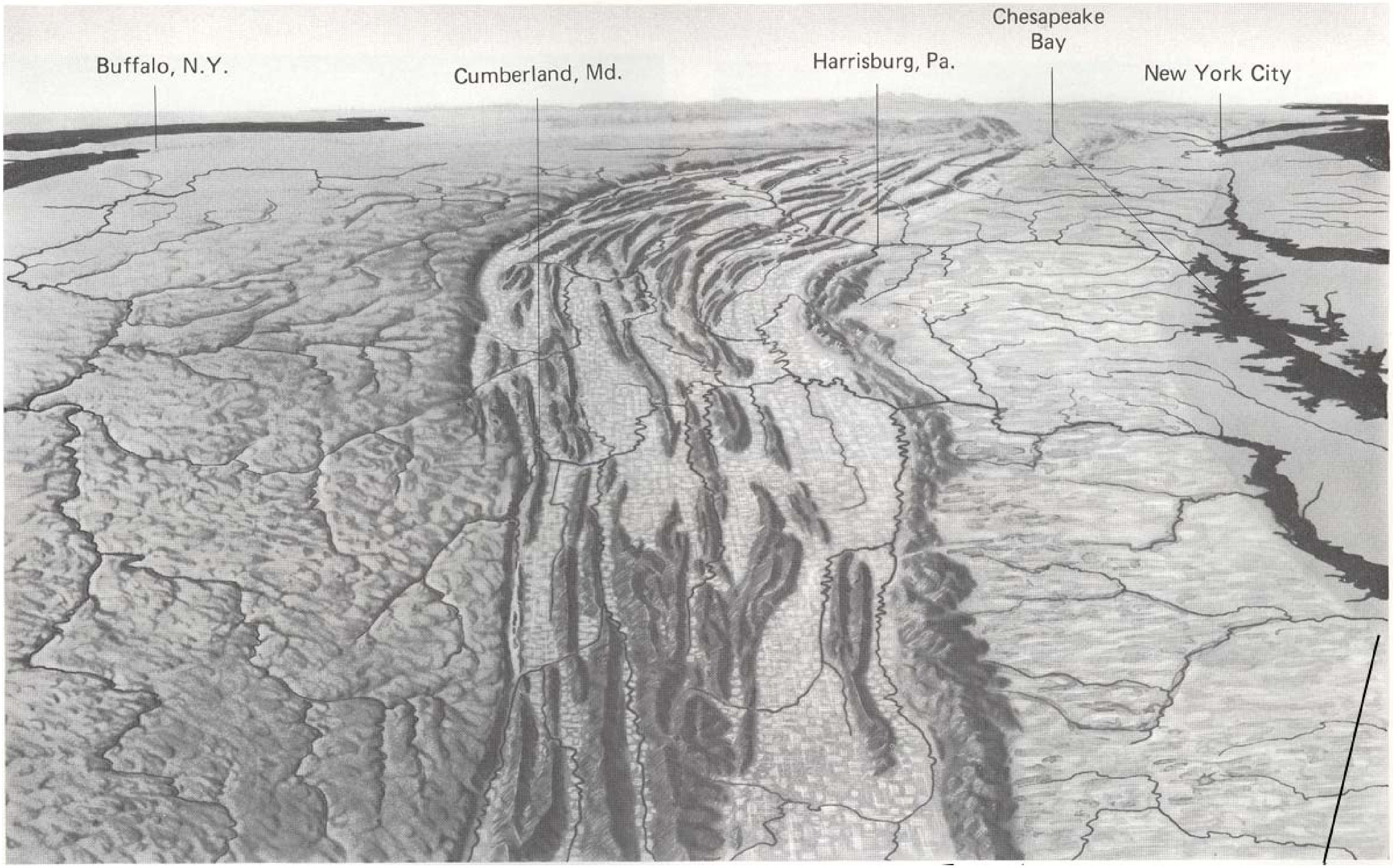
- *Carex* (166)
- *Cyperus* (29) and *Juncus* (29)
- *Symphyotrichum* (26)
- *Solidago* (25) and *Dichanthelium* (25)
- *Quercus* (21)

II. Physiogeography & The Flora

4 Main Physiogeographic Provinces



Rhoads & Block. 2007. *Plants of Pennsylvania.*



Buffalo, N.Y.
Cumberland, Md.
Harrisburg, Pa.
Chesapeake
Bay
New York City

Physiogeography & The Flora

4 Main Physiogeographic Provinces

- *Geographic regions with uniform geo-physical characteristics.*

- *These influence broad patterns of plant distribution & diversity.*

A. Appalachian Plateaus

Boundary: R&V, marked by escarpment (Plataeu front) rising several 100 ft.

A. Appalachian Plateaus

Topography: High elevation, low relief: relief due to dissection by streams/rivers.

A. Appalachian Plateaus

Geology:

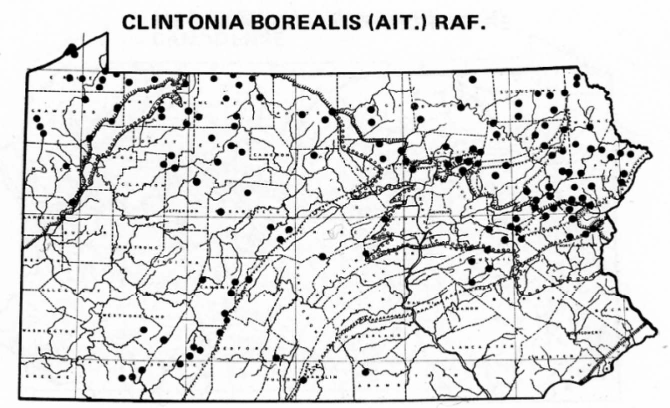
1. Near W & N of Scarp:
“Summits” capped by horizontal, resistant sandstone bands.
Acid soils, dry on outcrops, boggy around springs /depressions.

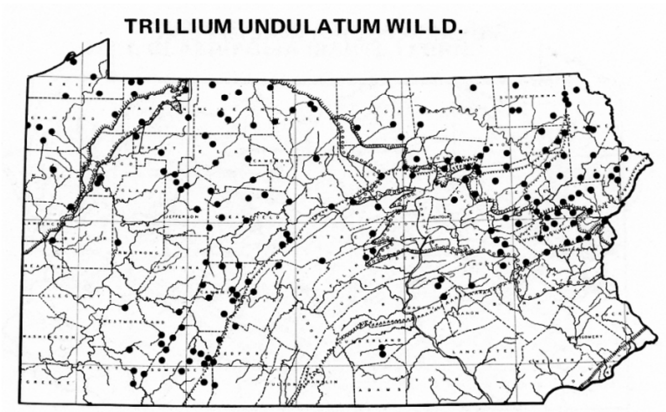
2. Far W & N:
Less resistant sandstones & shales, lower elevation.

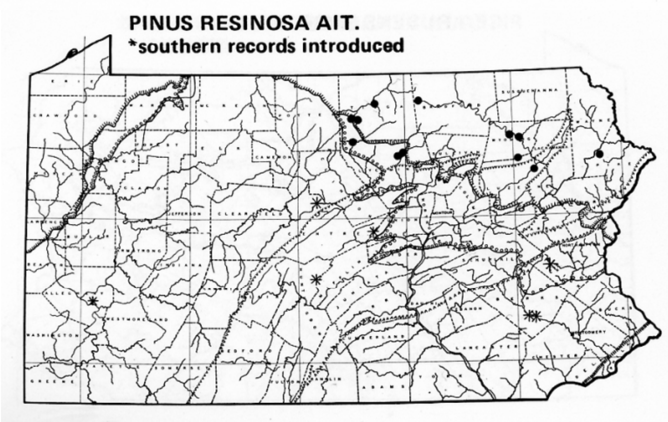
A. Appalachian Plateaus

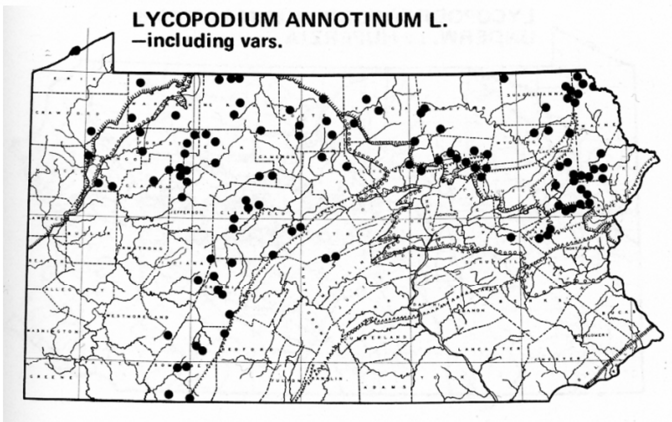
Vegetation:

Northern plants; and plants of Ohio Valley and Great lakes basin.



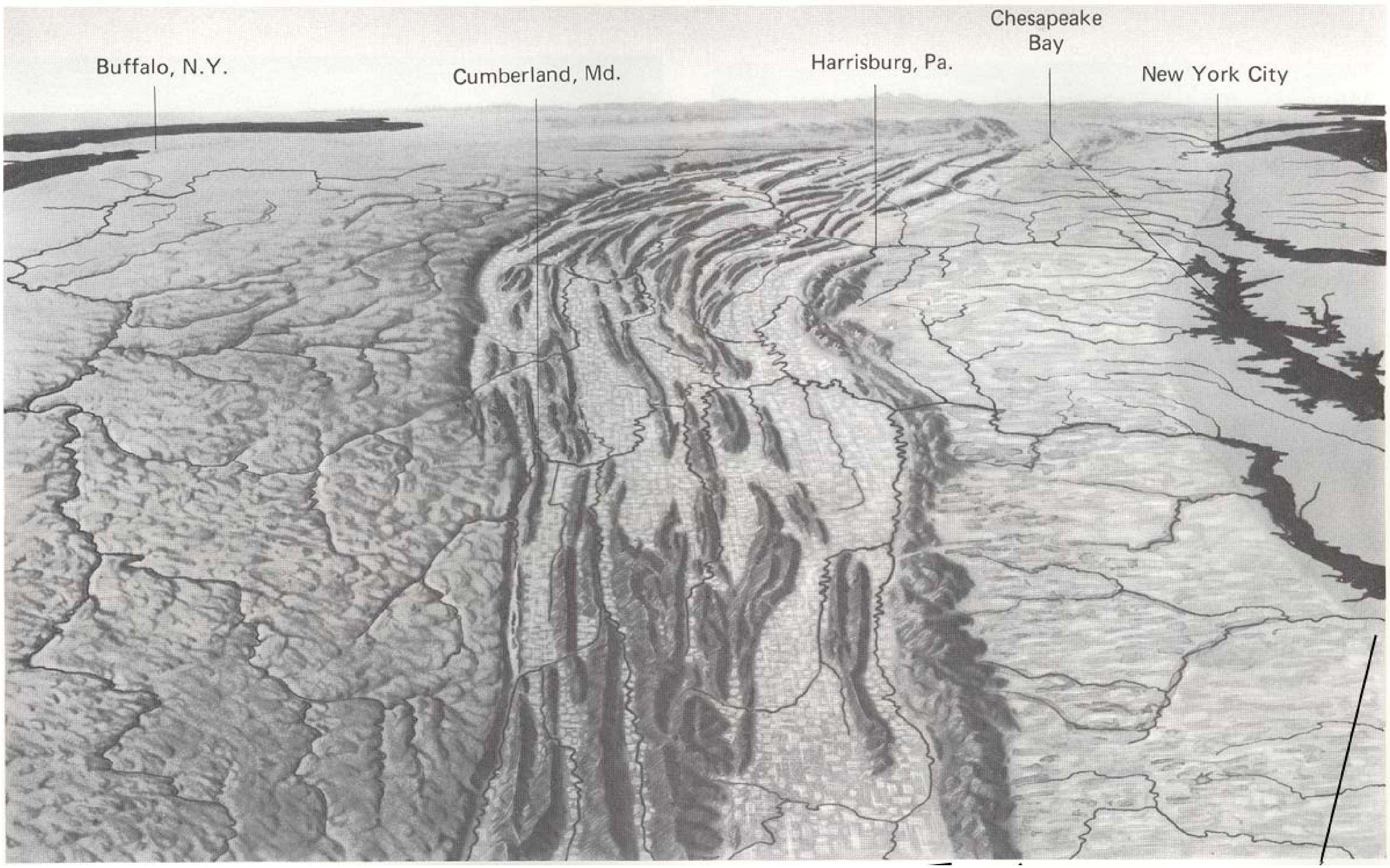






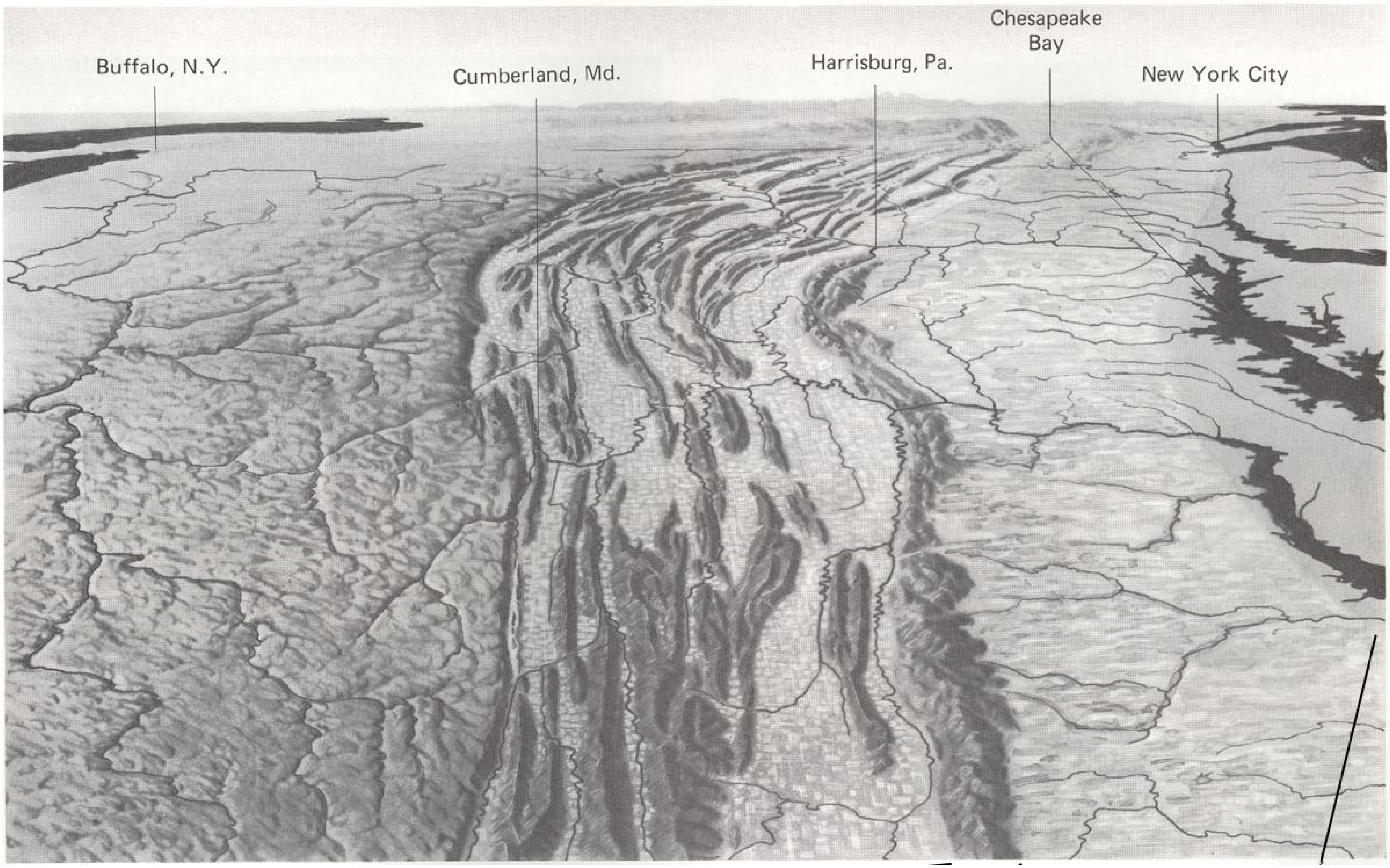
B. Ridge & Valley

Boundary: AP & Piedmont



B. Ridge & Valley

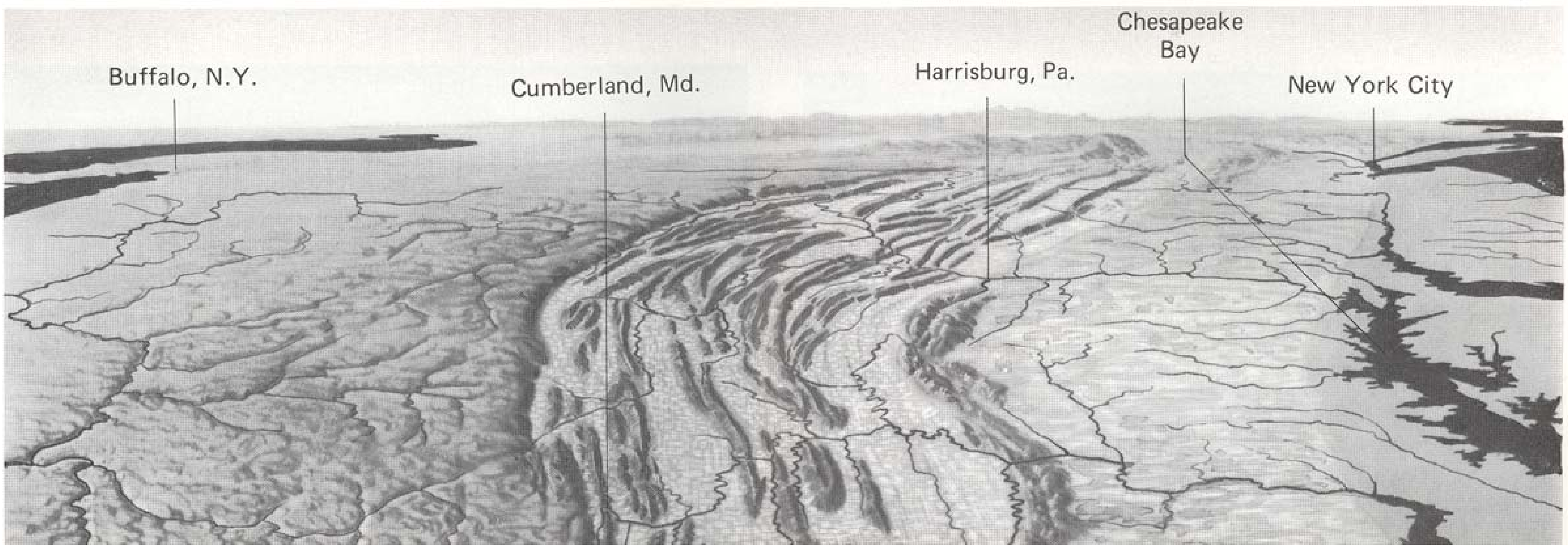
Topography: Parallel high elevation ridges and lower valleys.



B. Ridge & Valley

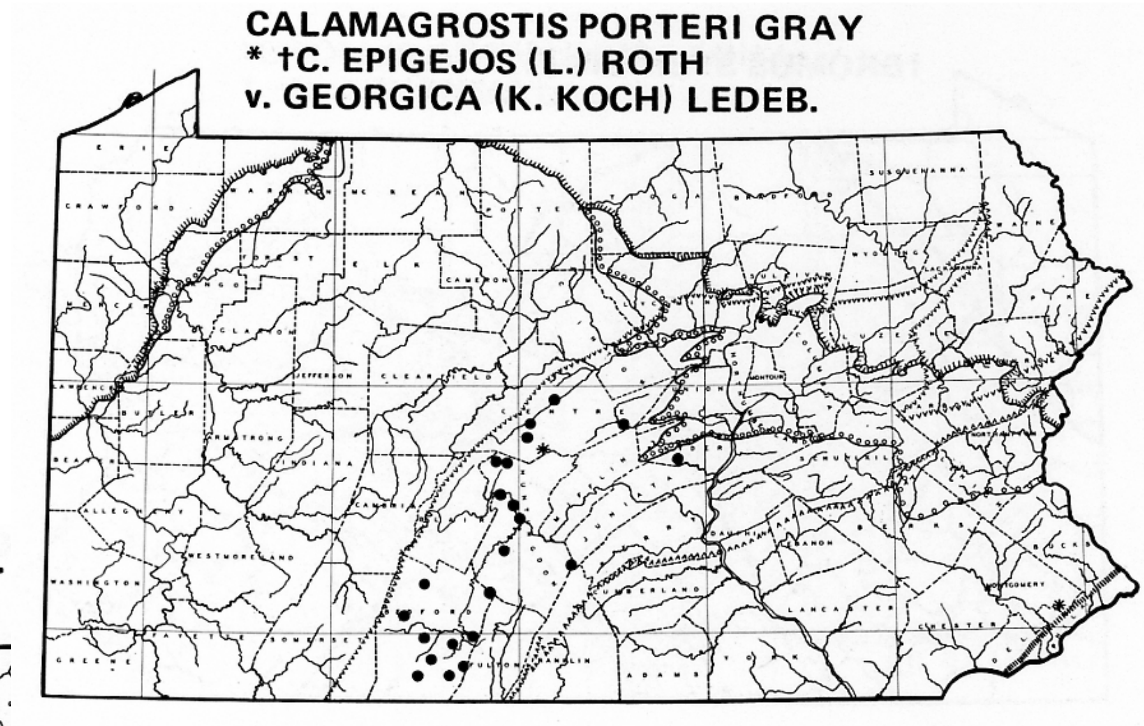
Geology:

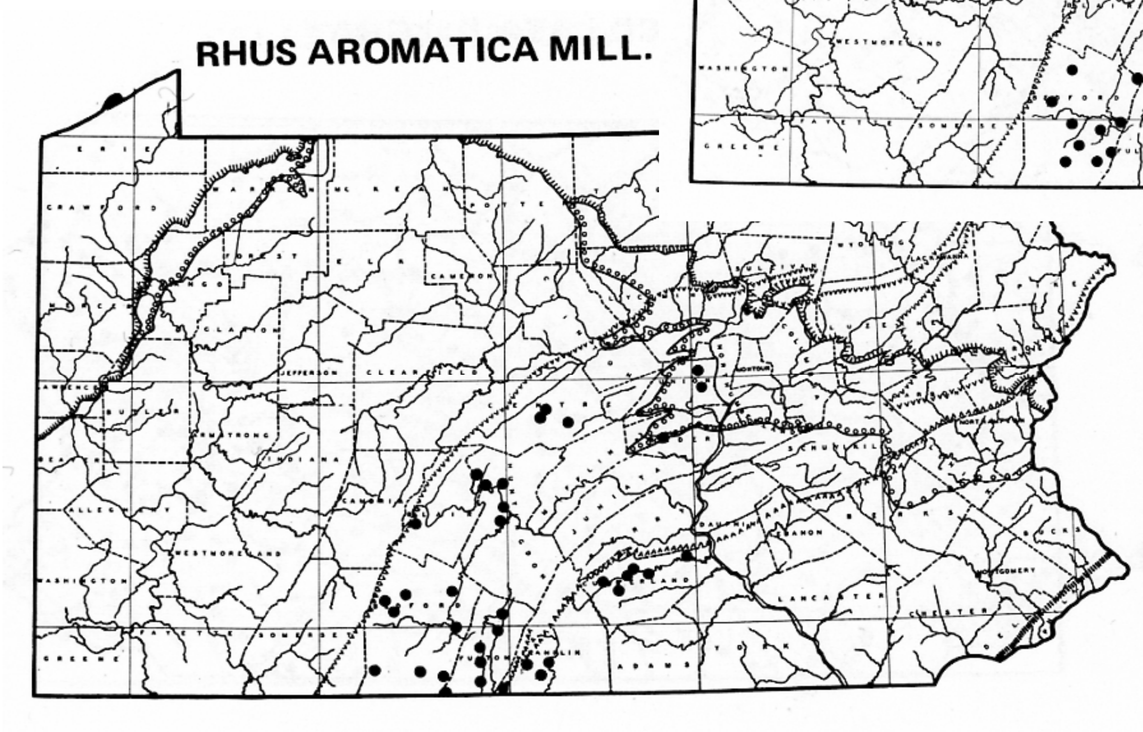
1. Ridges are sandstone outcrops, acid soils.
2. Valleys limestone.; circumneutral, basic
3. Some slopes with prominent shale bands forming shale barrens; acid and poor soil development.



B. Ridge & Valley

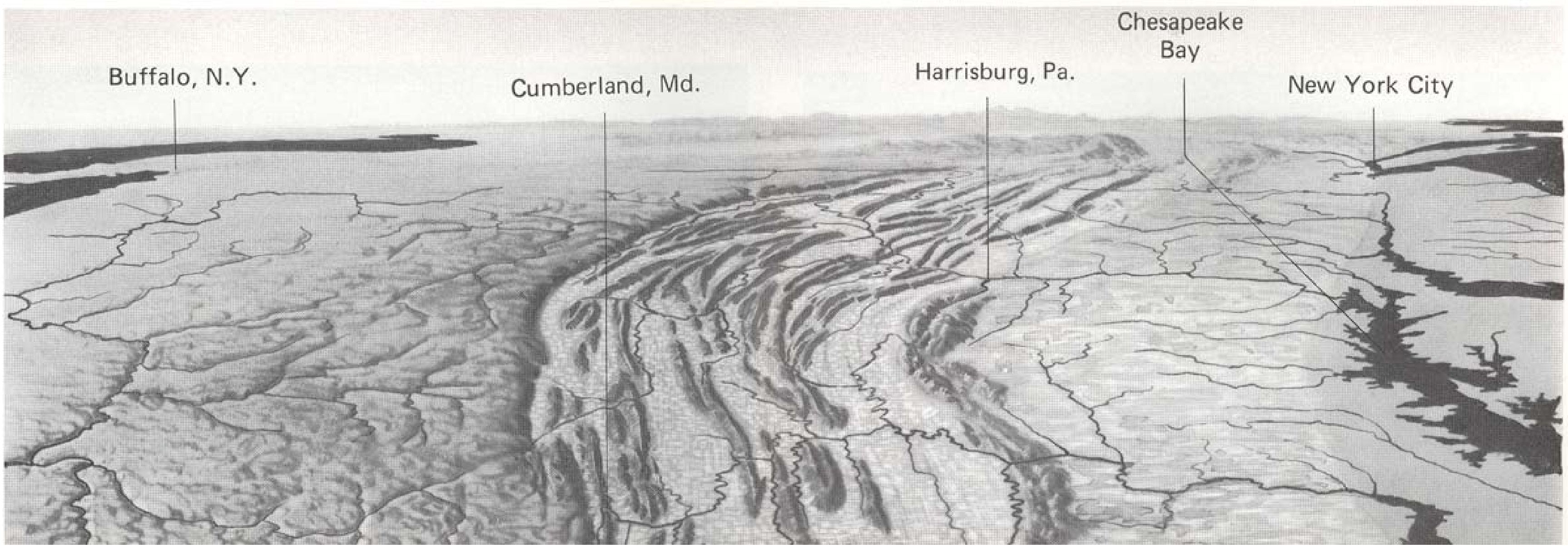
Vegetation:
Variable.





C. Piedmont

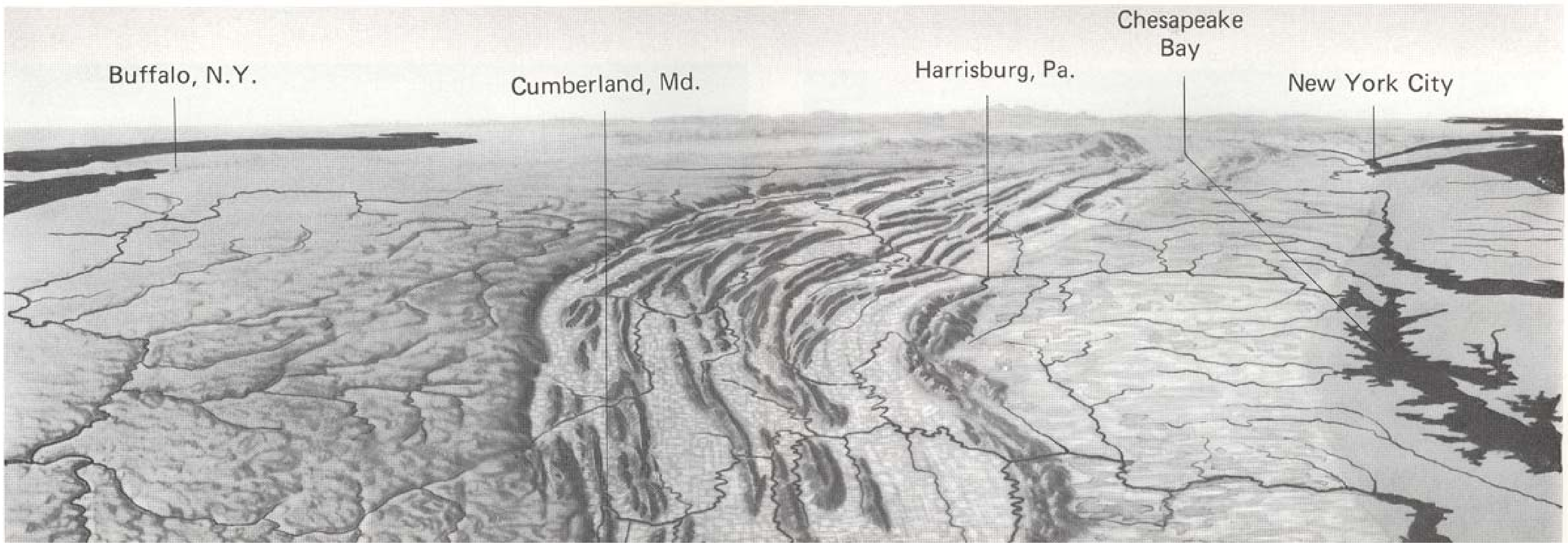
Boundary: R&V, CP



C. Piedmont

Topography:

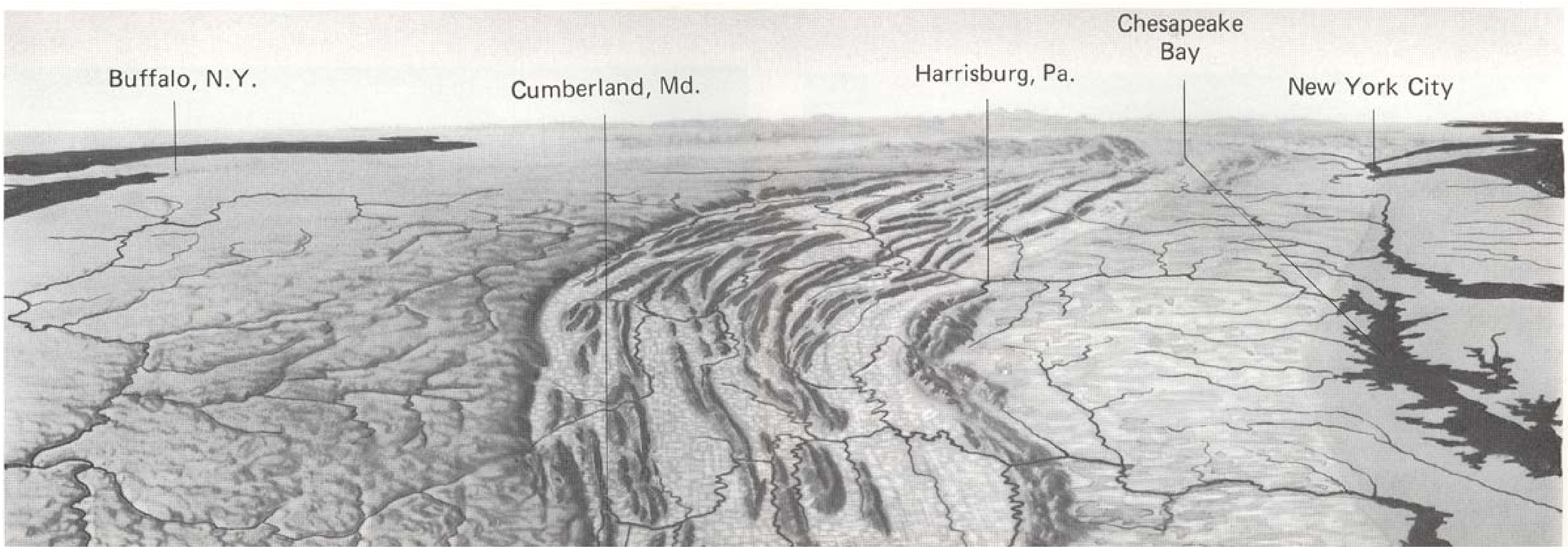
Low to moderate relief; hilly on crystalline bedrock.
Complexly folded/faulted.



C. Piedmont

Geology:

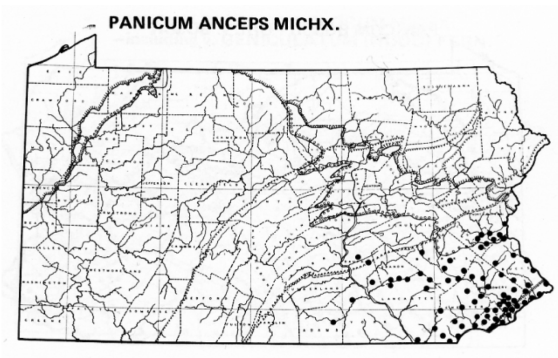
1. Hilly on crystalline bedrock; acid soils. Ridges are sandstone outcrops.
2. Low elevations limestone; circumneutral/basic soils.
3. Metamorphic rocks & plutons.

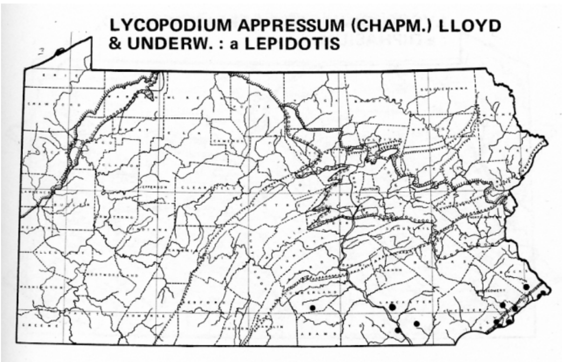


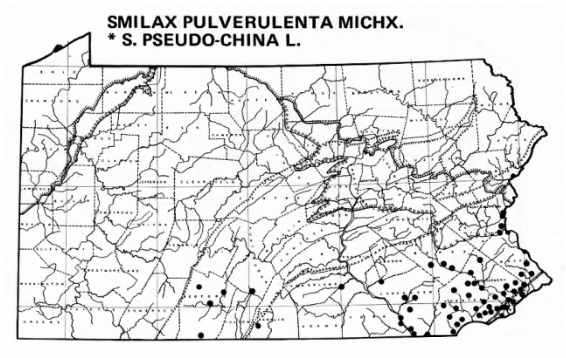
C. Piedmont

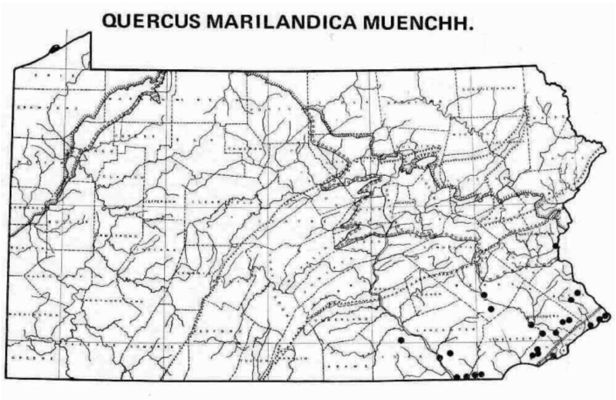
Vegetation:

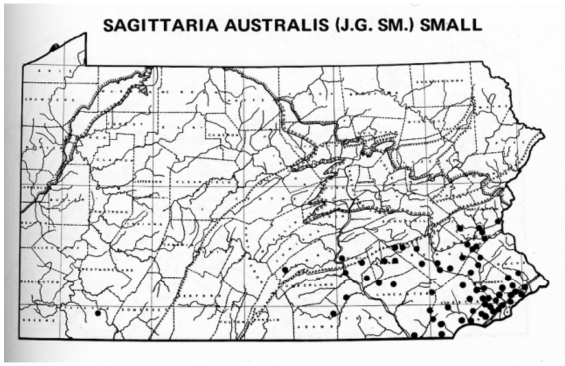
Variable, including southern plants at northern edge;
Lower Susquehanna Valley important.

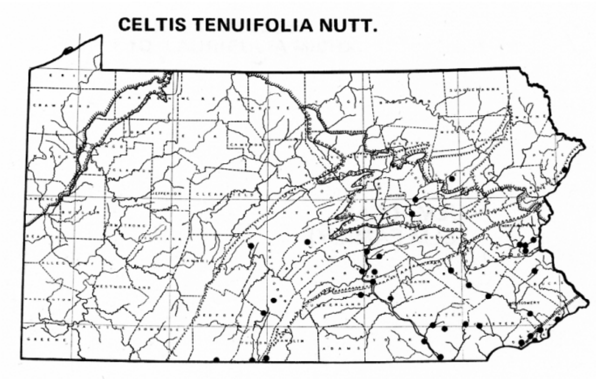






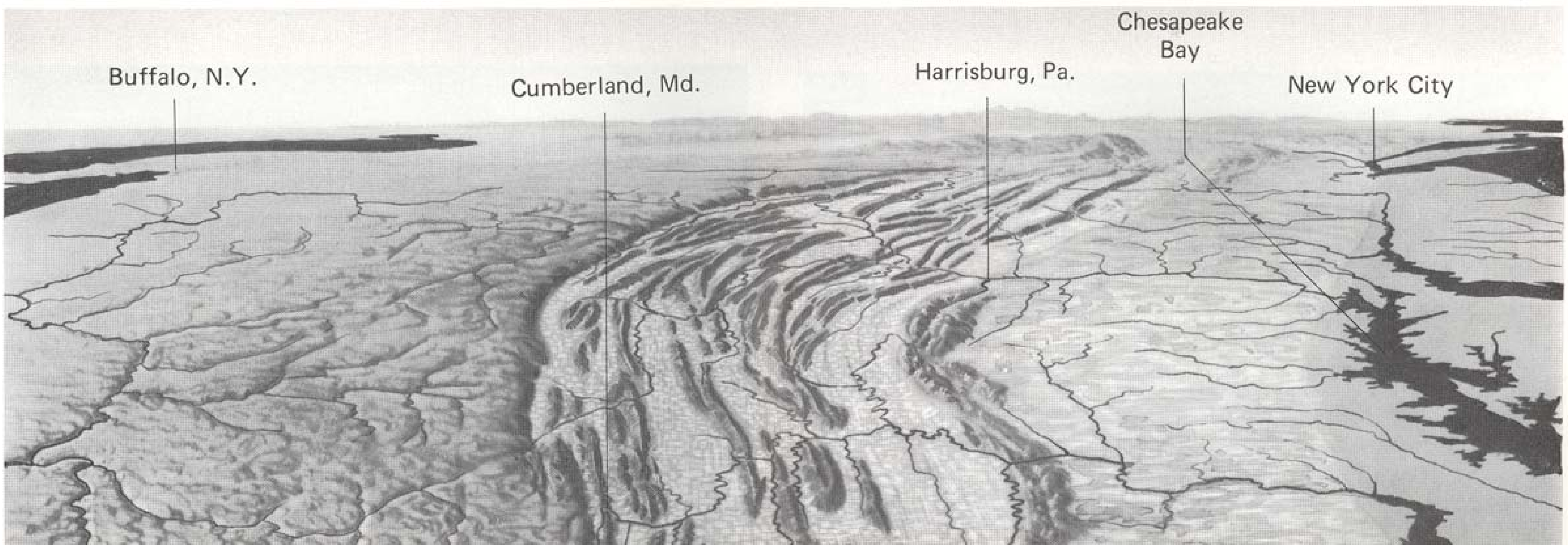






D. Coastal Plain

Boundary: Piedmont, Fall Line.
Topography:
Flat, low.



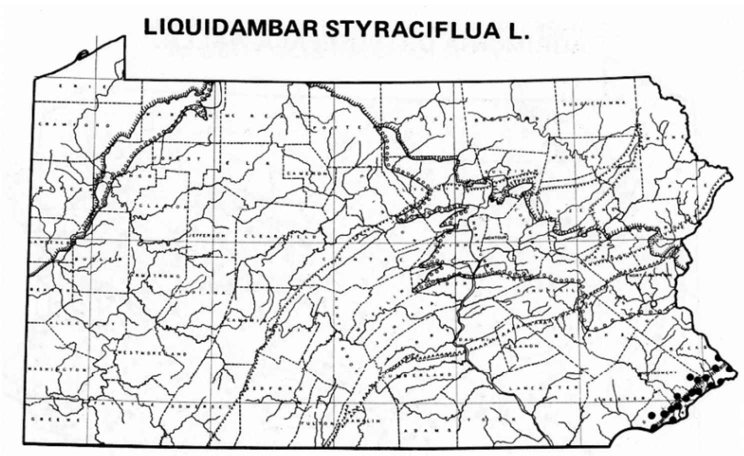
D. Coastal Plain

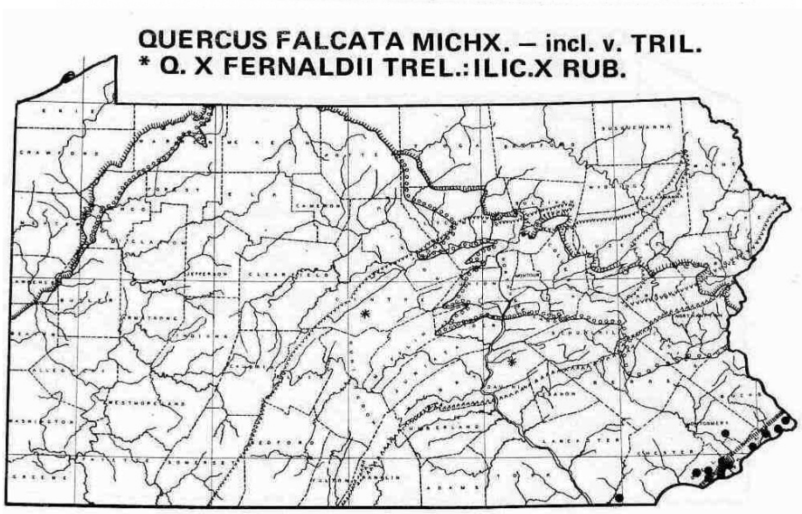
Geology:

Unconsolidated gravels and sands.

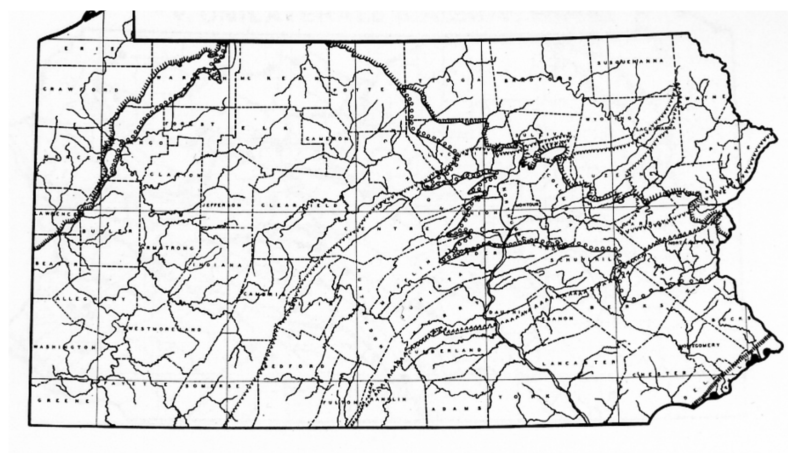
Vegetation:

Southern plants and Delaware River. Wetland plants common in sluggish waterways. Numerous invasives.



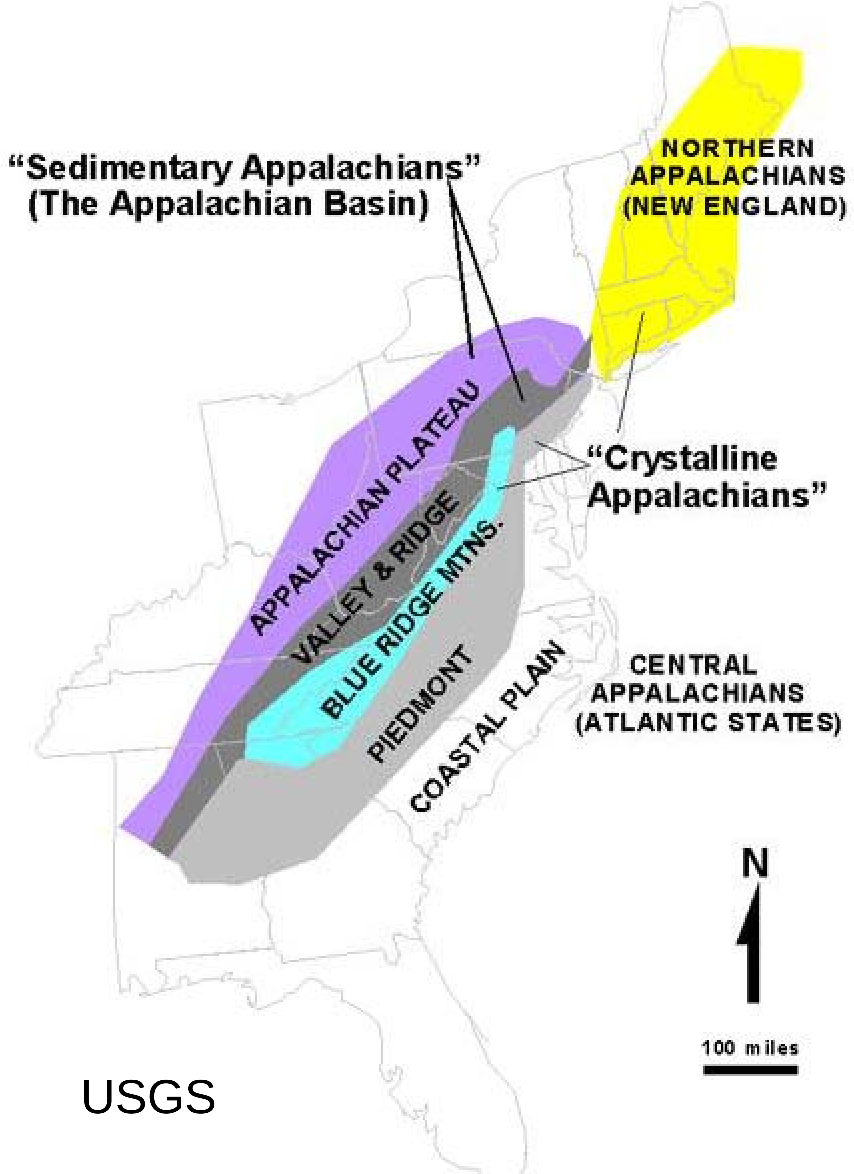


Sagittaria eatonii



III. Evolution of the Physiogeography & Flora

Part of larger system based on Appalachian uplift.

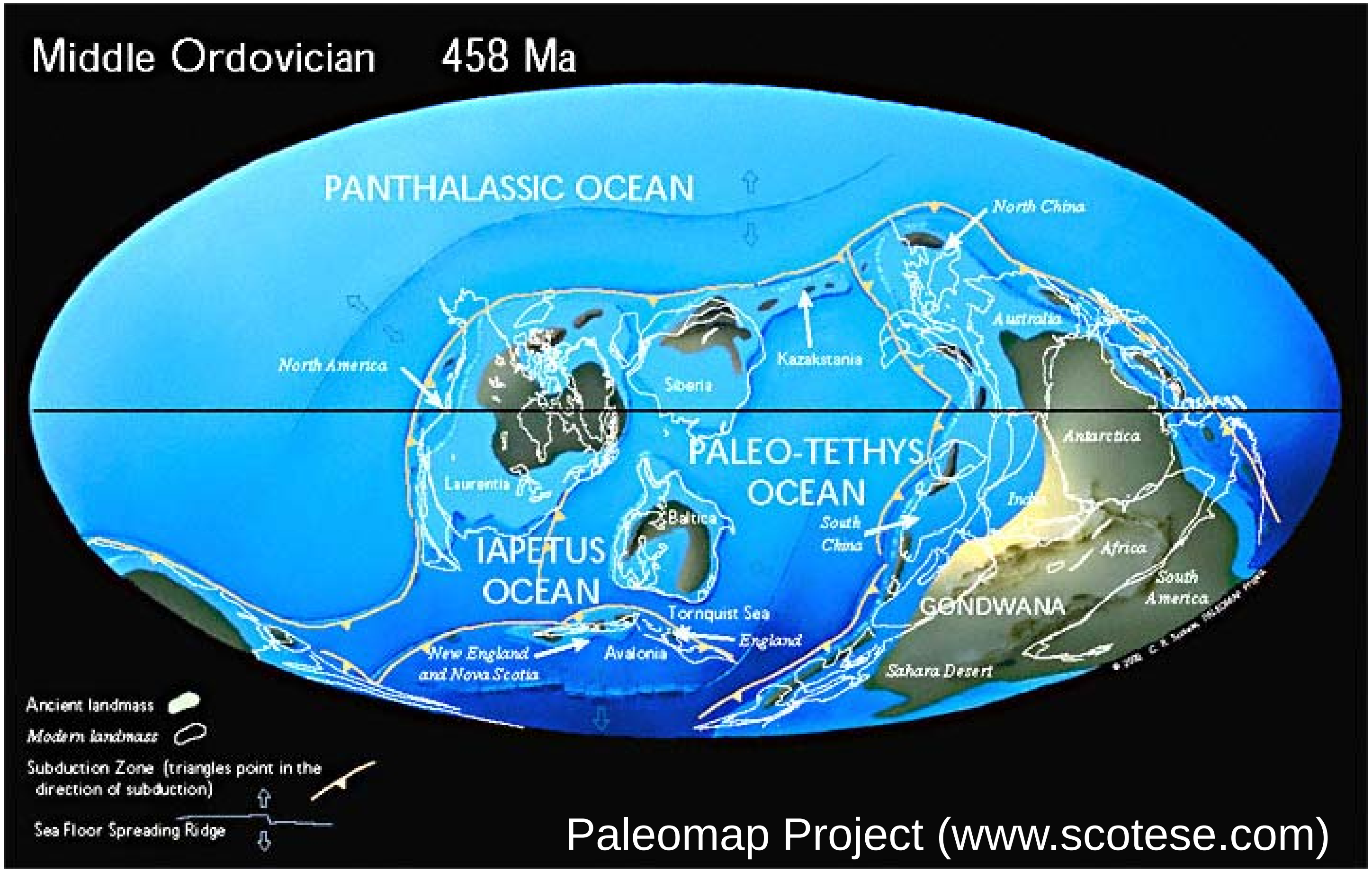


USGS

Evolution of the Physiogeography & Flora

The PA Flora 458 Ma:

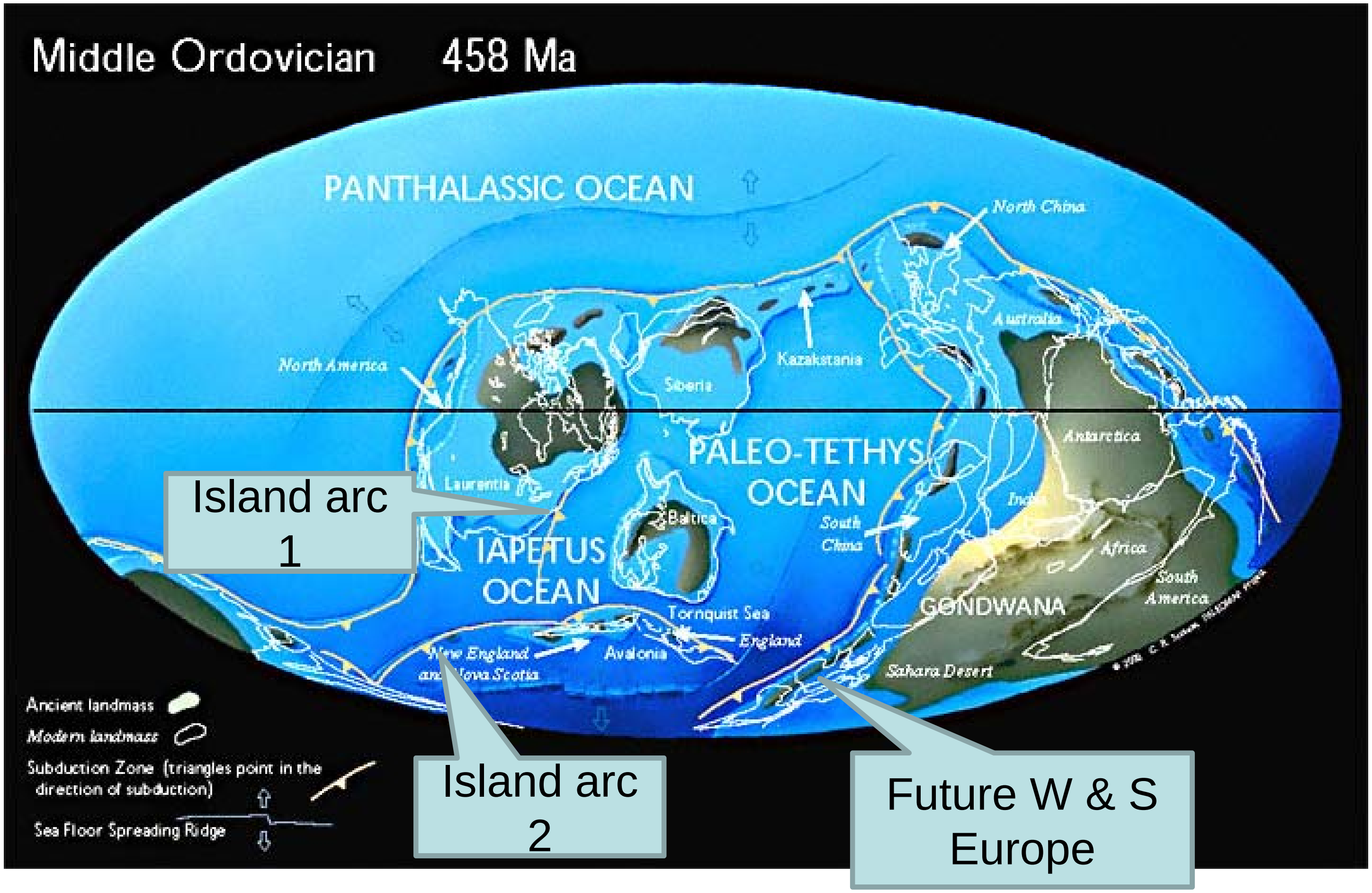
Did not exist. No plants, no animals on land.



Paleomap Project (www.scotese.com)

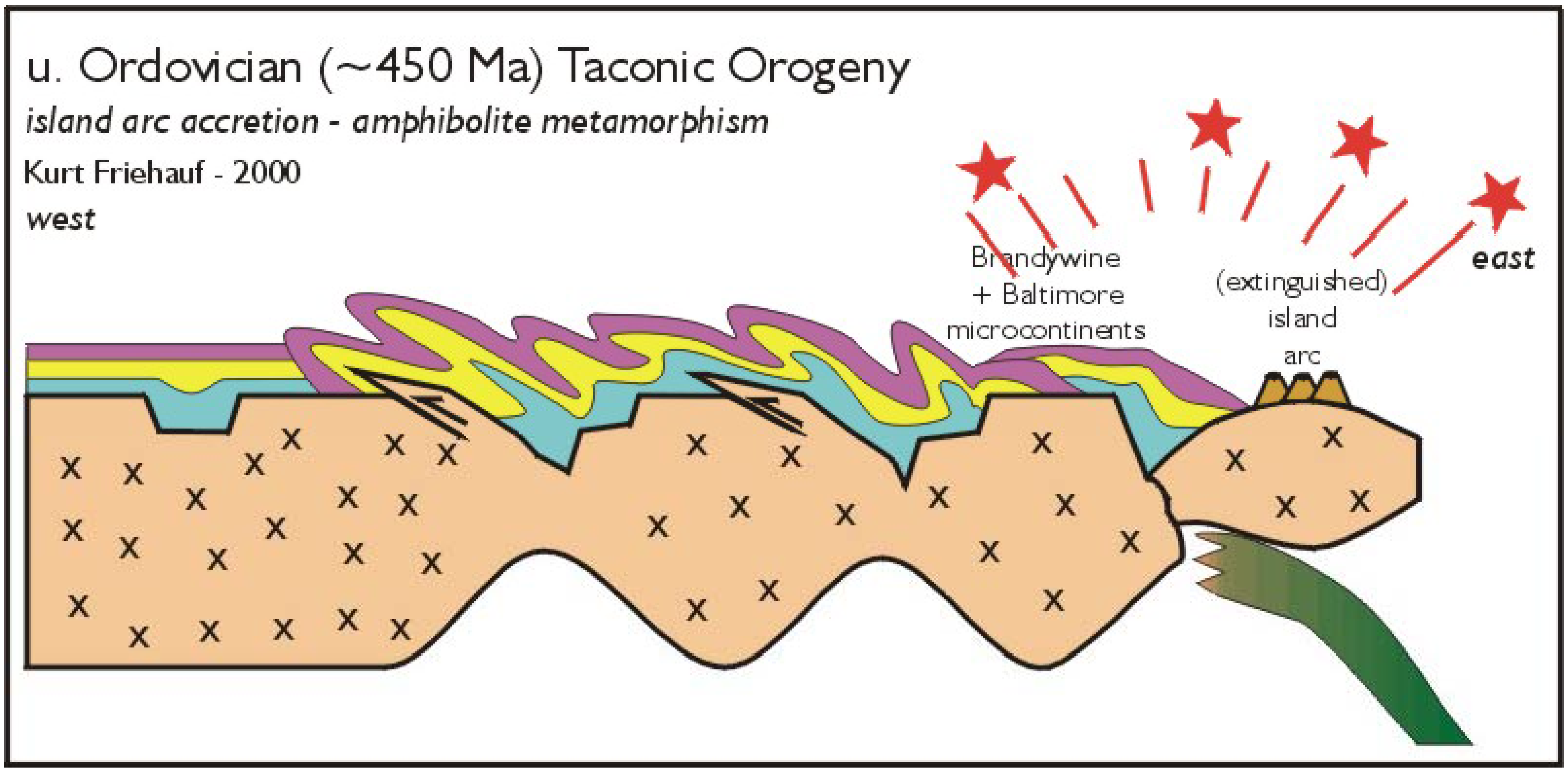
Evolution of the Physiogeography & Flora

A. Taconic Orogeny (450-435 Ma)



Evolution of the Physiogeography & Flora

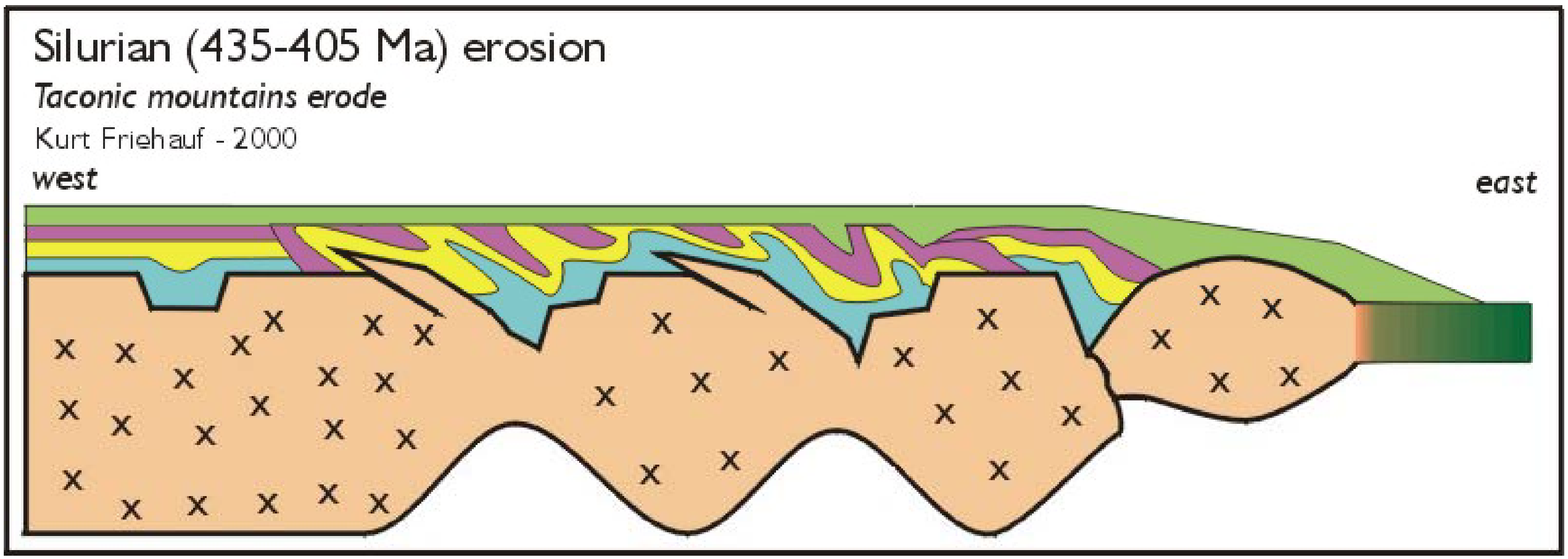
A. Taconic Orogeny (450-435 Ma)
   - Island arc accretion
   - Taconic Mountains (Pennsylvania) form



Evolution of the Physiogeography & Flora

B. Post-Taconic Passive Phase (435-405 Ma)

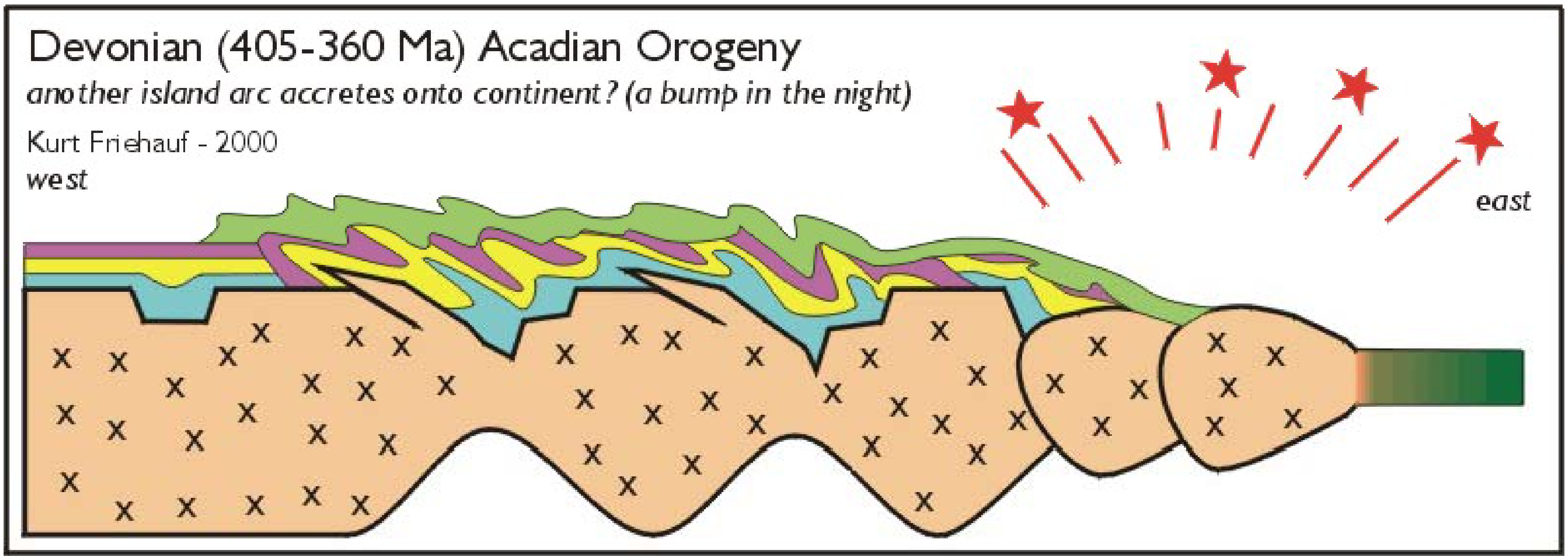
- Mtns erode
- PA's first plants – bryophytes – diversify along lakes & streams; arthropods follow.

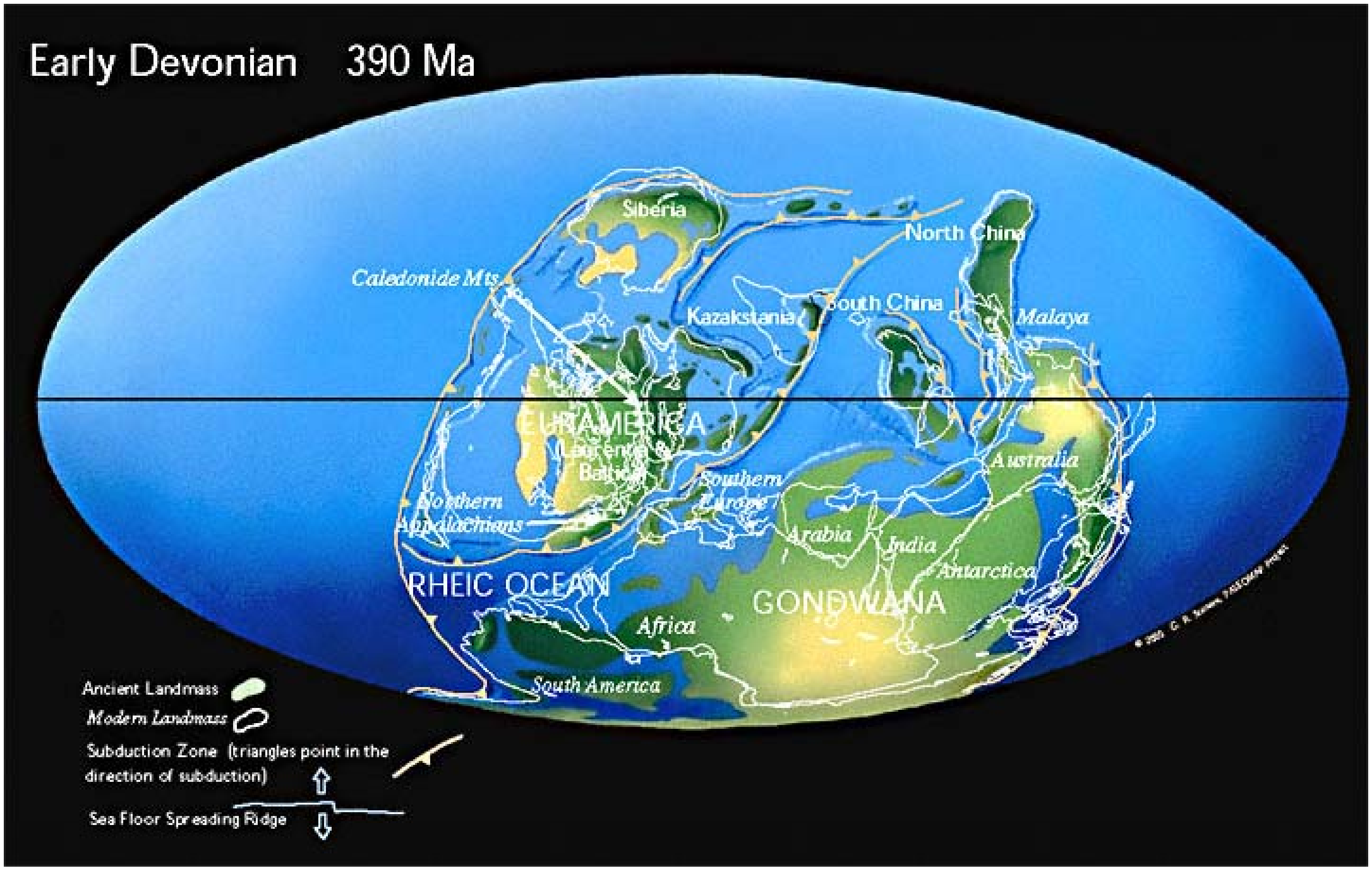


Evolution of the Physiogeography & Flora

C. Acadian Orogeny (405-360 Ma)

- Island arc #2 accretion
- Acadian Mtns.
- PA's first vascular plants diversify.




Early Devonian 390 Ma
Siberia
North China
Caledonide Mts
Kazakstania
South China
Malaya
EURAMERICA
(Laurentia & Baltica)
Australia
Southern Europe
Northern Appalachians
Arabia
India
Antarctica
RHEIC OCEAN
GONDWANA
Africa
South America
Ancient Landmass
Modern Landmass
Subduction Zone (triangles point in the direction of subduction)
Sea Floor Spreading Ridge


Eastern North American
Paleogeograpy
Michigan
Basin
Illinois
Basin
Cincinnati Arch
Appalachian Basin
Catskill Delta
Acadian Mountains
Rheic
Ocean
Middle Devonian
(385Ma)

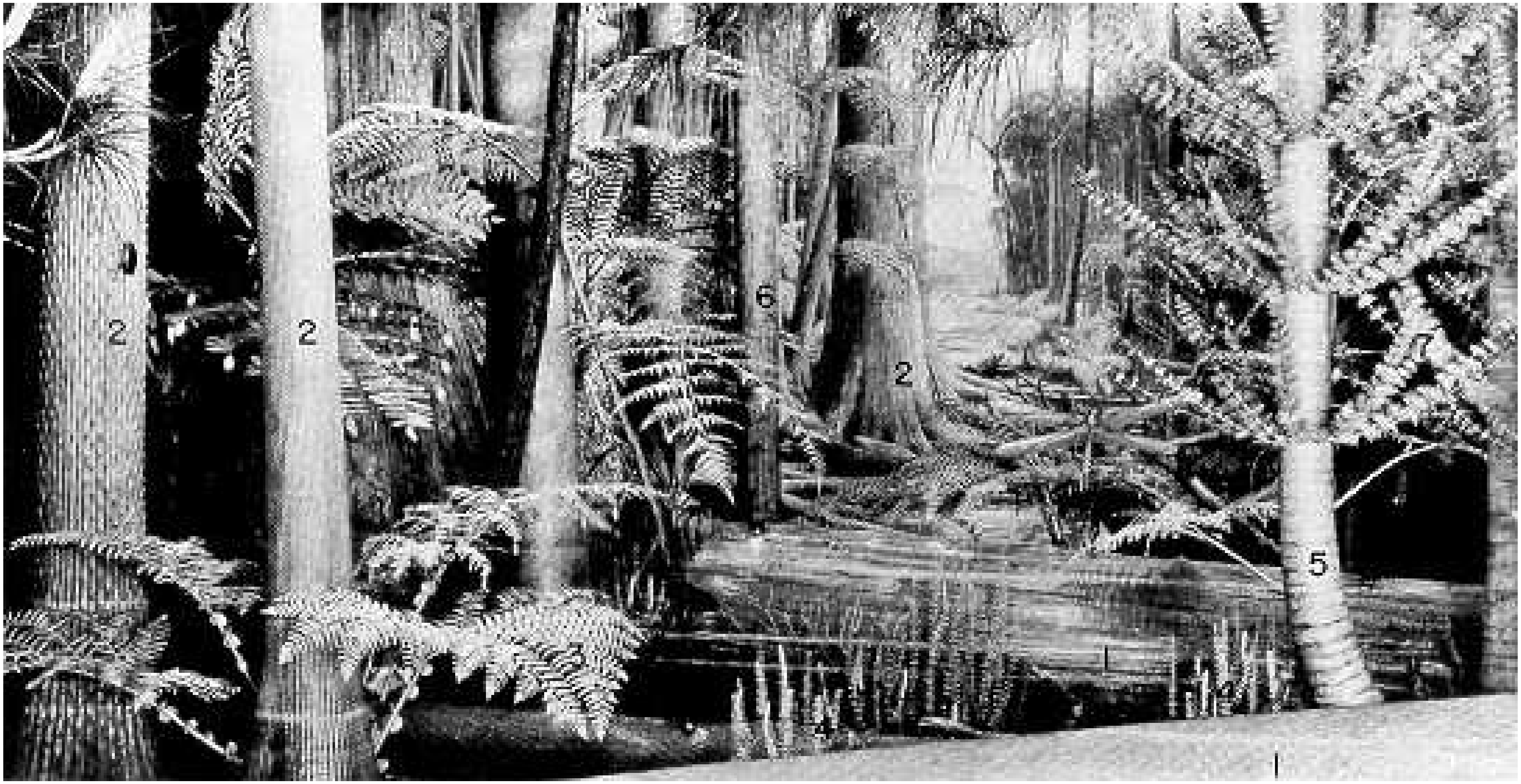
Evolution of the Physiogeography & Flora

D. Post-Acadian Passive Phase (360-285 Ma)

- Fern, Lycopod, Horsetail forests.

Evolution of the Physiogeography & Flora

D. Post-Acadian Passive Phase (360-285 Ma)
Fern, Lycopod, Horsetail forests.

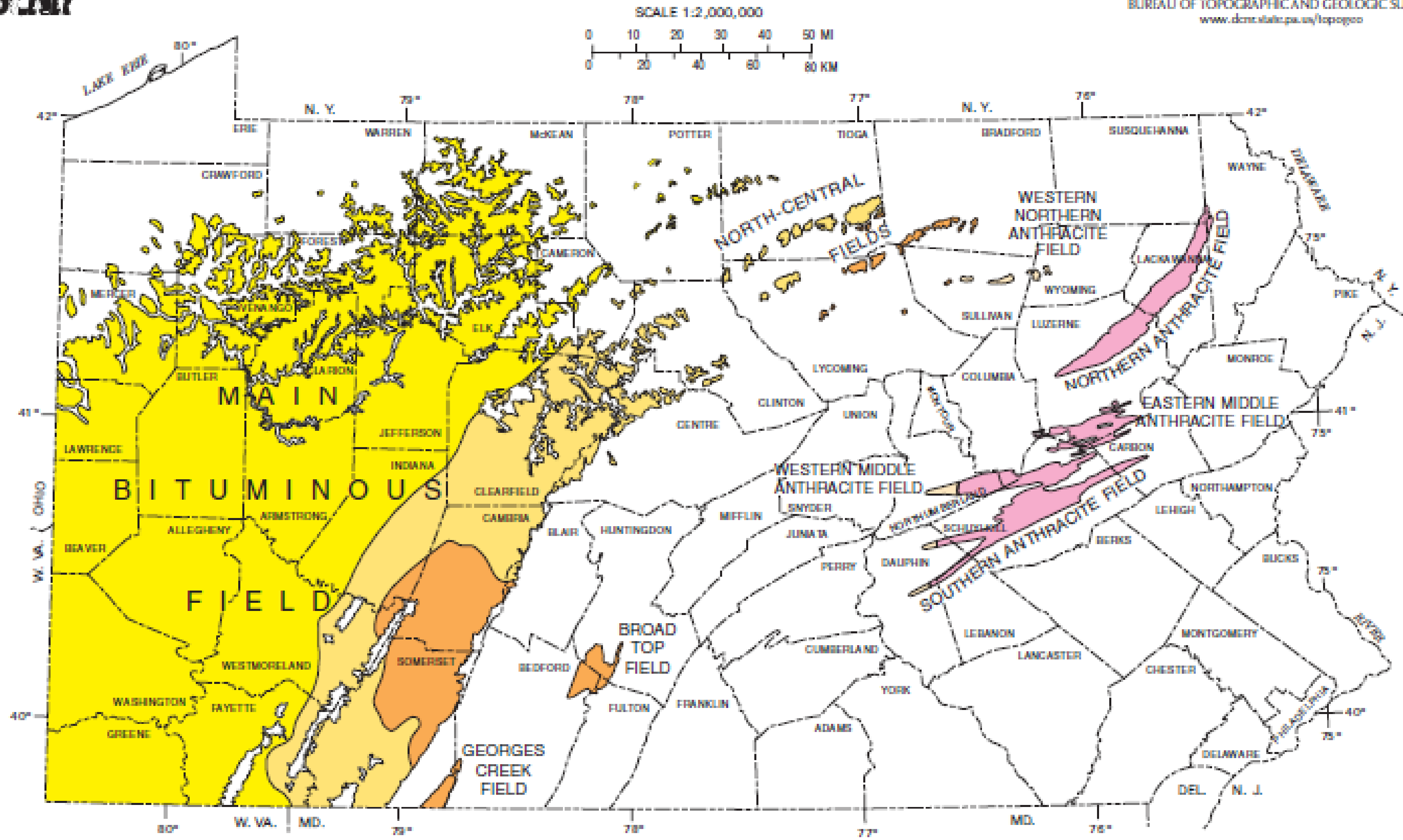


MAP 11

DCNR

DISTRIBUTION OF PENNSYLVANIA COALS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF
CONSERVATION AND NATURAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
www.dcnr.state.pa.us/topogeo



EXPLANATION

BITUMINOUS FIELDS

- High-volatile bituminous coal
- Medium-volatile bituminous coal
- Low-volatile bituminous coal

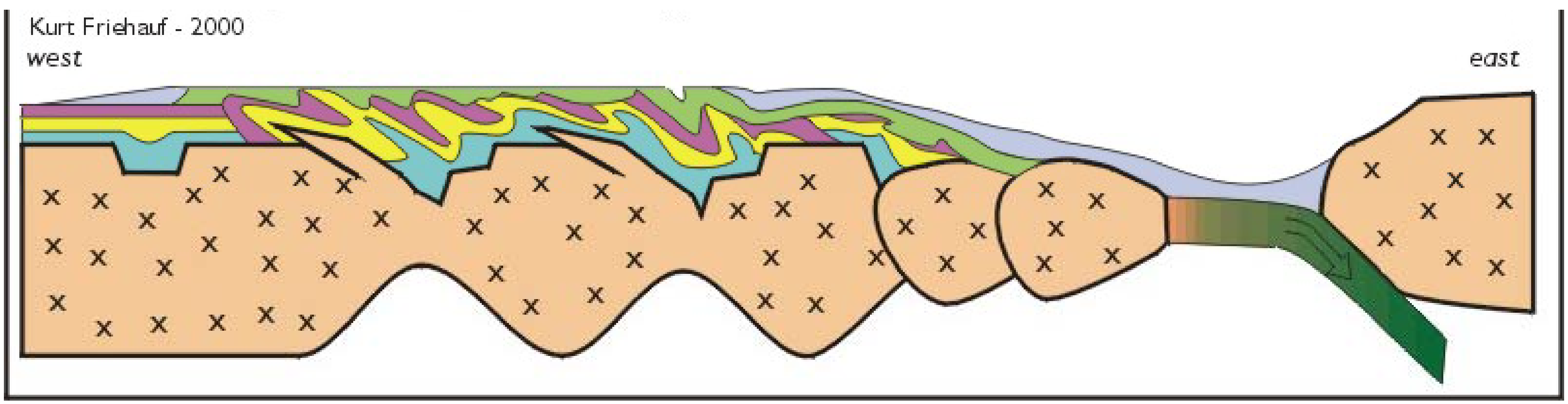
ANTHRACITE FIELDS

- Semi-anthracite
- Anthracite

Evolution of the Physiogeography & Flora

D. Post-Acadian Passive Phase (360-285 Ma)

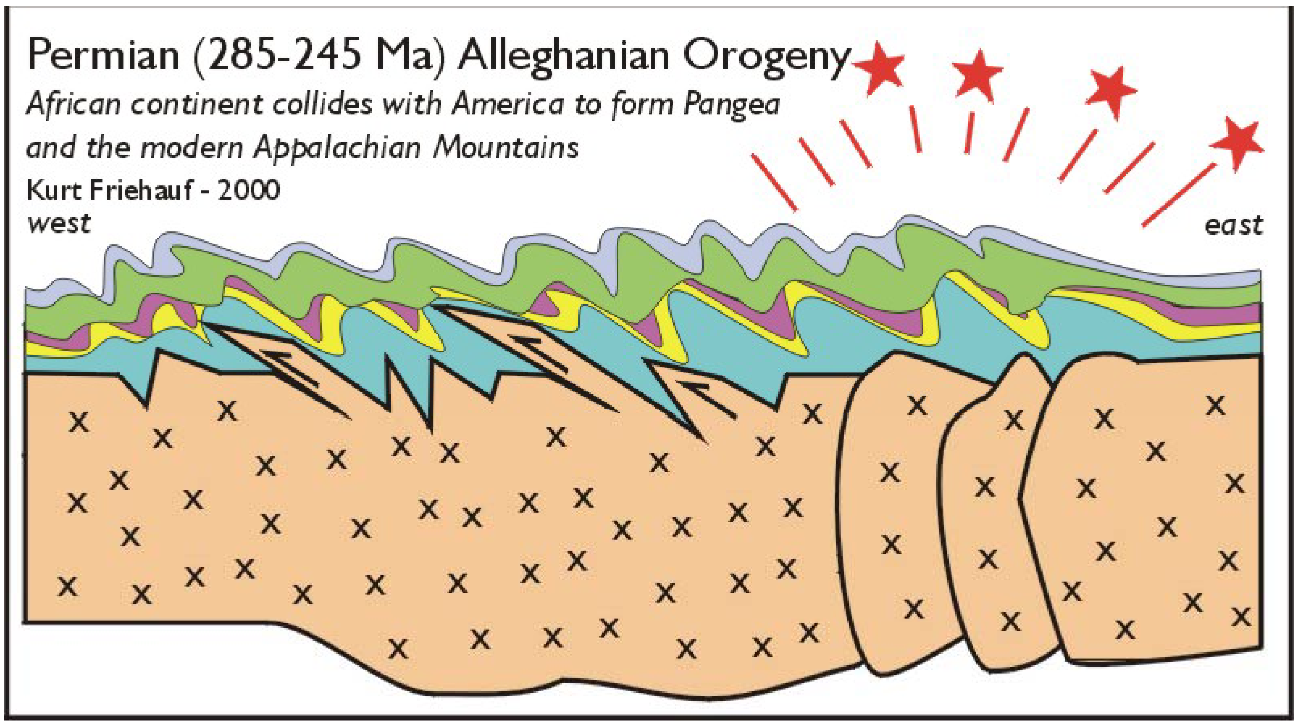
- Acadian Mtns. erode
- Amphibious tetrapods diversify



Evolution of the Physiogeography & Flora

E. Alleghenian Orogeny (285-245 Ma)

- African/Eurasian Collision w/ NA

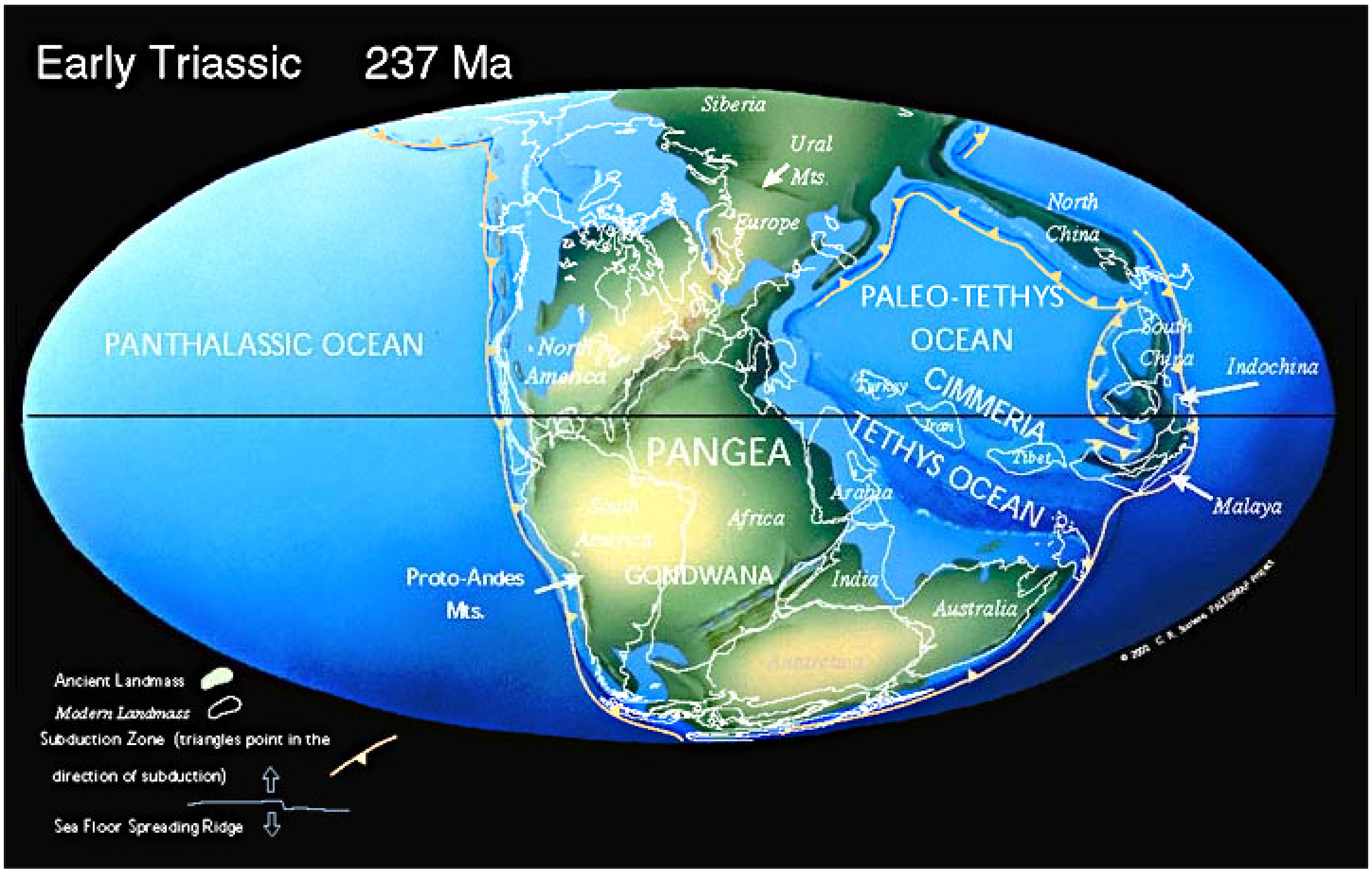


Evolution of the Physiogeography & Flora

E. Alleghenian Orogeny (285-245 Ma)

-African-Eurasian collision

-Pangea forms

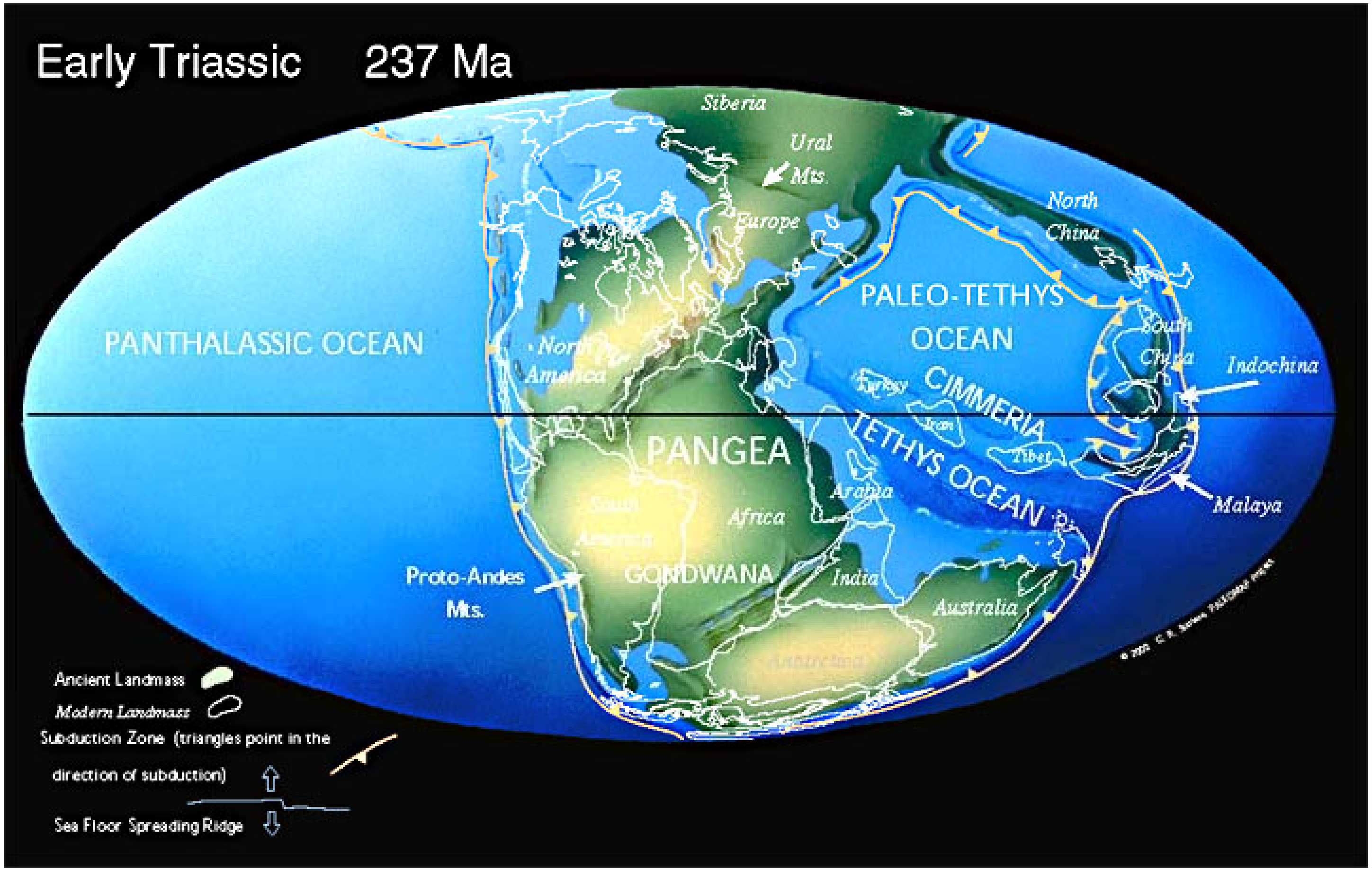


Evolution of the Physiogeography & Flora

F. Pangean Passive Phase (245-210 Ma)

-Alleghenian Mtns erode?

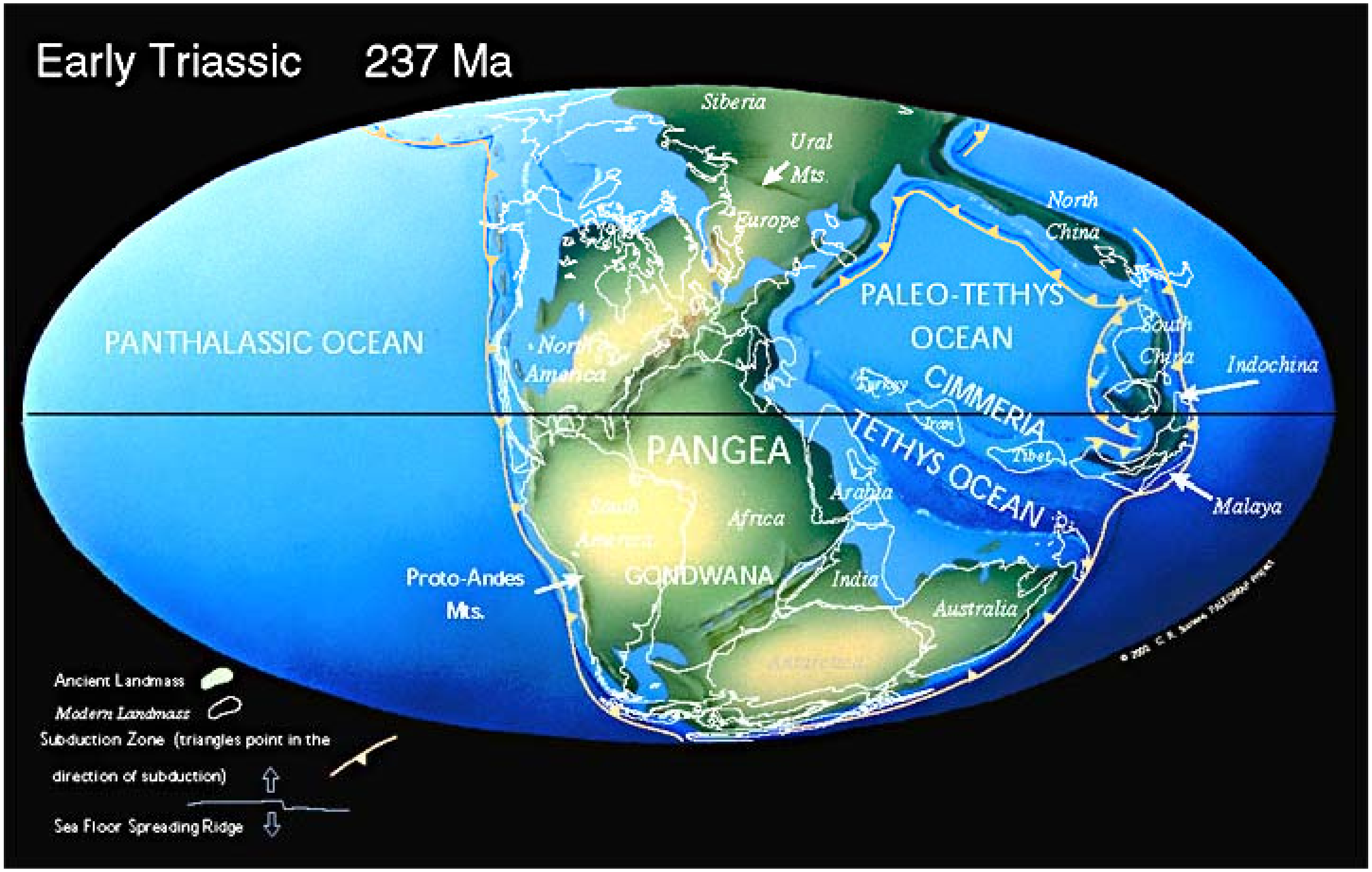
-Mass extinction.



Evolution of the Physiogeography & Flora

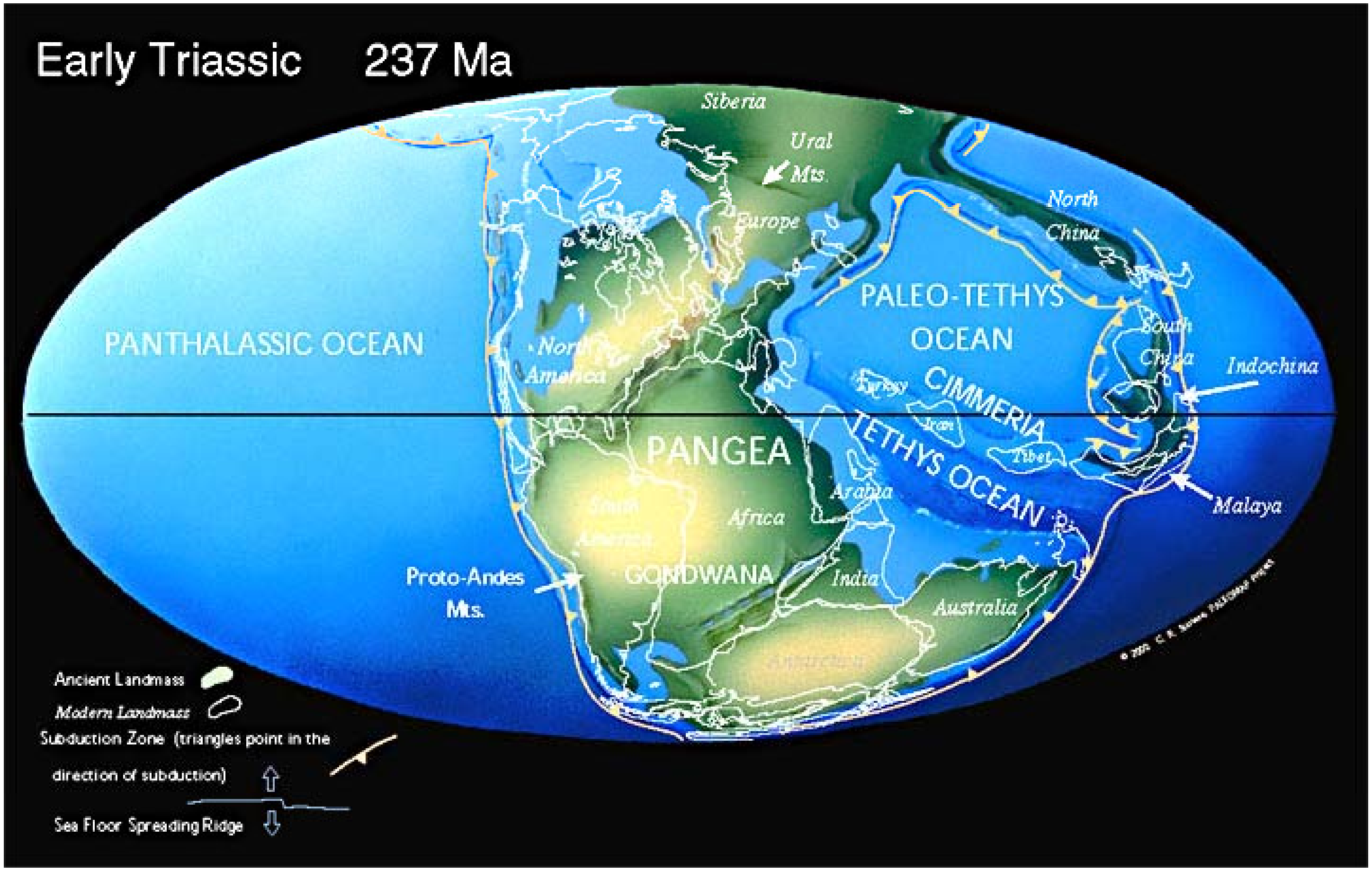
-Mass extinction.

- 90-95% of marine species.
- 70% of land species.
- Perhaps 99.5% of all organisms.



Why the mass extinction?

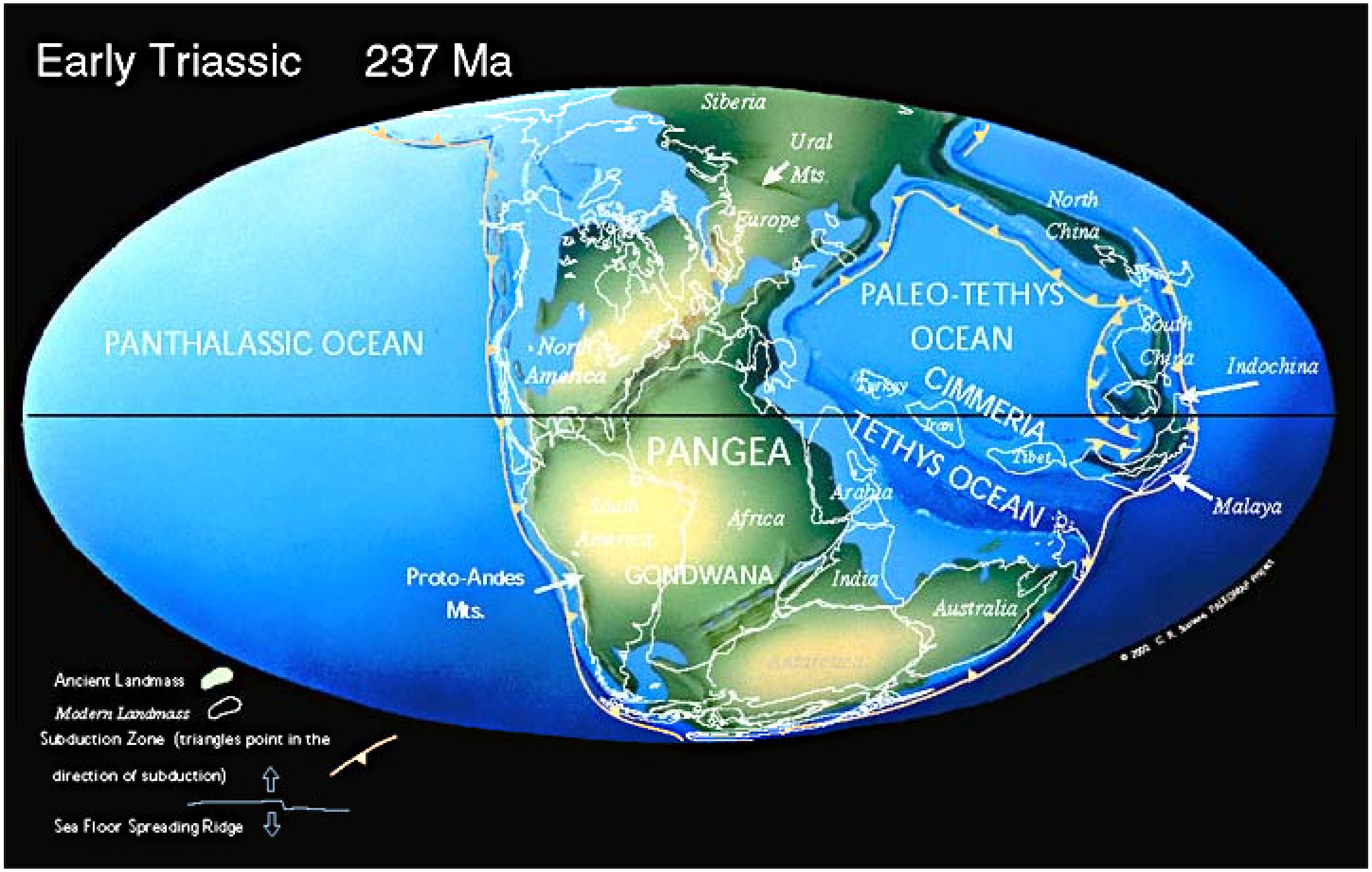
- 90-95% of marine species.
- 70% of land species.
- Perhaps 99.5% of all organisms.



Influence on Biota Today?

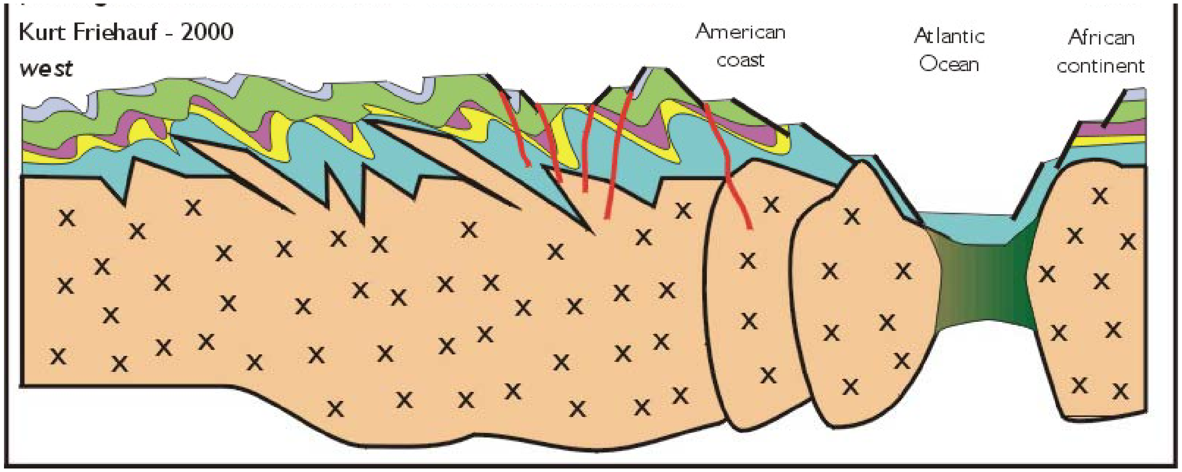
- Extinction of giant lycopods, horsetails, & ferns.
  - Seed plants evolve to fill void

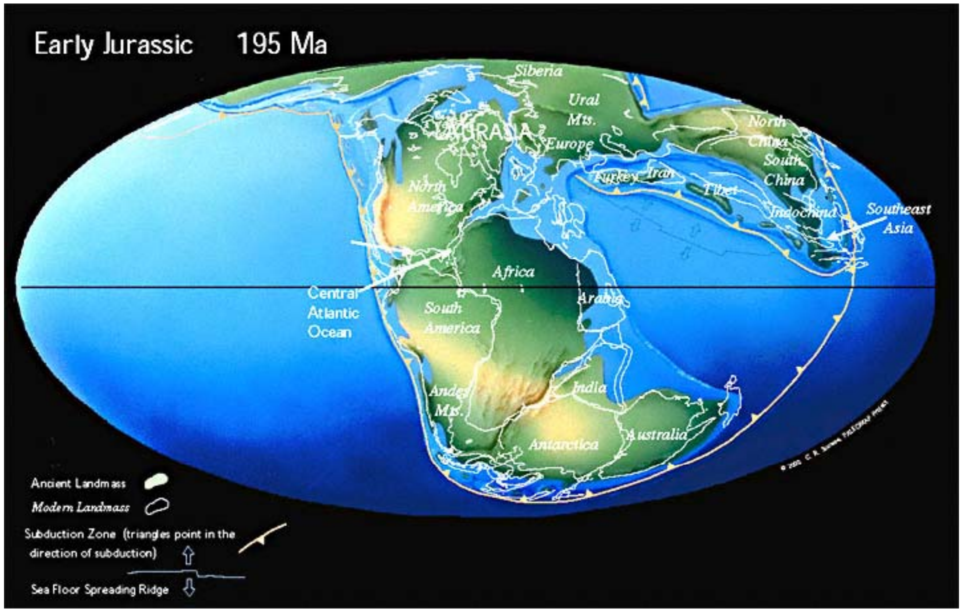
- Extinction of dominant amphibians
  - Reptiles evolve to fill void

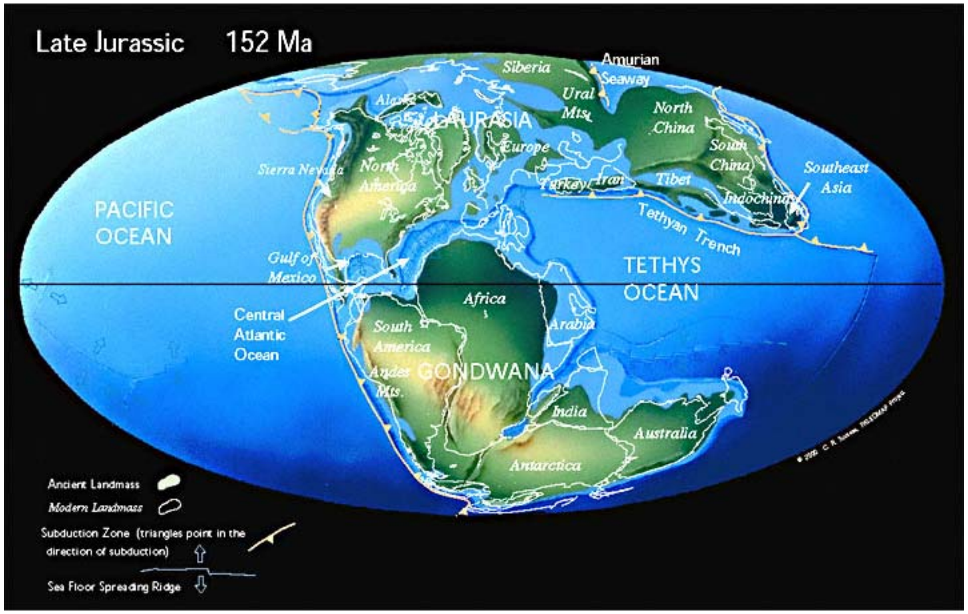


G. Mid-Jurassic Rifting Phase

- •Jurassic.
- •210 – present Ma.
- •Formation of Atlantic.
- •Giant reptiles evolve.
- •Angiosperms evolve.







H. Isostatic Rebound & Peripheral Bulge

- Ongoing
- Causal factors:
    - Erosion of Alleghenian (ancient).
    - Glacial melt (relatively recent).
    - Formation of Atlantic (ongoing).

Future World?