Geology & Geologic History of Natchez Trace State Forest & Park

31st Annual Central States Forest Soils Workshop

TN State Geologist Frank Alexander
1952 (TN State Archives)

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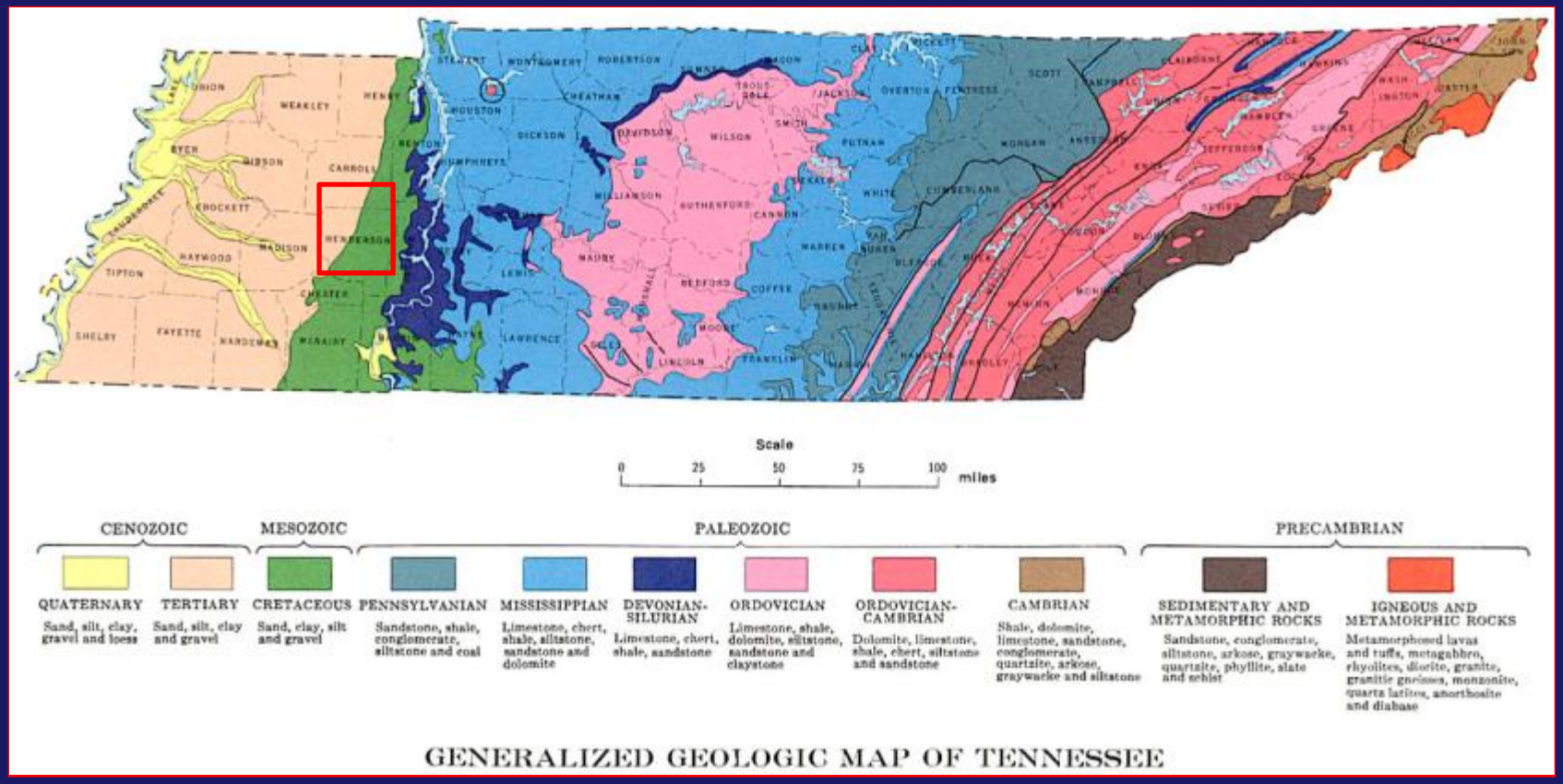
Geologist's Orientation to NTSP

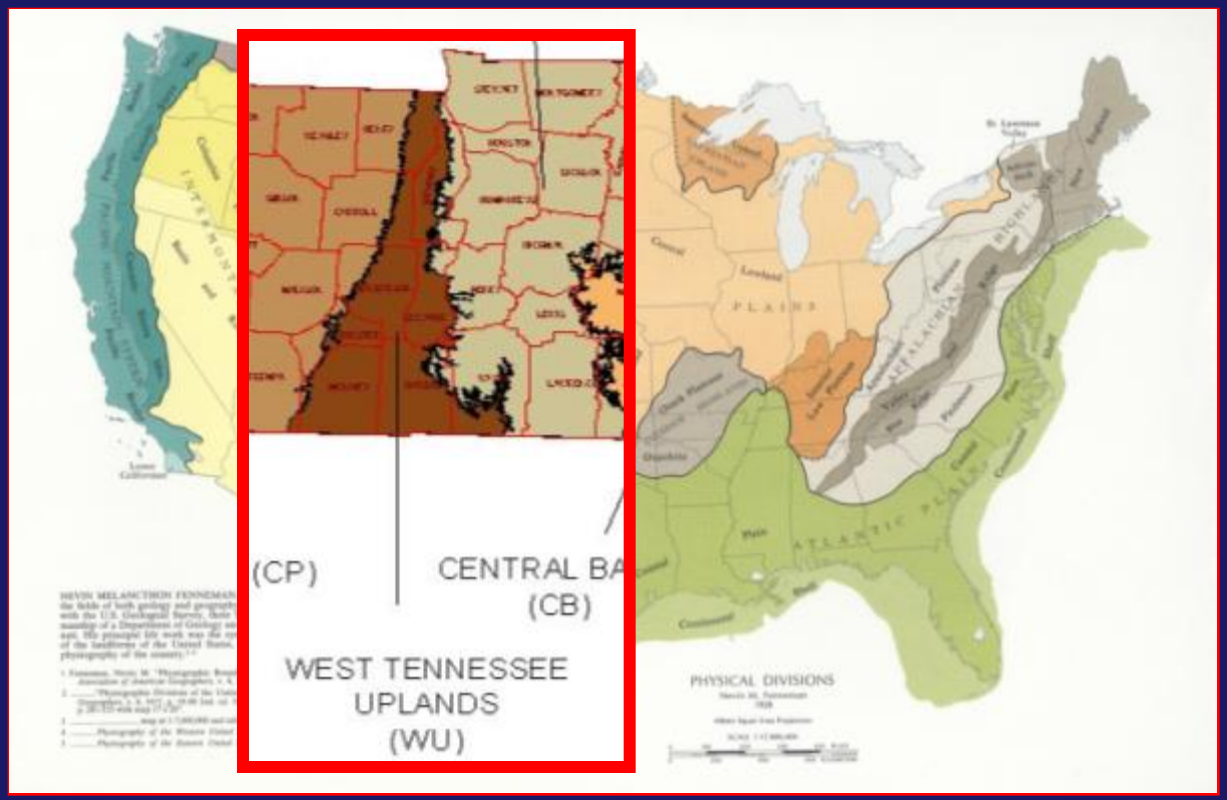
- Geographic Scale - Regional Physiographic Setting
- Stratigraphic Scale – Spans ~10 Formations
- Geologic Time Scale - 400 MYA - Today



GENERALIZED GEOLOGIC MAP OF TENNESSEE

Regional Physiographic Setting

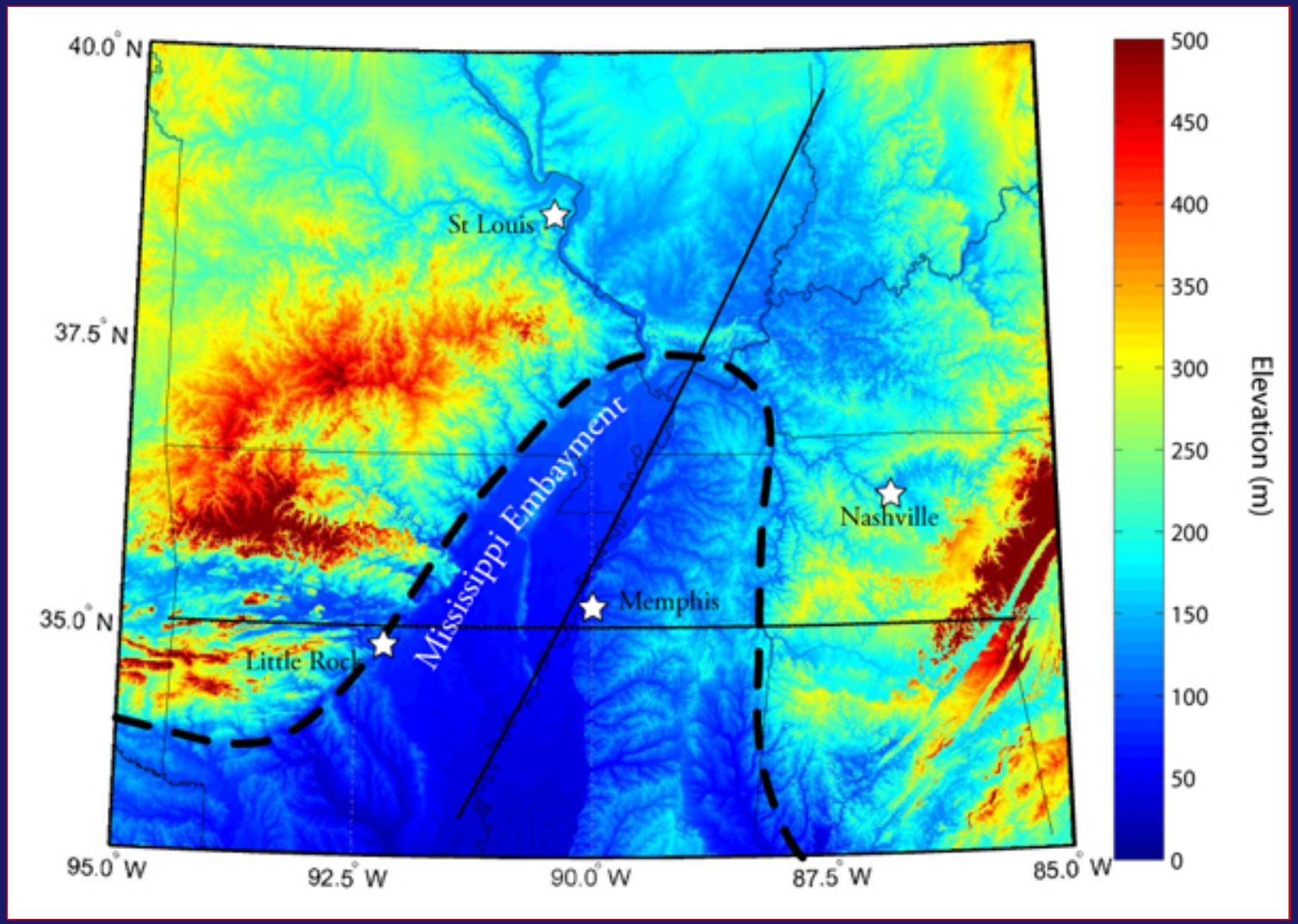
- Nevin Fenneman (1938) – Placed in Gulf Coastal Plain
- W TN Uplands Province – Fall Line Hills
- Maturely dissected sand hills just west of Western Valley of TN R.



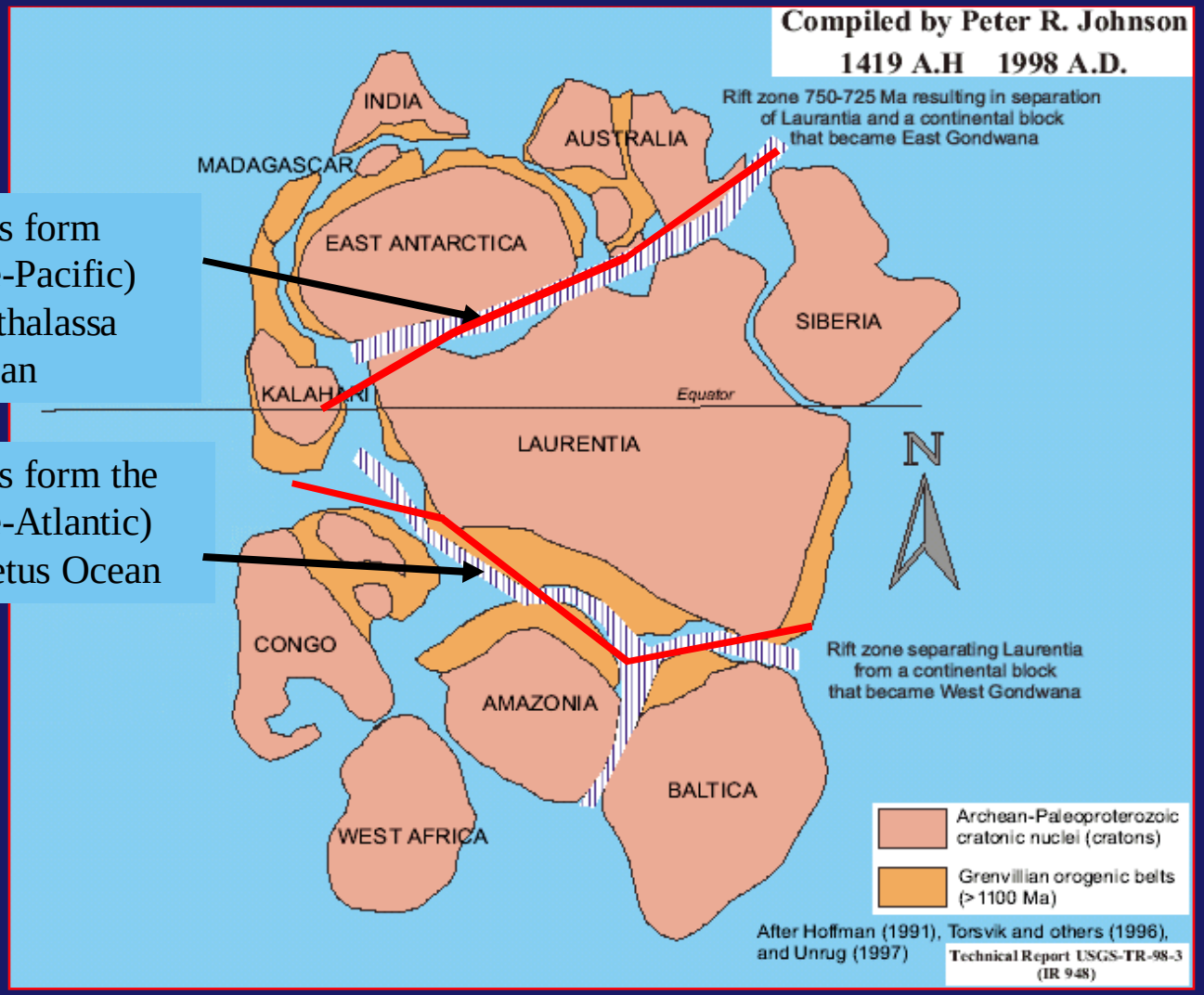
Boat Ramp @ NTSP (MAG 2011)

Structural "Big Picture" Setting

- Part of Mississippi Embayment Synclinorum



Neoproterozoic (700MYA) Rodinia Supercontinent Rifts



Rifts form (pre-Pacific) Panthalassa Ocean

Rifts form the (pre-Atlantic) Iapetus Ocean

Trench (Subduction Zone)

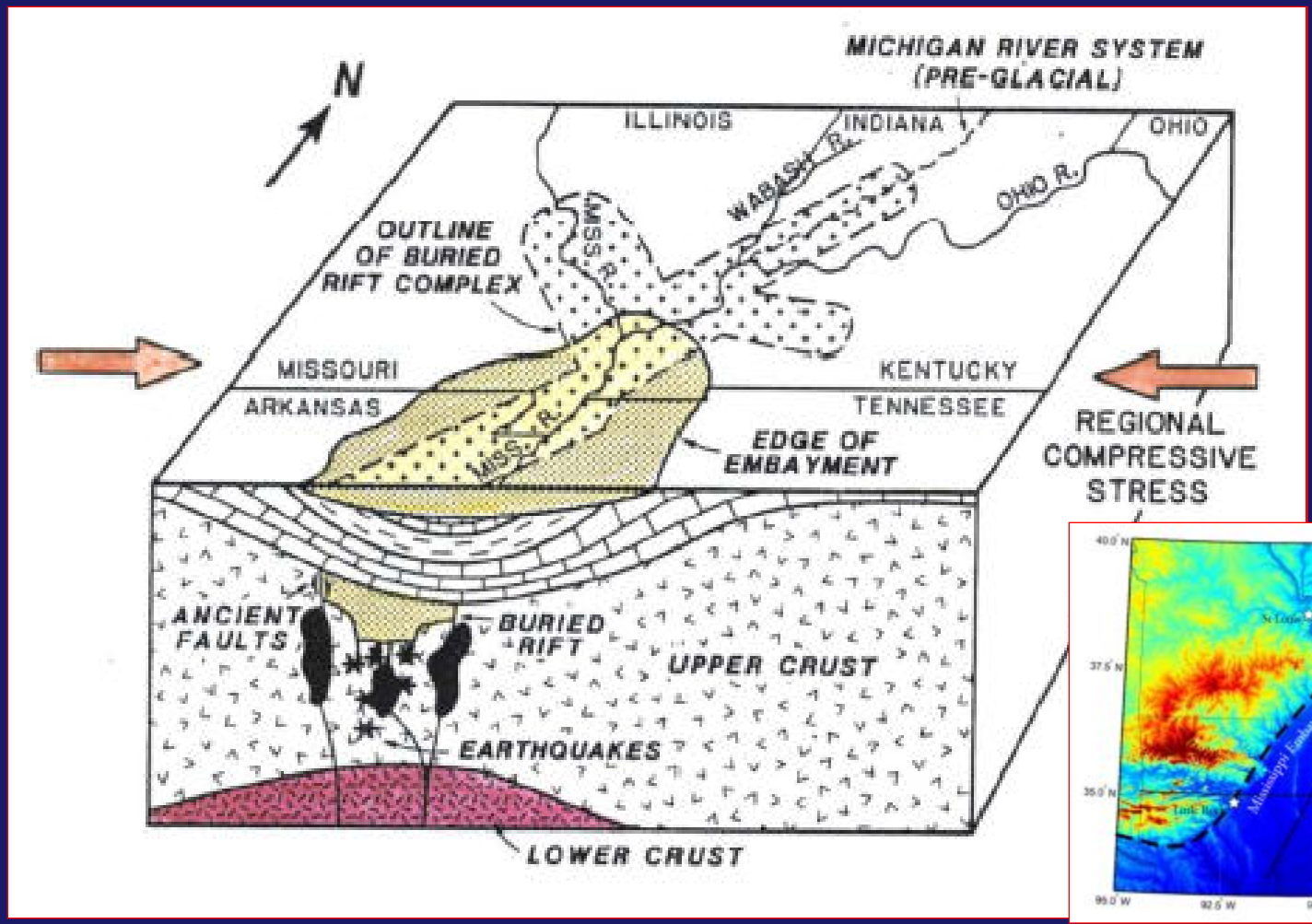
Spreading Center (Divergent Zone)

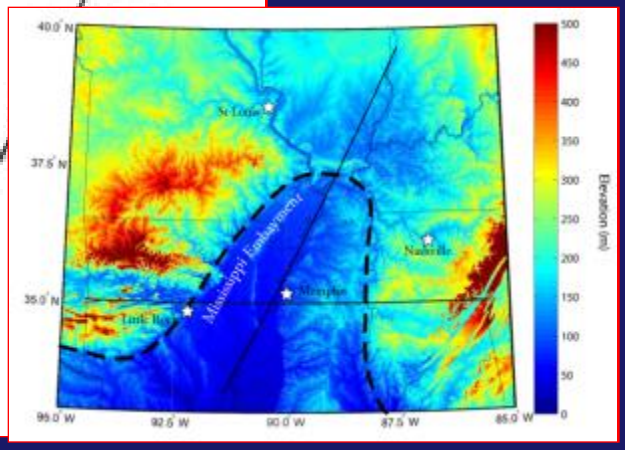
Orogeny (Collision Zone)

Continues to exert control over many features & processes

Structural "Big Picture" Setting

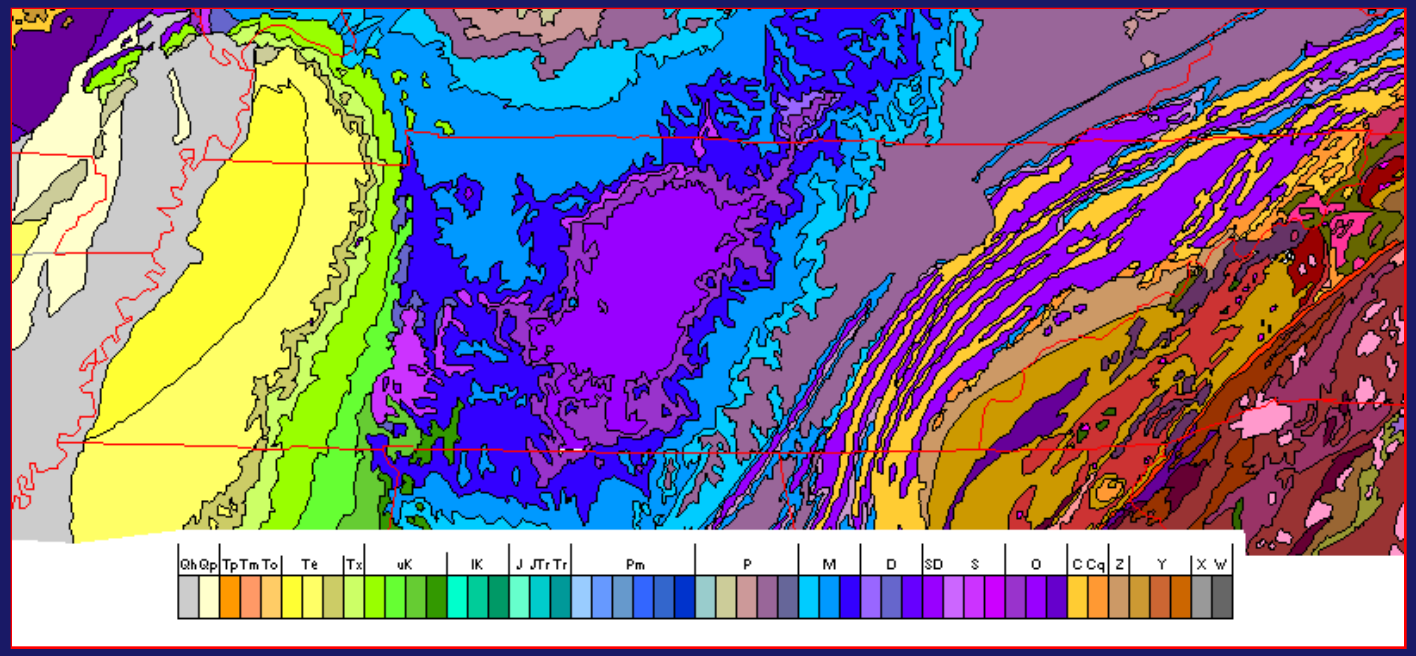
- Same rift causing NMSZ Quakes & MS River direction
- Infill from rifting of Rodinia (700 MYA – Today)





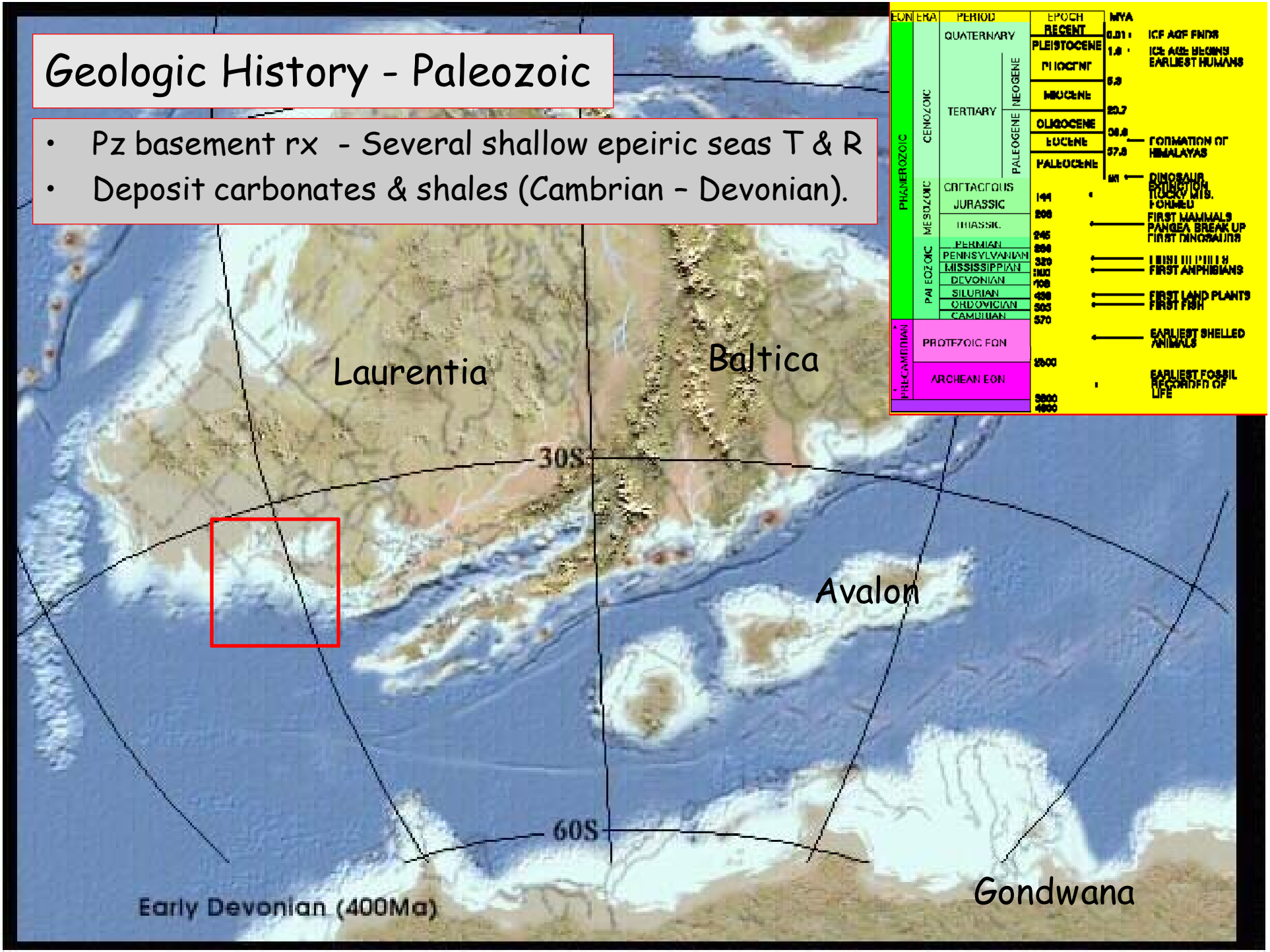
Local Stratigraphic Setting & Geologic History

- N – S trending outcrop belt
  - Near "Great Mz Unconformity"
- Shallow dip to west
  - Gets Young" to west (Walther's Law)
  - Oldest formations exposed (a) east & (b) lower elevations
    - Surface = Mostly loose K sands & clay (marine & fluvial)
    - Near – surface Paleozoic limestone, shale, chert

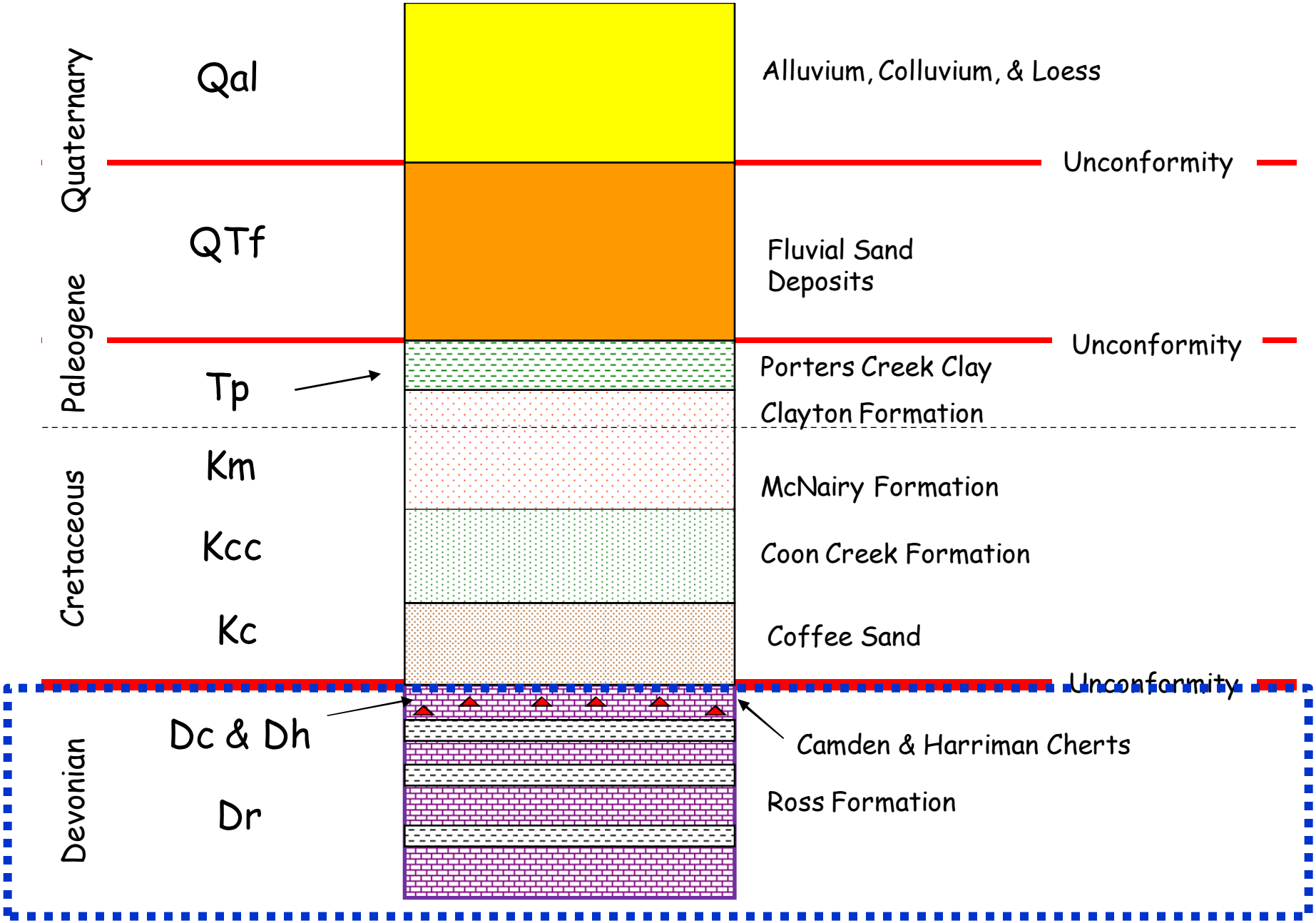


Geologic History - Paleozoic

- Pz basement rx - Several shallow epeiric seas T & R
- Deposit carbonates & shales (Cambrian – Devonian).



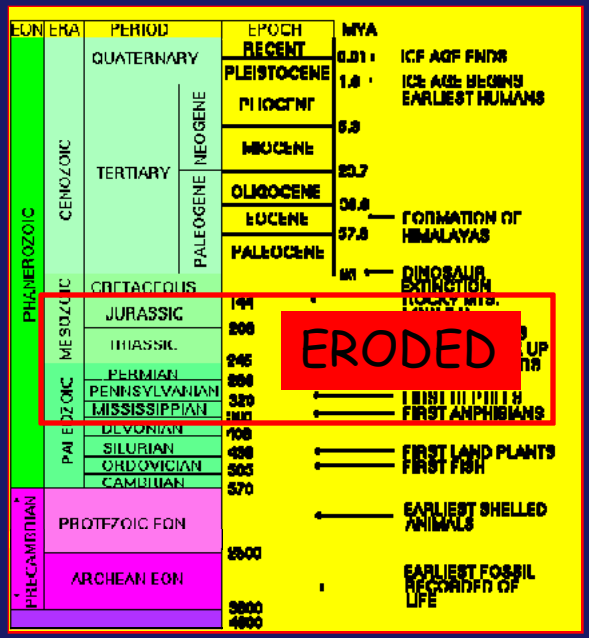
Local Stratigraphy - NTSP

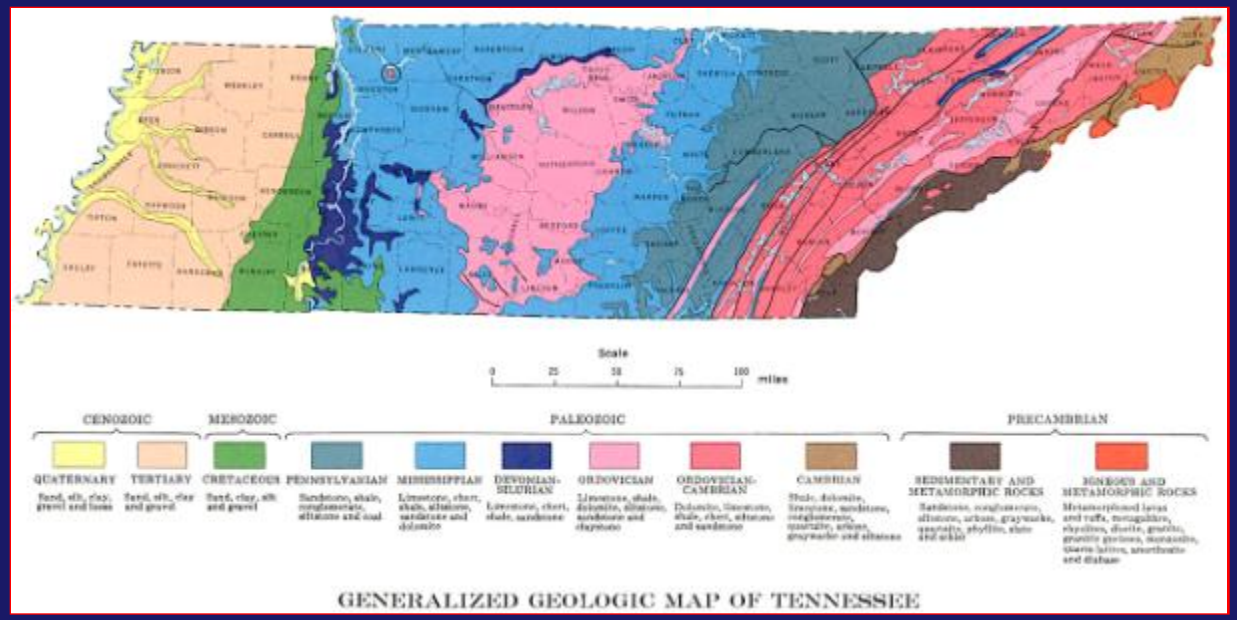


Paleozoic "Basement" & Unconformity

Devonian Seafloor

Late Pz Appalachian Orogeny causes Pascola Arch Uplift





GENERALIZED GEOLOGIC MAP OF TENNESSEE

T_R – K Erosion of M – late K Record

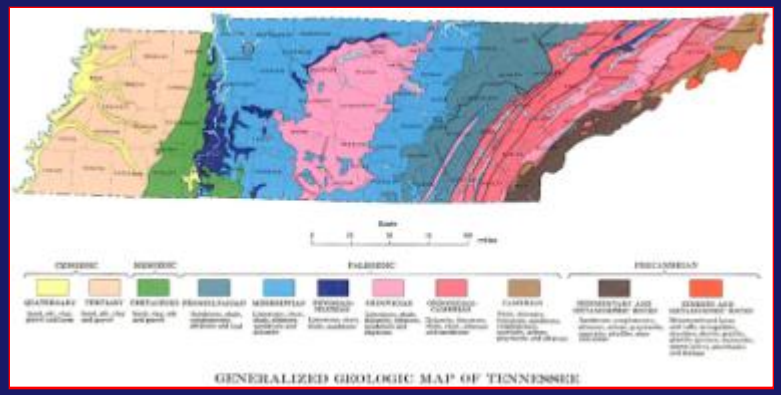
This map shows the how the Western Interior Seaway covered much of North America during the Cretaceous period.

Coon Creek of TN

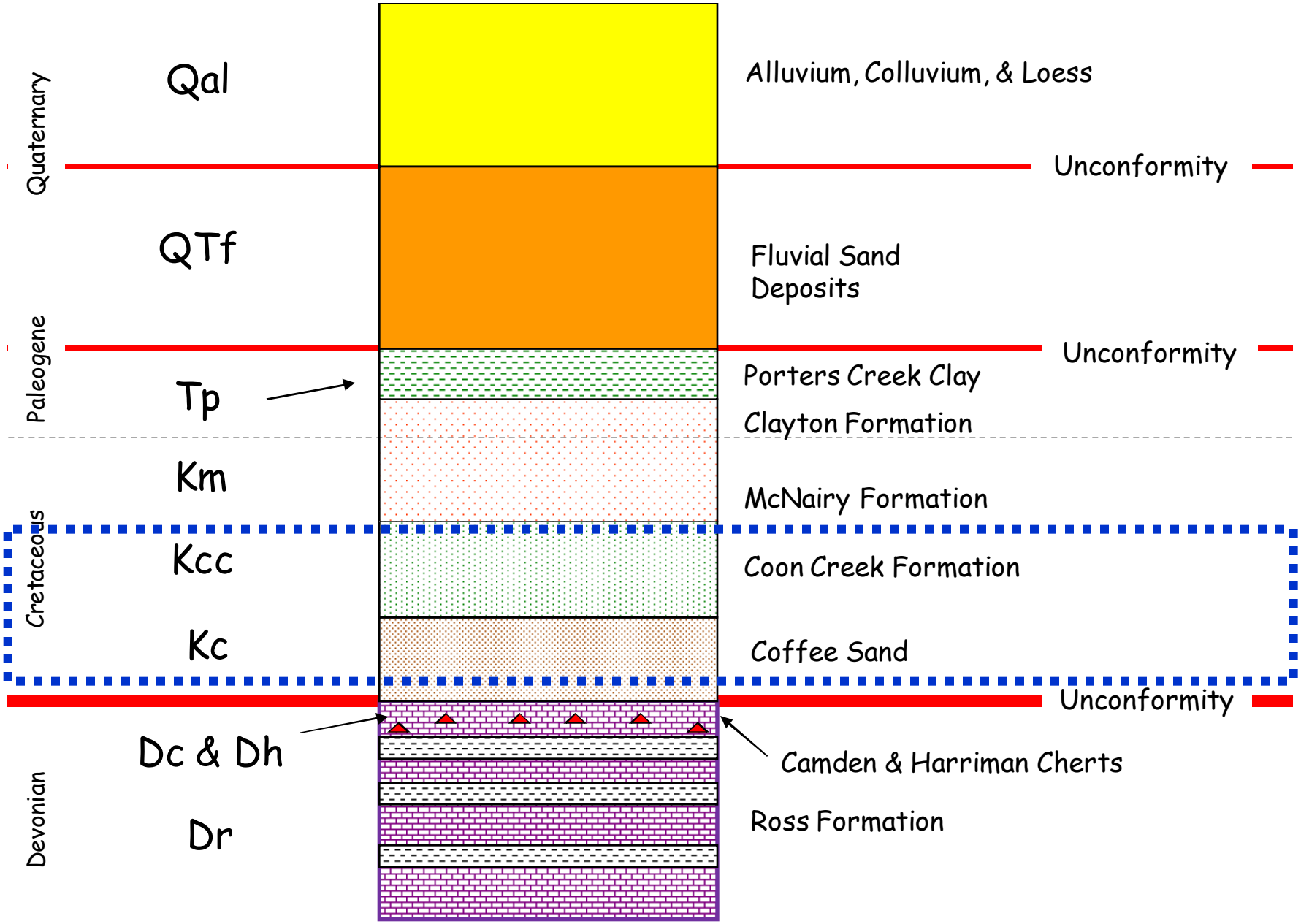
Cretaceous Global SL Rise

Interior Seaway

W TN Sediments



Local Stratigraphy - NTSP

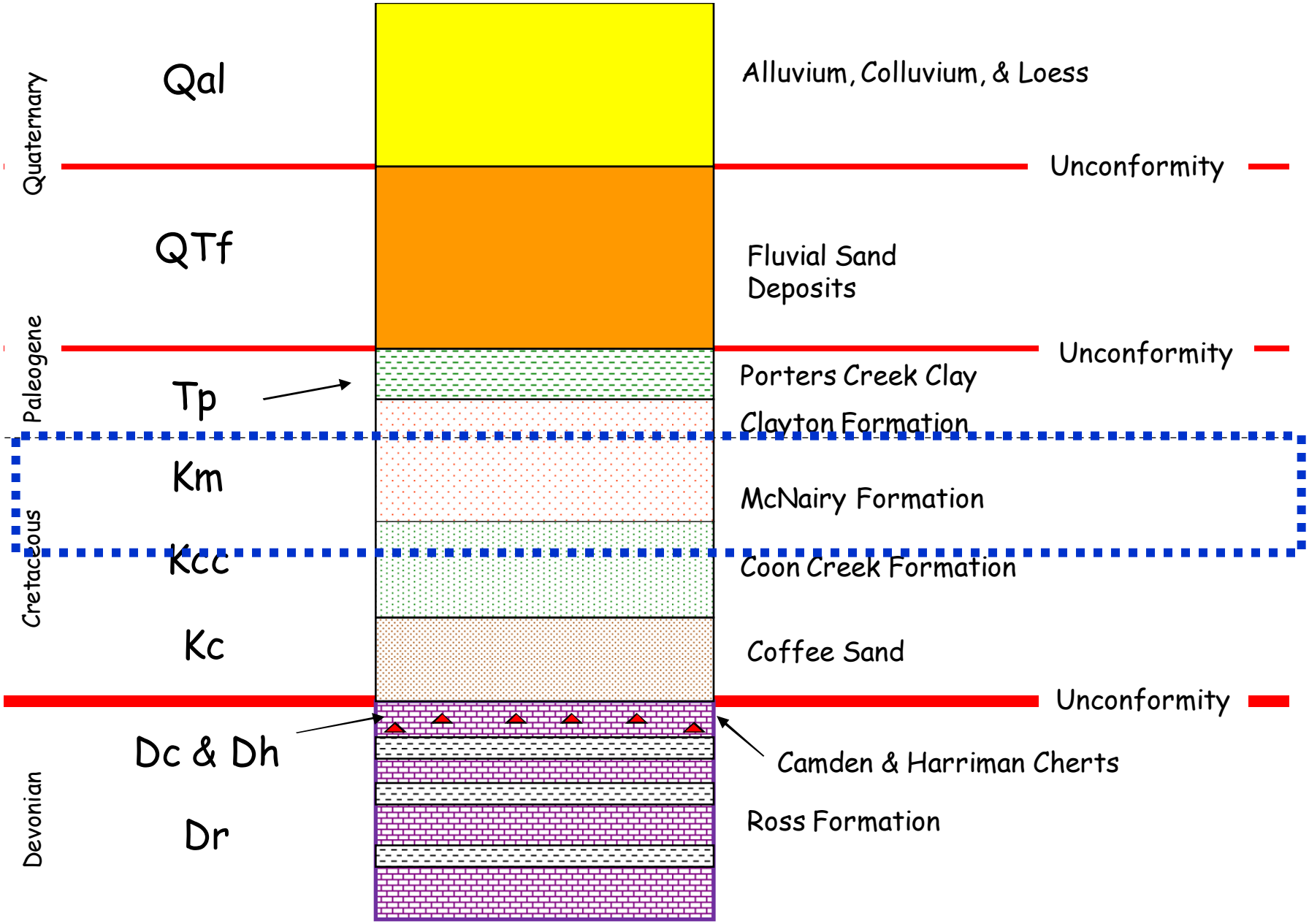


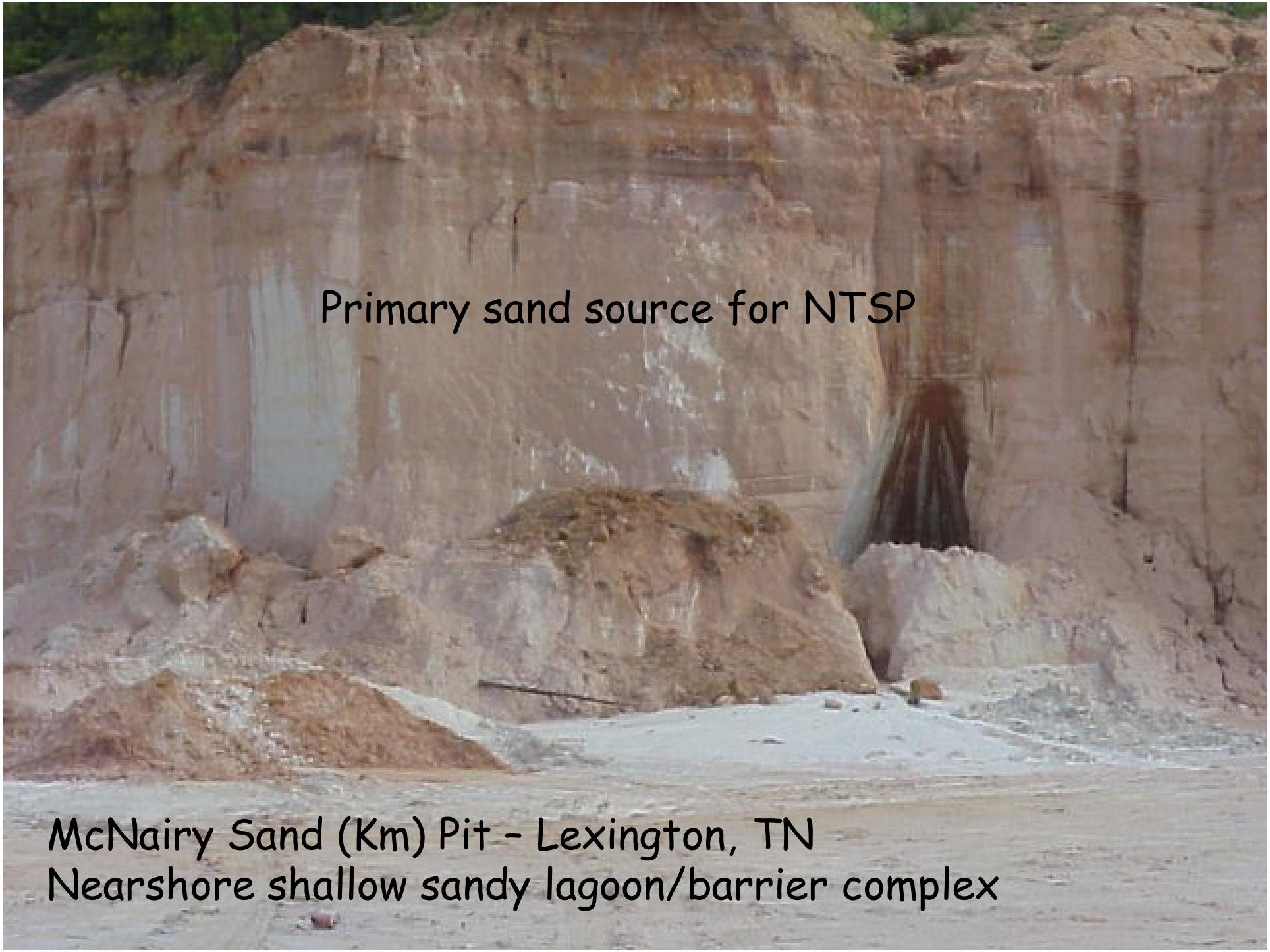
Stratigraphy of the Natchez Trace Area

Q	Qal & Qcol & Ql	0-30′ **Aluvium, Colluvium, Loess**. Unconsolidated quartz sand, silt, clay of modern streams alluvium slope colluvium; locally thin loess caps uplands
Ng-Q	QTf	0-50′ **Fluvial Deposits** (unsure age). Unconsolidated locally cross stratified quartz sand and gravel; mottled weathering, iron stained, ferricrete
Pg	Tp	0-30′ **Porters Creek Clay**. Red-brown, brown, pinkish or gray clay, silty clay
Cretaceous	Tc & Km	0-320′ **Clayton Formation Over McNairy Sand**. Usually mapped together as Tc grades downward into Km. Both gray to orange, pink quartz sand with localized clay interbeds
Cretaceous	Kcc	0-20′ **Coon Creek Formation**. Green-gray to olive clayey micaceous quartz sand and clay.
Cretaceous	Kc	0-20′ **Coffee Sand**. White to light gray quartz sand with clay stringers; localized lignite.
D	Dc, Dcr, Dr	0-20′ **Paleozoic "Basement". Camden and Harriman Chert Overlying Ross Formation**. Weathered white nodular bedded chert interbedded with tan clay localized lignite. Chert units are underlain by interbedded limestone and shale, which crop out east of the park region.

Welcome to West TenneSeas!

Local Stratigraphy - NTSP



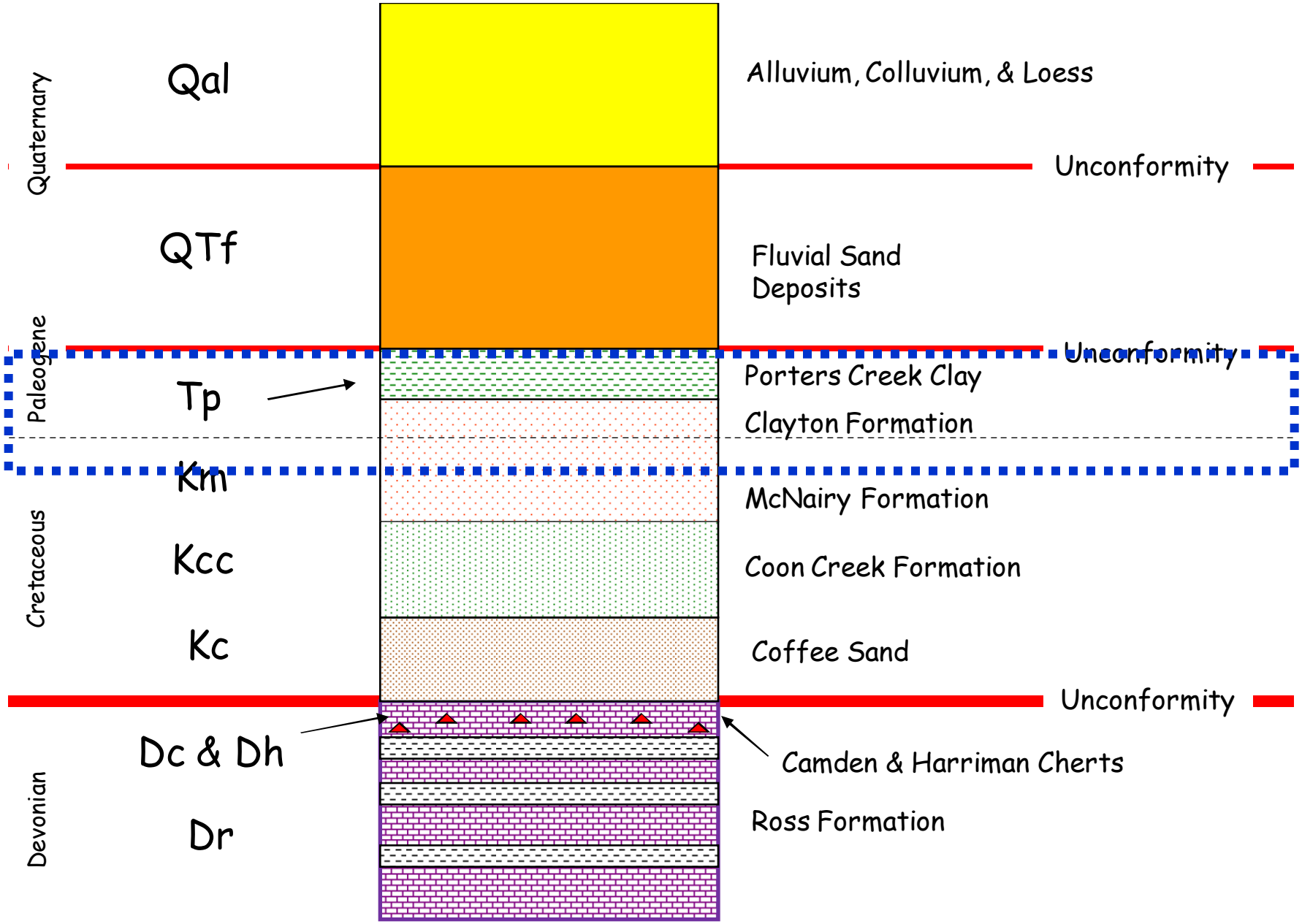

Primary sand source for NTSP
McNairy Sand (Km) Pit – Lexington, TN
Nearshore shallow sandy lagoon/barrier complex


Km South of Lexington (MAG, 2011)

Km South of Lexington (MAG, 2011)

Ophiomorpha burrows (MAG, 2011)

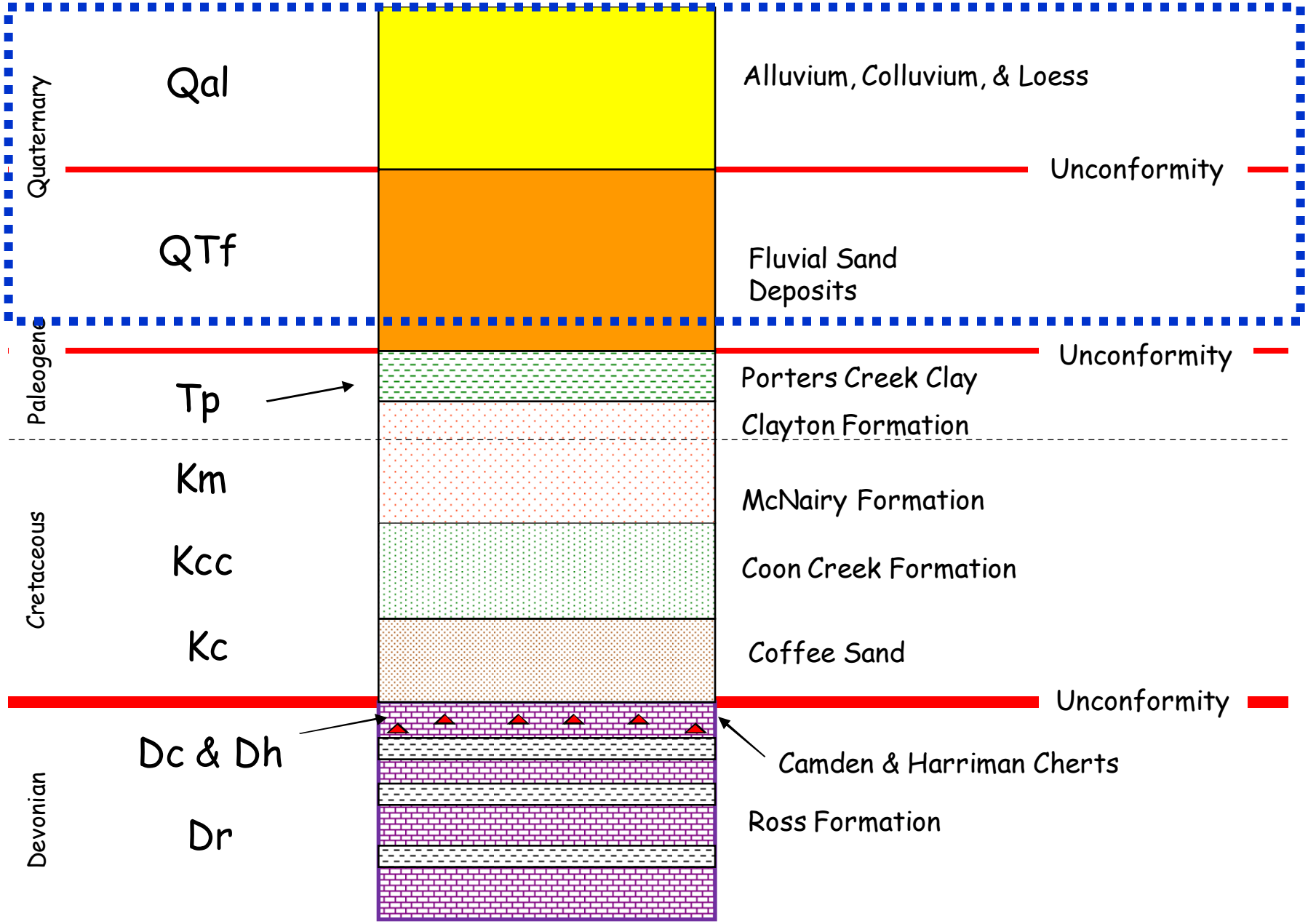
Local Stratigraphy - NTSP



- Sandstone in Km (Kc?) @ Stop 4

(31st Central States Forest Soils Wksp Guidebook, 2011)

Local Stratigraphy - NTSP

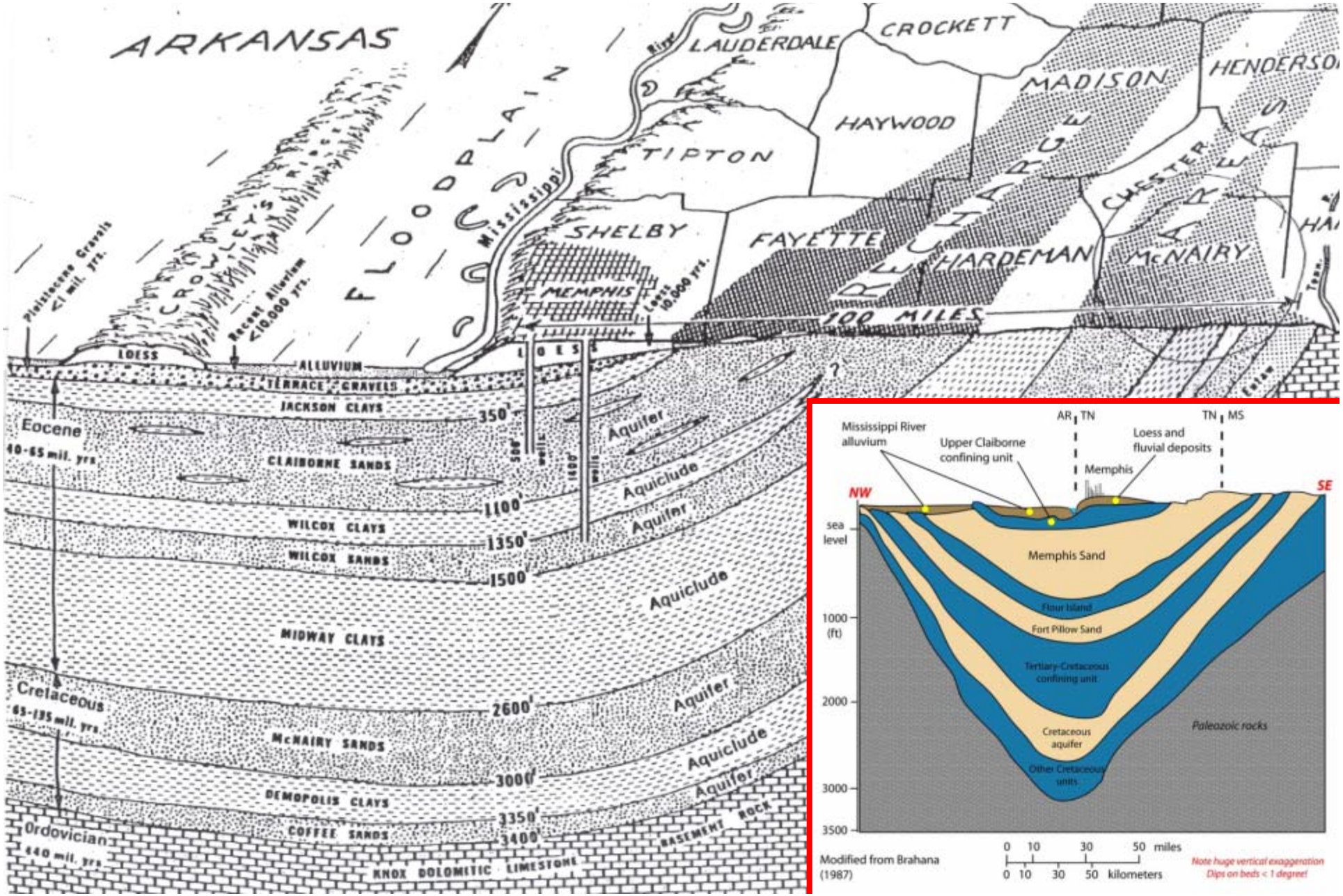



Qal

Ferricrete – Fe-cemented sandstone

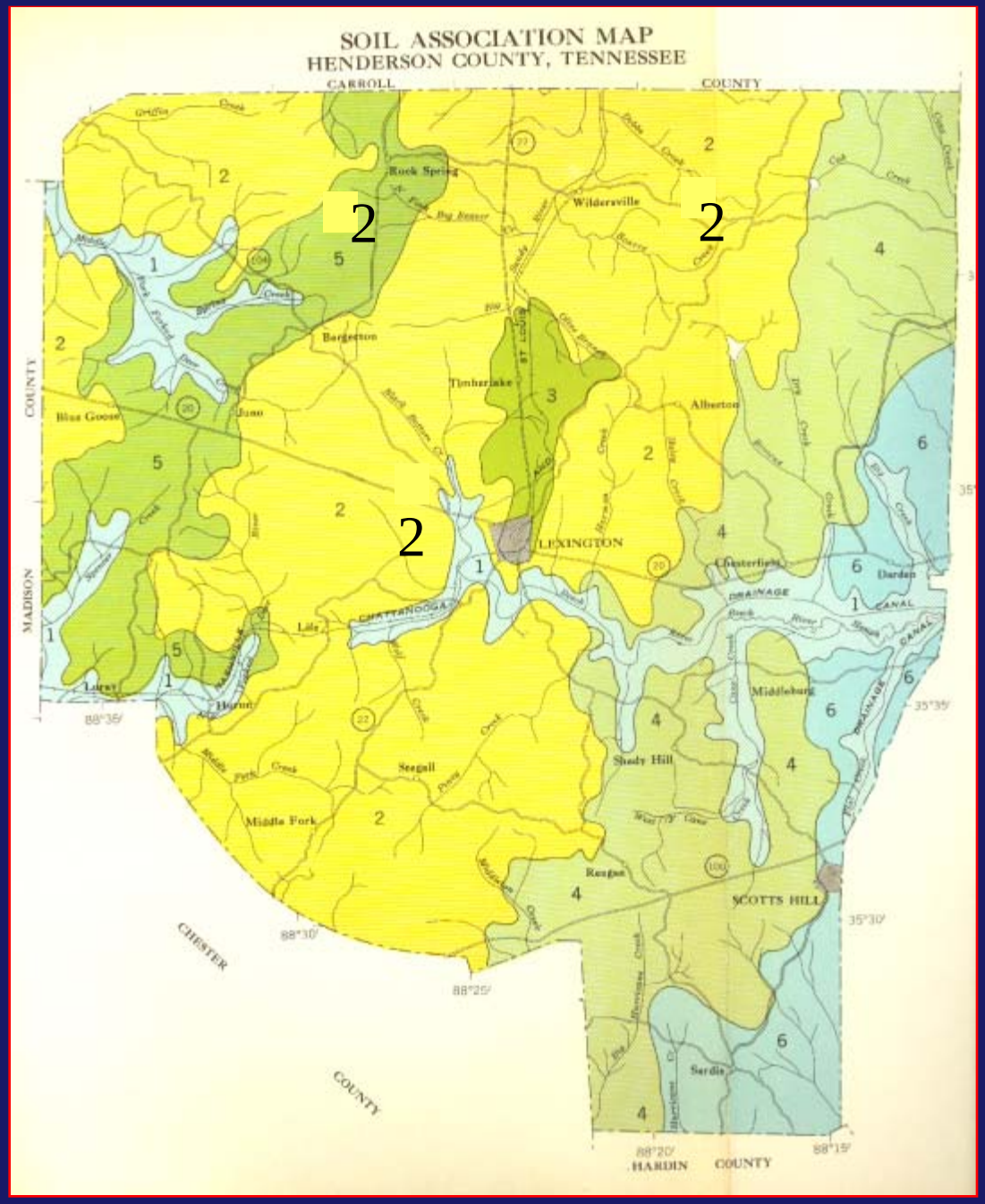
- Hematite (Fe_2O_3); Goethite/Limonite ($Fe_2O_3 \cdot H_2O$)
- Exhumation process
- Groundwater percolation cmt
- Common in lateritic areas

Groundwater Recharge Zone – Post Pz Infill




Questions?

Soil Types of Henderson County, Tennessee



(1) **INA-BEECHY-HYMON Association**, this association consists mainly of soils of the first bottoms, but the Ina soils predominate. This Ina soils is a fine sandy loam, which is nearly level, somewhat poorly drained bottom soil. It was derived from mixed alluvium washed from soils formed in loess and sandy Coastal Plain materials. The Beechy and Hymon soils are also a fine sandy loam, which is common around rivers and frequently flooded areas. The association areas lie along the Beech and Forked Deer Rivers and their tributaries.These soils are used mainly for summer crops, hay, and pasture. Cotton is the main crop in this area, with a little corn.

(2) **RUSTON-LEXINGTON Association** which covers nearly half the county, is composed of the almost identical soils that make up the Lexington-Ruston association. The larger amount of Ruston soil, which is occupying the majority of this association, is composed mainly of a fine sandy loam; where as the Lexington that along the narrow ridgetops are a silt loam. As a group the soils are less important to the agriculture of the county than the soils of the Lexington-Ruston association. This association is in the western part and in a belt through the central part of the county. Cotton is grown on the narrow Lexington ridgetops. Corn and hay are grown on the adjacent terraces.

(3) **LEXINGTON-RUSTON Association,** in this association the Lexington is the most important to the agriculture of the county. The majority of soil in this area around the town of Lexington that is farmable is considered to be the Lexington loam to Lexington silty clay loam. These two soil types make up the vast farmland in that area. This association includes the town of Lexington, and is again mainly used for the production of cotton.

(4) **SHUBUTA-CUTHBERT Association**, which lies in the eastern part of the county. This area is very well forested, underlined with highly acid soils such as sandy clays, silt loams, and very fine sandy loams. The areas of agriculture are small in comparison with the wooded uplands. The agriculture in this area is mainly for row crops in a silt loam type of soil

(5) **DULAC-TIPPAH-CUTHBERT Association**, This association lies in the western part of the county. Dulac, and Tippah have gently sloping to slopping ridgetops and consist mainly of silt loams. The Cuthbert-Dulac is made of sandy clays on the strongly sloping ridge sides. Because of the doughtiness, low fertility cotton is the most common type of crop in this area.

(6) **RUSTON-SHUBUTA-SILERTON Association**, This association is in the extreme eastern part of the county. The soil pattern and many of the soils, as well as the agriculture, are similar to that of the Shubuta-Cuthbert Association.

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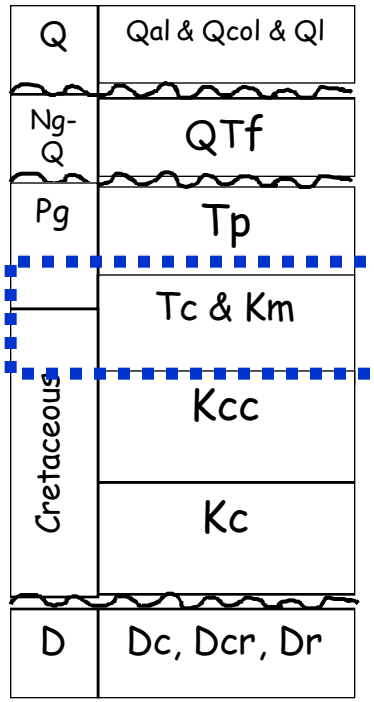

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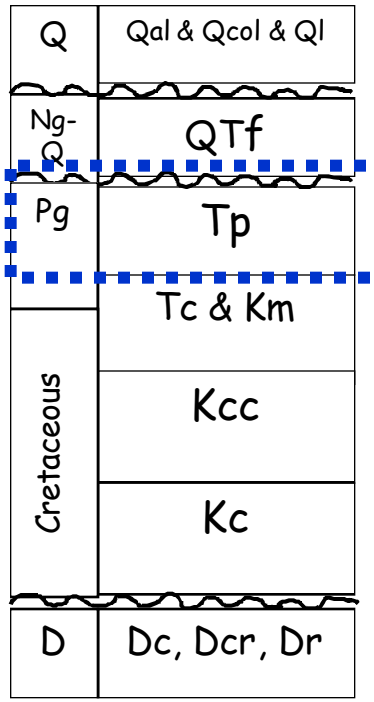
NOTE: Wavy line marks position of unconformities (major erosion surfaces)

Stratigraphy of the Natchez Trace Area



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