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
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 Synclinorium
Neoproterozoic (700MYA) Rodinia Supercontinent Rifts

Rifts form (pre-Pacific) Panthalassa Ocean

Rifts form the (pre-Atlantic) Iapetus Ocean

Compiled by Peter R. Johnson
1419 A.H 1998 A.D.

Rift zone 750-725 Ma resulting in separation of Laurania and a continental block that became East Gondwana

Rift zone separating Laurania from a continental block that became West Gondwana

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

- **Quaternary**
  - Qal: Alluvium, Colluvium, & Loess

- **Paleogene**
  - QTf: Fluvial Sand Deposits
  - Tp: Porters Creek Clay, Clayton Formation

- **Cretaceous**
  - Km: McNairy Formation
  - Kcc: Coon Creek Formation
  - Kc: Coffee Sand

- **Devonian**
  - Dc & Dh: Camden & Harriman Cherts
  - Dr: Ross Formation
Paleozoic “Basement” & Unconformity

Vulcan Materials Quarry - Parsons

Unconformity

K & Younger Seds

S & D Ls & Shale
Devonian Seafloor
Late Pz
Appalachian Orogeny causes Pascola Arch Uplift

T<sub>R</sub> - 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.
## Stratigraphy of the Natchez Trace Area

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Welcome to West TenneSeas!

Painting by Karen Car
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Unconformities:
- Devonian-Cretaceous
- Cretaceous-Paleogene
- Paleogene-Quaternary
Primary sand source for NTSP

McNairy Sand (Km) Pit - Lexington, TN
Nearshore shallow sandy lagoon/barrier complex
Km South of Lexington (MAG, 2011)
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• Sandstone in Km (Kc?) @ Stop 4

(31st Central States Forest Soils Wksp Guidebook, 2011)
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**Ferricrete** - Fe-cemented sandstone

- Hematite (Fe$_2$O$_3$); Goethite/Limonite (Fe$_2$O$_3$ · H$_2$O)
- 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; whereas 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 silt 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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