

patterns, several similarities were noted. For example, in comparing three year old individuals of the two species, two bands were observed to overlap. As noted above, when banding patterns for different age groups are compared, a number of similarities between the bands for the two species are observed. In comparing the three year old gizzard shad esterase banding pattern with the two year old threadfin shad esterase banding pattern, one notes that the gizzard shad bands 1 and 2 overlap the threadfin shad bands 1 and 2. Also, when one compares the two year old gizzard shad esterase banding pattern with the three year old threadfin shad esterase banding pattern, one notes that the gizzard shad bands 3 and 4 overlap the threadfin shad bands 1 and 2. From examination of the electrophoretic banding patterns in this study, the similarities suggest that the two species are closely related on a taxonomic basis.

Additional studies are needed in order to clearly establish the utility of electrophoresis to taxonomically distinguish between these two species. The studies could include the following areas of research: use of different proteins or isozymes, use of cathodal banding patterns (in this study only anodal patterns were examined), use of different buffer systems, and use of two dimensional electrophoresis.

#### ACKNOWLEDGEMENT

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## LOCALIZED SUBSURFACE MORPHOLOGIC CHANGES IN THE CRAB ORCHARD MOUNTAINS GROUP (PENNSYLVANIAN), SOUTHERN CUMBERLAND PLATEAU WEST OF SEQUATCHIE VALLEY, NORTHWESTERN MT. AIRY QUADRANGLE, TENNESSEE

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#### ABSTRACT

Localized thickness variation (morphologic change) of stratigraphic units in the Crab Orchard Mountains Group have been noted near the eastern margin of the Southern Cumberland Plateau in Bledsoe County, Tennessee. For example, the Sewanee Coal Seam likely formed as a thick deposit in a local basin in this area.

#### INTRODUCTION

In Southeastern Tennessee the Cumberland Plateau has been divided into three geomorphic provinces: (1) Walden Ridge (South), situated east of Sequatchie Valley; (2) Sequatchie Valley, and (3) Southern Cumberland Plateau, west of Sequatchie Valley. Figure 1 indicates location of the Mt. Airy quadrangle which spans these three geomorphic areas.

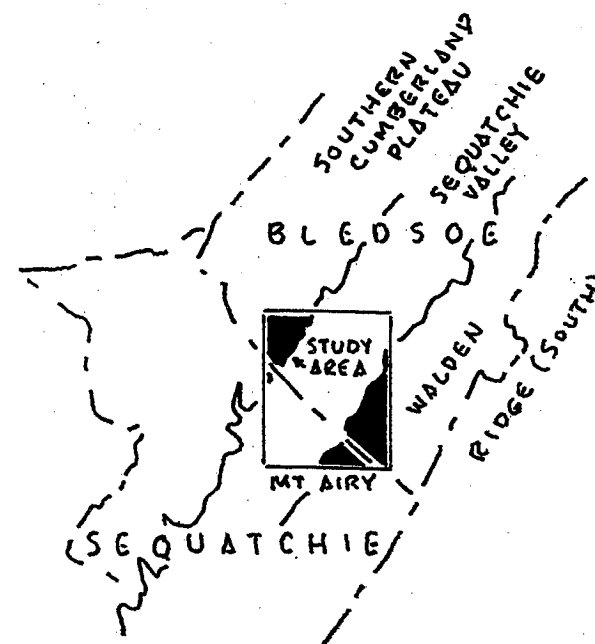


FIG. 1. Location of study area in Northwestern Mt. Airy Quadrangle, Bledsoe County, Tennessee.

Cores of the Pennsylvanian Crab Orchard Mountains Group were taken along the eastern margin of the Southern Cumberland Plateau in the northwestern por-

tion of Mt. Airy quadrangle. Figure 2 shows core hole locations.

The purpose of this paper is to document localized subsurface morphologic changes in stratigraphic units of the Pennsylvanian Crab Orchard Mountains Group on the Southern Cumberland Plateau in southeastern Tennessee.

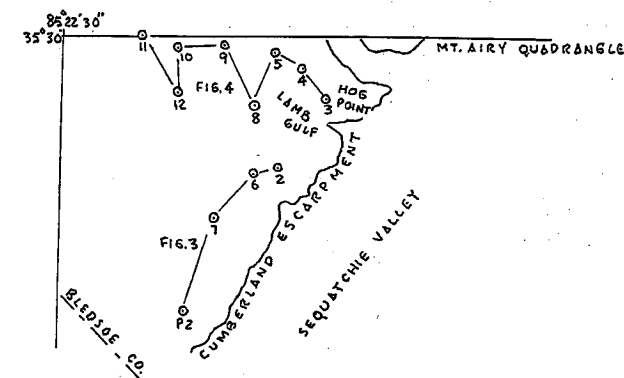


FIG. 2. Core hole locations in Northwestern Mt. Airy Quadrangle, Tennessee.

#### STRATIGRAPHY

C. W. Wilson and others (1956) presented the following stratigraphic subdivision of Pennsylvanian rocks in southern Tennessee:

CRAB ORCHARD MOUNTAINS GROUP	Rockcastle Conglomerate
	Vandever Upper Shale
	Vandever Needleseye Sandstone
	Vandever Lower Shale
	Newton Sandstone
	Whitwell Shale
GIZZARD GROUP	Sewanee Conglomerate
	Signal Point Shale
	Warren Point Sandstone
	Raccoon Mountain Formation

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STRUCTURE—SOUTHERN CUMBERLAND PLATEAU

In general, the structure of the Southern Cumberland Plateau geomorphic area is that of an asymmetrical syncline with relatively steep dips on the eastern limb and a low dip on the western limb. The northeast-southwest trending synclinal axis is near the eastern erosional edge of the plateau.

STRATIGRAPHIC FRAMEWORK

Figures 3 and 4 are panel diagrams, based on core data, which indicate the subsurface stratigraphic framework of the Pennsylvanian Crab Orchard Mountains Group in a local area on the eastern margin of the Southern Cumberland Plateau. Further, it has been noted that the thickest (most complete) stratigraphic section in this geomorphic area is situated over the synclinal axis. Figures 3 and 4 are located in the vicinity of this axis.

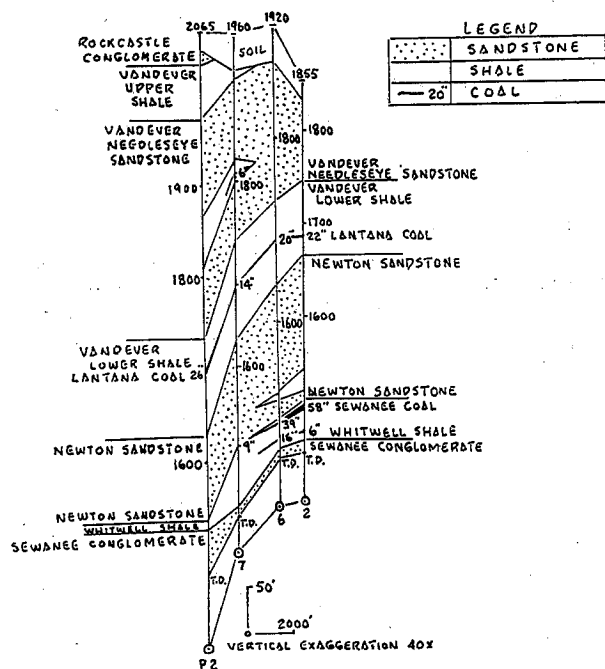


FIG. 3. Panel diagram showing Pennsylvanian Stratigraphic Framework of Crab Orchard Mountains Group, Bledsoe County, Tennessee.

In addition, these cores were drilled with the view of determining the thickness of the Sewanee and/or Richland Coal seams in the Whitwell Shale. It is standard drilling practice to penetrate the upper few feet of the Sewanee Conglomerate in order to insure that the entire Whitwell interval has been sampled. The Sewanee Conglomerate is, in general, a silica-cemented sedimentary quartzite and therefore presents drilling problems both with respect to the wearing out of drill bits as well as a significant increase in the time required to drill through this stratigraphic unit.

**Rockcastle Conglomerate**—uppermost stratigraphic unit in the Crab Orchard Mountains Group and has an erosional upper surface indicated in hole P2 (Fig. 3) and in holes 10 and 11 (Fig. 4).

**Vanover Upper Shale**—entire thickness is present in

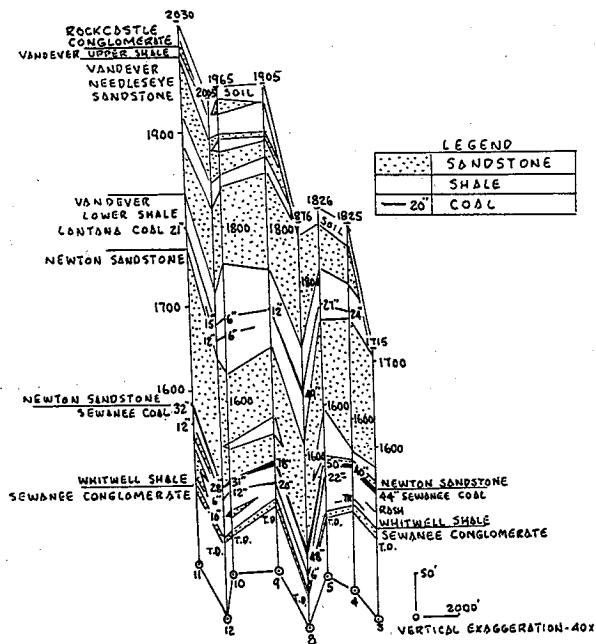


FIG. 4. Panel diagram showing Pennsylvanian Stratigraphic Framework of Crab Orchard Mountains Group, Bledsoe County, Tennessee.

hole P2 (Fig. 3) and holes 9, 10, 11 and 12 (Fig. 4) and ranges in thickness from 15 feet in hole 11 to 70 feet in hole P2 which indicates a general thickening of this stratigraphic unit to the south or southeast. No coal was encountered in this unit.

**Vanover Needleseye Sandstone**—complex stratigraphic unit that consists of thin to thick sandstones and lensing shales. Total thickness is in holes 7 and P2 (Fig. 3) and 9, 10, 11 and 12 (Fig. 4). The range in thickness is from 170 feet in hole 10 to over 270 feet in hole P2. Again, this indicates a thickening to the south or southeast.

**Vanover Lower Shale**—largely a shale unit with persistent Lantana Coal horizon which ranges in thickness from 6 inches in hole 12 to 49 inches in hole 8. Entire thickness is present in holes 2, 6, 7 and P2 (Fig. 3) and 4, 5, 8, 9, 10, 11 and 12 (Fig. 4), and the range in thickness is from just over 40 feet in hole 4 to 130 feet in holes 8 and P2 which indicates a general thickening to the south.

**Newton Sandstone**—a thick sandstone unit with shale lenses near the base. The shale is thickest (60 feet) in hole 5 (Fig. 4). The complete thickness of this unit is present in all holes and ranges from 100 feet thick in hole P2 to over 200 feet in hole 2. These observations indicate a thinning to the south.

**Whitwell Shale**—unit thickness is present in all holes. Thickness of the Whitwell ranges from over 100 feet in hole 11 to over 10 feet in hole P2 which suggests a southward thinning. Holes 10 and 11 show sandstone lenses in the Whitwell. There may be as many as four coal horizons in the Whitwell, but the seam of major interest is the Sewanee Coal situated at the top of the Whitwell just below the Newton Sandstone. The thickness of the Sewanee Coal ranges from 9 inches in hole 7 to 78 inches in hole 9.

**Sewanee Conglomerate**—only the upper few feet of the Sewanee Conglomerate is present in all holes.

CONCLUSIONS

It has been noted that stratigraphic units in the Crab Orchard Mountains Group near the eastern margin of the Southern Cumberland Plateau in Bledsoe County, Tennessee show a relatively large thickness variation (morphologic change) over a small area. Vanover

stratigraphic units thicken southward; whereas, the Newton Sandstone and Whitwell Shale thin to the south. The Sewanee Coal Seam occurs in the Whitwell as a locally thick seam which likely formed in a small depositional basin that thinned to the south.

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SUBSURFACE STRATIGRAPHIC FRAMEWORK OF CRAB ORCHARD MOUNTAIN AND GIZZARD GROUPS (PENNSYLVANIAN) ON WALDEN RIDGE (SOUTH) IN BLED SOE, HAMILTON AND RHEA COUNTIES, WEST OF GRAYSVILLE, TENNESSEE

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ABSTRACT

A number of bore holes in Pennsylvanian rocks on Walden Ridge South west of Graysville, Tennessee, enabled development of a localized, subsurface stratigraphic framework with marked thickness variation of stratigraphic units, as well as, an east-west geologic cross-section indicating the asymmetric synclinal nature of this part of the Cumberland Plateau.

INTRODUCTION

Recently obtained bore hole (air rotary) and core hole data from Walden Ridge South in Bledsoe, Hamilton and Rhea Counties west of Graysville, Tennessee, have enabled establishment of a subsurface stratigraphic framework for the lower Pennsylvanian Crab Orchard Mountain and Gizzard Groups.

STRATIGRAPHY

C. W. Wilson and others (1956) presented the following stratigraphic subdivision of Pennsylvanian rocks in southern Tennessee:

Crab Orchard Mountain	Rockcastle Conglomerate
	Upper Shale
	Needleseye Sandstone
	Lower Shale
	Newton Sandstone
Gizzard Group	Whitwell Shale
	Sewanee Conglomerate
	Signal Point Shale
	Warren Point Sandstone
	Raccoon Mountain Formation

STRATIGRAPHIC FRAMEWORK

Figure 1 indicates the geographic location of the Brayton and Graysville quadrangles on Walden Ridge South in Bledsoe, Hamilton and Rhea Counties, Tennessee. Bore hole and core hole locations, indicated on Figure 2, are situated in northwestern Hamilton County.

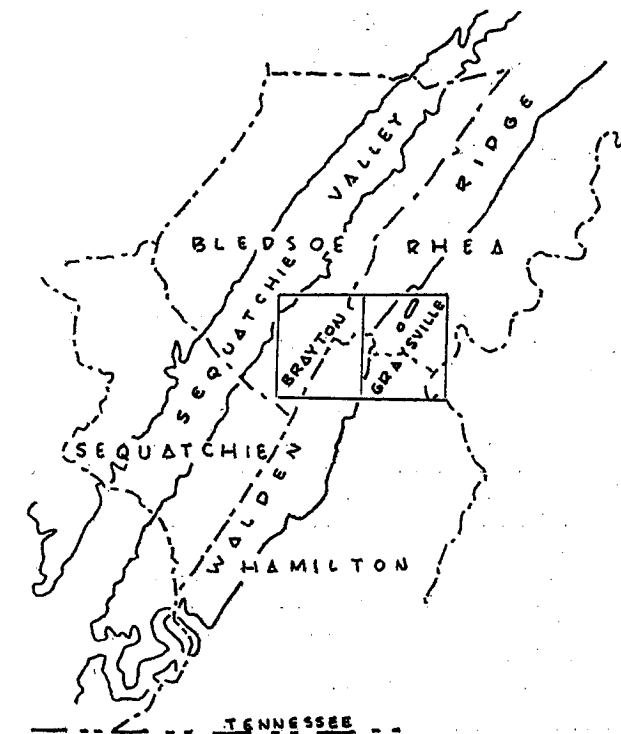


FIG. 1. Location of Brayton and Graysville Quadrangles on Walden Ridge (South), Tennessee.