Subsurface Changes in the Crab Orchard Mountains

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. Vandever 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.

LITERATURE CITED


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

RICHARD KETELLE AND RANDALL WILSON
Hensley-Schmidt, Consulting Engineers
Chattanooga, Tennessee 37401
and
RICHARD E. BERGENBACK
University of Tennessee at Chattanooga
Chattanooga, Tennessee 37401

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:

<table>
<thead>
<tr>
<th>Crab Orchard Mountain</th>
<th>Gizzard Group</th>
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</thead>
<tbody>
<tr>
<td>Vandever Formation</td>
<td></td>
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<tr>
<td>Upper Shale</td>
<td>Signal Point Shale</td>
</tr>
<tr>
<td>Needleseye Sandstone</td>
<td>Warren Point Sandstone</td>
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<tr>
<td>Lower Shale</td>
<td>Raccoon Mountain Formation</td>
</tr>
<tr>
<td>Newton Sandstone</td>
<td></td>
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<tr>
<td>Whitwell Shale</td>
<td></td>
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<tr>
<td>Sewanee Conglomerate</td>
<td></td>
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</tbody>
</table>

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.
thick (contains Nelson coal horizon) and the lower is 80 feet thick. A sandstone unit 120 feet thick is present in the Raccoon Mountain Formation. The Raccoon Mountain overlies the Mississippian Pennington Formation in a transitional relationship. The Pennington Formation is distinguished by dark-green siltstone and shale.

**FIG. 3.** Panel diagram indicating subsurface distribution of Pennsylvania Crab Orchard Mountain Group and Gizzard Group in Northwestern Hamilton County, Tennessee.

**DISCUSSION**

Figure 3 shows that stratigraphic units in the Crab Orchard Mountain Group appear to thicken eastward; however, they show what is likely three-dimensional, localized, depositional thickening and thinning, but at least part of the apparent eastward thickening is due to the fact that they are part of the westward-dipping east limb of the asymmetric Walden Ridge syncline. That is to say, drilling has not determined true stratigraphic thickness.

**GEOLOGIC CROSS-SECTION OF WALDEN RIDGE SOUTH**

The location of three bore holes in Pennsylvanian rocks on Walden Ridge (South) in Bledsoe and Rhea Counties, Tennessee, is indicated on Figure 4. Core hole 21, which is a composite of 30 blast holes, is located on the western margin of Walden Ridge (South) near Pitts Gap. Core hole 22 is situated above an abandoned strip mine, and is located several hundred yards north of Pikeville Road which leads to Brayton and Pitts Gap.

Core hole 23 is located near Laurel Brook, on top of the Cumberland Plateau, in the northwestern corner of the Graysville quadrangle.

**FIG. 4.** Location of bore holes on Brayton and Graysville Quadrangles, Bledsoe and Rhea Counties, Tennessee.

**DISCUSSION**

Data from three bore holes are summarized on Figure 5 which is an east-west geologic cross-section of Walden Ridge South located near Graysville, Tennessee. The line of cross-section is indicated on Figure 4.

The structure of Walden Ridge South is that of an asymmetric syncline with its axis situated near the eastern margin. Further, the Pennsylvania stratigraphic sequence, ranging from the Rockcastle Conglomerate down through the Raccoon Mountain Formation, is given on Figure 3.

Core hole 21 is a composite of 30 blast holes situated behind the highway of a reclaimed strip mine located near Pitts Gap, Tennessee. Stratigraphic units penetrated here include the lower part of the Pennsylvania Newson Sandstone and the Whitwell Shale which contains measurable thicknesses of both the Sewanee and Richland coal seams. Core hole 22—This hole penetrated the entire thickness (1025') of Pennsylvanian rocks from the lower portion of the Rockcastle Conglomerate to the base of the Raccoon Mountain Formation.

Formation thicknesses in this hole are: (1) 51' of Rockcastle Conglomerate (with what is considered as a stratigraphic unit), (2) 104' of Van dever Upper Shale (the No. 12 coal is located near the top of this stratigraphic unit), (3) 222' of Van dever Needlesey Sandstone, (4) 125' of Van dever Lower Shale, (5) 70' of Newton Sandstone, (6) 40' of Whitwell Shale (with the Richland coal near the base of this stratigraphic unit), (7) 182' of Sewanee Conglomerate, (8) 9' of Signal Point Shale, (9) 133' of Warren Point Sandstone and (10) 87' of Raccoon Mountain Formation (with the Nelson and Goodrich coal seams situated in the upper part of this stratigraphic unit).

Core hole 23—This hole penetrated 1178' of Pennsylvanian rocks extending from the lower part of the Rockcastle Conglomerate through the Raccoon Mountain Formation. Stratigraphic unit thicknesses are: (1) 70' of Rockcastle Conglomerate, (2) 142' of Van dever Upper Shale, (3) 62' of Van dever Needlesey Sandstone, (4) 14' of Van dever Lower Shale, (5) 220' of Newton Sandstone, (6) 130' of Whitwell Shale (with the Richland coal near the base of this stratigraphic unit), (7) 173' of Sewanee Conglomerate, (8) 151' of Signal Point Shale (with the No. 7 coal near the top and the No. 6 near the base of this stratigraphic unit), (9) 74' of Warren Point Sandstone and (10) 140' of Raccoon Mountain Formation (with the Nelson and Goodrich coal seams situated in the upper part of this stratigraphic unit).

**FIG. 5.** East-West geologic cross-section of Walden Ridge (South), Bledsoe and Rhea Counties, Tennessee.
and Goodrich coal seams in the upper part of this stratigraphic unit).

Comparison of formation thickness between core holes 22 and 23 (summarized on Figure 5) indicates a pronounced lateral thickness change for all Pennsylvanian stratigraphic units on Walden Ridge South. Hopefully, additional bore hole and core hole information will be obtained which should enable determination of the three dimensional morphology of these Pennsylvanian stratigraphic units.

**LITERATURE CITED**