MULTIPLE TILLS NEAR SHENANDOAH, RICHLAND COUNTY, OHIO[1]

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ABSTRACT

Near Shenandoah, in Richland County, is a geologic section that exposes ten different till units with some intercalated sand and gravel, and some evidence of weathering. The three uppermost tills correlate with the Hayesville, Navarre, and Millbrook Tills of the Killbuck Lobe, which are of Wisconsin age. The remaining seven till units occur below the oldest-named till in the Killbuck Lobe, the Millbrook Till, and are different from any other tills in the area. No definite age is inferred for any of these lower units. However, a 4½-ft noncalcareous weathered sand between two of the lower tills may represent a major retreat of the ice, possibly the Sangamon Interglacial stage.

The glacial deposits of the Killbuck lobe in Richland County are made up of several rock-stratigraphic units which are, from older to younger, the Millbrook,

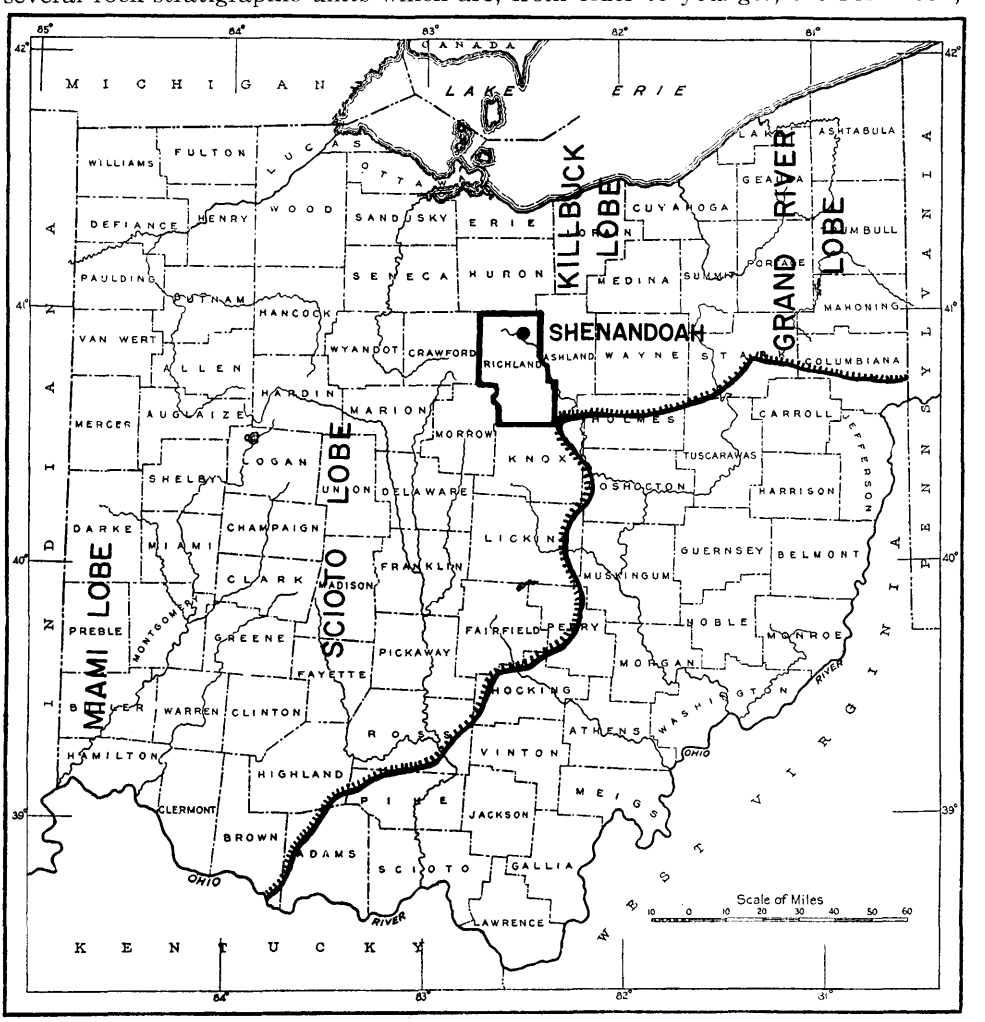

FIGURE 1. Index map of Ohio showing location of the Shenandoah section in Richland County, glacial lobes, and glacial boundary (hachured line).

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Navarre, Hayesville, and Hiram tills. These units can be traced in this and other counties at the surface and in the subsurface over hundreds of square miles (White, 1961; Totten, 1962).

Older tills occur in the subsurface at several places in Richland County. One of the best exposures of these older tills is 1 mile west of Shenandoah (fig. 1), on the north side of a tributary of the Black Fork of the Mohican River, in the N.E. ¼, sec. 33, Blooming Grove Township, northern Richland County. The section lies within the area mapped as Hiram Till (Totten, 1962). The face of the valley wall has been freshly exposed by slumping following undercutting by the stream. A sketch of the section is shown in figure 2 and the texture, quartz/feldspar ratio, and carbonate content of the till units are shown graphically in figures 3 to 5. For reference, the various till units in the section are numbered in the section description and in figures 2 to 5.

Description of the Shenandoah section is as follows:

	Thickness Feet	Inches
Colluvium	Variable	
Till (1), Medium to dark brown, much weathered, noncalcareous, horizontal partings about ½ inch apart, very few pebbles, few thin clay flows	2	0
Till (1), calcareous only around limestone and dolomite pebbles, otherwise as below	0	8
Till (1), medium to dark brown (10YR 4/3), calcareous, few pebbles, massive, blocky, some wavy horizontal partings, breaks into ¼ to ½ inch prisms	0	8
Till (2), yellow-brown (10YR 4/4), calcareous, pebbly, hard, massive	1	0
Stony clayey loam, reddish-brown, noncalcareous, clay flows common	1	6
Till (3), olive brown to gray brown (2.5Y 4/4), calcareous, blocky to massive, large irregular partings, rusty stains along partings, quite stony and pebbly	4	2
Iron-rich zone, reddish-brown, wavy but persistent, very hard and resistant	0	2
Till (4), yellow-brown (10YR 5/4), very sandy, pebbly, mealy, rather loose and crumbly	1	0
Sand, reddish-brown, noncalcareous, clay flows are common, hard, massive, cliff former	3	0
Sand, yellow-brown, noncalcareous, loose	1	6
Till (5), reddish-brown to purple-brown (5YR 4/3), upper 4 inches non-calcareous, lower part calcareous, blocky to massive, moderately pebbly, some gravel smeared into lower part of till	0	10
Clayey gravelly loam, reddish-brown, noncalcareous	0	4
Till (6), dark gray-brown to yellow-brown, calcareous, extremely hard and pebbly	0	4
Gravel streak, persistent	0	1
Till (7), gray-brown to yellow-brown, calcareous, massive, very hard and stony	0	8
Pebbly sand, little yellow-brown, calcareous	0	4
Till (8), dull gray-brown ("flint" gray), calcareous, very scaly and crumbly, large irregular partings, extremely stony and pebbly, rusty	3	0
Stone pavement, reddish-brown, gravelly, hard, persistent	0	3
Till (9), light gray brown to light gray, calcareous, extremely hard, very pebbly, many sand streaks and lenses	1	6
Till (10), bright to dark blue gray, calcareous, pebbly, soft when moist	2	0
Bottom of section, shale bedrock of Mississippian age in stream bed.		
Total thickness	25 feet	0 inches

Because the Shenandoah section is located within the area covered by Hiram ice, the top till in the section would be expected to be Hiram. However till 1 is leached a minimum of 32 inches which is characteristic of the Hayesville Till and in contrast to an average depth of leaching of 26 inches for the Hiram Till in this area (Totten, 1962: 79). The texture (fig. 3) and carbonate content (fig. 5) are characteristic of the Hayesville Till (Totten, 1962: 74). Evidently Hiram Till was either not deposited at this locality, or was removed by erosion. The colluvium at the top of the section may include weathered remnants of Hiram Till

Till 2 has been separated from till 1 on the basis of physical characteristics although there is no sharp contact between the tills. Till 2 is identified as Navarre Till because it is yellow-brown, as is characteristic of that till, in contrast to the dark brown of the overlying Hayesville Till and the olive brown of the underlying Millbrook Till (Totten, 1962: 73).

Till 3 is distinctly different from tills 2 and 4. The olive-brown color, sandy texture, and large irregular partings are characteristic of the Millbrook Till (Totten, 1962: 67). Its upper part contains a clayey loam soil which in places is accompanied by a stone pavement. This loam is thought to have been formed by weathering during the time of a major retreat of the ice. Such a weathered zone is found at the top of the Millbrook Till at many localities. Till 3 is separated

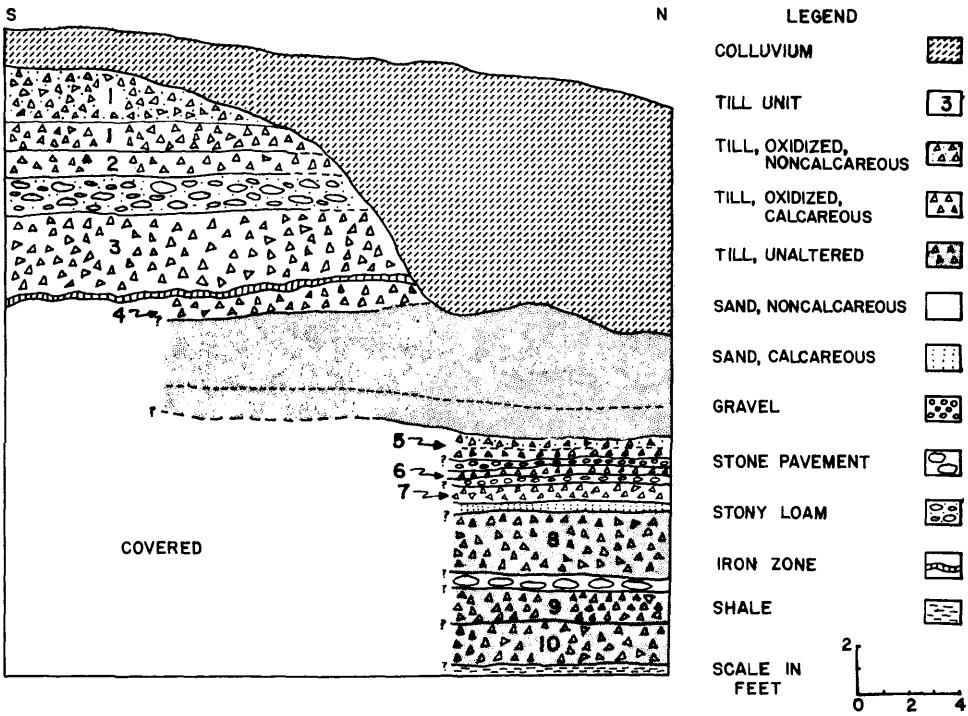

FIGURE 2. Section exposed near Shenandoah.

from till 4 by a thin persistent iron-rich layer. The mode of formation of this thin band is not known.

Till 4 is a very sandy till. Its stratigraphic significance is not known.

Two distinct sand units separate tills 4 and 5. These sands differ in color and compactness. The upper sand is reddish-brown and very compact while the lower sand is yellow-brown and loose. Both sands are noncalcareous and show some evidence of weathering. These sands may represent an interglacial period, possibly the Sangamon.

Till 5 is purple-brown and contains a significant amount of clay.

Tills 6 and 7 are similar in color, texture, and mineralogy, and may have been deposited by the same ice sheet. They are separated by a thin but persistent gravel layer. The top of till 6 is marked by a thin, noncalcareous, gravelly loam. Till 7 is separated from 8 by a calcareous pebbly sand.

Till 8 is a rusty, dull gray till which contains the largest percentage of sand

(and the lowest percentage of clay) of all the tills in the section. The till is very stony and crumbles easily.

Till 9 is an extremely hard, sandy till. It is characterized by many sand streaks, including one at its base. At the top of this till is a conspicuous stone pavement. This stone pavement, which is gravelly, is thought to be the remnant of a lag gravel developed on the surface of till 9.

The bottom till in the section, till 10, is much like till 9. Till 10 contains more clay, but this may be explained by the closeness to shale bedrock. Tills 9 and 10 may have been deposited by the same ice sheet, but possibly by two advances.

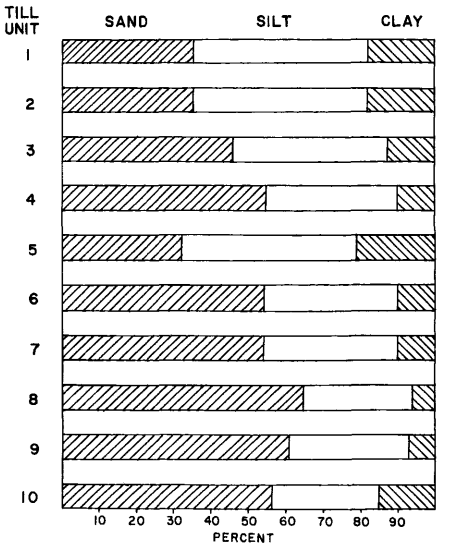

FIG. 3 ←

FIG. 4 →

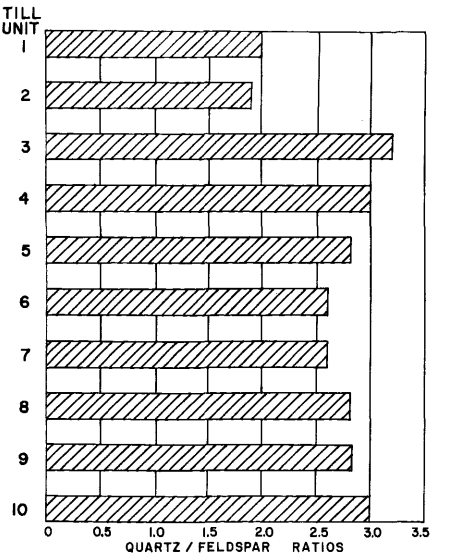

FIGURE 3. Bar diagrams of the percentages of sand, silt, and clay of the till units exposed near Shenandoah.

FIGURE 4. Bar diagrams of the quartz/feldspar ratios of the 0.125- to 0.177-mm size fraction of the till units exposed near Shenandoah.

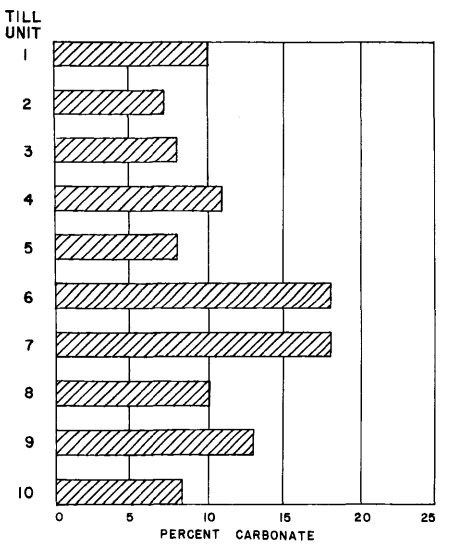

FIGURE 5. Bar diagrams of the carbonate percentages of the till units exposed near Shenandoah.

In summary, the Shenandoah section is believed to contain Hayesville, Navarre, and Millbrook till, and an undetermined number of older tills. No definite age can yet be assigned the lower deposits in this section. The two stone pavements and the 4½-ft sand layer are thought to represent major retreats of the ice. It is tempting to consider a Sangamonian age for the sand between tills 4 and 5 and thus a pre-Sangamonian age—Illinoian or even older—for the tills below the sand. However, any age assignment can be more firmly proposed after a study of other exposures of similar multiple tills separated by weathered zones; such exposures are now being discovered in new deep highway cuts in Ohio and Pennsylvania (Shepps et al., 1959: 14–19).

ACKNOWLEDGMENTS

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