PLEASANT HILL GAP

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During the summer of 1902, David White, then a geologist and paleobotanist with the U.S. Geological Survey, in Washington, DC, made an extended trip through parts of southwestern Pennsylvania, northern and western West Virginia, and eastern Ohio. His primary objectives, based on his locations during this time (determined from his field notebook), were to examine exposures of the Dunkard Group, meet with I. C. White in Morgantown in order to examine existing plant collections and exchange ideas, and acquire enough first-hand information to come to his own conclusions about the age of the Dunkard. David White accepted that a large part of the Dunkard was of Permian age, but disagreed with I.C. White on the particulars about where the boundary should be placed, preferring the base of the Greene Formation to the top of the Waynesburg coal. By the end of his career, however, based on a posthumous publication (White, 1936), he had converged with I.C. White's original conclusion that the entire Dunkard was of Permian age.

Much of the dispute about the age of the Dunkard revolved around the discovery of callipterid plant remains at about the level of the Washington coal. Callipterids are a group of plants that are typical of Permian-age deposits (see DiMichele et al., 2011). In the early 1900s, and until recently, one particular callipterid species, *Callipteris conferta* (now transferred to the genus *Autunia*), was considered to be an index fossil for the base of the Permian Period. As part of his plant collecting, David White found callipterids at several places in the Dunkard, all from the Washington coal zone or higher.

The youngest callipterid plants reported from the Dunkard Group, to this day, are a handful of specimens attributable to *Autunia* (*Callipteris*) *naumannii* from sandy shales that were exposed (in 1902, and perhaps as late as the 1930s, according to Darrah, 1975) on the roadside near Pleasant Hill Gap (Figure 1). The road configuration is slightly different today than in 1902, and we believe the original road can still be detected (Figure 2), though, as can be seen from the photograph, outcrop exposures are somewhat limited! Here D. White, at an elevation of about 1,270 ft (387 m), located these fossils in proximity to a coal bed we presume he identified as the Nineveh coal (Figure 3). White's notes are unclear, however. The word "Callipteris" is prominently displayed, apparently added later, next to the original annotation of "Plants". A pencil line leading from those words to the outcrop diagram appears to place the bed beneath the nearest coal (?) in the section; the dark line above the plant bed may have been a dark shale based on White's annotations ("drk sh" is written near, but not next to the dark line he usually uses to indicate coal beds). "Nineveh Coal" was apparently added as a marginal note at some later time, but exactly which bed this refers to is uncertain (Figure 4A). The callipterids are not preserved in dark shale (Figure 4B1 and B2).

According to W. C. Darrah, in 1932 White provided him (Darrah) with information on the location of this, and many other, Dunkard plant collecting sites (Darrah, 1969, p. 17; Darrah, 1975, p. 86). Darrah returned to the site and located the callipterid bearing bed, but could not locate any limestones or sandstones in the hillside (though note that White does record "LS" in the section, above the plant bed in his note, Figure 4A – we were not able to relocate this or any

DiMichele, W. A., Skema, V., and Harper, J. A., 2011, Pleasant Hill Gap, *in* Harper, J. A., ed., Geology of the Pennsylvanian-Permian in the Dunkard basin. Guidebook, 76th Annual Field Conference of Pennsylvania Geologists, Washington, PA, p. 168 -173.

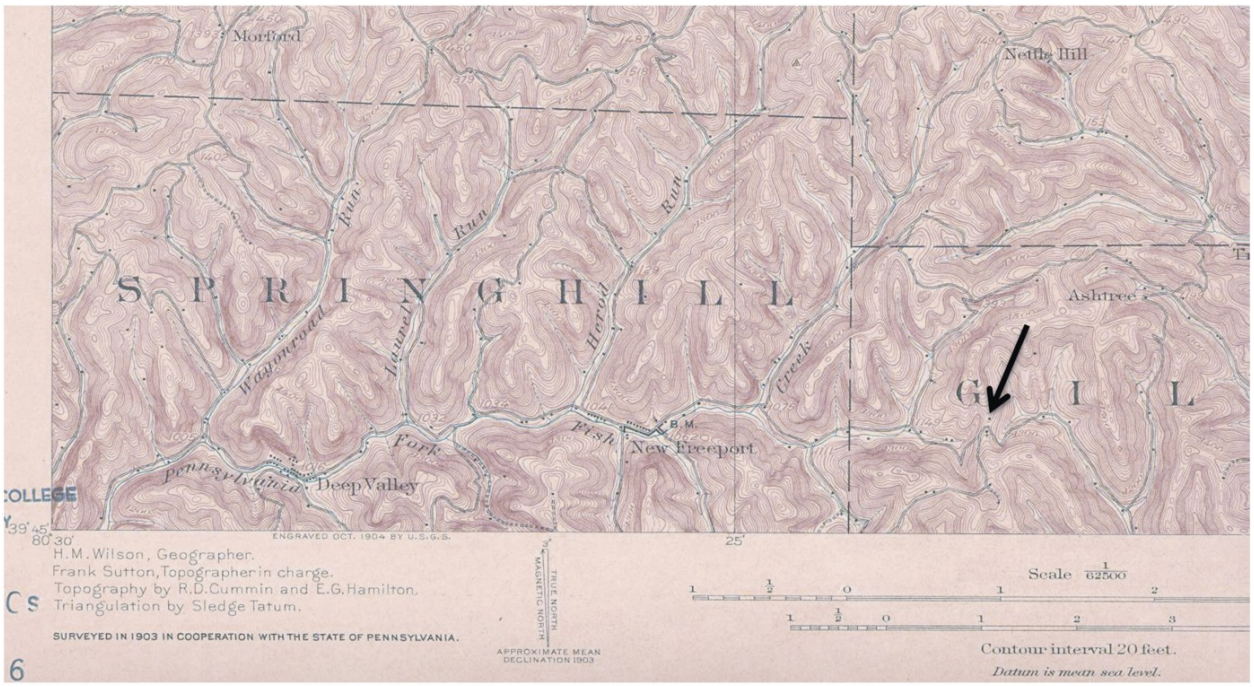

Figure 1. Rogersville 15-minute quadrangle, 1905 (survey of 1903). This map shows the road positions at the time of David White's examintion of this site, in 1902. Site is located at the arrow.

Figure 2. Pleasant Hill Gap, looking downhill to the SW, just below the point at which the modern road crests the hill. This is possibly the road on which David White would have traversed this area in 1902. He notes a "Pine Bank Road" in his field notes – see Figure 3. Note the heavy vegetation cover, making relocation of the plant-bearing bed difficult. A portion of the modern road can be seen down slope to the right.

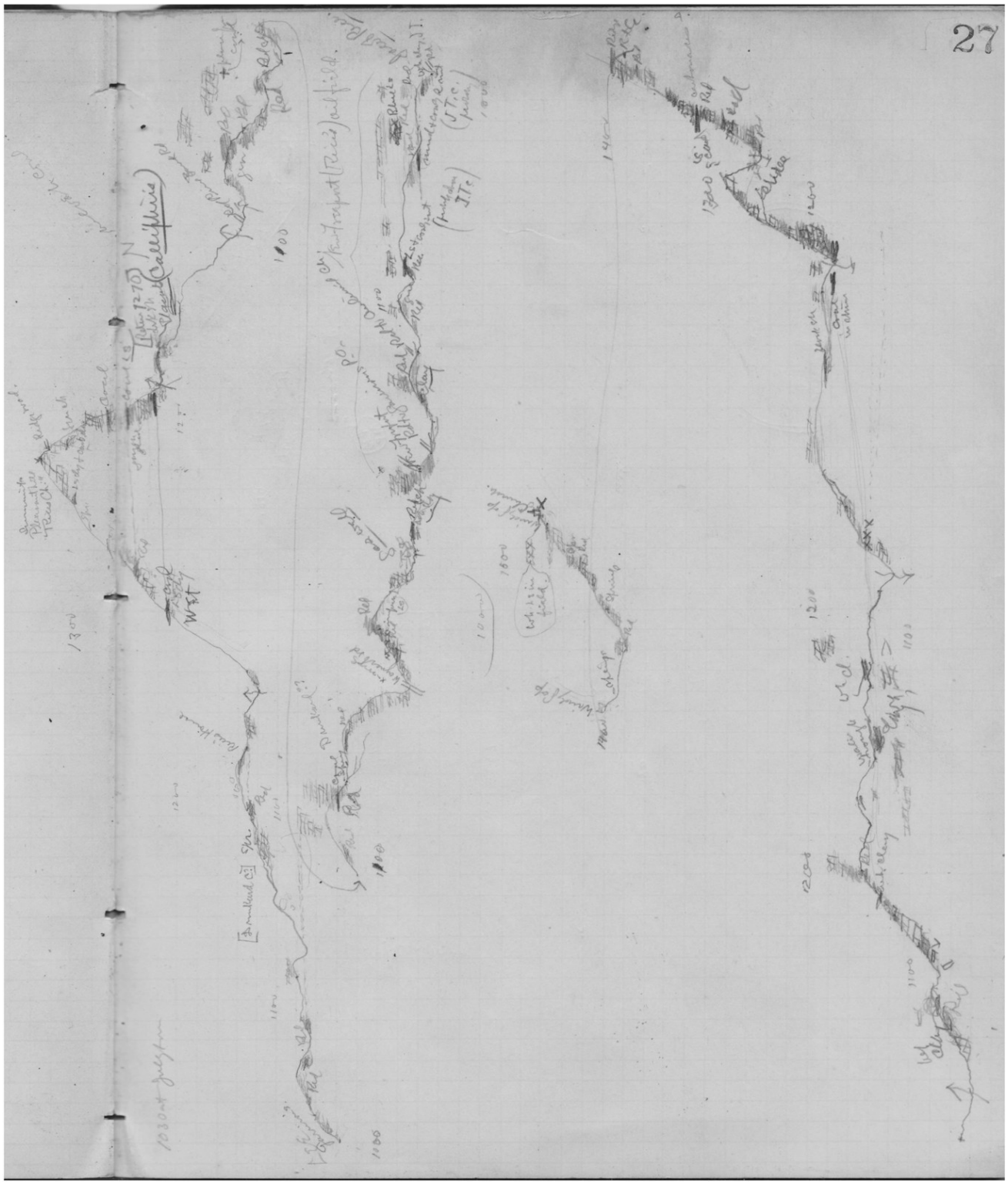

Figure 3. Page 27 from David White's 1902 field notebook, in which he records the presence of "*Callipteris*" in proximity to the Nineveh coal at Pleasant Hill Gap. Plant-bearing beds are noted at arrow.

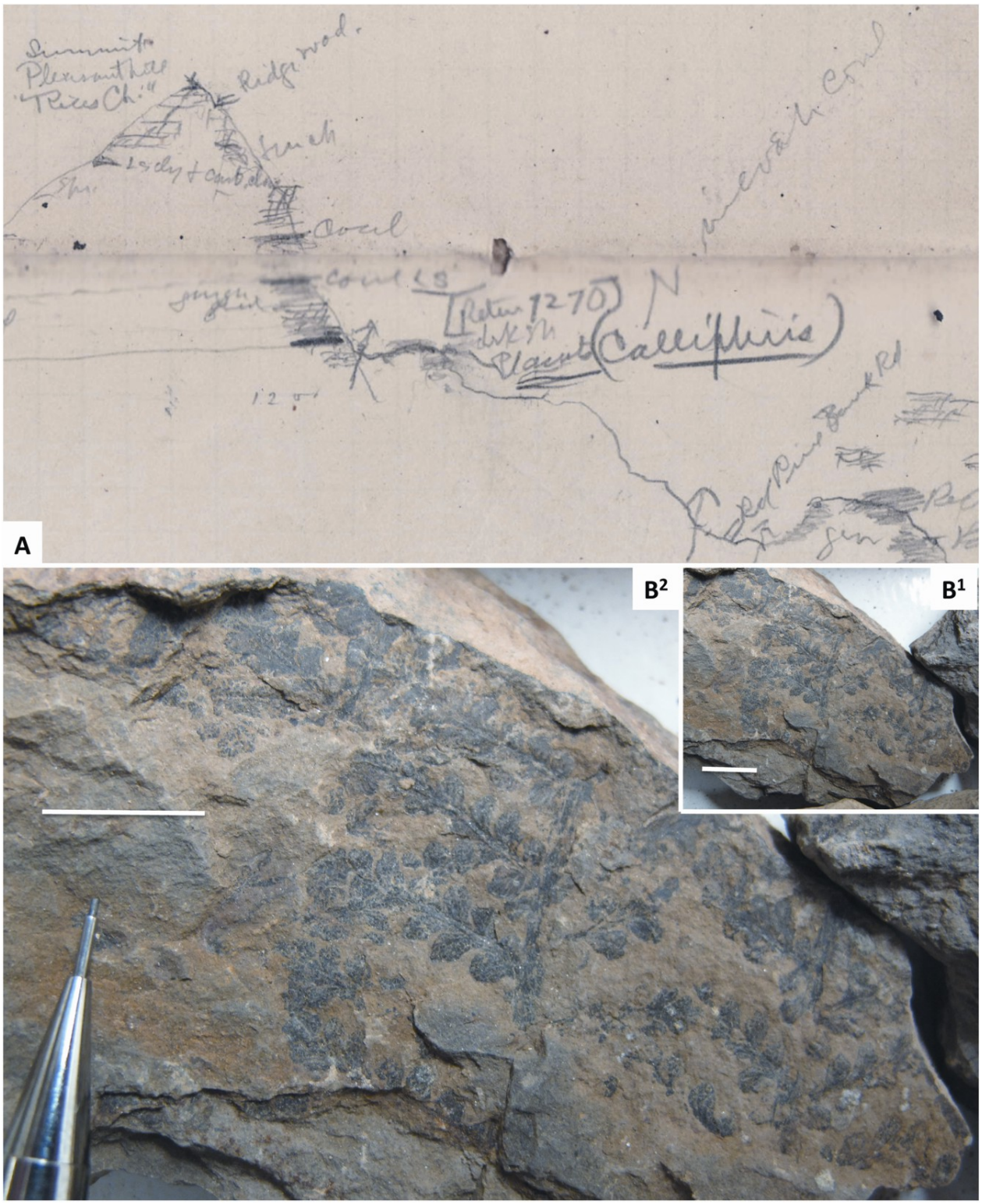

Figure 4. A—Enlargement of portion of page 27 from David White's 1902 field notebook where he describes the occurrence of "*Callipteris*" in proximity to the Nineveh coal. B1—*Autunia naumannii* from the National Museum of Natural History collections, USGS locality number 2915, X1. B2—Specimen illustrated in B1 X3, to show detail of the plant and composition of the rock matrix.

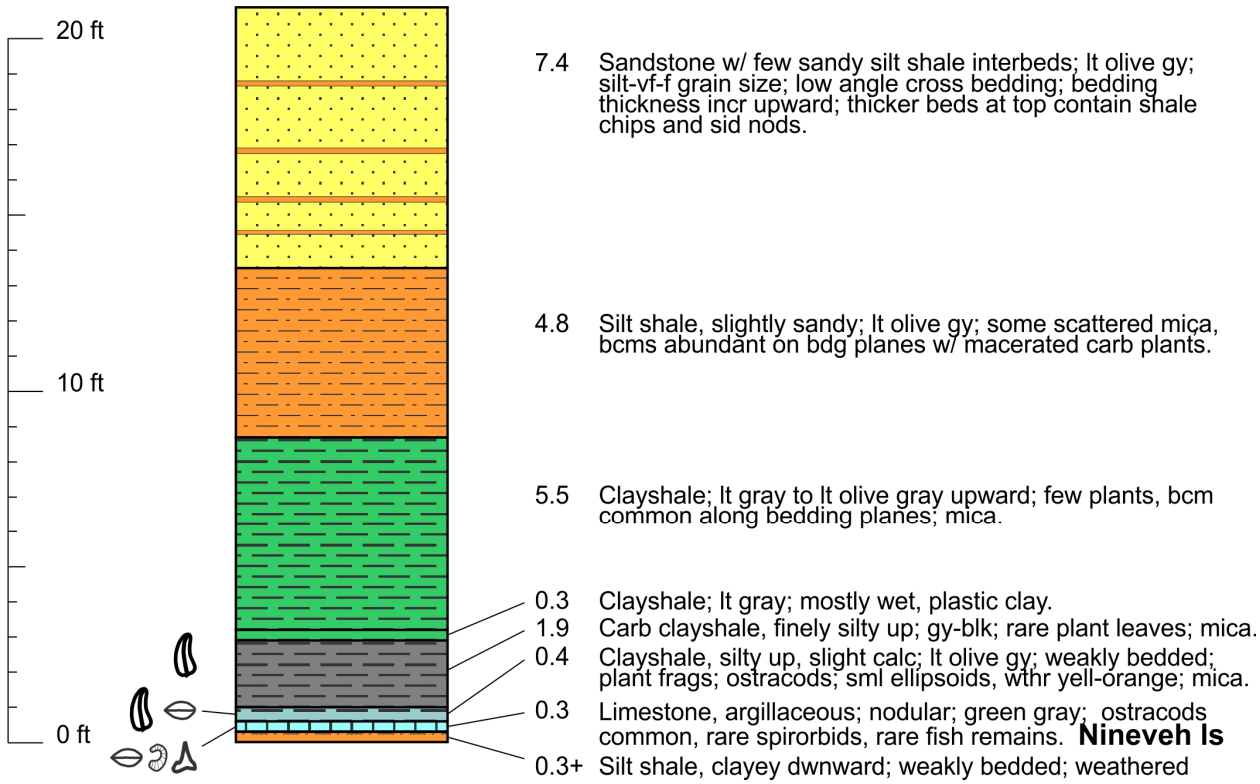

Figure 5. Graphic log of measured section of the lower Greene Formation along Shough Creek Road, about 1 mi (1.6 km) SW of Pleasant Hill Gap. Measured and described by Vik Skema and John Harper.

limestone in the hillside, in place or in float). In his opinion, the beds indeed lie somewhere close to the Nineveh coal horizon (Darrah, 1969, p. 17); he believed they occurred in clays above that coal, but neither the matrix in which the specimens are preserved, nor White's field notes support that assertion. Darrah reports finding two small specimens of fossil conifer (*Lebachia*) in association with the callipterids. This is consistent with the interpretation of callipterid-rich floras as indicators of periods of seasonally dry climate.

Vik Skema and John Harper found and described a better exposure of the same section that includes the Nineveh coal horizon and a thin nonmarine limestone (Figures 5 and 6). The exposure is along Shough Creek Road, a secondary gravel road located ~1 mi (~1.6 km) southwest of White's Pleasant Hill Gap site, and similarly situated on the western slope of the same ridge. The limestone is at about the same elevation as that which White measured at Pleasant Hill Gap. Skema and Harper did not find callipterids.

REFERENCES

Darrah, W. C., 1969, A critical review of the Upper Pennsylvanian floras of eastern United States with notes on the Mazon Creek flora of Illinois: Privately printed, Gettysburg, PA, 220 p.

Darrah, W. C., 1975, Historical aspects of the Permian flora of Fontaine and White, *in* Barlow, J. A. and Burkhammer, S, eds., 1975, Proceedings of the First I. C. White Symposium, "The Age of the Dunkard": West Virginia Geological and Economic Survey, Morgantown, WV, p. 81-99.

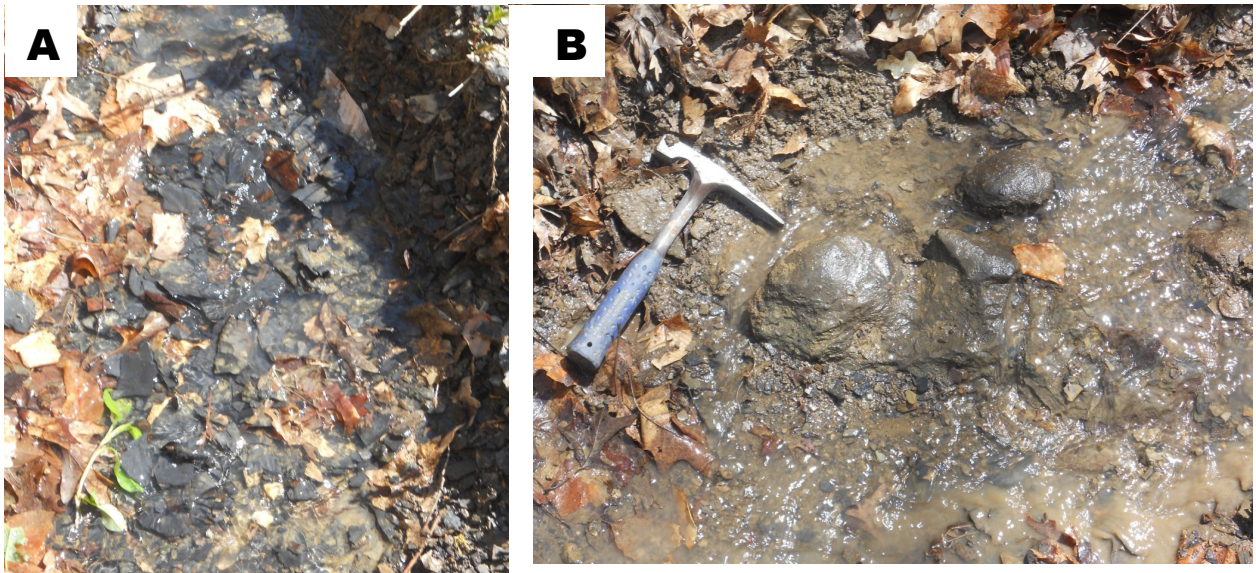

Figure 6. Photographs of the Nineveh horizon in the drainage ditch of Shough Creek Road, about 1 mi (1.6 km) SW of Pleasant Hill Gap. A—A carbonaceous clay shale at the horizon of the Nineveh coal. B—The Nineveh limestone.

White, D., 1936, Some features of the Early Permian flora of America: Proceedings of the 16th International Geological Congress (1933), v. 1, p. 679-689.