THE MISSISSIPPIAN-PENNSYLVANIAN CONTACT IN EASTERN KENTUCKY

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The contact between the basal Pennsylvanian rocks and underlying rocks at Stops 1, 11, and 12 and in most localities along the western belt of outcrop in eastern Kentucky is unconformable. At first glance, the contact at the southernmost roadcut at Stop 1 appears to be conformable, but if one follows the difference in lithologies (red and green shales, coals, gray to black shales, and sandstones) across all three sections of this large roadcut, the erosional nature of the contact can be seen (Fig. 25, Stop 1). At no point higher in the section (in the Breathitt Formation) are Pennington-type lithologies found at any of the stops. The interruption of sedimentation and erosion was caused by regional uplift or eustatic sea level change near the Mississippian-Pennsylvanian time boundary, and this affected sedimentation on the craton (especially on high areas. e.g.. along the Cincinnati Arch and the Waverly Arch). The Pennington is variably eroded and at some places is completely missing (Fig. 25). At Mt. Vernon (near milepost 61, Interstate Highway 75), a few miles north of Stop 1 (see Fig. 25), the Pennington is virtually absent, and paleoslumps of Pennsylvanian terrigenous clastics rest on the uppermost surface of the Newman Limestone (Dever and others, 1979; Hester and Brant, this volume). The slumping is very likely related to the very large and deep Livingston Channel, an ancient model of the Amazon or Brahmaputra Rivers, which cut scores of feet below sea level (Norman Hester, personal commun., 1981). In Rockcastle and Madison Counties, the large paleochannel cuts deeply into the Newman Limestone (Brown and Wixted, 1979a, 1979b). Evidence of deep erosion also occurs southwest of the stop near Somerset, Kentucky, at the old Colyer Quarry (Somerset Quadrangle, Carter coordinate location 20-H-59, 800 ft. FSL x 4,500 ft. FEL), where slumped Pennsylvanian rocks rest on limestone within the Newman Limestone equivalent (Hiram Smith, personal commun., 1980). An extensive channel-related paleoslump occurs at the Mississippian-Pennsylvanian contact in the Barthell Quadrangle, McCreary County, Kentucky *(see* Hester and Brant, this volume).

Further to the northeast in Carter County on the Wavery Arch of Ettensohn (1974) Pennsylvanian sediments rest unconformably on sediments as old as the Borden Formation, which occurs below the Newman Limestone (Sheppard, 1964). Pennsylvanian sediments also fill paleokarst in the Newman Limestone between milepost 35 and 36 on the Mountain Parkway near Slade, Kentucky (Weir, 1974), and at Stop 11 in the north half of eastern Kentucky.

Other than paleochannels such as these, the Pennington-Breathitt unconformity along the western belt of outcrop in eastern Kentucky is undulating. The unconformity is paraconformable in some places. However, only by tracing strata laterally does the nongradational and noninterfingering character of the two lithologies become apparent. Hematitic crust developed on the upper surface of the rocks overlain by Pennsylvanian strata, and the known missing section of the Pennington often indicate an unconformable contact. Along the western belt of Pennington outcrop, the preserved wedge of Pennington sediments increases in thickness to the south into Tennessee. Conformable contacts may be preserved in Tennessee (Milici, 1974). Conformable contacts are more likely to occur in a basin because subsidence is greater. Further basinward to the southeast, the Pennington Formation increases in thickness, and in extreme southeastern Kentucky Englund (1964) reported intertonguing of Pennington lithologies with Lee Formation (Pennsylvanian) sandstones.

The overall model of deposition of the Upper Mississippian and Lower Pennsylvanian in Kentucky still needs further study. McFarlan (1943) and other early workers characterized the Pennington Formation as uppermost Mississippian separated by a regional unconformity from the overlying Pennsylvanian Beattyville Shales (Lower Tongue of the Breathitt Formation) and Lee Formation, Englund (1964), in work done in extreme southeastern Kentucky, determined that there was lateral intertonguing between the Pennington Formation and Lee Formation. Horne and others (1971) developed a "Lee-Newman Barrier

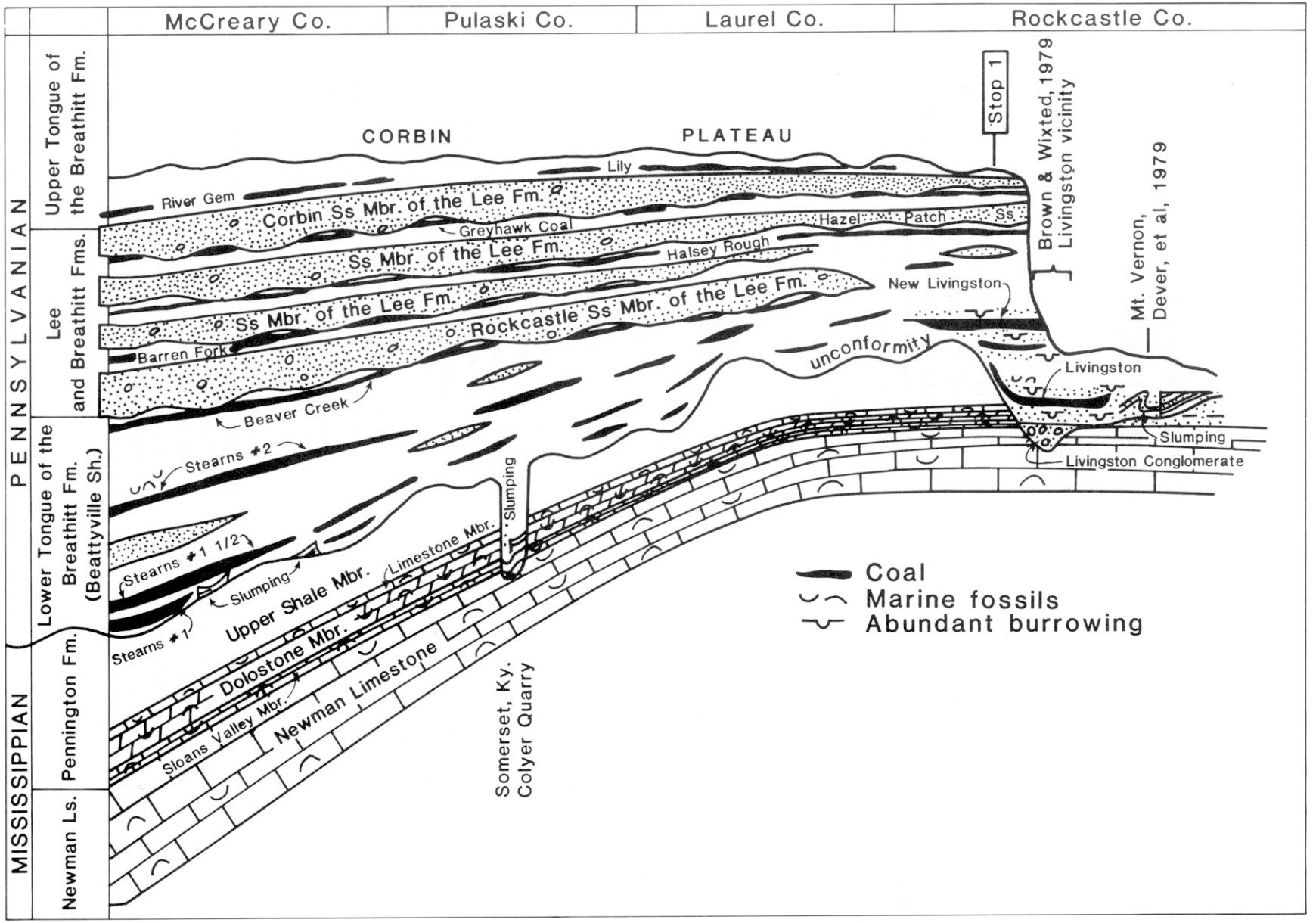

Figure 25. Generalized cross section from Stop 1 to Tennessee state line.

Shoreline Model" using an area in northeastern Kentucky as an example. They suggested that the Newman Limestone, the Pennington Formation, the Lee Formation, and the lower Breathitt Formation (the portion just above the Lee Formation in their study area) represented, respectively, carbonate barriers and carbonate-mud islands, off-shore clays, orthoquartzitic barrier sands, and tidal-flat clays and lagoonal sediments. They interpreted all of these formations to be lateral facies deposited at the same time. However, the assignment of different ages to these formations by biostratigraphic means and the occurrence of several widespread disconformities in the Upper Mississippian in north-central Kentucky and the regional unconformity near the Mississippian-Pennsylvanian boundary suggest that the "Lee-Newman Barrier Shoreline Model" may be incorrect (Ettensohn, 1980a. 1980b). Ettensohn characterized the Borden through the Breathitt Formation as being a series of tabular units representing several easterly and westerly transgressions and westerly clastic progradations. The last westerly progradation in latest Mississippian time began with deposition in east-central Kentucky of shallow distal prodelta clays of the Upper Shale Member of the Pennington Formation. In the cratonic area of eastern Kentucky a regional uplift (or eustatic sea level lowering) interrupted the westerly progradation near the Mississippian-Pennsylvanian boundary. (Further basinward in extreme southeastern Kentucky the unconformity may not be present, hence the intertonguing relationship between the upper Pennington and the Lee Formation reported by Englund. 1964.) Subsequent deposition following the tectonic uplift (or sea level lowering), resuming the westerly progradation, deposited the sediments represented by the Lower Tongue of the Breathitt and Lee Formations in east-central and south-central Kentucky. These sediments represent shallow-water deltaic environments including bays, mouth bars, channels, swamps, and marshes.

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