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THE BRENTWOOD LIMESTONE OF MADISON COUNTY, ARKANSAS

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INTRODUCTION

The Brentwood limestone, the lower limestone member of the Bloyd formation, is of lower Pennsylvanian age, and a part of the Morrow Group. It is exposed in a wide belt across South Central Madison County, trending generally in an east-west direction (Figure 1). Most of the outcrops are found on small hills on the northern edge of the Boston Mountains. The area included approximately 160 square miles.

GEOGRAPHY

The topography of the area varies from moderately rough to extremely rugged. Most of the hills are the outlying regions of the Boston Mountains, and are not as high as the Boston Mountains. The maximum relief in southern Madison County ranges from 800 to 900 feet.

BLOYD FORMATION

The Bloyd formation was named by A. H. Purdue (2) from Bloyd Mountain in Washington County, where it is well exposed. The Bloyd formation (Table I) consists of the Brentwood limestone member, the middle shale or "coal-bearing shale," which in some areas contains the Baldwin coal, the Kessler limestone, and the upper shale member. However, throughout Madison County, all of the beds above the Brentwood member are missing.

Brentwood limestone is the most persistent member of the Bloyd formation in Madison County. It occurs on the mountains on the north side of the Drakes Creek Fault in a belt trending generally east-west, and extending from the Washington County line to the vicinity of Kingston in eastern Madison County. In the vicinity of Kingston the Brentwood belt disappears and probably is absent to the east and north.

Thickness. The Brentwood member is characterized by a great variation in thickness. Sections measured within relatively small areas show great changes in thickness. One section near Aurora in Sect. 11, T. 15N., R. 26W., consists of 93 feet of Brentwood displayed in a massive bluff overlooking the highway. Only four miles to the northeast another section consists of only five feet of sandy limestone. In general, the thickness of the Brentwood member varies from 20 to 30 feet.

Lithology. The Brentwood consists of one, two, or three layers of calcitic limestone, interstratified with beds of shale. The limestone beds vary from lithographic to coarse crystalline.

A thin section study of some of the Brentwood shows an interesting grain size relationship. The limestone consists of three different sizes of grain. The larger grains are fossil fragments, measuring about 0.85 millimeters. Between the larger grains, occurring as interstitial material, numerous oolites measuring about 0.25 millimeters are found. These two types of grains are cemented by a very fine grained calcite. The crystals measure at most 0.067 millimeters. The smallest of these cementing grains was 0.0071 millimeters, and the average size was 0.026 millimeters.

In places the Brentwood is oolitic. Some of the oolites are elongated and appear to have formed around a nucleus of bryozoan branches. These oolites are microscopic in size.

The limestone is predominantly blue-gray, but the color is often variable. In some places it is light red, while in others it is light gray.

Sedimentation. The beds of the Brentwood were deposited during Bloyd time in a synclinal basin. Apparently they were deposited on a sea floor that was moving alternately up and down, as evidenced by the thin beds of alternating limestones and shales. The lower shale was formed by the deposition of much mud on a slowly subsiding sea floor, after which the sea became free from muddy sedi-

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ments and elements of marine life were deposited to form the limestone, most of the limestone seems to have as its origin the piling up of remains of the marine organisms.

Ripple marks and cross bedding found at various places suggest that the deposition of some of the Brentwood beds occurred in shallow water.

An angular unconformity above the Bloyd indicates that the land was uplifted at the end of Bloyd time and the surface was eroded before the deposition of the Atoka formation. During this erosion, the upper part of the formation was removed in many places, leaving only the Brentwood. In places the entire formation was removed, or never was deposited, and the Atoka formation was deposited on the Hale formation. Before deposition of the Atoka, the Bloyd beds were tilted, forming a conspicuous angular unconformity.

The general direction of thinning of the Brentwood in Madison County is to the northeast. Near the Madison-Newton County line it is very thin and is probably absent over a large area east of this line. This suggests two possibilities: (1) That the Brentwood first was deposited and later removed by erosion in this area, or (2) that the Brentwood never was deposited in that area, which may represent an ancient land mass present during the time of deposition of the Brentwood. Some field evidence has been found that supports the second possibility to a certain extent. In the area south and east around Huntsville, very near where the Brentwood seems to disappear, many sandy phases of the limestone are found, including pure sandstone channels in the limestone. These suggest the possibility that an ancient shoreline is represented here, with the land mass lying to the north and east of Huntsville.

Weathering. Normally the Brentwood weathers to a smooth, rounded surface. Two exceptions to this weathering were observed during field work. In the first, the lower bed of limestone, which is sandy, has weathered to a distinct honey-combed pattern. The other exception was noted in the lower bed of limestone at another location, where the limestone has weathered out into small squares of about two inches each.

A weathered surface of the Brentwood limestone generally shows many fossils which form small protrusions above the smooth surface of the rock. The more fossiliferous a given bed is, the rougher the surface will be. The smoother surfaces normally are restricted to the non-fossiliferous zones of the limestone.

Stratigraphic Relations. In previous reports the Brentwood member of the Bloyd formation has been considered to rest conformably upon the underlying Hale formation. However, during the present investigation, certain field evidence suggests that there may be no justification for placing a formational break between the Brentwood and the Hale. The faunas of the two formations are very similar, each having both Mississippian and Pennsylvanian forms. In fact, the Brentwood limestone, which is younger than the Hale, has more definitely Mississippian forms than does the older Hale formation (1).

In several places, the upper sandstone bed of the Hale grades vertically upward into the lower limestone bed of the Brentwood without a sharp lithologic break. One of the most striking examples of this was observed near Aurora, in the SE $\frac{1}{4}$ Sect. 11, T. 15N., R. 27W. The outcrop is an excellent example of large bluffs formed by the Brentwood. This is also one of the greatest known thicknesses of the Brentwood in Madison County--93 feet. The top of the Hale is encountered at the level of the highway at the foot of the bluff. The Hale at road level is a brown, almost pure sandstone. But only a few feet higher it becomes limy, and passes on into the Brentwood through a gradational zone of about 10 feet. The transition is so smooth that a break could not be found.

During the field work which is the basis for this report, several other instances were found which suggest the gradational conditions between the Brentwood and the Hale. Out of the 25 sections measured, eight of them contained evidence suggesting such conditions. South of the outcrop mentioned above, a section was measured in Sect. 14, T. 15N., R. 26W., that shows the gradational zone at the bottom of the lower limestone. Above this there is 11 feet of fossiliferous, bluish-gray, medium grained limestone, without arenaceous characteristics. But, above this there is 16.5 feet of sandstone with two thin limy zones about one-third and two-thirds of the way up, respectively. This bed is in places nearly pure sandstone, and does not appear to be calcareous at these places. On top of

this bed is two feet of very arenaceous limestone, and above that, approximately two feet of almost pure limestone. This section is unique in that it was the only section observed during the field work that contained beds of pure sandstone between the normal limestone beds of the Brentwood. It is possible that this may represent an ancient channel.

REFERENCES

1. Croneis, Carey. "Geology of the Arkansas Paleozoic Area," *Arkansas Geological Survey Bulletin 3* (1930).
2. Purdue, A. H. *U.S.G.S. Geological Atlas 154 Winslow Folio.*

System	Series	Group	Formations & Members
Carboniferous	Pennsylvanian	Pottsville ----- Morrow	Atoka Formation
			Blloyd Formation
			Kessler L.S. Member Brentwood L.S. Member
			Hale Formation
			Pitkin Formation
	Mississippian	Chester	Foyetteville Fm. Wedington S.S. Member
			Batesville Formation Hindsville L.S. Member
			Osage - Kinderhook
			Boone Formation St. Joe L.S. Member

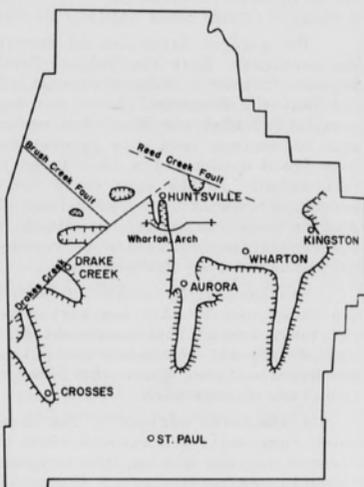


Table 1, Classification of the Rocks Exposed in Southern Madison County

Figure 1, Area of Outcrop of the Brentwood Limestone in Madison County