

University of Kentucky
College of Arts and Sciences

KENTUCKY GEOLOGICAL SURVEY
Lexington

In Cooperation With

AGRICULTURAL AND INDUSTRIAL
DEVELOPMENT BOARD OF KENTUCKY
Frankfort

SERIES IX

BULLETIN — NO. 11

Devonian and Lower Mississippian
Chert Formations of Western Kentucky

By

Eugene M. Luttrell and Ann Livesay



Printed by the Authority of the State of Kentucky

LEXINGTON, KENTUCKY

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ARTHUR C. McFARLAN, Director

DANIEL J. JONES, State Geologist

AGRICULTURAL AND INDUSTRIAL
DEVELOPMENT BOARD OF KENTUCKY

GEORGE W. HUBLEY, JR., Executive Director

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LETTER OF TRANSMITTAL

June 6, 1952

Dean M. M. White
College of Arts and Sciences
University of Kentucky

Dear Dean White:

The Kentucky Geological Survey is publishing Bulletin No. 11 by Eugene M. Luttrell and Ann Livesay dealing with "Devonian and Lower Mississippian Chert Formations of Western Kentucky." This is a contribution to Paleozoic stratigraphy in the western edge of the Purchase region. It is essential to the understanding of what underlies the blanket of Cretaceous and Tertiary sediments of that area and is to be tied in with subsurface data from drilled wells. See Kentucky Geological Survey Bulletin No. 6.

Respectfully submitted,

ARTHUR C. McFARLAN
Director

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INTRODUCTION

White and gray chert exposed along and near Kentucky Lake in the vicinity of Eggner's Ferry, near Aurora, Kentucky (fig. 1), was shown as undifferentiated Meramec on the geologic map of Kentucky (1929); as the St. Louis member of the Meramec on the Marshall County (1930) and Calloway County geologic maps (1929 by Roberts and Meacham); and was mapped as Fort Payne (Osage) by the Tennessee Valley Authority. (See correlation chart adapted from Cooper, 1942, and Weller, 1948.) Freeman (1950, p. 25) identified this chert as the Camden or Clear Creek (Devonian), which in its weathered and bleached state it closely resembles. However, it contains *Productus* and *Spiriferina* which are of Mississippian age. In this report the chert will be referred to as "Eggner's Ferry" chert since it is exposed near Eggner's Ferry. Traced northeast along the lake the sequence "Eggner's Ferry" chert, Warsaw, and St. Louis with *Lithostrotion proliferum* can be followed for about 5 miles. This sequence, the fossils, and the presence of the Chattanooga black shale near Aurora in a test core hole by the Tennessee Valley Authority (1949, p. 107) at an elevation of 47 feet, indicate that the "Eggner's Ferry" chert is of Fort Payne age.

Camden chert has been identified, however, in a narrow north-eastward trending fault block a quarter of a mile long, 0.4 of a mile south of Little Bear Creek on the west side of the lake, and 4½ miles above Kentucky Dam. This is the only known exposure of Camden chert in Kentucky. Chert carrying a Jeffersonville fauna overlies this Camden and is the first known occurrence in outcrop of the Jeffersonville in this part of the state. Similar fossils have been reported locally from the Pegram of Tennessee by Peoples (1931, p. 431-439).

	Kentucky	Illinois-Missouri	Tennessee
Mississippian	St. Louis ls.		
	Warsaw ls.		
	Fort Payne ls.		
	New Albany sh.		Chattanooga sh.
Devonian	Sellersburg ls.		
		Grand Tower ls.	Pegram ls.
	Jeffersonville ls.		
	Camden chert	Dutch Creek ss. Clear Creek chert	Camden chert
			Harriman chert

The writers wish to express their appreciation to A. C. McFarlan and William R. Brown, Department of Geology, University of Kentucky, for their advice and assistance in the field and in the preparation of this paper.

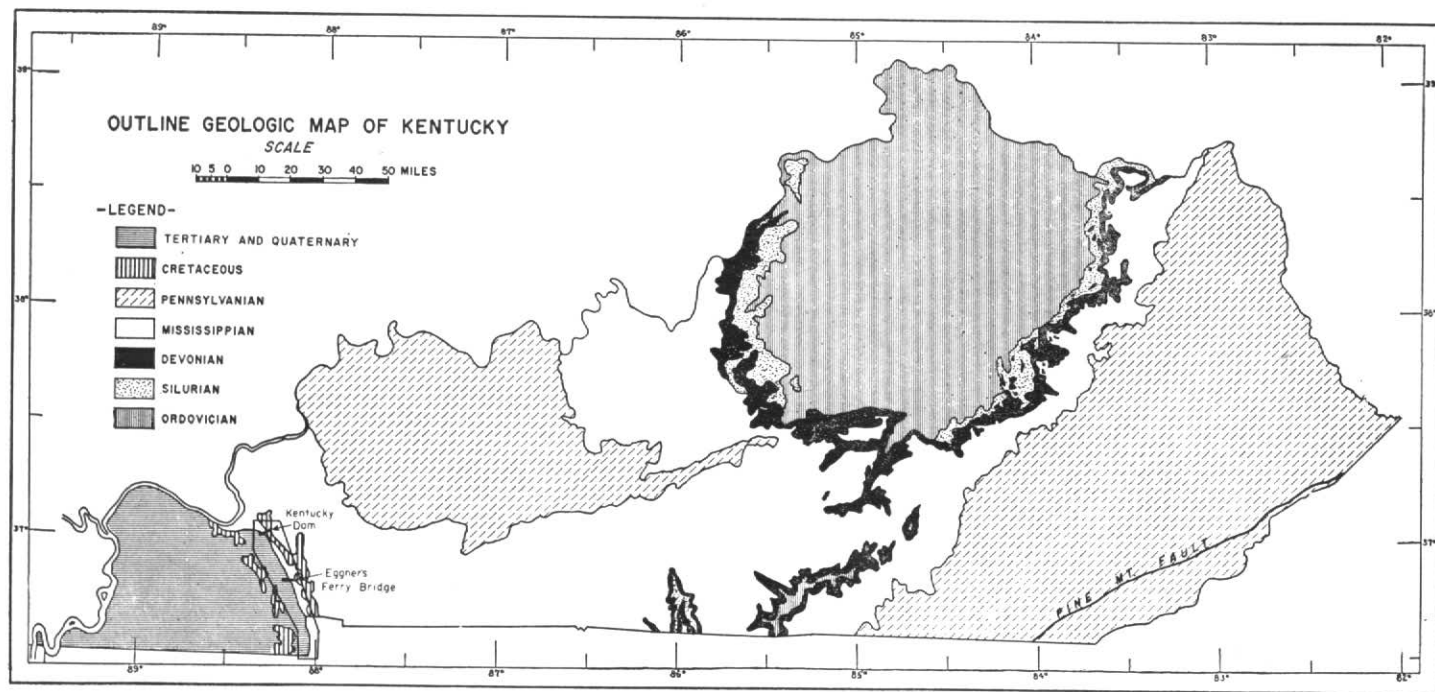


Figure 1

DEVONIAN

The Devonian formations are nowhere widely exposed in western Kentucky. The only information on their character and thickness, therefore, comes from outcrop in adjoining states and from a few drill holes. Freeman (1951) recognized both Camden and Jeffersonville in the subsurface. In three wells near this area she recognizes the following thicknesses of Devonian formations.

Ada Belle Oil Company No. 2A Hillman, 25-F-18, Trigg County,
17 miles southeast of Little Bear Creek.

85 feet of New Albany
20 feet of Jeffersonville
417 feet of Clear Creek (Camden)

Adams Oil and Gas Company No. 1 William Adlich, 25-D-14,
Marshall County, 16 miles southwest of Little Bear Creek.

Clear Creek-Bailey was encountered immediately
beneath the Cretaceous.

W. B. Phillips No. 1 J. H. Dunn, 18-H-14, Livingston County,
12 miles northwest of Little Bear Creek.

99 feet of Jeffersonville
325+ feet of Clear Creek. The lack of samples from the
lower part of the hole made it impossible to determine the
exact thickness.

CAMDEN AND PEGRAM FORMATIONS OF TENNESSEE:

In Tennessee the Camden is typically a white to buff novaculitic chert with thin partings of white clay (Wilson, 1949, p. 310-315). It is highly fossiliferous and is differentiated from the Harriman chert below only on the basis of fossils. The Camden is less commonly seen as a thin- to medium-bedded limestone with nodules and bands of chert. This thin-bedded limestone is regarded as the parent rock from which the much more common chert phase was formed by leaching. A maximum exposed thickness of 164 feet has been reported by Dunbar (1919).

The Pegram is a massive crystalline limestone with some associated sandstone and chert with a thickness up to 30 feet. Peoples (1931, p. 431-439) and Pohl (1930, p. 195-196) correlated the upper beds with the Sellersburg and the lower part with the Jeffersonville and proposed that the use of the name Pegram be discontinued. Cooper and Warthin (1942, p. 1775) questioned their identification of the Jeffersonville.

CLEAR CREEK AND GRAND TOWER FORMATIONS OF ILLINOIS AND MISSOURI:

The middle Devonian of Illinois includes 300 feet of Clear Creek chert and 126 feet of Grand Tower limestone, separated by about 35 feet of Dutch Creek sandstone according to Savage (1925, p. 550-558). Weller (1940, p. 14) says the Clear Creek is a fossiliferous novaculitic chert with fine-grained siliceous limestone present locally. The Dutch Creek is a fossiliferous, massive sandstone composed of rounded grains of the St. Peter type. It grades upward into the Grand Tower which is a fossiliferous, light- to dark-gray, granular to finely crystalline, more or less thick-bedded limestone. The chert present is confined to the uppermost strata.

According to Weller and St. Clair (1928) the upper part of the Grand Tower in Missouri is a white, thinly bedded, finely crystalline marble. In some beds grains of quartz sand are scattered more or less regularly throughout the limestone matrix. Weller and St. Clair (1928) correlate the Grand Tower of Missouri with the Jeffersonville of Indiana.

CAMDEN AND JEFFERSONVILLE FORMATIONS OF WESTERN KENTUCKY:

The Camden (Clear Creek) chert is recognized in western Kentucky in one exposure along the west side of Kentucky Lake 0.4 of a mile south of Little Bear Creek and $4\frac{1}{2}$ miles south of Kentucky Dam (see inset fig. 2; and pl. 1, figs. 1 and 2). It is exposed 8 feet above lake level (355 feet elevation) in a southwestward trending belt 30 to 40 feet wide and approximately a quarter of a mile long. On the northwest it is faulted against the Fort Payne. The strike of the fault is N. 45° E. and the dip of the Camden is 30° SE. Some of it is bedded and in place, but usually it is represented by large, angular chert fragments along the beach. To the south it is overlain by the Jeffersonville, possibly the New Albany black shale, and the Fort Payne (Mississippian) chert.

Individual beds in the Camden are from 6 inches to one foot thick. Most of the chert is deeply weathered and stained brown. Some is honeycombed, pitted, and strongly jointed at right angles to the bedding. On freshly broken surfaces the chert is light gray to white, has a sugary texture, and includes small grains of quartz. Fossils, particularly *Spirifer*¹ and *Amphigenia curta* are very plentiful. The following is a list of Camden fauna.

¹ No attempt is made to separate *Spirifer* into the many genera now recognized.

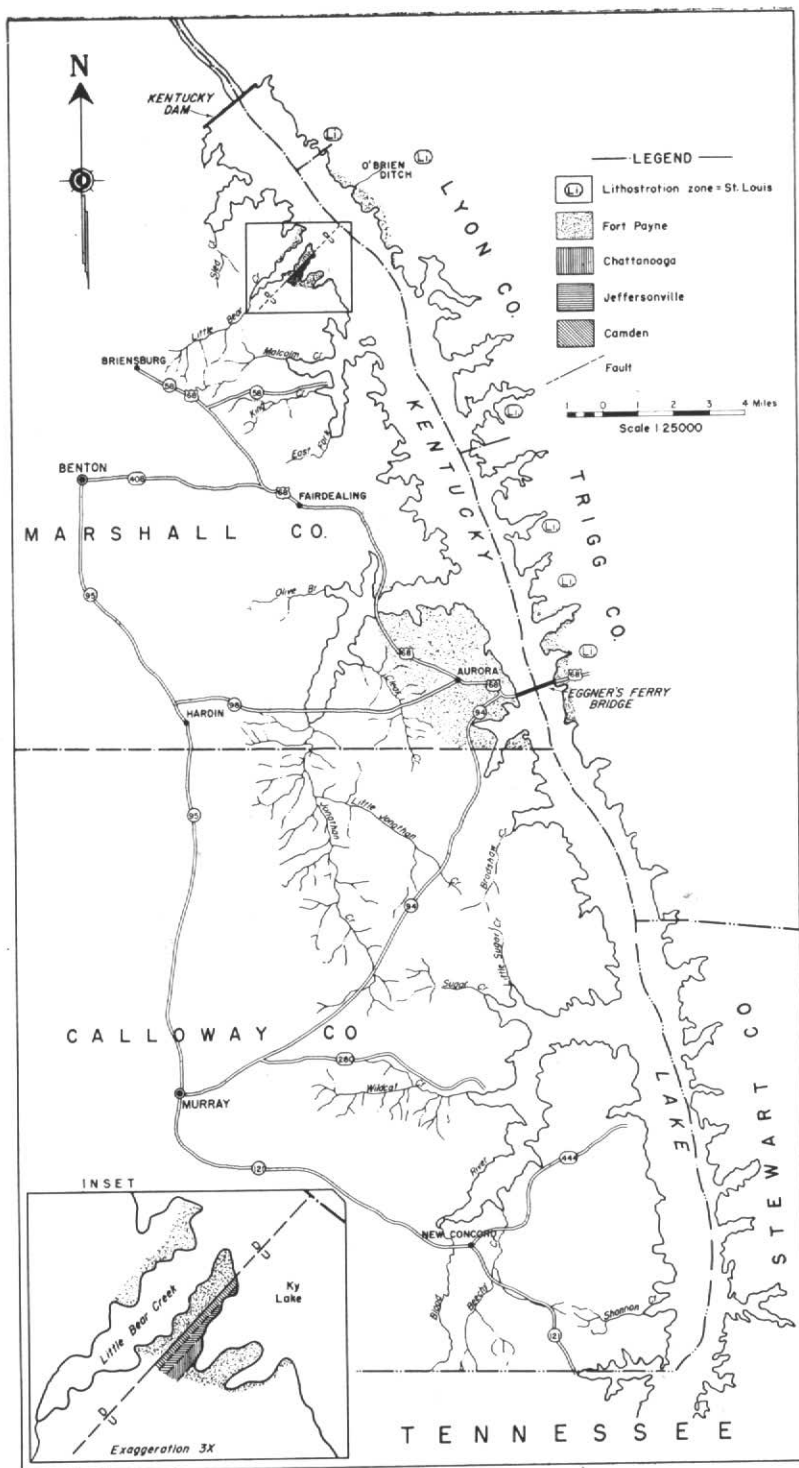


Figure 2

Amphigenia curta (c)
Anoplia nucleata
Chonostrophia reversa
Leptaena rhomboidalis (c)
Schuchertella pandora
Spirifer hemicyclus (c)
Spirifer worthenanus (c)
Stropheodonta perplana

Large angular fragments of loose chert up to one foot in diameter, lying along the beach southwest of the Camden outcrop, have been identified as Jeffersonville (see inset fig. 2; and pl. 2, fig. 1). This chert is exposed for 500 yards along the beach being partly covered by the lake to the south and by colluvial loess and loam to the north. The chert is dense, brittle, medium gray to brownish-gray, weathered and stained. Fossil corals and their external molds are common and include *Cystiphyllum*, *Favosites*, and *Eridophyllum*. *Leptaena rhomboidalis* is common and *Megastrophia hemisphaerica* and *Nucleocrinus verneuili* are diagnostic. Below is a list of Jeffersonville fauna.²

Brachiopods

Camarotoechia tethys
Leptaena rhomboidalis
Parazyga hirsuta
Productella semiglobosa
Spirifer acuminatus
Spirifer arctisegmentum
Spirifer divaricatus
Spirifer fornacula
Spirifer segmentum
Spirifer varicosus
Megastrophia hemisphaerica

Corals

Aulacophyllum?
Cystiphyllum sp. (c)
Dendropora sp.
Eridophyllum arundinaceum (c)
Favosites limitaris (c)
Favosites mundus (c)
Heliophyllum sp.
Zaphrentis?

Bryozoa

Fenestella sp.
Hemitrypa cribosa
Polypora sp.

Trilobites

Proetus crassimarginatus
Proetus microgemma

Blastoids

Nucleocrinus verneuili

² Op. cit.

MISSISSIPPIAN

FORT PAYNE FORMATION:

Rocks of Fort Payne age outcrop along and near Kentucky Lake from just south of Blood River, northward to within 3 miles of Kentucky Dam (fig. 2; and pl. 2, fig. 2). In its northward exposure it consists of interlayered limestone and black chert. To the south in the vicinity of Eggner's Ferry all limestone has been leached from the formation and only residual bleached chert remains. A Tennessee Valley Authority drill hole at Kentucky Dam shows 515 feet of Fort Payne. The thickness of the leached section at Eggner's Ferry is only 300 feet.

About 40 feet of interlayered limestone and chert are particularly well exposed on the east side of the lake, in the vicinity of O'Brien Ditch, $3\frac{1}{2}$ miles south of Kentucky Dam (fig. 2; and pl. 3, fig. 1). Here, chert makes up 30 to 40 percent of the rock and occurs interbedded with the limestone and as elongated lenses within it.

It is generally a nonfossiliferous dark blue-gray limestone with weathering bringing out a fine lamination. The chert is dark blue to black, and has a characteristic fine banding which parallels the bedding, but in the nodules is concentric. Weathering bleaches the chert from gray to white and the lamination is retained or even accentuated.

Elongated oval fragments up to 2 feet long of bleached, light-gray to white chert is exposed at Eggner's Ferry in beds from a few inches to a foot in thickness. In less weathered exposures, as in the small creek behind Union Ridge Church near Johnathan Creek, individual beds are separated by an inch or more of light-gray to white clay residue from the limestone. The chert is badly fractured with joint planes more or less at right angles to the bedding, and retains the fine banding or lamination characteristic of this chert. Occasional pieces have a darker center which has not been completely bleached. The crumpled appearance of these beds with their many minor dips is thought to be the result of sagging and compaction from the solution of the limestone.

Lithostrotion proliferum from the St. Louis is found on the higher hills on the east side of the lake near Eggner's Ferry. The Fort Payne is poorly represented by fossils but a few specimens have been found on U. S. Highway 68, at the west end of Eggner's Ferry Bridge, at the entrance to Kentucky Lake State Park (fig. 2; and pl. 3, fig. 2). These include several specimens of a large unidentified *Productus* and half a dozen specimens of *Spiriferina* indicating a Mississippian age. In addi-

tion, this same white chert may be traced about 5 miles to the north along the east side of the lake and into tributary valleys beneath porous, fossiliferous Warsaw chert overlain by a cap of residual *Lithostrotion*-bearing chert. A drill hole near Aurora, Kentucky, by the Tennessee Valley Authority (1949) encountered the New Albany black shale at an elevation of 47 feet. The stratigraphic position of the white "Eggner's Ferry" chert is thus established as being above the New Albany black shale and below the Warsaw chert and, therefore, of Fort Payne age.



Plate 1

Figures 1 and 2. Camden chert, 4.5 miles above Kentucky Dam and 0.4 of a mile south of Little Bear Creek on Kentucky Lake, Marshall County.



Plate 2

Figure 1. Jeffersonville formation, small bay immediately south of Little Bear Creek, Kentucky Lake.

Figure 2. Bedded Fort Payne Chert, 0.1 of a mile south of U. S. Highway 68 on the north bank of Cool Creek, Marshall County.

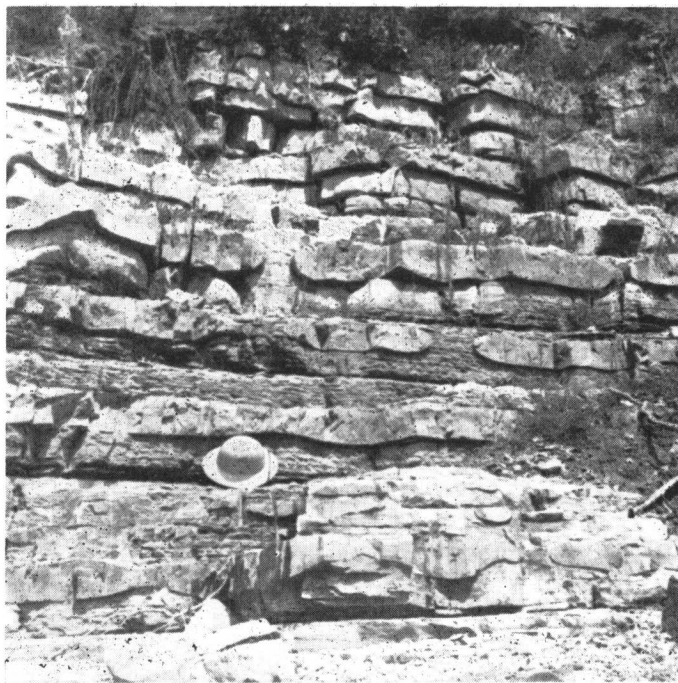


Plate 3

Figure 1. Fort Payne limestone and black chert sequence, north of O'Brien Ditch on Kentucky Lake, Lyon County.

Figure 2. Fort Payne chert on U. S. Highway 68 at entrance to Kentucky Lake State Park.

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