KEY BEDS OF THE PENNSYLVANIAN SECTION OF EASTERN VERMILION COUNTY, ILLINOIS, AND VERMILLION, WARREN, AND FOUNTAIN COUNTIES, INDIANA

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INTRODUCTION

The area in which the investigations leading to this discussion were carried out includes eastern Vermilion County, Illinois, northern Vermillion County, Indiana, and most of Warren and Fountain counties, Indiana. The strata that crop out in Illinois are included in the Caseyville, Tradewater, and Carbondale groups of Pennsylvanian age, except that the Sparland cyclothem is at the base of the McLeansboro group. In Indiana they are referred to the Mansfield, Bra-

Correlation between outcrops has been difficult at some places because of rapid lateral variations in thickness and lithology of many of the coals, shales, and sandstones. The limestones have proved to be the most important key beds even though some of them are absent or very thin at some places.

No attempt has been made to map this area owing to the lack of topographic base maps over most of the area and the scattered outcrops of bedrock.

Zones that are of value for correlation purposes in this area are numbered on the columnar section and are discussed by number beginning with the highest stratigraphic stratum.

DESCRIPTION OF KEY BEDS

1. The shale above the Danville (No. 7) coal is a thick- to thin-bedded gray shale which at places contains small ironstone concretions. It is 40 to 50 feet thick and persistent enough to be used for correlation purposes. It crops out on Vermilion River west of Danville, Illinois, and on Little Vermilion River west of Georgetown, Illinois.

2. The shale that lies above coal 5a is soft and brownish. It contains many large ironstone concretions and beds of ironstone in the lower part, some of which contain *Leaia tricarinata*. This shale crops out only on Little Vermilion River southeast of Georgetown and is nearly 70 feet thick.

3. The St. David limestone overlies the Grape Creek coal. It is a fine-grained gray limestone that at places becomes mostly shale. It is characterized by *Mesolobus mesolobus var. euampygus* and in the "Double Horseshoe" region contains many *Marginifera muricatina* along bedding-planes. The thickness ranges up to 4 feet.

The limestone is well exposed in numerous outcrops in the south part of Danville, Illinois, and down Vermilion River to sec. 21, a little north of Grape Creek, Illinois. It is not present again until Little Vermilion River is reached in sec. 11, T. 17 N., R. 11 W. It is well exposed at several places in the "Double Horseshoe" region. The discontinuity of the limestone in the Grape Creek area is due to post-St. David erosion during which a channel sand was deposited that cut out everything above the Grape Creek coal. This sand could be the basal member of the Brereton cyclothem, but probably is of Sparland age.

4. Zone 4 contains the marine members of the Double Horseshoe cyclothem. It is composed of two limestones in this area, both of which are thin and discontinuous. The upper bed is a limestone conglomerate which has a light gray limestone matrix and contains black pebbles of varying sizes and roundness. The maximum thickness is 6 inches, and at many places limestone nodules mark its position. This bed resembles the Covel conglomerate and has been correlated with it.

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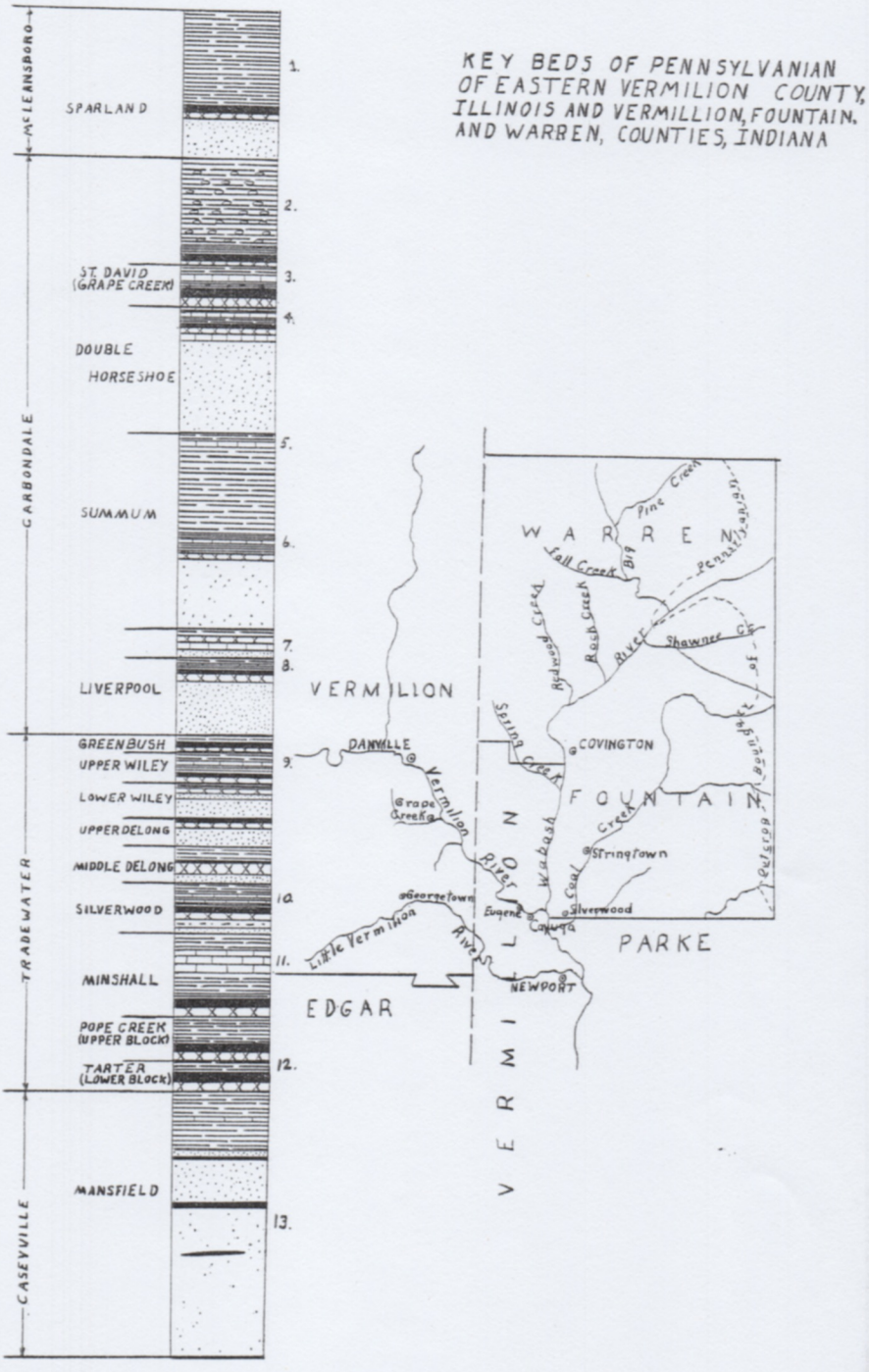

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also well developed in the "Double Horseshoe" region in the SE. ¼ sec. 19, T. 17 N., R. 10 W where the Double Horseshoe coal has been stripped and in the SE. ¼ NW ¼ sec. 32, T. 17 N., R. 10 W At other places in Danville, as along Little Vermilion River in sec. 11, T. 17 N., R. 11 W where the No. 5a coal is being stripped, this member becomes nodular.

At two localities nodules of this limestone containing numerous crinoid stems have been seen. These outcrops are near Grape Creek in the NW¼ sec. 27, T. 19 N., R. 11 W and in the SW ¼ sec. 14, T. 18 N., R 11 W

5. Zone 5 is a 4-foot limestone which occupies the position of the Hanover limestone of western Illinois. It is well developed only in the SE. ¼ NW ¼ sec. 32, T. 17 N., R. 10 W and in the immediate neighborhood. It is medium-grained, gray, and slightly fossiliferous.

6. Zone 6 is the black shale and black limestone that marks the position of Illinois No. 4 and Indiana IVa coal. The limestone averages 1 foot in thickness. It is a hard carbonaceous limestone that contains plant fossils at Whites' Mill. It commonly lies above about 3 feet of hard sheety black shale, but along Vermilion River a little south of Grape Creek, Illinois, it lies in the middle of about 6 feet of black shale.

This bed is one of the most widespread and easily recognized of all the key beds. It crops out at White's Mill in the NW. ¼ sec. 31, T. 17 N., R. 10 W. on Little Vermilion River and on Vermilion River from a point about two miles west of Eugene, Indiana, upstream nearly to Grape Creek, Illinois. According to the record of a diamond-drill core put down by the Western Brick Company it occurs at a depth of 140 feet in sec. 12, T. 19 N., R. 11 W.

7. In a rudmentary cyclothem below the Summum and above the Liverpool cyclothems occurs a 4-foot fresh-water limestone. It is light gray and fine- to medium-grained. It occurs in two benches both of which contain numerous fresh-water ostrocods. The upper bench is lighter in color, finer grained, and more fossiliferous than the lower.

This limestone is well exposed about two miles west of Eugene, Indiana, in the SW ¼ sec. 5, T. 17 N., R. 10 W.; the lower bench crops out across Vermilion River in the SE. ¼ NE. ¼ sec. 32, T. 18 N., R. 10 W

8. Zone 8 is the Oak Grove shale member of the Liverpool cyclothem. It is well exposed in the SW. ¼ NW. ¼ sec. 28, T. 18 N., R. 10 W. and on the road leading west from Eugene, Indiana.

It consists of 5 feet of dark shale with several concretionary bands of fossiliferous limestone. At the base of the shale is a 6-inch dark blue fossiliferous limestone that shows cone-in-cone structure. This limestone is represented by large concretions to the south in Indiana.

9. Zone 9 is the limestone member of the Upper Wiley cyclothem. It is well exposed in a ravine southeast of Newport, Indiana, the SE. ¼ NW. ¼ sec. 36, T. 17 N., R. 9 W., and about 100 feet downstream from the bridge at Eugene, Indiana. It is a black limestone with many white specks due to minute gastropods. It averages about 4 inches in thickness.

10. The name Silverwood is here applied to the cyclothem in which Indiana coal II is developed. This name is used because of the fine development of the marine member of the cyclothem around the town of Silverwood in southeastern Fountain County.

This member is a dark shale, 6 feet thick where it attains its maximum thickness. Near the base occur two thin limestones. The upper is 2 inches thick, dark blue, fossiliferous, and has cone-in-cone structure very well developed. Eight inches below is a 4-inch dark gray limestone. This cyclothem is well exposed on Coal Creek just north of route 234 in the NE. ¼ SW. ¼ sec. 36, T. 18 N., R. 8 W.

11. The Minshall limestone is the most persistent bed of the Pennsylvanian strata of Fountain and Warren counties. It rests at places directly upon the Minshall coal but at others has dark shale above and below. On Redwood and Rock creeks in southern Warren County it is very close to the Mansfield sandstone. In this area there is a thin limestone a few feet below the Minshall limestone.

The Minshall limestone averages about 4 feet in thickness. Its maximum thickness is found on Wabash Mill Creek in sec. 28, T. 18 N., R. 8 W., where it is 10 to 12 feet thick. It is hard, blue, fossiliferous, and sometimes cherty. It shows a well developed set of joints in this area and to the south in Parke County. Along

Redwood Creek in Warren County these joints strike at 18 degrees and 115 degrees from magnetic north. The limestone at this locality carries a silicified fauna that is abundant in gastropods, bryozoa, and many other types of fossils.

12. Zone 12 includes the Upper and Lower Block coals of Indiana which are tentatively correlated with the coals of the Pope Creek and Tarter cyclothems respectively. These two coals are extensively mined to the south around Brazil, Indiana, in northern Clay County. In the area under discussion their development is spotty. One or possibly both reach a thickness of 3 feet near Stringtown, Indiana, in sec. 1, T. 18 N., R. 9 W. North and east of Stringtown the Minshall limestone overlaps the Block coals. It is possible that thin coals locally developed near the top of what is called Mansfield sandstone are of the same age as the Block coals.

13. The basal part of the Pennsylvanian strata in this area is marked by a standstone and shale succession which averages about 150 feet in thickness. The sandstone varies from fine-grained in the upper part to medium-grained near the base. A thin limestone is present in Warren County, near the mouth of Fall Creek where it flows into Big Pine Creek in the NW. ¼ SE. ¼ sec. 22, T. 22 N., R. 8 W. At least three coals are found in the sandstone and may be equivalent to those found at other localities in the Mansfield sandstone. A coal, reported to be 16 inches thick, has been mined on Spring Creek in northern Vermillion County in the SE. ¼ SW. ¼ sec. 10, T. 19 N., R. 9 W. Twenty feet above this coal is a 7-inch bony coal. These coals may be, as stated, the Block coals found farther south. A lens of coal 6 inches thick was seen on Shawnee Creek in northern Fountain County.