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Upper Pennsylvanian Section in Western Adams County, Iowa

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UPPER PENNSYLVANIAN SECTION IN WESTERN ADAMS COUNTY, IOWA[1]

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Preparation of a report by the writer on the "Geology of Adams County" for the Iowa Geological Survey has required a more complete field study of coal mine shaft sections and natural exposures in the west part of the county than had hitherto been made. This field study has brought out interesting details of the beds above the Nodaway coal seam not reported in previous literature. The purpose of this paper is to present the section observed.

The Nodaway coal and associated bottom rock (Coal Creek) and caprock (Howard) are exposed naturally at a few points along Middle Nodaway River near and above the town of Carbon, but are better known in the numerous coal mines in the western tier of townships of Adams County. The Coal Creek is a gray to dark gray limestone, commonly three or four feet thick, partly fossiliferous, and in the upper part more shaly and irregularly bedded. It is separated from the coal by an underclay two to five feet thick. Above the coal is a dark gray to black fissile shale, including and locally replaced by a lenticular and irregularly bedded shaly limestone locally known as "bastard." This zone varies in thickness from zero to a maximum of four feet, the higher figure representing the "bastard" phase. Silicified fragments of various Pennsylvanian woods, some a foot or more in length, are found in this bed, or at its contact with the underlying coal. The caprock is one and a half to two feet thick, gray in color, and hard and strong except at the base where it grades to the underlying shale or shaly limestone.

Coal mine shafts show thicknesses up to 106 feet (south of center Section 9, Douglas Township) of gray to dark gray shale above the caprock. A characteristic reported at a number of shafts is the presence in the upper beds of this shale of septarian concretions from a few inches to a foot in diameter. These are reported to be found usually at or near the top of the shale and at various distances above the coal in the various mines, thus indicatting that they may be a product of secondary infiltration arrested

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at the shale surface, rather than a primary layer at a definite stratigraphic horizon. It is possible that they occurred originally in the upper members of the shale, and during erosion and weathering in preglacial times became concentrated on its surface, just as gravel and pebbles wash out of glacial till at present and are left concentrated on the surface by currents of water too weak to carry them away. This latter explanation is more nearly in agreement with their occurrence in the Missouri and Nebraska sections of this formation at certain definite stratigraphic levels.

A thick bed of shale with septarian concretions is well known at this horizon in the parts of Missouri and Nebraska nearest to southwestern Iowa. It has been called the White Cloud in recent reports by the geological surveys of those states. Overlying it is a thin shaly fossiliferous limestone known as the Happy Hollow and above that another shale known as the Cedarvale. The White Cloud-Happy Hollow-Cedarvale horizon is equivalent to the Scranton of earlier reports by the Iowa Survey. A Happy Hollow limestone has not been definitely recognized in the Adams County section, though it may be present. The thick shale in the mine shafts here is therefore given the name White Cloud, at the same time recognizing the possibility that it may be White Cloud-Cedarvale. Whatever terms are used, the fact remains that there is above the Nodaway caprock a bed of not less than 105 feet of shale without any limestones of importance or any other key beds by which it can be readily subdivided.

The White Cloud apparently occupies a large part of the western tier of townships of Adams County, though to the east only the lower portion is present. Natural exposures are confined almost entirely to Douglas Township and the northwest quarter of Nodaway Township. In these areas the presence of a capping of the Cretaceous sands and clays seems to have protected the Pennsylvanian beds from the severe preglacial erosion which they suffered farther east, and they appear therefore well up in the present drainage, frequently under a rather thin covering of glacial drift and loess. Natural sections with vertical range up to 50 feet are known.

A section stratigraphically higher is exposed in gullies in $SE\frac{1}{4}$ Section 31, Douglas Township, Adams County, and $N\frac{1}{2}$ Section 36 and $S\frac{1}{2}$ Section 25, Washington Township, Montgomery County, as follows:

NUMBER	DESCRIPTION	FEET
12	Limestone, shaly, or calcareous shale, drab to dark gray, rather thinly bedded, with abundant segments of crinoid stems, spines of *Archeocidaris* and productids, fenestellid and rhomboporoid bryozoa, a few fusilinids, and one layer with many large specimens of *Dictyoclostus americanus*.	5
11	Shale, siltstone, and sandstone, drab to dark gray. The lower 15 feet is darker colored and argillaceous, and locally includes small carbonized and pyritized wood fragments. Upper beds are silty to sandy, and include some lenses of drab fine-grained micaceous sandstone, usually poorly cemented. The whole member tends to be massive when unweathered. Full thickness is unexposed at any one point, but by hand levelling is determined to be approximately	30
10	Limestone, dark gray, full of broken fossil fragments among which a few Pennsylvanian brachiopods can be recognized.	½
9	Shale, very dark gray, soft, clayey.	1½
8	Shale, gray, laminated, calcareous, some layers almost a shaly limestone. This bed locally includes sandy lenses.	6½
7	Limestone, gray, weathers brown, dense, fine-grained and evenly bedded below, concretionary and very sandy above, one strong ledge.	1½
6	Shale, gray, argillaceous, weathers out to a bright gray clay.	10
5	Shale, dark gray, with laminations of pyritic material.	1
4	Coal, impure, dark brown to black, soft.	1
3	Shale, weathers yellow to buff, with thin hard stony layers.	5
2	Clay, bright gray when unweathered, not stratified, includes concretionary lumps of fine-grained fresh-water limestone up to six inches in diameter, scattered throughout the bed and forming a persistent layer near the bottom.	13
1	Shale, bluish-gray, rather thinly bedded.	3

This section evidently lies entirely above the White Cloud shale, unless Number 1 may be considered a part of it. The presence of Pennsylvanian fossils in the uppermost bed proves that it is all Pennsylvanian. Comparison with Nebraska and Missouri sections indicates that the coal is probably the Elmo, the limestones above (Numbers 7 to 10 inclusive) are the Burlingame, and the uppermost limestone the Wakarusa. The shale below the Elmo is known in those states as the Cedarvale, the shale above the Elmo as the Silver Lake, and the shale above the Burlingame as the Soldier

Creek. A limestone just above the Elmo coal, in the position of the Rulo of the Nebraska and Missouri sections, is not recognized. Since the lithology and fossil content of this section agrees with that observed in Nebraska and Missouri, their terms may properly be applied to this area.

It is not known whether or not there is an unexposed gap between the base of the foregoing section and the top of the White Cloud shale as found in the coal mine shafts. The shaft of the New Market Coal Company at Clarinda is reported to have penetrated a low-grade coal 140 feet above the Nodaway seam. There is information that a prospect shaft in SW¼ NW¼ Section 3, Jackson Township, Montgomery County, about three miles from the Adams County line, found a coal seam at 80 feet depth and that another seam was formerly exposed in a nearby gully about 20 feet above the top of the shaft. This information seems contradictory to the exposures of more than 100 feet of White Cloud shale in mine shafts, with no sign of the Elmo or underlying beds at the top; on the other hand, a local dip may make the true interval in Section 3, Jackson Township, greater than the 100 feet apparent. A very limited and obscure outcrop of a yellowish-gray limestone about a foot thick 1500 feet north of center Section 19, Lincoln Township (Adams County) appears to represent something above the White Cloud and yet is not like anything in the Elmo-Wakarusa section; this might be the equivalent of the Happy Hollow limestone of the Nebraska and Missouri sections. Considering all these lines of evidence, it appears probable that there is an unexposed interval between the lowest Cedarvale of the foregoing section and the highest White Cloud exposed in mine shafts, and that the interval is something in the order of magnitude of 25 feet. This figure places the Elmo seam about 150 feet above the Nodaway.

Outcrops known to represent the horizon of the Elmo and beds above are confined in Adams County to Sections 19, 30, and 31, of Douglas Township. Other exposures in the west part of Douglas and Nodaway Townships may represent this horizon in part, but present information favors their reference to the Cretaceous. It is almost certain that the Elmo nowhere extends more than a mile or so into the western edge of the county. Some of the best outcrops are in the eastern part of Washington and Jackson Townships of Montgomery County.

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