Limestone - Dolomite Facies of the Upper Wolfcampian of North Central Oklahoma

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Formations ranging in age from Upper Pennsylvanian Virgil to Lower Permian Wolfcampian are exposed across North Central Oklahoma. The beds trend in a generally north-south direction and dip gently to the west at approximately fifty feet per mile. The region is a transitional zone between the marine formations to the north and the continental beds southward. In addition, major color changes occur between the blue-grays of the east and the redbeds westward. Within this transitional zone many particularly striking limestone facies changes are found in the Upper Wolfcampian units.

Studies within the last ten years, carried out primarily by graduate students under the direction of Dr. Carl C. Branson of the University of Oklahoma, have been instrumental in unravelling the geologic units of this area. Careful tracing of rock outcrops from Osage County into Noble, Pawnee and Payne counties has revealed considerable change of the limestone formations of the Upper Wolfcampian into a dolomitic facies upon approaching the northern border of Payne County.

This paper deals with the limestones which occur above the Neva limestone and includes the Cottonwood, Wreford, Ft. Riley, and Winfield limestones, all of which are part of the Upper Wolfcampian series. Since these limestone units all develop essentially into dolomitic facies in Payne County, the Wreford limestone is discussed in detail.

The name Wreford was first applied to a cherty limestone which is about twenty-five feet thick at Wreford, Kansas. In Kansas the Wreford can be subdivided into three members none of which can be recognized in Oklahoma. Along the northern boundary of Kay and Osage counties the Wreford is a cherty limestone which becomes a sandy algal limestone in southern Kay County. In Noble and Pawnee counties the limestone splits into two algal members which are separated by a silty shale. At T21N, R3E in Noble County the Wreford is exposed in small outliers. Here the lower unit is fossiliferous and separated from the upper unit by a five-foot bed of red clay. The upper member is three feet thick and is a dolomitized algal limestone.

Paul Greig (see Bulletin 83, Oklahoma Geological Survey) stated: ". . . . where the Wreford is exposed along the Arkansas River it is a red

shaly limestone about 0.5 feet thick, containing a sparse molluscan fauna and small limonitic pellets which are probably altered algal material." He stated further that ordinarily the limestone is bounded on either side by red shale, but that locally a lenticular red sandstone about 20 feet thick occurs immediately above the limestone. Within one mile in Sec. 18, T22N, R4E there is a rapid change in color from a light gray spergenite to a red algal limestone. The southernmost exposure of the Wreford in Pawnee County occurs in the southwestern corner of Sec. 18, T22N, R4E. Here it consists of a few inches of a nodular dark-red limestone.

Unfortunately stream alluvium masks the underlying formations between much of the boundary separating Payne County from the two counties to the north. Dsecriptions by Greig and others of the Wreford, in Noble and Pawnee counties, indicate two important points.

1. The limestones thin and change from a gray limestone to a dark red algal or dolomitic limestone.

2. The limestones are generally bounded by shale, but locally a thick sandstone occurs at the top.

Continuing this study into Payne County, I found ample evidence to extend these same thin Wreford beds throughout Payne County and found close association with those units to the north. The Wreford, consistently a dark-red rubbly dolomite, was found usually below a thick sequence of cross-bedded sandstone. Being thin, the dolomite could not be traced continuously across the county, but its continuous nature was indicated by the frequent intervals at which it was found beneath the prominent sandstone. At the southern extremity of the county the red dolomite persisted in its general relationship to the sandstone above.

All of the other Upper Wolfcampian limestone formations display this same general facies change when traced from north to south. In ascending the section this limestone to dolomite facies change occurs progressively northward. For example, the Winfield limestone becomes dolomitic in northern Noble County and is a rubbly dolomite about 6 inches thick just beneath a sandstone in the southern part of that county.

It is concluded that a change from a limestone facies to a dolomite facies is clearly demonstrated in the upper Wolfcampian when projected in cross sectional view of north central Oklahoma. The Winfield, Ft. Riley, Wreford Cottonwood, and Neva limestones are present in Osage County. Projecting these beds southward the limestone facies are replaced by dolomitic facies which may be seen to progress northward as one ascends the geologic section.