Cretaceous sediments of the north plains and adjacent areas, McKinley, Valencia and Catron Counties, New Mexico

Keith L. Gadway

1959, pp. 81-84. https://doi.org/10.56577/FFC-10.81

in:

West-Central New Mexico, Weir, J. E., Jr.; Baltz, E. H.; [eds.], New Mexico Geological Society 10 th Annual Fall Field Conference Guidebook, p. https://doi.org/10.56577/FFC-10

This page is intentionally left blank to maintain order of facing pages.

CRETACEOUS SEDIMENTS OF THE NORTH PLAINS AND ADJACENT AREAS, McKINLEY, VALENCIA AND CATRON COUNTIES, NEW MEXICO

Keith L. Gadway [1]

GENERAL DISCUSSION

The area of this paper is essentially that part of west-central New Mexico which is bounded by the Zuni uplift on the north, the west flank of the Lucero uplift on the east, the unbroken Tertiary outcrop on the south and the New Mexico - Arizona border to the west. The title of the paper originates from a broad area of low relief in the center of this region which is called the North Plains.

A generalized geologic map of the area is included (see fig. 1). This map shows the formations immediately underlying the Cretaceous, the outcrops of the main Cretaceous units, the areas covered by younger deposits, and the locations of seven control points and lines of section used in making the fence diagram of the Cretaceous system (diagram in pocket). The fence diagram was constructed by placing the top of each section at the geographic location of each control point. The fence diagram, so constructed, serves only to show correlations or stratigraphic relationships.

The correlations of the Gallup sands between control points no. 3 and no. 4 have been taken from Dane, Wanek and Reeside (1957). Other correlations have been made across long intervals of no data or on the basis of meager and questionable evidence and should, in some cases, be regarded as "zonal" rather than specific. Primarily, the fence diagram was constructed to illustrate the general nature of the Cretaceous rocks of this area in terms of sandstone, shale and coal.

The thickness of Cretaceous rocks in this area has been strongly modified by pre-Tertiary and Quaternary erosion. Variation in thickness is from zero, where completely removed by erosion, to a maximum reported thickness in the D-Cross Mountain area of 2,657 feet (composite section of Pike, 1947, and Winchester, 1920). Maximum drilled thickness, to date, has been approximately 1,700 feet in the Huckleberry no. 1 Federal.

The Cretaceous succession in the D-Cross Mountain or Alamosa Creek area was first noted by Herrick (1900); mapped by Winchester (1920); and studied by Pike (1947), who correlated the Cretaceous rocks of the area with units recognized in the San Juan Basin to the north. Pike's correlations were subsequently modified by Dane, Wanek and Reeside (1957). Inasmuch as the section at D-Cross Mountain is the most complete and the best described in the area, a tabulation of the units recognized at that locality follows:

	Formation	Age	Thickness
Mesaverde group	Point Lookout ss (?)	Niobrara (?)	444'(?)
	Crevasse Canyon fm.	Niobrara	1,365'
	Gallego mbr. of Gallup	Early Niobrara to late Carlile	98'
	D-Cross tongue of Mancos shale	Late Carlile	175'
	Lower Gallup	Early Carlile	262'
	Lower Mancos	Graneros(?) and Greenhorn	286'
	Dakota ss.	?	31'

STRATIGRAPHY

Dakota

The oldest Cretaceous formation in the area is the Dakota sandstone. Precedence has restricted the term "Dakota" in this area to the basal sandstone zone of the Cretaceous. The exact age of the Dakota is unknown but is presumed to be Late Cretaceous and is overlain by Graneros shales.

Variation in thickness is from zero at scattered points in the eastern part of the area, where it is typically a single quartzose sandstone bed, to approximately 100 feet in the western part where shales and coal are frequently present. The Dakota is usually tan to brown, fine- to coarse-grained and is frequently conglomeratic and cross-bedded in the lower part.

Some variation in the thickness of the Dakota may be attributed to the uneven nature of the erosion surface over which the sea advanced. Other differences are probably due to the different environments associated with the advancing shoreline (Pike, 1947, p. 92).

Regional relationships of the Dakota and the overlying Greenhorn limestone, in the San Juan Basin to the north, show the Dakota transgression to have been from the northeast. A similar relationship is difficult to show in this area.

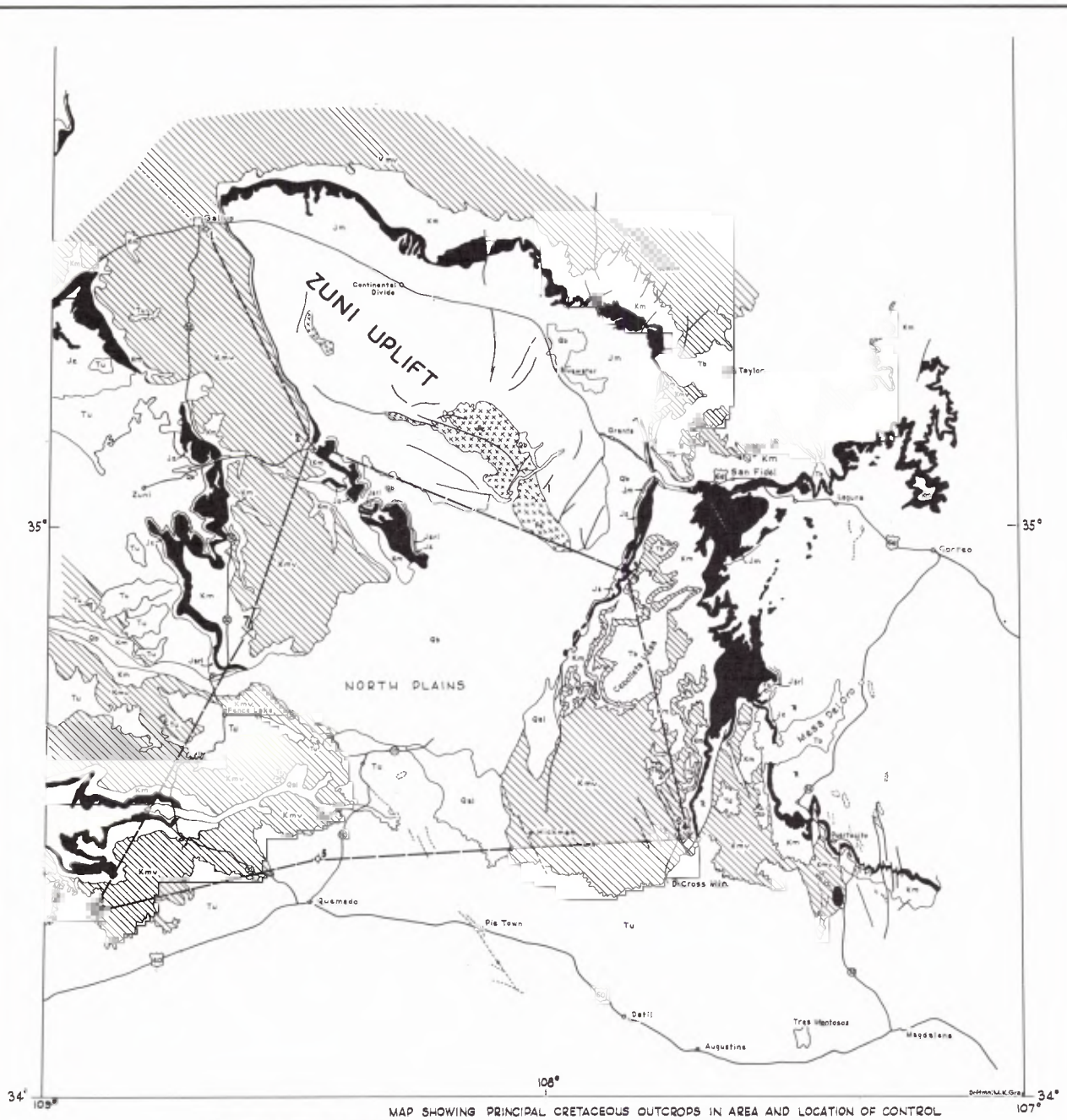
Mancos Shale

The Mancos shale of this area represents the lower part of the approximate 2,000-foot thickness which is present at the type locality in southwestern Colorado. As shown by Pike (1947) and others, the southward thinning of the Mancos is due to its intertonguing relationship with the sandstones of the Mesaverde group which occur progressively lower in the interval to the south. The Mancos shale of this area, however, does not "thin" as much as might be expected. Thicknesses of the Dakota - Tres Hermanos portion of the Mancos at control points no. 5 and no. 6 on the fence diagram are somewhat greater than at control points to the north and east, indicating that subsidence may have been faster in the southwestern part of the area during early Mancos deposition. It should be noted that the measurement of section no. 6 of the panel diagram involved long horizontal distances over some covered areas. In addition, the interval from the Dakota to the **Gryphea newberryi** zone at control point no. 4 could have been shown to be larger if the interval published by Winchester (1920) had been used.

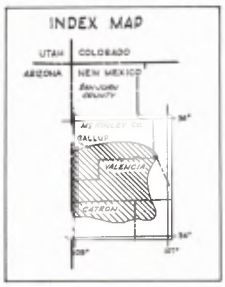
The Mancos shales are usually dark to medium gray. Thin concretionary limestones are rare; sandy and silty zones are more abundant.

The Tres Hermanos sandstones are the most persistent sands in the Mancos and, in this area, usually occur from 180 to 270 feet above the Dakota. The Tres Hermanos sandstones are usually fine- to medium-grained and

[1] Pan American Petroleum Corporation, Farmington, N. Mex.
The writer wishes to thank Pan American Petroleum Corporation for permission to publish this paper. Grateful acknowledgement is also made to Dr. Leo Hendricks, Texas Christian University.



MAP SHOWING PRINCIPAL CRETACEOUS OUTCROPS IN AREA AND LOCATION OF CONTROL POINTS FOR PANEL DIAGRAM



LEGEND

Outcrop Section ×1

Subsurface Section ◇2

GEOLOGY:

Precambrian — Pc
Triassic (Chinle fm) — Tr
Jurassic (Lower San Rafael Gp) — Jurl
Zuni ss — Jz
Morrison Fm — Jm
Cretaceous
Dakota ss
Mancos sh — Km
Mesa Verde Group Undiff. — Kmv

Tertiary Undiff — Tu
Intrusives — Ti
Basalt flow — Tb
Quaternary Basalt flow — Qb
Alluvium — Qal

(Generalized from USGS Map I-[illegible])

0 5 miles 10

K. L. GADWAY

commonly well bedded although some cross bedding was noted at section no. 6. It is possible that the Tres Hermanos sands were deposited in a broad shallow sea that allowed much reworking and relatively widespread distribution. At almost every outcrop locality, the Tres Hermanos sands are overlain by a zone of **Gryphea newberryi,** an index fossil of Greenhorn age. Variation in the interval between the Dakota and the Tres Hermanos sands overlain by **Gryphea newberryi,** is probably more indicative of irregularities in Dakota deposition than of stratigraphic discontinuity of Tres Hermanos sands. The presence of **Gryphea newberryi** establishes at least partial equivalence of the Tres Hermanos sands with the "Graneros sands" of the San Juan Basin.

Lower Gallup

The lower Gallup interval is a very complex zone of interrelated marine and non-marine deposition and possibly erosion. Pike (1947) and Dane, Wanek, and Reeside (1957) have interpreted the lower Gallup sequence in the D-Cross Mountain area to be the result of northeastward oscillation of the shoreline which produced a regressive lower sandstone followed by continental shale deposits which were in turn overlain by a transgressive sandstone, the initial deposit of the D-Cross sea. This seems to be a plausible sequence of events in that area and the higher stratigraphic position of the lowest Gallup sand above the **Gryphea newberryi** zone at control point no. 3 seems to indicate regression in that direction.

However, the "wedge" of lower Gallup sediments as shown from control points no. 4 to no. 5 and no. 3 to no. 2 does not appear to be the result of a regression to the north or northeast followed by transgression from the same direction.

Lower Gallup sedimentation may have been complicated by extremely irregular shoreline trends, erosion of the middle part of the interval in the western part of the area during lower Gallup time, multiple source areas of the sands, and the return of the marine environment from a different direction than the direction of regression.

The scope of this paper and the evidence available precludes adequate interpretation of the lower Gallup interval. The writer believes, however, that the remarkable consistency of the interval between the **Gryphea newberryi** zone and the lowest Gallup sands over the southwestern part of the area (control points 4, 5, 6 and 7 on the fence diagram) clearly shows that from the Gallup, New Mexico, area southward, into this area, Gallup sandstones do not occur progressively lower in the Mancos.

D-Cross Tongue of the Mancos

The D-Cross tongue of the Mancos ranges in thickness from 191 feet near Puertocito to 90 feet in the Ambrosia Lake area to the north, showing a consistent decrease in thickness in that direction (Dane, Wanek and Reeside, 1957, p. 187). Correlations on the fence diagram[1] indicate the western extremity of marine deposition in D-Cross time may have been in the western part of the North Plains area. The direction of transgression of the D-Cross sea is difficult to show from evidence available in this area.

The Pescado tongue of Pike (1947, p. 34) was named from exposures near control point no. 2 of the fence diagram and was thought by Dane, Wanek and Reeside (1957, p. 187) to be possibly older than the D-Cross tongue.

[1] The presence of the D-Cross tongue in the Huckleberry no. 1 Federal has not been definitely established, to the writer's knowledge.

Upper Gallup

Correlation of the Gallego member of the Gallup in the D-Cross Mountain area was reliably established with the upper Gallup sandstones of the Mt. Taylor area to the north by Dane, Wanek and Reeside (1957). The relationship of the Gallup in the Mt. Taylor area with the type locality near the town of Gallup has been discussed by Dane, Bachman and Reeside (1957).

The Gallego member was described by Pike (1947) in the D-Cross Mountain area: "Gray even-bedded sandstone in several benches", and was measured to be 98 feet thick.

Dane, Bachman and Reeside (1957, p. 99) describe the Gallup sandstone in Puerco Gap east of the town of Gallup: ". . . is composed of three conspicuous ledges of sandstone, of which the upper and lower part are generally pink and the middle is light gray or white, and of two intermediate softer zones. The whole formation in this area ranges from 220 to 280 feet thick."

The Gallego member of the Gallup appears to be distinguishable over the eastern two-thirds of the area, at least. Extensive outcrops of this member occur north from the D-Cross Mountain area, around Cebolleta Mesa and along the eastern edge of the North Plains.

Regionally considered, the Gallup sandstones, including the Gallego member of this area, were deposited in the initial stages of a regression which eventually moved the strand line of the Late Cretaceous sea more than 100 miles northeast of the Alamosa Creek area. The Gallego sandstone of the Alamosa Creek valley is latest Carlile to early Niobrara in age, while the Gallup far to the north along the San Juan River is of middle Niobrara age. (Dane, Wanek and Reeside, 1957, p. 195).

Post Gallup

Above the Gallego sandstone in the D-Cross Mountain area is a series of sand, shales and coal which appears to be of continental origin. This interval has been tentatively identified as Crevasse Canyon formation by Dane, Wanek and Reeside (1957). The corresponding interval in the Huckleberry no. 1 Federal appears to be of the same general nature but has considerably more coal and is possibly more continental in nature. The main basis for drawing correlation lines between the two points has been a possible equivalent of the Dilco(?) in the Huckleberry no. 1 Federal and a higher occurrence of coal in the Huckleberry no. 1 Federal being possibly correlative with a carbonaceous shale zone in the D-Cross Mountain section.

The uppermost Cretaceous sandstone of the D-Cross Mountain section, thought to be Point Lookout sandstone by Dane, Wanek and Reeside (1957), is one of two isolated outcrops that have been so identified in this area.

SUMMARY

Cretaceous deposition began in this area in the late Early Cretaceous or early Late Cretaceous time with a marine transgression which was, regionally, from the northeast.

Marine deposition of the Mancos shale began in Graneros(?) time and continued without major interruption until early Carlile time when deposition of lower Gallup sediments marked at least a partial regression. Events from early to late Carlile time are not clear.

Deposition of the D-Cross tongue of the Mancos occurred in a marine environment which covered at least the eastern two-thirds of the area in late Carlile time.

Strand line regression to the northeast began in the D-Cross Mountain area in latest Carlile or earliest Niobrara time with deposition of the Gallego sandstone member — the latest known marine deposit in the area.

Subsequent Cretaceous deposition was probably dominantly continental with an unknown thickness of Mesaverde sediments being deposited before regional erosion began in Late Cretaceous or early Tertiary (?) time.

LOCATION OF POINTS USED IN FENCE DIAGRAM

1. Gallup dome, Ford no. 1	SE¼ sec. 22, T. 15 N., R. 18 W., McKinley County
2. Dane, Bachman and Reeside (1957), stratigraphic section 2	Sec. 34, T. 11 N., R. 16 W., McKinley County
3. Pike (1947), stratigraphic sections 48 and 49	Secs. 17 and 19, T. 8 N., R. 9 W., Valencia County (Section near north end of Cebolleta Mesa)
4. Winchester (1920), D-Cross Mountain. (Point Lookout through Crevasse Canyon)	T. 2 N., R. 8 W., Socorro County. (Stratigraphic section north of Blue Mesa)
Pike (1947), stratigraphic sections 60 and 61. (Gallego through Dakota)	Secs. 17 and 18, T. 3 N., R. 8 W., Socorro County, and sec. 36, T. 3 N., R 9 W., Catron County
5. Huckleberry no. 1 Federal	NE¼ sec. 11, T-2 N., R. 16 W., Catron County
6. Pan American Petroleum Corp., surface stratigraphic section	Secs. 18, 19, 30, 31, T. 2 N., R. 20 W., and secs. 6, 7, 18, 19, T. 1 N., R. 20 W., Catron County
7. Pike (1947), stratigraphic section 46	Near center T. 7 N., R. 17 W., and sec. 7, T. 6 N., R. 17 W., Valencia County

REFERENCES CITED

Dane, C. H. and Bachman, G. O., 1957, Preliminary geologic map of the northwestern part of New Mexico: U. S. Geol. Survey Misc. Geol. Inv. Map I-224.

.....-, 1957, The Dakota sandstone and Mancos shale in the Gallup area: Four Corners Geol. Soc. Second Guidebook, p. 95-98.

.....-, and Reeside, J. B., Jr., 1957, The Gallup sandstone, its age and stratigraphic relations south and east of the type locality: Four Corners Geol. Soc. Second Guidebook, p. 99-113.

Dane, C. H., Wanek, A. A., and Reeside, J. B., 1957, Reinterpretation of section of Cretaceous rocks in Alamosa Creek valley area, Catron and Socorro Counties, New Mexico: Am. Assoc. Petroleum Geologists Bull., v. 41, p. 181-196.

Herrick, C. L., 1900, Report of a geological reconnaissance in western Socorro and Valencia Counties, New Mexico: Am. Geologists, v. 25, no. 6, p. 331-346.

Pike, W. S., Jr., 1947, Intertonguing marine and non-marine Upper Cretaceous deposits of New Mexico, Arizona and Southwestern Colorado: Geol. Soc. America Mem. 24.

Winchester, D. E., 1920, Geology of Alamosa Creek valley, Socorro County, New Mexico: U. S. Geol. Survey Bull. 716-A.