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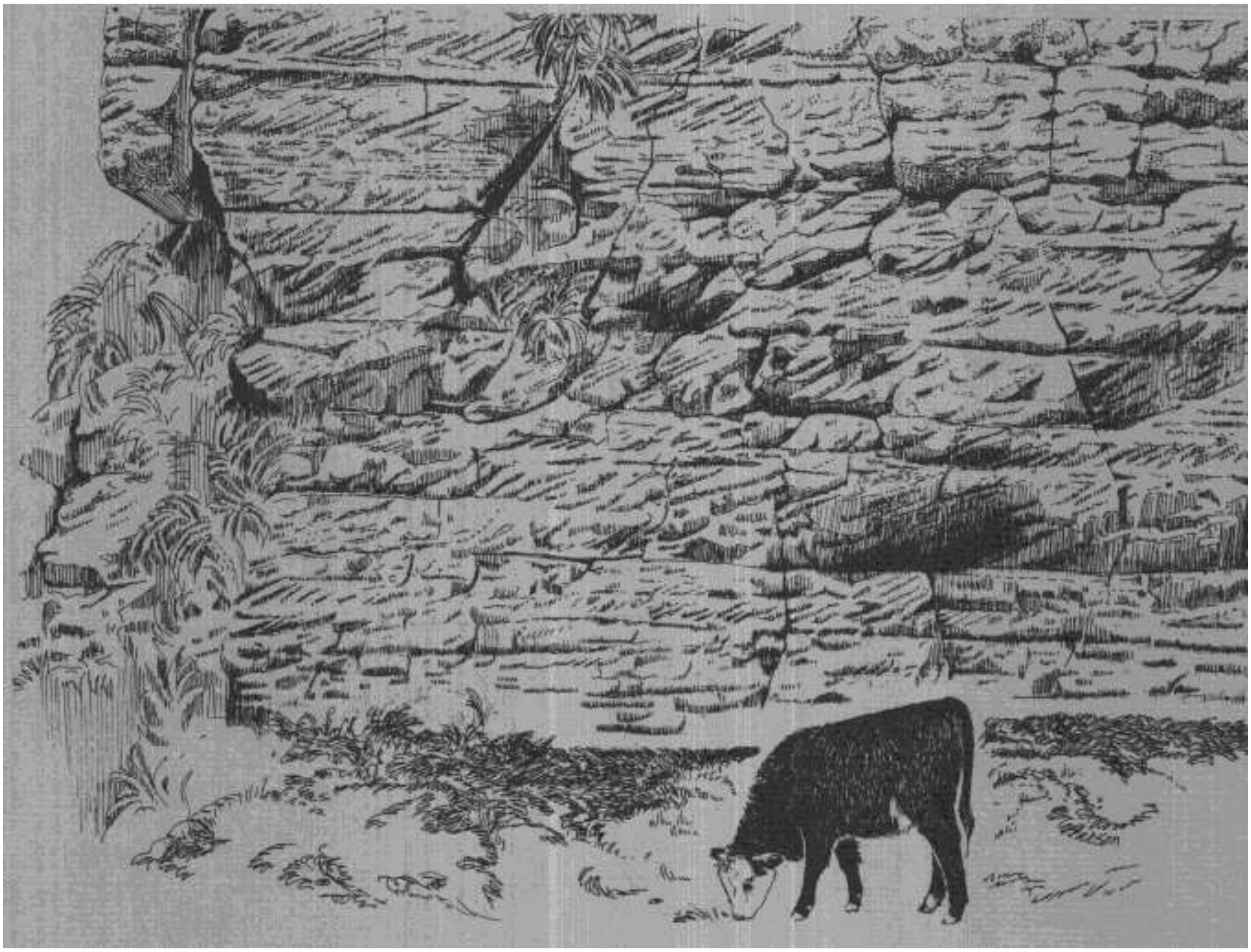

Sedimentology of Braided Alluvial Interval of Dakota Sandstone, Northeastern New Mexico

by J. L. Gilbert and G.B. Asquith

New Mexico Bureau of Mines & Mineral Resources

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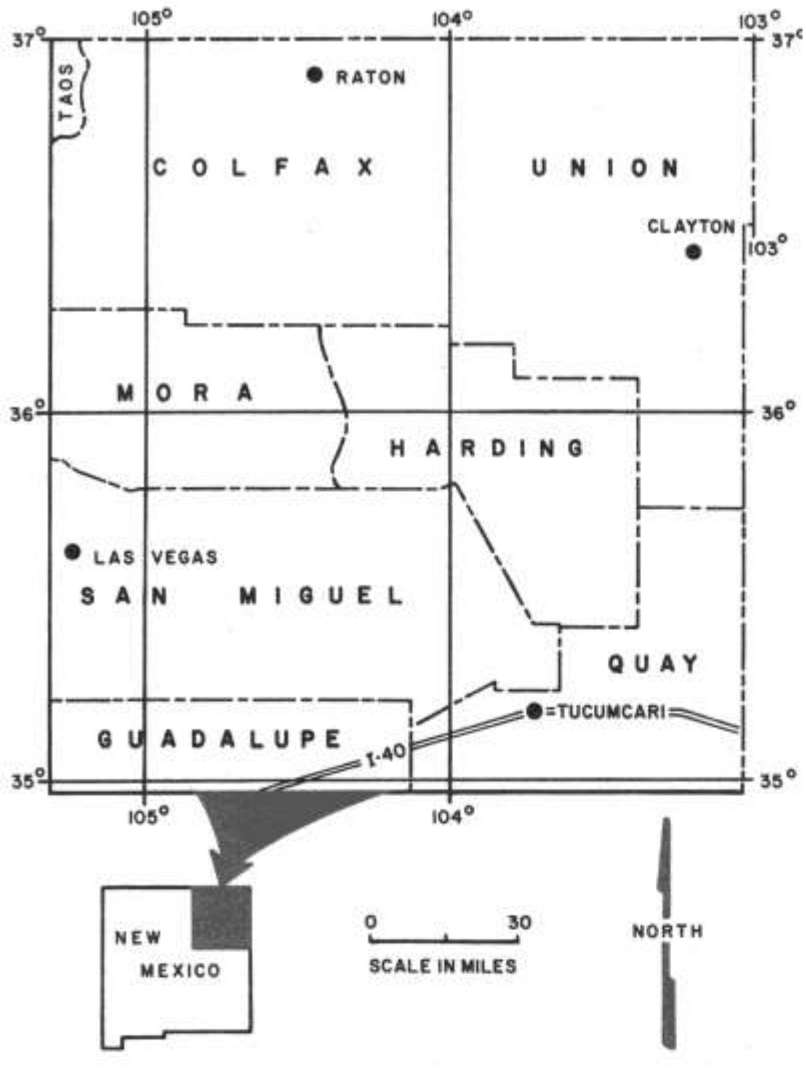


FIGURE 1 — Location of study area in northeastern New Mexico.

ABSTRACT

The Dakota Sandstone (Cretaceous) in northeastern New Mexico is subdivided i to 3 intervals (Jacka and Brand, 1973). The lower interval is a braided alluvial sheet composed of fine- to medium-grained, cross-stratified sandstone with conglomerate lenses. The middle interval represents a meander-belt environment and contains fine- to ery fine grained, lenticular sandstone with interbedded carbonaceous shale and coal. The upper interval represents a transgressive marine succession containing fine- to very fine grained, horizontally stratified sandstone with burrow casts of *Ophiomorpha.*

Paleocurrent analysis of the braided alluvial interval indicates a dominant southeasterly transport direction. This conclusion is supported by a decrease in mean grain size and thickness to the east and southeast. Analysis of the stratification ratio indicates that proximal braided-stream facies are predominant in the west and northwest parts of the study area, and that distal braided-stream facies are predominant to the east and southeast. The sediment dispersal pattern and the presence of proximal braided stream facies indicate that the source areas were the San Luis and Apishapa uplifts of Colorado and N w Mexico.

INTRODUCTION

Location

The approximate boundaries of the study area are the Texas-Oklahoma-New Mexico border, the Colorado-New Mexico border, the extreme eastern edge of the Sangre de Cristo Mountains, and 1-40 (fig. 1). The area is essentially rectangular, about 150 miles north to south and about 130 miles east to west.

Tectonic Setting

According to King (1959) and Baltz (1965), the major active Pennsylvanian and Permian tectonic features in the northern New Mexico-southern Colorado region (fig. 2) were the San Luis uplift (southern extension of the Uncompahgre uplift), the Wet Mountain-Apishapa uplift (southeast extension of the Front Range uplift), the Sierra Grande uplift, and the intervening Rowe-Mora basin (southern extension of the Central Colorado basin into New Mexico). Baltz (1965) noted that the Rowe-Mora basin was connected at its southern end to the Tucumcari basin (extension of the Palo Duro Basin of Texas). Permian, Upper Triassic, and Upper Jurassic rocks blanketed the northern New Mexico-southern Colorado region and buried the late Paleozoic Sierra Grande, Apishapa, and San Luis uplifts (Baltz, 1965; McGookey and others, 1972).

The San Luis and Apishapa uplifts (fig. 3), rejuvenated during the Early Cretaceous, were probably source areas for the Dakota braided alluvial interval (Baltz, 1965; McGookey and others, 1972). According to Jacka and Brand (1973) and Muehlberger and others (1967), the braided alluvial interval was deposited by streams originating from early Laramide uplifts to the west. During the Late Cretaceous, the western Cretaceous seaway (McGookey and others, 1972; King, 1959) inundated the Rocky Mountain region including northeastern New Mexico.

The San Luis uplift and the western parts of the Paleozoic Rowe-Mora and Central Colorado basins were elevated to form the Sangre de Cristo uplift during the early and middle Tertiary (Baltz, 1965). Baltz (1965) concluded that the present Raton basin, Las Vegas sub-basin, Wet Mountain uplift, and the Apishapa and Sierra Grande uplifts were formed during early Tertiary time (fig. 4).

Purpose

Jacka and Brand (1973) post i ated that the source area for the braided alluvial interval as probably early Laramide uplifts to the northwest. I hey based their conclusion on a study of pebbles in the onglomeratic fraction of the interval and on southeasterly ransport directions measured only in the Las Vegas-Canadian River areas. The purpose of this study was to determ ne the source area for the braided alluvial interval using regional paleocurrent analysis, grain size analysis, and thic ness variations. In addition quantitative sedimentary structure analysis was used to determine whether the posi on of the area within the braided stream system is proxi al or distal (Smith, 1970).

Acknowledgments

The authors are especially gra eful to the New Mexico Bureau of Mines and Mineral Resou ces, Socorro, New Mexico, for providing financial assis ance for the field work. The authors are grateful to Robert . Burton and Franklin W. Daugherty for their critical readi g of the manuscript. Assistance given in the field by Jam s B. Gilbert, Charles M. Puckett, and Don R. Matthews as greatly appreciated. Thanks also go to D. E. Owen, Dep rtment of Geology, Bowling Green State University for is suggestions. They were greatly appreciated. Acknowl dgment is also extended for the facilities and financial suppo t provided by the Killgore Research Center, West Tex s State University.

Methods

PALEOCURRENT ANALYSIS

At each of 12 sections in the braided alluvial interval, 25 paleocurrent directions were measured (Brunton compass) from trough axes, planar foresets, and current ripples.

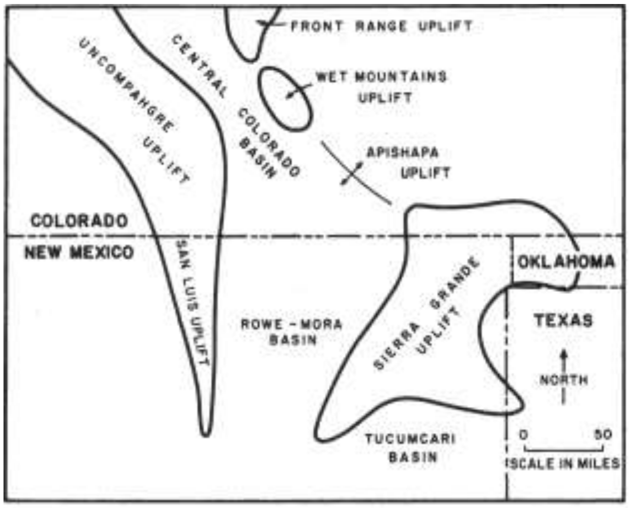


FIGURE 2 — Late Paleozoic uplifts and basins in New Mexico and Colorado.

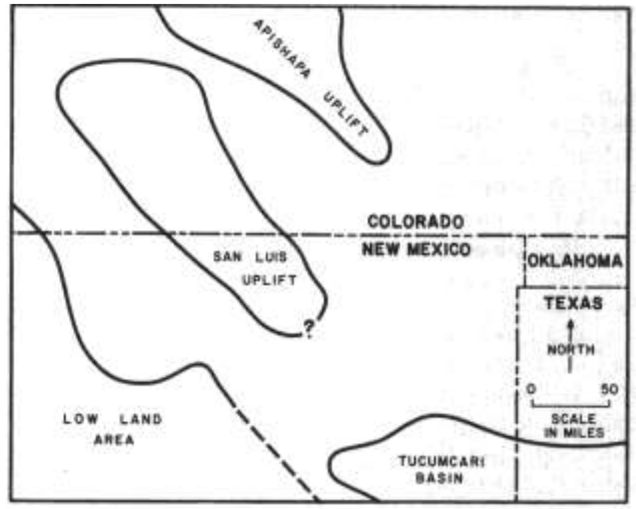


FIGURE 3 — Early Cretaceous uplifts and basins in New Mexico and Colorado (modified after McGookey and others, 1972).

According to High and Picard (1974, p. 165), 25 readings are the minimum number of measurements necessary to define reliably the mean paleocurrent direction when planar cross stratification is measured in addition to trough axes. The only corrections for structural dip were made in the field on the western side of the area where the braided interval dips 10° to 16° SE or NE; in the remainder of the area the braided interval is horizontal. A Fortran computer program CURT (Asquith, 1974) was used to calculate vector mean direction, consistency ratio (magnitude of mean vector in percent), and standard deviation. The program also calculated and performed a Raleigh test (Durand and Greenwood, 1958). The paleocurrent analysis at each of the 12 sections passed the Raleigh test indicating that the distributions differ significantly from a uniform distribution at a 5-percent level of significance. The vector means, therefore, are statistically valid.

GRAIN SIZE ANALYSIS

Five random samples were collected from the braided alluvial interval at each of the 12 sections for grain size analysis. Approximately 30 grams (Blatt and others, 1972, p. 47) from each sample was crushed, washed, dried, and then sieved down to 4.5 phi using one-quarter phi intervals. Each sieve fraction was then weighed to the nearest one-hundredth of a gram. A Fortran computer program GZSZ (Asquith, 1974) was used to calculate the Folk and Ward (1957) statistical parameters (mean, phi deviation, skewness, and kurtosis). The statistical parameters were then averaged for each of the 12 sections.

SEDIMENTARY STRUCTURE ANALYSIS

At each section the thickness of the braided alluvial interval was measured with a steel tape, and the percentage of each variety of sedimentary structure was recorded on a lithic log (fig. 5). Next the thickness of each variety of sedimentary structure in the 12 stratigraphic sections was measured to the nearest ft and recorded. A Fortran computer program SED (Asquith, 1974) was used to calculate the total thicknesses and percentages of each variety of sedimentary structure in each of the 12 sections. The program also calculated the stratification ratio (planar cross stratification/planar cross stratification + horizontal stratification; Smith, 1970, p. 3001) and percentage data for 3 component sedimentary facies plots (cross stratification-horizontal stratification-ripples; Allen, 1970, p. 310; and planar cross stratification-trough cross stratification-horizontal stratification).

STRATIGRAPHY

The Dakota Sandstone (Cretaceous) unconformably overlies the Morrison Formation (Jurassic) in the western portion of the area. However, the Morrison is overlain by the Purgatoire Formation (Lower Cretaceous) in the Raton basin and in the northeast and east portions of the area. The Tucumcari Shale of the Purgatoire Group (Griggs and Read, 1959) overlies the Morrison Formation in the Tucumcari basin (southern extent of study).

Dakota Sandstone

The age of the Dakota Sandstone in Colorado and New Mexico has been the subject of much controversy. Based on a study of fossil plant fragments Baldwin and Muehlberger (1959) concluded that the Dakota Sandstone in southeastern Colorado and northeastern New Mexico is Late Cretaceous. Scott (1970) determined, from a detailed stratigraphic study, that the Dakota Sandstone is equivalent to the Mesa Rica Sandstone (Upper Cretaceous) in the Tucumcari basin area. Reeside (1957), however, considered the Dakota Sandstone to be uppermost Lower Cretaceous.

Jacka and Brand (1973) subdivided the Dakota Sandstone into 3 intervals in northeastern New Mexico: a lower braided alluvial interval, a middle meander-belt interval, and an upper transgressive marine sandstone interval (figs. 5, 6 and 7). Mankin (1958) recognized a similar threefold subdivision of the Dakota Sandstone in northeastern New Mexico.

BRAIDED ALLUVIAL INTERVAL

The braided alluvial interval consists of a sheetlike body of sandstone and conglomerate with numerous scour-and-fill structures deposited over most of northeastern New Mexico. In the southern portion of the area, some workers have substituted the name Mesa Rica for the name Dakota (Jacka and Brand, 1972). Scott (1970) concluded that the Mesa Rica Sandstone and the Dakota Sandstone are correlative. According to Brand and Mattox (1972), the marine Mesa Rica Sandstone interfingers with Cretaceous nonmarine rocks northwest of the Tucumcari basin. In this study of the nonmarine braided alluvial interval, the name Dakota is used throughout the area except in the Tucumcari basin where the name Mesa Rica is retained. However, the Tucumcari basin area has been excluded from the sedimentological portions of this study.

The massive sandstone of the braided alluvial interval forms conspicuous cliffs capping many mesas and buttes. The main rock type of the braided alluvial interval is a pale-yellowish-brown to white, fine- to medium-grained, moderately well rounded, moderately well sorted, and cryptocrystalline quartz-cemented quartzose sandstone. Quartz overgrowths are common; limonite in some places forms cementing material. Feldspar grains are rare suggesting a source area of extensive weathering and high humidity (Mankin, 1958, p. 123). Conglomerate lenses composed predominantly of chert pebbles are common in this interval especially at sections located in the western part.

Jacka and Brand (1973, p. 25) described the pebbles in the braided alluvial interval as predominantly replacement chert derived from dissolution of the Espiritu Santo (Devonian), Tererro (Mississippian), and Madera (Pennsylvanian) limestones that crop out west of the study area. Other pebbles were composed of metamorphic rock fragments and quartz (Jacka and Brand, 1973, p. 25).

The braided alluvial interval varies from 195 ft thick at Shock Ranch to 45 ft thick at Black Mesa (table 1, Appendix). The interval is thickest on the west side and generally thins to the east and southeast (figs. 8, 9 and 10). The average thickness in the area is 105 ft.

The predominant sedimentary structures in the braided alluvial interval are high-angle (grea er than 10 degrees) and low-angle trough and planar cross s ratification, horizontal stratification, and scour channels. urrent ripples are rare; parallel stratification is present only in thin and discontinuous shale and siltstone stringer . No fossils are present within the braided interval; howev r, carbonized plant debris occur locally in furrows between ripple crests.

Electric logs from 6 wells drilled in the Raton basin were used to determine the thickness of the braided alluvial interval in the northwest part (table 1 and fig. 20, Appendix). All wells penetrated the 3 intervals of the Dakota Sandstone. Formation tops were correlated an marked using tops from wells 5 and 6 and from scout ickets. The log from the W. J. Gourley No. 2 Vermejo ell was selected as the type log of the Dakota Sandstone in the Raton basin (fig. 7).

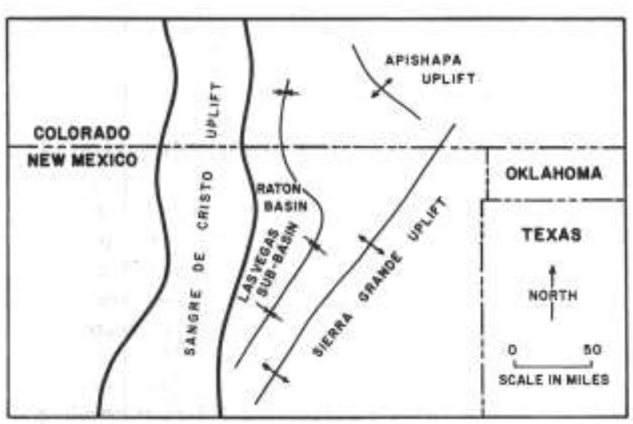
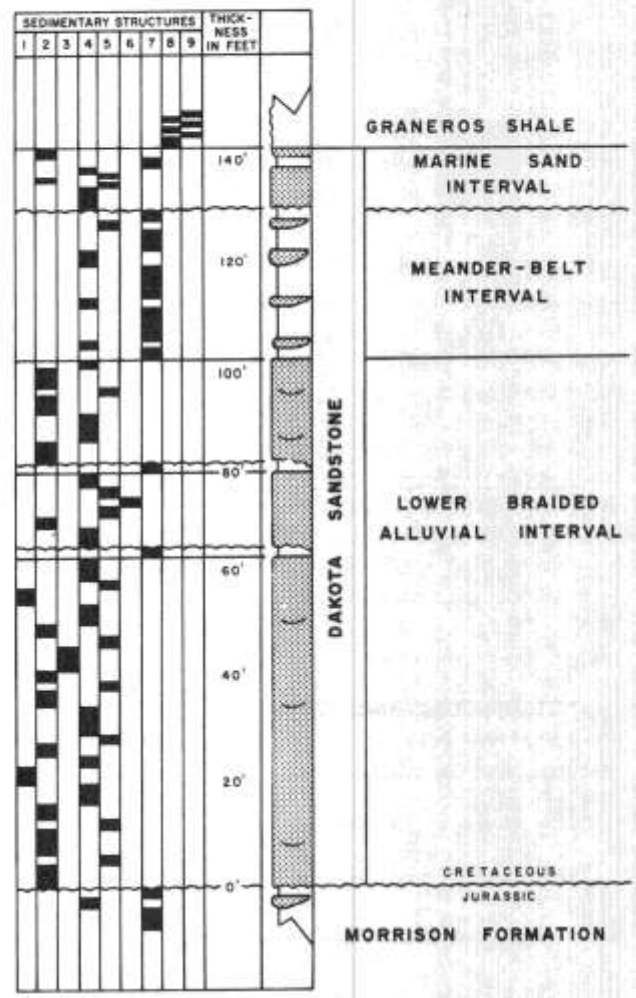


FIGURE 4 — Early and middle Tertiary uplifts and basins in New Mexico and Colorado (modified after Baltz, 1965).



Key to Sedimentary Structures

1 — *high angle planar cross stratification*
2 — *high angle trough cross stratification*
3 — *low angle planar cross stratification*
4 — *low angle trough cross stratification*
5 — *horizontal stratification*
6 — *ripples*
7 — *parallel stratification*
8 — *contorted stratification*
9 — *bioturbated*

FIGURE 5 — Stratigraphic section of Dakota Sandstone, Romeroville, New Mexico.

MEANDER-BELT INTERVAL

The braided alluvial interval is conformably overlain by a meander-belt interval composed of silty shale and interbedded channel sandstone. The silty shale is light to dark gray, thin bedded, lignitic, and contains abundant plant debris. The lenticular sandstone is white to light brown, fine to very fine grained, thin bedded, and forms lens-shaped bodies exhibiting trough cross stratification and horizontal stratification. Many of the channel sandstones contain clasts of carbonized wood and coal.

The meander-belt interval probably records headward erosion of the early Laramide uplands to the west, accompanied by a decrease in gradient over the area and the ultimate submergence of the region by a shallow sea (Jacka and Brand, 1973). The meander-belt interval averages 25 ft thick throughout.

MS — Marine sandstone interval
MB — Meander-belt interval
BA — Braided alluvial interval
Jm — Jurassic Morrison Formation

FIGURE 6 — View of Dakota Sandstone along US-85 north of Romeroville, New Mexico.

MARINE SANDSTONE INTERVAL

The meander-belt interval is unconformably overlain by a shore-zone marine sandstone interval. The sandstone is light yellowish brown, well sorted, well rounded, highly quartzose, and horizontally stratified. Vertical burrows of *Ophiomorpha* are present in the upper portion of the interval near the contact with the overlying marine Graneros Shale (Cretaceous) (fig. 7). The marine sandstone interval averages 12 ft thick.

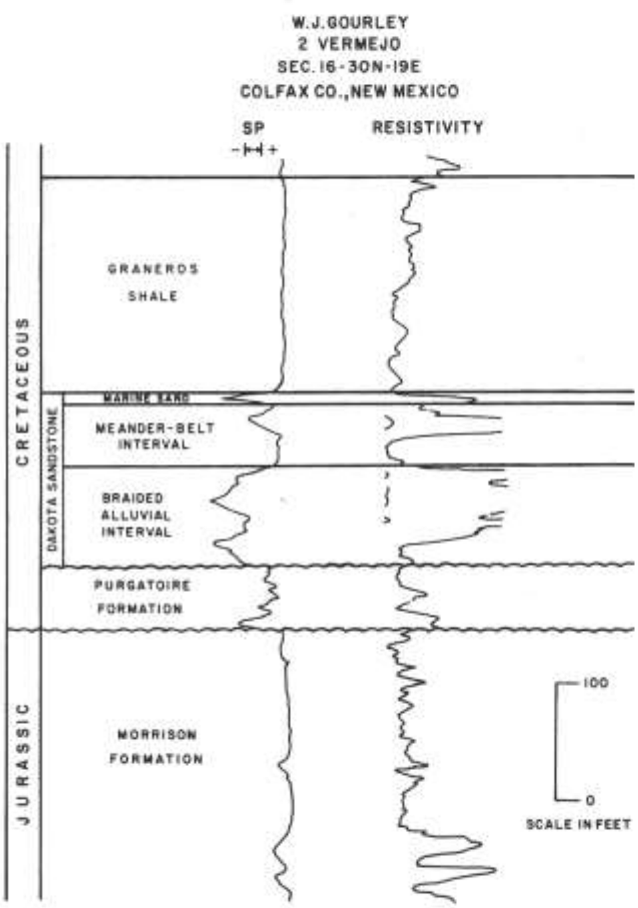


FIGURE 7 — Typical electric log characteristics of the Dakota Sandstone in the Raton basin, New Mexico.

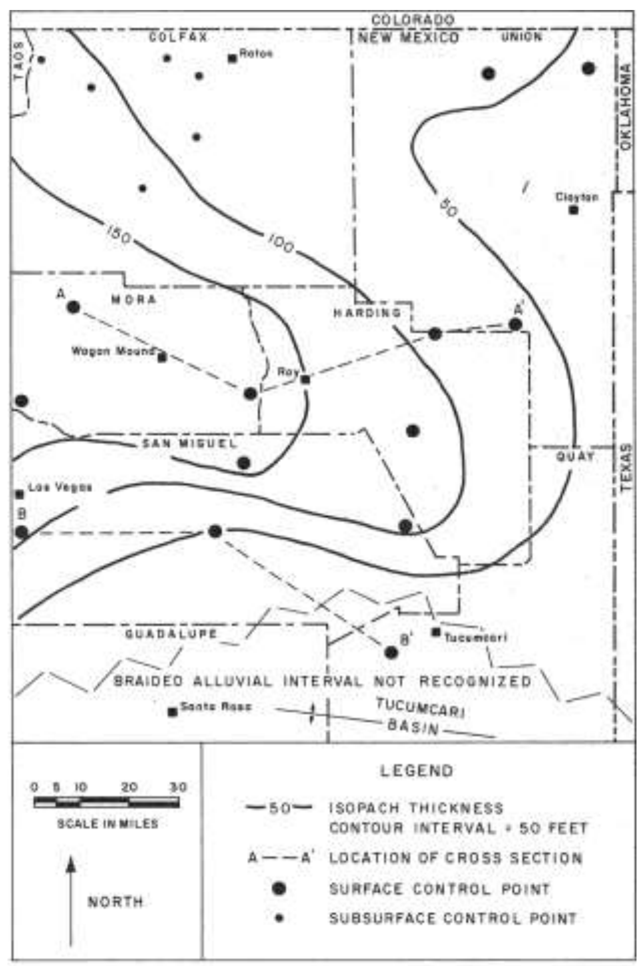


FIGURE 8 — Isopach map of the braided alluvial interval of the Dakota Sandstone, northeastern New Mexico.

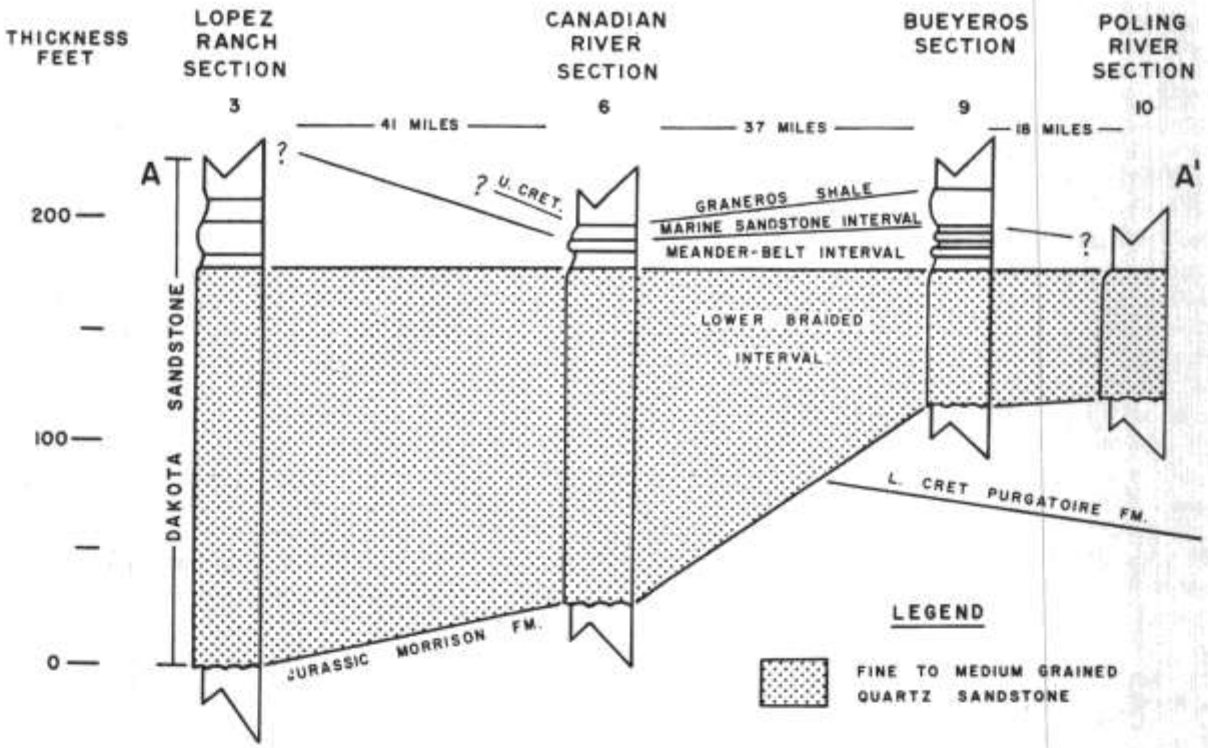


FIGURE 9 — Cross section A-A' of the Dakota Sandstone, northeastern New Mexico. Line of cross section shown on fig. 8.

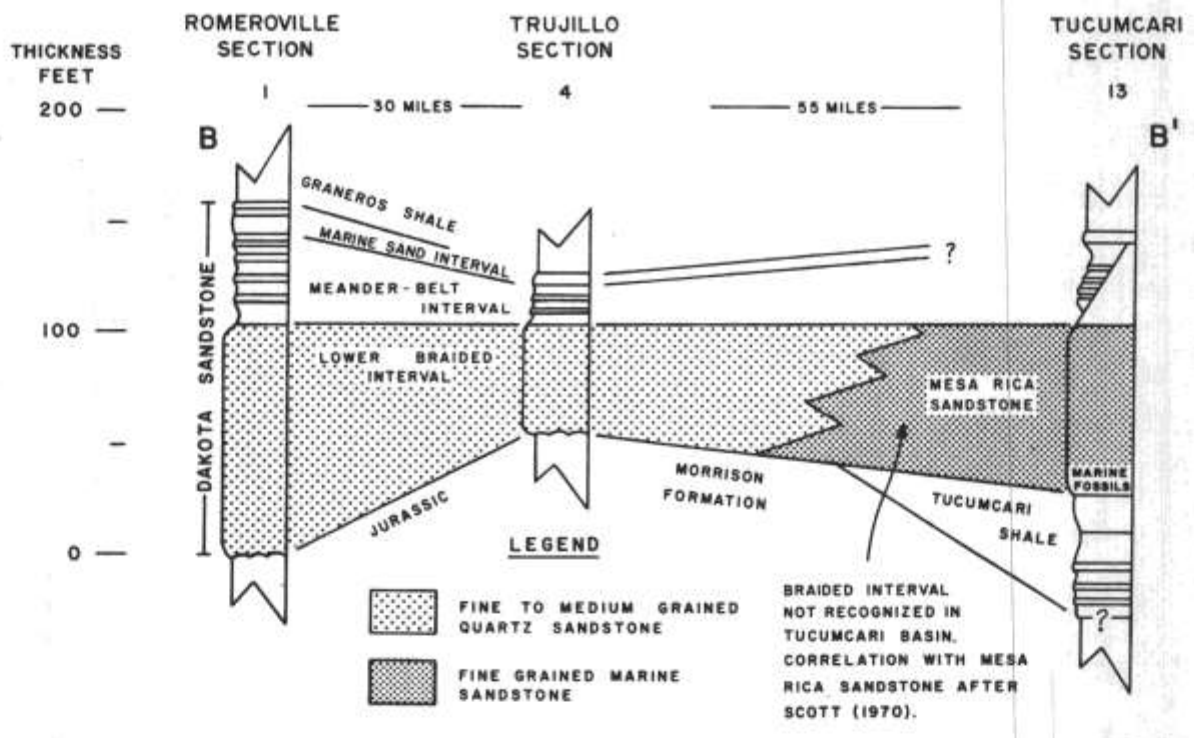


FIGURE 10 — Cross section B-B' of the Dakota Sandstone, northeastern New Mexico. Line of cross section shown on fig. 8.

SEDIMENTOLOGY

The lower sandstone interval is believed to have been deposited by braided streams (Jacka and Brand, 1973). Evidence suggesting a fluvial origin for the lower interval of the Dakota Sandstone includes the absence of marine fossils, the unimodal paleocurrent trends, the presence of numerous scour-and-fill structures, and the abundance of planar and trough cross stratification. Also a plot of mean grain size and phi deviation differentiates the lower Dakota Sandstone as a fluvial deposit in all but 6 of 60 samples analyzed (fig.11).

Several distinguishing features of braided stream deposits are found in the lower interval of the Dakota Sandstone. The characteristic sedimentary structures include mixed planar and trough cross stratification, horizontal stratification, and very few current ripples (fig. 12). The lower sandstone interval forms a sheetlike sandstone and conglomerate deposit containing numerous scour-and-fill structures and a low percentage of shale (figs. 5 and 6). Also, there are no definite cyclic vertical variations in grain size and sedimentary structures (fig. 5) as characteristically found in point-bar sequences of meandering streams. All these features are characteristic of braided streams as opposed to meandering streams (McGowen, 1975, oral communication; Brown and others, 1973).

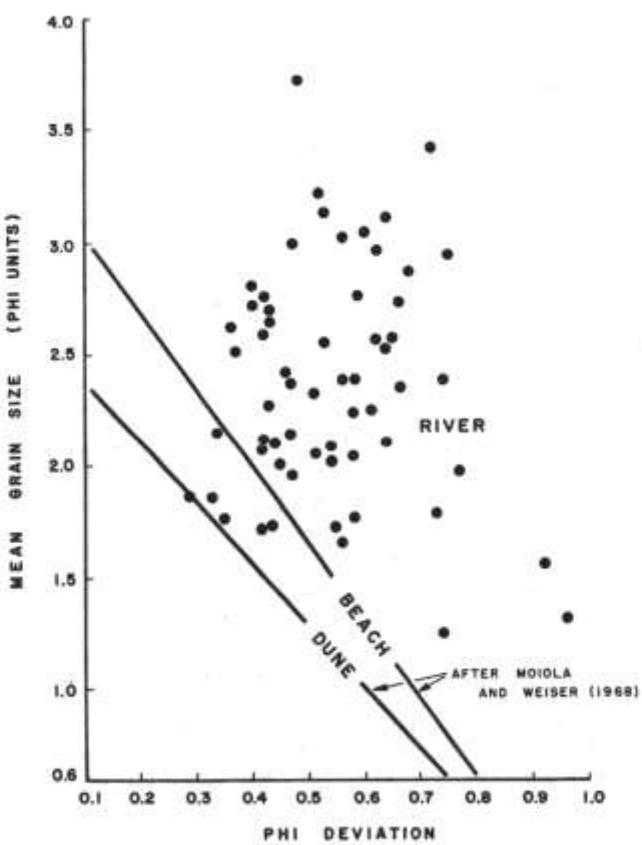


FIGURE 11 — Plot of mean grain size and phi deviation for the braided alluvial interval of the Dakota Sandstone, northeastern New Mexico.

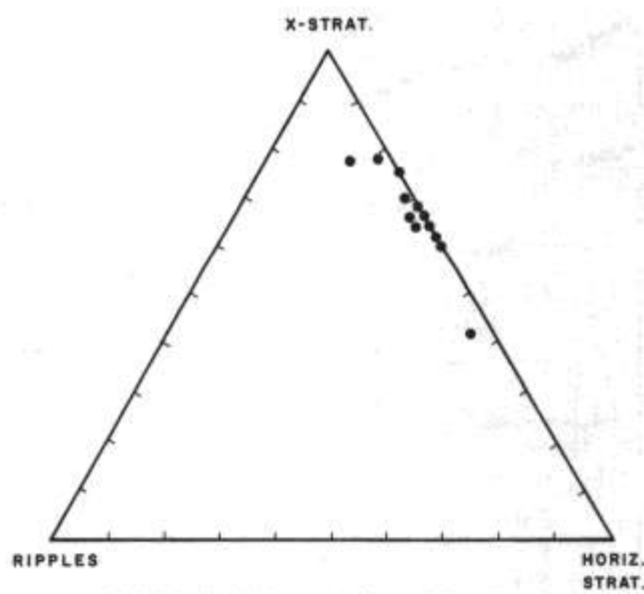
Paleocurrent Analysis

A computer analysis of 300 paleocurrent readings (25 readings per section) reveals a significant regional transport direction to the southeast (fig. 13). Vector mean directions in the western part show less dispersion than in the eastern part (fig. 13). However, the regional dispersion is low; all vector means are unimodal in distribution. The vector mean directions in the northeastern part show a somewhat more southerly transport direction, possibly indicating a different source area; other supporting evidence was not found. The grand mean paleocurrent direction calculated from 300 readings is 122 degrees.

The computer program CURT (Asquith, 1974) calculated the consistency ratio and standard deviation for each section, and these data along with the vector mean directions are summarized in table 2 (Appendix). The consistency ratio (L) is generally lower in the eastern part (fig. 13) and varies from 20.5 percent to 80.3 percent. The standard deviation varies from 38.8 to 94.7.

Grain Size Analysis

Mean grain size values range from 1.65 phi to 2.82 phi or medium to fine sand. In general the mean grain size in the braided alluvial interval decreases in an east to southeasterly direction (fig. 14) supporting the east and southeast paleocurrent directions and the decrease in thickness to the east and southeast. Mean inclusive graphic standard deviation (phi deviation) values range from 0.44 to 0.68 phi units or moderately well sorted to well sorted. A trend in phi deviation values across the area is not distinct. Table 3 (Appendix) is a summary of the grain size data.



● — Braided alluvial interval of the Dakota Sandstone, northeastern New Mexico.
x-strat. — Planar cross stratification + trough cross stratification.

FIGURE 12 — Three-component sedimentary facies plot (cross stratification-horizontal stratification-ripples).

Sedimentary Structure Analysis

Predominant sedimentary structures observed in the braided alluvial interval were planar cross stratification, trough cross stratification, horizontal stratification, and a few current ripples (fig. 12). Trough cross stratification is the most common variety of sedimentary structure and ranges from 36.0 to 68.3 percent of the sedimentary structures. Horizontal stratification ranges from 16.8 to 45.2 percent; planar cross stratification ranges from 9.2 to 42.0 percent. Ripples range from zero to 7.3 percent (table 4, Appendix).

The abundance of trough cross stratification and current ripples does not seem to change significantly across the study area. However, planar cross stratification increases in abundance to the east while horizontal stratification generally decreases.

Observations by Smith (1970) demonstrated that the ratio between planar cross stratification and planar cross stratification plus horizontal stratification (stratification ratio) could be used to determine the ratio of transverse bars to longitudinal bars. Smith (1970, p. 3010) determined that a predominance of longitudinal bars (proximal braided

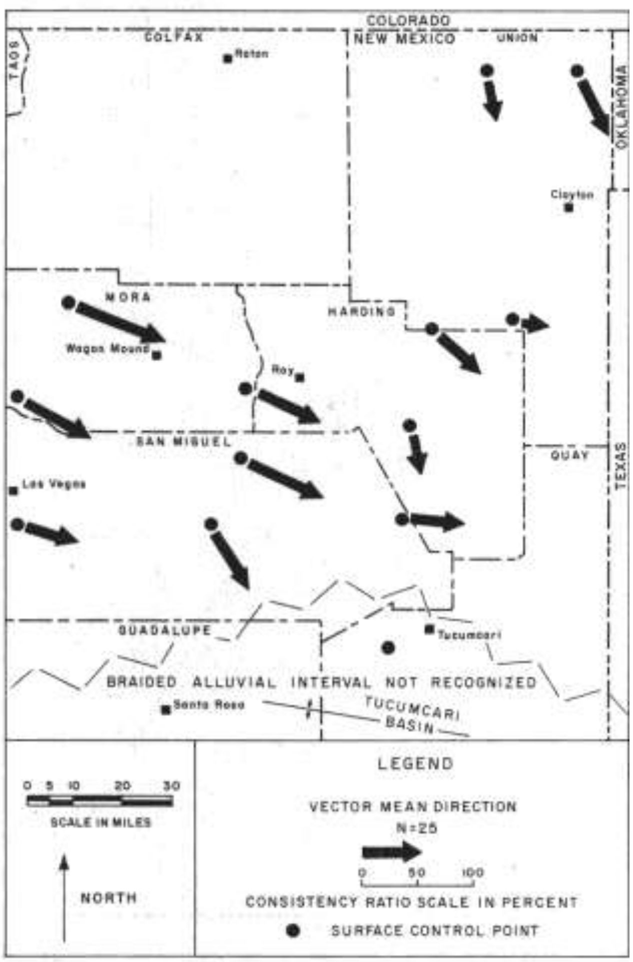


FIGURE 13 — Vector mean paleocurrent direction with consistency ratio for the braided alluvial interval of the Dakota Sandstone, northeastern New Mexico (25 readings per location).

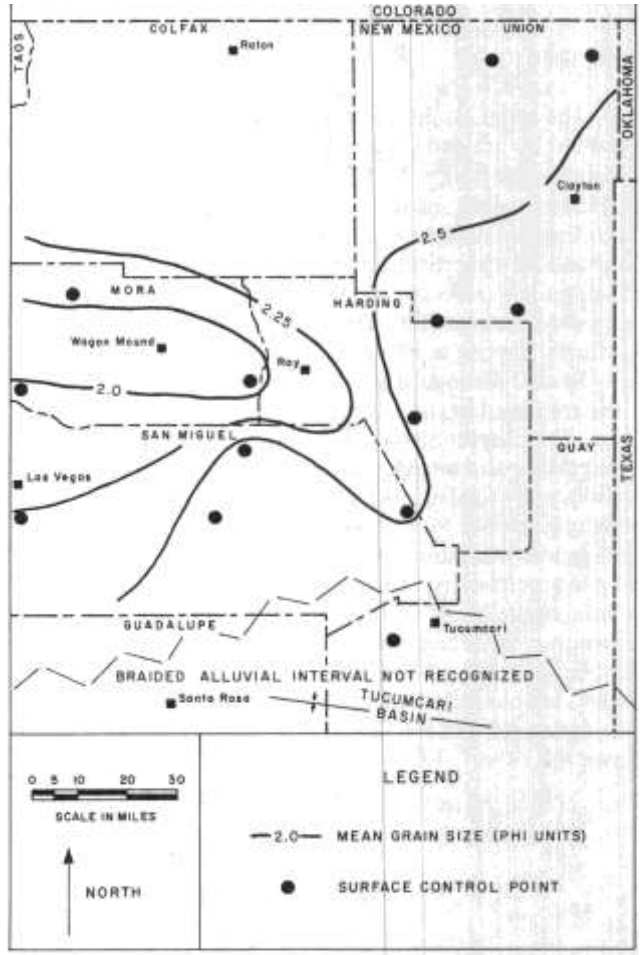


FIGURE 14 — Mean grain size in phi units for the braided alluvial interval of the Dakota Sandstone, northeastern New Mexico.

FIGURE 15 — View of proximal facies in the braided alluvial interval of the Dakota Sandstone along US-120 at the Canadian River (stratification ratio = 0.21).

FIGURE 16 — View of distal facies in the braided alluvial interval of the Dakota Sandstone along US-39 east of Mosquero, New Mexico (stratification ratio = 0.62).

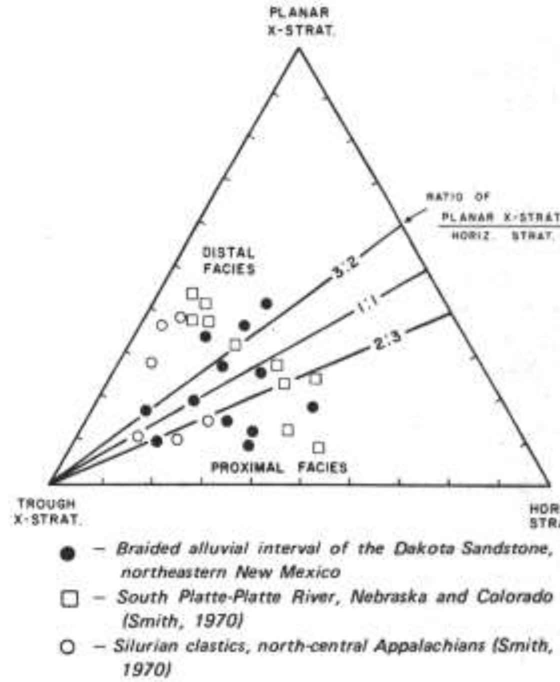


FIGURE 18 — Three-component sedimentary facies plot (planar cross stratification-horizontal stratification-trough cross stratification).

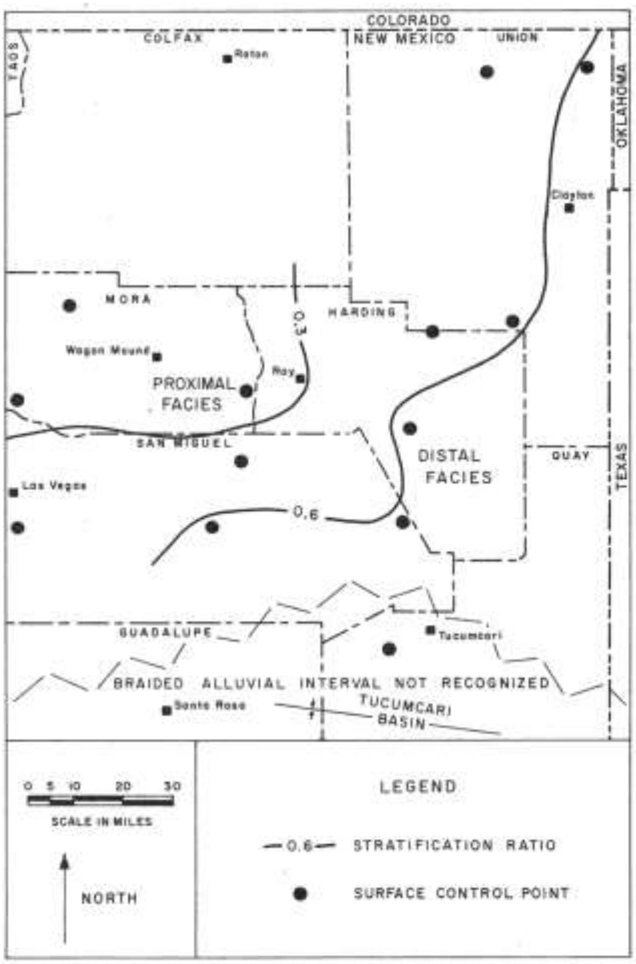


FIGURE 17 — Stratification ratio (planar cross stratification/planar cross stratification + horizontal stratification) for the braided alluvial interval of the Dakota Sandstone, northeastern New Mexico.

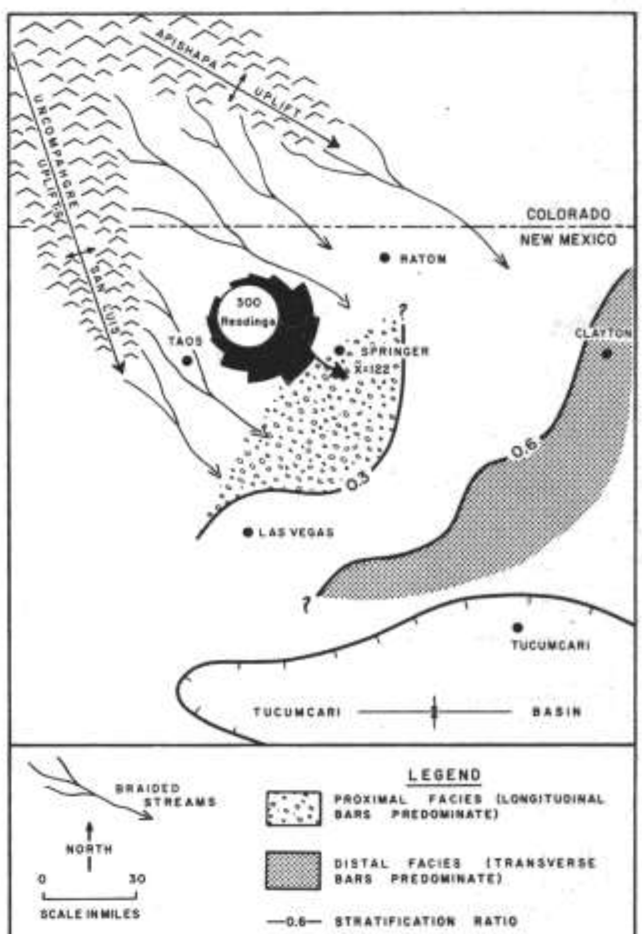


FIGURE 19 — Paleogeographic map of northeastern New Mexico and southern Colorado during deposition of the braided alluvial interval of the Dakota Sandstone. Source areas after McGookey and others (1972).

stream facies) was indicated by a low stratification ratio (0.3 or less) and that a predominance of transverse bars (distal braided stream facies) was indicated by a high stratification ratio (0.6 or greater).

The stratification ratio for the braided alluvial interval varies from 0.21 to 0.66 (table 4, Appendix). The ratio is lower (predominantly longitudinal bars, fig. 15) in the west and northwest and is higher (predominantly transverse bars, fig. 16) in the east and southeast (fig. 17). This relationship indicates a transition from proximal to distal braided stream facies moving eastward and southeastward (fig. 17). The same proximal-distal relationship can also be illustrated using a three-component sedimentary facies plot (fig. 18). Similar data for the South Platte-Platte River in Colorado and Nebraska and the Silurian clastics of the north-central Appalachians (Smith, 1970) are included for comparison.

Smith (1970, p. 3009 and 2996) noted that the downstream distance to the distal facies, where transverse bars first became predominant, varied from 100 miles for the Silurian clastics to 230 miles for the South Platte-Platte River. The data from the Silurian elastics (Smith, 1970) compared well with data from the Dakota braided alluvial interval which had a downstream 'stance of 100 to 160 miles to the distal braided stream-facies (fig. 19). The distance differences of the South Plat e-Platte River versus the Dakota braided alluvial interval an the Silurian clastics are probably the result of either differences in individual braided stream gradients or errors in determining the exact distance to the source area in ancient sediments.

Fig. 19 is a paleographic map f northeastern New Mexico and southern Colorado durining deposition of the braided alluvial interval of the Dakota Sandstone. This interpretation is based on isopach trends, paleocurrent directions, grain size variations, and sedimentary structure analysis.

SUMMARY

Regional paleocurrent analysis of the braided alluvial interval of the Dakota Sandstone in northeastern New Mexico indicates a dominant southeasterly transport direction This conclusion is supported by the decrease in mean grain size and thickness to the east and southeast. Analysis of stratification ratio (planar cross stratification/planar cross stratification + horizontal stratification; Smith, 1970) fir dicates that longitudinal bars are predominant (proximal braided stream facies) in the west and northwest parts, and that transverse bars are predominant (distal braided stream facies) to the east and southeast.

The downstream distance to the distal braided stream facies for the braided alluvial intery of the Dakota Sand. stone varies from 100 to 160 miles. This range compares favorably with the 100-mile distanc to the distal braided stream facies determined by Smith 1970) for the Silurian clastics of the north-central Appala ans. The sediment dispersal pattern and the presence of proximal braided stream facies in the west and northwest parts of the study area indicates that the source areas were the San Luis and Apishapa uplifts of Colorado and New Mexico (fig. 19).

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APPENDIX

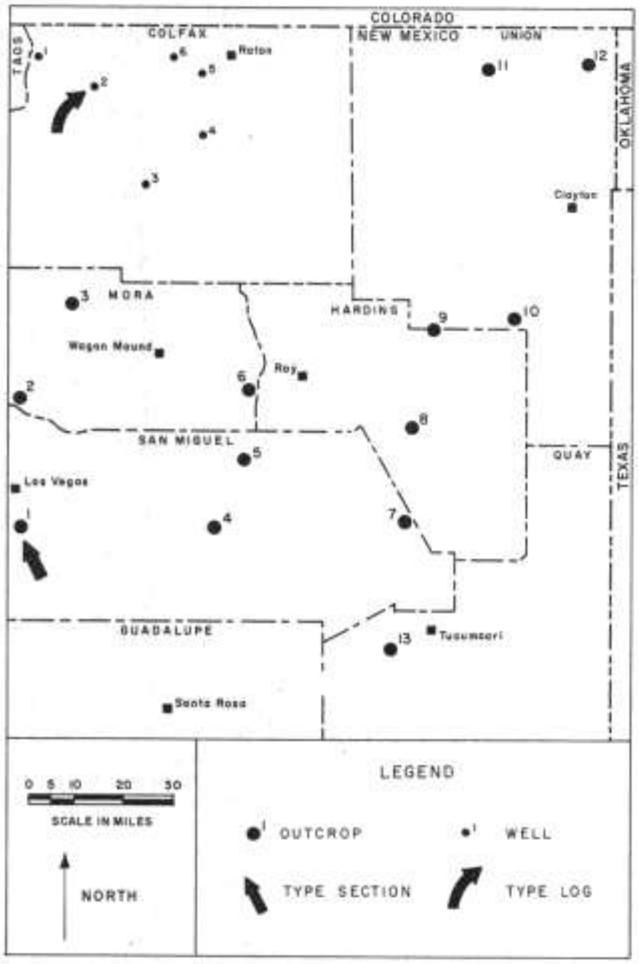

FIGURE 20 — Section and well locations for the braided alluvial interval of the Dakota Sandstone, northeastern New Mexico.

TABLE 1 — Thickness of braided alluvial interval of the Dakota Sandstone, northeastern New Mexico

Measured Section	Thickness (feet)	Well Log	Thickness (feet)
1. Romeroville	101	1. Vermejo # 1	115
2. Shock Ranch	195	2. Vermejo # 2	95
3. Lopez Ranch	180	3. W.S. Ranch # 1	103
4. Trujillo	50	4. Maxwell Land Grant # 1	74
5. Esquibel Ranch	161	5. St. Louis # 1	66
6. Canadian River	154	6. St. Louis # 2	60
7. Trigg Ranch	116		
8. Mosquero	128		
9. Bueyeros	62		
10. Poling Ranch	59		
11. Farr Ranch	75		
12. Black Mesa	45		
13. Tucumcari *	78		

* The braided alluvial interval is not recognized at this location in the study area. The thickness of the correlative Mesa Rica Sandstone was measured.

TABLE 2 — Paleocurrent data (25 readings per section) Dakota Sandstone, northeastern New Mexico

Section	Vector Mean Direction	Consistency Ratio (percent)	Standard Deviation
1. Romeroville	107.6°	47.4	89.7
2. Shock Ranch	118.1°	65.9	63.7
3. Lopez Ranch	115.2°	80.3	38.8
4. Trujillo	149.7°	63.8	55.2
5. Esquibel Ranch	115.9°	72.0	46.2
6. Canadian River	123.5°	59.2	57.8
7. Trigg Ranch	94.2°	46.1	89.1
8. Mosquero	165.1°	36.8	83.9
9. Bueyeros	137.1°	50.2	68.0
10. Poling Ranch	106.9°	20.5	94.7
11. Farr Ranch	170.3°	49.7	67.4
12. Black Mesa	155.0°	62.1	56.5

TABLE 3 — Grain size data (average of 5 samples per section) Dakota Sandstone, northeastern New Mexico

Section	Mean Grain Size (phi)	Mean Standard Deviation	Mean Skewness	Mean Kurtosis
1. Romeroville	2.26	0.50	+0.23	1.20
2. Shock Ranch	2.01	0.68	+0.08	1.20
3. Lopez Ranch	2.08	0.51	+0.09	1.03
4. Trujillo	2.35	0.67	+0.25	1.18
5. Esquibel Ranch	2.69	0.62	+0.27	1.24
6. Canadian River	1.65	0.48	+0.14	1.39
7. Trigg Ranch	2.36	0.50	+0.15	1.17
8. Mosquero	2.61	0.47	+0.13	1.16
9. Bueyeros	2.82	0.60	+0.15	1.29
10. Poling Ranch	2.62	0.44	-0.05	1.22
11. Farr Ranch	2.27	0.50	+0.23	1.23
12. Black Mesa	2.58	0.57	+0.19	1.07

Table 4 follows

TABLE 4 — Sedimentary structure data Dakota Sandstone, northeastern New Mexico.

Section	Planar X-Strat. (percent)	Trough X-Strat. (percent)	Horizontal Strat. (percent)	Ripples (percent)	Stratification Ratio
1. Romeroville	10.3	70.3	17.3	2.1	0.37
2. Shock Ranch	10.8	56.4	32.8	0.0	0.25
3. Lopez Ranch	13.2	38.9	45.2	2.7	0.24
4. Trujillo	42.0	36.0	22.0	0.0	0.66
5. Esquibel Ranch	14.4	56.5	29.1	0.0	0.33
6. Canadian River	9.2	56.5	34.3	0.0	0.21
7. Trigg Ranch	25.8	52.6	20.6	1.0	0.56
8. Mosquero	34.4	44.5	21.1	0.0	0.62
9. Bueyeros	12.1	67.7	12.9	7.3	0.48
10. Poling Ranch	19.6	60.8	19.6	0.0	0.50
11. Farr Ranch	29.2	44.6	24.9	1.3	0.54
12. Black Mesa	37.8	42.2	20.0	0.0	0.65

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