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CRETACEOUS ROCKS OF THE SAN JUAN BASIN AREA

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The Cretaceous in the San Juan Basin consists mainly of interbedded sandstone and shale varying in general from approximately a 5, 250-foot predominantly shale series in the northeastern portion to approximately a 4, 000-foot predominantly sandstone series in the southwestern portion. The Cretaceous thickness over the San Juan Basin is relatively uniform, considering the rapid change in the type of sediments.

The Graneros shale, 20-150 feet thick, consists of a black, dense, heavy, "poker chip" shale which can be correlated over the entire basin.

The overlying Greenhorn limestone, 50-100 feet thick, is recognized as a very calcareous shale over most of the central and northern portion of the San Juan Basin. The Mancos, with a thickness of 700-2, 300 feet, thins and intertongues with the Mesaverde in the southern portion of the San Juan Basin. In the northeastern portion of the basin the Mancos consists of black, dense shale, which grades to a more silty shale in the southwestern portion.

Although the Carlile and Niobrara shale are recognizable in some areas, they are not in common use. Most geologists at the present time prefer to obtain more control to determine the value of these members as correlative markers.

DEFIANCE UPLIFT	SAN JUAN UPLIFT	NACIMIENTO UPLIFT	ZUNI UPLIFT
WEST	NORTH	EAST	SOUTH
Ojo Alamo	Animas / Ojo Alamo	Ojo Alamo	Ojo Alamo
	McDermott		
Kirtland	Kirtland	Kirtland	Kirtland
Fruitland	Fruitland	Fruitland	Fruitland
Pictured Cliffs	Pictured Cliffs	Pictured Cliffs	Pictured Cliffs
Lewis	Lewis	Lewis	Lewis
Cliff House			See Coal Reports for Detail
Menefee	Menefee	Menefee	
Point Lookout	Point Lookout	Point Lookout	
Mancos	Mancos	Mancos	Mancos
Dakota	Dakota	Dakota	Dakota

CRETACEOUS FORMATIONS FLANKING THE MAJOR UPLIFTS IN THE SAN JUAN BASIN

The Dakota, with a thickness of 175-275 feet, varies from a fine-grained sandstone to a coarse conglomerate with intervening black shale and coal and is often divided into three zones commonly known as the upper, middle, and lower Dakota. Although these zones may be used in general as the upper, consisting of fine-grained sandstone, the middle, a shale and coal series, and the lower, a coarse conglomerate, such a division is difficult to correlate with any degree of accuracy.

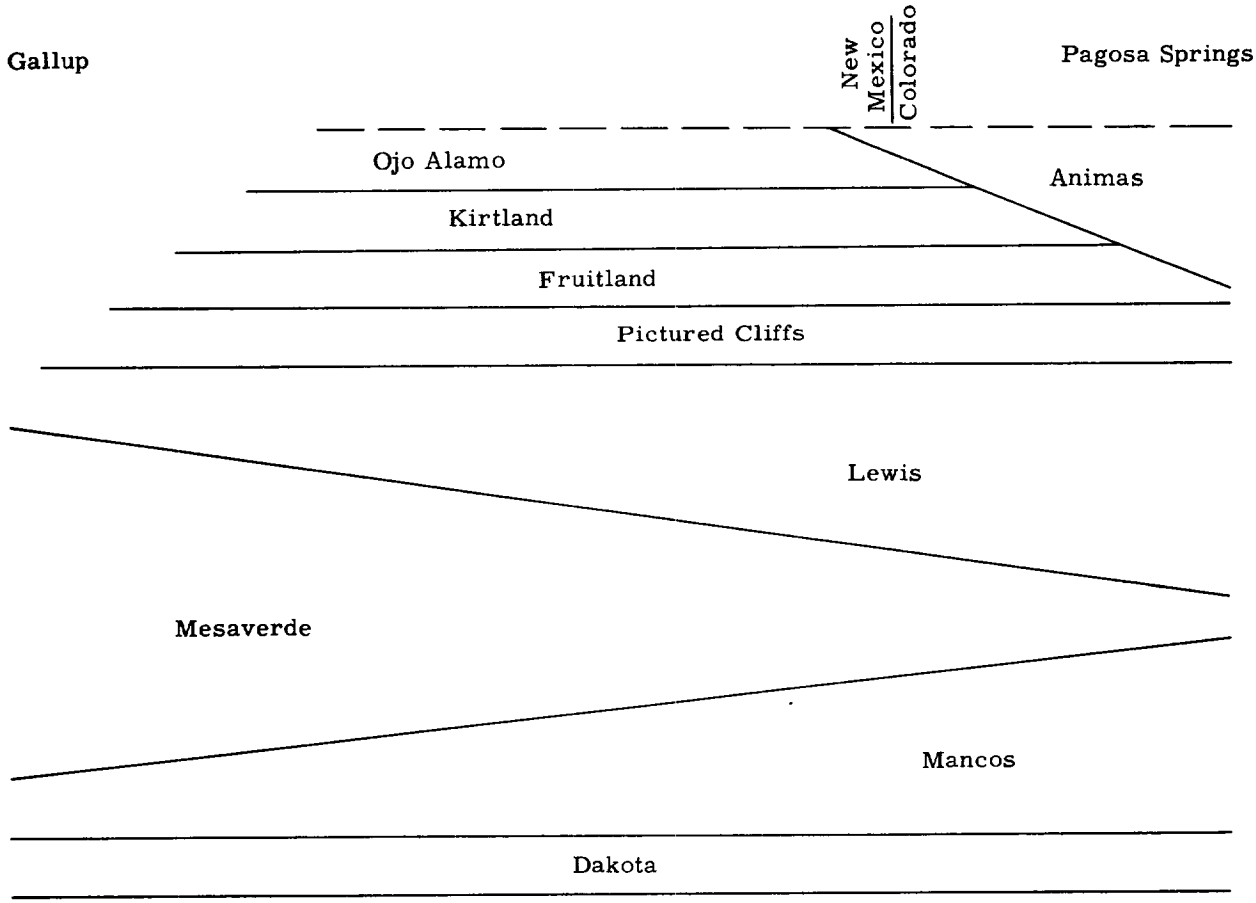
The Mesaverde Group

The Mesaverde group consists of the Point Lookout, Menefee, and Cliff House formations, with the exception of the southern portion of the San Juan Basin, where the group is further subdivided as a result of coal studies made by the U. S. Geological Survey.

The Point Lookout sandstone, 150-200 feet thick, consists of a medium- to fine-grained sandstone which extends over the central and northern portion of the basin. In the southern portion of the basin this sandstone is underlain by tongues of sandstone interbedded with shale and coal which are considered to be in the Mesaverde group.

The Fruitland formation 0-500 feet thick, consists of coal, clay, shale, and sandstone of brackish and fresh water origin.

The Kirtland formation 0-1, 200 feet thick, contains green to gray shale with interbedded sandstone and is divided into an upper and a lower



HYPOTHETICAL SECTION SHOWING RELATIONSHIP OF BEDS IN THE SAN JUAN BASIN BETWEEN GALLUP, NEW MEXICO, AND PAGOSA SPRINGS, COLORADO

The Menefee formation, 0-1, 600 feet thick, consisting of black shale, coal, and sandstone, is present in the northern three-fourths of the basin. In the southern portion the formation is subdivided into several coal members.

The Cliff House formation, 0-250 feet thick, contains medium- to fine-grained sandstone which thins northeastward in the San Juan Basin.

Overlying the Mesaverde is the Lewis formation, 150-2, 500 feet thick, a gray, silty shale with a few thin sandstone layers. This formation thickens to the east at the expense of the Mesaverde.

The Pictured Cliffs sandstone, 50-500 feet thick, contains interbedded shale and thin coal streaks within the massive white marine sandstone. This sandstone thickens northeastward at the expense of the overlying Fruitland formation.

member with a middle sandstone tongue which has been called the Farmington sandstone member.

The McDermott formation, 0-300 feet thick, is composed of brown to purple shale with a small amount of sandstone. This formation has its greatest thickness in the northwestern portion of the basin.

The Ojo Alamo sandstone, 0-200 feet thick, consists mainly of coarse sandstone and pebbles lying unconformably upon the Kirtland series. Although this contact has been reported as being conformable, sufficient evidence has been presented to prove that it is unconformable.

The Animas formation, 0-2, 000+ feet thick, of late Cretaceous and Paleocene age, consists predominantly of arkosic sandstone and green to gray micaceous shale.

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