

LOCATION OF STUDY AREA

INTRODUCTION

The southern High Plains of Colorado, an area of about 2,800 square miles in the southeastern part of the State, is underlain by the Ogallala Formation of late Tertiary age. The southern High Plains of Colorado extend from the Colorado State line on the east and south to the edge of the Ogallala Formation on the north and west. The Ogallala Formation is an unconsolidated or partly consolidated deposit of sand, gravel, clay, silt, and caliche.

The Ogallala aquifer, which consists of the Ogallala Formation and overlying thin, unconsolidated, surficial deposits, is an important aquifer in the southern High Plains. Water levels in the Ogallala aquifer have declined because of long-term pumping, mostly for irrigation. This report presents geohydrologic maps needed to understand the ground-water hydrology and to manage the water resources of the Ogallala aquifer.

Many of the data used to prepare the maps in this report were collected in cooperation with the Colorado Department of Natural Resources, Division of Water Resources, Office of the State Engineer and the Colorado Water Conservation Board.

BEDROCK GEOLOGY

The uppermost bedrock underlying the Ogallala Formation in the southern High Plains consists of generally eastward-dipping sedimentary rocks of Cretaceous, Jurassic, Triassic, and Permian ages. The Dakota Sandstone and Purgatoire Formation of Cretaceous age directly underlie the Ogallala Formation in about 70 percent of the southern High Plains. The next most extensive bedrock unit consists of the undifferentiated Cretaceous Carlile Shale, Greenhorn Limestone, and Graneros Shale and directly underlies the Ogallala Formation in about 19 percent of the area. This unit is present in the northern and northwestern parts of the southern High Plains. The Dockum Group of Triassic age subgroups in about 9 percent of the area in the southeast part of the southern High Plains. The Morrison, Ralston Creek, and Entrada Formations of Jurassic age and undifferentiated Triassic and Permian rocks subcrop near Two Buttes Reservoir. The Niobrara Formation of Cretaceous age subcrops in a small area along the northwest boundary of the study area. Permian sedimentary rocks subcrop in a small area in extreme southeastern Baca County.

The Dakota Sandstone, Purgatoire Formation, and Dockum Group are mostly sandstone and are important aquifers that commonly yield enough water for irrigation wells. Well yields vary, however, because of changes in the percentages of clay and shale, the extent of fracturing, and the degree of cementation (Hershey and Hampton, 1974).

ALTITUDE AND CONFIGURATION OF THE BEDROCK SURFACE

The bedrock surface is a surface eroded into Cretaceous, Jurassic, Triassic, and Permian rocks before deposition of the Ogallala Formation. This surface, shown on the geology and altitude of the bedrock surface map, generally slopes from west to east and, in the mapped area, ranges from a high of about 4,950 feet near Uteville in western Baca County to a low of about 3,250 feet along the Colorado State line in southeastern Prowers County. The bedrock surface dips to the east because of uplift of the Rocky Mountains to the west. The bedrock surface was eroded by generally eastward-flowing rivers. Bedrock valleys, such as the one in southeast Prowers County, are shown by parallel bends in the bedrock contours upgradient of the regional trend of the contours. The Ogallala Formation was deposited on the eroded bedrock surface by rivers carrying material weathered from the rising mountains to the west.

DEPTH TO BEDROCK

The depth to bedrock in the southern High Plains of Colorado ranges from less than 50 feet in several places to more than 350 feet near Campo in Baca County, south of Cheney Center in Prowers County, and in a small area along the Baca-Prowers County line as shown on the map. The depth to bedrock in much of the southern High Plains is between 50 and 150 feet.

The study area is limited to the area underlain by the Ogallala Formation. The Ogallala aquifer consists of the Ogallala Formation and overlying alluvium, colluvium, and eluvium. Therefore, the depth to bedrock at the boundary of the study area may be shown as more than 50 feet.

ALTITUDE AND CONFIGURATION OF THE WATER TABLE

The altitude of the water table in the mapped part of the southern High Plains of Colorado ranges from about 5,100 feet near the western Baca County line to about 3,400 feet in eastern Prowers County. The water table generally slopes in the same direction as the land surface and the bedrock surface. The water-table map is based on 1980 water levels from the wells shown, on historical water levels ranging in date from 1947 to 1979 from the wells shown and from other wells, and on the altitude and configuration of the land surface. The water table is in bedrock in the areas shown as unsaturated on the saturated thickness map of the Ogallala aquifer in 1980.

SATURATED THICKNESS OF THE OGALLALA AQUIFER

The saturated thickness of the Ogallala aquifer in 1980 in the southern High Plains ranged from zero in about 40 percent of the mapped area to 200 to 250 feet in a small area along the Baca-Prowers County line. The saturated thickness depends on the altitude and shape of both the bedrock surface and the water table. The saturated thickness is greatest where there are valleys eroded into the bedrock surface, such as in southeastern Prowers County and south of Campo in Baca County. The chances of drilling a successful irrigation well in the Ogallala aquifer are minimal in areas where the saturated thickness is less than 50 feet because of insufficient well yields.

Alluvium, colluvium, and eluvium commonly overlie the Ogallala Formation and are included in the Ogallala aquifer. The aquifer may be saturated, therefore, at the boundary of the Ogallala Formation.

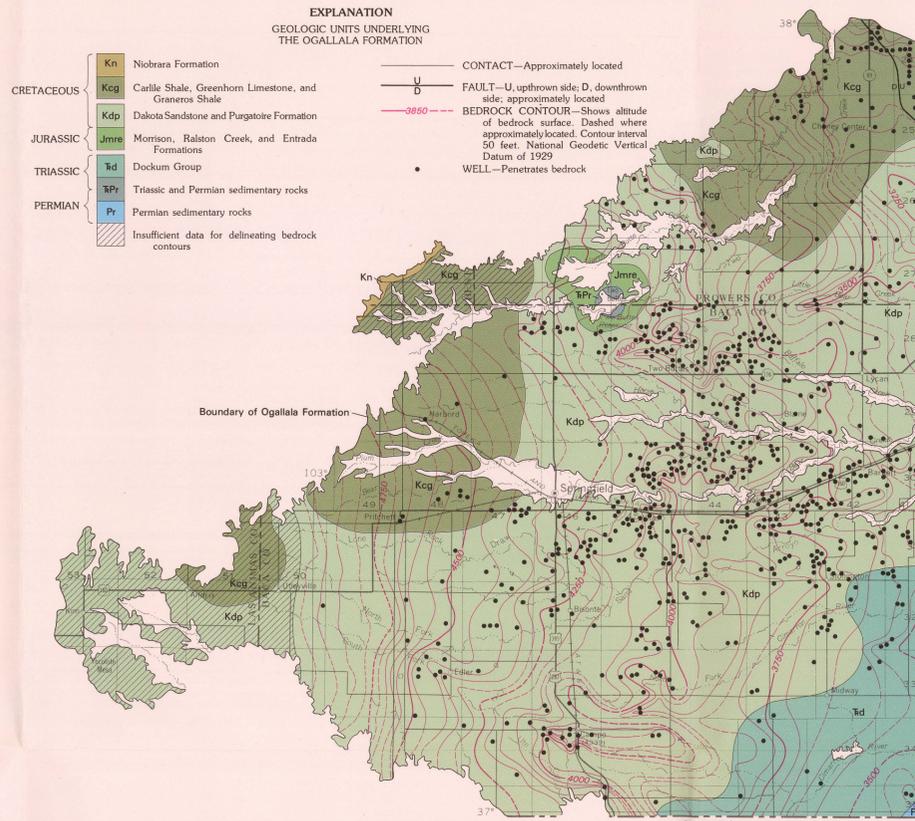
SELECTED REFERENCES

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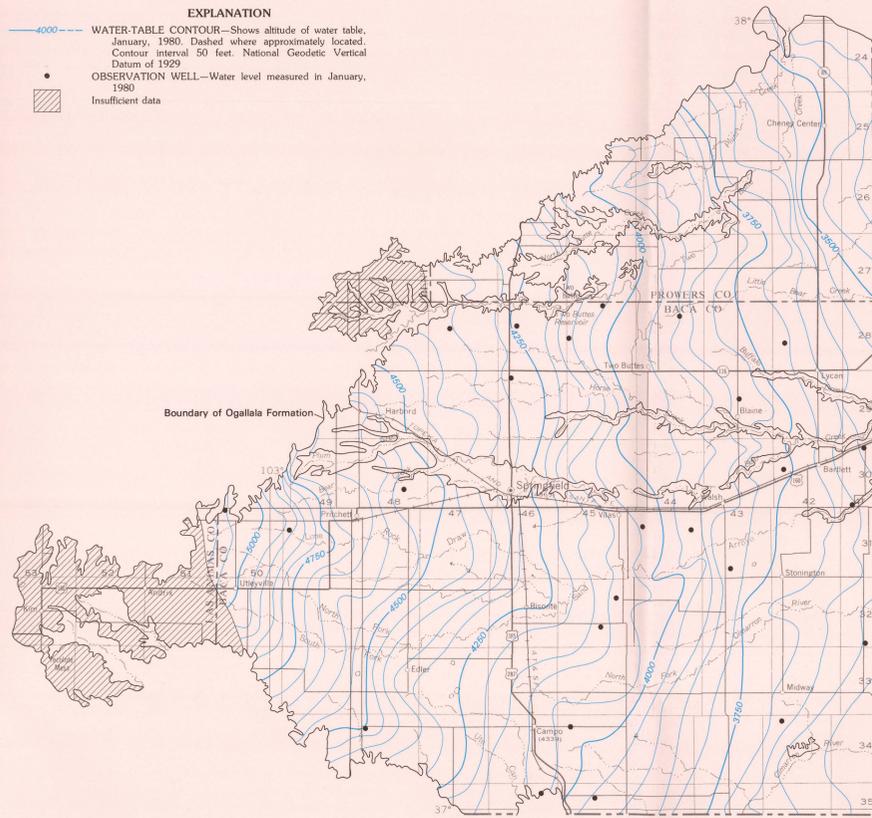
CONVERSION FACTORS

Multiply inch-pound units	By	To obtain SI units
foot	0.3048	meter
square mile	2.590	square kilometer
mile	1.609	kilometer

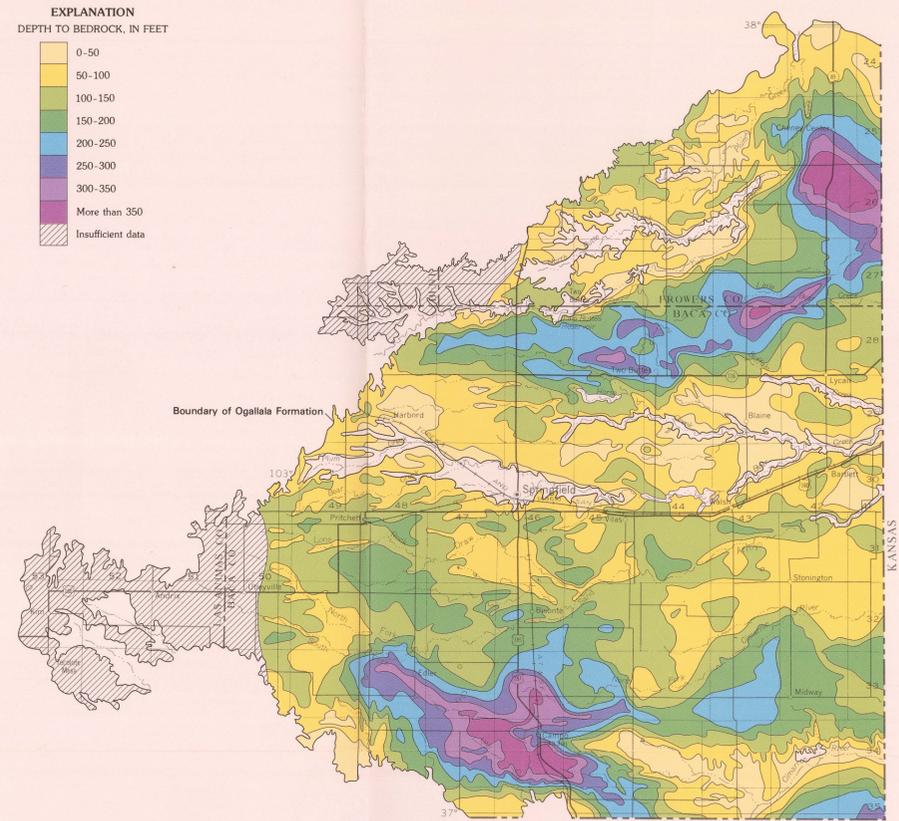
National Geodetic Vertical Datum of 1929: A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level.



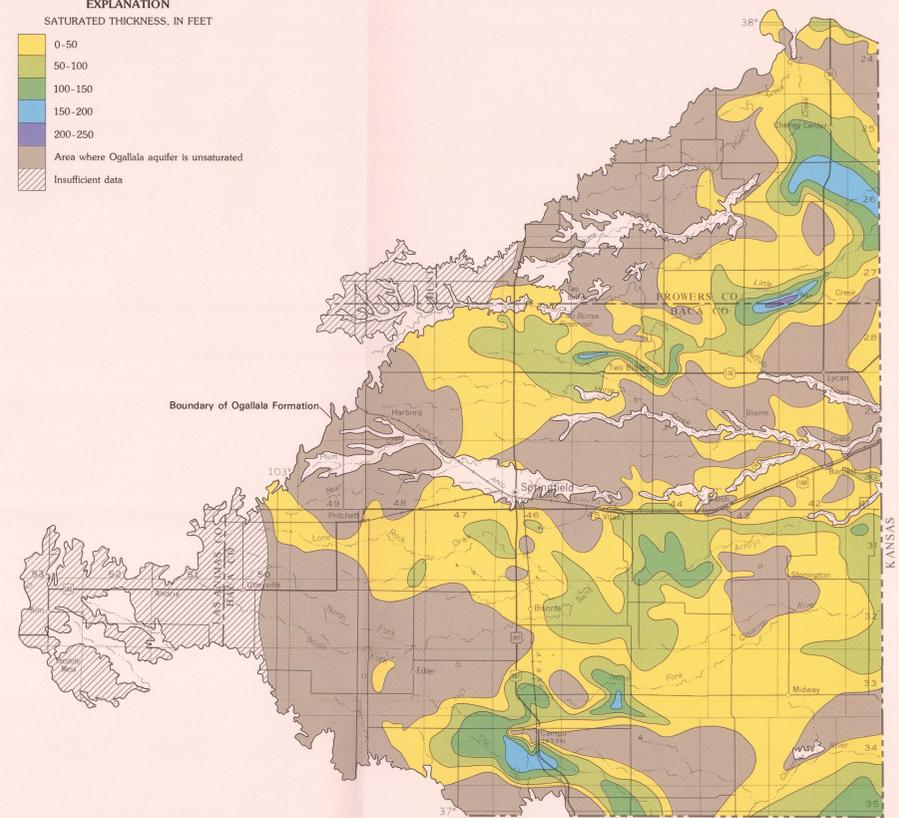
MAP SHOWING GEOLOGY AND ALTITUDE OF BEDROCK SURFACE



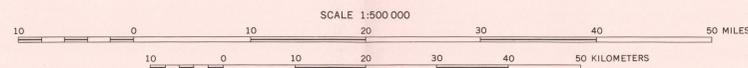
MAP SHOWING ALTITUDE AND CONFIGURATION OF THE WATER TABLE, 1980



MAP SHOWING DEPTH TO BEDROCK



MAP SHOWING SATURATED THICKNESS OF THE OGALLALA AQUIFER, 1980



GEOLOGY, ALTITUDE, AND DEPTH OF THE BEDROCK SURFACE; ALTITUDE OF THE WATER TABLE IN 1980; AND SATURATED THICKNESS OF THE OGALLALA AQUIFER IN 1980 IN THE SOUTHERN HIGH PLAINS OF COLORADO

By
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