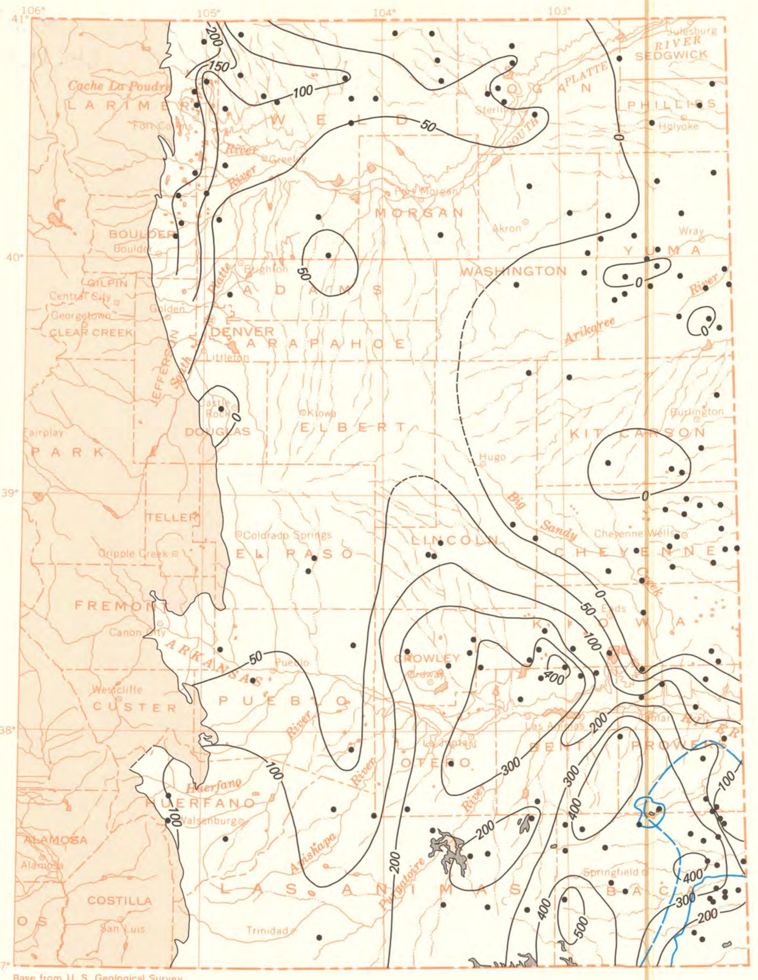
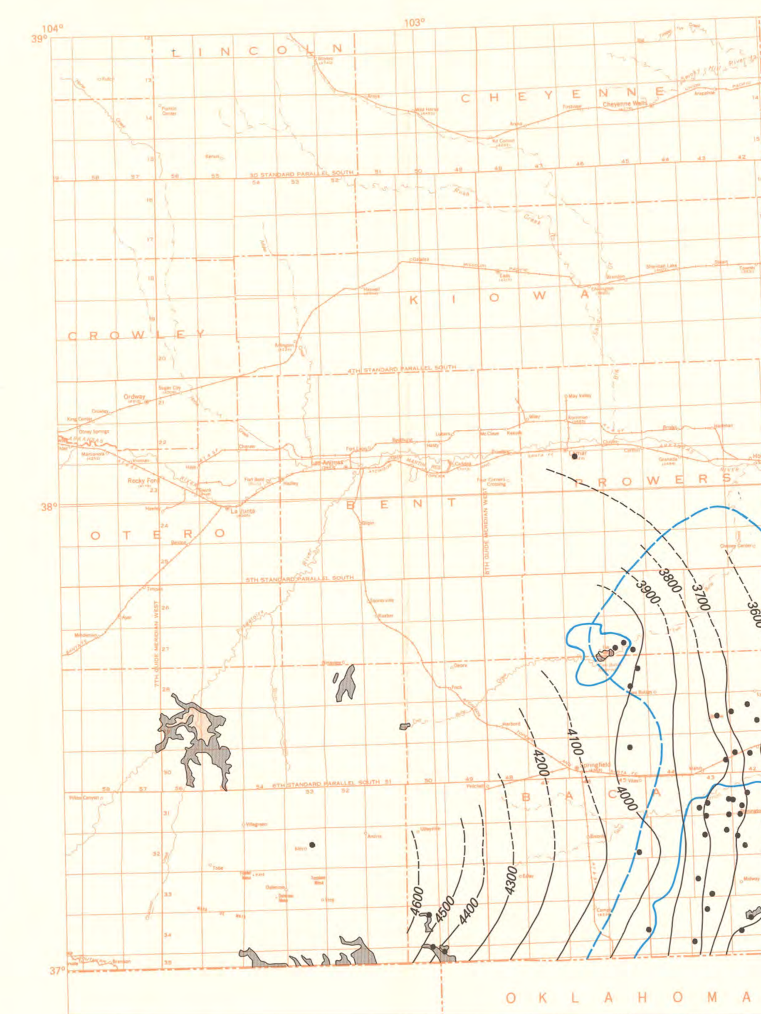


Base from U. S. Geological Survey United States base map, 1972

EXPLANATION

- OUTCROP OF PRE-TRIASSIC ROCKS
- OUTCROP OF DOCKUM GROUP
- —200— LINE OF EQUAL AGGREGATE SANDSTONE THICKNESS—Intervals 50 and 100 feet
- APPROXIMATE SOUTHEASTERN LIMIT OF THE DAKOTA-CHEYENNE AQUIFER
- APPROXIMATE SOUTHEASTERN LIMIT OF THE MORRISON FORMATION
- • DATA POINT

Figure 25.—Aggregate sandstone thickness in the Entrada-Dockum aquifer in eastern Colorado.



Base from U. S. Geological Survey Colorado State base map, 1969

EXPLANATION

- OUTCROP OF PRE-TRIASSIC ROCKS
- OUTCROP OF DOCKUM GROUP
- —4000— — POTENTIOMETRIC CONTOUR—Shows altitude of standing-water level in wells completed in the Entrada-Dockum aquifer. Dashed where approximately located. Contour interval 100 feet. Datum is sea level
- APPROXIMATE SOUTHEASTERN LIMIT OF THE DAKOTA-CHEYENNE AQUIFER
- APPROXIMATE SOUTHEASTERN LIMIT OF THE MORRISON AQUIFER
- • DATA POINT

Figure 26.—1963-1972 potentiometric surface for the Entrada-Dockum aquifer in southeastern Colorado.

ENTRADA-DOCKUM AQUIFER

Geology

Of the Triassic and Jurassic rocks in eastern Colorado, the sequence of relatively coarse-grained sedimentary rocks consisting of the Triassic Dockum Group, the Triassic Jelm Formation, the Jurassic Entrada Sandstone, and equivalent rocks (fig. 2) is the most promising in terms of water-yielding potential. Although, at present, these rocks are not extensively used as sources of water; their importance is likely to increase in the future as water demand increases. These rocks form the Entrada-Dockum aquifer in Colorado and are part of the Western Interior Plains confining system (fig. 2). The aquifer is underlain by fine-grained clastics, carbonates, and evaporites of Permian age and overlain by shale, carbonates, and evaporites of the Ralston Creek and Morrison Formations. The coarse-grained strata generally grade laterally into interbedded shale and siltstone toward the central and northeastern parts of the study area.

The Dockum Group in Colorado represents the northernmost extension of a sequence of predominantly clastic rocks deposited in an area centered in the Midland Basin of the Texas panhandle (McGowen and others, 1977). The Dockum Group consists mainly of fine- to medium-grained sandstone that is usually massively bedded, although locally, it is interbedded with siltstone and shale. In some places, layers of coarse-grained sandstone occur. The sandstone is mostly orange or red but ranges to buff, maroon, brown, or white in places. The intergranular cement commonly is silica and locally is anhydrite, calcite, or clay. Beds of carbonate and anhydrite uncommonly occur. In the Texas panhandle and eastern New Mexico, the Dockum Group was deposited in continental environments described by McGowen and others (1977) as fluvial, fan-deltaic, and lacustrine. The fine-grained sediments primarily were deposited near the center of the Midland Basin. The massive, fine- to medium-grained sandstones typical of the Dockum Group in the subsurface in Colorado were probably deposited in fluvial and alluvial-fan environments. This facies extends from the south into Colorado and is the lowermost unit of the aquifer as far north as Lincoln County. The fine-grained sandstone, siltstone, shale, and limestone that have been observed (McLaughlin, 1954) in Baca County were probably deposited in delta-fan and lacustrine environments.

The Jelm Formation of Triassic age forms the lowermost stratum of the Entrada-Dockum aquifer in the part of the study area north of Boulder and consists of "salmon-pink, calcareous, crossbedded sandstone" (Pipiringos and O'Sullivan, 1976).

In the northern part of the study area, the Jurassic Sundance Formation, which overlies the Jelm Formation where the Jelm is present, constitutes the entire Entrada-Dockum aquifer where the Jelm Formation is absent. In Colorado, the Sundance Formation is made up of, in ascending order, the Canyon Springs Sandstone Member, a generally pink to reddish-pink, calcareous, crossbedded sandstone; the Pine Butte Member, a yellowish-gray sandstone; and the Windy Hill Sandstone Member, a grayish limy sandstone with shale partings (Pipiringos and O'Sullivan, 1976).

The Jurassic Entrada Sandstone overlies the Dockum Group in much of the southern part of the study area; Pipiringos and others (1968) have correlated the Entrada Sandstone with the Canyon Springs Member of the Sundance Formation in western Colorado. The Entrada Sandstone consists of red, orange, and pink, crossbedded, eolian sandstone and planar-bedded, water-laid sandstone (Berman and others, 1980). Toward the central and northeastern parts of the study area, the sandstone of the Jelm, Sundance, and Entrada Formations grades into siltstone and shale, which were deposited in a marine environment (Berman and others, 1980).

The top of the Entrada-Dockum aquifer generally lies 200 to 300 ft below the base of the Dakota-Cheyenne aquifer, although in places the intervening rocks exceed 400 ft in thickness. In the southeastern corner of the study area, these intervening rocks are absent; where the Dakota-Cheyenne aquifer is also absent, the Entrada-Dockum aquifer crops out or is overlain by the Ogallala Formation or by Quaternary deposits.

The aggregate sandstone thickness of the Entrada-Dockum aquifer ranges from zero in much of the central and eastern part of the study area to more than 500 ft in the southeastern part (fig. 25). Large aggregate sandstone thicknesses for the Entrada-Dockum aquifer occur in two areas of eastern Colorado. In the smaller of the two areas, which is located along the eastern flank of the Front Range in eastern Larimer and eastern Boulder Counties and extends across northern Weld County, the aquifer consists of 50 to more than 200 ft of fine- to medium-grained sandstone of the Sundance and Jelm Formations. The larger of the two areas occurs in southwestern Lincoln, western Kiowa, Prowers, Crowley, Otero, Bent, Baca, and eastern Las Animas Counties where the aquifer contains 50 to more than 500 ft of sandstone. Most of the aggregate sandstone thickness of the Entrada-Dockum aquifer in this area occurs in the Dockum Group; the remainder of the sandstone is in the Entrada Sandstone. Where the aggregate sandstone thickness is greater than about 300 ft (fig. 25), the total thickness of the aquifer is approximately equal to the aggregate sandstone thickness; elsewhere, the total thickness of the aquifer ranges from zero in parts of the northeastern section of the study area to about 500 ft in the northwestern section.

Hydrology

In the southeastern part of the study area, the Entrada-Dockum aquifer currently (1985) is used to a limited extent as a source of domestic and stock water. Elsewhere in the study area, the Entrada-Dockum aquifer is not used as a source of water because of its depth of burial, small hydraulic conductivity, or poor quality water.

Hydrologic data for the Entrada-Dockum aquifer are largely restricted to a small area in the southeastern corner of the study area, where the Morrison Formation is absent. In this area, head measurements in water wells are numerous, and the potentiometric surface is shown to slope eastward, indicating ground-water flow in this direction (fig. 26). Although head measurements represented in figure 26 were made during 10 years, the relative uniformity of the gradient indicates that little fluctuation in head occurred during the period. The absence of the Morrison Formation here allows direct hydraulic connection between the Entrada-Dockum aquifer and the Cheyenne Sandstone Member of the Purgatoire Formation; thus, the potentiometric surfaces in these two units locally are at approximately equal altitudes (Hershey and Hampton, 1974). In southern Prowers County, sparse data indicate that flow in the Entrada-Dockum aquifer is approximately toward the northeast.

In the area of dissected-plain topography in southwestern Baca and southeastern Las Animas Counties, several wells sited on the canyon floors are completed in the Entrada-Dockum aquifer. In each well, the water level is several tens of feet below land surface, approximately at the level of the nearest stream. Within 5 mi of these wells, numerous contact springs issue from many of the outcropping bedrock units, including the Dakota Sandstone and the Cheyenne Sandstone Member of the Purgatoire Formation, at points as much as 300 ft above the water levels in the wells. These observations indicate that the intervening Morrison and Ralston Creek Formations have zones of low vertical hydraulic conductivity and that the potentiometric surface in the Dakota-Cheyenne aquifer locally is substantially higher than that in the Entrada-Dockum aquifer.

The relatively impermeable shale, siltstone, carbonates, and evaporites of the Ralston Creek and Morrison Formations probably form an effective upper confining layer for the Entrada-Dockum aquifer. In areas where the Morrison Formation is sandy, such as northern Weld, western Logan, southern Kit Carson, northwestern Baca, and southern Las Animas Counties, flow between the Morrison Formation and the Enttrada-Dockum aquifer may occur. The continuous and even-bedded evaporites, carbonates, shale, and siltstone found in the upper part of the Permian section likely form an effective lower confining layer for the Entrada-Dockum aquifer. The areally extensive fine-grained sedimentary rocks of Triassic and Jurassic age in the central part of the study area form a barrier to lateral hydraulic flow, thereby effectively isolating the northern part of the aquifer from the southern part.

The Entrada-Dockum aquifer in the southeastern part of the study area is recharged from above. In eastern Las Animas and western Baca Counties, some of the water that falls as precipitation on the extensive outcrops of the Dakota Sandstone and the Purgatoire, Morrison, and Ralston Creek Formations (fig. 25) eventually percolates to the Entrada-Dockum aquifer. A minor amount of water probably recharges the aquifer in the relatively small outcrop areas of the Entrada Sandstone and the Dockum Group. In eastern Baca County, where the Morrison Formation is absent, recharge from the overlying units occurs readily.

Discharge from the Entrada-Dockum aquifer occurs naturally to springs, creeks, and the Purgatoire River in eastern Las Animas and southwestern Baca Counties. Water within the aquifer also flows into Kansas and Oklahoma.

Recharge to and discharge from the Entrada-Dockum aquifer is also artificially affected by two types of stresses: (1) Pumping from wells completed in the aquifer, and (2) pumping from wells completed in overlying aquifers, such as the Dakota-Cheyenne or the Ogallala, in areas where the confining beds that elsewhere separate the aquifers are absent. The latter type of stress tends to reduce recharge to, or induce discharge from, the Entrada-Dockum aquifer. Reported yields from wells in the Dockum Group in eastern Baca County average 1,500 gal/min, and Entrada Sandstone wells in this area generally produce less than 100 gal/min (Hershey and Hampton, 1974). Actual well yields may differ significantly from reported yields. A transmissivity of 670 ft²/d and a hydraulic conductivity of 4.7 ft/d were calculated using data from a specific-capacity test of a well in T. 28 S., R. 45 W., sec. 14, completed in 144 ft of sandstone of the Entrada-Dockum aquifer.

The dissolved-solids concentration of water in the Entrada-Dockum aquifer ranges from 250 to more than 5,000 mg/L. The less saline water is found mainly in the southeastern corner of Baca County where the Entrada-Dockum aquifer is overlain by the Ogallala Formation and(or) Quaternary deposits. Low-salinity water also is found near the outcrop area at Two Buttes dome. More saline water occurs distant from recharge areas, such as in southwestern Baca or central Bent Counties. Water in the Entrada-Dockum aquifer is a mixed type (calcium, magnesium, sodium, bicarbonate, sulfate, chloride) in Baca County (Hershey and Hampton, 1974). Because no hydrologic data are available for the Entrada-Dockum aquifer in the central and northern parts of the study area, a thorough analysis of the hydrology of the aquifer in these areas cannot be made.

Although development of the Entrada-Dockum aquifer up to the present (1985) has been limited mostly to eastern Baca County, water supplies could be developed from the aquifer in other areas. Aggregate sandstone thicknesses are large in western Baca, southwestern Prowers, and southeastern Bent Counties, where the quality of the water should be suitable for most stock and irrigation purposes. The results of the above-mentioned specific-capacity test, which was conducted near this area, indicate that the sandstone of the Entrada-Dockum aquifer has good hydraulic conductivity and that wells completed in the aquifer in areas where the aggregate sandstone thickness is large probably will have yields similar to those of wells completed in the aquifer in eastern Baca County. Aggregate sandstone thickness also is large in northwestern Bent, eastern Otero, southeastern Crowley, and southwestern Kiowa Counties, although the quality of the water in the aquifer in this area, distant from recharge areas, probably is poor and may be unsuitable for agricultural use.

LYONS AQUIFER

Geology

The Lyons aquifer occurs in the Permian Lyons Sandstone, Glorieta Sandstone equivalent, and other equivalent sandstone beds in eastern Colorado. The aquifer is part of the Western Interior Plains confining system of the central United States (fig. 2). Although these rocks crop out only in a general area from Colorado Springs to the Colorado-Wyoming line (Mudge, 1967), the aquifer underlies most of the area of Colorado east of the Front Range and the Wet and Sangre de Cristo Mountains (fig. 27). In the Canon City embayment and south, the western limit of the Lyons aquifer is in the subsurface, near the 105° W. meridian. The aquifer is absent in Sedgwick, Phillips, and parts of Logan, Washington, and Yuma Counties, where the Lyons Sandstone pinches out; interbedded siltstone, shale, and silty shale occupy the correlative stratigraphic position in this area.

The Lyons Sandstone is composed mostly of grayish-orange-pink and light-brown, fine- to medium-grained, well-sorted, crossbedded quartz sandstone and minor amounts of siltstone and conglomeratic sandstone (Maughan and Wilson, 1960). Silica, carbonates, and anhydrite are the major cementing materials in the Lyons Sandstone (Levandowski and others, 1973). The degree of consolidation of the Lyons Sandstone and Glorieta equivalent ranges from unconsolidated to moderately consolidated. Thompson (1949) interprets the Lyons Sandstone as an eolian and littoral deposit.

The Lyons Sandstone is interstratified with, and overlies, arkose of the Fountain Formation in the outcrops from Lyons, Colo., south. In much of the subsurface, the Lyons Sandstone and Fountain Formation are separated by rocks of Pennsylvanian and Permian age, which thicken toward the east. North of Lyons, Colo., the Lyons Sandstone overlies the Owl Canyon Formation (Maughan, 1980). In the Raton Basin, the Glorieta Sandstone equivalent constitutes the Lyons aquifer. The Glorieta equivalent is a light orange-pink, buff, or white, medium-grained sandstone cemented with silica and minor amounts of calcite (Shaw, 1956).

The thickness of rocks between the top of the Lyons aquifer and the base of the Dakota-Cheyenne aquifer ranges from less than 100 ft in northeastern Baca and southeastern Prowers Counties to over 800 ft in western Baca and southeastern Las Animas Counties and in western Weld and eastern Larimer Counties. The top of the Lyons aquifer ranges from more than 5,000 ft below sea level in northwestern Weld County to over 5,000 ft above sea level over the Apishapa Arch (fig. 28).

The thickness of the Lyons aquifer ranges from 0 ft in the northeastern and southwestern parts of the study area to 370 ft (Thompson, 1949) at its type locality near the town of Lyons (fig. 27). Evidence indicates a trend of large thickness approximately extending from Lyons south through Denver and Colorado Springs, southeastward to western Crowley County, approximately southward across western Otero and central Las Animas Counties, and into New Mexico.

The porosity of the sandstone in the Lyons aquifer averages about 9 percent. Porosity, averaged over the sandstone in the aquifer at any geographic location, generally ranges from 4 to 13 percent; however, some values are outside this range.

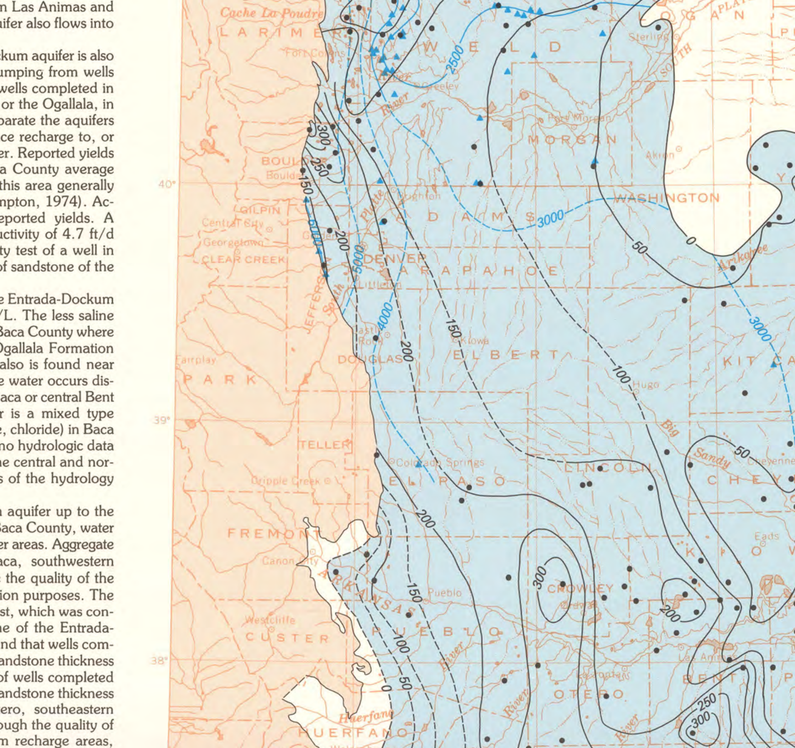
Hydrology

The Lyons aquifer is used as a water source only in and near its outcrops. As a result, few data relating to its water-yielding properties are available. Two water wells completed in the Lyons aquifer near Morrison yield 6 and 17 gal/min. The hydraulic conductivity of the sandstone in the Lyons aquifer, as estimated from specific capacities of these two water wells and drill-stem test data from three oil-test wells in the northern part of the Denver Basin, ranges from about 0.003 ft/d to about 0.12 ft/d. Multiplying these hydraulic-conductivity values by a typical thickness (150 ft) for the aquifer gives a range of transmissivity of 0.45 to 18 ft²/d.

The direction of ground-water flow, as interpreted from the potentiometric-surface map (fig. 27), is eastward near the outcrop of the aquifer and is eastward to northward in the eastern part of the study area. The spacing of the potentiometric contours indicates that the transmissivity of the Lyons aquifer may be greater in the eastern part of the study area than it is in the western part.

The Lyons aquifer is recharged by precipitation on the outcrop and by flow from the underlying Fountain aquifer, which is present in approximately the western one-third of the area in which the Lyons aquifer is present. Much of the water in the Lyons aquifer flows across the east boundary of the State. Some of the water also may discharge from the aquifer by leakage to underlying or overlying aquifers.

The quality of water from the Lyons aquifer is related to depth of burial; the dissolved-solids concentration is less than 400 mg/L in samples from two sites, near Boulder and Morrison, along the outcrop. Away from the outcrop, the water quality deteriorates markedly. About 20 mi east of the outcrop near Fort Collins, the dissolved-solids concentration of the water produced from various oil wells ranges from about 24,000 to about 100,000 mg/L; the water is of sodium chloride and sodium sulfate types. Possible sources for these dissolved minerals are the evaporite deposits that are found either directly overlying or 5 to 20 ft above the Lyons aquifer. Both dissolution and cation exchange probably are important processes in the development of the water types found in the aquifer distant from the outcrops.

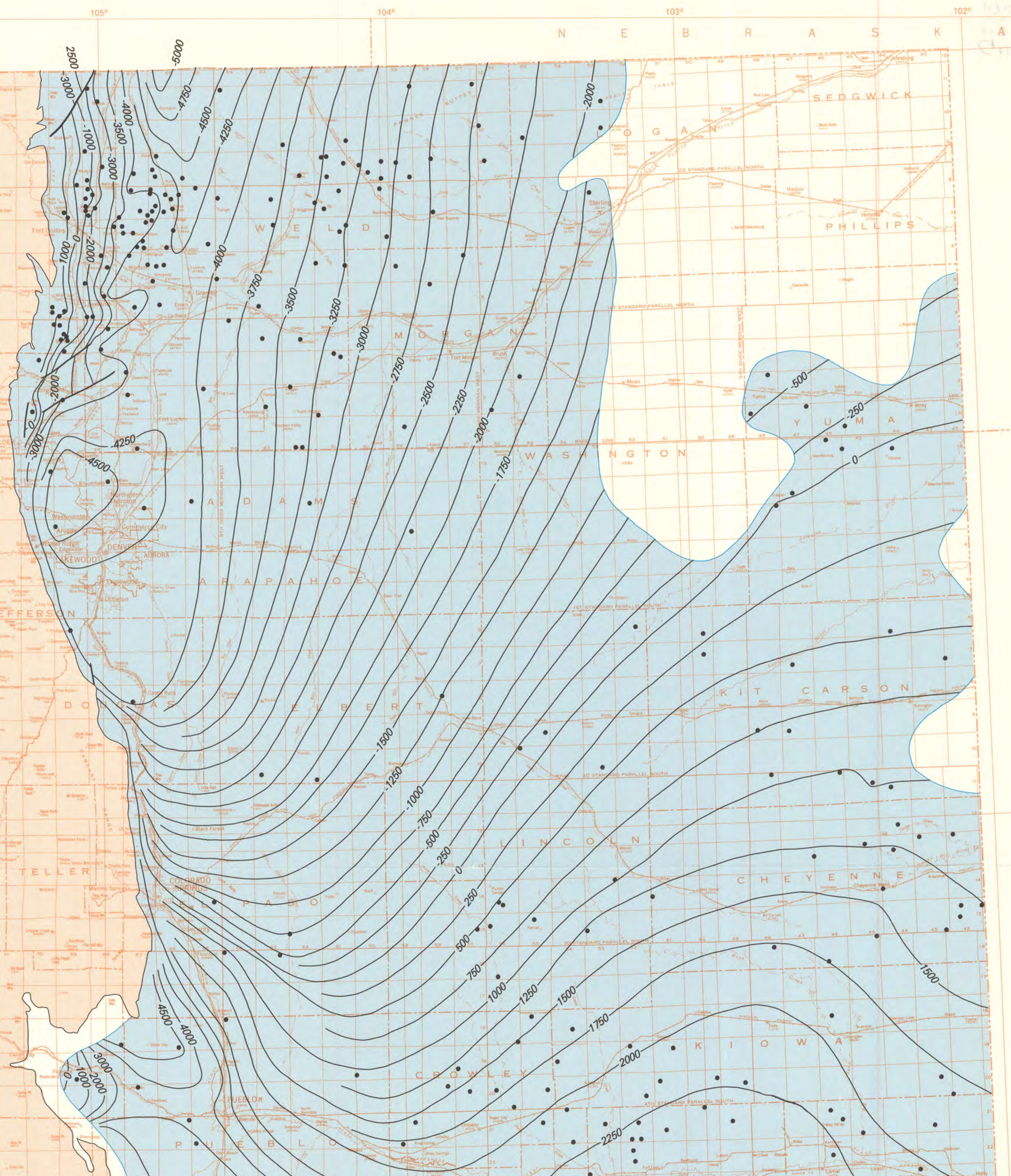


Base from U. S. Geological Survey United States base map, 1972

EXPLANATION

- OUTCROP OF ROCKS OLDER THAN THE LYONS AQUIFER
- AREA UNDERLAIN BY LYONS AQUIFER
- —100— — LINE OF EQUAL TOTAL THICKNESS OF THE LYONS AQUIFER—Dashed where approximately located. Interval 50 feet
- —3000— — POTENTIOMETRIC CONTOUR—Shows altitude of standing-water level in wells completed in the Lyons aquifer. Dashed where approximately located. Contour intervals 500 and 1000 feet. Datum is sea level
- • DATA POINT—For Lyons aquifer thickness
- ▲ DATA POINT—For Lyons aquifer potentiometric surface

Figure 27.—Aquifer thickness and predevelopment potentiometric surface for the Lyons aquifer in eastern Colorado.



Base from U. S. Geological Survey Colorado State base map, 1969

EXPLANATION

- OUTCROP OF ROCKS OLDER THAN THE LYONS AQUIFER
- AREA UNDERLAIN BY LYONS AQUIFER
- —1500— STRUCTURE CONTOUR—Shows altitude of the top of the Lyons aquifer. Intervals 250, 500, and 1000 feet. Datum is sea level
- FAULT
- APPROXIMATE LIMIT OF THE LYONS AQUIFER IN SUBSURFACE
- • DATA POINT

Figure 28.—Altitude and configuration of the top of the Lyons aquifer in eastern Colorado.

FOUNTAIN AQUIFER

Geology

The Fountain aquifer is part of the Western Interior Plains confining system and consists of the water-yielding, clastic sedimentary rocks of the Pennsylvanian and Permian Fountain Formation in the Denver Basin and Sangre de Cristo Formation in the Raton Basin (fig. 2). Although the rocks of Pennsylvanian age of the two formations are discontinuous across the Apishapa Arch (Mallory, 1972), rocks of Permian age of the Fountain and Sangre de Cristo Formations cover the Apishapa Arch, and they apparently correlate with each other (Rascoe and Baars, 1972).

The Fountain and Sangre de Cristo Formations primarily consist of red, maroon, gray, and pink, unsorted to poorly sorted arkose and arkosic conglomerate. These materials were deposited as a result of rapid erosion of uplifted areas now approximately occupied by the Front Range, the Apishapa/Wet Mountain uplift, and the Uncompahgre and San Juan Mountains (Mallory, 1958). Distant from these uplifts, the rocks become increasingly fine-grained; in the eastern part of the Denver Basin, the Pennsylvanian and Permian rocks are predominantly shale and carbonates of marine origin (Wilson, 1975). Porosity of the sandstone and conglomerate beds generally ranges from less than 3 to about 12 percent and averages about 7 percent. In both the Fountain and the Sangre de Cristo Formations, the degree of consolidation ranges from virtually unconsolidated to well consolidated, and may vary over the entire range at one geographic location.

The top of the Fountain Formation is progressively older toward the east (Peterson, 1966). Because the top of the Fountain Formation crosses time-stratigraphic lines, the structure map (fig. 29) indicates that the top of the Fountain aquifer dips into the Denver Basin more steeply than the bedding does. The top and eastern limits of the Fountain aquifer are not as clearly defined as the structure map (fig. 29) indicates; the Fountain Formation interfingers with and grades into the equivalent marine sedimentary rocks to the east (Peterson, 1966). Mississippian, Devonian, or Ordovician rocks underlie the Fountain Formation in much of the area north of the Apishapa Arch and south of about Elizabeth, Colo., and in a small area near the Sierra Grande uplift. The Fountain and Sangre de Cristo Formations are underlain by Precambrian rocks elsewhere. The Fountain Formation is overlain along its outcrop by the Ingleside Formation from the Wyoming border to about Lyons, Colo., by the Lyons Sandstone from about Lyons, Colo., to the northern margin of the Canon City embayment, by the Ralston Creek Formation in much of the Canon City embayment, and by the Entrada Sandstone at the southern margin of the Canon City embayment. The Sangre de Cristo Formation is overlain by the Entrada Sandstone or Glorieta and Yeso equivalents.

The aquifer generally extends 30 to 50 mi east from the outcrops on the flanks of the Front Range (fig. 30). In the Raton Basin in Colorado, the aquifer has an east-west dimension of approximately 80 to 90 mi. The Fountain aquifer extends east in the area immediately north of the Apishapa Arch into the extreme northwestern part of Baca County.

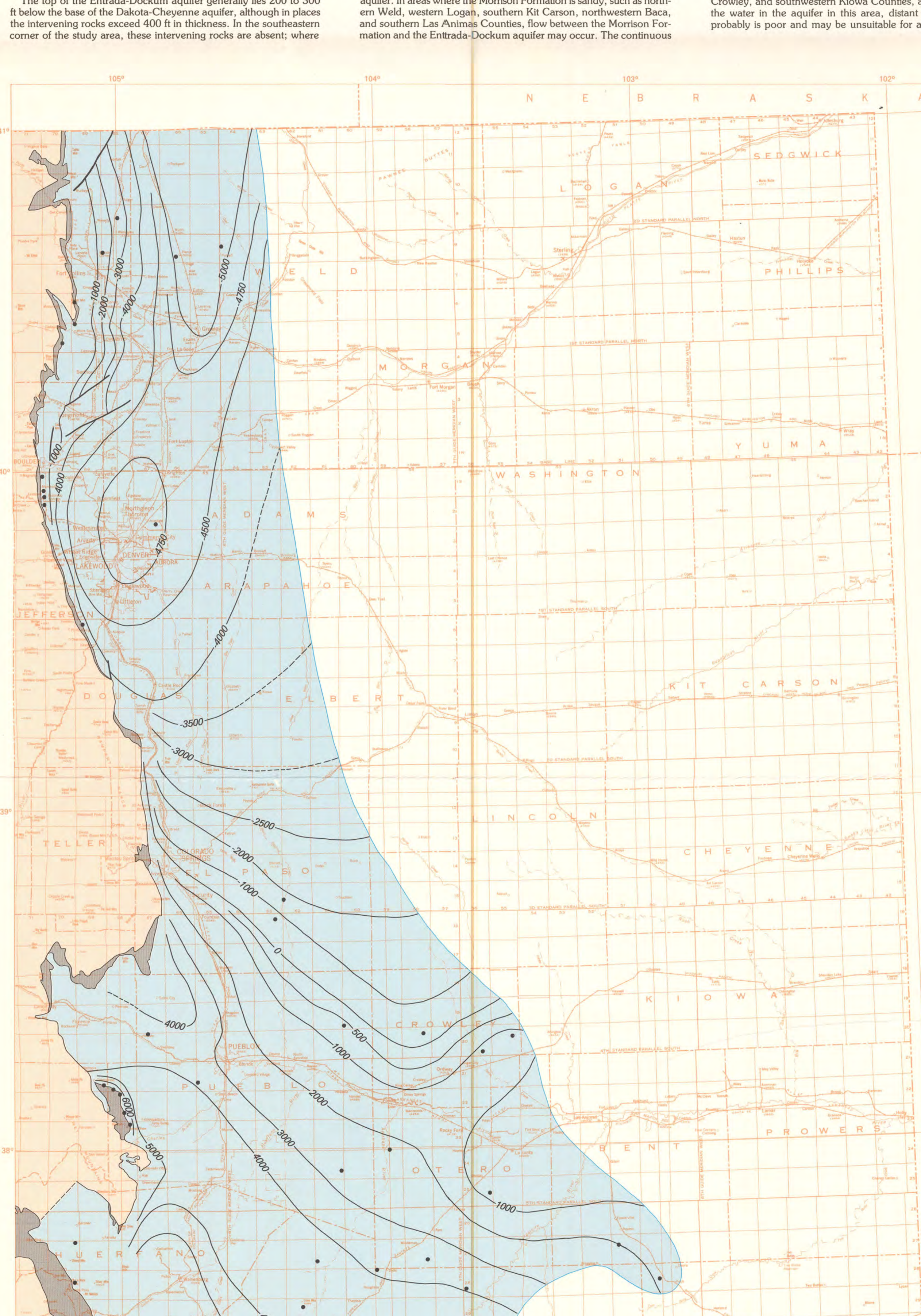
The thickness of the Fountain aquifer exceeds 4,000 ft near Colorado Springs and exceeds 3,000 ft in the area north of the Apishapa Arch in Pueblo County. Distant from the uplifts, however, the aquifer rapidly thins (fig. 30). The aquifer also is thin (less than 1,000 ft thick) along the crest of the Apishapa Arch.

Hydrology

Wells completed in the Fountain aquifer yield about 1 to 15 gal/min for domestic and stock use in the outcrop area. The hydraulic conductivity of the Fountain aquifer, as estimated from specific capacities of two water wells and drill-stem test data from an oil-test well, ranges from about 0.025 to about 4 ft/d. Hydraulic conductivity and transmissivity probably decrease to the east as the Fountain and Sangre de Cristo Formations thin and grade into finer-grained rocks of lesser hydraulic conductivity.

In the Pennsylvanian and Permian rocks of eastern Colorado, water recharged in the outcrops flows generally eastward to northeastward. Leakage from the Fountain aquifer occurs through leaky confining beds above or below the aquifer. Although Mississippian and Ordovician rocks are absent from the stratigraphic section in most of the area where the Fountain aquifer outcrops, these rocks underlie the aquifer in much of the area where the Fountain thins and pinches out. The Mississippian and Ordovician rocks, primarily carbonates, are the nearest underlying strata that may be recharged by the water discharged from the Fountain aquifer. Water in the Fountain aquifer also likely flows into the equivalent fine-grained sedimentary rocks to the east (see fig. 2 for correlative rocks).

The dissolved-solids concentration of water in the Fountain aquifer in and near its outcrop generally is 200 to 500 mg/L, although concentrations as large as 2,000 mg/L have been measured. Although dissolved-solids data are unavailable elsewhere for the Fountain aquifer, the dissolved-solids concentration of water in the aquifer undoubtedly increases eastward.

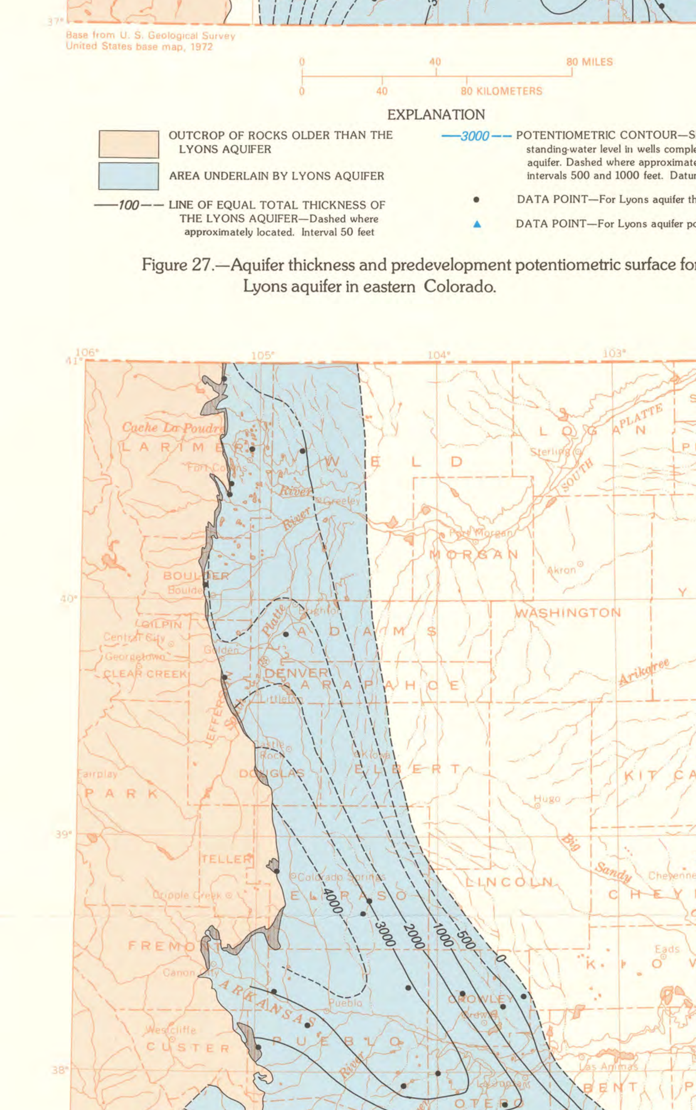


Base from U. S. Geological Survey Colorado State base map, 1969

EXPLANATION

- OUTCROP OF PRE-PENNSYLVANIAN ROCKS—Mostly Precambrian rocks, but includes Ordovician, Devonian, and Mississippian rocks in the Canon City embayment
- OUTCROP OF FOUNTAIN AQUIFER
- AREA UNDERLAIN BY FOUNTAIN AQUIFER
- —1000— — STRUCTURE CONTOUR—Shows altitude of the top of the Fountain aquifer. Dashed where approximately located. Contour interval, in feet, is variable. Datum is sea level
- FAULT—Dashed where inferred
- • DATA POINT

Figure 29.—Altitude and configuration of the top of the Fountain aquifer in eastern Colorado.



Base from U. S. Geological Survey United States base map, 1972

EXPLANATION

- OUTCROP OF PRE-PENSYLVANIAN ROCKS—Mostly Precambrian rocks, but includes Ordovician, Devonian, and Mississippian rocks in the Canon City embayment
- OUTCROP OF THE FOUNTAIN AQUIFER
- AREA UNDERLAIN BY THE FOUNTAIN AQUIFER
- —2000— — LINE OF EQUAL TOTAL THICKNESS OF THE FOUNTAIN AQUIFER—Dashed where approximately located. Intervals 500 and 1000 feet
- • DATA POINT

Figure 30.—Thickness of the Fountain aquifer in eastern Colorado.

METRIC CONVERSION FACTORS

The inch-pound units used in this report may be converted to SI (International System of Units) by use of the following conversion factors:

Multiply inch-pound unit	By	To obtain SI unit
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
foot (ft)	0.3048	meter
foot^{-1} (1/ft)	3.281	meter^{-1}
foot per day (ft/d)	0.3048	meter per day
foot per mile (ft/mi)	0.1894	meter per kilometer
foot per year (ft/yr)	0.3048	meter per year
foot squared per day (ft^2/d)	0.0929	meter squared per day
gallon per minute (gal/min)	0.06308	liter per second
inch squared per pound ($in.^2/lb$)	0.1450	kilopascal^{-1}
mile (mi)	1.609	kilometer
square mile (mi^2)	2.590	square kilometer

Degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) by using the following equation:

$$°C = (5/9)\ (°F - 32).$$

The following water-quality terms and abbreviations are also used in this report: milligrams per liter (mg/L) and micrograms per liter (μg/L).

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By
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