AVAILABILITY OF GROUND WATER IN NEW MEXICO

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ABSTRACT

Large supplies of ground water, of a quality that can be used now, exist in sand and gravel aquifers principally in the southeastern and southwestern part of the State, in the Rio Grande Valley, and smaller supplies are available in the alluvium of most valleys. Aquifers in limestone predominate in the south-central part of the State and in the Grants area where moderate to large supplies of water can be developed. Sandstone aquifers capable of yielding small to moderate supplies of water occur primarily in the northeastern and northwestern part of the State.

The depth to water in much of the area at the lower elevations in the State is less than 200 feet. At higher elevations underlain by limestone and sand and gravel, the depth to water is more than 1,000 feet.

Supplies of water containing less than 1,000 parts per million are scarce in a large part of the Tularosa Basin, the Pecos Valley, and parts of northeastern and northwestern New Mexico.

INTRODUCTION

The discussion of the availability of ground water, as used in this paper, is separated into three categories: 1) where useable ground waters exist in New Mexico; 2) the depth to these waters; and 3) the amount of water that can be developed in places by single wells. Availability might be treated from several other points of view. The quantitative aspects of the supply--that is, how long a supply will last--is discussed in a paper by Mr. J. C. Yates of the New Mexico State Engineer Office. The availability of ground water of a specific quality required for various uses is discussed in a paper by Mr. J. M. Stow of the U.S. Geological Survey. The economic and administrative aspects of availability are treated in other papers.

Information on the areal occurrence of ground water, the depth to water, and yield of water-bearing beds is obtained by qualitative areal studies. "Qualitative studies" are here used in contrast to quantitative studies, and do not refer to

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the quality of the ground water as such--although quality of water is an important phase of qualitative studies. Qualitative areal studies of various parts of New Mexico have been made by the U.S. Geological Survey in cooperation with Municipal, State, and Federal Agencies for many years. This paper presents general information, and some purely speculative comments, on the availability of ground water in New Mexico gleaned from these joint studies and from reports of State and other Federal Agencies.

Geology is a most important factor in the occurrence of ground water because the type, extent, thickness, and attitude of the rocks determine, to a great extent, the yield and quality of water that can be developed at a particular site. Precipitation, of course, is needed to supply the water that is in the rocks. Sand and gravel, limestone, and sandstone are the most important water-bearing rocks in the State; ricks of igneous origin contain and yield useable supplies of ground water to a much smaller degree. Clay, shale, anhydrite, and most igneous rocks, retard the movement of water, and in the places where these rocks are dominant, large supplies of water of satisfactory quality are difficult or impossible to obtain.

SAND AND GRAVEL AQUIFERS

The areal distribution of the principal sand and gravel aquifers in the State is shown in figure 1. Some consolidated sandstone and conglomerate deposits of Tertiary age are included in the areas shown on figure 1 because these rocks are closely associated hydraulically with the adjacent or overlying deposits of unconsolidated or poorly consolidated sand and gravel.

The sand and gravel underlying the High Plains are the western part of an extensive group of aquifers in Texas and Oklahoma and states farther north. In several places in Lea and Curry counties, wells yield more than 1,000 gpm (gallons per minute) from this aquifer. Yields of more than 300 gpm are common. Depths to water range from about 30 feet to more than 180 feet in northern Lea County. In parts of Curry County, the depth to water is more than 350 feet. In most of the other parts of the High Plains, the depth to water is about 100 feet.

Considerable difficulty with sand entering wells occurs in Lea County and other places on the High Plains. This difficulty might be avoided in some places by leaving the wells open only to beds of gravel in buried stream valleys at the base of the sand and gravel aquifers.

The quality of water is generally good. However, the fluoride content of the water in many places is higher than that recommended for domestic use by the U.S. Public Health Service.

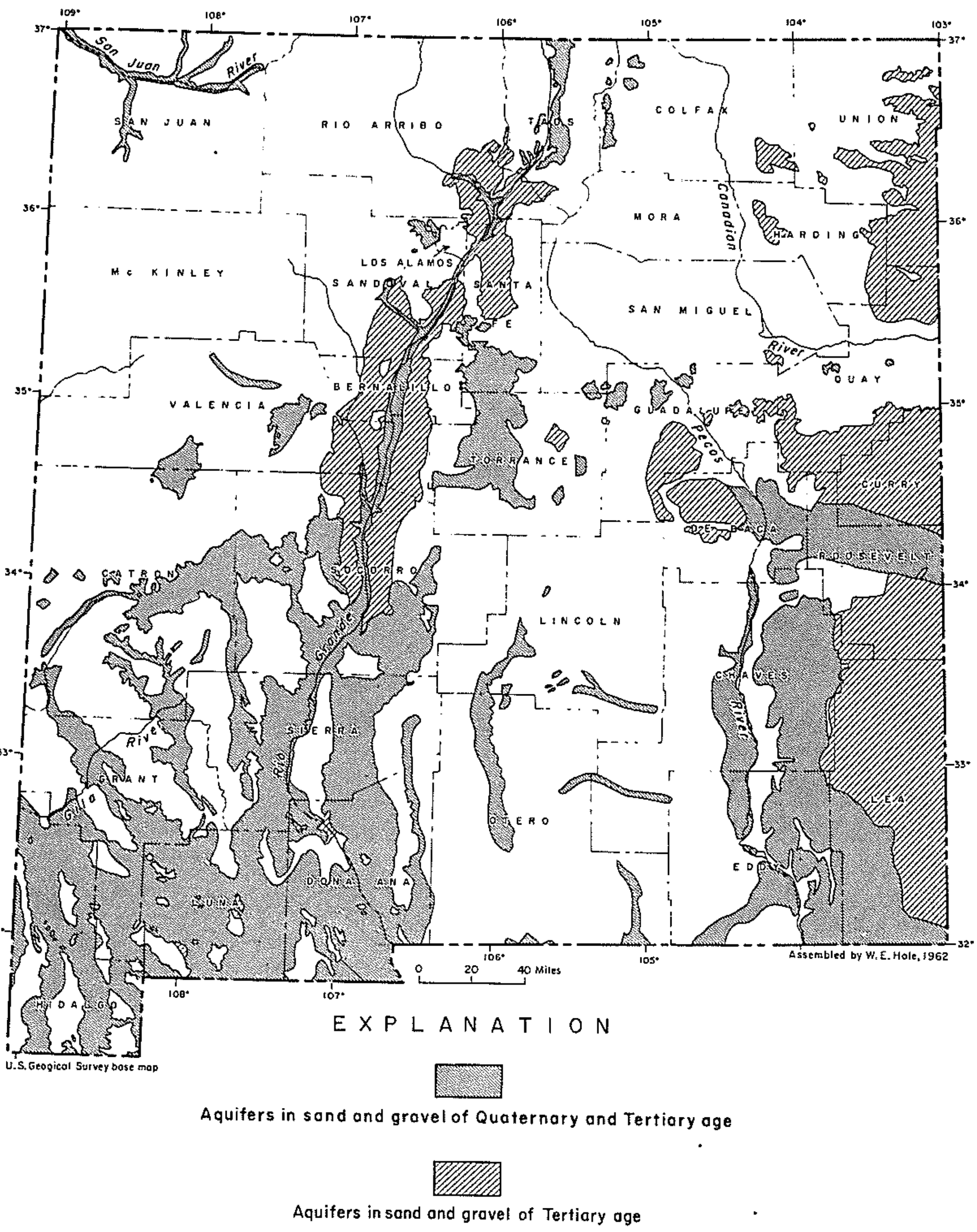


Figure I.--Distribution of principal sand and gravel aquifers in New Mexico

In Portales Valley in northern Roosevelt County, the alluvium has yielded 300 to 1,000 gpm to wells. Initial depths to water were about 15 to 30 feet. The quality of water is good, but the water has become somewhat more highly mineralized as a result of recharge from irrigation return water.

The alluvium is commonly thin west of the High Plains, south of De Baca County, and east of the Pecos River. Large supplies of water generally are not available in this area. In southern Lea County, however, ground water in a thick local alluvial deposit probably will supply the town of Jal for the foreseeable future. This thick alluvial deposit probably is the northern extension of a much thicker alluvial trough that extends south into Texas.

Another deep alluvial filled trough extends into New Mexico from Texas a few miles west of the trough that supplies water for Jal. In Texas these troughs are as much as 1,500 feet deep. The fill has been deposited in a trough probably created by a solution of salt that underlies much of this region. Water of good quality exists in the upper part of the fill.

The sand and gravel aquifer in the Pecos Valley extending south from the vicinity of Roswell in central Chaves County to Lake McMillan in central Eddy County and south of Carlsbad to Black River in south-central Eddy County has been utilized extensively for irrigation supplies for many years. Yields of more than 1,000 gpm are common. The high yields generally are obtained from fractures and solution zones in the conglomerates in the valley fill. In both the Roswell basin and Carlsbad basin the alluvium is thicker than might ordinarily be expected because the original basin was deepened by solution of the underlying gypsum and limestone.

Thick alluvium and bolson deposits exist in southeastern Otero County and along the Tularosa Basin in western Otero County and southwestern Lincoln County. However, the zone of saturation is below the alluvium in southeastern Otero County, and the aquifer in the central part of the Tularosa Basin contains water too saline for use without extensive treatment. Considerable fresh water does exist in the alluvium along the slopes off the bordering mountains. Water has been developed for irrigation use and municipal use along the eastern margin of the Tularosa Basin in the vicinity of Carrizozo in Lincoln County southward to Alamogordo in Otero County. Along the western margin of the Tularosa Basin, water has been developed from the alluvium to supply the White Sands Missile Range. Large volumes of fresh water underlie the western margin of the Tularosa Basin south of White Sands in southeastern Dona Ana County. This source of ground water is not developed at this time but is available to future developments in the Tularosa Valley.

The alluvium in Estancia Valley in Torrance and Santa Fe counties yields 200 to 1,200 gpm to wells bordering Highway 41, which runs north through the central part of Torrance County. Farther east, the water in places is too saline for irrigation use. To the west, the alluvium is much thinner, and depths to water are about 150 feet. Here the yield from wells is small.

In the southern Jornada del Muerto in north-central Dona Ana County, large supplies of potable water probably could be developed although this area is largely untested. Farther north, the water at most places is not potable, but locally it may be suitable for irrigation use.

The valley of the Rio Grande is remarkable because of its length, its width, and the depth of its alluvium. The Rio Grande throughout its course in New Mexico flows in a system of connected downthrown blocks. Various blocks have been displaced downward thousands of feet, and the trench has been filled mostly with alluvium. The depth of this fill is not known at many places, but in the vicinity of Albuquerque it is at least 6,000 feet. The total displacement of rocks along some of the faults is on the order of 20,000 feet or about 4 miles from the crest of the mountain to the top of the equivalent rocks in the trough. The Rio Grande trough is 15 to 30 miles wide from the vicinity of Socorro in central Socorro County northward to the Colorado State line and is much narrower in places south of Socorro to the Texas State line. Thus, there appears to be a vast volume of water in the alluvium of the Rio Grande Valley, and much of the contained water is of good quality. In places, tributary valleys, such as those of the Rio Puerco and Rio Salado in Socorro County, contribute moderately saline water.

Large yields of water are obtained from the alluvium, and the depth to water is only a few feet below land surface along the narrow central flood plain of the Rio Grande. Away from the flood plain, the depth to water increases as the land rises toward the flanking mountains.

The lowest part of the water table from the vicinity of Belen in Valencia County northward to the vicinity of Los Alamos is not along the river, as might generally be expected, but is several miles west of the river. In places along this depression, the water table is as much as 40 feet below the river level to the east. Such a depression in the water table may be the result of lack of recharge on the west side of the valley, but more probably the sands and gravels here may be more permeable and much thicker than in the vicinity of the river. The water table in places is more than 1,000 feet deep along the west margin of the Rio Grande trough in this locality.

In the Rio Grande and most other river valleys, the water in the alluvium is interrelated hydraulically to the water in the surface streams. Intensive development of ground water therefore diminishes ground-water additions to the streamflow of the river, and in time the river may lose water to the ground-water reservoir, as rivers do in many parts of the Southwest. In areas such as the Rio Grande where surface waters are fully appropriated, uncontrolled development of the adjacent ground-water reservoir would create problems although the valley contains large volumes of ground water that extend to great depths. Development of even small amounts of ground water near the Rio Grande will quickly affect the river regimen.

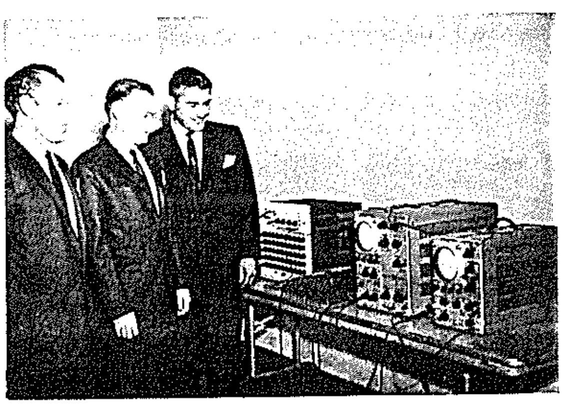
In the Basin and Range province in the southwest part of the State and west of the Rio Grande, the intermontane valleys are partly filled with extensive deposits of sand and gravel and older sandstone and conglomerate. One of the oldest irrigation developments in the State, the Deming area in Luna County, obtains water from alluvium. Here the depth to water is commonly less than 100 feet. Other irrigated areas include the Animas and Playas Valleys in Hidalgo County and, more recently, the valleys around Lordsburg in Hidalgo County and southern Grant County. In general, water is obtained from the upper part of a sand and gravel section. In this region, water also occurs within permeable beds and fractures in hard conglomerate at depths that discouraged drilling to some extent. Moderate to large water supplies probably could be developed from sands and gravels that are interbedded with basalt flows in the upland areas, but the depth to water commonly is great.

Farther north, in the valley of the Rio San Jose in Valencia County, water has been developed for irrigation and industrial use near Grants in north-central Valencia County. Downstream, water can be developed in places for irrigation use on the Acoma-Laguna Indian Reservations. However, in much of the lower valley of the Rio San Jose, the water may be too highly mineralized for even irrigation use.

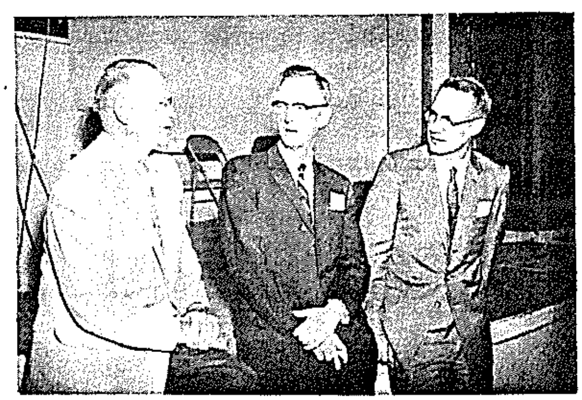
The alluvium in the San Juan Valley in San Juan County locally yields potable water, but here the alluvium is thin and spotty and in many places contains saline water. Towns along the San Juan River utilize surface water for municipal supplies.

New Mexico State University President Roger B. Corbett, left, with Mr. O. M. Hackett, Chief of the Ground Water Branch, U. S. Geological Survey, Washington, D. C.; Dean Frank Bromilow, College of Engineering, N.M.S.U.; and Dr. H. Ralph Stucky, Water Conference Chairman and Head of the Department of Agricultural Economics and Agricultural Business, N.M.S.U. President Corbett delivered the Address of Welcome and Mr. Hackett was the keynote speaker of the Conference.

This group, Dean Frank Bromilow, N.M.S.U.; Professor Nathaniel Wollman, University of New Mexico; State Engineer Steve Reynolds; and Jack Lacy, Deputy Director, Department of Development, relax a bit just prior to the start of a Conference session.



Wm. P. Stephens, Agricultural Economist, N.M.S.U.; Ralph Charles, Engineer, Bureau of Reclamation, Albuquerque; and F. X. Bushman, Ground Water Geologist, New Mexico Institute of Mining and Technology, Socorro, looking over the electronic equipment used by ground water geologists in studying ground water supplies.



Left to Right: William E. Hale, Engineer, Ground Water Branch, U.S. Geological Survey; Joe Yates, Chief, Technical Division, State Engineers Office; and Dr. James R. Gray, Agricultural Economist, N.M.S.U. considering water resources problems in New Mexico

LIMESTONE AQUIFERS

The second most important group of aquifers in New Mexico are in limestone. Figure 2 shows the principal areas in which these aquifers have been developed or contain water of fair quality. These areas are in the Pecos Valley, southeastern Otero County, some of the mountain areas as in the Sandias and Manzanos, the area in the general vicinity of Grants, and a few small places in the southwestern part of the State.

Limestone formations of Pennsylvanian age contain water in the upper Pecos River drainage. These limestone formations commonly contain much clayey material, which has retarded the development of solution channels, and the limestone itself has a low permeability. Small supplies of water generally are obtained from fractures. Adequate supplies for domestic use should be obtained from this limestone aquifer in the mountains, but the depth to water or the depth of wells required to develop these supplies are not known at this time. Farther south in the vicinity of Santa Rosa in Guadalupe County, large supplies of water can be developed from the San Andres Limestone of Permian age from wells drilled to below the elevation of the Pecos River. A large part of the recharge to this aquifer is from the river to the north. As the water moves southward through the aquifer, it dissolves large amounts of sulfate from the gypsum within and adjacent to the aquifer. The aquifer discharges large amounts of high sulfate water along the Pecos River Valley from Santa Rosa southward to Puerto de Luna in southern Guadalupe County. The water is suitable for irrigation use.

The limestone aquifer in the San Andres in the vicinity of Santa Rosa is probably continuous with the aquifer farther south in the vicinity of Roswell in Chaves County. It is not shown on the map, because in parts of this area the aquifer contains saline water, and in other parts data are lacking.

In this region, several tens of miles north of Roswell, water in the San Andres possibly may move east of the river and thence into the southeast corner of the State. This water probably is highly saline. Perhaps the recharge for this part of the system could be prevented from entering the aquifer by diverting it more directly to the Pecos River. The water might be better utilized by holding the water on the land for more intensive growths of grass, for it seems that little recharge of ground water takes place unless the water if ponded or enters stream channels.

The San Andres Limestone and the younger Grayburg Formation form the famous artesian aquifer of the Roswell basin mostly in Chaves and Eddy counties. In the western part of the Roswell basin, the water is unconfined, and water is 300 to more than

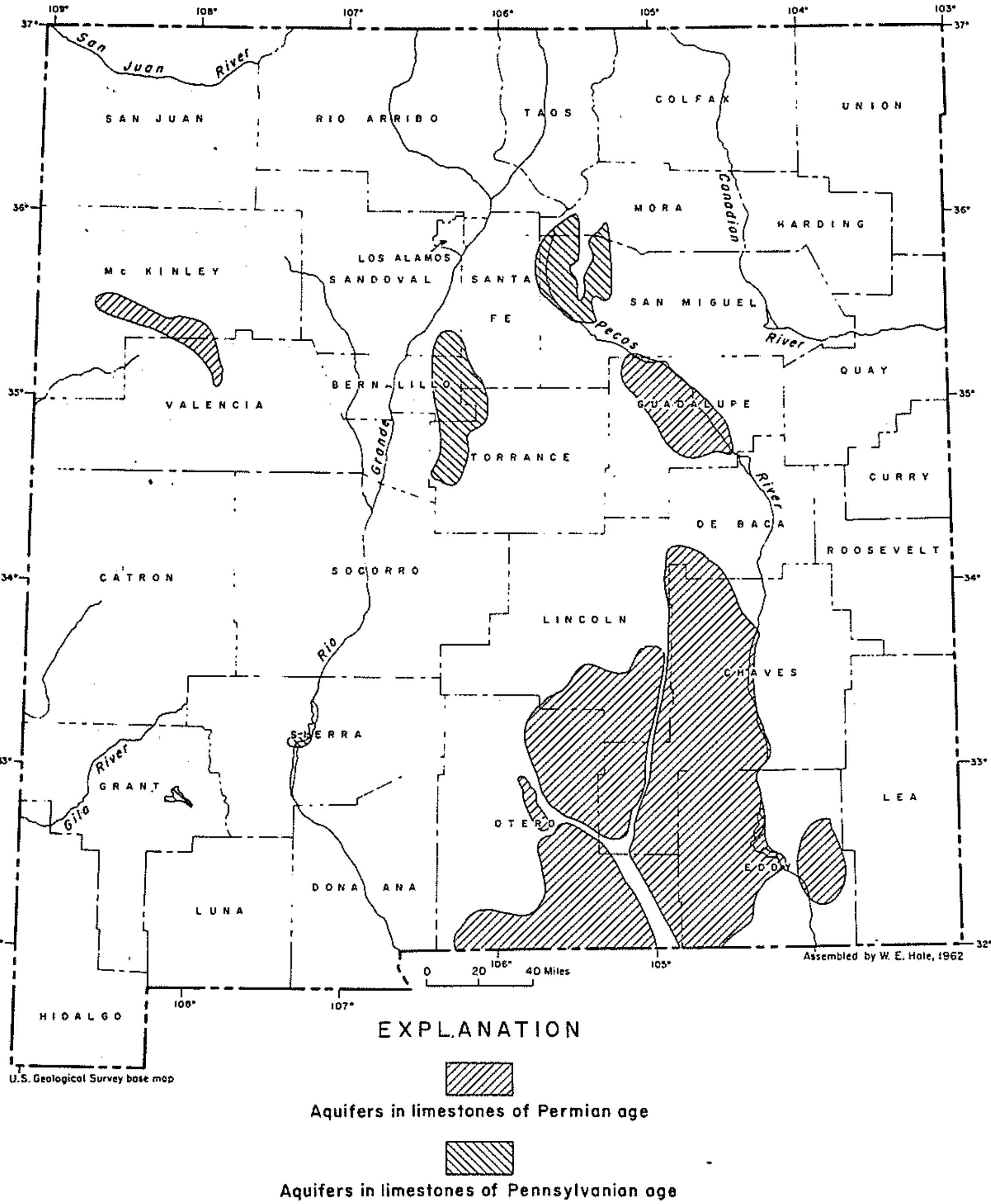


Figure 2.-- Distribution of principal limestone aquifers in New Mexico

1,000 feet deep in places. Farther east, as the aquifer dips to the east, it is overlain by partially confining beds. In the early 1900's, more than a thousand flowing wells were constructed in the artesian aquifer. The artesian pressure has declined over the years, and many of the artesian wells have been equipped with pumps. The area of flowing wells is now in a narrow band along the river and some of the larger tributaries. Wells range from a few hundred feet in depth in the northern part of the area of flowing wells to more than 1,000 feet in the southern part and yields of a few thousand gallons per minute are common.

The limestone aquifer continues eastward from the Pecos River, and some of the fresh water may possibly move east. One such area may exist east of Artesia in northern Eddy County, where relatively fresh water is developed from a well into the limestone a few miles east of the river. However, most of the fresh water in the system is discharged from the aquifer into the alluvium, either directly or through the semiconfining bed, and thence to the Pecos River.

Water is available in the limestone of the Yeso Formation of Early Permian age in the Sacramento Mountains in Lincoln, Otero, and Chaves counties. Ground water, in quantities sufficient for irrigation use, is in these rocks at shallow depths along the principal drainageways. In the highlands, recharge takes place through the San Andres Limestone cap and moves downward and eastward through the limestone beds of the Yeso Formation. Depth to water in many of the stock wells is more than 500 feet. A part of the water moving eastward through this system of rocks discharges into the San Andres Limestone and may amount to a substantial part of the recharge to the artesian system of the Roswell basin. The zone along which the water moves from the Yeso Formation and an immediately overlying sandstone aquifer into the San Andres Limestone is defined remarkably well by the change in slope of the water table or pressure gradient. To the east, in the San Andres, the gradient of the water table is a few feet to the mile; to the west, in the Yeso, the gradient is 75 to 100 feet to the mile.

The aquifers in the Carlsbad area, mostly in western Eddy County, are in limestone units that are younger than the San Andres and separate from the system of the Roswell basin. These rocks dip gently a little north of east. In the highlands of Guadalupe Mountains in Chaves, Otero, and Eddy counties; there is a series of limestone units stacked one upon another and separated by semipermeable silty sandstone beds. The water moves in these units to the east and north to merge into a common aquifer along the east front of the Guadalupe Mountains. This common aquifer is a permeable limestone reef which in this area serves as a large collecting gallery for the less permeable limestone aquifers in the high country of the Guadalupe Mountains. This aquifer discharges much of its water to the Pecos River at Carlsbad Springs in central Eddy County.

Large supplies can be obtained from the reef limestone. It is probably as permeable as the more permeable parts of the artesian limestone aquifer of the Roswell Basin. Within the reef aquifer, water levels are only slightly higher than the level of Carlsbad Springs several miles to the southeast. Because of recharge of slightly saline water to the limestone system north of Carlsbad, the water is highly mineralized in parts of Carlsbad. Farther to the southwest the water is of good quality, and the city has recently extended its well field to that locality to obtain the better water. Small supplies of water of fair quality can be obtained in perched aquifers in the less permeable limestones to the west of Carlsbad.

The reef limestone aquifer extends into the subsurface east from Carlsbad and swings southward into Texas along the Lea-Eddy County line. At Hobbs, water pumped along with the oil from some wells has a very low dissolved-solids content. Perhaps some of the fresh water in the Carlsbad area moves eastward from Carlsbad through the reef aquifer to discharge finally into the Pecos River several tens of miles southeast of Carlsbad where there is a large increase in the flow of the river. It would be interesting to test drill the reef aquifer in this area to learn whether this is so and how much water is moving through the system.

Water is obtained also from a limestone unit in the Rustler Formation of Permian age east and south of Carlsbad. In much of the area, the water is saline, but locally the quality is good enough for stock use.

In southeastern Otero County, limestone of the Yeso Formation, Hueco, and Bone Spring Limestones are permeable and yield large supplies to wells. The limestone in these formations is the northern part of the limestone aquifer developed intensively in the Dell City area in Texas. However, the land surface rises to the north and east in New Mexico, and since the water table is nearly flat, the depth to water is great, reaching 800 feet about 20 miles north and west of Dell City. Here the water is only of fair quality but is suitable for irrigation use.

In the Sandia and Manzano Mountains in Bernalillo, Sandoval, Santa Fe, and Torrance counties, limestone of Pennsylvanian age, similar to that in the headwaters of the Pecos, yields small supplies to wells. Water from these rocks generally is available in sufficient quantity and is of adequate quality for domestic use to supply the large number of summer homes being built in the area.

Important supplies of hot water are obtained from an artesian aquifer in limestone at Truth or Consequences in central Sierra County. Farther southwest, small supplies of water are obtained from the limestone for use in the mining industry near

Santa Rita in east-central Grant County.

Water of good quality from the limestone aquifer in the San Andres in the vicinity of Grants in Valencia and McKinley counties is obtained from wells only a few hundred feet deep. The water is suitable for industrial, irrigation, and municipal uses. Northwest from Grants, at some distance from the Zuni Mountains in Valencia and McKinley counties, wells tap water in the San Andres at a depth of more than 1,000 feet, but in places along the flank of the Zuni Mountains, flowing wells of small to moderate yield have been constructed in the San Andres Limestone.

The San Andres generally contains saline water to the north and south of the Zuni Mountains. To the east it may contain water of useable quality, and in this area where water is good quality is scarce in shallower formations, test drilling in the San Andres, to learn more of the quality of the water and yield of the aquifer seems warranted.

SANDSTONE AQUIFERS

The principal sandstone aquifers in New Mexico are in the northern part of the State (figure 3). The yield of sandstone aquifers tends to be more uniform than that of the sand and gravel or limestone aquifers. The permeability of the sandstone aquifers is quite low in general, but in places, where the sequence of sandstone beds is thick, moderate to large yields of water can be obtained. The sandstone aquifers are composed of a number of sandstone units ranging in age from Pennsylvanian to Tertiary.

The Sangre de Cristo Formation of Pennsylvanian and Permian age, on the eastern and southern flanks of the Sangre de Cristo Mountains in the northeastern part of the State, probably will yield small supplies of water of good quality. The Glorieta Sandstone of Permian age yields small to moderate supplies of water to wells in San Miguel, Torrance, and Lincoln counties.

The younger Santa Rosa Sandstone of Late Triassic age yields small supplies of water in southeastern Santa Fe County. The Santa Rosa also yields small to moderate supplies of water to wells in Guadalupe County and east of the Pecos River in Chaves, Eddy, and Lea counties. Sandstone beds in the Chinle Formation of Late Triassic age in parts of Guadalupe and Quay counties yield only a few gallons per minute to wells, but in many of these places it is the only water of suitable quality for domestic and stock use. The sandstones of the Chinle yield small supplies of water in Roosevelt, Chaves, and Lea counties.

The Entrada Sandstone of Jurassic age is an important aquifer near Tucumcari in Quay County. Moderate supplies of water of good quality have been developed in this sandstone for municipal use by the city of Tucumcari.

Farther north, the Dakota Sandstone of Early(?) and Late Cretaceous age yields water of useable quality in places. In the still higher country, beneath basalt, the Raton (Cretaceous and Paleocene) and Poison Canyon (Paleocene) Formations may be expected to yield water to wells.

The sandstone aquifers in northwestern New Mexico are varied in character. Some contain a large ratio of clay and silt to sand; some consist of well-sorted sand grains, and the sand grains vary in size from very fine to coarse. Most of the sandstone is firmly cemented, although some units are loosely cemented and friable.

The Gallup Sandstone (Late Cretaceous) yields as much as 250 gallons per minute of potable water to wells at Gallup in western McKinley County, and yields of 10 to 75 gpm for the Gallup Sandstone are common where it occurs in the subsurface throughout southern McKinley County. The Ojo Alamo Sandstone (Late Cretaceous) yields as much as 30 gpm of potable water to wells in eastern San Juan, western Rio Arriba, and northern Sandoval counties. The San Jose Formation (Eocene) yields as much as 60 gpm of potable water to wells in western Rio Arriba County, but the ground-water potential of the formation has not been tested.

Electric logs of wells that have been drilled for oil and gas indicate that the cumulative thickness of water-bearing sandstone in the Ojo Alamo Sandstone, Nacimiento (Paleocene), and San Jose Formations, in western Rio Arriba County is as much as 1,800 feet. Based on the yields of wells that tap only a few feet of sandstone, a properly constructed well that tapped all these beds of sandstone possibly would yield as much as 3,500 gpm of water. This area probably has the greatest potential for ground-water production of any area in northwestern New Mexico, exclusive of the Grants-Bluewater area.

Yields of other sandstone aquifers in northwestern New Mexico generally are less than 10 gpm. Domestic-and stock-water supplies generally can be obtained from sandstone aquifers in the northwestern part of the State, although potable-water supplies are scarce in some large areas.

DEPTH TO WATER

Depth to water is an important economic aspect of ground-water supply. Figure 4 shows the depth to water in variable intervals: less than 200 feet, 200 to 500 feet, and more than

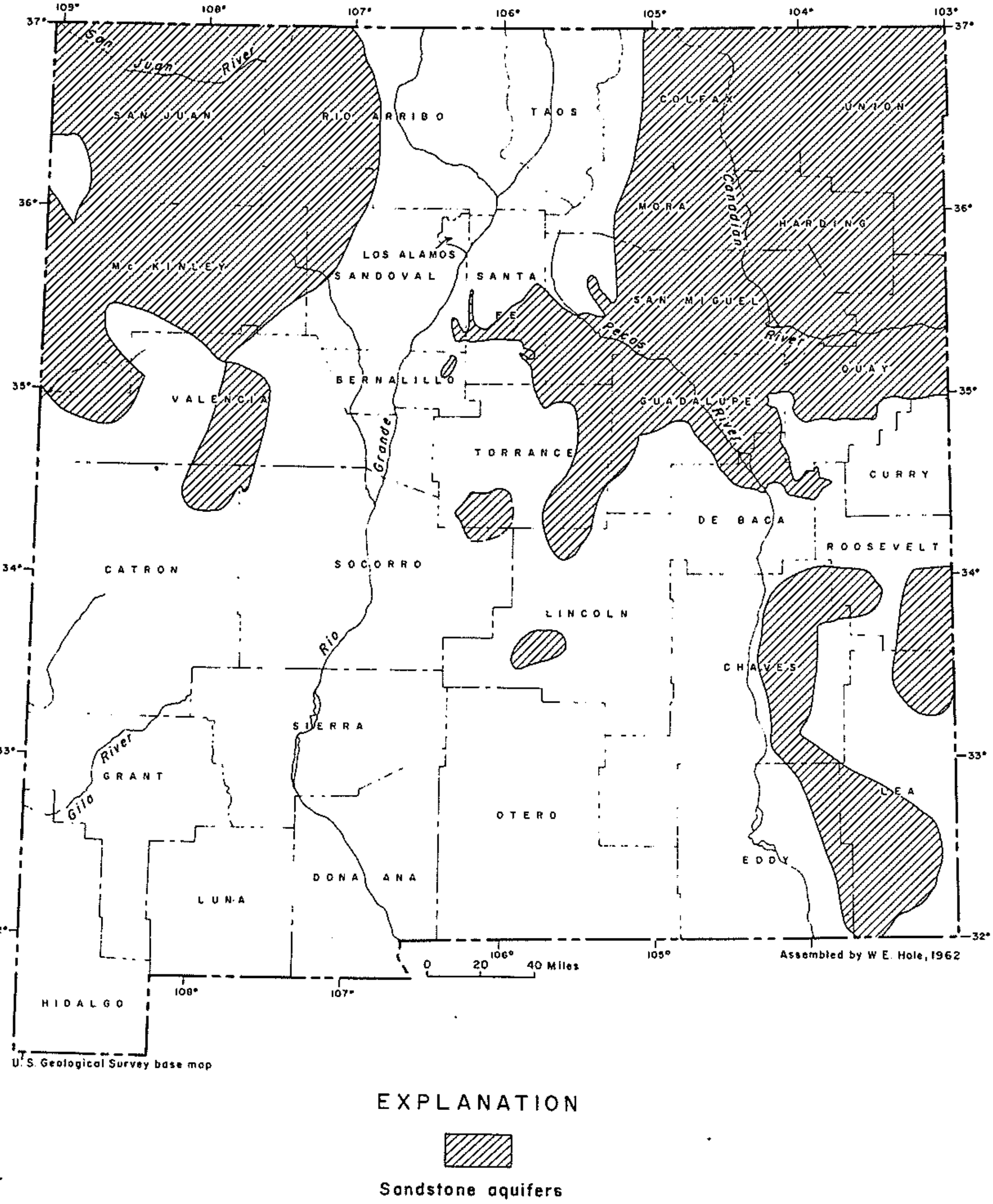


Figure 3.--Distribution of principal sandstone aquifers in New Mexico

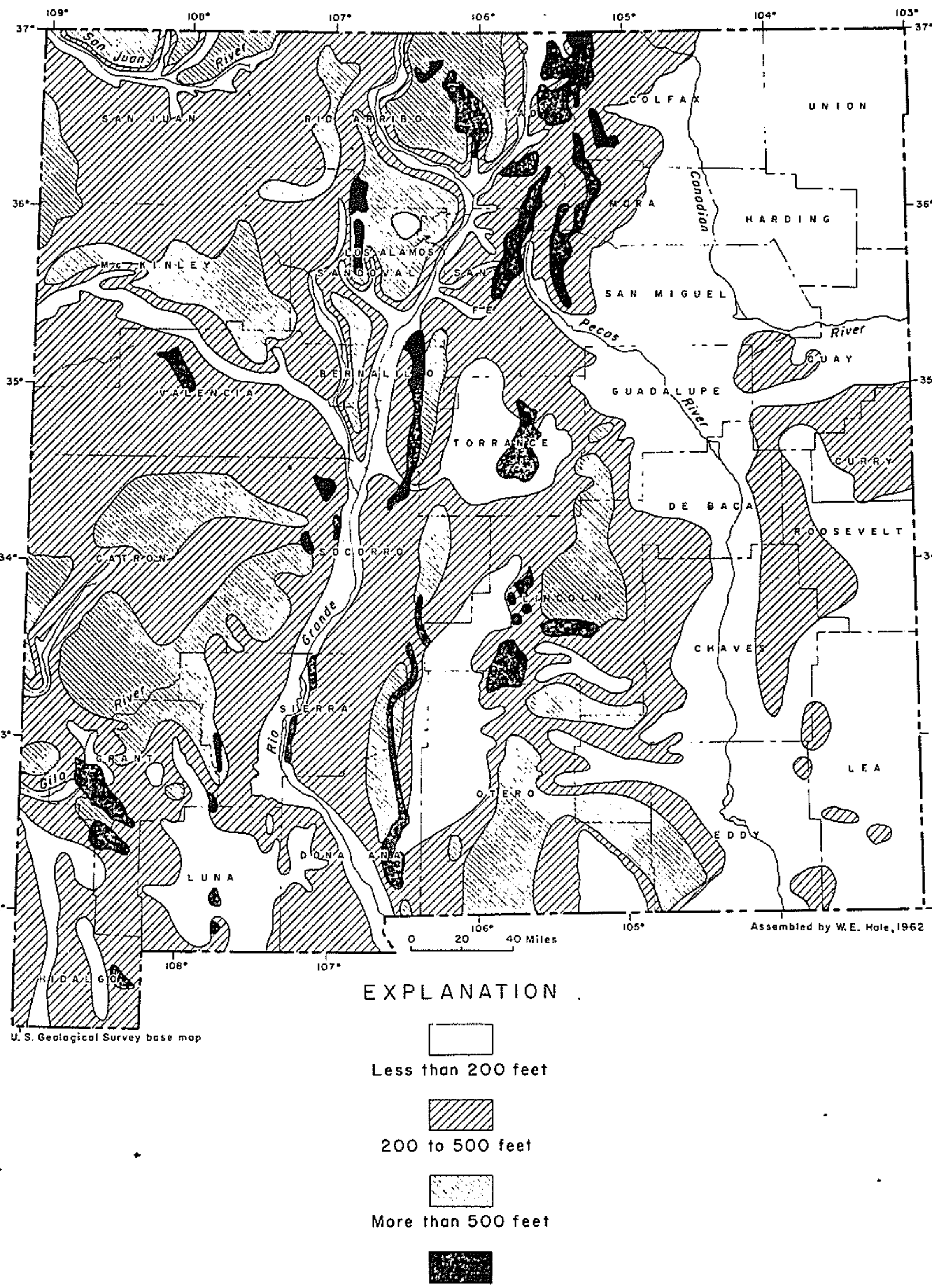


Figure 4. -- Depth to ground water in New Mexico

500 feet. In most of the valleys and plains areas, the depth to water is less than 200 feet, and it is in this depth range that water for irrigation use has been most intensively developed. In a few places such as Curry County and parts of the Pecos Valley, where lifts of more than 200 feet are required, water has been utilized for irrigation in spite of the greater than ordinary lift, but in Curry County, where rainfall some years may be almost sufficient to produce a crop, it has apparently been economical to pump a short time at these greater lifts to get the crop over the hump. Pumping from great depths is not so critical a factor for supplies developed for municipal and industrial use.

In several areas in the State, the depth to the water-table is more than 500, and in places more than 1,000 feet. One such area is in northwestern Eddy County. Other areas of great lift are in the high country in northern Grant and southern Catron County and along the west margin of the Rio Grande Valley north of Albuquerque to Los Alamos. In one small area along the south flank of the Jemez Mountains in Sandoval County, the depth to water probably is more than 1,500 feet.

In many areas where the depth to water is more than 500 feet, wells have been abandoned as dry before they reached the water table, because no one believed water could be so deep. Areas where Precambrian or intrusive rocks, which are nearly non-water-bearing, are also shown on figure 4.

The areas in which small, moderate, and large yields of ground water can be obtained are shown in a general way on figure 5. These areas more or less coincide with the areas of the sand and gravel and limestone aquifers (figures 1 and 2). In many of the areas of high yields, supplies of more than 1,000 gallons per minute are common.

QUALITY OF WATER

The areas in New Mexico where supplies of potable water are scarce are outlined on Figure 6. Actually the figure shows the areas in which ground water commonly contains more than 1,000 parts per million dissoved solids. These areas cover a large part of the Pecos Valley, the Tularosa Basin, the limestone upland in southeastern Otero County, much of the Jornada del Muerto, and northwestern New Mexico.

The water is only slightly saline in many parts of the areas where potable water is scarce, and it might be economically feasible to salvage some of this water by utilizing various saline-water-treatment methods. The saline-water-treatment plant to be built at Roswell should provide information on operational and economic factors.

SUMMARY

The most imporatnt sand and gravel aquifers are in the southeastern and southwestern part of the State and in the Rio Grande Valley. Limestone aquifers predominate in the south-central part of the State and in the Grants area. Sandstone aquifers occur primarily in the northeastern and northwestern part of the State.

The depth to water in much of the area at the lower elevations in the State is less than 200 feet. Locally, at the higher elevations underlain by limestone and sand and gravel, the depth to water is more than 1,000 feet.

Supplies of water containing less than 1,000 parts per million of dissolved solids are scarce in a large part of the Tularosa Basin, the Pecos Valley, and parts of northeastern and northwestern New Mexico.

Much work remains to be done to define our total water supply. Adequate qualitative areal studies have yet to be made in a large part of west-central and northeastern New Mexico. Furthermore, investigations should be extended to those aquifers containing moderately saline water inasmuch as these waters may be economical to treat and utilize in the not too distant future. Qualitative studies should extend to aquifers containing highly saline water and to poorly permeable aquifers to define areas in which wastes of all kinds can be stored with the least contamination hazard.

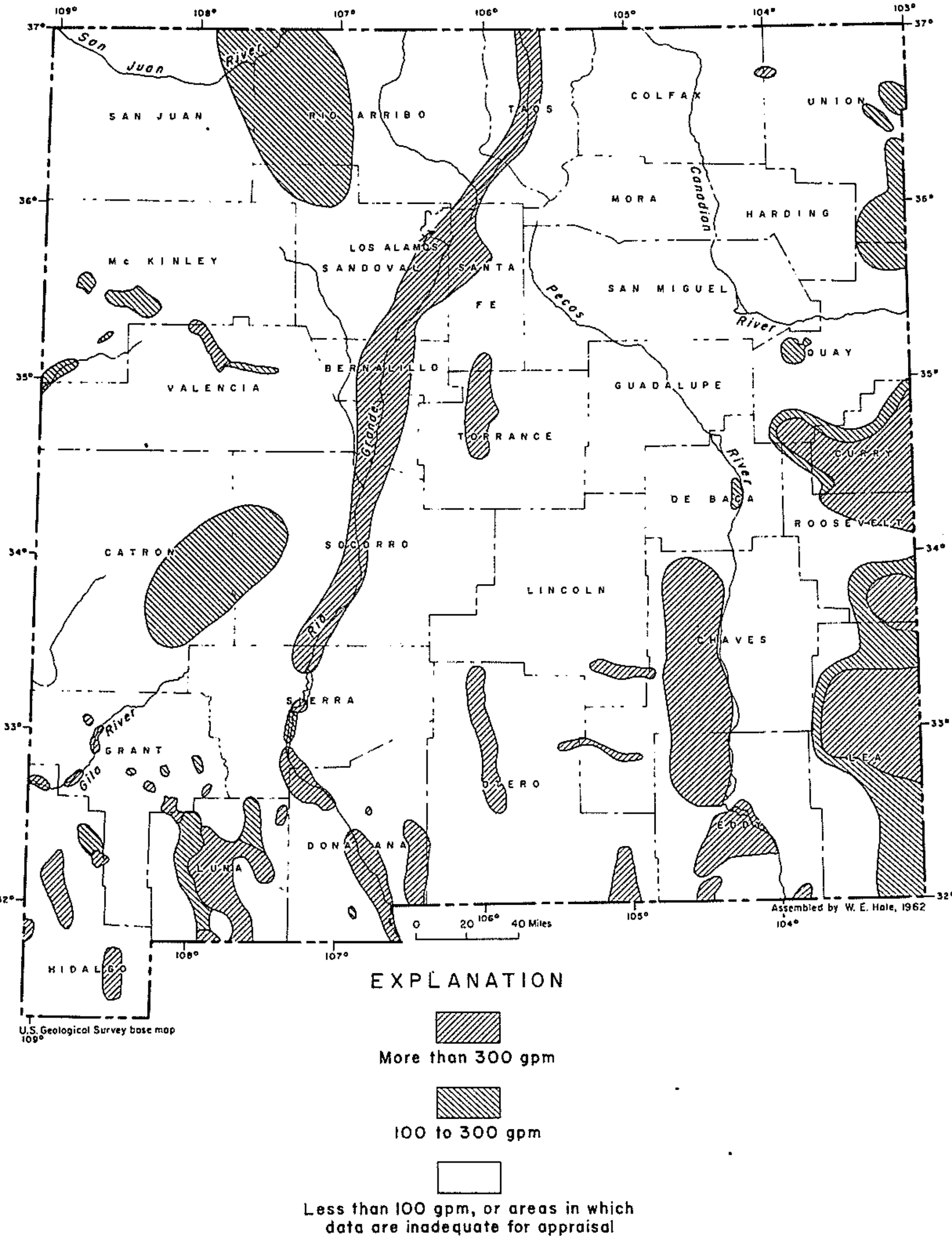
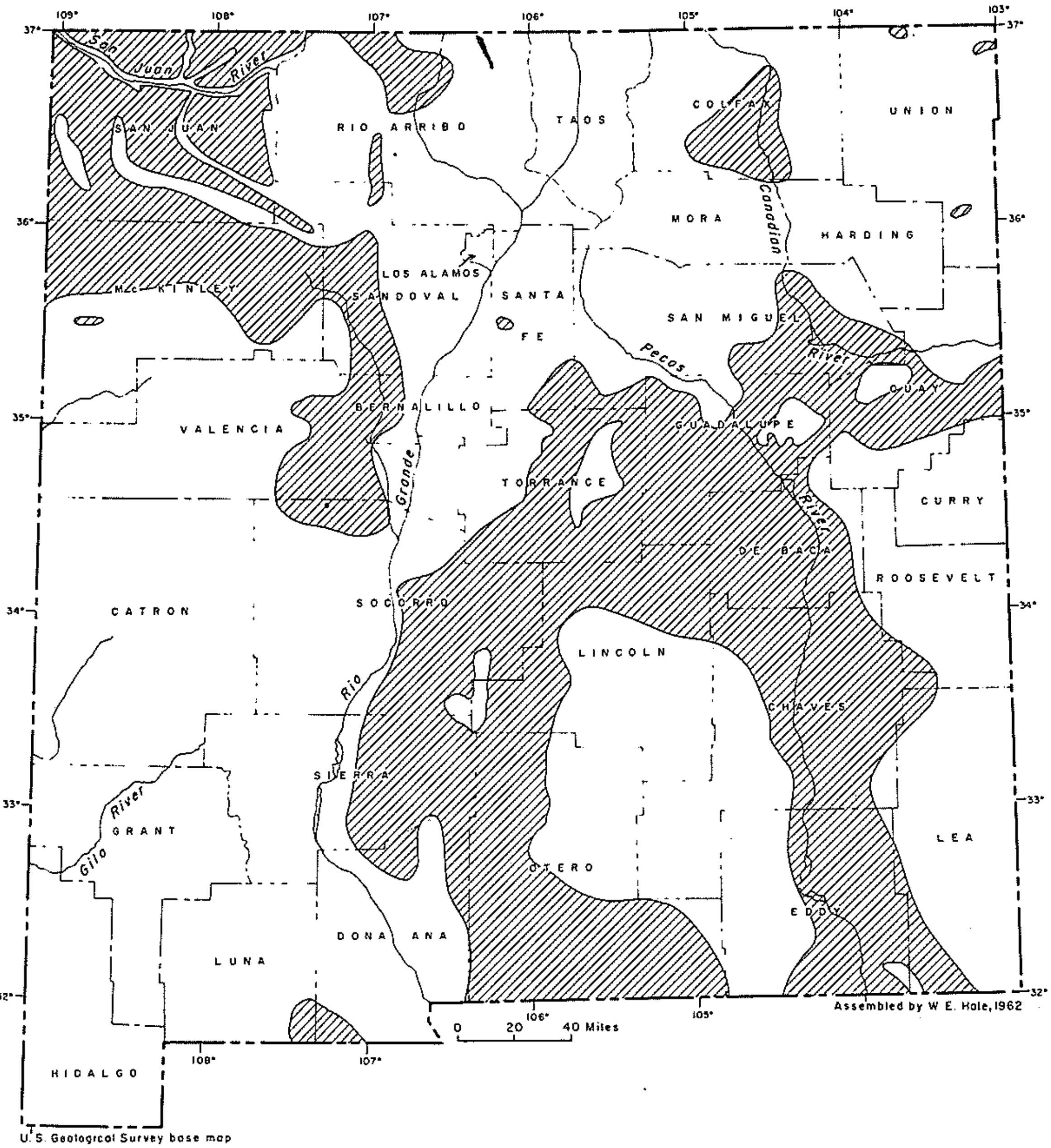


Figure 5.--General availability of relatively fresh ground water in New Mexico



EXPLANATION

Areas in which ground water commonly contains more than 1,000 ppm of dissolved solids

Figure 6.--Areas in New Mexico where supplies of relatively fresh ground water are scarce