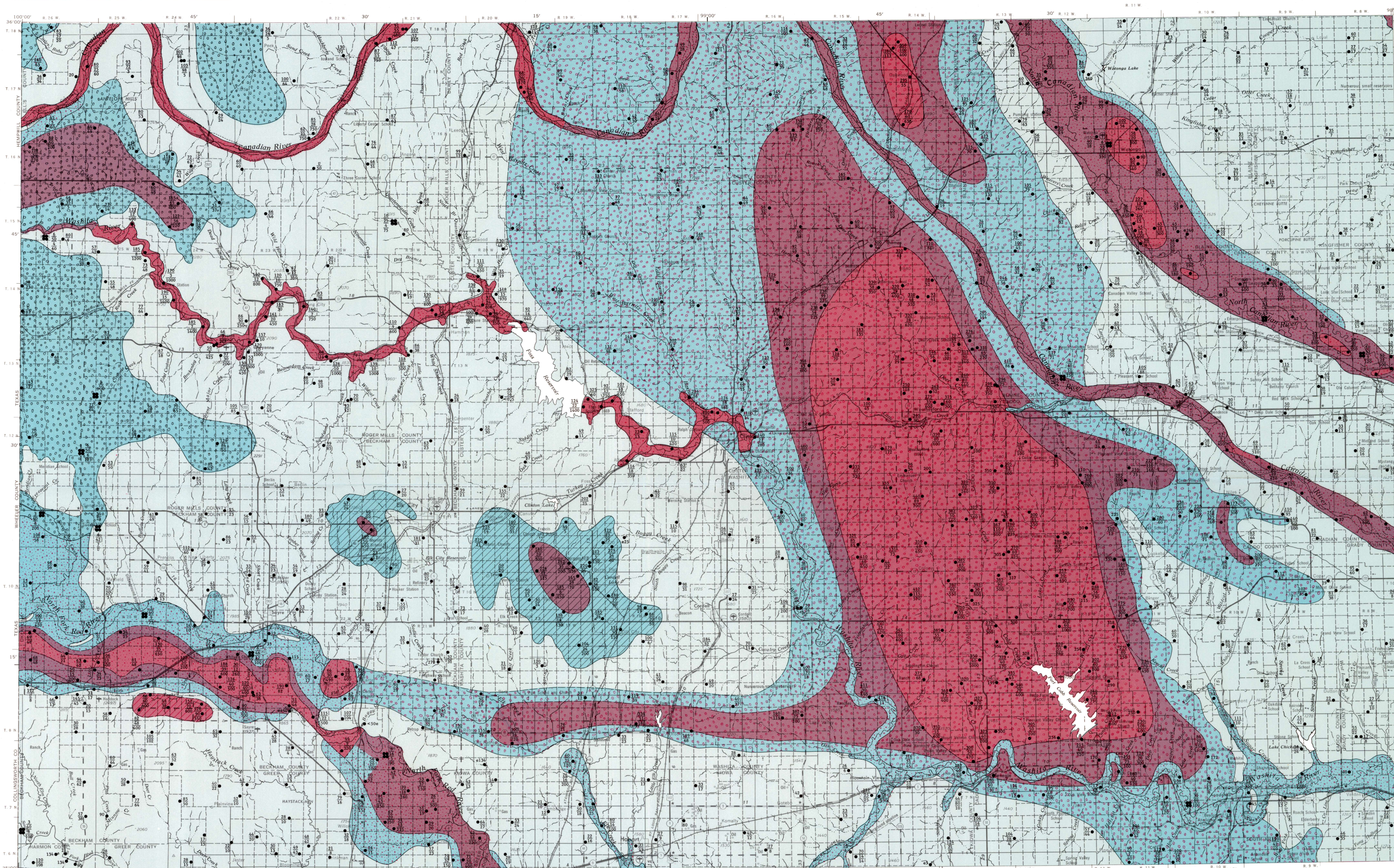

Base modified from U.S. Geological Survey 1:250,000 series: Clinton quadrangle, 1964

Compiled by Jerry E. Carr and DeRoy L. Bergman
U.S. Geological Survey, 1972

Scale 1:250,000

5 0 5 10 15 20 Statute Miles

5 0 5 10 15 20 25 30 Kilometers

CONTOUR INTERVAL 100 FEET
WITH SUPPLEMENTARY CONTOURS AT 50-FOOT INTERVALS
DATUM: MEAN SEA LEVEL

Figure 4. Map showing availability of ground water and pertinent data for drilled wells.

EXPLANATION

Major Aquifers

Alluvium and terrace deposits

Along large streams, deposits consist of clay and silt at the surface, grading downward into coarse sand and gravel at the base. Water is available from saturated layers of sand and gravel, and yields are highest where the coarse sand and gravel layers are thickest. In areas where an alluvium or terrace aquifer overlies the Rush Springs Sandstone, water is available from either aquifer.

Ogallala Formation

Semiconsolidated layers of fine to medium sand, clay, silt, and gravel. Average thickness is probably about 100 feet.

Elk City Sandstone

Mainly fine-grained sandstone with minor amounts of silt and clay. Maximum thickness is about 185 feet; formation thins toward the edges.

Rush Springs Sandstone and Marlow Formation

The Rush Springs Sandstone, which has a maximum thickness of about 300 feet, consists mainly of fine-grained sandstone with some dolomite, shale, and gypsum beds. The Marlow Formation has a maximum thickness of about 100 feet and consists of fine-grained sandstone with much gypsum and shale.

Blaine Formation

Mainly shale, interbedded with gypsum and dolomite. Maximum thickness is about 200 feet. Water is available from erratically occurring solution channels in the gypsum.

Yield of Major Aquifers, Range in Gallons per Minute

More than 300

150 to 300

25 to 150

Yield of Remaining Areas, in Gallons per Minute

Generally less than 25

Note: Evaluation of yield areas assumes that drilled wells will be completed in aquifer's total thickness. Locally, individual wells in any of the areas shown on the map may yield more or less than is indicated for that area.

Area boundary; dashed where approximately located

U
Information unknown

e
Estimated yield

<
Well yield less than amount shown

288 / 56 / 730
Well

Upper number is depth of well, in feet; middle number is depth to water, in feet below land surface; lower number is yield of well, in gallons per minute. Where only two numbers are shown, they are well depth and depth to water; where only one number is shown, it is well depth.

6 / 53 / 12 / 350
Well field

Upper number is number of wells in field; second number is average depth of wells, in feet; third number is average water level, in feet below land surface; fourth number is average well yield, in gallons per minute.

400 / 30
Flowing well

Upper number is depth of well, in feet; lower number is rate of flow, in gallons per minute.

5
Spring

Number beside spring symbol is yield in gallons per minute.

AVAILABILITY OF GROUND WATER

Information used to determine the availability of ground water was obtained in the field, from published and unpublished geologic maps, and from State and Federal agencies. Field information included measurement of well depth and depth to water and reported yield and well-construction data. The Oklahoma Water Resources Board provided data on industrial and irrigation wells. The U.S. Public Health Service provided records on wells in southern Caddo County.

The availability of ground water in any part of the Clinton quadrangle depends on the saturated thickness, permeability, and storage capacity of the underlying rocks. Permeability and storage capacity depend mainly on the number, size, shape, and arrangement of openings in the rocks. In general, fine-grained rocks such as siltstone and shale have low permeability, and yields for wells penetrating these rocks are small. Coarse-grained rocks such as medium- to coarse-grained sandstone and gravel have high permeability, and yields for wells penetrating these rocks are relatively large.

Major Aquifers

An aquifer is a geologic unit, a part of a geologic unit, or a group of units that will yield significant amounts of water to wells. For this report, major aquifers are those that will yield more than 25 gpm (gallons per minute). The location of major aquifers and the range in yields from wells in these aquifers are shown in figure 4.

Generally, the water-bearing properties of alluvium and terrace deposits are similar; therefore, these two units are combined and shown as a single aquifer. Alluvium and terrace deposits along the major rivers in the Clinton quadrangle are the source of water for irrigation, industrial, and municipal use. Alluvium along the Washita River upstream from Clinton provides large amounts of water for irrigation; most wells in the area yield 400 to 700 gpm. Most wells in the alluvium along the Washita River downstream from Clinton yield only 60 to 150 gpm. Alluvium and terrace deposits along the Canadian River provide moderate to large yields in some areas, although these deposits are largely undeveloped. Along most tributaries in the quadrangle, alluvium generally is thin and contains a high proportion of silt and clay; therefore it yields only small amounts of water, except possibly in a few local areas.

The Ogallala Formation in Roger Mills and Ellis Counties provides water mainly for municipal, domestic, and stock use; however, a small number of irrigation wells have been developed. Generally, the lower 50 feet of the formation consists mostly of friable, fine sand with a few layers of medium sand. The saturated thickness probably averages about 25 feet, but it may be as thick as 50 feet in some areas north of the Washita River in Roger Mills County.

The Elk City Sandstone provides water for municipal, irrigation, and industrial uses. In Washita County the formation is lens shaped and is thickest near the town of Burns Flat. The average depth of wells is about 160 feet, and most wells yield 60 to 200 gpm. In Beckham County the formation is thinner and is smaller in areal extent; thus the saturated thickness is less, and well yields are smaller.

The Rush Springs Sandstone is the principal aquifer in the quadrangle and supplies water for irrigation, municipal, and industrial use. The Rush Springs has a maximum thickness of about 300 feet in Caddo and Washita Counties, but it thins to about 200 feet northward in Blaine and Dewey Counties. In Caddo County a few irrigation wells are reported to yield as much as 1,000 gpm, but the average well yield probably is 400 to 500 gpm; elsewhere, the saturated thickness and permeability generally are less, and well yields are smaller. Although the Rush Springs Sandstone contains a large supply of ground water, high-yield wells concentrated in small areas can result in local overdevelopment. Such overdevelopment causes a steady water-level decline and a decrease in saturated thickness, which results in smaller well yields and increased pumping costs.

The Marlow Formation underlies the Rush Springs and has a maximum thickness of about 100 feet. In Canadian and eastern Caddo Counties, low permeability and high salinity of the water due to solution of disseminated gypsum keep the Marlow from being a good aquifer. However, in Blaine, Custer, and western Caddo Counties the Marlow has higher permeability, and the yield of a well may be appreciably increased by completing it in both the Marlow and Rush Springs Formations.

The Blaine Formation supplies water for use in irrigation. The formation consists mainly of shale interbedded with gypsum and dolomite. Data from a few wells indicate the presence of solution channels in the gypsum beds. These solution channels are believed to occur erratically, which would explain why well yields are highly variable, as yields are dependent upon the number, size, and interconnection of solution channels penetrated.

Water-Level Fluctuations

Fluctuations in water levels are primarily the result of changes in ground-water storage produced by an imbalance between recharge and discharge. (Changes in atmospheric pressure and other factors may also cause changes in water levels, but most of these factors represent no change in ground-water storage.) Discharge occurs by evaporation, transpiration, springs, and pumping. Recharge occurs from precipitation, irrigation water, and seepage from streams. Water-level fluctuations generally show seasonal patterns, either natural or man-made or a combination.

Natural seasonal patterns are caused mainly by annual variations in precipitation, evaporation, and transpiration. Although most rain falls during the spring and summer months, most ground-water recharge takes place during late winter and early spring when vegetation is dead or dormant, and evaporation and transpiration are at a minimum. Thus, water levels are normally highest in early spring, begin to decline in late spring or early summer, and continue to decline until autumn when they are at their lowest level. In late autumn they begin to rise as evaporation and transpiration decrease. During the summer months, intermittent rains of an inch or more may produce a temporary rise in water levels. Man-made seasonal patterns, which occur as a result of periodic pumpage for irrigation, municipal, or industrial use, are superimposed on natural seasonal patterns.

In addition to seasonal patterns, long-term trends in water levels can be observed. A long-term rise in water levels may occur during years of higher-than-normal precipitation, and a decline can occur during drought years. In heavily pumped areas, a trend of water-level decline may continue for years if discharge exceeds recharge.

The hydrographs shown as figure 5 chart the water-table response to precipitation and pumpage and 2- to 4-year trends of water levels in ground-water reservoirs in the Clinton quadrangle.

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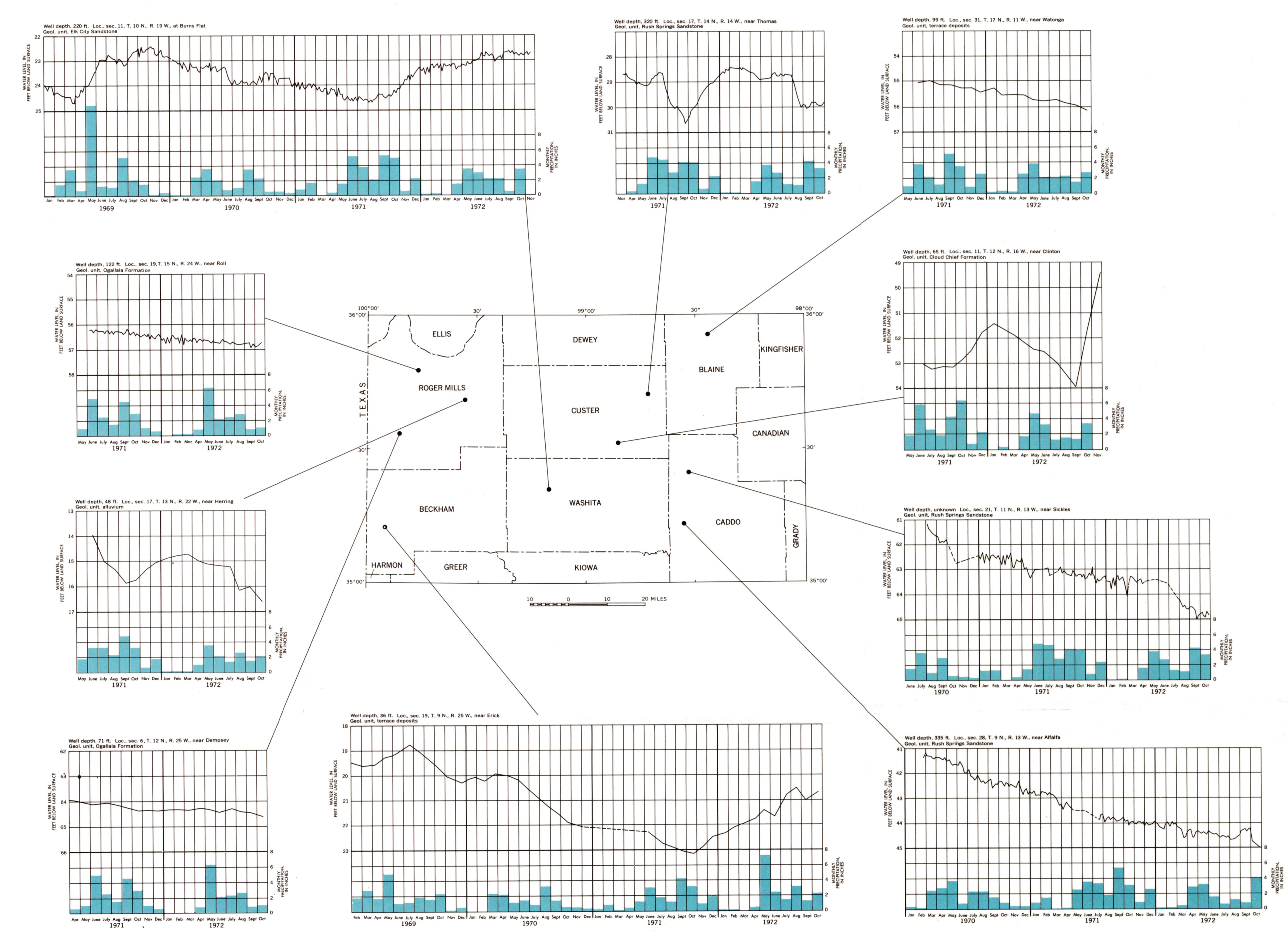

Figure 5. Hydrographs and precipitation data at selected sites.

RECONNAISSANCE OF THE WATER RESOURCES OF THE CLINTON QUADRANGLE, WEST-CENTRAL OKLAHOMA

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U.S. Geological Survey

1976

STAFFORD-LOWDON, OKLAHOMA
Cartographic preparation by Oklahoma Geological Survey