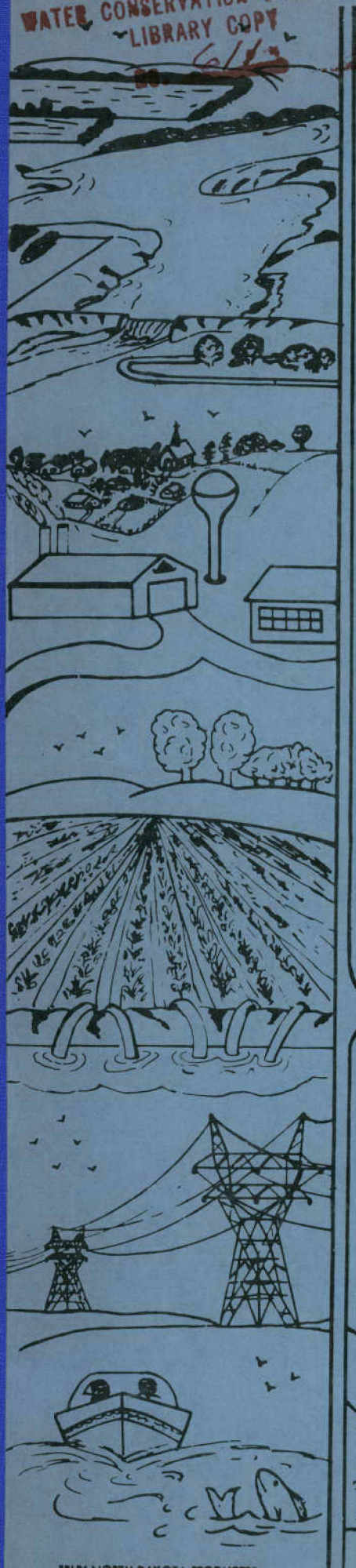

GROUND-WATER LEVELS IN NORTH DAKOTA, 1966

By
P. G. Randich
Geological Survey
United States Department of the Interior

NORTH DAKOTA GROUND-WATER STUDIES

NO. 74

Prepared by the United States Geological Survey in cooperation with the North Dakota State Water Commission

Published By
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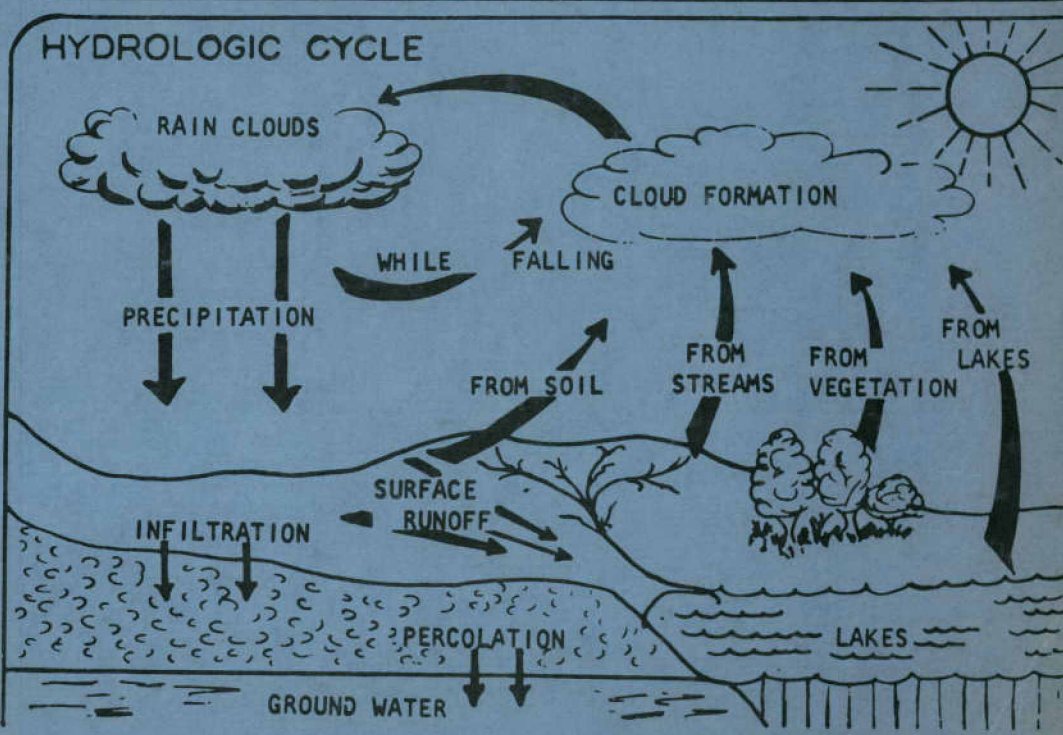
1301 State Capitol, Bismarck, North Dakota

- 1968 -



"BUY NORTH DAKOTA PRODUCTS"

GROUND-WATER LEVELS IN NORTH DAKOTA, 1966

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GROUND-WATER LEVELS IN NORTH DAKOTA

1966

By P. G. Randich

INTRODUCTION

The systematic measuring and recording of ground-water levels throughout the State is necessary to provide a sound basis for the development and management of the ground-water resources of North Dakota.

This is the first of a series of annual reports containing records of selected observation wells in North Dakota. Some of the more important objectives of the observation-well program are: (1) to provide long-term, continuous records of water-level fluctuations in representative wells in the major aquifers (ground-water reservoirs) in North Dakota, (2) to indicate changes of storage in the aquifers resulting from development or from natural causes, (3) to aid in the prediction of the base flow of streams, and (4) to provide information for use in water resources research.

COOPERATIVE GROUND-WATER STUDIES PROGRAM

The observation-well program in North Dakota is part of a cooperative ground-water studies program being conducted by the U.S. Geological Survey, North Dakota State Water Commission, North Dakota Geological Survey, and local boards of county commissioners or water management districts. The program consists of two main parts: Statewide general appraisals of ground-water resources, county by county; and detailed, problem-oriented studies of local extent in the vicinity of various cities and villages throughout the State. The results of the cooperative ground-water studies in North Dakota are published by the North Dakota Geological Survey and the North Dakota State Water Commission. Each county study covers a one or two county area for which State Bulletins are published in three parts: Part I - Geology; Part II - Ground-water basic data; and Part III - Ground-water resources. Since the program was started, studies of 26 counties have been completed or are in progress, as shown on figure 1. The results of the detailed municipal studies are published in the North Dakota State Water Commission Ground-Water Studies Series. To date (1967), 65 of these have been completed and published. Observation wells included in this report and continued into the long-term monitoring program originate from the cooperative county ground-water studies, from the city ground-water studies, and from the special ground-water studies.

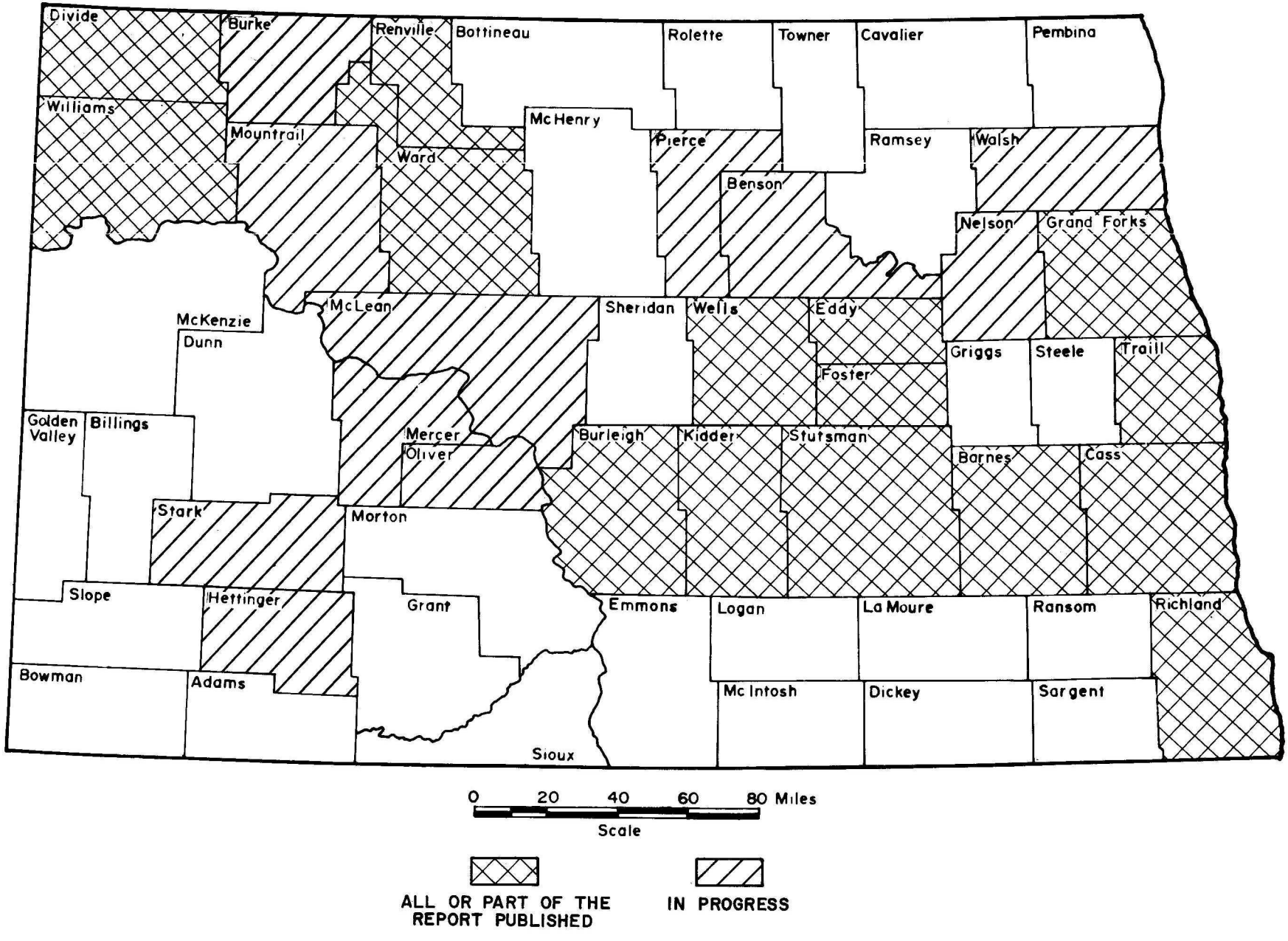


Figure 1.--Location of county ground-water studies in North Dakota.

The following is a list of available reports resulting from the county ground-water studies program.

Armstrong, C. A., 1965, Geology and ground water resources of Divide County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 45 and North Dakota State Water Comm. County Ground Water Studies 6, 112 p.

_____1966, Geology and ground water resources of Divide County, North Dakota; Part III, Ground water resources: North Dakota Geol. Survey Bull. 45 and North Dakota State Water Comm. County Ground Water Studies 6, 56 p.

_____1967, Geology and ground water resources of Williams County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 48 and North Dakota State Water Comm. County Ground Water Studies 9, 132 p.

Baker, C. H., Jr., 1966, Geology and ground water resources of Richland County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 46 and North Dakota State Water Comm. County Ground Water Studies 7, 170 p.

_____1967, Geology and ground water resources of Richland County, North Dakota; Part I, Geology: North Dakota Geol. Survey Bull. 46 and North Dakota State Water Comm. County Ground Water Studies 7, 45 p.

Baker, C. H., Jr., and Paulson, Q. F., 1967, Geology and ground water resources of Richland County, North Dakota; Part III, Ground water resources: North Dakota Geol. Survey Bull. 46 and North Dakota State Water Comm. County Ground Water Studies 7, 45 p.

Bluemle, J. P., 1965, Geology and ground water resources of Eddy and Foster Counties, North Dakota; Part I, Geology: North Dakota Geol. Survey Bull. 44 and North Dakota State Water Comm. County Ground Water Studies 5, 66 p.

Bluemle, J. P., Faigle, G. A., Kresl, R. J., and Reid, J. R., 1967, Geology and ground water resources of Wells County, North Dakota; Part I, Geology: North Dakota Geol. Survey Bull. 51 and North Dakota State Water Comm. County Ground Water Studies 12, 39 p.

Bradley, Edward, Petri, L. R., and Adolphson, D. G., 1963, Geology and ground water resources of Kidder County, North Dakota; Part III, Ground water and chemical quality of water: North Dakota Geol. Survey Bull. 36 and North Dakota State Water Comm. County Ground Water Studies 1, 38 p.

Huxel, C. J., Jr., and Petri, L. R., 1963, Geology and ground water resources of Stutsman County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 41 and North Dakota State Water Comm. County Ground Water Studies 2, 339 p.

_____1965, Geology and ground water resources of Stutsman County, North Dakota; Part III, Ground water and its chemical quality: North Dakota Geol. Survey Bull. 41 and North Dakota State Water Comm. County Ground Water Studies 2, 58 p.

Jensen, H. M., 1967, Geology and ground water resources of Traill County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 49 and North Dakota State Water Comm. County Ground Water Studies 10, 105 p.

Kelly, T. E., 1964, Geology and ground water resources of Barnes County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 43 and North Dakota State Water Comm. County Ground Water Studies 4, 156 p.

_____1966, Geology and ground water resources of Barnes County, North Dakota; Part III, Ground water resources: North Dakota Geol. Survey Bull. 43 and North Dakota State Water Comm. County Ground Water Studies 4, 67 p.

Klausing, R. L., 1966, Geology and ground water resources of Cass County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 47 and North Dakota State Water Comm. County Ground Water Studies 8, 158 p.

_____1967, Preliminary ground-water availability map of Cass County, North Dakota: U.S. Geol. Survey open-file report.

Kume, Jack, and Hansen, D. E., 1965, Geology and ground water resources of Burleigh County, North Dakota; Part I, Geology: North Dakota Geol. Survey Bull. 42 and North Dakota State Water Comm. County Ground Water Studies 3, 111 p.

Randich, P. G., 1965, Geology and ground water resources of Burleigh County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 42 and North Dakota State Water Comm. County Ground Water Studies 3, 273 p.

Randich, P. G., Petri, L. R., and Adolphson, D. G., 1962, Geology and ground water resources of Kidder County, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 36 and North Dakota State Water Comm. County Ground Water Studies 1, 134 p.

Randich, P. G., and Hatchett, J. L., 1966, Geology and ground water resources of Burleigh County, North Dakota; Part III, Ground water resources: North Dakota Geol. Survey Bull. 42 and North Dakota State Water Comm. County Ground Water Studies 3, 92 p.

Rau, J. L., Bakken, W. E., Chmelik, James, and Williams, B. J., 1962, Geology and ground water resources of Kidder County, North Dakota; Part I, Geology: North Dakota Geol. Survey Bull. 36 and North Dakota State Water Comm. County Ground Water Studies 1, 70 p.

Trapp, Henry, Jr., 1966, Geology and ground water resources of Eddy and Foster Counties, North Dakota; Part II, Ground water basic data: North Dakota Geol. Survey Bull. 44 and North Dakota State Water Comm. County Ground Water Studies 5, 243 p.

_____1967, Preliminary ground-water availability map of Eddy and Foster Counties, North Dakota: U.S. Geol. Survey open-file report.

Winters, H. A., 1963, Geology and ground water resources of Stutsman County, North Dakota; Part I, Geology: North Dakota Geol. Survey Bull. 41 and North Dakota State Water Comm. County Ground Water Studies 2, 84 p.

Publication of selected records of water levels in the United States by the U.S. Geological Survey began in 1935; records for North Dakota began in 1937. The following table gives by year the numbers of the Water-Supply Papers that contain water-level data for North Dakota.

Year	WSP	Year	WSP	Year(s)	WSP
1937	840	1944	1018	1951	1193
1938	845	1945	1025	1952	1223
1939	886	1946	1073	1953	1267
1940	908	1947	1098	1954	1323
1941	938	1948	1128	1955	1406
1942	946	1949	1158	1956	1456
1943	988	1950	1167	1957-61	1781
				1962-66	In press

The following is a list of ground-water reports for local areas prepared as part of the North Dakota State Water Commission Ground-Water Studies Series.

Adolphson, D. G., 1960, Test drilling in the Walhalla area, Pembina County, North Dakota: North Dakota Ground Water Studies no. 30, 19 p.

_____1961, Geology and ground-water resources of the Drake area, McHenry County, North Dakota: North Dakota Ground Water Studies no. 31, 44 p.

_____1961, Glacial drift aquifers in the Gackle area, Logan and Stutsman Counties, North Dakota: North Dakota Ground Water Studies no. 33, 16 p.

_____1962a, Artesian water from glacial drift near Lehr, Logan and McIntosh Counties, North Dakota: North Dakota Ground Water Studies no. 38, 22 p.

_____1962b, Ground water in the Hatton area, Traill and Steele Counties North Dakota: North Dakota Ground Water Studies no. 39, 23 p.

Akin, P. D., 1946, Ground water in beach deposits of glacial Lake Agassiz near Mountain, Pembina County, North Dakota: North Dakota Ground Water Studies no. 2, 27 p.

_____1947, Geology and ground-water conditions at Minot, North Dakota: North Dakota Ground Water Studies no. 6, 99 p.

_____1951, Ground water in the Mohall area, Bottineau and Renville Counties, North Dakota: North Dakota Ground Water Studies no. 17, 76 p.

_____1952, Ground water in the Litchville area, Barnes County, North Dakota: North Dakota Ground Water Studies no. 18, 51 p.

Armstrong, C. A., 1963, Ground water near Max, McLean and Ward Counties, North Dakota: North Dakota Ground Water Studies no. 45, 24 p.

Aronow, Saul, Dennis, P. E., and Akin, P. D., 1953a, Geology and ground-water resources of the Michigan City area, Nelson County, North Dakota: North Dakota Ground Water Studies no. 21, 125 p.

_____1953b, Geology and ground-water resources of the Minnewaukan area, Benson County, North Dakota: North Dakota Ground Water Studies no. 19, 125 p.

Beeks, C. H., 1967, Hatton water supply survey, Steele, Traill and Grand Forks Counties, North Dakota: North Dakota Ground Water Studies no. 66 (In preparation).

_____1967, Investigation of ground-water conditions at Lake Metigoshe State Park, Bottineau County, North Dakota: North Dakota Ground-Water Studies no. 68, 18 p.

Bradley, Edward and Jensen, H. M., 1962, Test drilling near Beulah, Mercer County, North Dakota: North Dakota Ground Water Studies no. 40, 19 p.

Brookhart, J. W. and Powell, J. E., 1961, Geology and ground-water resources of selected areas in North Dakota: North Dakota Ground Water Studies no. 28, 91 p.

Dennis, P. E., 1947a, Ground water near Buxton, Traill County, North Dakota: North Dakota Ground Water Studies no. 5, 29 p.

_____1947b, Ground water in the Aneta area, Nelson County, North Dakota: North Dakota Ground Water Studies no. 7, 23 p.

_____1947c, Ground water in the Sharon area, Steele County, North Dakota: North Dakota Ground Water Studies no. 8, 29 p.

_____1948a, Ground water in the Hope area, Steele County, North Dakota: North Dakota Ground Water Studies no. 9, 30 p.

_____1948b, Ground water in the Wimbledon area, Barnes and Stutsman Counties, North Dakota: North Dakota Ground Water Studies no. 10, 38 p.

Dennis, P. E., and Akin, P. D., 1950, Ground water in the Portland area, Traill County, North Dakota: North Dakota Ground Water Studies no. 15, 50 p.

Dennis, P. E., Akin, P. D., and Jones, S. L., 1949, Ground water in the Wyndmere area, Richland County, North Dakota: North Dakota Ground Water Studies no. 13, 59 p.

_____1950, Ground water in the Kindred area, Cass and Richland Counties, North Dakota: North Dakota Ground Water Studies no. 14, 75 p.

Dennis, P. E., Akin, P. D., and Worts, G. F., Jr., 1949, Geology and ground-water resources of parts of Cass and Clay Counties, North Dakota and Minnesota: North Dakota Ground Water Studies no. 11, 176 p.

Filaseta, Leonard, 1946, Ground water in the Fessenden area, Wells County, North Dakota: North Dakota Ground Water Studies no. 1, 22 p.

Froelich, L. L., 1963, Investigation of ground water conditions in the Bottineau area, Bottineau County, North Dakota: North Dakota Ground Water Studies no. 52, 60 p.

_____1964a, Ground-water survey of the Surrey area, Ward County, North Dakota: North Dakota Ground Water Studies no. 58, 62 p.

_____1964b, Ground-water survey of the Amenia area, Cass County, North Dakota: North Dakota Ground Water Studies no. 59, 20 p.

_____1964c, Ground-water survey of the Sheyenne area, Eddy County, North Dakota: North Dakota Ground Water Studies no. 60, 46 p.

_____1965, Ground-water survey of the Rugby area, Pierce County, North Dakota: North Dakota Ground Water Studies no. 62, 70 p.

_____1966, Lansford water-supply survey, Bottineau County, North Dakota: North Dakota Ground Water Studies no. 64, 32 p.

_____1967, Ground water in the St. John area, Rolette County, North Dakota: North Dakota Ground Water Studies no. 67, 33 p.

Huxel, C. J., Jr., 1961, Ground-water supply problems in the Sanborn area, Barnes County, North Dakota: North Dakota Ground Water Studies no. 32, 21 p.

Jensen, H. M., 1961a, Ground-water sources in the vicinity of Northwood, Grand Forks County, North Dakota: North Dakota Ground Water Studies no. 34, 22 p.

_____1961b, Ground-water occurrence in the Alexander area, McKenzie County, North Dakota: North Dakota Ground Water Studies no. 35, 20 p.

_____1962a, Geology and occurrence of ground water near Bowbells, Burke and Ward Counties, North Dakota: North Dakota Ground Water Studies no. 42, 65 p.

_____1962b, Ground water near Reynolds, Grand Forks and Traill Counties, North Dakota: North Dakota Ground Water Studies no. 47, 26 p.

Jensen, H. M., and Bradley, Edward, 1962, Ground water near Hoople, Walsh and Pembina Counties, North Dakota: North Dakota Ground Water Studies no. 49, 19 p.

_____1963, Ground water in the vicinity of Hillsboro, Traill County, North Dakota: North Dakota Ground Water Studies no. 55, 19 p.

Kahil, A. A., 1965, Ground-water survey of the Rock Lake area, Towner County, North Dakota: North Dakota Ground Water Studies no. 63, 32 p.

Laird, W. M., 1948, Ground water in the Zeeland area, North Dakota: North Dakota Ground Water Studies no. 12, 38 p.

LaRocque, G. A., Jr., Swenson, H. A., and Greenman, D. W., 1963, Ground water in the Crosby-Mohall area, North Dakota: North Dakota Ground Water Studies no. 54, 57 p.

Lindvig, M. O., 1965, Ground-water in the Ellendale area, Dickey County, North Dakota: North Dakota Ground Water Studies no. 61, 30 p.

McLaughlin, T. G., 1946, Ground water at Dickinson, North Dakota: North Dakota Ground Water Studies no. 3, 31 p.

Paulson, Q. F., 1951, Ground water in the Neche area, Pembina County, North Dakota: North Dakota Ground Water Studies no. 16, 37 p.

_____1952, Geology and occurrence of ground water in the Streeter area, Stutsman, Logan, and Kidder Counties, North Dakota: North Dakota Ground Water Studies no. 20, 73 p.

_____1953, Ground water in the Fairmount area, Richland County, North Dakota, and adjacent areas in Minnesota: North Dakota Ground Water Studies no. 22, 67 p.

_____1954, Geology and occurrence of ground water in the Stanley area, Mountrail County, North Dakota: North Dakota Ground Water Studies no. 23, 59 p.

Paulson, Q. F., and Akin, P. D., 1964, Ground water resources of the Devils Lake area, Benson, Ramsey, and Eddy Counties, North Dakota: North Dakota Ground Water Studies no. 56, 211 p.

Paulson, Q. F., and Powell, J. E., 1957, Geology and ground-water resources of the Upham area, McHenry County, North Dakota: North Dakota Ground Water Studies no. 26, 66 p.

_____1962, Geology and ground-water resources of Tioga and Hofflund Flats areas, Williams and Mountrail Counties, North Dakota: North Dakota Ground Water Studies no. 43, 65 p.

Pettyjohn, W. A., and Hills, D. L., 1965, Geohydrology of the Souris River Valley in the vicinity of Minot, North Dakota: North Dakota Ground Water Studies no. 65, 89 p.

Powell, J. E., 1956, Geology and ground-water resources of the Hankinson area, Richland County, North Dakota: North Dakota Ground Water Studies no. 25, 45 p.

_____1959, Progress report on the geology and ground-water resources of the Westhope area, Bottineau County, North Dakota: North Dakota Ground Water Studies no. 27, 68 p.

Powell, J. E., and Jones, S. L., 1962, Ground water resources in the Lakota area, Nelson County, North Dakota: North Dakota Ground Water Studies no. 48, 68 p.

Powell, J. E., and Paulson, Q. F., 1961, Geology and ground-water resources of the Richardton area, Stark County, North Dakota: North Dakota Ground Water Studies no. 29, 40 p.

Randich, P. G., 1961, Ground-water conditions in the vicinity of Ashley, McIntosh County, North Dakota: North Dakota Ground Water Studies no. 37, 20 p.

_____1963, Geology and ground-water resources near Berthold, Ward County, North Dakota: North Dakota Ground Water Studies no. 46, 26 p.

_____1963, Geology and ground-water resources of the Linton-Strasburg area, Emmons County, North Dakota: North Dakota Ground Water Studies no. 50, 53 p.

Randich, P. G., and Bradley, Edward, 1962, Ground-water resources in the vicinity of Leeds, Benson County, North Dakota: North Dakota Ground Water Studies no. 44, 27 p.

Rasmussen, W. C., 1947, Ground water in the deposits of ancient Lake Dakota, Dickey County, North Dakota: North Dakota Ground Water Studies no. 4, 87 p.

Robinove, C. J., 1956, Geology and ground-water resources of the Hettinger area, Adams County, North Dakota: North Dakota Ground Water Studies no. 24, 44 p.

Schmid, R. W., 1961, Report on ground-water availability for irrigation purposes in the Little Muddy valley area, Williams County, North Dakota: North Dakota Ground Water Studies no. 36, 22 p.

_____1962, Ground-water conditions in the vicinity of Parshall, Mountrail County, North Dakota: North Dakota Ground Water Studies no. 41, 31 p.

_____1963a, Ground water in the vicinity of Ryder, Ward County, North Dakota: North Dakota Ground Water Studies no. 53, 33 p.

_____1963b, Ground water in the vicinity of Dickinson, Stark County, North Dakota: North Dakota Ground Water Studies no. 51, 34 p.

_____1964, Ground water in the Rolla area, Rolette County, North Dakota: North Dakota Ground Water Studies no. 57, 47 p.

Requests for State reports that are available may be made to the North Dakota State Water Commission, Capitol Building, Bismarck, or the North Dakota Geological Survey, University Station, Grand Forks. U.S. Geological Survey Water Supply Papers may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402. The reports that are no longer available for distribution may be examined at either of the State agencies or at the U.S. Geological Survey, New Federal Building, Bismarck, N. Dak.

WELL-NUMBERING SYSTEM

The well-numbering system used in this report, illustrated in figure 2, is based on the location of the well in the federal system of rectangular surveys of public lands. The first numeral denotes the township north of a base line, the second denotes the range west of the fifth principal meridian, and the third denotes the section in which the well is located. The letters a, b, c, and d designate, respectively, the northeast, northwest, southwest, and southeast quarter section, quarter-quarter section, and quarter-quarter-quarter section (10-acre tracts). Thus, well 137-76-15daa is in the NE$\frac{1}{4}$NE$\frac{1}{4}$SE$\frac{1}{4}$ sec. 15, T. 137 N., R. 76 W.

CAUSES OF WATER-LEVEL FLUCTUATIONS

Water levels in wells are constantly fluctuating; some decline or rise a fraction of an inch or many feet in a relatively short time. These fluctuations of water levels in wells reflect fluctuations in water levels in the underground reservoirs tapped by the wells. They are similar to the changes in stage of surface-water reservoirs.

The underground reservoirs, or aquifers, may be divided into two main types--water table and artesian. Water-table aquifers generally lie at shallow depths. They commonly consist of sand and gravel deposits, which are exposed at or near to the land surface over much of their area. Thus, rainfall and snowmelt may infiltrate the deposits and seep downward to the zone of saturation. The surface of the zone of saturation is termed the water table. Artesian aquifers may also consist of sand and gravel deposits or they may consist of consolidated rocks such as sandstone. However, these aquifers differ from the water-table aquifers in that they

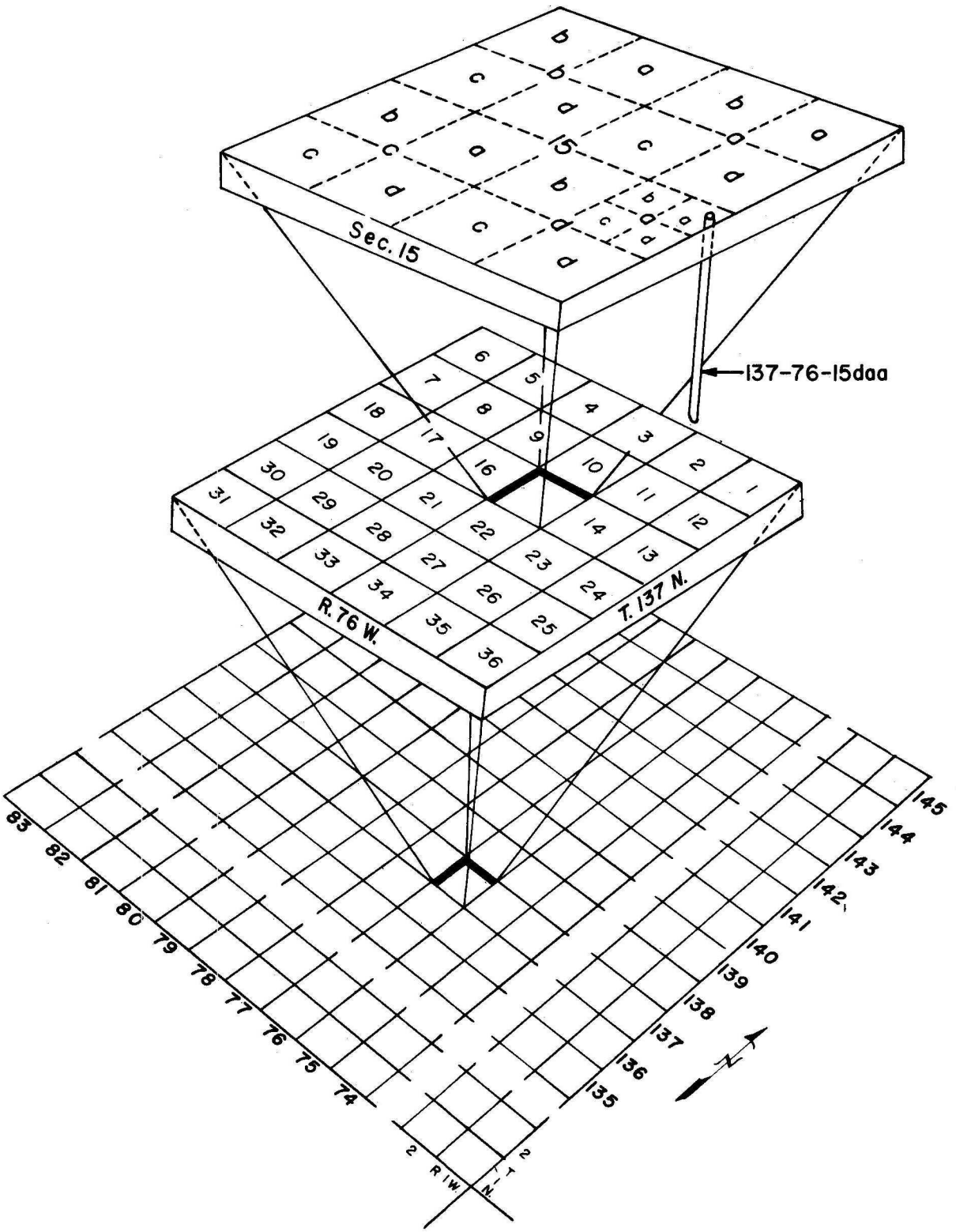


FIGURE 2--SYSTEM OF NUMBERING WELLS AND TEST HOLES.

generally are more deeply buried and are confined by overlying beds of relatively impermeable materials such as clay, silt, or shale. Rainfall and snowmelt cannot readily infiltrate these aquifers except in relatively small areas of outcrop.

Water levels in water-table wells are affected by direct recharge from precipitation, evapotranspiration, withdrawal by wells, and discharge to streams. Also, shallow earth-temperature gradients have important effects on the transfer of moisture from the soils to the water table and vice versa (Willis and others, 1963[1/]), thereby affecting water levels.

In North Dakota, the initial rise in a water-table well usually occurs in mid-April when frost in the ground commences to thaw. The water level generally continues to rise through the spring and early summer as the result of infiltrating rainfall and snowmelt. By midsummer, evapotranspiration losses, particularly in the shallower aquifers, exceed the quantities of water added by recharge and the water levels decline. The decline generally continues through the fall and winter until the spring thaw causes the cycle to begin again.

It is not uncommon for the midsummer-through-winter decline to be interrupted briefly in the fall by a small rise in water level. This reversal and slight rise in water level generally follows the first killing frost of the season and is attributed to a decrease in evapotranspiration losses. Commonly this also is a period of slightly increased spring discharge and streamflow.

1/ Willis, W. O., and others, 1963, Water table changes and soil moisture loss under frozen conditions: Soil Sci., v. 98, no. 4, Oct. 1964, p. 244-248

Water levels in wells in artesian aquifers do not respond readily to the effects of precipitation. They respond to recharge in the area of outcrop, and thus to precipitation on that area--but with a time lag in the response. However, they commonly are sensitive to pumpage withdrawals, atmospheric pressure changes, earthquake pressure waves, and loading and unloading of the land surface above the aquifer.

WATER-LEVEL RECORDS

Water-level measurements in this report are given to the nearest hundredth of a foot with reference to land-surface datum (lsd), a precise datum plane that is approximately at land surface at each well. A plus sign (+) is placed before the measurement if the water level is above land-surface datum. If known, the altitude of the land-surface datum above mean sea level is given in the well description. Mean sea level (msl) is the datum plane on which the national network of precise levels is based. In this report, many elevations were picked from topographic maps or were determined by altimeter methods. At these locations altitudes are reported only to the nearest foot, and probably have an accuracy of $\pm$ 2 feet. Otherwise, surveys were conducted and altitudes are reported to the nearest hundredth of a foot. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Measurements of water levels in wells equipped with continuous recording gages are given for every fifth day and for the end of each month (eom).

This report includes water-level measurements from 152 observation wells comprising the Statewide network. Significant water-level changes or trends are explained and illustrated by hydrographs, where applicable. A special effort was made to show at least one representative well from each major aquifer that would indicate changes resulting from development and (or) recharge from precipitation. Precipitation data were obtained from the U.S. Weather Bureau annual summaries for the years indicated on each hydrograph. Highest and lowest water levels for the period of record are indicated only for wells equipped with recording instruments or measured monthly.

Barnes County

Barnes County is in southeastern North Dakota and has an area of 1,501 square miles. Water levels are being monitored in 11 observation wells shown on figure 3.

The location and extent of aquifers in Barnes County are described by Kelly (1966).

Water-level trends and precipitation are shown on figure 4. The nearly uniform seasonal fluctuations indicate that the Sand Prairie aquifer, which is under water-table conditions, is near equilibrium; that is, discharge is balanced by recharge. There is no large development in the Sand Prairie aquifer, and the hydrograph shows no effects of withdrawals from wells. Water levels in the Spiritwood aquifer, which is under artesian conditions, have been continually rising since July 1965. The rise is apparently due to recharge exceeding discharge because of the large amount of precipitation received during 1965.

For the period of record (1963-66), the highest water levels in all aquifers generally occurred during 1966. The lowest water levels generally occurred during 1963-65 for the same period of record. Two wells, developed in the Spiritwood aquifer, are used to irrigate about 432 acres.

Ground water appropriated in Barnes County to the end of 1966 was 910 acre-feet. Ground-water usage in 1966 was reported to be about 545 acre-feet.

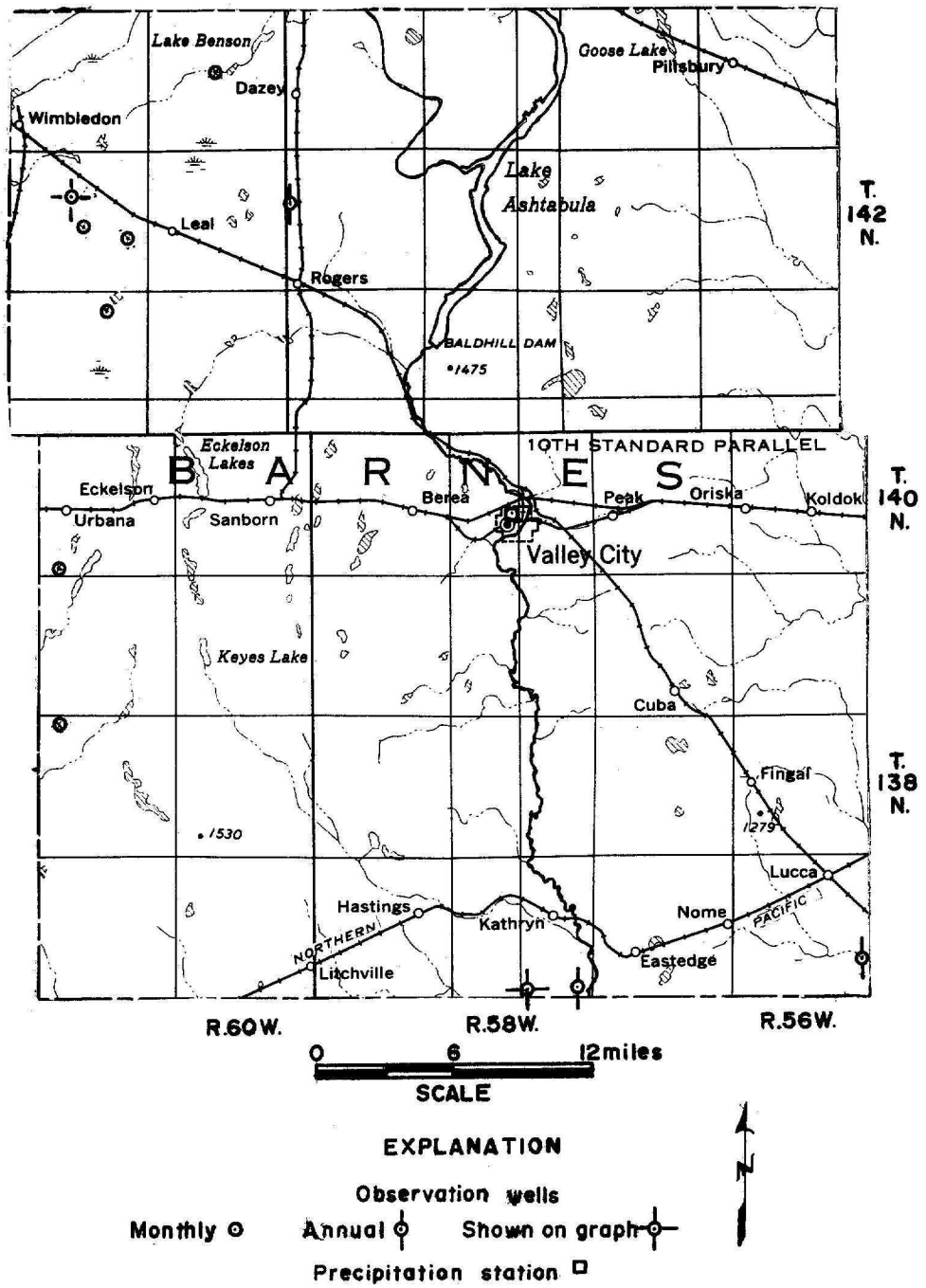


Figure 3.--Location of observation wells in Barnes County.

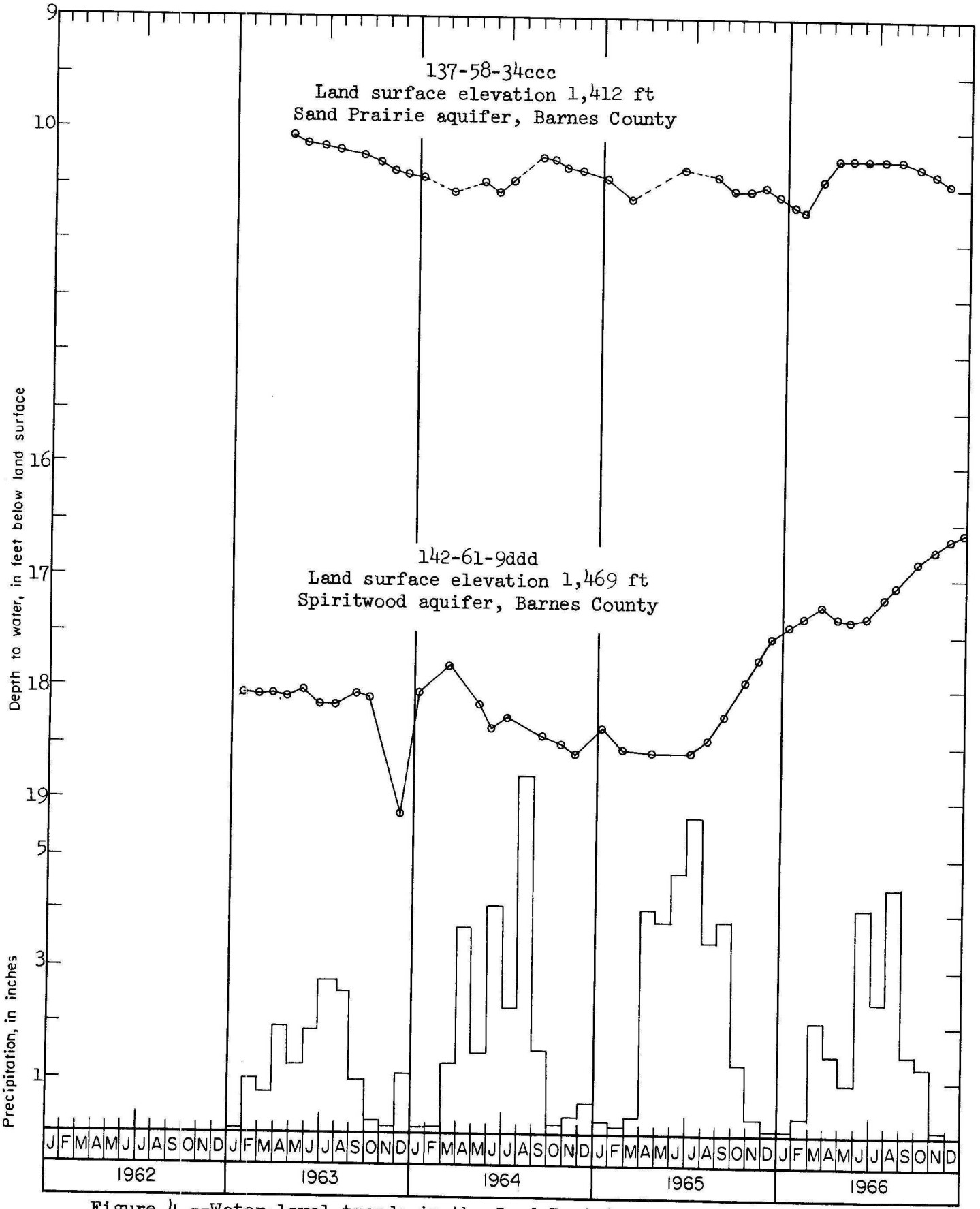


Figure 4.--Water-level trends in the Sand Prairie and Spiritwood aquifers and precipitation at Valley City.

137-56-25ada. Cooperative program. Drilled observation water-table well in sand and gravel from 22-102 ft. Depth 108 ft, cased to 80 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 60-80 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,178 ft above msl. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Dec. 9	22.64	Feb. 12	22.76	June 11	22.23
Sept. 2	22.46			Mar. 15	22.53		
Oct. 1	22.35	1965		Apr. 13	21.30	1966	
Nov. 3	22.33	Jan. 19	22.77	May 11	22.08	Aug. 5	22.78

137-58-34ccc. Cooperative program. Drilled observation water-table well in the Sand Prairie aquifer. Depth 26 ft, cased to 26 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 16-26 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,412 ft above msl. Highest water level 10.08 ft below lsd, Apr. 26, 1963; lowest 10.72 ft below lsd, Feb. 7, 1966. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Oct. 21	10.56	Feb. 7	10.72	Aug. 5	10.23
Jan. 6	10.46	Nov. 15	10.52	Mar. 15	10.43	14	10.23
Feb. 23	10.63	Dec. 13	10.60	Apr. 14	10.24	Sept. 27	10.30
June 2	10.38			May 9	10.24	Oct. 25	10.38
Aug. 10	10.43	1966		June 13	10.26	Nov. 25	10.45
Sept. 13	10.55	Jan. 10	10.70	July 12	10.23		

137-58-36ccc. North Dakota. Spring flowing from 1-in diam galv pipe. Discharging from Sand Prairie aquifer. MP, orifice of discharge pipe. Temperature in degrees F. Flow in gallons per minute.

Date	Flow	Temp.	Date	Flow	Temp.	Date	Flow	Temp.
1965			Oct. 21	3.0	47	1966		
Jan. 6	2.8	38	Nov. 15	Dry		Jan. 10	Dry	
Aug. 10	3.0	58	Dec. 13	Dry		Measurement reverted to yearly.		
Sept. 13	3.1	47						

138-61-6aaa. Cooperative program. Drilled observation artesian well in the Spiritwood aquifer. Depth 196 ft, cased to 175 ft with 1¼-in diam plastic pipe, slotted 155-175 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,457 ft above msl. Highest water level 9.80 ft below lsd, July 12 and Aug. 5, 1966; lowest 12.70 ft below lsd, Feb. 23, 1965. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Nov. 25	12.22	Oct. 21	10.23	June 13	10.04
Jan. 7	12.29			Nov. 15	9.94	July 12	9.80
Mar. 4	12.69	1965		Dec. 13	9.93	Aug. 5	9.80
May 4	12.54	Jan. 7	12.27			18	9.91
June 1	12.57	Feb. 23	12.70	1966		Sept. 27	10.20
July 2	12.03	Apr. 26	12.68	Jan. 10	10.11	Oct. 24	10.35
30	11.95	June 2	12.13	Feb. 7	10.43	Nov. 28	10.60
Sept. 1	11.68	July 8	11.73	Mar. 15	10.82	Dec. 27	10.76
29	11.93	Aug. 10	11.10	Apr. 15	10.88		
Oct. 27	12.18	Sept. 13	10.79	May 9	10.56		

140-61-31dda. Cooperative program. Drilled observation artesian well in the Spiritwood aquifer. Depth 240 ft, cased to 150 ft with 1¼-in diam plastic pipe, slotted 140-150 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,426 ft above msl. Highest water level 19.60 ft below lsd, Aug. 18, 1966; lowest 25.35 ft below lsd, Nov. 1, 1963. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1963		June 1	21.52	July 8	21.06	June 13	19.80
Sept. 26	20.74	July 2	21.24	Aug. 10	19.78	July 12	19.62
Oct. 10	20.57	30	21.39	Sept. 13	20.55	Aug. 4	19.61
17	21.08	Sept. 1	21.06	Oct. 21	20.22	18	19.60
22	20.49	29	21.94	Nov. 15	19.96	Sept. 27	19.70
25	20.96	Oct. 27	21.76	Dec. 13	19.89	Oct. 24	19.76
26	21.09	Nov. 25	21.43			Nov. 28	19.91
Nov. 1	25.35			1966		Dec. 27	20.02
5	24.16	1965		Jan. 10	19.92		
Dec. 4	22.48	Jan. 7	21.32	Feb. 7	20.07		
		Feb. 23	21.68	Mar. 15	20.15		
1964		Apr. 27	21.56	Apr. 15	20.20		
May 4	21.36	June 2	21.14	May 9	20.06		

141-61-2ccc. Cooperative program. Drilled observation artesian well in the Spiritwood aquifer. Depth 284 ft, cased to 250 ft with 1¼-in diam plastic pipe, slotted 220-250 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,465 ft above msl. Highest water level 15.06 ft below lsd, Dec. 27, 1966; lowest 17.64 ft below lsd, Jan. 7, 1965. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		1965		Dec. 13	15.80	Aug. 5	15.35
Mar. 4	15.76	Jan. 7	17.64			18	15.34
May 4	15.94	Feb. 23	16.92	1966		Sept. 27	15.22
June 1	15.98	Apr. 27	16.86	Jan. 10	15.69	Oct. 24	15.16
July 2	15.85	June 2	16.69	Feb. 7	15.63	Nov. 28	15.11
30	16.04	July 8	16.66	Mar. 15	15.49	Dec. 27	15.06
Sept. 1	16.85	Aug. 10	16.58	Apr. 15	15.63		
29	16.85	Sept. 13	16.57	May 9	15.65		
Oct. 27	16.91	Oct. 21	16.21	June 13	15.67		
Nov. 27	17.00	Nov. 15	15.97	July 12	15.44		

142-59-18bbb. Cooperative program. Drilled observation artesian well in the Spiritwood aquifer. Depth 252 ft, cased to 220 ft with 1¼-in diam plastic pipe, perforated 200-220 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,442 ft above msl. Records available 1962-66. Aug. 5, 1966, 19.82.

142-61-9ddd. Cooperative program. Drilled observation artesian well in the Spiritwood aquifer. Depth 231 ft, cased to 226 ft with 1¼-in diam plastic pipe, slotted 196-226 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,469 ft above msl. Highest water level 16.60 ft below lsd, Dec. 27, 1966; lowest 18.90 ft below lsd, Oct. 4, 1962. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Nov. 25	18.60	Nov. 15	17.72	July 12	17.19
Jan. 6	18.04			Dec. 13	17.53	Aug. 4	17.09
Mar. 4	17.80	1965				18	17.04
May 4	18.15	Jan. 7	18.34	1966		Sept. 27	16.86
June 1	18.37	Feb. 23	18.54	Jan. 10	17.43	Oct. 24	16.75
July 2	18.28	Apr. 26	18.59	Feb. 7	17.33	Nov. 28	16.67
30	18.49	July 8	18.59	Mar. 15	17.24	Dec. 27	16.60
Sept. 1	18.44	Aug. 10	18.46	Apr. 15	17.37		
29	18.50	Sept. 13	18.22	May 9	17.39		
Oct. 27	18.50	Oct. 21	17.93	June 13	17.34		

142-61-22bbb. Uxbridge Township. Bored unused water-table well overlying the Spiritwood aquifer. Depth 52.4 ft, cased to 52.4 ft. MP, top of galv pipe 0.80 ft above lsd. Lsd, 1,495 ft above msl. Highest water level 3.94 ft below lsd, July 12, 1966; lowest 19.98 ft below lsd, Dec. 4, 1963. Records available 1962-63, 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Dec. 13	7.42	Mar. 15	9.77	Aug. 18	5.08
Aug. 10	6.77			Apr. 15	7.07	Sept. 27	7.58
Sept. 13	7.66	1966		May 9	4.76	Oct. 24	8.63
Oct. 21	7.18	Jan. 10	7.14	June 13	5.00	Nov. 28	8.66
Nov. 15	7.24	Feb. 7	9.22	July 12	3.94	Dec. 27	8.98

142-61-24bcc2. Cooperative program. Drilled observation artesian well in the Spiritwood aquifer. Depth 290 ft, cased to 281 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point 281-284 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,482.3 ft above msl. Highest water level 43.70 ft below lsd, Dec. 27, 1966; lowest 49.28 ft below lsd, July 30, 1964. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1963		Sept. 1	47.30	Aug. 10	45.34	Apr. 15	44.18
Nov. 13	45.03	29	46.61	Sept. 13	45.12	May 9	44.20
		Nov. 25	47.63	Oct. 21	44.80	June 13	44.13
1964				Nov. 15	44.59	July 12	43.99
Jan. 6	44.77	1965		Dec. 13	44.39	Aug. 4	43.95
Mar. 4	45.82	Jan. 7	46.38			18	43.94
May 4	45.40	Feb. 23	45.98	1966		Sept. 27	43.88
June 1	45.82	Apr. 27	45.65	Jan. 10	44.32	Oct. 24	43.88
July 2	45.72	June 2	45.46	Feb. 7	44.20	Nov. 28	43.74
30	49.28	July 8	45.59	Mar. 15	44.06	Dec. 27	43.70

143-60-15ccc. Cooperative program. Drilled observation artesian well in the Spiritwood aquifer. Depth 195 ft, cased to 195 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 165-195 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,456.3 ft above msl. Highest water level 20.11 ft below lsd, July 12, 1966; lowest 22.41 ft below lsd, Feb. 26, 1965. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Nov. 25	22.27	Oct. 21	20.68	May 9	20.50
Jan. 6	22.20			Nov. 15	20.50	June 13	20.24
Mar. 4	22.35	1965		Dec. 13	20.44	July 12	20.11
May 4	22.13	Jan. 7	22.17			Aug. 5	20.16
June 1	22.29	Feb. 26	22.41	1966		18	20.20
July 2	22.02	Apr. 27	22.13	Jan. 10	20.53	Sept. 27	20.28
30	22.21	June 2	21.55	Feb. 7	20.62	Oct. 24	20.32
Sept. 1	22.17	July 8	21.46	Mar. 15	20.69	Nov. 28	20.32
29	22.13	Aug. 10	21.27	Apr. 15	20.67	Dec. 27	20.36
Oct. 27	22.14	Sept. 13	21.10				

Burleigh County

Burleigh County is in south-central North Dakota and has an area of 1,650 square miles. Water levels are being monitored in 15 observation wells shown on figure 5.

The location and extent of aquifers in Burleigh County are described by Randich and Hatchett (1966).

Water-level trends and precipitation are shown in figures 6 and 7. Water levels generally are rising. There is some development by large-yield wells in the Bismarck and McKenzie aquifers, and water levels in well 138-77-15aaa show the effects of pumping. Water-level fluctuations in other aquifers such as the Long Lake, Glencoe Channel, and Sibley Channel reflect changes in natural conditions. Highest water levels for the period of record (1962-66) have generally occurred in 1966. Most of the low water levels for the same period occurred during 1963-64. There are 16 irrigation and 2 industrial wells each pumping from 200 to 3,000 gpm (gallons per minute) from aquifers in Burleigh County.

Ground water appropriated in Burleigh County to the end of 1966 was 7,054 acre-feet. Ground-water usage in 1966 was reported to be about 3,258 acre-feet.

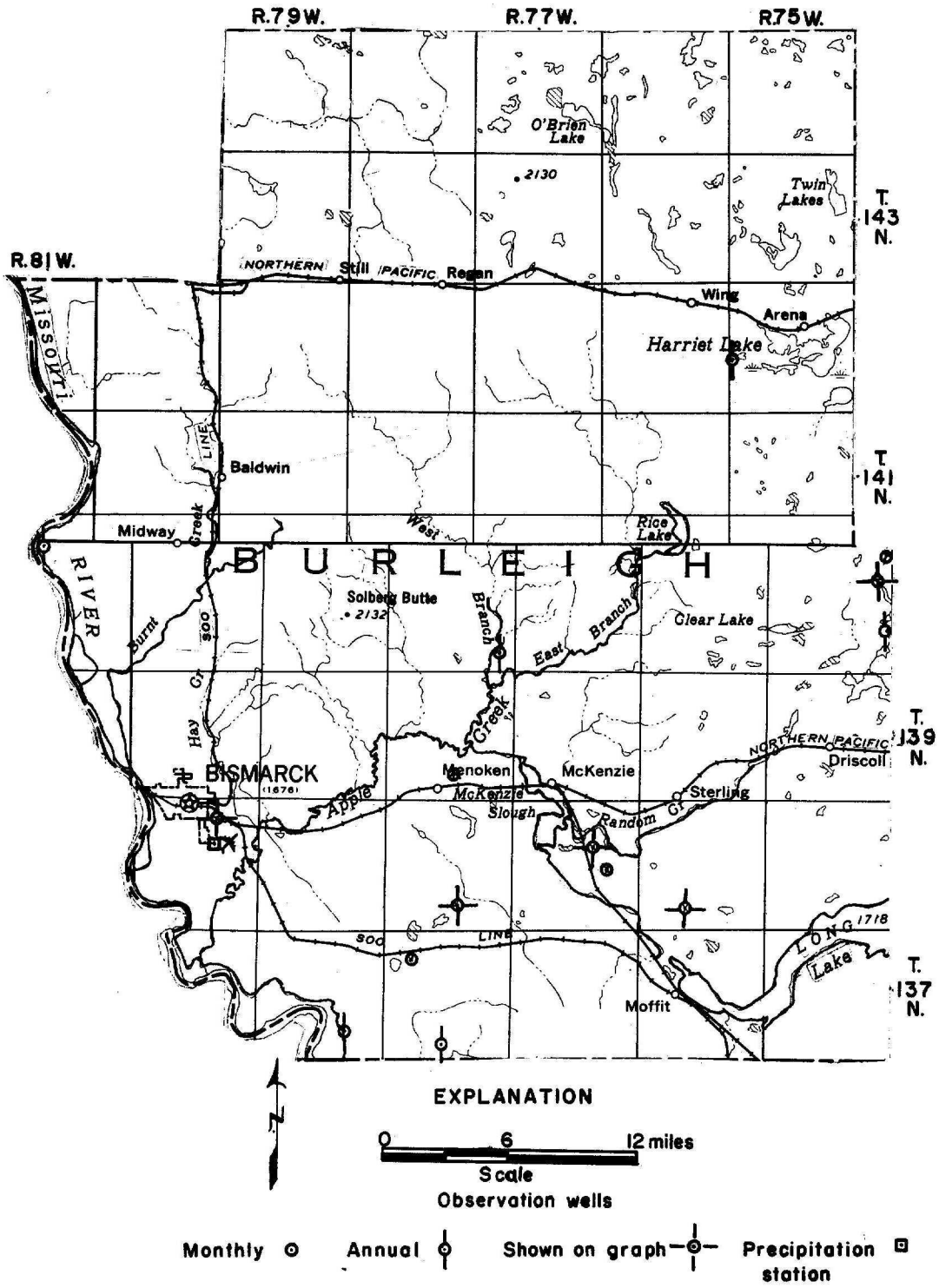


Figure 5.--Location of observation wells in Burleigh County.

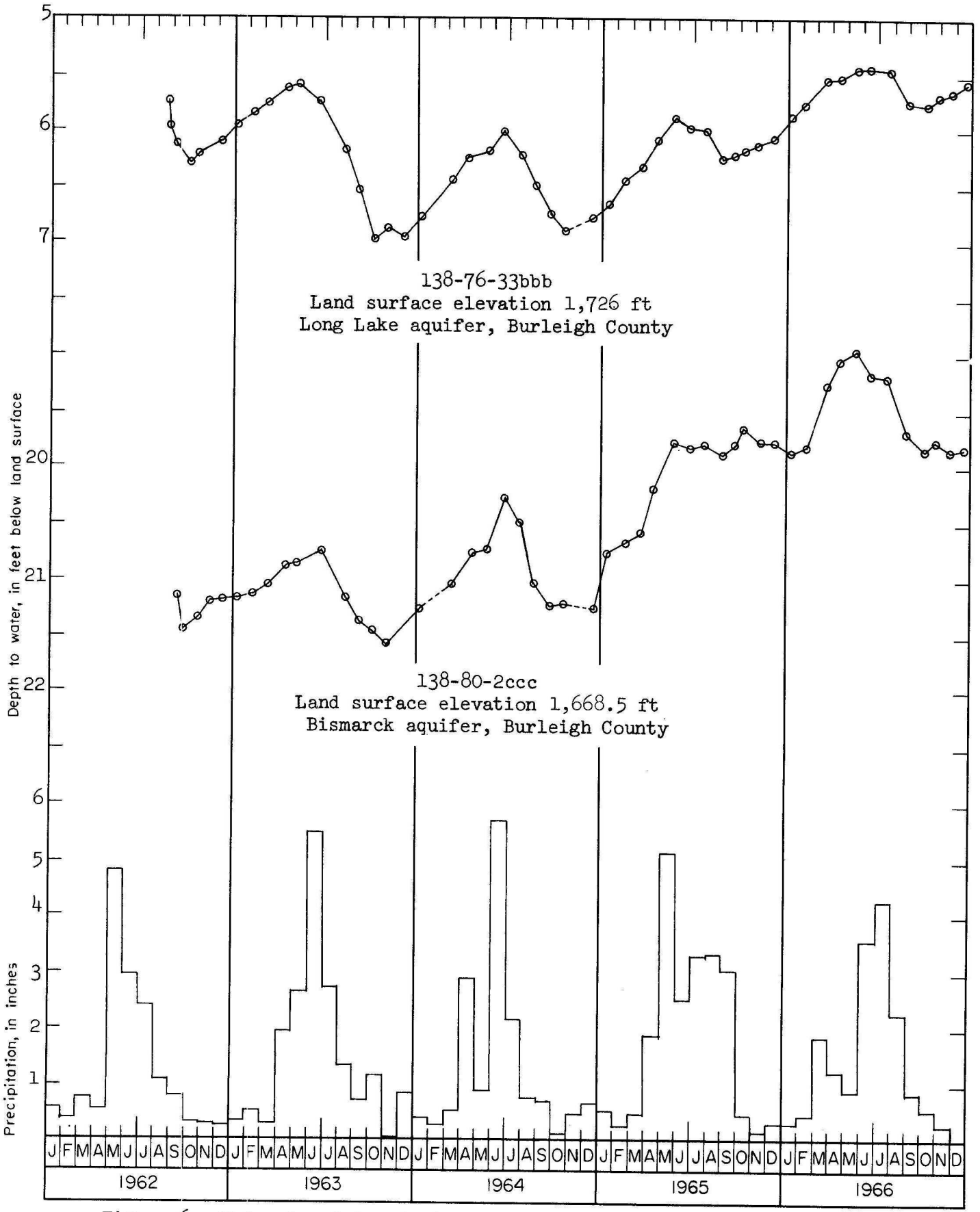


Figure 6.--Water-level trends in the Long Lake and Bismarck aquifers and precipitation at the Bismarck airport.

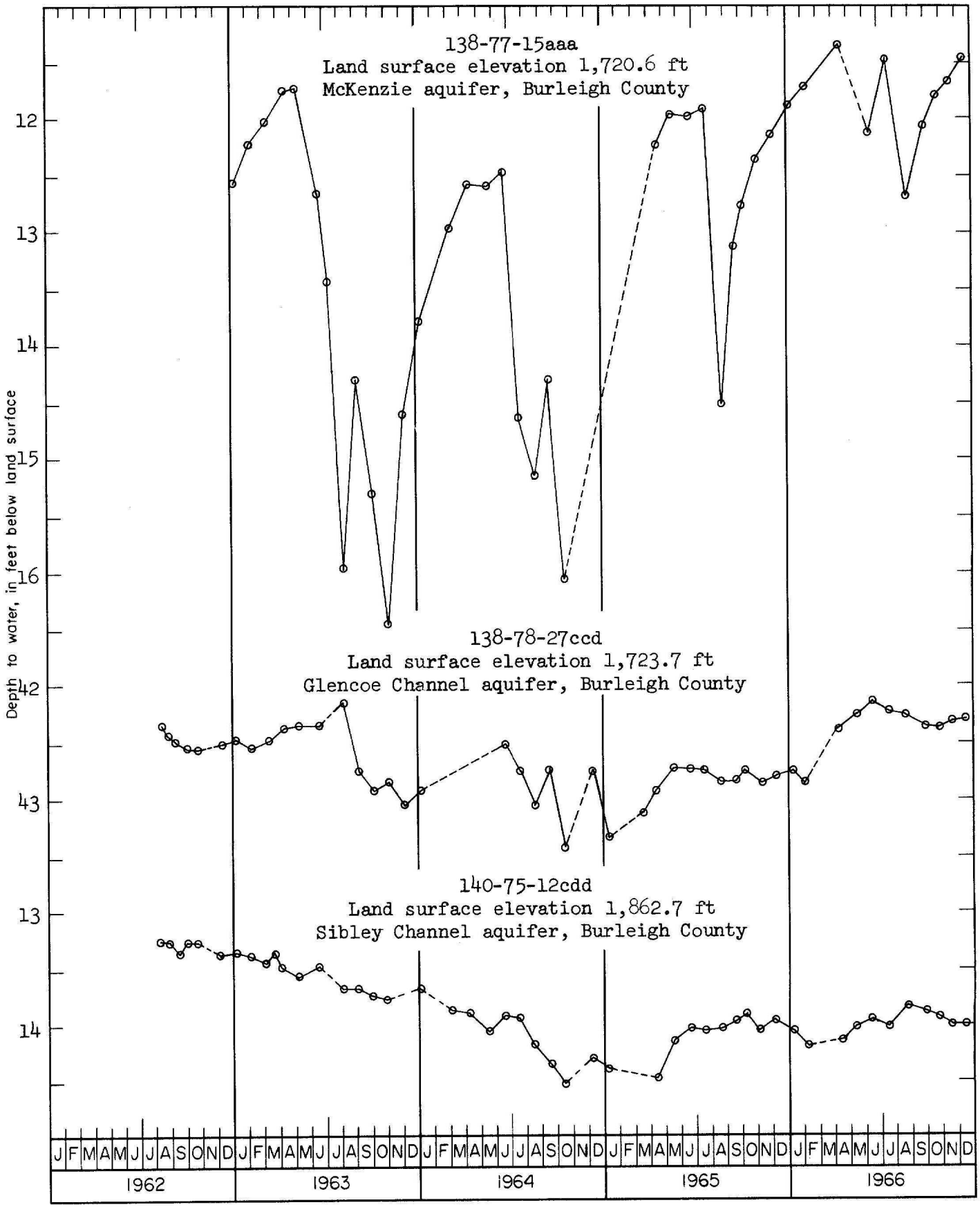


Figure 7.--Water-level trends in the McKenzie, Glencoe Channel, and Sibley Channel aquifers.

137-78-8bcb. Cooperative program. Drilled observation artesian well in the Glencoe Channel aquifer. Depth 240 ft, cased to 216 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 191-216 ft; gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,719.5 ft above msl. Highest water level 46.89 ft below lsd, June 10, 1966; lowest 47.97 ft below lsd, Dec. 3, 1963. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Feb. 4	47.28	June 10	46.89	Oct. 24	47.24
Dec. 3	47.42	Mar. 18	46.92	July 14	47.07	Nov. 15	47.17
		Apr. 12	46.93	Aug. 19	47.11	Dec. 12	47.15
1966		May 12	46.95	Sept. 30	47.22		
Jan. 4	47.34						

137-78-33aba. Cooperative program. Drilled observation artesian well in the Glencoe Channel aquifer. Depth 240 ft, cased to 185 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 172-182 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,711.1 ft above msl. Records available 1962-64 (discontinued).

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Apr. 16	66.18	July 28	66.51	Oct. 22	67.35
Jan. 2	66.58	May 25	66.33	Aug. 28	66.94	Dec. 16	67.23
Mar. 6	66.34	June 26	66.07	Sept. 25	67.81		

137-79-26cbb. Cooperative program. Drilled observation artesian well in Missouri River alluvium. Depth 105 ft, cased to 86 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 78-86 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,724.7 ft above msl. Records available 1962-66. Jan. 2, 1964, 11.90; June 28, 1966, 11.55.

138-76-33bbb. Cooperative program. Drilled observation artesian well in the Long Lake aquifer. Depth 120 ft, cased to 110 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 90-110 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,726.9 ft above msl. Highest water level 5.42 ft below lsd, June 10, 1966; lowest 6.98 ft below lsd, Oct. 2, 1963. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Dec. 15	6.78	Aug. 30	6.23	Apr. 12	5.52
Jan. 2	6.79			Sept. 24	6.21	May 12	5.44
Mar. 6	6.46	1965		Oct. 5	6.14	June 10	5.42
Apr. 16	6.27	Jan. 11	6.63	Nov. 5	6.13	July 14	5.45
May 25	6.19	Feb. 17	6.43	Dec. 3	6.04	Aug. 19	5.73
June 26	6.00	Mar. 25	6.30			Sept. 30	5.77
July 28	6.22	Apr. 26	6.09	1966		Oct. 24	5.69
Aug. 28	6.50	May 28	5.89	Jan. 4	5.88	Nov. 15	5.65
Sept. 25	6.74	June 28	5.96	Feb. 4	5.76	Dec. 12	5.57
Oct. 22	6.89	July 27	5.98	Mar. 18	5.53		

138-77-15aaa. Cooperative program. Drilled observation artesian well in the McKenzie aquifer. Depth 225 ft, cased to 210 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 190-210 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,720.6 ft above msl. Highest water level 10.32 ft below lsd, Apr. 12, 1966; lowest 16.34 ft below lsd, Sept. 2, 1962. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Oct. 22	15.05	Sept. 24	12.11	Apr. 12	10.32
Jan. 2	12.77			Oct. 5	11.74	June 10	11.11
Mar. 6	11.93	1965		Nov. 5	11.35	July 14	10.47
Apr. 16	11.56	Apr. 26	11.22	Dec. 3	11.11	Aug. 19	11.70
May 25	11.59	May 28	10.96			Sept. 30	11.04
June 26	11.45	June 28	10.98	1966		Oct. 24	10.79
July 28	13.62	July 27	10.90	Jan. 4	10.88	Nov. 15	10.65
Aug. 28	14.14	Aug. 30	13.50	Feb. 4	10.70	Dec. 12	10.47
Sept. 25	13.29						

138-77-25bab. Cooperative program. Drilled observation artesian well in the McKenzie aquifer. Depth 90 ft, cased to 83 ft with 1¼-in diam plastic pipe, sand point with 80 gage screen 83-85 ft. MP, top of protective casing 2.00 ft above lsd. Highest water level 24.82 ft below lsd, May 12, 1966; lowest 42.53 ft below lsd, Aug. 28, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Mar. 25	27.14	Dec. 3	26.08	July 14	30.47
May 25	36.04	Apr. 26	26.58			Aug. 19	28.52
June 26	29.59	May 28	26.20	1966		Sept. 30	26.39
July 28	38.92	June 28	26.04	Jan. 4	25.74	Oct. 24	26.03
Aug. 28	42.53	July 27	25.94	Feb. 4	25.45	Nov. 15	25.49
Sept. 28	33.45	Aug. 30	29.65	Mar. 18	25.04	Dec. 12	25.24
Oct. 22	36.82	Sept. 30	27.60	Apr. 12	25.01		
Dec. 15	30.17	Oct. 5	27.05	May 12	24.82		
		Nov. 5	26.45	June 10	25.48		
1965							
Jan. 11	29.03						

138-78-27ccd. Cooperative program. Drilled observation artesian well in the Glencoe Channel aquifer. Depth 230 ft, cased to 210 ft with 1¼-in diam plastic pipe, perforated 200-210 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,723.7 ft above msl. Highest water level 42.14 ft below lsd, Aug. 9, 1963; lowest 43.44 ft below lsd, Oct. 22, 1964. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Mar. 25	43.11	1966		Nov. 15	42.32
Jan. 2	42.92	Apr. 14	42.93	Jan. 4	42.74	Dec. 12	42.30
June 26	42.51	May 28	42.72	Feb. 4	42.84		
July 28	42.78	June 28	42.73	Apr. 12	42.39		
Aug. 28	43.09	July 27	42.75	May 12	42.27		
Sept. 25	42.76	Aug. 30	42.85	June 10	42.15		
Oct. 22	43.44	Sept. 24	42.83	July 14	42.22		
Dec. 16	42.76	Oct. 5	42.77	Aug. 19	42.28		
		Nov. 5	42.84	Sept. 30	42.37		
1965		Dec. 3	42.80	Oct. 24	42.39		
Jan. 11	43.33						

138-80-2ccc. Cooperative program. Drilled observation artesian well in the Bismarck aquifer. Depth 174 ft, cased to 142 ft with 1¼-in diam plastic pipe, perforated 130-142 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,668.5 ft above msl. Highest water level 18.95 ft below lsd, May 12, 1966; lowest 21.57 ft below lsd, Nov. 1, 1963. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Dec. 16	21.25	Aug. 30	19.87	Apr. 12	19.03
Jan. 2	21.24			Sept. 24	19.80	May 12	18.95
Mar. 6	21.02	1965		Oct. 5	19.63	June 10	19.15
Apr. 20	20.75	Jan. 11	20.75	Nov. 5	19.73	July 14	19.18
May 25	20.72	Feb. 17	20.66	Dec. 3	19.75	Aug. 19	19.68
June 26	20.26	Mar. 25	20.57			Sept. 30	19.83
July 28	20.49	Apr. 14	20.17	1966		Oct. 24	19.77
Aug. 28	21.01	May 28	19.74	Jan. 4	19.85	Nov. 15	19.83
Sept. 25	21.24	June 28	19.80	Feb. 4	19.80	Dec. 13	19.81
Oct. 22	21.20	July 27	19.79	Mar. 18	19.26		

139-78-27cbb. Cooperative program. Drilled observation artesian well in the McKenzie aquifer. Depth 255 ft, cased to 220 ft with 1¼-in diam plastic pipe, perforated 200-220 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,713.3 ft above msl. Highest water level 23.38 ft below lsd, June 10, 1966; lowest 24.88 ft below lsd, Oct. 22, 1964. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Dec. 16	24.62	Aug. 30	24.08	Apr. 12	23.56
Jan. 2	24.18			Sept. 24	24.11	May 12	23.44
Mar. 6	24.24	1965		Oct. 5	24.04	June 10	23.38
Apr. 16	24.68	Jan. 11	24.71	Nov. 5	24.09	July 14	23.44
May 25	24.49	Mar. 25	24.73	Dec. 3	24.08	Aug. 19	23.62
June 26	24.16	Apr. 14	24.53			Sept. 30	23.67
July 28	24.26	May 28	24.18	1966		Oct. 24	23.72
Aug. 28	24.63	June 28	24.09	Jan. 4	24.04	Nov. 15	23.68
Sept. 25	24.72	July 27	24.07	Feb. 4	24.04	Dec. 12	23.69
Oct. 22	24.88						

140-75-1aaa. Cooperative program. Drilled observation artesian well in the Sibley Channel aquifer. Depth 189 ft, cased to 179 ft with 1¼-in diam plastic pipe, perforated 169-179 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,917.2 ft above msl. Highest water level 51.18 ft below lsd, Aug. 28, 1964; lowest 53.58 ft below lsd, June 26, 1964. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Sept. 25	52.73	Apr. 26	53.16	Dec. 3	53.01
Jan. 2	51.87	Oct. 22	52.77	May 28	52.94		
Mar. 6	52.60	Dec. 15	52.65	June 28	53.03	1966	
Apr. 16	52.15			July 27	53.14	Jan. 4	53.14
May 25	51.59	1965		Aug. 30	52.86	Feb. 4	53.16
June 26	53.58	Jan. 11	52.82	Sept. 24	52.69	Oct. 24	52.88
July 28	52.93	Feb. 17	52.95	Oct. 5	52.54	Dec. 12	52.92
Aug. 28	51.18	Mar. 25	53.05	Nov. 5	52.93		

140-75-12cdd. Cooperative program. Drilled observation artesian well in the Sibley Channel aquifer. Depth 189 ft, cased to 167 ft with 1¼-in diam plastic pipe, slotted 140-167 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,862.7 ft above msl. Highest water level 13.26 ft below lsd, Aug. 17, 29, and Oct. 4, 1962; lowest 14.52 ft below lsd, Oct. 22, 1964. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Oct. 22	14.52	Aug. 30	14.01	Apr. 12	14.14
Jan. 2	13.65	Dec. 15	14.30	Sept. 24	13.94	May 12	14.02
Mar. 6	13.86			Oct. 5	13.90	June 10	13.95
Apr. 16	13.89	1965		Nov. 5	14.06	July 14	14.03
May 25	14.05	Jan. 11	14.40	Dec. 3	13.98	Aug. 19	13.82
June 26	13.90	Apr. 26	14.48			Sept. 30	13.89
July 28	13.92	May 28	14.13	1966		Oct. 24	13.92
Aug. 28	14.19	June 28	14.02	Jan. 4	14.04	Nov. 14	14.00
Sept. 25	14.33	July 27	14.06	Feb. 4	14.19	Dec. 12	14.00

140-75-24ddd. Cooperative program. Drilled observation artesian well in the Random Creek aquifer. Depth 147 ft, cased to 132 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 110-132 ft, gravel packed. MP, top of casing 2.00 ft above lsd. Lsd, 1,836.7 ft above msl. Records available 1963-66. Jan. 2, 1964, 4.77; June 22, 1966, 4.33.

140-78-36bba. Cooperative program. Drilled observation artesian well in the Upper Apple Creek aquifer. Depth 105 ft, cased to 86 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 81-86 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,742.4 ft above msl. Records available 1962-66. June 22, 1966, 11.92.

140-81-5aaa. Cooperative program. Drilled observation artesian well in the Wagonsport aquifer. Depth 105 ft, cased to 90 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 80-90 ft, gravel packed. MP, top of casing 2.00 ft above lsd. Lsd, 1,644.6 ft above msl. Records available 1962-66. Jan. 2, 1964, 6.74; June 22, 1966, 6.73.

142-75-19ccb. Cooperative program. Drilled observation artesian well in the Wing Channel aquifer. Depth 210 ft, cased to 197 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 190-197 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,890.1 ft above msl. Records available 1962-66. June 22, 1966, 6.13.

Cass County

Cass County is in southeastern North Dakota and has an area of 1,749 square miles. Water levels are being monitored in 21 observation wells shown on figure 8.

The location and extent of aquifers in Cass County are described by Klausing (1967). Water-level trends and precipitation shown in figures 9 and 10 indicate water levels generally are rising in all undeveloped aquifers, and are declining in aquifers sustaining heavy industrial and municipal pumpage. Highest water levels for the period of record generally have occurred in 1966 in all aquifers except the West Fargo aquifer. The West Fargo aquifer shows an areal water-level decline of about 1 foot for 1966, and an average annual decline of about 1.5 feet since 1962. There are 6 industrial and 3 municipal wells pumping from 400 to 1,300 gpm from the West Fargo aquifer.

Ground water appropriated in Cass County to the end of 1966 was 4,655 acre-feet. Ground-water usage in 1966 was reported to be about 2,297 acre-feet.

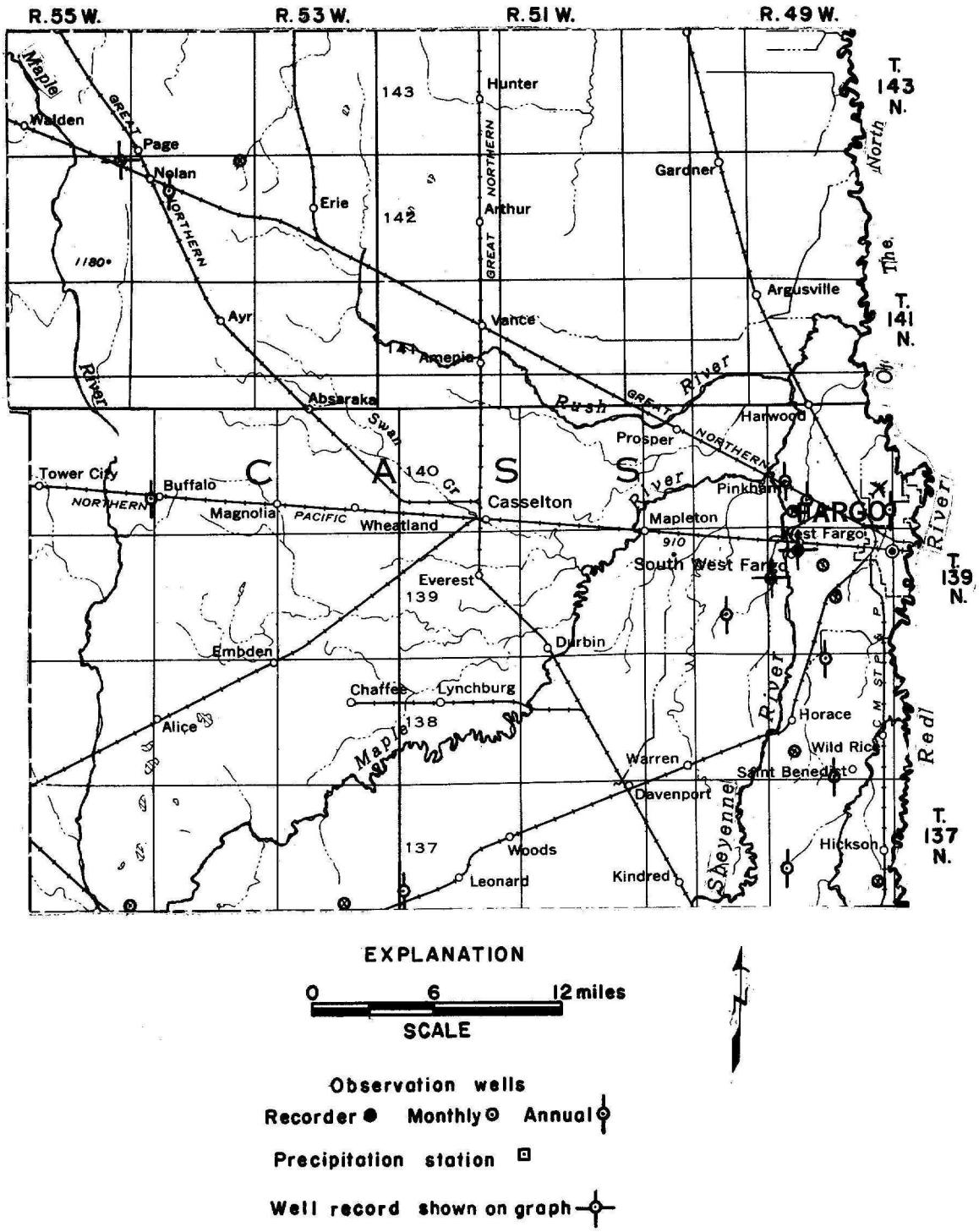


Figure 8.--Location of observation wells in Cass County.

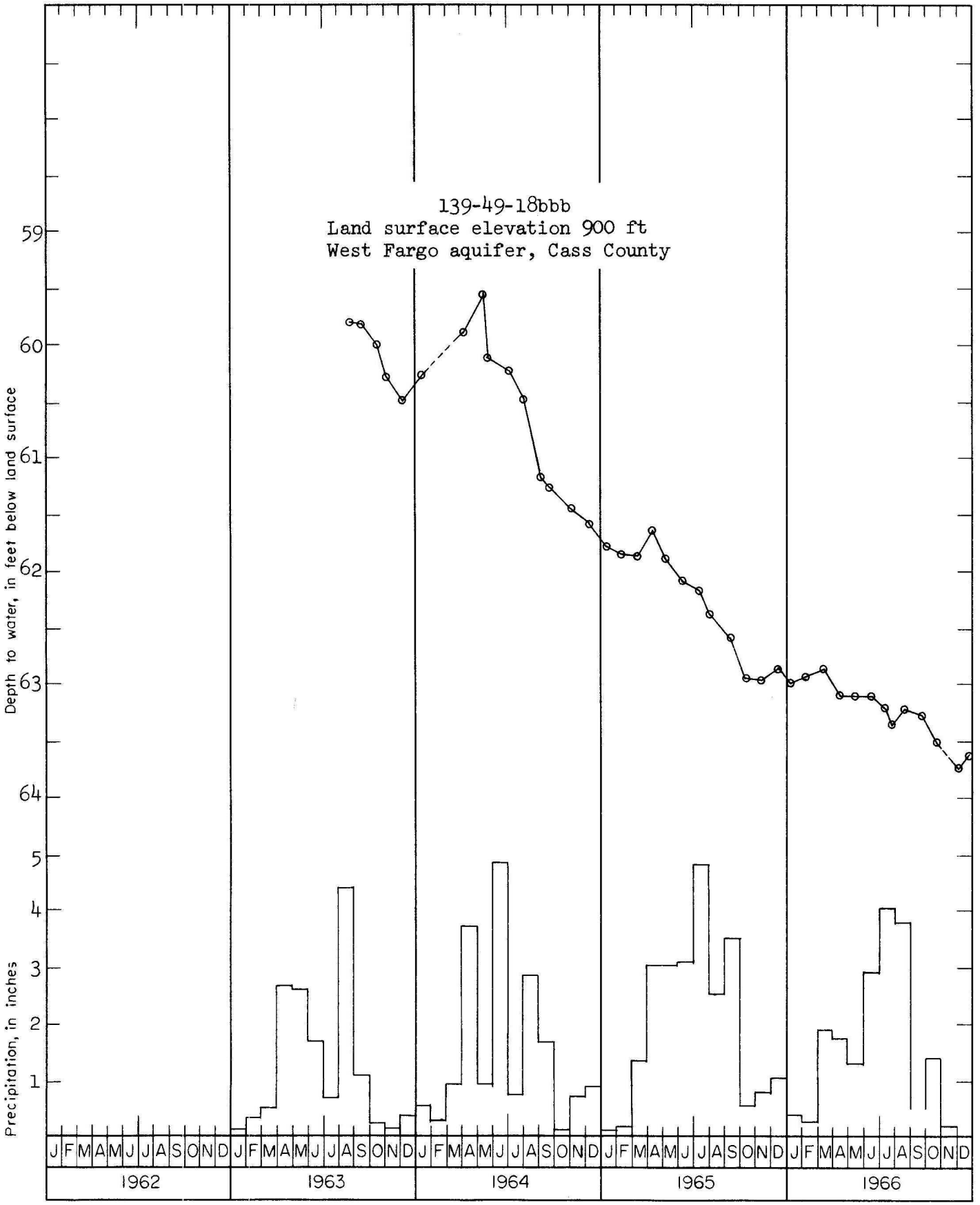
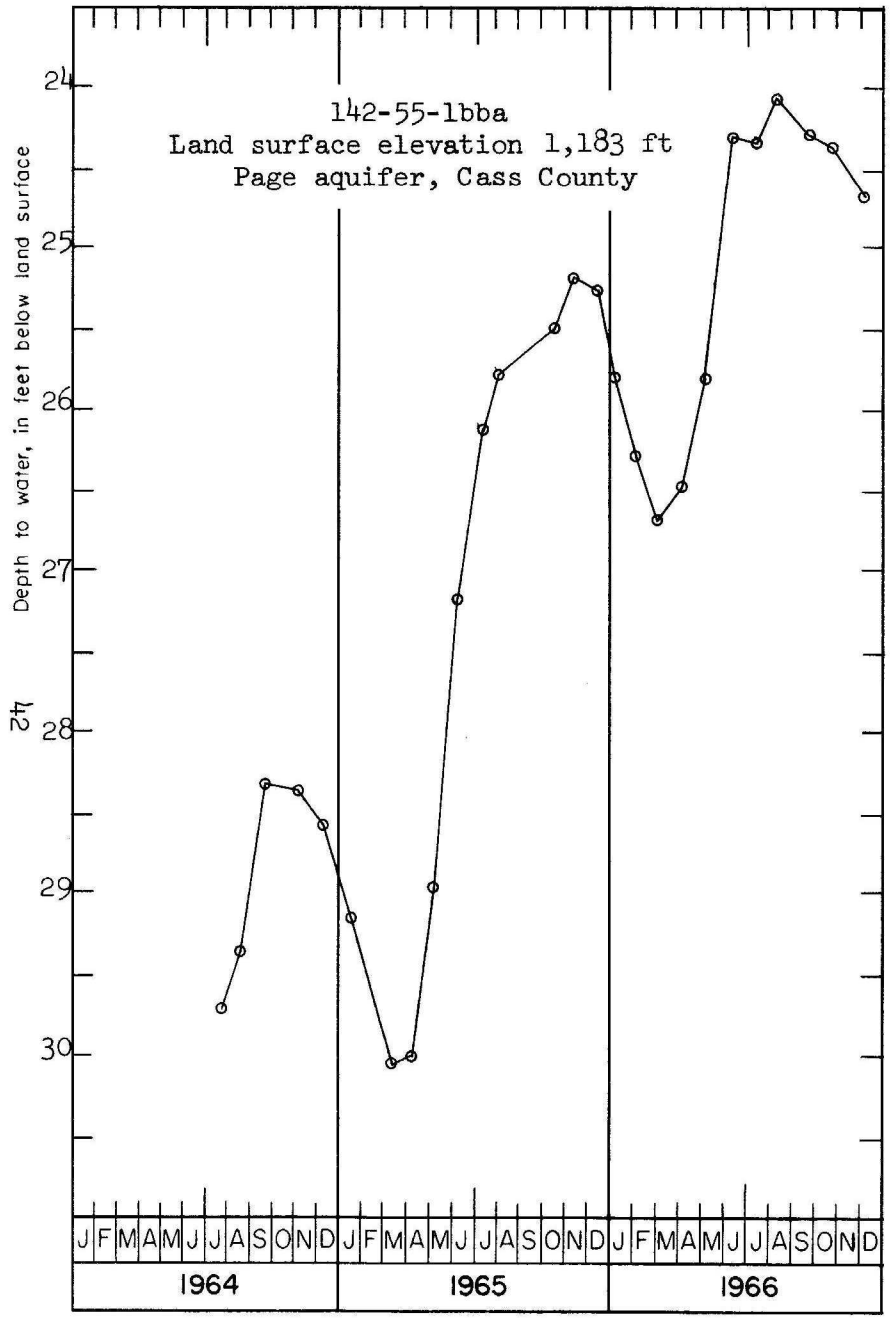
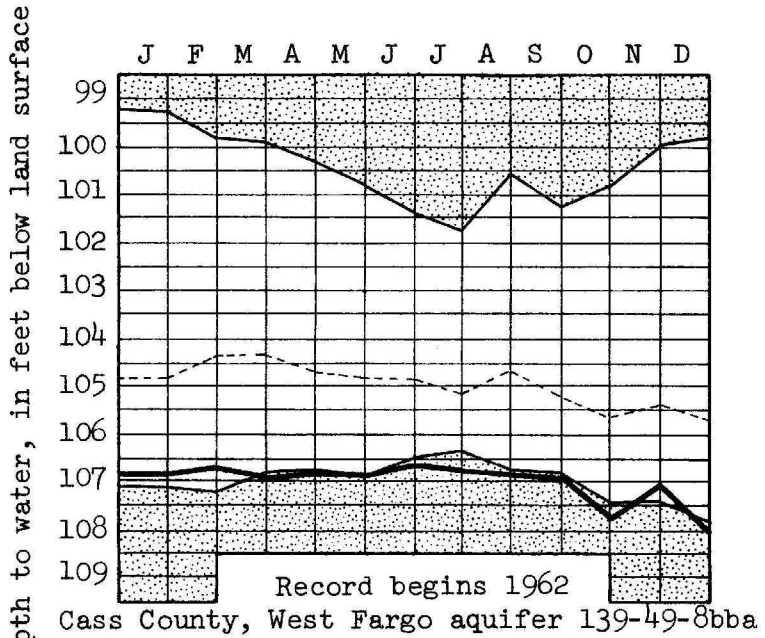


Figure 9.--Water-level trends in the West Fargo aquifer and precipitation at Fargo.





——— Solid line indicates 1966 water levels. Unshaded area shows highest and lowest levels

----- Broken line shows mean water level observed

Figure 10.--Water-level trends in the Page and West Fargo aquifers.

137-49-25ccc. Cooperative program. Drilled observation artesian well in sand and gravel from 138-247 ft. Depth 254 ft, cased to 240 ft with 1¼-in diam plastic pipe, perforated 230-240 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 919 ft above msl. Highest water level 20.85 ft below lsd, Oct. 1, 1964; lowest 25.56 ft below lsd, Sept. 3, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Sept. 14	22.28	Feb. 8	22.40	July 21	22.67
Jan. 18	22.00	Oct. 21	22.38	Mar. 14	22.28	Aug. 13	22.45
Feb. 12	21.93	Nov. 16	22.39	Apr. 14	22.55	Sept. 28	22.60
Mar. 15	21.95	Dec. 14	22.28	May 10	22.44	Oct. 25	22.67
Apr. 13	21.48			June 14	22.49	Dec. 2	22.75
May 10	22.19	1966		July 12	22.58	29	22.64
June 11	21.61	Jan. 11	22.44				

137-49-30aaa. Cooperative program. Drilled observation artesian well in sand and gravel from 83-180 ft. Depth 255 ft, cased to 180 ft with 1¼-in diam plastic pipe, perforated 160-180 ft, open end. MP, top of casing 1.2 ft above lsd. Lsd, 922 ft above msl. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		May 10	29.90	July 13	30.07	1966	
Apr. 13	29.58	June 11	29.97	Aug. 3	30.26	Aug. 3	30.97

137-52-31bbb. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 314 ft, cased to 20 ft with 1¼-in diam plastic pipe, sand point 18-20 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,056 ft above msl. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 15	6.55	June 11	2.41	1966	
Jan. 19	6.81	Apr. 13	4.14	July 13	2.58	July 21	4.88
Feb. 12	7.01	May 10	2.20	Aug. 3	5.01		

137-53-34ccc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 136 ft, cased to 40 ft with $1\frac{1}{4}$-in diam steel pipe, sand point 38-40 ft. MP, top of protective casing 2.1 ft above lsd. Lsd, 1,058 ft above msl. Highest water level 1.06 ft above lsd, Oct. 31, and Nov. 16, 1963; lowest 4.24 ft below lsd, Mar. 15, 1965. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Sept. 14	2.36	Feb. 7	3.99	Oct. 25	2.28
Jan. 19	3.91	Oct. 21	1.11	May 7	+0.48	Nov. 30	2.89
Feb. 12	4.22	Nov. 16	1.66	June 13	0.02	Dec. 27	3.83
Mar. 15	4.24	Dec. 13	1.46	July 12	1.09		
May 10	0.49			21	2.25		
June 11	+0.15	1966		Aug. 14	0.45		
July 13	0.00	Jan. 10	2.72	Sept. 27	3.16		
Aug. 3	1.80						

137-55-35ddd. Cooperative program. Drilled observation artesian well in sand. Depth 299 ft, cased to 125 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 105-125 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,114 ft above msl. Highest water level 46.12 ft below lsd, Sept. 27, 1966; lowest 48.04 ft below lsd, Nov. 2, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Oct. 21	47.43	Mar. 15	47.54	Sept. 27	46.12
Jan. 19	47.83	Nov. 15	47.35	Apr. 14	47.10	Oct. 25	46.84
Feb. 12	47.88	Dec. 13	47.47	May 9	46.93	Nov. 30	47.14
Mar. 15	47.94			June 13	46.87	Dec. 27	47.27
Apr. 13	47.85	1966		July 12	46.90		
May 11	47.44	Jan. 10	47.50	21	46.93		
June 11	47.36	Feb. 7	47.55	Aug. 14	46.64		

138-49-4aaa. Cooperative program. Drilled observation artesian well in the West Fargo aquifer. Depth 350 ft, cased to 150 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point 148-150 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 904 ft above msl. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Apr. 13	38.52	July 13	39.16	1966	
Jan. 18	38.66	May 10	38.91	Aug. 13	39.27	July 22	39.99
Mar. 15	38.74	June 11	38.94				

138-49-29ccc. Cooperative program. Drilled observation artesian well in the West Fargo aquifer. Depth 314 ft, cased to 280 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point 278-280 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 912 ft above msl. Highest water level 32.17 ft below lsd, Aug. 1, 1964; lowest 35.36 ft below lsd, Dec. 2, 1966. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Aug. 3	34.45	Feb. 8	34.11	Sept. 28	35.23
Jan. 18	34.08	Sept. 14	34.50	Mar. 14	34.34	Oct. 25	35.28
Feb. 12	34.14	Oct. 21	34.57	Apr. 14	34.65	Dec. 2	35.36
Mar. 15	34.22	Nov. 16	34.61	May 10	34.69	29	35.24
Apr. 13	33.98	Dec. 14	34.47	June 14	34.88		
May 10	34.13			July 13	35.07		
June 11	34.14	1966		21	35.17		
July 13	34.31	Jan. 11	34.53	Aug. 17	35.09		

138-49-34ccc. Cooperative program. Drilled observation artesian well in sand and gravel. Depth 344 ft, cased to 100 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 90-100 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 910 ft above msl. Records available 1964-66. May 10, 1965, 23.40; June 11, 1965, 23.50; July 21, 1966, 24.47.

139-49-8bbal. South West Fargo. Drilled artesian well in the West Fargo aquifer. Depth 131.7 ft, cased to 131.7 ft, 8 in diam. MP, top edge of casing 1.12 ft above lsd. Lsd, 898 ft above msl. Highest water level 99.35 ft below lsd, Jan. 8, 1963; lowest 108.00 ft below lsd, Dec. 22, 1966. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Dec. 25	106.62	Apr. 27	105.98	Sept. 15	106.74
Jan. 16	104.94	31	106.19	30	106.70	20	106.73
Feb. 23	105.12			May 3	106.79	25	106.81
Mar. 30	105.17	1966		5	106.44	30	106.21
Apr. 23	105.50	Jan. 5	106.60	10	106.51	Oct. 5	107.03
May 22	105.81	10	106.64	15	105.66	10	106.80
June 17	105.73	11	106.15	20	106.10	15	107.12
July 28	105.86	15	106.90	25	106.25	20	106.73
Sept. 4	105.56	16	107.01	31	106.55	21	105.99
10	106.30	20	106.84	June 5	106.12	25	107.68
15	106.07	25	106.70	10	106.38	29	107.48
20	106.25	31	106.50	11	105.68	31	107.23
25	106.54	Feb. 5	106.60	15	106.25	Nov. 5	107.08
26	106.69	9	105.49	20	106.23	10	107.04
30	106.08	10	106.20	25	106.28	14	107.51
Oct. 5	106.27	15	106.60	26	106.52	15	107.09
7	105.48	20	107.11	30	106.15	20	107.27
10	106.41	25	106.41	July 5	106.13	25	107.00
15	106.12	29	106.02	8	105.91	26	106.48
20	106.70	Mar. 3	106.76	10	106.25	30	107.48
25	106.59	5	106.55	15	106.60	Dec. 5	106.97
27	106.72	10	106.48	20	106.64	6	106.01
31	106.58	15	105.34	25	106.48	10	107.61
Nov. 2	105.98	20	105.36	31	106.37	15	107.56
16	106.33	25	105.58	Aug. 2	106.71	20	107.56
20	106.10	30	104.68	17	106.20	22	108.00
25	106.31	31	104.98	20	106.65	25	107.51
30	106.39	Apr. 5	105.34	24	106.74	28	107.09
Dec. 5	106.61	10	105.44	25	106.41		
10	106.45	15	106.62	31	106.37		
15	106.25	20	106.37	Sept. 5	106.58		
20	105.95	25	106.52	10	106.58		

139-49-9ddd3. Cooperative program. Drilled observation artesian well in the West Fargo aquifer. Depth 256 ft, cased to 180 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 170-180 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 905 ft above msl. Highest water level 42.82 ft below lsd, Sept. 30, 1964; lowest 44.66 ft below lsd, July 22, 1966. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Aug. 3	43.77	Feb. 8	43.57	Sept. 28	44.44
Jan. 18	43.12	Sept. 14	43.74	Mar. 14	43.72	Oct. 26	44.45
Feb. 15	43.17	Oct. 21	43.74	Apr. 14	43.82	Dec. 2	44.47
Mar. 15	43.16	Nov. 16	43.79	May 10	43.89	29	44.26
Apr. 14	42.90	Dec. 14	43.58	June 14	44.00		
May 10	43.24			July 13	44.43		
June 11	43.29	1966		22	44.66		
July 13	43.52	Jan. 11	43.71	Aug. 17	44.41		

139-49-18bbb. Cooperative program. Drilled observation artesian well in the West Fargo aquifer. Depth 231 ft, cased to 210 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 180-205 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 900 ft above msl. Highest water level 59.51 ft below lsd, May 6, 1964; lowest 63.76 ft below lsd, Dec. 2, 1966. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Aug. 3	62.36	Feb. 8	62.93	Sept. 28	63.29
Jan. 18	61.79	Sept. 14	62.59	Mar. 14	62.86	Oct. 26	63.51
Feb. 15	61.83	Oct. 21	62.92	Apr. 14	63.11	Dec. 2	63.76
Mar. 15	61.84	Nov. 16	62.94	May 10	63.11	19	63.67
Apr. 14	61.62	Dec. 14	62.85	June 14	63.11		
May 10	61.87			July 13	63.21		
June 11	62.08	1966		22	63.37		
July 13	62.13	Jan. 11	63.00	Aug. 17	63.22		

139-49-22bbb. Cooperative program. Drilled observation artesian well in the West Fargo aquifer. Depth 464 ft, cased to 236 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 207-226 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 911 ft above msl. Highest water level 47.81 ft below lsd, Sept. 24, 1963; lowest 50.06 ft below lsd, July 22, 1966. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Sept. 14	49.32	Feb. 8	48.52	Sept. 28	49.98
Jan. 18	48.55	Oct. 21	49.32	Apr. 14	49.35	Oct. 25	50.00
Apr. 14	48.56	Nov. 16	49.35	May 10	49.44	Dec. 2	49.97
May 10	48.75	Dec. 14	49.18	June 14	49.55	29	49.83
June 11	48.43			July 13	49.88		
July 13	49.08	1966		22	50.05		
Aug. 3	49.27	Jan. 11	49.24	Aug. 17	49.93		

139-50-23aaa. Cooperative program. Drilled observation artesian well in sand. Depth 216 ft, cased to 150 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point 148-150 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 900 ft above msl. Records available 1964-66. May 10, 1965, 27.15; June 11, 1965, 27.22; Aug. 3, 1966, 27.94.

140-49-19ddd. Cooperative program. Drilled observation artesian well in the West Fargo aquifer. Depth 227 ft, cased to 100 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point 98-100 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 897 ft above msl. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 15	91.67	June 11	92.33	1966	
Jan. 18	91.11	Apr. 14	91.70	July 13	92.18	Aug. 3	93.60
Feb. 12	91.60	May 10	91.78	Aug. 3	92.34		

140-49-29ddd. Cooperative program. Drilled observation artesian well in the West Fargo aquifer. Depth 212 ft, cased to 211 ft with $1\frac{1}{4}$-in diam steel pipe, slotted 104-167.5 ft. MP, top of casing 2.02 ft above lsd. Lsd, 894 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		May 10	92.50	July 13	92.90	1966	
Apr. 14	92.13	June 11	92.83	Aug. 3	92.83	July 22	94.03

140-49-32bbb. Cooperative program. Drilled observation artesian well in the West Fargo aquifer. Depth 232 ft, cased to 232 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 178-228 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 894 ft above msl. Highest water level 97.41 ft below lsd, Aug. 19, 1963; lowest 103.70 ft below lsd, Dec. 3, 1966. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		July 13	100.99	1966		July 22	102.36
Jan. 18	100.44	Aug. 3	101.09	Jan. 11	102.55	Aug. 17	102.12
Feb. 12	100.20	Sept. 14	101.34	Feb. 8	102.03	Sept. 28	101.85
Mar. 15	100.32	Oct. 21	102.31	Apr. 14	102.57	Oct. 26	102.84
Apr. 14	100.34	Nov. 16	102.30	May 10	102.22	Dec. 3	103.70
May 10	100.73	Dec. 14	102.15	June 14	102.26	28	102.92
June 11	101.12						

140-49-36aaa. Cooperative program. Drilled observation artesian well in sand and gravel from 157.5 to 228 ft. Depth 289 ft, cased to 228 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 188-228 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 896 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 15	17.13	June 11	50.31	1966	
Jan. 18	17.28	May 10	35.16	Aug. 3	51.19	Aug. 3	49.18
Feb. 12	17.01						

140-55-25aaa. Cooperative program. Drilled observation artesian well in sand from 197-229 ft. Depth 390 ft, cased to 220 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 200-220 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,194 ft above msl. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 15	29.98	May 11	48.11	1966	
Jan. 19	27.28	Apr. 13	28.54	June 11	29.85	July 22	29.19
Feb. 12	27.24						

142-54-1bbb. Cooperative program. Drilled observation artesian well in the Page aquifer. Depth 464 ft, cased to 160 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 140-160 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,180 ft above msl. Highest water level 0.04 ft above lsd, May 10, 1966; lowest 7.48 ft below lsd, July 30, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Nov. 17	1.64	Mar. 14	2.20	Aug. 13	0.74
Feb. 12	3.32	Dec. 14	1.75	Apr. 13	2.30	Sept. 28	1.02
Mar. 15	3.21			May 10	+0.04	Oct. 26	1.28
June 10	0.42	1966		June 14	0.14	Dec. 3	1.68
July 13	0.92	Jan. 11	2.22	July 13	1.00		
Aug. 3	1.48	Feb. 8	Frozen	22	1.29		

142-54-8ddd. Cooperative program. Drilled observation artesian well in the Page aquifer. Depth 256 ft, cased to 100 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 90-100 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,189 ft above msl. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 15	24.10	June 11	21.46	1966	
Jan. 19	23.65	Apr. 13	23.05	July 13	21.46	July 22	20.87
Feb. 12	23.91	May 12	22.17	Aug. 3	21.28		

142-55-1bba. Cooperative program. Drilled observation artesian well in the Page aquifer. Depth 135 ft, cased to 96 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 81-96 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,183 ft above msl. Highest water level 24.11 ft below lsd, Aug. 13, 1966; lowest 30.02 ft below lsd, Mar. 15, 1965. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Aug. 3	25.79	Feb. 8	26.55	July 22	24.90
Jan. 19	29.16	Oct. 21	25.49	Mar. 14	27.34	Aug. 13	24.11
Mar. 15	30.02	Nov. 17	25.17	Apr. 13	26.89	Sept. 28	24.50
Apr. 13	30.00	Dec. 14	25.23	May 10	25.58	Oct. 26	24.84
May 12	28.96			June 14	24.58	Dec. 3	25.30
June 11	27.18	1966		July 13	24.64	28	25.82
July 13	26.10	Jan. 11	25.79				

Divide County

Divide County is in the northwestern corner of North Dakota and has an area of about 1,300 square miles. Water-levels are being monitored in 11 observation wells shown on figure 11.

The location and extent of aquifers in Divide County are described by Armstrong (1967).

Water-level trends and precipitation shown in figure 12 indicate that artesian water levels are gradually rising for the period of record (1964-66). The West Wildrose aquifer graph shows irrigation effects of one well pumping 400-700 gpm about 0.5 mile from the observation well. No other large-yield wells are known to exist in these aquifers.

Ground water appropriated in Divide County to the end of 1966 was 1,253 acre-feet. Ground-water usage during 1966 was reported to be about 313 acre-feet.

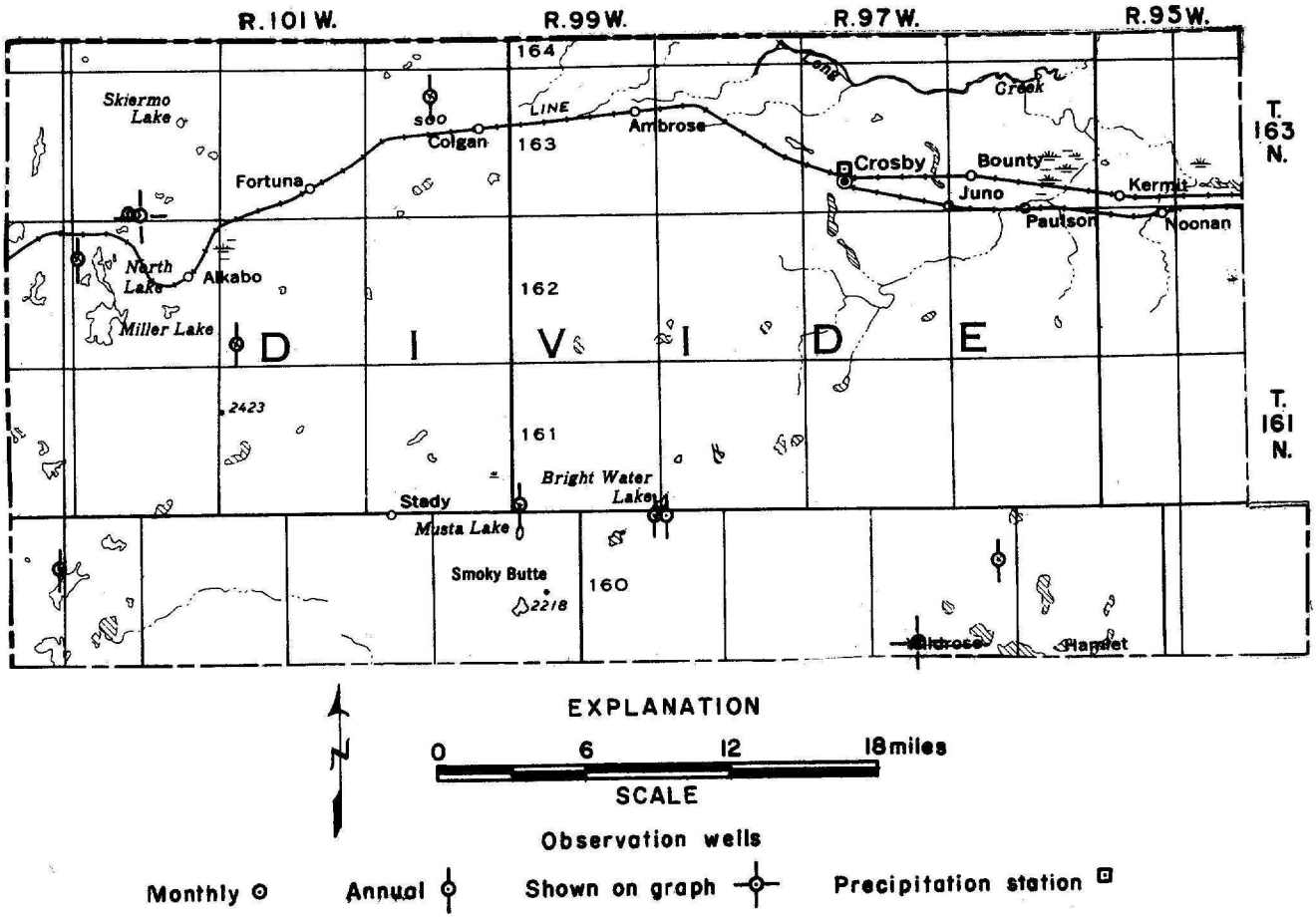


Figure 11.--Location of observation wells in Divide County.

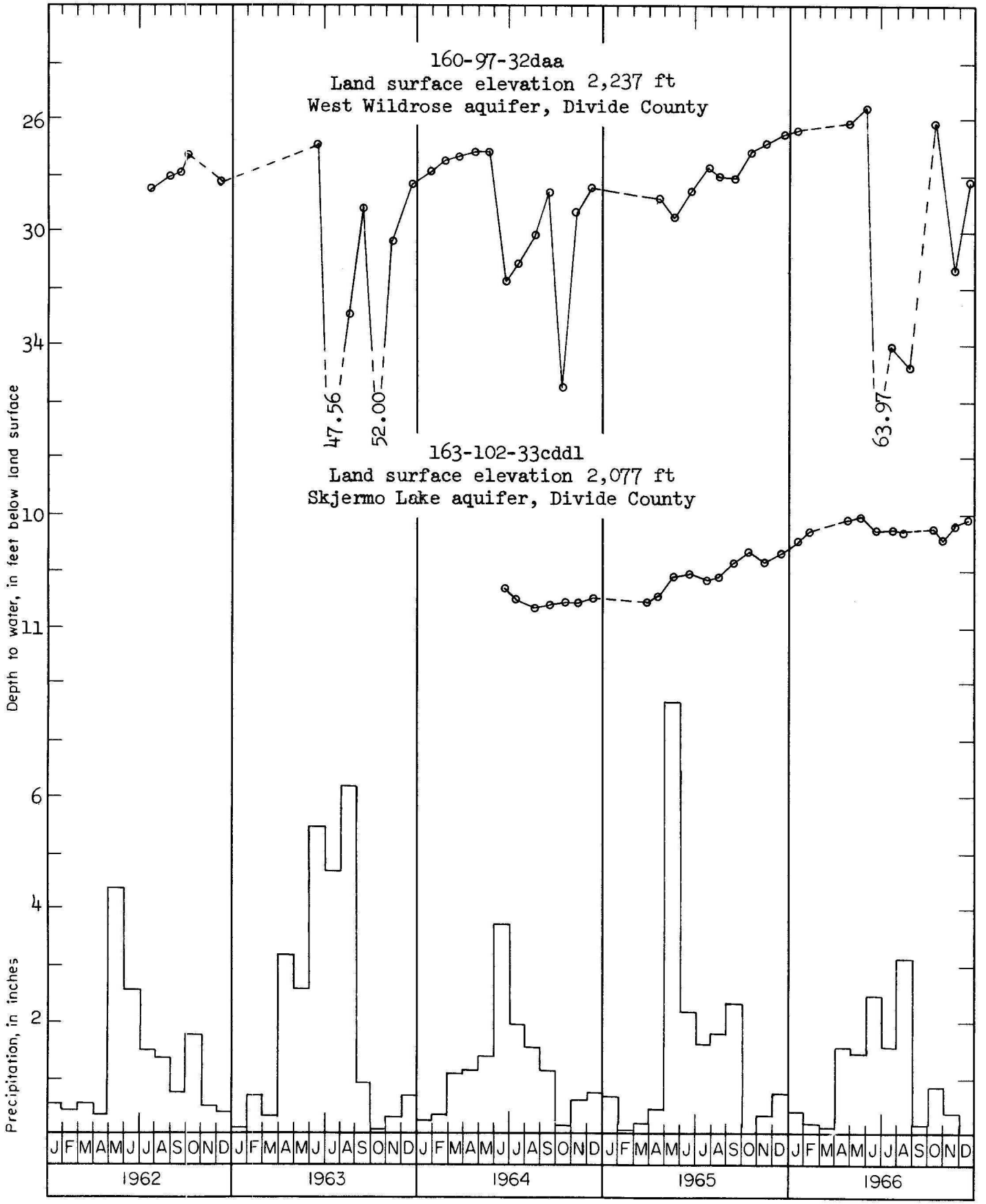


Figure 12.--Water-level trends in the West Wildrose and Skjermo Lake aquifers and precipitation at Crosby.

160-97-13bbb. Cooperative program. Drilled observation artesian well in sand and gravel from 58-78 ft. Depth 160 ft, cased to 80 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 55-80 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,257 ft above msl. Records available 1963-66. Oct. 7, 1965, 32.80; Aug. 4, 1966, 33.02; Aug. 11, 1966, 33.28.

160-97-32daa. Cooperative program. Drilled observation artesian well in the West Wildrose aquifer. Sand and gravel deposits from 99-126 ft. Depth 132 ft, cased to 123 ft with $1\frac{1}{4}$-in diam steel pipe, screened 123-126 ft. MP, top of casing 2.00 ft above lsd. Lsd, 2,237 ft above msl. Affected by nearby well pumping. Highest water level 25.63 ft below lsd, May 18, 1966; lowest 63.97 ft below lsd, June 20, 1966. Records available 1962-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Oct. 7	27.24	May 18	25.63	Nov. 15	31.36
Apr. 13	28.93	Nov. 8	26.98	June 20	63.97	Dec. 13	28.37
May 13	29.60	Dec. 9	26.67	July 16	34.07		
June 15	28.73			Aug. 4	46.86		
July 20	27.78	1966		11	34.93		
Aug. 11	28.14	Jan. 5	26.56	Oct. 5	27.32		
Sept. 11	28.28	Apr. 22	26.23	18	40.65		

160-99-3bbb1. Cooperative program. Drilled observation artesian well in sand from 97-152 ft. Depth 590 ft, cased to 115 ft with $1\frac{1}{4}$-in diam flexible plastic pipe, $1\frac{1}{4}$-in galv pipe slotted 115-125 ft. MP, 2.00 ft above lsd. Lsd, 2,047 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 17	13.06	June 20	10.07	1966	
Jan. 21	12.82	Apr. 22	13.01	July 6	10.70	Aug. 12	11.18
Feb. 18	12.95	May 18	9.43	Aug. 4	11.13		

160-99-3bbb2. Cooperative program. Drilled observation artesian well in sand and gravel from 270-397 ft. Depth 590 ft, cased to 330 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 310-330 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,047 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 17	8.66	June 20	8.50	1966	
Jan. 21	8.59	Apr. 22	8.68	July 16	8.59	Aug. 12	8.56
Feb. 18	8.63	May 18	8.31	Aug. 4	8.63		

160-103-16bbb. Cooperative program. Drilled observation artesian well in sand and gravel from 60-102 ft. Depth 270 ft, cased to 102 ft with 1¼-in diam plastic pipe, perforated 92-102 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,052 ft above msl. Records available 1963-66. Oct. 6, 1965, 42.40; Aug. 4, 1966, 42.63; Aug. 11, 1966, 42.67.

161-99-31ccc. Cooperative program. Drilled observation artesian well in sand and gravel from 75-120 ft. Depth 280 ft, cased to 120 ft with 1¼-in diam plastic pipe, perforated 100-120 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,195 ft above msl. Records available 1963-66. Oct. 6, 1965, 56.18; Aug. 4, 1966, 56.00.

162-101-31aaa. Cooperative program. Drilled observation artesian well in gravel from 93-125 ft. Depth 445 ft, cased to 115 ft with 1¼-in-diam plastic pipe, perforated 100-115 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,158 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		May 13	21.33	Aug. 11	19.06	1966	
Jan. 21	22.59	June 15	19.69	Sept. 11	18.84	May 18	18.48
Apr. 13	22.75	July 20	19.19	Oct. 6	18.67	Aug. 4	18.57

162-102-7ccc. Cooperative program. Drilled observation artesian well in sand and gravel from 78-114 ft. Depth 189 ft, cased to 115 ft with 1¼-in diam plastic pipe, slotted 105-115 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,116 ft above msl. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Aug. 11	53.77	1966		Aug. 4	53.23
Apr. 13	54.51	Sept. 11	53.62	Apr. 22	53.23	11	53.25
May 13	54.40	Oct. 6	53.54	May 18	53.17		
June 15	54.42	Nov. 8	53.52	June 21	53.24		
July 20	53.95	Dec. 7	53.39	July 16	53.23		

163-100-9aaa. Cooperative program. Drilled observation artesian well in sand from 110-145 ft. Depth 475 ft, cased to 140 ft with 1¼-in diam plastic pipe, sand point 140-143 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,164 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Aug. 11	42.16	1966		Aug. 4	41.84
June 15	41.79	Sept. 11	42.09	May 18	41.72	11	41.84
July 20	42.05	Oct. 6	41.98				

163-102-33cddl. Cooperative program. Drilled observation artesian well in the Skjermo Lake aquifer. Gravel from 165-196 ft. Depth 220 ft, cased to 190 ft with 1¼-in diam plastic pipe, screened 190-193 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,077 ft above msl. Highest water level 10.05 ft below lsd, May 18, 1966; lowest 10.82 ft below lsd, Aug. 17, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Sept. 11	10.47	Feb. 2	10.19	Oct. 5	10.15
Mar. 18	10.79	Oct. 6	10.36	Apr. 22	10.09	18	10.23
Apr. 13	10.73	Nov. 8	10.43	May 18	10.05	Nov. 15	10.11
May 13	10.58	Dec. 7	10.33	June 21	10.16	Dec. 13	10.09
June 15	10.55			July 16	10.15		
July 20	10.60	1966		Aug. 4	10.18		
Aug. 11	10.58	Jan. 5	10.26	12	10.17		

163-102-33cdd2. Cooperative program. Drilled observation artesian well in the Skjermo Lake aquifer. Sand and gravel from 42-73 ft. Depth 84 ft, cased to 73 ft with 1¼-in diam plastic pipe and to 36 ft with 4 in plastic. The 1¼-in diam plastic is slotted from 63-73 ft. MP, top of 4 in plastic 1.4 ft above lsd. Lsd, 2,078 ft above msl. Highest water level 11.55 ft below lsd, Nov. 15, 1966; lowest 12.46 ft below lsd, June 12, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		June 15	12.10	1966		Aug. 4	11.60
Jan. 1	12.33	July 20	12.06	Jan. 2	11.85	12	11.58
Feb. 18	12.33	Aug. 11	12.00	Apr. 4	11.65	Oct. 5	11.55
Mar. 17	12.34	Sept. 11	11.95	May 18	11.67	18	11.65
Apr. 13	12.36	Oct. 6	11.90	June 21	11.64	Nov. 15	11.55
May 13	12.31	Nov. 8	11.87	July 16	11.62	Dec. 13	11.63

Eddy County

Eddy County is in east-central North Dakota and has an area of 642 square miles. Water levels are being monitored in 10 observation wells shown on figure 13.

The location and extent of aquifers in Eddy County are described by Trapp (1967), and Froelich (1960).

Water-level trends and precipitation shown in figure 14 indicate that the highest levels occurred in 1965 and 1966. Responses to precipitation in the water-table well (150-66-8aaa) are more gradual than those in the artesian well (149-67-17ccb). The village of Sheyenne draws a small amount of water from the Sheyenne Village aquifer. The city of New Rockford pumps from the New Rockford aquifer about 1 mile southeast of observation well 149-67-17ccb.

Ground water appropriated in Eddy County to the end of 1966 was 1,082 acre-feet. Ground-water usage in 1966 was reported to be about 238 acre-feet.

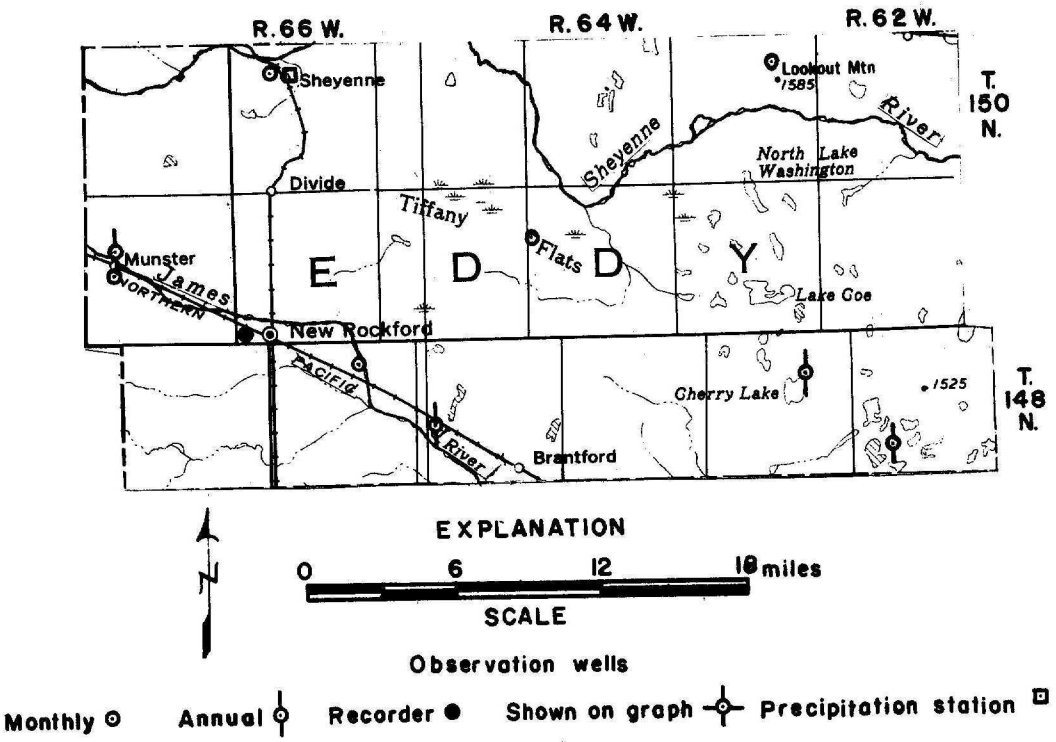


Figure 13.--Location of observation wells in Eddy County.

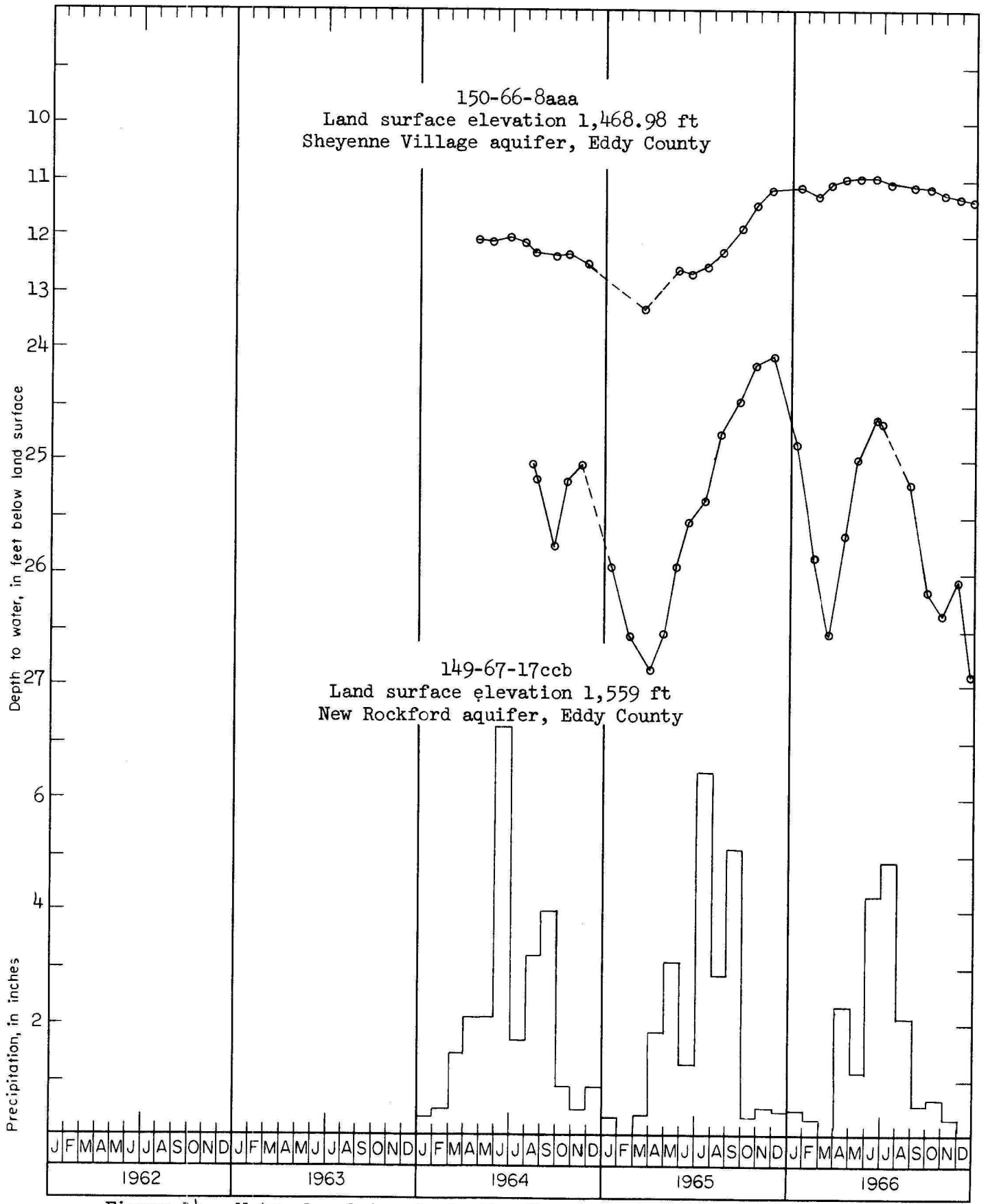


Figure 14.--Water-level trends in the Sheyenne Village and New Rockford aquifers and precipitation at Sheyenne.

148-62-29daa. Cooperative program. Drilled observation artesian well in sand and gravel from 85-105 ft. Depth 126 ft, cased to 100 ft with $1\frac{1}{4}$-in diam plastic pipe. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,540 ft above msl. Records available 1964-66. June 28, 1966, 23.55.

148-63-11ccb. Cooperative program. Drilled observation artesian well in sand and gravel. Depth 84 ft, cased to 40 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 30-40 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,511 ft above msl. Records available 1964-66. June 28, 1966, 1.04.

148-65-19daa. Cooperative program. Drilled observation artesian well in the New Rockford aquifer. Sand and gravel deposits from 89-222 ft. Depth 242 ft, cased to 220 ft with $1\frac{1}{4}$-in diam plastic pipe. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,526 ft above msl. Records available 1964-66. June 28, 1966, 43.51.

148-66-3ddc. Cooperative program. Drilled observation artesian well in the New Rockford aquifer. Depth 252 ft, cased to 220 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 210-218 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,493 ft above msl. Highest water level 10.32 ft below lsd, May 11, 1966; lowest 12.38 ft below lsd, Aug. 12, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		May 11	10.33	Aug. 23	10.94	Nov. 22	11.19
Mar. 14	11.23	June 15	10.43	Sept. 29	11.05	Dec. 20	11.15
Apr. 12	10.35	July 28	10.47	Oct. 26	11.13		

149-64-18bbb. Cooperative program. Drilled observation water-table well in sand and gravel. Depth 13.35 ft, cased to 12.0 ft with 2-in diam steel pipe, sand point 12-14 ft. MP, top of casing 2.43 ft above lsd. Lsd, 1,524.0 ft above msl. Highest water level 6.20 ft below lsd, June 14, 1951; lowest 9.59 ft below lsd, May 21, 1964. Records available 1951-54, 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		May 11	7.49	Aug. 23	7.37	Nov. 22	7.98
Mar. 13	8.97	June 15	7.25	Sept. 29	7.60	Dec. 20	8.17
Apr. 13	8.31	28	7.24	Oct. 25	7.74		

149-66-31cad1. Great Northern Railway. Drilled former railroad supply artesian well in the New Rockford aquifer. Depth 146 ft, cased from 7-113 ft with 12-in diam steel pipe, 7-in diam No. 14 screen 113-143 ft. MP, top of curb inside well house 0.83 ft above lsd. Lsd, 1,540 ft above msl. Highest water level 20.90 ft below lsd, July 10, 1966; lowest 25.61 ft below lsd Apr. 29, 1965. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Apr. 5	23.19	Aug. 31	22.66	Nov. 15	24.29
Nov. 25	22.46	12	23.10	Sept. 5	23.18	20	24.38
30	22.38	15	23.03	10	23.10	22	24.33
Dec. 5	22.38	20	23.00	15	23.28	25	24.32
10	22.36	May 5	22.31	20	23.42	30	24.12
		June 15	21.11	28	23.62	Dec. 5	23.91
1966		30	21.12	30	23.74	10	23.84
Jan. 12	22.40	July 5	21.04	Oct. 5	23.73	15	23.74
Feb. 17	22.89	10	20.90	10	23.80	20	23.56
20	22.98	13	21.42	26	24.09	25	23.71
25	23.00	15	21.30	31	24.14	31	23.63
29	23.00	20	21.06	Nov. 5	24.23		
Mar. 30	23.18	Aug. 25	22.29	10	24.26		

149-67-17bbb. Cooperative program. Drilled observation artesian well in the New Rockford aquifer. Depth 284 ft, cased to 260 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 253-260 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,540 ft above msl. Records available 1964-66. June 28, 1966, 24.64.

149-67-17ccb. Cooperative program. Drilled observation artesian well in the New Rockford aquifer. Depth 157.5 ft, cased to 140 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 63-140 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,559 ft above msl. Highest water level 24.09 ft below lsd, Nov. 24, 1965; lowest 26.90 ft below lsd, Dec. 20, 1966. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		May 10	25.00	Aug. 23	25.50	Nov. 22	26.07
Mar. 13	26.53	June 15	24.61	Sept. 29	26.16	Dec. 20	26.90
Apr. 12	25.64	28	24.64	Oct. 26	26.37		

150-63-13bbb. Cooperative program. Drilled observation water-table well in sand and gravel. Depth 17.0 ft, cased to 15.0 ft with 2-in diam steel pipe, $1\frac{1}{4}$ in No. 50 sand point 15-17 ft. MP, top of casing 4.9 ft above lsd. Lsd, 1,477.0 ft above msl. Highest water level 5.61 ft below lsd, May 10, 1966; lowest 15.30 ft below lsd, Mar. 13, 1964. Records available 1952-56, 1960, and 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		May 10	5.61	Sept. 29	10.52	Dec. 20	11.56
Mar. 13	12.67	June 28	6.76	Oct. 26	10.90		
Apr. 13	8.62	Aug. 23	9.30	Nov. 22	11.24		

150-66-8aaa. Cooperative program. Drilled observation water-table well in the Sheyenne Village aquifer. Depth 24 ft, cased to 22 ft with 4-in diam steel pipe, open end. MP, top edge of casing 1.30 ft above lsd. Lsd, 1,468.98 ft above msl. Highest water level 10.20 ft below lsd, Oct. 5, 1958; lowest 12.90 ft below lsd, Mar. 20, 1956. Records available 1956-59, 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		May 10	10.95	Aug. 23	11.07	Nov. 22	11.30
Mar. 13	11.05	June 14	10.93	Sept. 29	11.13	Dec. 20	11.37
Apr. 12	10.99	July 13	11.02	Oct. 26	11.22		

Emmons County

Emmons County is in south-central North Dakota. Water levels are being monitored in one observation well near an irrigation development shown on figure 15. The well monitors water-level fluctuations principally due to pumping from an aquifer in a preglacial channel. The period of record is too short to determine water-level trends in the area.

Ground water appropriated in Emmons County to the end of 1966 was 1,162 acre-feet. Ground-water usage in 1966 was reported to be about 324 acre-feet.

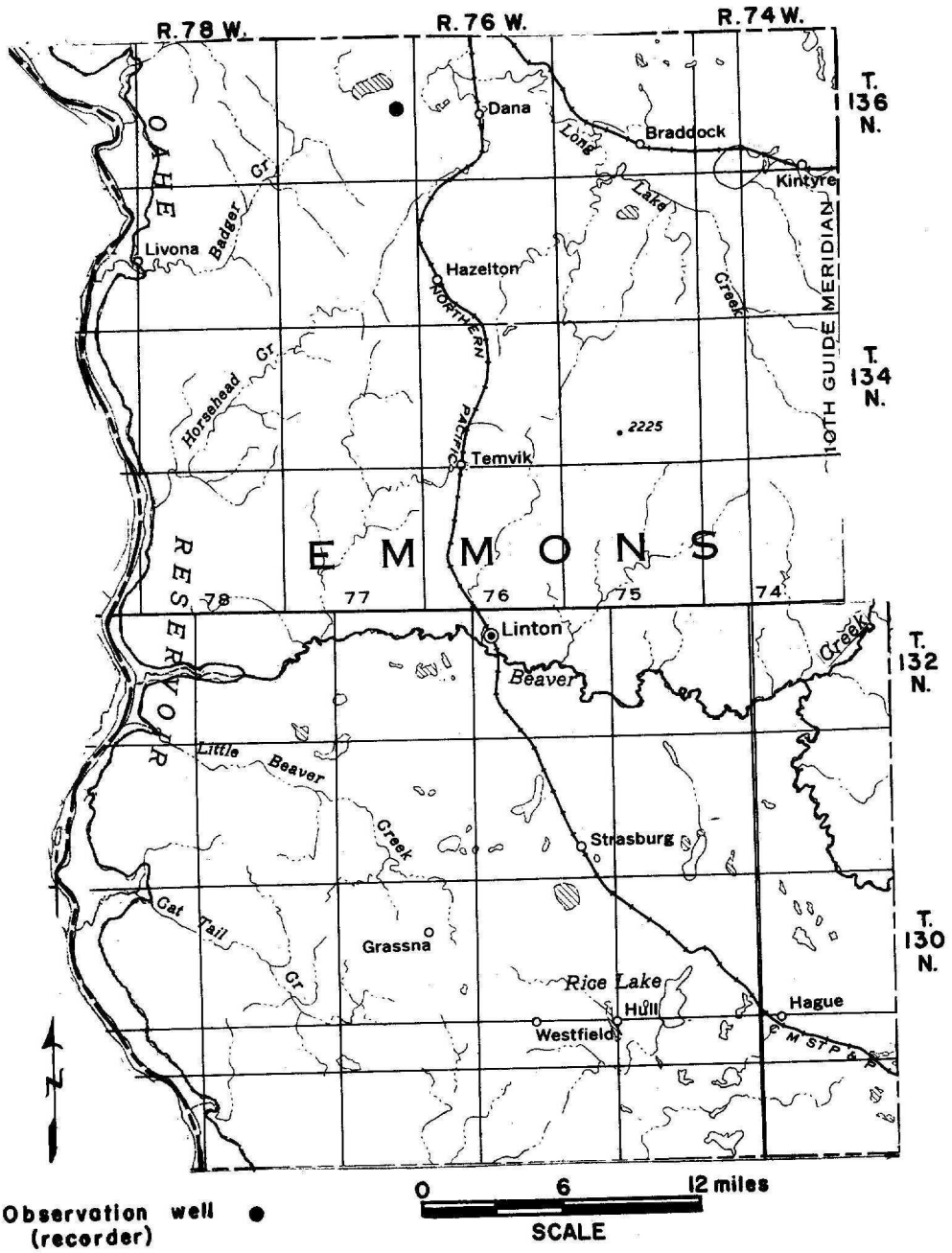


Figure 15.--Location of observation well in Emmons County.

136-77-29bbb. Cooperative program. Drilled observation artesian well in sand and gravel. Depth 180 ft, cased to 176 ft with 3-in diam plastic pipe, perforated 166-176 ft. MP, top of casing 1.60 ft above lsd. Lsd, 1,732.3 ft above msl. Affected by pumping of nearby irrigation well. Highest water level 19.63 ft below lsd, May 15, 1966; lowest 24.77 ft below lsd, June 24, 1966. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Dec. 25	21.15	May 5	19.93	Sept. 15	19.99
Apr. 26	21.28	27	21.11	10	19.93	25	19.95
30	21.27	31	21.20	15	19.63	30	19.93
May 5	21.27			20	19.70	Oct. 5	19.91
10	21.27	1966		21	24.15	10	19.92
15	21.26	Jan. 18	21.27	25	20.15	15	19.88
20	21.26	20	21.22	31	22.70	20	19.89
25	21.26	25	21.25	June 5	20.70	22	19.82
28	21.05	28	21.21	10	19.88	25	19.92
31	21.02	31	21.24	15	19.90	29	19.94
June 5	21.10	Feb. 5	21.38	20	21.37	31	19.93
10	21.07	6	21.41	23	19.63	Nov. 1	19.92
15	21.12	10	21.26	24	24.77	5	19.93
20	21.00	15	21.26	25	20.30	10	19.94
28	22.36	20	21.22	30	19.73	15	20.00
Aug. 30	21.32	25	21.20	July 5	24.00	20	19.99
Sept. 24	21.13	28	21.13	10	28.75	25	19.99
Oct. 5	21.05	Mar. 5	21.06	14	21.30	30	19.96
Nov. 5	21.08	28	20.66	Aug. 19	20.11	Dec. 5	19.95
25	21.26	31	20.66	20	21.10	7	20.06
30	21.25	Apr. 5	20.62	25	20.97	10	20.04
Dec. 4	21.25	12	20.27	30	23.93	15	19.94
5	21.22	15	20.17	31	21.65	20	19.93
10	21.19	20	20.17	Sept. 1	21.22	25	19.96
15	21.19	25	20.10	5	21.03	31	19.96
20	21.20	31	19.97	10	21.00		

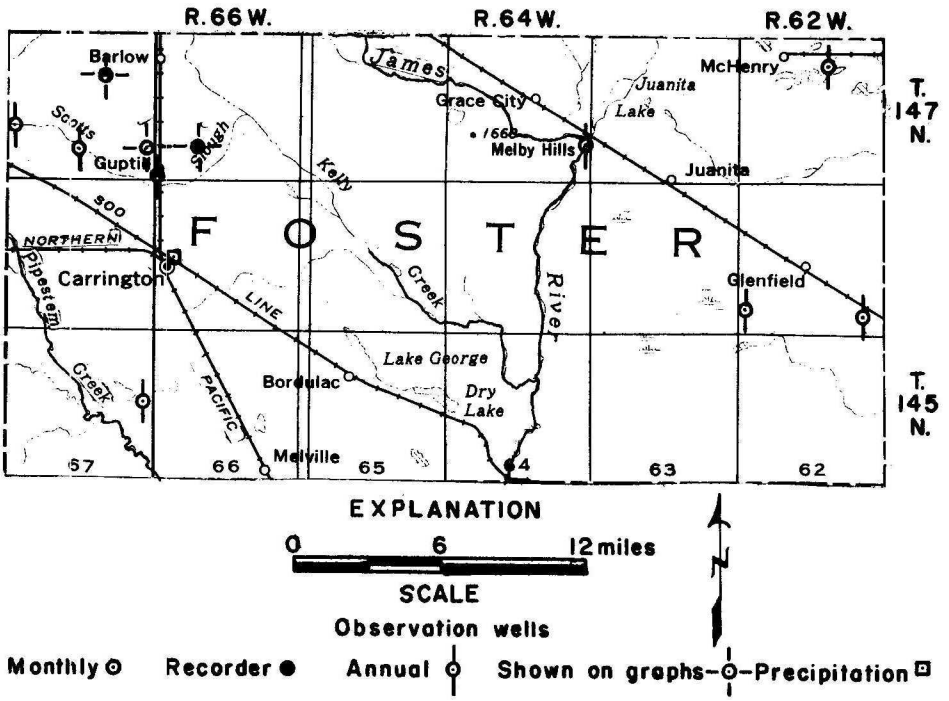
Foster County

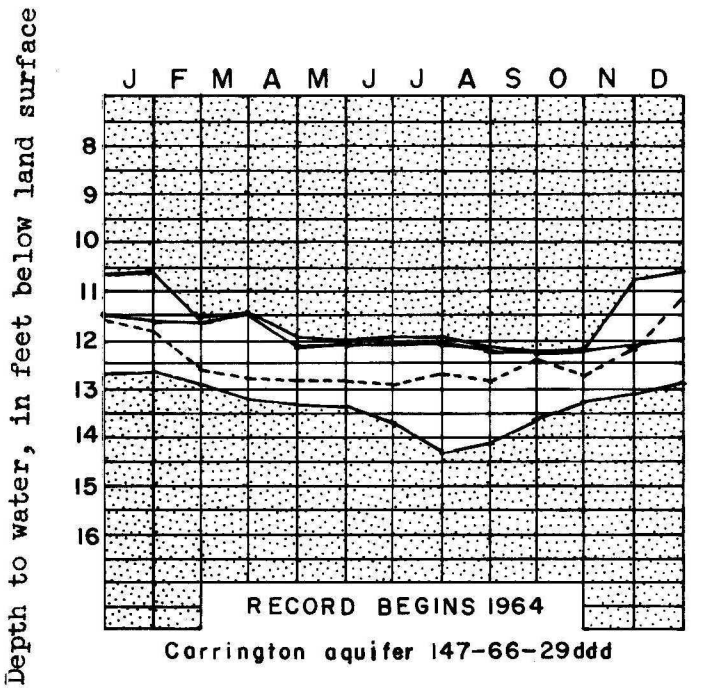
Foster County is in east-central North Dakota and has an area of 646 square miles. Water levels are being monitored in 11 observation wells shown on figure 16.

The location and extent of aquifers in Foster County are described by Trapp (1967).

Water-level trends and precipitation shown in figures 16 and 17 indicate water levels were rising for the period of record. Highest water levels for the period of record (1963-66) have occurred in 1965 and 1966. Most of the low levels for the same period occurred in 1964. There are 2 municipal and 7 irrigation wells developed in the Carrington aquifer producing from 100 to 1,500 gpm.

Ground water appropriated in Foster County to the end of 1966 was 3,083 acre-feet. Ground-water usage in 1966 was reported to be about 1,326 acre-feet.





Unshaded area shows highest and lowest on record
Broken line indicates average level for the past record

Figure 16.--Location of observation wells in Foster County and water-level fluctuations in the Carrington aquifer.

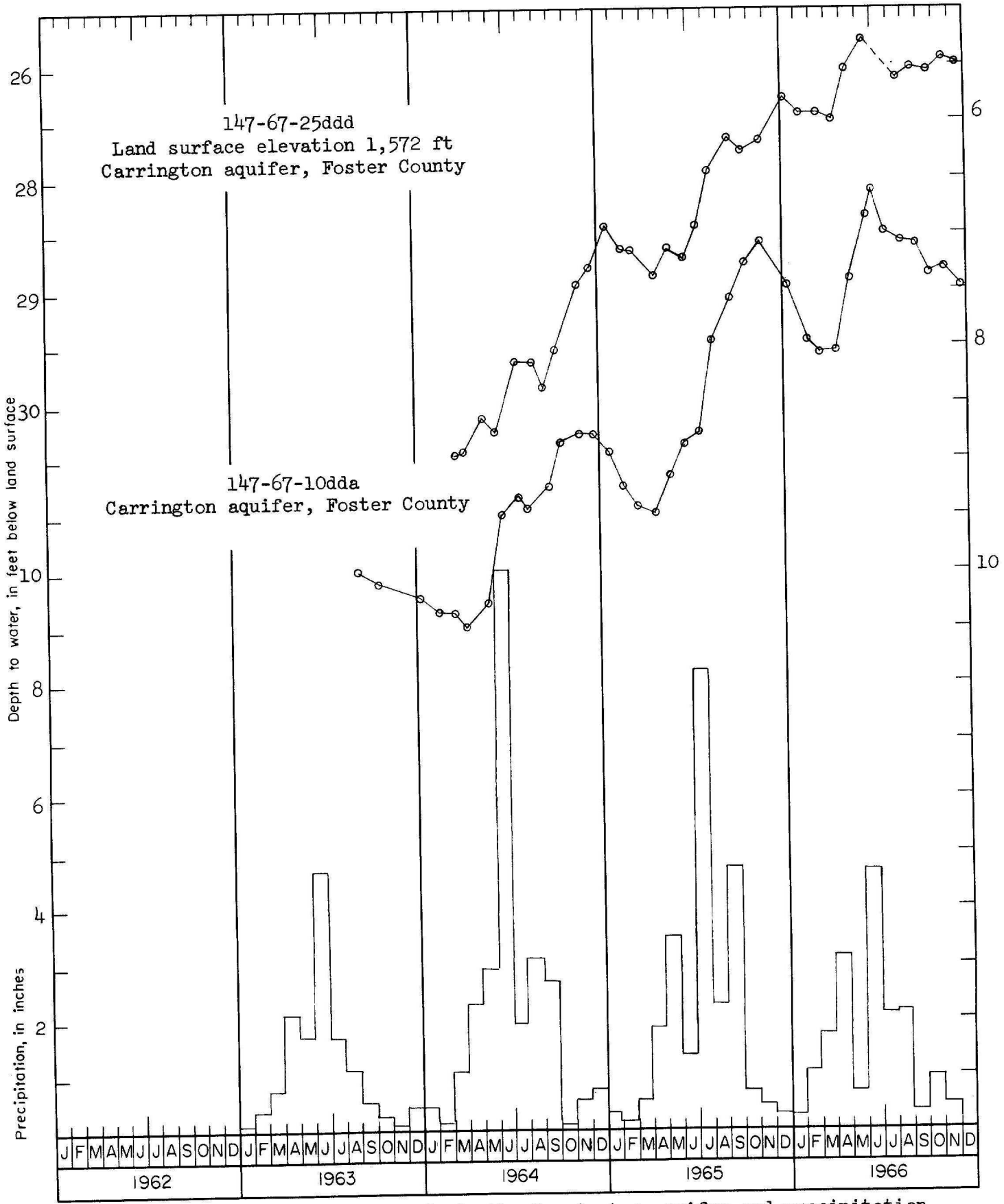


Figure 17.--Water-level trends in the Carrington aquifer and precipitation at Carrington.

145-67-13dcc. Cooperative program. Drilled observation artesian well in an esker deposit. Depth 170 ft, cased to 50 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 40-50 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,584 ft above msl. Records available 1963-66. June 29, 1966, 16.96.

146-62-30ccc. Cooperative program. Drilled observation artesian well in the New Rockford aquifer. Depth 177 ft, cased to 150 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 140-150 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,502 ft above msl. Records available 1963-66. June 29, 1966, 10.17.

146-62-36bbb. Cooperative program. Drilled observation artesian well in the New Rockford aquifer. Depth 231 ft, cased to 200 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 190-200 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,486 ft above msl. Records available 1964-66. June 29, 1966, 23.22.

147-62-10abb. Cooperative program. Drilled observation artesian well in buried outwash deposits. Depth 63 ft, cased to 50 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 45-50 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,504 ft above msl. Records available 1964-66. June 29, 1966, 9.46.

147-64-25add. Cooperative program. Drilled observation water-table well in sand and gravel. Depth 84 ft, cased to 65 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 55-64 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,458 ft above msl. Records available 1964-66. June 29, 1966, 1.65.

147-66-29ddd. Cooperative program. Drilled observation artesian well in the Carrington aquifer. Depth 105 ft, cased to 89 ft with 3-in diam plastic pipe, perforated 69-89 ft. MP, top of protective casing 1.60 ft above lsd. Lsd, 1,545 ft above msl. Highest water level 10.49 ft below lsd, Dec. 20, 1965; lowest 14.30 ft below lsd, July 10, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 28	11.49	July 12	12.00	Sept. 20	12.35
Nov. 25	10.73	Apr. 12	12.07	15	12.01	25	12.36
30	10.69	15	12.08	20	12.04	30	12.30
Dec. 5	10.65	20	12.07	25	12.05	Oct 5	12.31
10	10.63	25	12.11	30	12.11	10	12.33
15	10.56	30	11.95	Aug. 5	12.19	15	12.30
20	10.49	May 5	12.00	10	12.19	20	12.27
25	10.53	11	12.10	15	12.20	25	12.26
		June 15	12.06	23	12.25	30	12.27
1966		20	12.05	25	12.24	Nov. 5	12.26
Jan. 12	10.51	25	11.96	31	12.26	10	12.23
15	11.56	30	11.99	Sept. 5	12.26	15	12.23
20	11.55	July 5	11.96	10	12.27	20	12.20
Feb. 17	11.60	10	11.94	15	12.31		

147-66-31ccc. Cooperative program. Drilled observation artesian well in the Carrington aquifer. Depth 103 ft, cased to 80 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 70-80 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,561 ft above msl. Records available 1963-66. June 29, 1966, 15.88.

147-67-10dda. Cooperative program. Drilled observation artesian well in the Carrington aquifer. Depth 91 ft, cased to 78.5 ft with $1\frac{1}{4}$-in diam plastic pipe. MP, top of protective casing 2.00 ft above lsd. Highest water level 6.60 ft below lsd, June 29, 1966; lowest 10.48 ft below lsd, Apr. 10, 1964. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		May 11	7.40	Aug. 23	6.98	Nov. 22	7.30
Mar. 14	8.05	June 15	6.82	Sept. 29	7.07	Dec. 20	7.44
Apr. 12	8.04	29	6.60	Oct. 26	7.33		

147-67-19cbc. Cooperative program. Drilled observation artesian well in the Carrington aquifer. Depth 110 ft, cased to 80 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 70-80 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,568 ft above msl. Records available 1963-66. June 29, 1966, 10.80.

147-67-22ddd. Cooperative program. Drilled observation artesian well in the Carrington aquifer. Depth 136 ft, cased to 100 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 85-100 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,566 ft above msl. Records available 1963-66. June 29, 1966, 20.62.

147-67-25ddd. E. Stauffer. Dug abandoned domestic water-table well overlying the Carrington aquifer. Depth 38.0 ft, cased with 36-in diam concrete. MP, inside base of box 0.4 ft above lsd. Lsd, 1,572 ft above msl. Highest water level 26.79 ft below lsd, June 15, 1966; lowest 29.70 ft below lsd, Mar. 6, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		May 11	27.05	Sept. 29	27.02	Dec. 20	27.00
Mar. 14	27.45	June 15	26.79	Oct. 26	27.08		
Apr. 12	27.50	Aug. 23	27.12	Nov. 22	26.96		

Griggs County

Griggs County is located in east-central North Dakota and has an area of 715 square miles. Water levels are being monitored in one observation well shown on figure 18.

Water-level trends in the New Rockford aquifer and precipitation at Cooperstown shown in figure 19 indicate water levels are rising for the period of record. Response to precipitation lags by about 4 to 6 months.

Two municipalities in Griggs County have been granted water rights for 648 acre-feet. Of this amount, 278 acre-feet was reported used during 1966.

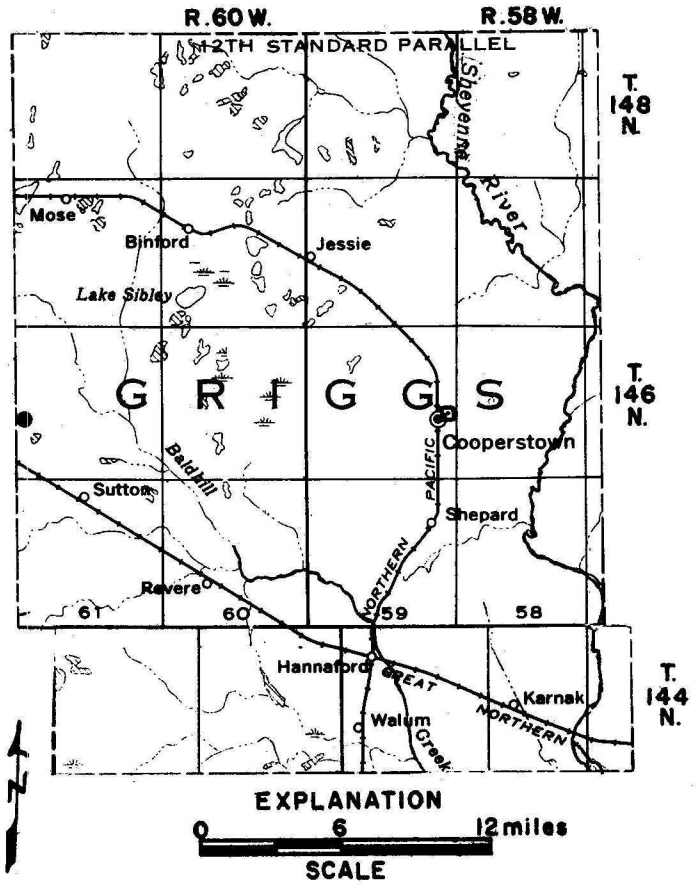


Figure 18.--Location of observation well in Griggs County.

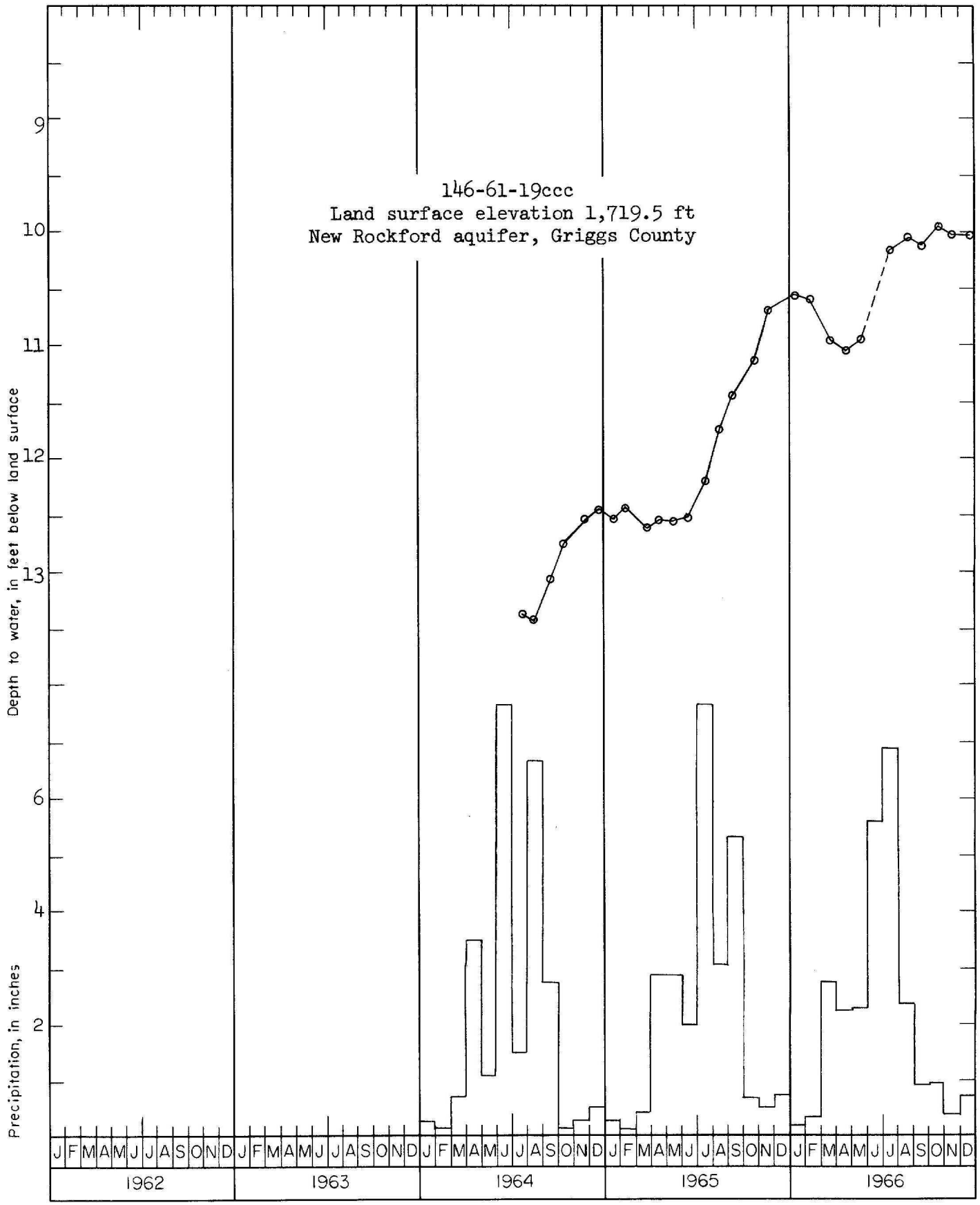


Figure 19.--Water-level trends in the New Rockford aquifer and precipitation at Cooperstown.

146-61-19ccc. Cooperative program. Drilled observation artesian well in the New Rockford aquifer. Depth 252 ft, cased to 220 ft with 3-in diam plastic pipe, perforated 180-220 ft. MP, top of casing 1.44 ft above lsd. Lsd, 1,719.5 ft above msl. Highest water level 9.87 ft below lsd, Dec. 5, 1966; lowest 13.43 ft below lsd, Aug. 18, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Mar. 31	10.94	July 31	10.12	Oct. 15	9.95
Nov. 23	10.70	Apr. 5	11.01	Aug. 5	10.12	20	9.94
		10	11.04	10	10.11	25	9.93
1966		15	11.06	15	10.08	31	9.96
Jan. 11	10.60	20	11.03	20	10.06	Nov. 5	9.95
15	10.52	25	11.06	25	10.10	10	9.90
20	10.54	30	10.99	31	10.08	15	9.96
Feb. 8	10.54	May 5	10.96	Sept. 5	10.10	20	10.00
10	10.60	10	10.89	10	10.12	25	9.95
14	10.46	15	10.75	15	10.13	30	10.03
15	10.51	20	10.76	20	10.12	Dec. 5	9.87
Mar. 15	10.81	22	10.69	25	10.13	10	10.05
17	10.77	July 13	10.10	28	9.89	15	9.96
20	10.86	15	10.17	30	9.90	20	9.92
25	10.97	20	10.16	Oct. 5	9.97	25	10.04
27	10.98	25	10.15	10	9.96	31	10.02

Kidder County

Kidder County is in central North Dakota and has an area of 1,427 square miles. Water levels are being monitored under this program in two wells shown on figure 20.

The location and extent of aquifers in Kidder County are described by Bradley, Petri, and Adolphson (1963). A short record of ground-water fluctuations and precipitation is shown on figure 21. There are two irrigation wells developed in Kidder County aquifers producing from 200 to 600 gpm.

Ground water appropriated in Kidder County to the end of 1966 was 1,998 acre-feet. Ground-water usage in 1966 was reported to be about 205 acre-feet.

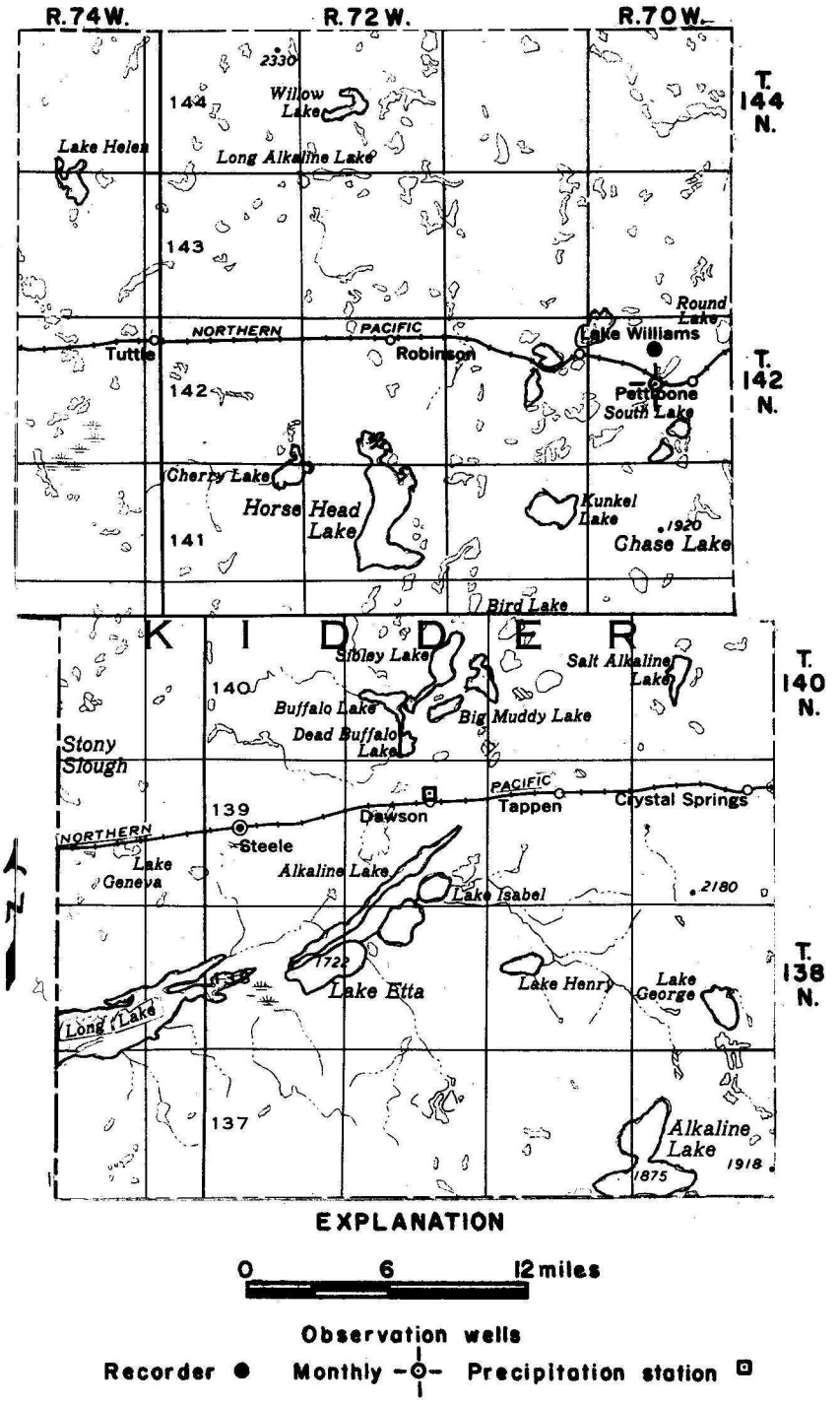


Figure 20.--Location of observation wells in Kidder County.

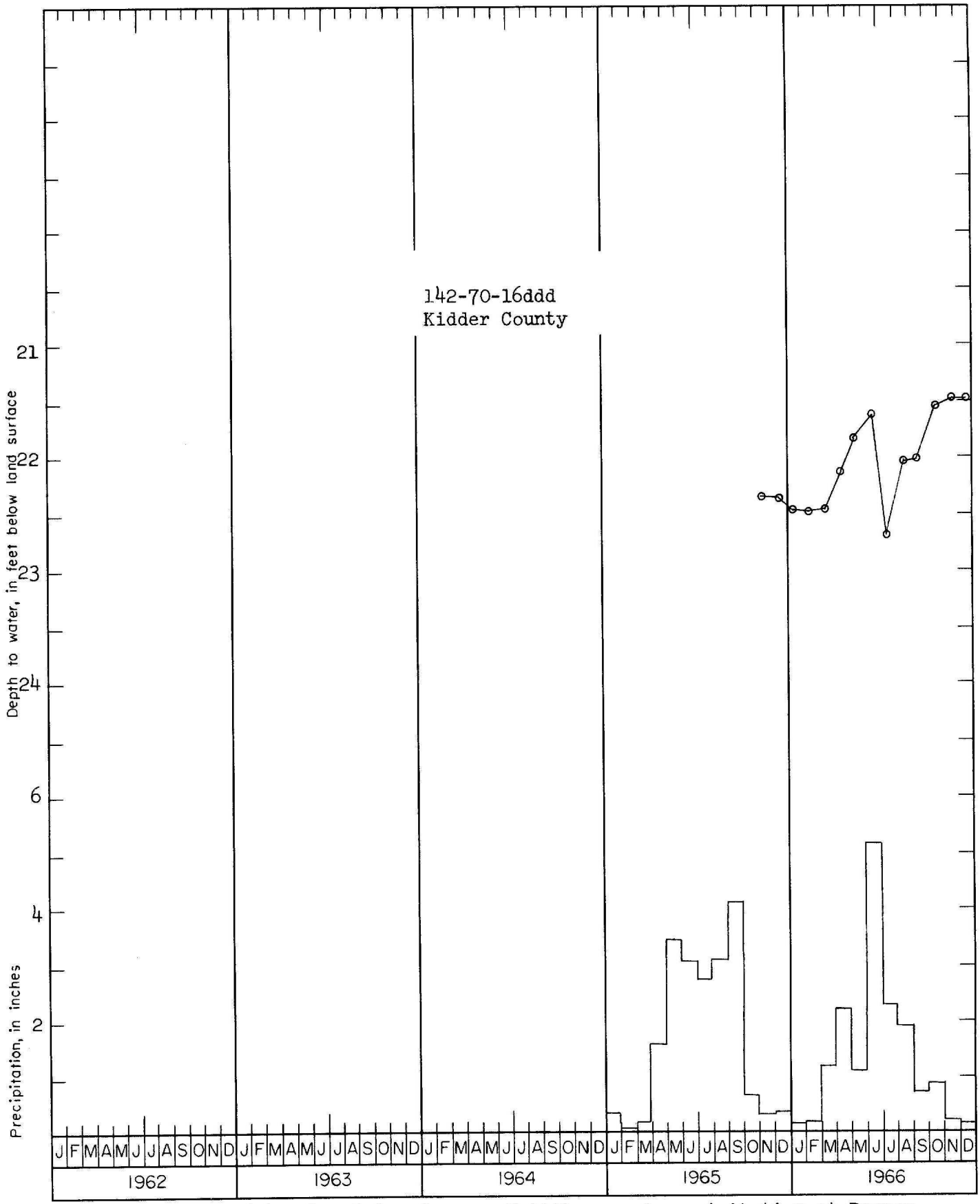


Figure 21.--Water-level trends near Pettibone and precipitation at Dawson.

142-70-9aaa. U.S. Geological Survey. Drilled observation artesian well in sand and gravel from 87-107 ft. Depth 126 ft, cased to 90 ft with 3-in diam plastic pipe, perforated 70-90 ft. MP, top edge of casing 0.50 ft above lsd. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Apr. 15	68.74	July 5	67.27	Sept. 20	67.44
Oct. 15	68.00	20	68.65	12	67.34	25	67.40
20	68.05	25	68.56	15	67.36	30	67.43
25	68.12	May 10	67.56	20	67.37	Oct. 5	67.42
31	68.17	15	67.47	25	67.38	10	67.42
Nov. 12	67.93	20	67.47	31	67.46	15	67.42
Dec. 13	67.89	25	67.47	Aug. 5	67.52	20	67.33
		31	67.46	10	67.58	25	67.49
1966		June 5	67.40	28	67.47	31	67.51
Jan. 10	66.45	15	67.33	Sept. 2	67.50	Nov. 5	67.46
Feb. 7	66.37	20	67.33	5	67.53	10	67.49
Mar. 31	67.85	25	67.30	10	67.49	15	67.43
Apr. 12	68.73	30	67.25	15	67.46	20	67.48

142-70-16ddd. U.S. Geological Survey. Drilled observation artesian well in sand and gravel from 41-79 ft. Depth 84 ft, cased to 70 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 18 slot sand point 67-70 ft. MP, top of casing 2.50 ft above lsd. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Feb. 7	22.50	July 12	22.70	Dec. 19	21.50
Nov. 12	22.35	Mar. 15	22.48	Aug. 23	22.03		
Dec. 13	22.38	Apr. 12	22.12	Sept. 27	22.01		
		May 9	21.86	Oct. 24	21.56		
1966		June 13	21.63	Nov. 23	21.50		
Jan. 1	22.49						

McHenry County

McHenry County is in north-central North Dakota and has an area of 1,904 square miles. Water levels are being monitored in two wells shown on figure 22. There are about 8 irrigation wells developed in the county producing from 100 to 800 gpm.

Ground water appropriated in McHenry County to the end of 1966 was 10,067 acre-feet. Ground-water usage in 1966 was reported to be about 1,598 acre-feet.

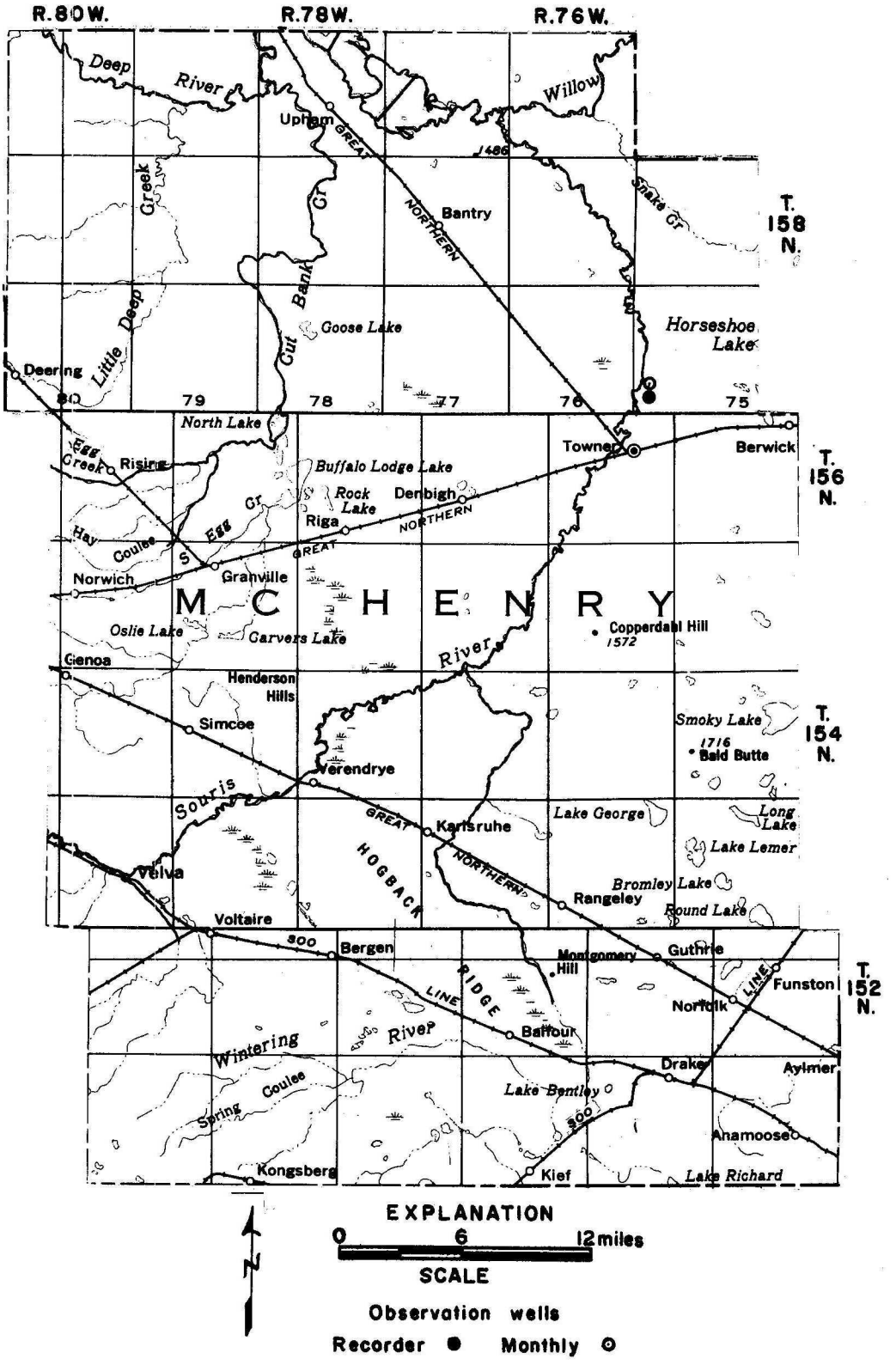


Figure 22.--Location of observation wells in McHenry County.

157-75-31aabl. Cooperative program. Drilled observation well. Depth 84 ft, cased to 84 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 64-84 ft. MP, top of protective casing 2.00 ft above lsd. Records available 1966.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Nov. 15	17.95	Nov. 23	19.55	Dec. 21	19.51
Nov. 1	52.85						

157-75-31aab2. Cooperative program. Drilled observation water-table well in sand and gravel. Depth 31.5 ft, cased to 30 ft with 4-in diam plastic pipe, slotted 20-30 ft. MP, top of casing 2.00 ft above lsd. Records available 1966. Dec. 15, 1966, 16.95; Dec. 20, 1966, 16.96; Dec. 28, 1966, 17.00.

Pierce County

Pierce County, in north-central North Dakota, has an area of 1,080 square miles. Water levels are being monitored in one observation well shown on figure 23. The well reflects initial effects of pumpage from the aquifer for the municipal supply of Rugby. Water-level fluctuations resulting from development are shown on figure 24. There are two wells developed in the aquifer producing from 400 to 600 gpm.

Ground water appropriated in Pierce County to the end of 1966 was 1,650 acre-feet. Ground-water usage during 1966 was reported to be about 390 acre-feet.

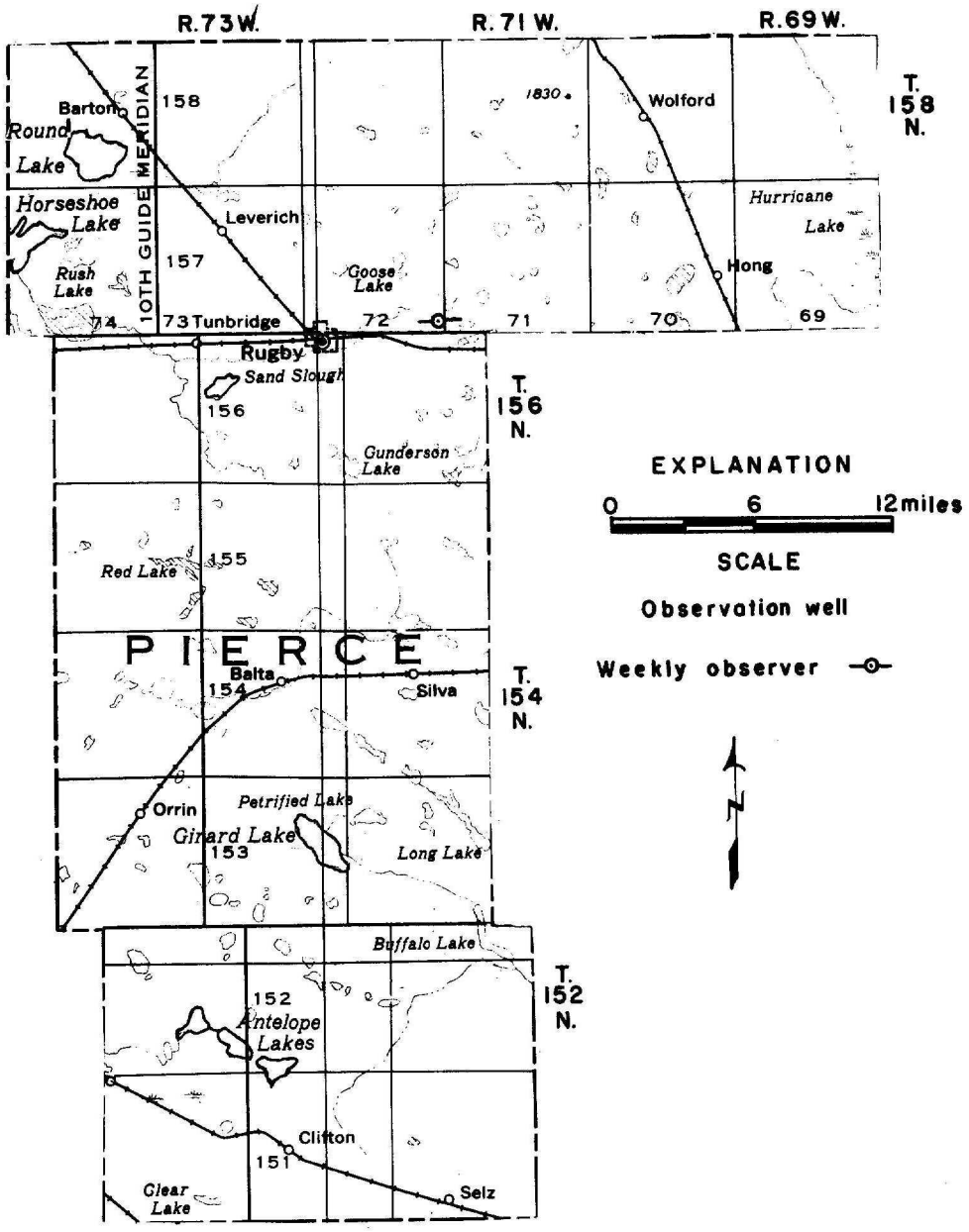


Figure 23.--Location of observation well in Pierce County.

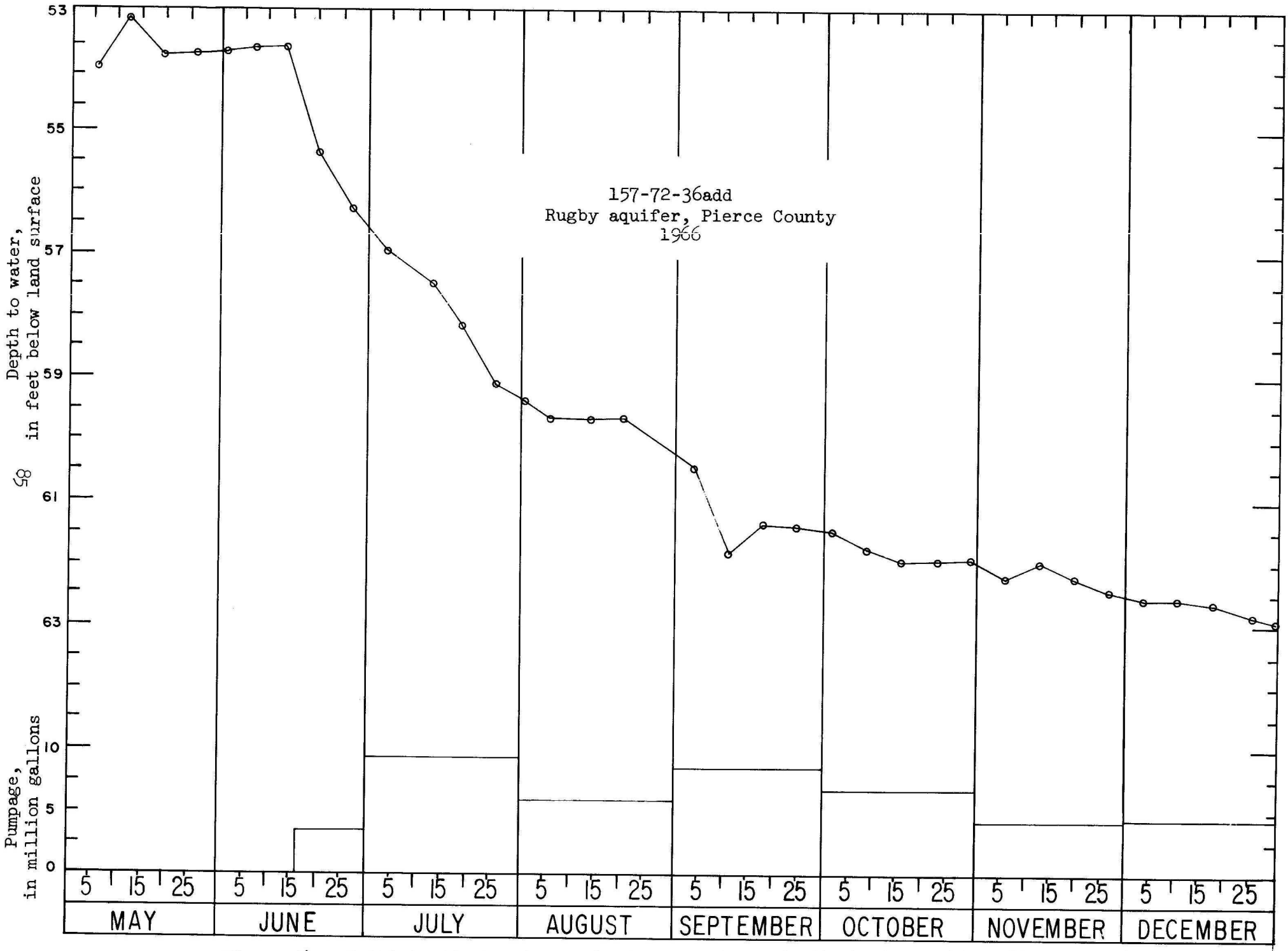


Figure 24.--Initial effects of a well field developed in the Rugby aquifer, Pierce County.

157-72-36add. Cooperative program. Drilled observation artesian well in sand and gravel. Depth 147 ft, cased to 120 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 110-120 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Records available 1966.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		June 27	56.23	Sept. 4	60.46	Nov. 6	62.21
May 5	53.95	July 4	56.94	11	61.83	13	61.96
12	53.15	13	57.48	18	61.35	20	62.21
19	53.74	19	58.17	25	61.40	27	62.48
26	53.71	26	59.08	Oct. 2	61.49	Dec. 4	62.56
June 1	53.68	Aug. 1	59.33	9	61.74	11	62.57
7	53.63	6	59.66	16	61.97	18	62.61
13	53.61	14	59.63	23	61.95	26	62.83
20	55.34	21	59.61	30	61.91	31	62.94

June 16, 1966 - Nearby well field started pumping.

Ransom County

Ransom County is in southeastern North Dakota and has an area of 861 square miles. Water levels are being monitored in five observation wells shown on figure 25. These wells tap aquifers in the Sheyenne delta.

Water-level trends and precipitation shown in figure 26 indicate that levels are generally rising for the period of record (1963-66) and that the water-table responses reflect precipitation received in the area. Highest levels occurred in 1966 and the lowest occurred in 1964.

Ground water appropriated in Ransom County to the end of 1966 was 1,443 acre-feet. Ground-water usage during 1966 was reported to be about 727 acre-feet.

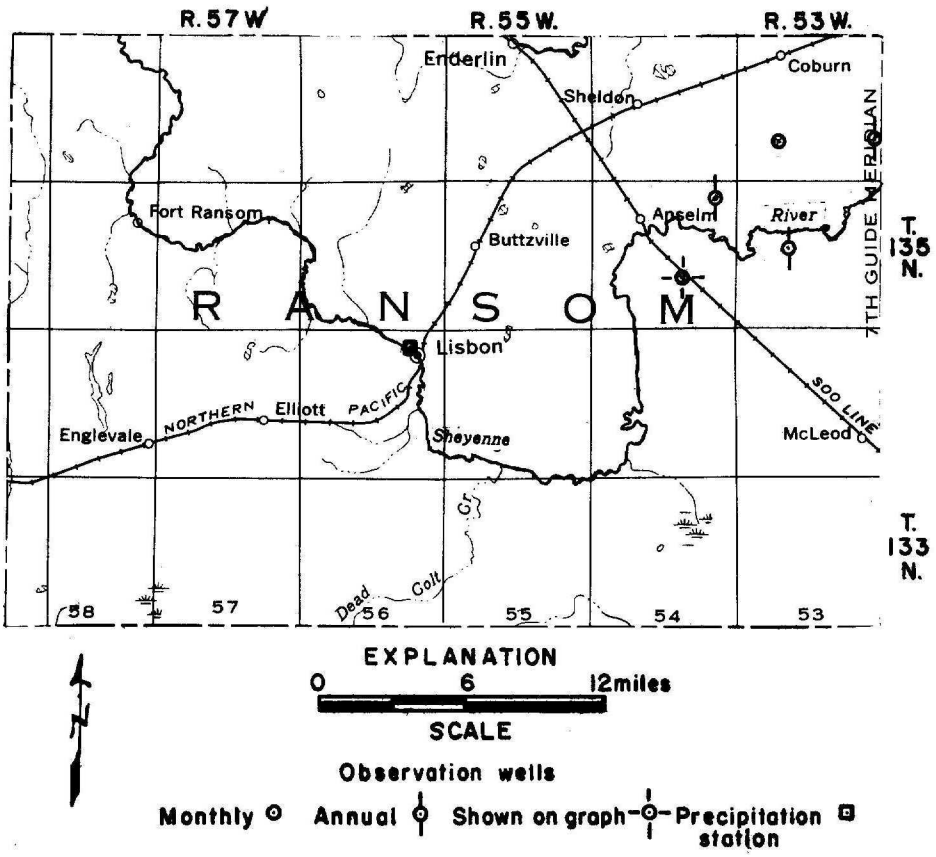


Figure 25.--Location of observation wells in Ransom County.

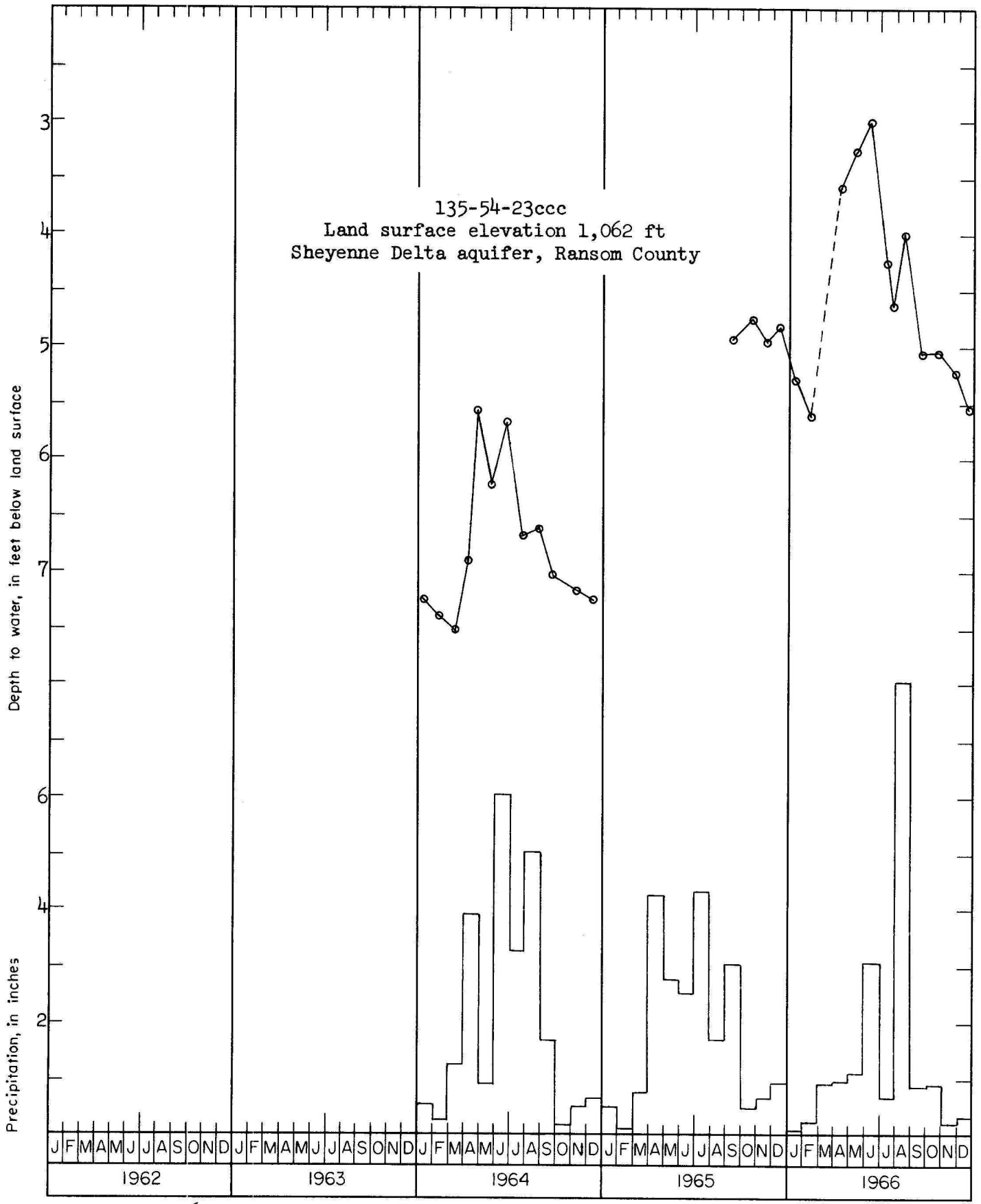


Figure 26.--Water-level trends in the Sheyenne Delta aquifer and precipitation at Lisbon.

135-53-16ccc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 40 ft, cased to 38 ft with 1¼-in diam plastic pipe, sand point 70 screen size 38-40 ft. MP, top of casing 2.6 ft above lsd. Lsd, 1,069 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1963		Feb. 6	12.63	July 30	12.26	1965	
Nov. 18	12.54	Mar. 9	12.48	Aug. 27	12.23	Apr. 20	13.23
Dec. 2	12.52	Apr. 9	12.41	Sept. 29	12.19		
		28	12.40	Nov. 10	12.19	1966	
1964		May 27	12.37	Dec. 10	12.17	July 12	12.00
Jan. 2	12.57	June 26	12.30				

135-54-1ccc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 17.4 ft, cased to 17.4 ft with 4-in diam plastic pipe, slotted 7-17.4 ft. MP, top of casing 1.90 ft above lsd. Lsd, 1,061 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1963		Feb. 5	7.18	Aug. 27	6.68	1966	
Oct. 31	6.89	Mar. 9	7.24	Sept. 29	6.98	July 12	3.96
Nov. 10	6.73	Apr. 9	6.85	Nov. 10	7.17		
Dec. 2	6.87	25	6.26	Dec. 10	7.31		
		May 27	6.16				
1964		June 26	5.82				
Jan. 2	7.00	July 30	6.55				

135-54-23ccc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 37.6 ft, cased to 37.6 ft with 4-in diam plastic pipe, slotted 27-37.6 ft. MP, top of casing 1.60 ft above lsd. Lsd, 1,062 ft above msl. Highest water level 3.00 ft below lsd, June 13, 1966; lowest 7.51 ft below lsd, Mar. 9, 1964. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1963		May 27	6.22	Nov. 16	4.95	Aug. 14	4.00
Nov. 1	6.03	June 26	5.68	Dec. 13	4.81	Sept. 28	5.06
18	7.05	July 30	6.68			Oct. 25	5.02
Dec. 2	7.12	Aug. 27	6.56	1966		Nov. 30	5.23
		Sept. 29	7.01	Jan. 10	5.29	Dec. 27	5.55
1964		Nov. 10	7.16	Feb. 7	5.60		
Jan. 2	7.24	Dec. 10	7.23	Apr. 14	3.59		
Feb. 5	7.40			May 9	3.27		
Mar. 9	7.51	1965		June 13	3.00		
Apr. 9	6.89	Sept. 13	4.91	July 12	4.26		
28	5.56	Oct. 21	4.74	19	4.61		

136-53-25aaa. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 38.3 ft, cased to 38.3 ft with 4-in diam plastic pipe, slotted 28-38.3 ft. MP, top of casing 1.50 ft above lsd. Lsd, 1,059 ft above msl. Records available 1963-66.

1963		Feb. 5	8.45	Sept. 29	8.75	1965	
Oct. 15	7.56	Mar. 9	8.65	Nov. 10	8.96	Jan. 20	9.34
31	7.72	Apr. 9	8.47	Dec. 10	9.12		
Nov. 18	7.87	28	7.53				
Dec. 2	8.00	May 27	7.39				
		June 26	7.43				
1964		July 30	8.12				
Jan. 2	8.22	Aug. 27	8.47				

136-53-29aaa. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 22.9 ft, cased to 22.9 ft with 4-in diam plastic pipe, slotted 13-22.9 ft. MP, top of casing 1.60 ft above lsd. Lsd, 1,069 ft above msl. Highest water level 7.40 ft below lsd, June 13, 1966; lowest 12.33 ft below lsd, March 9, 1964. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1963		May 27	10.24	Oct. 21	8.94	July 12	8.51
Oct. 10	11.40	June 26	8.24	Nov. 16	9.24	Aug. 14	8.35
Nov. 18	11.53	July 30	10.65	Dec. 13	9.27	Sept. 1	8.64
Dec. 2	11.57	Aug. 27	10.64			28	9.43
		Sept. 29	11.16	1966		Oct. 25	9.59
1964		Oct. 10	11.45	Jan. 10	9.73	Nov. 30	9.77
Jan. 2	11.84	Dec. 10	11.64	Feb. 7	10.24	Dec. 22	10.11
Feb. 5	12.13			Mar. 15	9.59		
Mar. 9	12.33	1965		Apr. 14	8.46		
Apr. 9	11.99	Apr. 20	10.02	May 9	7.62		
28	10.17	Sept. 13	9.43	June 13	7.40		

Richland County

Richland County is in the southeast corner of North Dakota and has an area of 1,441 square miles. Water levels are being monitored in 25 observation wells shown on figure 27.

The location and extent of aquifers in Richland County are described by Baker and Paulson (1967).

Water-level trends and precipitation shown in figures 28 and 29 indicate a gradual rise in water levels in the Milnor Channel and Sheyenne Delta aquifers. However, the highs observed in the northern part of the Sheyenne Delta aquifer show a general lowering trend (136-52-22ddd). The responses to precipitation are generally reflected at the same time and the change in magnitude is directly related to the permeability difference of the aquifer.

Ground water appropriated in Richland County to the end of 1966 was 1,040 acre-feet. Ground-water usage during 1966 was reported to be about 282 acre-feet.

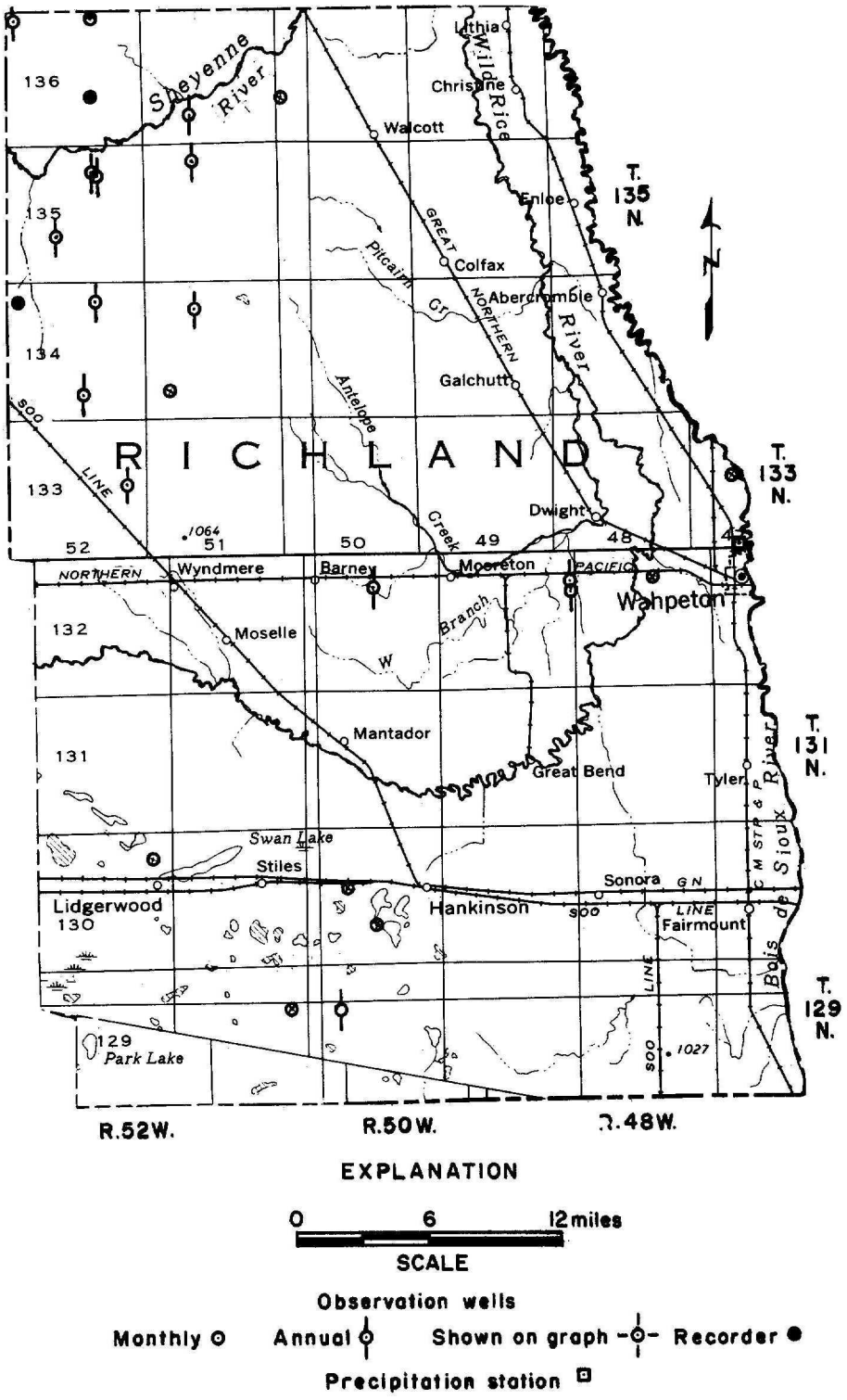


Figure 27.--Location of observation wells in Richland County.

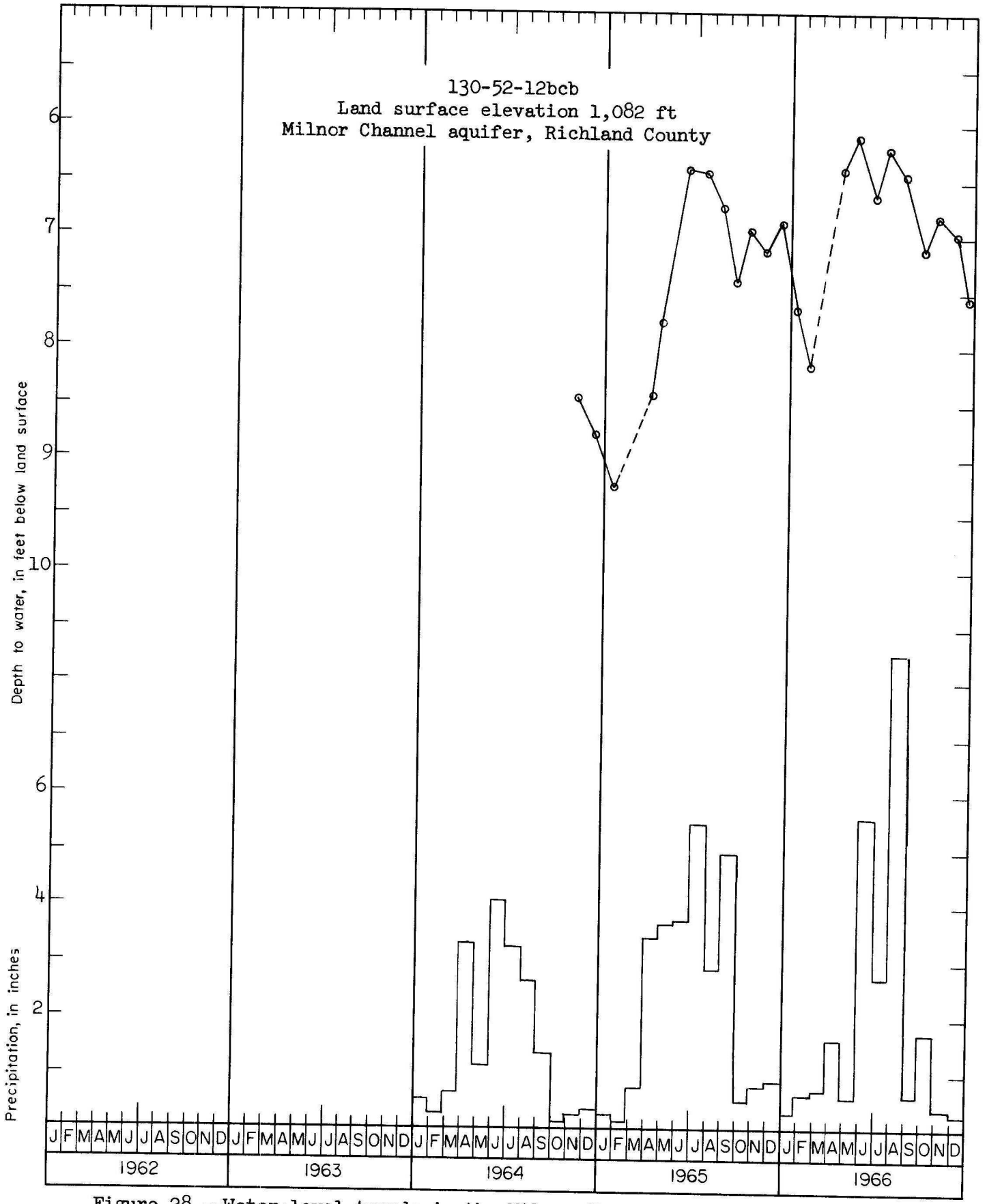


Figure 28.--Water-level trends in the Milnor Channel aquifer and precipitation at Wahpeton.

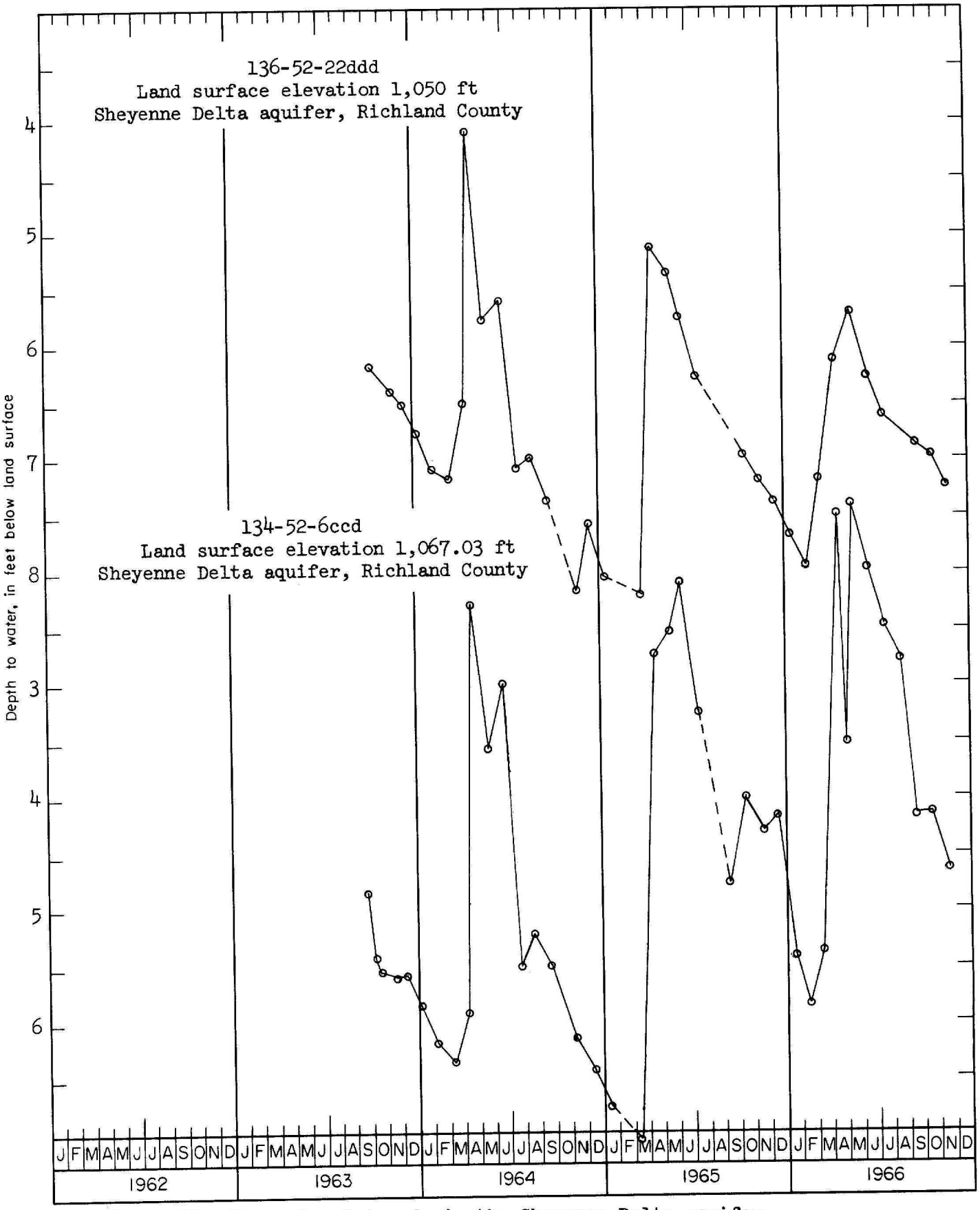


Figure 29.--Water-level trends in the Sheyenne Delta aquifer.

129-50-5bbb. Cooperative program. Drilled observation water-table well in sand and gravel. Depth 152 ft, cased to 140 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 125-140 ft. MP, top of casing 0.8 ft above lsd. Lsd, 1,218 ft above msl. Records available 1964-66. July 7, 1966, 84.15.

129-51-1bbb. Cooperative program. Drilled water-table well in gravel. Depth 140.3 ft, cased to 140.3 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 130-140 ft. MP, top of casing 1.2 ft above lsd. Lsd, 1,195 ft above msl. Highest water level 63.35 ft below lsd, Sept. 28, 1966; lowest 64.11 ft below lsd, Oct. 21, 1965. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		June 11	63.98	1966		July 6	63.89
Nov. 11	63.62	July 15	63.79	Jan. 11	63.99	Aug. 17	63.74
Dec. 9	63.68	Aug. 17	63.63	Feb. 8	63.65	Sept. 28	63.35
		Sept. 14	63.67	Mar. 14	63.73	Oct. 25	63.77
1965		Oct. 21	64.11	Apr. 14	63.99	Nov. 30	63.82
Jan. 19	63.64	Nov. 16	63.98	May 10	63.77	Dec. 28	63.45
Apr. 1	64.08	Dec. 14	63.91	June 14	63.95		

130-50-17ddd. Cooperative program. Drilled water-table well in the Milnor Channel aquifer. Depth 57.6 ft, cased to 57.6 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 47-57.6 ft. MP, top of casing 3.3 ft above lsd. Lsd, 1,126 ft above msl. Highest water level 2.79 ft below lsd, May 10, 1966; lowest 6.39 ft below lsd, Jan. 19, 1965. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Nov. 9	4.31	Feb. 8	5.75	Aug. 17	3.59
July 15	3.68	16	4.37	Mar. 14	5.22	Sept. 28	4.61
Aug. 17	3.89	Dec. 14	3.94	Apr. 14	3.74	Oct. 25	4.01
Sept. 14	4.97			May 10	2.79	Nov. 30	4.29
Oct. 13	4.07	1966		June 14	3.77	Dec. 28	5.12
21	4.12	Jan. 11	5.10	July 6	3.60		

130-50-27bbb. Cooperative program. Drilled water-table well in gravel. Depth 100.4 ft, cased to 100.4 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 90-100.4 ft. MP, top of casing 1.2 ft above lsd. Lsd, 1,126 ft above msl. Highest water level 40.55 ft below lsd, July 6, 1966; lowest 44.39 ft below lsd, Jan. 19, 1965. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		Sept. 14	41.03	Feb. 8	41.14	Nov. 30	40.69
Nov. 11	40.92	Oct. 17	41.02	Mar. 14	41.15	Dec. 28	40.81
Dec. 9	41.28	21	41.01	Apr. 14	40.89		
		Nov. 9	41.21	May 10	40.66		
1965		16	41.02	June 14	40.58		
Jan. 19	44.39	Dec. 14	41.02	July 6	40.55		
June 11	40.90			Aug. 17	40.63		
July 15	40.83	1966		Sept. 28	40.57		
Aug. 17	40.91	Jan. 11	41.05	Oct. 25	40.65		

130-52-12bcb. Cooperative program. Drilled water-table well in the Milnor Channel aquifer. Depth 40.3 ft, cased to 40.3 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 25-40.3 ft. MP, top of casing 1.1 ft above lsd. Lsd, 1,082 ft above msl. Highest water level 6.10 ft below lsd, May 10, 1966; lowest 9.23 ft below lsd, Jan. 18, 1965. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1964		June 11	6.39	Dec. 14	6.88	July 6	6.20
Nov. 11	8.46	July 15	6.41			Aug. 17	6.43
Dec. 9	8.79	Aug. 17	6.73	1966		Sept. 28	7.10
		Sept. 14	7.39	Jan. 11	7.63	Oct. 25	6.80
1965		Oct. 12	6.94	Feb. 8	8.13	Nov. 30	6.98
Jan. 18	9.23	21	6.92	Apr. 14	6.39	Dec. 28	7.57
Apr. 1	8.41	Nov. 9	7.12	May 10	6.10		
21	7.76	16	7.11	June 14	6.62		

132-48-10bcc. Cooperative program. Drilled artesian well in gravel. Depth 100 ft, cased to 100 ft with 1¼-in diam plastic pipe, slotted 85-100 ft. MP, top of casing 1.1 ft above lsd. Lsd, 958 ft above msl. Highest water level 6.66 ft below lsd, Oct. 25, 1966; lowest 9.63 ft below lsd, June 11, 1965. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		1966		May 10	8.24	Oct. 25	6.66
Sept. 14	8.12	Jan. 11	7.57	June 14	8.34	Dec. 1	6.74
Oct. 21	7.60	Feb. 8	7.61	July 7	7.88	28	6.74
Nov. 16	7.59	Mar. 14	7.72	Aug. 17	8.24		
Dec. 14	7.47	Apr. 14	8.07	Sept. 28	6.74		

132-49-12daal. Cooperative program. Drilled observation artesian well in gravel. Depth 272 ft, cased to 240 ft with 1¼-in diam plastic pipe, slotted 220-240 ft. MP, top of casing 1.00 ft above lsd. Lsd, 961 ft above msl. Records available 1964-66. July 7, 1966, 1.90.

132-49-12daa2. Cooperative program. Drilled observation artesian well in gravel. Depth 80 ft, cased to 80 ft with 1¼-in diam plastic pipe, perforated 60-80 ft. MP, top of casing 1.7 ft above lsd. Lsd, 961 ft above msl. Records available 1964-66. July 7, 1966, 1.30.

132-50-10bcc. Cooperative program. Drilled observation artesian well in gravel. Depth 242 ft, cased to 220 ft with 1¼-in diam plastic pipe. MP, top of casing 0.9 ft above lsd. Lsd, 990 ft above msl. Records available 1964-66. July 7, 1966, +0.24.

133-47-17ddd. Cooperative program. Drilled artesian well in sand and gravel. Depth 80.3 ft, cased to 80.3 ft with 1¼-in diam plastic pipe, slotted 70-80.3 ft. MP, top of casing 1.6 ft above lsd. Lsd, 964 ft above msl. Highest water level 19.17 ft below lsd, May 9, 1966; lowest 22.02 ft below lsd, Sept. 30, 1964. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		1966		May 9	19.17	Oct. 25	20.31
Sept. 14	20.71	Jan. 10	20.41	June 13	19.25	Dec. 2	20.24
Oct. 21	20.52	Feb. 7	20.17	July 1	19.18	28	19.97
Nov. 16	20.68	Mar. 14	19.69	Aug. 17	20.58		
Dec. 13	20.40	Apr. 14	19.29	Sept. 28	20.20		

133-52-13ccc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 63 ft, cased to 42.6 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 70 sand point. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,070 ft above msl. Records available 1963-66. July 7, 1966, 5.12.

134-51-9bbb. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 60 ft, cased to 50.9 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,061 ft above msl. Records available 1963-66. June 30, 1966, 9.60.

134-51-29ccc. Cooperative program. Drilled water-table well in the Sheyenne Delta aquifer. Depth 41.8 ft, cased to 41.8 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point 40-41.8 ft. MP, top of casing 2.00 ft above lsd. Lsd, 1,062 ft above msl. Highest water level, 1.30 ft below lsd, Aug. 17, 1966; lowest 8.68 ft below lsd, March 31, 1965. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Dec. 14	3.17	Apr. 14	1.85	Oct. 25	2.20
Sept. 13	5.13			May 10	1.52	Nov. 30	3.29
Oct. 13	2.99	1966		June 14	2.00	Dec. 29	5.49
21	3.06	Jan. 11	5.36	30	1.55		
Nov. 9	3.43	Feb. 8	7.76	Aug. 17	1.30		
16	3.50	Mar. 14	5.72	Sept. 28	2.94		

134-52-3ddd. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 50 ft, cased to 49.8 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,063 ft above msl. Records available 1963-66. June 30, 1966, 2.39.

134-52-6ccd. Cooperative program. Drilled water-table well in the Sheyenne Delta aquifer. Depth 38.8 ft, cased to 38.8 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 28-38.8 ft. MP, top of west side of casing 0.65 ft above lsd. Lsd, 1,067.03 ft above msl. Highest water level 1.23 ft below lsd, April 30, 1966; lowest 7.08 ft below lsd, March 31, 1965. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Dec. 30	3.92	Apr. 5	1.64	Sept. 1	2.82
May 24	2.50			10	1.50	5	3.43
June 9	2.08	1966		14	1.48	10	3.85
July 15	3.22	Jan. 5	4.17	20	1.45	15	4.17
Sept. 13	4.73	10	4.84	25	1.43	20	4.43
Oct. 15	3.99	15	5.07	30	1.23	25	4.68
20	3.83	20	5.40	May 1	1.23	27	4.72
25	3.88	25	5.53	5	1.24	30	4.56
31	4.01	31	5.65	10	1.35	Oct. 5	4.72
Nov. 1	4.01	Feb. 1	5.67	15	1.39	10	4.88
5	4.11	5	5.75	20	1.43	15	4.12
10	4.19	10	5.79	23	1.48	20	4.28
15	4.08	15	5.81	25	1.47	22	4.07
20	4.13	20	5.85	June 15	1.95	25	4.18
25	4.20	25	5.95	20	2.04	31	4.34
30	4.28	29	6.03	22	2.10	Nov. 5	4.41
Dec. 1	4.28	Mar. 4	6.04	25	2.04	6	4.32
5	4.14	14	5.38	28	1.79	10	4.49
10	3.90	15	5.33	30	1.80	15	4.64
15	3.55	20	4.23	July 5	1.94	20	4.77
20	3.64	25	3.03	13	2.44	25	4.72
25	3.76	31	2.27	Aug. 17	2.73	30	4.78

134-52-27ccc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 63 ft, cased to 32.1 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,076 ft above msl. Records available 1963-66. June 30, 1966, 3.34.

135-51-4ccc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 83 ft, cased to 67.5 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 57-67.5 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,054 ft above msl. Records available 1963-66. July 1, 1966, 17.94.

135-52-10acal. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 38 ft, cased to 32.8 ft with 4-in diam plastic pipe, perforated 22-32.8 ft. MP, top of casing 2.5 ft above lsd. Lsd, 1,045 ft above msl. Records available 1963-66. June 30, 1966, 8.92.

135-52-10aca2. Cooperative program. Drilled observation artesian well in gravel. Depth 294 ft, cased to 240 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 220-240 ft. MP, top of casing 3.40 ft above lsd. Lsd, 1,045 ft above msl. Records available 1963-66. June 30, 1966, 11.23.

135-52-21ccc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 110 ft, cased to 50 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 8 slot screen 50-52 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,060 ft above msl. Records available 1963-66. June 30, 1966, 4.50.

136-50-19ccc. Cooperative program. Drilled water-table well in the Sheyenne Delta aquifer. Depth 38.5 ft, cased to 38.5 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 18-38.5 ft. MP, top of permanent casing 2.00 ft above lsd. Lsd, 1,035 ft above msl. Highest water level 2.79 ft below lsd, April 14, 1966; lowest 7.12 ft below lsd, April 1, 1965. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Dec. 13	4.44	Mar. 14	4.67	Aug. 17	3.72
July 15	3.82			Apr. 14	2.79	Sept. 28	4.81
Sept. 13	5.55	1966		May 9	2.79	Oct. 25	4.35
Oct. 21	4.52	Jan. 10	5.41	June 13	3.35	Dec. 1	5.28
Nov. 16	4.83	Feb. 7	6.34	July 1	3.43	29	5.93

136-51-28cbc. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 30 ft, cased to 28 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 70 sand point 28-30 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,070 ft above msl. Records available 1963-66. July 1, 1966, 14.16.

136-52-3aaa. Cooperative program. Drilled water-table well in the Sheyenne Delta aquifer. Depth 25.2 ft, cased to 25.2 ft with $1\frac{1}{4}$-in plastic pipe, No. 80 sand point 23-25.2 ft. MP, top of casing 2.00 ft above lsd. Lsd, 1,048 ft above msl. Highest water level 0.11 ft below lsd, May 9, 1966; lowest 5.22 ft below lsd, Mar. 9, 1964. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		1966		May 9	0.11	Oct. 25	3.49
Sept. 13	3.25	Jan. 10	3.31	June 13	1.27	Nov. 30	3.95
Oct. 21	2.36	Feb. 7	4.12	July 1	2.03	Dec. 29	4.40
Nov. 16	2.72	Mar. 15	3.14	Aug. 17	2.48		
Dec. 13	2.50	Apr. 14	0.65	Sept. 27	3.64		

136-52-6bbb. Cooperative program. Drilled observation water-table well in the Sheyenne Delta aquifer. Depth 43 ft, cased to 33.2 ft with $1\frac{1}{4}$-in diam plastic pipe, sand point 31-33.2 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,051 ft above msl. Records available 1963-66. July 1, 1966, 2.39.

136-52-22ddd. Cooperative program. Drilled water-table well in the Sheyenne Delta aquifer. Depth 26.9 ft, cased to 26.9 ft with 4-in diam plastic pipe, slotted 17-26.9 ft. MP, top of casing 0.50 ft above lsd. Lsd, 1,050 ft above msl. Highest water level 4.07 ft below lsd, April 28, 1964; lowest 8.19 ft below lsd, March 31, 1965. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1965		Jan. 15	7.63	May 10	5.83	Oct. 1	6.83
July 15	6.25	20	7.64	14	5.62	5	6.88
Oct. 15	6.93	25	7.65	15	5.69	10	6.95
20	6.96	31	7.65	20	5.88	15	6.92
25	7.01	Feb. 8	7.89	25	5.94	20	6.86
31	7.06	10	7.91	31	6.20	25	6.86
Nov. 1	7.06	15	7.92	June 5	6.34	31	6.93
5	7.10	20	7.97	10	6.03	Nov. 1	6.94
10	7.15	25	8.02	15	6.23	5	6.97
15	7.17	28	8.03	20	6.35	10	7.01
20	7.19	Mar. 5	7.89	23	6.40	15	7.05
25	7.22	15	7.17	25	6.16	20	7.08
30	7.26	20	5.76	30	6.31	25	7.08
Dec. 5	7.28	23	5.31	July 5	6.45	30	7.12
10	7.24	25	5.56	10	6.60		
15	7.20	31	5.66	Sept. 1	6.10		
20	7.30	Apr. 5	5.89	5	6.25		
25	7.35	10	6.03	10	6.42		
31	7.42	15	6.10	15	6.55		
		20	6.05	20	6.66		
1966		25	5.86	25	6.78		
Jan. 11	7.58	30	5.54	30	6.84		

Stutsman County

Stutsman County is in south-central North Dakota and has an area of 2,300 square miles. Water levels are being monitored in one observation well shown on figure 30. Data are not available to determine long-range trends at this time.

Ground water appropriated in Stutsman County to the end of 1966 was 8,433 acre-feet. Ground-water usage in 1966 was reported to be 558 acre-feet.

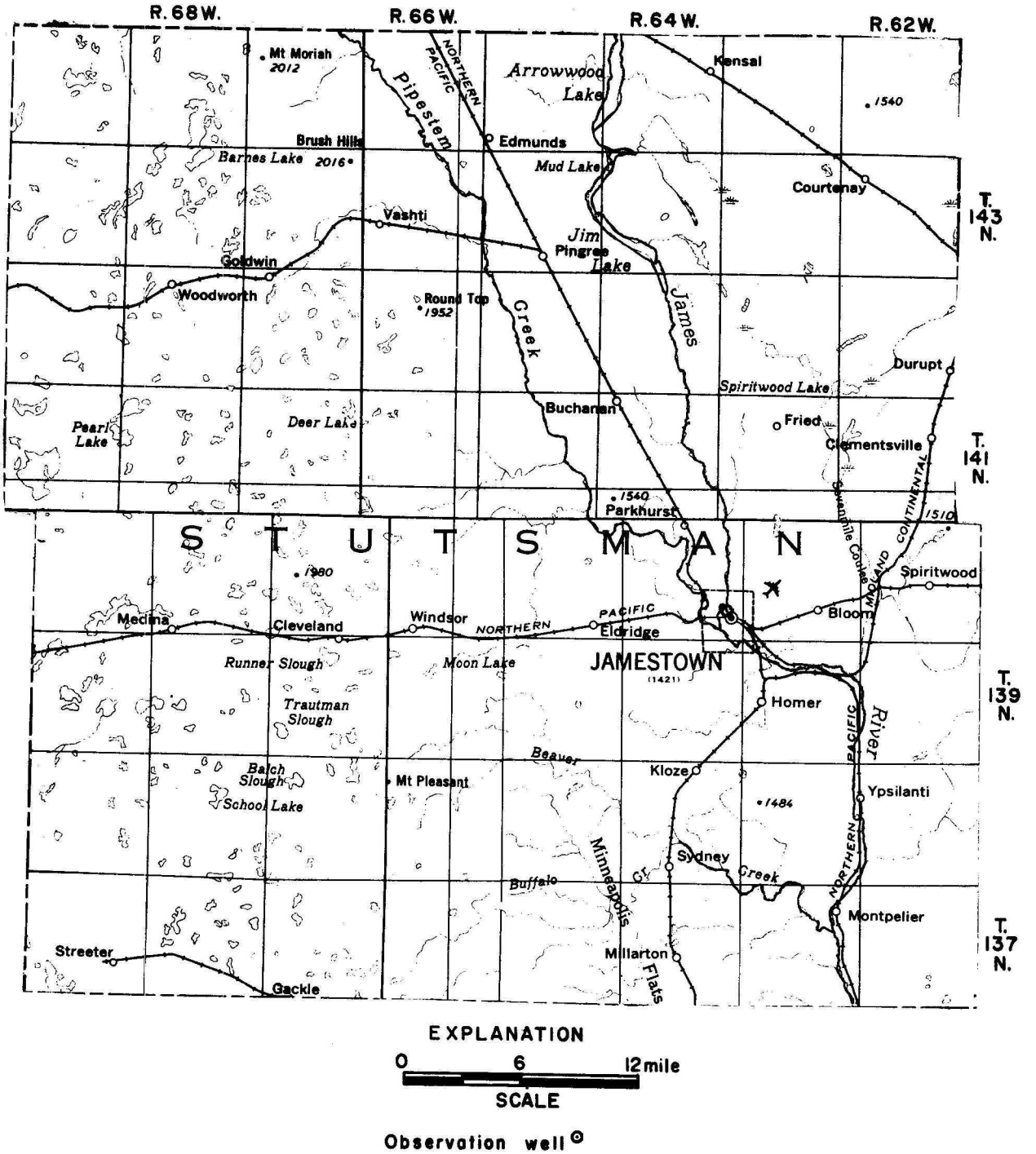


Figure 30.--Location of observation well in Stutsman County.

140-64-25bcc8. City of Jamestown. Dug water-table well in the Jamestown aquifer. Depth 57 ft, cased to 57 ft with 300-in diam concrete casing, open end. MP, top rim of manhole 2.00 ft above lsd. Lsd, 1,395 ft above msl. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1963		Nov. 15	10.75	Mar. 15	10.82	Oct. 24	10.59
Sept. 16	12.04	Dec. 13	10.90	Apr. 15	9.72	Nov. 23	10.78
				May 9	9.59	Dec. 19	10.90
1964		1966					
Aug. 25	11.83	Jan. 10	10.94				
		Feb. 7	10.99				
1965							
Oct. 21	10.71						

Williams County

Williams County is in northwestern North Dakota and has an area of 2,162 square miles. Water levels are being monitored in 35 observation wells shown on figure 31.

The location and extent of aquifers in Williams County are described by Armstrong (1967).

Water-level trends and precipitation shown in figures 32 and 33 indicate that the aquifers respond rapidly to annual precipitation. Most levels are rising to new highs in the water-table and artesian aquifers. There were 3 irrigation wells developed in Williams County during 1966--1 in the Little Muddy aquifer north of Williston, and 2 in the Hofflund aquifer south of Ray (Armstrong, 1967).

Ground water appropriated in Williams County to the end of 1966 was 2,035 acre-feet. Ground-water usage during 1966 was reported to be 631 acre-feet.

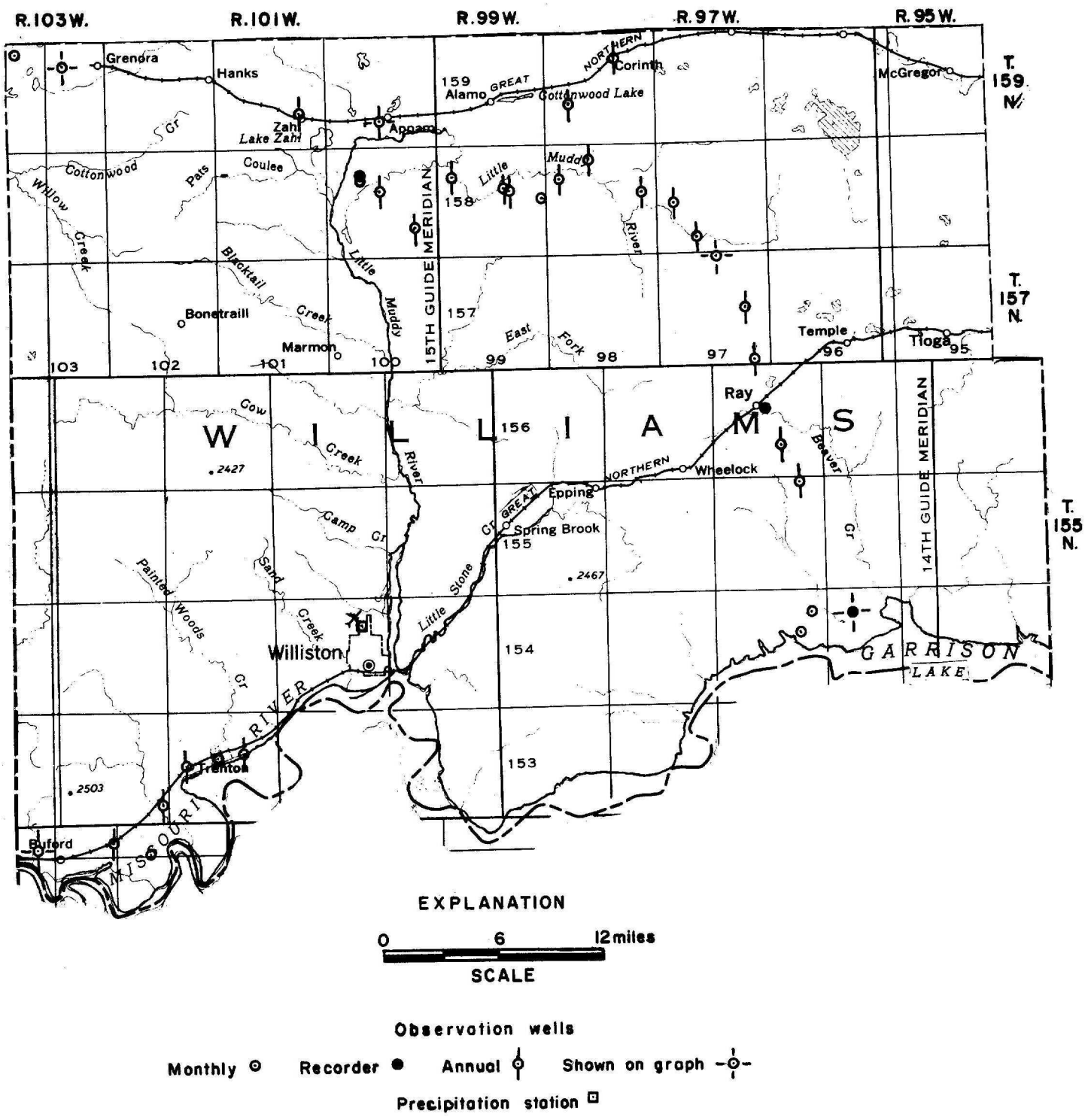


Figure 31.--Location of observation wells in Williams County.

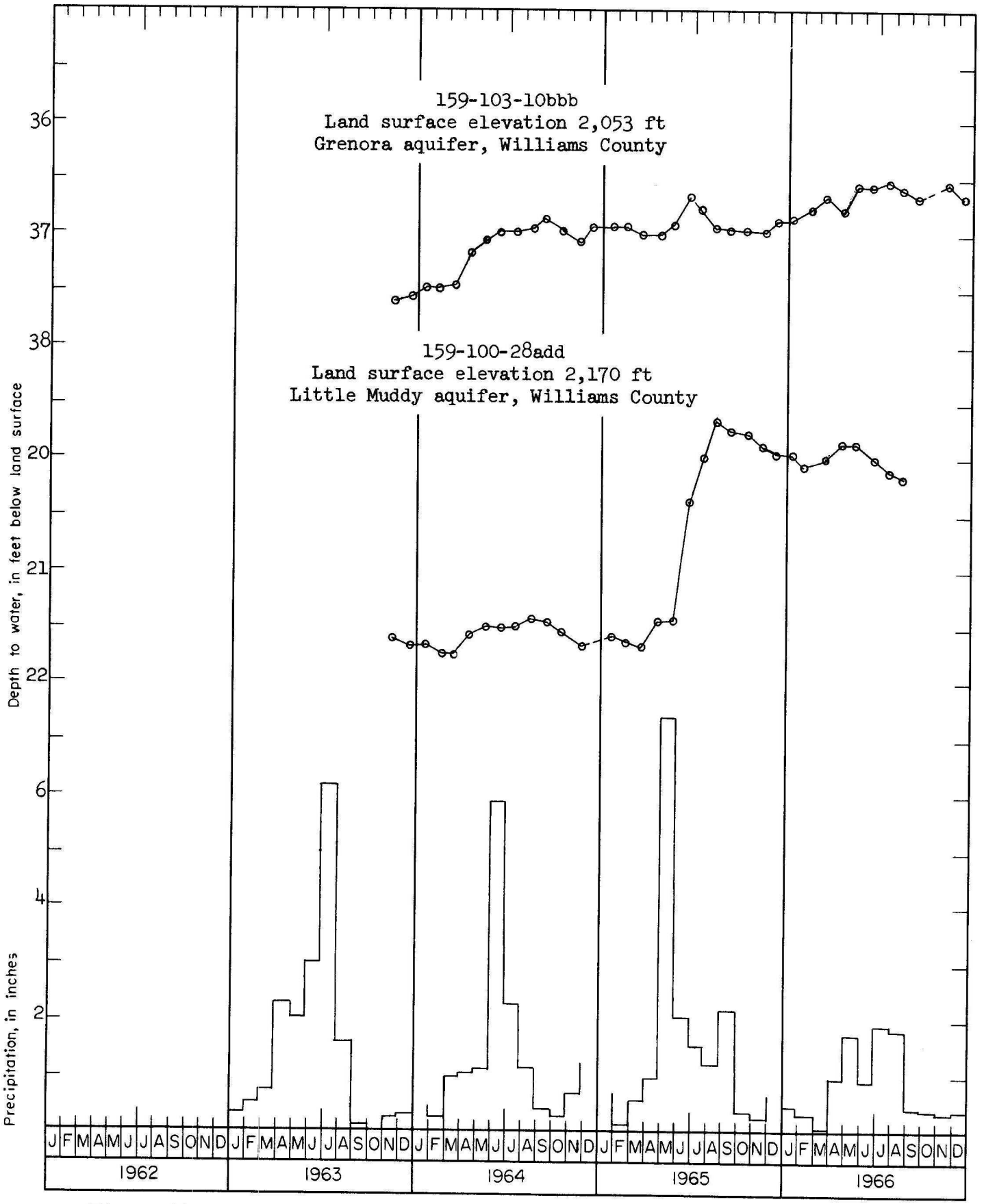


Figure 32.--Water-level trends in the Grenora and Little Muddy aquifers and precipitation at Williston.

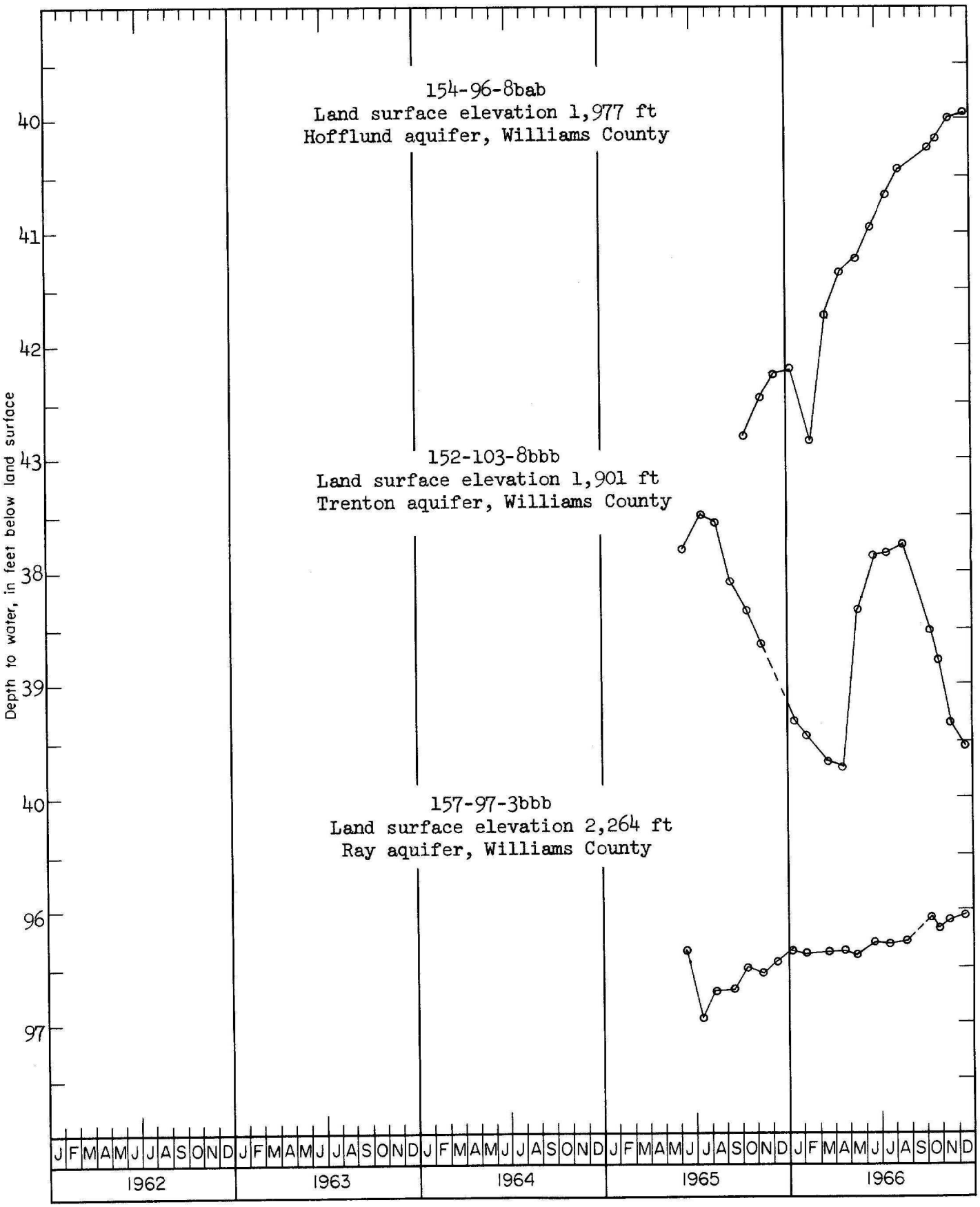


Figure 33.--Water-level trends in the Hofflund, Trenton, and Ray aquifers.

152-103-7ddd. Cooperative program. Drilled observation water-table well in the Trenton aquifer. Depth 199 ft, cased to 151 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 50 slot screen 151-153 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,871 ft above msl. Highest water level 4.06 ft below lsd, June 21, 1966; lowest 7.58 ft below lsd, March 17, 1966. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Aug. 8	4.77	Oct. 17	6.37	Dec. 13	7.28
Aug. 3	4.51	Oct. 6	6.03	Nov. 16	6.99		

152-103-8bbb. Cooperative program. Drilled observation water-table well in the Trenton aquifer. Depth 220 ft, cased to 135 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 125-135 ft, gravel packed. MP, top edge of protective casing 2.00 ft above lsd. Lsd, 1,901 ft above msl. Highest water level 36.69 ft below lsd, March 17, 1966; lowest 39.74 ft below lsd, April 19, 1966. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Aug. 13	37.78	Oct. 17	38.80	Dec. 13	39.56
Aug. 8	38.94	Oct. 6	38.53	Nov. 16	39.36		

152-104-1ddd. Cooperative program. Drilled observation water-table well in the Trenton aquifer. Depth 116 ft, cased to 76 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 66-76 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,940 ft above msl. Records available 1965-66. Aug. 3, 1966, 66.42; Aug. 8, 1966, 66.52.

153-102-13ddd. Cooperative program. Drilled observation water-table well in the Trenton aquifer. Depth 19 ft, cased to 19 ft with $1\frac{1}{2}$-in diam steel pipe. MP, top of casing cover 0.95 ft above lsd. Lsd, 1,853 ft above msl. Records available 1953-56, 1964-66. Aug. 3, 1966, 6.45; Aug. 8, 1966, 6.52.

153-102-16ddd. Corps of Engineers. Drilled observation water-table well. Depth 21 ft, cased to 21 ft with $1\frac{1}{4}$-in diam steel pipe. MP, top of cap 1.20 ft above lsd. Lsd, 1,856.17 ft above msl. Highest water level 0.93 ft below lsd, Oct. 5, 1966; lowest 11.23 ft below lsd, Mar. 18, 1953. Records available 1953-56, 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Aug. 8	2.92	Oct. 17	8.99	Dec. 13	9.05
Aug. 3	3.60	Oct. 5	0.93	Nov. 16	9.01		

153-102-17ccc. Cooperative program. Drilled observation water-table well in the Trenton aquifer. Depth 94 ft, cased to 75 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 67-75 ft, gravel packed. MP, top of casing 0.80 ft above lsd. Lsd, 1,900 ft above msl. Records available 1965-66. Aug. 3, 1966, 49.49; Aug. 8, 1966, 49.57.

153-103-25dad. Cooperative program. Drilled observation artesian well in the Trenton aquifer. Depth 116 ft, cased to 73 ft with $1\frac{1}{4}$-in diam plastic pipe. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,895 ft above msl. Records available 1965-66. Aug. 3, 1966, 32.69; Aug. 8, 1966, 32.76.

154-96-8bab. Cooperative program. Drilled observation water-table well in the Hofflund aquifer. Depth 120 ft, cased to 67 ft with 4-in diam plastic pipe, slotted 47-67 ft. MP, top edge of casing 1.70 ft above lsd. Lsd, 1,977 ft above msl. Highest water level 39.93 ft below lsd, Dec. 12, 1966; lowest 43.79 ft below lsd, Oct. 4, 1966. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Oct. 6	40.21	Nov. 15	39.99	Dec. 12	39.93
Aug. 9	40.45	18	40.17				

154-97-12bbb. Cooperative program. Drilled observation well in the Hofflund aquifer. Depth 120 ft, cased to 100 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 18 slot sand point 100-102 ft. MP, top edge of protective casing 2.00 ft above lsd. Lsd, 1,903 ft above msl. Highest water level 60.52 ft below lsd, Aug. 9, 1966; lowest 63.24 ft below lsd, Oct. 4, 1965. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Oct. 6	60.60	Nov. 16	60.53	Dec. 13	60.55
Aug. 9	60.52	18	60.75				

154-97-14acb. Cooperative program. Drilled observation artesian well in the Hofflund aquifer. Depth 147 ft, cased to 128 ft with 1¼-in diam plastic pipe, slotted 113-128 ft, gravel packed. MP, top edge of protective casing 2.00 ft above lsd. Lsd, 1,899 ft above msl. Records available 1966.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Oct. 5	60.60	Nov. 16	61.33	Dec. 13	61.80
Aug. 9	59.86	18	61.04				

155-97-2aaa. Cooperative program. Drilled observation water-table well in the Ray aquifer. Depth 126 ft, cased to 108 ft with 1¼-in diam plastic pipe, slotted 87-108 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,190 ft above msl. Records available 1965-66. Aug. 4, 1966, 65.53; Aug. 9, 1966, 65.56.

156-97-16aaa. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 200 ft, cased to 182 ft with 4-in diam steel pipe, slotted 162-182 ft. MP, top edge of casing 0.60 ft above lsd. Lsd, 2,274 ft above msl. Records available 1966.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Oct. 10	115.33	Oct. 25	115.60	Nov. 15	115.42
Aug. 5	115.58	15	115.85	31	116.01	Dec. 15	115.37
Oct. 5	115.26	20	115.62	Nov. 5	115.51		

156-97-27aaa. Cooperative program. Drilled observation water-table well in the Ray aquifer. Depth 178 ft, cased to 155 ft with 3-in diam plastic pipe, slotted 78-98 ft and 138-155 ft. MP, top of casing 1.70 ft above lsd. Lsd, 2,255 ft above msl. Records available 1964-66. Aug. 4, 1966, 109.92; Aug. 9, 1966, 110.00.

157-97-3bbb. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 199 ft, cased to 199 ft with 1¼-in diam plastic pipe, slotted 180-199 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,264 ft abcve msl. Highest water level 96.01 ft below lsd, Dec. 13, 1966; lowest 96.94 ft below lsd, July 14, 1966. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Aug. 10	96.27	Oct. 18	96.14	Dec. 13	96.01
Aug. 4	96.28	Oct. 5	96.06	Nov. 16	96.06		

157-97-14ccc. Cooperative program. Drilled observation water-table well in the Ray aquifer. Depth 240 ft, cased to 218 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 178-218 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,308 ft above msl. Records available 1965-66. Aug. 4, 1966, 142.83; Aug. 10, 1966, 142.85.

157-97-36ccc. Cooperative program. Drilled observation water-table well in the Ray aquifer. Depth 252 ft, cased to 217 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 177-217 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,303 ft above msl. Records available 1965-66. Aug. 4, 1966, 132.24; Aug. 9, 132.29.

158-97-19aaa. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 200 ft, cased to 178 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 148-178 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,235 ft above msl. Records available 1965-66. Aug. 4, 1966, 76.01.

158-97-33bbb. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 220 ft, cased to 198 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 178-198 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,235 ft above msl. Records available 1965-66. Aug. 4, 1966, 69.72; Aug. 10, 1966, 69.72.

158-98-4ccc. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 160 ft, cased to 138 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 128-138 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,182 ft above msl. Records available 1965-66. Aug. 4, 1966, 64.90, Aug. 10, 1966, 64.96.

158-98-7ddd. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 304 ft, cased to 276 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 18 slot sand point 276-278 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,226 ft above msl. Records available 1965-66. Aug. 4, 1966, 120.77; Aug. 11, 1966, 120.73.

158-98-13ccb. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 260 ft, cased to 217 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 197-217 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,208 ft above msl. Records available 1965-66. Aug. 4, 1966, 56.16; Aug. 10, 1966, 56.30.

158-99-7ddd. Cooperative program. Drilled observation water-table well in the Ray aquifer. Depth 199 ft, cased to 178 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 15 slot screen 178-180 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,089 ft above msl. Records available 1965-66. Aug. 4, 1966, 75.68; Aug. 11, 1966, 75.59.

158-99-13ddd. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 294 ft, cased to 255 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 18 slot sand point 255-257 ft. MP, top edge of protective casing 2.00 ft above lsd. Lsd, 2,243 ft above msl. Highest water level 145.57 ft below lsd, Oct. 5, 1966; lowest 146.09 ft below lsd, Nov. 8, 1966. Records available 1965-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Aug. 11	145.62	Oct. 18	144.69	Dec. 13	145.58
Aug. 4	145.65	Oct. 5	145.57	Nov. 16	145.64		

158-99-15aaal. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 210 ft, cased to 187 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 18 slot screen 187-189 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,119 ft above msl. Records available 1965-66. Aug. 4, 1966, 50.12; Aug. 11, 1966, 50.30.

158-99-15aaa2. Cooperative program. Drilled observation artesian well in the Ray aquifer. Depth 160 ft, cased to 126 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 21 slot sand point 126-128 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,118 ft above msl. Records available 1965-66. Aug. 4, 1966, 49.59; Aug. 11, 1966, 49.65.

158-100-8daal. Cooperative program. Drilled observation artesian well in the Little Muddy aquifer. Depth 189 ft, cased to 157 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 142-157 ft. MP, top edge of protective casing 2.00 ft above lsd. Lsd, 1,998 ft above msl. Records available 1966.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		July 16	21.22	Oct. 5	22.33	Nov. 15	22.38
June 21	21.97	Aug. 11	22.30	18	22.14	Dec. 13	22.45

158-100-8daa2. Cooperative program. Drilled observation artesian well in the Little Muddy aquifer. Depth 94 ft, cased to 78 ft with 4-in diam plastic pipe, slotted 68-78 ft. MP, top of casing 1.43 ft above lsd. Lsd, 1,998 ft above msl. Records available 1966.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Sept. 5	26.85	Nov. 5	26.42	Dec. 10	26.62
June 21	21.97	Oct. 5	26.38	10	26.46	15	26.54
July 16	21.22	10	26.42	15	26.41	20	26.52
Aug. 11	26.21	15	26.43	20	26.43	25	26.49
15	26.60	20	26.42	25	26.40	31	26.49
20	26.40	25	26.45	30	26.50		
25	26.75	31	26.59	Dec. 5	26.45		

158-100-17ada. Cooperative program. Drilled observation artesian well in the Little Muddy aquifer. Depth 52 ft, cased to 43 ft with $1\frac{1}{4}$-in diam plastic pipe, perforated 35-43 ft. MP, top of casing at lsd. Lsd, 1,987 ft above msl. Records available 1966. Aug. 11, 1966, 19.51.

158-100-26aaa. Cooperative program. Drilled observation water-table well in the Ray aquifer. Depth 157 ft, cased to 128 ft with $1\frac{1}{4}$-in diam plastic pipe, No. 15 slot screen 128-130 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,137 ft above msl. Records available 1965-66. Aug. 4, 1966, 119.15; Aug. 11, 1966, 119.13.

159-98-10aad. Cooperative program. Drilled observation artesian well in sand and gravel. Depth 260 ft, cased to 214 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 200-214 ft, open end. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,230 ft above msl. Records available 1965-66. Aug. 4, 1966, 153.72; Aug. 10, 1966, 153.73.

159-98-20cbb. Cooperative program. Drilled observation water-table well in sand and gravel. Depth 74 ft, cased to 72 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 52-72 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,170 ft above msl. Records available 1965-66. Aug. 4, 1966, 51.87; Aug. 10, 1966, 52.73.

159-100-28add. Cooperative program. Drilled observation water-table well in the Little Muddy aquifer. Depth 375 ft, cased to 98 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 88-98 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,170 ft above msl. Records available 1963-66. Aug. 4, 1966, 20.16; Aug. 10, 1966, 20.19.

159-101-26abc. Cooperative program. Drilled observation water-table well in the Little Muddy aquifer. Depth 215 ft, cased to 49 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 42-49 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 1,997 ft above msl. Records available 1963-66. Aug. 4, 1966, 15.40; Aug. 10, 1966, 15.45.

159-103-6ddd. Cooperative program. Drilled observation artesian well in the Grenora aquifer. Depth 346 ft, cased to 159 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 139-159 ft. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,000 ft above msl. Highest water level 23.62 ft below lsd, Mar. 16, 1966; lowest 24.80 ft below lsd, Nov. 18, 1966. Records available 1964-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Aug. 10	24.13	Oct. 18	24.26	Dec. 13	24.18
Aug. 4	24.07	Oct. 5	24.19	Nov. 15	24.23		

159-103-10bbb. Cooperative program. Drilled observation artesian well in the Grenora aquifer. Depth 249 ft, cased to 249 ft with $1\frac{1}{4}$-in diam plastic pipe, slotted 229-249 ft, gravel packed. MP, top of protective casing 2.00 ft above lsd. Lsd, 2,053 ft above msl. Highest water level 36.51 ft below lsd, July 16, 1966; lowest 37.69 ft below lsd, Nov. 12, 1963. Records available 1963-66.

Date	Water level	Date	Water level	Date	Water level	Date	Water level
1966		Aug. 10	36.58	Oct. 18	36.64	Dec. 13	36.63
Aug. 4	36.58	Oct. 5	36.56	Nov. 16	36.52		