WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN NEBRASKA, FISCAL YEARS 1990-91

Compiled by Daniel J. Fitzpatrick and Jean E. McKinney

U.S. GEOLOGICAL SURVEY

Open-File Report 92-633

Lincoln, Nebraska
1992

DEPARTMENT OF THE INTERIOR

MANUEL LUJAN, JR., Secretary

U. S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

For information on the water programs in Nebraska, write to:

District Chief
U. S. Geological Survey
406 Federal Building
100 Centennial Mall, North
Lincoln, NE 68508

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Denver, CO 80225-0425

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CONVERSION FACTORS

Multiply	By	To obtain
inch	25.4	millimeter
mile	1.609	kilometer
square mile	2.590	square kilometer
acre-foot	1,233	cubic meter

MESSAGE FROM THE DISTRICT CHIEF

The U.S. Geological Survey (USGS) has been involved in the collection and interpretation of hydrologic information in Nebraska for more than 100 years and has published numerous reports and papers documenting the results of this effort. Some of these activities have been funded by direct allocations from Congress to address issues of National concern, but most of the program through the years has been funded through the Federal-State cooperative program with State and local cooperators in Nebraska. It is this ongoing cooperation with State and local agencies on water issues of mutual concern and interest to all that continues to enhance the program of the USGS in Nebraska and to provide important hydrologic data for State, local, and National needs. Another significant contribution to our program in Nebraska is the collection and interpretation of hydrologic data in support of other Federal agencies (OFA). The coordination of hydrologic activities with OFA's increases efficiency at the Federal level and stretches decreasing resources that result from a shrinking Federal budget.

In 1991, the USGS implemented a full-scale National Water-Quality Assessment (NAWQA) program. The long-term goals of the NAWQA program are to describe the status and trends in the quality of a large, representative part of the Nation's surface- and ground-water resources and to provide a sound, scientific understanding of the primary human and natural factors affecting the quality of these resources. The Central Nebraska Basins NAWQA is underway as one of the first 20 study units selected for full implementation.

Quality has been a priority with the USGS since the agency was created, and Nebraska District personnel continually strive to assure that the agency's high standards are maintained in everything we do. In order to carry out our mission effectively, we need and encourage feedback from everyone we serve so we can do our job even better.

In the pages that follow, you will have an opportunity to review some brief descriptions of specific projects that were in progress during fiscal years 1990 and 1991. If you need additional information on any of these programs or on any issue relating to water resources in Nebraska, please give me a call at (402)437-5082.

Michael V. Shulters
District Chief
USGS
Lincoln, Nebraska

WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN NEBRASKA, FISCAL YEAR 1990-91

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ABSTRACT

Water-resources activities of the U.S. Geological Survey in Nebraska consist principally of hydrologic-data collection and local, areal, or statewide interpretive studies. Hydrologic studies in Nebraska are conducted through three basic programs: (1) hydrologic data collection, (2) local or areal hydrologic investigations, and (3) statewide or regional studies. These programs are funded by cooperative agreements with State and local agencies, transfer of funds from other Federal agencies, and direct Federal funds. The data and results of the investigations are published or released either by the U.S. Geological Survey or by cooperating agencies. This report describes the hydrologic data-collection programs and local or areal hydrologic investigations in Nebraska during fiscal years 1990 and 1991 and provides a list of reports published by the Nebraska District during 1985-91.

U.S. GEOLOGICAL SURVEY ORIGIN AND MISSION

The U.S. Geological Survey was established by an act of Congress on March 3, 1879, to provide a permanent Federal agency to conduct the systematic and scientific "classification of the public lands, and examination of the geological structure, mineral resources, and products of national domain." An integral part of that original mission includes publishing and disseminating the Earth-science information needed to understand, to plan the use of, and to manage the Nation's energy, land, mineral, and water resources.

Since 1879, the research and fact-finding role of the U.S. Geological Survey has increased and been modified to meet the changing needs of the Nation it serves. Today's programs serve a diversity of needs and users. These programs include:

* Conducting detailed assessments of the energy and mineral potential of the Nation's land and offshore areas.
* Investigating and issuing warnings of earthquakes, volcanic eruptions, landslides, and other geologic and hydrologic hazards.
* Conducting research on the geologic structure of the Nation.
* Studying the geologic features, structure, processes, and history of the other planets of our solar system.
* Conducting topographic surveys of the Nation and preparing topographic and thematic maps and related cartographic products.
* Developing and producing digital cartographic data bases and products.

* Collecting data on a routine basis to determine the quantity, quality, and use of surface and ground water.
* Conducting water-resource appraisals in order to describe the consequences of alternative plans for developing land and water resources.
* Conducting research in hydraulics and hydrology, and coordinating all Federal water-data acquisition.
* Using remotely sensed data to develop new cartographic, geologic, and hydrologic research techniques for natural resources planning and management.
* Providing Earth-science information through an extensive publications program and a network of public access points.

Along with its continuing commitment to meet the growing and changing Earth-science needs of the Nation, the U.S. Geological Survey remains dedicated to its original mission to collect, analyze, interpret, publish, and disseminate information about the natural resources of the Nation--providing "Earth Science in the Public Service."

WATER RESOURCES DIVISION MISSION AND PROGRAM

The mission of the Water Resources Division is to provide the hydrologic information and understanding needed for the optimum utilization and management of the Nation's water resources for the overall benefit of the people of the United States.

This is accomplished, in large part, through cooperation with other Federal and non-Federal agencies, by:

* Collecting, on a systematic basis, data needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources.
* Conducting analytical and interpretive water-resource appraisals describing the occurrence, availability, and the physical, chemical, and biological characteristics of surface and ground water. Disseminating the water data and the results of these investigations and research through reports, maps, computerized information services, and other forms of public releases.
* Coordinating the activities of Federal agencies in the acquisition of water data for streams, lakes, reservoirs, estuaries, and ground water.
* Providing scientific and technical assistance in hydrologic fields to other Federal, State, and local agencies, to licensees of the Federal Energy Regulatory Commission, and to international agencies on behalf of the Department of State.

NEBRASKA DISTRICT ORGANIZATION

The Nebraska District Office of the U.S. Geological Survey, Water Resources Division, under the direction of Michael V. Shulters, is headquartered in Lincoln, Nebraska. The District Office consists of four sections: Computer Services, Hydrologic Investigations, Hydrologic Data and Quality Assurance, and Administrative Services (fig. 1). Field headquarters for the Hydrologic Data and Quality Assurance Section are located in Bridgeport, Cambridge, Lincoln, Norfolk, and Ord, Nebraska.

The Computer Services Section manages and maintains the District's computer system and coordinates processing, storage, and retrieval of data for the District and National computer files. The Section helps design, implement, and maintain the computer software necessary for District operation.

The Hydrologic Investigations Section conducts both problem-oriented and resource-appraisal studies within the State and prepares reports for publication on the results of the studies. These studies analyze and interpret hydrologic and geologic systems and their relations to availability, quantity, quality, and use of water.

The Hydrologic Data and Quality Assurance Section designs, constructs, operates, and maintains all hydrologic-data networks in the State. The Section manages the collection and analysis of the hydrologic data for the State network, processes and reviews data for publication, prepares water-resources data for the annual water-data report, and provides quality control of results for field and office methods.

The Administrative Services Section is responsible for financial management, personnel, payroll, procurement, equipment maintenance, and other administrative duties of the District.

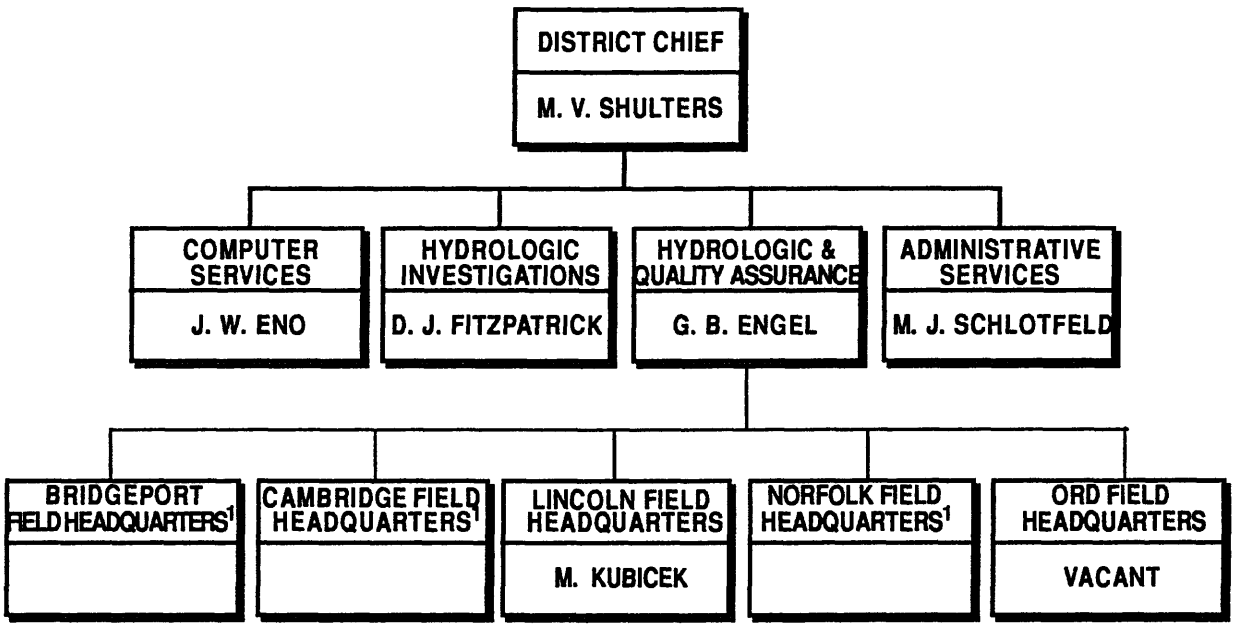


Figure 1. -- Nebraska District organization.

1. These offices are staffed by Nebraska Department of Water Resources personnel as part of the Federal-State cooperative program operating under the direction of the Chief, Hydrologic Data and Quality Assurance Section, District Office, Lincoln, Nebraska.

Inquiries regarding projects described in this report may be directed to the District Office. Addresses for the District Office and field headquarters are listed below. The field headquarters at Bridgeport, Cambridge, and Norfolk, Nebraska, are staffed by personnel from the Nebraska Department of Water Resources as part of the Federal/State cooperative program operated under the direction of the Chief, Hydrologic Data and Quality Assurance Section of the District Office in Lincoln.

District Office
Room 406, Federal Building
100 Centennial Mall, North
Lincoln, NE 68508
(402)437-5082

Field Headquarters
700 West Benjamin Ave.
Norfolk, NE 68701
(402)379-2750

Field Headquarters
Room 406, Federal Building
100 Centennial Mall, North
Lincoln, NE 68508
(402)437-5114

Field Headquarters
Hwy. 11, North
Ord, NE 68862
(308)728-5601

Field Headquarters
315 Nelson Street
Cambridge, NE 69022
(308)697-3730

Field Headquarters
729 Main Street
Bridgeport, NE 69336
(308)262-0856

NEBRASKA DISTRICT FUNDING

Programs of the Water Resources Division in Nebraska are funded as follows: (1) The Federal program, where funds are appropriated annually by Congress to the Geological Survey; (2) the Federal-State cooperative program, where the Water Resources Division represents National interest, the cooperating agencies represent State and local interest, and the funding generally is shared equally; (3) other Federal agencies (OFA program), where funding is received from the Federal agencies that request the work. Distribution of funding for program operation during fiscal year 1991 is shown in figure 2.

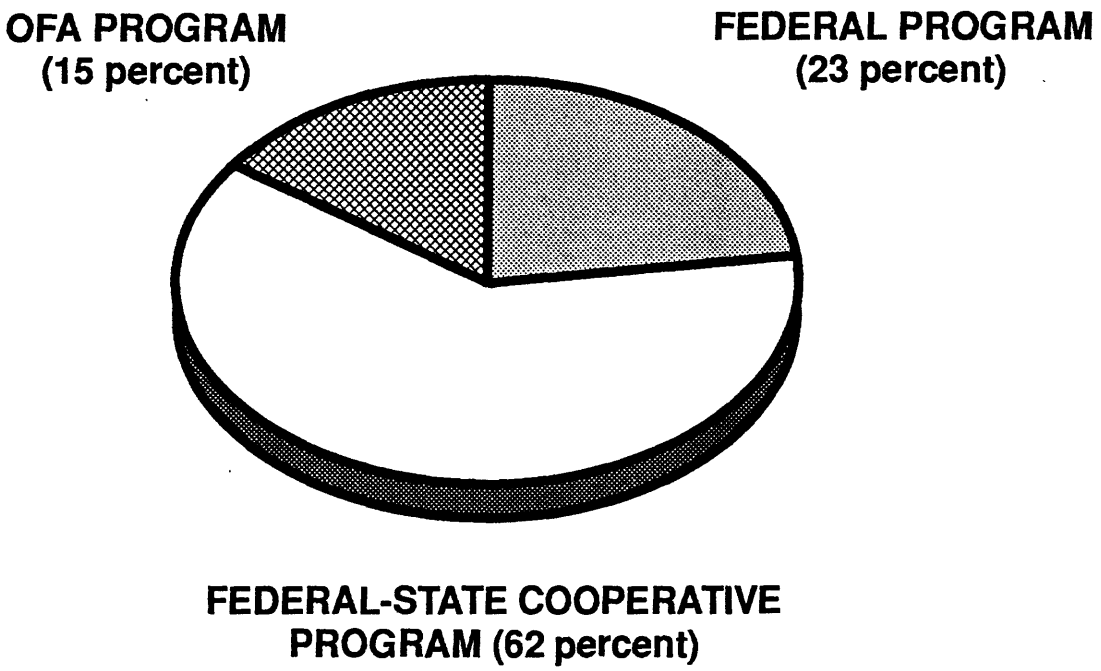


Figure 2. -- Distribution of funding, fiscal year 1991.

COOPERATING AGENCIES

Most of the Nebraska District programs are carried out by joint-funding agreements with State, local, or other Federal agencies. During fiscal year 1991, the following agencies contributed funds and/or services to cooperative programs with the Nebraska District:

* Kansas-Nebraska Big Blue River Compact Administration
* Nebraska Department of Environmental Control
* Nebraska Department of Roads
* Nebraska Department of Water Resources
* Nebraska Natural Resources Commission
* Nebraska Natural Resources Districts (NRD's):
  Central Platte, Little Blue, Lower Loup, Lower Platte North, Lower Platte South, Lower Republican, Middle Niobrara, Middle Republican, Nemaha, North Platte, Papio-Missouri River, South Platte, Twin Platte, Upper Elkhorn, Upper Loup, Upper Niobrara-White, Upper Republican
* University of Nebraska-Lincoln, Conservation and Survey Division
* City of Lincoln
* Santee-Sioux Tribal Office
* U.S. Army Corps of Engineers
* U.S. Bureau of Indian Affairs
* U.S. Bureau of Reclamation
* U.S. Environmental Protection Agency

WATER CONDITIONS AND RESOURCES

An abundant supply of water is available in Nebraska for most uses, although quantity varies areally, as well as seasonally and annually. Rainfall is extremely variable across the State, ranging from about 14 inches in the west to about 35 inches in the southeast. Runoff, too, is extremely variable, with annual amounts ranging from about 0.5 inch in the west and southwest to about 6 inches in the southeast (U.S. Geological Survey, 1986). A large percentage of the annual runoff occurs from snowmelt in the spring or thunderstorms in the spring and early summer.

Agriculture is the major industry in Nebraska, and irrigation constitutes the major use of both surface water and ground water in the State. Surface water for irrigation is obtained from reservoirs, canal systems, and directly from stream channels. Ground water is pumped from more than 74,000 wells to irrigate nearly 6 million acres (Steele and Wigley, 1991). Ground-water development for irrigation has caused declining water levels in some areas of the State.

Water in the principal aquifers in Nebraska generally is suitable for most uses; however, contamination, principally from agricultural activities, has occurred in some areas. Large increases in the use of fertilizers and pesticides have accompanied irrigation development and have provided the potential for widespread nitrate and pesticide contamination of shallow ground water. Concentrations of nitrate as nitrogen exceed the U.S. Environmental Protection Agency Drinking-Water Regulation of 10 milligrams per liter in several areas of the State, with the most extensive of these located within the Platte River valley (Exner and Spalding, 1990). Pesticides also are found in the ground water in many areas of the State.

NATIONAL HYDROLOGIC-DATA NETWORKS AND PROGRAMS

A significant amount of stream water-quality data is collected in Nebraska as part of the National Stream Quality Accounting Network (NASQAN). NASQAN is a data-collection effort for obtaining consistent regional and nationwide overviews of the quality of streams. The primary objectives of the network are: (1) To account for the quantity and quality of water moving within and from major river basins in the United States; (2) to depict areal variability; (3) to detect changes in stream quality; and (4) to provide data for future assessments of changes in stream quality. Seven NASQAN stations are included in the Nebraska District's hydrologic data-collection program.

The National Water-Use Information Program of the U.S. Geological Survey is a Federal-State cooperative program designed to collect, store, and disseminate water-use information both nationally and locally. The program was begun during 1978 to meet the need for a single source of uniform information on water use. Information on the National Water-Use Program and its data bases can be obtained from:

National Water-Use Information Program
U.S. Geological Survey
440 National Center
Reston, VA 22092

As part of the U.S. Geological Survey's program of releasing water data to the public, a large-scale computerized system is used for the storage and retrieval of water data. U.S. Geological Survey water-resources data are maintained on the National Water Data Storage and Retrieval System (WATSTORE) at the central computer facilities in Reston, Virginia. In addition, much of this data is stored and available on District minicomputer files using a distributed information system (DIS). The DIS configuration provides easy dissemination and access of data that pertain to a given state. These data are available for water planning and management in machine-readable form, computer-printed tables or graphs, statistical tabulations, and digital plots. Information about the availability of specific types of data, the acquisition of data or products, and user charges can be obtained from the District Office in Lincoln.

NEBRASKA DISTRICT HYDROLOGIC DATA-COLLECTION PROGRAMS

Hydrologic data-collection stations are maintained by the U.S. Geological Survey throughout Nebraska to obtain records of stream discharge or stage, lake and reservoir storage, ground-water levels, and quality of surface and ground water. On October 1, 1989, there were 147 continuous-record stations in operation, which included 5 lake stations. Records of physical, chemical, micro-biological, or radiochemical quality of water were obtained from 27 stream sites and 126 wells. Table 1 lists current surface-water gaging stations, in downstream order, and type of data collected at each station. The location of active surface-water gaging stations is shown in figure 3, and the location of active surface-water-quality stations is shown in figure 4.

Ground-water levels are measured routinely in a network of selected observation wells in Nebraska (see listing in table 2). These data are intended to provide a sampling and historical record of water-level changes in the most important aquifers. The location of the selected observation wells in this network is shown in figure 5. Besides this network of selected observation wells, ground-water levels are obtained through cooperative efforts of many Federal, State, and local agencies for several thousand observation wells throughout Nebraska, and these data are placed in computer storage. Each year the Nebraska District and the Conservation and Survey Division of the University of Nebraska publish a report for the previous calendar year entitled "Groundwater Levels in Nebraska, 19__." This report contains hydrographs of recorder wells, and detailed maps showing changes in water levels from the previous year. Hydrologic data collected in Nebraska are published annually in a report entitled "Water Resources Data, Nebraska, Water Year 19__" (the water year is from October 1 to September 30 of the following year). These reports are available for inspection at the U.S. Geological Survey in Lincoln, Nebraska, or may be purchased from the U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161.

Table 1.-- Surface-water gaging stations, in downstream order, and type of data collected
[Type of data: D, discharge; E, elevation or contents; C, chemical; M, microbiological; S, sediment; T, temperature]

Station number	Station Name	Type of data
06444000	White River at Crawford	D
06453500	Ponca Creek at Anoka	D
06453600	Ponca Creek at Verdel	D
06454000	Niobrara River at Wyoming-Nebraska State line	D
06454100	Niobrara River at Agate	D
06454500	Niobrara River above Box Butte Reservoir	D
65455000	Box Butte Reservoir near Hemingford	E
06455500	Niobrara River below Box Butte Reservoir	D
06457500	Niobrara River near Gordon	D
06459175	Snake River at Doughboy	D
06459300	Merritt Reservoir near Burge	E
06459500	Snake River near Burge	D
06461000	Minnechaduza Creek at Valentine	D
06461500	Niobrara River near Sparks	DCT
06462500	Plum Creek at Meadville	D
06463080	Long Pine Creek near Long Pine	D
06463500	Long Pine Creek near Riverview	DC
06463720	Niobrara River near Mariaville	DC
06464900	Keya Paha River near Naper	D
06465000	Niobrara River near Spencer	D
06465300	Eagle Creek near Redbird	DC
06465400	Redbird Creek at Redbird	D
06465500	Niobrara River near Verdel	DCMS
06465600	North Branch Verdigre Creek near Verdigre	D
06466500	Bazile Creek near Niobrara	D
06478500	Bow Creek near St. James	D
06601000	Omaha Creek at Homer	D
06677500	Horse Creek near Lyman	D
06678000	Sheep Creek near Morrill	D
06679500	North Platte River at Mitchell	D
06681500	Gering drain near Gering	D
06682000	North Platte River near Minatare	D
06684500	North Platte River at Bridgeport	D
06685000	Pumpkin Creek near Bridgeport	D

Table 1.-- Surface-water gaging stations, in downstream order, and type of data collected--Continued
[Type of data: D, discharge; E, elevation or contents; C, chemical; M, microbiological; S, sediment; T, temperature]

Station number	Station Name	Type of data
06686000	North Platte River at Lisco	DCMS
06687000	Blue Creek near Lewellen	D
06687500	North Platte River at Lewellen	D
06690000	Lake McConaughy near Keystone	E
06690500	North Platte River near Keystone	D
06691000	North Platte River near Sutherland	D
06692000	Birdwood Creek near Hershey	D
06693000	North Platte River at North Platte	D
06762500	Lodgepole Creek at Bushnell	D
06764500	South Platte River at Roscoe	D
06765500	South Platte River at North Platte	D
06766000	Platte River at Brady	D
06766500	Platte River near Cozad	D
06768000	Platte River near Overton	DCMT
06770000	Platte River near Odessa	D
06770200	Platte River near Kearney	D
06770500	Platte River near Grand Island	DCM
06771500	Wood River near Gibbon	D
06772000	Wood River near Alda	D
06773050	Prairie Creek near Ovina	D
06773150	Silver Creek at Ovina	D
06774000	Platte River near Duncan	DCMS
06775500	Middle Loup River at Dunning	D
06775900	Dismal River near Thedford	DCMS
06776500	Dismal River at Dunning	D
06779000	Middle Loup River at Arcadia	D
06783500	Mud Creek near Sweetwater	D
06784000	South Loup River at St. Michael	DC
06784200	Sherman Reservoir near Loup City	E
06784800	Turkey Creek near Dannebrog	D
06785000	Middle Loup River at St. Paul	DC
06786000	North Loup River at Taylor	D
06787000	Calamus River near Harrop	D
06787300	Calamus Reservoir near Burwell	E
06787500	Calamus River near Burwell	D

Table 1.-- Surface-water gaging stations, in downstream order, and type of data collected--Continued
[Type of data: D, discharge; E, elevation or contents; C, chemical; M, microbiological; S, sediment; T, temperature]

Station number	Station Name	Type of data
06788500	North Loup River at Ord	D
06788988	Mira Creek near North Loup	D
06790500	North Loup River near St. Paul	DC
06791500	Cedar River near Spalding	D
06792000	Cedar River near Fullerton	DCMS
06792500	Loup River power canal near Genoa	D
06793000	Loup River near Genoa	D
06793500	Beaver Creek at Loretto	D
06794000	Beaver Creek at Genoa	D
06795500	Shell Creek near Columbus	D
06796000	Platte River at North Bend	D
06796973	Elkhorn River near Atkinson	D
06797500	Elkhorn River at Ewing	D
06798000	South Fork Elkhorn River near Ewing	D
06798300	Clearwater Creek near Clearwater	D
09798500	Elkhorn River at Neligh	D
06799000	Elkhorn River at Norfolk	D
06799080	Willow Creek near Foster	D
06799100	North Fork Elkhorn River near Pierce	D
06799230	Union Creek at Madison	D
06799350	Elkhorn River at West Point	D
06799685	Pebble Creek at Scribner	D
06799450	Logan Creek at Pender	D
06799500	Logan Creek near Uehling	D
06800000	Maple Creek near Nickerson	D
06800500	Elkhorn River at Waterloo	DCMS
06801000	Platte River near Ashland	D
06803000	Salt Creek at Roca	D
06803500	Salt Creek at Lincoln	D
06803510	Little Salt Creek near Lincoln	D
06803520	Stevens Creek near Lincoln	D
06803530	Rock Creek near Ceresco	D
06803555	Salt Creek at Greenwood	D
06804000	Wahoo Creek at Ithaca	D
06804700	Wahoo Creek at Ashland	D

Table 1.-- Surface-water gaging stations, in downstream order, and type of data collected--Continued
[Type of data: D, discharge; E, elevation or contents; C, chemical; M, microbiological; S, sediment; T, temperature]

Station number	Station Name	Type of data
06804900	Johnson Creek near Memphis	D
06805500	Platte River at Louisville	DCMS
06806500	Weeping Water Creek at Union	D
06811500	Little Nemaha River near Auburn	D
06814500	North Fork Big Nemaha River at Humboldt	D
06818000	Big Nemaha River at Falls City	DCM
06821500	Arikaree River (head of Kansas River) at Haigler	D
06823000	North Fork Republican River at Colorado-Nebraska State line	D
06823500	Buffalo Creek near Haigler	D
06824000	Rock Creek at Parks	D
06824500	Republican River at Benkelman	D
06827500	South Fork Republican River near Benkelman	D
06728500	Republican River at Stratton	D
06829000	Swanson Lake near Trenton	E
06829500	Republican River at Trenton	D
06831500	Frenchman Creek near Imperial	D
06832000	Enders Reservoir near Enders	E
06832500	Frenchman Creek near Enders	D
06834000	Frenchman Creek at Palisade	D
06835000	Stinking Water Creek near Palisade	D
06835500	Frenchman Creek at Culbertson	D
06836500	Driftwood Creek near McCook	D
06837000	Republican River at McCook	D
06837300	Red Willow Creek above Hugh Butler Lake	D
06837390	Hugh Butler Lake near McCook	E
06837500	Red Willow Creek near McCook	D
06838000	Red Willow Creek near Red Willow	D
06840000	Fox Creek at Curtis	D
06841000	Medicine Creek above Harry Strunk Lake	D
06842000	Harry Strunk Lake near Cambridge	E
06842500	Medicine Creek below Harry Strunk Lake	D
06843500	Republican River at Cambridge	D
06844000	Muddy Creek at Arapahoe	D
06844210	Turkey Creek at Edison	D
06844500	Republican River near Orleans	DCM

Table 1.-- Surface-water gaging stations, in downstream order, and type of data collected--Continued
[Type of data: D, discharge; E, elevation or contents; C, chemical; M, microbiological; S, sediment; T, temperature]

Station number	Station Name	Type of data
06847000	Beaver Creek near Beaver City	D
06847500	Sappa Creek near Stamford	D
06849000	Harlan County Lake near Republican City	E
06849500	Republican River below Harlan County Dam	D
06851000	Center Creek at Franklin	D
06851500	Thompson Creek at Riverton	D
06852000	Elm Creek at Amboy	D
06852500	Courtland Canal at Nebraska-Kansas State line	D
06853020	Republican River at Guide Rock	D
06879900	Big Blue River at Surprise	D
06880000	Lincoln Creek near Seward	D
06880500	Big Blue River at Seward	D
06880800	West Fork Big Blue River near Dorchester	DCMS
06881000	Big Blue River near Crete	D
06881200	Turkey Creek near Wilber	DCM
06881500	Big Blue River at Beatrice	D
06882000	Big Blue River at Barneston	DCM
06883000	Little Blue River near Deweese	D
06883570	Little Blue River near Alexandria	D
06883940	Big Sandy Creek at Alexandria	D
06884000	Little Blue River near Fairbury	D
06884025	Little Blue River at Hollenberg, KS	DCM

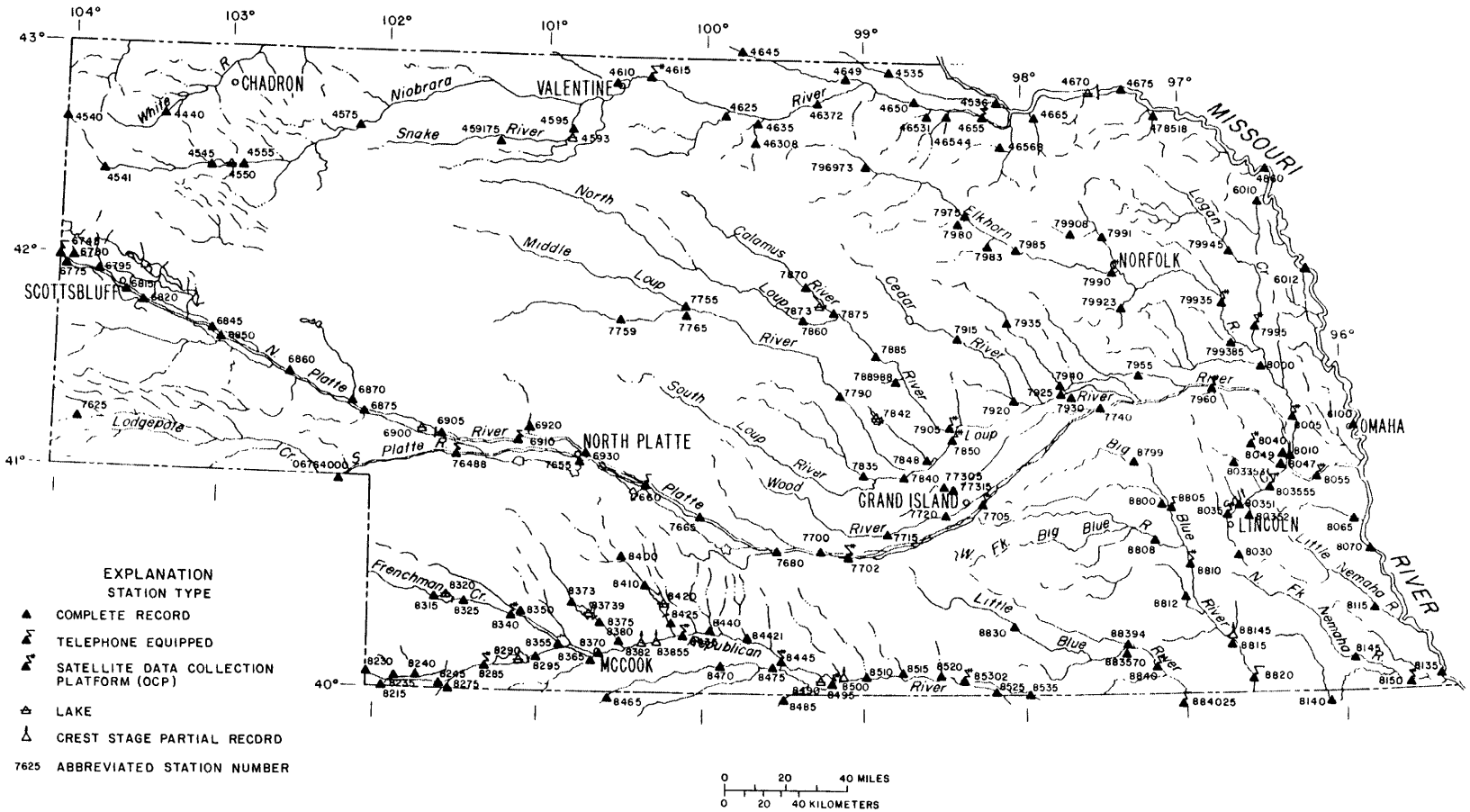


Figure 3. -- Location of active surface-water gaging stations.

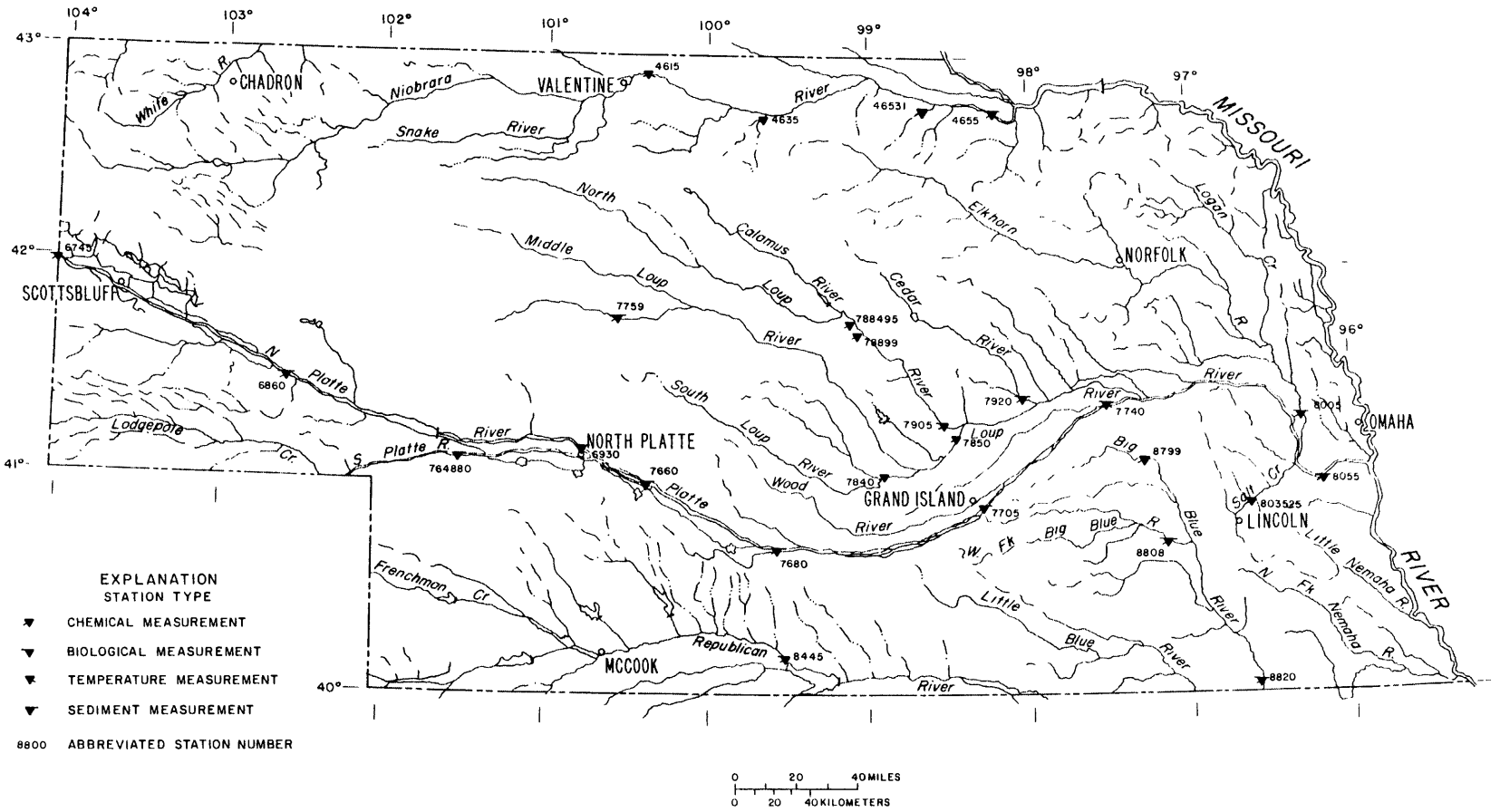


Figure 4. -- Location of active surface-water-quality stations.

Table 2. -- Selected observation wells in Nebraska, 1991

County	Local well number	County	Local well number
Adams	7N10W23AB	Dawson	11N25W24BCB
Adams	6N11W17CB	Dawson	10N21W18DDD
Antelope	27N5W17AAA	Dawson	10N22W36DDA
Antelope	23N6W28DC	Dawson	9N20W10ADDD
Banner	19N54W8ACBB	Dundy	2N38W10DD
Banner	20N53W26ABAB	Dundy	4N38W30BBC
Boone	19N7W2BBC	Dundy	1N40W29BB2
Box Butte	25N48W12CC	Dundy	3N40W16BBB
Box Butte	26N50W20CBBB	Fillmore	7N1W19AA2
Box Butte	25N50W34BDCD	Fillmore	8N2W26AD
Brown	30N21W19CC	Fillmore	5N4W12BDC
Buffalo	9N14W1CD	Franklin	4N14W23CC
Buffalo	10N16W5DC	Frontier	6N25W4DDB
Buffalo	10N16W8BAAA	Furnas	4N24W2BAAB
Butler	13N4E17ABA	Gage	2N5E8AD
Butler	15N1E27DD2	Hall	11N11W25CC2
Butler	13N4E36AAAA	Hall	11N12W12BCB
Cass	13N13E31CAA	Hall	9N9W14AAB
Chase	6N41W21CCC	Hall	9N9W14AAB2
Chase	7N38W29CBB	Hamilton	10N6W27ACAA
Chase	7N41W11DAA	Hamilton	12N5W23CCC
Chase	16N49W19BBB	Hamilton	11N7W3CCB
Cheyenne	16N49W19BBB	Harlan	2N18W9BCC
Cheyenne	13N50W4ADDD	Harlan	4N18W15AD
Clay	6N8W21DD	Harlan	3N19W10CDAA
Clay	8N7W23BB	Hayes	7N33W35DDD
Custer	18N22W24CCCC	Hitchcock	4N34W34DDD
Dawson	12N21W12BAAA	Holt	31N14W27DDD

Table 2. -- Selected observation wells in Nebraska, 1991--Continued

County	Local well number	County	Local well number
Holt	26N12W26AAA	Perkins	11N41W4DDDD
Holt	30N10W32DAA	Phelps	7N20W31CD
Holt	27N9W23ACCC	Phelps	7N18W31AA
Hooker	24N35W8BCCC	Pierce	28N3W33BA
Howard	14N11W22DD	Polk	14N2W21DB
Jefferson	4N1E31AA	Polk	15N1W9BBBB
Jefferson	4N3E13DA	Red Willow	4N27W16ABB
Johnson	6N11E4DDD	Saline	8N3E19ADA
Johnson	6N9E15ADDD	Sarpy	13N13E29BCB
Kearney	6N15W34DC	Sarpy	12N10E4BADB
Keya Paha	33N20W19DCDD	Sarpy	13N10E32DBBA
Kimball	15N55W7ABB	Saunders	14N8E24ACD2
Lancaster	10N7E30CCCD	Saunders	13N9E13ADBA
Lancaster	10N7E31BACB	Saunders	13N10E18CDBD
Lancaster	10N7E30CDBD	Saunders	13N9E24DDCC
Lancaster	10N7E31BDBD	Saunders	13N10E19CDDD
Lancaster	10N7E31ABDC	Saunders	13N10E30DAAB
Lancaster	10N7E31CAAD	Saunders	13N9E36ABAA
Lancaster	7N7E26CDDB	Saunders	13N10E30CDAA
Lancaster	7N6E15DCCC	Saunders	13N10E31ACDB
Lincoln	10N33W36ADD	Saunders	13N10E32CBAB
Lincoln	9N26W36ADDA	Saunders	13N10E32CABC
Lincoln	12N32W6BAB	Scotts Bluff	22N55W11DDC
Lincoln	11N31W5BBB	Seward	11N2E21DD
Merrick	13N8W11DDDD	Sheridan	29N46W10AA
Merrick	14N6W26AAAA	Thayer	3N4W2AA
Morrill	18N48W16BBCB	Valley	18N15W13ACD
Perkins	9N35W23BBB	Wheeler	22N10W1BA
Perkins	12N38W31CCCC	York	9N4W5CCC
Perkins	9N39W2DDDD	York	11N2W31BA3

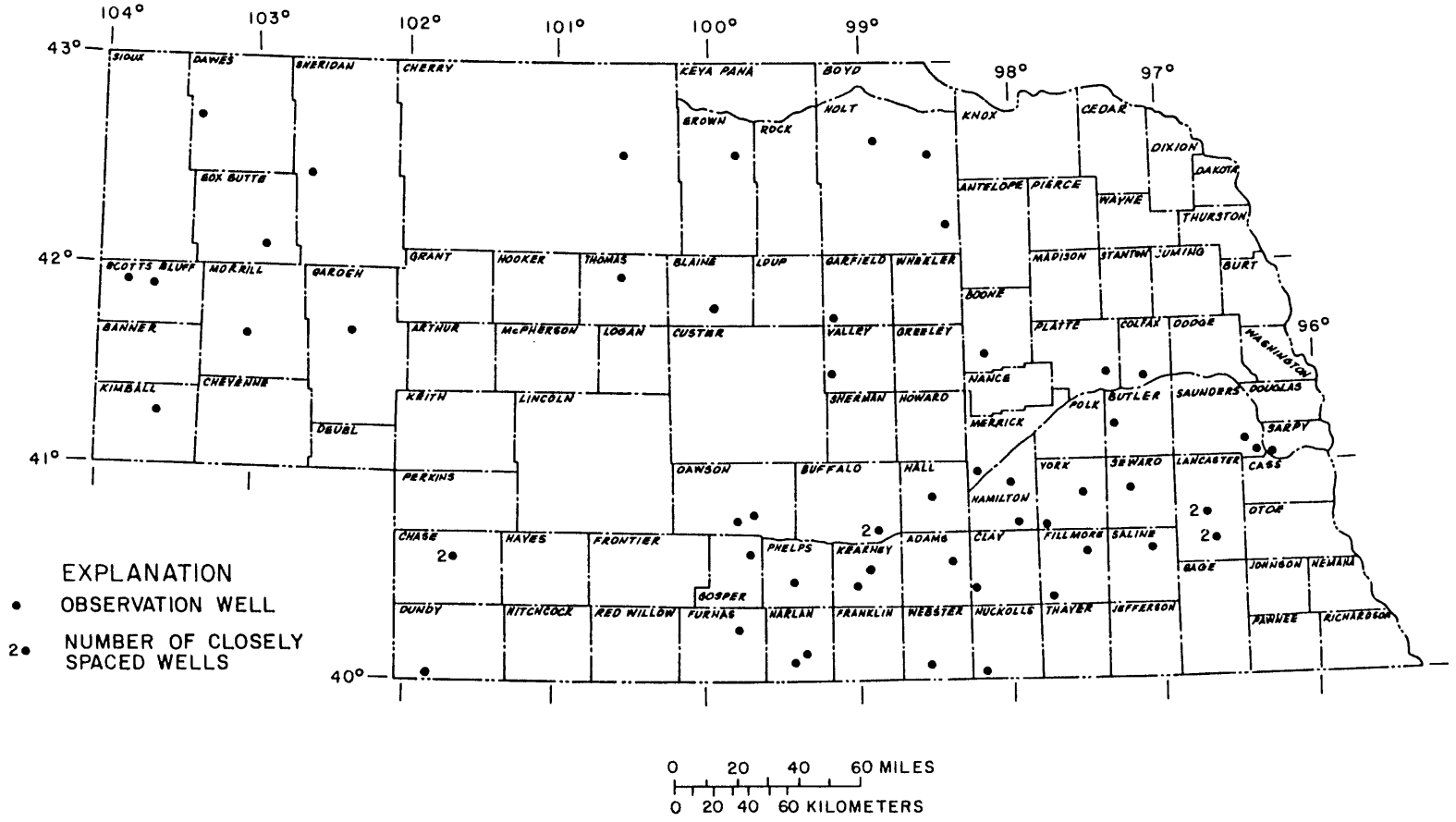
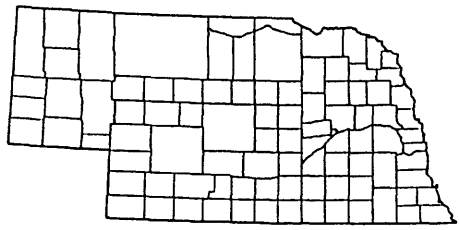


Figure 5. -- Location of selected observation wells, 1991.

NEBRASKA PROJECTS

Descriptions of projects in Nebraska during fiscal year 1991 are given on the following pages. The area or areas of study are shown on a small map of Nebraska along with each project.

COLLECTION OF SURFACE-WATER DATA (NE-001)



Continuous since 1900

Location: Statewide

Project leader: Glenn Engel

Cooperating agencies: Nebraska Department of Water Resources; Kansas-Nebraska Blue River Compact Administration; City of Lincoln; U.S. Corps of Engineers; U.S. Bureau of Reclamation; Central Platte NRD; and Little Blue NRD.

NEED FOR STUDY -- Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management in such water-related fields as water supply, hydroelectric power, flood control, irrigation, flood-plain management, and water-resources development. To provide this information, an appropriate and comprehensive data base is necessary.

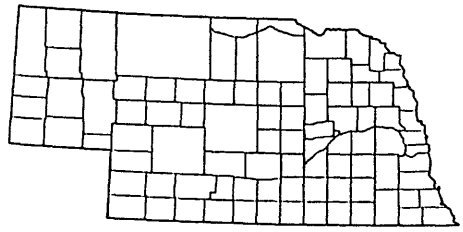
OBJECTIVES -- (1) To collect surface-water data sufficient to satisfy needs for current purposes, such as: assessment of water resources, operation of reservoirs and irrigation projects, projection of stages and discharges, pollution control and disposal of wastes, discharge data to accompany water-quality measurements, compact and legal requirements, and research and special studies. (2) To collect data necessary for analytical studies to define the statistical properties of, and trends in, the occurrence of water in streams, lakes, and reservoirs for use in planning and design.

APPROACH -- A network of gaging stations is maintained to provide surface-water data for management and operation, determination of long-term trends, and research and special studies. Data are collected for stage and discharge of streams or canals, stage, surface area, content of lakes and reservoirs, and temperature and precipitation. The network of stations is reviewed periodically to ensure the collection of meaningful and worthwhile data.

RESULTS -- Data were collected and annual water-year records were prepared and published in "Water Resources Data for Nebraska, Water Year 1990," U.S. Geological Survey Water-Data Report NE-90-1. At the end of fiscal year 1991, there were 148 continuous-record stations in operation, which included five lake stations. General maintenance and rehabilitation were performed at gages to ensure that records obtained are of highest quality and that safety measures are continued.

PLANS FOR FISCAL YEAR 1992 -- Collect data as scheduled for all continuous-record, crest-stage, and miscellaneous sites. Make additional measurements as needed to define stage-discharge ratings. Make low-flow measurements in project areas. Perform necessary maintenance and rehabilitation. Publish the streamflow records in "Water Resources Data for Nebraska, Water Year 1991."

COLLECTION OF GROUND-WATER DATA (NE-002)



Continuous since 1934

Location: Statewide

Project leader: Gregory V. Steele

Cooperating agencies: University of Nebraska-Lincoln Conservation and Survey Division; U.S. Bureau of Reclamation; Lower Platte South NRD; and Nemaha NRD.

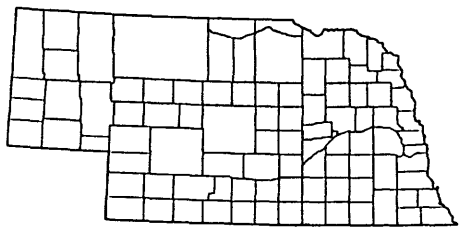
NEED FOR STUDY -- Long-term water-level records are needed to evaluate the effects of climatic variations on the recharge to and discharge from ground-water systems, to provide a data base from which to measure the effects of development, to assist in the projection of future supplies; and to provide data for management of the resource.

OBJECTIVES -- (1) To collect water-level data sufficient to provide a minimum long-term data base by which the general response to the hydrologic system, to natural climatic variations, and to induced stresses can be better understood, and potential problems can be defined early enough to allow proper planning and management. (2) To provide a data base against which the short-term records acquired in areal studies can be analyzed. This analysis should provide an assessment of the ground-water resource, allow projection of future conditions, detect and define pollution and supply problems, and provide the data base necessary for management of the resource.

APPROACH -- Establish and maintain a network of observation wells from which water-level records are obtained. Analyze these records and other information obtained from detailed areal studies of ground-water systems so as to improve knowledge of the aquifer systems and their responses to stresses.

RESULTS -- One new recorder well was installed. Discussions were held with the manager of the Upper Niobrara-White NRD about a new recorder in that District. Water-level data for the 1990 calendar year were evaluated, analyzed, and published in the cooperative State report summarizing water-level changes in Nebraska. All ground-water-level data were collected on schedule and published in "Water Resources Data for Nebraska, Water Year 1990," U.S. Geological Survey Water-Data Report NE-90-1.

PLANS FOR FISCAL YEAR 1992 -- Continue water-level monitoring with existing ground-water observation-well network. Continue updating ground-water-level data base . Install two new recorder wells. Prepare State-published report summarizing water-level changes for 1991 calendar year. Publish 1991 water year ground-water level data in "Water Resources Data for Nebraska, Water Year 1991."



COLLECTION OF WATER-QUALITY DATA (NE-003)

Continuous since 1943

Location: Statewide

Project leader: Carol G. Hoy

Cooperating agencies: Nebraska Natural Resources Commission; Nebraska Department of Environmental Control; U.S. Army Corps of Engineers; U.S. Bureau of Reclamation; and Lower Platte North NRD.

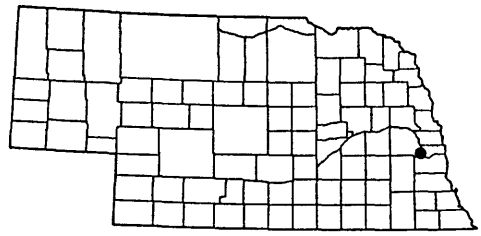
NEED FOR STUDY -- Water-resources planning and water-quality assessment require a nationwide base of relatively standardized information. For appropriate planning and realistic assessment of the water resource, the chemical and physical quality of the rivers, streams, lakes, and reservoirs, as well as major ground-water systems, should be defined and monitored.

OBJECTIVES -- To provide a national data base of water-quality data for State, local, and Federal planning and action programs. Primary objectives of the network are to depict areal variability of streamflow and water-quality conditions nationwide on a year-by-year basis and to detect and assess long-term changes in water quality.

APPROACH -- Obtain samples for water-quality analysis using established protocols and techniques from a network of stations to provide for broad Federal planning and action programs and to provide data for local management of the water resources of Nebraska.

RESULTS -- Records of the physical, chemical, microbiological, or radiochemical quality of water were obtained from 23 stream sites and 152 wells. Records were evaluated, updated, and published in "Water Resources Data for Nebraska, Water Year 1990." Ground water was sampled in the Big Blue and Elkhorn units as part of the Missouri River Basin Program. Ground-water samples collected by the Lower Platte North NRD were analyzed.

PLANS FOR FISCAL YEAR 1992 -- Twenty-two stream sites will be sampled under NASQAN, Benchmark, Missouri River Basin, and National Research programs. Samples of ground water will be collected from established networks of wells in the Little Blue and North Loup units. Results of water-quality analyses will be published in "Water Resources Data for Nebraska, Water Year 1991."



GROUND-WATER AND WATER-QUALITY MONITORING AT THE LINCOLN MUNICIPAL WELL FIELDS (NE-00301)

Location: Lincoln and near Ashland, Nebraska

Project leaders: Ingrid Verstraeten and Gregory V. Steele

Cooperating agency: City of Lincoln

NEED FOR STUDY -- (1) The Ashland well field is the principal source of public water supply for the City of Lincoln. Monitoring of the ground-water quality upgradient from the well field is needed to provide for an early warning of potential contaminate movement that could threaten this resource. (2) Long-term water-level records are needed to evaluate the stress variations on the ground-water systems near and including the City of Lincoln well fields. The data base is needed to determine the long-term effects of ground-water withdrawals.

OBJECTIVES -- (1) To obtain baseline ground-water-quality data for monitoring potential contamination of the municipal water supply from upgradient of the Ashland well field. (2) To compile and evaluate present and historical ground-water-level data. (3) To develop a data base of both historical and ongoing ground-water-level data for use in future studies.

APPROACH -- (1) The study is planned as a 3-year project. During the first year, dedicated stainless-steel pumps will be installed in five monitoring wells located upgradient from the Lincoln Municipal well field. Quarterly samples will be collected and analyzed for major ions, trace metals, volatile organic compounds, industrial chemicals, pesticides, and explosives. (2) Maintain the observation-well network and input historical data and data provided by the cooperator into the U.S. Geological Survey data base. Evaluate all the data.

RESULTS -- Sutron[1] electric data loggers were installed in the City of Lincoln well field near Ashland, Nebraska. Collection of historical data from Ashland and Lincoln well fields was started. Analysis of data from City of Lincoln Water System computer files was begun. Well schedules for all wells were established. Five monitoring wells were sampled once during September 1991 to obtain background water-quality data and to provide a baseline for subsequent monitoring. Samples were sent to the USGS laboratory in Denver.

PLANS FOR FISCAL YEAR 1992 -- Three additional samples will be collected on a quarterly basis from the five selected monitoring wells. Data will be compiled and evaluated. Input historical data and data presently on the City of Lincoln's computer system into the U.S. Geological Survey data base. Analyze data from Ashland well field for possible determination of boundary conditions and use in ground-water flow model.

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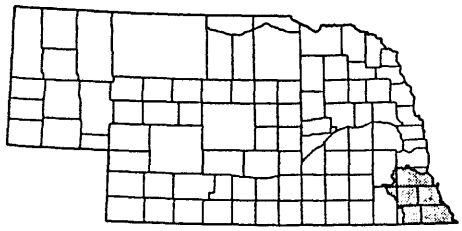
1. The use of trade names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.



NEMAHA NATURAL RESOURCES DISTRICT GROUND-WATER-QUALITY INVESTIGATION (NE-00304)

Location: Southeastern Nebraska

Project leader: Dwight Q. Tanner

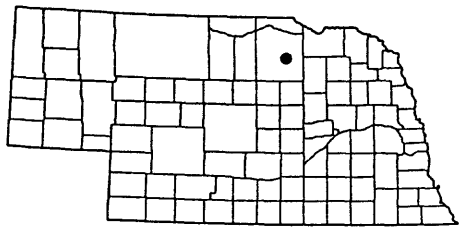
Cooperating agency: Nemaha Natural Resources District

NEED FOR STUDY -- Ground-water-quality problems have been documented in parts of the Nemaha Natural Resources District (NRD). Nitrates and pesticides contaminate some areas of the shallow aquifer. Buried-channel aquifers are used for irrigation, but their quality has not been fully described. The bedrock aquifers contain large concentrations of dissolved solids. Wells in the Missouri River alluvial aquifer yield water with elevated iron and manganese concentrations. A further evaluation of the quality of these aquifers is vital to assess the resource.

OBJECTIVES -- To describe the areal and hydrological distributions of the following water-quality constituents: nitrates and other nutrients, pesticides, major cations, and trace elements.

APPROACH -- (1) Approximately 80 wells will be selected for sampling. Criteria for selection will be that the well is properly constructed, that it has a complete well log, and that it is not near a point-source of contamination. (2) These wells will be sampled using a team consisting of a U.S. Geological Survey employee and an NRD employee. (3) All samples will be analyzed for dissolved nitrate and screened for triazine herbicides using immunoassay methods. Selected samples from each aquifer will be analyzed for major ions and trace elements. (4) The results will be used to characterize the ground-water quality within the NRD.

RESULTS -- A U.S. Geological Survey Water-Resources Investigations Report titled "Ground-Water Quality in the Nemaha Natural Resources District, Southeastern Nebraska" was published in 1990.



O'NEILL GROUND-WATER RECHARGE: WATER-QUALITY INVESTIGATION (NE-00308)

Location: Northeastern Nebraska

Project leader: A. Douglas Druliner

Cooperating agency: U.S. Bureau of Reclamation

NEED FOR STUDY -- The U.S. Bureau of Reclamation (USBR) has been investigating the possibility of transporting water from the Niobrara alluvial aquifer near Mariaville in northern Rock County to two locations in central Holt County for the purpose of irrigation and ground-water recharge. The USBR has been conducting aquifer tests in the alluvial deposits and recharge demonstrations at the two sites. As part of a cooperative agreement, the USGS has collected and analyzed water-quality samples from pumped wells near Mariaville during aquifer tests and from pumped and observation wells associated with the recharge-demonstration effort near O'Neill. In February of 1991 after completion of the tests and demonstrations, the USBR asked the U.S. Geological Survey to interpret the results of the water-quality data and to investigate potential changes in the quality of the alluvial water resulting from transport and mixing.

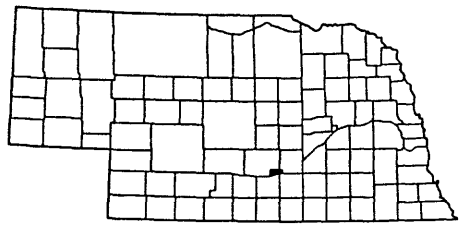
OBJECTIVES -- (1) To determine if changes in water quality have occurred with time during the aquifer tests in the Niobrara alluvial aquifer. (2) To document any changes in water-quality during the recharge demonstrations in which local ground water was injected. (3) To estimate the compatibilities of ground water from the Niobrara alluvial aquifer with ground water from the recharge areas and to examine the likelihood of decreases in permeability of the recharged aquifer resulting from chemical reactions associated with the transport and mixing of the ground water.

APPROACH -- Ground- and surface-water-quality data, which included major ion, nutrient, trace element, and selected pesticide data that were collected previously at the study sites, will be accessed through the U.S. Geological Survey's computerized water-quality data base (WATSTORE). The concentrations of these constituents in the discharged water and the Niobrara River during and after the alluvial-aquifer tests will be compared to determine if significant changes in water quality have occurred. Similarly, water-quality samples collected from the local recharge source wells and from observation wells will be compared at both demonstration areas before and during the recharge demonstration. WATEQF and PHREEQE (geochemical computer models) will be used to model changes in water quality that could occur as a result of the mixing of water from the Niobrara alluvial aquifer with water from the recharge-demonstration areas.

RESULTS -- All comparisons and geochemical modeling of water-quality data have been completed. A report describing the results of these modeling activities has been prepared and is being reviewed.

PLANS FOR FISCAL YEAR 1992 -- Complete report review, revision, and publication.

RELATION OF SPECIFIC CONDUCTANCE AND NITRATE CONCENTRATIONS AT THE NEBRASKA MANAGEMENT SYSTEMS EVALUATION AREA SITE (NE-00309)



Location: Near Shelton in south-central Nebraska

Project leader: A. Douglas Druliner

Cooperating agency: Nebraska Department of Environmental Control

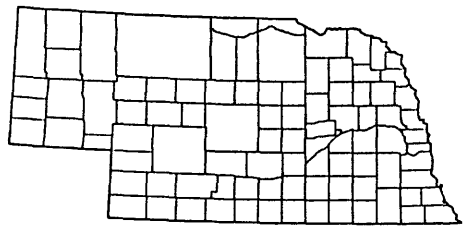
NEED FOR STUDY -- The Management Systems Evaluation Area (MSEA) projects supported by the U.S. Department of Agriculture are intended to demonstrate the effects of agricultural management practices on the quality of ground water. This is complicated by the fact that the ground water in an area already may contain large concentrations of nitrate from past agricultural practices. It may take many years for the effect of new management practices to make a detectable difference in ground-water concentrations of nitrate. A technique is needed that permits instantaneous detection of nitrate as it is leached into the top of the aquifer.

OBJECTIVE: (1) To determine if specific conductance is a reliable, real-time indicator of ground-water concentrations of nitrate in the top few centimeters of the aquifer; (2) to determine the temporal relation between recharge and changes in nitrate concentrations at the top of the aquifer.

APPROACH -- A specific conductance and temperature-monitoring probe will be suspended at the top of the water table in an observation well beneath an irrigated cornfield and monitored electronically throughout the corn-growing season. Water samples from the top of the water table in a second observation well will be analyzed for nitrate and major ion concentrations. As nitrate is leached into the top of the aquifer, changes in specific conductance will be compared to weekly chemical analyses, which should permit the development of a relation between changes in specific conductance and changes in nitrate concentration in the ground water. A combination of precipitation data collected by the MSEA project, irrigation-water usage data at the study site, and specific-conductance and nitrate data will be used to determine the relative timing of nitrate leaching and to estimate the apparent loading of nitrate in the top of the aquifer.

RESULTS -- During the 1991 growing season, a study site was selected, and the necessary equipment and supplies were obtained. In October 1991 after the corn was harvested from the study site, both observation wells were drilled, cased, sealed, and buried.

PLANS FOR FISCAL YEAR 1992 -- In late March to early April 1992, the wells will be uncovered and instrumented, and a series of trial tests will be completed to ensure that the system is fully operational. Active data collection will begin during late April through September 1992.



1990-91 NATIONAL WATER SUMMARY: NEBRASKA STREAM-WATER QUALITY (NE-00310)

Location: Statewide

Project leaders: Abraham H. Chen and Carol G. Hoy

Cooperating agency: USGS Federal Program

NEED FOR STUDY -- The 1990-91 National Water Summary (NWS) is the seventh in a series of reports that describe an aspect of the water resources in each State. Information on conditions and long-term trends in stream-water quality will be presented in the 1990-91 summary.

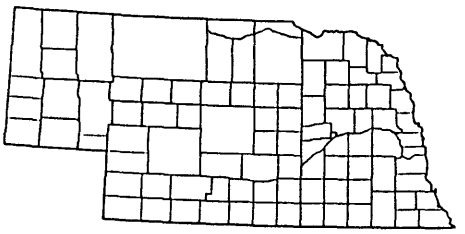
OBJECTIVE -- National Water Summary reports are intended for use by Congressional staff, Federal-agency personnel, State and local officials, and the general public. Specific objectives of the 1990-91 report are: (1) to present an overview of stream-water quality and monitoring networks in the various States; and (2) to report water-quality conditions, long-term trends, and management of stream-water quality in each State.

APPROACH -- The individual State reports will be preceded by a synopsis to inform the reader as to what is contained in the collective State summaries and to provide background information on the technical aspects of stream-water quality and to define terms. The State summaries will consist of six components: (1) an overview section, (2) description of the network that provided the data, (3) discussion of stream-water quality for 1987-89, (4) trends of selected water-quality constituents, (5) stream water-quality management, and (6) a list of references.

RESULTS -- Eight selected water-quality constituents at 16 monitoring stations for water years 1975-89 were used to describe stream-water quality, conditions, and trends in nine major river basins in Nebraska. The Nebraska summary was reviewed by State and Federal officials before being approved for publication.

PLANS FOR FISCAL YEAR 1992 -- The project is completed. The Nebraska State summary will be published along with the other State summaries in U.S. Geological Survey Water-Supply Paper 2400.

SEDIMENT-DATA PROGRAM (NE-004)



Continuous since 1946

Location: Statewide

Project leaders: Carol G. Hoy and Glenn B. Engel

Cooperating agency: U.S. Bureau of Reclamation and USGS Federal Program

NEED FOR STUDY --Sediment concentrations and discharges in rivers and streams need to be defined and monitored in order to make a comprehensive water-quality assessment of the Nation's water resources.

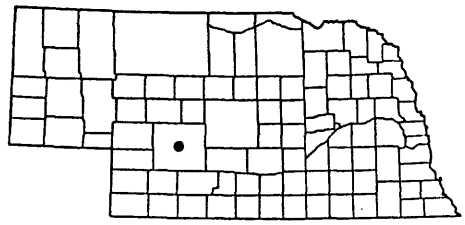
OBJECTIVE -- To provide a national data base of standardized sediment information for use in Federal and State planning and action programs and to provide data for Federal management of interstate and international waters.

APPROACH -- Establish and operate a network of sediment stations to provide spatial and temporal averages and trends in sediment concentration, sediment discharge, and particle size of sediment being transported by rivers and streams in Nebraska.

RESULTS -- Data for eight nondaily sediment stations, one daily sediment station, and five high-water sites in the Platte River basin were collected and prepared for publication in "Water Resources Data for Nebraska, Water Year 1990."

PLANS FOR FISCAL YEAR 1992 -- Nine nondaily sediment stations, one daily station, and five high-water sites will be operated, and the data will be published in "Water Resources Data for Nebraska, Water Year 1991."

MONITOR ATMOSPHERIC PRECIPITATION FOR NATIONAL TRENDS NETWORK (NE-005)



Continuous since August 1985

Location: Near North Platte, Nebraska

Project leader: Glenn B. Engel

Cooperating agency: USGS Federal Program

NEED FOR STUDY -- There is a potential for damage to the environment from acid rain, and improved knowledge of precipitation chemistry and resulting effects on the environment are necessary to help avert future problems.

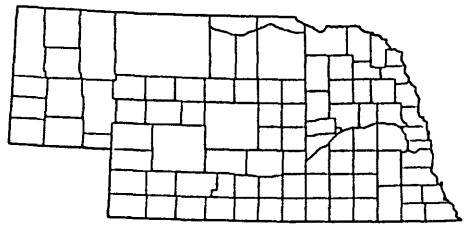
OBJECTIVE -- The objective of the National Trends Network (NTN) is to establish a record that will allow the detection of trends in the chemical composition of atmospheric deposition and to improve understanding of the sources, movement, and transformation of materials contributing to or associated with acidic atmospheric deposition in the United States and its effects on the environment.

APPROACH -- Install a wet-atmospheric-deposition monitoring station at the University of Nebraska West Central Research and Extension Center near North Platte, Nebraska. Provide training for local station operators. Visit the station on a quarterly basis to evaluate operator efficiency and inspect the facility. Samples are collected weekly and analyzed for pH, specific conductance, and major ions at the Illinois Water Survey Laboratory in Champaign, Illinois.

RESULTS -- The precipitation collector for atmospheric-deposition analysis was operated at the University of Nebraska Agricultural Station near North Platte, Nebraska. Samples were collected and analyzed at the Illinois Water Survey Laboratory in Champaign, Illinois, and results are published annually by the National Atmospheric Deposition Program in "Precipitation Chemistry of the United States."

PLANS FOR FISCAL YEAR 1992 -- Sample collection will continue on a weekly basis. Quality control will be maintained by contacts with the station operator and by monitoring of analyses.

WATER-USE PROGRAM (NE-007)



Continuous since 1965

Location: Statewide

Project leader: Zachary D. Hill

Cooperating agencies: Nebraska Natural Resources Commission and Nebraska Department of Water Resources

NEED FOR STUDY -- Water-use data are needed to provide the basis for resource assessment, regional and national policy formulation, specific problem analysis, and research activity. With the increasing demand for water for domestic, industrial, agricultural, and other uses, it is necessary to inventory and plan for the most beneficial use of the resource.

OBJECTIVE -- The principal objective is to collect and compile water-use information for the State of Nebraska that meets both State and national needs. Additional objectives are to:

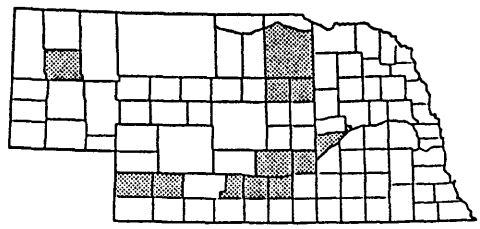
(1) Develop guidelines for data storage and retrieval and for collecting and processing water-use data that will provide a means to achieve an appropriate level of quality assurance and quality control.

(2) Prepare reports on water-use data by category for the 1990 calendar year, and at 5-year intervals thereafter.

APPROACH -- In cooperation with the Natural Resources Commission, information will be collected for 13 national water-use categories--irrigation, industrial, commercial, domestic, public supply, sewage treatment, mining, livestock, animal specialties, reservoir evaporation, hydroelectric power, fossil-fuel power, and nuclear power. Data will be entered into the U.S. Geological Survey National Water-Use Data System. A water-use data report will be prepared for the 1990 calendar year. Methods and techniques for collection, storage, and dissemination of water-use information will be improved.

RESULTS -- Data for 7 of the 13 categories were compiled and entered into the National Water-Use Data System. Data compilation and entry for the remaining categories were in progress. Documentation of procedures also was underway.

PLANS FOR FISCAL YEAR 1992 -- Compilation and entry of water-use data for 1990 will be completed. Documentation of water-use data-collection procedures also will be completed. A draft of the 1990 Nebraska water-use data report will be prepared.



EFFECTS OF HYDROGEOLOGY, LAND USE, SOILS, AND CLIMATE ON NONPOINT-SOURCE NITRATE AND ATRAZINE CONCENTRATIONS IN THE HIGH PLAINS AQUIFER IN NEBRASKA (NE-048)

Location: Six areas in 12 counties

Project leader: A. Douglas Druliner

Cooperating agency: USGS Federal Program

NEED FOR STUDY -- Degradation of ground water by agricultural chemicals or other contaminants is a major concern. Nitrate concentrations in ground water have exceeded the U.S. Environmental Protection Agency's Primary Drinking-Water Regulation of 10 milligrams per liter (mg/L), and trace amounts of atrazine have been detected in relatively broad spatial distributions in some areas of the State. This suggests that one or more combinations of physical factors may be affecting the transport of these contaminants into the ground water. An improved understanding of the relations of these contaminants to quantifiable physical factors could aid in determining the areas that are susceptible to agricultural chemical contamination.

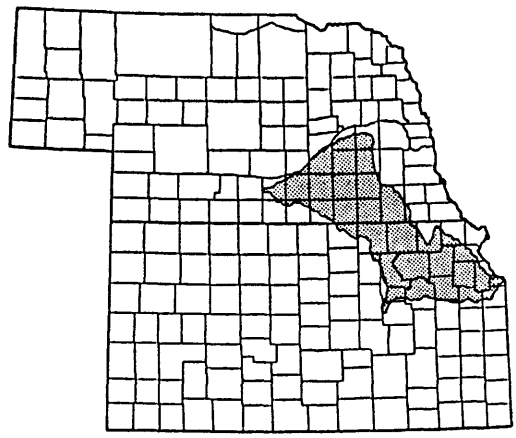
OBJECTIVE -- (1) Determine what local hydrogeological, land-use, soil, and climatic conditions may be responsible for the variations in nitrate and atrazine concentrations in ground water; and to improve definition of their relation to these contaminants. (2) Provide techniques that may be used to recognize or estimate areas of potential ground-water contamination with selected agricultural chemicals.

APPROACH -- During the first phase of the study, 268 ground-water sampling sites will be selected and sampled in 12 counties that represent different hydrogeologic, land-use, soils, and climatic conditions within the High Plains aquifer in Nebraska. The samples will be analyzed for nitrate and triazine herbicides. During the second phase of the study, more than 40 explanatory variables will be identified as possibly affecting the contamination of ground water with either nitrate or triazine herbicides. Data describing each of the explanatory variables will be compiled for each of the 268 sampling sites. A series of predictive models will be generated through multiple-linear regression (MLR) and logistic regression techniques to determine which explanatory variables are significant. Confirmation of the models will be done for either a separate analytical data set or for an additional study area. Selected predictive models will be used to map the likelihood of ground-water contamination with nitrate and atrazine in one or more of the counties studied.

RESULTS -- MLR and logistic regression modeling of the data are complete. The MLR models explain from 45 to 68 percent of the variation in ground-water concentrations of nitrate and 54 to 63 percent of the variation in ground-water concentrations of atrazine. The logistic models correctly identified the presence or absence of atrazine herbicide within an accuracy of 80 to 90 percent. Confirmation of the selected models and predictive mapping of the targeted study area are being completed. A report on the first phase of the study was published as U.S. Geological Survey Water-Resources Investigations Report 86-4338, "Nonpoint-source agricultural chemicals in ground water in Nebraska--Preliminary results for six areas of the High Plains aquifer," by A.H. Chen and A.D. Druliner.

PLANS FOR FISCAL YEAR 1992 -- A draft of the phase-two report will be prepared.

NATIONAL WATER-QUALITY ASSESSMENT OF THE LOWER KANSAS RIVER BASIN, KANSAS AND NEBRASKA (NE-053)



Location: Northeastern Kansas and southeastern Nebraska

Project leaders: John Stamer and Dwight Q. Tanner, Nebraska part

Cooperating agency: USGS Federal Program

NEED FOR STUDY -- Protecting and increasing the supply of suitable quality water in the Nation is a high priority. The Nation's midwest is a very productive agricultural grain belt. The lower Kansas River drainage is typical of this midwestern agricultural region that includes irrigated and nonirrigated land. The basin also is representative of regional water use; namely, irrigation, municipal, and industrial uses. An assessment of the water quality and quantity of the lower Kansas River basin, which includes the Big Blue River basin in Nebraska and Kansas, is important to the adequate management and protection of this valuable resource.

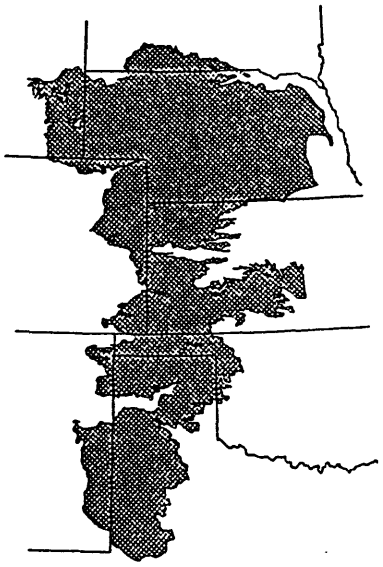
OBJECTIVE -- (1) Define the surface-water quality of the lower Kansas River basin, its major tributaries, and selected reservoirs; (2) determine trends in water quality of the lower Kansas River basin, its major tributaries, and selected reservoirs; (3) define cause-effect relations for a selected subbasin or river reach; and (4) identify water-quality problems or potential problems.

APPROACH -- The surface-water pilot study was divided into three elements: (1) Fixed-station studies to assess mean annual constituent transport and water-quality trends; (2) synoptic studies to determine the quantity and quality of ground-water and irrigation return flows to determine trace organic residues in the streambed sediment during low flow, and to calculate constituent transport at the fixed stations during high flow; and (3) intensive subbasin or river-reach studies to define cause-and-effect relations.

RESULTS -- Water-quality sampling on a monthly basis was accomplished at the three fixed stations through April 1990. An open-file report describing major metals and trace elements in streambed sediment has been published. The report on metals and trace elements in streambed sediment of first- and second-order streams has been submitted for preliminary review. Water-quality sampling at West Fork Big Blue River near Dorchester was continued on a bimonthly basis through August 1991 under the reduced-level phase of the pilot study.

PLANS FOR FISCAL YEAR 1992 -- Reports on various elements of the study will be reviewed and published.

MONITORING GROUND-WATER CONDITIONS AND WATER-LEVEL CHANGES IN THE HIGH PLAINS AQUIFER UNDERLYING PARTS OF COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING (NE-055)



Location: High Plains area

Project leaders: Jack T. Dugan and Gregory V. Steele

Cooperating agencies: The City of Lincoln and the following Natural Resources Districts: Central Platte, North Platte, South Platte, Upper Republican, Lower Republican, Upper Niobrara-White, and Upper Elkhorn

NEED FOR STUDY -- The High Plains aquifer underlies one of the major agricultural areas in the United States, and about 30 percent of the ground water used for irrigation is pumped from the High Plains aquifer. The Omnibus Water Resources Development Act of 1986 (Public Law 99-662), which amended the Water Resources Act of 1984, added a Title III to the legislation which states that the U.S. Geological Survey in cooperation with the States of the High Plains region is authorized and directed to monitor the levels of the High Plains aquifer and to report annually to Congress. Congress recognized that accurate information on the conditions and changes in the aquifer is necessary to make sound management decisions concerning the use of water, to project future economic conditions, and to conduct hydrologic research pertaining to the High Plains.

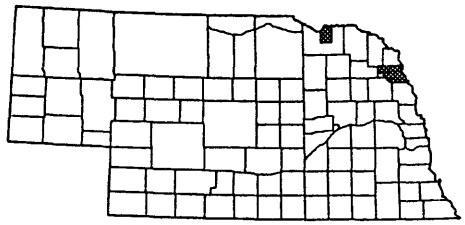
OBJECTIVES -- Nebraska District objectives for this program are twofold: (1) to develop a monitoring-well network that allows for an adequate description of water-level conditions in the High Plains aquifer system; and (2) interpret and report on water-level conditions for the entire extent of the High Plains aquifer system.

APPROACH -- (1) Review data from U.S. Geological Survey and local agency observation-well networks to determine if data are adequate for defining areal and temporal water-level changes in Nebraska; (2) work in cooperation with local agencies to expand the U.S. Geological Survey's capability of reporting on changes in the High Plains aquifer system; (3) compile and collate information on precipitation, land use, and water levels from the eight states in the High Plains region in order to analyze and describe annual water-level changes and water-level changes since 1980 in the High Plains aquifer and to report the results in an annual report.

RESULTS -- Annual water-level data for Nebraska were compiled from the various Federal, State, and local agencies. Information on precipitation, land use, and water levels in the eight States within the entire High Plains region also were compiled. The 1988-89 and 1989-90 reports have been published.

PLANS FOR FISCAL YEAR 1992 -- Information on precipitation, land use, and water levels in the eight States within the High Plains region for 1991 will be collected and analyzed. The 1990-91 report on water-level changes in the High Plains aquifer will be prepared.

WATER-RESOURCES EVALUATION OF THE OMAHA, WINNEBAGO, AND SANTEE INDIAN RESERVATIONS, NEBRASKA (NE-057)



Location: Northeastern Nebraska

Project leader: Jon M. Peckenpaugh

Cooperating agency: U.S. Bureau of Indian Affairs [Omaha, Winnebago, and Santee-Sioux Tribes]

NEED FOR STUDY -- Although some water-related data have been collected on the Omaha, Winnebago, and Santee-Sioux Reservations, no thorough water-resource investigation has been performed, and the water resources have not been adequately evaluated. To understand the potentialities and limitations of the water-resources system in these areas, an evaluation of the ground- and surface-water quantity and quality needs to be accomplished.

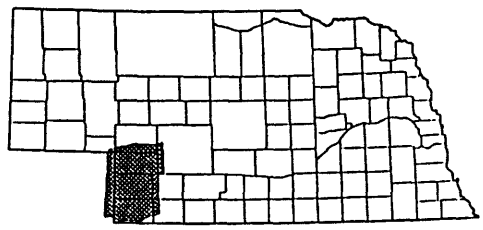
OBJECTIVE -- To describe and define the water-resources system, which will include the hydrology and related hydrogeology of the study areas; to discuss and define water-use characteristics that affect the water-resources system; and to recommend areas where additional field work and data need to be collected so that the water-resources systems can be more adequately defined.

APPROACH -- This study will consist primarily of evaluating and compiling existing data. Additional data will be collected and evaluated as time and resources permit. The hydrogeology of the study area will be evaluated through analysis of geologic logs of test holes and existing wells. From these data, hydrogeologic cross sections, thicknesses of lithologic units and/or formations, and hydraulic conductivity, transmissivity, and storage capability of the materials will be determined.

RESULTS -- Hydrogeologic cross sections for both study areas were completed. Additional surface-water-quality (15 sites) and ground-water-quality (37 sites) data were collected to obtain additional information on the water quality of surface drainages and of the different aquifers. An analysis of the surface- and ground-water quality of the areas has begun.

PLANS FOR FISCAL YEAR 1992 -- Reports on the two areas will be completed.

HYDROGEOLOGY OF THE UPPER REPUBLICAN NATURAL RESOURCES DISTRICT, NEBRASKA (NE-058)



Location: Southwestern Nebraska

Project leader: Jon M. Peckenpaugh

Cooperating agencies: Upper Republican Natural Resources District, University of Nebraska-Lincoln Conservation and Survey Division, and Nebraska Natural Resources Commission

NEED FOR STUDY -- The Upper Republican Natural Resources District (NRD) needs to update and improve their understanding of the hydrogeologic system within their ground-water control area. Much of the knowledge of this area comes from a hydrogeologic study and ground-water-flow model that was developed using 1950 through 1975 data. The NRD uses this model to project ground-water-level changes, and these model changes differed considerably in some areas from the measured water levels. Since 1975, additional hydrogeologic data have been collected, and improved modeling procedures have been developed that can be used to increase understanding of the hydrogeologic system within the NRD's control area.

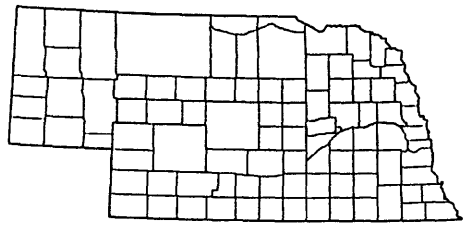
OBJECTIVE -- To describe the hydrogeologic system in and adjacent to the NRD's ground-water control area; to develop and demonstrate the capability for evaluating quantitatively the effects of management practices on future ground-water levels and streamflows within the control area; and by comparing modeling approaches, to determine why procedures developed during the 1975 study have not been able to match some of the 1980's measured conditions.

APPROACH -- Assemble, evaluate, and process existing hydrogeologic and water-use data. The hydrogeologic system will be analyzed in two problem areas using a modular ground-water flow model to determine whether the existing data and this model can adequately project water levels. Mass water-level measurements and low-flow measurements of area streams will be performed. Climate, water-use, and land-use data will be used in computerized water-use programs (PET, Soil-Water, and PUMP) to generate input for the ground-water flow model. The computed pumpage data will be compared with the NRD's measured pumpage data. Sensitivity analyses on hydraulic and water-use characteristics will be performed. The model will be calibrated from spring 1951 to spring 1989. After the model is calibrated, management options will be selected and simulated.

RESULTS -- The TESTHOLE program has been developed using revised input data for hydraulic conductivity and specific yield. The PET and SOIL-WATER programs were revised and developed with data from 1951-89. Sensitivity analyses of the input data for the SOIL-WATER program were performed. The PUMP program was developed and used. Streamflow, canal diversions, and other water-use data were obtained and evaluated. Input data for the flow model were developed and checked to eliminate errors. The flow model was used with the test data.

PLANS FOR FISCAL YEAR 1992 -- Calibrate the ground-water flow model from 1951-89. Develop future management alternatives with cooperators; use water-use programs to generate discharge and recharge values based on those alternatives; and use the ground-water flow model to obtain projected water levels and streamflows based on those alternatives. Prepare a report on the hydrogeology of the Upper Republican Natural Resources District, Nebraska.

CONTAMINATION POTENTIAL OF GROUND WATER IN NEBRASKA BY GRAIN-STORAGE FACILITIES (NE-059)



Location: Statewide

Project leader: Abraham H. Chen

Cooperating agency: U.S. Environmental Protection Agency

NEED FOR STUDY -- Thirty-seven public-water supply wells in Nebraska have been found to be contaminated presumably by pesticides used as fumigants at grain-storage facilities. Because of concern regarding contamination of these wells by Federal and commercial grain-storage facilities, the U.S. Environmental Protection Agency, Region 7, requested that the Nebraska District, as well as the Iowa, Kansas, and Missouri Districts of the U.S. Geological Survey, assess the possible contamination of public water-supply systems by fumigant use at grain-storage sites.

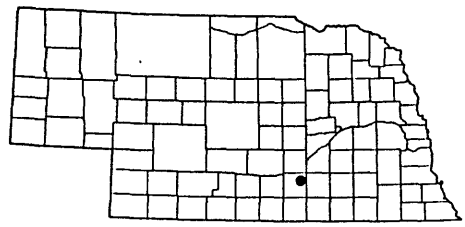
OBJECTIVES -- (1) To identify sites and evaluate the potential for ground-water contamination associated with fumigant use in grain-storage facilities in Nebraska; (2) to develop a consistent approach, methodology, and data-management system for addressing the problem in large geographic areas.

APPROACH -- (1) Identify Federal and/or commercial grain-storage facilities and enter information such as location, type of storage capacity, chemical use, and other historical information into a geographic information system (GIS) data base. (2) Identify the locations, physical characteristics, and pesticide contamination of public water supplies in the vicinity of grain-storage facilities. (3) Compile site-specific hydrogeologic information, such as soils, geology, hydraulic conductivity, depth to water, and ground-water flow direction and velocity. (4) Digitize and produce a series of GIS coverages to assess the available information for the sites.

RESULTS -- (1) The usefulness of geographic information systems (GIS) as a tool for the grain-bin contamination study was demonstrated; (2) grain-storage pesticides and related chemicals were identified; (3) locations and characteristics of former U.S. Department of Agriculture (550) and commercial (697) sites were identified; (4) water-quality data from State agencies regarding public water-supply systems were collected; (5) a GIS data base and workplan for FY 1991 were created; and (6) a combined proposal, "Contamination potential of ground water by grain-storage facilities in Iowa, Kansas, Missouri, and Nebraska" was presented to the U.S. Environmental Protection Agency, Region 7.

PLANS FOR FISCAL YEAR 1992 -- Project suspended due to unavailability of funding.

DATA APPRAISAL OF THE GROUND-WATER CONTAMINATION SITE AT HASTINGS, NEBRASKA (NE-060)



Location: South-central Nebraska

Project leader: Abraham H. Chen

Cooperating agency: U.S. Environmental Protection Agency

NEED FOR STUDY -- Contamination at the U.S. Environmental Protection Agency (EPA) designated Ground-Water Contamination Site (located at Hastings, Nebraska) is associated with landfills, agricultural-related operations, and a former Naval ammunitions depot. Data have been collected at the site for a number of years; however, the total extent of contaminants at the site is not known, and the adequacy of the data for preparation of a ground-water flow model also is not known. The EPA requested technical assistance from the U.S. Geological Survey in evaluating the adequacy of existing data.

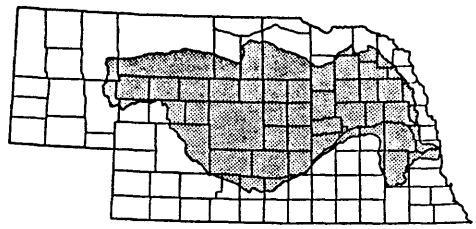
OBJECTIVE -- (1) To evaluate the existing data and data network for adequacy in defining the total extent of contamination at the Hastings site. (2) To provide EPA with a description of additional data needed to adequately define the extent of ground-water contamination. (3) To evaluate existing data for adequacy in preparing a ground-water flow model of the area and to provide EPA with a description of modeling needs.

APPROACH -- (1) Review existing data related to ground-water quality and hydrologic conditions at the site. (2) Meet with EPA technical and legal representatives to review USGS suggestions. (3) Brief the EPA Regional Administrator concerning applications for computer modeling at this site. (4) Identify any additional data needs prior to beginning remediation of the ground-water resources.

RESULTS -- All existing data related to ground-water quality and hydrologic conditions at or near the Hastings site have been evaluated. A series of slides summarizing the results of the evaluation of data collected at the Hastings site was transmitted to the U.S. Environmental Protection Agency, Region 7.

PLANS FOR FISCAL YEAR 1992 -- Project completed.

NATIONAL WATER-QUALITY ASSESSMENT OF THE CENTRAL NEBRASKA BASINS (NE-061)



Location: Central Nebraska

Project leader: Thomas L. Huntzinger

Cooperating agency: USGS Federal Program

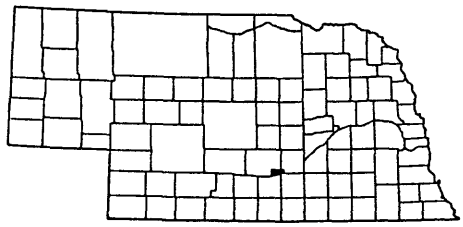
NEED FOR STUDY -- The Central Nebraska Basins, which include the Platte, Loup, and Elkhorn River drainages, are a significant resource to the area and to users downstream who are affected by it. Hydrologically, the area is an integrated stream and water-table aquifer system with reservoir control and pumpage for irrigation and public water supplies. Economically, the area is primarily agricultural and has the potential for depletion of ground-water supplies and contamination from agricultural chemicals. Current information indicates large nitrate and pesticide concentrations in the water. The Platte River is located within the Central Flyway for migratory birds and is a major stopover for waterfowl, including endangered species such as the whooping crane. There is concern that decreased streamflow and deteriorating water quality will have a negative effect on this wildlife resource.

OBJECTIVE -- To assess the water-quality conditions in the Platte River basin. Maximum use of existing data will: (1) provide a description of current water-quality conditions and trends in water quality, including sources of contamination, and (2) conceptually describe apparent relations between water-quality conditions and natural and human factors. Additional analyses and field data will: (1) verify the description of water-quality conditions, (2) define long-term trends in water quality, (3) reduce the uncertainty of the described water-quality conditions, and (4) increase knowledge of the relations between causative factors and water quality.

APPROACH -- The water-quality assessment of the Central Nebraska Basins will include four distinct components that relate to a quantitative description of the water-quality conditions in the area. (1) A thorough compilation, analysis, and interpretation of existing hydrologic data will be performed. (2) The analysis will provide the basis for developing the strategy for obtaining specific additional hydrologic data that will be used to define areal and temporal distribution of water quality. (3) Ancillary information will be obtained that will provide the most reliable information about current water-quality conditions and trends and their relation to human and natural factors. (4) Hydrologic processes may be investigated in more detail in smaller areas on river reaches that relate to the solution of critical water-quality problems in the study area through analyses of available data or collection of new data.

RESULTS -- Staffing for the project was completed as planned. All major hydrologic data sets have been obtained. The summary of available data has been started. An extensive list of publications was compiled for the area. The first draft of the work plan was completed.

PLANS FOR FISCAL YEAR 1992 -- Complete the summary of available data and a field reconnaissance data-collection effort. Select representative areas for study.



HYDROGEOLOGY OF THE MANAGEMENT SYSTEMS EVALUATION AREA SITE IN NEBRASKA (NE-062)

Location: Near Shelton in south-central Nebraska

Project leader: Michael J. Ellis

Cooperating agency: USGS Federal Program

NEED FOR STUDY -- The Management Systems Evaluation Area (MSEA) projects, supported by the U.S. Department of Agriculture, are intended to demonstrate the effects of agricultural management practices on the quality of ground water. The principal research site for the Nebraska MSEA is a 560-acre tract of irrigated cropland located in the Platte River valley near Shelton, Nebraska. Ground water in this part of the State has been contaminated from long-term agricultural use of chemicals. Because concentrations of agricultural chemicals in ground water represent a composite of past and present agricultural practices, any evaluation of the effectiveness of different water- and chemical-application techniques to be tested at the site will require an accurate and detailed description of the hydrogeologic framework in the vicinity of the site and quantification of the movement of water into, through, and out of the ground-water system.

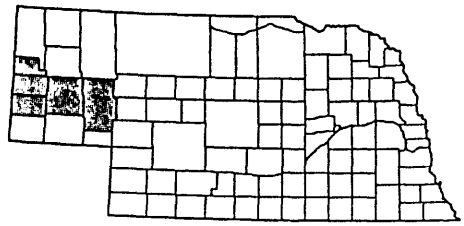
OBJECTIVE -- The objective of this project is to characterize the hydrogeologic system in the vicinity of the Nebraska MSEA site and its response to natural and anthropogenic stresses. This information is essential to research efforts at the MSEA site to interpret the significance of changing concentrations of agricultural chemicals in the ground water and their relations to different irrigation-management systems.

APPROACH -- The approach to be used for this study consists of four main components: (1) assembly and evaluation of existing hydrogeologic data; (2) collection of additional data needed to define the hydrogeologic system; and (3) interpretation of data, including an evaluation of adequacy and accuracy of data and synthesis of variables needed for defining the hydrogeologic system and hydrologic budget.

RESULTS -- Reviewed published reports pertaining to the study area. Obtained three sets of water-level measurements at 170 sites. Compiled a well-log file, including geologic logs for 43 test holes and driller's logs for 129 selected irrigation wells. Collected supplemental warm-season precipitation data at 18 sites. Completed plans and began preparations for aquifer tests, which included installation of 18 observation wells and piezometers.

PLANS FOR FISCAL YEAR 1992 -- Continue to collect water-level, precipitation, pumpage, and land-use data. Conduct aquifer tests to determine hydrologic properties of the aquifer and any interrelations between aquifers. Begin preparation and calibration of a ground-water model for the study area.

GROUND-WATER QUALITY OF THE NORTH PLATTE NATURAL RESOURCES DISTRICT, NEBRASKA (NE-063)



Location: Western Nebraska

Project leader: Ingrid Verstraeten

Cooperating agencies: North Platte NRD, Nebraska Natural Resources Commission, University of Nebraska-Lincoln Conservation and Survey Division

NEED FOR STUDY -- The quality of ground water is an important issue in the North Platte Natural Resources District (NRD) because ground water is an important source for domestic, agricultural, and industrial water users. To date, there has been no comprehensive study that adequately addresses the ground-water-quality concerns of the North Platte NRD. These concerns include agricultural contamination and the existence of naturally occurring radionuclides and trace elements.

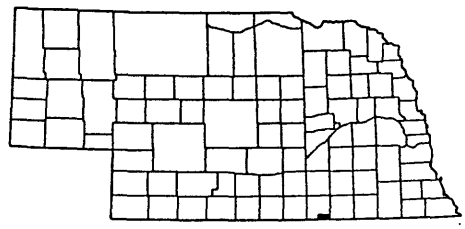
OBJECTIVE -- The major objectives of the project are: (1) to determine the occurrence and distribution of agricultural contaminants and naturally occurring constituents in order to establish a baseline of ground-water-quality conditions; and (2) to relate the concentrations of these constituents to the geologic, hydrologic, and land-use characteristics of the area.

APPROACH -- The first phase of the study will consist of an evaluation of the hydrogeology of the area using available data to determine the major aquifer systems within the NRD. Approximately 180 wells will be selected for potential sampling using a stratified random approach. During the summer of 1991, 120 wells will be sampled. Data will be analyzed using statistical methods. Findings will include a summary of the ground-water-quality characteristics in the North Platte NRD.

RESULTS -- Existing hydrogeologic information was collected and evaluated for the study area. One-hundred twenty sampling sites were selected, and water samples were collected at those sites during June and July 1991. Several agencies were contacted for water-use and land-use information. Ground-water-quality data were retrieved and reviewed.

PLANS FOR FISCAL YEAR 1992 -- Complete retrieval and processing of ground-water-quality data. Complete project report.

GROUND-WATER- AND SEDIMENT-QUALITY MONITORING FOR THE SUPERIOR SPECIAL PROTECTION AREA, SUPERIOR, NEBRASKA (NE-064)



Location: South-central Nebraska

Project leader: Abraham H. Chen

Cooperating agencies: Nebraska Department of Environmental Control, Lower Republican and Little Blue Natural Resources Districts, University of Nebraska-Lincoln Conservation and Survey Division

NEED FOR STUDY -- After conducting a ground-water-quality investigation at a 32-square mile site in southern Nuckolls County during the spring and summer of 1988, the Nebraska Department of Environmental Control concluded that ground-water contamination with nitrate was sufficiently widespread and concentrations were large enough to justify establishment of a Special Protection Area. A ground-water- and sediment-quality monitoring program is important in evaluating the effects of land-management practices instituted as part of the Special Protection Area designation.

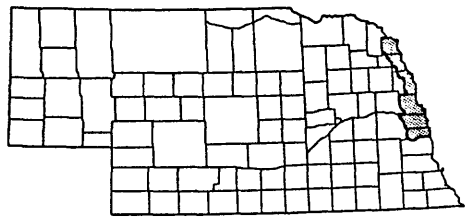
OBJECTIVE -- (1) Identify acceptable sites for monitoring-well locations within the Special Protection Area; (2) determine the frequency with which ground-water samples should be collected and analyzed from these sites; (3) determine if nitrate concentrations in ground water are changing significantly in the study area and at what rate; (4) estimate the nitrate concentration of the unsaturated zone prior to fertilizer application at representative sites in the bottom and terrace lands; and (5) determine if nitrate concentrations in the unsaturated zone are changing significantly at representative sites in the study area and estimate the rate of change.

APPROACH -- (1) About 16 sites will be selected and an observation well will be installed in a suitable location at each site. (2) Water samples from each well will be collected bimonthly and analyzed for nitrate concentration. (3) A minimum of two representative sites will be selected for deep cores of the unsaturated zone, and sediment will be collected for nitrate analysis to determine the quantity and distribution of nitrate in the system. (4) Ground-water and sediment-nitrate data will be interpreted statistically.

RESULTS -- A ground-water monitoring network was designed by considering geologic, hydrogeologic, soils, land-use, and physiographic factors. A total of 16 sites were selected, and a total of 20 monitoring wells were drilled. Dedicated pumps were installed in 18 of the wells. Ground-water samples were collected four times at each of the 20 wells, and samples plus 10-percent replicates were sent to the U.S. Geological laboratory in Arvada, Colorado, for nitrate analysis. In addition, two sites were selected for sediment coring, and a total of 101 core samples were collected for ammonium-nitrogen and nitrate-nitrogen analysis.

PLANS FOR FISCAL YEAR 1992 -- A total of six ground-water samples will be collected for nitrate analysis at each of the 20 monitoring wells; nitrate-specific probes will be used to determine sample timing. Spring water-level measurements will be conducted.

GROUND-WATER QUALITY OF THE PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT, NEBRASKA (NE-066)



Location: Eastern Nebraska

Project Leader: Ingrid Verstraeten

Cooperating Agencies: Papio-Missouri NRD and the Nebraska Natural Resources Commission

NEED FOR STUDY -- More than 115,000 acre-feet of water is used annually in the Papio-Missouri River Natural Resources District (NRD) (Steele, 1988). The major geologic sources of ground water are Pleistocene sand and gravel, Missouri River alluvium, and Dakota sandstone. The quality of ground water is important to domestic, agricultural, urban, municipal, and industrial water users. Previous investigations of ground-water quality were concerned chiefly with the major inorganic constituents. The Dakota Formation statewide yields water with large concentrations of dissolved solids (Engberg, 1984). Tanner and Steele (1991) characterized the Missouri River alluvial aquifer south of the NRD as having relatively large concentrations of iron and manganese. No available comprehensive study exists that adequately addresses the current ground-water-quality concerns of the NRD. These include agricultural contamination from nitrate and pesticides, naturally occurring radionuclides and trace elements, and industrial organic contaminants. There is a further need to identify the distinct chemical characteristics of water from each of the aquifer systems.

OBJECTIVES -- The overall objective of the study is to describe the ground-water quality of the principal aquifer units in the NRD. The specific objectives are: (1) to determine the occurrence and distribution of the following constituents in ground water--nitrates, pesticides, radionuclides, major ions, industrial organic contaminants, and trace elements; (2) to relate concentrations of these constituents to the geologic, hydrologic, and land-use characteristics of the area; and (3) to establish a baseline of ground-water-quality conditions for future monitoring programs.

APPROACH -- The hydrogeology of the NRD will be evaluated using data from well logs, test holes, and other available information. Approximately 100 wells will be selected for sampling using a stratified random approach. The 100 wells will be sampled during July and August 1992. All of the samples will be analyzed for nitrate concentrations; 40 of the 100 wells will be selected for more complete water-quality analysis, which will include selected pesticides, organic compounds, major ions and trace elements. Fifty-four sites also will be selected for sediment analysis within the unsaturated zones. Sediment will be analyzed for nitrate, alachlor, and atrazine. Data will be analyzed using statistical methods. Findings will include a summary of ground-water-quality characteristics in the NRD.

RESULTS -- Planning for project activities was completed.

PLANS FOR FISCAL YEAR 1992 -- Sampling sites will be selected. Sampling of all wells and sediment sites will be completed, and samples will be submitted for laboratory analysis. Initial data analysis will begin.

SOURCES OF GEOLOGICAL SURVEY PUBLICATIONS AND INFORMATION

Books

Current U.S. Geological Survey reports are listed in a pamphlet entitled "New Publications of the Geological Survey." The pamphlet, issued monthly, is free on request to the U.S. Geological Survey, 582 National Center, Reston, VA 22092.

Professional papers, bulletins, water-supply papers, techniques of water-resources investigations, circulars, and publications of general interest, such as leaflets, pamphlets, and booklets, are available from the U.S. Geological Survey Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225. Open-file reports and water-resources investigations reports are available for inspection at the District Office of the U.S. Geological Survey in Lincoln, Nebraska, or the reports can be purchased in microfiche or paper copy from the Books and Open-File Reports Section listed above.

Records of streamflow, quality of water, and ground-water levels are available in a series of reports published annually for each State. For Nebraska, the report is entitled, "Water-Resources Data, Nebraska--Water Year 19__." Copies of the Nebraska report may be obtained by writing to the District Office, 406 Federal Building, Lincoln, NE 68508.

Maps

Miscellaneous investigations maps, hydrologic investigations atlases, hydrologic unit maps, and topographic maps are available for sale from the U.S. Geological Survey Map Distribution, Federal Center, Box 25286, Denver, CO 80225.

Flood-prone maps for selected areas of Nebraska can be obtained from the District Office, 406 Federal Building, Lincoln, NE 68508.

Other Information Available

Hydrologic data stations maintained at selected locations throughout Nebraska make up a water-resources data network for obtaining records on stream discharge and stage, reservoir and lake storage, ground-water levels, and the quality of ground and surface water. The U.S. Geological Survey has both a current and historical file of these data, which are filed in WATSTORE (National Water Data Storage and Retrieval System). Data from these files are available in machine-readable form or in computerized tables, statistical analyses, and digital plots. These services or products can be obtained by contacting the Nebraska District Office.

NAWDEX, the National Water Data Exchange, was established to assist users of water data to identify, locate, and acquire needed data. It provides a nationwide service for indexing and describing the characteristics of data available throughout the Federal and non-Federal water-data community. NAWDEX maintains two data bases: (1) a Water-Data Sources Directory and (2) a Master Water-Data Index, which identifies and describes available water data. The Nebraska District Office is a designated Local Assistance Center for searching for and accessing water data held by NAWDEX members.

WATER-RESOURCES REPORTS PREPARED BY U.S. GEOLOGICAL SURVEY, 1985-91

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