



# WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

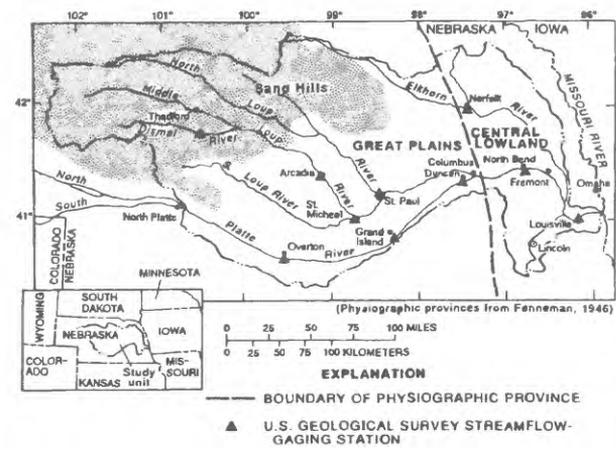
## NATIONAL WATER-QUALITY ASSESSMENT PROGRAM—The Central Nebraska Basins

In 1991, the U.S. Geological Survey (USGS) began to implement 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 natural and human factors affecting the quality of these resources. In meeting these goals, the program will provide water-quality information that will be useful to policy makers and managers at the national, State, and local levels.

The NAWQA program will integrate water-quality information that has been generated from different areal scales into the national assessment. A major component of the program is study-unit investigations, which comprise the principal building blocks of the program on which national-level assessments are based. The 60 study-unit investigations that make up the full-scale NAWQA program represent hydrologic systems that include parts of most major river basins and aquifer systems. The study units vary in size from 1,200 to more than 65,000 square miles and incorporate about 60 to 70 percent of the Nation's water use and population served by public water supplies. In 1991, the Central Nebraska Basins area was among the first 20 NAWQA study units selected for study under the full-scale implementation plan.

### DESCRIPTION OF STUDY UNIT

The Central Nebraska Basins study unit includes the Platte River and its tributaries between the confluence of the North and South Platte Rivers in western Nebraska downstream to the Missouri River at the eastern boundary of Nebraska. Major tributary systems in the study unit are the Loup and Elkhorn River basins (fig. 1). Hydrologically, the area is an integrated stream-aquifer system with reservoir controls and an unconfined aquifer that is used for irrigation and public water supplies. Water supplies could become depleted by pumping and contaminated from agricultural chemicals because the area is primarily agricultural. The Platte River is located within the Central Flyway and provides critical habitat for wildlife and migratory birds.



The area of the study unit is approximately 30,000 square miles. The western three-fourths of the study unit is in the Great Plains physiographic province. It is characterized by gently rolling grasslands of the High Plains and Sand Hills, which are sand dunes stabilized by native grasses common to the North and Middle Loup River basins. The eastern one-fourth of the study unit lies in the more humid Central Lowland physiographic province, which typically consists of loess-covered hills with native tall grasses. The Platte Valley, a flat lowland, is a mix of rich alluvial soils and wet meadowlands. Historically, the Platte Valley was primarily a wide sand channel, but the channel is becoming overgrown with timber and brush in many places because control structures have stabilized flow in the Platte.

As stated earlier, agriculture is the primary land use: 47 percent is cropland and 48 percent range or pastureland. Cropland is evenly distributed throughout the study unit, except in the North and Middle Loup River basins where land use is primarily rangeland. More than 3 million acres of cropland were irrigated in 1985. Population of major towns in the area is typically less than 10,000. Urban and industrial areas are located in the downstream reaches of the Platte River between Omaha and Lincoln. Officials of these two metropolitan areas report estimated populations of about 600,000 (Omaha) and 200,000 (Lincoln) in 1991.

The estimated water use in the Central Nebraska Basins study unit during 1985 (see table) was about 7,400 million gallons per day or about 8 million acre-feet, which represents about 40 percent of water use in the State. Power generation and irrigation constitute the primary demands for water in the study unit.

Table. Summary of 1985 water use in the Central Nebraska Basins study unit

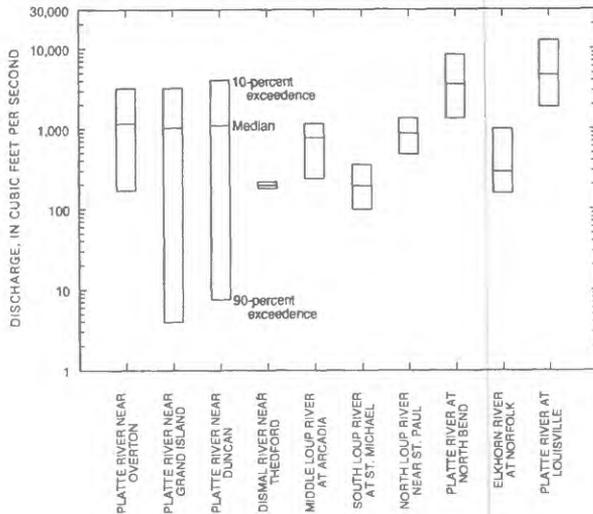
River Basin	Total use (million gallons per day)	Percentage of total by type of use					
		Irrigation Ground-water	Irrigation Surface-water	Public supply	Power generation	Live-stock	All other <sup>1</sup>
Platte (excludes Loup and Elkhorn).	4,987	20.0	5.7	1.2	71.8	0.3	1.0
Loup (North, Middle, and South).	1,842	32.5	9.3	.4	56.1	1.2	.5
Elkhorn.....	579	86.8	3.9	3.1	.1	3.3	2.8

<sup>1</sup>Includes self-supplied domestic, commercial, industrial, and mining uses.

### CLIMATE AND HYDROLOGY

Extreme seasonal temperature variations (subzero degrees Fahrenheit in winter to more than 100 degrees Fahrenheit in summer) are typical of climate in the study-unit area. The annual number of frost-free days ranges from about 150 in the west to 165 in the east. Average annual precipitation ranges from less than 20 inches west of North Platte to about 30 inches near Omaha. The three major stream systems in the study unit have significantly different flow characteristics. The Platte River is a controlled stream with major diversions for irrigation that cause large seasonal

changes in flows upstream from Duncan. Median flows of the Platte River are smaller, about 200 cubic feet per second at St. Michael. Downstream from Duncan, Platte River flows are relatively constant (fig. 2) because of sustained ground-water discharge from the Sand Hills in the Loup River system and more stable flows from the Elkhorn River and other drainage in the more humid part of the basin. Mean annual runoff in the Central Nebraska Basins study unit ranges from about 1 inch in the western part to about 5 inches in the eastern part.



The High Plains aquifer system, which consists of sand, gravel, silt, and clay, is the primary source of ground water throughout most of the study unit. Saturated thicknesses range locally from more than 200 feet to more than 800 feet. The aquifer is generally unconfined and is hydraulically connected to valley alluvial deposits. Depths to water range from more than 200 feet in upland areas to less than 20 feet in the Platte River valley. The Dakota aquifer, which consists of sandstone and shale, is present at relatively shallow depths in the extreme eastern part of the study unit. Yields to wells typically range from 500 to 1,000 gallons per minute in the High Plains aquifer system and from 300 to 750 gallons per minute in the Dakota aquifer near Lincoln.

Long-term water-level declines of as much as 10 feet in some parts of the High Plains aquifer system have been caused by extensive pumping for irrigation. In some areas that are irrigated by surface water, ground-water levels have risen because of increased recharge.

#### MAJOR WATER-QUALITY ISSUES

The Platte and Loup River systems and the underlying High Plains aquifer are critical resources in the study unit. Because irrigated agriculture is the dominant land use in the unit, the quantity and quality of water supplies can be affected by agriculture. In 1987, 200 million pounds of fertilizer and 30 million pounds of pesticides were applied to Nebraska cropland. Elevated concentrations of nitrates and pesticides are present in surface and ground water in many areas. Personnel of the U.S. Department of Agriculture, the U.S. Environmental Protection Agency (EPA), and State agencies are working to determine nonpoint sources of contaminants from agricultural lands in order to mitigate impaired water quality.

Wetlands in the North and Middle Loup River basins and meadowlands in the Platte Valley near Grand Island are the critical habitat areas for migratory birds. As many as 500,000 sandhill cranes use a reach of the Platte Valley near Grand Island to feed every spring before

continuing their northward migration. Many species using the Platte River, including the piping plover, interior least tern, whooping crane, and bald eagle, are classified as being either endangered or threatened. Upstream reservoir controls and other water-development activities are often in conflict with the maintenance of critical habitat for wildlife. Habitat deterioration caused by changes in flow characteristics or water-quality conditions are of concern, and personnel of the EPA, U.S. Bureau of Reclamation, and U.S. Fish and Wildlife Service have increased their attention to the protection of the Platte River environment.

#### COMMUNICATION AND COORDINATION

The USGS will ensure that Federal, State, and local interests are recognized throughout the course of its NAWQA activities. Communication processes traditional in USGS cooperative programs among Federal, State, and local organizations will continue to provide a basic means of agency interaction. A liaison committee, which consists of representatives from many organizations, will provide a consistent forum for communication and coordination of activities in the study unit. The liaison committee will provide information to the NAWQA team during planning, exchange information during ongoing activities, and provide comments on documents and reports prior to their publication.

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