WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

NATIONAL WATER-QUALITY ASSESSMENT PROGRAM—South Platte River Basin

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 produce a wealth of water-quality information that will be useful to policy makers and managers at the national, State, and local levels.

A major design feature of the NAWQA program is the integration of water-quality information at different areal scales. The principal building blocks of the program are the study-unit investigations on which the national-level assessments are based. The 60 study-unit investigations that make up the program are hydrologic systems that include parts of the Nation's major river basins and aquifer systems. These study units include areas ranging 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 supply. In 1991, the South Platte River basin was among the first 20 NAWQA study units selected for study under the full-scale implementation plan.

DESCRIPTION OF THE SOUTH PLATTE RIVER BASIN

The South Platte River basin includes parts of three States, Colorado (79 percent), Wyoming (6 percent), and Nebraska (15 percent), and has a drainage area of approximately 24,300 square miles. The primary river within the basin, the South Platte River, originates in the mountains of central Colorado and flows about 450 miles northeast across the Great Plains where it joins the North Platte River at North Platte, Nebr. The boundaries of the basin are the Colorado River headwaters drainage to the west, the upper Arkansas River drainage to the south, the North Platte River drainage to the north, and the Republican River drainage to the east.

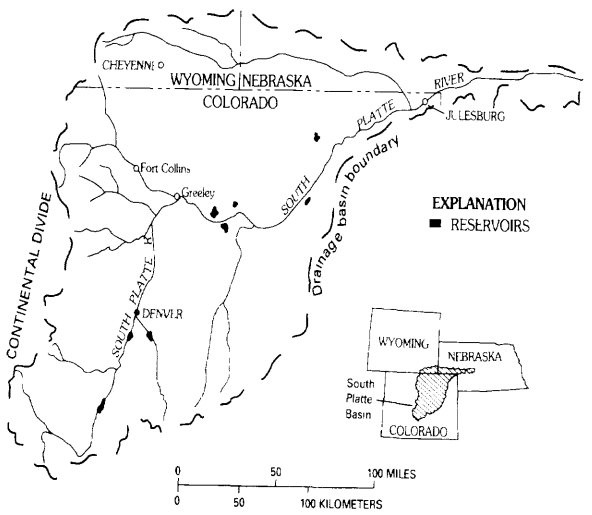
The three-State study area is inhabited by about 2 million people; 96 percent reside in Colorado. About 68 percent of Colorado's population lives within the South Platte River basin. The majority of the basin population is concentrated along the Front Range urban corridor.

The study area is characterized by diverse population density that ranges from sparsely populated mountainous areas in the headwaters and rural agricultural areas downstream from Denver to the densely populated Denver metropolitan area in the south-central part of the basin. The principal economy in the mountainous headwaters is based on tourism and recreation. The economy in the urbanized south-central region is mostly related to manufacturing, service and trade industries, and government services. The economy of the basin downstream from Denver is based on grain and livestock production.

PHYSIOGRAPHY, GEOLOGY, HYDROLOGY, AND WATER USE

The headwaters area of the South Platte River and its major tributaries is on the eastern slope of the Continental Divide. The basin stretches over two large physiographic provinces, the Front Range section of the Southern Rocky Mountains on the west and the Colorado Piedmont section of the Great Plains on the east. The Southern Rocky Mountain province is characterized by steeply sloping valleys that drain high mountain ranges. Average annual precipitation ranges from about 7 to 60 inches. In contrast, the Great Plains province is characterized by dissected plains and rolling hills with average annual precipitation ranging from about 12 to 16 inches.

The Front Range is the headwaters area of the South Platte River and is composed of Precambrian-age metamorphic schists and gneisses intruded by igneous rocks. The Colorado Piedmont is located between the Front Range to the west and the High Plains to the east. The western boundary of the High Plains is delineated by the west-facing scarp of the Ogallala Formation, which is composed of loosely cemented sandstone, caliche, sand, gravel, and volcanic ash. Most of the Colorado Piedmont is underlain by the Denver Basin, which is composed of sedimentary rocks in beds of consolidated sandstone and conglomerate. East of the mountain front along the mainstem and tributaries,the South Platte River valley is underlain by valley-fill alluvium composed of gravel, sand, silt, and clay.



Surface-water supplies of the South Platte River basin are a combination of imported and native water. In 1985, about 96 percent (388,700 acre-feet) of the water imported into the South Platte River basin was from the Colorado and Arkansas River basins for municipal, industrial, and agricultural uses. Seventy-three percent of those diversions (285,200 acre-feet) were from the Colorado-Big Thompson-Alva B. Adams Tunnel.

The quantity of native surface water present in the South Platte River basin averaged 1,441,000 acre-feet per year for 1950 to 1970. Surface flows are generated by a combination of snowmelt in late spring and rainfall in spring and summer. Low flows in the South Platte River and its tributaries occur in late summer, fall, and winter. To meet irrigation demands during late summer, natural streamflow is supplemented with reservoir releases and ground-water withdrawals. About 79 percent of the annual surface-water supply (imported plus native) is used within the basin, based on the long-term average annual discharge of the South Platte River at Julesburg, Colo. (379,000 acre-feet per year based on 82 years of record).

Three aquifers are the principal sources of ground water within the study area. Two aquifers that consist of unconsolidated deposits account for most of the withdrawals. These aquifers are the alluvial aquifer along the South Platte River and its tributaries and the High Plains aquifer in eastern Colorado, southeastern Wyoming, and western Nebraska. The unconfined alluvial aquifer is hydraulically connected with the South Platte River along its mainstem and major perennial tributaries. The alluvial aquifer is recharged by precipitation, by leakage from streams, reservoirs, and ditches, and by percolation of applied irrigation water diverted from the river and its tributaries. The High Plains aquifer generally is unconfined, but is confined locally by lenses of silt and clay. The third important aquifer consists of consolidated rocks in the Denver Basin aquifer system, which underlies the South Platte River basin. This aquifer system is recharged in outcrop areas by rainfall, snowmelt, and streamflow. Discharge from all three aquifers occurs primarily through wells, seeps, springs, discharge to streams, and evapotranspiration.

Total off-stream water use in the South Platte River basin during 1985 totaled about 4,192 million gallons per day. About 71 percent of the water used (2,968 million gallons per day) was surface water. About 71 percent of the total water use was for irrigation, 42 percent (1,235 million gallons per day) from surface water. About 9 percent (45 million gallons per day) of the water withdrawn by public suppliers in the study area was from ground-water resources. In general, the large metropolitan public-supply systems rely on surface water, whereas the smaller, rural suppliers rely on ground water.

MAJOR WATER-QUALITY ISSUES

The major water-quality issues in the South Platte River basin relate to land and water use and differ in the headwaters, south-central, and downstream areas. Some issues are specific to surface or ground water, whereas other issues are broader and can affect both resources. The major water-quality issues include effects of nutrients, heavy metals, organic chemicals, and bacteria from municipal wastewater-treatment-plant effluents on biology, sediment, and water quality in the receiving streams, lakes, and reservoirs; effects of nutrients, heavy metals, pesticides, herbicides, and sediment from point and nonpoint agricultural and feedlot sources on the biology, sediment, and water quality of the affected ground-water systems and receiving streams, lakes, and reservoirs; and contamination of surface and ground waters from solid, liquid, or hazardous waste storage and disposal sites (commercial and governmental facilities). Also, degradation of surface and ground water from point and nonpoint sources, such as residential (septic-system effluents and lawn and garden chemicals) and urban (runoff, industrial discharges, and hydrocarbon and other organic chemical leaks and spills) land use; deterioration of ground-water quality as a result of induced infiltration of degraded surface water, specifically within the shallow alluvial aquifer downstream from the Denver metropolitan area; effects of past and present mining activities on the biological and chemical quality of receiving waters, particularly in headwaters of the South Platte River and its tributaries; and naturally occurring trace elements and radionuclides in ground water.

COMMUNICATION AND COORDINATION

Communication and coordination between USGS personnel and other interested scientists and water-management organizations are critical components of the NAWQA program. Each of the study-unit investigations will have a local liaison committee that consists of representatives who have water-resources responsibilities from Federal, State, and local agencies, universities, and the private sector. Specific activities of each liaison committee will include the exchange of information about water-quality issues of regional and local interest; the identification of sources of data and information; assistance in the design and scope of project products; and review of project planning documents and reports. The liaison committee for the South Platte River basin study unit will be formed in 1991.

SELECTED REFERENCES

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Information on technical reports and hydrologic data related to the NAWQA program can be obtained from:

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