



WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY GROUND-WATER STUDIES IN SOUTH DAKOTA

GROUND-WATER ISSUES

Sedimentary bedrock aquifers underlie most of South Dakota; however, glacial-drift and alluvial aquifers underlie the State east of the Missouri River. Although the quality of some ground-water supplies is less than desirable owing to excessive mineral content, ground water generally is the only source of water available for domestic, public-supply, and agricultural uses. Eighty-three percent of the State's population of 706,000 is served by ground water. Of the total quantity of ground water withdrawn, 53 percent is used for agriculture, 26 percent for public supply, 11 percent for domestic and commercial supplies, 8 percent for industrial uses, and 2 percent for thermo-power uses. The major issues related to ground water in South Dakota are:

- Contamination of ground water by hazardous wastes leaked or spilled from petroleum pipelines and storage tanks, and leachates from municipal sewage-treatment plants, feedlots, landfills, and septic systems, and
- Effects of land use on ground-water quality, specifically agriculture (chemicals) and gold and silver mining (leachates).

U.S. GEOLOGICAL SURVEY PROGRAMS

The U.S. Geological Survey (USGS), established in 1879, is the principal source of scientific and technical expertise in the earth sciences within the Federal government. USGS activities include research and services in the fields of geology, hydrology, and cartography. The mission of the Water Resources Division of the USGS is to develop and disseminate scientific information on the Nation's water resources. The activities of the USGS in South Dakota are conducted by scientists, technicians, and support staff in offices in Huron, Pierre, and Rapid City.

Hydrologic-data stations are maintained at selected locations throughout South Dakota to record stream discharge and stage, reservoir and lake storage, ground-water levels, well and spring discharge, and the quality of surface and ground water. Water-resources data are stored in the USGS National Water Data Storage and Retrieval System data base. These data are used by water planners and others involved in making decisions that affect South Dakota's water resources.

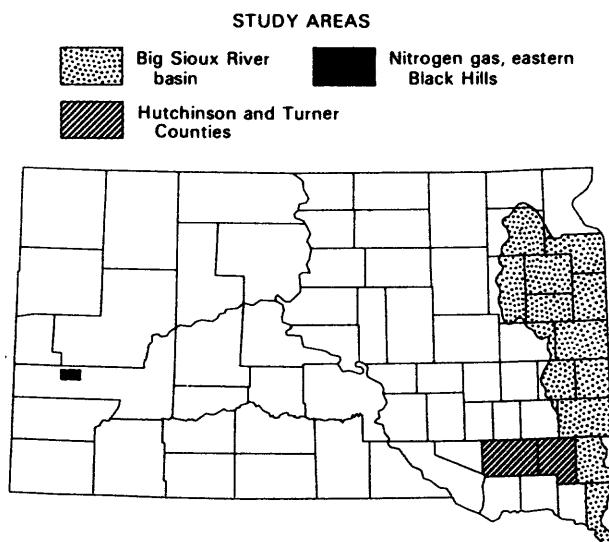
During 1987, the USGS, in cooperation with various Federal, State, and local agencies, maintained a network of about 500 observation wells in South Dakota to measure fluctuations in water levels. These measurements are used to monitor trends in ground-water levels; however, they need to be integrated with

other observations and ground-water investigations to have the most relevance and usefulness.

The USGS has conducted about 100 hydrologic investigations in South Dakota. During fiscal year 1987, the USGS entered into agreements with 26 Federal, State, and local agencies to conduct 14 hydrologic investigations in the State; seven of these investigations included studies of ground-water quantity and quality. Three examples of USGS studies that are designed to address specific ground-water issues in South Dakota are discussed in the following sections.

Ground Water in the Big Sioux River Basin

The Big Sioux River basin of eastern South Dakota contains a sizable aquifer system of major importance to the economy of South Dakota. Management problems already exist and, as development continues, the problems will increase. The aquifer system is complex, consisting of many small aquifers that are hydraulically connected with several large aquifers and with the Big Sioux River. To provide a scientific basis for evaluation and efficient use of water resources, information was needed on the availability of surface- and ground-water resources, definition of the hydrologic system, and the effect of water-resources development on the hydrologic system. From 1982 through 1987, the USGS, in cooperation with the South Dakota Department of Water and Natural Resources (DWNR), studied



the water resources of the Big Sioux basin. During the study, 1,800 test holes were drilled; of these, 300 were used as observation wells, and water-quality data were collected from 90 wells. Maps and tables that show the extent, thickness, and water quality of the major aquifers were prepared. A computer model of ground-water flow in the Big Sioux aquifer was developed to define the water budget and to investigate the water-level response of the Big Sioux aquifer to various rates of pumping and recharge. The results of this study will be used by water managers in South Dakota to plan future ground-water development.

Ground Water in Hutchinson and Turner Counties

From 1982 through 1987, the USGS, in cooperation with the DWNR and with Hutchinson and Turner Counties, studied the water resources of Hutchinson and Turner Counties. During the study, test wells were drilled to define the geohydrology, observation wells were established to provide water-level data, and water samples were collected to determine the chemical characteristics of the ground water. Results of data analyses were used to determine the location, extent, and thickness of aquifers, as well as the hydraulic connection between the aquifers. The results of this study will be used by water developers and managers in Hutchinson and Turner Counties.

Nitrogen Gas in Ground Water, Eastern Black Hills

The water from Cleghorn Springs is used by Rapid City for public supply and by the South Dakota Department of Game, Fish, and Parks (DGFP) for their fish hatchery. Although Cleghorn Springs water is supersaturated with nitrogen gas which limits fish production, the water is still suitable for use at the fish hatchery. Rapid City, the DGFP, and the USGS entered into a cooperative agreement to study the occurrence of dissolved nitrogen gas and the process of gas supersaturation in ground water. Information from the study will be used to develop a hydrologic budget for the Rapid Creek drainage from Pactola Reservoir through Rapid City. The USGS established 15 streamflow gaging stations on Rapid Creek and installed 30 observation wells near three Rapid City infiltration galleries to determine a water budget for the drainage and to conduct aquifer tests to determine hydrologic characteristics at the galleries. The results of the study will be used to determine whether the water for Rapid City is mostly spring water or if it is surface water, and how the ground water from Cleghorn Springs becomes supersaturated with nitrogen gas. This will enable both Rapid City officials and the DGFP to manage and improve the quantity and quality of the water supply.

GROUND-WATER MANAGEMENT

Management of the State's ground-water resources is accomplished through a water-record and permit system, and a State Water Plan administered by the Department of Water and Natural Resources. The various aspects of ground-water policies are the responsibility of divisions within the department. The Division of the Geological Survey conducts ground-water investigations that involve the quality, quantity, and contamination of ground water. The Division of Water Rights regulates

water use, construction of wells, and the licensing of well drillers. The Division of Drinking Water monitors public drinking-water supplies under the Federal Safe Drinking Water Act. The Division of Environmental Quality coordinates activities to protect ground-water quality. The Division's Office of Air Quality and Solid Waste is responsible for the management of solid and hazardous wastes in the State. The Division of Water Quality has the primary responsibility for dealing with ground-water contamination. These agencies use ground-water data and the results of ground-water studies provided by the USGS for management of ground-water resources in the State. During 1987-88, the following Federal, State, and local agencies entered into interagency or cooperative joint-funding agreements with the USGS to conduct ground-water investigations in South Dakota:

City of Rapid City

City of Sioux Falls

Counties of:

Brookings, Kingsbury, Moody, Codington, Lawrence, Spink, Grant, Lincoln, Turner, Hutchinson, Minnehaha, and Union

East Dakota Water Development District

James River Water Development District

Mid-Dakota Water Development District

Ogallala Sioux Tribe

Sisseton-Wahpeton Sioux Tribe

South Dakota Department of Game, Fish and Parks

South Dakota Department of Water and Natural Resources

Division of Water Rights

Geological Survey

South Dakota School of Mines and Technology

U.S. Bureau of Indian Affairs

U.S. Bureau of Reclamation

U.S. National Park Service

West Dakota Water Development District

SELECTED REFERENCES

- Decker, E.M., compiler, 1987, Water-resources activities of the U.S. Geological Survey in South Dakota—Fiscal years 1986-87: U.S. Geological Survey Open-File Report 87-383, 61 p.
- U.S. Geological Survey, 1984, National water summary 1983—Hydrologic events and issues: U.S. Geological Survey Water-Supply Paper 2250, 243 p.
- _____, 1985, National water summary 1984—Hydrologic events, selected water-quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, 467 p.

Information on technical reports and data related to ground water in South Dakota can be obtained from:

District Chief

U.S. Geological Survey

Water Resources Division

Rm. 317, Federal Bldg.

200 4th St. SW

Huron, South Dakota 57350

Director

South Dakota Water Resources Research Institute

South Dakota State University

Brookings, South Dakota 57007