



WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY GROUND-WATER STUDIES IN OKLAHOMA

GROUND-WATER ISSUES

Ground water, one of the State's most important natural resources, is the source of supply for about 56 percent of the freshwater used in Oklahoma. Counties in the eastern part of the State rely on surface-water supplies; western counties rely mainly on ground-water supplies. Of the ground water used in Oklahoma during 1980, about 76 percent was for irrigation; about 11 percent for self-supplied industrial use; about 9 percent for public supply; about 3 percent for rural domestic use; and about 1 percent for livestock. About 1,240,000 people in Oklahoma depend on ground-water supplies. The major issues related to ground water in Oklahoma are:

- Areal distribution,
- Potentially toxic chemicals in aquifers, and
- Effects of land use.

U.S. GEOLOGICAL SURVEY PROGRAMS

The U.S. Geological Survey (USGS), established in 1879, is the principal source of scientific 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 information on the Nation's water resources. The activities of the Water Resources Division in Oklahoma are conducted by scientists, technicians, and support staff in Oklahoma City, Tulsa, and Woodward.

Hydrologic data-collection stations are maintained at selected locations throughout Oklahoma 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. These water-resources data are stored in the USGS National Water Data Storage and Retrieval System data base. The data are used by water planners and others to make decisions that affect Oklahoma's water resources.

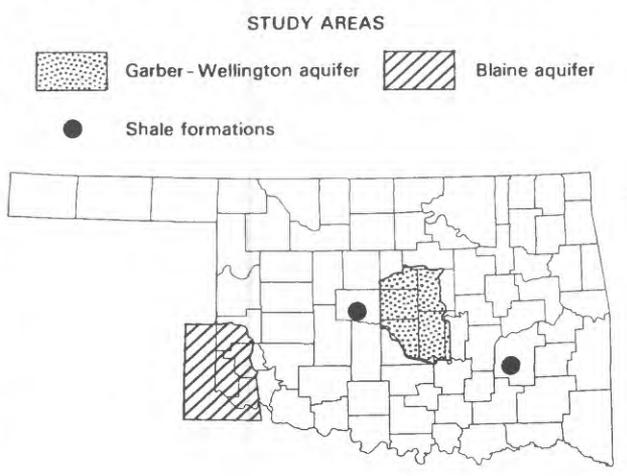
During 1987, the USGS, in cooperation with the Oklahoma Water Resources Board, maintained a network of 1,074 observation wells to monitor fluctuations of water levels. These water-level measurements are used primarily to monitor ground-water trends, and they need to be integrated with other climatic and hydrologic observations for maximum relevance and usefulness when conducting ground-water investigations.

The USGS, in cooperation with many Federal, State, and local agencies, has produced more than 330 reports on Oklahoma's water resources. About 200 of these reports provide information on ground-water resources. During fiscal year 1987,

the Survey conducted 10 projects dealing with the quantity and quality of ground water in Oklahoma. Three examples of studies that address specific ground-water issues in Oklahoma are discussed in the following sections.

Garber-Wellington National Water-Quality Assessment

The Central Oklahoma (Garber-Wellington) aquifer project is part of a pilot program, begun by the USGS in 1986, called the National Water-Quality Assessment program. The objectives of the Central Oklahoma aquifer project are to investigate regional ground-water quality, emphasizing potentially toxic trace elements, organic compounds, and radioactive constituents; to describe relations between ground-water quality, land use, and hydrogeology; to determine the location, nature, and possible causes of selected water-quality problems; and to describe the potential for ground-water-quality degradation. The Central Oklahoma aquifer underlies about 3,000 square miles, including most of the Oklahoma City metropolitan area. The aquifer is the source of public water supplies for more than 20 municipalities in the metropolitan area. Known water-quality problems include concentrations of arsenic, chromium, selenium, and gross-alpha radiation that exceed drinking-water standards. Other problems are suspected, including possible contamination from oil-field brines and drilling fluids, pesticides, fertilizers, septic tank effluent, and various organic chemicals and trace metals that typically are associated with large urban and industrially developed areas. All available water-quality data for the aquifer is being collected and evaluated. A computer model will be used to evaluate flow directions. Water samples



have been collected and analyzed to study the geochemistry of the flow system. Information from this study will be used by residents, municipalities, and the Garber-Wellington Association to manage future development of the resources. The Oklahoma Water Resources Board (OWRB) will use the information in the allocation of ground-water-pumpage rights.

Selected Shaley Formations in Oklahoma

Thick shales probably are the most suitable environment in Oklahoma for the disposal of liquid industrial wastes. Few data are available on the hydraulic properties of shales, however, and little is known of the role of shales in ground-water flow systems. Knowledge of the hydrology of shales is needed to make reliable estimates of the rates of contaminant movement in shales. The USGS, in cooperation with the Oklahoma Geological Survey (OGS), has chosen four representative shale units in Oklahoma for evaluation of their hydraulic and physical properties. Preliminary testing has been completed at two of the sites where the shale beds were continuously cored to a depth of 200 feet. Geophysical logs were made in the boreholes, in-place hydraulic-conductivity tests were made, and selected cores were submitted for laboratory determination of various properties. Results of this study will assist the OGS and State regulatory agencies in their selection of waste-disposal sites.

Blaine Aquifer, Southwestern Oklahoma

Gypsum and dolomite beds of the Blaine aquifer provide irrigation water to a 1,500-square-mile area in the Hollis Basin in southwestern Oklahoma and adjacent parts of Texas. In addition to natural recharge, the Blaine aquifer is recharged artificially by the diversion of storm runoff into sinkholes and into wells drilled into cavernous rocks. The USGS, in cooperation with the OWRB and the OGS, is studying the Blaine aquifer. Data-collection activities include establishing water-level, water-quality, and water-use networks; inventorying irrigation and recharge wells and sinkholes; test drilling; measuring stream discharge; and estimating aquifer transmissivity. These data are being used to map the hydrogeologic units; to determine the distribution of major, trace, and organic chemical constituents and radionuclides; to analyze the effects of irrigation and artificial recharge on the quantity and quality of water; and to simulate the ground-water flow system with a computer model. Information from the study will be used by the OWRB to establish ground-water allocations for the Blaine aquifer, and by State, Federal, and local agencies to determine the potential for artificial recharge.

GROUND-WATER MANAGEMENT

Several State agencies share statutory authority for management of Oklahoma's ground water. The Oklahoma Water Resources Board has primary responsibility for managing the quantity and distribution of ground-water withdrawals in the State. The board allocates water rights, based on the findings of hydrologic investigations of the State's aquifers, and is authorized to classify the aquifers according to beneficial uses and to promulgate water-quality standards to protect those uses. The board also establishes well-construction standards, primarily to protect ground-water quality.

Other agencies have responsibilities relating to the protection of ground-water quality. The Oklahoma State Department of Health has jurisdiction in any situation that could contaminate, or has contaminated, a source of drinking water. The department has approval and regulatory authority for all public water supplies, solid waste management facilities, and septic systems. The Oklahoma Corporation Commission has jurisdiction over any production activities of the oil and gas industry that may effect ground water. The commission has the authority to issue rules and regulations to prevent pollution of ground water that may result from those activities.

The Oklahoma State Department of Agriculture, the Oklahoma Conservation Commission, and the Oklahoma Department of Mines also have statutory authority relating to the protection of ground-water quality. The Oklahoma Department of Pollution Control is responsible for coordinating the activities of these agencies and other State agencies relating to environmental pollution when duplication of effort is possible. The department functions as a clearing house for pollution complaints, particularly if there is a jurisdictional question. During fiscal year 1988, the following agencies entered into interagency or cooperative agreements with the USGS to conduct ground-water investigations in Oklahoma.

Association of Central Oklahoma Governments
Oklahoma Geological Survey
Oklahoma State Health Department
Oklahoma Water Resources Board
U.S. Air Force
U.S. National Park Service

SELECTED REFERENCES

- Christenson, S.C., and Parkhurst, D.L., 1987, Ground-water quality assessment of the central Oklahoma aquifer, Oklahoma: U.S. Geological Survey Open-File Report 87-235, 30 p.
- Havens, J.S., compiler, 1988, Oklahoma, a summary of activities of the U.S. Geological Survey, Water Resources Division, for fiscal years 1986-87: U.S. Geological Survey Open-File Report 88-172, 137 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 Oklahoma can be obtained from:

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