93-140

WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, U.S. DEPARTMENT OF THE INTERIOR

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

GROUND-WATER ISSUES

Ground-water sources supply the water needs of about 40 percent of Missouri's population and are significant sources for many public supplies, except in the St. Louis and Kansas City areas. Ground water is the source of all rural domestic self-supplied water, 93 percent of all irrigation water, and 42 percent of all industrial self-supplied water (excluding water for thermoelectric power generation). The major issues related to ground water in Missouri are:

- Effects of land use on ground-water quality,
- Contamination of ground water by hazardous wastes, and
- Locally decreasing ground-water supplies.

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 disciplines 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 Water Resources Division in Missouri are conducted by scientists, technicians, and support staff in offices in Rolla, Olivette, and Independence.

Hydrologic-data stations are maintained at selected locations throughout Missouri and constitute a water-resources network to record data on 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 decisions that affect the water resources of Missouri.

During 1992, the USGS, in cooperation with Federal, State, and local agencies, measured water levels in about 250 wells in Missouri. Water-level measurements from wells are used to monitor ground-water trends; however, they need to be integrated with other observations and ground-water investigations to be most relevant and useful.

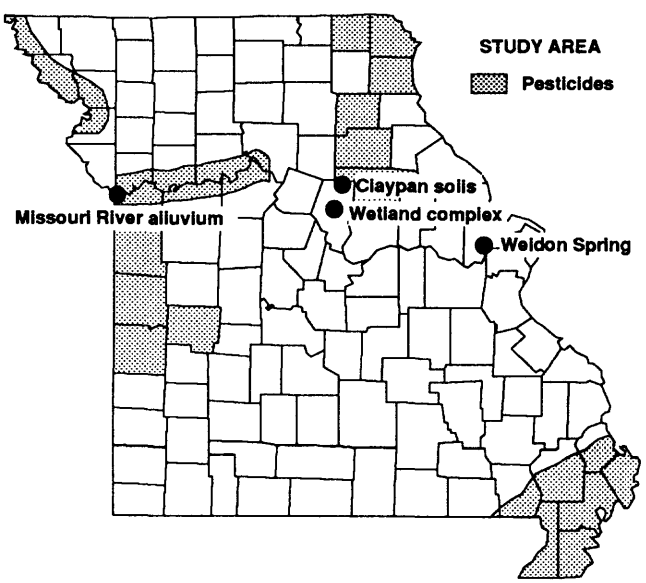
The USGS has conducted about 90 hydrologic investigations in Missouri since the 1920's. During fiscal year 1992, the USGS had cooperative or cost-sharing agreements with about 30 Federal, State, and local agencies involving 20 hydrologic investigations in Missouri; 12 investigations included studies of ground-water quantity and quality. These investigations provide information to answer questions that are specific to the State's principal ground-water issues. Also, some of these investigations provide information on state-wide, multistate, and national hydrologic issues. Several examples of ground-water studies by the USGS that address specific ground-water issues in Missouri are discussed in the following sections.

Occurrence of Pesticides

Increased and prolonged use of pesticides is a potential threat to ground-water resources in Missouri. Information on the occurrence and quantity of common pesticides in ground water is needed to determine the magnitude and extent of pesticide contamination. From 1986 through 1992, the USGS, in cooperation with the Missouri Department of Health, collected water samples from domestic, irrigation, and public-supply wells to study the occurrence of pesticides. The results of the study indicate that 20 percent of the wells sampled had detectable concentrations of pesticides, but no pesticides were detected in public-supply wells. Atrazine and deethylatrazine, an atrazine degradation product, were the most frequently detected pesticides. Atrazine concentrations were greater than or equal to the maximum contaminant level of 3 micrograms per liter set by the U.S. Environmental Protection Agency in 2 percent of the wells sampled.

Ground-Water Flow and Quality in the Missouri River Alluvium near Kansas City

The Missouri River alluvium is the only aquifer near Kansas City that commonly yields more than 20 gallons of water per minute to wells. This aquifer is used as a source of water for public supply, industry, and irrigation, but the quantity and quality of water in the aquifer are threatened by urban and rural



activities. The USGS, in cooperation with the Mid-America Regional Council, is monitoring ground-water levels in the Missouri River alluvium during different seasons and stages of the Missouri River. This information will aid in the delineation of the areas that contribute water to municipal wells. Areas of the alluvial aquifer most susceptible to contamination from the land surface are being identified, and a water-quality and water-level monitoring network is being established. A geographic information system data base being developed will be used in the development of a ground-water flow model.

Ground-Water Flow in Claypan Soils

The claypan soils that cover about 16,000 square miles of the central United States have low intrinsic permeabilities. However, macropores that form in these soils from shrinkage cracks and biologic activity allow recharge and potential contaminants, such as agricultural chemicals, to be transmitted to the underlying aquifers. Knowledge of the effects, processes, and rates of water flow and chemical transport in claypan soils is crucial to controlling water contamination from agricultural sources. Nitrate concentrations in ground water under claypan soils in northern Missouri commonly are greater than the Missouri drinking water supply standard of 10 milligrams per liter (as nitrogen). Because of these increased concentrations, the effects of nitrogen fertilizers on nitrate concentrations in ground water and runoff from the claypan soils are being studied to determine the hydrogeochemical factors that have significant roles in the transport of nitrogen through these soils.

Radioactive- and Nitroaromatic-Compound Contamination at Weldon Spring

The Weldon Spring chemical plant processed uranium ore concentrates and uranium scrap into uranium trioxide, tetrafluoride, and metal. Wastes from these operations were pumped into four large pits that are leaking, and large concentrations of sodium, sulfate, nitrate, lithium, uranium, and various trace elements have been detected in both the ground and surface water.

The chemical plant was part of the Weldon Spring ordnance works, which produced explosives between 1941 and 1945. Consequently, the ground water and soils also contain various quantities of nitroaromatic compounds, such as trinitrotoluene (TNT), trinitrobenzene (TNB), 2,4-dinitrotoluene (2,4-DNT), 2,6-dinitrotoluene (2,6-DNT), nitrobenzenes, and various degradation products of TNT. Most of the soil contamination is restricted to the Weldon Spring training area (also part of the Weldon Spring ordnance works). Large quantities of TNT have been detected in surficial soils in the training area. Small concentrations of nitroaromatic compounds have been detected in water samples from 17 of 34 monitoring wells in the training area. The USGS, in cooperation with the U.S. Army Corps of Engineers, is conducting a study to determine if contaminated surficial soils are the source of the nitroaromatic compounds in the ground water.

Hydrologic Monitoring of a Wetland Complex

Wetland areas are sensitive to chemical and physical changes in the hydrologic environment. The USGS, in cooperation with the Missouri Department of Conservation, is establishing a monitoring network to provide data that can be used to evaluate water-quality changes at the Eagle Bluffs Wildlife Area near Columbia caused by using treated sewage effluent as the major source of water for wetland management. Wells and surface-water sites are being sampled for inorganic and organic constituents to characterize the water quality before and after the wetland is inundated by the treated effluent.

GROUND-WATER MANAGEMENT

The principal State agencies responsible for ground-water management are the Department of Natural Resources, Division of Geology and Land Survey (DGLS) and Division of Environmental Quality (DEQ), and the Missouri Department of Health (DOH). The DGLS is responsible for the administration of water law in Missouri. The DEQ supervises the design and construction of water-supply systems and, in cooperation with the DOH, monitors contaminants in water supplies. These agencies use ground-water data and the results of ground-water studies provided by the USGS. During 1991-92, the following Federal, State, and local agencies entered into interagency or cooperative cost-sharing agreements with the USGS to conduct ground-water investigations in Missouri:

City of Springfield
Mid-America Regional Council
Missouri Department of Conservation
Missouri Department of Health
Missouri Department of Natural Resources
  Division of Environmental Quality
  Division of Geology and Land Survey
National Park Service
St. Francois County Environmental Corporation
U.S. Army Corps of Engineers
U.S. Department of Agriculture
  Forest Service
U.S. Department of Energy
U.S. Department of the Interior
  Bureau of Land Management
Watershed Committee of the Ozarks, Inc.

SELECTED REFERENCES

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U.S. Geological Survey, 1988, National water summary 1986--Hydrologic events and ground-water quality: U.S. Geological Survey Water-Supply Paper 2325, 560 p.

_____ 1990, National water summary 1987--Hydrologic events and water supply and use: U.S. Geological Survey Water-Supply Paper 2350, 553 p.

_____ 1991, National water summary 1988-89--Hydrologic events and floods and droughts: U.S. Geological Survey Water-Supply Paper 2375, 591 p.

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

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