

In 1991, the U.S. Geological Survey (USGS) began the full-scale National Water-Quality Assessment (NAWQA) program. The long-term goals of the NAWQA program are to describe the status of, and trends in, the quality of a large, representative part of the Nation's surface- and ground-water resources and to identify the major natural and human factors that affect the quality of these resources. In addressing 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.

The NAWQA program emphasis is on regional-scale water-quality problems.

The program will not diminish the need for smaller scale studies and monitoring presently designed and implemented by State, Federal, and local agencies to meet specific needs. The NAWQA program, however, will provide a framework for understanding the regional and national water-quality conditions that cannot be acquired from small-scale programs and studies.

Study-unit investigations of 60 hydrologic systems that include parts of most major river basins and aquifer systems throughout the Nation are the building blocks of the national assessment. The 60 study units range in size from 1,000 to more than 60,000 mi<sup>2</sup> (square miles) and

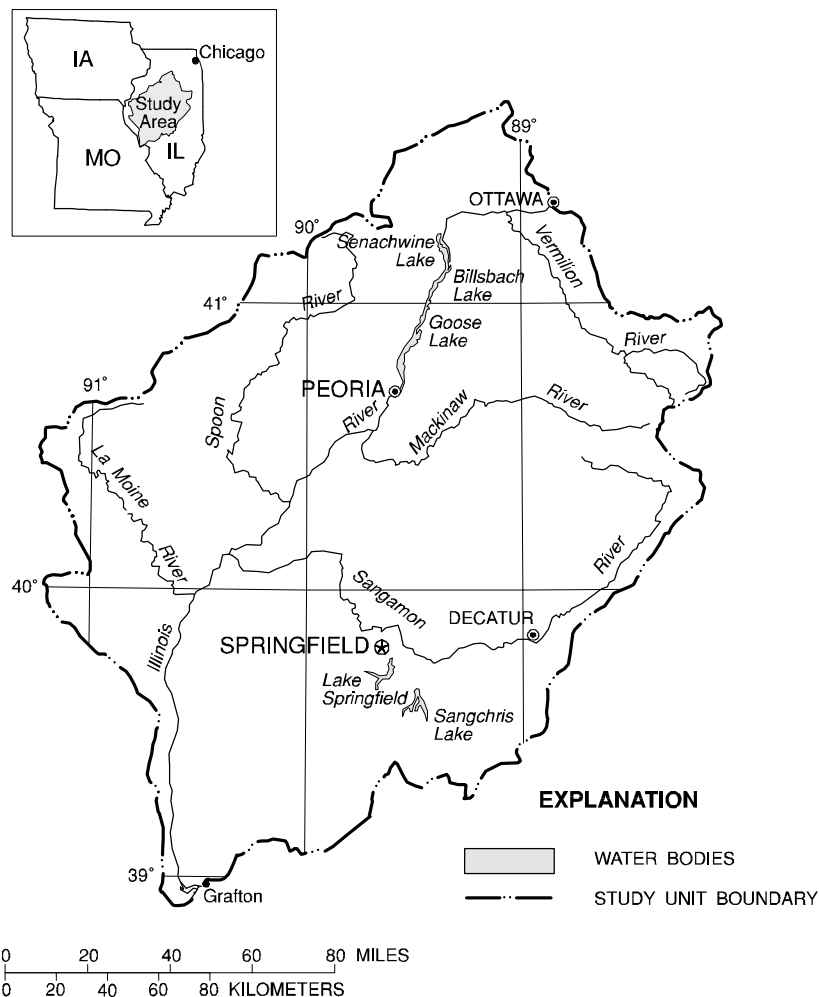
include 60 to 70 percent of the Nation's population served by public water supplies. Twenty study-unit investigations were started in 1991, 20 additional investigations are starting in 1994, and 20 more are planned to start in 1997. The lower Illinois River Basin was selected by the USGS as 1 of 20 study units that will be investigated starting in 1994.

### Description of the Lower Illinois River Basin

The lower Illinois River Basin study unit includes 17,960 mi<sup>2</sup> of central and western Illinois. The basin extends from the downstream end of the 10,950 mi<sup>2</sup> upper Illinois River Basin at Ottawa, Ill., to the confluence of the Illinois and Mississippi Rivers at Grafton, Ill. Major rivers in the basin include 240 miles of the main stem of the Illinois River and the Vermilion (1,330 mi<sup>2</sup>), Mackinaw (1,140 mi<sup>2</sup>), Spoon (1,860 mi<sup>2</sup>), Sangamon (5,420 mi<sup>2</sup>), and La Moine (1,350 mi<sup>2</sup>) Rivers. The mean annual flow of the Illinois River at Valley City (61 miles upstream from the river mouth) is 22,560 ft<sup>3</sup>/s (cubic feet per second), and the mean annual flow from the upper Illinois River to the lower Illinois River is 12,580 ft<sup>3</sup>/s. The Illinois River is a navigable link between Lake Michigan and the Mississippi River. Water depth in the channel is maintained by three dams in the basin and four dams upstream from the basin.

Land use in the study area is primarily agricultural. Corn and soybeans are the major crops in the basin. Major cities in the basin are Peoria (population 114,000), Springfield (105,000), and Decatur (84,000). The 1990 population in the basin was 1.33 million.

The climate of the lower Illinois River Basin is continental. Summers generally are hot and humid, and winters are cold. Mean daily temperatures in July, typically the hottest month, range from 23 to 26°C (degrees Celsius). Mean daily temperatures in January, typically the



Base from U.S. Geological Survey digital data, 1:2,000,000, 1972  
Albers Equal-Area Conic projection  
Standard parallels 29° 30' and 45° 30', central meridian 89° 30'

coldest month, range from -6 to -3°C. Mean annual precipitation in the basin is 36 inches.

The major aquifers in the basin are composed of glacial deposits of Quaternary age and bedrock of Pennsylvanian to Mississippian age. Many of the major Quaternary aquifers are in buried bedrock valleys.

## Major Water-Quality Issues

Major water-quality issues in the basin include sedimentation, toxic chemicals in sediment, high concentrations of nutrients and agricultural chemicals, and low dissolved oxygen. Sedimentation has resulted in the partial or complete filling of many lakes in the study area. The average depth of Peoria Lake has decreased 5.4 feet from 1903 to 1985. Of the 300 backwater lakes that were once along the lower Illinois River in 1903, only 53 presently remain; 30 to 99 percent are filled by sediment (Talkington, 1991). Sedimentation has resulted in high costs to maintain the navigation channel and in loss of aquatic habitat. Sedimentation, and the resulting loss of food and habitat, is the limiting factor for fish and duck populations.

The Illinois River is a primary channel for the transport and disposal of much of the State's human, animal, industrial, and agricultural wastes. Sediments from the Chicago metropolitan area in the upper Illinois River Basin have distinct chemical characteristics; these characteristics have been identified in sediments in the lower Illinois River Basin.

High concentrations of nitrate and agricultural chemicals are expected in parts of the basin. Results of recent statewide studies in and near the basin indicate that concentrations of nitrate and agricultural chemicals exceeded U.S. Environmental Protection Agency maximum contaminant levels (MCL's) for drinking water in surface and ground water. In 1990, about 9-million pounds of atrazine were applied in Illinois, nearly one-sixth of the national total and more than any other State. Several recent studies of the quality of ground water from public supply

wells throughout Illinois have shown the presence of concentrations of nitrate, pesticides, and volatile organic compounds above drinking water MCL's.

Dissolved oxygen is needed to support aquatic life. During the 1988 summer low-flow period, dissolved oxygen concentrations in the lower Illinois River decreased to 2 ppm (parts per million), which is below the U.S. Environmental Protection Agency aquatic life criterion of 5 ppm. Domestic and industrial wastes that are discharged to the Illinois River can produce ammonia and consume oxygen, resulting in seasonal shortages of dissolved oxygen, but the study of the upper Illinois River showed that changes in wastewater-treatment practices reduced the ammonia concentrations in effluent discharged to streams from some wastewater facilities.

European zebra mussels—an exotic species that has recently been found in the basin—compete with native species, create operational problems for hydraulic structures and water intakes, and affect the supply of dissolved oxygen. Studies by the Illinois Department of Natural History during the flood of 1993 showed zebra mussel densities of less than 1 per square meter north of Peoria, but up to 61,000 per square meter near the confluence of the Illinois and Mississippi Rivers at Grafton, Ill.

## Communication and Coordination

Several agencies have past or on-going activities in the basin that will enhance the understanding of the water quality in the lower Illinois River Basin. Among these are—

- 1 A study of resource trends in the Upper Mississippi River ecosystem;
- 1 Recent sampling of rural wells for nutrients and agricultural-organic compounds;
- 1 Monitoring of the Sangamon River and reservoirs and shallow aquifers for nutrients, atrazine, and other pesticides;
- 1 Surface-water and ground-water monitoring for a wide range of constituents, including nutrients, pesticides, industrial chemicals, and metals;

- 1 Monitoring of the Illinois River upstream from Peoria for changes in selected water-quality constituents; and
- 1 Sedimentation studies on the Peoria pool of the Illinois River (Peoria Lake).

Communication and coordination among the USGS, water managers, and other related scientific organizations are critical components of the NAWQA program. Study-unit liaison committees have proven effective in this process and consist of representatives from Federal, State, and local agencies, universities, and the private sector with water-resources interests. Specific activities of each liaison committee include—

- 1 Exchange of information on and prioritization of water-quality issues of regional and local interest;
- 1 Identification of sources of water-quality data and other information—for example, land use, demographics, soils, land-management practices, and pesticide use;
- 1 Assistance in design and scope of study elements;
- 1 Review of study-planning activities, findings, and interpretations, including reports.

The liaison committee for the lower Illinois River Basin study unit held its first meeting on March 4, 1994, and will meet annually.

—Kelly L. Warner and Arthur R. Schmidt

## Selected Reference

Talkington, L.M., 1991, *The Illinois River--Working for our State: Illinois State Water Survey, Miscellaneous Publication 128*, 51 p.

### Information on technical reports and water-quality data related to the NAWQA program can be obtained from:

Project Chief  
Lower Illinois River Basin NAWQA  
U.S. Geological Survey  
102 East Main Street, 4th Floor  
Urbana, Illinois 61801