

## Background

The U.S. Geological Survey (USGS) began implementation of the National Water-Quality Assessment (NAWQA) Program in 1991 to provide a nationally consistent description of the quality of the Nation's water resources. The long-term goals of the NAWQA Program are to describe the status and trends in the quality of the Nation's ground- and surface-water resources, and to provide a sound understanding of the natural and human factors that affect these resources. To meet these goals, nationally consistent ground- and surface-water quality data and ecological information useful to policy makers and managers at local, study-unit, regional, and national levels are being collected and analyzed. Factors such as climate, geology, hydrology, land use, and agricultural practices that affect water quality also are being studied along with specific water-quality issues that affect large hydrologic regions of the United States.

When fully implemented, the NAWQA Program will include a total of 60 study units. The areas covered by these 60 study units are the source of 60 to 70 percent of the Nation's public water supply withdrawn from surface and ground waters. The Ozark Plateaus region was among the first 20 NAWQA study units selected for study. The initial phase of the Ozark Plateaus NAWQA study began in 1991 and is scheduled to continue through 1996. This fact sheet focuses on the surface-water component of the Ozark Plateaus NAWQA.

## Description Of The Ozark Plateaus Study Unit

The Ozark Plateaus study unit is approximately 48,000 mi<sup>2</sup> (square miles) in size and includes parts of northern Arkansas, southeastern Kansas, southern Missouri, and northeastern Oklahoma. The study unit includes 40,000 mi<sup>2</sup> of the Ozark Plateaus Province as well as parts of the Central Lowland Province known as the Osage Plains section, and a small part of the Mississippi Alluvial Plain sec-

tion of the Coastal Plain Province. The boundaries of the study unit approximate the natural flow boundaries of the Ozark Plateaus aquifer system.

The Ozark Plateaus study unit is drained by seven major rivers--the White, Neosho-Illinois, Osage, Gasconade, Meramec, Black, and St. Francis. These rivers are either direct or indirect tributaries to the Mississippi River.

The population within the study unit in 1990 was approximately 2.3 million people, a 28 percent increase from 1970, with growth predominately being in northwestern Arkansas and southwestern Missouri. Springfield, Mo., the largest city in the study unit, has a population of about 140,000. Joplin, Mo., and Fayetteville, Rogers, and Springdale, Ark., are the only other cities within the study unit with populations exceeding 20,000.

Land use in the study unit is predominately forest and agriculture (includes pasture and cropland). Large concentrations of poultry operations are located in northeastern Oklahoma, northwestern Arkansas, and southwestern Missouri. Cropland dominates the extreme northwestern and southeastern part of the study unit. Forests and pastures are the major land uses in the eastern and southern part of the study unit. Lead-zinc mining historically occurred in the tri-state areas near the Kansas, Missouri, and Oklahoma borders and continues today near the St. Francois Mountains along the northeastern part of the study unit. The study unit has a temperate climate with average annual precipitation ranging from about 38 inches in the north to 48 inches in the south. Mean annual temperature ranges from 56 °F in the northeast to 60 °F in the southwest.

## Study Objective and Approach

The objective of the surface-water quality component of the Ozark Plateaus NAWQA study is to examine the major factors that affect the quality of the surface waters and to study the status and trends of water quality in the Ozark streams. Major activities include retrospective analyses of available water-quality data, reconnaissance of sampling sites within the study unit, and sampling network design and implementation. Data will be collected and analyzed for a wide variety of physical and chemical constituents. Interpretation and presentation of data will be published in a series of reports.

Existing surface-water quality data for the Ozark Plateaus study unit have been accumulated, reviewed, and stored in a computerized data base. A retrospective analysis of these data provides an initial description of water-quality conditions, helps define additional data needs, and is used to design the surface-water quality monitoring networks. Quality assurance data and ancillary information, such as hydrology, geology, climate, land use, and agricultural statistics, also are stored in a data base.

Reconnaissance of about 60 potential surface-water sampling sites within the study unit was performed in 1992 by a drive-by visual assessment or an onsite inspection. Thirteen sites were selected for long-term monitoring as a result of this reconnaissance. The sites were selected in small (34 to 54 mi<sup>2</sup>) and medium (323 to 943 mi<sup>2</sup>) size basins with near-homogenous land uses (indicator sites) and one basin (527 mi<sup>2</sup>) that integrates several major land uses and physiographic sections.

Three sampling networks--basic fixed site, intensive fixed site, and synoptic survey--have been designed to address specific questions concerning the quality of water in Ozark streams. Data from the study unit reconnaissance, physiography, land use, and the NAWQA Program's goals were the major considerations in the selection of monitoring sites for the sampling networks.

The basic fixed site network is the cornerstone of the NAWQA Program's monitoring network. The 13 basic fixed sites selected for long term water-quality mon-

itoring are in the Boston Mountains, Springfield Plateau, and Salem Plateau physiographic sections. These sites represent agricultural (pasture and confined animal), forest, and lead-zinc mining land uses. The basic fixed sites include: (1) Center Creek near Smithfield, Mo., (2) Elk River near Tiff City, Mo., (3) Illinois River near Tahlequah, Okla., (4) Kings River near Berryville, Ark., (5) Yocum Creek near Oak Grove, Ark., (6) Buffalo River near Boxley, Ark., (7) Buffalo River near St. Joe, Ark., (8) North Sylamore Creek near Fifty Six, Ark., (9) Jacks Fork River at Alley Springs, Mo., (10) Black River below Annapolis, Mo., (11) Paddy Creek above Slabtown Spring, Mo., (12) Niangua River at Windyville, Mo., and (13) Dousinbury Creek near Wall Street, Mo. During the intensive sampling phase (1993-95), monthly sampling and additional high-flow event samples will be conducted at the basic fixed sites to describe the seasonal and temporal variations and frequency of occurrence of selected water-quality constituents, to estimate loads, and to define long-term trends in water quality. The analysis of water samples collected at these sites focuses on a national target list of physical properties that include specific conductance, pH, temperature, dissolved oxygen, and suspended sediment, and chemical constituents that include major ions, nutrients, trace elements, dissolved organic compounds, and fecal indicator bacteria.

Collection of water samples from two intensive fixed sites is scheduled for 1994 to assess the occurrence and temporal distribution of nutrients and dissolved organic compounds in two small agricultural land-use basins. Yocum Creek near Oak Grove, Ark. (site 5), is located in the White River Basin in the Springfield Plateau physiographic section; the drainage area above this site is about 75 percent agricultural land, predominately poultry operations and beef cattle. Dousinbury Creek near Wall Street, Mo. (site 13), is located in the Osage River Basin in the Salem Plateau physiographic section; the area above this site is about 60 percent agricultural land use, predominately dairy operations and pasture. The animal waste and litter from these operations are used to fertilize pasturelands. Crops such as alfalfa, corn, soybean, and milo also are

grown in these basins. Twice monthly samples will be collected in February, March, and July; weekly samples will be collected in April, May, and June. The weekly sampling will coincide with the application of manure, commercial fertilizer, and pesticides to pasturelands and crops. The analysis of these water samples will focus on physical properties, basic fixed site inorganic target constituents, dissolved organic constituents, and fecal indicator bacteria.

A synoptic survey is scheduled for 1994 to improve the spatial coverage, and to verify that the basic fixed sites are representative of the physiography and land-use type in their drainage basins. About 30 sites, representing the major land uses throughout the study unit, will be sampled during a high-flux period (May or June) when water quality is most affected by surface runoff, and during the low-flow period (August or September) when water quality is most affected by ground-water inflow and point-source discharge. Water samples will be analyzed for physical properties, nutrients, and fecal indicator bacteria. About one-half of these samples also will be analyzed for major ions and trace elements, and all samples will be analyzed for dissolved organic compounds during the high-flux period.

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## Information

The Ozark Plateaus NAWQA study is headquartered in the USGS office in Little Rock, Ark., with a project office located in Rolla, Mo. Technical assistance is provided by USGS personnel in Fayetteville, Ark., Lawrence, Kans., and Oklahoma City, Okla. Many other Federal, State, and local agencies also are providing technical advice and assistance. Further information on the Ozark Plateaus NAWQA study can be obtained from:  
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