

**Kentucky Interagency
Groundwater
Monitoring Network**

Annual Report
2002–2003

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Kentucky Interagency Groundwater Monitoring Network: Annual Report, 2002–2003

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Executive Summary

The Kentucky Interagency Groundwater Monitoring Network was established by the 1998 Kentucky General Assembly in recognition that groundwater is an essential but poorly characterized resource in the Commonwealth. The General Assembly found that systematic groundwater-quality monitoring and evaluation is needed to provide information so that groundwater can be protected and managed. The General Assembly also recognized that coordination between agencies that address groundwater issues could improve the effectiveness and efficiency of their groundwater programs.

The network is to collect groundwater data, characterize groundwater quality, distribute groundwater information, promote interagency cooperation, and facilitate data sharing. These activities are to be carried out in coordination with an Interagency Technical Advisory Committee. The Kentucky Geological Survey is charged with annually reporting network activities to the Governor and the Legislative Research Commission.

From July 2002 through June 2003, groundwater was sampled and analyzed on both regional and local scales, and several mapping projects addressed groundwater in karst areas. The regional studies were designed to determine ambient (regional in scope and not affected by point-source discharges) groundwater quality and assess the effects of nonpoint-source contamination, whereas the local studies focused on specific problems or issues. Karst mapping projects were designed to delineate groundwater basins, show areas where groundwater is particularly susceptible to contamination, and quantify travel times to springs. One major report on regional groundwater quality and a statewide map and data summary for pH in groundwater were published; four others are being prepared and will soon be made available to policy-makers, landowners, researchers, and the general public. These reports are the most recent assessments of regional groundwater quality, and are the

first that are concerned with a large suite of nonpoint-source chemicals. The focused studies addressed groundwater quality in particular areas and addressed specific water-quality issues. The resulting information was communicated to the scientific and regulatory communities and to the public through presentations, publications, and postings on Web sites. Quarterly meetings of the Interagency Technical Advisory Committee provided an opportunity to coordinate groundwater-related efforts and share information. Exchange of groundwater data, including electronic transfer between State and university databases, has proceeded through close cooperation between the agencies.

The Kentucky Interagency Groundwater Monitoring Network has now been in existence for 5 years. During this time, significant progress has been made toward collecting and reporting groundwater-quality data and improving interagency cooperation. Important work remains, however. Among the major issues still to be addressed are (1) developing new long-term sampling sites in areas where there are no existing wells or springs that can be sampled (2) optimizing the sampling frequency to account for different groundwater flow systems throughout the state, (3) determining how large an area is represented by a sample at a particular well or spring, (4) investigating the existence of pathogens such as bacteria in regional groundwater flow systems, (5) standardizing reporting information about sampling methods, field measurements, and sample-site descriptions, (6) developing a water-level monitoring network to track long-term land use and climate effects on groundwater supplies, (7) standardizing laboratory reporting procedures, (8) facilitating electronic data sharing among agencies that work with groundwater measurements, and (9) providing public access to groundwater quality data via interactive Web sites.

Introduction

Kentucky groundwater is used extensively for domestic, agricultural, commercial, and industrial purposes. Because of its interactions with rivers, lakes, and wetlands, groundwater is also essential to the health of these surface-water systems. Monitoring the quality of this critical resource and protecting it from contamination are important to the future of water resources in the Commonwealth and to its citizens.

Information provided by the Groundwater Branch of the Kentucky Division of Water (DOW) indicates that more than 500,000 citizens in private households rely on groundwater from wells and springs for drinking, cooking, and washing. An additional 254 public water systems, serving more than 1.2 million people, rely on groundwater supplies. This dependence on groundwater resources will continue into the foreseeable future. Many public water-supply systems are considering switching from surface water to groundwater sources because the required treatment is less extensive and less expensive. Currently, the cities of Louisville, Hardinsburg, and Salyersville, and the Greater Fleming Regional Water Supply are either considering switching to groundwater sources or are supplementing surface-water supplies with groundwater. Furthermore, many people who now rely on wells or springs for private domestic water supplies will remain dependent on groundwater because of the cost of extending public water-supply systems to rural areas, because some people prefer water without added chlorine and fluoride, and because groundwater supplies are more than sufficient in some places.

Significant quantities of groundwater are also used for commercial and industrial applications, crop irrigation, livestock watering, mining, and thermoelectric power generation. Groundwater also sustains valuable ecosystems by providing base flow to streams, lakes, and wetlands. This is particularly important during droughts such as the one that occurred in 1999. In the absence of precipitation, groundwater base flow is the only source of water to maintain stream flow and lake levels, and to preserve riparian and wetland ecosystems.

Recognizing the importance of groundwater, the 1998 Kentucky General Assembly directed the Kentucky Geological Survey (KGS) to establish a long-term, interagency groundwater monitoring network to characterize the quality, quantity, and distribution of groundwater in Kentucky (Kentucky Revised Statute [KRS] 151.620 and 151.625). The major goals of the Interagency Groundwater Monitoring Network are to (1) collect groundwater data, (2) characterize groundwater quality, (3) distribute groundwater information, (4) improve coordination between agencies that collect groundwa-

ter data, and (5) facilitate sharing of groundwater data (Interagency Technical Advisory Committee, 1996).

The 1998 General Assembly also established an Interagency Technical Advisory Committee on Groundwater (ITAC) to assist KGS in the development, coordination, and implementation of a groundwater monitoring network (KRS 151.629). ITAC consists of representatives of the following agencies:

- ◆ Kentucky Department for Environmental Protection
- ◆ Kentucky Department for Natural Resources
- ◆ Kentucky Department for Surface Mining Reclamation and Enforcement
- ◆ Kentucky Department of Mines and Minerals
- ◆ Kentucky Division of Conservation
- ◆ Kentucky Division of Environmental Health and Community Safety
- ◆ Kentucky Division of Forestry
- ◆ Kentucky Division of Pesticide Regulation, Department of Agriculture
- ◆ Kentucky Division of Waste Management
- ◆ Kentucky Division of Water
- ◆ University of Kentucky, Kentucky Geological Survey
- ◆ University of Kentucky, College of Agriculture
- ◆ University of Kentucky, Kentucky Water Resources Research Institute
- ◆ U.S. Geological Survey

The 1998 legislation directed KGS to provide an annual summary of groundwater monitoring activities to the Governor and the Legislative Research Commission. This is the fifth annual report of the Kentucky Interagency Groundwater Monitoring Network. All previous annual reports are posted at www.uky.edu/kgs/water/gnet/gnet.htm.

2002–2003 Activities and Accomplishments

Brief summaries of work performed by the ITAC agencies during the 2002–2003 fiscal year are given below. Activities are organized to show how each of the major goals of the network have been addressed. Additional information regarding these projects can be obtained by contacting the responsible agency or visiting their Web site.

Groundwater Data Collection

Collecting and analyzing groundwater from wells and springs, measuring water levels in wells, and map-

ping hydrogeologic features provide the basic data needed to determine the current quality of the groundwater resource, detect changes in groundwater quality over time, and assess hazards that are related to hydrogeologic processes. Two general types of groundwater-data collection programs were conducted during the reporting period. Statewide and expanded groundwater monitoring programs are designed to show regional groundwater quality (groundwater that is not affected by point-source contamination) and to determine whether nonpoint-source contaminants such as sewage, pesticides, fertilizers, and volatile organic compounds have entered the groundwater system. In contrast, site-specific studies are designed to evaluate groundwater conditions in locations where the effects of particular land uses are being investigated or where water supplies are being evaluated. Figure 1 shows sites and areas where groundwater samples were collected.

Statewide Ambient Groundwater Quality Monitoring

DOW collected nearly 400 groundwater samples from approximately 120 wells and springs that make up the ambient groundwater monitoring program (Fig. 1). Most of these sites were sampled quarterly. DOW also conducted additional assessment monitoring to support targeted watershed management efforts. Temperature, pH, conductivity, major and minor solutes, metals, nutrients, pesticides, and synthetic and volatile organic chemicals were analyzed. These analyses also provide information for the DOW wellhead protection program and public water-supply systems. Analytical results are entered into the DOW database and copied to the KGS data repository.

Expanded Groundwater Monitoring for Nonpoint-Source Pollution Assessment in the Tradewater River and Green River Watersheds (Basin Management Unit 4)

In cooperation with the Kentucky Watershed Management Framework (Kentucky Division of Water, 1997), DOW completed quarterly sampling of 30 wells and springs in the Tradewater and Green River watersheds (Fig. 1). Quarterly sampling began in the fall of 2001 and ended in the summer of 2002. Samples were analyzed for temperature, pH, conductivity, major and minor solutes, metals, nutrients, pesticides, and synthetic and volatile organic chemicals. Analytical results were added to the DOW database and will be copied to the KGS data repository. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Expanded Groundwater Monitoring for Nonpoint-Source Pollution Assessment in Watersheds of the Big Sandy River, Little Sandy River, and Tygarts Creek (Basin Management Unit 5)

KGS, in cooperation with the Kentucky Watershed Management Framework (Kentucky Division of Water, 1997), selected 30 wells and springs in Basin Management Unit 5 (Fig. 1) and sampled them in the fall and winter of 2002 and the spring of 2003. Final quarterly sampling will occur in late summer of 2003. Samples were analyzed for bulk water properties, major and minor solutes, metals, nutrients, pesticides, and synthetic and volatile organic chemicals. Analytical results were added to the DOW database and will be copied to the KGS data repository. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Evaluation of Pesticide and Nutrient Loadings, and Best Management Practice Education

The Pesticide Regulatory Division, Kentucky Department of Agriculture, initiated three studies of pesticide and nutrient concentrations in surface water and groundwater in western Kentucky. These studies are designed to measure pesticide and nutrient loads in runoff, karst springs, and shallow wells. The effectiveness of various management practices in reducing or eliminating impacts on groundwater and surface-water systems will be evaluated as a major part of these projects. This work is funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Evaluation of High-Yield Well Potential in the Eastern Kentucky Coal Field

In past years, KGS used geologic and remote-sensing methods to locate high-yield (greater than 30 gallons of groundwater per minute) wells in the Eastern Kentucky Coal Field. During the past fiscal year KGS began a study of the hydrologic properties of the Lee Sandstone to assist the city of Salyersville, Magoffin County, in locating a field of high-yield wells to supplement the city's water supply. This work is partially funded by the Kentucky Infrastructure Authority.

Assessing Water Supplies from Abandoned Underground Coal Mines in Eastern Kentucky

KGS had previously investigated abandoned underground coal mines in eastern Kentucky as potential municipal water supplies. Analyses of sites in Letcher, Perry, Clay, and Harlan Counties found storage volumes for mines that ranged from 260 million to 480 million gallons and recharge rates that ranged from 120,000 to 700,000 gallons per day. Funding limitations during the

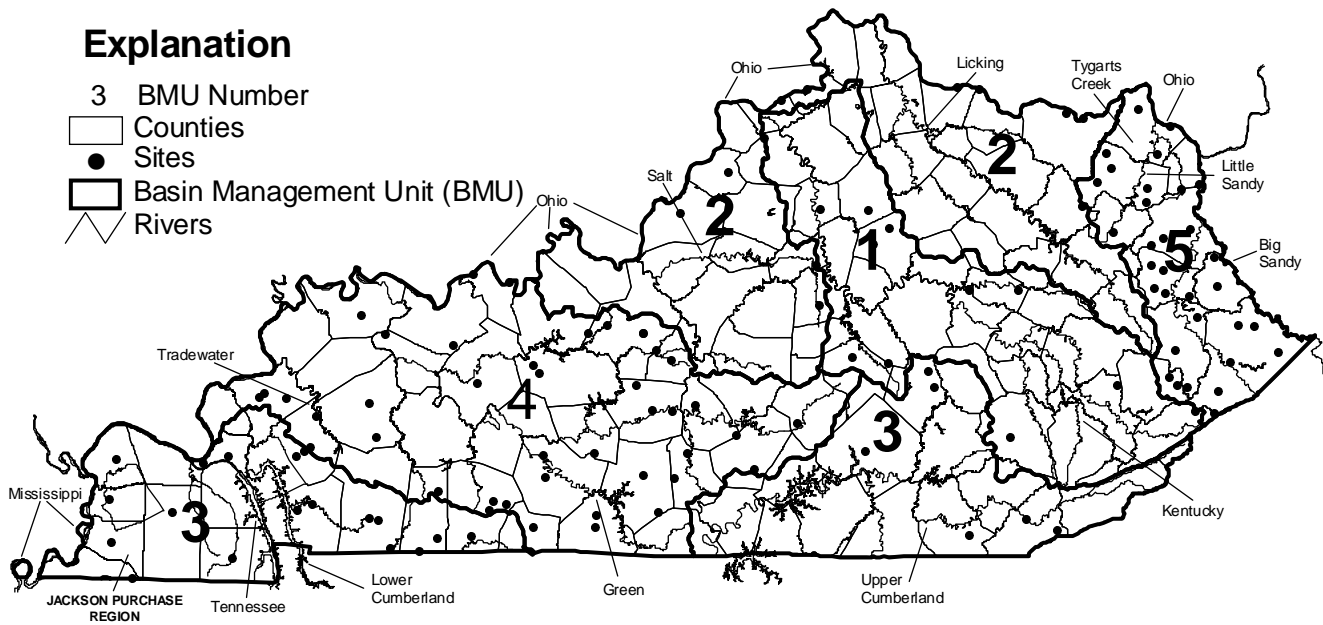


Figure 1. Basin Management Units and sites that were sampled repeatedly during the 2002–2003 State fiscal year.

2002–2003 State fiscal year restricted activities to water-level monitoring at several previously investigated sites.

Monitoring Impacts of the University of Kentucky Animal Research Center on Surface-Water and Groundwater Quality

KGS and the UK Department of Biosystems and Agricultural Engineering are monitoring streams, springs, and wells at the UK Animal Research Center, Woodford County, to determine how farm practices are affecting water quality. This work is funded by Kentucky Senate Bill SB-271, administered through the University of Kentucky College of Agriculture.

Karst Studies

KGS completed mapping karst groundwater basins in the Inner Bluegrass. Two maps showing karst groundwater basins in the Lexington and Harrodsburg 30 x 60 minute quadrangles were substantially revised, and the revised map for Lexington was published in 2002. These maps outline the boundaries of groundwater drainage basins and show groundwater flow paths. The maps provide valuable information for emergency-services personnel responding to chemical spills, agricultural producers, property owners, local and regional water planners, and researchers. These and other karst maps can be downloaded as PDF files from the KGS Web site at www.uky.edu/KGS/pubs/lop.htm or they can be purchased from the KGS Public Information Center. This work is funded by a one-time grant from the U.S. Envi-

ronmental Protection Agency, administered by the DOW Nonpoint Source Section.

KGS mapped areas with high, moderate, and no potential for karst development and published the result as “Karst Occurrence in Kentucky.” Persons interested in sinkhole collapse, sinkhole flooding, and pollution of springs in karst areas will find this map useful. The map can be downloaded as a PDF file from the KGS Web site at www.uky.edu/KGS/pubs/lop.htm or it can be purchased from the KGS Public Information Center. This work was performed as part of regular KGS investigations.

KGS and DOW staff completed an “Inventory of Karst Springs of Fayette County, Kentucky.” This record of springs provides a foundation for future studies of the hydrology and karst geology of the Inner Bluegrass Region. The map can be downloaded as a PDF file from the KGS Web site at www.uky.edu/KGS/pubs/lop.htm or it can be purchased from the KGS Public Information Center. This work was performed as part of regular KGS investigations.

KGS initiated a pilot study to develop a methodology for determining the frequency of occurrence of cover-collapse sinkholes using historical aerial photography. KGS also initiated an online system to allow people from across the state to report cover-collapse sinkholes using a form available at www.uky.edu/KGS/water/research/kasinkreport.html. This work was performed as part of regular KGS investigations.

Protecting Community Water Quality

Georgetown, in central Kentucky, depends on Royal Spring for its water. The groundwater basin of Royal Spring receives drainage from southern Scott County and northern Fayette County, which are largely urbanized areas. With funding from the Georgetown Water and Sewer Service, KGS staff began developing a set of maps that depicts the time it takes a pollutant to reach Royal Spring, and thus the intakes for the water treatment plant in Georgetown.

Groundwater Contamination from Abandoned Feedlots

KGS hydrogeologists discovered that a well in Henderson County, western Kentucky, produced groundwater that contained 45 mg/L of nitrate-nitrogen, 4.5 times the U.S. Environmental Protection Agency's (EPA) maximum contaminant level (MCL). Investigations showed that an abandoned feedlot was the source of the nitrate. A remediation plan was developed and implemented. Subsequent testing has shown that nitrate-nitrogen levels in both groundwater and soil are decreasing. This work is funded by Kentucky Senate Bill SB-271, administered through the University of Kentucky College of Agriculture.

Nitrate Contamination of Well Water

More than 75 percent of residents in the Jackson Purchase Region rely on groundwater. Many private wells there yield water with nitrate-nitrogen concentrations that exceed the MCL, however. KGS completed land-use and well-construction surveys to determine the possible sources of the elevated nitrate concentrations, sampled wells, and analyzed groundwater from domestic wells to determine if they were leaking. Results showed that six of eight 24-inch-diameter wells leaked, but only one of twenty-seven 4-inch- or smaller-diameter wells leaked. Continuing work is focusing on the role of 24-inch-diameter wells on shallow groundwater quality in the Jackson Purchase Region. The findings of this joint research project with the UK Department of Agronomy will be communicated to the public through State and local officials and public outreach programs. This work is funded by Kentucky Senate Bill SB-271, administered through the University of Kentucky College of Agriculture.

Water Quality at Kentucky Army National Guard Training Facilities

KGS is assisting the Kentucky Department of Military Affairs in the assessment of water quality at the Wendell H. Ford, Artemus, and Eastern Kentucky training sites operated by the Kentucky Army National Guard. KGS assessed the impact of current activities on surface water and water exiting from the sites, and ex-

amined groundwater quality at the Wendell H. Ford site. Where applicable, KGS developed long-term plans to monitor surface water and groundwater. Future work will include analysis of groundwater quality and flow, and a study of the relation between groundwater and surface-water resources in order to assess the cumulative impact of land use on water quality at the Wendell H. Ford site. This work is funded by the Kentucky Department of Military Affairs.

Maps for Protecting Water Quality

The Kentucky Groundwater Data Repository has a wealth of data useful for environmental consultants, engineers, and citizens. Since the spring of 2002, KGS has compiled 13 maps showing the locations of water wells and springs in the Harrodsburg, Lexington, Somerset, Bowling Green, Campbellsville, Beaver Dam, Evansville, Louisville, Falmouth-Cincinnati-Madison, Murray, Corbin, Morehead, and Madisonville 30 x 60 minute quadrangles. Maps for the entire state will be compiled by the end of 2003. Each map displays the locations of springs and four types of water wells (domestic or private, industrial, public, and monitoring). Detailed information about the wells and springs identified on the maps is available from the Kentucky Groundwater Data Repository, which is maintained by KGS. The maps are available as PDF files at www.uky.edu/KGS/pubs/lop.htm, or can be purchased from the KGS Public Information Center. This work was performed as part of regular KGS investigations.

The Kentucky District Office of the U.S. Geological Survey continues a variety of groundwater-quality and water-level investigations throughout the Commonwealth.

USGS Groundwater-Quality Monitoring

Ohio River alluvial aquifer near Fort Knox, Hardin County: Water samples are collected monthly from nine wells for chloride analysis as part of a project to develop a groundwater-flow and solute-transport model for the Fort Knox public-supply well field.

Maxey Flats Low-Level Radioactive Materials Depository, Fleming and Rowan Counties: Groundwater samples are collected for routine monitoring purposes on a progressive schedule. Ten wells are sampled annually for tritium, five wells are sampled semiannually for tritium and other radionuclides, and four wells are sampled quarterly for tritium and field water-quality parameters.

Distler Brickyard Superfund Site, Hardin County: As part of an ongoing project to monitor on-site contaminant concentrations and bioremediation progress, 11 wells are sampled quarterly for volatile organics, se-

lected inorganic chemicals, and certain biogeochemical indicators.

USGS Groundwater-Level Monitoring

Real-time continuous water-level data: Real-time continuous water-level data are collected at an observation well near Paducah in Graves County. The well is included in the USGS National Climate Response Network, which tracks long-term changes in groundwater levels caused by changing hydrologic conditions.

Ohio River alluvial aquifer in downtown Louisville, Jefferson County: Because of present funding limitations, this network has been reduced to two wells equipped with continuous recording equipment collecting water-level and water-temperature measurements. Hydrographs of the data collected presently from these two wells, and collected previously from additional wells, are available on the USGS Web site at ky.water.usgs.gov.

Ohio River alluvial aquifer in northeast Louisville, Jefferson County: Water-level measurements are collected quarterly from 19 wells. Five additional wells are equipped with continuous recording equipment collecting both water levels and temperatures.

Ohio River alluvial aquifer near Fort Knox, Hardin County: Three wells are equipped with continuous water-level recorders. Synoptic water-level measurements are also collected quarterly in 24 wells.

Maxey Flats Low-Level Radioactive Materials Depository, Fleming and Rowan Counties: Water-level measurements are collected quarterly in three wells, and from 15 wells equipped with continuous recorders.

Distler Brickyard Superfund Site, Hardin County: Eight wells are equipped with continuous water-level recording equipment. Synoptic water-level measurements are also made semimonthly in 25 additional monitoring wells. On-site rainfall data are also collected continuously.

Groundwater Quality Characterization

Expanded Groundwater Monitoring for Nonpoint-Source Pollution Assessment in the Salt and Licking River Basins (Basin Management Unit 2)

DOW completed a summary of the results of expanded groundwater monitoring activities in the Salt and Licking River watersheds (Webb and others, 2003). This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Groundwater Monitoring for Nonpoint-Source Pollution Assessment in the Kentucky River Basin (Basin Management Unit 1)

DOW is summarizing the results of expanded groundwater monitoring activities in the Kentucky River watershed. Expected completion date is late 2003. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Groundwater Monitoring for Nonpoint-Source Pollution Assessment in the Upper Cumberland, Lower Cumberland, and Tennessee River Basins, and the Jackson Purchase Region (Basin Management Unit 3)

KGS is summarizing the results of expanded groundwater monitoring activities in the Upper Cumberland, Lower Cumberland, and Tennessee River Basins, and the Jackson Purchase Region. Expected completion date is fall 2003. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Evaluation of Existing Groundwater Quality Data from Wells and Springs in the Upper Cumberland, Lower Cumberland, Green, Tradewater, and Tennessee River Basins, and the Jackson Purchase Region (Basin Management Units 3 and 4)

KGS and DOW are summarizing existing groundwater-quality data for samples taken from sites in the Upper Cumberland, Lower Cumberland, Green, Tradewater, and Tennessee River Basins, and the Jackson Purchase Region. The Kentucky Groundwater Data Repository is the source of the analytical records. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Evaluation of Existing Groundwater Quality Data from Wells and Springs in Watersheds of the Kentucky, Salt, Licking, Big Sandy, and Little Sandy Rivers, and Tygarts Creek (Basin Management Units 1, 2, and 5)

KGS and DOW are summarizing existing groundwater-quality data for samples taken from sites in the Kentucky, Salt, Licking, Big Sandy, and Little Sandy River, and Tygarts Creek watersheds. The KGS Groundwater Data Repository is the source of the analytical records. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Regional Groundwater Quality

KGS published a report on pH concentrations in groundwater throughout Kentucky. This study includes

a map showing pH values in Kentucky wells and springs. Previously, similar maps and data summaries were completed on nitrate-nitrogen, fluoride, and arsenic. All of these maps are available as PDF files at www.uky.edu/KGS/pubs/lop.htm and can be purchased from the KGS Public Information Center.

Distribution of Groundwater Information

One of the most important functions of the Groundwater Monitoring Network is to convert analytical data derived from water-level measurements and groundwater analyses to understandable information, and communicate that information to the public. During the past fiscal year, groundwater information was distributed via oral and poster presentations at meetings and conferences, published reports, and Web sites.

Providing the Public with Groundwater Information

In the summer of 2002, KGS began providing online access to public information about water wells and springs (kgsweb.uky.edu/DataSearching/Water/WaterWellSearch.asp). During the past year DOW imaged all water-well records and provided digital files of the images to KGS for publication on the Web. The images are useful to the public, well drillers, consultants, and researchers. A tutorial is being developed for online use, and it is expected that it will be possible to search the images via the Web by the end of 2003.

KGS maintains and annually updates a Web site for the Kentucky Interagency Groundwater Monitoring Network (www.uky.edu/kgs/water/gnet/gnet.htm). This site contains maps and data summaries of nitrate and fluoride concentrations, maps of pH and hardness, a location map showing wells and springs that have been analyzed for various water-quality parameters, and previous annual reports of the network. The site also has links to the Web sites of the ITAC agencies and organizations. KGS has compiled information about hydrology, geology, topography, water supply, and water quality from maps, reports, and data collected from 1940 to 2000 and posted them for public access at www.uky.edu/KGS/water/library/webintro.html.

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Interagency Coordination

Cooperation among agencies and research organizations that collect, analyze, and use groundwater data is essential to reduce monitoring costs, improve program efficiency, and promote data sharing. The Kentucky Interagency Groundwater Monitoring Network provides a forum for organizations that participate in the Interagency Technical Advisory Committee to meet quarterly and discuss groundwater issues.

Cooperation and interaction within the ITAC agencies and between ITAC agencies and other groups and organizations is routine. Many programs benefit from DOW's willingness to collect and analyze groundwater samples to support various projects. Recent examples include DOW coordinating with KGS to collect groundwater samples at the Salyersville drilling site, and DOW's regular sampling of Royal Spring, the focus of a KGS travel-time study. DOW also samples groundwater and surface water for nonpoint-source constituents in support of projects for the Division of Pesticide Regulation. DOW and KGS regularly answer inquiries from the public and communicate with staff of the Kentucky Rural Water Association. KGS has been meeting with County Extension Service agents and Area Development Districts throughout the Commonwealth to promote awareness of hydrogeologic issues. Many of the ITAC agencies are also members of the Kentucky Agricultural Water Quality Authority, or cooperate with the Authority and participate in their meetings.

KGS researchers serve on the following committees and work groups:

- ◆ Certified Water Well Drillers' Advisory Board
- ◆ Cumberland River Basin and Four Rivers Region Team
- ◆ Kentucky River Basin Team
- ◆ Onsite Sewage Disposal Advisory Committee
- ◆ Kentucky Watershed Steering Committee

Groundwater Data Sharing

Sharing groundwater data is an essential function of the Interagency Groundwater Monitoring Network. Data transfers between agencies provide each group access to a larger database than any agency could develop independently, thereby improving evaluations of groundwater quality and suitability for various uses, threats to groundwater quality, and the effects of mining, logging, agricultural practices, urbanization, waste disposal, and oil and gas production. Sharing data also reduces the overall expense and increases the efficiency of monitoring efforts.

Data have been transferred electronically between the DOW groundwater database and the Kentucky Groundwater Data Repository, and between the KGS analytical laboratory and DOW, since 1992. There has also been a high level of collaboration and data sharing between KGS and DOW during the reporting period, as the agencies are jointly reporting on groundwater quality throughout the state. During the past fiscal year, DOW converted paper copies of water-well records to digital images for the DOW groundwater database; DOW also provided copies of the scanned images to KGS, and they will be added to the Kentucky Groundwater Data Repository. DOW is working with the Department for Environmental Protection EMPOWER team to migrate their groundwater quality data to a relational database to improve performance.

Future Activities

Preparing and distributing reports that summarize the results of groundwater investigations in terms that are readily understood by the public will remain an important function of the Kentucky Interagency Groundwater Monitoring Network. Reports summarizing expanded groundwater monitoring activities in Basin Management Unit 1 (Kentucky River watershed), Basin Management Unit 3 (watersheds of the Upper and Lower Cumberland Rivers, Tennessee River, and the Jackson Purchase Region), and summaries of groundwater quality data in Basin Management Units 3 and 4 (watersheds of the Upper and Lower Cumberland, Tennessee, Green and Tradewater Rivers, and the Jackson Purchase Region) will be completed and distributed within the next year. Expanded groundwater monitoring in watersheds of the Big Sandy River, Little Sandy River, and Tygarts Creek (Basin Management Unit 5) will be completed in late summer 2003, and a report will be prepared. Quarterly sampling of the wells and springs that make up the DOW ambient groundwater monitoring network will continue.

In addition to continuing these existing projects, the following activities are needed and will be initiated as funding becomes available:

- ◆ Evaluating the optimal sample collection frequency for wells and springs in different flow systems so that the efficiency of monitoring programs can be increased
- ◆ Developing a network to record water levels in strategically located wells
- ◆ Developing a common set of data elements for recording information about sample sites, sample collection procedures, and field-measured water-quality parameters
- ◆ Transferring groundwater-level and groundwater-quality data from paper files to the electronic database
- ◆ Expanding the number of sampled wells and springs to improve coverage of the state
- ◆ Using groundwater-quality data to help delineate groundwater basins and wellhead protection areas
- ◆ Delineating areas where different groundwater flow systems prevail. It is essential to distinguish between shallow, intermediate, and deep flow systems and between the laminar flow conditions that occur in porous media and the turbulent flow that can occur in karst systems so that nonpoint-source best management practices and groundwater vulnerability can be better assessed.

Summary

The Kentucky Interagency Groundwater Monitoring Network was very active during the reporting period. Programs to collect statewide ambient groundwater quality data, as well as to investigate specific problems of karst hydrology and aquifer sensitivity, potential nonpoint-source contamination of groundwater supplies, and the effects of agricultural practices on groundwater resources were completed or are in progress. One major report and one Information Circular were completed, and four summary reports on ambient groundwater quality are in preparation.

Most of the activities conducted during the reporting period were largely investigations of identified or suspected groundwater-quality problems and were possible only because the agencies involved were able to obtain funding from outside sources. As noted in previous annual reports, the availability of these funds is decreasing. A stable source of recurring funding is essential if groundwater issues are to be addressed on a proactive basis, which will best serve the needs of citizens, resource managers, and environmental regulators.

References Cited

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