The KENTUCKY Ground-Water Monitoring NETWORK

Eastern Kentucky Coal Field Perspective

Interagency Technical Advisory Committee

University of Kentucky Water Resources Research Institute
Kentucky Geological Survey
Kentucky Department for Environmental Protection
Division of Water
Division of Waste Management
Kentucky Department for Surface Mining Reclamation and Enforcement
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Kentucky Protection and Regulation Cabinet, Department of Mines and Minerals
Kentucky Ground-Water Association

Network

Citizens of the Commonwealth are dependent upon clean, reliable ground-water resources. According to the 1990 U.S. Census, about one in four Kentuckians (approximately 900,000) uses ground water from wells and springs in their homes, schools, and businesses. All of Kentucky's streams and rivers are sustained by ground water during periods of low rainfall.

Information on the quality and quantity of ground-water resources in Kentucky is inadequate for most uses. Baseline information is needed by industry and government agencies for public policy matters. This information includes documentation of the wide-ranging natural variability of ground-water quality in each region. Just as important, identifying subsurface zones that have different ground-water quality will in many cases reduce costs and raise the likelihood of obtaining an adequate ground-water supply for the homeowner, agriculture, municipalities, and industry.

A Kentucky Ground Water Consensus Group, with representation from State, Federal, local, industrial, and public interests, was established in 1993 to consider State needs in this vital area. One of their recommendations was to establish a ground-water monitoring network to be administered by the Kentucky Geological Survey. The goals of this network are to characterize and monitor the occurrence, quantity, and quality of Kentucky's ground water, and to support a data base that is readily available to the public, and upon which reliable policy decisions can be based. Legislation will be introduced in the 1996 session of the Kentucky General Assembly for statutory authority for such a network.

Coordination

An interagency advisory board is developing a framework for the Network. This framework will be used to coordinate with other data-collection efforts in the State and build an appropriate information base on ground-water resources.

Increased coordination of ground-water data collection and data reporting among agencies is a priority. This will limit redundant efforts, make certain that data from various sources are available for use, and assure that the information collected by this network can be used for multiple purposes.

First step

Information in the Kentucky Ground-Water Data Repository, housed at the Kentucky Geological Survey, is being summarized by the KGS. State agencies are required (KRS 151:035) to provide non-proprietary ground-water information to the Repository; this procedure centralizes the information for more efficient public access. However, the water-quality analyses that are now available are poorly distributed across the State, and most lack enough data on elements, ions, and organic chemicals to sufficiently characterize the quality of ground water for human use. Some preliminary findings concerning ground water in the Eastern Kentucky Coal Field are provided in this pamphlet.

Collection

Wide gaps in existing ground-water data for Kentucky need to be filled. Collection and annual reporting of standardized information will be a major contribution of the Network. New information will be stored in the data repository and made available for public use.

Summaries and characterization

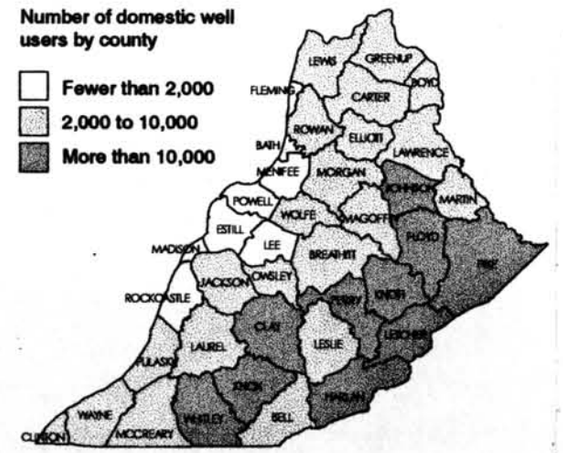
The location and character of the State's ground-water resources will be determined, and the information will be accessible. Characterization of the aquifers will include defining well yield, normal variations in ground-water quality, and ground-water flow systems that directly influence water quality.

Eastern Kentucky Coal Field

Approximately 280,000 people in the Eastern Kentucky Coal Field are served by 110,000 private water wells (U.S. Census, 1990). Approximately 50,000 additional people at homes, schools, and businesses use ground water from high-yield wells or springs that is piped by public water systems.

Distribution of well users

Most counties in eastern Kentucky have over 2,000 well users, and 10 counties have over 10,000 well users. The figure below shows the number of water-well users in each county (U.S. Census, 1990).



Aquifers

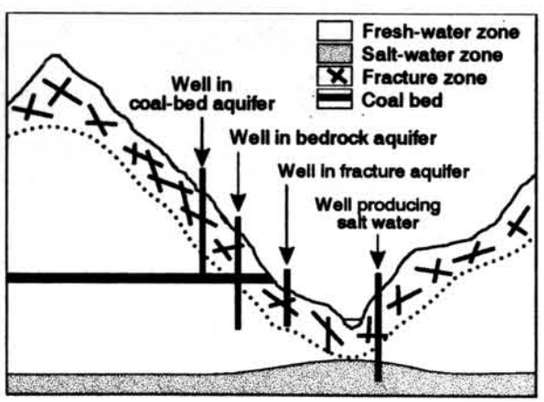
Bedrock or sediments that yield enough water to supply a household well are called aquifers. Several types of aquifers exist in eastern Kentucky, but most ground water is obtained from wells in fractured bedrock at depths less than 100 feet. The figure to the right shows that coal seams and other bedrock units provide water to many wells, and some wells receive water from both shallow and deeper sources. Local springs and ground water stored in underground mines provide domestic water supplies in some areas.

Variations in well yield depend on the location of fracture zones and other controls on the movement of ground water. Water quality varies both laterally and with depth below the ground surface. Salty water is often encountered below fresh-water zones in wells drilled more than 100 feet below valley bottoms.

Wells that are drilled near each other at the ground surface can tap different aquifers at various depths; the different aquifers can provide very different water quality. Defining aquifer systems and their associated water quality and well yield will lead to more effective development of ground-water supplies in eastern Kentucky.

Condition of supplies

In some communities of eastern Kentucky, over half the residents report their ground-water supply is inadequate because of poor water quality or low well yield. Quality problems include staining of clothes, hair, and porcelain; an unpleasant odor; bad taste; hard water; high concentrations of nitrate, barium, thalium, or fluoride; bacteria contamination; and salty water. Where water-quality problems are common, they affect the quality of life and the economy. Some sources of ground-water in these areas are better than others, and the extent of these sources should be defined for development.

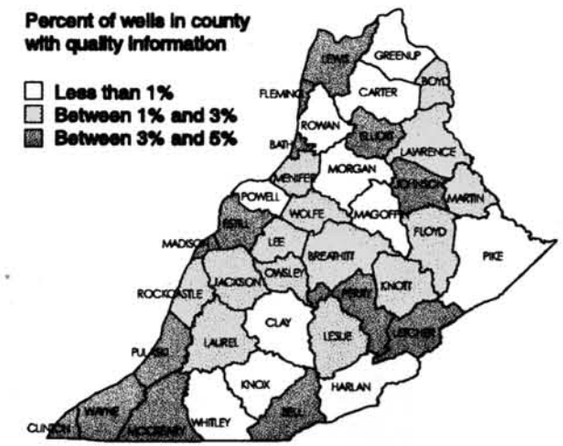


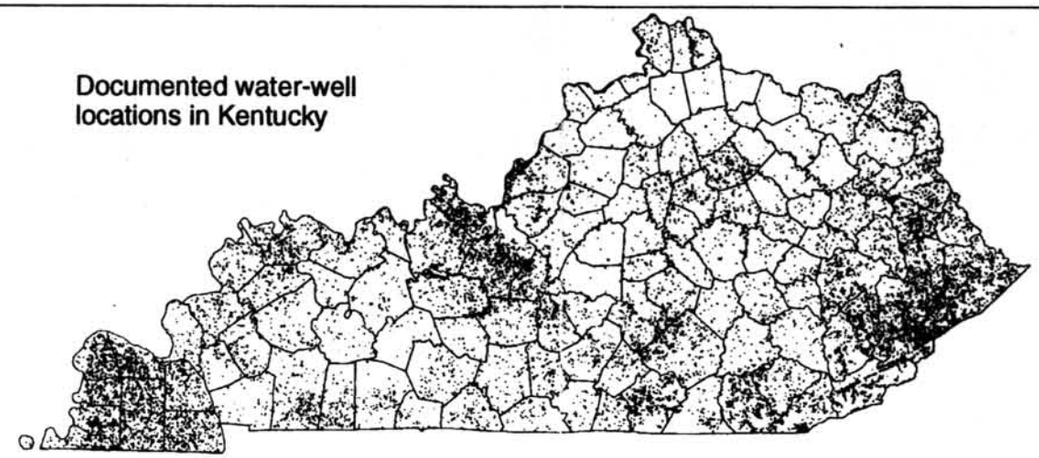
How much information is available?

As part of the KGS summary of information in the Ground-Water Data Repository, the number of wells tested in three important categories of water quality were compared with the total number of private wells in eastern Kentucky.

Information in the Ground Water Data Repository as of June 1995		
Category of wells and springs	Number of wells and springs in region	Percentage of wells and springs in region
Total wells in region	113,000*	100.0%
Records in Repository	8,500	7.5%
Records with any quality analyses	2,077	1.8%
Bacteria analyses	86	0.1%
Organic analyses	173	0.2%
Major-ion analyses	1,215	1.1%
*U.S. Census Bureau, 1990—household wells only.		

The categories are bacteria content,, man-made organic chemicals,, and major ions (the most abundant elements and ions that influence ground-water quality). As the table shows,,, that information is available for one in 100 wells or fewer in any of the three categories. Most of these wells have been analyzed for a limited number of constituents. The following figure shows how this information is distributed among the counties in eastern Kentucky.





Bacteria

Each newly drilled water well is disinfected with chlorine, and shortly afterward a water sample is collected and tested for bacteria. Because of the disinfection, these results should not be used to judge typical conditions, and therefore these data were excluded from the summary of available data. Thousands of analyses have been conducted on water from wells in eastern Kentucky that had not recently been disinfected, but only 81 of these analyses were available in the Kentucky Ground-Water Data Repository in early 1995.

Improving the information base

- The most valuable ground-water data that are recorded only on paper should be computerized and transferred to the Ground-Water Data Repository. Selected ground-water data submissions to State agencies should be in a computerized format, whenever possible.
- The Network is coordinating with other data-collection activities in the State. An interagency advisory board is creating a framework for data collection by the Network, and will provide continued input on the most-needed ground-water information. The Network will fill many gaps in the data to provide baseline information.
- The Kentucky Ground-Water Monitoring Network will characterize the quality and quantity of ground-water resources in each region. Summaries will include the horizontal and vertical patterns of ground-water quality and quantity. Information will be available in reports, including annual reports. Raw data will be available in various formats through the Kentucky Ground-Water Data Repository.

For more information, contact Jim Dinger at the Kentucky Geological Survey, (859) 257-5500 ext. 163.