The KENTUCKY Ground-Water Monitoring NETWORK

Western 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
University of Kentucky College of Agriculture
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Kentucky Department of Agriculture, Division of Pesticides
Kentucky Cabinet for Human Resources, Division of Environmental Sanitation and Community Safety
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 the 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 Western 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

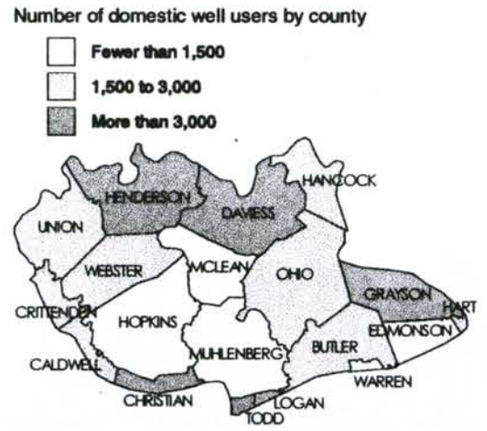
The location and character of the State's ground-water resources will be determined, and the information will be accessible. Characterization of the aquifers will include defining well yield, normal variations in ground-water quality, and ground-water flow systems that directly influence water quality.

Western Kentucky Coal Field

Over 27,000 people are served by 11,500 private water wells in the Western Kentucky Coal Field and the adjacent Ohio River alluvium (U.S. Census, 1990). Public water utilities that pipe ground water serve over 10,000 additional people in homes, schools, and businesses.

Distribution of well users

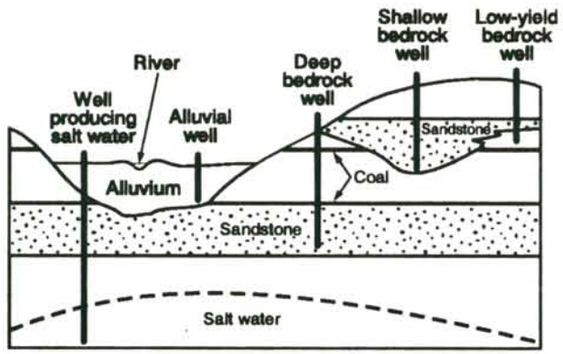
Most counties in the Western Kentucky Coal Field have over 1,500 private-well users, and five counties have over 3,000 users. The following figure shows the approximate number of private-well users in each county (U.S. Census, 1990). In addition, 10,000 people in five counties use piped public-water supplies from high-yield wells.



Aquifers

Bedrock or sediments that yield enough water to supply a household well are called aquifers. Sand and gravel deposits (alluvium) are common aquifers throughout the Ohio River Valley and near other local rivers. Bedrock aquifers are tapped for most wells in the region.

The following figure shows typical aquifers of the Western Kentucky Coal Field. Ground water that moves in alluvial sand and gravel provides water to wells along the major river valleys. Shallow bedrock aquifers generally consist of thick sandstone units less than 300 feet below the ground surface. Thin sandstone, limestone, and coal beds typically yield less water than thick sandstone. Deeper aquifers have the potential to yield good water supplies in some areas, but the quality and quantity of this ground water is undefined.



Salty water lies below fresh ground water in the region. In some locations the salty water is less than 200 feet below the ground surface; however, in some regions, fresh water may be present at depths up to 1,000 feet. The presence of fault zones in the Western Kentucky Coal Field appears to locally change the pattern of ground-water quality. In a faulted area of southern Hopkins County and central Muhlenberg County, information from a few wells suggests a greater amount of fresh water above the salt-water zone than in the rest of the coal field. However, information on fresh and salt water throughout the Western Kentucky Coal Field is insufficient to characterize the fresh-water resource for development.

Condition of supplies

Most residents in the Western Kentucky Coal Field that use ground water have adequate yields for normal household demands, although yield varies greatly from place to place. Inadequate yield of ground water occurs where sandstone units are thin and allow only a small degree of ground-water movement. The highest yield of ground water is found in wells along the Ohio River. In some areas, faults prevent recharge of aquifers, and well yields decline over time.

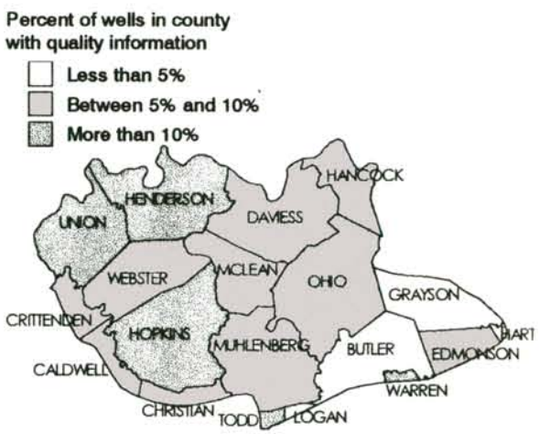
Most well owners do not have major water-quality problems, though some water is considered hard. A minority of wells have water-quality problems such as iron staining, metallic taste, high nitrates, bacteria contamination, or salty water. The patterns of ground-water quality and quantity in the region are currently poorly defined, but some sources of ground water are better than others. The higher quality sources should be defined to allow more efficient development by the public and private sector.

How much information is available?

As part of the summary of information in the KGS Ground-Water Data Repository, the number of wells with information in three important categories of water quality was compared with the total number of private wells in the Western Kentucky Coal Field. Categories are bacteria content, man-made organic chemicals, and major ions (the most abundant elements and ions that determine ground-water quality). The table at the upper right shows that information is available for at most four out of 100 wells in any of the three categories.

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	11,500*	100.0%
Records in Repository	1,243	10.8%
Records with any quality analyses	812	7.1%
Bacteria analyses	1	0.01%
Organic analyses	235	2.0%
Major-ion analyses	457	4.0%
*U.S. Census Bureau, 1990—household wells only		

Fewer wells have ground-water analyses in all three categories. The following figure shows how this information is distributed among counties in the coal field region.



Improving the information base

- The most valuable ground-water data that are recorded 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, where possible.
- The Network is coordinating its activities 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 as to 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
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