The KENTUCKY Ground-Water Monitoring NETWORK

Blue Grass & Knobs 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 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 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 Blue Grass and Knobs Regions 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

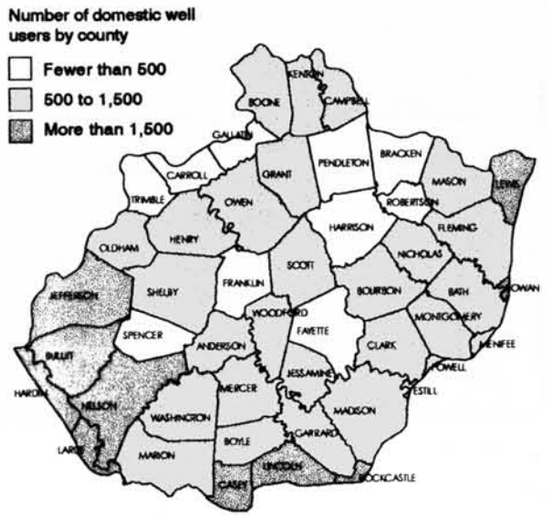
The location and character of the State's ground-water resources will be determined, and the information will be accessible. Characterization of the aquifers will include defining well yield, normal variations in ground-water quality, and ground-water flow systems that directly influence water quality.

Blue Grass & Knobs

Approximately 47,000 people in the Blue Grass and Knobs Regions, and along the Ohio River, are served by 18,500 private wells (U.S. Census, 1990). An additional 50,000 people at homes, schools, and businesses use ground water from high-yield springs or wells that is piped by over 20 public-water systems.

Distribution of private well users

Most counties in the Blue Grass have over 500 private well users, and six counties have over 1,500 users. The figure below shows the approximate number of private-well users in each county (U.S. Census, 1990). The 50,000 people using piped public-water supplies from high-yield springs or wells are distributed among 17 counties in the area.



Aquifers

Rock units and sediments that yield enough water to supply a household well are called aquifers. There are three major types of aquifers in the region: (1) karst (or conduit flow), (2) fractured shales and siltstones, and (3) deposits of sand and gravel (alluvium) along the Ohio and other rivers. Most wells are less than 125 feet deep. The fractured shale and siltstone aquifers are ground-water sources in the Outer Blue Grass. About half of the Blue Grass has well-developed karst features. Karst aquifers are created when part of the limestone bedrock is slowly dissolved by moving ground water. The enlarged openings in the rock form sinkholes, sinking streams, caves, and springs. The block diagram shows the kinds of karst features that are frequently found in the Inner Blue Grass.

Springs are the traditional source of water in karst areas. Today, many springs are used for livestock, public-water utilities, and industry.

Drilling a well for a ground-water supply in the Blue Grass is often a hit-or-miss proposition. In karst and fractured shale aquifers, only wells completed into conduits or enlarged fractures have reliable and adequate yields. These features are small targets for a well driller compared to widespread sand or gravel layers in alluvium.

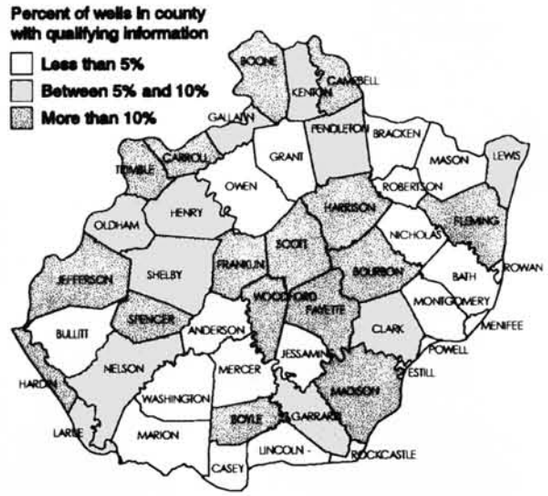
Condition of supplies

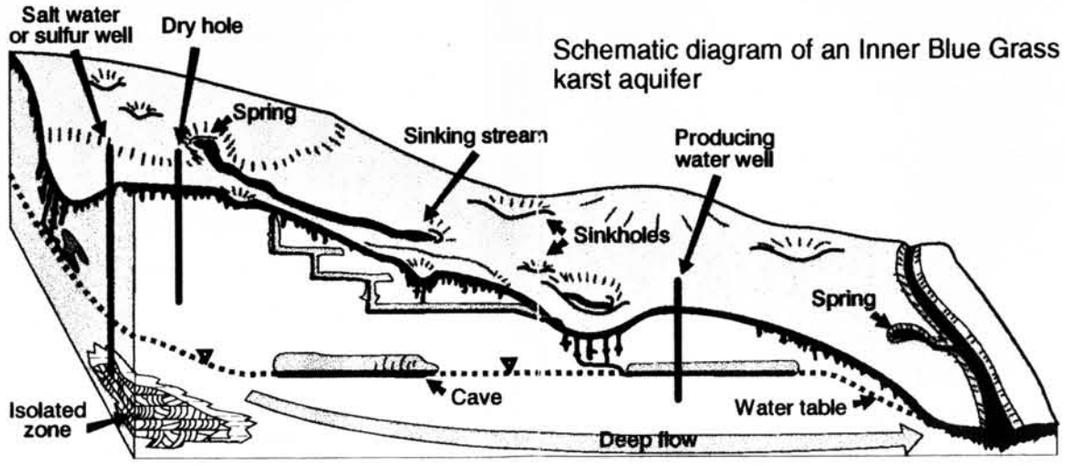
The quality of ground-water supplies in the region is highly variable. Many supplies are adequate for household use. However, aquifers in fractured shales may produce water laden with high concentrations of iron, sulfate, and other dissolved minerals. Wells in karst aquifers produce hard water (high calcium concentration). Karst springs and wells drilled into conduits produce muddy water during storms. Karst aquifers are also more vulnerable to contamination from human activities. Sand and gravel aquifers in the region that are near rivers often supply softer water. Salty water lies below fresh ground water, and deep wells can encounter salty water or water containing hydrogen sulfide.

How much information is available?

As part of the KGS summary of information in the Ground-Water Data Repository, the number of wells and springs tested in three important categories of water quality was compared with the total number of private wells in the Blue Grass. The categories are bacteria content, man-made organic chemicals, and major ions (the most abundant elements and ions that influence ground-water quality). The table at left shows that information is available for at most five out of 100 wells in any of the three categories. A spring or well was included in the count even if only one compound or ion of the hundreds possible was measured. The following figure shows how this information is distributed among the counties in the Blue Grass.

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	18,500*	100.0%
Records in Repository	1,862	10.1%
Records with any quality analyses	1,298	7.0%
Bacteria analyses	47	0.3%
Organic analyses	275	1.5%
Major-ion analyses	897	4.8%
*U.S. Census Bureau, 1990—Household wells only		





Schematic diagram of an Inner Blue Grass karst aquifer

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.

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