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Contact:
James Eychaner
Katherine Paybins

Address: 11 Dunbar Street
Charleston, WV 25301

Email: eychaner@usgs.gov
kpaybins@usgs.gov

Phone: (304) 347-5130 ext. 225
(304) 347-5130 ext. 236

Fax: (304) 347-5133

Coal mining, fecal bacteria, and radon are water-quality issues for the Kanawha River basin

A new study by the U.S. Geological Survey shows that water quality in the Kanawha River and its major tributaries, including the New, Gauley, Coal, and Bluestone Rivers, is generally good for drinking-water supply, recreation, and the protection of fish and other aquatic life. Significant water issues, however, are demonstrated in the coal-mined areas of the Kanawha River watershed in West Virginia, including high levels of sulfate and impaired aquatic communities. In addition, the USGS report shows elevated fecal bacteria in streams and water from homeowners' older wells as well as high concentrations of radon in water from wells in the southern part of the watershed in North Carolina and Virginia.

"The relatively small population and low intensity of agriculture and urban land uses throughout the watershed are reflected in low concentrations of nutrients and pesticides in streams and rivers," said USGS project leader James Eychaner. "But coal mining moves more earth in this watershed than any other land use, so it's not surprising to see some effects on water quality."

Mining Causes Concern in Some Areas

The Surface Mining Control and Reclamation Act of 1977 (SMCRA) resulted in improved water quality in West Virginia streams in the coal region of the Kanawha River watershed between 1980 and 1998 with respect to pH (a measure of acidity), iron, manganese, and sedimentation. Other unregulated factors, however, show the effects of continued mining. Streams draining areas that have been mined since 1980 show increased dissolved sulfate and impaired benthic-invertebrate communities compared to streams not mined since 1980.

"The community of stream-bottom insects and other invertebrates was impaired in all heavily-mined basins in the study," Eychaner said. "These benthic invertebrates are sensitive indicators of many types of disturbance and respond to impairment of stream chemistry or physical habitat. They are an important

part of the food web that supports sport fishing. Mining-related impairment of the insect community was of similar magnitude to the effects of urban development or agriculture elsewhere in the Nation. Some basins where the insect community was impaired, of course, were affected by disturbances other than mining.”

Ground water is also affected in the mined area. For example, iron and manganese concentrations exceeded federal drinking-water guidelines in at least 40 percent of West Virginia homeowners’ wells in the Kanawha River watershed, but the guidelines were exceeded in about 70 percent of wells near reclaimed surface coal mines. Elevated sulfate concentration and slightly acidic water were more common at wells within 1,000 feet of reclaimed mines than elsewhere.

About 7 percent of all coal mined in the nation comes from the Kanawha River watershed. Between 100,000 and 2 million tons of coal per square mile were mined between 1980 and 1995 in heavily-mined parts of the watershed. Total production is about 90 million tons per year. A coal seam 1 foot thick and 1 mile square weighs about 1 million tons.

Stream water quality in basins where less than 10,000 tons of coal per square mile have been mined since 1980 is similar to that in unmined basins. Only three basins greater than 10 square miles where no coal had been mined were identified in the 5,000-square-mile coal region.

Bacteria Found In Some Areas

Concentrations of *Escherichia coli* exceeded the national guideline for public swimming areas in 26 percent of samples from major rivers in the Kanawha River watershed and in 43 percent of samples from tributary streams. Inadequate sewage treatment and manure management contribute to elevated *E. coli* concentrations. *E. coli* are bacteria that grow in the intestines of people, other mammals, and birds. Most strains of *E. coli* do not cause disease, but they do indicate the water is contaminated by feces, which could contain other disease-causing organisms. No outbreak of waterborne disease was reported in the watershed during 1991–98.

Levels of bacteria in wells varied, most likely because of well construction. “When we sampled homeowners’ wells that were in good condition, we found almost no bacteria,” Eychaner said. “These wells have a section of pipe sealed tight with concrete against the soil and rock near the land surface. But when we sampled wells without seals, especially close to livestock or a septic system, we often found bacteria.”

Radon Levels Highest In Nation

Radon concentrations in ground water from homeowners’ wells in the Blue Ridge area of the New River watershed, in parts of North Carolina and Virginia, were among the highest measured by USGS in the Nation. Radon is a radioactive gas that forms during the decay of natural uranium and can also seep into basements from the soil. Radon in air is the second leading cause of lung cancer.

Water from almost 90 percent of wells sampled in the Blue Ridge area exceeded the proposed national drinking-water standard of 300 picocuries per liter (pCi/L). One-third of the wells contained more than 4,000 pCi/L, the alternate standard proposed for regions where action is taken to decrease radon levels in air. Additional information on radon can be found at the National Safety Council’s telephone hotline 800-SOS-RADON or the USEPA web site <http://www.epa.gov/ogwdw000/radon/fact.html/>.

The USGS report, "Water Quality in the Kanawha-New River Basin, West Virginia, Virginia, and North Carolina, 1996-98," will soon be available on the World Wide Web as downloadable portable document files (PDF) at <http://water.usgs.gov/nawqa/>. Single copies of the printed report are available at no cost from the USGS Branch of Information Services, P.O. Box 25286, Denver, CO 80225 or by fax request to 303-236-4693. Please identify the report as USGS Circular 1204.

The USGS report is part of a national program that is currently releasing results on surface and ground water quality in 15 other major river basins. The USGS National Water-Quality Assessment (NAWQA) program seeks to improve scientific and public understanding of water quality in the Nation's major river basins and ground-water systems. Better understanding facilitates effective resource management, accurate identification of water-quality priorities, and successful development of strategies that protect and restore water quality. Individual basin reports, other NAWQA publications, and national data sets and maps are available at <http://water.usgs.gov/nawqa/>.

The NAWQA program has worked in 50 major watersheds since 1991. The program is designed to understand water-quality trends by repeating the assessment in each watershed about every 10 years. The Kanawha-New River Basin assessment, however, is slated to be discontinued because of budget limitations.

The USGS serves the nation by providing reliable scientific information to: describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

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