

One in five streams damaged by mine pollution in southern West Virginia: study

July 30 2012

Water pollution from surface coal mining has degraded more than 22 percent of streams and rivers in southern West Virginia to the point they may now qualify as impaired under state criteria, according to a new study by scientists at Duke and Baylor.

The study, published this week in the peer-reviewed journal [Environmental Science & Technology](#), documents substantial losses in aquatic insect biodiversity and increases in salinity linked to sulfates and other pollutants in runoff from mines often located miles upstream.

"Our findings offer concrete evidence of the cumulative impacts surface mining is having on a regional scale," said Emily S. Bernhardt, associate professor of biogeochemistry at Duke's Nicholas School of the Environment. "The relationship is clear and direct. The more mining you have upstream, the higher the biological loss and salinity levels will be downstream, and the farther they will extend."

Numerous recent studies have demonstrated the water-quality problems caused at or near the site of individual surface coal mines, Bernhardt noted. She and her team "set out to understand how the large and growing number of surface mines is affecting water quality throughout Appalachia."

They used NASA satellite images and computer data to map the extent of surface mining taking place across a 12,000-square-mile area of the southern West Virginia coalfields between 1976 and 2005.

They found that companies had converted more than five percent of the land into mine sites and buried 480 miles of [streams](#) beneath adjacent valley fills during this period.

Chemical and biological data from 223 streams sampled by the West Virginia Department of Environmental Protection between 1997 and 2007 were combined with mapping to help the researchers determine that pollution runoff from the mines could substantially degrade more than 1,400 miles of streams in the region. That's four times the length of streams buried by the valley fills.

"It's important to recognize that surface [coal mining](#) pollution doesn't stop at mine-permit boundaries," said Brian D. Lutz, a postdoctoral associate in Bernhardt's lab.

"Our analysis suggests that mining only five percent of the land surface is degrading between 22 percent and 32 percent of the region's rivers," he said.

Substantial declines in insect diversity began to occur when companies had mined as little as one percent of upstream land, the analysis showed. In areas where companies had converted about five percent of the land into mines, sensitive species such as mayflies and stoneflies had vanished or declined to an extent that the streams would qualify as biologically impaired under criteria set by the state of West Virginia.

The designation means the streams could be placed on a list of waterways that the state must take steps to rehabilitate.

"What is so compelling is that we found many different types of organisms are lost downstream of surface coal mines, and most of them begin to disappear at similar levels of mining," said Ryan S. King, associate professor of biology at Baylor. "Our analysis shows that coal

mining is leading to widespread declines in aquatic biodiversity in Appalachian streams."

Provided by Duke University

Citation: One in five streams damaged by mine pollution in southern West Virginia: study (2012, July 30) retrieved 22 May 2024 from <https://phys.org/news/2012-07-streams-pollution-southern-west-virginia.html>

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