

Coal mining reduces abundance, richness of aquatic life

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Coal mining, under current US regulations, has significantly reduced the abundance and variety of fish, invertebrates, salamanders, and other aquatic life in streams, according to a new study from the University of Tennessee, Knoxville.

That damage to stream biodiversity could extend to humans and impact everything from public health outcomes to recreational fishing and hunting, according to the study, which was published today in the journal *Nature Sustainability*.

"Our article will be interesting to policymakers as well as the broad public as trade-offs between fossil fuel development and environmental conservation are currently being actively debated in the political arena," said Xingli Giam, assistant professor in UT's Department of Ecology and Evolutionary Biology and the study's lead author.

Giam co-authored the study with Daniel Simberloff, Gore Hunger Professor of Environmental Science in UT's Department of Ecology and Evolutionary Biology, and Julian D. Olden of the University of Washington.

Scientists have long agreed that coal mining negatively affects water quality. But this study is the first to provide a quantitative analysis of its impact on different aquatic species affected by different mining methods.

Coal mining in the US is currently governed primarily by two federal statutes—the 1972 Clean Water Act, which regulates discharge of dredged or fill material and other pollutants, and the 1977 Surface Mining Control and Reclamation Act, which established operational standards to minimize the impacts of both surface and underground mines. In both types of mining, harmful solutes can leak into streams.

The researchers examined data and literature on the richness and abundance of species in streams affected by coal mining and unaffected streams. They found that streams affected by coal mining were, on average, 32 percent lower in taxonomic richness and 53 percent lower in total abundance than unmined streams. Even after mining companies' efforts to reclaim mined lands and return them to health, streams affected by mining still had lower richness and abundance of species than unmined streams.

"Our investigation demonstrates that current US regulations are insufficient to fully protect stream biodiversity," the study states.

Because coal mining is expected to continue until at least the year 2040 and will likely expand to previously unmined lands as current mines are depleted, the researchers have identified several watersheds—mainly in the central and southern Appalachians and on the Colorado Plateau—that will suffer the greatest and most irreversible biodiversity declines and whose aquatic species will be most affected. These watersheds deserve the greatest regulatory scrutiny, the authors say. They include the Elk in West Virginia, the Upper Clinch and Powell in Tennessee and Virginia, the Upper

Cumberland in Tennessee and Kentucky, the Locust and Upper Black Warrior in Alabama, and the Upper Mississippi-Cape Girardeau in Illinois and Missouri.

In December 2016, the Office of Surface Mining Reclamation and Enforcement issued the Stream Protection Rule, which revised regulations implemented under the 1977 Surface Mining Control and Reclamation Act. The goal was to reduce coal mining's impact on water quality and biodiversity by requiring companies to collect pre-mining, mining, and post-mining/reclamation data on [water quality](#) and biodiversity at regular intervals. This requirement would help ensure that they do the necessary remediation work.

In January 2017, Congress enacted a joint resolution to repeal the rule, claiming the requirement was too costly to businesses.

The authors note that [coal](#) mining's impact goes beyond [aquatic species](#) and can affect the health of communities. It is linked to increased human mortality from lung cancer, chronic health problems, and kidney disease. It also can affect recreational opportunities, including fishing and game hunting, by killing off fish and animals and making the surviving fish too dangerous to eat.

The study makes several recommendations, including reinstating the Stream Protection Rule, tightening current regulations to reduce the impact of [coal mining](#) on stream biodiversity, implementing stringent monitoring requirements, prohibiting the dumping of [mining](#) waste to preserve habitats and minimize downstream pollution, and rejecting permit requests once a certain percentage of a watershed has been mined.

More information: Xingli Giam et al. Impact of coal mining on stream biodiversity in the US and its regulatory implications, *Nature Sustainability* (2018). [DOI: 10.1038/s41893-018-0048-6](https://doi.org/10.1038/s41893-018-0048-6)

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