

# Radioactivity from oil and gas wastewater persists in Pennsylvania stream sediments

19 January 2018, by Tim Lucas



Treated oil and gas wastewater flows into a stream in western Pennsylvania. A new Duke study finds stream sediments at disposal sites such as this one have levels of radioactivity that are 650 times higher than at unaffected upstream sites. Credit: Avner Vengosh, Duke University

More than seven years after Pennsylvania officials requested that the disposal of radium-laden fracking wastewater into surface waters be restricted, a new Duke University study finds that high levels of radioactivity persist in stream sediments at three disposal sites.

The contamination is coming from the disposal of conventional, or non-fracked, oil and gas wastewater, which, under current state regulations, can still be treated and discharged to local streams.

"It's not only fracking fluids that pose a risk; produced water from conventional, or non-fracked, oil and gas wells also contains high levels of radium, which is a radioactive element. Disposal of this wastewater causes an accumulation of radium on the stream sediments that decays over time and converts into other radioactive elements," said

Avner Vengosh, professor of geochemistry and water quality at Duke's Nicholas School of the Environment.

The level of radiation found in stream sediments at the disposal sites was about 650 times higher than radiation in upstream sediments. In some cases, it even exceeded the radioactivity level that requires disposal only at federally designated radioactive waste disposal sites.

"Our analysis confirms that this accumulation of radioactivity is derived from the disposal of conventional oil and gas wastewater after 2011, when authorities limited the disposal of unconventional oil and gas wastewater," said Nancy Lauer, a Nicholas School PhD student who led the study.

"The radionuclide ratios we measured in the sediments and the rates of decay and growth of radioactive elements in the impacted sediments allowed us to essentially age-date the contamination to after 2011," she explained.

The researchers published their findings in a peer-reviewed policy paper Jan. 4 in *Environmental Science and Technology*.

To conduct the study, they collected stream sediments from three wastewater disposal sites in western Pennsylvania, as well as three upstream sites, and analyzed the [radioactive elements](#) in the sediments. Samples were collected annually from 2014 to 2017 at disposal sites on Blacklick Creek in Josephine, on the Allegheny River in Franklin, and on McKee Run in Creekside.

In 2011, in response to growing public concern about the possible environmental and human health effects of fracking wastewater, Pennsylvania's Department of Environmental Protection requested that the discharge of fracking fluids and other unconventional oil and gas

wastewater into surface waters be prohibited from central water-treatment facilities that release high salinity effluents. However, the disposal of treated wastewater from conventional oil and gas operations was allowed to continue.

"Despite the fact that [conventional oil](#) and gas [wastewater](#) is treated to reduce its radium content, we still found high levels of radioactive build-up in the stream sediments we sampled," Vengosh said. "Radium is attached to these sediments, and over time even a small amount of radium being discharged into a stream accumulates to generate high radioactivity in the stream sediments."

"While restricting the disposal of fracking fluids to the environment was important, it's not enough," he said. "Conventional oil and gas wastewaters also contain radioactivity, and their disposal to the environment must be stopped, too."

**More information:** Nancy E. Lauer et al, Sources of Radium Accumulation in Stream Sediments near Disposal Sites in Pennsylvania: Implications for Disposal of Conventional Oil and Gas Wastewater, *Environmental Science & Technology* (2018). [DOI: 10.1021/acs.est.7b04952](#)

Provided by Duke University

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