



UNM METALS Superfund Research Center Research Brief No. 3.1 **Jackpile Mine wastes source of uranium in Rio Paguete and likely source of metals building up in sediments behind Paguate Reservoir**

The UNM METALS Superfund Research Program (SRP) conducts field and laboratory research to better understand how metals in uranium mine wastes affect the air, land and water and the health of people who live nearby.

The METALS SRP is focused on mining impacts in three Native American communities in the Southwest:

- Pueblo of Laguna/ Jackpile Mine
- Red Water Pond Road Community/Northeast Church Rock Mine
- Blue Gap-Tachee Chapter, Navajo Nation/Claim 28 Mine

For information about research being conducted on the Pueblo of Laguna, contact METALS community liaison, Kyle Swimmer, at 505-262-1862, or laguna.swimmer1680@gmail.com, or visit hsc.unm.edu/college-of-pharmacy/research-and-scholarship/metals/index.html.



How uranium moves and accumulates in the environment can affect the quality of surface water while also contributing to the buildup of metals in river and reservoir sediments.

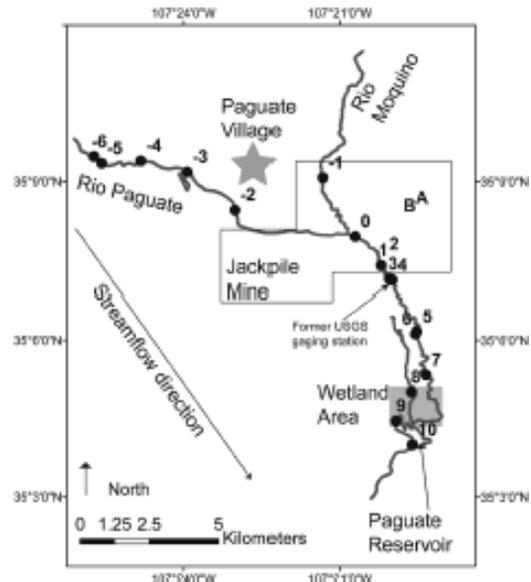
Between 2014 and 2017, UNM researchers, led by geochemist Johanna Blake (now with the U.S. Geological Survey) and Professor Jose Cerrato, an environmental engineer, investigated the mobility of uranium in water and accumulation in sediments along the Rio Paguete and in the wetlands of Paguate Reservoir, located 5 kilometers (about 3.1 miles) south of the Jackpile Mine.

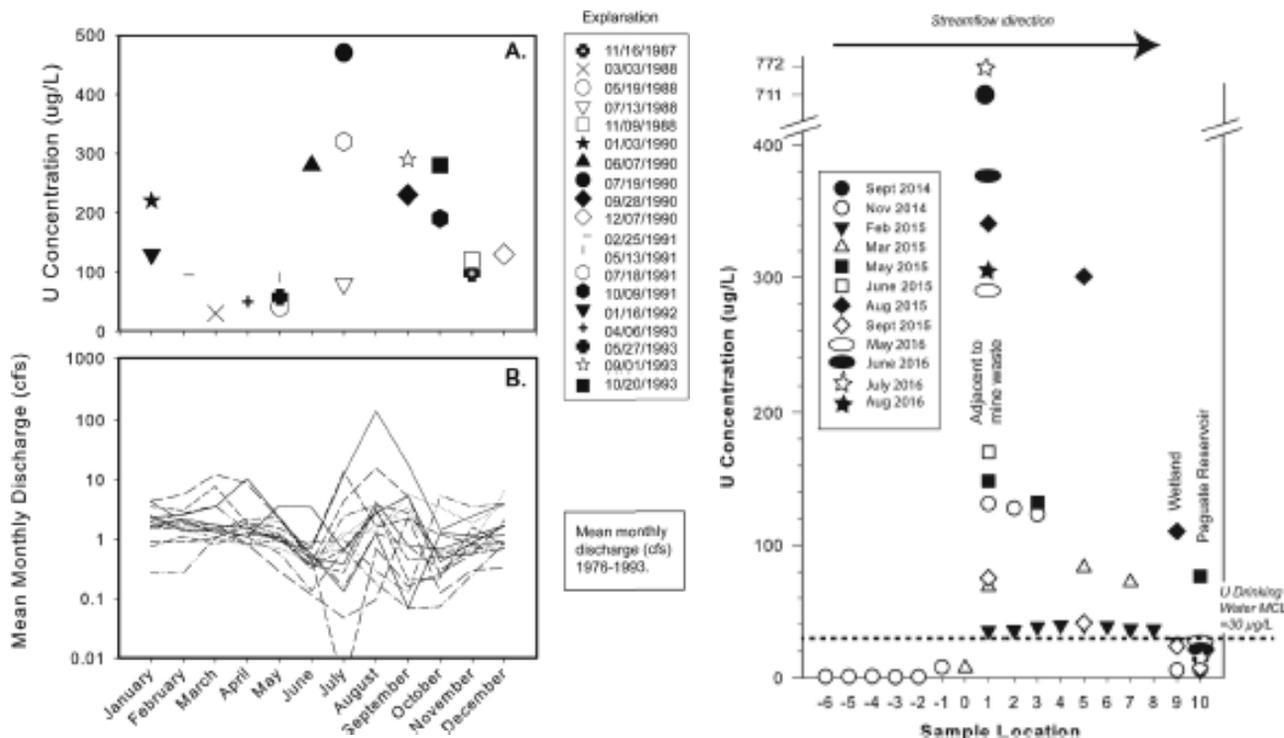
In a paper published in 2017 in the scientific journal, *Environmental Science: Process and Impacts*, Dr. Blake and colleagues reported results of water and sediment sampling in the Rio Paguete and Paguate Reservoir behind Mesita Dam (map below). The investigators found that ore and mine wastes on the surface of the Jackpile Mine are the source of uranium in the surface water.

They also found that the concentration, or amount, of uranium in the Rio Paguete varies seasonally, with higher concentrations during the summer monsoon season runoff. While the uranium concentration in surface water decreases downstream of the mine, the uranium itself was found to accumulate, or build up, in organic-rich sediments in the Paguate Reservoir wetland.

The UNM findings are consistent with studies conducted in the late 1970s when the Jackpile Mine was operating. New Mexico Bureau of Mines and Mineral Resources researchers found increased concentrations of uranium, other metals and radioactive elements derived from the decay of uranium in the bottom sediments of the Reservoir (Popp, et al., 1983).

These studies, spaced nearly 40 years apart, document continuing impacts of the mine on Laguna water sources – long after mining stopped and initial reclamation was conducted. They help inform discussions about the extent of remediation of the possible effects of the mine releases on downstream resources.





Historical Comparisons of Uranium Levels and Stream Flow in Rio Paguete:

The figures above, from the 2017 Blake paper (left), show how uranium concentrations increase as stream flows in the Rio Paguete increase in the summer monsoon season across two separate periods: historically, 1987 and 1993 (upper left), and recently, 2014-2016 (upper right). Virtually all uranium concentrations during runoff events in both time periods exceeded the USEPA maximum contaminant level (MCL) of 30 micrograms per liter ($\mu\text{g}/\text{l}$). Maximum uranium concentrations ranged from 500 $\mu\text{g}/\text{l}$ to nearly 800 $\mu\text{g}/\text{l}$ in surface water at the Rio Paguete crossing (called the “ford”), identified as sample station 1 in the graphic to the right and map on the front. A uranium concentration exceeding 500 $\mu\text{g}/\text{l}$ at the ford was the basis for the listing of the Jackpile Mine as a federal Superfund Site in 2013.

Citations:

Blake JM, DeVore CH, Avsarala S, Ali AM, Roldan C, Bowers F, Spilde MN, Artyushkova K, Kirk MF, Peterson E, Rodriguez-Freire L, Cerrato JM. Uranium mobility and accumulation along the Rio Paguete, Jackpile Mine in Laguna Pueblo, NM. *Environmental Science: Process and Impacts*, 2017. DOI:10.1039/c6em00612d.

Popp CJ, Hawley JW, Love DW. Radionuclide and Heavy Metal Distribution in Recent Sediments of Major Streams in the Grants Mineral Belt, N.M. Socorro: New Mexico Bureau of Mines and Mineral Resources, prepared for the U.S. Office of Surface Mining, Gll5352 (1981-82), 1983. Available at <https://www.yumpu.com/en/document/view/15484953/radionuclide-and-heavy-metal-distribution-in-recent-sediments-of->

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