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Does Arsenic and Uranium in the bedrock affect water quality on the Navajo Nation?

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The Navajo Nation is located in the Four Corners region, extending into Arizona, New Mexico, and Utah. Access to public water systems and water quality are major problems in the Navajo Nation. Poor water quality is an ancillary concern for 15% of Navajo Nation residents who do not have access to piped public water. Of this proportion, they face a potential alternative in sourcing their water from unregulated private wells (EPA 2020). In consequence of U.S. historical mining in the Navajo Nation, residents face elevated chronic exposure to metals such as arsenic (As) and uranium (U) by way of environmental contamination. There are over 500 abandoned uranium mines on the Navajo Nation (EPA 2020), the vast majority of which are not properly remediated and potentially contribute to elevated levels of uranium and arsenic in groundwater.

The purpose of the project is to determine how geological sources of arsenic and uranium may contaminate groundwater. We hypothesized that there is some relationship between bedrock chemistry and water quality. We analyzed bedrock chemistry by looking at X-Ray Fluorescence Spectroscopy data (XRF) measured on cores from the Colorado Plateau Coring Project (CPCP-1). XRF includes measurements of toxic elements such as U, As, and other elements that are important in regulating As and U solubility like Si and Fe. We compared XRF data to lithologic logs to determine the relationship between bedrock lithology and chemistry. We used QGIS to compare bedrock chemistry to measurements of Arsenic from public and private wells on the Navajo Nation. Initial results show that there is more arsenic in the claystone than in the sandstone. This is encouraging because water is more likely to flow through sand than clay, therefore, the groundwater aquifer that is most commonly used is less likely to be contaminated by the bedrock. However, water derived from the boundary between clay and sandstones may be more susceptible to contamination because the clays can contribute those metals to the aquifer.

EPA (2020) Providing Safe Drinking Water in Areas with Abandoned Uranium Mines.

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