

FACT SHEET

USGS Groundwater Study: “An assessment of uranium in groundwater in the Grand Canyon region”

November 2021

In November 2021, scientists at the U.S. Geological Survey studying uranium in groundwater around the Grand Canyon published a paper reporting their findings. The full paper can be downloaded at: <https://www.nature.com/articles/s41598-021-01621-8>

The study relies on 573 data samples collected from 180 springs and 26 wells (60 percent of the samples were collected since 2009, 40 percent were collected earlier, dating as far back as 1981).

What the study does

Establishes baseline water quality for certain springs and wells in the Grand Canyon region to compare future changes in water chemistry.

Important findings



(11 of the 206 springs and wells sampled) showed levels of uranium above the U.S. Environmental Protection Agency's (EPA) safe drinking water level.



of springs and wells with uranium levels above the EPA limit (8 of the 11) are located just west of the South Rim Village and below the nearby abandoned Orphan uranium mine, inside Grand Canyon National Park.



of samples had levels above the Canadian benchmark for protection of aquatic life in freshwater (the U.S. does not have such a benchmark).

It could take many years for contamination from uranium mining to show up in springs and wells in the Grand Canyon region.

“While no conclusive effects from breccia-pipe mining activities on uranium concentrations in groundwater samples collected to date (2021) in the Grand Canyon region can be confirmed (although the Horn Creek/Orphan Mine investigation is ongoing), the timing of potential effects may take many years to reach groundwater discharge locations.”

—U.S. Geological Survey

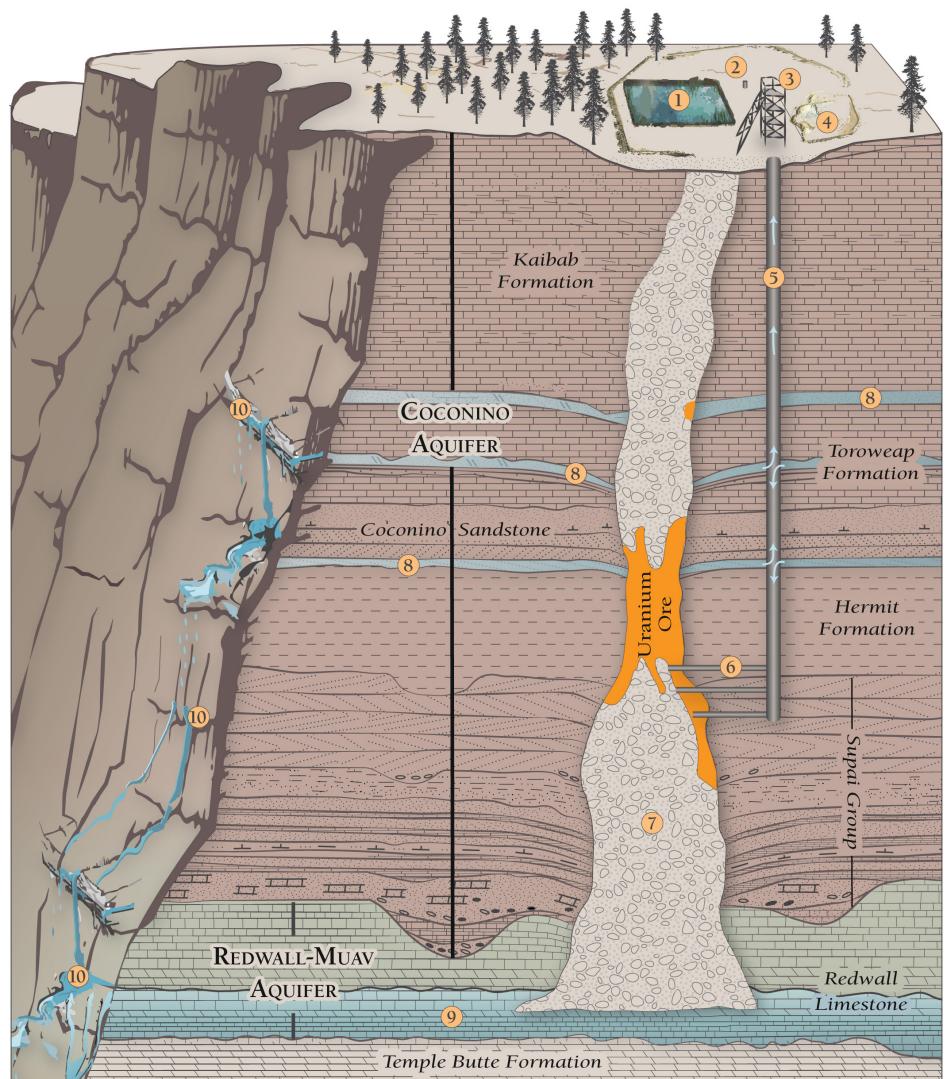
"What we know about the groundwater system in that area is that some of the flow paths are really long, so it can take an extensive amount of time to get from point A to point B, so if we're looking for effects from uranium mines on groundwater resources, they might not show up at spring sites for hundreds, to possibly thousands of years."

—Fred Tillman,
Lead Hydrologist on the Study

What remains unknown

- Where, how fast, and how far could contaminated water travel?** Scientists don't understand groundwater flow direction and speed in this highly complex landscape of fractured rock. It could take decades to thousands of years for contamination from past mines to show up in springs, creeks, and wells in and around the Grand Canyon.
- Are past or present uranium mines contaminating groundwater?** If water quality at any of the sampled sites were to change in the future, information would still be needed to understand where contamination is coming from.

The bottom line: No one can say that uranium mines have not or are not currently causing contamination. It's too early to say.



SOURCE: Generalized and modified from the USGS Site Characterization of Breccia Pipe Uranium Deposits in Northern Arizona and Uranium Mine Conceptual Model
GRAPHIC BY STEPHANIE SMITH, GRAND CANYON TRUST

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|--|-------------------------------|--------------------|
| ① Containment pond | ⑤ Mine shaft | ⑨ Regional aquifer |
| ② Ventilation shaft | ⑥ Horizontal shaft ("drifts") | ⑩ Seep or spring |
| ③ Mine headframe | ⑦ Breccia collapse feature | |
| ④ Waste rock, ore pile, & top soil storage | ⑧ Perched aquifer | |
| Potential water flow in mine shaft | | |

Other important notes beyond the scope of the study

- Successful cleanup of uranium contamination in groundwater in this complex region would be unlikely, if not impossible.
- Groundwater contamination is one concern about mining in the region, next to the cultural and existential concerns of Indigenous tribes and nations, concerns about impacts to wildlife and the environment, and concerns about the economic impacts of contamination, especially on tourism.
- The Grand Canyon region is the ancestral homeland of many Indigenous peoples, including the Havasupai, Hualapai, Navajo, and Hopi, all of whom strongly oppose uranium mining in the region.

"Oh, you won't see the contamination until hundreds of years from now. We're not willing to take that risk. There's only 757 of us left, and we just can't risk that right now for the future of our children."

—Carletta Tilousi, Havasupai Tribal Council



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