TESTIMONY TO THE SUBCOMMITTEE ON NATIONAL PARKS, FORESTS AND PUBLIC LANDS OF THE HOUSE NATURAL RESOURCES COMMITTEE HEARING ON THE GRAND CANYON WATERSHEDS PROTECTION ACT OF 2009
H.R. 644
JULY 21, 2009

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I wish to thank Chairman Grijalva and the Subcommittee for the opportunity to testify, and for your leadership in addressing this important issue. This testimony is in support of the Grand Canyon Watersheds Protection Act of 2009 (H.R. 644). I am a Professor of Hydrology at the University of Nevada, Las Vegas (UNLV) where I have been studying groundwater – surface water interaction in the Southwest, and in the national parks in particular. I have visited the Grand Canyon since the 1960s and have conducted research on Grand Canyon springs for over 25 years. I have authored several publications related to Grand Canyon springs. This testimony does not represent the views of the University of Nevada, or any of the institutions with which I have past or present affiliation. My past affiliations include Director of Water Resources Management Graduate Program at UNLV, and I have taught at Arizona State University and the University of Arizona in the 1970s and 80s. I also serve as Secretary of the U.S. National Chapter of the International Association of Hydrogeologists, and on the Board of Directors of the National Ground Water Association, Association of Ground Water Scientists and Engineers.

My research group was the first to study uranium concentrations in water from various springs in the Grand Canyon, including Horn Creek (which is below the site of the abandoned Orphan Uranium Mine on the Rim). In 1995 we discovered elevated uranium levels in Horn Creek (92.7 ppb), which is above the EPA Maximum Contaminant Level Goals (0 ppb), and in excess of the EPA Maximum Contaminant Levels (30 ppb). This provided part of the impetus for the Park Service to clean up the Orphan Mine site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The cost for remediation of the Orphan Mine's surface area is estimated at $15 million (Phase 1), but costs to remediate contamination in the underground portion of the mine and in Horn Creek are unknown (Washington Independent July 22, 2008).

My comments in this testimony are restricted to my areas of professional and academic experience in hydrology, water quality, and geology. Specifically, I would like to address the potential that mining, in or near the Tusayan Ranger District and Federal land managed by the Bureau of Land Management in the vicinity of Kanab Creek and in House Rock Valley, can negatively impact the quantity and quality of spring water issuing in the Grand Canyon, and thereby impact human health and safety, and wildlife habitat that those springs support.

Background

I have researched spring water quality and quantity in the Grand Canyon with my graduate students since the 1980's, particularly looking at environmental tracers and groundwater-surface water connections. Environmental tracers are water quality parameters which are useful in understanding groundwater movement and flow. The value of these tracers includes: tracking subsurface water migration, revealing evidence to show hydrologic connection between aquifers and springs, dating the entry of rainfall infiltrating into the subsurface, and specifying ground water recharge areas and amounts of recharge.

On the basis of this research and that of others, I am profoundly concerned that mining in or near the Tusayan Ranger District and Federal land managed by the Bureau of Land Management in the vicinity of Kanab Creek and in House Rock Valley will damage the quantity and quality of Grand Canyon springs, and the plants and animals that depend on those springs. The springs support a rich diversity of animals, birds, insects and plants, and provide water for backcountry hikers and Native Americans.

Uranium mines in the arid Southwest use water, which is usually supplied from wells or imported from springs. These types of mines in the Grand Canyon area typically excavate vertical and horizontal shafts into, or near, breccia pipes, which are geologic collapse features and zones of historical groundwater recharge. Breccia pipes are abundant in the region, form vertical zones of angular clasts surrounded by a consolidated rock matrix originally formed by the caving-in of paleochannels in underlying rock, and can form ground surface depressions and sink holes (Huntoon, 1996). Many potential mine sites are located in these sinkholes which can be subject to surface flooding. This type of uranium mine generates ore and waste rock which is typically stockpiled on the land surface until shipment to a mill takes place. Local precipitation and surface runoff waters can be in contact with this surface uranium ore. Certain mining activities, such as the interception of water by wells, creation of vertical shafts, the diversion of surface water, and the collection of surface water into holding ponds, has the potential to alter the amount and quality of water recharging the aquifers surrounding Grand Canyon National Park.

Diminishment of Spring Water Quantity

Water is necessary at mining operations to support drilling, potable water supply and sanitary needs. Wells in the Grand Canyon region typically are over 2000 feet deep, tapping the Redwall-Muav aquifer. This same Redwall-Muav formation is the level in the Canyon where the large majority of springs discharge (approximately halfway down the Canyon vertically). Previous uranium mining in the Grand Canyon region estimates that this water usage would be, at a minimum, over 2.5 million gallons per year for one mine (Canyon Uranium Mine EIS, 1986). There are many springs and seeps in the Grand Canyon that, according to the US Geological Survey and other investigators, have discharge similar to these amounts, or even much less. Some of these springs and seeps are ephemeral, and the biotic communities associated with them are very vulnerable to the abstraction of water and reduction of flow. Multiplying potential mining water use by the number of potential mine sites, coupled with the up-gradient location of potential mine sites, a majority of springs and seeps in the Grand Canyon could be eliminated and/or critically diminished in flow. The work of our research group at the University of Nevada, Las Vegas with environmental tracers (including stable and radiogenic isotopes, trace elements, chlorofluorocarbons, and uranium isotope disequilibrium measurements) shows compelling supporting evidence for existence of a hydrologic connection between the aquifers surrounding the Canyon and the springs within the Canyon (Goings, 1985; Zukosky, 1995; Fitzgerald, 1996; Ingraham et al., 2001).

Also, the deep, drilled wells associated with projected mining operations throughout the Grand Canyon region, and the mine shafts themselves, have the potential to pierce smaller perched aquifers in the overlying Coconino Sandstone (approximately one-quarter of the way down the Canyon vertically), which supplies water to springs higher up on the wall of the Canyon. In one uranium mine in the Grand Canyon region, a perched aquifer was encountered during exploratory drilling operations. Long-term downward drainage and water disruption potential of the mining operation was estimated to be over 1.3 million gallons per year (Canyon Uranium Mine EIS, 1986). Piercing a perched aquifer would have the effect of draining the perched aquifer, and disrupting flow to springs issuing from the Coconino Sandstone-Hermit Shale contact and the underlying Supai Group.

The historical water recharge to the subsurface in potential mining areas could be altered by surface mining structures. These structures include diversion channels, berms, dikes, or barriers to surface flow. These structures are designed, in part, to minimize contact of surface ore piles and waste rock with surface water runoff. Eventually this impoundment of surface water would manifest itself as diminished groundwater recharge and spring flow. Retention of surface water would unbalance the groundwater equilibrium between recharge and spring discharge, and could also affect the timing of downward water percolation, and eventually spring water quality.

Diminishment of Spring Water Quality

The disruption to the normal recharge processes (vertical water flow in the subsurface) by mining operations will not only change the underground pathway and quantity of spring and creek flow within the Grand Canyon, it is likely to also change the quality of those waters. As may be obvious, lower flows may produce less dilution of dissolved components, but surprisingly, high flows coupled with a change in water's oxidation level as it descends in the subsurface, can increase sulfate, magnesium, carbonate, and even uranium concentrations (Hockley et al., 2000). Elevated uranium concentrations in spring water that my research team observed in Horn Creek, below the rim of the Grand Canyon, were at a time of high flow.

Vertical and horizontal shafts built with uranium mining will be expected to change water quality in the Canyon. The effects on water quality of expanded uranium mining near the Rim of the Grand Canyon, irreversible environmental impacts of those changes, and the cost of cleaning up contamination from those operations is not defined at this time for receiving waters.

Summary

Scientific evidence suggests that the exploitation of uranium resources near the Grand Canyon will be intimately connected with the groundwater aquifers and springs in the region. The hydrologic impacts have a great potential to be negative to people and biotic systems. I believe that an assumption that uranium mining will have minimal impact on springs, people and ecosystems in the Grand Canyon is unreasonable, and is not supported by past investigations, research, and data. Therefore, I support passage of H.R. 644. In my best professional judgment, I believe H.R. 644 will help preserve clean water and the sustainable natural resources that water supports, in this treasured region of our country. In my view, at the same time it will support recreational economic interests and indigenous peoples of the region.

I greatly appreciate the opportunity to address this issue and wish to thank the Subcommittee.