Testimony by DMMR Re: H.R. 644, Grand Canyon Watersheds Protection Act

Open File Report 09-28
July, 2009

by Dr. Madan M. Singh, Director

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This is a preliminary report, subject to technical and editorial revision.

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Testimony for The Subcommittee on National Parks, Forests and Public Lands of the Committee on Natural Resources.

July 21, 2009

Members of the Subcommittee, Ladies and Gentlemen, Good Morning:

My name is Dr. Madan M. Singh and I am Director of the Department of Mines and Mineral Resources, State of Arizona. I have been in this position since August 2005. I have served on five (5) Committees of The National Academies; one in 2007 which resulted in the report entitled "Managing Materials for a 21st Century Military." I have received awards and recognition for my work by my alma mater, The Pennsylvania State University, and the premier mining society in the United States, the Society for Mining, Metallurgy and Exploration, Inc., and was selected as its Distinguished Member in 2004. In 1997, I was elected Fellow of the American Consulting Engineers Council (ACEC) and a Fellow of the American Society of Civil Engineers (ASCE) in 1985. I have chaired six (6) national conferences and have authored over 120 technical publications, many of them peer-reviewed.

This testimony is presented against the withdrawal of the uranium-bearing lands around the Grand Canyon National Park.

The Arizona Strip is the part of the State of Arizona that lies above the Grand Canyon and the Utah border. The Strip occupies a total surface area of 20,404.2 km^2 (7,878.11 mi^2). Of this, 20,348.12 km^2 (7,856.45 mi^2) is land, and only 56.08 km^2 (21.653 mi^2) is water. Its land area comprises 6.9 percent of Arizona's land area. About 64.4 percent of its area is in Mohave County and 35.6 percent in Coconino County. The region is typical of the Colorado Plateau with an arid climate and sagebrush vegetation. The Kaibab National Forest also is being considered for withdrawal and these remarks apply equally to that area. A significant part of the area is already withdrawn from mineral entry:

National Monuments

Grand Canyon-Parashant – Covers an area of 4,115 km^2 (1,017,000 acres); about 81 km^2 (20,000 acres) within Lake Mead National Recreation Area. It was established by Presidential Proclamation 7265 on January 11, 2000. There are no paved roads into the monument and no visitor services.

Pipe Spring –Comprises an area of 0.16 km² (40 acres), and was established on May 31, 1923. The monument was listed in the National Register of Historic Places on October 15, 1966.

Vermillion Cliffs – This 1,189 km² (294,000 acre)-monument was established by proclamation on November 9, 2000.

National Park

Grand Canyon – Is one of the oldest national parks, having been established as national monument on January 11, 1908 and designated as a national park on February 26, 1919. It extends over 4,927 km² (1,902 mi²) and is considered one the natural wonders of the world, the gorge of the Colorado River.

National Recreation Areas

Glenn Canyon – Covers 5,076 km² (1,254,429 acres) of primarily desert land surrounding Lake Powell. A part of the recreation area is in Utah. It was established in 1972.

Lake Mead – The area was established as the Boulder Dam Recreation Area on October 31, 1936 but the name was changed to Lake Mead Recreation Area on August 11, 1947. It covers 6,053 km² (1,495,665.69 acres) with water over 756 km² (186,000 acres). Nearly 81 km² (20,000 acres) overlaps the Grand Canyon-Parashant National Monument. A small portion is in Nevada.

Wilderness Areas

Beaver Dam Mountains – The wilderness area, designated as such in 1984, comprises 71 km^2 (17,600 acres) of which 61 km^2 (15,000 acres) lies in Arizona and the rest in Utah.

Grand Walsh Cliffs – Occupies 323 km^2 (37,030 acres), selected as a wilderness in 1984.

Kanab Creek – Covers 305 km^2 (75,300 acres) and was established in 1984.

Mount Trumbull – Was also established in 1984 and comprises 31 km² (7,880 acres).

Mount Logan – Occupies 59 km² (14,650 acres) and was designated as a wilderness in 1984.

Paiute – Has witnessed very little incursion by humans and covers 356 km^2 (87,900 acres); chosen to be a wilderness in 1984.

Paria Canyon-Vermillion Cliffs – Established on August 28, 1984 and occupies 455 km^2 (112,500 acres); partly in Utah.

It should be noted that all of the above wilderness areas were established in 1984. This was the result of the Arizona Wilderness Act of 1984, which had been negotiated during 1983 and 1984 between various environmental groups, industry, and other stakeholders. It was agreed at that time that the areas designated in the bill as wilderness would be removed from mineral entry, but

that the remaining areas would remain open to multiple use. Senators McCain (then Congressman and party to the discussions) and Kyl have written a letter (Attachment 1) to Representative Grijalva stating this to be the case. Senators DeConcini and Hatch (who were also involved in the negotiations at the time) have written to Secretary Salazar, outlining the results of those meetings (Attachment 2). Thus it seems that the sections of the Arizona Strip not specifically withdrawn as noted above were to remain open to mineral entry. A Resolution adopted by the Board of Supervisors of Mohave County supporting the mining of uranium on the Strip is also attached (Attachment 3).

Currently over 55.6% of the total area of the State of Arizona is already withdrawn from mineral exploration and mining. The State is fortunate enough to be blessed with considerable mineral wealth. According to the U.S. Geological Survey Arizona was the No. 1 non-fuel mineral producing state in the country in 2008. However, continual withdrawal of land from mining is depriving the state of revenues that it direly needs, and the country of necessary raw materials.

In recognition of this fact the Arizona Legislature has recently passed HCM 2006 (Attachment 4) requesting Congress to refrain from enacting any legislation that affects Arizona public lands.

Economic Impact

Mohave County has an area of 34,886 km^2 (13,470 mi^2) and had an estimated population of 196,281 in 2008. The median household income in 2007 was $39,669 compared with $49,923 for the State of Arizona. In the county, 13.5% of the persons were living below the poverty line. The household income figure for Fredonia, the largest town, is $39,295; the per capita income is $17,616 and it is even lower in the rural areas. For Kanab, Utah, across the border, the comparative figures are $43,025 and $20,153 respectively. The average household income for Utah in 2007 was $55,109. Coconino County had an estimated population of 128,558 in 2008. The median household income was $48,546 in 2007, and 16.2% of the population lived below the poverty line. The county is spread over 48,332 km^2 (18,661 mi^2). The income for miners in the area varies between $60,000 and $80,000 per annum.

The occurrence of breccias pipes, which may host uranium deposits, make it possible to operate mines with a footprint of 10 to 20 acres. The mines are small and generally are in production for about two years. There may be a year of pre-production activity and then there is dismantling and reclamation. During the 1980s and early 1990s there were seven mines in operation in the area. These have now been reclaimed so well that it is difficult to locate them without prior knowledge of their existence.

According to U. S. Geological Survey estimates (USGS Circular 1051) there are probably 375 million pounds of yellowcake (uranium oxide, U_3O_8) in the area that is to be removed from mining by H.R.644. This result was based on work performed in 1987, when the presence of the breccia pipes was only detected by their visibility on the surface. Recently some mineralized pipes have been located by geophysical means that are not evident on the surface. So it is

probable that the amount of uranium present is greater. The ore from these pipes have an average grade above 0.6% which is the highest grade ore in the United States. Even if we accept the 375-million pound figure this is the equivalent of 27 billion kilowatt-hours of electricity. At the present rate of generation, this could replace all the power generated by coal plants in the United States for a decade. Another way to look at this – it is the equivalent of 13.3 billion barrels of oil. That is the total amount of recoverable oil in the Prudhoe Bay oilfield, the largest in the U.S. At a price of $50 per pound of U_3O_8, this resource is worth $18.75 billion.

Based on a recent study conducted by Tetra Tech, Inc., there will be approximately six (6) mines in operation at any one time with another six (6) being reclaimed over roughly a 20-year period. These mines will generate an average of 552 direct jobs and another 432 indirect jobs, primarily in the service sector. The average wages for miners was $65,741 in 2008. The direct construction costs will range from $2.97 billion to $3.67 billion; the indirect impact will range from $2.13 billion to $2.63 billion. Thus the total economic impacts will be from $5.06 billion to $6.29 billion during the construction period. During the mine operation period there will be 366 direct and 646 indirect jobs resulting in 1,012 new jobs in the community. The total economic will range between $23.53 billion and $29.41 billion, that is, $1.31 billion to $1.34 billion annually. Some of the jobs may be for persons residing in Kane or San Juan Counties in Utah, in which case the impact on Mohave and Coconino Counties in Arizona will be reduced somewhat. The tax implications for Federal, state, and local governments is estimated to be $360 million per year, or $7 billion for the two-decade period under consideration.

The ore that is produced from the mines is planned to be trucked to the White Mesa Mill in Blanding, Utah. The mill employs 150 persons, which implies an economic impact of $2.9 billion to San Juan County, Utah and the surrounding communities. However the shipping will benefit trucking companies in the vicinity of the mines and generate $1.01 billion for the local area.

Environmental Considerations and Safety

Since the ore is transported to Blanding, Utah there will no local impact from the tailings. The rock from the shaft and other excavations for the mine will be poured back into the openings after the ore has been removed. Without tailings, there will be no dust problems that would be a concern. The surface facilities and roads are removed, and the sites reclaimed.

It should be mentioned that the Arizona Department of Environmental Quality will investigate the mining operations before they issue any permits, as will all the other state and Federal agencies that are involved. This includes the U.S. Nuclear Regulatory Commission. The operations are fully permitted in compliance with State and Federal regulations and bonded to ensure reclamation.

Nuclear power plants produce no air pollutants such as sulfur, mercury, greenhouse gases, or particulates. Dr. El-Baradei, Director General of the International Atomic Energy Agency and

Nobel laureate, has stated (2005), "Nuclear power emits virtually no greenhouse gases. The complete nuclear power chain, from uranium mining to waste disposal, and including reactor and facility construction, emits only two to six grams of carbon per kilowatt-hour. This is about two orders of magnitude below coal, oil, and even natural gas."

A few environmental groups claim, without providing any scientific supporting data, that the groundwater of the Redwall-Muav aquifer and the Colorado River would be contaminated by uranium mining. The occurrence of the uranium deposits in the breccias pipes is a few hundred feet below the surface and generally about 1,000 feet above the aquifer, separated by the impermeable Supai formation. Hence there is little chance of the water being contaminated.

The area in question, as mentioned above is desert; the annual precipitation varies from 20 inches at the higher elevations to 12 inches in the low regions. The area where the mining will be is in the low section. There is little runoff to be concerned about, however the operators ensure that no water gets off the mine property, and all of it is contained in a lined pond.

Based on USGS data for November 1990 and June 1991, published in 1996 (USGS OFR 96-614), the Colorado River water enters and leaves the mineralized breccia zone at uranium concentration of between 4 and 5 parts per billion (ppb). This level continues to decrease as it goes down the river. The EPA safe drinking water concentration is 30 ppb – so the level is significantly lower! It is worth noting that the average concentration of uranium in the Colorado River is 4.6 ppb, lower than that of fresh water in an arid region, which is 5.0 ppb.

Water taken in a two-week period in April and May 1991 from a well in the Redwall-Muav aquifer near the Kanab North Mine, which was in operation at the time, had uranium concentrations between 0.8 and 5.9 ppb; again much lower than the safe drinking water level.

Modeling of the groundwater during its transitory passage through the Orphan Mine, which was mined prior to its inclusion in the National Park, contributes very small amounts of uranium to the Redwall-Muav aquifer and the Colorado River compared to the mineral existing in the river and the aquifer. Data accumulated by the USGS and others indicate that the springs around the mineralized breccia pipes in proximity to the rim of the Grand Canyon contribute insignificant amounts of uranium to the Colorado River because the flow rates from the springs is very low. This also applies to Horn Creek, the spring closest to the historic Orphan Mine. It is safe to conclude that springs further away from the River, beyond even the boundaries of the National Park, would have even less impact on the waters of the Colorado River and would not pose any health hazard to the people using the water.

Dr. Charles Sanchez and Dr. John T. Chesley at the University of Arizona, and Dr. Yemane Asmerom at the University of New Mexico, with funding from the Arizona Water Sustainability Program and agricultural interests, have used isotopic methodologies along with elemental analysis to study metal contamination sources in Colorado River water. The methodology utilized is relatively new, but can help discriminate between natural and anthropogenic input. It

can directly target anthropogenic sources such as mining or it can be used (as was done for uranium by the investigators) to suggest that the source of uranium observed in the Colorado River in their study is not from mining activity. Based on the preliminary results to date for a single set of samples along the Colorado River from 2007, Drs. Sanchez, Chesley and Asmerom state: "Although we did not sample on a spatial scale to rule out temporary local contamination, or on a temporal scale to rule out transitory plumes, the isotope data (uranium, strontium, and lead) in the main channel of the Colorado River are generally consistent with the normal weathering of uranium containing geomedia within the area of interest and rule against major contamination from uranium mines or tailings." As a minimum the study has established a baseline to which longer term studies of potential uranium contamination in the Colorado River can be evaluated. As well, studies such as these may allow us to separate "real" contamination issues from "perceived" contamination.

USGS Open File Report OFR-89-550 shows the location of 1,296 breccia pipes. More than 400 of these pipes occur within the boundaries of the Grand Canyon National Park; of these an estimated 30 to 50 are probably mineralized (that is, uranium bearing). Water passing through these, because of erosion, is flowing into the Colorado River, even though these have never been touched by mining. One of these pipes, approximately three miles from the Park Service Phantom Ranch lodge, shows high grade uranium mineralization at the surface. All of these have not affected the number of visitors coming to the Park.

A major concern in the mining of uranium is safety and radiation exposure. In general the impacts of mining uranium are not much different than other mining. Natural uranium ore is about as radioactive as the granite countertops that many people have in their kitchens. The risk comes from the associated radon gas and radium. Since this is now well understood, mining companies protect the workers with excellent ventilation. Epidemiological studies have established that the risk of lung cancer among smokers is between 10 and 20 times higher than with persons who have never smoked. The industry appreciates this risk and does not permit smoking.

It should also be remembered that the industry now has over half a century of experience with uranium mining and has adopted internationally recognized standards. The radiation safety regulations used in the United States, Australia, and Canada are the most comprehensive and stringent in the world, and the radiation doses are well within the regulatory limits. Uranium mines are probably the most highly regulated industrial operations in the world; both by state and Federal agencies. Frequent inspections ensure that employees and environment are duly protected. The industry has long accepted that it is much more efficient to prevent pollution than to remediate it later.

Everyone receives small amounts of radiation from natural sources such as cosmic radiation, rocks, soil, and air. Uranium mining does not increase this noticeably for the surrounding

communities and the public at large. The objective of the nuclear industry – from mines to reactors – is to control and limit the release of potentially harmful substances into the environment.

Supply and Demand

Over 92 percent of the uranium required for the nuclear plants in the United States is imported, a significant amount of that from Russia. A part of this comes from the decommissioning of nuclear warheads in accordance with the START treaties. Russia has stated that it will not supply this secondary uranium beyond 2012. This source is dwindling from all countries. The demand for the fuel will expand in the future, especially with the emphasis on control of greenhouse gases. China, for example plans to increase the power from nuclear plants from 9 gigawatts per year at the present to 75 gigawatts by 2020. Other countries, such Russia, India, and other Asian nations are also increasing the capacity for power from this source. There are 436 reactors in operation in the world; another 433 are in development or on the drawing boards. It is evident that the demand for uranium will be strong in the coming years.

At this time 64 percent of the uranium is being mined from just eight mines. This makes the supply prone to disruptions. The flooding of Cigar Lake mine in Canada, which is now expected to become operational in 2014, and the delays in the Olympic Dam project in Australia, which will be commissioned with increased production in 2016, serve as examples of the type of setbacks that may be expected. These are two of the larger mines.

Recently China has made an agreement with Australia to buy uranium from it; even though there is the danger of China diverting some of it for military purposes. In Kazakhistan, JSC Atomredmetzoloto (ARMZ) has agreed to acquire 16.6 percent of Uranium One, for a stake in its Karatau mine; this could rise up to 19.95 percent in the next five years. ARMZ will take 50 percent of the production from Karatau or 20 percent of Uranium One's total production, whichever is larger. Uranium One's partner in Karatau will be Kazatomprom, a Kazakh state-owned company. The money for the deal comes from a Japanese consortium, which has the option to purchase 20 percent of Uranium One's production. This appears to provide Uranium One with strategic partners in Russia, Japan, and Kazakhistan. However, it may be recalled that Kazakhistan's president recently arrested the president of Kazatomprom on charges of improper uranium sales. These are just a couple of examples of the control that foreign companies and countries are now exerting over uranium deposits worldwide.

This also points to the importance of obtaining the mineral domestically from a national and homeland security viewpoint.

Other Concerns

There is concern about uranium mining because of the legacy of mining left by mining of the mineral during the 1940s for the war effort. It should be borne in mind that the dangers

associated with uranium were not well understood at the time. Persons were permitted to watch atomic blasts without protective gear and seamen were ordered to scrub the decks of ships after test were conducted in the atolls. "Fiesta ware" was sold openly and watches with radium dials were worn with pride. Significantly, the formations that contained the uranium were quite different, as was the mining practice. The government was more interested in obtaining the uranium and provided incentives that encouraged lack of safety. The contracts were suddenly terminated when the need declined. Those circumstances do not apply to the contemplated mining in the Arizona Strip. Mining in the 1980s and early 1990s in the region has shown that there was no damage to the environment and the miners have not been injured or wronged in any manner.

The number of claims in the Strip has also been used to create an atmosphere of trepidation among the general public. Every claim does not imply the existence of breccia pipes in it and every pipe does not signify that there is even mineralization in it. Further, the amount of minerals has to be economically workable. Historically, only 1 to 5 percent of the breccia pipes are sufficiently mineralized to be mined profitably. Both the discovery and marketability criteria need to be met to establish the validity of a claim.

It may be mentioned that there are currently 104 reactors in operation in the United States, the largest number in any country in the world. Nuclear reactors have also been used in the Navy, in ships and submarines, for the last 60 years. There has been only one accident, Three Mile Island (TMI), in all that time; even at TMI there was no significant release or a fatality. Thus, the use of nuclear power is probably the safest and most environmentally appropriate; even Mr. Patrick Moore, the co-founder of Greenpeace has advocated its use. For that to continue, uranium is required for fuel. The Arizona Strip provides the richest source of domestic uranium. It would serve the nation best if this was permitted to be mined.

Thank you for the opportunity to present my remarks today.

United States Senate

WASHINGTON, DC 20510

June 8, 2009

The Honorable Raul Grijalva
1440 Longworth House Office Building
United States House of Representatives
Washington, DC 20515

Dear Congressman Grijalva:

We are writing regarding the Grand Canyon Watersheds Protection Act of 2009 (H.R. 644). We are concerned that your proposal to withdraw 1.1 million acres of federal land from all future mineral location, entry and development would violate the spirit of a historic agreement between the mining industry and the environmental community as embodied by the Arizona Wilderness Act, and begin to unravel decades of balanced, responsible resource development and wilderness protection near Grand Canyon National Park.

The Grand Canyon is a powerful and awe-inspiring landscape attracting millions of visitors from the United States and abroad. For this reason, we understand the concerns about mining on federal lands near the Park. Fortunately, a solution to these concerns was devised 25 years ago through the enactment of the Arizona Wilderness Act of 1984 (P.L. 98-406), and to this day uranium mining activities on the Arizona Strip have a record of productive operation and successful reclamation without impacting the Grand Canyon.

In the early 1980s, the late House Interior Committee Chairman, Morris Udall, led the Arizona congressional delegation, including the late Senator Barry Goldwater and then Congressman John McCain, in crafting legislation to designate 290,000 acres of Bureau of Land Management (BLM) lands and 834,000 acres of Forest Service lands as wilderness. Chairman Udall initiated an exhaustive collaborative process that included the mining and livestock industries, the National Parks Conservation Association, the Wilderness Society, the Sierra Club and other stakeholders that, among other things, ultimately resulted in an agreement on lands that would not be mined in order to protect the Grand Canyon.

This collaborative agreement was one of the principal reasons for the enactment of the Arizona Wilderness Act in the 98th Congress. The Act added over one million acres of land to the National Wilderness Preservation System and provided that mining and grazing in those areas not designated as wilderness be allowed to go forward in an environmentally responsible and sustainable manner. The Act also directed the release of 490,000 acres of BLM lands and 50,000 acres of Forest Service lands from wilderness study with the full understanding and intention that this action would allow uranium mining on the Arizona Strip and the Kaibab National Forest.

Unfortunately, some of our friends in the environmental community have apparently decided not to acknowledge the 1984 agreement that Chairman Udall worked so hard to assemble. They've argued that a land withdrawal, much like the proposal under H.R. 644, would only apply to new mining claims. The reality is that the mere threat of a withdrawal has had effects similar to the consequences of closing these lands to mining. For example, banks are growing reluctant to lend money for mineral exploration and development and the mining industry is hesitant to commit financial capital to projects. The kind of heavy-handed government interference your bill proposes would also likely make subsequent validation of existing mining claims problematic.

Ensuring the protection of the Grand Canyon is the duty of every Arizonan. We have spent our entire careers both in the House of Representatives and in the Senate working to preserve its natural beauty for future generations. Fortunately, Chairman Udall successfully struck the proper balance between conservation and public use of lands outside of the Grand Canyon National Park. As Chairman Udall stated on the House floor on April 2, 1984, the Arizona Wilderness Act was "an extraordinary example of what cooperation and compromise between business and conservation groups can produce, even when the subject is as emotional and controversial a subject as wilderness." We strongly urge you to consider the implications that H.R. 644 would have on this historic achievement.

Sincerely,

John McCain
United States Senator

Jon Kyl
United States Senator

United States Senate

WASHINGTON, DC 20510

June 5, 2009

The Honorable Ken Salazar
Secretary
Department of the Interior
18th and C Street, N.W.
Washington, D.C. 20240

Dear Mr. Secretary:

It has come to our attention that advocacy groups have submitted a request to your office regarding mining restrictions in the Arizona Strip. We write to strongly oppose the withdrawal of any part of the Arizona Strip and similar National Forest lands south of the Grand Canyon from mineral entry that would ultimately block further uranium mining in the area.

As you may know, in the period between 1983 and 1984 we worked together with then House Interior Committee Chairman, Mo Udall, Congressman Bob Stump, then Congressman John McCain and Senate colleagues Barry Goldwater and Jake Garn in a thoroughly collaborative process that led to the designation of 285,000 acres of Bureau of Land Management (BLM) lands and 102,000 acres of U.S. Forest Service (USFS) lands as wilderness and for the release of 490,000 acres of BLM lands and 50,000 acres of USFS lands from Wilderness Study Areas. These efforts were carried out with the understanding and intention that this action would allow uranium mining on the BLM and National Forest lands where, according to the U.S. Geological Survey (USGS), more than 40 percent of the nation's best uranium potential exists.

This carefully crafted compromise provided new Wilderness designations to ensure that the Grand Canyon watershed was fully protected and allowed mining and grazing to continue in the remaining areas of the region. The agreement led to the passing of the Arizona Wilderness Act by large majorities in both the House and Senate. It is important to note that research conducted by USGS and preliminary findings by the University of Arizona confirm that uranium exploration and mining pose no threat to the Grand Canyon watershed or to the Park.

We believe strongly that the recent calls for a withdrawal of the area and last year's questionable House Natural Resources Committee "Emergency" Resolution violate the spirit of that 1983/84 agreement. Moreover, with depressed market conditions during much of the intervening time between 1984 and today, only five uranium mines have been drilled, mined, and reclaimed. Even with nearly 15,000 claims in the area in question, any future mining will likely follow a similar pattern with only a handful of mines operating at a time.

As you know, a very large proportion of human carbon emissions result from electric power generation. As the nation begins an effort to reduce these emissions, we believe that the continuation of our nation's 90 percent dependence foreign uranium imports would be a dangerous policy, made only more dangerous by any decision that would lock out 40 percent of our best domestic uranium resources.

The mere threat of a withdrawal has already had a negative impact on needed uranium mining activity. As long as this uncertainty remains, no banks will lend money, and prudent company Boards of Directors will not commit financial capital to mining projects on the Arizona Strip and similar lands south of the Grand Canyon. Moreover, the BLM's director of mining has indicated that BLM is unlikely to grant mining companies access to perfect their valid claims under the current scenario.

To break this impasse, we recommend you take the following steps:

- Request a National Academy of Sciences/National Research Council review under Section 204(c) of the Federal Land Management Policy Act to determine whether an objective basis exists to withdraw the lands. Section 204(c) calls for a public process and documentation of the basis, duration and impacts on the environment, local communities and the national minerals policies. Such a process would help ensure decisions are well-informed and public.

- Announce that exploration and mining can continue as envisioned in the 1984 Wilderness Bill agreement provided that companies follow all applicable state and federal environmental laws, including reclamation.

We hope this clarification of the background and agreements which led to the passage of the 1984 Arizona Wilderness bill will be helpful to you. Our late Senate colleague Barry Goldwater loved the Grand Canyon and believed that our actions then provided necessary protections. Time, scientific evidence, and ground mining practices have borne that out.

Sincerely,

Dennis DeConcini
United States Senator (Retired)

Orrin G. Hatch
United States Senator

RESOLUTION NO. 2009-040

A RESOLUTION URGING CONGRESS TO PRESERVE ACCESS TO THE URANIUM RESERVES OF NORTHERN ARIZONA, IN ORDER TO MEET AMERICA'S DEMAND FOR CLEAN NON-CARBON EMITTING ENERGY AND ENERGY INDEPENDENCE

WHEREAS, there is a need to utilize northern Arizona's rich uranium reserves to meet America's pressing demand for clean, domestic non-carbon emitting energy; and

WHEREAS, NACo urges Congress to allow ongoing uranium and other mineral development on the Arizona Strip, the far northwestern corner of Arizona north of the Colorado River and south of the Utah border, and urges Congress to reject H.R. 644 (111th Cong.) and any other attempt to withdraw the Arizona Strip from mineral location, entry and patent; and

WHEREAS, America's demand for domestic non-carbon emitting energy sources like uranium far outpaces current domestic supply, and that demand is growing. The US is 68% dependent on foreign countries for oil. For uranium, the U.S. currently imports 90% (much of it from Russia) to operate America's 120 operating nuclear power plants. As the nations of the world turn increasingly to nuclear power in an effort to reduce greenhouse gas emissions, this huge domestic resource stands to play a pivotal role in supplying domestic uranium to utilities here and reducing our foreign dependence. Uranium energy provides a non carbon-emitting reliable proven source of electricity generation, which is so vital to our nation's energy independence, economic stability and prosperity; and

WHEREAS, the Arizona Strip region, located in the Utah-Arizona border region, is estimated to contain a resource endowment of 375 million pounds of uranium oxide (US Geological Survey Circular 1051) making it the second most important in the United States. The energy potential of this quantity of uranium rivals the energy equivalence of the total recoverable oil discovered at Prudhoe Bay, Alaska, the largest oil field in North America. This quantity of uranium comprises over 40% of the nation's estimated uranium resource endowment, and Arizona Strip area uranium is by far the highest grade uranium nationally; and

WHEREAS, ten years of past uranium mining and exploration in the Arizona Strip have been fully backfilled and reclaimed, producing only a small disturbance over a relatively short mine life (5 – 7 years), which is barely detectible after reclamation; and

WHEREAS, allegations of a threat to the watershed are scientifically unsubstantiated. Uranium is naturally occurring in breccias pipe formations inside the Grand Canyon. EPA water quality studies validate that Colorado River water contains trace elements of uranium at levels far below that which is considered any sort of health threat to human beings. According to USGS data, uranium traces in the Colorado River drainage is 4.6 ppb, far below the 30 ppb Safe Drink Water Standard set by EPA. The deepest mine ever drilled on the Strip was fully 1000 feet above the nearest aquifer. No new mines will use water-laden in-situ leaching as a mining technique, because little water is available and better non-water use mining techniques are available. Companies holding valid claims inside the area are subject to the most stringent environmental and reclamation requirements ever imposed; and

WHEREAS, Congressional bi-partisan foresight in the early 1980's kept the Arizona Strip open for uranium mining, providing jobs, tax base, economic growth and stability for communities in Mohave County. Continued uranium exploration and mining activities in the Arizona Strip will continue to stimulate and revitalize the economy of this region.

NOW, THEREFORE, BE IT RESOLVED, that the Board of Supervisors of Mohave County, Arizona, urges Congress to allow ongoing uranium and other mineral development on the Arizona Strip, and urges Congress to reject H.R. 644 (111th Cong.) and any other attempt to withdraw the Arizona Strip from mineral location, entry and patent.

PASSED, APPROVED AND ADOPTED this 5th day of February, 2009

MOHAVE COUNTY BOARD OF SUPERVISORS

GARY WATSON, VICE-CHAIRMAN

ATTEST:

Linda Romero, Deputy Clerk of the Board

BOARD OF SUPERVISORS MOHAVE CO. ARIZONA DITAT DEUS

REFERENCE TITLE: state land; natural resources

State of Arizona
House of Representatives
Forty-ninth Legislature
First Regular Session
2009

HCM 2006

Introduced by
Representatives Jones, Konopnicki: Barto, Crandall, Hendrix, Kavanagh, Mason, Pratt, Quelland

A CONCURRENT MEMORIAL

URGING THE UNITED STATES CONGRESS TO REFRAIN FROM ENACTING ANY LEGISLATION AFFECTING ARIZONA'S PUBLIC LANDS.

(TEXT OF BILL BEGINS ON NEXT PAGE)

To the United States Congress, the Director of the Bureau of Land Management and the Chief of the United States Forest Service:

Your memorialist respectfully represents:

Whereas, currently, Arizona lands are significantly encumbered and controlled by a variety of federally managed public lands and other government designations, including 12.2 million acres of Bureau of Land Management surface lands and an additional 17.5 million acres of subsurface, 11.4 million acres of United States Forest Service lands, 7.9 million acres of military installations and 24.7 million acres of Indian tribal lands; and

Whereas, the United States House of Representative's Committee on Natural Resources passed a resolution to withdraw nearly 1.1 million acres of land from new mining claims and exploration; and

Whereas, the people of Arizona rely on access to public lands for a large number of economic, infrastructure and recreational purposes, including mining, oil and natural gas development, grazing, outdoor recreation and rights of way for transportation, waterlines, electric transmission and telecommunication lines; and

Whereas, the state of Arizona's economy relies on these important industries to fuel its economy and tax base; and

Whereas, energy price increases have a disproportionately negative impact on Arizona's poor individuals and families; and

Whereas, Arizona schools, as well as state and local government, are among the benefactors of access to Arizona public lands; and

Whereas, the Arizona Strip is estimated by the United States Geological Survey to contain uranium with the energy equivalent of 375 billion barrels of oil, an amount equal to the total recoverable oil from the Alaskan pipeline through Prudhoe Bay; and

Whereas, the area is currently mining flagstone, sand and gravel, is known to have vanadium and may have copper and other minerals; and

Whereas, the world's shortage of uranium continues to escalate and our country continues to import more than three-fourths of the uranium we use from foreign sources; and

Whereas, uranium production will significantly reduce the United States' energy vulnerability; and

Whereas, in the 1980s, uranium mining operations existed that have now been so well reclaimed that it is difficult to discern where these mines existed; and

Whereas, there are no known detrimental effects of mining uranium in the area to the waters of the Grand Canyon or to the health and safety of the miners or surrounding communities; and

Whereas, the effort by Congress to withdraw these lands from new mining claims and exploration will cost Arizona hundreds of millions of dollars in lost revenues that help fund local communities and schools; and

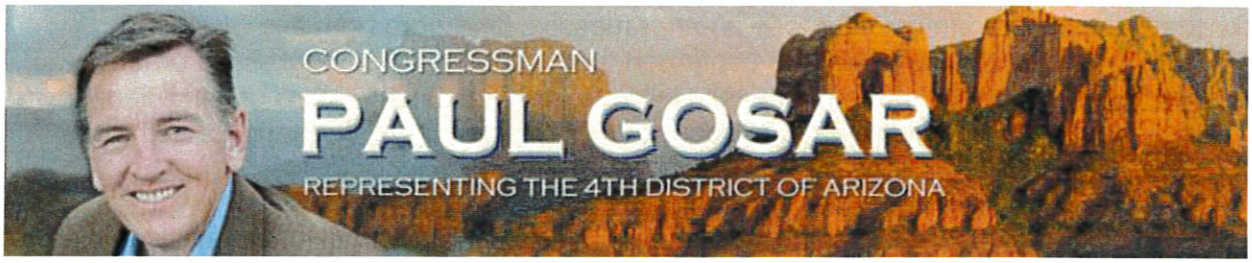
Whereas, locking away much of Arizona's valuable mineral resources from environmentally sound development not only hurts Arizona economically, but also weakens America by hamstringing the production of more energy in Arizona and the nation.

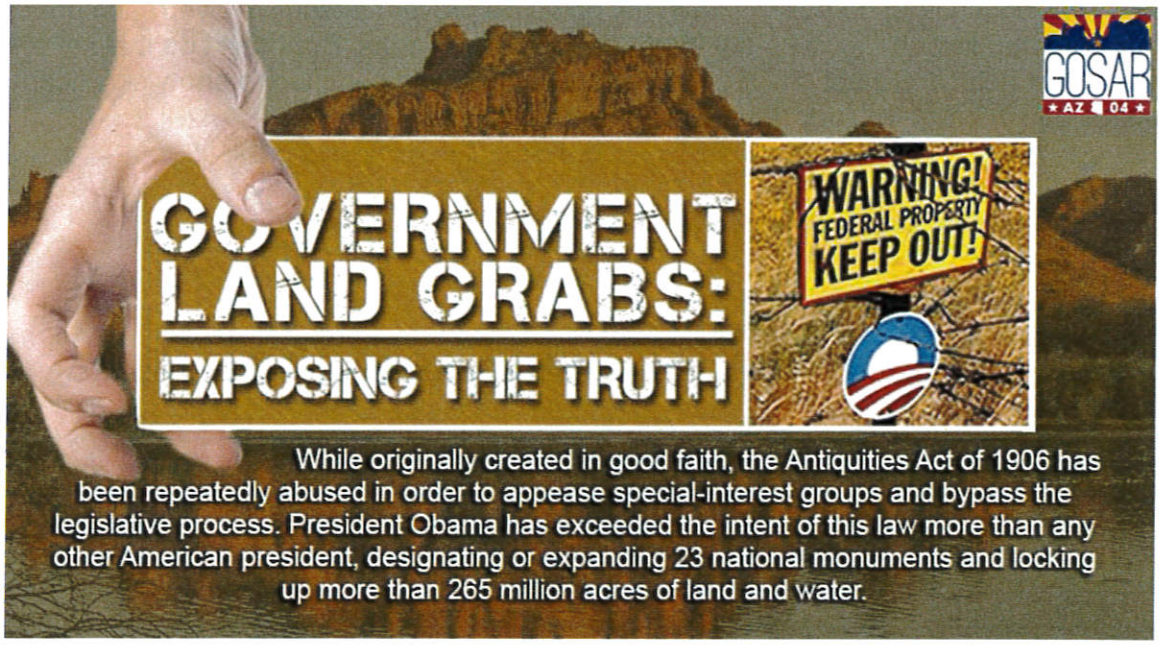
Wherefore your memorialist, the House of Representatives of the State of Arizona, the Senate concurring, prays:

1. That the United States Congress refrain from passing any new legislation to withdraw any lands in Arizona from mining, and refrain from enacting any wilderness designations in Arizona without the unanimous support of Arizona's congressional delegation.

2. That the Bureau of Land Management and the United States Forest Service not limit the public's access to public lands under their jurisdiction for mining, grazing, recreation or other uses.

3. That the Secretary of State of the State of Arizona transmit copies of this Memorial to the President of the United States Senate, the Speaker of the United States House of Representatives, the Director of the Bureau of Land Management, the Chief of the United States Forest Service and each Member of Congress from the State of Arizona.





We received great comments and feedback from countless Arizonans about my public listening session in Kingman this past Monday titled, "**Government Land Grabs: Exposing the Truth.**"

During the event, I heard from concerned citizens for more than three hours on the need to reform the Antiquities Act and the negative impacts that would result should President Obama appease special-interest groups by unilaterally locking up nearly two million acres in northern Arizona through the creation of a new national monument under presidential decree.

While originally created in good faith, the Antiquities Act of 1906 has been repeatedly abused in order to appease extremist environmentalists and bypass the legislative process. President Obama has exceeded the intent of this law **more than any other American president**, designating or expanding 23 national monuments and locking up more than 265 million acres of land and water.

National monument designations under the Antiquities Act typically have significant consequences that negatively affect grazing rights, water rights, wildfire prevention and other land management activities. These declarations also result in some of the most restrictive land-use regulations possible, greatly impacting hunting, fishing, OHV use, and other recreational activities.

At Monday's listening session, we heard resounding testimony from **sportsmen, farmers, ranchers, elected officials** and numerous other stakeholders who made clear

that Arizonans adamantly oppose another massive land grab from the Obama Administration. These witnesses confirmed that circumventing Congress in order to create this proposed monument would kill jobs, prevent mining, retire grazing permits, close roads to OHV users, reduce access for sportsmen, steal water rights and harm 4FRI.

I have introduced legislation, passed an amendment through the House, and submitted an appropriations rider in order to stop this proposal and rein in abuse of the Antiquities Act. I will continue to do everything in my power to prevent executive overreach under this outdated law and to keep our lands open to our citizens. But I can't do it alone and need your help. We must stand shoulder to shoulder and continue to show significant opposition in order to block this massive land grab.

Read more from local media coverage of the Listening Session:

Lake Havasu City's Today's News-Herald
GRAND CANYON MONUMENT: PRESERVING ARIZONA WILDERNESS OR A NAKED LAND GRAB?

Kingman Daily Miner
OBAMA'S PROPOSAL RAPPED IN MEETING HOSTED BY GOSAR

Mohave Valley Daily News
HEARING DISCUSSES PROPOSED NATIONAL MONUMENT PLAN

Witnesses who submitted testimony for the Listening Session stated:

Arizona Governor Doug Ducey submitted testimonystating, "Imposition of a preservation management objective overlay on 1.7 million acres of land in Arizona thwarts Arizona's land management objectives and values, and it does so by bypassing a public process that would most certainly result in a much more thoughtful result. The Grand Canyon Watershed National Monument is not narrow, targeted, warranted, or being considered through an open cooperative public process."

Arizona State Land Department Commissioner Lisa Atkins submitted testimony stating, "Of the 1.7 million acres included in proposals for the Grand Canyon Watershed National Monument (GCWNM), 64,000 acres belong solely to the Common Schools beneficiary: K-12 education...Inclusion of the checker-boarded State Trust land within the GCWNM essentially traps the State Trust land, significantly limiting economic opportunity and, in some cases, eliminating their value to the Trust altogether. Ultimately, if the GCWNM is created, these trapped State Trust lands would be adversely relinquished to federal management objectives without consultation or coordination with the State on behalf of the Trust beneficiaries, as currently exists within other federal land use designations. These designations impose potential limitations to not only the types of activities and businesses that can be conducted on these trapped State Trust lands, but also increases federal regulatory burdens that impose greater costs to lessees. Potential land devaluation can also result from the increased costs to prospective buyers and lessees as a result of the regulatory burdens imposed by federal regulations."

Arizona Game and Fish Commission Chairman Kurt R. Davis testified, "Arizona has had enough public land that have seen declining access; declining ability to manage wildlife and declining ability to maintain the heritage and history of those who came to Arizona to build families and lives in rural Arizona. Arizonans have witnessed massive and cataclysmic wild fires across our federal lands over the past two decades because of a lack of proactive habitat management. This unfortunately, will be the destiny of the North Kiabab if a monument is established. Simply and sadly stated, the President is being asked to use the stroke of a pen, but it will also certainly serve as the strike of the match."

Arizona Chamber of Commerce President Glenn Hamer submitted testimony stating, "Monument designations have a significant economic impact because they entail restrictions, limitations, or out-right bans on land use, including commercial development, grazing, timber production, mining, and the use of off-road vehicles. By preventing economic activity that generates needed income and tax revenue, monument designation will have far-reaching consequences for infrastructure, job creation, and economic growth in the towns surrounding the proposed monument areas as well as across the state."

Congressman Trent Franks (R-AZ) submitted testimony stating, "The ability of the Arizonans to enjoy the responsible use of their public land must be respected, as must the primacy of state agencies to manage the land under their authority. A unilateral designation of the Grand Canyon Watershed as a National Monument would erode the extensive work that federal and state land agencies have done to successfully manage this land."

Jim Parks, President of the Coconino County Farm Bureau and Cattle Growers Association (on behalf of the Arizona Farm Bureau), testified, "Within the bounds of the proposed Grand Canyon Watershed National Monument are over 64,000 acres of Arizona State Trust lands and almost 28,000 acres of private land. This alone violates federal and state laws, as it amounts to a 'taking' of these state and private lands."

Eric Duthie, Town Manager of the Town of Tusayan, testified, "Tusayan would become the only municipality entirely swallowed up in this monument...Tusayan strongly opposes the establishment of the Grand Canyon Watershed Monument, whether through Congressional decree or Executive Order. Tusayan believes such action would

constitute federal overreach in order to appease special-interest groups who do not live among, nor represent the views of the many life-long residents who cherish and manage the Grand Canyon."

Kelly Shaw-Norton, President of the Arizona Mining Association, testified, "The Antiquities Act was intended as a tool to set aside 'the smallest area compatible with the proper care and management of the objects to be protected.' It was not meant to be used for expansive amounts of land without public input and Congressional approval."

Bob Lynch, an Arizona water law expert and attorney, submitted testimony stating, "The first thing that came to mind when I looked at the map was how will the Four Forest Restoration Initiative Program, the Federal/Arizona partnership for forest thinning for fire protection and watershed management, continue in a national monument?...The designation will only complicate the ability of the United States and the State of Arizona to work together to improve this forest for watershed purposes and to protect it from catastrophic wildfire...Designation of the monument will tie up not only any future surface water use but any future groundwater use as well."

My opening statement and PowerPoint from Monday's Public Listening Session can be viewed by clicking on the links below:

Opening Statement of U.S. Congressman Paul Gosar, 4th Congressional District

PowerPoint Presentation that accompanied Congressman Gosar's Opening statement

To view the testimonies submitted by witnesses at this public listening session, click on their name below:

Doug Ducey, State of Arizona, Governor (testimony for the record)

Lisa A. Atkins, Arizona State Land Department, Commissioner (testimony for the record)

Kurt Davis, Chairman, Arizona Game and Fish Commission

Glenn Hamer, President and CEO, Arizona Chamber of Commerce and Industry (testimony for the record)

Bob Lynch, Robert S. Lynch and Associates, Arizona Attorney (testimony for the record)

Tyler Carlson, CEO, Mohave Electric Cooperative

Pamela Hill, Executive Director, American Clean Energy Resources Trust

Jim Parks, President, Coconino County Farm Bureau and Cattle Growers' Association on behalf of the Arizona Farm Bureau

Kelly Shaw-Norton, President, Arizona Mining Association

Emmett Sturgill, Chairman of the Federal Lands/Bureau of Land Management Committee for the Arizona Cattle Growers' Association

Emmett Sturgill PowerPoint Presentation

Gary Watson, Mohave County Supervisor, District 1

Jim Unmacht, President, Arizona Sportsmen for Wildlife Conservation

Harold Roberts, Executive Vice President of Conventional Operations, Energy Fuels Resources Inc.

Shari Farrington, on behalf of U.S. Congressman Trent Franks, 8th Congressional District

Eric Duthie, Town Manager, Town of Tusayan

Joe Bardswich, Professional Engineer, L. J. Bardswich Mine Consultant Inc.

Frank McNelly, Williams City Council Member

Craig Wiita, President, Wiita Mining and Exploration

Buster Johnson, Mohave County Supervisor, District 3

PowerPoint Presentation by Dwight Kadar and Mike Schroeder of Arizona Liberty

Sylvia Allen, State Senator, District 6, Arizona State Senate (opposition letter for the record)

Gail Griffin, State Senator, District 14, Arizona State Senate (opposition letter for the record)

Alvy Johnson, Mayor, Town of Fredonia (resolution in opposition for the record)

David Gowan, Speaker of the House, District 14, Arizona House of Representatives (Gave verbal testimony)

Brenda Barton, State Representative, District 6, Arizona House of Representatives (Gave verbal testimony)

Richard Anderson, Mayor, City of Kingman (Gave verbal testimony)

Mike Macauley, Chairman, Coconino NRCD, Arizona Association of Conservation Districts (Gave verbal testimony)

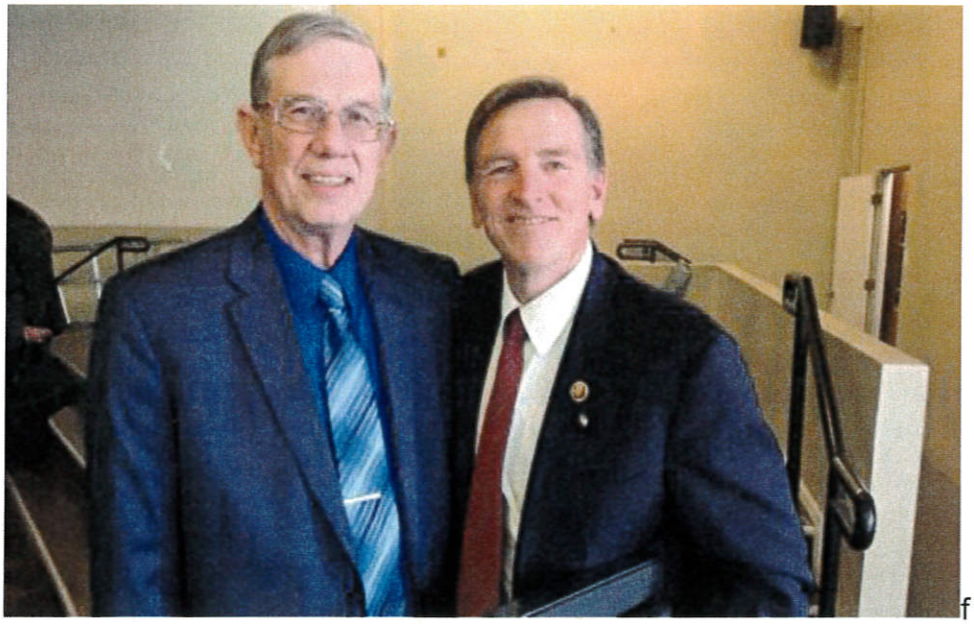
Donna Crouse, taxpayer (submitted written testimony at listening session in opposition)

Susan McAlpine, taxpayer (submitted written testimony at listening session in opposition)

***

Approximately 135 people attended the Public Listening Session in person and hundreds more watched online.

Williams City Councilman Frank McNelly, Mike Macauley on behalf of the Arizona Association of Conservation Districts, and Jim Parks on behalf of the Arizona American Farm Bureau Federation testified at the Public Listening Session.



Kingman Mayor Richard Anderson provided excellent testimony in opposition to the proposed Grand Canyon Watershed Monument.

Kelly Shaw-Norton, President of the Arizona Mining Association testified, "The Antiquities Act was intended as a tool to set aside 'the smallest area compatible with the proper care and management of the objects to be protected.' It was not meant to be used for expansive amounts of land without public input and Congressional approval."

Harold Roberts, Executive Vice President of Conventional Operations for Energy Fuels Resources Inc. gave testimony on the negative impact a national monument designation would have on energy development in Arizona.

Craig Wiita, President of Wiita Mining and Exploration, testified on the need to reform the
Antiquities Act.

Background:

In November of 2015, I introduced legislation, H.R. 3946, the Protecting Local Communities from Executive Overreach Act, which updates the 1906 Antiquities Act in order to protect property rights, water rights and jobs from presidential overreach. More information HERE. I have also passed an amendment and submitted an appropriation's rider to prevent further abuse of the Antiquities Act. In February of 2015, I led my initial effort that was supported by 24 members of Congress to oppose declaration of the Grand Canyon Watershed under the Antiquities Act.

H.R. 3946 is supported by all five Arizona House Republicans and blocks two misguided monument efforts in the Grand Canyon Watershed and the Sedona Verde Valley, both of which have significant local opposition. The bill accomplishes this task by explicitly prohibiting declarations in Coconino and Mohave and Yavapai counties by executive fiat.

The proposed Grand Canyon Watershed would be significantly larger than the Grand Canyon. It's a watershed though so there will be no new monies from Congress and no significant tourism dollars associated with this land grab. A unilateral declaration of the nearly two million acres in the Grand Canyon Watershed as a National Monument would stifle economic development, kill jobs and erode the extensive cooperation and success that federal and state agencies in Arizona have achieved to date.

Shamefully, some proponents of the monument have been lying to the American people by stating this was an idea that was initiated by tribal governments. This proposal was put forth by the Sierra Club, the Center for Biological Diversity and the Wilderness Society.

Groups in Opposition to the Grand Canyon Watershed Monument: American Farm Bureau Federation, National Cattlemen's Beef Association; Public Lands Council; Motorcycle Industry Council (MIC); the Recreational Off-Highway Vehicle Association (ROHVA); Specialty Vehicle Institute of America (SVIA); Americans for Limited Government; Archery Trade Association; Association of Fish and Wildlife Agencies; Boone and Crockett Club; Camp Fire Club of America; Council for Citizens Against Government Waste; Eagle Forum; Congressional Sportsmen's Foundation; Council to Advance Hunting and the Shooting Sports; Dallas Safari Club; Delta Waterfowl Foundation; Heritage Action, Houston Safari Club; Masters of Foxhounds Association; Mule Deer Foundation; National Association of Forest Service Retirees; National Rifle Association; National Shooting Sports Foundation; National Wild Turkey Federation; North American Bear Foundation; Orion: The Hunter's Institute; Quality Deer Management Association; Rocky Mountain Elk Foundation; Ruffed Grouse Society; Safari Club International, Tread Lightly!; Theodore Roosevelt Conservation Partnership; Wildlife Management Institute; Wild Sheep Foundation; Whitetails Unlimited; U.S. Sportsmen's Alliance; Anglers United of Arizona; Arizona Antelope Foundation; Arizona Bass Federation Nation; Arizona Big Game Super Raffle; Arizona Cattle Feeders' Association; Arizona Cattle Growers' Association; Arizona Chapter National Wild Turkey Federation; Arizona Chapter Safari Club International; Arizona Deer Association; Arizona Desert Bighorn Sheep Society; Arizona Elk Society; Arizona Farm Bureau Federation; Arizona Flycasters Club; Arizona Game and Fish Commission; Arizona Houndsmen; Arizona Liberty; Arizona Mining Association; Arizona Outdoor Sports; Arizona Rock Products; Arizona Small Business Association; Arizona Wildlife Federation; Bullhead Area Chamber of Commerce; the Mayor and City Council of Bullhead City; Catron County; City of Williams; Cochise /Graham Cattle Growers Association; Coconino County Farm Bureau and Cattle Growers Association, Coconino Sportsmen; Concerned Citizens for America; Ellsworth Ranch; Gila County Cattle Growers Association; Grand Canyon State Electric Cooperative Association; Greenlee Cattle Growers Association; La Paz County Stockmen's Association; Livestock Market Digest Newspaper; Maricopa County Cattle Growers Association, Mohave County Board of Supervisors; Mohave Livestock Association, Mohave Sportsman's Club; Navajo/Apache Cattle Growers Association; New Mexico Cattle Growers' Association; New Mexico Wool Growers, Inc.; New Mexico Federal Lands Council; New Mexico Stockman magazine; Outdoor Experience 4 ALL; Prescott's HWY69 Group; South Eastern Arizona Sportsmen; Southern Arizona Cattlemen's Protective Association; SRT Outdoors; Shake, Rattle and Troll Radio; The Bass Federation; Town of Fredonia; Veritas Research; Whitewater Cattle Co.; Xtreme Predator Callers; Yavapai Cattle Growers Association; 1.2.3.Go…

Formal Resolutions and Letters can be viewed by clicking on the links below:
American Hunter and Conservationists Letter
Arizona Game and Fish Commission Resolution
Arizona Sportsmen for Wildlife Conservation Letter
Arizona Sportsmen for Wildlife Conservation Resolution
Arizona Wildlife Federation Letter

Arizona Elk Society Letter
Motorcycle Industry Council (MIC), Specialty Vehicle Institute of America (SVIA) and the Recreational Off-Highway Vehicle Association (ROHVA) Letter
Theodore Roosevelt Conservation Partnership 3.15.16 Letter
Theodore Roosevelt Conservation Partnership 5.14.15 Letter
City of Williams Resolution
Town of Fredonia Resolution
Senate Concurrent Memorial 1001
Arizona House Legislative Resolution
Sylvia Allen, State Senator, District 6, Arizona State Senate, Letter
Gail Griffin, State Senator, District 14, Arizona State Senate. Letter
Steve Pierce, State Senator, District 1, Arizona State Senate, Letter

In addition, the following members of Congress have joined me in opposing the National Monument designation in the Grand Canyon Watershed: U.S. Senators John McCain and Jeff Flake, U.S. Representatives Mark Amodei, Brian Babin, Ken Buck, Paul Cook, Kevin Cramer, John Culberson, John Duncan, John Fleming, Trent Franks, Louie Gohmert, Bob Goodlatte, Crescent Hardy, Tim Huelskamp, Walter Jones, Mike Kelly, Steve King, Raul Labrador, Doug LaMalfa, Doug Lamborn, Mia Love, Cynthia Lummis, Patrick McHenry, Martha McSally, Tom McClintock, Dan Newhouse, Richard Nugent, Stevan Pearce, Aumua Amata Coleman Radewagen, Steve Russell, Matt Salmon, David Schweikert, Chris Stewart, Glenn Thompson, Scott Tipton, David Valadao, Daniel Webster, Bruce Westerman, Don Young and Ryan Zinke.

The following state officials from Arizona also oppose the monument designation: Governor Doug Ducey, Attorney General Mark Brnovich, Former U.S. Senator John Kyl, Arizona State Land Commissioner Lisa Atkins, Speaker of the House David Gowan, Senate President Andy Biggs, State Senator Gail Griffin, State Senator Sylvia Allen, State Senator Steve Pierce, Apache County Supervisor Barry Weller, Pinal County Supervisors Cheryl Chase, Stephen Miller and Anthony Smith, the Yavapai County Board of Supervisors, La Paz County Supervisor King Clapperton, the five-member Arizona Game and Fish Commission and 10 former commissioners.

In addition, Resolutions opposing the monument passed in the Arizona State House and State Senate.

Other Relevant Materials:
Arizona Chamber Foundation and Prosper Foundation Policy Brief
Arizona Game and Fish Department Pamphlet
Congressional Research Report on National Monuments

As always, you can follow everything I am working on in Arizona and Washington, D.C. through my website (http://gosar.house.gov) on Twitter @RepGosar, through Facebook at Representative Paul Gosar or on Instagram at RepGosar.

Sincerely,

Paul A. Gosar, D.D.S.
Member of Congress

CONGRESSMAN
PAUL GOSAR
ARIZONA'S 4TH DISTRICT

OPEN-FILE REPORT OFR-11-04 V1.0

Arizona Geological Survey
www.azgs.az.gov

BRECCIA-PIPE URANIUM MINING IN THE GRAND CANYON REGION AND IMPLICATIONS FOR URANIUM LEVELS IN COLORADO RIVER WATER

Jon E. Spencer and Karen Wenrich (Consulting Geologist)

April 2011

ARIZONA GEOLOGICAL SURVEY

Breccia-pipe uranium mining in the Grand Canyon region and implications for uranium levels in Colorado River water

April, 2011

Arizona Geological Survey, Open-File Report OFR-11-04, version 1.0, 13 p.

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Abstract

The Grand Canyon region contains over 1300 known or suspected breccia pipes, which are vertical, pipe-shaped bodies of highly fractured rock that collapsed into voids created by dissolution of underlying rock. Some breccia pipes were mineralized with uranium oxide as well as sulfides of copper, zinc, silver, and other metals. Renewed exploration during and following a steep rise in uranium prices during 2004-2007 led some to concerns about contamination of the Colorado River related to uranium mining and ore transport. Total breccia-pipe uranium production as of Dec. 31, 2010 has been more than 10,700 metric tons (23.5 million pounds) from nine underground mines, eight of which are north of Grand Canyon near Kanab Creek. Colorado River water in the Grand Canyon region currently contains about 4 µg/l (micrograms per liter) of uranium (equivalent to 4 ppb [parts per billion by mass]), with approximately 15 cubic kilometers annual discharge. Thus, approximately 60 metric tons of dissolved uranium are naturally carried by the Colorado River through the Grand Canyon in an average year. We consider a hypothetical, worst-case accident in which a truck hauling thirty metric tons (66,000 pounds) of one-percent uranium ore is overturned by a flash flood in Kanab Creek and its entire ore load is washed into the Colorado River where it is pulverized and dissolved during a one-year period to become part of the dissolved uranium content of the river (such a scenario is extremely unlikely if not impossible). This addition of 300 kilograms (660 pounds) of uranium over one year would increase uranium in river water from 4.00 ppb to 4.02 ppb. Given that the EPA maximum contaminant level for uranium in drinking water is 30 ppb, this increase would be trivial. Furthermore, it would be undetectable against much larger natural variation in river-water uranium content.

Breccia-pipe uranium deposits

Paleozoic strata of the southwestern Colorado Plateau are spectacularly exposed in the walls of the Grand Canyon. This approximately 1 km-thick sedimentary sequence rests on Proterozoic schist, granite, and tilted sedimentary rocks visible in the bottom of the eastern Grand Canyon. The Mississippian Redwall Limestone, one of the cliff-forming Paleozoic sedimentary rock units exposed in the Canyon, is located several hundred meters (up to several thousand feet) below the Canyon rim. After the Redwall Limestone was deposited (between about 359 and 318 million years ago), it was slightly elevated above sea level, leading to dissolution of the limestone and formation of a rubble zone called a dissolution breccia (McKee and Gutschick, 1969; Beus, 1989; Troutman, 2004). Some of these breccias remained highly porous and permeable while overlying strata were deposited, and are now an excellent source of potable groundwater in some areas, and contain significant dissolved solids in others.

A breccia pipe is a vertical, pipe-like mass of broken rock (breccia), typically a few tens of meters across and hundreds of meters in vertical extent (Fig. 1). Breccia pipes formed within Paleozoic and Triassic strata over a broad area around the Grand Canyon. They were created when groundwater, flowing through Redwall Limestone dissolution breccias and along fracture zones, dissolved more limestone, causing collapse of overlying rocks and possibly creating sink holes. Some pipes extend many hundreds of meters upward into the Chinle Group (formerly Chinle Formation; Heckert and Lucas, 2003), indicating that some pipes are at least as young as this Upper Triassic rock unit (Brown and Billingsley, 2010). Some pipes are blind and never broke through to the surface. Breccia pipes are abundant in the Grand Canyon region, with approximately 1300 pipes or suspected pipes identified (Fig. 2; Sutphin and Wenrich, 1989; Brown and Billingsley, 2010).

Cover Illustration. The high plateaus above Kanab Creek are barren of most vegetation except sagebrush. Within these plateaus lie thousands of breccia pipes. Some of them contain the highest grade uranium in the U.S. and some are dissected by the canyons and tributaries of northern Arizona, exposing them to oxidation and weathering. The Kanab North breccia pipe, which contains high-grade ore and is incised along the west wall of Kanab Creek, is shown in the center of this aerial view over Kanab Creek (see insert). Note the small area of red Moenkopi Sandstone within the amphitheater eroded into the breccia pipe. Much of the ore from this dissected breccia pipe has been mined (2.7 million pounds of U_3O_8) through the shaft below the headframe in photo. This block of sandstone was downdropped 700 feet into the pipe during breccia-pipe collapse over 200 million years ago. Photos by K. Wenrich.

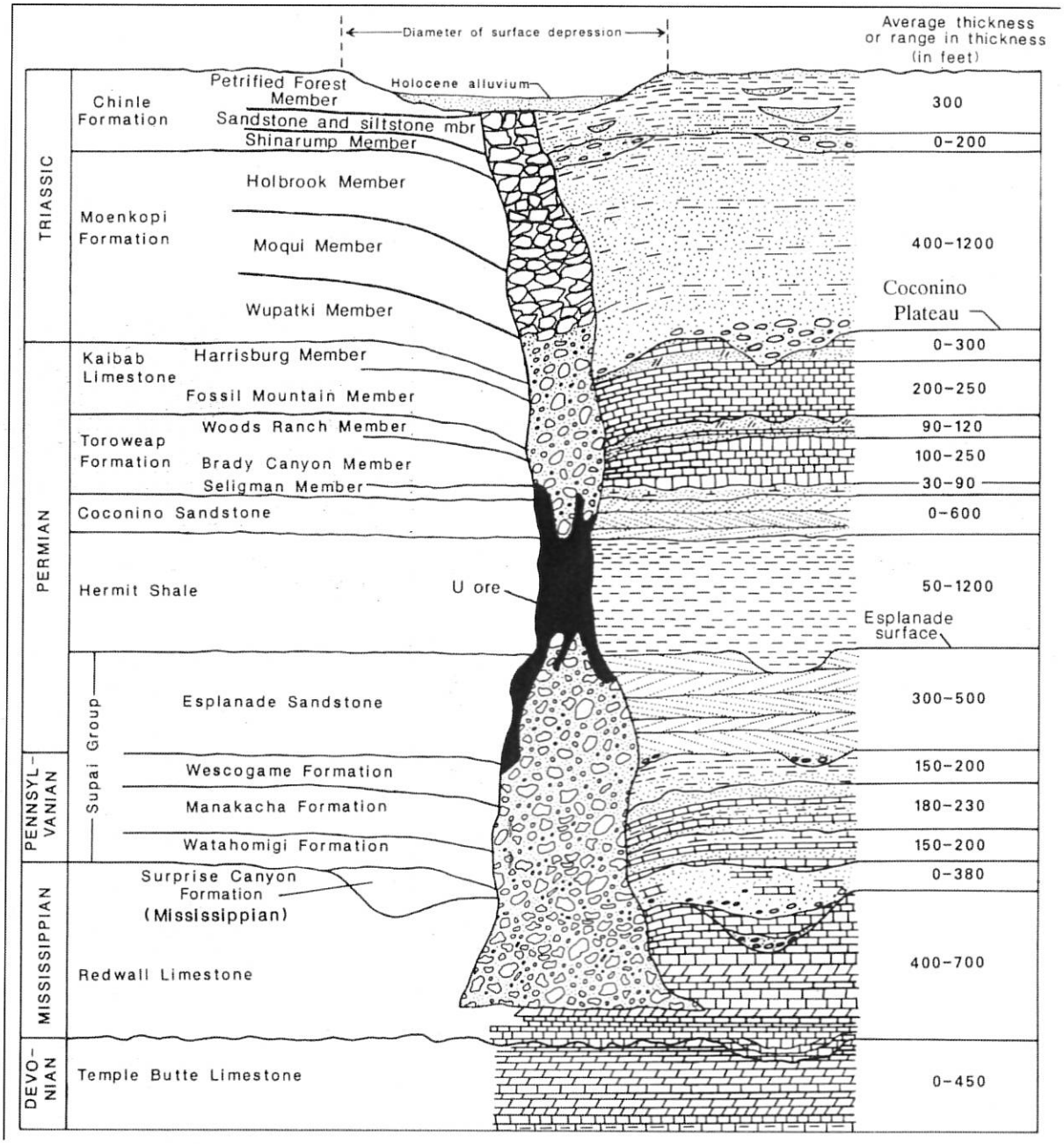
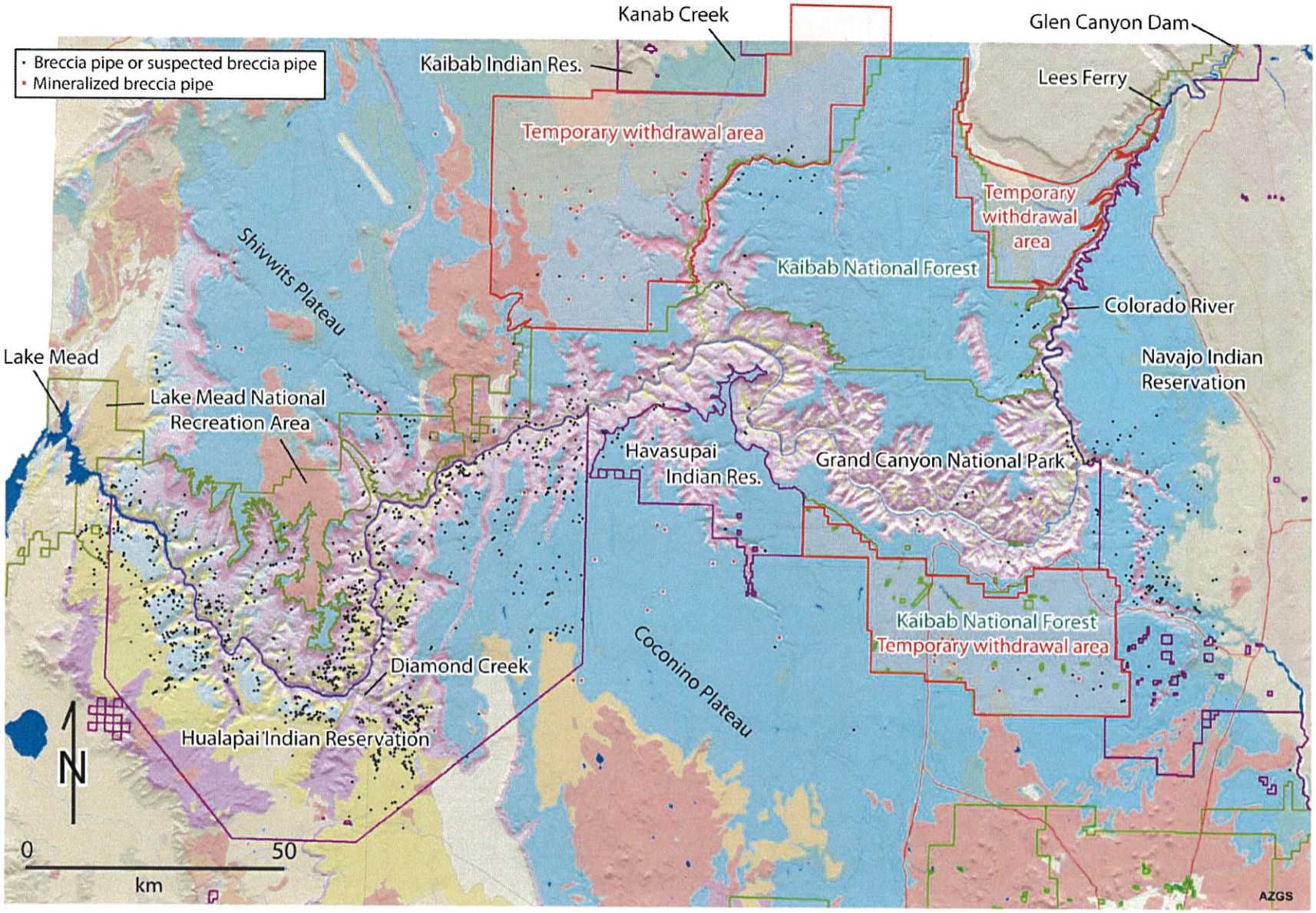


Figure 1. Simplified cross section of a breccia pipe and host uranium mineralization (modified from Finch et al., 1990).

Figure 2 (next page). Geologic map of the Grand Canyon area in northwestern Arizona showing the many areas that are off-limits to uranium mining (all labeled areas except parts of the Shivwits and Coconino Plateaus), including the three 2009 temporary withdrawal areas. Blue represents the Kaibab Limestone that forms most of the rim of the Grand Canyon and surrounding plateaus. Red represents late Cenozoic volcanic rocks. Thin red lines represent highways.


Breccia pipe or suspected breccia pipe
Mineralized breccia pipe
Kanab Creek
Glen Canyon Dam
Kaibab Indian Res.
Lees Ferry
Temporary withdrawal area
Temporary withdrawal area
Kaibab National Forest
Shivwits Plateau
Colorado River
Lake Mead
Navajo Indian Reservation
Lake Mead National Recreation Area
Havasupai Indian Res.
Grand Canyon National Park
Kaibab National Forest Temporary withdrawal area
Coconino Plateau
Diamond Creek
Hualapai Indian Reservation
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Warm to hot brines migrated through the Redwall solution breccia and up the breccia pipes at about the time, or shortly after, the pipes formed, and may have contributed to some late-stage pipe dissolution and collapse. Abundant sulfide minerals were precipitated from these brines, including pyrite (FeS), chalcopyrite ($CuFeS_2$), galena (PbS), and sphalerite (ZnS), and a great variety of other minerals, including Ni-Co sulfides. Fluid-inclusion analysis of some of the precipitated minerals indicates that mineralizing solutions were brines with salinities commonly >18 wt% NaCl equivalent and homogenization temperatures of, generally, 80° to 173°C (Wenrich and Sutphin, 1989).

Uranium, in the form of uraninite (UO_2), is abundant in some breccia pipes. Because uranium is soluble and hence mobilized by oxidizing aqueous solutions, such as most shallow groundwater, and is immobile in reducing aqueous solutions, such as those associated with sulfide mineral precipitation, it is generally believed that breccia-pipe uraninite was derived from different solutions than were the sulfide minerals. This inference is supported by the observation that uranium minerals were precipitated after most sulfide minerals. Most likely, oxidizing aqueous solutions carrying dissolved uranium flowed laterally through the Esplanade Sandstone Member of the Supai Group, entered the breccia pipes, and mixed with ascending, reducing brines (Wenrich and Titley, 2008). Mixing of solutions caused chemical reduction of the uranium and immediate precipitation of uraninite, typically in the pipe breccia adjacent to the Hermit Shale or Coconino Sandstone (Fig. 1). Alternatively, oxidizing, uranium-bearing solutions reacted with previously precipitated sulfide minerals, similarly causing prompt uraninite precipitation (oxidation/reduction front in figure 19 of Wenrich and Titley, 2008). Uranium-lead isotopic analysis of uraninite indicates uraninite precipitation at 200-260 Ma (Ludwig and Simmons, 1992).

Breccia-pipe uranium exploration and mining

As noted above, the Grand Canyon region contains at least 1300 known or suspected breccia pipes (Sutphin and Wenrich, 1989; Wenrich and Titley, 2008). Exploration for mineralized breccia pipes over the flat to gently sloping plateaus around the Grand Canyon is directed at finding a set of features, as follows: (1) a circular depression a hundred meters to 1.5km across, (2) inward-dipping beds that may indicate collapse into an underlying pipe, (3) brecciated rock, (4) sulfide minerals or altered sulfide minerals, and (5) radioactivity anomalies. In most cases, it is necessary to drill into the underlying rock to determine if a breccia pipe is mineralized, and necessary to drill hundreds of meters to determine if the breccia pipe contains uraninite ore. Electromagnetic techniques that identify electrically conductive minerals deep below the surface have been successfully used in the search for uranium ore.

By 1989, over 71 breccia pipes had been drilled and were found to contain ore-grade mineralized rock (Sutphin and Wenrich, 1989). As of 2010, nine of these breccia pipes had yielded approximately 10,653 metric tons (23.5 million pounds) of uranium. Eight of these breccia pipes produced approximately 10,522 metric tons (23.2 million pounds) of uranium between 1980 and 1994 (Wenrich and Titley, 2008). The ninth has produced an additional 132 metric tons (0.29 million lbs.) of uranium over a 13-month period between Dec. 1, 2009 until Dec. 31, 2010 (Harold Roberts, Denison Mines (USA), written communication, 2011). These small, deep uranium deposits are mined by way of conventional underground mining rather than

by open-pit methods. Generally, two shafts are used, with a second shaft to provide ventilation and an alternative escape route in case of emergency. Remediation and mine closure are done by filling the shafts with waste rock and re-grading and re-vegetating the land. This can be, and has been, done with essentially no long-term environmental consequences.

Dissolved uranium in the Colorado River

Concerns about adverse environmental consequences of uranium mining led to temporary withdrawal from mineral entry of approximately one million acres of public land in the Grand Canyon region encompassing three different sub-areas ("Temporary withdrawal area" on Figure 2). This was done in spite of the fact that there had been no environmental accidents or significant events during the 1980-1995 period of breccia-pipe mining, nor during the following 15 years of mining inactivity. This temporary withdrawal was placed into effect on July 21, 2009, by the U.S. Secretary of the Interior, Ken Salazar, for period of time "up to two years". During this time the U.S. Bureau of Land Management (BLM) was instructed to prepare an Environmental Impact Statement (EIS) evaluating the consequences of various alternatives for a 20-year withdrawal period. BLM retained SWCA Environmental Consultants (SWCA) to prepare the EIS under BLM's direction. The Arizona Geological Survey is one of the many Cooperating Agencies in the EIS development process.

One concern about adverse environmental consequences of uranium mining was expressed by then Governor of Arizona Janet Napolitano in a letter, dated March 6, 2008, to U.S. Secretary of the Interior Dirk Kempthorne (Appendix 1). That letter stated that "the dramatic rise in prices for uranium over the last three years has created a 'boom' that has the potential to seriously harm the Grand Canyon National Park and the water quality of the lower Colorado River." Concern about contamination to the Colorado River was reiterated by environmental groups such as the Sierra Club: "Mining would have … threatened to contaminate the Colorado River, the source of drinking water for tens of millions of people." (http://sierraclub.typepad.com/scrapbook/2008/10/club-allies-sto.html, accessed Dec. 10, 2010 under the heading "Club, Allies Stop Uranium Mining Next to Grand Canyon").

An evaluation of potential contamination of the Colorado River due to uranium mining requires consideration of the natural uranium concentration in river water. Two hundred and seventy uranium analyses of river water from three sites along the Colorado River between Glen Canyon Dam and Lake Mead, summarized by Bills et al. (2010, Figure 15 and Appendix 4), indicate average dissolved uranium concentration of generally between three and eight parts per billion (ppb), with significant variability (Fig. 3; Table 1). One hundred measurements during a nine-year period (1963-1972) from a site below Page, Arizona, show decreasing dissolved uranium concentrations after the first ~1.5 years, possibly because of increasingly significant effects of water impoundment by Glen Canyon dam directly upstream (Fig. 3). Dissolved uranium concentration during this initial measurement period varied from six to twelve ppb, but then dropped below approximately eight ppb. The average concentration for the entire nine year measurement period was 6.46 ppb uranium (U) (n=100), while the average concentration following the first 18 months of the measurement period was 5.57 ppb U (n=73) (Table 1). Measurements at Lees Ferry during 1996 to 1998 averaged 3.24 ppb U (n=19), while measurements near Peach Spring (1997-2007), near the head of Lake Mead, averaged 3.57 ppb U (n=78). On the basis of these data sets, we consider modern Colorado River water to have a dissolved uranium concentration of 4±1 ppb uranium.

Table 1. Uranium concentration in Colorado River water, Grand Canyon area*

site	time period of survey	n	average U (ppb)	standard deviation	source
Page	5-1963 to 5-1972	100	6.46	2.24	USEPA (1973)
Page	7-1965 to 4-1972	73	5.57	1.49	USEPA (1973)
Lees Ferry	1-1996 to 8-1998	19	3.24	0.38	USGS (2009)
Near mouth of Diamond Creek	11-1996 to 8-2007	78	3.57	0.46	USGS (2009)

*table derived from Bills et al., 2010, Appendix 4

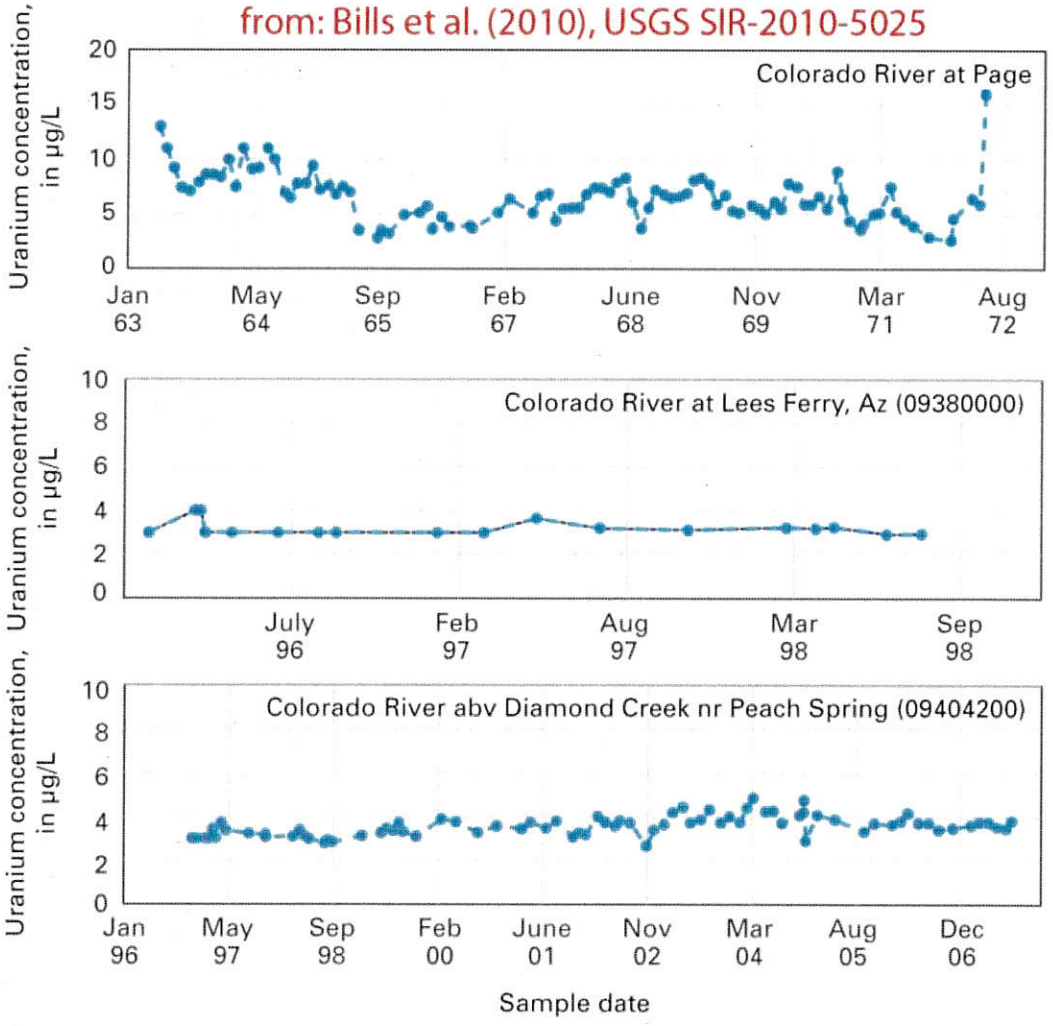

Figure 3. Dissolved uranium concentration in Colorado River water from measurements at three sites in the Grand Canyon area (modified from Bills et al., 2010, Figure 15). Sample locations are shown in Figure 2 (Page locality is just below Glen Canyon dam).

The 4±1 ppb uranium level considered to be representative of Colorado River water is below the 5.57 ppb average for a long set of measurements made during the period 1965-1972 (Table 1; Fig. 3). We consider this acceptable partly because analytical methods improved considerably by the time later measurements yielded generally lower levels, and consider it likely that earlier measurements were less accurate. This is indicated by much greater variability of earlier measurements, with a standard deviation of the older data set that is considerably higher than for later data sets (Table 1).

The 4±1 ppb uranium level estimated for the modern Colorado River probably underestimates natural Colorado River water conditions, as indicated by higher levels recorded below Glen Canyon dam immediately after initial water impoundment. We speculate that Colorado River uranium levels were naturally higher before river water was impounded and suspended sediment removed by settling to the reservoir floor. While 4±1 ppb uranium in Colorado River water may be an underestimate of pre-reservoir, natural water conditions, it is more relevant to evaluating potential contamination from future mining.

Colorado River water flux in the Grand Canyon region averages 13 to 16 cubic kilometers per year (km^3/yr), depending on the measurement site and set of years over which measurements were made (Table 2, note that 1.29E+07 = 1.27×10^7). A cubic kilometer of water, corresponding to a cube of water 1000 m along each side, contains a billion cubic meters, each of which has a mass of one metric ton (a tonne). Thus, if one cubic kilometer of water contains one ppb of uranium, it contains one tonne of uranium (one tonne = 1000 kg = 2205 lbs). As outlined above, uranium concentration of Colorado River water is estimated at 4±1 ppb. Thus, 13 to 16 km^3/yr of river water carrying 4±1 ppb dissolved uranium correspond to a uranium flux of 39 to 80 tonnes (86,000 to 176,400 lbs.) carried by the Colorado River each year. We represent this as 60±20 tonnes/year uranium.

Table 2. Colorado River water volume, Grand Canyon area

Source	ac-ft / yr	gal / ac-ft	m^3/gal	m^3/yr	km^3/yr
Smith et al., 1997, p. 49*	1.29E+07	325851	0.003785	1.59E+10	15.95
Irelan, 1971, p. E9**	1.21E+07	325851	0.003785	1.50E+10	14.96
Anning, 2002, Table 3***	1.08E+07	325851	0.003785	1.33E+10	13.26

*Discharge at Lees Ferry (1912-1962) before Lake Powell began filling in March, 1963
**Discharge at Grand Canyon 1926-1962
***Discharge at Davis Dam, 1995-1999

A worst-case uranium-ore spill

We now consider a maximum credible uranium-ore spill into the Colorado River that assumes a sequence of worst-case events. We consider this scenario as bordering on impossible, but consider it nevertheless in order to address concerns about contamination of a vast and enormously valuable water resource. Any real uranium spill is likely to be much smaller than the scenario outlined here.

Uranium ore is hauled in trucks with loads up to 30 tons (about 27.2 tonnes), usually in a 20 ton trailer with a second trailer containing 10 tons (Kris Hefton, Vane Minerals LLC, personal communication, 2010). We represent this as 30 tonnes of ore, recognizing that this is slightly larger than a likely real full load. Most breccia-pipe uranium ore varies from 0.4 to 0.8% uranium oxide, but we represent this as 1.0% uranium for analytical simplicity (again, recognizing that this is a modest overestimate). Consider a hypothetical truck hauling 30 tonnes of uranium ore at 1% uranium grade (300 kg U). If this ore truck was overturned by a flash flood while crossing Kanab Creek, and its entire load of uranium ore was washed 60 km down Kanab Creek, completely pulverized in the riverbed, and dissolved into Colorado River water over a one-year period, then 0.3 tonnes of uranium would be added to the river over this time period. Against a natural background of 60±20 tonnes/year of uranium dissolved in the Colorado River, this amounts to an approximately 0.5% increase in river-water uranium concentration, or a change from 4.00 ppb to 4.02 ppb (an increase of 0.02 ppb, or 20 parts per trillion). This change would be trivial, especially when considered in light of the EPA Maximum Contaminant Level for drinking water of 30 ppb uranium.

Standard deviation of uranium measurements at Lees Ferry and near Peach Spring is 0.38 and 0.46 ppb, respectively (Table 1). Thus, in our worst-case uranium-spill scenario, uranium concentration in the Colorado River would be increased by about one twentieth of one standard deviation of uranium measurements in these two data sets. If deviation primarily represents natural variation, which seems likely, then uranium added to the Colorado River in this hypothetical situation would be undetectable against much larger natural variation.

Our deliberately exaggerated, worst-case scenario for a uranium-ore spill into the Colorado River can be applied to even more unlikely environmental situations. Consider the entire 132 tonnes of uranium production from the Arizona 1 mine that occurred during 13 months in 2009-2010. Then consider that, for some reason, the ore containing this uranium was not trucked to a distant uranium mill, but was stockpiled on site in a location vulnerable to flash flooding. At a grade of 1% uranium, this stockpile would consist of 13,200 tonnes of uranium ore. If a flash flood washed the entire 13,200 tonnes of uranium ore into the Colorado River, and all of the ore was pulverized and its 132 tonnes of uranium dissolved in the Colorado River over one year, then the annual uranium flux in the Colorado River would increase from approximately 60 tonnes to 192 tonnes. Uranium concentration in river water would increase from 4.0 to 12.8 ppb for one year, which is still far below the 30 ppb EPA Maximum Contaminant Level. Thus, even in this implausible scenario, with approximately 20% of the entire ore body washed into the Colorado River and completely dissolved in river water, the water would still be considered safe to drink by the EPA under current regulations. In reality, any such flash-flood mobilization of uranium ore would result in mixing of ore with stream-bed sediment, in the Colorado River as well as in tributaries, and a much more gradual addition of uranium to river water.

Conclusion

Uranium, present in typical crustal rock at about 3 ppm (Spencer, 2002), is one of the many chemical elements in Earth's crust that are gradually washed away by weathering and erosion and dissolved in very small concentrations in river water and groundwater. The seemingly large amount of naturally occurring uranium in the Colorado River (tens of tonnes per year) reflects the large water flux in the river, not unusually high uranium concentration. Colorado River water is consumed by millions of people in Arizona, California, and Nevada. Uranium concentration in

river water, at about 4 ppb, has been consistently well below the EPA Maximum Contaminant Level (MCL) of 30 ppb for drinking water. Under the conditions modeled here for a uranium ore-truck accident, designed to represent an extremely unlikely, worst-case, mining-related uranium spill into the Colorado River, an increase of 0.02 ppb uranium would be trivial in comparison to the EPA drinking water MCL of 30 ppb uranium. Furthermore, such an increase of uranium in river water would be undetectable against natural variation as revealed by variability in past uranium measurements of river water.

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APPENDIX A: Letter from Arizona Governor Janet Napolitano regarding uranium mining

STATE OF ARIZONA

JANET NAPOLITANO
GOVERNOR

OFFICE OF THE GOVERNOR
1700 WEST WASHINGTON STREET, PHOENIX, AZ 85007

MAIN PHONE: 602-542-4331
FACSIMILE: 602-542-7601

March 6, 2008

The Honorable Dirk Kempthorne
Secretary of the Interior
Department of the Interior
1849 C Street, N.W.
Washington DC 20240

Dear Mr. Secretary:

I am writing to you on behalf of the citizens of the State of Arizona to express concerns regarding the impact of uranium development on the Grand Canyon National Park. As you know, the Grand Canyon is not only an Arizona treasure, it is a National one and we must fully understand environmental impacts before moving forward with uranium mining or millsite activities. Therefore, I request that you exercise your emergency withdrawal authority under the Federal Land Policy and Management Act (FLPMA), 43 U.S.C. Section 1714 to stop new claimstaking and conduct an overall environmental impact analysis of uranium development around the Grand Canyon. It is imperative that we fully understand impacts to the land and water in the Canyon region before moving forward with mining and millsite activities. Should the analysis determine a negative impact to the Canyon, you should exercise your authority to withdraw the lands from mineral entry for twenty years. The attached map shows the areas of concern.

As you may be aware, the dramatic rise in prices for uranium over the last three years has created a "boom" that has the potential to seriously harm the Grand Canyon National Park and the water quality of the lower Colorado River. According to a report by The Environmental Working Group, 2,215 new mining claims have been filed within 10 miles of Grand Canyon National Park since 2003, and that 805 of those claims are within 5 miles of the Grand Canyon National Park. As those claims are further developed, the industrial development in the vicinity of the Park and along its watersheds would have significant negative economic, cultural, and environmental repercussions for the residents of Northern Arizona and for the citizens of the State of Arizona.

On Tuesday, February 5, 2008 the Board of Supervisors for Coconino County passed a resolution opposing uranium development in the vicinity of the Grand Canyon National Park and its watershed. The resolution reflects the sentiment of citizens in the local communities around the Grand Canyon and calls for the withdrawal of mineral entry that I am now requesting.

These efforts have resulted in stories and editorials in the New York Times and other newspapers. These reflect the high level of public concern, both here in Arizona, and nationally, about the prospect of uranium mines opening on the rim of the Grand Canyon. This is not just an Arizona concern; this has national implications.

There are places where uranium might be appropriately mined, but I think that almost every American can agree that the Grand Canyon is not one of those places. As President Theodore Roosevelt, who created what is now Grand Canyon National Park, said:

> *In the Grand Canyon, Arizona has a natural wonder which, so far as I know, is in kind absolutely unparalleled throughout the rest of the world...*
>
> *Leave it as it is. You can not improve on it. The ages have been at work on it, and man can only mar it. What you can do is to keep it for your children, your children's children, and for all who come after you...*

In 1906, President Roosevelt put his words into action and removed the land from mineral entry that is now largely encompassed by the North Kaibab Ranger District of the Kaibab National Forest. Since that time, additional lands in the region, including those that fall within the boundaries of the Grand Canyon Parashant and Vermillion Cliffs National Monuments were protected from new mineral entry. The Navajo Nation has prohibited uranium development on their tribal lands bordering the Grand Canyon and other tribes are considering doing the same. Indeed, the Navajo Nation just passed Tribal Superfund legislation to specifically help address the large number of abandoned and unreclaimed uranium sites on their land.

The withdrawal from mineral entry of the three areas that I have indicated will complete the process of protecting the Grand Canyon from the adverse affects of mineral development that President Roosevelt began more than a century ago. On behalf of the citizens of the state of Arizona, I, therefore, petition and request that you remove those federal lands identified on the attached map. Should you need additional information, please contact Lori Faeth, Sr. Policy Advisor for Natural Resources, Agriculture and Environment at 602-542-1334, lfaeth@az.gov.

I thank you for your consideration of this very important issue.

Yours very truly,

Janet Napolitano
Governor

cc: Congressman Rick Renzi
Congressman Raul Grijalva
Congressman Nick Rahall
Senator John McCain
Senator John Kyl
Senator Jeff Bingaman
The Honorable Ed Schafer Secretary U.S. Department of Agriculture
Chairwoman Ono Segundo, The Kaibab Paiute Tribe
Chairman Don Watahomigie, The Havasupai Tribe
Chairman Ben Nuvamsa, The Hopi Tribe
Chairman Charles Vaughn Sr., The Hualapai Tribe
President Joe Shirley Jr., The Navajo Nation

Northern Arizona Uranium is Key to US National Security

but not for the reasons you might think...

October 2nd, 2018

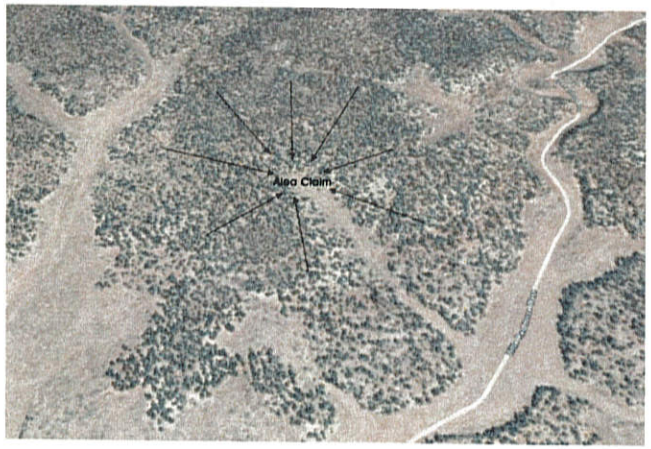
Fueling US Nuclear Power Plants

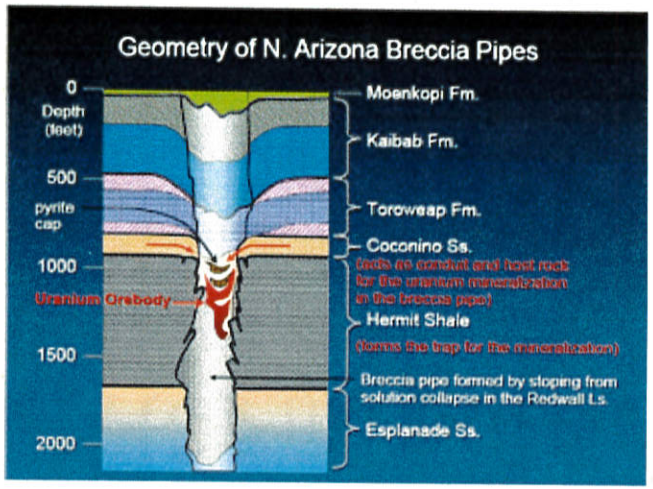
The World Turned Upside Down

- As of October 2018, there are 98 domestic nuclear reactors in operation providing 20 percent of our daily electrical requirements
- 95 percent of the Uranium used to fuel those reactors comes from foreign sources
- In 1986, the United States was almost fully self-sufficient providing domestic Uranium to meet these same needs

Source: U.S. Energy Information Administration CNBC

There is an Easy Solution

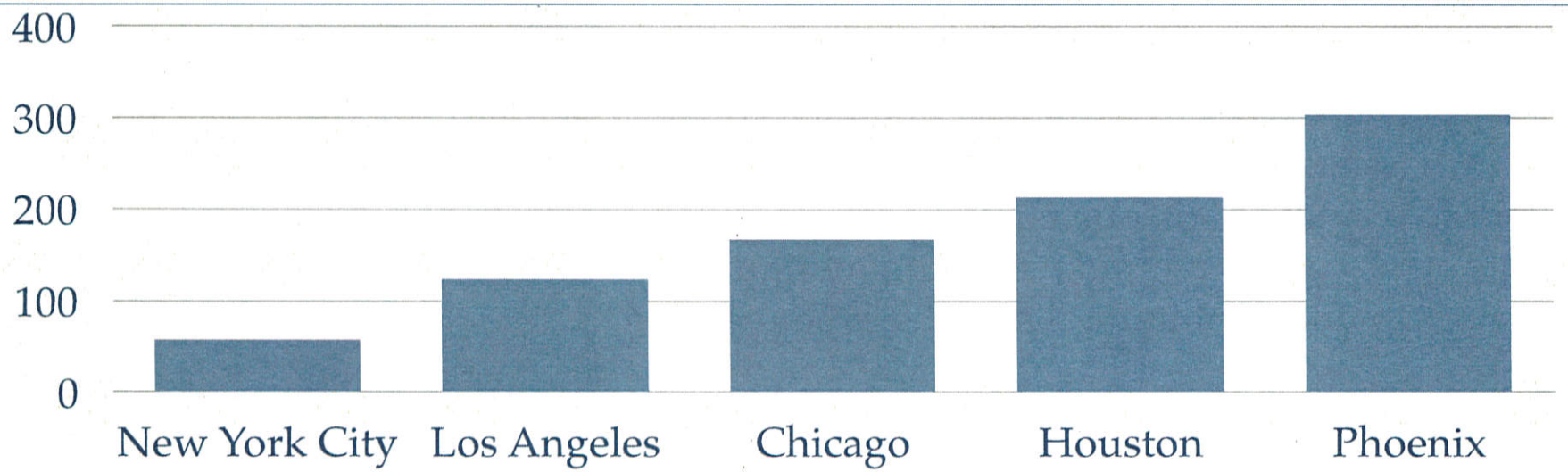




- In Northern Arizona, America's premier Uranium deposits exist in abundance in geologic formations called breccia pipes

- America's premier Uranium source is a 326 million lb. deposit of high grade Ore located in Northern Arizona and specifically set aside as part of the 1984 Arizona Wilderness Agreement

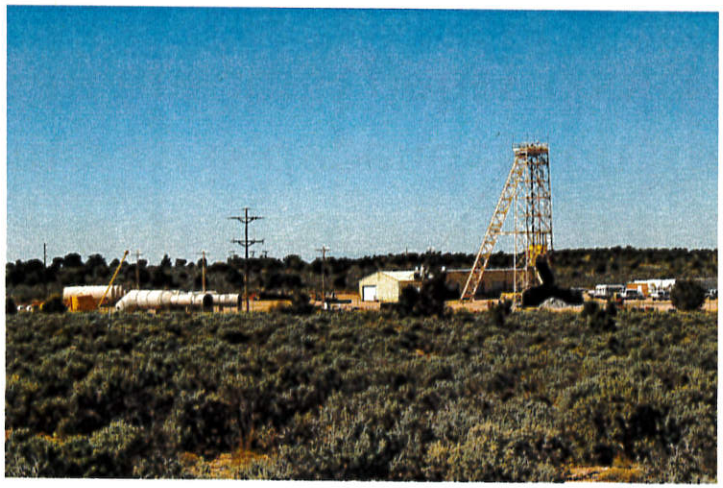
Potential Years of Electricity from No. AZ Uranium

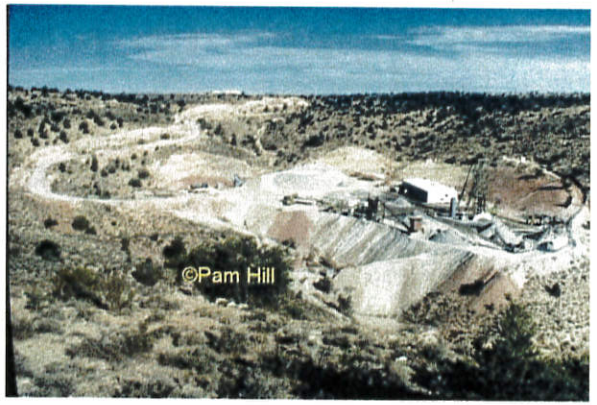


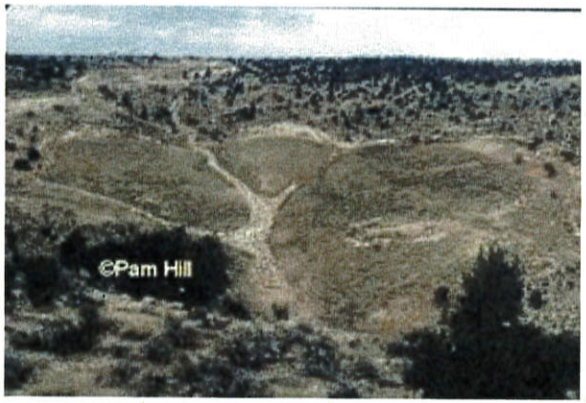
- The deposit is so large that the Nuclear Energy Institute calculated there is enough Uranium in Northern Arizona to provide 5 of America's largest cities with abundant electricity for up to 304 years in the case of Phoenix, AZ.
- Alternatively, the deposit could provide all of California's 45 million residents electricity for 22 1/2 years

Mining in N Arizona is Environmentally Sound & Strictly Regulated

- State Permits & Reclamation Plan
- Federal Permits & Reclamation Plan







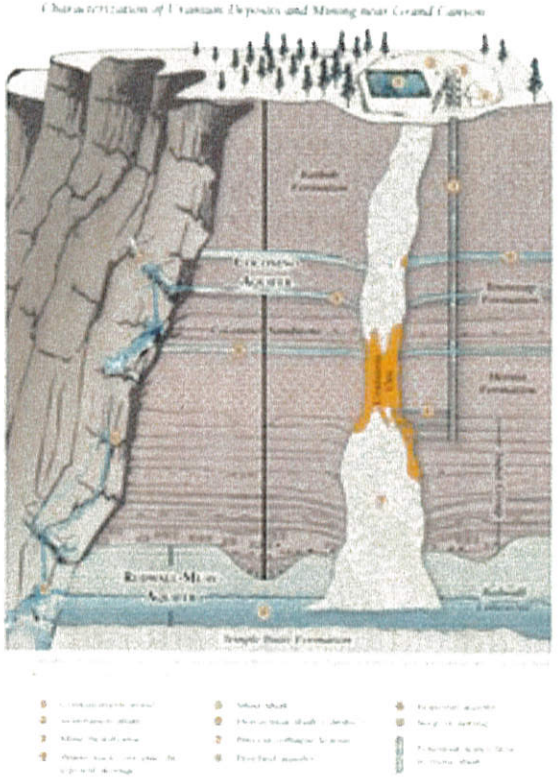
Industry Petition to Department of Commerce

(Section 232 of Trade Law/National Security Law)

- America is dependent on Russia & its satellites for future nuclear fuel as an unsound policy choice
- All of this imported uranium is available from domestic sources as a wise policy choice
- Secretary of Defense asked Interior Department to designate domestic uranium as a critical mineral because by law US military Uranium requirements (fuel & weapons) must come from domestic production sources
- Draw down of uranium from former weapons stockpiles is waning and can only be replaced by additional domestic mining

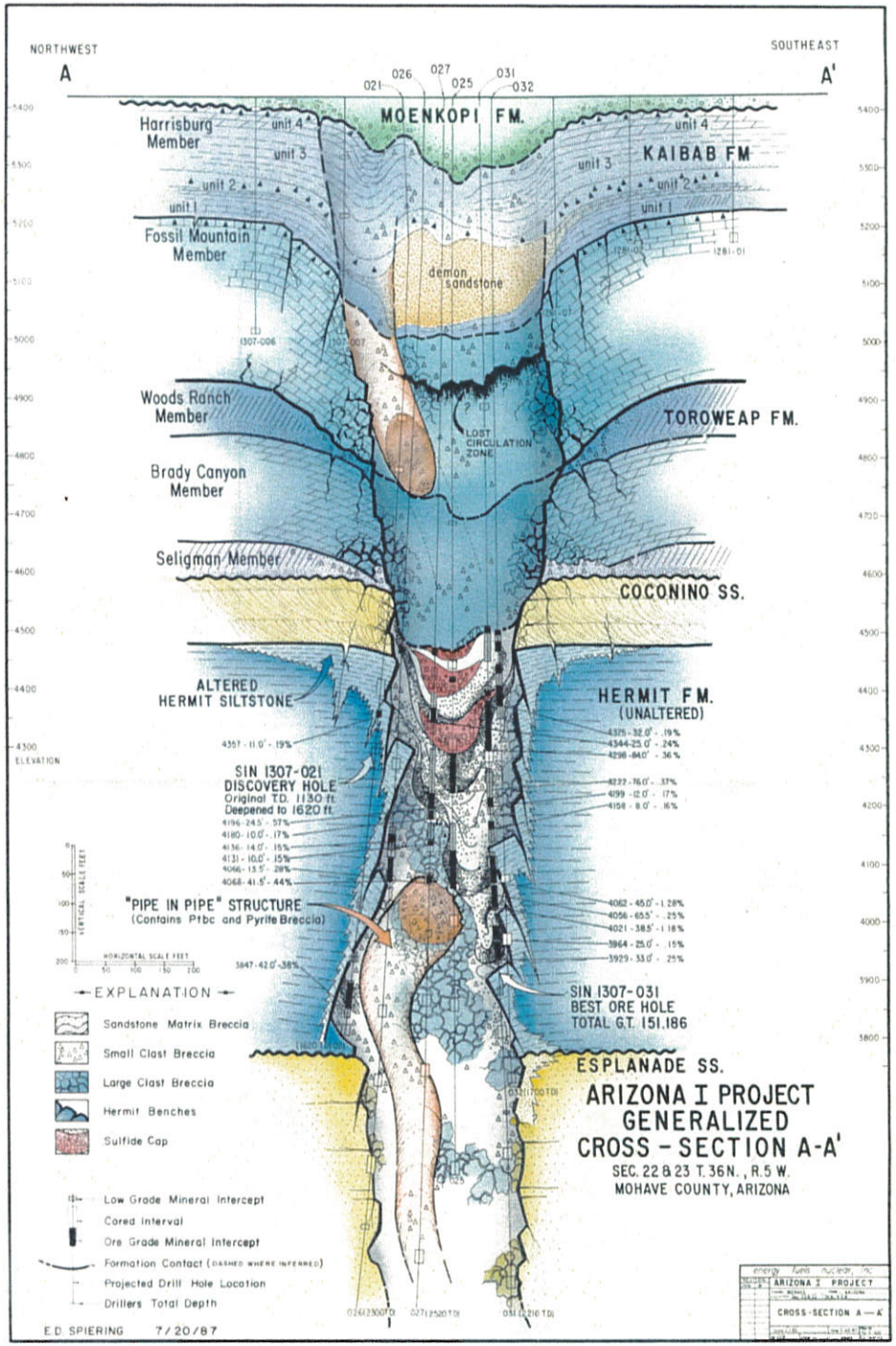
Uranium Mining History…
We've Learned From Our Mistakes in the Past

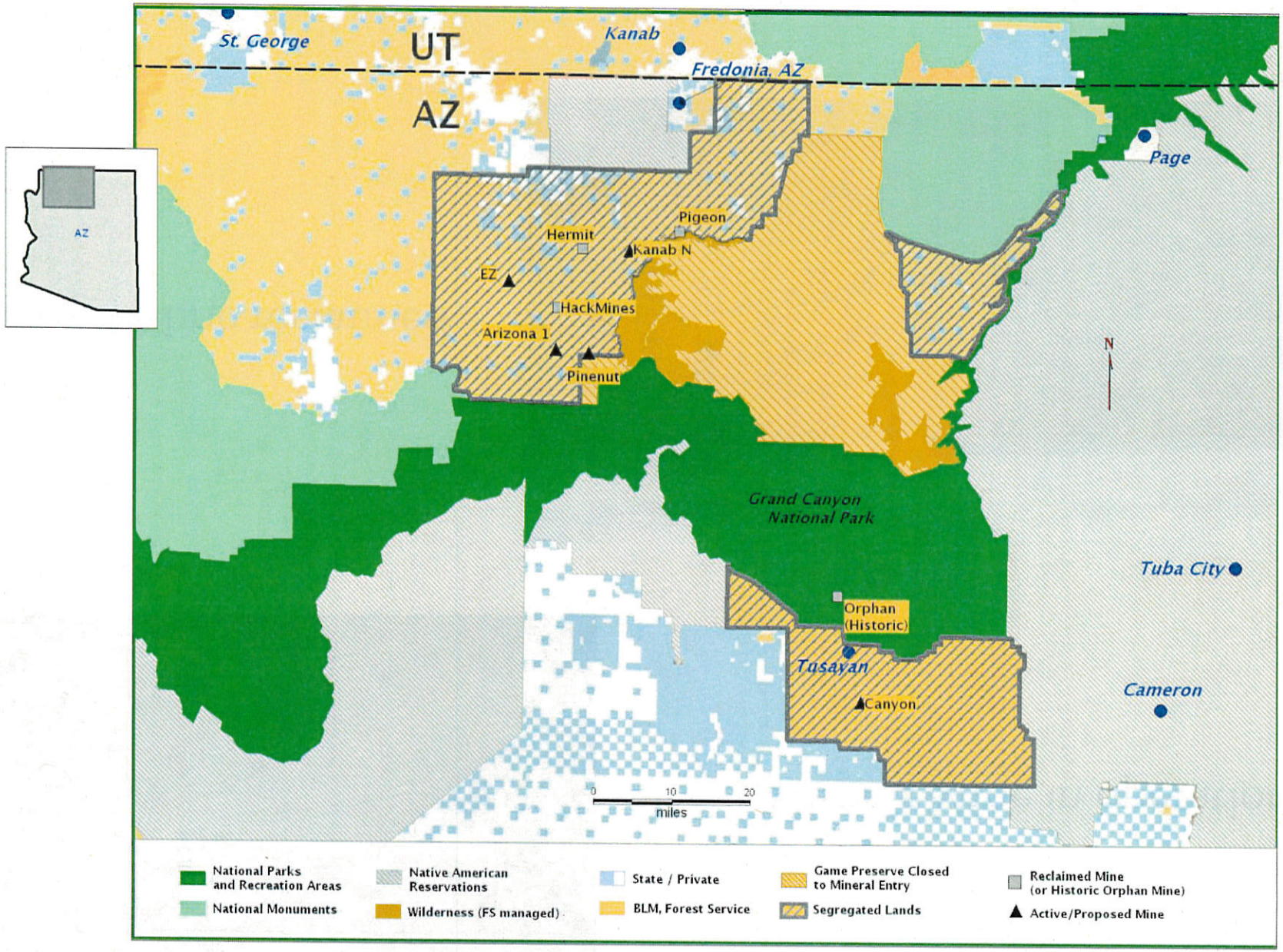
- Atomic Energy Boom
- Impact on Native Americans
- Industry Commitment to clean up abandoned sites on reservations
- New Mining techniques are safe to humans



Northern Arizona Breccia Pipe

- Deposits are vertical cylinders
- 6 to 8 times higher grade deposits than other U.S. uranium deposits
- Naturally occurring throughout the Grand Canyon region
- All enCore holdings are OUTSIDE National Park
- Total life of mine -- five to seven years on average
- Easy to reclaim with little surface disturbance





Segregated Lands in Northern Arizona

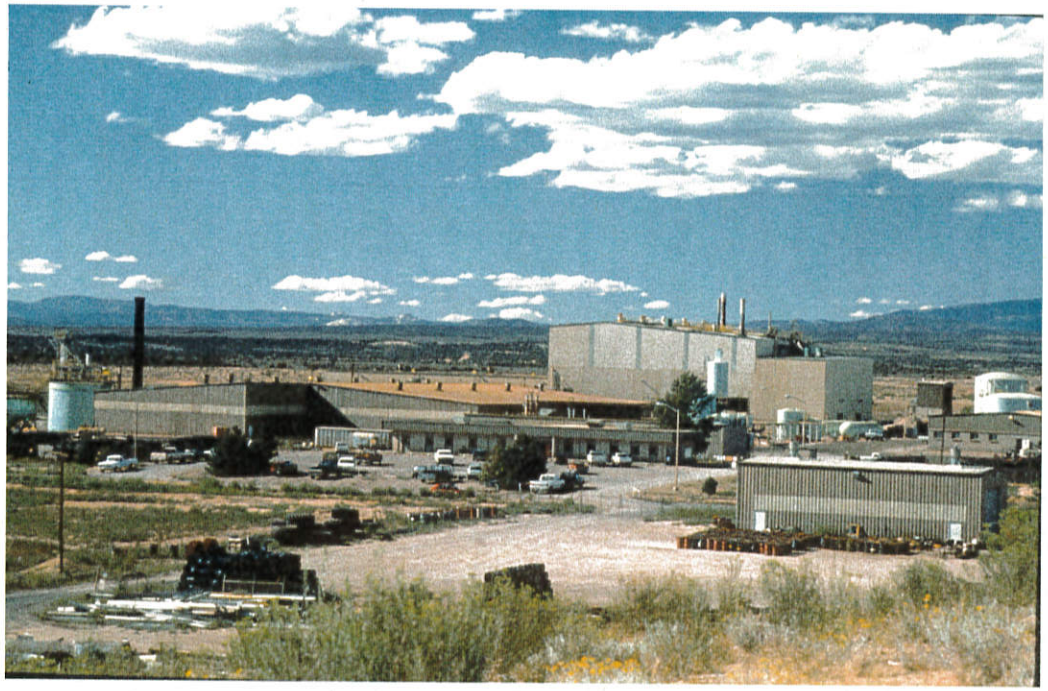
Protecting the Environment

Hermit Mine in operation

Hermit Mine reclaimed

Safe Transportation

From Mine to Utah Mill...



Faces of Mining