

URANIUM MINING

in the
Grand
Canyon
Region

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GRAND CANYON
TRUST



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Executive Summary



AMY MARTIN

The Grand Canyon region is home to some of the highest-grade uranium ore in the United States, which has made it a focal point of mining interests in the past. The Grand Canyon is also an important cultural and environmental resource where substantial scientific questions regarding the scope and severity of risks posed by uranium mining remain unanswered. East of Grand Canyon National Park, hundreds of abandoned uranium mines still litter the Navajo Nation, contaminating land and water. Across the Colorado Plateau, uranium mining and milling have left a toxic and expensive legacy.

In 2012, in response to a spike in uranium prices that triggered 10,000 new mining claims around the Grand Canyon, the secretary of the interior placed a 20-year ban on all new mining claims on about 1 million acres of federal land surrounding the national park. The ban is intended to allow time for scientists to study the risks of mining uranium in this treasured landscape. Six years in, that research remains chronically underfunded and incomplete. The uranium industry has repeatedly challenged the Grand Canyon mining ban in court and lost. In October 2018, the Supreme Court laid legal challenges to the mining ban to rest by refusing to hear an appeal by mining industry groups.

However, uranium companies and politicians claim mining uranium in the U.S. is an issue of economic and national security. In 2018, two executive orders from the Trump administration renewed interest in uranium. Now, at the request of uranium companies, the Department of Commerce is considering recommending uranium import quotas and other protective measures. If the president acts to enhance access to domestic uranium reserves and to boost uranium prices, the Grand Canyon mining ban may end up in the administration's crosshairs.

But is mining uranium in the Grand Canyon region really an issue of economic security? In northern Arizona, the data suggests otherwise. Outdoor recreation and tourism are the economic engines of the Grand Canyon region. They support over 9,000 jobs, contribute over \$938 million annually to gateway economies, and generate over \$160 million in annual state and local tax revenues. Uranium mining threatens these economic drivers while possessing little capacity to support the regional economy.

Additionally, mining uranium in the Grand Canyon region does not appear to be key to U.S. national security. The U.S. has enough already-mined uranium to meet its defense needs, supply its electrical grid, and insulate itself from disruptions in the supply chain. The U.S. is able to obtain the majority of the uranium it needs from suppliers in the U.S., Canada, and Australia, and has enough enriched uranium stockpiled to meet military needs until 2060. Forcing the purchase of domestically mined uranium would actually harm the U.S. uranium supply by shutting out uranium from allied countries. Lastly, according to the U.S. nuclear power industry, protecting domestic uranium mining through import quotas and a "buy American" requirement would, in fact, raise costs and force nuclear power plants to close.

Uranium mining around the Grand Canyon does not make economic, cultural, or ecological sense. Uranium deposits are common throughout the world and the Grand Canyon region is home to only 0.29 percent of all known U.S. reserves. Attempts to cast domestic uranium mining as critical to U.S. economic and national security are misleading and aimed at increasing demand and boosting the bottom line of uranium companies. Given the significant environmental, cultural, and economic risks, the Grand Canyon mining ban should remain in place and uranium that lies next to the Grand Canyon should be left in the ground.

BLAKE MCCORD



Introduction



MICHAEL QUINN, NATIONAL PARK SERVICE

The Grand Canyon has been inhabited by humans for thousands of years and is culturally significant to at least 11 federally recognized Native American tribes.¹ The Grand Canyon region is incredibly biodiverse; it is home to five of the seven life zones and three of the four desert types found in North America. The region hosts over 2,000 plant and animal species, some of which are threatened, endangered, and/or not found anywhere else in the world.² Each year, Grand Canyon National Park draws millions of visitors who spend hundreds of millions of dollars in gateway communities in northern Arizona.³

The Grand Canyon region is also home to some of the highest-grade uranium ore in America. Due to uncertainties surrounding the environmental impacts of uranium mining, in 2012, the secretary of the interior placed a 20-year ban on new mining claims on about 1 million acres of federal land around Grand Canyon National Park.⁴ Some want to see that ban end prematurely.

In 2018, the Interior Department officially listed uranium as a “critical mineral,”^a and, at the request of mining companies, the Commerce Department launched an investigation into whether to impose import quotas and domestic-purchasing requirements on U.S. uranium buyers.⁵ Both actions imply that mining uranium in the U.S. is vital for economic and national security. Both actions could ultimately lead to an increase in demand for domestically mined uranium. Some cite economic and national security as reasons to reopen the Grand Canyon region to mining. But is domestic uranium mining really an important economic and national security issue? Who stands to benefit if the regional ban on uranium mining is lifted? This report explores these questions and explains why the ultimate beneficiary of mining around the Grand Canyon is the uranium industry, not the American public.

^a Executive Order 13817. “A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals.” 3 C.F.R. (2017). Section 2. [whitehouse.gov](https://www.whitehouse.gov/presidential-actions/presidential-executive-order-federal-strategy-ensure-secure-reliable-supplies-critical-minerals/). December 20, 2017. <https://www.whitehouse.gov/presidential-actions/presidential-executive-order-federal-strategy-ensure-secure-reliable-supplies-critical-minerals/>. Accessed 15 October 2018. “A ‘critical mineral’ is a mineral identified by the Secretary of the Interior pursuant to subsection (b) of this section to be (i) a non-fuel mineral or mineral material essential to the economic and national security of the United States, (ii) the supply chain of which is vulnerable to disruption, and (iii) that serves an essential function in the manufacturing of a product, the absence of which would have significant consequences for our economy or our national security.”

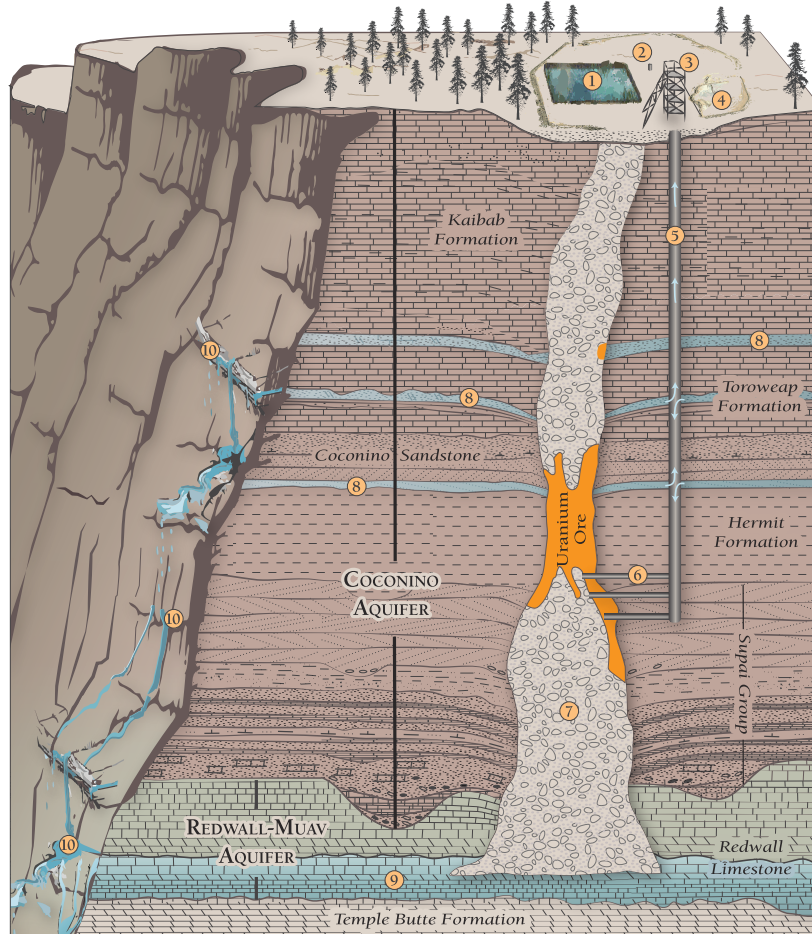
Background

URANIUM DEPOSITS AROUND THE GRAND CANYON

The Grand Canyon region holds some of the richest known reserves of uranium ore in the U.S., though these reserves are still far below ore grades found in Canada, Australia, and other countries. For comparison, the McArthur River Mine in Saskatchewan, Canada, has ore containing 9.6 percent uranium oxide,⁶ while even the higher-quality ore deposits in the Grand Canyon region contain less than 1 percent uranium oxide.⁷ The ore deposits in the Grand Canyon region that are most attractive for mining are found in geologic features called breccia pipes.

Below the rim of the Grand Canyon, many layers deep into the earth, sits a layer of Redwall Limestone between 120 and 215 meters thick. Hundreds of millions of years ago, underground caves formed in this layer as the limestone reacted with carbonic acid—essentially carbon-dioxide-laden water—and dissolved.⁸ Over time, these caves collapsed, triggering the eventual collapse of the sedimentary rock layers that sat atop them. The results are vertical, pipe-like features thousands of feet deep and typically about 300 feet in diameter. Inside of them, breccia—a rock composed of broken fragments of rock and minerals—formed from the pieces of collapsed rock. Mineralized groundwater flowed through the breccia pipes and deposited various minerals, including uranium, in concentrated forms.⁹

Characterization of Uranium Deposits and Mining near Grand Canyon



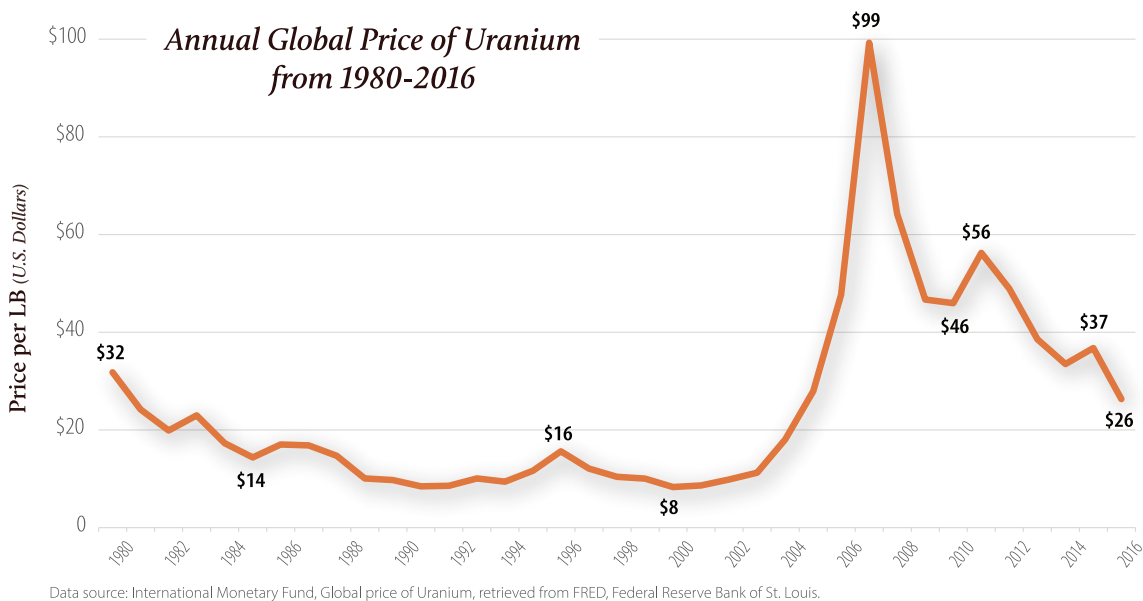
SOURCE: Generalized and modified from the USGS Site Characterization of Breccia Pipe Uranium Deposits in Northern Arizona and Uranium Mine Conceptual Model GRAPHIC BY STEPHANIE SMITH

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

Unlike some uranium deposits, breccia pipe deposits are mined using underground mechanical methods, not in open pits or with chemical solutions to dissolve the uranium in place.

Uranium Market

Uranium, like many mineral resources, is a boom-and-bust commodity. Since the federal government recognized that it possessed a surplus of uranium and stopped paying bonuses to mining companies for discoveries,¹⁰ the price of uranium has fluctuated with supply and demand within the global uranium market. Over much of the past three decades, the global uranium market has been saturated, a circumstance compounded by a drop in demand after the 2011 Fukushima nuclear disaster. Consequently, the average price of uranium has, for the most part, remained low. But there was a relatively brief period in 2007-2008 when the price of uranium spiked to an all-time high.¹¹ This caused renewed interest in uranium deposits in the Grand Canyon region. By 2009, over 10,000 mining claims had been staked on public lands adjacent to Grand Canyon National Park¹² even though the price of uranium had again started to decline.¹³



THE GRAND CANYON MINING BAN

The potential for uranium mining in the Grand Canyon region caught the attention of more than just mining companies. Native American tribes, local governments, conservationists, hunters and anglers, business owners, and other stakeholders grew concerned about the effects of a drastic increase in uranium mining in the Grand Canyon region and what it could mean for such a culturally, ecologically, and economically significant landscape. In 2012, triggered by those concerns and following a multi-year public process, then Interior Secretary Ken Salazar withdrew for 20 years about 1 million acres of federal land next to Grand Canyon National Park from the location and entry of new mining claims under the 1872 Mining Law.¹⁴

This two-decade mining ban was meant to give scientists more time to research the region's vast hydrologic and biological unknowns before allowing new mines to begin operating, potentially putting the landscape and ecosystems of the Grand Canyon at risk.¹⁵ As long as these unknowns exist, land managers and the public cannot understand and weigh all of the risks. Researchers don't know if or how uranium can be mined safely in this region while protecting land, water, wildlife, people, and one of the Seven Natural Wonders of the World.

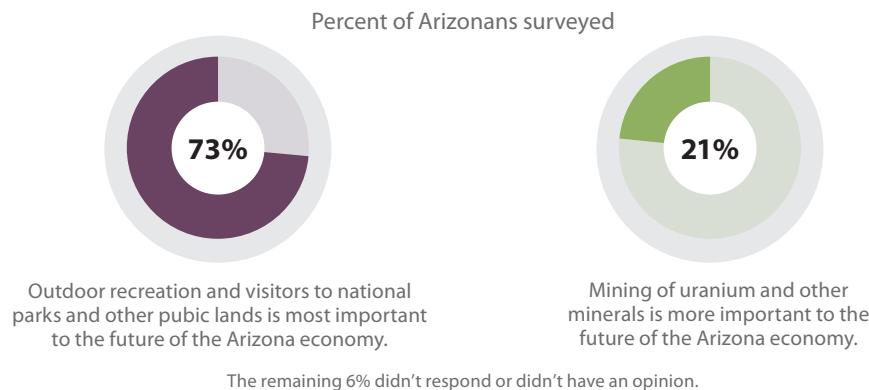
Although the ban was intended to hit pause on mining to allow time for research, to date, Congress has underfunded that research, causing it to fall behind schedule, according to the U.S. Geological Survey (USGS), the Interior Department’s scientific research arm. In fact, the USGS didn’t receive initial funding for the planned research until 2015 and in subsequent years has received just a fraction of the amount budgeted in the original research plan. The Trump administration’s 2019 budget proposal eliminates this research funding entirely.¹⁶ The delay of the planned studies jeopardizes the goals of the research: to find definitive answers to critical scientific questions by the ban’s expiration in 2032.^b

It is important to note that the mining ban doesn’t necessarily stop all mining. Miners who had established valid rights before the ban was adopted may still be allowed to mine despite the ban. To date, only Canyon Mine, located on the Kaibab National Forest near the popular south rim entrance to Grand Canyon National Park, has been allowed to operate during the ban, thanks to a green light from the U.S. Forest Service. That green light is being challenged in the courts.

Broad Support, Sharp Opposition

The public process that preceded the mining ban considered nearly 300,000 public comments¹⁷ and revealed broad support for the ban from people across northern Arizona. Native American tribes, local governments and businesses, elected officials, sportsmen, and recreationists agreed that a mining ban was in the best interest of the Grand Canyon region and the northern Arizona economy. This sentiment was recently reaffirmed by a bipartisan poll conducted in the summer of 2018.¹⁸ The poll, administered by Republican and Democratic polling firms, showed that the majority of Arizonans across the political spectrum support protecting the mining ban and view the protection of the state’s public lands and the value of outdoor recreation and tourism as more critical to the long-term health of the state’s economy than mining for uranium or other minerals.

Large majority in bipartisan poll say outdoor recreation and tourism is more important to Arizona economy than mining

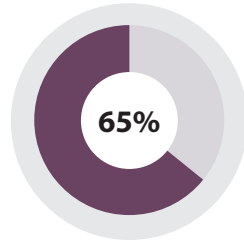


^bUnited States Geological Survey staff member. Personal Interview. March 1, 2018. Based upon a telephone conversation between Grand Canyon Trust staff and USGS research staff on March 1, 2018: While research funding was planned to begin in 2013 (see USGS 15-Year Science Plan), Congress did not approve those funds. It wasn’t until 2015 that partial funding began to be approved, but even then, it was only about \$1 million per year, about one quarter of the budgeted annual amounts for 2013-2016, according to the 15-year science plan (plan viewable at <https://az.water.usgs.gov/projects/Uranium/docs/GrandCanyonSciencePlan.pdf>). About half of the annual funding for 2013-2014 was needed for the drilling and development of key monitoring wells. Without funding to drill those wells, they were never completed. President Trump’s 2019 budget proposal completely eliminates the funding for the USGS Toxic Substances Hydrology Program under which Grand Canyon research is conducted. According to USGS staff, with no monitoring wells and improper funding, definitive answers are “not possible” before 2032.

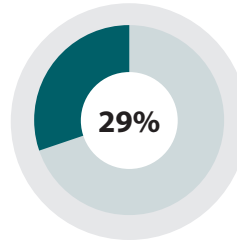
Majority support the ban to protect Grand Canyon

Bipartisan poll: continuing the existing ban on new uranium mining next to Grand Canyon National Park.

Percent of Arizonans surveyed



Continue the existing ban.



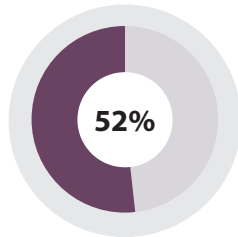
The ban will stifle job creation, decimate local economies, and endanger national security.

The remaining 6% didn't respond or didn't have an opinion.

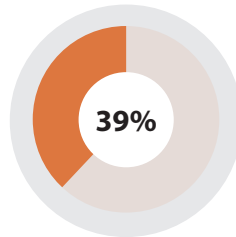
Majority say more needs to be done to protect Grand Canyon

Bipartisan poll: protecting the air, land, and water around the Grand Canyon

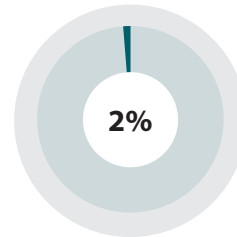
Percent of Arizonans surveyed



More needs to be done.



Enough is being done.



Too much is being done.

The remaining 7% didn't respond or didn't have an opinion.

Court Case

While the mining ban has been challenged in court, it has been repeatedly upheld. The mining industry and some elected officials continue to argue that the ban constitutes federal overreach and that uranium mining around the Grand Canyon is necessary for economic and national security. In 2014, the National Mining Association and its allies lost a legal battle in U.S. District Court for the District of Arizona when the court upheld the mining ban. They appealed to the 9th Circuit Court of Appeals and lost in December 2017. In early 2018, the mining industry asked the U.S. Supreme Court to take the case; that request was denied in October 2018, ending efforts to dissolve the ban via the courts.

Executive Orders

The pressure to lift the mining ban extends beyond the judiciary. Two executive orders from President Trump have contributed to tension around the mining ban. Executive Order 13783 mandated that federal agencies “immediately review existing regulations that potentially burden the development or use of domestically produced energy resources and appropriately suspend, revise, or rescind those that unduly burden the development of domestic energy resources.”¹⁹ In response, the Agriculture Department included the Grand Canyon mining ban on a list of recommended actions for review and revision by 2020.²⁰ On December 20, 2017, President Trump signed Executive Order 13817, directing Interior Secretary Ryan Zinke to develop a new list of critical minerals.²¹ Curiously, the USGS had released an updated list of critical minerals just the day before; that list did not include uranium.²² However, the new list, created in accordance with the executive order and finalized in May 2018, does include uranium.²³ Under the executive order, the Commerce Department is required, by late 2018, to develop a report that includes, among other objectives, “recommendations to streamline permitting and review processes related to developing leases; enhancing access to critical mineral resources; and increasing discovery, production, and domestic refining of critical minerals.”²⁴

Uranium Industry Petition for Import Quotas

Meanwhile, in January 2018, two uranium-mining companies submitted a petition to the Commerce Department under Section 232 of the Trade Expansion Act. In the petition, both companies assert that state-sponsored producers in Russia, Kazakhstan, Uzbekistan, and China are “destroying” the U.S. uranium-mining industry and have “already seized the majority of the U.S. market.”²⁵ The companies insist that, in the name of national security, the Commerce Department must ask President Trump to impose import quotas and a “buy American” requirement for uranium. They contend that the requested measures would result in a higher market price for domestically mined uranium,^c which one company executive told investors could “change our business overnight.”^d In July 2018, the Commerce Department agreed to consider the petition and plans to send any recommendations to the president no later than mid-April 2019.²⁶

If President Trump takes measures to enhance access to domestic uranium reserves and to boost uranium prices, the Grand Canyon mining ban may end up in the crosshairs. If mining uranium in the U.S. becomes an administrative priority, it is conceivable that some would look to end the Grand Canyon mining ban given that the Grand Canyon region is home to some of the country’s highest-grade known uranium reserves.²⁷ The current political conversation already involves such suggestions. For example, citing national security and lost economic opportunity,²⁸ members of the Congressional Western Caucus²⁹ and the Mohave County Board of Supervisors³⁰ have separately urged that the mining ban be eliminated.

PAST URANIUM OPERATIONS ON THE COLORADO PLATEAU

Concerns about uranium mining near the Grand Canyon haven’t materialized from thin air. Past uranium-mining activities have exacted a serious toll across the Colorado Plateau, especially on Native American lands. Since the 1950s, the plateau has been home to at least 22 uranium mills^e and to the

^c According to the Energy Fuels Resources (USA) Inc. and Ur-Energy USA Inc. Petition For Relief Under Section 232 Of The Trade Expansion Act Of 1962 From Imports Of Uranium Products That Threaten National Security: “Under the 25 percent quota, prices increase \$21 per pound in 2018 and \$32 per pound in 2022. ...which translate to a 69 and 104 percent increase in domestic prices respectively.” See page 2 of exhibit 2: http://www.energyfuels.com/wp-content/uploads/2018/01/2018.01.16-Exhibits-to-Petition_Part1.pdf.

^d Energy Fuels’ president told an audience at an investor conference that if the requests in the Section 232 Petition were granted, “that could change our business overnight.” See timestamp 8:53 at <http://noble.mediasite.com/mediasite/Play/b50773278de54313bf57df435ba81a881d>.

^e Ambrosia Lake, NM, Title I (Legacy Management (LM) Site); Bluewater, NM, Title II (LM Site); Church Rock, NM, Title I (Pending transfer to LM); Grants, NM, Title I (Pending transfer to LM); L-Bar, NM, Title II (LM Site); Lisbon Valley, UT, Title II (Pending transfer to LM); Moab, UT Title I, (Pending transfer to LM); Shootaring, UT, Title II (Pending transfer to LM); Uravan, CO, Title II (Pending transfer to LM); White Mesa, UT, Title II, (Pending transfer to LM); Monticello, UT, Title I (LM Site); Slick Rock Processing, CO, Title I (LM Site); Rifle, CO, Title I (LM Site); Naturita, CO, Title I (LM Site); Gunnison, CO, Title I (LM Site); Green River, UT, Title I (LM Site); Grand Junction, CO, Title I (LM Site); Durango Disposal/Processing, CO, Title I (LM Site); Shiprock, NM, Title I (LM Site); Mexican Hat, UT, Title I (LM Site); Monument Valley, AZ, Title I (LM Site); Tuba City, AZ, Title I (LM Site).



The Kanab North Mine located on the north rim of the Grand Canyon. Reclamation is finally underway after decades of the mine sitting on standby, but not before USGS scientists discovered that dust with radiation levels greater than 10 times background levels had blown beyond the mine's perimeter. ECOFLIGHT

majority of all uranium mining conducted in the U.S.³¹ Estimates suggest that there have been over 1,000 mines and four uranium mills on the Navajo Nation alone.³² Today, more than 500 of those mines have been abandoned by the mining companies that operated them and remain in need of cleanup.³³ To date, the Environmental Protection Agency (EPA) has entered into more than \$1.7 billion in enforcement agreements and settlements for the cleanup of fewer than half the remaining sites.³⁴ While the Navajo Nation and the EPA work to assess and clean up these sites, the abandoned mines continue to contaminate groundwater and land near homes. In 2008, several U.S. and tribal government agencies identified 29 water sources on the Navajo Nation with uranium and other radionuclide levels in excess of drinking water standards.^f A 2016 study by the Centers for Disease Control and Prevention and several state and local groups surveyed 599 participants on the Navajo Nation and found that “27 percent of the participants have high levels of uranium in their urine, compared to 5 percent of the U.S. population as a whole.”³⁵

The uranium mining industry dismisses past contamination, points to current environmental regulations as bulwarks, and claims that recent mines prove that modern uranium mines can be operated and cleaned up without contaminating land and water.³⁶ However, the dearth of evidence for these claims is the primary reason that the 2012 mining ban was put in place. In fact, more recent incidents at mines near the Grand Canyon demonstrate that there is still a lot of uncertainty about potential pathways for contamination in the region.

In 2010, the USGS noted that a 1984 flash flood washed ore from the Hack Canyon mines into Kanab Creek,³⁷ a major tributary of the Colorado River within the Grand Canyon. On the North Rim, the Pinenut uranium mine sat idle for two decades until 2009, when the mine shaft unexpectedly filled with over 2 million gallons of radioactively contaminated water.³⁸ Meanwhile, radioactive dust at the

^fUnited States Environmental Protection Agency, Bureau of Indian Affairs, Nuclear Regulatory Commission, Department of Energy, Indian Health Services, Agency for Toxic Substances and Disease Registry and Navajo Nation. “Federal Actions to Address Impacts of Uranium Contamination in the Navajo Nation: 2014-2018.” Page 6. <https://www.epa.gov/sites/production/files/2016-06/documents/nn-five-year-plan-2014.pdf>. Accessed October 15, 2018. “EPA has entered into enforcement agreements and settlements valued at over \$1.7 billion to reduce the highest risks of radiation exposure to the Navajo people from AUMs [abandoned uranium mines]. As a result, funds are available to begin the assessment and cleanup process at 219 of the 523 abandoned uranium mines.”



Despite claims that the mine shaft at Canyon Mine would not hit significant water, the mineshaft has taken on so much water that the company has repeatedly resorted to misting it into the air. Contact between water and exposed uranium ore risks the spread of uranium and other mining contaminants. BLAKE MCCORD

Kanab North uranium mine blew from the mine site into the surrounding ecosystem.³⁹ Then, in the winter of 2016-2017, after the mining company claimed it would not hit significant water, the mine shaft at Canyon Mine flooded as the mine operator was in the process of digging it.⁴⁰ At the time of this report, more than a year after a perched aquifer was pierced, water is still draining from the aquifer into the mine shaft. In addition to hauling over 1 million gallons of water to the White Mesa Mill in southeastern Utah,⁸ the company has installed water sprayers to keep the mine's onsite storage pond from overflowing. The water that is sprayed into the air, and potentially beyond the mine's fence line and into the surrounding landscape, carries elevated levels of uranium.⁴¹ Sprayers were still in use at Canyon Mine as recently as October 2018. Determining whether groundwater has been contaminated at any of these sites is impossible when, in many places, scientists don't even know the direction of groundwater flow. This determination cannot be made without multiple costly, deep monitoring wells, which are currently expected to be funded by taxpayers rather than by the mine's owner, Energy Fuels Resources, Inc.

Next, there are uranium mills. Mills convert raw uranium ore into a purified and usable form, called yellowcake. Of the 22 conventional uranium mills that once operated on the Colorado Plateau, only one—the White Mesa Mill, owned and operated by Energy Fuels Resources, Inc., in southeastern Utah—is still operational. Currently, this is the only mill in the country that could process uranium ore mined around the Grand Canyon. Groundwater flows from the mill site south toward White Mesa, a small reservation community that is home to members of the Ute Mountain Ute Tribe. There is confirmed shallow-groundwater contamination beneath the mill site, though the mill's owner, the state of Utah, and the Ute Mountain Ute Tribe disagree about whether the mill's operations are the cause.

⁹ An email obtained through a public records request from Lee Decker, an attorney at Gallagher & Kennedy to Kenneth C. Slowinski of the Arizona Department of Water Resources, dated Tuesday, May 23, 2017 at 12:51 p.m. states: "To date approximately 1.3 million gallons of impacted water has been transported to the Mill..."

The 21 other uranium mills that once operated on the Colorado Plateau are in various stages of standby, cleanup, and long-term maintenance by the federal government.^{h 42} The toxic and radioactive waste at some uranium mills is buried at the site rather than hauled elsewhere; this is the plan for future waste at the White Mesa Mill. Many conventional mills have left behind legacies of contamination.⁴³ The cleanup of these sites has been so expensive that, by the year 2000, the U.S. Department of Energy estimated it had spent nearly \$1.5 billion toward cleanup efforts since 1978—a figure that one analysis found exceeds by over 50 percent the selling price of the uranium milled at these sites.⁴⁴ Contamination cleanup and control have continued in the 18 years since that figure was released. The cleanup of the Atlas Mill near Moab, Utah, alone is expected to cost around \$1 billion by 2032.⁴⁵

The rest of this report seeks to uncover who stands to benefit and who bears the risks of additional uranium mining in the Grand Canyon region.



The White Mesa Mill, located just three miles north and up-gradient of the Ute Mountain Ute Tribe's White Mesa community. AARON PAUL



Cleanup of the Atlas Uranium Mill, on the bank of the Colorado River in Moab, Utah, is expected to cost around \$1 billion by 2032. JIM HODDENBACH, MOAB URANIUM MILL TAILINGS REMEDIAL ACTION (UMTRA) PROJECT, U.S. DEPARTMENT OF ENERGY

^h At <https://www.energy.gov/lm/sites>, click links to "LM sites" or "Pending Transfer sites" then click on names of different uranium mills. This will bring you to fact sheets about each mill for background on contamination, cleanup, and other information.

The Grand Canyon Regional Economy

As the damage of past uranium operations lingers, mining companies and other opponents of the Grand Canyon mining ban pivot the conversation to jobs, economic growth, and national security. They insist that the ban on uranium mining on 1 million acres of public land stifles job creation and economic growth in northern Arizona. They also claim that domestically mined uranium is critical to national security and the stability of the U.S. electrical grid, since nuclear power plants supply about 20 percent of U.S. electricity.⁴⁶

Are these claims accurate? Using data and public records, we look at the reality of the regional economy, explore some of the mining industry's claims about national security, and consider whether those assertions justify putting the health and future of the Grand Canyon region at risk.

IS URANIUM MINING A REALISTIC ECONOMIC DRIVER?

Jobs and Revenue from Mining

An economic analysis conducted during the public process before the Grand Canyon mining ban was finalized estimated that if the ban did not exist, the uranium-mining industry could hypothetically support 636 jobs in the region,⁴⁷ 295 of those directly.⁴⁸ Before the ban, 0.6 percent of jobs in northern Arizona came from a variety of mining types, including oil, gas, coal, nickel, zinc, copper, stone, iron, and others.⁴⁹ In the 2000s, the region's entire mining industry provided an average of 545 jobs per year.⁵⁰ Notably, that time period included the last uranium price spike in 2007, which was an all-time high for the commodity.⁵¹ In 2009, before the mining ban took effect, mining supported 345 jobs in Coconino and Mohave counties; none of them were in uranium mining.⁵²

Case Study: Canyon Mine

Today, one of the region's uranium mines—Canyon Mine, near the south rim of the Grand Canyon—is poised to begin extracting ore despite the mining ban. Though Canyon Mine has been exempted from the ban, the mine's owner, Energy Fuels Resources, Inc., has postponed mining and hauling ore to the White Mesa Mill because of low uranium prices. The company's last two quarterly reports to the Mine Safety and Health Administration declared nine and then two employees at the site.⁵³ These numbers reflect staffing during a difficult market environment. However, even if the price of uranium rose and business were booming, breccia pipe uranium mines are relatively quick operations; even the best mining jobs would be temporary. Canyon Mine's 1986 plan of operations estimated that the mine would be depleted after 10 years of operation.⁵⁴ Energy Fuels maintains that the mine would employ 60 people during whatever period of that 10 years the mine is in peak operation.⁵⁵ Based on this information, uranium mining was never a key provider of regional jobs, let alone sustainable jobs, even before the mining ban was established. Even in the best of market environments, it is unlikely that uranium mining would ever provide a large number of stable, long-term jobs for local communities.

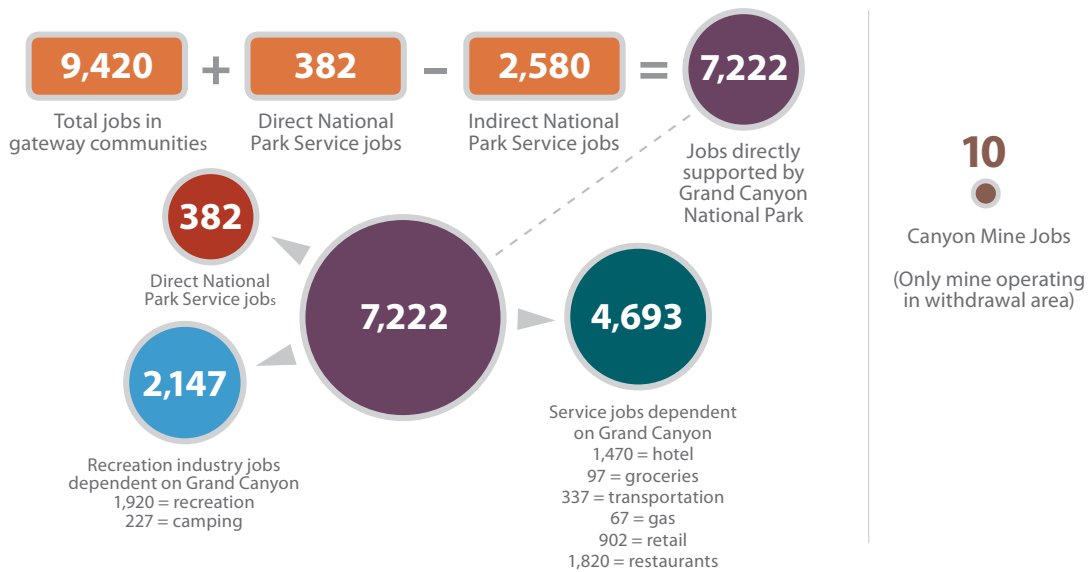
The Tourism Economy

By comparison, Grand Canyon National Park is a key driver of the regional economy. In 2017, the park employed 382 people⁵⁶ and supported an additional 9,420 jobs in gateway communities—that's 9,802 total jobs attributable to Grand Canyon National Park, 7,222 of them directly supported by the park.⁵⁷ All of these jobs depend on the health of the cultural, recreational, and ecological resources of the Grand Canyon. Yet, uranium mining—especially if it is done without completing the research the ban promised—could gravely harm the Grand Canyon, to the lasting detriment of those who live in and depend on it.

In addition to jobs, gateway economies benefit from tax revenues and increases to the gross regional product. Outdoor recreation and tourism in northern Arizona generated \$160 million in local and state tax revenue in 2016.⁵⁸ Visitors to Grand Canyon National Park contributed \$938 million to gateway economies in 2017.⁵⁹

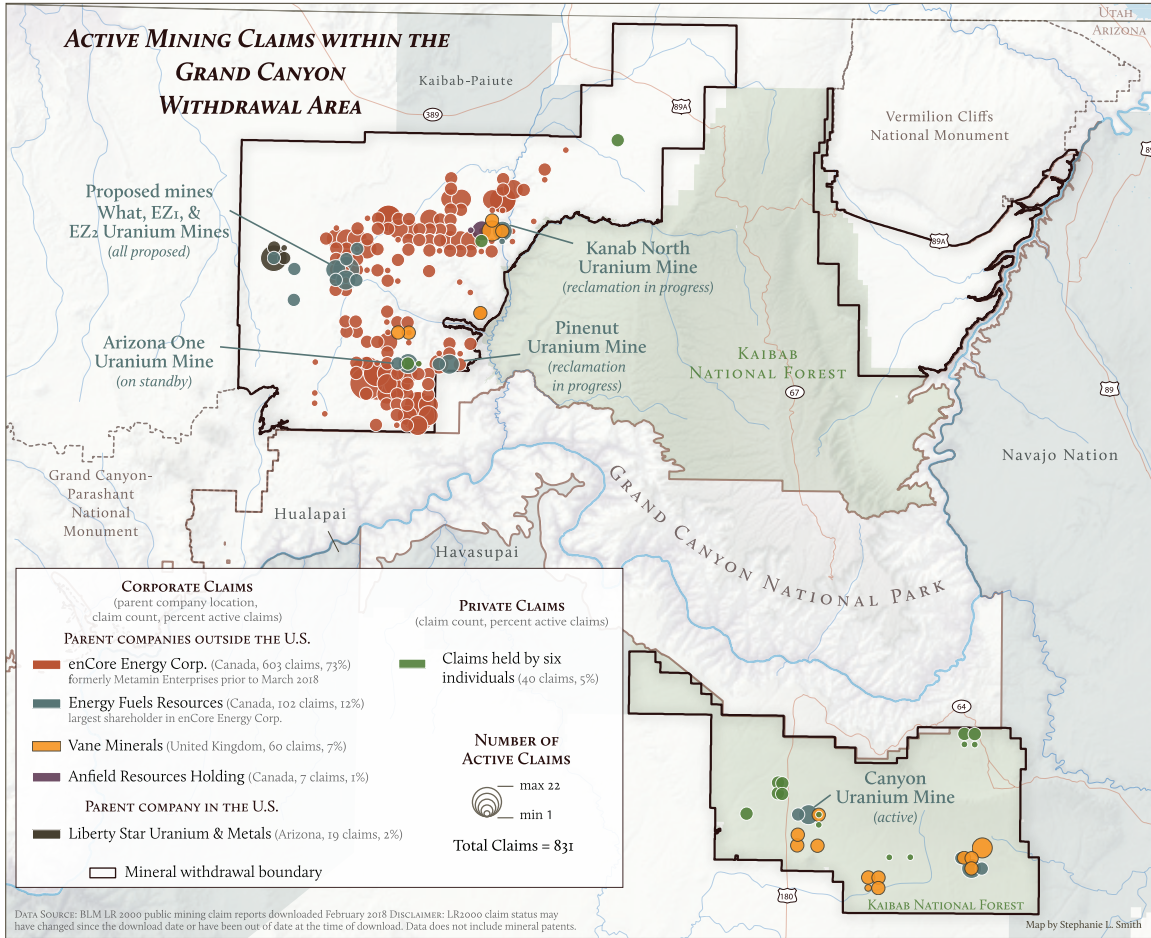
Meanwhile, uranium mining is still regulated under the 1872 Mining Law, enacted during the time of Manifest Destiny, when the federal government provided every possible incentive to encourage westward expansion. Under the law, uranium-mining companies owe no federal royalties on minerals they extract from public lands. This is in contrast to oil and gas drilling or coal mining, for which companies pay a percentage of their sales to public coffers at the local and federal levels.⁶⁰ The economic analysis conducted as part of the environmental impact statement prior to the mining ban estimated that federal, state, and local governments could see approximately \$22.9 million in added annual revenue as a result of uranium mining if the ban were not implemented—\$12.3 million of which would be state and local tax revenues.⁶¹ The same study projected that the minable uranium resources in the area of the proposed ban would be “exhausted by the end of the 20 year period,” at which point “uranium mining related jobs and economic benefits would cease.”⁶²

Jobs created by Grand Canyon National Park v. Jobs in mining (2017)



International Uranium Players

Current Bureau of Land Management data reveals that of the more than 10,000 mining claims within the mining-ban boundaries in 2009,⁶³ 831 remain in active status as of February 2018. Of those 831 remaining mining claims, 93 percent are held by just four mining companies, all subsidiaries of companies based in either Canada or the United Kingdom.⁶⁴ One of those companies, Energy Fuels Resources, Inc., co-authored the Section 232 Petition urging the Commerce Department to provide subsidies for businesses that mine uranium in the U.S. Another of these companies, enCore Energy Corp., acquired the vast majority (73 percent) of claims in the region in early 2018.⁶⁵ EnCore—a U.S. subsidiary of a Canadian company—also bought mining claims in the Bears Ears region in Utah from Energy Fuels. Part of the sale price was shares in enCore. That deal made Energy Fuels a primary shareholder of enCore, with about 20 percent of the company’s shares, more than any other individual or entity.⁶⁶ Together, Energy Fuels and enCore now control 85 percent of claims in the current Grand Canyon mining ban area.



Both companies are positioned to start mining if the ban is lifted, and both openly advertise their willingness to sell U.S. uranium globally. One paid internet advertisement for Energy Fuels reads “American Uranium, Clean Global Energy.” In a January 2015 letter to the Energy Department (DOE), enCore wrote that it had “the capacity to license, develop and produce uranium properties in the United States and market that material throughout the world.”⁶⁷ This raises doubts about whether any of their operations in the Grand Canyon region would truly be done in service to U.S. economic and national security.



“American Uranium, Clean Global Energy” Advertisement by Energy Fuels taken 9/28/2018

National Security and Grand Canyon Uranium

In the petition submitted in early 2018 under Section 232 of the Trade Expansion Act, uranium-mining companies argued that enabling more domestic uranium mining is key to U.S. national security. According to the petition, a national security threat stems from state-sponsored producers in Russia, Kazakhstan, Uzbekistan, and China “destroying” the U.S. uranium-mining industry. The petition states that these producers have “already seized the majority of the U.S. market.”⁶⁸ It also claims that “maintaining [the U.S. nuclear] deterrent requires a healthy U.S. uranium mining industry,” and that, if U.S. mining fades, the country will “lose a highly-skilled workforce.”⁶⁹ These are overstatements made by private mining companies in the pursuit of profit.

U.S. PURCHASES FROM STATE-OWNED MINES

Contrary to a misrepresentation early on in the petition that claims U.S. uranium supplies are primarily obtained from foreign state-owned mines, U.S. Energy Information Administration (EIA) data shows that the majority of uranium purchased by U.S. nuclear utilities in 2016 originated from countries other than Russia, Kazakhstan, Uzbekistan, and China.⁷⁰ The mining companies even share EIA data later in the petition that shows the earlier alarmist claim to be a misrepresentation of the facts.⁷¹

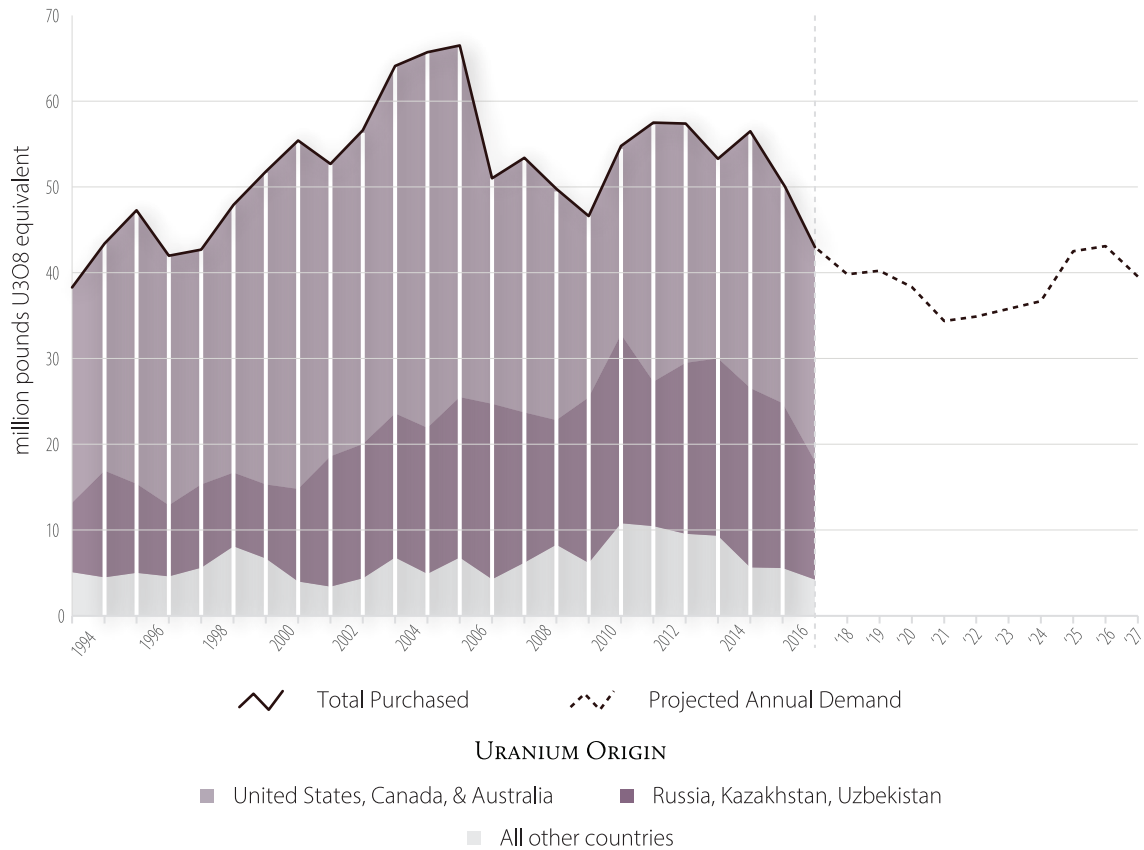
The data shows that mines in these four countries actually supplied about 13.7 million pounds of uranium, only 32 percent of U.S. demand in 2017. That minority role in the U.S. market is not an anomaly. Based on government data, since 1994, imports from Russia, Kazakhstan, Uzbekistan, and China have never made up the majority of U.S. uranium supplies. U.S. purchases of uranium from these four countries have slightly decreased since 2008. That year, mines in Russia, Kazakhstan, and Uzbekistan supplied about 17.5 million pounds, or 33 percent, of U.S. uranium demand.⁷² China did not sell uranium to the U.S. that year.

2010 saw the largest share of U.S. demand ever supplied by these countries, when just over 19 million pounds, or 41 percent of U.S. uranium purchases, came from mines in Russia, Kazakhstan, and Uzbekistan; China did not sell uranium to the U.S. in 2010 either.⁷³ These countries accounted for similar portions of U.S. uranium purchases in 2007⁷⁴ and 2011,⁷⁵ when Russian, Kazakh, and Uzbek mines collectively supplied 20 and 22 million pounds respectively; both figures represent 40 percent of U.S. demand for those years. China contributed to the U.S. supply only in 2011, but not in 2007. Since 1994, these four countries have provided an average of 29 percent of U.S. uranium demand, far below a majority.⁷⁶

On average, the majority of uranium purchased by the U.S. has come from the U.S., Canada, and Australia. In 2017, these three countries supplied 58 percent of U.S. demand. Since 1994, an average of 59 percent of U.S. demand has come from the U.S., Canada, and Australia.¹

¹ Data taken from annual Uranium Marketing Reports by the Energy Information Administration from 1994 to 2017. Divided the sum of uranium supplied to U.S. nuclear reactors from the U.S., Canada, and Australia each year by the total uranium purchased by U.S. reactors each year (U.S. demand). Example: In 2017, 25 million pounds U₃O₈ came from U.S., Canada, Australia; 25 million pounds divided by 43 million pounds total U₃O₈ purchased by U.S. reactors = 58 percent of U.S. demand. EIA Annual Uranium Marketing Reports accessible at: <https://www.eia.gov/uranium/marketing/>.

Total Annual Uranium Purchased by Origin Country and Projected Future Demand



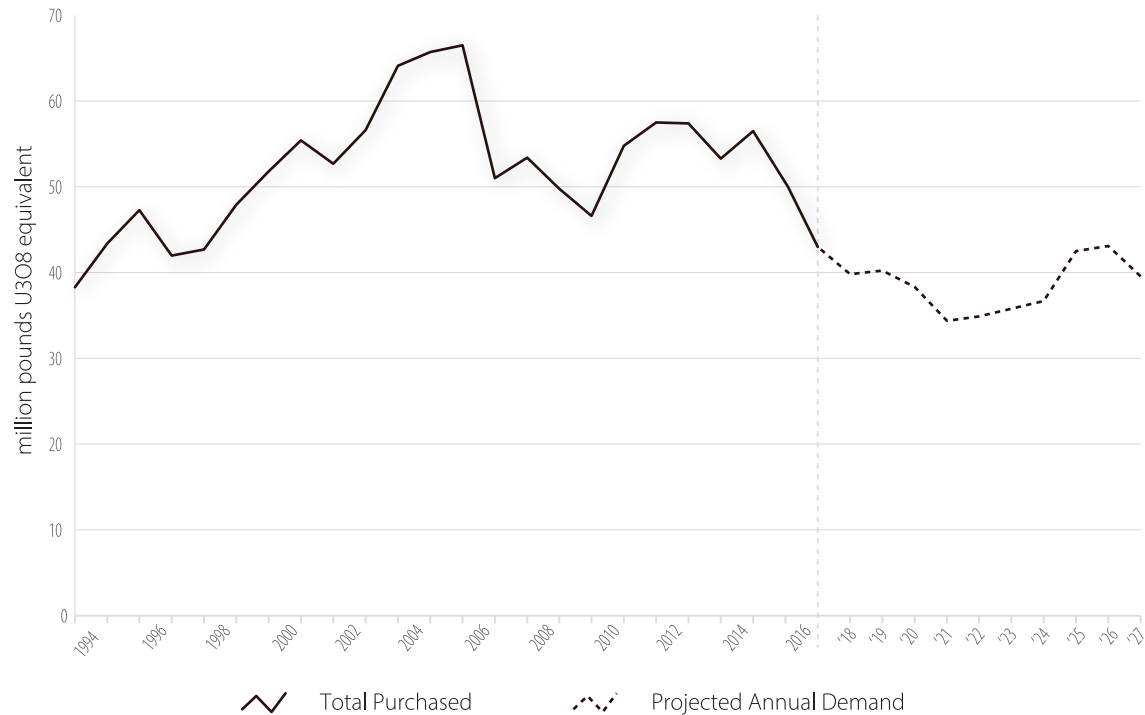
Data Source: EIA Uranium Marketing Annual Reports, Uranium purchased by owners and operators of U.S. civilian nuclear power reactors, 1994–2017 and Contracted purchases of uranium by owners and operators of U.S. civilian nuclear power reactors, signed in 2017, by delivery year, 2018–2027

Import Quotas and a “Buy American” Requirement Could Hurt Supply

The Section 232 Petition argues that uranium mines in the U.S. are put at risk by the looming expiration of an agreement that restricts Russian uranium imports, as well as by Russia’s and China’s plans to ramp up their roles in the U.S. uranium market.⁷⁷ To further emphasize the argument that foreign state-owned uranium suppliers jeopardize U.S. uranium supply, the petition points to Canadian mines—which meet a significant portion of U.S. uranium demand—that were placed on standby in 2018 due to poor market conditions.⁷⁸ If these threats to U.S. uranium supplies are real, there are three reasons that import quotas and a “buy American” requirement are not the answer.

First, the Commerce Department report mandated by Executive Order 13817⁷⁹ is due in late 2018. If U.S. dependence on uranium is indeed a point of national security vulnerability, more emphasis should be placed on Section 4(i) of the order, which requires “a strategy to reduce the Nation’s reliance on critical minerals.” Lowering domestic demand for uranium would be the most effective long-term safeguard against U.S. dependence on state-owned uranium mines in countries such as Russia. Even without explicit measures to decrease U.S. uranium demand, demand is already declining.⁸⁰ In 2017, U.S. uranium demand was 43 million pounds, down from 50.6 million pounds in 2016.⁸¹ The average of the EIA’s “maximum anticipated uranium market requirements” for the years 2018 through 2027 is just 38.5 million pounds per year.⁸²

Total Annual Uranium Purchased and Projected Future Demand



Data Source: EIA Uranium Marketing Annual Reports, Uranium purchased by owners and operators of U.S. civilian nuclear power reactors, 1994–2017 and Contracted purchases of uranium by owners and operators of U.S. civilian nuclear power reactors, signed in 2017, by delivery year, 2018–2027

Second, quotas would not differentiate between uranium from allied countries such as Canada or Australia and uranium from state-owned Russian or Chinese mines. Cameco, a uranium company with significant operations in the U.S. and Canada, submitted comments regarding the 232 Petition to the Commerce Department suggesting that import quotas would harm the company’s operations.^j Cameco claims that quotas would, in fact, reduce allied supplies of uranium and serve to further necessitate purchasing uranium from countries like Russia and Kazakhstan.^k

And finally, Cameco cautions that the petition is “unrealistic in its estimate of feasible U.S. uranium production capabilities.”⁸³ In other words, according to Cameco, quotas and a “buy American” requirement could actually prevent the U.S. from acquiring all the uranium it needs by blocking access to the international market.

^j Cameco Corporation. “Comments of Cameco Corporation on the Section 232 National Security Investigation of Imports of Uranium.” September 25, 2018. Page 28. <https://www.regulations.gov/document?D=BIS-2018-0011-0748>. Accessed 25 October 2018. “If an import quota were placed on imports of Canadian uranium despite existing NAFTA provisions and longstanding bilateral trade policy, further eroding the viability of Canadian producers, Cameco might not be able to make the investment required to sustain reliable uranium supply to U.S. customers in the long-term. Unavailability of Canadian uranium supply would necessarily increase U.S. dependence on state-owned/state controlled producers, which would pose a clearer threat to U.S. energy and national security.”

^k “Cameco does not support the specific quota proposed by the petitioners, as it is unrealistic in its estimate of feasible US uranium production capabilities; would be difficult to implement and harmful to responsible participants in the US nuclear energy industry; and could ultimately increase US dependence on state-controlled uranium supplied by the countries of concern as listed in the petition.”

Is the U.S. Uranium-Mining Industry Critical to National Security?

The Section 232 Petition claims that, should the U.S. uranium mining industry fade, more than only immediate uranium supplies will take a hit. The petition argues that the U.S. would “lose a highly-skilled workforce” along with the ability to maintain its nuclear deterrent⁸⁴ and a stable electrical grid.⁸⁵ But the facts do not support these claims.

On a global scale, uranium mining is not a dying practice. The fact that the companies that submitted these petitions and many in their leadership hail from outside of the U.S.^{86, 87} demonstrates that these skillsets are readily importable, if indeed the risk of losing those skills is real.

URANIUM STOCKPILES FOR DEFENSE

The Section 232 Petition does not accurately represent the truth as to whether domestic uranium mining is the linchpin in assuring that the U.S. has the uranium it needs for defense. The petition misrepresents U.S. uranium supply for defense as directly dependent upon the U.S. uranium-mining industry. In fact, the U.S. already has enough enriched uranium stockpiled to meet military needs for decades to come; improving technology only strengthens that outlook. According to an October 2015 DOE report, tritium supplies—a fuel for nuclear warheads partly derived from nuclear fission of uranium—are sufficient through at least 2040, while other defense uses may not demand new uranium until 2060.⁸⁸ Even these estimates may be conservative.

A more recent study by Frank von Hippel⁸⁹ of Princeton University’s Program on Science and Global Security showed that downblending (processing highly enriched uranium into any form of uranium product that contains less than 20 percent uranium-235) of excess weapons-grade uranium could supply enough low-enriched uranium for tritium production for another 20 years—through at least 2060.⁹⁰ According to von Hippel, the DOE has twice the amount of weapons-grade uranium it needs for the country’s current stockpile of 3,800 nuclear warheads. Downblending just 20 percent of this weapons-grade uranium between 2035 and 2055 would provide enough low-enriched uranium for tritium production through 2060.⁹¹

Indeed, for years, the DOE has been managing a stash of excess uranium that is not needed for national security purposes.⁹² Commentators such as the Union of Concerned Scientists have suggested that the U.S. may never need additional uranium for military purposes if it continues to reduce its nuclear weapons stockpile and converts its naval reactors to use low-enriched uranium rather than highly enriched uranium.⁹³ In its petition asking the Commerce Department to protect the U.S. uranium industry, Energy Fuels extensively discusses the importance of uranium to the U.S. nuclear weapons stockpile and naval fleet, but it avoids referencing the October 2015 DOE report on this topic.⁹⁴ As the former president of the World Nuclear Association has observed, “both Russia and the United States have stockpiles of highly enriched uranium from post-Cold War arms reductions. Neither country need ever fear a shortage of uranium, for weapons or electricity.”⁹⁵

URANIUM FOR NUCLEAR POWER

Regarding nuclear power generation, the stated goal of import quotas and a “buy American” requirement is to stabilize domestic nuclear power generation. But according to the nuclear power industry, this strategy is likely to fail.

In 2018, the NorthBridge Group, an economic and strategic consulting firm serving the electricity and natural gas industries, conducted a market impact study of the proposed import quotas on the U.S.

nuclear power industry. It found the analysis of costs to the power industry in the Section 232 Petition to be “deficient.” According to the study, if the Section 232 Petition had made more reasonable commonsense assumptions about how much the price of uranium would need to increase in order to jumpstart U.S. production, “the resulting range of prices is both very wide and much higher than quota proponents’[sic] estimate.”⁹⁶ The study also shows that the nuclear power industry may not be able to afford to depend on domestic uranium sources. It estimates that the proposed quotas would cost the nuclear power industry “\$500 to \$800 million per year” and possibly more “in the early years of the policy.”⁹⁷ The study goes on to state that the proposed import quotas are likely to lead to further closures of nuclear power plants, causing an employment impact likely to dwarf any increase in mining jobs. It adds that nuclear plant closures would “permanently diminish demand for uranium” and “decrease the resiliency of the electric system.”⁹⁸

Further, regarding the stated goal of maintaining a stable uranium supply for the purpose of nuclear power generation, even in the event that supplies for nuclear power generation are suddenly cut off tomorrow, the U.S. currently holds significant inventories separate from the defense stockpiles. According to the EIA, U.S. utilities currently manage an inventory of about 143 million pounds of uranium oxide. When combined with the roughly 14 million pounds⁹⁹ of excess inventory managed by the federal government, the U.S. could meet 100 percent of anticipated annual demand¹⁰⁰ for the next four years just on stockpiles alone.



SARANA RIGGS

Mining Uranium in the Grand Canyon Region Is Unnecessary

Despite evidence to the contrary, if the Commerce Department still determines that increased domestic uranium mining would somehow benefit economic and national security, the region surrounding the Grand Canyon should not be a source for enlarging the country's uranium stockpile. Even if uranium mining posed no threat to the lands and waters around the Grand Canyon, it still isn't economically practical.

First, uranium can be mined at a higher profit elsewhere in the U.S. Despite the higher grade of uranium ore in the Grand Canyon region, these deposits are in a higher forward-cost category, meaning they are more expensive to mine than other deposits.¹⁰¹ The price of uranium would need to be much higher for it to be economically worthwhile to run a mine in the Grand Canyon region compared to a mine in Wyoming. At the end of 2017, the U.S. government knew of 45.4 million pounds of uranium oxide reserves in the lowest forward-cost category of \$0-\$30 per pound. All of these reserves were located in Colorado, Nebraska, Wyoming, and Texas.¹⁰² Backing up that estimate, the president and CEO of Energy Fuels stated that the price of uranium would need to be at least \$40-\$50 per pound for the deposits at Canyon Mine to be mined at a profit.¹⁰³

Second, uranium is a relatively common metal found in economic concentrations all around the world. The amount of known and minable resources grows as more mineral exploration is completed.¹⁰⁴ In the U.S., mineral exploration has uncovered 836 million pounds of economically minable uranium reserves.¹⁰⁵ The Grand Canyon region is home to just 0.29 percent of that total.¹⁰⁶ More uranium reserves could be identified in the region, but significant uranium reserves have already been identified elsewhere. Even if the price of uranium rises to make Grand Canyon deposits economically viable to mine, a greater volume, and greater efficiency, is already available elsewhere.

To put the volume of known uranium reserves into perspective, in 2017, the U.S. spent 43 million pounds of uranium in nuclear reactors. The federal government forecasts that the country will need, at most, 386 million pounds of uranium through 2027.¹⁰⁷ Without lifting a finger to locate additional minable reserves and without touching the Grand Canyon region, the U.S. demand for uranium could be met for decades with currently identified domestic deposits. Additionally, despite efforts by the uranium industry to see the ban lifted, mining companies have admitted on the record that the Grand Canyon region is not the most important resource. In an interview with Bloomberg News in July 2018, the chief operating officer of Energy Fuels replied to a reporter's question about the Grand Canyon and Bears Ears regions with: "[t]here's enough existing, permitted, licensed capacity to meet that new demand," and "[f]rom our perspective, we don't see a quota [on imports] creating a need to go into those areas."¹

¹ Lee, Stephen. "Uranium Producer Says It Won't Touch Grand Canyon." Bloomberg News. July 19, 2018. <https://news.bloombergenvironment.com/environment-and-energy/uranium-miner-energy-fuels-says-it-wont-touch-grand-canyon>. Accessed 16 October 2018. "Energy Fuels Inc., one of the companies seeking a national quota on uranium imports, probably won't mine for the radioactive element in sensitive areas near the Grand Canyon and Bears Ears National Monument, a top company official told Bloomberg Environment. 'There's enough existing, permitted, licensed capacity to meet that new demand,' said Paul Goranson, chief operating officer of Energy Fuels, one of the nation's biggest uranium producers, headquartered in Lakewood, Colo.. 'From our perspective, we don't see a quota [on imports] creating a need to go into those areas.' The U.S. has plenty of areas to develop uranium production, he said. 'We don't need to go into these culturally sensitive areas.'"

Conclusion

Without question, uranium mining damages the environment. Roads are built across landscapes and industrial truck traffic impacts wildlife and air quality. Storage ponds holding contaminated water in a semi-arid region attract birds and other wildlife. And merely exposing uranium ore to the elements by mining it mobilizes its harmful effects into air and water. We know that uranium mining comes with environmental harm, but data and research to help understand the scope and severity of that harm in the Grand Canyon region is lacking and chronically underfunded. The incomplete evidence that is available does not support claims that uranium can be safely mined in the Grand Canyon region. Without knowing how severe the impacts of mining would be for this landscape, there is no telling how mining might affect the outdoor recreation and tourism industries that depend on it.¹⁰⁸

Uranium operations have left a toxic legacy across the Colorado Plateau, a legacy that still impacts land, drinking water, and public health today. The cleanup of that legacy is slow and expensive.

We know that the Grand Canyon region holds just 0.29 percent of known U.S. uranium reserves. The U.S. has enough stored uranium to meet its defense needs, supply its electrical grid, and to insulate itself from disruptions in supply. In fact, forcing the purchase of domestically mined uranium could actually harm the U.S. uranium supply by harming key suppliers in Canada and other allied countries. It would also harm the U.S. nuclear power industry by increasing costs and driving additional reactors to close. If, despite this evidence, the Trump administration still determines that mining and using more U.S. uranium is a matter of national security, the evidence—even from the mouths of industry officials themselves—says that the Grand Canyon region is not the place to get it.

The dearth of scientific information about environmental risks is a primary reason the mining ban exists. Even if the ban were lifted, outdoor recreation and tourism tied to Grand Canyon National Park and nearby public lands are a more significant and sustainable driver of the regional economy than uranium mining is, has been, or could ever be.

It is clear that enhancing access to U.S. uranium resources and instituting import quotas and a “buy American” requirement are policies suggested by some who seem to be taking advantage of fear, a protectionist agenda, and the very real economic woes of others to overcome the market reality of uranium mining. Given this market reality and the mischaracterization of data to justify these policy changes, the true goal seems to be to increase demand and industry profits rather than to protect short and long-term economic and national security. These policies could jeopardize the temporary mining ban that currently protects the Grand Canyon region from the environmental, cultural, and economic risks of uranium mining.

In the face of significant scientific uncertainty about the scope and severity of the risks uranium mining poses to critical water supplies, cultural values, and the regional economy, the benefits of mining cannot be assumed to outweigh the risks. With only history as a reference point, the precautionary principle tells us to assume that mining could harm a primary component of the regional economy while providing little economic benefit in return. With so many unknowns and so much at stake, uranium should not be mined near the Grand Canyon.

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